# FRE20 Series Bidirection Programmabe AC Power Supply Program Guide



爱科赛博 ACTIONPOWER

# Table of Contents

# 1 General

The PRE20 series bidirectional Programmable AC power supply (hereinafter referred to as PRE20) uses SCPI (Standard Commands for Programmable Instruments) for remote control.

# 2 Communication Protocol

Commands and response information are transmitted in ASCII code, and the minimum delay time between commands is suggested to be 15ms. The PRE20 has an commands buffer and can receive a certain number of consecutive commands. PRE20 executes commands in the order in which they are received.

## 2.1 Common Symbol

1) Angle bracket <>

Angle brackets indicate that the contents are command arguments and are replaced with a valid value when used. For example, <NR1> represents a particular form of numeric data that is used instead of a decimal point.

2) Vertical line |

The vertical line is used to separate multiple parameters. When using a command, only one parameter can be selected at a time.

3) Square bracket []

The square brackets indicate that the contents are omit keywords, and the commands is executed whether or not the key is omitted. For example, [SOURce:]CHANnel? indicates that [SOURce:] can be omitted.

4) Curly braces {}

Curly braces indicate that the argument is multiple.

5) Terminator <LF>

A terminal character is added to each commands, which corresponds to the hexadecimal value 0x0A.

## 2.2 Parameter Format

The remote control input command and power response command can be in three formats: digital, boolean, and string.

1) Digital format

The digital format of the program commands is shown in Table 1.

Table 1 The digital format of program commands

| Symbol | Description | Parameter example |
|---|---|---|
| **NR1** | Numbers don't have a decimal point | 123 |
| **NR2** | Numbers have a decimal point, including NR1 | 12.3 |
| **NR3** | Numbers have decimal points and exponents | 1.23E+2 |
| **NRF** | <NR1> or <NR2> | 123/12.3 |
| **DSC** | A character parameter that sets a limited number of parameter values | MANUal |

2) Boolean format

The input Boolean parameter <Bool> can be expressed as ON|OFF or 0|1.

The Boolean parameter <Bool> in response is expressed only by 0|1.

3) String format

Query commands string returned:

<SRD>: Respond to any ASCII string.

## 2.3 SCPI Commands Introduction

### 2.3.1 SCPI Commands Type

SCPI has two types of commands, common commands and instrument commands.

1） Common commands

Common commands are usually independent of a specific operation and are used to control the overall PRE20 function. Common commands consist of a three-letter mnemonic and an asterisk

*RST (Reset commands)

*IDN? (Instrument identification query)

2） Instrument commands

Instrument commands perform specific PRE20 functions. They are organized into a tree structure with a "root" at the top, consisting of multiple subsystems, each consisting of a root keyword and one or more hierarchical keywords. The SCPI commands tree is detailed in Section 4.5.

### 2.3.2 SCPI Commands Structure

An SCPI commands consists of one or more message units that end with terminators. The terminator is not part of the syntax and is implied at the end of the message unit.

Figure 1 shows the commands structure of a compound commands, which is described in detail below.

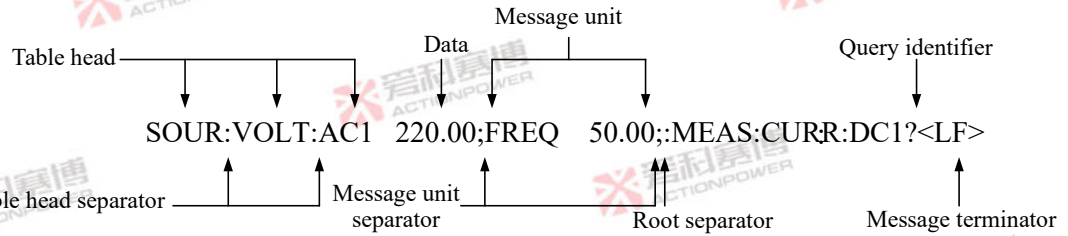


Figure 1 Commands Strucure

1) Table head

The heads of Figure 1 **错误!未找到引用源。** are SOUR, VOLT, AC1, FREQ, MEAS, CURR, DC1.

The header is the commands recognized by the PRE. It can be in a long or short format.

**Long format** Table heads are spelled completely, such as VOLTAGE, MEASURE.

**Short format** Only the first three or four letters are included in the head, such as VOLT or MEAS.

SCPI commands are case-insensitive and can be all uppercase or lowercase. But if you want to abbreviate, you must type all uppercase letters in the commands format, such as:

MEASure:TPOWer:ACTIve? can be abbreviated to:MEAS:TPOW:ACTI? MeaS:Tpow:ACTI? Meas:tpow:acti?

Short heads speed up program execution.

If a command has more than one table header, they must be separated by a colon (table head separator), for example:SOUR:VOLT:AC1 220.00

The head and parameters are separated by one space. The table head is followed by multiple arguments separated by commas “,”, for example:

PROG:LIST:CONT 100,10,50

2） Query identifier

If the commands ends with a question mark (query identifier), for example: MEAS:CURR:DC1? Indicates that the command is a query command. After the command is executed, the device will return the corresponding response information

3） Message unit separator

When two or more message units are combined into a composite message, separate the units with semicolons, for example:SOUR:VOLT:AC1 220.00;FREQ 50.00

4） Root separator

When the colon precedes the first table head of the message unit, it becomes the root separator, the root node of the command tree. In the following example, notice the difference between the root separator and the table head separator:

MEAS:CURR:DC1? All colons are table head delimiters

:MEAS:CURR:DC1? Only the first colon is the root separator

MEAS:CURR:DC1?;:SOUR:VOLT:AC1 220.00 Only the third colon is the root separator

Root commands do not need to be preceded by a colon, because each root command is preceded by an implicit colon.

5） Message terminator

The message terminator notifies PRE20 that the end of the message has been reached, and its

corresponding hexadecimal value is 0x0A. In the examples in this manual, there is an assumed message terminator at the end of each example.

## 2.4 Commands Mark

The commands supported by each PRE20 model vary. This guide will mark the support of the model in the upper right corner of each commands description, as shown in Table 2.

Table 2 Commands Mark

| Model | Mark |
|---|---|
| PRE20XXB | B |
| PRE20XXS | S |
| PRE20XXL | L |

# 3 Common Commands

Common commands available in PRDS are shown in Table 3.

Table 3 Common commands

| Commands | Function description |
|---|---|
| ***IDN?** | Identification Query |
| ***RST** | Reset Command |
| ***TRG** | Trigger to Sequencer |
| **ABORt** | Stop triggered action |
| ***STB?** | Status word register query (Status Byte) |
| ***CLS** | Status register clearing |

The common directives are described in detail below.

| ***IDN?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Query Brand, Device Model, Serial Number, and Device Version of PRE20. | | | |
| Returned Data Format | <SRD> | | | |
| Example | *IDN?<br>ACTIONPOWER,PRE2020B,E1022G0017,01.01.01.01 | | | |

| ***RST** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | After the command is executed, PRE20 does the following:<br>1） If the device is faulty, reset the device fault.<br>2） The system parameters will be restored to the factory default values, which are detailed in the description of each commands.<br>3） User-defined data clearing, such as user-defined waveform data, etc.<br>Notes:<br>1） Some parameters are not within the reset range of this commands, such as communication parameters, etc.<br>2） In case of parallel machine, the parallel machine settings are retained when the host is used, and the parameters associated with the number of parallel machines are restored to the default values according to the number of parallel machines when the device receives this commands. | | | |
| Example | *RST | | | |

| ***TRG** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Program trigger commands. In general, before sending a program trigger command, you need to enter the program enable state. | | | |
| Example | *TRG | | | |

| **ABORt** | | **B** | **S** | **L** |
|---|---|---|---|---|

| | |
|---|---|
| Description | Program exit commands. After the command is executed, the program experiment is terminated and the current program enabled state is exited. |
| Example | ABOR |

| ***STB?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Status Byte query. See the Status report section for the definition of status register. | | |
| Example | *STB? | | |

| ***CLS** | **B** | **S** | **L** |
|---|---|---|---|
| Description | To clear the status register, the following registers will be cleared:<br>1) Status Byte<br>2) Error Queue<br>3) Questionable Status<br>4) Operation Status<br>See the Status Report section for the status register definition. | | |
| Example | *CLS | | |

# 4 Instrument Commands

The subsystem commands available to PRE20 are shown in Table 4.

Table 4 SCPI subsystem commands

| Subsystem | Description |
|---|---|
| **MEASure** | Measure subsystem |
| **SOURce** | Source subsystem |
| **LOAD** | Load subsystem |
| **OUTPut** | Output subsystem |
| **SYSTem** | System subsystem |
| **PROTection** | Protection subsystem |
| **PROGram** | Program subsystem |
| **CEVent** | Event subsystem |
| **MEMory** | Memory subsystem |

## 4.1 MEASure Subsystem

The MEASure subsystem is used to query the value of PRE20 operating parameters. The MEASure subsystem consists of measurement commands such as voltage, current, power, frequency and harmonics.

### 4.1.1 Voltage Measurement Commands

| **MEASure:VOLTage:ACDC#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the valid voltage value for the selected phase #. (unit: V)<br>When the output phase number of PRE20 is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3.<br>When PRE20 output phase number is 1 phase, #=1 means φ1, #=2, #=3 return invalid value. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:VOLT:ACDC1?<br>220.0 | | |

| **MEASure:VOLTage:AC#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the voltage AC component of the selected phase #. (Unit: V)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value. | | |

| | |
|---|---|
| | When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. |
| Returned Data Format | <NR2> |
| Example | MEAS:VOLT:AC1?<br>220.0 |

| **MEASure:VOLTage:DC#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the voltage DC component of the selected phase #. (Unit: V)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:VOLT:DC1?<br>100.0 | | |

| **MEASure:VOLTage:VLL#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the line voltage valid value for the selected line #. (Unit: V)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and | | |

| | |
|---|---|
| | #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. |
| Returned Data Format | <NR2> |
| Example | MEAS:VOLT:VLL1?<br>380.0 |

| **MEASure:VOLTage:THD#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the voltage THD of the selected phase #. (Unit: %)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:VOLT:THD1?<br>5.0 | | |

| **MEASure:VOLTage:PEAK#?** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Returns the peak voltage of the selected phase #. (Unit: V)<br>When the output phase number of PRE20 is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3.<br>When PRE20 output phase number is 1 phase, #=1 means φ1, #=2, #=3 return invalid value. |
| Returned Data Format | <NR2> |
| Example | MEAS:VOLT:PEAK1?<br>311.0 |

### 4.1.2 Current Measurement Commands

| **MEASure:CURRent:ACDC#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns valid current values for the selected phase #. (Unit: A)<br>When the output phase number of PRE20 is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3.<br>When PRE20 output phase number is 1 phase, #=1 means φ1, #=2, #=3 return invalid value. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:CURR:ACDC1?<br>10.0 | | |

| **MEASure:CURRent:AC#?** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Returns the AC component of the current in the selected phase #. (Unit: A)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. |
| Returned Data Format | <NR2> |
| Example | MEAS:CURR:AC1?<br>10.0 |

| **MEASure:CURRent:DC#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the DC component of the current in the selected phase #. (Unit: A)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:CURR:DC1?<br>10.0 | | |

| **MEASure:CURRent:CRESt#?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Returns the peak current factor of the selected phase #.<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | | |
| Returned Data Format | <NR2> | | | |
| Example | MEAS:CURR:CRES1?<br>1.414 | | | |

| **MEASure:CURRent:THD#?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Returns the current THD of the selected phase #. (Unit: %)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | | |
| Returned Data Format | <NR2> | | | |

| | |
|---|---|
| Example | MEAS:CURR:THD1?<br>5.0 |

| **MEASure:CURRent:PEAK#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the peak current of the selected phase #. (Unit: A)<br>When the output phase number of PRE20 is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3.<br>When PRE20 output phase number is 1 phase, #=1 means φ1, #=2, #=3 return invalid value. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:CURR:PEAK1?<br>14.14 | | |

| **MEASure:CURRent:INRush#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the impact current of the selected phase #. (Unit: A)<br>When the output phase number of PRE20 is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3.<br>When PRE20 output phase number is 1 phase, #=1 means φ1, #=2, #=3 return invalid value. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:CURR:INR1?<br>20.0 | | |

### 4.1.3 Power Measurement Commands

| **MEASure:POWer:ACTive#?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Returns the active power of the selected phase #. (Unit: kW)<br>When the output phase number of PRE20 is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3.<br>When PRE20 output phase number is 1 phase, #=1 means φ1, #=2, #=3 return invalid value. | | | |
| Returned Data Format | <NR2> | | | |
| Example | MEAS:POW:ACT1?<br>5.0 | | | |

| **MEASure:POWer:APPArent#?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Returns the apparent power of the selected phase #. (Unit: kVA)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | | |
| Returned Data Format | <NR2> | | | |

| | |
|---|---|
| Example | MEAS:POW:APP1?<br>5.0 |

| **MEASure:POWer:REACtive#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the reactive power of the selected phase #. (Unit: kvar)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:POW:REAC1?<br>0.0 | | |

| **MEASure:POWer:PFACtor#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the power factor of the selected phase #.<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and | | |

| | |
|---|---|
| | #=3 are invalid. |
| Returned Data Format | <NR2> |
| Example | MEAS:POW:PFAC1?<br>0.99 |

| **MEASure:TPOWer:ACTive?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns total active power. (Unit: kW) | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:TPOW:ACT?<br>15.0 | | |

| **MEASure:TPOWer:APParent?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns total apparent power. (Unit: kVA)<br>If the PRE20 coupling mode is DC, return invalid. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:TPOW:APP?<br>15.0 | | |

| **MEASure:TPOWer:REACTive?** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Returns total reactive power. (Unit: kvar)<br>If the PRE20 coupling mode is DC, return invalid. |
| Returned Data Format | <NR2> |
| Example | MEAS:TPOW:REAC?<br>0.0 |

| **MEASure:TPOWer:PFACtor?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the total power factor.<br>If the PRE20 coupling mode is DC, return invalid. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:TPOW:PFAC?<br>0.99 | | |

### 4.1.4 Frenquency Measurement Commands

| **MEASure:FREQuency#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the output frequency of the selected phase #. (Unit: Hz)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and | | |

| | |
|---|---|
| | #=3 are invalid. |
| Returned Data Format | <NR2> |
| Example | MEAS:FREQ1?<br>50.0 |

### 4.1.5 Harmonic Measurement Commands

| **MEASure:HARMonic:VOLTage#?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Returns the voltage harmonic content of the selected phase #. (Unit: %)<br>A total of 100 data items are returned, separated by commas (,). The first data is the voltage fundamental wave content, the second data is the voltage second harmonic content, and so on.<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | | |
| Returned Data Format | <NR2>,<NR2>,…,<NR2> | | | |
| Example | MEAS:HARM:VOLT1?<br>100.0,1.0,…,0.0 | | | |

| MEASure:HARMonic:CURRent#? | B | S | L |
|---|---|---|---|
| Description | Returns the current harmonic content of the selected phase #. (Unit: %)<br>A total of 100 data items are returned, separated by commas (,). The first data is the voltage fundamental wave content, the second data is the voltage second harmonic content, and so on.<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. | | | |
| Returned Data Format | <NR2>,<NR2>,…,<NR2> | | | |
| Example | MEAS:HARM:CURR1?<br>100.0,1.0,…,0.0 | | | |

### 4.1.6 Phase Measurement Commands

| MEASure:PHASe#? | B | S | L |
|---|---|---|---|
| Description | Returns the voltage phase of the selected phase #. (Unit: °)<br>When the coupling mode of PRE20 is AC or AC+DC, if the number of output phases is 3 phase or split phase, #=1 represents φ1, #=2 represents φ2, and #=3 represents φ3. If the number of output phases is 1 phase, #=1 means φ1, | | | |

| | |
|---|---|
| | #=2, #=3 returns invalid value.<br>When the coupling mode of PRE20 is DC, the return values of #=1, #=2 and #=3 are invalid. |
| Returned Data Format | <NR2>,<NR2>,<NR2>,……,<NR2> |
| Example | MEAS:PHAS2?<br>240.0 |

### 4.1.7 Other Measurement Commands

| **MEASure:TIME:TRAN?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Return the transition time of the load. (Unit: ms)<br>When PRE20 works in Load mode and the load mode is CR, return valid. | | |
| Returned Data Format | <NR2> | | |
| Example | MEAS:TIME:TRAN?<br>100 | | |

| **MEASure:TIME:RUN:HOUR?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Return load running hour (unit: h).<br>When PRE20 works in Load mode, return valid.<br>OUTPut:TIME | | |
| Returned Data Format | <NR2> | | |
| Example | MEASure:TIME:RUN:HOUR? | | |

| | |
|---|---|
| | 100 |

| **MEASure:TIME:RUN:MINute?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Return load running minute (unit: min).<br>When PRE20 works in Load mode and the load mode is CR, return valid. | | | |
| Returned Data Format | <NR2> | | | |
| Example | MEAS:TIME:TRAN?<br>100 | | | |

| **MEASure:TIME:RUN:SECond?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Return load running second (unit: s).<br>When PRE20 works in Load mode and the load mode is CR, return valid. | | | |
| Returned Data Format | <NR2> | | | |
| Example | MEAS:TIME:TRAN?<br>100 | | | |

| **MEASure:ALL#?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Returns 63 running parameter values separated by commas “,”. The parameter list is as follows:<br>Effective value of voltage of φ1、φ2、φ3 (unit: V)<br>Voltage THD of φ1、φ2、φ3 | | | |

Voltage AC component of φ1、φ2、φ3 (unit: V)
Voltage DC component of φ1、φ2、φ3 (unit: V)
Peak voltage of φ1、φ2、φ3 (unit: V)
Voltage phase of φ1、φ2、φ3 (unit: °)
Output frequency of φ1、φ2、φ3 (unit: Hz)
Effective value of line voltage of $U_{12}$,$U_{23}$,$U_{31}$ (unit: V)
Effective value of current of φ1、φ2、φ3 (unit: A)
Current THD of φ1、φ2、φ3
AC component of current of φ1、φ2、φ3 (unit: A)
DC component of current of φ1、φ2、φ3 (Unit: A)
Peak current of φ1、φ2、φ3 (unit: A)
Current peak factor of φ1、φ2、φ3
Apparent power of φ1、φ2、φ3 (unit: kVA)
Active power of φ1、φ2、φ3 (unit: kW)
Reactive power of φ1、φ2、φ3 (unit: kvar)
Total apparent power (unit: kVA)
Total active power (unit: kW)
Total reactive power (unit: kvar)
Power factor of φ1、φ2、φ3
Total power factor
Impulse current of φ1、φ2、φ3 (unit: A)

| | |
|---|---|
| | Running time (unit: h)<br>Conversion time (unit: ms))<br>If the output phase number of PRE20 is 1 phase, φ1 is 1 phase operating parameter, and the return value of φ2 and φ3 is invalid.<br>The influence of PRE20 coupling mode on data validity is described in the description of each measurement commands. |
| Returned Data Format | <NR2>,<NR2>,…,<NR2>,<NR1>,<NR1> |
| Example | MEAS:ALL?<br>220.0,220.0,220.0,5.0,5.0,5.0,220.0,220.0,220.0,0.0,0.0,0.0,311.0,311.0,311.0<br>,0.0,240.0,120.0,50.0,50.0,50.0,380.0,380.0,380.0,10.00,10.00,10.00,5.0,5.0,5<br>.0,10.0,10.0,10.0,0.0,0.0,0.0,14.14,14.14,14.14,1.414,1.414,1.414,2.2,2.2,2.2,<br>2.2,2.2,2.2,0.0,0.0,0.0,15.0,15.0,0.0,0.99,0.99,0.99,0.99,20.0,20.0,20.0,2,100 |

## 4.2 SOURce Subsystem

The SOURce subsystem is used to set the given and limit parameter values in the source mode. The SOURCE subsystem consists of voltage, current, power, internal impedance and other setting commands.

### 4.2.1 Voltage Setting Commands

| **[SOURce]:VOLTage:CHANnel** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the number of output phases in source mode, which can only be set in standby mode. | | | |
| Parameters | <THRee\|EACH\|SINGle>,Default THRee.<br>THRee:3-phase<br>EACH:split-phase<br>SINGle:1-phase | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **[SOURce]:VOLTage:CHANnel?** | | | |
| Returned Data Format | <DSC> | | | |
| Example | SOUR:VOLT:CHAN THR<br>SOUR:VOLT:CHAN?<br>THRee | | | |

| **[SOURce]:VOLTage:COUPling** | **B** | **S** | |
|---|---|---|---|

| | |
|---|---|
| Description | Set the source mode coupling mode, which can only be set in standby mode. |
| Parameters | <AC\|DC\|ACDC>,Default AC.<br>AC<br>DC<br>ACDC:AD+DC |
| Parameter Format | <DSC> |
| Query Format | [SOURce]:VOLTage:COUPling? |
| Returned Data Format | <DSC> |
| Example | SOUR:VOLT:COUP AC<br>SOUR:VOLT:COUP?<br>AC |

| **[SOURce]:VOLTage:WAVeform** | **B** | **S** |
|---|---|---|
| Description | Set the source mode output waveform, which can only be set in standby mode. The waveform definition list is as follows:<br>0:Sine wave<br>1:Pulse wave<br>2:Triangular wave<br>3:clipping<br>4:Positive half wave<br>5:Negative half wave<br>6:Front half wave<br>7:Trailing edge half wave | |

| | |
|---|---|
| | 8~37:DST1~DST30<br>38:2 Pulse wave<br>39:6 Pulse wave<br>40:12 Pulse wave<br>41:18 Pulse wave<br>42:24 Pulse wave<br>43~142:Shape1~Shape100(The current version supports 43~57) |
| Parameters | 0~142,Default 0. |
| Parameter Format | <NR1> |
| Query Format | **[SOURce]:VOLTage:WAVeform?** |
| Returned Data Format | <NR1> |
| Example | SOUR:VOLT:WAV 0<br>SOUR:VOLT:WAV?<br>0 |

| **[SOURce]:VOLTage:DCYCle** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the duty cycle of the source mode pulse wave, which takes effect when the pulse wave is selected as the output waveform. (%) | | | |
| Parameters | 0.00~100.00,Default 50.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:VOLTage:DCYCle?** | | | |
| Returned Data Format | <NRF> | | | |

| | |
|---|---|
| Example | SOUR:VOLT:DCYC 50.00<br>SOUR:VOLT:DCYC?<br>50.0 |

| **[SOURce]:VOLTage:SYMMetry** | | **B** | **S** |
|---|---|---|---|
| Description | Set the symmetry of triangle wave in source mode, which takes effect when triangle wave is selected for output waveform. (%) | | |
| Parameters | 0.00~100.00,Default 50.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:SYMMetry?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:SYMM 50.00<br>SOUR:VOLT:SYMM?<br>50.0 | | |

| **[SOURce]:VOLTage:CSINewave** | | **B** | **S** |
|---|---|---|---|
| Description | Set the clipping percent of source mode, which takes effect when clipping is selected for output waveform. (%) | | |
| Parameters | 0.00~50.00,Default 0.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:CSINewave?** | | |
| Returned Data Format | <NRF> | | |

| | |
|---|---|
| Example | SOUR:VOLT:CSIN 0.00<br>SOUR:VOLT:CSIN?<br>0.0 |

| **[SOURce]:VOLTage:LEAD** | **B** | **S** | |
|---|---|---|---|
| Description | Set the conduction angle percent of the source mode, which takes effect when the leading edge half wave is selected for the output waveform. (%) | | |
| Parameters | 0.00~100.00,Default 50.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:LEAD?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:LEAD 50.00<br>SOUR:VOLT:LEAD?<br>50.0 | | |

| **[SOURce]:VOLTage:WMODe** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the source mode and custom waveform mode. It will take effect when shape\\. | | |
| Parameters | <PEAK\|RMS>,Default PAKE.<br>PEAK:Peak mode<br>RMS:Valid value mode | | |
| Parameter Format | <DSC> | | |
| Query Format | **[SOURce]:VOLTage:WMODe?** | | |

| | |
|---|---|
| Returned Data Format | <DSC> |
| Example | SOUR:VOLT:WMOD PEAK<br>SOUR:VOLT:WMOD?<br>PEAK |

| **[SOURce]:VOLTage:TRAil** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the turn off angle percent of the source mode, which takes effect when the output waveform is selected as the trailing half wave. (%) | | | |
| Parameters | 0.00~100.00,Default 50.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:VOLTage:TRAil?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:VOLT:TRA 50.00<br>SOUR:VOLT:TRA?<br>50.0 | | | |

| **[SOURce]:VOLTage:AC#** | | **B** | **S** | |
|---|---|---|---|---|

| | |
|---|---|
| Description | Set the AC voltage setting value of the selected phase . (V)<br>When the coupling mode of PRE20 source mode is AC or AC+DC:<br>If the number of output phases in source mode is split,#=1 is φ1,#=2 is φ2,#=3 is φ3;<br>If the output phase number of source mode is 3-phase,#=1 is φ1, φ2, φ3 values are automatically consistent with φ1;<br>If the output phase number of source mode is 1-phase,#=1 is φ1,#=2, #=3 Set invalid value.<br>When the coupling mode of pre20 source mode is DC:#=1,#=2,#=3 are invalid. |
| Parameters | 0.00~450.00,Default 220.00. |
| Parameter Format | <NRF> |
| Query Format | **[SOURce]:VOLTage:AC#?** |
| Returned Data Format | <NRF> |
| Example | SOUR:VOLT:AC1 220.00<br>SOUR:VOLT:AC1?<br>220.0 |

| **[SOURce]:VOLTage:DC#** | **B** | **S** |
|---|---|---|

| | |
|---|---|
| Description | Set the DC voltage setting value of the selected phase .(V)<br>When the coupling mode of PRE20 source mode is AC or AC+DC:<br>If the number of output phases in source mode is split,#=1 is φ1,#=2 is φ2,#=3 is φ3;<br>If the output phase number of source mode is 3-phase,#=1 is φ1, φ2, φ3 values are automatically consistent with φ1;<br>If the output phase number of source mode is 1-phase,#=1 is φ1,#=2, #=3 Set invalid value.<br>When the coupling mode of pre20 source mode is AC:#=1,#=2,#=3 are invalid. |
| Parameters | -636.00~636.00,Default 0.0. |
| Parameter Format | <NRF> |
| Query Format | **[SOURce]:VOLTage:DC#?** |
| Returned Data Format | <NRF> |
| Example | SOUR:VOLT:DC1 10.00<br>SOUR:VOLT:DC1?<br>10.0 |

| **[SOURce]:VOLTage:PHASe#** | **B** | **S** |
|---|---|---|
| Description | Set the phase setting value of the selected phase .(°)<br>When the coupling mode of PRE20 source mode is AC or AC+DC:<br>If the number of output phases of source mode is split phase or 3-phase,#=1 is φ1,#=2 is φ2,#=3 is φ3; | |

| | |
|---|---|
| | If the output phase number of source mode is 1-phase,#=1 is φ1,#=2, #=3 Set invalid value.<br>When the coupling mode of pre20 source mode is DC::#=1,#=2,#=3#=1,#=2,#=3 are invalid. |
| Parameters | 0.0~359.9,φ1 defaults to 0.0,φ2 defaults to 240.0,φ3 defaults to 120.0. |
| Parameter Format | <NRF> |
| Query Format | **[SOURce]:VOLTage:PHASe#?** |
| Returned Data Format | <NRF> |
| Example | SOUR:VOLT:PHAS2 240.00<br>SOUR:VOLT:PHAS2?<br>240.0 |

| **[SOURce]:VOLTage:FREQuency** | **B** | **S** |
|---|---|---|
| Description | Set the output frequency setting value.(Hz)<br>When the coupling mode of PRE20 source mode is AC or AC+DC, the setting value is valid. |
| Parameters | 0.001~200.000,Default 50.000. |
| Parameter Format | <NRF> |
| Query Format | **[SOURce]:VOLTage:FREQuency?** |
| Returned Data Format | <NRF> |
| Example | SOUR:VOLT:FREQ 50.0<br>SOUR:VOLT:FREQ? |

| | |
|---|---|
| | 50.0 |

| **[SOURce]:VOLTage:SRATe:AC** | | **B** | **S** |
|---|---|---|---|
| Description | Set the AC voltage slope.(V/ms)<br>When the coupling mode of PRE20 source mode is AC or AC+DC, the setting value is valid. | | |
| Parameters | 0.01~3000.00,Default 50.000. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:SRATe:AC?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:SRAT:AC 500.00<br>SOUR:VOLT:SRAT:AC?<br>500.0 | | |

| **[SOURce]:VOLTage:SRATe:DC** | | **B** | **S** |
|---|---|---|---|
| Description | Set the DC voltage slope.(V/ms)<br>When the coupling mode of PRE20 source mode is AC or AC+DC, the setting value is valid. | | |
| Parameters | 0.01~3000.00,Default 500.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage: SRATe:DC?** | | |
| Returned Data Format | <NRF> | | |

| | |
|---|---|
| Example | SOUR:VOLT:SRAT:DC 500.00<br>SOUR:VOLT:SRAT:DC?<br>500.0 |

| **[SOURce]:VOLTage:SRATe:FREQ** | **B** | **S** |
|---|---|---|
| Description | Set the frequency slope.(Hz/ms)<br>When the coupling mode of PRE20 source mode is AC or AC+DC, the setting value is valid. | |
| Parameters | 0.0001~20000.0000,Default 100.0000. | |
| Parameter Format | <NRF> | |
| Query Format | **[SOURce]:VOLTage:SRATe:FREQ?** | |
| Returned Data Format | <NRF> | |
| Example | SOUR:VOLT:SRAT:FREQ 100.0000<br>SOUR:VOLT:SRAT:FREQ?<br>200.0 | |

| **[SOURce]:VOLTage:SPEed** | **B** | **S** |
|---|---|---|
| Description | Set the response speed of source mode. | |
| Parameters | <FAST\|MIDium\|SLOW>,Default MIDium.<br>SLOW:Low speed<br>MIDium:Medium speed<br>FAST:High speed | |

| | |
|---|---|
| Parameter Format | <DSC> |
| Query Format | **[SOURce]:VOLTage:SPEed?** |
| Returned Data Format | <DSC> |
| Example | SOUR:VOLT:SPE MID<br>SOUR:VOLT:SPE?<br>MID |

| **[SOURce]:VOLTage:SLEW** | | **B** | **S** |
|---|---|---|---|
| Description | Set the voltage swing rate.(V/us) | | |
| Parameters | 0.020~10.000,Default 1.000. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:SLEW?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:SLEW 1.000<br>SOUR:VOLT:SLEW?<br>1.0 | | |

| **[SOURce]:VOLTage:OFFSr** | | **B** | **S** |
|---|---|---|---|
| Description | Set the source mode off swing rate.(V/us) | | |
| Parameters | 0.0020~10.0000,Default 2.0000. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:OFFSr?** | | |

| | |
|---|---|
| Returned Data Format | <NRF> |
| Example | SOUR:VOLT:OFFS 2.0000<br>SOUR:VOLT:OFFS?<br>2.0 |

| **[SOURce]:VOLTage:ANGLe:ON** | **B** | **S** |
|---|---|---|
| Description | Set the degree of source mode.(°) | |
| Parameters | 0.0~359.9,Default 0.0. | |
| Parameter Format | <NRF> | |
| Query Format | **[SOURce]:VOLTage:ANGLe:ON?** | |
| Returned Data Format | <NRF> | |
| Example | SOUR:VOLT:ANGL:ON 0.0<br>SOUR:VOLT:ANGL:ON?<br>0.0 | |

| **[SOURce]:VOLTage:ANGLe:OFF** | **B** | **S** |
|---|---|---|
| Description | Set the source mode shutdown angle.(°) | |
| Parameters | 0.0~359.9,Default 0.0. | |
| Parameter Format | <NRF> | |
| Query Format | **[SOURce]:VOLTage:ANGLe:OFF?** | |
| Returned Data Format | <NRF> | |
| Example | SOUR:VOLT:ANGL:OFF 0.0 | |

| | |
|---|---|
| | SOUR:VOLT:ANGL:OFF?<br>0.0 |

| **[SOURce]:VOLTage:TPHase:SYNC** | | **B** | **S** |
|---|---|---|---|
| Description | Set the source mode transient angle enable. | | |
| Parameters | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Enable<br>OFF/0:Disable | | |
| Parameter Format | <Bool> | | |
| Query Format | **[SOURce]:VOLTage:TPHase:SYNC?** | | |
| Returned Data Format | <Bool> | | |
| Example | LOAD:VOLT:TPH:SYNC OFF<br>LOAD:VOLT:TPH:SYNC?<br>0 | | |

| **[SOURce]:VOLTage:TPHase:VALue** | | **B** | **S** |
|---|---|---|---|
| Description | Set the source mode transient angle.(°) | | |
| Parameters | 0.0~359.9,Default 0. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:TPHase:VALue?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:TPH:VAL 0.0 | | |

| | |
|---|---|
| | SOUR:VOLT:TPH:VAL?<br>0.0 |

| **[SOURce]:VOLTage:SYNCdelay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the external synchronization delay time.(unit:ms) | | |
| Parameters | 0~999999,Default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **[SOURce]:VOLTage:SYNCdelay?** | | |
| Returned Data Format | <NR1> | | |
| Example | SOUR:VOLT:SYNC 0<br>SOUR:VOLT:SYNC?<br>0 | | |

| **[SOURce]:VOLTage:ACULimit** | | **B** | **S** |
|---|---|---|---|
| Description | Set the upper limit of AC voltage.(V) | | |
| Parameters | 0.00~450.00,Default 450.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:ACULimit?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:ACUL 450.00<br>SOUR:VOLT:ACUL?<br>450.0 | | |

| **[SOURce]:VOLTage:ACLLimit** | | **B** | **S** |
|---|---|---|---|
| Description | Set the lower limit of AC voltage.(V) | | |
| Parameters | 0.00~450.00,Default 0.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:ACLLimit?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:ACLL 0.00<br>SOUR:VOLT:ACLL?<br>0.0 | | |

| **[SOURce]:VOLTage:DCULimit** | | **B** | **S** |
|---|---|---|---|
| Description | Set the upper limit of DC voltage.(V) | | |
| Parameters | -636.00~636.00,Default 636.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:VOLTage:DCULimit?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:VOLT:DCUL 636.00<br>SOUR:VOLT:DCUL?<br>636.0 | | |

| **[SOURce]:VOLTage:DCLLimit** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the lower limit of DC voltage.(V) | | | |
| Parameters | -636.00~636.00,Default -636.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:VOLTage:DCLLimit?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:VOLT:DCLL -636.00<br>SOUR:VOLT:DCLL?<br>-636.0 | | | |

| **[SOURce]:VOLTage:FULimit** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the upper frequency limit.(Hz) | | | |
| Parameters | 0.001~200.000,Default 200.000. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:VOLTage:FULimit?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:VOLT:FUL 200.000<br>SOUR:VOLT:FUL?<br>200.0 | | | |

| **[SOURce]:VOLTage:FLLimit** | | **B** | **S** | |
|---|---|---|---|---|

| | |
|---|---|
| Description | Set the lower frequency limit.(Hz) |
| Parameters | 0.001~200.000,Default 0.001. |
| Parameter Format | <NRF> |
| Query Format | **[SOURce]:VOLTage:FLLimit?** |
| Returned Data Format | <NRF> |
| Example | SOUR:VOLT:FLL 0.001<br>SOUR:VOLT:FLL?<br>0.001 |

### 4.2.2 Current Setting Commands

| **[SOURce]:CURRent:AC#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set AC current limit,#1~4(A),<br>#=1 is φ1, #=2 is φ2,#=3 is φ3,#=4 is single phase φ 1. | | |
| Parameters | See the current item in table 13 in section 8.3 of the operation manual for details. | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:CURRent:AC#?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:CURR:AC1 28.00<br>SOUR:CURR:AC1?<br>28.00 | | |

| **[SOURce]:CURRent:PDC#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set positive DC current limit,#1~4(A),<br>#=1 is φ1, #=2 is φ2,#=3 is φ3,#=4 is single phase φ 1. | | | |
| Parameters | See the positive current item in table 13 in section 8.3 of the operation manual for the range and default values. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:CURRent:PDC#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:CURR:PDC1 28.00<br>SOUR:CURR:PDC1?<br>28.00 | | | |

| **[SOURce]:CURRent:NDC#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set negative DC current limit,#1~4(A),<br>#=1 is φ1, #=2 is φ2,#=3 is φ3,#=4 is single phase φ 1. | | | |
| Parameters | See the negative current item in table 13 in section 8.3 of the operation manual for details. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:CURRent:NDC#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:CURR:NDC1 -28.00<br>SOUR:CURR:NDC1? | | | |

| | |
|---|---|
| | -28.00 |

| **[SOURce]:CURRent:ACULimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the upper limit of AC current setting(A). | | | |
| Parameters | See Table 5 for details | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:CURRent:ACULimit?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:CURR:ACUL 28.00<br>SOUR:CURR:ACUL?<br>28.00 | | | |

Table 5 Given upper/lower limit range and default value of source current

| Parameters | Model | Parameters | Default value |
|---|---|---|---|
| Upper limit of AC current<br>Lower limit of AC current<br>Upper limit of DC current | PRE2006S | 0~30 | upper limit:30<br>lower limit:0 |
| | PRE2007S | | |
| | PRE2009S | 0~35 | upper limit:35<br>lower limit:0 |
| | PRE2012S | | |
| | PRE2015S | | |
| | PRE2020S | | |

| **[SOURce]:CURRent:ACLLimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the lower limit of AC current setting(A). | | | |
| Parameters | See Table 5 for details | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:CURRent:ACLLimit?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:CURR:ACLL 8.00<br>SOUR:CURR:ACLL?<br>8.00 | | | |

| **[SOURce]:CURRent:DCULimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the given upper limit of DC current(A). | | | |
| Parameters | See Table 5 for details | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:CURRent:DCULimit?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:CURR:DCUL 28.00<br>SOUR:CURR:DCUL?<br>28.00 | | | |

| **[SOURce]:CURRent:DCLLimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the given lower limit of DC current(A). | | | |
| Parameters | See Table 6 for details | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:CURRent:DCLLimit?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:CURR:DCLL -28.00<br>SOUR:CURR:DCLL?<br>-28.00 | | | |

Table 6 SOURce lower limit range and default value of DC current

| Parameters | Model | Parameters | Default value |
|---|---|---|---|
| Lower limit of DC current | PRE2006S | -30~0 | -30 |
| | PRE2007S | | |
| | PRE2009S | -35~0 | -35 |
| | PRE2012S | | |
| | PRE2015S | | |
| | PRE2020S | | |

| **[SOURce]:CURRent:INRush:STARt** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the start time of impulse current (ms). | | | |

| | |
|---|---|
| Parameters | <0~999999>,Default 0. |
| Parameter Format | <NR1> |
| Query Format | **[SOURce]:CURRent:INRush:STARt?** |
| Returned Data Format | <NR1> |
| Example | SOUR:CURR:INR:STAR 999<br>SOUR:CURR:INR:STAR?<br>999 |

| **[SOURce]:CURRent:INRush:INTerval** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set impulse current interval (ms). | | |
| Parameters | <0~999999>,Default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **[SOURce]:CURRent:INRush:INTerval?** | | |
| Returned Data Format | <NR1> | | |
| Example | SOUR:CURR:INR:INT 999<br>SOUR:CURR:INR:INT?<br>999 | | |

### 4.2.3 Power Setting Commands

| **[SOURce]:POWer:PACTive#** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Set positive active power limit,#1~4 (kW)<br>#=1 is φ1, #=2 is φ2,#=3 is φ3,#=4 is single phase φ 1. |
| Parameters | See table 13 of section 8.3 of the operation manual for the positive active power term |
| Parameter Format | <NRF> |
| Query Format | **[SOURce]:POWer:PACTive#?** |
| Returned Data Format | <NRF> |
| Example | SOUR:POW:PACT1 1.00<br>SOUR:POW:PACT1?<br>1.00 |

| **[SOURce]:POWer:NACTive#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set negative active power limit,#1~4 (kW)<br>#=1 is φ1, #=2 is φ2,#=3 is φ3,#=4 is single phase φ 1. | | |
| Parameters | See the negative active power item in table 13 in section 8.3 of the operation manual for the range and default values | | |
| Parameter Format | <NRF> | | |
| Query Format | **[SOURce]:POWer:NACTive#?** | | |
| Returned Data Format | <NRF> | | |
| Example | SOUR:POW:NACT1 -1.00<br>SOUR:POW:NACT1?<br>-1.00 | | |

| **[SOURce]:POWer:APParent#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set apparent power limit,#1~4 (kVA) | | | |
| Parameters | See the apparent power item in table 13 in section 8.3 of the operation manual for details. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:POWer:APParent#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:POW:APP1 1.000<br>SOUR:POW:APP1?<br>1.000 | | | |

| **[SOURce]:POWer:ACULimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the upper limit of active power (kW) | | | |
| Parameters | See Table 7 for details. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:POWer:ACULimit#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:POW:ACUL 1.00<br>SOUR:POW:ACUL?<br>1.00 | | | |

Table7 SOURce lower limit range and default value

| Parameters | Model | Parameters | Default value |
|---|---|---|---|
| Upper limit of active power<br>Upper limit of apparent power<br>Lower limit of apparent power | PRE2006S | 0~2 | upper limit:2<br>lower limit:0 |
| | PRE2007S | 0~2.5 | upper limit:2.5<br>lower limit:0 |
| | PRE2009S | 0~3 | upper limit:3<br>lower limit:0 |
| | PRE2012S | 0~4 | upper limit:4<br>lower limit:0 |
| | PRE2015S | 0~5 | upper limit:5<br>lower limit:0 |
| | PRE2020S | 0~6.667 | upper limit:6.667<br>lower limit:0 |

| **[SOURce]:POWer:ACLLimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the given lower limit of active power (kW) | | | |
| Parameters | See Table 8 for details | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:POWer:ACLLimit#?** | | | |

| | |
|---|---|
| Returned Data Format | <NRF> |
| Example | SOUR:POW:ACLL -1.00<br>SOUR:POW:ACLL?<br>-1.00 |

Table 8 SOURce lower limit range and default value

| Parameters | Model | Ranges | Default value |
|---|---|---|---|
| Lower limit of active power | PRE2006S | -2~0 | -2 |
| | PRE2007S | -2.5~0 | -2.5 |
| | PRE2009S | -3~0 | -3 |
| | PRE2012S | -4~0 | -4 |
| | PRE2015S | -5~0 | -5 |
| | PRE2020S | -6.667~0 | -6.667 |

| **[SOURce]:POWer:APULimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the upper limit of apparent power (kW) | | | |
| Parameters | See Table 7 for details | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:POWer:APULimit#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:POW:APUL 1.000<br>SOUR:POW:APUL? | | | |

| | |
|---|---|
| | 1.000 |

| **[SOURce]:POWer:APLLimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the given lower limit of apparent power (kW) | | | |
| Parameters | See Table 7 for details | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:POWer:APLLimit#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:POW:APLL 1.000<br>SOUR:POW:APLL?<br>1.000 | | | |

### 4.2.4 Other Setting Commands

| **[SOURce]:IMPedance[:STATe]** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the impedance enable. | | | |
| Parameters | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |
| Parameter Format | <Bool> | | | |
| Query Format | **[SOURce]:IMPedance[:STATe]?** | | | |
| Returned Data Format | <Bool> | | | |

| | |
|---|---|
| Example | SOUR:IMP ON<br>SOUR:IMP?<br>1 |

| **[SOURce]:IMPedance:R#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set impedance R,#1~4 (Ohm). | | | |
| Parameters | <0.000~10.000>,Default 0. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:IMPedance:R#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:IMP:R1 8.000<br>SOUR:IMP:R1?<br>8.000 | | | |

| **[SOURce]:IMPedance:L#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set impedance L,#1~4 (mH) | | | |
| Parameters | <0.000~2.000>,Default 0. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **[SOURce]:IMPedance:L#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | SOUR:IMP:L1 1.000 | | | |

| | |
|---|---|
| | SOUR:IMP:L1?<br>1.000 |

| **[SOURce]:SETTing:ACLimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the AC current limit switch. | | | |
| Parameters | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Open<br>OFF/0:Close | | | |
| Parameter Format | <Bool> | | | |
| Query Format | **[SOURce]:SETTing:ACLimit?** | | | |
| Returned Data Format | <Bool> | | | |
| Example | SOUR:SETT:ACL ON<br>SOUR:SETT:ACL?<br>1 | | | |

| **[SOURce]:SETTing:DCLimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set DC current limit switch. | | | |
| Parameters | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Open<br>OFF/0:Close | | | |
| Parameter Format | <Bool> | | | |

| | |
|---|---|
| Query Format | **[SOURce]:SETTing:DCLimit?** |
| Returned Data Format | <Bool> |
| Example | SOUR:SETT:DCL ON<br>SOUR:SETT:DCL?<br>1 |

## 4.3 LOAD Subsystem

The LOAD subsystem is used to set parameters such as given and limit values in LOAD mode. The LOAD subsystem is composed of current, voltage, power, impedance and other setting commands.

### 4.3.1 Current Setting Commands

| **LOAD:CURRent:CHANnel** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the number of output phases in load mode. This parameter can be set only in standby mode. | | | |
| Parameter Ranges | <THRee\|EACH\|SINGle>,Default THRee.<br>THRee:3 phase<br>EACH:Split Phase<br>SINGle:1 phase | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **LOAD:CURRent:CHANnel?** | | | |
| Returned Data Format | <DSC> | | | |
| Example | LOAD:CURR:CHAN EACH<br>LOAD:CURR:CHAN?<br>EACH | | | |

| **LOAD:CURRent:MODE** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set load mode. This parameter can be set only in standby mode. | | | |

| | |
|---|---|
| Parameter Ranges | <CC\|CP\|CR\|RLC\|PQ>,Default CC.<br>CC:Constant current mode<br>CP:Constant power mode<br>CR:Constant impedance mode<br>RLC:RLC mode<br>PQ:PQ mode |
| Parameter Format | <DSC> |
| Query Format | **LOAD:CURRent:MODE?** |
| Returned Data Format | <DSC> |
| Example | LOAD:CURR:MODE RLC<br>LOAD:CURR:MODE?<br>RLC |

| **LOAD:CURRent:COUPling** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the on-load coupling mode, which can be set only in the standby state.<br>This parameter is valid when the load mode is CC, CP, or CR. | | |
| Parameter Ranges | <AC\|DC\|ACDC>,Default AC.<br>AC:Alternating current<br>DC:Direct current<br>ACDC:Direct current+Direct current | | |
| Parameter Format | <DSC> | | |
| Query Format | **LOAD:CURRent:COUPling?** | | |

| | |
|---|---|
| Returned Data Format | <DSC> |
| Example | LOAD:CURR:COUP DC<br>LOAD:CURR:COUP?<br>DC |

| **LOAD:CURRent:CFPF** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the CF/PF mode, which can be set only in standby mode.<br>This parameter is valid when the load mode is CC or CP. | | | |
| Parameter Ranges | <PF\|CF\|BPF\|BCF>,Default PF.<br>PF:PF only<br>CF:CF only<br>BPF:Both,PF priority<br>BCF:Both,CF priority | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **LOAD:CURRent:CFPF?** | | | |
| Returned Data Format | <DSC> | | | |
| Example | LOAD:CURR:CFPF CF<br>LOAD:CURR:CFPF?<br>CF | | | |

| **LOAD:CURRent:WAVeform** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Set the on-load mode output waveform, which can be set only in standby mode. This parameter is valid when the load mode is CC or CP and the CF/PF mode is PF.<br>The list of waveform definitions is as follows:<br>0: sine wave<br>1: Pulse wave<br>2: triangular wave<br>3: Clipping waves<br>4: positive half wave<br>5: negative half wave<br>6: front half wave<br>7: back along half wave<br>8 to 37: DST1 to DST30<br>38:2 Pulse<br>39:6 pulse<br>40:12 Pulse<br>41:18 pulse<br>42:24 pulse<br>43-142: Shape1 to Shape100 (The current version supports 43 to 57) |
| Parameter Ranges | 0~142,Default 0. |
| Parameter Format | <NR1> |
| Query Format | **LOAD:CURRent:WAVeform?** |
| Returned Data Format | <NR1> |

| | |
|---|---|
| Example | LOAD:CURR:WAV 0<br>LOAD:CURR:WAV?<br>0 |

| **LOAD:CURRent:DCYCle** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set duty cycle of load mode pulse wave. It takes effect when the output waveform is pulse wave. (Unit: %) | | | |
| Parameter Ranges | 0.00~100.00,Default 50.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:CURRent:DCYCle?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:CURR:DCYC 50.00<br>LOAD:CURR:DCYC?<br>50.0 | | | |

| **LOAD:CURRent:SYMMetry** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load mode triangle wave symmetry, which takes effect when the output waveform selects triangle wave. (Unit: %) | | | |
| Parameter Ranges | 0.00~100.00,Default 50.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:CURRent:SYMMetry?** | | | |
| Returned Data Format | <NRF> | | | |

| | |
|---|---|
| Example | LOAD:CURR:SYMM 50.00<br>LOAD:CURR:SYMM?<br>50.0 |

| **LOAD:CURRent:CSINewave** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load mode clipping percent. It takes effect when the output waveform is clipped. (Unit: %) | | | |
| Parameter Ranges | 0.00~50.00,Default 0.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:CURRent:CSINewave?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:CURR:CSIN 0.00<br>LOAD:CURR:CSIN?<br>0.0 | | | |

| **LOAD:CURRent:LEAD** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the percent of on-off Angle of the load mode. It takes effect when the output waveform is the leading half wave. (Unit: %) | | | |
| Parameter Ranges | 0.00~100.00,Default 50.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:CURRent:LEAD?** | | | |
| Returned Data Format | <NRF> | | | |

| | |
|---|---|
| Example | LOAD:CURR:LEAD 50.00<br>LOAD:CURR:LEAD?<br>50.0 |

| **LOAD:CURRent:TRAil** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the percent of load mode turn-off Angle to take effect when the output waveform is selected as the rear half wave. (Unit: %) | | | |
| Parameter Ranges | 0.00~100.00,Default 50.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:CURRent:TRAil?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:CURR:TRA 50.00<br>LOAD:CURR:TRA?<br>50.0 | | | |

| **LOAD:CURRent:WMODe** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set Load Mode User-defined waveform mode. This mode takes effect only when the output waveform is Shape#. | | | |
| Parameter Ranges | <PEAK\|RMS>,Default PEAK.<br>PEAK:Peak mode<br>RMS:Root Mean Square mode | | | |
| Parameter Format | <DSC> | | | |

| | |
|---|---|
| Query Format | LOAD:CURRent:WMODe? |
| Returned Data Format | <DSC> |
| Example | LOAD:CURR:WMOD PEAK<br>LOAD:CURR:WMOD?<br>PEAK |

| **LOAD:CURRent:AC#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the AC current of selected phase #. (Unit: A)<br>This parameter is valid when the load mode is CC.<br>When the PRE20 load mode coupling mode is AC or AC+DC:<br>If the load mode output phase number is divided into phases, #=1 represents φ1, #=2 represents φ2, #=3 represents φ3;<br>If the load mode output phase number is 3-phase, #=1 represents φ1, φ2, φ3 values are automatically consistent with φ1;<br>If the number of load mode output phases is 1-phase, #=4 means φ1, #=1, #=2, #=3 setting value is invalid.<br>When the coupling mode of PRE20 load mode is DC: #=1, #=2, #=3, #=4 Setting values are invalid. | | | |
| Parameter Ranges | #=1 、 2 、 3:0.00~Max 3-phase current of a Single * number of parallel machines,Default 0.00.<br>#=4:0.00~Max 1-phase current of a Single * Number of parallel machines,Default 0.00. | | | |

| | |
|---|---|
| Parameter Format | <NRF> |
| Query Format | **LOAD:CURRent:AC#?** |
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:AC1 0.00<br>LOAD:CURR:AC1?<br>0.0 |

| **LOAD:CURRent:DC#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the DC current value for the selected phase #. (Unit: A)<br>This parameter is valid when the load mode is CC.<br>When the PRE20 load mode coupling mode is DC or AC+DC:<br>If the load mode output phase number is divided into phases, #=1 represents φ1, #=2 represents φ2, #=3 represents φ3;<br>If the load mode output phase number is 3-phase, #=1 represents φ1, φ2, φ3 values are automatically consistent with φ1;<br>If the number of load mode output phases is 1-phase, #=4 means φ1, #=1, #=2, #=3 setting value is invalid.<br>When the coupling mode of PRE20 load mode is AC: #=1, #=2, #=3, #=4 Setting values are invalid. | | | |
| Parameter Ranges | #=1、2、3:-Max 3-phase current of a Single * Number of parallel machines ~ Max 3-phase current of a Single * number of parallel machines,Default 0.00.<br>#=4:-Max 1-phase current of a Single * Number of parallel machines ~ Max | | | |

| | |
|---|---|
| | 1-phase current of a Single * number of parallel machines,Default 0.00. |
| Parameter Format | <NRF> |
| Query Format | **LOAD:CURRent:DC#?** |
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:DC1 0.00<br>LOAD:CURR:DC1?<br>0.0 |

| **LOAD:CURRent:CF#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the peak coefficient of the selected phase #.<br>This parameter is valid when the load mode is CC or CP, and the CF/PF mode is CF, BPF, or BCF.<br>When the PRE20 load mode coupling mode is AC or AC+DC:<br>If the load mode output phase number is divided into phases, #=1 represents φ1, #=2 represents φ2, #=3 represents φ3;<br>If the load mode output phase number is 3-phase, #=1 represents φ1, φ2, φ3 values are automatically consistent with φ1;<br>If the number of load mode output phases is 1-phase, #=4 means φ1, #=1, #=2, #=3 setting value is invalid.<br>When the coupling mode of PRE20 load mode is DC: #=1, #=2, #=3, #=4 Setting values are invalid. | | | |
| Parameter Ranges | 1.414~5.000,Default 1.414. | | | |
| Parameter Format | <NRF> | | | |

| | |
|---|---|
| Query Format | **LOAD:CURRent:CF#?** |
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:CF1 1.414<br>LOAD:CURR:CF1?<br>1.414 |

| **LOAD:CURRent:PF#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the power factor of the selected phase #. Sensibility is positive, tolerance is negative.<br>This parameter is valid when the load mode is CC or CP, and the CF/PF mode is PF, BPF, or BCF.<br>When the PRE20 load mode coupling mode is AC or AC+DC:<br>If the load mode output phase number is divided into phases, #=1 represents φ1, #=2 represents φ2, #=3 represents φ3;<br>If the load mode output phase number is 3-phase, #=1 represents φ1, φ2, φ3 values are automatically consistent with φ1;<br>If the number of load mode output phases is 1-phase, #=4 means φ1, #=1, #=2, #=3 setting value is invalid.<br>When the coupling mode of PRE20 load mode is DC: #=1, #=2, #=3, #=4 Setting values are invalid. | | | |
| Parameter Ranges | -1.000~1.000,Default 1.000. | | | |
| Parameter Format | <NRF> | | | |

| | |
|---|---|
| Query Format | **LOAD:CURRent:PF#?** |
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:PF1 1.000<br>LOAD:CURR:PF1?<br>1.0 |

| **LOAD:CURRent:SRATe:AC** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the AC current slope. (Unit: A/ms) | | |
| Parameter Ranges | 0.01~3000.00,Default 50.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:CURRent:SRATe:AC?** | | |
| Returned Data Format | <NRF> | | |
| Example | LOAD:CURR:SRAT:AC 50.00<br>LOAD:CURR:SRAT:AC?<br>50.0 | | |

| **LOAD:CURRent:SRATe:DC** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the DC current slope. (Unit: A/ms) | | |
| Parameter Ranges | 0.01~3000.00,Default 50.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:CURRent:SRATe:DC?** | | |
| Returned Data Format | <NRF> | | |

| | |
|---|---|
| Example | LOAD:CURR:SRAT:DC 50.00<br>LOAD:CURR:SRAT:DC?<br>50.00 |

| **LOAD:CURRent:SPEed** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load mode response speed. | | | |
| Parameter Ranges | <SLOW\|MIDium\|FAST>,Default MIDium.<br>SLOW:Slow speed<br>MIDium:Medium speed<br>FAST:Fast speed | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **LOAD:CURRent:SPEed?** | | | |
| Returned Data Format | <DSC> | | | |
| Example | LOAD:CURR:SPE MID<br>LOAD:CURR:SPE?<br>MIDium | | | |

| **LOAD:CURRent:FRANge** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the frequency range. | | | |
| Parameter Ranges | <LOW\|HIGH>,Default LOW.<br>LOW:Low frequency<br>HIGH:High frequency | | | |

| | |
|---|---|
| Parameter Format | <DSC> |
| Query Format | **LOAD:CURRent:FRANge?** |
| Returned Data Format | <DSC> |
| Example | LOAD:CURR:FRAN LOW<br>LOAD:CURR:FRAN?<br>LOW |

| **LOAD:CURRent:SLEW** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the current swing rate. (Unit: A/us) | | | |
| Parameter Ranges | 0.001~5.000,Default 2.000. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:CURRent:SLEW?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:CURR:SLEW 2.000<br>LOAD:CURR:SLEW?<br>2.0 | | | |

| **LOAD:CURRent:OFFSr** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set load mode shutdown swing rate. (Unit: A/us) | | | |
| Parameter Ranges | 0.001~5.000,Default 1.000. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:CURRent:OFFSr?** | | | |

| | |
|---|---|
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:OFFS 1.000<br>LOAD:CURR:OFFS?<br>1.0 |

| **LOAD:CURRent:ANGLe:ON** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the boot Angle in load mode. (Unit: °) | | |
| Parameter Ranges | 0.0~359.9,Default 0.0. | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:CURRent:ANGLe:ON?** | | |
| Returned Data Format | <NRF> | | |
| Example | LOAD:CURR:ANGL:ON 0.0<br>LOAD:CURR:ANGL:ON?<br>0.0 | | |

| **LOAD:CURRent:ANGLe:OFF** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the load mode shutdown Angle. (Unit: °) | | |
| Parameter Ranges | 0.0~359.9,Default 0.0. | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:CURRent:ANGLe:OFF?** | | |

| | |
|---|---|
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:ANGL:OFF 0.0<br>LOAD:CURR:ANGL:OFF?<br>0.0 |

| **LOAD:CURRent:TPHase:SYNC** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Enable the load mode transient Angle function. | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |
| Parameter Format | <Bool> | | | |
| Query Format | **LOAD:CURRent:TPHase:SYNC?** | | | |
| Returned Data Format | <Bool> | | | |
| Example | LOAD:CURR:TPH:SYNC OFF<br>LOAD:CURR:TPH:SYNC?<br>0 | | | |

| **LOAD:CURRent:TPHase:VALue** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load mode transient Angle. (Unit: °) | | | |
| Parameter Ranges | 0.0~359.9,Default 0.0. | | | |
| Parameter Format | <NRF> | | | |

| | |
|---|---|
| Query Format | **LOAD:CURRent:TPHase:VALue?** |
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:TPH:VAL 0.0<br>LOAD:CURR:TPH:VAL?<br>0.0 |

| **LOAD:CURRent:ACULimit** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the upper limit of the AC current. (Unit: A) | | |
| Parameter Ranges | 0.00~Max 3-phase current of a Single * number of parallel machines, Default max 3-phase current of a Single * number of parallel machines.<br>Note: When The number of output phases in load mode is set to single phase, the parameter setting range remains unchanged. The actual limit value is set value *3. The actual default the maximum current of a single 3-phase machine *3* the number of parallel machines. | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:CURRent:ACULimit?** | | |
| Returned Data Format | <NRF> | | |
| Example | LOAD:CURR:ACUL 35.00<br>LOAD:CURR:ACUL?<br>35.0 | | |

| **LOAD:CURRent:ACLLimit** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Set the lower limit of AC current. (Unit: A) |
| Parameter Ranges | 0.00~Maximum 3-phase current of a Single * number of parallel machines, Default 0.00.<br>Note: When The number of on-load mode output phases is set to 1-phase, the parameter setting range remains unchanged. The actual limit value is set to *3, and the actual default 0.00. |
| Parameter Format | <NRF> |
| Query Format | **LOAD:CURRent:ACLLimit?** |
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:ACLL 0.00<br>LOAD:CURR:ACLL?<br>0.0 |

| **LOAD:CURRent:DCULimit** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the DC current upper limit. (Unit: A) | | |
| Parameter Ranges | -Max 3-phase current of a Single * number of parallel machines ~ Max 3-phase current of a Single * number of parallel machines, Default maximum 3-phase current of a Single * number of parallel machines.<br>Note: When The number of output phases in load mode is set to single phase, the parameter setting range remains unchanged. The actual limit value is set value *3. The actual default the max current of a single 3-phase machine *3* the number of parallel machines. | | |

| | |
|---|---|
| Parameter Format | <NRF> |
| Query Format | **LOAD:CURRent:DCULimit?** |
| Returned Data Format | <NRF> |
| Example | LOAD:CURR:DCUL 35.00<br>LOAD:CURR:DCUL?<br>35.0 |

| **LOAD:CURRent:DCLLimit** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the DC current lower limit. (Unit: A) | | |
| Parameter Ranges | -Max 3-phase current of a Single * Number of parallel machines ~ Max 3-phase current of a Single * number of parallel machines, Default - Max 3-phase current of a Single * number of parallel machines.<br>Note: When The number of output phases in load mode is set to 1-phase, the parameter setting range remains unchanged. The actual limit value is set to *3. The actual default - max 3-phase current of a Single *3* number of parallel machines. | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:CURRent:DCLLimit?** | | |
| Returned Data Format | <NRF> | | |
| Example | LOAD:CURR:DCLL -35.00<br>LOAD:CURR:DCLL?<br>-35.0 | | |

### 4.3.2 Power Setting Commands

| **LOAD:POWer:APParent#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set apparent power (unit: kVA), where # ranges from 1 to 4,<br>Where: #=1 represents φ1, #=2 represents φ2, #=3 represents φ3, and #=4 represents 1-phase φ1. | | | |
| Parameter Ranges | See the apparent power items in Table 13 of Section 8.3 of the Operation manual for the ranges and defaults | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:POWer:APParent#?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:POW:APP1 0.00<br>LOAD:POW:APP1?<br>0.00 | | | |

| **LOAD:POWer:ACTive#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the active power (unit: kW). The value of # ranges from 1 to 4. | | | |
| Parameter Ranges | See Table 11 for details. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:POWer:ACTive#?** | | | |
| Returned Data Format | <NRF> | | | |

| | |
|---|---|
| Example | LOAD:POW:ACT1 0.00<br>LOAD:POW:ACT1?<br>0.00 |

Table 11-On-load power ranges and default values

| Parameter | Model | Parameter Ranges | Default |
|---|---|---|---|
| Active power | PRE2006S | 3/split phase:-2~2<br>1-phase:-6~6 | 3/split phase: 2<br>1-phase: 6 |
| | PRE2007S | 3/split phase:-2.5~2.5<br>1-phase:-7.5~7.5 | 3/split phase:2.5<br>1-phase:7.5 |
| | PRE2009S | 3/split phase:-3~3<br>1-phase:-9~9 | 3/split phase:3<br>1-phase:9 |
| | PRE2012S | 3/split phase:-4~4<br>1-phase:-12~12 | 3/split phase:4<br>1-phase:12 |
| | PRE2015S | 3/split phase:-5~5<br>1-phase:-15~15 | 3/split phase: 5<br>1-phase:15 |
| | PRE2020S | 3/split phase:-6.667~6.667<br>1-phase:-20~20 | 3/split phase:6.667<br>1-phase:20 |

| **LOAD:POWer:APULimit** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the upper limit of apparent power (unit: kVA). | | |

| | |
|---|---|
| Parameter Ranges | See Table 12 for details. |
| Parameter Format | <NRF> |
| Query Format | **LOAD:POWer:APUL?** |
| Returned Data Format | <NRF> |
| Example | LOAD:POW:APUL 6.00<br>LOAD:POW:APUL?<br>6.00 |

Table 12 Upper/lower range of apparent power and default values

| Parameter | Model | Ranges | Default |
|---|---|---|---|
| Apparent power upper limit<br>Lower apparent power limit | PRE2006S | 0~2 | 2 |
| | PRE2007S | 0~2.5 | 2.5 |
| | PRE2009S | 0~3 | 3 |
| | PRE2012S | 0~4 | 4 |
| | PRE2015S | 0~5 | 5 |
| | PRE2020S | 0~6.667 | 6.667 |

| **LOAD:POWer:APLLimit** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the lower limit of apparent power (unit: kVA). | | |
| Parameter Ranges | See Table 12 for details. | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:POWer:APLL?** | | |

| | |
|---|---|
| Returned Data Format | <NRF> |
| Example | LOAD:POW:APLL 6.000<br>LOAD:POW:APLL?<br>6.000 |

| **LOAD:POWer:ACULimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the upper limit of active power (unit: kW). | | | |
| Parameter Ranges | See Table 13 for details. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:POWer:ACUL?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:POW:ACUL 6.00<br>LOAD:POW:ACUL?<br>6.00 | | | |

Table 13 Upper/lower range of on-load active power and default values

| Parameter | Model | Ranges | Default |
|---|---|---|---|
| Upper limit of active power<br>Lower limit of active power | PRE2006S | -2~2 | 2 |
| | PRE2007S | -2.5~2.5 | 2.5 |
| | PRE2009S | -3~3 | 3 |
| | PRE2012S | -4~4 | 4 |
| | PRE2015S | -5~5 | 5 |

| | | | |
|---|---|---|---|
| | PRE2020S | -6.667~6.667 | 6.667 |

| **LOAD:POWer:ACLLimit** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the lower limit of active power (unit: kW). | | | |
| Parameter Ranges | See Table 13 for details. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:POWer:ACLL?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:POW:ACLL -2.000<br>LOAD:POW:ACLL?<br>-2.000 | | | |

| **LOAD:POWer:SRATe:APParent** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the apparent power slope. | | | |
| Parameter Ranges | <0.001~3000.000>,Default 20 . | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:POWer:SRATe:APParent?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:POW:SRAT:APP 2.000<br>LOAD:POW:SRAT:APP?<br>2.000 | | | |

| LOAD:POWer:SRATe:ACTive | | B | S | L |
|---|---|---|---|---|
| Description | Set the active power slope (unit: kVA/ms). | | | |
| Parameter Ranges | <0.001~3000.000>,Default 20 . | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **LOAD:POWer:SRATe:ACTive?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | LOAD:POW:SRAT:ACT 2.000<br>LOAD:POW:SRAT:ACT?<br>2.000 | | | |

### 4.3.3 Impedance setting commands

| LOAD:IMPedance:R# | | B | S | L |
|---|---|---|---|---|
| Description | Set impedance. (Unit: Ω)<br>This parameter is valid when the load mode is CR.<br>If the load mode output phase number is divided into phases, #=1 represents φ1, #=2 represents φ2, #=3 represents φ3;<br>If the load mode output phase number is 3-phase, #=1 represents φ1, φ2, φ3 values are automatically consistent with φ1;<br>If the load mode output phase number is 1-phase, #=1 means φ1, #=2, #=3 setting value is invalid. | | | |

| | |
|---|---|
| Parameter Ranges | 0.001~1000.000,Default 1000. |
| Parameter Format | <NRF> |
| Query Format | **LOAD:IMPedance:R#?** |
| Returned Data Format | <NRF> |
| Example | LOAD:IMP:R1 1000<br>LOAD:IMP:R1?<br>1000 |

| **LOAD:IMPedance:RULimit** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the upper limit of the impedance (unit: ohm). | | |
| Parameter Ranges | <0.001~1000.000>,Default 1000 . | | |
| Parameter Format | <NRF> | | |
| Query Format | **LOAD:IMPedance:RULimit?** | | |
| Returned Data Format | <NRF> | | |
| Example | LOAD:IMP:RUL 20.000<br>LOAD:IMP:RUL?<br>20.000 | | |

| **LOAD:IMPedance:RLLimit** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the lower limit of the impedance (unit: ohm). | | |
| Parameter Ranges | <0.001~1000.000>,Default 1 . | | |

| | |
|---|---|
| Parameter Format | <NRF> |
| Query Format | **LOAD:IMPedance:RLLimit?** |
| Returned Data Format | <NRF> |
| Example | LOAD:IMP:RLL 20.000<br>LOAD:IMP:RLL?<br>20.000 |

| **LOAD:IMPedance:RLC:DATA** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set load RLC mode RLC topology and parameters. A total of 18 parameters are listed as follows:<br>Topology selection of φ1RLC<br>φ1RLC mode R (unit: Ω)<br>φ1RLC mode L (unit: mH)<br>φ1RLC mode RL (Unit: Ω)<br>φ1RLC mode C (Unit: uF)<br>φ1RLC mode RC (Unit: Ω)<br>Topology selection of φ2RLC<br>φ2RLC mode R (unit: Ω)<br>φ2RLC mode L (unit: mH)<br>φ2RLC mode RL (Unit: Ω)<br>φ2RLC mode C (Unit: uF)<br>φ2RLC mode RC (Unit: Ω)<br>Topology selection of φ3RLC | | | |

| | |
|---|---|
| | φ3RLC mode R (unit: Ω)<br>φ3RLC mode L (unit: mH)<br>φ3RLC mode RL (Unit: Ω)<br>φ3RLC mode C (Unit: uF)<br>φ3RLC mode RC (Unit: Ω) |
| Parameter Ranges | φ1, φ2, φ3RLC topology selection: 0~11, Default 0;<br>φ1, φ2, φ3RLC mode R: 0.001~1000.0, Default 1000.0;<br>φ1, φ2, φ3RLC mode L: 1.000~5000.0, Default 5000.0;<br>φ1, φ2, φ3RLC mode RL: 0.000~1000.0, Default 0.000;<br>φ1, φ2, φ3RLC mode C: 1.000~5000.0, Default 1.000;<br>φ1, φ2, φ3RLC mode RC: 0~1000.0, Default 0.000; |
| Parameter Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR1,NR2,NR2,NR2,NR2,NR2,NR1,NR2,NR2,NR2,NR2,NR2> |
| Query Format | **LOAD:IMPedance:RLC:DATA?** |
| Returned Data Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR1,NR2,NR2,NR2,NR2,NR2,NR1,NR2,NR2,NR2,NR2,NR2> |
| Example | LOAD:IMP:RLC:DATA 0,1000.0,5000.0,0.0,1.0,0.0,0,1000.0,5000.0,0.0,1.0,0.0,0,1000.0,5000,0,0.0,1.0,0.0<br>LOAD:IMP:RLC:DATA?<br>0,1000.0,5000.0,0.0,1.0,0.0,0,1000.0,5000.0,0.0,1.0,0.0,0,1000.0,5000.0,0.0,1.0,0.0 |

| **LOAD:IMPedance:PQ:TDATa** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Set the 1-phase topology and parameters in load PQ mode. A total of 9 parameters are listed as follows:<br>φ1PQ mode P<br>φ1PQ mode Q1 (Unit: Ω)<br>φ1PQ mode Qc (unit: mH)<br>φ2PQ mode P<br>φ2PQ mode Q1 (Unit: Ω)<br>φ2PQ mode Qc (Unit: mH)<br>φ3PQ mode P<br>φ3PQ mode Q1 (Unit: Ω)<br>φ3PQ mode Qc (unit: mH) |
| Parameter Ranges | See Table 13 in Section 8.3 of the Operation manual for the corresponding range and default value of the visible power item |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2> |
| Query Format | **LOAD:IMPedance:PQ:TDATa?** |
| Returned Data Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2> |
| Example | LOAD:IMP:PQ:TDAT 1000.0,1000.0,1000.0,1000.0,1000.0,1000.0,1000.0,1000.0,1000.0<br>LOAD:IMP:PQ:TDAT?<br>1000.0,1000.0,1000.0, 1000.0,1000.0,1000.0, 1000.0,1000.0,1000.0 |

| **LOAD:IMPedance:PQ:SDATa** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Set the 1-phase topology and parameters in load PQ mode. There are three parameters in total, listed as follows:<br>1-phase PQ mode P<br>1-phase PQ mode Q1 (unit: Ω)<br>1-phase PQ mode Qc (unit: mH) |
| Parameter Ranges | See Table 13 in Section 8.3 of the Operation manual for the 1-phase corresponding range and default values of the apparent power item |
| Parameter Format | <NR2,NR2,NR2> |
| Query Format | **LOAD:IMPedance:PQ:SDATa?** |
| Returned Data Format | <NR2,NR2,NR2 > |
| Example | LOAD:IMP:PQ:SDAT 1000.0,1000.0,1000.0<br>LOAD:IMP:PQ:SDAT?<br>1000.0,1000.0,1000.0 |

## 4.4 OUTPut Subsystem

The OUTPut subsystem is used to control the output state of PRE20 and set the related time parameters. The OUTPut subsystem consists of output control and time setting.

### 4.4.1 Output Control Commands

| **OUTPut[:STATe]** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | PRE20 communication port When you select a remote interface (LAN, USB, or MagicBus), you can use this command to control the PRE20 output or standby mode. | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Output<br>OFF/0:Standby | | | |
| Parameter Format | <Bool> | | | |
| Query Format | **OUTPut[:STATe]?** | | | |
| Returned Data Format | <Bool> | | | |
| Example | OUTP:STAT ON<br>OUTP:STAT?<br>1 | | | |

| **OUTPut:DElay:RUN** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the output connection delay (unit: ms). | | | |

| | |
|---|---|
| Parameter Ranges | <0~999999>,Default 0. |
| Parameter Format | < NR1 > |
| Query Format | **OUTPut:DELay:RUN?** |
| Returned Data Format | < NR1 > |
| Example | OUTPut:DEL:RUN 500<br>OUTPut:DEL:RUN?<br>500 |

| **OUTPut:DElay:STOP** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the output disconnect delay time (unit: ms). | | | |
| Parameter Ranges | <0~999999>,Default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **OUTPut:DELay:STOP?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | OUTPut:DEL:STOP 500<br>OUTPut:DEL:STOP?<br>500 | | | |

| **OUTPut:AUTorun** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the power supply to run automatically. | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,Default 0. | | | |

| | |
|---|---|
| | ON/1:Enable<br>OFF/0:Disable |
| Parameter Format | < Bool > |
| Query Format | **OUTPut:AUTorun?** |
| Returned Data Format | < Bool > |
| Example | OUTPut:AUT ON<br>OUTPut:AUT?<br>1 |

### 4.4.2 Time Setting Commands

| **OUTPut:TIME:ENABle** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | The load timing function is enabled. | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |
| Parameter Format | < Bool > | | | |
| Query Format | **OUTPut:TIME:ENABle?** | | | |
| Returned Data Format | < Bool > | | | |
| Example | OUTPut:TIME:ENAB ON<br>OUTPut:TIME:ENAB?<br>1 | | | |

| **OUTPut:TIME:HOUR** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load running time (hour) (unit: h). | | | |
| Parameter Ranges | <0~9999>,Default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **OUTPut:TIME:HOUR?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | OUTPut:TIME:HOUR 33<br>OUTPut:TIME:HOUR?<br>33 | | | |

| **OUTPut:TIME:MINute** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load running time (min) (unit: min). | | | |
| Parameter Ranges | <0~60>,Default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **OUTPut:TIME:MINute?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | OUTPut:TIME:MIN 21<br>OUTPut:TIME:MIN?<br>21 | | | |

| **OUTPut:TIME:SECond** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load running time in seconds (unit: sec). | | | |
| Parameter Ranges | <0~60>,Default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **OUTPut:TIME:SECond?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | OUTPut:TIME:SEC 10<br>OUTPut:TIME:SEC?<br>10 | | | |

## 4.5 SYSTem Subsystem

The SYSTem subsystem is used to set and query the PRE20 system parameters. The SYSTem subsystem consists of the system, Anyport interface, waveform setting commands and various system information query commands.

### 4.5.1 System Config Commands

| **SYSTem:MODE** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the PRE20 working mode, which can be set only in standby mode. | | | |
| Parameter Ranges | <SOURce\|LOAD>, default SOURce.<br>SOURce:Source<br>LOAD:Load | | | |
| Parameter Format | <DSC> | | | |

| | |
|---|---|
| Query Format | **SYSTem:MODE?** |
| Returned Data Format | <DSC> |
| Example | SYST:MODE SOUR<br>SYST:MODE?<br>SOURce |

| **SYSTem:RESet** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Reset commond. After receiving the commands, PRE20 shall perform the following operations:<br>1） If the device is faulty, reset the device fault.<br>2） Clear the alarm information. | | |
| Example | SYSTem:RESet | | |

| **SYSTem:INTerface** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the communication port of the power supply | | |
| Parameter Ranges | <SCReen\|LAN\|USB>, Default SCReen.<br>SCReen: display, local control<br>LAN: LAN port on the rear panel for remote control<br>USB: USB TypeC port on the rear panel for remote control | | |
| Parameter Format | <DSC> | | |
| Query Format | **SYSTem:INTerface?** | | |

| | |
|---|---|
| Returned Data Format | <DSC> |
| Example | SYST:INT SCR<br>SYST:INT?<br>SCReen |

| **SYSTem:FZERo** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | The voltage return to zero function is enabled. | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>, default 0.<br>ON/1:Enable<br>OFF/0: Disable | | | |
| Parameter Format | < Bool > | | | |
| Query Format | **SYSTem:FZERo?** | | | |
| Returned Data Format | < Bool > | | | |
| Example | SYST:FZERo ON<br>SYST:FZERo?<br>1 | | | |

| **SYSTem:MCLear** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Clear event commond. | | | |
| Example | SYST:CCLE | | | |

| **SYSTem:POWeron** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set power on mode. | | | |
| Parameter Ranges | <MANual\|AUTO>, default MANUal.<br>MANUal: Manual<br>AUTO: Automatic | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **SYSTem:POWeron?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | SYST:POW MANU<br>SYST:POW?<br>MANUal | | | |

### 4.5.2 Anyport Interface Commands

| **SYSTem:ANYPort:POLarity:IN#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the polarity of the Anyport digital input interface. # indicates the number of the digital input interface, ranging from 1 to 6. | | | |
| Parameter Ranges | <POSitive\|NEGative>, default POSitive.<br>POSitive: Positive, high level active<br>NEGative: Negative, low level active | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **SYSTem:ANYPort:POLarity:IN#?** | | | |

| | |
|---|---|
| Returned Data Format | <DSC> |
| Example | SYST:ANYP:POL:IN1 POS<br>SYST:ANYP:POL:IN1?<br>POSitive |

| **SYSTem:ANYPort:POLarity:OUT#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the polarity of the Anyport digital output interface. # indicates the number of the digital output interface, ranging from 1 to 6. | | |
| Parameter Ranges | <POSitive\|NEGative>, default POSitive.<br>POSitive: Positive, high level active<br>NEGative: Negative, low level active | | |
| Parameter Format | <DSC> | | |
| Query Format | **SYSTem:ANYPort:POLarity:OUT#?** | | |
| Returned Data Format | <DSC> | | |
| Example | SYST:ANYP:POL:OUT1 POS<br>SYST:ANYP:POL:OUT1?<br>POSitive | | |

| **SYSTem:ANYPort:FUNCtion:IN#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the Anyport digital input interface function. # indicates the number of the digital input interface, ranging from 1 to 6. | | |
| Parameter Ranges | <NONE\|ANAlogy\|TRIG\|DAISy\|RUN\|RESet\|ESTOp\|SYNin>, default NONE. | | |

| | |
|---|---|
| | NONE:None<br>ANAlogy: External settings are enabled<br>TRIG: Trigger<br>DAISy: Chain<br>RUN: Run<br>RESet: Reset<br>ESTOp: Emergency stop<br>SYNin: External synchronous input |
| Parameter Format | <DSC> |
| Query Format | **SYSTem:ANYPort:FUNCtion:IN#?** |
| Returned Data Format | <DSC> |
| Example | SYST:ANYP:FUNC:IN1 TRIG<br>SYST:ANYP:FUNC:IN1?<br>TRIG |

| **SYSTem:ANYPort:FUNCtion:OUT#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the Anyport digital output interface function. # indicates the number of the digital output interface, ranging from 1 to 6. | | |
| Parameter Ranges | <NONE\|DAISy\|TRIG\|RUN\|CV\|FAULt\|VINDicate\|CINDicate\|PSIGnal\|SYNout>, default None<br>NONE: None<br>DAISy: Chain<br>TRIG: Trigger | | |

| | |
|---|---|
| | RUN: Run<br>CV: CV State<br>FAULt: Fault state<br>VINDicate: Voltage indicate<br>CINDicate: Current indicate<br>PSIGnal: General<br>SYNin: External synchronous output |
| Parameter Format | <DSC> |
| Query Format | **SYSTem:ANYPort:FUNCtion:OUT#?** |
| Returned Data Format | <DSC> |
| Example | SYST:ANYP:FUNC:OUT1 DAIS<br>SYST:ANYP:FUNC:OUT1?<br>DAISy |

| **SYSTem:ANYPort:ENABle:IN#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the switch status of the Anyport digital input interface. # indicates the number of the digital input interface, ranging from 1 to 6. | | |
| Parameter Ranges | <ON\|OFF\|1\|0>, default 0.<br>ON/1: On(enable)<br>OFF/0: Off(disable) | | |
| Parameter Format | <Bool> | | |
| Query Format | **SYSTem:ANYPort:ENABle:IN#?** | | |

| | |
|---|---|
| Returned Data Format | <Bool> |
| Example | SYST:ANYP:ENAB:IN1 ON<br>SYST:ANYP:ENAB:IN1?<br>1 |

| **SYSTem:ANYPort:ENABle:OUT#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the switch status of the Anyport digital output port. # indicates the number of the digital output port, ranging from 1 to 6. | | |
| Parameter Ranges | <ON\|OFF\|1\|0>, default 0.<br>ON/1: On(enable)<br>OFF/0: Off(disable) | | |
| Parameter Format | <Bool> | | |
| Query Format | **SYSTem:ANYPort:ENABle:OUT#?** | | |
| Returned Data Format | <Bool> | | |
| Example | SYST:ANYP:ENAB:OUT1 ON<br>SYST:ANYP:ENAB:OUT1?<br>1 | | |

| **SYSTem:REFerence:RANGe** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the Anyport analog input interface range. (Unit: V) | | |
| Parameter Ranges | <5\|10>, default 5V.<br>5: 5V | | |

| | |
|---|---|
| | 10: 10V |
| Parameter Format | <DSC> |
| Query Format | **SYSTem:REFerence:RANGe?** |
| Returned Data Format | <DSC> |
| Example | SYST:REF:RANG 10<br>SYST:REF:RANG?<br>10 |

| **SYSTem:REFerence:ENABle:IN#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the status of the Anyport analog input port. # indicates the number of the analog input port, ranging from 1 to 4. | | |
| Parameter Ranges | <ON\|OFF\|1\|0>, default 0.<br>ON/1: On(enable)<br>OFF/0: Off(disable) | | |
| Parameter Format | <Bool> | | |
| Query Format | **SYSTem:REFerence:ENABle:IN#?** | | |
| Returned Data Format | <Bool> | | |
| Example | SYST:REF:ENAB:IN1 ON<br>SYST:REF:ENAB:IN1?<br>1 | | |

| **SYSTem:REFerence:ENABle:OUT#** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Set the status of the Anyport analog output port. # indicates the number of the analog output port, ranging from 1 to 4. |
| Parameter Ranges | <ON\|OFF\|1\|0>, default 0.<br>ON/1: On(enable)<br>OFF/0: Off(disable) |
| Parameter Format | <Bool> |
| Query Format | **SYSTem:REFerence:ENABle:OUT#?** |
| Returned Data Format | <Bool> |
| Example | SYST:REF:ENAB:OUT1 ON<br>SYST:REF:ENAB:OUT1?<br>1 |

| **SYSTem:REFerence:TYPE:IN#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the Anyport analog input interface function. # indicates the analog input interface number, ranging from 1 to 3.<br>Note: The function of analog input interface 4 is fixed, so you do not need to select. | | |
| Parameter Ranges | <AMP\|RMS\|IMME>, default AMP.<br>AMP: Tracking amplitude<br>RMS: Tracking RMS<br>IMME: Real-time tracking | | |
| Parameter Format | <DSC> | | |

| | |
|---|---|
| Query Format | **SYSTem:REFerence:TYPE:IN#?** |
| Returned Data Format | <DSC> |
| Example | SYST:REF:TYPE:IN1 AMP<br>SYST:REF:TYPE:IN1?<br>AMP |

| **SYSTem:REFerence:TYPE:OUT#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the Anyport analog output interface function. # Indicates the analog output interface number, ranging from 1 to 2. | | |
| Parameter Ranges | <0~17>, default 0.<br>0:φ1 Urms, effective voltage value of φ1<br>1:φ2 Urms, effective voltage value of φ2<br>2:φ3 Urms, effective voltage value of φ3<br>3:φ1 Irms, effective current value of φ1<br>4:φ2 Irms, effective current value of φ2<br>5:φ3 Irms, effective current value of φ3<br>6:φ1 P, active power of φ1<br>7:φ2 P, active power of φ2<br>8:φ3 P, active power of φ3<br>9:φ1 S, apparent power of φ1<br>10:φ2 S, apparent power of φ2<br>11:φ3 S, apparent power ofφ3<br>12:φ1 Q, reactive power of φ1 | | |

| | |
|---|---|
| | 13:φ2 Q, reactive power of φ2<br>14:φ3 Q, reactive power of φ3<br>15:ΣP, total active power<br>16:ΣS, total apparent power<br>17:ΣQ, total reactive power |
| Parameter Format | <DSC> |
| Query Format | **SYSTem:REFerence:TYPE:OUT#?** |
| Returned Data Format | <DSC> |
| Example | SYST:REF:TYPE:OUT1 4<br>SYST:REF:TYPE:OUT1?<br>4 |

### 4.5.3 Waveform Setting Commands

| **SYSTem:WAVEform:DATA#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Deliver 4096 customized waveforms. Data delivery is divided into eight groups of 512 data points. # Indicates the group number of the customized waveforms. | | |
| Parameter Ranges | <-32768~32767> | | |
| Parameter Format | < NR1>……<NR1 > | | |
| Query Format | **SYSTem:WAVEform:DATA#?** | | |
| Returned Data Format | <NR1>……<NR1> | | |
| Example | SYST:WAVE:DATA3 1024,256……1024,255<br>SYST:WAVE:DATA3? | | |

| | |
|---|---|
| | 1024,256……1024,255 |

| **SYSTem:WAVEform:STORe** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Stores the shape waveform data to the specified location. | | | |
| Parameter Ranges | <1\|2\|3\|4\|5\|6\|...\|100> | | | |
| Parameter Format | < NR1 > | | | |
| Example | SYST:WAVE:STOR 10 | | | |

| **SYSTem:WAVEform:LOAD** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Reads shape waveform data from the specified position. | | | |
| Parameter Ranges | <1\|2\|3\|4\|5\|6\|...\|100> | | | |
| Parameter Format | < NR1 > | | | |
| Example | SYST:WAVE:LOAD 10 | | | |

### 4.5.4 Information Query Commands

| **SYSTem:ERRor?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | An error message is returned from the instrument error event queue. If there is No error, 0, "No error" is returned. The following table shows | | | |

| | |
|---|---|
| | the supported error messages: |

| Error | Description |
|---|---|
| -0, "No error" | No error |
| -100,"Command error" | Command error |
| -102," Syntax error” | Syntax error |
| -109,"Missing parameter” | Missing parameters after the command |
| -200,"Execution error" | Command execution error |
| -201,Invalid while in local | Local mode |
| -220,“Parameter error” | Command parameter error |
| -222,Data out of range | Parameter overrun |
| -350,”Queue overflow” | Error queue overflow |
| -400,"Query error" | Query error |
| -401,Buffer Error | Buffer overflow |

| | |
|---|---|
| Parameter Format | <NR1>,<AADR> |
| Example | SYST:ERR?<br>-100,”Command error” |

| **SYSTem:PNUMber?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Query the number of parallel machines. | | |
| Example | SYST:PNUM?<br>2 | | |

| **SYSTem:STEP?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Query the number of current steps of program experiment. | | |

| | |
|---|---|
| Example | SYST:STEP?<br>2 |

| **SYSTem:LOOP?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Query the number of current execution loops of program experiment. | | | |
| Example | SYST:LOOP?<br>2 | | | |

## 4.6 PROTection Subsystem

The PROTection subsystem is used to set protection parameters. The PROTection subsystem consists of various protection thresholds and protection time commands.

### 4.6.1 Protection Threshold Commands

| **PROTection:LEVel:VOLTage** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the effective overvoltage threshold. (Unit: V) | | | |
| Parameter Ranges | 0.00~636.00, default 636.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:VOLTage?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:VOLT 636.00<br>PROT:LEV:VOLT?<br>636.0 | | | |

| **PROTection:LEVel:AC** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the AC overvoltage threshold. (Unit: V) | | | |
| Parameter Ranges | 0.00~450.00, default 450.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:AC?** | | | |
| Returned Data Format | <NRF> | | | |

| | |
|---|---|
| Example | PROT:LEV:AC 450.00<br>PROT:LEV:AC?<br>450.0 |

| **PROTection:LEVel:POSitive** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the DC positive overvoltage threshold. (Unit: V) | | | |
| Parameter Ranges | 0.00~636.00, default 636.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:POSitive?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:POS 636.00<br>PROT:LEV:POS?<br>636.0 | | | |

| **PROTection:LEVel:NEGative** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the DC negative overvoltage threshold. (Unit: V) | | | |
| Parameter Ranges | -636.00~0.00, default -636.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:NEGative?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:NEG -636.00<br>PROT:LEV:NEG? | | | |

| | |
|---|---|
| | -636.00 |

| **PROTection:LEVel:FVOLtage** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the fast overvoltage threshold. (Unit: V) | | | |
| Parameter Ranges | 0.00~700.00, default 650.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:FVOLtage?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:FVOL 650.00<br>PROT:LEV:FVOL?<br>650.0 | | | |

| **PROTection:LEVel:LVOLtage** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load AC lowvoltage threshold. (Unit: V) | | | |
| Parameter Ranges | 10.00~450.00, default 10.00. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:LVOLtage?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:LVOL 10.00<br>PROT:LEV:LVOL?<br>10.0 | | | |

| **PROTection:LEVel:CURRent** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the effective current threshold. (Unit: A) | | | |
| Parameter Ranges | 0.00~1.05* Maximum 3 phase current of a Single * number of parallel machines, default 1.05* Maximum 3 phase current of a Single * number of parallel machines. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:CURRent?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:CURR 36.75<br>PROT:LEV:CURR?<br>36.75 | | | |

| **PROTection:LEVel:ACTive** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the active power threshold. (Unit: kW) | | | |
| Parameter Ranges | 0.000~maximum power of a single 3 phase machine*3* number of parallel machines, default the maximum power of a single 3 phase machine *3* number of parallel machines. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:ACTive?** | | | |
| Returned Data Format | <NRF> | | | |

| | |
|---|---|
| Example | PROT:LEV:ACT 20.000<br>PROT:LEV:ACT?<br>20.000 |

| **PROTection:LEVel:APParent** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the apparent power threshold. (Unit: kVA) | | | |
| Parameter Ranges | 0.000~maximum power of a single 3 phase machine*3*number of parallel machines, default the maximum power of a single 3 phase machine *3* number of parallel machines. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:APParent?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:APP 20.000<br>PROT:LEV:APP?<br>20.0 | | | |

| **PROTection:LEVel:HFReq** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the highfrequency threshold. (Unit: Hz) | | | |
| Parameter Ranges | 0.001~2000.000, default 2000.000. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:HFReq?** | | | |

| | |
|---|---|
| Returned Data Format | <NRF> |
| Example | PROT:LEV:HFR 2000.000<br>PROT:LEV:HFR?<br>2000.000 |

| **PROTection:LEVel:LFReq** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the lowfrequency threshold. (Unit: Hz) | | | |
| Parameter Ranges | 0.001~2000.000, default 0.001. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | **PROTection:LEVel:LFReq?** | | | |
| Returned Data Format | <NRF> | | | |
| Example | PROT:LEV:LFR 0.001<br>PROT:LEV:LFR?<br>0.001 | | | |

### 4.6.2 Protection Time Commands

| **PROTection:TDELay:VOLTage** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the effective overvoltage time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 100. | | | |
| Parameter Format | <NR1> | | | |

| | |
|---|---|
| Query Format | **PROTection:TDELay:VOLTage?** |
| Returned Data Format | <NR1> |
| Example | PROT:TDEL:VOLT 100<br>PROT:TDEL:VOLT?<br>100 |

| **PROTection:TDELay:AC** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the AC overvoltage time. (Unit: ms) | | |
| Parameter Ranges | 1~3000, default 100. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROTection:TDELay:AC?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROT:TDEL:AC 100<br>PROT:TDEL:AC?<br>100 | | |

| **PROTection:TDELay:POSitive** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the DC positive overvoltage time. (Unit: ms) | | |
| Parameter Ranges | 1~3000, default 100. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROTection:TDELay:POSitive?** | | |

| | |
|---|---|
| Returned Data Format | <NR1> |
| Example | PROT:TDEL:POS 100<br>PROT:TDEL:POS?<br>100 |

| **PROTection:TDELay:NEGative** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the DC negative overvoltage time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 100. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROTection:TDELay:NEGative?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROT:TDEL:NEG 100<br>PROT:TDEL:NEG?<br>100 | | | |

| **PROTection:TDELay:CURRent** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the valid overcurrent time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 100. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROTection:TDELay:CURRent?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROT:TDEL:CURR 100 | | | |

| | |
|---|---|
| | PROT:TDEL:CURR?<br>100 |

| **PROTection:TDELay:ACTive** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the active power time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 100. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROTection:TDELay:ACTive?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROT:TDEL:ACT 100<br>PROT:TDEL:ACT?<br>100 | | | |

| **PROTection:TDELay:APParent** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set apparent power time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 100. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROTection:TDELay:APParent?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROT:TDEL:APP 100<br>PROT:TDEL:APP?<br>100 | | | |

| **PROTection:TDELay:HFReq** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the highfrequency time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 100. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROTection:TDELay:HFReq?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROT:TDEL:HFR 100<br>PROT:TDEL:HFR?<br>100 | | | |

| **PROTection:TDELay:LFReq** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the lowfrequency time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 100. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROTection:TDELay:LFReq?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROT:TDEL:LFR 100<br>PROT:TDEL:LFR?<br>100 | | | |

| **PROTection:TDELay:LVOLtage** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load AC lowvoltage time. (Unit: ms) | | | |
| Parameter Ranges | 1~3000, default 20. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROTection:TDELay:LVOLtage?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROT:TDEL:LVOL 20<br>PROT:TDEL:LVOL?<br>20 | | | |

## 4.7 PROGram Subsystem

The PROGram subsystem is used to set various program parameters. The PROGram subsystem consists of List, Wave, Advanced and HARMonic program control commands.

### 4.7.1 LIST Program Commands

| **PROGram:LIST:INITiate** | **B** | **S** |
|---|---|---|
| Description | After receiving this commands, PRE20 will enter the state of experiment preparation. At this time, the data of program experiment will be locked. If PRE20 is in output state and receives *TRG experiment trigger commands, LIST program experiment will enter the state of trigger and start to execute the preset experiment steps.<br>Note: When the LIST program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. For details about the setting, see related sections of Anyport. | |
| Example | PROG:LIST:INIT | |

| **PROGram:LIST:SEGMent** | **B** | **S** |
|---|---|---|
| Description | Set the number of steps for the LIST program experiment. | |
| Parameter Ranges | 1~300 | |
| Parameter Format | <NR1> | |
| Query Format | **PROGram:LIST:SEGMent?** | |

| | |
|---|---|
| Returned Data Format | <NR1> |
| Example | PROG:LIST:SEGM 10<br>PROG:LIST:SEGM?<br>10 |

| **PROGram:LIST:DATA#** | **B** | **S** |
|---|---|---|
| Description | Set the LIST program experiment parameters of step #, which has 9 parameters in total. The list is as follows:<br>ProgEn (Program enablement, 1: Enable, 0: Disable)<br>φ1、φ2、φ3 Uac (AC voltage, Unit: V)<br>φ1、φ2、φ3 Udc (DC voltage, Unit: V)<br>Freq (Frequency, Unit: Hz)<br>Dwell (Hold time, Unit: hundred μs)<br>Where, # indicates the number of program experiment steps in LIST, ranging from 1 to 300.<br>Note 1:<br>1)If the number of output phases is 3 phase, the values of φ2 and φ3 are automatically consistent with φ1.<br>2)If the number of output phases is 1 phase, the setting values of φ1 are valid, while the setting values of φ2 and φ3 are invalid but cannot be omitted.<br>Note 2:<br>1) If the coupling mode is AC, the Udc values of φ1, φ2 and φ3 are invalid but | | |

| | |
|---|---|
| | cannot be omitted.<br>2) If the coupling mode is DC, the Uac and Freq values of φ1, φ2 and φ3 are invalid, but cannot be omitted. |
| Parameter Ranges | ProgEn, Program enablement:0~1<br>φ1, φ2, φ3 Uac, AC voltage: 0.00~450.00<br>φ1, φ2, φ3 Uac, DC voltage: -636.00~636.00<br>Freq, Frequency: 0.001~200.000<br>Dwell, Holding time: 0~9999999 |
| Parameter Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Query Format | **PROGram:LIST:DATA#?** |
| Returned Data Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Example | PROG:LIST:DATA1 1,220.00,220.00,220.00,0.00,0.00,0.00,50.000,10000<br>PROG:LIST:DATA1?<br>1,220.0,220.0,220.0,0.0,0.0,0.0,50.0,10000 |

| **PROGram:LIST:COUNt** | **B** | **S** |
|---|---|---|
| Description | Set the number of loops for the LIST program experiment. | |
| Parameter Ranges | 0~9999999, 0 is infinite loop. Default 0. | |
| Parameter Format | <NR1> | |
| Query Format | **PROGram:LIST:COUNt?** | |
| Returned Data Format | <NR1> | |
| Example | PROG:LIST:COUN 10 | |

| | |
|---|---|
| | PROG:LIST:COUN?<br>10 |

| **PROGram:LIST:ENDState** | | **B** | **S** |
|---|---|---|---|
| Description | Set the end state of the LIST program experiment. | | |
| Parameter Ranges | <STEady\|HOLD\|STANdby>, default STEady.<br>STEady: Steady. After the end of the experiment, PRE20 returned to steady state parameters to continue operation.<br>HOLD: Hold. After the end of the experiment, PRE20 will keep the parameters of the last step and continue to run.<br>STANdby:Standby. After the experiment, PRE20 stops running and enters standby state. | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:LIST:ENDState?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:LIST:ENDS STE<br>PROG:LIST:ENDS?<br>STEady | | |

| **PROGram:LIST:CONTinuous** | | **B** | **S** |
|---|---|---|---|
| Description | Set the LIST program experiment to trigger continuously. After it is enabled, the program will not exit the enabled state after the experiment, and the trigger | | |

| | |
|---|---|
| | commands *TRG can be directly sent to restart the experiment. |
| Parameter Ranges | <ON\|OFF\|1\|0>, default OFF.<br>ON/1: Enable (On)<br>OFF/0: Disable (Off) |
| Parameter Format | <Bool> |
| Query Format | **PROGram:LIST:CONTinuous?** |
| Returned Data Format | <Bool> |
| Example | PROG:LIST:CONT OFF<br>PROG:LIST:CONT?<br>0 |

| **PROGram:LIST:TRIGer** | **B** | **S** |
|---|---|---|
| Description | Set the trigger mode for the LIST program experiment. | |
| Parameter Ranges | <AUTO\|MANual>, default AUTO.<br>AUTO: Automation. After receiving *TRG or external trigger commands, PRE20 will execute the full number of program experiment steps.<br>MANual: Manual. After receiving *TRG or external trigger commands, PRE20 performs only one step program experiment. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LIST:TRIGer?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LIST:TRIG AUTO | |

| | |
|---|---|
| | PROG:LIST:TRIG?<br>AUTO |

| **PROGram:LIST:INPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger input for the LIST program experiment. | | |
| Parameter Ranges | <INTernal\|EXTernal>, default INTernal.<br>INTernal: Internal. Trigger the experiment by display or external communication commands *TRG.<br>EXTernal: External. Trigger experiments through the Anyport digital input interface, see the Anyport Interface Commands section. | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:LIST:INPut?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:LIST:INP INT<br>PROG:LIST:INP?<br>INTernal | | |

| **PROGram:LIST:DELay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger delay time of LIST program experiment. (Unit: ms) | | |
| Parameter Ranges | 0~999999, default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LIST:DELay?** | | |

| | |
|---|---|
| Returned Data Format | <NR1> |
| Example | PROG:LIST:DEL 0<br>PROG:LIST:DEL?<br>0 |

| **PROGram:LIST:OUTPut** | **B** | **S** |
|---|---|---|
| Description | Set LIST program experiment trigger output mode. It is used to output narrow pulses through Anyport interface at the specified time in the experiment, which needs to be enabled through Anyport interface. For details, see related sections of Anyport Interface. | |
| Parameter Ranges | <ONCE\|STEP\|CYCLe>, default ONCE.<br>ONCE: Output pulses only when each experiment enters the trigger state<br>STEP: Pulses are output at each step of the experiment<br>CYCLe: The pulse is output for each cycle in the experiment | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LIST:OUTPut?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LIST:OUTP ONCE | |

| | |
|---|---|
| | PROG:LIST:OUTP?<br>ONCE |

| **PROGram:LIST:RMSMode** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the valid value mode of LIST program experiment. | | | |
| Parameter Ranges | <AUTO\|ENABle\|DISable>, default AUTO.<br>AUTO: Automation. When the program waveform is sin wave, clipping wave, built-in harmonic wave and custom waveform, and the custom waveform mode is effective value, effective value mode is automatically enabled, the output voltage is closed loop, and the output voltage is automatically adjusted to be consistent with the set value. Otherwise, the RMS mode is automatically disabled and the output voltage value is open loop.<br>ENABle: Enable. The RMS of the output voltage is force enabled.<br>DISable: Disable. Mandatory disable output voltage RMS adjustment. | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **PROGram:LIST:RMSMode?** | | | |
| Returned Data Format | <DSC> | | | |
| Example | PROG:LIST:RMSM AUTO<br>PROG:LIST:RMSM?<br>AUTO | | | |

### 4.7.2 WAVE Program Commands

| **PROGram:WAVE:INITiate** | | **B** | **S** |
|---|---|---|---|
| Description | After receiving the WAVE program enable command, PRE20 will enter the experiment preparation state. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the *TRG experiment trigger command, the WAVE program experiment will enter the trigger state and start to execute the preset experiment steps.<br>Note: when the WAVE program trigger input is set as external input, the experiment will be triggered through the Anyport input interface. See the relevant chapters of Anyport for specific settings. | | |
| **Example** | PROG:WAVE:INIT | | |

| **PROGram:WAVE:SEGMent** | | **B** | **S** |
|---|---|---|---|
| Description | Set the segment of WAVE program experiment. | | |
| Parameters | 1~300 | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:WAVE:SEGMent?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:WAVE:SEGM 1<br>PROG:WAVE:SEGM?<br>1 | | |

| **PROGram:WAVE:DATA#** | **B** | **S** |
|---|---|---|
| Description | Set the WAVE program experiment parameters of the selected step ,There are 9 parameters in total, and the list is as follows:<br>ProgEn(Program enable, 1: enable, 0: Disable)<br>φ1、φ2、φ3 Uac(AC voltage V)<br>φ1、φ2、φ3 Udc(DC Voltage V)<br>Freq(Frequency Hz)<br>Ramp(Ramp 100μs)<br>#WAVE program experiment steps #1~300.<br>Note 1:<br>1)If the number of output phases is 3-phase,The value of φ 2 φ3 is automatically associated with φ 1 keep consistent.<br>2)If the number of output phases is 3-phase,The setting value of φ 1 is valid, φ 2 φ 3 the setting value is invalid but cannot be omitted.Note 2:<br>1） If the coupling mode is AC,The UDC setting value of φ1、φ2、φ3 is invalid but cannot be omitted.<br>2） If the coupling mode is DC,The UAC and freq settings of φ1、φ2、φ3 are invalid, but cannot be omitted. | | |
| Parameters | ProgEn,Program enable:0~1<br>φ1、φ2、φ3 Uac,AC voltage:0.00~450.00<br>φ1、φ2、φ3Uac,DC voltage:-636.00~636.00 | | |

| | |
|---|---|
| | Freq,Frequency:0.001~200.000<br>Ramp,Ramp:0~9999999 |
| Parameter Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Query Format | **PROGram:WAVE:DATA#?** |
| Returned Data Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Example | PROG:WAVE:DATA1 1,220.00,220.00,220.00,0.00,0.00,0.00,50.000,10000<br>PROG:WAVE:DATA1?<br>1,220.0,220.0,220.0,0.0,0.0,0.0,50.0,10000 |

| **PROGram:WAVE:COUNt** | **B** | **S** |
|---|---|---|
| Description | Set the cycle times of WAVE program experiment. | |
| Parameters | 0~9999999,0 is infinite loop. | |
| Parameter Format | <NR1> | |
| Query Format | **PROGram:WAVE:COUNt?** | |
| Returned Data Format | <NR1> | |
| Example | PROG:WAVE:COUN 10<br>PROG:WAVE:COUN?<br>10 | |

| **PROGram:WAVE:ENDState** | **B** | **S** |
|---|---|---|
| Description | Set the end state of wave program experiment. | |
| Parameters | <STEady\|HOLD\|STANdby>,Default STEady. | |

| | |
|---|---|
| | STEady:Steady state. After the experiment, PRE20 returns to steady state parameters and continues to run.<br>HOLD:Hold. After the experiment, PRE20 keeps the parameters of the last step and continues to run.<br>STANdby:Standby. After the experiment, PRE20 stops running and enters the standby state. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:WAVE:ENDState?** |
| Returned Data Format | <DSC> |
| Example | PROG:WAVE:ENDS STE<br>PROG:WAVE:ENDS?<br>STEady |

| **PROGram:WAVE:CONTinuous** | **B** | **S** |
|---|---|---|
| Description | Set the continuous trigger of WAVE program experiment. After enabling, the program enabling state will not exit after the experiment. You can directly send the trigger command *TRG to restart the experiment. | |
| Parameters | <ON\|OFF\|1\|0>,Default OFF.<br>ON/1:Enable<br>OFF/0:Disable | |
| Parameter Format | <Bool> | |
| Query Format | **PROGram:WAVE:CONTinuous?** | |

| | |
|---|---|
| Returned Data Format | <Bool> |
| Example | PROG:WAVE:CONT OFF<br>PROG:WAVE:CONT?<br>0 |

| **PROGram:WAVE:TRIGer** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger mode of WAVE program experiment. | | |
| Parameters | <AUTO\|MANual>,Default auto.<br>AUTO:Automation, after receiving *TRG or external trigger command, PRE20 will execute all program experiment steps.<br>MANual:Manual, after receiving *TRG or external trigger command, PRE20 only performs one-step program experiment. | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:WAVE:TRIGer?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:WAVE:TRIG AUTO<br>PROG:WAVE:TRIG?<br>AUTO | | |

| **PROGram:WAVE:INPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger input of WAVE program experiment. | | |
| Parameters | <INTernal\|EXTernal>,Default INTernal. | | |

| | |
|---|---|
| | INTernal:Internal, the experiment is triggered by the display screen or external communication command *TRG.<br>EXTernal:External, trigger the experiment through the Anyport digital input interface. See the Anyport interface commands section for details. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:WAVE:INPut?** |
| Returned Data Format | <DSC> |
| Example | PROG:WAVE:INP INT<br>PROG:WAVE:INP?<br>INTernal |

| **PROGram:WAVE:DELay** | **B** | **S** | |
|---|---|---|---|
| Description | Set the trigger delay time of WAVE program experiment. (ms) | | |
| Parameters | 0~999999,Default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:WAVE:DELay?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:WAVE:DEL 0<br>PROG:WAVE:DEL?<br>0 | | |

| **PROGram:WAVE:OUTPut** | **B** | **S** | |
|---|---|---|---|

| | |
|---|---|
| Description | Set the WAVE program experiment trigger output mode. It is used to output narrow pulses through the Anyport interface at the specified time of the experiment. It needs to be enabled through the Anyport interface. See the relevant chapters of the Anyport interface for details. |
| Parameters | <ONCE\|STEP\|CYCLe><br>ONCE:Output pulse only when each experiment enters the trigger state.<br>STEP:Output pulses at each step of the experiment.<br>CYCLe:Output pulse for each cycle in the experiment. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:WAVE:OUTPut?** |
| Returned Data Format | <DSC> |
| Example | PROG:WAVE:OUTP ONCE<br>PROG:WAVE:OUTP?<br>ONCE |

| **PROGram:WAVE:RMSMode** | **B** | **S** | |
|---|---|---|---|
| Description | Set the effective value mode of WAVE program experiment. | | |
| Parameters | <AUTO\|ENABle\|DISable>,Default AUTO.<br>AUTO:Automation, when the programmed waveform is sine wave, clipping, built-in harmonic and user-defined waveform, and the user-defined waveform mode is effective value, the effective value mode is automatically enabled, the output voltage value is closed-loop, and the output voltage value is automatically adjusted to be consistent with the set value. Otherwise, the RMS mode is | | |

| | |
|---|---|
| | automatically disabled and the output voltage value is open-loop.<br>ENABle:Enable, force enable output voltage RMS adjustment.<br>DISable:Disable, force disable the output voltage RMS adjustment. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:WAVE:RMSMode?** |
| Returned Data Format | <DSC> |
| Example | PROG:WAVE:RMSM AUTO<br>PROG:WAVE:RMSM?<br>AUTO |

### 4.7.3 STEP Program Commands

| **PROGram:STEP:INITiate** | **B** | **S** |
|---|---|---|
| Description | STEP program enable command. After receiving the command, PRE20 will enter the experiment preparation state. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the *TRG experiment trigger command, the STEP program experiment will enter the trigger state and start to execute the preset experiment steps.<br>Note: when the step program trigger input is set as external input, the experiment will be triggered through the Anyport input interface. See the relevant chapters of Anyport for specific settings. | |
| Example | PROG:STEP:INIT | |

| PROGram:STEP:DATA# | B | S |
|---|---|---|
| Description | Set STEP program experiment parameters,A total of 32 parameters are listed as follows:<br>φ1、φ2、φ3 Uac Start(AC voltage Start value V)<br>φ1、φ2、φ3 Udc Start(DC voltage Start value V)<br>Freq Start(Frequency start value Hz)<br>φ1、φ2、φ3 Uac End(AC voltage end value V)<br>φ1、φ2、φ3 Udc End(DC voltage End value V)<br>Freq End(Frequency end value Hz)<br>φ1、φ2、φ3 Uac Δ(AC voltage step value V)<br>φ1、φ2、φ3 Udc Δ(DC voltage Step value V)<br>Freq Δ(Frequency step value Hz)<br>φ1、φ2、φ3 Phase(Phase °)<br>φ1、φ2、φ3 Percent(Percent %)<br>φ1、φ2、φ3 Waveform(Waveform)<br>Degree(Initial phase angle °)<br>Time(Time per step 100us)<br>Note 1:<br>1)If the number of output phases is 3-phase,except φ 1 φ 2 φ 3. In addition to the phase setting value,The value of φ2、φ3 is automatically associated with φ 1 keep consistent. | | |

| | |
|---|---|
| | 2)If the number of output phases is 1-phase,The setting value of φ 1 is valid, φ 2 φ 3 the setting value is invalid but cannot be omitted.<br>Note 2:<br>3） When PRE20 coupling mode is AC,φ 1 φ 2 φ 3 UDC start, UDC end, UDC Δ ,The setting value is invalid but cannot be omitted.<br>4） When PRE20 coupling mode is DC,φ 1 φ 2 φ 3UAC start, UAC end, UAC Δ,The phase, percent, waveform, freq, and degree settings are invalid, but cannot be omitted.<br>Note 3:<br>1） WaveForm for parameter definition, see[SOURce]:VOLTage:Waveform command description.<br>2)Percent,The parameter definitions vary according to the selected waveform. See the waveform settings for details. |
| Parameters | φ1、φ2、φ3 Uac Start,Start value of AC voltage:0.00~450.00<br>φ1、φ2、φ3 Udc Start,Start value of DC voltage:-636.00~636.00<br>Freq Start,Frequency start value:0.001~200.000<br>φ1、φ2、φ3 Uac End,AC voltage end value:0.00~450.00<br>φ1、φ2、φ3 Udc End,End value of DC voltage:-636.00~636.00<br>Freq End,Frequency end value:15.000~200.000<br>φ1、φ2、φ3 Uac Δ,AC voltage step value:0.00~450.00<br>φ1、φ2、φ3 Udc Δ,Step value of DC voltage:-1272.00~1272.00<br>Freq Δ,Frequency step value:0.001~200.000 |

| | |
|---|---|
| | φ1、φ2、φ3 Phase,Phase:0.0~359.9<br>φ1、φ2、φ3 Percent,Waveform parameters:0.00~100.00(Cipping:0.00~50.00)<br>φ1、φ2、φ3 Waveform,Phase:0~142,For detailsVOLTage:WAVeform command<br>Degree,Phase angle:0.0~359.9<br>Time,Time per step:0~9999999 |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR2,NR1> |
| Query Format | PROGram:STEP:DATA? |
| Returned Data Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR2,NR1> |
| Example | PROG:STEP:DATA 220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.00,240.00,240.00,10.00,10.00,10.00,60.000,2.00,2.00,2.00,1.00,1.00,1.00,1.000,0.0,240.0,120.0,50.00,50.00,50.00,0,0,0,90.0,10000<br>PROG:STEP:DATA?<br>220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.00,240.00,240.00,10.00,10.00,10.00,60.000,2.00,2.00,2.00,1.00,1.00,1.00,1.000,0.0,240.0,120.0,50.00,50.00,50.00,0,0,0,90.0,10000 |

| **PROGram:STEP:COUNt** | **B** | **S** |
|---|---|---|
| Description | Set the number of cycles of STEP program experiment. | |

| | |
|---|---|
| Parameters | 0~9999999,0 is infinite loop. |
| Parameter Format | <NR1> |
| Query Format | PROGram:STEP:COUNt? |
| Returned Data Format | <NR1> |
| Example | PROG:STEP:COUN 10<br>PROG:STEP:COUN?<br>10 |

| **PROGram:STEP:ENDState** | **B** | **S** |
|---|---|---|
| Description | Set the end state of STEP program experiment. | |
| Parameters | <STEady\|HOLD\|STANdby>,Default STEady.<br>STEady:Steady. After the experiment, pre20 returns to steady state parameters and continues to run.<br>HOLD: Hold,After the experiment, pre20 keeps the parameters of the last step and continues to run.<br>STANdby:Standby,After the experiment, pre20 stops running and enters the standby state. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:STEP:ENDState?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:STEP:ENDS STE<br>PROG:STEP:ENDS? | |

| | |
|---|---|
| | STEady |

| **PROGram:STEP:CONTinuous** | | **B** | **S** |
|---|---|---|---|
| Description | Set the continuous trigger of the STEP program experiment. After enabling, the program enabling state will not exit after the experiment. You can directly send the trigger command *TRG to restart the experiment. | | |
| Parameters | <ON\|OFF\|1\|0>,Default OFF.<br>ON/1:Enable<br>OFF/0:Disable | | |
| Parameter Format | <Bool> | | |
| Query Format | **PROGram:STEP:CONTinuous?** | | |
| Returned Data Format | <Bool> | | |
| Example | PROG:STEP:CONT OFF<br>PROG:STEP:CONT?<br>0 | | |

| **PROGram:STEP:TRIGer** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger mode of STEP program experiment. | | |
| Parameters | <AUTO\|MANual>,Default AUTO.<br>AUTO:Automation, after receiving *TRG or external trigger command, PRE20 will execute all program experiment steps. | | |

| | |
|---|---|
| | MANual:Manual, *TRG or external trigger command is received, PRE20 only performs one step program experiment. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:STEP:TRIGer?** |
| Returned Data Format | <DSC> |
| Example | PROG:STEP:TRIG AUTO<br>PROG:STEP:TRIG?<br>AUTO |

| **PROGram:STEP:INPut** | **B** | **S** |
|---|---|---|
| Description | Set the trigger input of STEP program experiment. | |
| Parameters | <INTernal\|EXTernal>,Default INTernal.<br>INTernal:through the display screen or external communication command *TRG trigger experiment.<br>EXTernal:trigger the experiment through the Anyport digital input interface. See the Anyport interface commands section for details. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:STEP:INPut?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:STEP:INP INT<br>PROG:STEP:INP?<br>INTernal | |

| **PROGram:STEP:DELay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger delay time of STEP program experiment. (ms) | | |
| Parameters | 0~999999,Default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:STEP:DELay?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:STEP:DEL 0<br>PROG:STEP:DEL?<br>0 | | |

| **PROGram:STEP:OUTPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set the STEP program experiment trigger output mode. It is used to output narrow pulses through the Anyport interface at the specified time of the experiment. It needs to be enabled through the Anyport interface. See the relevant chapters of the Anyport interface for details. | | |
| Parameters | <ONCE\|STEP\|CYCLe><br>ONCE:Output pulse only when each experiment enters the trigger state.<br>STEP:Output pulses at each step of the experiment.<br>CYCLe:Output pulse for each cycle in the experiment. | | |
| Parameter Format | <DSC> | | |

| | |
|---|---|
| Query Format | PROGram:STEP:OUTPut? |
| Returned Data Format | <DSC> |
| Example | PROG:STEP:OUTP ONCE<br>PROG:STEP:OUTP?<br>ONCE |

| **PROGram:STEP:RMSMode** | **B** | **S** |
|---|---|---|
| Description | Set the STEP program experiment effective value mode. | |
| Parameters | AUTO:Automation, when the programmed waveform is sine wave, clipping, built-in harmonic and user-defined waveform, and the user-defined waveform mode is effective value, the effective value mode is automatically enabled, the output voltage value is closed-loop, and the output voltage value is automatically adjusted to be consistent with the set value. Otherwise, the RMS mode is automatically disabled and the output voltage value is open-loop.<br>ENABle: force enable output voltage RMS adjustment.<br>DISable:force disable the output voltage RMS adjustment. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:STEP:RMSMode?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:STEP:RMSM AUTO<br>PROG:STEP:RMSM?<br>AUTO | |

### 4.7.4 PULSe Program Commands

| **PROGram:PULSe:INITiate** | **B** | **S** | **L** |
|---|---|---|---|
| Description | PULSe program enable command. After receiving the command, PRE20 will enter the experiment preparation state. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the *TRG experiment trigger command, the pulse program experiment will enter the trigger state and start to execute the preset experiment steps.<br>Note: when the PULSe program trigger input is set as external input, the experiment will be triggered through the Anyport input interface. See the relevant chapters of Anyport for specific settings. | | |
| Example | PROG:PULS:INIT | | |

| **PROGram:PULSe:COUNt** | **B** | **S** |
|---|---|---|
| Description | Set the cycle times of PULSe program experiment. | |
| Parameters | <0~9999999>,Default 0. | |
| Parameter Format | < NR1 > | |
| Query Format | **PROGram:PULSe:COUNt?** | |
| Returned Data Format | < NR1 > | |
| Example | PROG:PULS:COUN 10<br>PROG:PULS:COUN? | |

| | |
|---|---|
| | 10 |

| **PROGram:PULSe:OUTPut** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set PULSe program experiment trigger output mode. It is used to output narrow pulses through the Anyport interface at the specified time in the experiment. It needs to be enabled through the Anyport interface. See relevant chapters for details. | | | |
| Parameters | <ONCE\|STEP\|CYCLe>,Default ONCE.<br>ONCE:Output pulse only when each experiment enters the trigger state.<br>STEP:Output pulses at each step of the experiment.<br>CYCLe:Output pulse for each cycle in the experiment. | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **PROGram:PULSe:OUTPut?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | PROG:PULS:OUTP STEP<br>PROG:PULS:OUTP?<br>STEP | | | |

| **PROGram:PULSe:CONTinuous** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set PULSe program experiment to trigger continuously. | | | |
| Parameters | <ON\|OFF\|1\|0>,Default 0. | | | |

| | |
|---|---|
| | ON/1:Enable<br>OFF/0:Disabled |
| Parameter Format | < Bool > |
| Query Format | **PROGram:PULSe:CONTinuous?** |
| Returned Data Format | < Bool > |
| Example | PROG:PULS:CONT ON<br>PROG:PULS:CONT?<br>1 |

| **PROGram:PULSe:TRIGer** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set PULSe program experiment trigger mode. | | | |
| Parameters | <AUTO\|MANual>,Default AUTO.<br>AUTO:Automation<br>MANual:Manual | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **PROGram:PULSe:TRIGer?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | PROG:PULS:TRIG AUTO<br>PROG:PULS:TRIG?<br>AUTO:Automation | | | |

| **PROGram:PULSe:INPut** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set PULSe program experiment trigger input. | | | |
| Parameters | <INTernal\|EXTernal>,Default INTernal.<br>INTernal:Internal<br>EXTernal:External | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **PROGram:PULSe:INPut?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | PROG:PULS:INP INT<br>PROG:PULS:INP?<br>INTernal:Internal | | | |

| **PROGram:PULSe:DELay** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set PULSe program experiment trigger delay time (ms). | | | |
| Parameters | <0~999999>,Default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **PROGram:PULSe:DELay?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | PROG:PULS:DELay 300<br>PROG:PULS:DELay?<br>300 | | | |

| **PROGram:PULSe:RMSMode** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set transient PULSe RMS mode | | | |
| Parameters | <AUTO\|ENABle\|DISable>,Default AUTO.<br>AUTO:Atuomation<br>ENABle:Enable<br>DISable:Disable | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **PROGram:PULSe:RMSMode?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | PROG:PULS:RMSM AUTO<br>PROG:PULS:RMSM?<br>AUTO:Automation | | | |

| **PROGram:PULSe:ENDState** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the end state of transient PULSe. | | | |
| Parameters | <STEady\|HOLD\|STANdby>,Default STEady.<br>STEady:Steady<br>HOLD:Hold<br>STANdby:Standby | | | |
| Parameter Format | < DSC > | | | |

| | |
|---|---|
| Query Format | **PROGram:PULSe:ENDState?** |
| Returned Data Format | < DSC > |
| Example | PROG:PULS:ENDS STE<br>PROG:PULS:ENDS?<br>STEady:Steady |

| **PROGram:PULSe:DATA** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the selected PULSe program experiment parameters,A total of 35 parameters are listed as follows:<br>φ1 pulse Uac AC voltage(V)<br>φ2 pulse Uac AC voltage(V)<br>φ3 pulse Uac AC voltage(V)<br>φ1 pulse Udc DC Voltage(V)<br>φ2 pulse Udc DC Voltage(V)<br>φ3 pulseUdc DC Voltage(V)<br>Pulse Frequency(Hz)<br>φ1 pulse Phase(°)<br>φ2 pulse Phase(°)<br>φ3 pulse Phase(°)<br>φ1 pulse Percent percent(%)<br>φ2 pulsePercent percent(%)<br>φ3 pulsePercent percent(%)<br>φ1 pulseWaveform wave | | | |

| | |
|---|---|
| | φ2 pulseWaveform wave<br>φ3 pulseWaveform wave<br>Pulse Degree(°)<br>φ1 Fundamental wave Uac AC voltage(V)<br>φ2 Fundamental wave Uac AC voltage(V)<br>φ3 Fundamental wave Uac AC voltage(V)<br>φ1 Fundamental wave Udc DC Voltage(V)<br>φ2 Fundamental wave Udc DC Voltage(V)<br>φ3 Fundamental waveUdc DC Voltage(V)<br>Fundamental wave Frequency(Hz)<br>φ1 Fundamental wave Phase(°)<br>φ2 Fundamental wave Phase(°)<br>φ3 Fundamental wave Phase(°)<br>φ1 Fundamental wave Percent percent(%)<br>φ2 Fundamental wave Percent percent(%)<br>φ3 Fundamental wave Percent percent(%)<br>φ1 Fundamental waveWaveform wave<br>φ2 Fundamental waveWaveform wave<br>φ3 Fundamental waveWaveform wave<br>Fundamental wave Period Cycle(100us)<br>Fundamental wave Width Pulse width(100us) |
| Parameters | φ1、φ2、φ3 pulse Uac AC voltage:0.00~300.00,0.00~450.00,Default 10;<br>φ1、φ2、φ3 pulse Uac DC voltage:-636.00~636.00,Default 0; |

| | |
|---|---|
| | φ1、φ2、φ3 pulse Freq Frequency:0.001~2000.000,Default 1000;<br>φ1、φ2、φ3 pulse Phase:0.0~359.9,Default φ1=0,φ2=240,φ3=120;<br>φ1、φ2、φ3 pulse Percent percent:0.00~100.00,Default 50;<br>φ1、φ2、φ3 pulse Waveform wave:0~142,Default 0;<br>φ1、φ2、φ3 pulse Degree phase angle:0~359.9,Default 0;<br>φ1、φ2、φ3 Fundamental wave UacAC voltage:0.00~300.00,0.00~450.00,Default 220;<br>φ1、φ2、φ3 Fundamental wave Uac DC voltage:-636.00~636.00,Default 0;<br>φ1、φ2、φ3 Fundamental wave Frequency:0.001~2000.000,Default 50;<br>φ1、φ2、φ3 Fundamental wave Phase:0.0~359.9,Default φ1=0,φ2=240,φ3=120;<br>φ1、φ2、φ3 Fundamental wave Percent percent:0.00~100.00,Default 50;<br>φ1、φ2、φ3 Fundamental wave Waveform wave:0~142,Default 0;<br>φ1、φ2、φ3 Fundamental wave Period Cycle:0~9999999,Default 1000;<br>φ1、φ2、φ3 Fundamental wave Width:0~9999999,Default 200; |
| Parameter Format | < NR2,NR2,NR2,NR2,NR2,NR2,NR2, NR2,NR2, NR2, NR2,NR2, NR2,NR1, NR1, NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2, NR2,NR2, NR2, NR2,NR2, NR2,NR1, NR1, NR1, NR1, NR1,> |
| Query Format | **PROGram: PULSe:DATA?** |
| Returned Data Format | < NR2,NR2,NR2,NR2,NR2,NR2,NR2, NR2,NR2, NR2, NR2,NR2, NR2,NR1, NR1, NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2, NR2,NR2, NR2, NR2,NR2, NR2,NR1, NR1, NR1, NR1, NR1,> |

| | |
|---|---|
| Example | PROGram:PULS:DATA 220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.0,240.0,240.0,50.00,50.00,50.00,4,4,5,280.0,220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.0,240.0,240.0,50.00,50.00,50.00,4,4,5,10000,10000<br>PROGram:PULS:DATA?<br>220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.0,240.0,240.0,50.00,50.00,50.00,4,4,5,280.0,220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.0,240.0,240.0,50.00,50.00,50.00,4,4,5,10000,10000 |

### 4.7.5 ADVanced Program Commands

| **PROGram:ADVanced:INITiate** | **B** | **S** |
|---|---|---|
| Description | The ADVanced program enable command. After receiving the command, PRE20 will enter the experiment preparation state. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the *TRG experiment trigger command, the ADVanced program experiment will enter the trigger state and start to execute the preset experiment steps.<br>Note: when the ADVanced program trigger input is set as external input, the experiment will be triggered through the Anyport input interface. See the relevant chapters of Anyport for specific settings. | |
| Example | PROG:ADV:INIT | |

| **PROGram:ADVanced:SEGMent** | **B** | **S** |
|---|---|---|

| | |
|---|---|
| Description | Set the number of steps for the ADVanced program experiment. |
| Parameters | 1~300 |
| Parameter Format | <NR1> |
| Query Format | PROGram:ADVanced:SEGMent? |
| Returned Data Format | <NR1> |
| Example | PROG:ADV:SEGM 10<br>PROG:ADV:SEGM?<br>10 |

| **PROGram:ADVanced:DATA#** | **B** | **S** |
|---|---|---|
| Description | Set the ADVanced program experiment parameters of the selected step.A total of 25 parameters are listed as follows:<br>ProgEn(Program enable,1:Enable,0:Disable)<br>φ1、φ2、φ3 Uac(AC voltage V)<br>φ1、φ2、φ3 Udc(DC voltage V)<br>Freq(Frequency Hz)<br>Ramp(Ramp 100μs)<br>Dwell(HOLD 100μs)<br>φ1、φ2、φ3 Phase(phase °)<br>φ1、φ2、φ3 Percent(Waveform parameters %)<br>Degree(Degree °)<br>DegreeEn(Degree enable,1:Enable,0:Disable) | | |

Link(Link)
Count(Count)
φ1、φ2、φ3 WaveForm(Waveform)
Trig In (Trigger input enable,1:Enable,0:Disable)
Trig Out(Trigger output enable,1:Enable,0:Disable)
#ADVanced program experiment steps,#1~300.
Note 1:
1)If the number of output phases is 3-phase,except φ 1 φ 2 φ 3. In addition to the phase setting value, The value of φ 2 φ3 is automatically associated with φ 1 keep consistent.
2)If the number of output phases is 1-phase,The setting value of φ1 is valid, φ 2 φ 3 the setting value is invalid but cannot be omitted.
Note 2:
1） When PRE20 coupling mode is AC,The UDC setting value of φ 1 φ 2 φ 3 is invalid but cannot be omitted.
2） When PRE20 coupling mode is DC,The UAC, phase, percent, waveform, freq, degree, and degree settings of φ1、φ2、φ3 are invalid, but cannot be omitted.
Note 3:
WaveForm for parameter definition, see[SOURce]:VOLTage:WAVeform Description.
1） Percent The parameter definitions vary according to the selected waveform. See the waveform settings for details.

| | |
|---|---|
| Parameters | ProgEn,Program enable:0~1<br>φ1、φ2、φ3 Uac,AC voltage:0.00~450.00<br>φ1、φ2、φ3 Udc,DC voltage:-636.00~636.00<br>Freq,Frequency:0.001~200.000<br>Ramp,Ramp:0~9999999<br>Dwell,HOLD:0~9999999<br>φ1、φ2、φ3 Phase:0.0~359.9<br>φ1、φ2、φ3 Percent:0.00~100.00(Clipping:0.00~50.00)<br>Degree,Degree:0.0~359.9<br>DegreeEn,Degree enable:0~1<br>Link,Link:0~300<br>Count,Count:0~9999999<br>φ1 、 φ2 、 φ3 WaveForm,Waveform:0~142,For details VOLTage:WAVeform commands<br>Trig In,Trigger input enable:0~1<br>Trig Out,Trigger output enable:0~1 |
| Parameter Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR1,NR1,NR1,NR1,NR1> |
| Query Format | PROGram:ADVanced:DATA#? |
| Returned Data Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR1,NR1,NR1,NR1,NR1> |
| Example | PROGram:ADVanced:DATA1 1,220.00,220.00,220.00,0.00,0.00,0.00,50.000,10 |

| | |
|---|---|
| | 000,10000,0.0,240.0,120.0,50.00,50.00,50.00,0.0,0,0,0,0,0,0,0,0<br>PROGram:ADVanced:DATA1?<br>1,220.0,220.0,220.0,0.0,0.0,0.0,0.0,50.0,10000,10000,0.0,240.0,120.0,50.0,50.0,50.0<br>,0.0,0,0,0,0,0,0,0,0,0 |

| **PROGram:ADVanced:COUNt** | **B** | **S** |
|---|---|---|
| Description | Set the number of cycles of the ADVanced program experiment. | |
| Parameters | 0~9999999 | |
| Parameter Format | <NR1> | |
| Query Format | PROGram:ADVanced:COUNt? | |
| Returned Data Format | <NR1> | |
| Example | PROG:ADV:COUN 10<br>PROG:ADV:COUN?<br>10 | |

| **PROGram:ADVanced:ENDState** | **B** | **S** |
|---|---|---|
| Description | Set the end state of the ADVanced program experiment. | |
| Parameters | <STEady\|HOLD\|STANdby>,Default STEady.<br>STEady:After the experiment, PRE20 returned to the steady-state parameters and continued to run.<br>HOLD:After the experiment, PRE20 keeps the parameters of the last step and | |

| | |
|---|---|
| | continues to run.<br>STANdby:After the experiment, PRE20 stops running and enters standby mode. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:ADVanced:ENDState?** |
| Returned Data Format | <DSC> |
| Example | PROG:ADV:ENDS STE<br>PROG:ADV:ENDS?<br>STEady |

| **PROGram:ADVanced:CONTinuous** | **B** | **S** |
|---|---|---|
| Description | Set the continuous trigger of LIST program experiment. After enabling, the program enabling state will not exit after the experiment, and the trigger command *TRG can be directly sent to restart the experiment. | |
| Parameters | <ON\|OFF\|1\|0>,Default OFF.<br>ON/1:Enable<br>OFF/0:Disable | |
| Parameter Format | <Bool> | |
| Query Format | **PROGram:ADVanced:CONTinuous?** | |
| Returned Data Format | < Bool > | |
| Example | PROG:ADV:CONT OFF<br>PROG:ADV:CONT?<br>0 | |

| **PROGram:ADVanced:TRIGer** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger mode of the ADVanced program experiment. | | |
| Parameters | <AUTO\|MANual>,Default AUTO.<br>AUTO:Automatically, after receiving *TRG or external trigger command, PRE20 will execute all program experiment steps.<br>MANual:For a manual, after receiving *TRG or external trigger command, PRE20 only performs one-step program experiment. | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:ADVanced:TRIGer?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:ADV:TRIG AUTO<br>PROG:ADV:TRIG?<br>AUTO | | |

| **PROGram:ADVanced:INPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger input of the ADVanced program experiment. | | |
| Parameters | <INTernal\|EXTernal>,Default INTernal.<br>INTernal:Trigger the experiment through the display screen or external communication command *TRG.<br>EXTernal:Trigger the experiment through the Anyport digital input interface. See | | |

| | |
|---|---|
| | the Anyport interface commands section for details. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:ADVanced:INPut?** |
| Returned Data Format | <DSC> |
| Example | PROG:ADV:INP INT<br>PROG:ADV:INP?<br>INTernal:Internal |

| **PROGram:ADVanced:DELay** | **B** | **S** |
|---|---|---|
| Description | Set the trigger delay time of ADVanced program experiment.(ms) | |
| Parameters | <0~999999>,Default 0. | |
| Parameter Format | <NR1> | |
| Query Format | **PROGram:ADVanced:DELay?** | |
| Returned Data Format | <NR1> | |
| Example | PROG:ADV:DEL 0<br>PROG:ADV:DEL?<br>0 | |

| **PROGram:ADVanced:OUTPut** | **B** | **S** |
|---|---|---|
| Description | Set the ADVanced program experiment trigger output mode. It is used to output | |

| | |
|---|---|
| | narrow pulses through the Anyport interface at the specified time of the experiment. It needs to be enabled through the Anyport interface. See the relevant chapters of the Anyport interface for details. |
| Parameters | <ONCE\|STEP\|CYCLe><br>ONCE:Output pulse only when each experiment enters the trigger state.<br>STEP:Output pulses at each step of the experiment.<br>CYCLe:Output pulse for each cycle in the experiment.<br>Note: the Trig Out enable in the single-step program data can be configured to output pulses at the beginning of any step or multiple steps. At this time, it is necessary to set the ADVanced program experiment trigger output mode to STEP. |
| Parameter Format | <DSC> |
| Query Format | PROGram:ADVanced:OUTPut? |
| Returned Data Format | <DSC> |
| Example | PROG:ADV:OUTP STEP<br>PROG:ADV:OUTP?<br>STEP |

| **PROGram:ADVanced:RMSMode** | **B** | **S** | |
|---|---|---|---|
| Description | Set the ADVanced program experiment RMS mode. | | |
| Parameters | <AUTO\|ENABle\|DISable>,Default AUTO.<br>AUTO:Automatic, when the programmed waveform is sine wave, clipping, built-in harmonic and user-defined waveform, and the user-defined waveform | | |

| | |
|---|---|
| | mode is effective value, the effective value mode is automatically enabled, the output voltage value is closed-loop, and the output voltage value is automatically adjusted to be consistent with the set value. Otherwise, the RMS mode is automatically disabled and the output voltage value is open-loop.<br>ENABle:Forc enable output voltage RMS adjustment.<br>DISable: Forc disable output voltage RMS adjustment |
| Parameter Format | <DSC> |
| Query Format | **PROGram:ADVanced:RMSMode?** |
| Returned Data Format | <DSC> |
| Example | PROG:ADV:RMSM AUTO<br>PROG:ADV:RMSM?<br>AUTO |

### 4.7.6 HARMonic Program Commands

| **PROGram:HARMonic:INITiate** | **B** | **S** | |
|---|---|---|---|
| Description | HARMonic program enable command. After receiving the command, PRE20 will enter the experiment enable state. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the *TRG experiment trigger command, the program experiment will enter the trigger state and start to output the harmonic waveform according to the preset harmonic parameters.<br>In the triggered state of the HARMonic program experiment, after a new set of experiment parameters is issued, the HARMonic program enable command can | | |

| | |
|---|---|
| | be directly issued again to update a set of experiment parameters and output, without re issuing the *TRG experiment trigger command.<br>Note 1: the following conditions are required for PRE20 to enter the HARMonic program enable state:<br>1） Coupling mode is AC or AC+DC.<br>2） Select sine wave as waveform.<br>3） Output frequency setting range:40Hz~200Hz.<br>Note 2: when the HARMonic program trigger input is set as external input, the experiment will be triggered through the Anyport input interface. See the relevant chapters of Anyport for specific settings. |
| Example | PROG:HARM:INIT |

| **PROGram:HARMonic:DATA#** | **B** | **S** |
|---|---|---|
| Description | Set the HARMonic program experiment parameters of the selected harmonic order.A total of 6 parameters are listed as follows:<br>φ1#harmonic voltage THD(%)<br>φ1#harmonic voltage Phase(°)<br>φ2#harmonic voltage THD(%)<br>φ2#harmonic voltage Phase(°)<br>φ3#harmonic voltage THD(%)<br>φ3#harmonic voltage Phase(°)<br>#Indicates the harmonic order, and the range is divided into two gears:<br>1） Output frequency is[40Hz~70Hz],#=2~100 | |

| | |
|---|---|
| | 2） Output frequency is(70~200Hz],#=2~25<br>Note 1:<br>When the HARMonic program experiment is in the trigger state, the output frequency parameter can still be modified, and the range cannot exceed the gear at the beginning of the experiment.<br>Note 2:<br>If the number of output phases is 3-phase,The value of φ 2 φ3 is automatically associated with φ 1 keep consistent.<br>If the number of output phases is 1-phase,The setting value of φ 1 is valid, φ 2 φ 3 the setting value is invalid but cannot be omitted. |
| Parameters | φ1#harmonic voltage THD:0.00~40.00<br>φ1#harmonic voltage Phase:0.0~359.9<br>φ2#harmonic voltage THD:0.00~40.00<br>φ2#harmonic voltage Phase:0.0~359.9<br>φ3#harmonic voltage THD:0.00~40.00<br>φ3#harmonic voltage Phase:0.0~359.9 |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2> |
| Query Format | PROGram:HARMonic:DATA#? |
| Returned Data Format | <NR2,NR2,NR2,NR2,NR2,NR2> |
| Example | PROGram:HARMonic:DATA1 5.00,0.0,3.00,180.0,1.00,0.0<br>PROGram:HARMonic:DATA1?<br>5.0,0.0,3.0,180.0,1.0,0.0 |

| **PROGram:HARMonic:INPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger input of HARMonic program experiment. | | |
| Parameters | <INTernal\|EXTernal>,Default INTernal.<br>INTernal:Trigger the experiment through the display screen or external communication command *TRG.<br>EXTernal:Trigger the experiment through the Anyport digital input interface. See the Anyport interface commands section for details. | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:HARMonic:INPut?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:HARM:INP INT<br>PROG:HARM:INP?<br>INTernal | | |

| **PROGram:HARMonic:DELay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger delay time of HARMonic program experiment. (ms) | | |
| Parameters | 0~999999,Default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:HARMonic:DELay?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:HARM:DELay 0 | | |

| | |
|---|---|
| | PROG:HARM:DELay?<br>0 |

| **PROGram:HARMonic:OUTPut** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set HARMonic program experiment trigger output mode. It is used to output narrow pulses through the Anyport interface at the specified time in the experiment. It needs to be enabled through the Anyport interface. See relevant chapters for details. | | | |
| Parameters | <ONCE\|BASE>,Default ONCE.<br>ONCE:once, output pulse only when each experiment enters the trigger state.<br>BASE:Fundamental wave, output pulse at zero crossing of each fundamental wave. | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **PROGram:HARMonic:OUTPut?** | | | |
| Returned Data Format | <DSC> | | | |
| Example | PROG:HARM:OUTP ONCE<br>PROG:HARM:OUTP?<br>ONCE | | | |

### 4.7.7 INTerharm Program Commands

| **PROGram:INTerharm:INITiate** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | The source mode INTerharm program enable command will enter the experiment | | | |

| | |
|---|---|
| | preparation state upon receipt by PRE20. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the * TRG experiment trigger command, the INTerharm program experiment will enter the trigger state and start executing the preset experiment steps<br>Note: When the INTerharm program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. Please refer to the relevant chapters of Anyport for specific settings |
| Example | PROG:INT:INIT |

| **PROGram:INTerharm:COUNt** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Sets the number of loops for the source mode INTerharm program experiment. | | |
| Parameter Ranges | <0~9999999>,default 0. | | |
| Parameter Format | < NR1> | | |
| Query Format | **PROGram:INTerharm:COUNt?** | | |
| Returned Data Format | < NR1 > | | |
| Example | PROG:INT:COUN 10<br>PROG:INT:COUN?<br>10 | | |

| **PROGram:INTerharm:SEGMent** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the number of steps for the source mode INTerharm program experiment. | | |

| | |
|---|---|
| Parameter Ranges | <1~300>,default 1. |
| Parameter Format | < NR1 > |
| Query Format | **PROGram:INTerharm:SEGMent?** |
| Returned Data Format | < NR1 > |
| Example | PROG:INT:SEGM 10<br>PROG:INT:SEGM?<br>10 |

**PROGram:INTerharm:OUTPut** **B** **S** **L**

| | |
|---|---|
| Description | Set the source mode to trigger the output mode in the program experiment of the INTerharm. It is used to output narrow pulses through the Anyport interface at the specified time in the experiment. It needs to be enabled through the Anyport interface, as detailed in the relevant chapters |
| Parameter Ranges | <ONCE\|STEP\|CYCLe\|BASE>,defult ONCE.<br>ONCE:Only output pulses when each experiment enters the triggering state<br>STEP:Each step of the experiment outputs pulses<br>CYCLe:Output pulses for each cycle in the experiment<br>BASE: Fundamental wave |
| Parameter Format | < DSC > |
| Query Format | **PROGram:INTerharm:OUTPut?** |
| Returned Data Format | < DSC > |
| Example | PROG:INT:OUTP ONCE |

| | |
|---|---|
| | PROG:INT:OUTP?<br>ONCE |

| **PROGram:INTerharm:CONTinuous** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | The source mode INTerharm program experiment continuously triggers commands | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |
| Parameter Format | < Bool > | | | |
| Query Format | **PROGram:INTerharm:CONTinuous?** | | | |
| Returned Data Format | < Bool > | | | |
| Example | PROG:INT:CONT ON<br>PROG:INT:CONT?<br>1 | | | |

| **PROGram:INTerharm:TRIGer** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the source mode INTerharm program experiment trigger mode. | | | |
| Parameter Ranges | < AUTO\|MANual >,deault AUTO.<br>AUTO:Automation<br>MANual:Manual | | | |

| | |
|---|---|
| Parameter Format | < DSC > |
| Query Format | **PROGram:INTerharm:TRIGer?** |
| Returned Data Format | < DSC > |
| Example | PROG:INT:TRIG AUTO<br>PROG:INT:TRIG?<br>AUTO |

| **PROGram:INTerharm:INPut** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the source mode INTerharm program experiment trigger input. | | | |
| Parameter Ranges | <INTernal\|EXTernal>,default INTernal.<br>INTernal:Internal<br>EXTernal:External | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **PROGram:INTerharm:INPut?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | PROG:INT:INP INT<br>PROG:INT:INP?<br>INT | | | |

| **PROGram:INTerharm:DELay** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the source mode INTerharm program experiment trigger delay time ( unit : | | | |

| | |
|---|---|
| | ms ). |
| Parameter Ranges | <0~999999>,default 0. |
| Parameter Format | < NR1 > |
| Query Format | **PROGram:INTerharm:DELay?** |
| Returned Data Format | < NR1 > |
| Example | PROG:INT:DELay 300<br>PROG:INT:DELay?<br>300 |

| **PROGram:INTerharm:DATA#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the source mode Select the INTerharm program experiment parameters of step #, the 7 parameters are as follows :<br>ProgEn program enable<br>Value # Inter-step harmonic content thd<br>Start Step # Interharmonic start frequency ( unit : Hz )<br>End # Interharmonic end frequency ( unit : Hz )<br>Δ # Inter-step harmonic step frequency ( unit : Hz )<br>Dwell Execution time ( unit: us )<br>Pause Interval time(unit:us) | | | |
| Parameter Ranges | Set the selected step # for the INTerharm program experiment parameters, with a total of 25 parameters listed as follows:<br>ProgEn Program enable: 0-1, default 1; | | | |

| | |
|---|---|
| | Value Step # harmonic content thd: 0.00-40.00, default 0;<br>Start Step # harmonic start frequency: 0.001~2000.000, default 15;<br>End Step # harmonic end frequency: 0.001~2000.000, default 400;<br>Δ Step # Interharmonic step frequency: 0.001~2000.000, default 5;<br>Dwell Execution time: 0-9999999, default 50000;<br>Pause Interval time: 0~9999999, default 10000; |
| Parameter Format | < NR1,NR2,NR2,NR2,NR2,NR1,NR1 > |
| Query Format | **PROGram:INTerharm:DATA#?** |
| Returned Data Format | < NR1,NR2,NR2,NR2,NR2,NR1,NR1 > |
| Example | PROGram:INT:DATA1 1,22.00,50.000,50.000,50.000,455,455<br>PROGram:INT:DATA1?<br>1,22.00,50.000,50.000,50.000,455,455 |

### 4.7.8 ISLand Program Commands

| **PROGram:ISLand:INITiate** | | **B** | **S** | |
|---|---|---|---|---|
| Description | ISLand program enable commands. After receiving this command, PRE20 will enter the experiment preparation state. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the * TRG experiment trigger command, ISLand program experiment will enter the trigger state and start executing the preset experiment steps<br>Note: When the ISLand program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. Please refer to the relevant sections of Anyport for specific settings | | | |
| Example | PROG:ISLand:INIT | | | |

| **PROGram:ISLand:MODE** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the load mode for ISLand program. | | | |
| Parameter Ranges | <RLC\|PQ>,default RLC.<br>RLC:RLC mode<br>PQ:PQ mode | | | |
| Parameter Format | < DSC> | | | |
| Query Format | PROGram:ISLand:MODE? | | | |
| Returned Data Format | <DSC> | | | |
| Example | PROG:ISL:MODE RLC | | | |

| | |
|---|---|
| | PROG:ISL:MODE?<br>RLC |

| **PROGram:ISLand:PENable** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set degree enable for ISLand program | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |
| Parameter Format | < Bool > | | | |
| Query Format | PROGram:ISLand:PENable? | | | |
| Returned Data Format | < Bool > | | | |
| Example | PROG:ISL:PEN ON<br>PROG:ISL:PEN?<br>1 | | | |

| **PROGram:ISLand:PHASe** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the phase for ISLand program (Unit: °) | | | |
| Parameter Ranges | 0.0~359.9,default 0.0. | | | |
| Parameter Format | <NRF> | | | |
| Query Format | PROGram: ISLand:PHASe**?** | | | |
| Returned Data Format | <NRF> | | | |

| | |
|---|---|
| Example | PROG:ISL:PHA 30.0<br>PROG:ISL:PHA?<br>30.0 |

| **PROGram:ISLand:ESENable** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the emergency stop enable for ISLand program | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |
| Parameter Format | < Bool > | | | |
| Query Format | PROGram:ISLand:ESENable? | | | |
| Returned Data Format | < Bool > | | | |
| Example | PROG:ISL:ESEN ON<br>PROG:ISL:ESEN?<br>1 | | | |

| **PROGram:ISLand:VSENable** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the voltage stop enable for ISLand program | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |

| | |
|---|---|
| Parameter Format | < Bool > |
| Query Format | PROGram:ISLand:VSENable? |
| Returned Data Format | < Bool > |
| Example | PROG:ISL:VSEN ON<br>PROG:ISL:VSEN?<br>1 |

| **PROGram:ISLand:VSValue** | **B** | **S** | |
|---|---|---|---|
| Description | Set the voltage stop threshold for ISLand program | | |
| Parameter Ranges | 0.00~450.00,default 0.00. | | |
| Parameter Format | <NRF> | | |
| Query Format | PROGram:ISLand:VSValue? | | |
| Returned Data Format | <NRF> | | |
| Example | PROG:ISL:VSV 20.00<br>PROG:ISL:VSV?<br>20.00 | | |

| **PROGram:ISLand:CSENable** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the current stop Enable for ISLand program | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default 0.<br>ON/1:Enable | | |

| | |
|---|---|
| | OFF/0:Disable |
| Parameter Format | < Bool > |
| Query Format | PROGram:ISLand:CSENable? |
| Returned Data Format | < Bool > |
| Example | PROG:ISL:CSEN ON<br>PROG:ISL:CSEN?<br>1 |

| **PROGram:ISLand:TCSValue** | **B** | **S** |
|---|---|---|
| Description | Set the current stop threshold for ISLand program, which is only valid when the output phase number in source mode is 3-phase | |
| Parameter Ranges | 0.00~ Single 3-phase maximum current * number of parallel machines,default 0.00. | |
| Parameter Format | <NRF> | |
| Query Format | PROGram:ISLand:TCSValue**?** | |
| Returned Data Format | <NRF> | |
| Example | PROG:ISL:TCSV 20.00<br>PROG:ISL:TCSV?<br>20.00 | |

| **PROGram:ISLand:SCSValue** | **B** | **S** |
|---|---|---|

| | |
|---|---|
| Description | Set the current stop threshold for ISLand program, which is only valid when the output phase number in source mode is 1-phase |
| Parameter Ranges | 0.00~ 1 phase maximum current * number of parallel units,default 0.00. |
| Parameter Format | <NRF> |
| Query Format | PROGram:ISLand:SCSValue**?** |
| Returned Data Format | <NRF> |
| Example | PROG:ISL:SCSV 20.00<br>PROG:ISL:SCSV?<br>20.00 |

| **PROGram:ISLand:PSENable** | **B** | **S** | **L** |
|---|---|---|---|

| | |
|---|---|
| Description | Set the active power stop enable for ISLand program |
| Parameter Ranges | <ON\|OFF\|1\|0>,default 0.<br>ON/1:Enable<br>OFF/0:Disable |
| Parameter Format | < Bool > |
| Query Format | PROGram:ISLand:PSENable? |
| Returned Data Format | < Bool > |
| Example | PROG:ISL:PSEN ON<br>PROG:ISL:PSEN?<br>1 |

| **PROGram:ISLand:TPSValue** | | **B** | **S** |
|---|---|---|---|
| Description | Set the active power stop threshold for ISLand program, which is only valid when the output phase number in source mode is 3-phase | | |
| Parameter Ranges | See Table 11 for details | | |
| Parameter Format | <NRF> | | |
| Query Format | PROGram:ISLand:TPSValue**?** | | |
| Returned Data Format | <NRF> | | |
| Example | PROG:ISL:TPSV 1.000<br>PROG:ISL:TPSV?<br>1.000 | | |

| **PROGram:ISLand:SPSValue** | | **B** | **S** |
|---|---|---|---|
| Description | Set the active power stop threshold for ISLand program, which is only valid when the output phase number in source mode is 1-phase | | |
| Parameter Ranges | See Table 11 for details | | |
| Parameter Format | <NRF> | | |
| Query Format | PROGram: ISLand:SPSValue**?** | | |
| Returned Data Format | <NRF> | | |
| Example | PROG:ISL:SPSV 1.000<br>PROG:ISL:SPSV?<br>1.000 | | |

| **PROGram:ISLand:TRLCdata** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set ISLand program RLC mode 3 phase parameters, with a total of 9 parameters listed as follows:<br>φ1RLC mode R(unit:Ω)<br>φ1RLC mode L(unit:mH)<br>φ1RLC mode C(unit:uF)<br>φ2RLC mode R(unit:Ω)<br>φ2RLC mode L(unit:mH)<br>φ2RLC mode C(unit:uF)<br>φ3RLC mode R(unit:Ω)<br>φ3RLC mode L(unit:mH)<br>φ3RLC mode C(unit:uF) | | | |
| Parameter Ranges | φ1、φ2、φ3RLCmodeR:0.001~1000.0,default 1000.0;<br>φ1、φ2、φ3RLCmodeL:1.000~5000.0,default 5000.0;<br>φ1、φ2、φ3RLCmodeC:1.000~5000.0,default 5000.0; | | | |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2 > | | | |
| Query Format | **PROGram:ISLand:TRLCdata?** | | | |
| Returned Data Format | < NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2> | | | |
| Example | PROG:ISL:TRLC 1000.0,5000.0,5000.0,1000.0,5000.0,5000.0,1000.0,5000.0,5000.0<br>PROG:ISL:TRLC? | | | |

| | |
|---|---|
| | 1000.0,5000.0,5000.0,1000.0,5000.0,5000.0,1000.0,5000.0,5000.0 |

| **PROGram:ISLand:SRLCdata** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set ISLand program RLC mode 1 phase parameters, with a total of 3 parameters listed below:<br>1 phase RL C mode R(unit:Ω)<br>1 phase RLC modeL(unit:mH)<br>1 phase RLC mode C(unit:uF) | | |
| Parameter Ranges | 1 phase RLC mode R:0.001~1000.0,default 1000.0;<br>1 phase RLC mode L:1.000~5000.0,default 5000.0;<br>1 phase RLC mode C:1.000~5000.0,default 5000.0; | | |
| Parameter Format | < NR2,NR2,NR2 > | | |
| Query Format | **PROGram:ISLand:SRLCdata?** | | |
| Returned Data Format | < NR2,NR2,NR2 > | | |
| Example | PROG:ISL:SRLC 1000.0,5000.0,5000.0<br>PROG:ISL:SRLC?<br>1000.0,5000.0,5000.0 | | |

| **PROGram: ISLand:TPQData** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set ISLand program PQ mode 3 phase parameters. There are a total of 9 parameters, listed as follows: | | |

| | |
|---|---|
| | φ1PQ mode P<br>φ1PQ mode $Q_L$(unit:Ω)<br>φ1PQ mode $Q_C$(unit:mH)<br>φ2PQ mode P<br>φ2PQ mode $Q_L$(unit:Ω)<br>φ2PQ mode $Q_C$(unit:mH)<br>φ3PQ mode P<br>φ3PQ mode $Q_L$(unit:Ω)<br>φ3PQ mode $Q_C$(unit:mH) |
| Parameter Ranges | Please refer to Table 13 in Section 8.3 of the opertion manual for the corresponding range and default values of the apparent power term in 3/split phases |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2> |
| Query Format | **PROGram:ISLand:TPQData?** |
| Returned Data Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2> |
| Example | PROG:ISL:TPQD 1000.0,1000.0,1000.0,1000.0,1000.0,1000.0,1000.0,1000.0,1000.0<br>PROG:ISL:TPQD?<br>1000.0,1000.0,1000.0, 1000.0,1000.0,1000.0, 1000.0,1000.0,1000.0 |

| **PROGram: ISLand:SPQData** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the PQ mode1 phase parameters for ISLand program. There are a total of 3 | | |

| | |
|---|---|
| | parameters, listed as follows:<br>1 phase PQ mode P<br>1 phase PQ mode $Q_L$(unit:Ω)<br>1 phase PQ mode $Q_C$(unit:mH) |
| Parameter Ranges | Please refer to Table 13 in Section 8.3 of the operation manual for the corresponding range and default values of the 1 phase of the apparent power term |
| Parameter Format | <NR2,NR2,NR2> |
| Query Format | **PROGram:ISLand:SPQData?** |
| Returned Data Format | <NR2,NR2,NR2 > |
| Example | PROG:ISL:SPQD 1000.0,1000.0,1000.0<br>PROG:ISL:SPQD?<br>1000.0,1000.0,1000.0 |

### 4.7.9 LLISt Program Commands

| **PROGram:LLISt:INITiate** | **B** | **S** | |
|---|---|---|---|
| Description | LLISt program enable command, upon receiving it, PRE20 will enter the experiment preparation state. At this time, the program experiment data will be locked. If PRE20 is in the output state and receives the * TRG experiment trigger command, the LLISt program experiment will enter the trigger state and start executing the preset experiment steps<br>Note: When the LLISt program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. Please refer to | | |

| | |
|---|---|
| | the relevant sections of Anyport for specific settings |
| Example | PROG:LLIS:INIT |

| **PROGram:LLISt:SEGMent** | | **B** | **S** |
|---|---|---|---|
| Description | Set the number of steps for the LLISt program experiment | | |
| Parameter Ranges | 1~300 | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LLISt:SEGMent?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:LLIS:SEGM 10<br>PROG:LLIS:SEGM?<br>10 | | |

| **PROGram:LLISt:CCData#** | | **B** | **S** |
|---|---|---|---|
| Description | Set the LLISt program experiment parameters for the selected step # in CCmode, with a total of 10 parameters listed below:<br>ProgEn(Program Enable,1:Enable,0:Disable)<br>φ1、φ2、φ3 Iac(3-phase AC current,unit:V)<br>1 phase Iac(1 phase AC current,unit:V)<br>φ1、φ2、φ3 Idc(DC current,unit:V)<br>1 phase Idc(1 phase DC current,unit:V) | | |

| | |
|---|---|
| | Dwell (hold time,unit:μs)<br># represents the number of steps in the LIST program experiment, ranging from 1 - 300<br>note1:<br>1)If the output is 3 phase, the φ2 and φ3 are automatically consistent with φ1.<br>2)If the output is 1 phase, the setting value of 1 phase Iac is valid, and the setting of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>note2:<br>1) If the coupling method is AC, The Idc setting value of φ1,φ2 and φ3 is invalid but cannot be omitted.<br>2) If the coupling method is DC, The Iac setting value of φ1,φ2 and φ3 is invalid but cannot be omitted. |
| Parameter Ranges | ProgEn,Program Enable:0~1<br>φ1、φ2、φ3 Iac:0.00~ Single 3-phase maximum current * number of parallel machines<br>1 phase Iac:0.00~ Single 1 phase maximum current * number of parallel machines<br>φ1、φ2、φ3 Idc:- Single 3-phase maximum current * number of parallel machines~Single 3-phase maximum current * number of parallel machines<br>1 phase Idc:- Single 1 phase maximum current * number of parallel machines~Single 1 phase maximum current * number of parallel machines<br>Dwell,Hold Times:0~9999999 |
| Parameter Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |

| | |
|---|---|
| Query Format | **PROGram:LLISt:CCData #?** |
| Returned Data Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Example | PROG:LLIS:CCD1 1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000<br>PROG:LLIS:CCD1?<br>1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000 |

| **PROGram:LLISt:CPData#** | **B** | **S** |
|---|---|---|
| Description | Set the LLISt program experiment parameters for the selected step # in CPmode, with a total of 10 parameters listed below:<br>ProgEn(Program Enable,1:Enable,0:Disable)<br>φ1、φ2、φ3 S(3 phase apparent power,unit:kVA)<br>1 phase Sa(1 phase apparent power,unit:kVA)<br>φ1、φ2、φ3 P(3 phase active power,unit:kW)<br>1 phase Pa(1 phase active power,unit:kW)<br>Dwell (Hold Times,unit:μs)<br># represents the number of LISTProgram experiment steps, ranging from 1- 300<br>note1:<br>1) If the output is 3-phase, The value of φ2, φ3 automatically matches φ 1. Maintain consistency<br>2) If the output is 1 phase, the set values of 1 phase Sa and Pa are valid, The setting value φ1、φ2 and φ3 is invalid but cannot be omitted<br>Note 2: | | |

| | |
|---|---|
| | 3) If the coupling method is AC, The setting values of φ1、φ2 、φ3 P and 1 phase Pa are invalid but cannot be omitted<br><br>4) If the coupling method is DC, The setting values of φ1、φ2 、φ3 S and 1 phase Sa are invalid but cannot be omitted |
| Parameter Ranges | ProgEn,ProgramEnable:0~1<br>φ1、φ2、φ3 S:0.00~ Single rated power * number of parallel machines, (see the apparent power item in Table 13 of Section 8.3 of the operation manual for Single rated power)<br>1 phase S:0.00~ Single unit rated power * number of parallel units<br>φ1、φ2、φ3 P:- The maximum active power of Single 3-phase * number of parallel machines~the maximum active power of Single 3-phase * number of parallel machines. The details of the range of Single active power are shown in Table 11.<br>1 phase P:- Single 1 phase maximum active power * number of parallel machines~Single 1 phase maximum active power * number of parallel machines<br>Dwell,Hold Times:0~9999999 |
| Parameter Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Query Format | **PROGram:LLISt:CPData #?** |
| Returned Data Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Example | PROG:LLIS:CPD1 1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000<br>PROG:LLIS:CPD1?<br>1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000 |

| **PROGram:LLISt:COUNt** | | **B** | **S** |
|---|---|---|---|
| Description | Set the number of cycles for LLISt Program experiment | | |
| Parameter Ranges | 0~9999999,0 for infinite loops.default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LLIS:COUNt?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:LLIS:COUN 10<br>PROG:LLIS:COUN?<br>10 | | |

| **PROGram:LLISt:ENDState** | | **B** | **S** |
|---|---|---|---|
| Description | Set the end state of LLISt Program experiment | | |
| Parameter Ranges | <STEady\|HOLD\|STANdby>,default STEady.<br>STEady:steady,After the experiment, PRE20 returned to the steady-state parameters and continued to run.<br>HOLD:hold,After the experiment, PRE20 continues to run with the last step parameters.<br>STANdby:standby,After the experiment, PRE20 stops running and enters standby mode. | | |
| Parameter Format | <DSC> | | |

| | |
|---|---|
| Query Format | **PROGram:LLIS:ENDState?** |
| Returned Data Format | <DSC> |
| Example | PROG:LLIS:ENDS STE<br>PROG:LLIS:ENDS?<br>STEady |

| **PROGram:LLISt:CONTinuous** | **B** | **S** |
|---|---|---|
| Description | Set the continuous trigger of LLISt Program experiment. After Enable, the ProgramEnable state will not exit after the experiment is completed. You can directly send the trigger command * TRG to restart the experiment | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default OFF.<br>ON/1:Enable(on)<br>OFF/0:Disable(off) | |
| Parameter Format | <Bool> | |
| Query Format | **PROGram:LLISt:CONTinuous?** | |
| Returned Data Format | <Bool> | |
| Example | PROG:LLIS:CONT OFF<br>PROG:LLIS:CONT?<br>0 | |

| **PROGram:LLISt:TRIGer** | **B** | **S** |
|---|---|---|
| Description | Set the trigger mode for LLISt Program experiment | |

| | |
|---|---|
| Parameter Ranges | <AUTO\|MANual>,default AUTO.<br>AUTO: Automatic, upon receiving * TRG or external trigger commands, PRE20 will execute all Program experiment steps<br>MANual: Manual,After receiving * TRG or external trigger commands, PRE20 only executes one step of the Program experiment |
| Parameter Format | <DSC> |
| Query Format | **PROGram:LLISt:TRIGer?** |
| Returned Data Format | <DSC> |
| Example | PROG:LLIS:TRIG AUTO<br>PROG:LLIS:TRIG?<br>AUTO |

| **PROGram:LLISt:INPut** | **B** | **S** |
|---|---|---|
| Description | Set the trigger input for LLISt Program experiment | |
| Parameter Ranges | <INTernal\|EXTernal>,default INTernal.<br>INTernal:internal,Trigger the experiment through the display screen or external communication command * TRG<br>EXTernal:external,Trigger the experiment through the Anyport digital input interface, as detailed in the Anyport interface commands section | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LLISt:INPut?** | |
| Returned Data Format | <DSC> | |

| | |
|---|---|
| Example | PROG:LLIS:INP INT<br>PROG:LLIS:INP?<br>INTernal |

| **PROGram:LLISt:DELay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the delay time for trigger the LLISt Program experiment (unit: ms) | | |
| Parameter Ranges | 0~999999,default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LLISt:DELay?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:LLIST:DEL 0<br>PROG:LLIST:DEL?<br>0 | | |

| **PROGram:LLISt:OUTPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set LLISt Program experiment trigger output mode. It is used to output narrow pulses through the Anyport interface at the specified time in the experiment. It needs to be enabled through the Anyport interface, as detailed in the relevant chapters of the Anyport interface | | |
| Parameter Ranges | <ONCE\|STEP\|CYCLe>,default ONCE.<br>ONCE: Only output pulses when each experiment enters the triggering state<br>STEP: Each step of the experiment outputs pulses | | |

| | |
|---|---|
| | CYCLe: Output pulses for each cycle in the experiment |
| Parameter Format | <DSC> |
| Query Format | **PROGram:LLISt:OUTPut?** |
| Returned Data Format | <DSC> |
| Example | PROG:LLIS:OUTP ONCE<br>PROG:LLIS:OUTP?<br>ONCE |

| **PROGram:LLISt:RMSMode** | **B** | **S** |
|---|---|---|
| Description | Set the effective value mode of LLISt Program experiment | |
| Parameter Ranges | <AUTO\|ENABle\|DISable>,default AUTO.<br>AUTO: Automation, when the Program waveform is a sine wave, clipping, built-in harmonic, and custom waveform, and the custom waveform mode is a valid value, the valid value mode is automatically enabled, the output voltage value is closed-loop, and the output voltage value is automatically adjusted to be consistent with the set value. Otherwise, the valid value mode is automatically disabled, and the output voltage value is open-loop.<br>ENABle:Enable,force Enable to adjust the effective value of the output voltage.<br>DISable:Disable,force disable to adjust the effective value of the output voltage. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LLISt:RMSMode?** | |
| Returned Data Format | <DSC> | |

| | |
|---|---|
| Example | PROG:LLIS:RMSM AUTO<br>PROG:LLIS:RMSM?<br>AUTO |

### 4.7.10 LWAVe Program Commands

| **PROGram:LWAVe:INITiate** | **B** | **S** |
|---|---|---|
| Description | LWAVe Program Enable commands, After receiving this command, PRE20 will enter the experiment preparation state. At this time, the Program experiment data will be locked. If PRE20 is in the output state and receives the * TRG experimentl trigger command, the WAVEProgram experiment will enter the trigger state and start executing the preset experiment steps<br>Note: When the LWAVe Program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. Please refer to the relevant sections of Anyport for specific settings. | |
| Example | PROG:LWAV:INIT | |

| **PROGram:LWAVe:SEGMent** | **B** | **S** |
|---|---|---|
| Description | Set the number of steps for LWAVe Program experiment | |
| Parameter Ranges | 1~300 | |
| Parameter Format | <NR1> | |
| Query Format | **PROGram:LWAVe:SEGMent?** | |

| | |
|---|---|
| Returned Data Format | <NR1> |
| Example | PROG:LWAV:SEGM 1<br>PROG:LWAV:SEGM?<br>1 |

| **PROGram:LWAVe:CCData#** | **B** | **S** |
|---|---|---|
| Description | Set the WAVeProgram experiment parameters for the selected step # ,with a total of 10 parameters listed as follows:<br>ProgEn(Program Enable,1:Enable,0:Disable)<br>φ1、φ2、φ3 Iac(3 phase AC current,unit:V)<br>1 phase Iac(1 phase AC current,unit:V)<br>φ1、φ2、φ3 Idc(DC current,unit:V)<br>1 phase Idc(1 phase DC current,unit:V)<br>Ramp(Ramp,unit:μs)<br>Where # denotes the number of steps in the WAVEProgram experiment, ranging from 1 to 300.<br>Note 1 :<br>1 ) If the number of output phases is three, the values of φ2 and φ3 are automatically consistent with φ1.<br>2 ) If the output phase number is 1 phase, the setting value of 1 phase Iac is valid, and the setting values of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>Note 2 : | | |

| | |
|---|---|
| | 1 ) If the coupling mode is AC, the Idc setting values of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>2 ) If the coupling mode is DC, the Iac setting values of φ1, φ2 and φ3 are invalid but cannot be omitted. |
| Parameter Ranges | ProgEn, ProgramEnable : 0 ~ 1<br>φ1, φ2, φ3 Iac : 0.00 ~ single 3 phase maximum current * parallel number<br>1 phase Iac : 0.00 ~ single 1 phase maximum current * parallel number<br>φ1, φ2, φ3 Idc : -single 3 phase maximum current * parallel number ~ single 3 phase maximum current * parallel number<br>1 phase Idc : -single 1 phase maximum current * parallel number ~ single 1 phase maximum current * parallel number<br>Ramp, Ramp : 0 ~ 9999999 |
| Parameter Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Query Format | **PROGram:LWAVe:CCData #?** |
| Returned Data Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Example | PROG:LWAV:CCD1 1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000<br>PROG:LWAV:CCD1?<br>1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000 |

| **PROGram:LWAVe:CPData#** | **B** | **S** | |
|---|---|---|---|
| Description | Set the LWAVE Program experiment parameters with CPmode selected step #, a total of 10 parameters, the list is as follows : | | |

| | |
|---|---|
| | ProgEn ( ProgramEnable, 1 : Enable, 0 : Disable )<br>φ1, φ2, φ3 S ( 3 phase apparent power, unit : kVA )<br>1 phase Sa ( 1 phase apparent power, unit : kVA )<br>φ1, φ2, φ3 P ( 3 phase active power, unit : kW )<br>1 phase Pa ( 1 phase active power, unit : kW )<br>Ramp ( ramp, unit : 100 μs )<br>Where # denotes the number of steps in the WAVEProgram experiment, ranging from 1 to 300.<br>Note 1 :<br>1 ) If the number of output phases is three, the values of φ2 and φ3 are automatically consistent with φ1.<br>2 ) If the output phase number is 1 phase, the setting values of 1 phase Sa and Pa are valid, and the setting values of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>Note 2 :<br>1 ) If the coupling mode is AC, the setting values of φ1, φ2, φ3 P and 1 phase Pa are invalid but cannot be omitted.<br>2 ) If the coupling mode is DC, the setting values of φ1, φ2, φ3 S and 1 phase Sa are invalid but cannot be omitted. |
| Parameter Ranges | ProgEn, ProgramEnable : 0 ~ 1<br>φ1, φ2, φ3 S : 0.00 ~ single rated power * number of parallel machines, ( single rated power see the user manual 8.3 section Table 13 apparent power item )<br>1 phase S : 0.00 ~ single rated power * parallel number |

| | |
|---|---|
| | φ1, φ2, φ3 P : -single 3 phase maximum active power * parallel number ~ single 3 phase maximum active power * parallel number, single active power range is detailed.<br>Ramp,Ramp:0~9999999 |
| Parameter Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Query Format | **PROGram:LWAVe:CPData #?** |
| Returned Data Format | <NR1,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NRF,NR1> |
| Example | PROG:LWAV:CPD1 1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000<br>PROG:LWAV:CPD1?<br>1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000 |

| **PROGram:LWAVe:COUNt** | **B** | **S** |
|---|---|---|
| Description | Set the number of cycles of LWAVe Program experiment. | |
| Parameter Ranges | 0~9999999,0 is infinite cycle | |
| Parameter Format | <NR1> | |
| Query Format | **PROGram:LWAVe:COUNt?** | |
| Returned Data Format | <NR1> | |
| Example | PROG:LWAV:COUN 10<br>PROG:LWAV:COUN?<br>10 | |

| **PROGram:LWAVe:ENDState** | | **B** | **S** |
|---|---|---|---|
| Description | Set the end state of LWAVe Program experiment. | | |
| Parameter Ranges | <STEady\|HOLD\|STANdby>,default STEady.<br>STEady : Steady state. After the experiment, PRE20 returns to the steady state parameters and continues to run.<br>HOLD : Hold. After the experiment, PRE20 keeps the last step parameters to continue running.<br>STANdby : Standby, after the experiment, PRE20 stops running and enters the standby state. | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:LWAVe:ENDState?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:LWAV:ENDS STE<br>PROG:LWAV:ENDS?<br>STEady | | |

| **PROGram:LWAVe:CONTinuous** | | **B** | **S** |
|---|---|---|---|
| Description | The continuous trigger of LWAVe Program experiment is set. After Enable, the ProgramEnable state will not be exited after the experiment, and the trigger command * TRG can be sent directly to restart the experiment. | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default OFF.<br>ON/1:Enable(on) | | |

| | |
|---|---|
| | OFF/0:Disable(off) |
| Parameter Format | <Bool> |
| Query Format | **PROGram:LWAVe:CONTinuous?** |
| Returned Data Format | <Bool> |
| Example | PROG:LWAV:CONT OFF<br>PROG:LWAV:CONT?<br>0 |

| **PROGram:LWAVe:TRIGer** | **B** | **S** |
|---|---|---|
| Description | Set the trigger mode of LWAVe Program experiment. | |
| Parameter Ranges | <AUTO\|MANual>,default AUTO.<br>AUTO : Automation, after receiving * TRG or external trigger commands, PRE20 will perform all Program steps.<br>MANual : Manual, PRE20 performs only one Program experiment after receiving * TRG or external trigger commands. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LWAVe:TRIGer?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LWAV:TRIG AUTO<br>PROG:LWAV:TRIG?<br>AUTO | |

| **PROGram:LWAVe:INPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger input of LWAVe Program experiment. | | |
| Parameter Ranges | <INTernal\|EXTernal>,default INTernal.<br>INTernal:Internal, The experiment is triggered by the display or external communication command * TRG.<br>EXTernal : External, trigger the experiment through the Anyport digital input interface, see the Anyport interface command chapter. | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:LWAVe:INPut?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:LWAV:INP INT<br>PROG:LWAV:INP?<br>INTernal | | |

| **PROGram:LWAVe:DELay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger delay time of LWAVe Program experiment. ( unit : ms ) | | |
| Parameter Ranges | 0~999999,default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LWAVe:DELay?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:LWAV:DEL 0<br>PROG:LWAV:DEL? | | |

| | |
|---|---|
| | 0 |

| **PROGram:LWAVe:OUTPut** | | **B** | **S** |
|---|---|---|---|
| Description | Setting the LWAVe Program experiment trigger output mode.which is used to output a narrow pulse through the Anyport interface at a specified time in the experiment. | | |
| Parameter Ranges | <ONCE\|STEP\|CYCLe><br>ONCE : Output pulse only when each experiment enters the trigger state<br>STEP : Pulse output at each step of the experiment<br>CYCLe : Output pulse per cycle in the experiment | | |
| Parameter Format | <DSC> | | |
| Query Format | **PROGram:LWAVe:OUTPut?** | | |
| Returned Data Format | <DSC> | | |
| Example | PROG:LWAV:OUTP ONCE<br>PROG:LWAV:OUTP?<br>ONCE | | |

| **PROGram:LWAVe:RMSMode** | | **B** | **S** |
|---|---|---|---|
| Description | The effective value of LWAVe Program experiment mode. | | |
| Parameter Ranges | <AUTO\|ENABle\|DISable>,default AUTO.<br>AUTO : automatic. When the Program waveform is sine wave, clipping wave, built-in harmonic and custom waveform, and the | | |

| | |
|---|---|
| | custom waveform mode is effective value, the effective value mode is automatically Enable, the output voltage value is closed loop, and the output voltage value is automatically adjusted to be consistent with the set value. Otherwise, the effective value mode is automatically Disable, and the output voltage value is open loop.<br>ENABle : Enable, forcing Enable output voltage RMS adjustment.<br>DISable : Disable, forced Disable output voltage RMS adjustment. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:LWAVe:RMSMode?** |
| Returned Data Format | <DSC> |
| Example | PROG:LWAV:RMSM AUTO<br>PROG:LWAV:RMSM?<br>AUTO |

### 4.7.11 LSTep Program Commands

| **PROGram:LSTep:INITiate** | **B** | **S** | |
|---|---|---|---|
| Description | LSTep Program Enable command is loaded. When PRE20 receives the command, it will enter the experiment preparation state. At this time, the Program experiment data will be locked. If PRE20 is in the output state and receives the * TRG experiment trigger command, the STEPProgram experiment will enter the trigger state and begin to perform the preset experiment steps.<br>Note : When the LSTep Program trigger input is set as an external input, the | | |

| | |
|---|---|
| | experiment will be triggered through the Anyport input interface. The specific settings are detailed in the relevant chapters of Anyport. |
| Example | PROG:LST:INIT |

| **PROGram:LSTep:CCData#** | **B** | **S** |
|---|---|---|
| Description | Setting CC LSTep program experiment parameters, a total of 32 parameters, the list is as follows :<br>φ1, φ2, φ3 Iac Start ( AC current start value, unit : V )<br>1 phase Iac Start ( 1 phase AC current start value, unit : V )<br>φ1, φ2, φ3 Idc Start ( DC current start value, unit : V )<br>1 phase Idc Start ( 1 phase DC current start value, unit : V )<br>φ1, φ2, φ3 Iac End ( AC current end value, unit : V )<br>1 phase Iac End ( 1 phase AC current end value, unit : V )<br>φ1, φ2, φ3 Idc End ( DC current end value, unit : V )<br>1 phase Idc End ( 1 phase DC current end value, unit : V )<br>φ1, φ2, φ3 IacΔ ( AC current step value, unit : V )<br>1 phase IacΔ ( 1 phase AC current step value, unit : V )<br>φ1, φ2, φ3 IdcΔ ( DC current step value, unit : V )<br>1 phase IdcΔ ( 1 phase DC current step value, unit : V )<br>φ1, φ2, φ3 Phase ( phase, unit : ° )<br>φ1, φ2, φ3 Percent ( waveform parameter, unit : % ) | | |

| | |
|---|---|
| | φ1, φ2, φ3 Waveform ( waveform )<br>Degree ( degree, unit : ° )<br>Time ( per step, unit : 100 us )<br>Note 1 :<br>1 ) If the number of output phases is three, the values of φ2 and φ3 are automatically consistent with φ1 except for the set values of φ1, φ2 and φ3 phases.<br>2 ) If the output phase number is 1 phase, the setting value of 1 phase Iac is valid, and the setting values of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>Note 2 :<br>3 ) When the coupling mode of PRE20 is AC, the setting values of Idc Start, Idc End and IdcΔ of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>4 ) When the PRE20 coupling mode is DC, the Iac Start, Iac End, IacΔ, Phase, Percent, WaveForm setting values, Freq and Degree setting values of φ1, φ2 and φ3 are invalid, but cannot be omitted.<br>Note 3 :<br>1 ) WaveForm ( waveform ) parameter definition see [ SOURce ] : VOLTage : WAVeformDescription.<br>2 ) Percent ( waveform parameters ), according to the choice of waveform, parameter definition is different, see the waveform settings. |
| Parameter Ranges | φ1, φ2, φ3 Iac Start, AC current start value : 0.00 ~ single three-phase maximum current * parallel number<br>1 phase Iac Start, 1 phase AC current start value : 0.00 ~ single 1 phase |

maximum current * parallel number

φ 1, φ2, φ3 Idc Start, DC current start value : -single three-phase maximum current * parallel number ~ single three-phase maximum current * parallel number

1 phase Idc Start, 1 phase DC current start value : -single 1 phase maximum current * parallel number ~ single 1 phase maximum current * parallel number

φ1, φ2, φ3 Iac End, AC current end value : 0.00 ~ single three-phase maximum current * parallel number

1 phase Iac End, AC current end value : 0.00 ~ single 1 phase maximum current * parallel number

φ1, φ2, φ3 Idc End, DC current end value : -single three-phase maximum current * parallel number ~ single three-phase maximum current * parallel number

1 phase Idc End, 1 phase DC current end value : -single 1 phase maximum current * 3 * parallel number ~ single 1 phase maximum current * 3 * parallel number

φ 1, φ2, φ3 IacΔ, AC current step value : 0.0 ~ single three-phase maximum current * parallel number

1 phase IacΔ, 1 phase AC current step value : 0.0 ~ single three-phase maximum current * 3 * parallel number

φ 1, φ2, φ3 IdcΔ, DC current step value : 0.0 ~ single three-phase maximum current * 2 * parallel number

1 phase IdcΔ, 1 phase DC current step value : 0.0 ~ single 1 phase maximum current * 2 * parallel number

| | |
|---|---|
| | φ1, φ2, φ3 Phase, phase : 0.0 ~ 359.9<br>φ 1, φ2, φ3 Percent, waveform parameters : 0.00 ~ 100.00 ( clipping is 0.00 ~ 50.00 )<br>φ 1, φ2, φ3 Waveform, waveform : 0 ~ 142, see VOLTage : WAVeform Commands<br>Degree, phase angle : 0.0 ~ 359.9<br>Time, each step time : 0 ~ 9999999, unit : 100us |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR2,NR1> |
| Query Format | **PROGram:LSTep:CCData?** |
| Returned Data Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR2,NR1> |
| Example | PROG:LST:CCD 220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.00,240.00,240.00,10.00,10.00,10.00,60.000,2.00,2.00,2.00,1.00,1.00,1.00,1.000,0.0,240.0,120.0,50.00,50.00,50.00,0,0,0,90.0,10000<br>PROG:LST:CCD?<br>220.00,220.00,220.00,0.00,0.00,0.00,50.000,240.00,240.00,240.00,10.00,10.00,10.00,60.000,2.00,2.00,2.00,1.00,1.00,1.00,1.000,0.0,240.0,120.0,50.00,50.00,50.00,0,0,0,90.0,10000 |

| PROGram:LSTep:CPData# | B | S |
|---|---|---|
| Description | Setting CP LSTep Program experiment parameters, a total of 32 parameters, the list is as follows :<br>φ1, φ2, φ3 S Start ( apparent power start value, unit : KVA )<br>1 phase S Start ( 1 phase apparent power start value, unit : KVA )<br>φ1, φ2, φ3 P Start ( active power start value, unit : KW )<br>1 phase P Start ( 1 phase active power start value, unit : KW )<br>φ1, φ2, φ3 S End ( apparent power end value, unit : V )<br>1 phase S End ( 1 phase apparent power end value, unit : V )<br>φ1, φ2, φ3 P End ( active power end value, unit : V )<br>1 phase P End ( 1 phase active power end value, unit : V )<br>φ1, φ2, φ3SΔ ( apparent power step, unit : V )<br>1 phase SΔ ( 1 phase apparent power step value, unit : V )<br>φ1, φ2, φ3 PΔ ( active power step value, unit : V )<br>1 phase PΔ ( 1 phase active power step value, unit : V )<br>φ1, φ2, φ3 Percent ( waveform parameter, unit : % )<br>φ1, φ2, φ3 Waveform ( waveform )<br>Degree ( degree, unit : ° )<br>Time ( Time per step, unit : 100us )<br>Note 1 :<br>1 ) If the number of output phases is three, the values of φ2 and φ3 are automatically consistent with φ1 except for the set values of φ1, φ2 and φ3 | | |

| | |
|---|---|
| | phases.<br>2 ) If the output phase number is 1 phase, the setting values of 1 phase Sa and Pa are valid, and the setting values of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>Note 2 :<br>3 ) When the PRE20 coupling mode is AC, the P Start, P End and PΔ settings of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>4 ) When the coupling mode of PRE20 is DC, the setting values of S Start, S End, SΔ, Percent and WaveForm of φ1, φ2 and φ3 are invalid, but cannot be omitted.<br>Note 3 :<br>1 ) WaveForm ( waveform ) parameter definition see [ SOURce ] : VOLTage : WAVeformDescription.<br>2 ) Percent ( waveform parameters ), according to the choice of waveform, parameter definition is different, see the waveform settings. |
| Parameter Ranges | φ 1, φ2, φ3 S Start, apparent power start value : 0.00 ~ single rated power * parallel number.<br>( Single rated power see user manual 8.3 section table 13 of the apparent power )<br>1 phase S Start, 1 phase apparent power start value : 0.00 ~ single rated power * parallel number<br><br>φ 1, φ2, φ3 P Start : Active power start value : -Single three-phase maximum active power * parallel number ~ Single three-phase maximum active power * |

parallel number, Single active power range Details are shown in Table 11
1 phase P Start, 1 phase active power start value : -1 phase maximum active power * parallel number ~ 1 phase maximum active power * parallel number
φ 1, φ2, φ3 S End, apparent power end value : 0.00 ~ single rated power * parallel number.
( Single rated power see user manual 8.3 section table 13 of the apparent power )
1 phase S End, 1 phase apparent power end value : 0.00 ~ single rated power * parallel number
φ1, φ2, φ3 P End : Active power end value : -Single three-phase maximum active power * parallel number ~ Single three-phase maximum active power * parallel number, Single active power range Details are shown in Table 11
1 phase P End : 1 phase active power end value : -1 phase maximum active power * parallel number ~ 1 phase maximum active power * parallel number
φ1, φ2, φ3 SΔ, apparent power step value : 0.00 ~ single rated power * parallel number.
( Single rated power see user manual 8.3 section table 13 of the apparent power )
1 phase SΔ, 1 phase apparent power step value : 0.00 ~ single rated power * parallel number
φ 1, φ2, φ3 PΔ : active power step value : 0.00 ~ Single three-phase maximum active power * 2 * parallel machine number, Single active power range details see table 11
1 phase PΔ : 1 phase active power step value : 0.00 ~ 1 phase maximum active power * 2 * parallel number

| | |
|---|---|
| | φ1, φ2, φ3 Percent, waveform parameters : 0.00 ~ 100.00 ( clipping is 0.00 ~ 50.00 )<br>φ 1, φ2, φ3 Waveform, waveform : 0 ~ 142, see VOLTage : WAVeform Commands<br>Degree, phase angle : 0.0 ~ 359.9<br>Time, each step time : 0 ~ 9999999 |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR2,NR1> |
| Query Format | **PROGram:LSTep:CPData?** |
| Returned Data Format | <NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR2,NR1> |
| Example | PROG:LST:CPD 1.00,1.00,1.00,1.00,1.00,1.00,1.000,1.00,2.00,2.00,2.00,2.00,2.00,2.000,2.00,2.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,50.00,50.00,50.00,0,0,0,90.0,10000<br>PROG:LST:CPD?<br>1.00,1.00,1.00,1.00,1.00,1.00,1.000,1.00,2.00,2.00,2.00,2.00,2.00,2.000,2.00,2.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,50.00,50.00,50.00,0,0,0,90.0,10000 |

| | | | |
|---|---|---|---|
| **PROGram:LSTep:COUNt** | **B** | **S** | |

| | |
|---|---|
| Description | Set the number of cycles of LSTep Program experiment |
| Parameter Ranges | 0~9999999,0 infinite cycles |
| Parameter Format | <NR1> |
| Query Format | **PROGram:LSTep:COUNt?** |
| Returned Data Format | <NR1> |
| Example | PROG:LST:COUN 10<br>PROG:LST:COUN?<br>10 |

| **PROGram:LSTep:ENDState** | **B** | **S** |
|---|---|---|
| Description | Set the end state of LSTep Program experiment. | |
| Parameter Ranges | <STEady\|HOLD\|STANdby>,default STEady.<br>STEady : Steady state. After the experiment, PRE20 returns to the steady state parameters and continues to run.<br>HOLD : Hold. After the experiment, PRE20 keeps the last step parameters to continue running.<br>STANdby : Standby, after the experiment, PRE20 stops running and enters the standby state | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LSTep:ENDState?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LST:ENDS STE | |

| | |
|---|---|
| | PROG:LST:ENDS?<br>STEady |

| **PROGram:LSTep:CONTinuous** | | **B** | **S** |
|---|---|---|---|
| Description | The continuous trigger of LSTep Program experiment is set. After Enable, the ProgramEnable state will not be exited after the experiment, and the trigger command * TRG can be sent directly to restart the experiment. | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default OFF.<br>ON/1:Enable(on)<br>OFF/0:Disable(off) | | |
| Parameter Format | <Bool> | | |
| Query Format | **PROGram:LSTep:CONTinuous?** | | |
| Returned Data Format | <Bool> | | |
| Example | PROG:LST:CONT OFF<br>PROG:LST:CONT?<br>0 | | |

| **PROGram:LSTep:TRIGer** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger mode of LSTep Program experiment. | | |
| Parameter Ranges | AUTO : Automatically, after receiving * TRG or external trigger commands, PRE20 will perform all Program steps. | | |

| | |
|---|---|
| | MANual : Manual, After receiving * TRG or external trigger commands, PRE20 only performs one step Program experiment. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:LSTep:TRIGer?** |
| Returned Data Format | <DSC> |
| Example | PROG:LST:TRIG AUTO<br>PROG:LST:TRIG?<br>AUTO |

| **PROGram:LSTep:INPut** | **B** | **S** |
|---|---|---|
| Description | Sets the trigger input for LSTep Program experiment. | |
| Parameter Ranges | <INTernal\|EXTernal>,default INTernal.<br>INTernal : Internal, the experiment is triggered by the display or external communication command * TRG.<br>EXTernal : External, trigger the experiment through the Anyport digital input interface, as shown in the Anyport interface command chapter. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LSTep:INPut?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LST:INP INT<br>PROG:LST:INP?<br>INTernal | |

| **PROGram:LSTep:DELay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger delay time of LSTep Program experiment. ( unit : ms ) | | |
| Parameter Ranges | 0~999999,default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LSTep:DELay?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:LST:DEL 0<br>PROG:LST:DEL?<br>0 | | |

| **PROGram:LSTep:OUTPut** | | **B** | **S** |
|---|---|---|---|
| Description | Set LSTep Program experiment trigger output mode.Used to output a narrow pulse through the Anyport interface at a specified time in the experiment, it needs to be Enabled through the Anyport interface, as detailed in the relevant chapters of the Anyport interface. | | |
| Parameter Ranges | <ONCE\|STEP\|CYCLe><br>ONCE : Output pulse only when each experiment enters the trigger state<br>STEP : Pulse output at each step of the experiment<br>CYCLe : Output pulse per cycle in the experiment | | |
| Parameter Format | <DSC> | | |

| | |
|---|---|
| Query Format | **PROGram:LSTep:OUTPut?** |
| Returned Data Format | <DSC> |
| Example | PROG:LST:OUTP ONCE<br>PROG:LST:OUTP?<br>ONCE |

| **PROGram:LSTep:RMSMode** | **B** | **S** |
|---|---|---|
| Description | Set LSTep Program experiment effective value mode. | |
| Parameter Ranges | AUTO: automation. When the Program waveform is sine wave, clipping wave, built-in harmonic and custom waveform, and the custom waveform mode is effective value, the effective value mode is automatically Enable, the output voltage value is closed loop, and the output voltage value is automatically adjusted to be consistent with the set value. Otherwise, the effective value mode is automatically Disable, and the output voltage value is open loop.<br>ENABle: Enable, forcing Enable output voltage RMS adjustment.<br>DISable : Disable, forced Disable output voltage RMS adjustment. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LSTep:RMSMode?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LST:RMSM AUTO<br>PROG:LST:RMSM? | |

| | |
|---|---|
| | AUTO |

### 4.7.12 LADVanced Program Commands

| **PROGram:LADVanced:INITiate** | | **B** | **S** |
|---|---|---|---|
| Description | LADVanced Program Enable commands, PRE20 will enter the experiment preparation state after receiving the command. At this time, the Program experiment data will be locked. If PRE20 is in the output state and receives the *TRG experiment trigger command, LADVanced Program experiment will enter the trigger state and begin to perform the preset experiment steps.<br>Note : When LADVanced Program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. The specific settings are detailed in the relevant chapters of Anyport. | | |
| Example | PROG:LADV:INIT | | |

| **PROGram:LADVanced:SEGMent** | | **B** | **S** |
|---|---|---|---|
| Description | Set the steps of LADVanced Program experiment. | | |
| Parameter Ranges | 1~300 | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LADVanced:SEGMent?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:LADV:SEGM 10 | | |

| | |
|---|---|
| | PROG:LADV:SEGM?<br>10 |

| **PROGram:LADVanced:CCData#** | **B** | **S** |
|---|---|---|
| Description | Set LADVanced Program experiment parameters with CCdata check step #, a total of 23 parameters, the list is as follows :<br>ProgEn(ProgramEnable,1:Enable,0:Disable)<br>φ1、φ2、φ3 Iac(3 phase AC current,unit:V)<br>1 phase Iac(1 phase AC current,unit:V)<br>φ1、φ2、φ3 Idc(DC current,unit:V)<br>1 phase Idc(1 phase DC current,unit:V)<br>Ramp(ramp,unit:100μs)<br>Dwell ( Hold Times, unit : 100μs )<br>φ1, φ2, φ3 Percent ( waveform parameter, unit : % )<br>Degree ( degree, unit : ° )<br>DegreeEn ( degree Enable, 1 : Enable, 0 : Disable )<br>Link ( link )<br>Count ( Count )<br>φ1, φ2, φ3 WaveForm ( waveform )<br>Trig In ( trigger input Enable, 1 : Enable, 0 : Disable )<br>Trig Out ( Trigger output Enable, 1 : Enable, 0 : Disable )<br>Where # denotes the number of ADVancedProgram steps, ranging from 1 to 300. | | |

| | |
|---|---|
| | Note 1 :<br>1) If the number of output phases is three, the values of 1 phase Iac and Idc are invalid, and the values of φ2 and φ3 are automatically consistent with φ1.<br>2) If the output phase number is 1 phase, the setting values of 1 phase Iac and Idc are valid, and the setting values of φ1, φ2 and φ3 are invalid but cannot be omitted. Note 2 :<br>1) When the PRE20 coupling mode is AC, the Idc, 1 phase Idc setting values of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>2) When the PRE20 coupling mode is DC, the Iac, 1 phase Iac, Percent, WaveForm setting values, Degree, DegreeEn setting values of φ1, φ2, φ3 are invalid, but cannot be omitted.<br>Note 3 :<br>3) WaveForm ( waveform ) parameter definition see [ SOURce ] : VOLTage : WAVeformDescription.<br>4) Percent ( waveform parameters ), depending on the selected waveform, parameter definition is different, see the waveform settings. |
| Parameter Ranges | ProgEn,ProgramEnable:0~1<br>φ1, φ2, φ3 Iac : 0.00 ~ single three-phase maximum current * parallel number<br>1 phase Iac : 0.00 ~ single 1 phase maximum current * parallel number<br>φ1, φ2, φ3 Idc : -single three-phase maximum current * parallel number ~ single three-phase maximum current * parallel number<br>1 phase Idc : -single 1 phase maximum current * parallel number ~ single 1 phase maximum current * parallel number |

| | |
|---|---|
| | Ramp, Ramp : 0 ~ 9999999<br>Dwell, Hold Times : 0 ~ 9999999<br>φ1, φ2, φ3 Percent : 0.00 ~ 100.00 ( clipping : 0.00 ~ 50.00 )<br>Degree, degree : 0.0 ~ 359.9<br>DegreeEn, degree Enable : 0 ~ 1<br>Link, link : 0 ~ 300<br>Count, Count : 0 ~ 9999999<br>φ 1, φ2, φ3 WaveForm, waveform : 0 ~ 142, see VOLTage : WAVeform Commands<br>Trig In, trigger input Enable : 0 ~ 1<br>Trig Out, trigger output Enable : 0 ~ 1 |
| Parameter Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR1,NR1,NR1,NR1,NR1> |
| Query Format | **PROGram:LADVanced:CCData#?** |
| Returned Data Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR1,NR1,NR1,NR1,NR1> |
| Example | PROGram:LADVanced:CCD1 1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000,10000,50.00,50.00,50.00,0.0,0,0,0,0,0,0,0,0<br>PROGram:LADVanced:CCD1?<br>1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000,10000,50.00,50.00,50.00,0.0,0,0,0,0,0,0,0,0,0 |

| PROGram:LADVanced:CPData# | B | S |
|---|---|---|
| Description | Set LADVanced Program experiment parameters with CPdata check step #, a total of 23 parameters, the list is as follows :<br>ProgEn ( ProgramEnable, 1 : Enable, 0 : Disable )<br>φ1, φ2, φ3 S ( three-phase apparent power, unit : kVA )<br>1 phase Sa ( 1 phase apparent power, unit : kVA )<br>φ1, φ2, φ3 P ( three-phase active power, unit : kW )<br>1 phase Pa ( 1 phase active power, unit : kW )<br>Ramp ( ramp, unit : 100μs )<br>Dwell ( Hold Times, unit : 100μs )<br>φ1, φ2, φ3 Percent ( waveform parameter, unit : % )<br>Degree ( degree, unit : ° )<br>DegreeEn ( degree Enable, 1 : Enable, 0 : Disable )<br>Link ( link )<br>Count ( number of count )<br>φ1, φ2, φ3 WaveForm ( waveform )<br>Trig In ( trigger input Enable, 1 : Enable, 0 : Disable )<br>Trig Out ( Trigger output Enable, 1 : Enable, 0 : Disable )<br>Where # denotes the number of LADVanced Program steps, ranging from 1 to 300. Note 1 :<br>1 ) If the number of output phases is three, the values of φ2 and φ3 are automatically consistent with φ1. | | |

| | |
|---|---|
| | 2 ) If the output phase number is 1 phase, the setting values of 1 phase Sa and Pa are valid, and the setting values of φ1, φ2 and φ3 are invalid but cannot be omitted.<br>Note 2 :<br>3 ) When the coupling mode of PRE20 is AC, the setting values of φ1, φ2, φ3 P and 1 phase Pa are invalid but cannot be omitted.<br>4 ) When the coupling mode of PRE20 is DC, the setting values of φ1, φ2, φ3 S, 1 phase Sa, Percent, WaveForm, Degree and DegreeEn are invalid, but cannot be omitted.<br>Note 3 :<br>5 ) WaveForm ( waveform ) parameter definition see [ SOURce ] : VOLTage : WAVeformDescription.<br>6 ) Percent ( waveform parameters ), depending on the selected waveform, parameter definition is different, see the waveform settings. |
| Parameter Ranges | ProgEn,ProgramEnable:0~1<br>φ1, φ2, φ3 S : 0.00 ~ single rated power * number of parallel machines, ( single rated power see the user manual 8.3 section Table 13 apparent power )<br>1 phase S : 0.00 ~ single rated power * parallel number<br>φ1, φ2, φ3P : -Single three-phase maximum active power * parallel number ~ Single three-phase maximum active power * parallel number, Single active power range details are shown in table 11<br>1 phase P : -Single 1 phase maximum active power * parallel number ~ Single 1 phase maximum active power * parallel number |

| | |
|---|---|
| | Ramp, ramp : 0 ~ 9999999<br>Dwell, Hold Times : 0 ~ 9999999<br>φ1, φ2, φ3 Percent : 0.00 ~ 100.00 ( clipping : 0.00 ~ 50.00 )<br>Degree, degree : 0.0 ~ 359.9<br>DegreeEn, degree Enable : 0 ~ 1<br>Link, link : 0 ~ 300<br>Count, repeat number : 0 ~ 9999999<br>φ 1, φ2, φ3 WaveForm, waveform : 0 ~ 142, see VOLTage : WAVeform Commands<br>Trig In, trigger input Enable : 0 ~ 1<br>Trig Out, trigger output Enable : 0 ~ 1 |
| Parameter Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR1,NR1,NR1,NR1,NR1> |
| Query Format | **PROGram:LADVanced:CPData#?** |
| Returned Data Format | <NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR2,NR2,NR2,NR2,NR2,NR2,NR2,NR1,NR1,NR1,NR1,NR1,NR1,NR1,NR1> |
| Example | PROGram:LADVanced:CPD1 1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000,10000,50.00,50.00,50.00,0.0,0,0,0,0,0,0,0,0<br>PROGram:LADVanced:CPD1?<br>1,1.00,1.00,1.00,1.00,1.00,1.00,1.00,1.00,10000,10000,50.00,50.00,50.00,0.0,0,0,0,0,0,0,0,0 |

| **PROGram:LADVanced:COUNt** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Sets the number of cycles of LADVanced Program experiment. | | | |
| Parameter Ranges | 0~9999999 | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **PROGram:LADVanced:COUNt?** | | | |
| Returned Data Format | <NR1> | | | |
| Example | PROG:LADV:COUN 10<br>PROG:LADV:COUN?<br>10 | | | |

| **PROGram:LADVanced:ENDState** | | **B** | **S** | |
|---|---|---|---|---|
| Description | Set the end state of LADVanced Program experiment. | | | |
| Parameter Ranges | <STEady\|HOLD\|STANdby>,default STEady.<br>STEady : Steady state. After the experiment, PRE20 returns to the steady state parameters and continues to run.<br>HOLD : Hold. After the experiment, PRE20 keeps the last step parameters to continue running.<br>STANdby : Standby, after the experiment, PRE20 stops running and enters the standby state. | | | |
| Parameter Format | <DSC> | | | |
| Query Format | **PROGram:LADVanced:ENDState?** | | | |

| | |
|---|---|
| Returned Data Format | <DSC> |
| Example | PROG:LADV:ENDS STE<br>PROG:LADV:ENDS?<br>STEady |

| **PROGram:LADVanced:CONTinuous** | | **B** | **S** |
|---|---|---|---|
| Description | After setting the continuous trigger.Enable of the LIST Program experiment, the Program Enable state will not be exited after the experiment, and the trigger command * TRG can be sent directly to restart the experiment. | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default OFF.<br>ON/1:Enable(on)<br>OFF/0:Disable(off) | | |
| Parameter Format | <Bool> | | |
| Query Format | **PROGram:LADVanced:CONTinuous?** | | |
| Returned Data Format | < Bool > | | |
| Example | PROG:LADV:CONT OFF<br>PROG:LADV:CONT?<br>0 | | |

| **PROGram:LADVanced:TRIGer** | | **B** | **S** |
|---|---|---|---|
| Description | Sets the trigger mode of LADVanced Program experiment. | | |

| | |
|---|---|
| Parameter Ranges | <AUTO\|MANual>,default AUTO.<br>AUTO : Automation, after receiving * TRG or external trigger commands, PRE20 will perform all Program steps.<br>MANual : Manual, PRE20 performs only one Program experiment after receiving * TRG or external trigger commands. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:LADVanced:TRIGer?** |
| Returned Data Format | <DSC> |
| Example | PROG:LADV:TRIG AUTO<br>PROG:LADV:TRIG?<br>AUTO |

| **PROGram:LADVanced:INPut** | **B** | **S** |
|---|---|---|
| Description | Sets the trigger input for LADVanced Program experiment | |
| Parameter Ranges | <INTernal\|EXTernal>,default INTernal.<br>INTernal : Internal, the experiment is triggered by the display or external communication command * TRG.<br>EXTernal : External, trigger the experiment through the Anyport digital input interface, as shown in the Anyport interface command chapter. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LADVanced:INPut?** | |
| Returned Data Format | <DSC> | |

| | |
|---|---|
| Example | PROG:LADV:INP INT<br>PROG:LADV:INP?<br>INTernal |

| **PROGram:LADVanced:DELay** | | **B** | **S** |
|---|---|---|---|
| Description | Set the trigger delay time of LADVanced Program experiment. ( unit : ms ) | | |
| Parameter Ranges | <0~999999>,default 0. | | |
| Parameter Format | <NR1> | | |
| Query Format | **PROGram:LADVanced:DELay?** | | |
| Returned Data Format | <NR1> | | |
| Example | PROG:LADV:DEL 0<br>PROG:LADV:DEL?<br>0 | | |

| **PROGram:LADVanced:OUTPut** | | **B** | **S** |
|---|---|---|---|
| Description | LADVanced Program experiment trigger output mode.Used to output a narrow pulse through the Anyport interface at a specified time in the experiment, it needs to be Enabled through the Anyport interface, as detailed in the relevant chapters of the Anyport interface. | | |
| Parameter Ranges | <ONCE\|STEP\|CYCLe> | | |

| | |
|---|---|
| | ONCE : Output pulse only when each experiment enters the trigger state<br>STEP : Pulse output at each step of the experiment<br>CYCLe : Output pulse per cycle in the experiment<br>Note : The output pulse at the beginning of any step or multiple steps can be achieved by configuring the Trig OutEnable in the single-step Program data. At this point, the ADVancedProgram experiment trigger output mode needs to be set to STEP. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:LADVanced:OUTPut?** |
| Returned Data Format | <DSC> |
| Example | PROG:LADV:OUTP STEP<br>PROG:LADV:OUTP?<br>STEP |

| **PROGram:LADVanced:RMSMode** | **B** | **S** |
|---|---|---|
| Description | Set the effective value of LADVanced Program experiment. | |
| Parameter Ranges | <AUTO\|ENABle\|DISable>,default AUTO.<br>AUTO : automation. When the Program waveform is sine wave, clipping wave, built-in harmonic and custom waveform, and the custom waveform mode is effective value, the effective value mode is automatically Enable, the output voltage value is closed loop, and the output voltage value is automatically adjusted to be consistent with | |

| | |
|---|---|
| | the set value. Otherwise, the effective value mode is automatically Disable, and the output voltage value is open loop.<br>ENABle : Enable, forcing Enable output voltage RMS adjustment.<br>DISable : Disable, forced Disable output voltage RMS adjustment. |
| Parameter Format | <DSC> |
| Query Format | **PROGram:LADVanced:RMSMode?** |
| Returned Data Format | <DSC> |
| Example | PROG:LADV:RMSM AUTO<br>PROG:LADV:RMSM?<br>AUTO |

### 4.7.13 LHARmonic Program Commands

| **PROGram:LHARmonic:INITiate** | **B** | **S** | |
|---|---|---|---|
| Description | LHARmonic Program Enable command is carried. After receiving the command, PRE20 will enter the experiment Enable state. At this time, the Program experiment data will be locked. If PRE20 is in the output state and receives the *TRG experiment trigger command, the Program experiment will enter the trigger state and begin to output the harmonic waveform according to the preset harmonic parameters.<br>In the trigger state of LHARmonic Program experiment, after issuing a new set | | |

| | |
|---|---|
| | of experiment parameters, the LHARmonic Program Enable command can be directly issued once again, and a set of experiment parameters can be updated and output, without re-issuing the * TRG experiment trigger command.<br>Note 1 : PRE20 enters the HARMonicProgramEnable state with the following conditions :<br>1 ) Coupling mode is AC or AC + DC<br>2 ) Select the waveform is sine wave<br>3 ) Output frequency setting range 40Hz ~ 200Hz<br>Note 2 : When LHARmonic Program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. The specific settings are detailed in the relevant chapters of Anyport. |
| Example | PROG:LHAR:INIT |

| **PROGram:LHARmonic:DATA#** | **B** | **S** |
|---|---|---|
| Description | Set the load mode to select LHARmonic Program experiment parameters of the harmonic order #, a total of 6 parameters, the list is as follows :<br>φ1 # harmonic voltage THD ( unit : % )<br>φ1 # harmonic voltage phase ( unit : ° )<br>φ2 # harmonic voltage THD ( unit : % )<br>φ2 # harmonic voltage phase ( unit : ° )<br>φ3 # harmonic voltage THD ( unit : % )<br>φ3 # harmonic voltage phase ( unit : ° ) | |

| | |
|---|---|
| | Where # represents the harmonic order, the range is divided into two gears :<br>1 ) The output frequency is [ 40Hz ~ 70Hz ], # = 2 ~ 100<br>2 ) The output frequency is ( 70 ~ 200Hz ], # = 2 ~ 25<br>Note 1 :<br>When LHARmonic Program experiment is in the trigger state, the output frequency parameters can still be modified, and the range cannot exceed the gear at the beginning of the experiment.<br>Note 2 :<br>If the output phase number is three-phase, the values of φ2 and φ3 are automatically consistent with φ1.<br>If the output phase number is 1 phase, the setting value of φ1 is valid, the setting values of φ2 and φ3 are invalid but cannot be omitted. |
| Parameter Ranges | φ1 # harmonic voltage THD : 0.00 ~ 40.00<br>φ1 # harmonic voltage phase : 0.0 ~ 359.9<br>φ2 # harmonic voltage THD : 0.00 ~ 40.00<br>φ2 # harmonic voltage phase : 0.0 ~ 359.9<br>φ3 # harmonic voltage THD : 0.00 ~ 40.00<br>φ3 # harmonic voltage phase : 0.0 ~ 359.9 |
| Parameter Format | <NR2,NR2,NR2,NR2,NR2,NR2> |
| Query Format | **PROGram:LHARmonic:DATA#?** |
| Returned Data Format | <NR2,NR2,NR2,NR2,NR2,NR2> |
| Example | PROGram:LHARmonic:DATA1 5.00,0.0,3.00,180.0,1.00,0.0 |

| | |
|---|---|
| | PROGram:LHARmonic:DATA1?<br>5.0,0.0,3.0,180.0,1.0,0.0 |

| **PROGram:LHARmonic:INPut** | **B** | **S** |
|---|---|---|
| Description | Set the trigger input for LHARmonic Program experiment. | |
| Parameter Ranges | <INTernal\|EXTernal>,default INTernal.<br>INTernal : Internal, the experiment is triggered by the display or external communication command * TRG.<br>EXTernal : External, trigger the experiment through the Anyport digital input interface, as shown in the Anyport interface command chapter. | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LHARmonic:INPut?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LHAR:INP INT<br>PROG:LHAR:INP?<br>INTernal | |

| **PROGram:LHARmonic:DELay** | **B** | **S** |
|---|---|---|
| Description | Setting the trigger delay time of LHARmonic program experiment. ( unit : ms ) | |
| Parameter Ranges | 0~999999,default 0. | |
| Parameter Format | <NR1> | |

| | |
|---|---|
| Query Format | **PROGram:LHARmonic:DELay?** |
| Returned Data Format | <NR1> |
| Example | PROG:LHAR:DELay 0<br>PROG:LHAR:DELay?<br>0 |

| **PROGram:LHARmonic:OUTPut** | **B** | **S** |
|---|---|---|
| Description | Setting LHARmonic Program experiment trigger output mode.Used to output a narrow pulse through the Anyport interface at a specified time in the experiment, it needs to be Enabled through the Anyport interface, as detailed in the relevant chapters. | |
| Parameter Ranges | <ONCE\|BASE>,default ONCE.<br>ONCE : Once, output pulse only when each experiment enters the trigger state.<br>BASE : fundamental wave, output pulse at each fundamental wave zero crossing | |
| Parameter Format | <DSC> | |
| Query Format | **PROGram:LHARmonic:OUTPut?** | |
| Returned Data Format | <DSC> | |
| Example | PROG:LHAR:OUTP ONCE<br>PROG:LHAR:OUTP?<br>ONCE | |

### 4.7.14 LINTerharm Program Commands

| **PROGram:LINTerharm:INITiate** | **B** | **S** | **L** |
|---|---|---|---|
| Description | After receiving LINTerharm Program Enable command, PRE20 will enter the experiment preparation state. At this time, the Program experiment data will be locked. If PRE20 is in the output state and receives the * TRG experiment trigger command, the LINTerharm Program experiment will enter the trigger state and begin to perform the preset experiment steps.<br>Note : When LINTerharm Program trigger input is set to external input, the experiment will be triggered through the Anyport input interface. The specific settings are detailed in the relevant chapters of Anyport. | | |
| Example | PROG:LINT:INIT | | |

| **PROGram:LINTerharm:COUNt** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Sets the number of cycles | | |
| Parameter Ranges | <0~9999999>,default 0. | | |
| Parameter Format | < NR1> | | |
| Query Format | **PROGram:LINTerharm:COUNt?** | | |
| Returned Data Format | < NR1 > | | |
| Example | PROG:LINT:COUN 10<br>PROG:LINT:COUN?<br>10 | | |

| **PROGram:LINTerharm:SEGMent** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the steps of LINTerharm Program experiment. | | | |
| Parameter Ranges | <1~300>,default 1. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **PROGram:LINTerharm:SEGMent?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | PROG:LINT:SEGM 10<br>PROG:LINT:SEGM?<br>10 | | | |

| **PROGram:LINTerharm:OUTPut** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set LINTerharm Program experiment trigger output mode.Used to output a narrow pulse through the Anyport interface at a specified time in the experiment, it needs to be Enabled through the Anyport interface, as detailed in the relevant chapters. | | | |
| Parameter Ranges | <ONCE\|STEP\|CYCLe\|BASE>,default ONCE.<br>ONCE : Output pulse only when each experiment enters the trigger state<br>STEP : Pulse output at each step of the experiment<br>CYCLe : Output pulse per cycle in the experiment<br>BASE : Fundamental | | | |

| | |
|---|---|
| Parameter Format | < DSC > |
| Query Format | **PROGram:LINTerharm:OUTPut?** |
| Returned Data Format | < DSC > |
| Example | PROG:LINT:OUTP ONCE<br>PROG:LINT:OUTP?<br>ONCE |

| **PROGram:LINTerharm:CONTinuous** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set LINTerharm Program experiment continuous trigger . | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,default 0.<br>ON/1:Enable<br>OFF/0:Disable | | |
| Parameter Format | < Bool > | | |
| Query Format | **PROGram:LINTerharm:CONTinuous?** | | |
| Returned Data Format | < Bool > | | |
| Example | PROG:LINT:CONT ON<br>PROG:LINT:CONT?<br>1 | | |

| **PROGram:LINTerharm:TRIGer** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set LINTerharm Program experiment trigger mode. | | |

| | |
|---|---|
| Parameter Ranges | < AUTO\|MANual >,default AUTO.<br>AUTO:Automation<br>MANual:Manual |
| Parameter Format | < DSC > |
| Query Format | **PROGram:LINTerharm:TRIGer?** |
| Returned Data Format | < DSC > |
| Example | PROG:LINT:TRIG AUTO<br>PROG:LINT:TRIG?<br>AUTO |

| **PROGram:LINTerharm:INPut** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set LINTerharm Program experiment trigger input. | | | |
| Parameter Ranges | <INTernal\|EXTernal>,default INTernal.<br>INTernal:Internal<br>EXTernal:External | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **PROGram:LINTerharm:INPut?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | PROG:LINT:INP INT<br>PROG:LINT:INP?<br>INT | | | |

| **PROGram:LINTerharm:DELay** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the trigger delay time ( unit : ms ) of LINTerharm Program experiment. | | | |
| Parameter Ranges | <0~999999>,default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **PROGram:LINTerharm:DELay?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | PROG:LINT:DELay 300<br>PROG:LINT:DELay?<br>300 | | | |

| **PROGram:LINTerharm:DATA#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set LINTerharm Program experiment parameters of step #, a total of 7 parameters, the list is as follows :<br>ProgEn ProgramEnable<br>Value # inter-step harmonic content thd<br>Start # Inter-step Harmonic Initiation Frequency ( unit : Hz )<br>End # inter-step harmonic end frequency ( unit : Hz )<br>Δ # inter-step harmonic step frequency ( unit : Hz )<br>Dwell execution time ( unit : 100us )<br>Pause interval ( unit : 100us ) | | | |
| Parameter Ranges | Set LINTerharm Program experiment parameters of the selected step #, a total of | | | |

| | |
|---|---|
| | 25 parameters, the list is as follows :<br>ProgEnProgramEnable : 0 ~ 1, default 1 ;<br>value step # interharmonic content thd : 0.00-40.00, default 0 ;<br>start # inter-step harmonic start frequency : 0.001 ~ 2000.000, default 15 ;<br>end # inter-step harmonic end frequency : 0.001 ~ 2000.000, default 400 ;<br>Δ# inter-step harmonic step frequency : 0.001 ~ 2000.000, default 5 ;<br>dwell execution time : 0 ~ 9999999, default 50000 ;<br>pause interval : 0 ~ 9999999, default 10000 ; |
| Parameter Format | < NR1,NR2,NR2,NR2,NR2,NR1,NR1 > |
| Query Format | **PROGram:LINTerharm:DATA#?** |
| Returned Data Format | < NR1,NR2,NR2,NR2,NR2,NR1,NR1 > |
| Example | PROGram:LINT:DATA1 1,22.00,50.000,50.000,50.000,455,455<br>PROGram:LINT:DATA1?<br>1,22.00,50.000,50.000,50.000,455,455 |

## 4.8 CEVent Subsystem

### 4.8.1 Event Setting Commands

| **CEVent:ENABle#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Event # Indicates the event number. The value ranges from 1 to 10. | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,Default 0.<br>ON/1:Enable<br>OFF/0:Disable | | | |
| Parameter Format | <Bool> | | | |
| Query Format | **CEVent:ENABle#?** | | | |
| Returned Data Format | <Bool> | | | |
| Example | CEV:ENAB1 ON<br>CEV:ENAB1?<br>1 | | | |

| **CEVent:CASe#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set event trigger source. # Indicates the event number. The value ranges from 1 to 10. | | | |
| Parameter Ranges | <0~44>,Default 0. | | | |
| Parameter Format | <NR1> | | | |
| Query Format | **CEVent:CASe#?** | | | |

| | |
|---|---|
| Returned Data Format | < NR1 > |
| Example | CEV:CAS1 3<br>CEV:CAS1?<br>3 |

| **CEVent:VALue#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set event trigger threshold (unit: %). # Indicates the event number. The value ranges from 1 to 10. | | | |
| Parameter Ranges | <0~100>,Default 100. | | | |
| Parameter Format | < NRF> | | | |
| Query Format | **CEVent:VALue#?** | | | |
| Returned Data Format | < NRF > | | | |
| Example | CEV:VAL1 30.3<br>CEV:VAL1?<br>30.3 | | | |

| **CEVent:DELay#** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set event trigger time (unit: ms). # Indicates the event number. The value ranges from 1 to 10. | | | |
| Parameter Ranges | <0~999999>,Default 0. | | | |
| Parameter Format | < NR1> | | | |
| Query Format | **CEVent:DELay#?** | | | |

| | |
|---|---|
| Returned Data Format | < NR1 > |
| Example | CEV:DEL1 99<br>CEV:DEL1?<br>99 |

| **CEVent:ACTion#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the action mode of event #. # indicates the event number. The value ranges from 1 to 10. | | |
| Parameter Ranges | <WARNing\|ALARm\|RECord> ,Default WARNing.<br>WARNing:Warning<br>ALARm:Alarm<br>RECord:Record | | |
| Parameter Format | < DSC> | | |
| Query Format | **CEVent:ACTion#?** | | |
| Returned Data Format | < DSC > | | |
| Example | CEV:ACT1 WARN<br>CEV:ACT1?<br>WARNing | | |

| **CEVent:DIRection#** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the action direction of event #. # indicates the event number. The value ranges from 1 to 10. | | |

| | |
|---|---|
| Parameter Ranges | < UP\|DOWN >,Default UP.<br>UP: up<br>DOWN :down |
| Parameter Format | < DSC> |
| Query Format | **CEVent:DIRection#?** |
| Returned Data Format | < DSC > |
| Example | CEV:DIR1 UP<br>CEV:DIR1?<br>UP |

## 4.9 MEMory Subsystem

### 4.9.1 Data Record Commands

| **MEMory:RATE** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the data record memory rate (unit: SPS). | | | |
| Parameter Ranges | <0\|1\|2\|3>,Default 0.<br>0:1 SPS<br>1:2 SPS<br>2:5 SPS<br>3:10 SPS | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **MEMory:RATE?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | MEM:RATE 1<br>MEM:RATE?<br>2 | | | |

| **MEMory:COUNter** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the counter of data record. | | | |
| Parameter Ranges | <1~9999999>,Default 1000. | | | |
| Parameter Format | < NR1 > | | | |

| | |
|---|---|
| Query Format | **MEMory:COUNter?** |
| Returned Data Format | < NR1 > |
| Example | MEM:COUN 99<br>MEM:COUN?<br>99 |

| **MEMory:CONDition** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the condition for data record. | | | |
| Parameter Ranges | <CEVent\|IMMediate>,Default IMMediate.<br>CEVent :Event trigger<br>IMMediate:Immediate trigger | | | |
| Parameter Format | < DSC > | | | |
| Query Format | **MEMory:CONDition?** | | | |
| Returned Data Format | < DSC > | | | |
| Example | MEM:COND CEV<br>MEM:COND?<br>CEVent | | | |

| **MEMory:STATe** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the state for data record. | | | |
| Parameter Ranges | <ON\|OFF\|1\|0>,Default 0. | | | |

| | |
|---|---|
| | ON/1:Start<br>OFF/0:Stop |
| Parameter Format | < Bool> |
| Query Format | **MEMory:STATe?** |
| Returned Data Format | < Bool > |
| Example | MEM:STAT ON<br>MEM:STAT?<br>1 |

# 5 Status Report

The IEEE488.2 standard defines a standardized status register system. This section provides a detailed description of the status registers, and describes the relationship between the status registers in the form of diagrams.

## 5.1 Status Commands

### 5.1.1 Operation Status Commands

| **STATus:OPERation:CONDition?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Read the real-time operation status of the power supply. The operation status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~14, coupling mode: [00] AC [01] DC [10] AC+DC<br>Bit13~12, output phase number: [00] three phase [01] split phase [10] single phase<br>Bit11, reset state: [1] Reset<br>Bit10, Protection status: [1] Protection<br>Bit9, output waiting state: [1] Output is not ready [0] Output is allowed<br>Bit8, disk operation status: [1] Operation succeeded [0] Operation in progress or operation failed<br>Bit7, program status: [1] program running [0] program not running<br>Bit6, trigger wait: [1] Wait for experiment to trigger [0] triggered | | | |

| | |
|---|---|
| | Bit5, communication interface: [1] remote control [0] local control (display)<br>Bit4, running status: [1] in operation<br>Bit3, Source Load state: [1] load [0] source<br>Bit2, internal impedance state: [1] On (enable) [0] Off (disable)<br>Bit1, DC limit state: [1] On (Enable) [0] Off (Disable)<br>Bit0, AC limit state: [1] On (Enable) [0] Off (disable)<br>Note: Disk operation status. After the disk operation commands is delivered, this flag is set to 0 first, and then to 1 after the operation succeeds. |
| Returned Data Format | <NR1> |
| Example | STAT:OPER:COND?<br>65535(State all 1) |

| **STATus:OPERation:EVENt?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Query the operation event register, which is a read-only register whose value depends on the operation status register and the operation event enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:OPER:EVEN?<br>64 | | |

| **STATus:OPERation:ENABle** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the enable register of the operation event. When querying the status of the operation register, check whether the corresponding bit of the register is enabled. | | |

| | |
|---|---|
| Parameter Ranges | < 0~65535 >,Default 0. |
| Parameter Format | < NR1 > |
| Query Format | **STATus:OPERation:ENABle?** |
| Returned Data Format | < NR1 > |
| Example | STAT:OPER:ENAB 125<br>STAT:OPER:ENAB?<br>125 |

### 5.1.2 Running Status Commands

| **STATus:QUEStionable:CONDition?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Read the real-time running status of the power supply. The operation status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~8, reserved<br>Bit7, transient register CONStant: See the Running status commands for details<br>Bit6, load trigger register LTRProgram: See program status commands for details<br>Bit5, load enable register LENProgram: See program status commands for details<br>Bit4, WARNing register WARNing: See the Running status commands for details<br>Bit3, Alarm register ALARm: See Running Status commands for details<br>Bit2, Source trigger register STRProgram: See Program Status Commands for details<br>Bit1, Source enable register SENProgram: See Program Status Commands | | |

| | |
|---|---|
| | Bit0, Event register CEVent: See Event Status Commands |
| Parameter Format | < NR1 > |
| Example | STAT:QUES:COND?<br>64 |

| **STATus:QUEStionable:EVENt?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Queries the run status register, which is a read-only register whose value depends on the operation status register and the operation event enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:QUES:EVEN?<br>64 | | |

| **STATus:QUEStionable:ENABle** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the running status enable register. When querying the status of the running status register, you need to check whether the bit corresponding to the register is enabled. | | |
| Parameter Ranges | < 0~65535 >,Default 0. | | |
| Parameter Format | < NR1 > | | |
| Query Format | **STATus:QUEStionable:ENABle?** | | |
| Returned Data Format | < NR1 > | | |
| Example | STAT:QUES:ENAB 125 | | |

| | |
|---|---|
| | STAT:QUES:ENAB?<br>125 |

| **STATus:QUEStionable:ALARm:CONDition?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Read the status of the power supply real-time fault register, which is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~14, reserved<br>Bit13, lowvoltage fault LVP: [1] fault [0] normal<br>Bit12, lowfrequency fault LFP: [1] Fault [0] normal<br>Bit11, overfrequency fault OFP: [1] fault [0] normal<br>Bit10, chain fault CHAF: [1] fault [0] normal<br>Bit9, slave machine fault SLAF: [1] fault [0] normal<br>Bit8, internal fault INSF: [1] fault [0] Normal<br>Bit7, Power supply failure POWF: [1] Fault [0] Normal<br>Bit6, parallel communication failure PARF: [1] fault [0] normal<br>Bit5, communication timeout fault COMF: [1] Fault [0] Normal<br>Bit4, outlet overtemperature fault OTP: [1] fault [0] normal<br>Bit3, sensing fault SENF: [1] fault [0] normal<br>Bit2, output overpower fault OPP: [1] fault [0] normal<br>Bit1, output overcurrent fault OCP: [1] fault [0] Normal<br>Bit0, output overvoltage fault OVP: [1] Fault [0] normal | | | |
| Parameter Format | < NR1 > | | | |
| Example | STAT:QUES:ALAR:COND? | | | |

| | |
|---|---|
| | 64 |

| **STATus:QUEStionable:ALARm:EVENt?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Query the fault status register, which is a read-only register whose value depends on the fault status register and the fault enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:QUES:ALAR:EVEN?<br>64 | | |

| **STATus:QUEStionable:ALARm:ENABle** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the fault enable register. When querying the status of the fault register, check whether the bit corresponding to the register is enabled. | | |
| Parameter Ranges | < 0~65535 >,Default 0. | | |
| Parameter Format | < NR1 > | | |
| Query Format | **STATus:QUEStionable:ALARm:ENABle?** | | |
| Returned Data Format | < NR1 > | | |
| Example | STAT:QUES:ALAR:ENAB 125<br>STAT:QUES:ALAR:ENAB?<br>125 | | |

| STATus:QUEStionable:WARNing:CONDition? | B | S | L |
|---|---|---|---|
| Description | Read the real-time alarm register status of the power supply. This status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~9, reserved<br>Bit8, USBTMC queue empty alarm TMCE: [1] Alarm [0] Normal<br>Bit7, emergency stop alarm EMST: [1] Alarm [0] Normal<br>Bit6, IP conflict alarm IPAF: [1] Alarm [0] Normal<br>Bit5, AC load RLC/PQ exceed limit LREL: [1] Alarm [0] normal<br>Bit4, AC load program data limit LPDL: [1] Alarm [0] Normal<br>Bit3: AC source program data limit. SPDL: [1] Alarm [0] Normal<br>Bit2, line voltage limit LVL: [1] Alarm [0] Normal<br>Bit1 Parallel wait WAIT: [1] Alarm [0] normal<br>Bit0, parallel redundancy alarm PARA: [1] Alarm [0] Normal | | | |
| Parameter Format | < NR1 > | | | |
| Example | STAT:QUES:WARN:COND?<br>64 | | | |

| STATus:QUEStionable:WARNing:EVENt? | B | S | L |
|---|---|---|---|
| Description | Query the alarm status register. This register is a read-only register. Its value depends on the alarm status register and alarm enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:QUES:WARN:EVEN? | | |

| | |
|---|---|
| | 64 |

| **STATus:QUEStionable:WARNing:ENABle** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the alarm enable register. When querying the status of the alarm register, check whether the bit corresponding to the register is enabled. | | | |
| Parameter Ranges | < 0~65535 >,Default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **STATus:QUEStionable:WARNing:ENABle?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | STAT:QUES:WARN:ENAB 125<br>STAT:QUES:WARN:ENAB?<br>125 | | | |

| **STATus:QUEStionable:CONStant:CONDition?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Read the state of the power running mode register, which is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~9, reserved<br>Bit8, C phase CP: [1] On (enable) [0] Off (disable)<br>Bit7, C phase CC: [1] On (enable) [0] Off (disable)<br>Bit6, C phase CV: [1] On (Enable) [0] Off (Disable)<br>Bit5, B phase CP: [1] On (Enable) [0] Off (disable) | | | |

| | |
|---|---|
| | Bit4, B phase CC: [1] On (Enable) [0] Off (disable)<br>Bit3, B phase CV: [1] On (Enable) [0] Off (disable)<br>Bit2, A phase CP: [1] On (Enable) [0] Off (disable)<br>Bit1, Aphase CC: [1] On (Enable) [0] Off (disable)<br>Bit0, A phase CV: [1] On (Enable) [0] Off (disable) |
| Parameter Format | < NR1 > |
| Example | STAT:QUES:CONS:COND?<br>64 |

**STATus:QUEStionable:CONStant:EVENt?** **B** **S** **L**

| | |
|---|---|
| Description | Query the run mode register, which is a read-only register. Its value depends on the run mode register and the Run mode enable register. |
| Parameter Format | < NR1 > |
| Example | STAT:QUES:CONS:EVEN?<br>64 |

**STATus:QUEStionable:CONStant:ENABle** **B** **S** **L**

| | |
|---|---|
| Description | Set the running mode enable register. When querying the status of the running mode register, check whether the corresponding bit of the register is enabled. |
| Parameter Ranges | < 0~65535 >,Default 0. |
| Parameter Format | < NR1 > |

| | |
|---|---|
| Query Format | **STATus:QUEStionable:CONStant:ENABle?** |
| Returned Data Format | < NR1 > |
| Example | STAT:QUES:CONS:ENAB 125<br>STAT:QUES:CONS:ENAB?<br>125 |

### 5.1.3 Event Status Commands

| **STATus:QUEStionable:CEVent:CONDition?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Read the event status recorded by the power supply in real time. This status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~10, reserved<br>Bit9, event 10: [1] triggered [0] not triggered<br>Bit8, event 9: [1] triggered [0] not triggered<br>Bit7, event 8: [1] triggered [0] not triggered<br>Bit6, event 7: [1] triggered [0] not triggered<br>Bit5, event 6: [1] triggered [0] not triggered<br>Bit4, Event 5: [1] triggered [0] not triggered<br>Bit3, event 4: [1] triggered [0] not triggered<br>Bit2, event 3: [1] triggered [0] not triggered<br>Bit1, event 2: [1] triggered [0] not triggered<br>Bit0, event 1: [1] triggered [0] not triggered | | | |

| | |
|---|---|
| Parameter Format | < NR1 > |
| Example | STAT:QUES:CEV:COND?<br>64 |

| **STATus:QUEStionable:CEVent:EVENt?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Queries the event status register, which is a read-only register and whose value depends on the event status register and the event enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:QUES:CEV:EVEN?<br>64 | | |

| **STATus:QUEStionable:CEVent:ENABle** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the event enable register. When querying the status of the event register, check whether the bit corresponding to the register is enabled. | | |
| Parameter Ranges | < 0~65535 >,Default 0. | | |
| Parameter Format | < NR1 > | | |
| Query Format | **STATus:QUEStionable:CEVent:ENABle?** | | |
| Returned Data Format | < NR1 > | | |
| Example | STAT:QUES:CEV:ENAB 125<br>STAT:QUES:CEV:ENAB?<br>125 | | |

### 5.1.4 Program Status Commands

| **STATus:QUEStionable:SENProgram:CONDition?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Read the status of the source program register recorded in real time by the power supply. This status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~7, reserved<br>Bit6, INTERHARMONIC program: [1] enabled [0] disabled<br>Bit5, HARMONIC program: [1] Enabled [0] disabled<br>Bit4, ADVANCE program: [1] Enabled [0] Disabled<br>Bit3, PULSE program: [1] Enabled [0] Disabled<br>Bit2, STEP program: [1] Enabled [0] disabled<br>Bit1, WAVE program: [1] Enabled [0] Disabled<br>Bit0, LIST program: [1] Enabled [0] disabled | | | |
| Parameter Format | < NR1 > | | | |
| Example | STAT:QUES:SENP:COND?<br>64 | | | |

| **STATus:QUEStionable:SENProgram:EVENt?** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Query the source program status register. This register is a read-only register. Its value depends on the source program status register and the source program | | | |

| | |
|---|---|
| | enable register. |
| Parameter Format | < NR1 > |
| Example | STAT:QUES:SENP:EVEN?<br>64 |

| **STATus:QUEStionable:SENProgram:ENABle** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the source program enable register. When querying the status of the source program register, check whether the corresponding bit of the register is enabled. | | |
| Parameter Ranges | < 0~65535 >,Default 0. | | |
| Parameter Format | < NR1 > | | |
| Query Format | **STATus:QUEStionable:SENProgram:ENABle?** | | |
| Returned Data Format | < NR1 > | | |
| Example | STAT:QUES:SENP:ENAB 125<br>STAT:QUES:SENP:ENAB?<br>125 | | |

| **STATus:QUEStionable:STRProgram:CONDition?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Read the status of the source trigger register recorded in real time by the power supply. This status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~7, reserved | | |

| | |
|---|---|
| | Bit6, INTERHARMONIC program: [1] enabled [0] disabled<br>Bit5, HARMONIC program: [1] enabled [0] disabled<br>Bit4, ADVANCE program: [1] enabled [0] disabled<br>Bit3, PULSE program: [1] enabled [0] disabled<br>Bit2, STEP program: [1] enabled [0] disabled<br>Bit1, WAVE program: [1] enabled [0] disabled<br>Bit0, LIST program: [1] enabled [0] disabled |
| Parameter Format | < NR1 > |
| Example | STAT:QUES:STRP:COND?<br>64 |

| **STATus:QUEStionable:STRProgram:EVENt?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Query the source trigger status register, which is a read-only register and whose value depends on the source trigger status register and the source trigger enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:QUES:STRP:EVEN?<br>64 | | |

| **STATus:QUEStionable:STRProgram:ENABle** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the source trigger enable register. When querying the status of the source trigger register, check whether the bit corresponding to the register is enabled. | | |

| | |
|---|---|
| Parameter Ranges | < 0~65535 >,Default 0. |
| Parameter Format | < NR1 > |
| Query Format | **STATus:QUEStionable:STRProgram:ENABle?** |
| Returned Data Format | < NR1 > |
| Example | STAT:QUES:STRP:ENAB 125<br>STAT:QUES:STRP:ENAB?<br>125 |

| **STATus:QUEStionable:LENProgram:CONDition?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Read the status of the on-board program register recorded by the power supply in real time. This status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~7, reserved<br>Bit6, INTERHARMONIC program: [1] enabled [0] disabled<br>Bit5, HARMONIC program: [1] enabled [0] disabled<br>Bit4, ADVANCE program: [1] enabled [0] disabled<br>Bit3, PULSE program: [1] enabled [0] disabled<br>Bit2, STEP program: [1] enabled [0] disabled<br>Bit1, WAVE program: [1] enabled [0] disabled<br>Bit0, LIST program: [1] enabled [0] disabled | | | |
| Parameter Format | < NR1 > | | | |
| Example | STAT:QUES:LENP:COND? | | | |

| | |
|---|---|
| | 64 |

| **STATus:QUEStionable:LENProgram:EVENt?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Query the on-load program status register, which is a read-only register. Its value depends on the on-load program status register and the on-load program enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:QUES:LENP:EVEN?<br>64 | | |

| **STATus:QUEStionable:LENProgram:ENABle** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Set the load program enable register. When querying the status of the load program register, check whether the corresponding bit of the register is enabled. | | |
| Parameter Ranges | < 0~65535 >,Default 0. | | |
| Parameter Format | < NR1 > | | |
| Query Format | **STATus:QUEStionable:LENProgram:ENABle?** | | |
| Returned Data Format | < NR1 > | | |
| Example | STAT:QUES:LENP:ENAB 125<br>STAT:QUES:LENP:ENAB?<br>125 | | |

| **STATus:QUEStionable:LTRProgram:CONDition?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Read the on-load trigger register status recorded by the power supply in real time. This status register is a read-only register. The register has 16 bits, which are defined as follows:<br>Bit15~7, reserved<br>Bit6, INTERHARMONIC program: [1] enabled [0] disabled<br>Bit5, HARMONIC program: [1] Enabled [0] disabled<br>Bit4, ADVANCE program: [1] Enabled [0] Disabled<br>Bit3, PULSE program: [1] Enabled [0] Disabled<br>Bit2, STEP program: [1] Enabled [0] disabled<br>Bit1, WAVE program: [1] Enabled [0] Disabled<br>Bit0, LIST program: [1] Enabled [0] disabled | | | |
| Parameter Format | < NR1 > | | | |
| Example | STAT:QUES:LTRP:COND?<br>64 | | | |

| **STATus:QUEStionable:LTRProgram:EVENt?** | **B** | **S** | **L** |
|---|---|---|---|
| Description | Query the load trigger status register, which is a read-only register. Its value depends on the load trigger status register and load trigger enable register. | | |
| Parameter Format | < NR1 > | | |
| Example | STAT:QUES:LTRP:EVEN?<br>64 | | |

| **STATus:QUEStionable:LTRProgram:ENABle** | | **B** | **S** | **L** |
|---|---|---|---|---|
| Description | Set the on-load trigger enable register. When querying the status of the on-load trigger register, check whether the corresponding bit of the register is enabled. | | | |
| Parameter Ranges | < 0~65535 >,Default 0. | | | |
| Parameter Format | < NR1 > | | | |
| Query Format | **STATus:QUEStionable:LTRProgram:ENABle?** | | | |
| Returned Data Format | < NR1 > | | | |
| Example | STAT:QUES:LTRP:ENAB 125<br>STAT:QUES:LTRP:ENAB?<br>125 | | | |

## 5.2 Status Report

# 6 Appendix

## 6.1 Model Information

| Machine type | Single 3-phase Max current A_rms | 1-phase Max current A_rms | Single 3-phase Max power kVA |
|---|---|---|---|
| PRE2006S | 30 | 90 | 6 |
| PRE2007S | 30 | 90 | 7.5 |
| PRE2009S | 35 | 105 | 9 |
| PRE2012S | 35 | 105 | 12 |
| PRE2015S | 35 | 105 | 15 |
| PRE2020S | 35 | 105 | 20 |

## Version Revision History

| date | version | content |
| --- | --- | --- |
| May 2023 | V1.0 | |
| May 2023 | V1.1 | 1、Added ISland、Load Program Commands; |