
User's Guide

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For Safety information, Warranties, and Regulatory information,
see the pages behind the Index.

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**Agilent E3631A
Triple Output
DC Power Supply**

Remote Interface Reference



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If you are a first-time user of the SCPI language, you may want to refer to these sections to become familiar with the language before attempting to program the power supply.

SCPI Command Summary

This section summarizes the SCPI (*Standard Commands for Programmable Instruments*) commands available to program the power supply over the remote interface. Refer to the later sections in this chapter for more complete details on each command.

Throughout this manual, the following conventions are used for SCPI command syntax.

- Square brackets ([]) indicate optional keywords or parameters.
- Braces ({ }) enclose parameters within a command string.
- Triangle brackets (< >) indicate that you must substitute a value or a code for the enclosed parameter.
- A vertical bar (|) separates one of two or more alternative parameters.



First-time SCPI users, see page 102

Output Setting and Operation Commands

```
APPLy
{ P6V|P25V|N25V } [ , { <voltage> | DEF | MIN | MAX } [ , { <current> | DEF | MIN | MAX } ] ]
APPLy? [ { P6V|P25V|N25V } ]

INSTRument
[:SElect] { P6V|P25V|N25V }
[:SElect]?
:NSElect { 1|2|3 }
:NSElect?
:COUPle[:TRIGger] { ALL|NONE|<list> }
:COUPle[:TRIGger]?

MEASure
:CURRent[:DC]? [ { P6V|P25V|N25V } ]
[:VOLTagE][:DC]? [ { P6V|P25V|N25V } ]

OUTPut
[:STATe] { OFF|ON }
[:STATe]?
:TRACk[:STATe] { OFF|ON }
:TRACk[:STATe]?

[SOURce:]
CURRent[:LEVel][:IMMediate][:AMPLitude] { <current> [MIN|MAX] }
CURRent[:LEVel][:IMMediate][:AMPLitude]? [MIN|MAX]
CURRent[:LEVel]:TRIGgered[:AMPLitude] { <current> [MIN|MAX] }
CURRent[:LEVel]:TRIGgered[:AMPLitude]? [MIN|MAX]
VOLTagE[:LEVel][:IMMediate][:AMPLitude] { <voltage> | MIN | MAX }
VOLTagE[:LEVel][:IMMediate][:AMPLitude]? [MIN|MAX]
VOLTagE[:LEVel]:TRIGgered[:AMPLitude] { <voltage> [MIN|MAX] }
VOLTagE[:LEVel]:TRIGgered[:AMPLitude]? [MIN|MAX]
```

Triggering Commands

```
INITiate [:IMMediate]
TRIGger[:SEquence]
:DELay { <seconds> | MIN | MAX }
:DELay?
:SOURce { BUS | IMM }
:SOURce?

*TRG
```

System-Related Commands

```
DISPlay[:WINDow]
  [:STATe] {OFF|ON}
  [:STATe]?
  :TEXT[:DATA] <quoted string>
  :TEXT[:DATA]?
  :TEXT:CLEar

SYSTem
  :BEEPer[:IMMediate]
  :ERRor?
  :VERSion?

*IDN?
*RST
*TST?
*SAV {1|2|3}
*RCL {1|2|3}
```

Calibration Commands

```
CALibration
  :COUNT?
  :CURRent[:DATA] <numeric value>
  :CURRent:LEVel {MIN|MAX}
  :SECure:CODE <new code>
  :SECure:STATe {OFF|ON}, <code>
  :SECure:STATe?
  :STRing <quoted string>
  :STRing?
  :VOLTage[:DATA] <numeric value>
  :VOLTage:LEVel {MIN|MAX}
```

Status Reporting Commands

```
STATus:QUEStionable
  [:EVENT]?
  :ENABle <enable value>
  :ENABle?
  :INSTrument[:EVENT]?
  :INSTrument:ENABle <enable value>
  :INSTrument:ENABle?
  :INSTrument:ISUMmary<n>[:EVENT]?
  :INSTrument:ISUMmary<n>:CONDition?
  :INSTrument:ISUMmary<n>:ENABle <enable value>
  :INSTrument:ISUMmary<n>:ENABle?
SYSTem:ERRor?

*CLS
*ESE <enable value>
*ESE?
*ESR?
*OPC
*OPC?
*PSC {0|1}
*PSC?
*SRE <enable value>
*SRE?
*STB?
*WAI
```

RS-232 Interface Commands

```
SYSTem
  :LOCal
  :REMote
  :RWLock
```

IEEE-488.2 Common Commands

*CLS
*ESE *<enable value>*
*ESE?
*ESR?
*IDN?
*OPC
*OPC?
*PSC {0|1}
*PSC?
*RST
*SAV {1|2|3}
*RCL {1|2|3}
*SRE *<enable value>*
*SRE?
*STB?
*TRG
*TST?
*WAI



*First-time
SCPI users,
see page 102*

Simplified Programming Overview

This section gives an overview of the basic techniques used to program the power supply over the remote interface. This section is only an overview and does not give all of the details you will need to write your own application programs. Refer to the remainder of this chapter and also chapter 6, Application Programs, for more details and examples. Also refer to the programming reference manual that came with your computer for details on outputting command strings and entering data.

Using the APPLy Command

The APPLy command provides the most straightforward method to program the power supply over the remote interface. For example, the following statement executed from your computer will set the +6V supply to an output of 3 V rated at 1 A:

```
"APPL P6V, 3.0, 1.0"
```

Using the Low-Level Commands

Although the APPLy command provides the most straightforward method to program the power supply, the low-level commands give you more flexibility to change individual parameters. For example, the following statements executed from your computer will set the +6V supply to an output of 3 V rated at 1 A:

| | |
|------------|------------------------------------|
| "INST P6V" | <i>Select +6V output</i> |
| "VOLT 3.0" | <i>Set output voltage to 3.0 V</i> |
| "CURR 1.0" | <i>Set output current to 1.0 A</i> |

Reading a Query Response

Only the query commands (commands that end with “?”) will instruct the power supply to send a response message. Queries return either output values or internal instrument settings. For example, the following statements executed from your computer will read the power supply's error queue and print the most recent error:

| | |
|----------------------------------|---|
| <code>dimension statement</code> | <i>Dimension string array (80 elements)</i> |
| <code>"SYST:ERR?"</code> | <i>Read error queue</i> |
| <code>bus enter statement</code> | <i>Enter error string into computer</i> |
| <code>print statement</code> | <i>Print error string</i> |

Selecting a Trigger Source

The power supply will accept a “bus” (software) trigger or an immediate internal trigger as a trigger source. By default, the “BUS” trigger source is selected. If you want the power supply to use an immediate internal trigger, you must select “IMMediate”. For example, the following statements executed from your computer will set the +6V supply to an output of 3 V/1 A immediately:

| | |
|------------------------------|---|
| <code>"INST P6V"</code> | <i>Select the +6V output</i> |
| <code>"VOLT:TRIG 3.0"</code> | <i>Set the triggered voltage level to 3.0 V</i> |
| <code>"CURR:TRIG 1.0"</code> | <i>Set the triggered current level to 1.0 A</i> |
| <code>"TRIG:SOUR IMM"</code> | <i>Select the immediate trigger as a source</i> |
| <code>"INIT"</code> | <i>Cause the trigger system to initiate</i> |

Programming Ranges and Output Identifiers

Output setting commands require a parameter for programming ranges and an output name or an output number as the identifier of each output and most queries will return a parameter. The programming range for a parameter varies according to the selected output of the power supply. The following table lists the programming ranges, output names, and output numbers for each output.

Refer to this table to identify parameters when programming the power supply.

Table 4-1. Agilent E3631A Programming Ranges and Output Identifiers

| | | Output | | |
|-------------------|----------------------------|-------------|---------------|---------------|
| | | +6V output | +25V output | -25V output |
| Voltage | Programming Range | 0 to 6.18 V | 0 to +25.75 V | 0 to -25.75 V |
| | MAX value | 6.18 V | 25.75 V | -25.75 V |
| | MIN value | 0 V | 0 V | 0 V |
| | *RST value (DEFAult value) | 0 V | 0 V | 0 V |
| Current | Programming Range | 0 to 5.15 A | 0 to 1.03 A | 0 to 1.03 A |
| | MAX value | 5.15 A | 1.03 A | 1.03 A |
| | MIN value | 0 A | 0 A | 0 A |
| | *RST value (DEFAult value) | 5 A | 1 A | 1 A |
| Output identifier | | P6V | P25V | N25V |
| Output number | | 1 | 2 | 3 |

Using the APPLy Command

The APPLy command provides the most straightforward method to program the power supply over the remote interface. You can select the specific output, output voltage, and output current all in one command.

APPLy

{P6V | P25V | N25V}[,<voltage>| DEF | MIN | MAX][,<current>| DEF | MIN | MAX]}

This command is combination of INSTRument : SElect, [SOURce :] VOLTage, and [SOURce :] CURRent commands. The values of voltage and the current of the specified output are changed as soon as the command is executed.

You can identify each output by the output name (P6V, P25V or N25V) as described in Table 4-1. For the *voltage* and *current* parameters of the APPLy command, the ranges depend on the output currently selected. You can substitute “MINimum”, “MAXimum”, or “DEFault” in place of a specific value for the *voltage* and *current* parameters. MIN selects the lowest voltage and current values allowed for the selected output. MAX selects the highest voltage and current values allowed. The *default voltage* values are 0 volts for all outputs. The *default current* values are 5 A for +6V output and 1 A for ±25V outputs. The default voltage and current values are exactly the same as the *RST values. See Table 4-1 for details of parameters.

If you specify only one value for the parameter, the power supply regards it as voltage setting value. If you do not specify any value for the parameter, the APPLy command only selects the output specified and acts as the INSTRument command.

APPLy? [{P6V | P25V | N25V}]

This command queries the power supply's present *voltage* and *current* values for each output and returns a quoted string. The voltage and current are returned in sequence as shown in the sample string below (the quotation marks are returned as part of the string). If any output identifier is not specified, the voltage and the current of the currently selected output are returned.

```
"5.000000,1.000000"
```

In the above string, the first number 5.000000 is the voltage limit value and the second number 1.000000 is the current limit value for the specified output.

Output Setting and Operation Commands

This section describes the low-level commands used to program the power supply. Although the `APPLY` command provides the most straightforward method to program the power supply, the low-level commands give you more flexibility to change individual parameters.

See page 102 for programming ranges, output identifiers, and MIN / MAX values in the following commands.

Output Selection Commands

INSTRument[:SElect] {P6V | P25V | N25V}

This command selects the output to be programmed among three outputs by the output identifier. The outputs of the power supply are considered three logical instruments. The `INSTRument` command provides a mechanism to identify and select an output. When one output is selected, the other outputs are unavailable for programming until selected. The commands which are affected by the `INSTRument` command are output setting commands (`SOURCE`), measurement commands (`MEASURE`), and calibration commands (`CALIBRATION`). “P6V” is the identifier for +6V output, “P25V” is for +25V output and “N25V” is for -25V output.

INSTRument[:SElect]?

This query returns the currently selected output by the `INSTRument[:SElect]` or `INSTRument:NSElect` command. The returned parameter is “P6V”, “P25V”, or “N25V”.

INSTRument:NSElect {1 | 2 | 3}

This command selects the output to be programmed among three outputs by a *numeric value* instead of the output identifier used in the `INSTRument[:SElect]` command. “1” selects +6V output, “2” selects +25V output, and “3” selects -25V output.

INSTRument:NSElect?

This query returns the currently selected output by the `INSTRument:NSElect` or `INSTRument[:SElect]` command. The returned parameter is “1” for +6V output, “2” for +25V output or “3” for -25V output.

INSTrument:COUPle[:TRIGger] {ALL | NONE <list>}

This command defines a coupling between various logical outputs of the power supply. The couple command consists of an optional subsystem node followed by a single parameter. The *only* valid parameter for the optional subsystem node is TRIGger subsystem. If no node follows the couple command, TRIGger subsystem is assumed to be coupled.

The parameter indicates to which logical outputs the specified coupling is to apply. "ALL" indicates that specified coupling is to apply to all outputs. "NONE" indicates that specified coupling is to be removed. A list of outputs specifies a particular set of logical outputs to be coupled. At *RST, all outputs are uncoupled. *Notice that TRACK must be off before the ±25V supplies can be coupled.*

**INST:COUP
Example (1)**

The following program segment shows how to use the INSTrument:COUPle command to couple two outputs between the +6V and the +25V outputs with voltage and current triggered levels. The power supply is set to the newly programmed values as set by the VOLTage:TRIGgered and CURRent:TRIGgered commands.

| | |
|----------------------|--|
| "INST:SEL P6V" | <i>Select the +6V output</i> |
| "VOLT:TRIG 5" | <i>Set triggered level to 5 V</i> |
| "CURR:TRIG 3" | <i>Set triggered level to 3 A</i> |
| "INST:SEL P25V" | <i>Select the +25V output</i> |
| "VOLT:TRIG 20" | <i>Set triggered level to 20 V</i> |
| "CURR:TRIG 0.5" | <i>Set triggered level to 0.5 A</i> |
| "INST:COUP P6V,P25V" | <i>Couple the +6V and +25V supply</i> |
| "TRIG:SOUR IMM" | <i>Set trigger to immediate</i> |
| "INIT" | <i>Trigger the power supply to output the trigger values for the +6V and the +25V supplies</i> |

Note

*If you select the bus trigger source in the above program (see page 79 for the detailed information), you must send the *TRG or Group Execute Trigger (GET) command to start the trigger action after sending the INITiate command.*

INSTRument:COUPlE[:TRIGger]?

This query returns the currently coupled output. Returns “ALL”, “NONE”, or a list. If any output is not coupled, “NONE” is returned. If all of three outputs are coupled, “ALL” is returned. If a list of outputs is coupled, the list is returned.

Measurement Commands

MEASure:CURRent[:DC]? [{P6V | P25V | N25V}]

This command queries the current measured at the *output terminals* of the power supply. The physical outputs of measurement are specified by the output identifier. If any output identifier is not specified, the current of the currently selected output is returned.

MEASure[:VOLTage][:DC]? [{P6V | P25V | N25V}]

This command queries the voltage measured at the *output terminals* of the power supply. If any output identifier is not specified, the voltage of the currently selected output is returned.

Output On/Off and Tracking Operation Commands

OUTPut[:STATe] {OFF | ON}

This command enables or disables all *three* outputs of the power supply. The state of the disabled outputs is a condition of less than 0.6 volts of opposite polarity with no load and less than 60 mA of opposite direction with a short circuit. At *RST, the output state is off.

OUTPut[:STATe]?

This command queries the output state of the power supply. The returned value is “0” (OFF) or “1” (ON).

OUTPut:TRACk[:STATe] {OFF | ON}

This command enables or disables the power supply to operate in the track mode. When the track mode is first enabled, the -25V supply will be set to the same voltage level as the +25V supply. Once enabled, any change of the programmed voltage level in either +25V supply or -25V supply will be reflected in the other supply. The TRACK OFF command returns the power supply to the non-track mode. The ±25V supplies must not be coupled to enable “Track”. At *RST, the track mode is disabled.

OUTPut:TRACk[:STATe]?

This command queries the track mode state of the power supply. The returned value is “0” (OFF) or “1” (ON).

Output Setting Commands

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude] {<current>|MINimum | MAXimum}

This command directly programs the immediate current level of the power supply. The immediate level is the current limit value of the output selected with the INSTRUMENT command.

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]? [MINimum | MAXimum]

This query returns the presently programmed current limit level of the selected output. CURRent? MAXimum and CURRent? MINimum return the maximum and minimum *programmable* current levels of the selected output.

[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude]
{<current>| MINimum | MAXimum}

This command programs the pending triggered current level of the power supply. The pending triggered current level is a *stored* value that is transferred to the output terminals when a trigger occurs. A pending triggered level is not affected by subsequent CURRent commands.

[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude]?
[MINimum | MAXimum]

This query returns the presently programmed triggered current level. If no triggered level is programmed, the CURRent level is returned. CURRent :TRIGgered? MAXimum and CURRent:TRIGgered? MINimum return the maximum and minimum programmable triggered current levels.

VOLTage[:LEVel][:IMMediate][:AMPLitude]
{<voltage>| MINimum | MAXimum}

This command directly programs the immediate voltage level of the power supply. The immediate level is the voltage limit value of the selected output with the INSTRument command.

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]?
[MINimum | MAXimum]

This query returns the presently programmed voltage limit level of the selected output. VOLTage? MAXimum and VOLTage? MINimum return the maximum and minimum *programmable* voltage levels of the selected output.

[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]
{<voltage>| MINimum | MAXimum}

This command programs the pending triggered voltage level of the power supply. The pending triggered voltage level is a *stored* value that is transferred to the output terminals when a trigger occurs. A pending triggered level is not affected by subsequent VOLTage commands.

[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]?
[MINimum | MAXimum]

This query returns the presently programmed triggered voltage level. If no triggered level is programmed, the VOLTage level is returned. VOLTage :TRIGgered? MAXimum and VOLTage:TRIGgered? MINimum return the maximum and minimum programmable triggered voltage levels.

Triggering Commands

The power supply's triggering system allows a change in voltage and current when receiving a trigger, to select a trigger source, and to insert a trigger. Triggering the power supply is a multi-step process.

- First, you must select an output with the `INSTRument:SElect` command and then configure the power supply for the triggered output level by using `CURRent:TRIGgered` and `VOLTage:TRIGgered` commands.
- Then, you must specify the source from which the power supply will accept the trigger. The power supply will accept a bus (software) trigger or an immediate trigger from the remote interface.
- Then, you can set the time delay between the detection of the trigger on the specified trigger source and the start of any corresponding output change. *Notice that the time delay is valid for only the bus trigger source.*
- Finally, you must provide an `INITiate[:IMMediate]` command. If the `IMMediate` source is selected, the selected output is set to the triggered level immediately. But if the trigger source is the bus, the power supply is set to the triggered level after receiving the Group Execute Trigger (GET) or `*TRG` command.

Trigger Source Choices

You must specify the source from which the power supply will accept a trigger. The trigger is stored in *volatile* memory; the source is set to bus when the power supply has been off or after a remote interface reset.

Bus (Software) Triggering

- To select the bus trigger source, send the following command.

```
TRIGger:SOURce BUS
```
- To trigger the power supply from the remote interface (GPIB or RS-232) after selecting the bus source, send the `*TRG` (trigger) command. When the `*TRG` is sent, the trigger action starts after the specified time delay if any delay is given.

- You can also trigger the power supply from the GPIB interface by sending the IEEE-488 Group Execute Trigger (GET) message. The following statement shows how to send a GET from a Agilent Technologies controller.

```
TRIGGER 705 (group execute trigger)
```

- To ensure synchronization when the bus source is selected, send the *WAI (wait) command. When the *WAI command is executed, the power supply waits for all pending operations to complete before executing any additional commands. For example, the following command string guarantees that the first trigger is accepted and is executed before the second trigger is recognized.

```
TRIG:SOUR BUS;*TRG;*WAI;*TRG;*WAI
```

- You can use the *OPC? (operation complete query) command or the *OPC (operation complete) command to signal when the operation is complete. The *OPC? command returns “1” to the output buffer when the operation is complete. The *OPC command sets the “OPC” bit (bit 0) in the Standard Event register when the operation is complete.

Immediate Triggering

- To select the immediate trigger source, send the following command.

```
TRIGger:SOURce IMM
```

- When the IMMEDIATE is selected as a trigger source, an INITiate command immediately transfers the VOLTage:TRIGgered[:AMPLitude] and CURRent:TRIGgered[:AMPLitude] values to VOLTage[:LEVel][:IMMEDIATE][:AMPLitude] and CURRent[:LEVel][:IMMEDIATE][:AMPLitude] values. Any delay is ignored.

Triggering Commands

INITiate:IMMEDIATE]

This command causes the trigger system to initiate. This command completes one full trigger cycle when the trigger source is an immediate and initiates the trigger subsystem when the trigger source is bus.

TRIGger[:SEQUENCE]:DELay{<seconds>| MINimum | MAXimum}

This command sets the time delay between the detection of an event on the specified trigger source and the start of any corresponding trigger action on the power supply output. Select from 0 to 3600 seconds. MIN = 0 seconds. MAX = 3600 seconds. At *RST , this value is set to 0 seconds.

TRIGger[:SEQUENCE]:DELay?

This command queries the trigger delay.

TRIGger[:SEQUENCE]:SOURce {BUS | IMMEDIATE}

This command selects the source from which the power supply will accept a trigger. The power supply will accept a bus (software) trigger or an internal immediate trigger. At *RST, the bus trigger source is selected.

TRIGger[:SEQUENCE]:SOURce?

This command queries the present trigger source. Returns “BUS” or “IMM”.

***TRG**

This command generates a trigger to the trigger subsystem that has selected a bus (software) trigger as its source (TRIGger:SOURCE BUS). The command has the same effect as the Group Execute Trigger (GET) command. For RS-232 operation, make sure the power supply is in the remote interface mode by sending the SYSTem:REMOte command first.

System-Related Commands

DISPlay[:WINDow][:STATe] {OFF | ON}

This command turns the front-panel display off or on. When the display is turned off, outputs are not sent to the display and all annunciators are disabled except the **ERROR** annunciator.

The display state is automatically turned on when you return to the local mode. Press the **Local** key to return to the local state from the remote interface.

DISPlay[:WINDow][:STATe]?

This command queries the front-panel display setting. Returns “0” (OFF) or “1” (ON).

DISPlay[:WINDow]:TEXT[:DATA] <quoted string>

This command displays a message on the front panel. The power supply will display up to 12 characters in a message; any additional characters are truncated. Commas, periods, and semicolons share a display space with the preceding character, and are not considered individual characters.

DISPlay[:WINDow]:TEXT[:DATA]?

This command queries the message sent to the front panel and returns a quoted string.

DISPlay[:WINDow]:TEXT:CLEAr

This command clears the message displayed on the front panel.

SYSTem:BEEPer[:IMMediate]

This command issues a single beep immediately.

SYSTem:ERRor?

This command queries the power supply's error queue. When the front-panel **ERROR** annunciator turns on, one or more command syntax or hardware errors have been detected. Up to 20 errors can be stored in the error queue. See “Error Messages” in chapter 5.

- Errors are retrieved in first-in-first-out (FIFO) order. The first error returned is the first error that was stored. When you have read all errors from the queue, the **ERROR** annunciator turns off. The power supply beeps once each time an error is generated.
- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with -350, “Too many errors”. No additional errors are stored until you remove errors from the queue. If no errors have occurred when you read the error queue, the power supply responds with +0, “No error”.
- The error queue is cleared when power has been off or after a *CLS (clear status) command has been executed. The *RST (reset) command *does not* clear the error queue.

SYSTem:VERSion?

This command queries the power supply to determine the present SCPI version. The returned value is of a string in the form YYYY.V where the “Y’s” represent the year of the version, and the “V” represents a version number for that year (for example, 1995.0).

*IDN?

This query command reads the power supply's identification string. The power supply returns four fields separated by commas. The *first* field is the manufacturer's name, the *second* field is the model number, the *third* field is not used (always “0”), and the *fourth* field is a revision code which contains three numbers. The first number is the firmware revision number for the *main* power supply processor; the second is for the *input/output* processor; and the third is for the *front-panel* processor.

The command returns a string with the following format (be sure to dimension a string variable with at least 40 characters):

```
HEWLETT-PACKARD,E3631A,0,X.X-X.X-X.X
```

***RST**

This command resets the power supply to its power-on state as follows:

| <u>Command</u> | <u>State</u> |
|------------------|-------------------------|
| CURR[:LEV][:IMM] | Output dependent value* |
| CURR[:LEV]:TRIG | Output dependent value* |
| DISP[:STAT] | ON |
| INST[:SEL] | P6V |
| INST:COUP | NONE |
| OUTP[:STAT] | OFF |
| OUTP:TRAC | OFF |
| TRIG:DEL | 0 |
| TRIG:SOUR | BUS |
| VOLT[:LEV][:IMM] | 0 |
| VOLT[:LEV]:TRIG | 0 |

**The reset operation sets the current of +6V output to 5 A and the current of +25V and -25V outputs to 1 A.*

***TST?**

This query performs a *complete* self-test of the power supply. Returns “0” if the self-test passes or “1” or any non-zero value if it fails. If the self-test fails, an error message is also generated with additional information on why the test failed.

***SAV { 1 | 2 | 3 }**

This command stores the present state of the power supply to the specified location in *non-volatile* memory. Three memory locations (numbered 1, 2 and 3) are available to store operating states of the power supply. The state storage feature “remembers” the states or values of INST[:SEL], VOLT[:IMM], CURR[:IMM], OUTP[:STAT], OUTP:TRAC, TRIG:SOUR, and TRIG:DEL. To recall a stored state, you must use the same memory location used previously to store the state.

***RCL {1 | 2 | 3 }**

This command recalls a previously stored state. To recall a stored state, you must use the same memory location used previously to store the state. You recall *RST states or values of the power supply from a memory location that was not previously specified as a storage location.