Regurated DC Power Supply PWX Series
Communication Interface Manual

Introduction

The PWX Series Communication Interface Manual explains the settings that are used to control the PWX remotely through one of the following interfaces, the multichannel settings, and commands.

- RS232C interface
- USB interface
- LAN interface

When the PWX is operating under remote control, the REMOTE LED on the display on the front panel lights. To switch from remote mode to local mode (panel operation) from the panel, press LOCAL.

How to read this manual

This manual is in HTML format that can be viewed with a WWW (World Wide Web) browser. The HTML manual can be viewed using the following browsers.

Browser: Microsoft Edge or Google Chrome

Related manuals

For the safety precautions, installation, operation, and specifications of the PWX, read the accompanying PWX User's Manual.

Intended readers

This manual is written for readers with sufficient basic knowledge of how to control instruments using a personal computer.

Structure of the manual

This manual consists of the following sections.

- Overview
- Setup
- Overview of messages
- Command (list*1)
- Appendix
- Tutorial
- Multi channel*2

*1. The list of command is provided in a PDF file.

*2. Multichannel is a high-level function. Familiarize yourself with the syntax of the basic SCPI commands that are used with the PWX before you use this function.

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Firmware version of the product to which this manual applies

This manual applies to products with firmware version 3.1x.

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IX00038D, May. 2022

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Setup

A VISA library is required to use the software application. The VISA library (NI-VISA, Keysight VISA, or KI-VISA) must be installed on the controller (Windows). Do not install multiple VISA libraries on the PC. Doing so may cause errors.

When the product is controlled by the LAN interface, middleware which applies to the VXI-11 or HiSLIP protocol is required. Middleware is automatically installed by the VISA library.

Installing the VISA Library

VISA (Virtual Instrument Software Architecture) is a specification for standard software that is used to connect instruments. VISA was defined by the IVI Foundation.

One of the VISA libraries (driver software implemented in compliance with the VISA specifications) below is necessary.

Do not install multiple VISA libraries on the same PC. Doing so may cause errors.

If your VISA library is an older version than that specified, you may not be able to use it depending on the interface.

•NI-VISA by NI Corporation (Ver. 5.1.1 or later)

•Keysight VISA by Keysight Technologies (Keysight IO Libraries Suite16.0 or later)

•KI-VISA Ver. 5.0.4 or later

Setup

The PWX is equipped with LAN, RS232C, and USB interfaces as standard.

The LAN interface complies with LXI version 1.3 Class C and supports the VXI-11, HiSLIP, and SCPI-RAW protocols.

The USB interface complies with USBTMC device class.

NOTE

There is no need to switch interfaces. All interfaces can be used simultaneously.
LAN Interface can be set to OFF in CONFIG settings (CF20).

Interface Setup

Overview of Messages

The information that is exchanged between the controller (computer) and the device (PWX series) is called a message.

The PWX uses the SCPI language for the messages.

There are two types of messages, commands that are sent from the computer to the PWX and responses that are sent from the PWX to the computer.

Command Hierarchy

SCPI commands are ASCII-based commands designed for test and measurement devices. The command hierarchy is structured around the common root or node, which is the construction block of the SCPI subsystem. A command consists of a program header, parameters, and punctuation.

The hierarchy is explained using the SOURce subsystem as an example.

Program header	Parameter	Hierarchy of node
SOUR:		Root node
CURR		Second level
:EXT		Third level
:RANG	<numeric>	Fourth level
:SOUR	<bool>	Fourth level
VOLT		Second level
[:PROT]		Third level
[:LEV]	<numeric>	Fourth level
:STAT	<bool>	Fourth level

A higher node is separated from a lower node using a colon (:).

Command Syntax

This manual denotes SCPI commands using the following format.

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

SCPI commands can be issued using the short form. The short form of a SCPI command is the section of the command written in uppercase.

SCPI commands can be sent in the long form or short form. Since SCPI commands are not case-sensitive, CURR, Curr, and curr are all accepted as the short form of CURRent. In the long form, CURRENT, Current, and current are all acceptable.

- A space is required between the program header section and the parameter section.
- Multiple parameters, when available, are concatenated using commas.
- Commands are concatenated using semicolons (compound command).

```
SOURce:CURRent MINimum;VOLTage MINimum
```

In the second command, SOURce is omitted. This is because the path is set to SOURce by the first command SOURce:CURRent MINimum.

This compound command is the same as entering the following commands.

```
SOURce:CURRent MINimum

SOURce:VOLTage MINimum
```

An error occurs if a node that is not defined in the current path is designated.

Commands of different subsystems can be concatenated using a colon and a semicolon together.

```
SOURce:CURRent MINimum;:MEASure:CURRent?
```

This compound command contains two root nodes, SOURce and MEASure.

When the second or subsequent command starts with a colon, the path specified by the previous command is cleared.

- The maximum number of characters that can be transmitted in a single line is 128.

Special symbols

Special symbols used in this manual to describe SCPI commands are defined below.

• Characters and numbers delimited by "|" in braces indicate that one of the items is to be selected.

Do not include the braces in the actual program.

• The characters <> indicate program data.

Do not write <> in the actual program.

• Brackets indicate option data.

When option data is not sent with the program, the default value is applied.
Do not write [ ] in the actual program.

Queries

The device settings or status can be queried.

To make a query, add a question mark at the end of the program header section.

If a query has parameters, enter a space after the question mark followed by the parameters.

```
SOURce:CURRent? MIN
```

Response

A response returned as an answer to a query. It is a message that is always sent from the device to the computer. The status of the device or measured values are transmitted to the computer.

NOTE

When transmitting two queries in separate lines, read the response to the first query before transmitting the second line. If you send two lines of query commands at once, an incomplete response may be received.

Program terminator

All commands must be terminated using a valid terminator.

The available terminators are <new line> (ASCII 0x0A) and EOI (end-or-identify). Either one can be used as a terminator.

EOI cannot be used with the RS232C interface. Be sure to use <new line>.

When a command string is terminated, the path is reset to the root level.

NOTE

CR (ASCII 0x0D) is not a terminator.

Common commands

The IEEE-488.2 and SCPI standards contain a set of common commands for reset, self-test, and other functions. These common commands always start with an asterisk. The commands may have one or multiple parameters.

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Overview of Messages

Parameters

The parameter format of SCPI is derived from the program parameter format defined in IEEE 488.2.

The representation system of the program data that is used on the PWX is indicated below.

Non-numeric parameters

Character string data (String)

Used when a series of ASCII characters are requested.

Be sure to enclose a string in single or double quotation marks. The start and end quotation marks must match.

```
SYSTem:LANGuage "SCPI"
```

If you wish to use a quotation mark as a part of the string, enter two quotation marks consecutively (with no characters in between).

Character data

Character data is used when only a limited number of values are available for the program setting. Responses are returned in the short form.

```
TRIGger:SOURce {BUS|IMMediate|TIMer}
```

Boolean data

Boolean data expresses a 1 or 0 condition or an ON or OFF condition. Responses are returned as 1 or 0.

```
OUTPut {ON|OFF|1|0}
```

Numeric parameters

R1

Represents an integer.

Details are given in the IEEE 488.2 Standard Digital Interface for Programmable Instrumentation.

NR2

Represents a real number (floating point).

Details are given in the IEEE 488.2 Standard Digital Interface for Programmable Instrumentation.

NR3

Represents a real number (exponential).

Details are given in the IEEE 488.2 Standard Digital Interface for Programmable Instrumentation.

The value +3.80000+E02 is returned for the response data 380. The number of digits to the right of the decimal is 5.

NRf

NRf is a generic term that includes NR1, NR2, and NR3.

Numeric

A numeric parameter such as a decimal point, optional prefix, or measurement unit.

The syntax as a numeric representation is the same as NRf.

MINimum and MAXimum are available as substitutes for declaring certain values.

Units such as V, A, and W can also be used in a numeric parameter.

If a value that cannot be assigned is entered, the device rounds the value to the closest possible value.

For PWX750ML:

```
VOLT 100
```

The PWX750ML current is set to a value between the value set by VOLT:LIM:LOW and 105 % of the rated output voltage, so 84 is returned in response to the VOLT? query.

Special form numeric parameters

The special form numeric parameters MINimum, MAXimum and DEFault can be used as substitutes for limit values when the parameter is numeric. In the example below, the current limit is set to the minimum value.

```
CURRent:PROTection MINimum
```

Queries can be used to inquire the minimum and maximum values for most parameters.

```
CURRent:PROTection? MAX
```

```
CURRent:PROTection? MIN
```

Measurement units

Below are the default measurement units.

·V (voltage) ·A (current)
·S (second)

The following optional prefixes are supported.

·M (milli) ·U (micro)

NOTE

• The unit symbols in the International System of Units (SI) contain lowercase characters. The IEEE standard uses uppercase characters. SCPI commands are not case-sensitive.

Commands are accepted even if a measurement unit is not specified.

• To enter "μ" in the data, use "U" instead.

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Overview of Messages

Default Conditions

Conditions after sending a *RST, *RCL, and at power-on

The following table shows how the PWX is set when *RST or *RCL is executed, at the time the PWX is shipped from the factory, and when the power is turned on.

Setup item	Setting				Unit	Function
	*RST	*RCL	Factory default	At power-on		
OUTP	0/OFF	--	0/OFF	0/OFF*1	--	OUTPUT on/off setting
VOLT	0	Depends on the settings in memory	0	Setting immediately before turning the POWER switch off	--	Voltage setting
VOLT:LIM:LOW	0		0		V	UVP setting
VOLT:LIM:AUTO	ON	ON	ON		--	Voltage limit setting
VOLT:PROT	112 % of the rated output voltage	Depends on the settings in memory	112 % of the rated output voltage		V	OVP setting
CURR	105 % of the rated output current		105 % of the rated output current		A	Current setting
CURR:PROT	112 % of the rated output current		112 % of the rated output current		A	OCP setting
CURR:LIM:AUTO	ON	ON	ON		--	Current limit setting
VOLT:EXT:SOUR	NONE	NONE	NONE		--	Whether CV mode is being controlled externally
CURR:EXT:SOUR	NONE	NONE	NONE		--	Whether CC mode is being controlled externally
OUTP:EXT	OFF	OFF	OFF		--	Whether output is being turned on and off externally
VOLT:TRIG	0	The same value as VOLT	0		V	Target voltage using a trigger
CURR:TRIG	105.0 % of the	The same value as	105.0 % of the		A	Target current

	rated output current	CURR	rated output current			using a trigger
TRIG:SOUR TRIG:TRAN:SOUR	IMM	IMM	IMM	IMM	--	Trigger source

*1 The output may turn on at PWX power-on depending on the OUTP:PON setting.

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Command (Function/ Subsystem)

IEEE488.2 Common Commands

*CLS	Clears all the event registers
*ESE	Sets the event status enable register bits
*ESR	Queries the event status register
*IDN	Queries the identification string (manufacturer information)
*OPC	Causes the device to generate the operation complete message in the event status register when all pending selected device operations have been finished
*OPT	Queries the hardware interface board and enhanced functions that are installed.
*PSC	Initializes *ESE and *SRE
*RCL	Recalls the contents saved to memory
*RST	Performs a device reset; configures the PWX to a known condition independent from the usage history of the device
*SAV	Saves the current settings to memory
*SRE	Sets the service request enable register bits
*STB	Reads the status byte and master summary status bits
*TRG	Trigger command
*TST	Executes a self-test
*WAI	Prevents the device from executing subsequent commands or queries until the No Operation Pending flag becomes true

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Command (Function)

Output Settings

Output on/off

OUTP	Output on/off
OUTP:PON:STAT	Output status at power-on
OUTP:PON	Output status at power-on (old command)

Voltage and current settings

VOLT	Sets the voltage
CURR	Sets the current

Variable internal resistance feature settings

RES	Sets the internal resistance

Command (Function)

Protection and Clearing Alarms

Overcurrent protection settings

CURR:PROT	Sets the OCP
CURR:PROT:DEL	Sets the detection time of OCP activation
CURR:LIM:AUTO	Enables and disables the current setting limit

Overcurrent protection settings

VOLT:PROT	Sets the OVP
VOLT:LIM:LOW	Sets the UVP
VOLT:LIM:AUTO	Enables and disables the voltage setting limit

Clearing alarms

OUTP:PROT:CLE	Clears alarms
SYST:CONF:PROT:REC	Sets the method for clearing OHP, FAN, AC-FAIL, and SD alarms

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Command (Function)

System Configuration

Output settings

OUTP:PON:STAT	Output status at power-on
OUTP:PON	Output status at power-on (old command)

Setting limits

CURR:LIM:AUTO	Enables and disables the current setting limit
VOLT:LIM:AUTO	Enables and disables the voltage setting limit

Remote control settings

SYST:COMM:LANG	Sets the command language
SYST:LANG	Sets the command language (old command)
SYST:COMM:EMUL	Sets the emulation
SYST:LANG:EMUL	Sets the emulation (old command)
SYST:ERR:TRAC	Sets whether to display or hide communication errors
OUTP:PROT:WDOG	Sets the communication monitoring

PWX status

SYST:CONF:BLE	Turns the bleeder on and off
SYST:CONF:MAST	Queries the number of units in master-slave parallel operation
SYST:CONF:MON:RANG	Sets the range for voltage and current monitoring
SYST:CONF:PROT:REC	Sets the method for clearing OHP, FAN, AC-FAIL, and SD alarms
SYST:CONF:STAR:PRI	Sets the output-on startup state

External control settings

CURR:EXT:SOUR	Sets the CC control mode setting
VOLT:EXT:SOUR	Sets the CV control mode setting
CURR:EXT:RANG VOLT:EXT:RANG	Sets the CC or CV control range
OUTP:EXT	Sets whether to turn the output on and off using triggers
OUTP:EXT:LOG	Sets the logic used to control the turning of output on and off using an external contact

Panel display setting

DISP:BRIG	Sets the panel display brightness

Master-Slave control setting

SYST:CONF:SLAV:AMM	Sets the current and power display on slave units

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Command (Function)

Using Triggers to Change Settings

-> Tutorial

VOLT:TRIG	Target voltage using a trigger
CURR:TRIG	Target current using a trigger
TRIG:TRAN:SOUR	Sets the trigger source
TRIG:SOUR	Sets the trigger source (old command)
INIT:TRAN	Starts the trigger function
INIT	Starts the trigger function (old command)
TRIG:TRAN	Software trigger
TRIG	Software trigger (old command)
ABOR	Aborts the trigger function

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Command (Function)

Measurement

-> Tutorial

MEAS:VOLT	Queries the measured voltage output
MEAS:CURR	Queries the measured current output

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Command (Function)

System

SYST:COMM:RLST	Sets the PWX to remote mode or local mode
SYST:ERR	Reads the error information
SYST:KLOC	Locks and unlocks panel operations
SYST:LOC	Sets the PWX to local mode
SYST:REM	Sets the PWX to remote mode; locks all the panel keys except for the LOCAL key
SYST:RWL	Sets the PWX to remote mode; locks panel operations
SYST:VERS	Queries the SCPI specification version with which the PWX complies

Command (Function)

Registers

Status byte register

Event status register

OPERation status register

STAT:OPER	Event
STAT:OPER:COND	Register status
STAT:OPER:ENAB	Enable
STAT:OPER:NTR	Negative transition
STAT:OPER:PTR	Positive transition

QUEStionable status register

STAT:QUES	Event
STAT:QUES:COND	Register status
STAT:QUES:ENAB	Enable
STAT:QUES:NTR	Negative transition
STAT:QUES:PTR	Positive transition

Preset status

STAT:PRES	Resets the enable register

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ABOR

Aborts operations that are changing settings

The trigger status immediately after the power is turned on is the same as the trigger status when the ABOR command is received.

Command

```
ABORt[:ALL]
```

C

DISP:BRIG

Sets the panel display brightness.

Command

```
DISPlay:BRIGhtness <NR1>

DISPlay:BRIGhtness?
```

Parameter

Value 1 to 7(The default value is 7)

A SCPI error (-222, "Data out of range") occurs if outside the range.

Response

Returns the panel display brightness in NR1 format in response to DISP:BRIG?.

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RES

Sets the internal resistance.

If the variable internal resistance feature (factory options) is in use, this command is valid.

If you are not using the variable internal resistance feature, set this to 0.

Command

```
[SOURce:]RESistance {<numeric>|MINimum|MAXimum}

[SOURce:]RESistance? {MINimum|MAXimum}
```

Parameter

Value 0 to the rated output voltage/ rated output current
(The default value is 0.)

Unit OHM

A SCPI error (-222, "Data out of range") occurs if outside the range.

Response

Returns the internal resistance setting in NR3 format in response to RES?.

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Command (Subsystem)

SOURce subsystem

CURR	Sets the current
CURR:EXT:RANG	Sets the CC or CV control range
CURR:EXT:SOUR	Sets the constant current control mode
CURR:LIM:AUTO	Enables and disables the current setting limit
CURR:PROT	Sets the OCP
CURR:PROT:DEL	Sets the detection time of OCP activation
CURR:TRIG	Target current using a trigger
RES	Sets the internal resistance
VOLT	Sets the voltage
VOLT:EXT:RANG	Sets the CC or CV control range
VOLT:EXT:SOUR	Sets the CV control mode setting
VOLT:LIM:AUTO	Enables and disables the voltage setting limit
VOLT:LIM:LOW	Sets the UVP
VOLT:PROT	Sets the OVP
VOLT:TRIG	Target voltage using a trigger

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Command (Subsystem)

OUTPut Subsystem

OUTP	Output on/off
OUTP:EXT	Sets whether to turn the output on and off using triggers
OUTP:EXT:LOG	Sets the logic used to control the turning of output on and off using an external contact
OUTP:PROT:CLE	Clears alarms
OUTP:PROT:WDOG	Sets the communication monitoring
OUTP:PON	Output status at power-on (old command)
OUTP:PON:STAT	Output status at power-on

Command (Subsystem)

MEASure and FETCh Subsystems

MEAS:CURR	Queries the measured current output
MEAS:VOLT	Queries the measured voltage output

Command (Subsystem)

TRIGger Subsystem

ABOR	Aborts the operation of all sequences
INIT:TRAN	Starts the trigger function
INIT	Starts the trigger function (old command)
TRIG	Software trigger (old command)
TRIG:SOUR	Sets the trigger source (old command)
TRIG:TRAN	Software trigger
TRIG:TRAN:SOUR	Sets the trigger source

Command (Subsystem)

SYSTem Subsystem

SYST:COMM:EMUL	Sets the emulation
SYST:COMM:LANG	Sets the command language
SYST:COMM:RLST	Sets the PWX to remote mode or local mode
SYST:CONF:BLE	Turns the bleeder on and off
SYST:CONF:MAST	Queries the number of units in master-slave parallel operation
SYST:CONF:MON:RANG	Sets the range for voltage and current monitoring
SYST:CONF:PROT:REC	Sets the method for clearing OHP, FAN, AC-FAIL, and SD alarms
SYST:CONF:SLAV:AMM	Sets the current and power display on slave units
SYST:CONF:STAR:PRI	Sets the output-on startup state
SYST:ERR	Reads the error information
SYST:ERR:TRAC	Sets whether to display or hide communication errors
SYST:KLOC	Locks and unlocks panel operations
SYST:LANG	Sets the command language (old command)
SYST:LANG:EMUL	Sets the emulation (old command)
SYST:LOC	Sets the PWX to local mode
SYST:REM	Sets the PWX to remote mode; locks all the panel keys except for the LOCAL key
SYST:RWL	Sets the PWX to remote mode; locks panel operations
SYST:VERS	Queries the SCPI specification version with which the PWX complies

DISPlay subsystem Subsystem

DISP:BRIG	Sets the panel display brightness

Command (Subsystem)

STATus Subsystem

STATus:OPERation	OPERation status register: Event
STATus:OPERation:CONDtion	OPERation status register: Register status
STATus:OPERation:ENABle	OPERation status register: Enable
STATus:OPERation:PTRansition	OPERation status register: Negative transition
STATus:OPERation:NTRansition	OPERation status register: Positive transition
STATus:QUESionable	QUEStionable status register: Event
STATus:QUESionable:CONDtion	QUEStionable status register: Register status
STATus:QUESionable:ENABle	QUEStionable status register: Enable
STATus:QUESionable:PTRansition	QUEStionable status register: Negative transition
STATus:QUESionable:NTRansition	QUEStionable status register: Positive transition
STATus:PRESet	Resets the enable register

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List of Messages

SCPI command: Command name in the short form.

*RST: “Yes” for commands that are affected by *RST.

R/W: “R” for query commands and “W” for set commands.

INST: “Yes” for commands that you can use the INST command to specify the target channel of.

SOURce subsystem

SCPI command		Response	*RST	Description	R/W	INST
Program header	Parameter					
[SOUR:]						
CURR[:LEV][:IMM][:AMPL]	numeric	NR3	Yes	Current	R/W	Yes
CURR:EXT:RANG	LOW|HIGH	char	Yes	CC control range used during external control	R/W	Yes
CURR:EXT:SOUR	NONE|VOLT	char	Yes	Whether constant current will be controlled externally	R/W	Yes
CURR:LIM:AUTO	bool	NR1	Yes	Current control	R/W	Yes
CURR:PROT[:LEV]	numeric	NR3	Yes	OCP trip point	R/W	Yes
CURR:PROT:DEL	numeric	NR3	Yes	Detection time of OCP activation	R/W	Yes
CURR[:LEV]:TRIG[:AMPL]	numeric	NR3	Yes	Current that will be set when a trigger is received	R/W	Yes
RES	numeric	NR3	Yes	Internal Resistance	R/W	Yes
VOLT[0][:LEV][:IMM][:AMPL]	numeric	NR3	Yes	Voltage	R/W	Yes
VOLT:EXT:RANG	LOW|HIGH	char	Yes	CV control range used during external control	R/W	Yes
VOLT:EXT:SOUR	NONE|VOLT	char	Yes	Whether constant current will be controlled externally	R/W	Yes
VOLT:LIM:AUTO	bool	NR1	Yes	Voltage control	R/W	Yes
VOLT:LIM:LOW	numeric	NR3	Yes	UVL trip point	R/W	Yes
VOLT:PROT[:LEV]	numeric	NR3	Yes	OVP trip point	R/W	Yes
VOLT[:LEV]:TRIG[:AMPL]	numeric	NR3	Yes	Voltage that will be set when a trigger is received	R/W	Yes

OUTPut subsystem

SCPI command		Response		Description	R/W	INST
Program header	Parameter					
OUTP						
[:STAT][:IMM]	bool	NR1	Yes	Output on/off	R/W	Yes
:EXT[:STAT]	bool	NR1	Yes	Output on/off for external control	R/W	Yes
:EXT:LOG	LOW|HIGH	char	Yes	Output on/off logic during external control	R/W	Yes
:ISOL		NR1		Queries the isolation relay control signal	R	Yes
:PROT:CLE				Alarm clearing	W	Yes
:PROT:WDOG	numeric	NR3		Communication monitoring	R/W	Yes
:PON[:STAT]	SAFE|AUTO|FORC	char		Power-on state	R/W	Yes
:SENS		NR1		Queries the sens relay signal	R	Yes
[:STAT]:TRIG	bool	NR1	Yes	Output that will be set when a trigger is received	R/W	Yes

MEASure subsystem

SCPI command		Response	*RST	Description	R/W	INST
Program header	Parameter					
MEAS[:SCAL]:						
[:SCAL]:CURR[:DC]		NR3		Queries the measured output current	R	Yes
[:SCAL]:VOLT[:DC]		NR3		Queries the measured output voltage	R	Yes

TRIGger subsystem

SCPI command		Response	*RST	Description	R/W	INST
Program header	Parameter					
ABOR				Aborts the trigger function	W	
INIT[:IMM][:TRAN]				Starts the trigger function	W	
TRIG[:TRAN][:IMM]				Executes a software trigger	W	
TRIG[:TRAN]:SOUR	IMM|BUS	char	Yes	Sets the trigger source	R/W	Yes

DISPlay subsystem

SCPI command		Response	*RST	Description	R/W	INST
Program header	Parameter					
DISP						
:BRIG	NR1	NR1		Panel display brightness	R/W	Yes

INSTrument subsystem

SCPI command		Response	*RST	Description	R/W	INST
Program header	Parameter					
INST						
:CAT				Queries the multichannel configuration	R	
[:SEL|:NSEL]	NR1	NR1	Yes	Specifies the channel	R/W	

GLOBal subsystem

SCPI command		Response	*RST	Description	R/W	INST
Program header	Parameter					
GLOB						
:CURR[:LEV][:IMM][:AMPL]	numeric			Current of all channels	W	
:OUT[:STAT]	bool			Output on/off for all channels	W	
:VOLT[0][:LEV][:IMM][:AMPL]	numeric			Voltage of all channels	W	

STATus subsystem

SCPI command		Response	Description	R/W	INST
Program header	Parameter				
STAT					
:OPER					
[:EVEN]		NR1	Event[1]	R	
:COND		NR1	Register status[1]	R	
:ENAB	NRf	NR1	Enable[1]	R/W	
:PTR	NRf	NR1	Positive transition[1]	R/W	
:NTR	NRf	NR1	Negative transition[1]	R/W	
:INST					
[:EVEN]		NR1	Event[2]	R	
:COND		NR1	Register condition[2]	R	
:ENAB	NRf	NR1	Enable[2]	R/W	
:PTR	NRf	NR1	Positive transition[2]	R/W	
:NTR	NRf	NR1	Negative transition[2]	R/W	
:ISUM<n>[3]					
[:EVEN]		NR1	Event[4]	R	
:COND		NR1	Register condition[4]	R	
:ENAB	NRf	NR1	Enable[4]	R/W	
:PTR	NRf	NR1	Positive transition[4]	R/W	
:NTR	NRf	NR1	Negative transition[4]	R/W	
:PRES			Resets the enable register	W	
:QUES					
[:EVEN]		NR1	Event[5]	R	
:COND		NR1	Register status[5]	R	
:ENAB	NRf	NR1	Enable[5]	R/W	
:PTR	NRf	NR1	Positive transition[5]	R/W	
:NTR	NRf	NR1	Negative transition[5]	R/W	
:INST					
[:EVEN]		NR1	Event[6]	R	
:COND		NR1	Register condition[5]	R	
:ENAB	NRf	NR1	Enable[5]	R/W	
:PTR	NRf	NR1	Positive transition[5]	R/W	
:NTR	NRf	NR1	Negative transition[5]	R/W	
:ISUM<n>[3]					
[:EVEN]		NR1	Event[7]	R	
:COND		NR1	Register condition[7]	R	
:ENAB	NRf	NR1	Enable[7]	R/W	
:PTR	NRf	NR1	Positive transition[7]	R/W	
:NTR	NRf	NR1	Negative transition[7]	R/W	

1 OPERation status register
2 OPERation:INSTrument subregister
3 Use <n> to specify the channel number
4 OPERation:INSTrument:ISUMmary subregister
5 QUEStionable status register
6 QUEStionable:INSTrument subregister
7 QUEStionable:INSTrument:ISUMmary subregister

SYSTem subsystem

SCPI command		Response	*RST	Description	R/W	INST
Program header	Parameter					
SYST						
:COMM:RLST	LOC|REM|RWL	char		Remote/local	R/W	
:CONF						
:BLEeder	bool	NR1		Bleeder on/off	R/W	Yes
:MAST		NR1		Master-slave parallel operation	R	Yes
:MON:RANG	LOW|HIGH	char		Range for voltage and current monitoring	R/W	Yes
:PROT:REC	SAFE|AUTO	char		Method for clearing OHP, FAN, AC-FAIL, and SD alarms	R/W	Yes
:STAR:PRI	CC|CV	char		Output-on startup state	R/W	Yes
:ERR[:NEXT]		string		Reads error information	R	
:ERR:TRAC	bool	NR1		Communication error display	R/W	
:KLOC	bool	NR1		Panel operation lock	R/W	Yes
:LANG[:SEL]	"SCPI"|"GEN"	string		Command language	R/W	
:LANG:EMUL	"NONE"|"N5700"|"GEN"	string		Emulation	R/W	
:LOC				Switches the PWX to local mode	W	
:NET:TERM	1|2|3|4	NR1		Terminators	R/W	
:REM				Sets the PWX to remote mode; locks all panel controls, except the LOCAL key	W	
:RWL				Sets the PWX to remote mode; locks panel controls	W	
:VERS				Queries SCPI specification version that the PWX complies with	R	

IEEE 488.2 common commands

IEEE488.2 common commands	Parameter	Description	R/W	INST
*CLS		Clears all the event registers	W	
*ESE	NR1	Sets the event status enable register bits	R/W	
*ESR		Queries the event status register	R	
*IDN		Queries the identification string (manufacturer information)	R	
*OPC		Causes the PWX to generate the operation complete message in the event status register when all of its pending operations have finished	R/W	
*OPT		Queries the optional interface boards and enhanced functions that are installed in the PWX	R	
*PSC	bool	Sets whether the *ESE and *SRE settings will be cleared	R/W	
*RCL	NR1	Loads the settings that have been stored to memory		
*RST		Resets the PWX. Configures the PWX to a known condition independent from the usage history of the device	W	
*SAV	NR1	Saves the current settings to memory		
*SRE	NR1	Sets the service request enable register bits	R/W	
*STB		Reads the status byte and master summary status bits	R	
*TRG		Trigger command	W	
*TST		Executes a self test	R	
*WAI		Prevents the PWX from executing subsequent commands or queries until the flag indicating that there are no operations standing by becomes true	W	

Registers

Architecture

IEEE488.2 and SCPI registers are used for the status reports.

In each SCPI status register, there are the following sub registers: CONDition register, EVENt register, ENABle register, PTRansition filter, and NTRansition filter.

CONDition register

The transition of the CONDition register is automatic and reflects the condition of the PWX in real-time. Reading this register does not affect the contents.

EVENt register

The EVENt register bits are automatically set according to the changes in the CONDition register. The rule varies depending on the positive and negative transition filters (PTRansition and NTRansition). The EVENt register is reset when it is read.

ENABle register

The ENABle register enables the reports to the summary bit or status bit of the event bit.

Transition filter

The PTRansition (positive transition) filter is used to report events when the condition changes from false to true.

The NTRansition (negative transition) filter is used to report events when the condition changes from true to false.

If both the positive filter and the negative filter are set to true, events can be reported each time the status changes.

If both filters are cleared, event reporting is disabled.

Registers

Register Structure

Appendix

Instrument Interface Standards

The PWX conforms to the following standards.

•IEEE Std 488.2-1992 IEEE Standard Codes, Formats, Protocols, and Common Commands For Use With IEEE Std 488.1-1987

•Standard Commands for Programmable Instruments (SCPI) version 1999.0

•Universal Serial Bus Specification Rev 2.0

•Universal Serial Bus Test and Measurement Class Specification (USBTMC) Rev 1.0

•Universal Serial Bus Test and Measurement Class, Subclass USB488 Specification (USBTMC-USB488) Rev 1.0

•TCP/IP Instrument Protocol Specification VXI-11

•TCP/IP-IEEE488.2 Instrument Interface Specification VXI-11.3

•IVI-6.1 IVI High-Speed LAN Instrument Protocol (HiSLIP) Rev 1.0

•LXI Standard 1.3

[-199,-100] | [-299,-200]
[-399,-300] | [-499,-400]
[100-]

A List of Errors

Command errors

An error in the range [-199, -100] indicates that an IEEE 488.2 syntax error has been detected by the instrument's parser. The occurrence of any error in this class shall cause the Command Error (bit 5) in the event status register to be set.

Error code		Error message description
-100	Command error	This is the generic syntax error.
-101	Invalid character	A syntactic element contains a character that is invalid for that type.
-102	Syntax error	An unrecognized command or data type was encountered.
-103	Invalid separator	The parser was expecting a separator and encountered an illegal character.
-104	Data type error	The parser recognized a data element different than one allowed.
-105	GET not allowed	A Group Execute Trigger was received within a program message.
-108	Parameter not allowed	More parameters were received than expected for the header.
-109	Missing parameter	Fewer parameters were recieved than required for the header.
-110	Command header error	An error was detected in the header.
-113	Undefined header	The header is undefined for this device.
-120	Numeric data error	This error is generated when parsing a data element that appears to be numeric, including the nondecimal numeric types.
-130	Suffix error	This error is generated when parsing a suffix.
-131	Invalid suffix	The suffix does not follow the syntax or the suffix is inappropriate for this device.
-134	Suffix too long	The suffix contained more than 12 characters.
-138	Suffix not allowed	A suffix was encountered after a numeric element which does not allow suffixes.
-140	Character data error	This error is generated when parsing a character data element.
-141	Invalid character data	Either the character data element contains an invalid character or the particular element received is not valid for the header.
-144	Character data too long	The character data element contains more than twelve characters.
-148	Character data not allowed	A legal character data element was encountered where prohibited by the device.
-150	String data error	This error is generated when parsing a string data element.
-160	Block data error	This error is generated when parsing a block data element.
-170	Expression error	This error is generated when parsing an expression data element.

-180	Macro error	This error is generated when defining a macro or executing a macro.

>top

Execution errors

An error in the range [-299, -200] indicates that an error has been detected by the instrument's execution control block. The occurrence of any error in this class shall cause the Execution Error (bit 4) in the event status register to be set.

Error code		Error message description
-200	Execution error (generic)	This is the generic syntax error for devices that cannot detect more specific errors.
-203	Command protected	Indicates that a legal password-protected program command or query could not be executed because the command was disabled.
-210	Trigger error	Trigger error.
-211	Trigger ignored	Indicates that a GET, *TRG, or triggering signal was received and recognized by the device but was ignored because of device timing considerations.
-213	Init ignored	Indicates that a request for a measurement initiation was ignored as another measurement was already in progress.
-214	Trigger deadlock	Indicates that the trigger source for the initiation of a measurement is set to GET and a subsequent measurement query was received.
-220	Parameter error	Indicates that a program data element related error occurred.
-221	Settings conflict	Indicates that a legal program data element was parsed but could not be executed due to the current device state.
-222	Data out of range	Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range as defined by the device.
-223	Too much data	Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.
-224	Illegal parameter value	Used where an exact value, from a list of possible values, was expected.
-230	Data corrupt or stale	Possibly invalid data; new reading started but not completed since last access.
-241	Hardware missing	Indicates that a legal program command or query could not be executed because of missing device hardware.

>top

Device-specific errors

The occurrence of any error in this class shall cause the Device Dependent Error (bit 3) in the event status register to be set.

Error code		Error message description
-350	Queue overflow	A specific code entered into the queue in lieu of the code that caused the error. This code indicates that there is no room in the queue and an error occurred but was not recorded.
-360	Communication error	Communication error when the flow control is turned off. This error applies when the RS232C interface is used.
-362	Framing error in program message	Framing error. This error applies when the RS232C interface is used.
-363	Input buffer overrun	Buffer overrun error. This error applies when the RS232C interface is used.
-364	Time out error	Time out error. This error applies when the RS232C interface is used.

>top

Query errors

An error in the range [-499, -400] indicates that the output queue control of the instrument has detected a problem with the message exchange protocol described in IEEE 488.2, chapter 6. The occurrence of any error in this class shall cause the Query Error (bit 2) in the event status register to be set.

Error code		Error message description
-400	Query error (generic)	This is the generic query error for devices that cannot detect more specific errors.
-410	Query INTERRUPTED	Received a new command before the response was read.
-420	Query UNTERMINATED	The controller attempted to read the response after the device received an unsupported query or has not received a query. The -100 "COMMAND ERROR" error and this error are stored in the error queue. The controller will time out.
-430	Query DEADLOCKED	The error queue, input buffer, and output buffer are full when sending large binary data as a response, and the transmission timing is off.
-440	Query UNTERMINATED after indefinite response	Received a separate query in semicolon-delimited format after a query that returns a response in an indefinite form. (Example: A command such as the following. *IDN?;SYST:ERR?)

>top

Device-dependent errors

The occurrence of any error in this class shall cause the Device Dependent Error (bit 3) in the event status register to be set.

Error code		Error message description
103	Operation denied while in PROTection state	The operation was denied because a protection function has been activated.
141	CURR setting conflicts with CURR:PROT setting	The set current conflicts with the set OCP.
142	CURR:PROT setting conflicts with CURR setting	The set OCP conflicts with the set current.
151	VOLT setting conflicts with VOLT:PROT setting	The set voltage conflicts with the set OVP.
152	VOLT:PROT setting conflicts with VOLT setting	The set OVP conflicts with the set voltage.
153	VOLT setting conflicts with VOLT:LIM:LOW setting	The set voltage conflicts with the set UVP.
154	VOLT:LIM:LOW setting conflicts with VOLT setting	The set UVP conflicts with the set voltage.
155	Operation denied during ALARM condition	The operation was denied because an alarm is occurring on the PWX.
901	EEPROM content error for CRITICAL data	An error has occurred in a critical area. Contact your Kikusui agent or distributor.

902	EEPROM content error for CAL data	An error has occurred in a calibration area. Contact your Kikusui agent or distributor.
903	EEPROM content error for CONFIG data	An error has occurred in the configuration area. The PWX will be reset to its factory default settings. This error occurring multiple times indicates that the memory is damaged. Contact your Kikusui agent or distributor.
904	EEPROM content error for PANEL data	An error has occurred in the panel memory area. The PWX will be reset to its factory default settings. This error occurring multiple times indicates that the memory is damaged. Contact your Kikusui agent or distributor.

>top

Processing Time of Commands

The command processing time is the time until the next command is accepted.
It does not include the response time of the hardware.
The processing times indicated here are typical values.
They are not guaranteed.
Unit: ms

Measurement environment
Software: Test programs written in python, KI-VISA 5.5.0, VISA-SPY disabled
PC： Core i7-4790 3.6GHz Windows7 (x64)

Command	USB	RS232C		LAN*3			Description
		*1	*2	VXI-11	HiSLIP	SCPI-RAW	
*IDN?	0.34	25	4.5	4.75	2.2	2	Queries the model name
VOLT 20	0.72	4	0.7	2.4	0.42	0.04	Sets the voltage
CURR 20	0.72	4	0.7	2.4	0.46	0.3	Sets the current
OUTP ON	0.72	4	0.7	2.4	0.46	0.02	Output on
MEAS:VOLT?	0.42	15	2.8	4.75	2.3	2.57	Queries the measured voltage output
MEAS:CURR?	0.42	15	2.8	4.75	2.3	2	Queries the measured current output

*1 : Data rate setting: 19200 bps.
*2 : Data rate setting: 1152000 bps
*3 : 100BASE-TX Ethernet

FAQ

The settings are not changed even when a trigger is sent.

Is the sequence in the WTG (Waiting for Trigger) state?

To change the setting using a trigger, set the trigger source to BUS and send the INIT command to set the sequence in the WTG state.

```
:TRIGger:SOURce BUS
:INITiate
```

If a trigger is sent in the WTG state, setting changes.

```
:TRIGger
```

->View details

The panel display is abnormal.

Are you communicating via LAN using the HiSLIP or SCPI-RAW protocol?

Using the HiSLIP or SCPI-RAW protocol may slow down the panel display updating. Even if this is the case, communication is operating normally.

If the delay is a concern, wait about 1 ms before sending the next command.

Tutorial

Settings and Measurement

Voltage and current

The output voltage and output current are controlled by the VOLTage and CURRent commands. The output ON/OFF state is controlled by the OUTPut command.

```
:VOLTage 80     'Set the voltage to 80 V
:CURRent 5      'Set the current to 5 A
:OUTPut ON      'Turn the output on
```

To set the current to the maximum value, set the value of the CURRent command to MAXimum.

The setting can be set to a value in the range from 0 to 105 % of the rated output current.

```
:VOLTage 80     'Set the voltage to 80 V
:CURRent MAXimum    'Set the current to the maximum value
```

To set the voltage to the maximum value, set the value of the VOLTage command to MAXimum.

The setting can be set to a value in the range from the value of the VOLTage:LIMit:LOW setting to 105 % of the rated output voltage.

```
:CURRent 5     'Set the current to 5 A
:VOLTage MAXimum    'Set the voltage to the maximum value
```

You can confirm the maximum allowed value that can be specified in the VOLTage and CURRent commands by specifying the MAXimum parameter in the VOLTage? and CURRent? queries, respectively.

```
:VOLTage? MAXimum
 <Read the response>
:CURRent? MAXimum
 <Read the response>
```

The values that the queries above return may vary depending on the VOLTage:PROTection (OVP) and CURRent:PROTection (OCP) settings.

If a value exceeding the upper limit is specified with the VOLTage or CURRent command, it is interpreted as MAXimum and does not result in an error.

Setting the protection functions

The PWX provides overvoltage protection (OVP) and overcurrent protection (OCP) functions that can be configured. The VOLTage:PROTection and CURRent:PROTection commands are used to set the OVP and OCP, respectively.

```
:VOLTage:PROTection 50     'Set the OVP to 50 V
:CURRent:PROTection 4.5     'Set the OCP to 4.5 A
```

If you want to set the OVP or OCP setting to the maximum or minimum value, you can specify MAXimum or MINimum for the parameter.

```
:VOLTage:PROTection MAXimum     'Set the OVP to the maximum value
:CURRent:PROTection MAXimum     'Set the OCP to the maximum value
```

The output turns off if an OVP or OCP function is activated.

Measurement

After you have set the output and protection function settings, query the measured values. The PWX can return the measured voltage and the measured current.

To measure the voltage and current, use the following queries.

```
:MEASure:VOLTage?     'Query the voltage output
:MEASure:CURRent?     'Query the current output
```

The measured voltage and the measured current are updated alternately at 25 ms intervals.

If you query the measured value at an interval shorter than 50 ms, the previous measured value will be returned.

>top

Tutorial

Using Triggers to Change Settings

You can use triggers to synchronize the setting of the voltage and current. This is convenient if you want to synchronize output changes with the action of other instruments such as electronic loads. To reserve triggered settings, use the VOLTage:TRIGgered and CURRent:TRIGgered commands.

```
:VOLTage 12.0     'Set the voltage to 12.0 V
:CURRent 1.5      'Set the current to 1.5 A

:VOLTage:TRIGgered 13.5     'Set the PWX so that the voltage is 13.5 V when
triggered
:CURRent:TRIGgered 2.5      'Set the PWX so that the current is 2.5 A when
triggered

:TRIGger:TRANsient:SOURce BUS     'Set the trigger source to BUS

:INITiate:TRANsient     'Initiate
:TRIGger:TRANsient      'Apply a software trigger
```

The TRIGger:TRANSient:SOURce command sets the trigger source to BUS or IMMediate. The INITiate:TRANsient command makes the trigger subsystem leave the IDLE state and enter the initiated state. When the Trigger Source is set to IMMediate, the transient action is executed immediately, which causes the voltage or current or both to change to a new setting. When the Trigger Source is set to BUS, the trigger subsystem enters the WTG (Waiting For Trigger) state.

If the trigger subsystem is in the WTG state and a software trigger is applied with the TRIGger or *TRG command, the transient action is executed. The TRIGger and *TRG commands apply a software trigger to all channels, so if there are other channels that are in the INITiated state, their settings will be changed at the same time. When the operation is completed, the trigger subsystem returns to the IDLE state again. When an ABORt command or an equivalent command is sent without executing the trigger, the transient action is canceled, and then the trigger subsystem returns to the IDLE state.

When the PWX is turned on, all the TRIGger subsystems are in the IDLE state. In this state, the TRIGger subsystem ignores all triggers. If you send one of the following commands, the TRIGger subsystem is switched to the IDLE state, regardless of its current state.

:ABORt
*RST

Device clear (GPIB or USB interface) or break signal (RS232 interface)

Operation using a software trigger

The PWX can synchronize the output changes using triggers.

When ABOR is sent, INIT:TRAN is cancelled. The VOLT:TRIG setting does not change.

The following table shows the responses when the voltage is set to 20 V (VOLT 20) and when the target value to which the voltage will change when a trigger is received is set to 10 V (VOLT:TRIG 10).

	Response	
	VOLT?	VOLT:TRIG?
Immediately after the setting is made.	20	10
After a trigger is sent.	10	10
After *RST is sent.	0	0
When ABOR is sent before sending a trigger.	20	20 (cancel)
When "VOLT 30" (to change the voltage) is sent before sending a trigger.	30	30 (cancel)

>top

Tutorial

Status Monitoring

The PWX has two mandatory SCPI standard registers, STATus:OPERation and STATus:QUEStionable, in addition to the IEEE488.2 standard registers.

Register basics

All SCPI registers have standard event/filter architecture, employing CONDition, EVENt, ENABle, and optionally PTRansition and NTRansition. CONDition and EVENt are read-only registers working as status indicators, and ENABle, PTRansition and NTRansition are read-write registers working as event and summary filters.

STATus:OPERation

The STATus:OPERation register records events or signals that occur during normal operation.

For example, to check if the PWX is being regulated in CV state, check the CV bit (bit 8) on the STATus:OPERation register.

```
:STATus:OPERation?     'Check whether the CV bit is set
```

STATus:QUEStionable

The STATus:QUEStionable register records events or signals that indicate abnormal operation.

To check if the protection function is working, check the OV bit (bit 0) on the STATus:QUEStionable register.

```
:STATus:QUEStionable?     'Check whether the OV bit is set
```

PON (Power ON) bit

The PON bit (bit 7) in the event status register is set whenever the PWX is turned on. The most common use for the PON bit is to generate an SRQ at power-on to keep track of unexpected loss of power or power line failure. To do this, follow the steps shown below.

1. Set *PSC (Power-on Status Clear) to 0 (or OFF).

Enable the backup function of the event status enable register and service request enable register (*PSC 0).

2. Set the PON bit (bit 7) of the event status enable register.

Permit the transmission of a power-on event to the upper layer (*ESE 128).

3. Set the ESB bit (bit 5) of the status byte enable register.

Permit the generation of an SRQ caused by a standard event (*SRE 32).

```
*PSC 0;*ESE 128;*SRE 32
```

When using the RS232C interface, the PON bit cannot be assigned to the service request, because SRQs are not generated.

Though the SRQ feature itself is provided by communication protocol on the USB interface or LAN (VXI-11/ HiSLIP) interface, a Connection Lost error in the VISA I/O session occurs immediately before the power-on event. It may be difficult to handle PON events when using the USB interface.

>top

Tutorial

Error Checking

Error/event queue

The SCPI specifications define a standard error reporting scheme, Error/Event Queue. This is a FIFO (First In First Out) queue, which records errors and events. The maximum number of errors/events that the PWX can record is 255. Each error/event can be read with the SYSTem:ERRor query.

```
:SYSTem:ERRor?
```

The response to this query contains a numeric part (error/event number) and a textual description, such as:

```
-222,"Data out of range"
```

The error/event queue is empty when the *CLS common command is sent, when the last item in the queue is read, and when the PWX is turned on. When the error/event queue is empty, the query returns the following:

```
0,"No error"
```

Displaying communication errors

The PWX has a debug trace function. The oldest item among the errors and events (if they are present) can be displayed on the PWX. This function is convenient when you debug your remote applications.

While an error/event item is displayed on the panel, the normal voltmeter and ammeter are disabled.

If the error/event queue is empty, the debug trace function does not display any errors. Sending the *CLS command clears the communication error display.

If in local mode, the debug trace function is temporarily disabled.

The communication error display can be enabled or disabled with the SYSTem:ERRor:TRACe command.

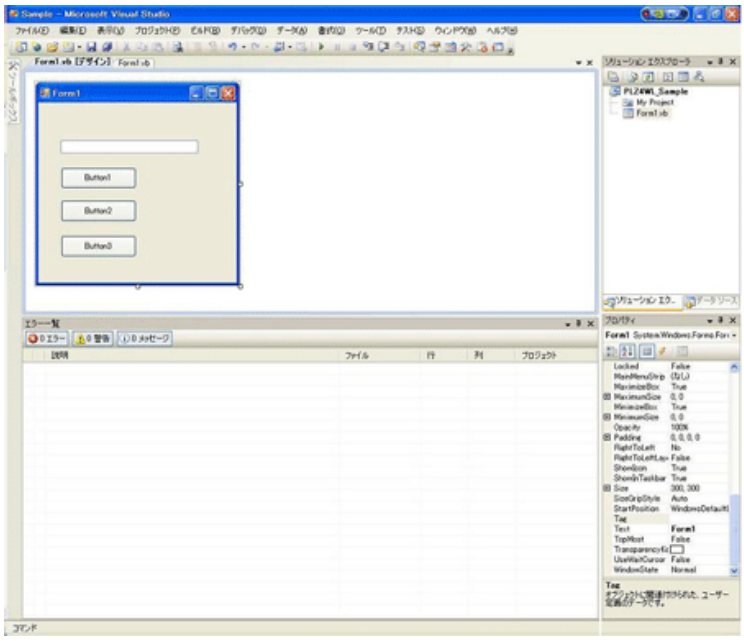
```
SYSTem:ERRor:TRACe {ON|OFF}
```

>top

Tutorial

Visual Basic 2008

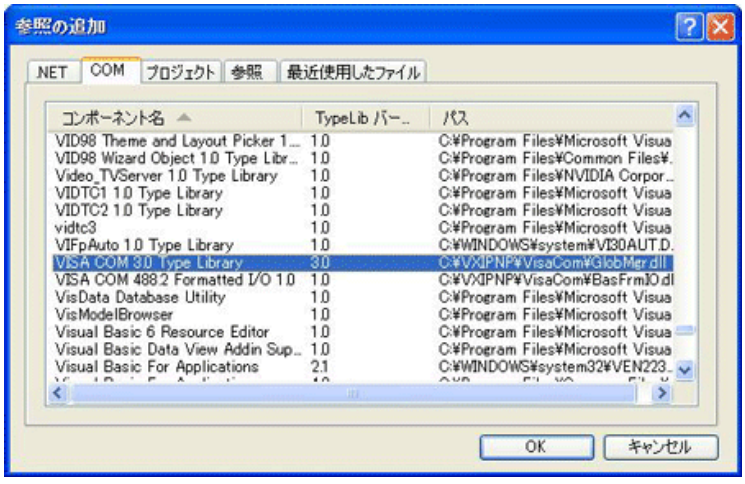
Communicate with the PWX series using VISA through RS232C, USB, or LAN.



Setting the "Project"

First, set the communication driver (VISA library) for the "Project."

Click "Project" on the menu bar, then select "Add Reference" to refer to "VISA COM 3.0 Type Library."



Communication through RS232C, USB, or LAN

After setting the communication driver, you can communicate with the PWX through RS232C, USB, or LAN.

The following describes the communication procedure using VISA.

Open the VISA

To communicate with an RS232C, USB, or LAN device using VISA, you have to first open

VISA. When you open VISA, specify the I/O resource.

Example : To open VISA by using USB

```
Set rm = CreateObject("VISA.GlobalRM")
Set msg = rm.Open("USB::0x0B3E::0x1025::00000001::INSTR", NO_LOCK, 0, "")
```

"USB::0x0B3E::0x1025::00000001::INSTR" is the I/O resource.

The I/O resource is specified by the following constructions. The part indicated with [ ] can be omitted. Enter the appropriate values in the parts specified in oblique characters.

Serial (RS232C)		ASRL[*board*][::INSTR] Example : The measuring instrument connected to the serial port COM1. ASRL1::INSTR
USB		USB[*board*]::*VendorID*::*ProductID*::*SerialNumber*[::*InterfaceNumber*][::INSTR] Example: The USNTMC measuring instrument having vendor ID (VID) 2878, Product ID (PID) 4133 and serial number "00000001." USB0::0x0B3E::0x1025::00000001::INSTR
LAN*1	VXI-11	TCPIP[*board*]::*hostname*[::inst*0*][::INSTR] Example :The measuring instrument whose IP address (hostname) is 169.254.7.8. TCPIP::169.254.7.8::INSTR You can also set the LAN device name using the host name.
	HiSLIP	TCPIP[*board*]::*hostname*::hislip0[::INSTR] Example :The measuring instrument whose IP address (hostname) is 169.254.7.8. TCPIP::169.254.7.8::hislip0::INSTR You can also set the LAN device name using the host name.
	SCPI-RAW	TCPIP[*board*]::*hostname*::*portno*::SOCKET Example :The measuring instrument whose IP address (hostname) is 169.254.7.8. (The "portno" setting of the PWX is always 5025.) TCPIP::169.254.7.8::5025::SOCKET You can also set the LAN device name using the host name.

*1: The hostname must be a valid mDNS hostname (a Bonjour hostname that ends in ".local") or a DNS hostname that is managed by an external DNS server (a full-qualified domain name—FQDN). If you are using an mDNS hostname, Apple Bonjour (alternatively, iTunes or Safari) must be installed on your PC.

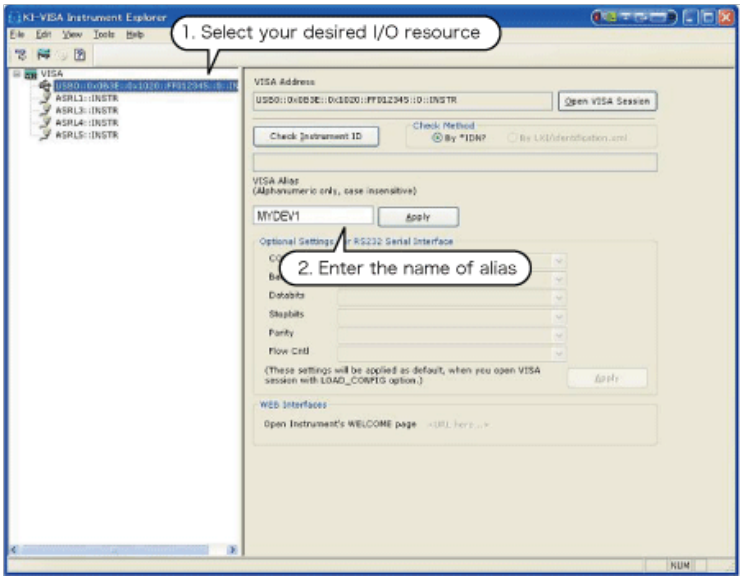
For VISA, the alias can be used for the I/O resource.

When using the alias for the I/O resource, even if the alias name is hard-coded directly in the application, the alias name can be easily converted to the appropriate I/O resource name.

Example : When using the alias (MYDEV1) for the I/O resource.

```
Set msg = rm.Open("MYDEV1", NO_LOCK, 0, "")
```

When the alias is used, the actual I/O resource is specified by an external configuration table. When using USB (example for KI-VISA):



If you are using a VISA implementation other than KI-VISA, please refer to the applicable VISA manual.

Controlling the devices

Next, use "Read" and "Write" commands to control devices. You must include line-feed codes in the command strings.

Example:

```
msg.WriteString ("VOLT 80" & vbLF)         'Set the voltage to 80 V
msg.WriteString ("CURR 150.0" & vbLF;)       'Set the current to 10 A
msg.WriteString ("OUTP 1" & vbLF)            'Turn the output on
```

Closing the VISA

Close the VISA at the end.

You only need to include one "open" VISA command and one "close" VISA command in the program.

```
msg.Close
```

Sample program

```
Imports Ivi.Visa.Interop

Public Class Form1

  Dim rm As ResourceManager
  Dim msg As IMessage

  Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Load
    rm = CreateObject("VISA.GlobalRM")
    'msg = rm.Open("MYDEV1", AccessMode.NO_LOCK, 0, "")  'Example: Using an alias
    'msg = rm.Open("USB0::0x0B3E::0x1025::00000001::INSTR", AccessMode.NO_LOCK, 0, "")  'Example: USB
    'msg = rm.Open("TCPIP::169.254.7.8::INSTR", AccessMode.NO_LOCK, 0, "")  'Example: LAN
    msg.TerminationCharacterEnabled = Truemsg.TerminationCharacterEnabled = True
  End Sub

  'Query the instrument identity
  Private Sub cmdIdn_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles cmdIdn.Click
    msg.WriteString("*IDN?" & vbLF)
    TextBox1.Text = msg.ReadString(256)
  End Sub

  'Set the operation mode and voltage
  Private Sub cmdCurr_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles cmdCurr.Click
    msg.WriteString("OUTP 0" & vbLF)
    msg.WriteString("VOLT 80" & vbLF)
    msg.WriteString("CURR 5" & vbLF)
    msg.WriteString("OUTP 1" & vbLF)
  End Sub

  'Query the instrument identity
  Private Sub cmdMeas_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles cmdMeas.Click
    msg.WriteString("MEAS:CURR?" & vbLF)
    TextBox1.Text = msg.ReadString(256)
  End Sub

  Private Sub Form1_Disposed(ByVal sender As Object, ByVal e As System.EventArgs) Handles Me.Disposed
    msg.Close()
  End Sub

END CLASS
```

>top

Multichannel (VMCB)

Setup

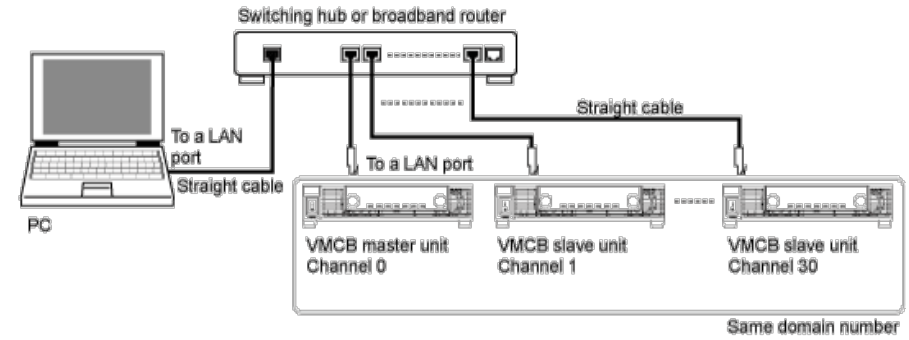
If you use the multichannel (VMCB) function, you can connect one PC to up to 31 PWXs to construct a virtual multichannel power supply system. This is useful when you want to synchronize the operation of multiple PWXs or minimize the number of communication ports that are required.

If N5700/N8700 or DCS emulation is selected, you cannot use multichannel.

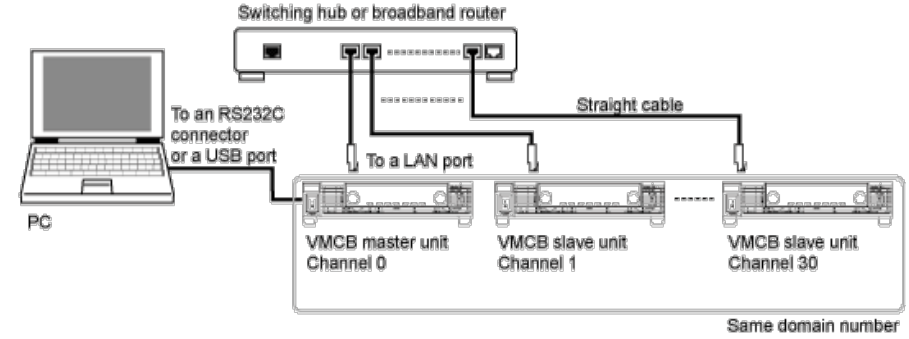
Multichannel connections

Set one PWX as the master unit (VMCB master unit), and then connect this PWX to the PC through the LAN, RS232C, or USB interface. The other PWXs are slave units (VMCB slave units). Use a switching hub or broadband router to connect the slave units to the master unit through the LAN interface. Use standard LAN cables (category 5 and straight).

When the master unit is connected to the PC through the LAN interface



When the master unit is connected to the PC through the RS232C or USB interface



Multichannel settings

On the master unit, configure the settings for the connection with the PC, and set the channel and domain.

On the slave units, configure the LAN settings, and set the channels and domains.

PWXs that have the same domain number perform multichannel operations as a single VMCB network. You can connect up to 31 PWXs to a single VMCB network.

NOTE

Within the VMCB network, channel 0 is assigned to the master unit and all other channel numbers are assigned to slave units. Do not assign the same channel to two different PWXs on the same VMCB network.

Configure all PWXs so that they have the same LAN settings (CF21: command language, CF22: emulation during remote control, CF24: VMCB domain number, CF41: IP address allocation method).

Slave unit settings

Normally, you should set DHCP and AUTO IP to ON to set the IP address automatically. For details on the LAN settings, see LAN under Interface Setup.

Configure all PWXs on the same VMCB network so that they have the same CONFIG settings (CF21: command language, CF22: emulation during remote control, CF24: VMCB domain number, CF41: IP address allocation method).

The remote interface setting (CF20) is not valid on slave units.

1. For the IP address allocation method of CONFIG settings, set DHCP to on, AUTO IP to on, and MANUAL to off (CF41: 110).

   To set the IP address manually, select 001, and set the IP address (CF42 to CF45). For details, see the user's manual.

2. In the CONFIG settings, set the domain number (CF24).

   PWXs that have the same domain number perform multichannel operations. Set this value to a number other than 0.

3. In the CONFIG settings, select the channel number (CF25).

   Specify a unique channel number on the VMCB network. For a slave unit, set this value to a number other than 0.

4. Turn the PWX off.

Master unit settings

1. Configure the settings for the connection with the PC.

   For details on settings for the connection with the PC, see Interface Setup.

2. In the CONFIG settings, set the domain number (CF24).

   PWXs that have the same domain number perform multichannel operations. Set this value to a number other than 0.

3. In the CONFIG settings, select the channel number (CF25: 0).

   Because this is the master unit, set this value to 0.

4. Turn the PWX off.

Caution

The LAN interface can be accessed from any place on the network. If necessary, configure the security settings. You can apply password protection for security, and you can restrict the IP addresses to limit the hosts.
-> Setting procedure

Turning power on

First turn the slave units on, and then turn the master unit on. If the PWXs are organized in a rack system, turn all the units on at the same time. If you turn the master unit on first, the slave units will not be detected correctly.

When a slave unit turns on, all its LEDs light, and then the following sequence is displayed: the rated voltage and rated current, the firmware version number, and then the build number. Each item is displayed for approximately 1 second. Then, the slave unit displays "I-F SLAV" and enters the wait state. When the PWX is designated as a slave unit by the master unit, the slave unit enters the operation wait state.

The slave unit will not stop displaying "I-F SLAV" until it receives the slave designation from the master unit. Check the CONFIG parameters (CF21, CF22, CF24, CF25, and CF41) and the LAN connection. If you change the CONFIG parameters, reboot the PWX.

When the master unit turns on, all its LEDs light, and then the following sequence is displayed: the rated voltage and rated current, the firmware version number, and then the build number. Each item is displayed for approximately 1 second. Then, the master unit displays "FIND CH" and searches for slave units. When the master unit finishes searching, it enters the operation wait state.

Checking the multichannel configuration

To check the multichannel configuration, send the INSTrument:CATalog? query. You cannot check the configuration from the panel.

>top

Multichannel

Multichannel Commands

-> Multichannel Commands (Subsystem)

Output settings for all channels

GLOB:OUTP	Turns output on/off for all channels
GLOB:VOLT	Sets the voltage of all channels
GLOB:CURR	Sets the current of all channels

Channel specification

INST	Specifies the channel to configure

Checking the multichannel configuration

INST:CAT	Checks the channel configuration

OPERation:INSTrument subregister

STAT:OPER:INST	Event
STAT:OPER:INST:COND	Register condition
STAT:OPER:INST:ENAB	Enable
STAT:OPER:INST:NTR	Negative transition
STAT:OPER:INST:PTR	Positive transition

OPERation:INSTrument:ISUMmary<n> subregister

STAT:OPER:INST:ISUM<n>	Event
STAT:OPER:INST:ISUM<n>:COND	Register condition
STAT:OPER:INST:ISUM<n>:ENAB	Enable
STAT:OPER:INST:ISUM<n>:NTR	Negative transition
STAT:OPER:INST:ISUM<n>:PTR	Positive transition

QUEStionable:INSTrument subregister

STAT:QUES:INST	Event
STAT:QUES:INST:COND	Register condition
STAT:QUES:INST:ENAB	Enable
STAT:QUES:INST:NTR	Negative transition
STAT:QUES:INST:PTR	Positive transition

QUEStionable:INSTrument:ISUMmary<n> subregister

STAT:QUES:INST:ISUM<n>	Event
STAT:QUES:INST:ISUM<n>:COND	Register condition
STAT:QUES:INST:ISUM<n>:ENAB	Enable
STAT:QUES:INST:ISUM<n>:NTR	Negative transition
STAT:QUES:INST:ISUM<n>:PTR	Positive transition

>top

Multi channel

Registers

Multichannel

Tutorial

Setup

When you are using the multichannel function, the PWX that communicates with the PC is the VMCB master unit.

To configure a PWX that you are using with the multichannel function, you first have to specify the channel of the PWX that you want to configure.

At power on, the PWX is set to channel 0.

First specify the channel, and then configure the other settings.

Setup example for a PWX that you set to channel 2:

```
:INST:NSEL 2 'Specify channel 2.
:VOLT 12.0   'Set the channel 2 voltage to 12.0 V.
:CURR 1.5    'Set the channel 2 current to 1.5 A.
```

You can use the GLOBal subsystem to make changes to the settings (voltage, current, turning output on or off) of all channels at the same time. Insert a wait of at least 200 ms after sending a GLOBal subsystem command.

```
:GLOB:VOLT 20 'Set the voltage of all channels to 20 V.
:GLOB:CURR 2  'Set the current of all channels to 2 A.
:GLOB:OUTP 1  'Turn output on for all channels.
```

The GLOB:OUTP command turns on/off the output of all configured channels, but they are not turned on/off at the same time. There is a slight time offset between channels.

-> Tutorial for settings and measurement

You can configure changes to settings on the PWXs in advance, and then use triggers to synchronize the changes on all units. The INIT and TRIG commands are sent to all channels.

```
:INST:NSEL 0   'Specify channel 0.
:TRIG:TRAN:SOUR BUS 'Set the trigger source of channel 0 to BUS.
:VOLT:TRIG 10;:CURR:TRIG 10
     'Configure channel 0 so that the voltage will be set to 10 V and the
current to 10 A when a trigger occurs.
:INST:NSEL 1   'Specify channel 1.
:TRIG:TRAN:SOUR BUS 'Set the trigger source of channel 1 to BUS.
:VOLT:TRIG 20;:CURR:TRIG 20
     'Configure channel 1 so that the voltage will be set to 20 V and the
current to 20 A when a trigger occurs.
:INIT:TRAN  'Initiate the measurement.
:TRIG:TRAN  'Apply a software trigger.
```

When you send the TRIG command, the settings of channel 0 and channel 1 are changed.

-> Tutorial for using triggers to change settings

Status Monitoring

STATus:OPERation

The OPERation Status register is used to record events and notifications that occur during normal operations.

To check whether CV output is being performed, check the CV bit (bit 8) of the OPERation:INSTrument:ISUMmary<n> subregister.

```
:STAT:OPER:INST:ISUM2? 'Check whether the CV bit of channel 2 is set.
```

STATus:QUEStionable

The QUEStionable Status register is used to record events and notifications that occur during abnormal operations.

To check whether the overvoltage protection function has been activated, check the OV bit

(bit 0) of the STATus:QUEStionable register.

```
:STAT:QUES? 'Check whether the OV bit is set.
```

Even if bit 0 is true, you can not tell on which channel the overvoltage protection function has been activated. To check which channel is operating abnormally, check the STATus:QUEStionable:INSTrument subregister.

```
:STAT:QUES:INST? 'Check which channel is operating abnormally.
```

All channels whose corresponding bits are true are operating abnormally. You can determine how the specified channel is operating abnormally by checking the STATus:QUEStionable:INStrument:ISUMmary<n> subregister of the channel.

```
:STAT:OPER:INST:ISUM2? 'Check whether the OV bit of channel 2 is set.
```

>top

Command for DCS

These commands are valid when the emulation is set to DCS (SYST:COMM:EMUL DCS).

OUTP:ISOL	Sets the isolation relay control signal ON or OFF.
OUTP:SENS	Sets the sens relay signal open or close.
SYST:NET:TERM	Sets the terminators.

Setup

Interface Setup

LAN

Before you use the LAN interface, see the LXI setup guide that is downloadable from the Kikusui Electronics Corporation website.

By changing the legacy language and emulation settings, you can execute existing programs that were written for other instruments. Normally, select the SCPI language and turn emulation off (these are the factory default settings).

To use the LAN interface to control the PWX, middleware that supports the VXI-11 or HiSLIP protocol must be installed on the controller. The middleware is installed automatically by the VISA library.

There is a Web browser interface to the PWX embedded in the LAN interface board. You can configure the LAN interface settings from your PC's Web browser.

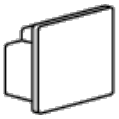
For information on topics such as connecting to your corporate LAN, your IP address, your host name, and security, contact your network administrator.

If you are using a host name (a Bonjour host name), you have to install Apple Bonjour.

LAN connection

Use a standard LAN cable (category 5 and straight) to connect the PWX to a network hub or router. Use a crossover cable when making a direct connection.

The LAN port of this product comes with a cover. Remove the cover to use the port. Store the cover in a safe place so that you can use it to cover the LAN port when the port is no longer in use. For safety reasons, when not using the LAN port, be sure to attach to cover. For safety reasons, when not using the sensing terminals, be sure to attach to terminal cover.



Port cover
[P1-000-118]

The PWX RS232C port is the same shape as a LAN port. Check the port name marked on the rear panel to identify the appropriate one to use.

LAN setting

For normal use, we recommend using the factory default settings.

For details on CONFIG settings, see the user's manual.
When you change the LAN or emulation settings, you need to restart the power supply.

Setting	Description (Factory default setting)	CONFIG setting
LAN setting	Use LAN	CF20 : on
LAN interface setting	DHCP: on AUTO IP: on SCPI-RAW port: 5025	CF40 : LCi
Emulation	Not use	CF22 : nonE

When connecting directly, for the IP address allocation method, set DHCP to off, Auto-IP to on, and MANUAL to off (CF41: 010) to automatically set the IP address.

To set the IP address manually, for the IP address allocation method, set DHCP to off, Auto-IP to off, MANUAL to on (CF41: 001), and set the IP address (CF42 to CF45).

If you change the interface settings (CF41 to CF47), apply the changes (CF40: APPL) or restart the power supply to make the new settings take effect.

Caution

The LAN interface can be accessed from any place on the network. If necessary, configure the security settings. You can apply password protection for security, and you can restrict the IP

addresses to limit the hosts.
-> Setting procedure

NOTE

The LAN interface should be shifted remotely by the command. Use the "SYSTem:REMote" SCPI command to set the RS232C interface to the remote state. Be sure to include this command at the start of the program when you are performing remote programming.

Service request

The PWX is equipped with service request and serial polling functions.

LAN function

The PWX may require an Internet connection depending on the how the PWX is accessed through a Web browser.

Complies with the LXI Specification Ver.1.3 Class C

Complies with the VXI-11/HiSLIP/SCPI-RAW protocol

Communication speed: Maximum 100 Mbps (Auto negotiation)

AUTO MDIX function

Web browser access

- LAN setting
- Security setting
- Use of temporary control application

Resetting the LAN interface (LCI)

You can use the CONFIG settings to reset the LAN interface. If you reset the LAN interface, its settings are changed to the factory default values. You can use this feature when you have forgotten the security password or the IP address.

This operation does not affect the PWX's panel settings. If the product is in remote mode, you can use panel operations to switch it to local mode.

>top

Setup

Interface Setup

Accessing and operating the PWX from a Web browser (LAN interface)

You can use the LAN interface to configure detailed settings from a Web browser on your PC.

The Web site's URL is defined by adding "http://" in front of the PWX's IP address.

You can enter the URL directly in the address bar of your Web browser by using the CONFIG settings (CF30 to CF33) to view the IP address.

Parameter number	Display	Description
CF30	0 to 255	Display the 1st number of the IP address
CF31	0 to 255	Display the 2nd number of the IP address
CF32	0 to 255	Display the 3rd number of the IP address
CF33	0 to 255	Display the 4th number of the IP address

(Example) When the IP address is 169.254.7.8

http://169.254.7.8

When you are using a VISA library, a function is available that enables the application program (such as National Instruments NI-MAX, Agilent Connection Expert, and Kikusui KI-VISA Instrument Explorer) to retrieve the VXI-11 measuring instrument. This function is provided by VISA vendors. You can access the PWX by clicking on the hyperlink that is provided in the retrieval results.

Recommended browsers：

Google Chrome
Microsoft Edge
Safari

WELCOME page

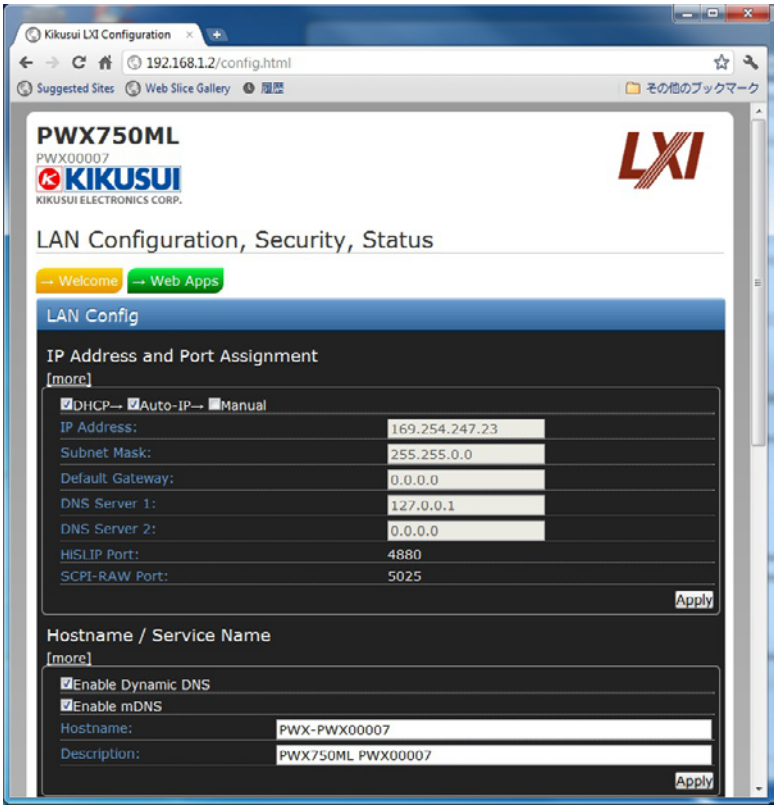
When you access the PWX from a Web browser, the WELCOME page is displayed first.

The instrument information, network information, and VISA resource (I/O resource) information appear on the display.

Click items in the navigation menu to move to the other pages.

LAN CONFIG page

This page is used to update the network settings/configure security settings, displays the LAN status. It is also used to turn the PWX's "identify" display on and off.



LAN COnfiguration

You can use this page to configure settings such as the allocation of IP address and the host name. Once you set the host name, you can access the LAN interface by using the host name instead of the IP address. For normal operation, we recommend that you select the "DHCP," "AUTO-IP," "Dynamic DNS," and "mDNS" check boxes.

To apply the settings, click “Apply” after you change the fixed IP address or host name.

SECURITY

This page is used to configure security settings.

You can use this page to set the password protection and to limit hosts by restricting IP addresses.

Password protection is an effective security feature for the Web site. It prevents the settings from being changed inadvertently. The password can contain alphanumeric characters, hyphens, and underscores. The first character should be an alphabetical character. The maximum password length is 15 characters.

IP address restriction to limit hosts is an effective security feature for the VXI-11. If at least one unit is registered, this security feature prevents against access from non-registered hosts.

Up to four IP addresses (each for a different unit) can be registered on the host side.

STATUS

Turn the identify display on to identify the PWX that is being controlled through the LAN interface. The PWX that is being controlled will display "Device Identify" on its front panel.

Web Applications page

You can use this page to set up the simple power supply control application program.

Click "Refresh" to load the current PWX settings. On the Front panel control and Steu Up/Down pages, the measured values on the PWX at the time that you clicked "Refresh" are displayed.

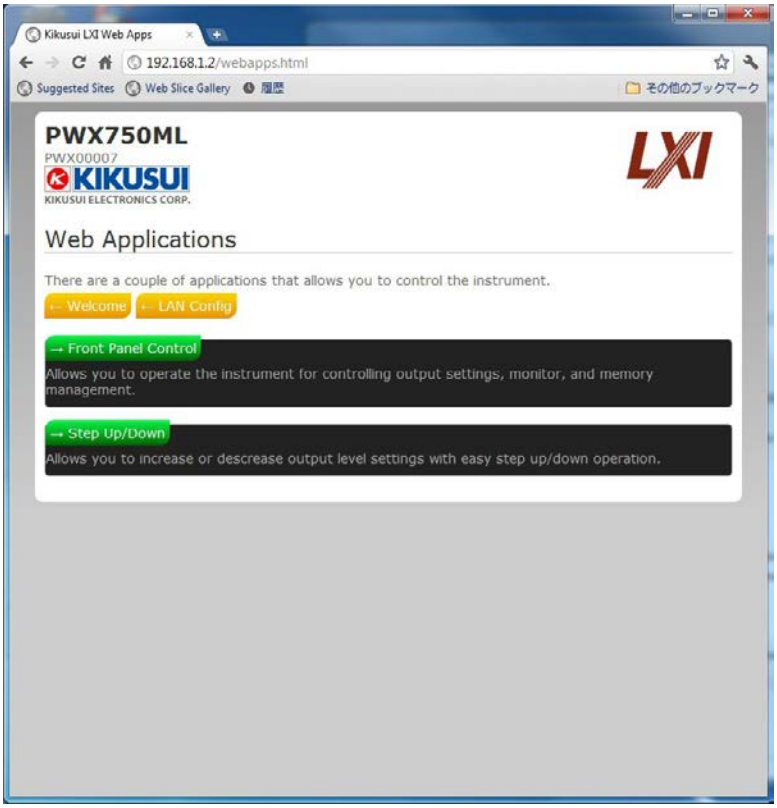
Front Panel Control

You can use this page to set the voltage and the current, control the output, display measured values, save and recall preset memory entries, configure protection settings, and set CONFIG settings.

If you recall preset memory entries when you are using the multichannel (VMCB) function, all channel settings will be recalled.

Step Up/Down

You can use this page to set the voltage and the current, control the output, display measured values, and increase or decrease the voltage and current in steps.



>top

Setup

Interface Setup

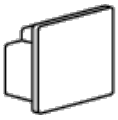
RS232C

By changing the legacy language and emulation settings, you can execute existing programs that were written for other instruments. Normally, select the SCPI language and turn emulation off (these are the factory default settings).

RS232C connection

The RS232C port on the PWX is an RJ-45. Check that the PWX and your PC are off before connecting them.

The RS232C port of this product comes with a cover. Remove the cover to use the port. Store the cover in a safe place so that you can use it to cover the RS232DC port when the port is no longer in use. For safety reasons, when not using the RS232C port, be sure to attach to cover. For safety reasons, when not using the sensing terminals, be sure to attach to terminal cover.

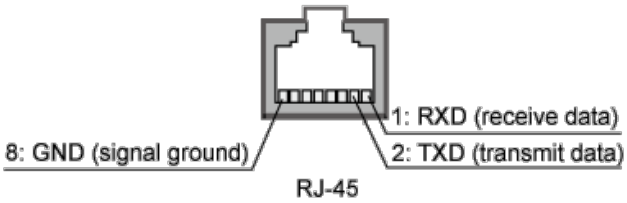


Port cover
[P1-000-118]

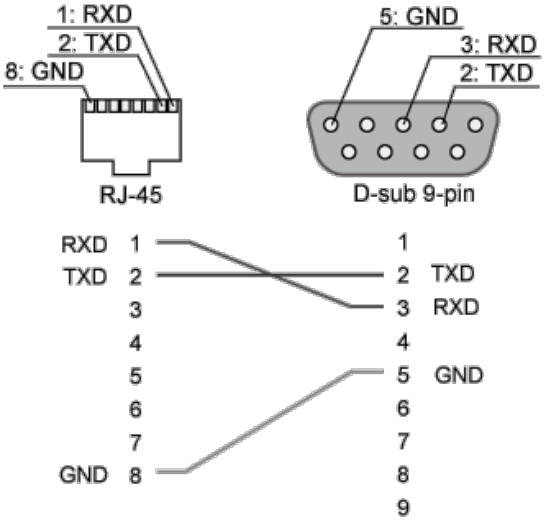
The PWX LAN port is the same shape as a RS232C port. Check the connector name marked on the rear panel to identify the appropriate one to use.

The optional adapter cable can be used to connect the PWX to a PC.

[PWX]
Shows the connector pinout when you are facing the rear panels



[Adapter cable (RD-8P/9P)]
Shows the connector pinout when you are facing the cable



RS232C configuration

1. In the CONFIG settings, set the RS232C data rate (CF52).
For the settings, see the following table of settings that correspond to the protocol.

2. In the CONFIG settings, set the command language (CF21) and emulation (CF22).
   Normally, use the default values (CF21: SCPi and CF22: nonE).

3. Restart the PWX.

Protocol

The following table shows the settings that correspond to the RS232C protocol.
Underlined values are factory default settings.

Item	Setting
Baudrate (CF60)	1 200 bps/ 2 400 bps/ 4 800 bps/ 9 600 bps/ 19 200 bps/ 38 400 bps/ 57 600 bps/ 115 200 bps (1.2/ 2.4/ 4.8/ 9.6/ 19.2/ 38.4/ 57.6/ 115.2)
Data	Fixed to 8 bits
Stop	Fixed to 1 bit
Parity	Fixed to none
Flow (X-flow control)	Fixed to none

RS232C communication

The PWX does not have flow control (this is fixed). If you send setting commands consecutively at a high speed, the PWX reception buffer may overflow. Do not send setting commands consecutively. Send query commands and read the responses at a certain interval, or reduce the command transmission frequency.

Break signal

The break signal functions as a substitute for the IEEE488.1 dcl / sdc (Device Clear, Selected Device Clear) message.

NOTE

The RS232C interface should be shifted remotely by the command. Use the "SYSTem:REMote" SCPI command to set the RS232C interface to the remote state. Be sure to include this command at the start of the program when you are performing remote programming.

>top

Setup

Interface Setup

USB

A device driver supporting USB T&M Class (USBTMC) is required to control the PWX through the USB interface. The USBTMC driver is automatically installed by the VISA library.

By changing the legacy language and emulation settings, you can execute existing programs that were written for other instruments. Normally, select the SCPI language and turn emulation off (these are the factory default settings).

USB connection

Use a standard USB cable to connect the PWX to the computer.

USB configuration

1. In the CONFIG settings, set the emulation (CF22).
   Normally, use the default value (CF22: nonE).
2. Restart the PWX.

Service request

The PWX is equipped with service request and serial polling functions.

USB function

Complies with USB Specification 2.0

Complies with USBTMC Specification 1.0 and USBTMC-USB488 Specification 1.0

Data rate: 480 Mbps maximum (High speed)

VID （Vender ID）

0x0B3E

PID （Product ID）

750W model: 0x1025

1500W model: 0x1024

>top

*CLS

Clears all event registers including the status byte, event status, and error queue.

Command

```
*CLS
```

*ESE

Sets the event status enable register that is counted by the event summary bit (ESB) of the status byte.

Command

```
*ESE <NRf>

*ESE?
```

Parameter
Value：0 to 255

(Example) When *ESE 16 is transmitted, bit 4 of the event status enable register is set. Each time the execution error bit (bit 4) of the event status register is set, the summary bit (ESB) of the status byte is set.

Response

Returns the value of the event status enable register in NR1 format in response to *ESE?.

*ESR

Queries the event status register. Registers that are read are cleared.

Command

```
*ESR?
```

Response

Returns the value of the event status register in NR1 format in response to *ESR? and clears the register.

*IDN

Queries the model name, serial number, and firmware version of the PWX.

Command

```
*IDN?
```

Response

The response to *IDN? is indicated below.

(Example) For a PWX750ML with serial number AB123456 and firmware version 1.00, this returns:

```
KIKUSUI,PWX750ML,AB123456,1.00
```

When the multichannel function is in use, this query returns the master unit's information.

*OPC

Sets the OPC bit (bit 0) of the event status register when all the commands in standby have been completed.

See section 12.5.3 in IEEE 488.2-1992.

Command

```
*OPC
```

```
*OPC?
```

Response

Returns 1 in response to *OPC? when all the commands in standby have been completed.

*OPT

Queries the optional interface boards and enhanced functions that are installed in the PWX.

Command

```
*OPT?
```

Response

Returns "VMCB,OHP2" in response to *OPT? if there is no option installed.

*PSC

Sets whether to clear the event status enable register and the service request enable register when the POWER switch is turned on (power-on status).

Command

```
*PSC <NRf>

*PSC?
```

Parameter

Value 0 The *ESE and *SRE settings are not cleared when the POWER switch is turned on.
1 The *ESE and *SRE settings are cleared when the POWER switch is turned on.

(Example) To enable the power-on SRQ function

```
*PSC 0;*SRE 32;*ESE 128
```

Response

Returns the power-on status setting in response to *PSC?.

*RCL

Reads the contents stored in memory.

For the commands that are affected, see this table.

When you are using the multichannel function, insert a wait of at least 200 ms after sending the *RCL command.

Command

```
*RCL {0|1|2|3}
```

Parameter

Value	0	*RST transmission state
	1	Memory entry A
	2	Memory entry B
	3	Memory entry C

*RST

Aborts the measurement operation and initializes the PWX to its factory default condition.

For the commands that are affected, see this table.

When you are using the multichannel function, insert a wait of at least 200 ms after sending the *RST command.

Command

```
*RST
```

*SAV

Stores the current PWX settings to memory.

When you are using the multichannel function, insert a wait of at least 200 ms after sending the *SAV command.

Command

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

Parameter

Value	1	Memory entry A
	2	Memory entry B
	3	Memory entry C

*SRE

Sets the service request enable register.

The service request enable register is used to select the summary messages in the status byte register that will be able to perform service requests.

To clear the service request enable register, send *SRE 0. If the register is cleared, service requests cannot be generated by status information.

Command

```
*SRE <NRf>

*SRE?
```

Parameter

Value 0 to 255

(Example) Sending *SRE 8 sets bit 3 of the service request enable register. Each time the summary bit (bit 3) of the QUEStionable status register in the status byte is set, a service request message is generated.

Response

Returns the value of the service request enable register in NR1 format in response to *SRE?.

*STB

Queries the contents of the status byte register and the MSS (master summary status) message.

The response is the same as serial polling only with the exception that the MSS message appears in place of the RQS message in bit 6.

Command

```
*STB?
```

Response

Returns the value of the status byte register and the MSS message (bit 6) in NR1 format in response to *STB?.

*TRG

Trigger command.

This is a substitute command for the IEEE488.1 get (Group Execute Trigger) command.

If the PWX is not in a condition to accept triggers, an SCPI error (-211,"Trigger ignored") occurs.

See section 10.37 in IEEE 488.2-1992.

When you are using the multichannel function, insert a wait of at least 200 ms after sending the *TRG command.

Command

```
*TRG
```

*TST

This command is used to perform the self-test, however, the PWX is not equipped with this feature.

See section 10.38 in IEEE 488.2-1992.

Command

```
*TST?
```

Response

Returns 0 in response to *TST?.

*WAI

Prevents the PWX from executing subsequent commands until all operations in standby are complete.

Command

```
*WAI
```

OUTP

Turns the output on and off.

Use the OUTP:PON:STAT command to set the output condition that the PWX will be in when the power is turned on.

If the PWX is set so that external control is used to turn output is on and off, an SCPI error (-221, "Setting conflict") may occur depending on the on/off logic setting and the level of the signal applied to pin 1 of the J1 connector.

Command

```
OUTPut[:STATe][:IMMediate] {ON|OFF|1|0}

OUTPut[:STATe][:IMMediate]?
```

Parameter

Value	ON (1)	Output on
	OFF (0)	Output off (default)

For the setting that is applied when *RST is sent, see this table.

Response

Returns whether the output is on in NR1 format in response to OUTP?.

OUTP:PON:STAT

Sets the output state at power-on.

Command

```
OUTPut:PON:STATe {SAFE|AUTO|FORCe}

OUTPut:PON:STATe?
```

Parameter

Value	SAFE	The PWX turns on in the previous power-off state. The output is off (default).
	AUTO	The PWX turns on in the previous power-off state, with the output on/off setting being remained.
	FORCe	The PWX turns on in the previous power-off state. The output is on.

Response

Response

Returns the output state at power-on in CHAR format in response to OUTP:PON:STAT?.

OUTP:PON

The OUTP:PON command was changed to OUTP:PON:STAT.

The OUTP:PON command still works, but when creating new programs, use OUTP:PON:STAT.

VOLT

Sets the voltage

When the PWX is set so that constant voltage is controlled externally (VOLT:EXT:SOUR VOLT), settings performed by this command are invalid.

Command

```
[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]
  {<numeric>|MINimum|MAXimum}

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

Parameter

Value A value in the range of the VOLT:LIM:LOW setting to 105 % of the rated output voltage (the default value is 0 V)

Unit V

A SCPI error (-222, "Data out of range") occurs if outside the range.

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns the voltage setting in NR3 format in response to VOLT?.

CURR

Sets the current.

When the PWX is set so that constant current is controlled externally (CURR:EXT:SOUR VOLT), settings performed by this command are invalid.

Command

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

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

Parameter

Value 0 % to 105 % of the rated output current
(The default value is 105 % of the rated output current.)

Unit A

A SCPI error (-222, "Data out of range") occurs if outside the range.

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns the current setting in NR3 format in response to CURR?.

CURR:PROT

Sets the overcurrent protection (OCP) value.

Command

```
[SOURce:]CURRent:PROTection[:LEVel] {<numeric>|MINimum|MAXimum}

[SOURce:]CURRent:PROTection[:LEVel]? {MINimum|MAXimum}
```

Parameter

Value Approximately 105 % to 110 % of the present current value (CURR; the default value is 111.5 % of the rated output current)
If you attempt to specify a value that is 105 % of the current value or less, an SCPI error (-222, "Data out of range") will occur.
If the PWX is set so that constant current is being controlled externally (CURR:EXT:SOUR VOLT), you can specify 10 % to 111.5 % of the rated output current.

Unit A

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns the OCP value in NR3 format in response to CURR:PROT?.

CURR:PROT:DEL

Sets the detection time of OCP activation.

Command

```
[SOURce:]CURRent:PROTection:DELay {<numeric>|MINimum|MAXimum}
[SOURce:]CURRent:PROTection:DELay? {MINimum|MAXimum}
```

Parameter

Value	0 to 2.0 (The default value is 0.)
Resolution	100 ms
Unit	S

Response

Returns the detection time of OCP activation in NR3 format in response to CURR:PROT:DEL?.

CURR:LIM:AUTO

Enables or disables the limit on the current setting.

If you enable the limit when the OCP setting is lower than the current setting, the OCP setting will be set to 105 % of the current setting.

Command

```
[SOURce:]CURRent:LIMit:AUTO {ON|OFF|1|0}

[SOURce:]CURRent:LIMit:AUTO?
```

Parameter

Value	ON (1)	The current setting limit is enabled.
	OFF (0)	The current setting limit is disabled (default).

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns whether the limit on the current setting is enabled in NR1 format in response to CURR:LIM:AUTO?

VOLT:PROT

Sets the overvoltage protection (OVP).

Command

```
[SOURce:]VOLTage:PROTection[:LEVel] {<numeric>|MINimum|MAXimum}

[SOURce:]VOLTage:PROTection[:LEVel]? {MINimum|MAXimum}
```

Parameter

Value Approximately 105 % to 110 % of the present voltage setting (VOLT; the default value is 110 % of the rated output voltage)
If you attempt to specify a value that is 105 % of the voltage setting or less, an SCPI error (-222, "Data out of range") will occur.
If the PWX is set so that constant voltage is being controlled externally (VOLT:EXT:SOUR VOLT), you can specify 10 % to 110 % of the rated output voltage.

Unit V

For the setting that is applied when *RST is sent, see this table.

If you enable the voltage setting limit (VOLT:LIM:AUTO ON) when the OVP trip point is higher than the voltage setting, the OVP trip point setting is changed to 105 % of the voltage setting.

Response

Returns the OVP value in NR3 format in response to VOLT:PROT?.

VOLT:LIM:LOW

Sets the undervoltage limit (UVL) trip point.

Command

```
[SOURce:]VOLTage:LIMit:LOW {<numeric>|MINimum|MAXimum}

[SOURce:]VOLTage:LIMit:LOW? {MINimum|MAXimum}
```

Parameter

Value 0 to the present voltage setting (VOLT; the default value is 0 V)
Unit V
A SCPI error (-222, "Data out of range") occurs if outside the range.

For the setting that is applied when *RST or *RCL is sent, see this table.

If you enable the voltage setting limit (VOLT:LIM:AUTO ON) when the UVP trip point is lower than the voltage setting, the UVP trip point setting is changed to the voltage setting.

Response

Returns the UVL trip point in NR3 format in response to VOLT:LIM:LOW?.

VOLT:LIM:AUTO

Set whether to limit the voltage setting so that it does not exceed the OVP setting or become lower than the UVP setting.

If you enable the limit when the OVP setting is lower than the voltage setting, the OVP setting will be set to 105 % of the voltage setting.

If you enable the limit when the UVP setting is higher than the voltage setting, the UVP setting will be equal to the voltage setting.

Command

```
[SOURce:]VOLTage:LIMit:AUTO {ON|OFF|1|0}

[SOURce:]VOLTage:LIMit:AUTO?
```

Parameter

Value	ON (1)	The voltage setting limit is enabled (default).
	OFF (0)	The voltage setting limit is disabled.

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns whether the voltage setting limit is enabled in NR1 format in response to VOLT:LIM:AUTO?.

OUTP:PROT:CLE

Clears alarms.

Command

```
OUTPut:PROTection:CLEar
```

SYST:CONF:PROT:REC

Sets the method of clearing OHP, FAN, and AC-FAIL alarms.

Command

```
SYSTem:CONFigure:PROTection:RECovery {SAFE|AUTO}

SYSTem:CONFigure:PROTection:RECovery?
```

Parameter

Value	SAFE	Output is not turned on automatically when the problem that caused the alarm is fixed.
	AUTO	Output is turned on automatically when the problem that caused the alarm is fixed.

Response

Returns the method of clearing OHP, FAN, and AC-FAIL alarms in CHAR format in response to SYST:CONF:PROT:REC?.

SYST:COMM:LANG

Sets the command language.

Command

```
SYSTem:COMMunicate:LANGuage {"SCPI"|"LEGACY"}

SYSTem:COMMunicate:LANGuage?
```

Parameter

Value	SCPI	The SCPI language is used (default).
	LEGACY	Legacy languages are used.

Changing the command language setting may also change the emulation (SYST:COMM:EMUL) setting.

Response

Returns the command language in STRING format in response to SYST:COMM:LANG?.

SYST:LANG

The SYST:LANG command was changed to SYST:COMM:LAN.

The SYST:LANG command still works, but when creating new programs, use SYST:COMM:LANG.

SYST:COMM:EMUL

Sets the emulation that you want to use.

This setting does not guarantee compatibility with all measuring instrument application software and drivers.

You can only specify parameters "N5700" and "DCS" when the command language is set to SCPI (SYST:COMM:LANG).

Command

```
SYSTem:COMMunicate:EMULate {"NONE"|"N5700"|"GENESYS"|"PAG"|"DCS"}

SYSTem:COMMunicate:EMULate?
```

Parameter

Value	"NONE"	Emulation is not used (default).
	"N5700"	N5700/N8700 emulation is used.
	"GENESYS"	GENESYS emulation is used.
	"PAG"	PAG emulation is used.
	"DCS"	DCS emulation is used.

Changing the command language setting may also change the emulation (SYST:COMM:LANG) setting.

Response

Returns the emulation that is being used in STRING format in response to SYST:COMM:EMUL?.

SYST:LANG:EMUL

The SYST:LANG:EMUL command was changed to SYST:COMM:EMUL.

The SYST:LANG:EMUL command still works, but when creating new programs, use SYST:COMM:EMUL.

SYST:ERR:TRAC

Sets whether to display communication errors by performing a debug trace. If the debug trace function is turned on, error codes (example: Err-100) are shown on the PWX display.

Command

```
SYSTem:ERRor:TRACe {ON|OFF|1|0}

SYSTem:ERRor:TRACe?
```

Parameter

Value	ON (1)	Communication errors are displayed.
	OFF (0)	Communication errors are not displayed.

Response

Returns whether communication errors are displayed in NR1 format in response to SYST:ERR:TRAC?

OUTP:PROT:WDOG

Sets the Communication monitor timer.

When an alarm occurs, set the value to zero first and then clear the alarm (OUTP:PROT:CLE).

Command

```
OUTPut:PROTection:WDOG[:DELay] {<numeric>|MINimum|MAXimum}

OUTPut:PROTection:WDOG[:DELay]? {MINimum|MAXimum}
```

Parameter

Value 0(Off), 1, 3, 10, 30, 100, 300, 1000, 3000 (The default value is 0.)

Unit S

A SCPI error (-222, "Data out of range") occurs if outside the range.

Response

Returns the Communication monitor timer in NR1 format in response to OUTP:PROT:WDOG?.

SYST:CONF:BLE

Turns the bleeder on and off.

Command

```
SYSTem:CONFigure:BLEeder {ON|OFF|1|0}

SYSTem:CONFigure:BLEeder?
```

Parameter

Value	ON (1)	The bleeder is on.
	OFF (0)	The bleeder is off.

Response

Returns whether the bleeder is on or off in NR1 format in response to SYST:CONF:BLE?.

SYST:CONF:MAST

Queries the number of units in master-slave parallel operation.

Command

```
SYSTem:CONFigure:MASTer?
```

Response

Returns the number of units in master-slave parallel operation (the master unit is included in this number) in NR1 format in response to SYST:CONF:MAST?.

SYST:CONF:MON:RANG

Sets the range for voltage and current monitoring.

Command

```
SYSTem:CONFigure:MONitor:RANGe {LOW|HIGH}

SYSTem:CONFigure:MONitor:RANGe?
```

Parameter

Value	LOW	A range of 0 V to 5 V is used.
	HIGH	A range of 0 V to 10 V is used.

Response

Returns the range for voltage and current monitoring in CHAR format in response to SYST:CONF:MON:RANG?.

SYST:CONF:STAR:PRI

Sets the operation mode to be prioritized when the output is turned on.

Command

```
SYSTem:CONFigure:STARtup:PRIority {CC|CV}

SYSTem:CONFigure:STARtup:PRIority?
```

Parameter

Value	CC	CC (constant current) is prioritized.
	CV	CV (constant voltage) is prioritized.

Response

Returns the state that the PWX starts up in when the output state at power-on is set to on in CHAR format in response to SYST:CONF:STAR:PRI?.

CURR:EXT:SOUR

Sets whether constant current will be controlled externally.

Command

```
[SOURce:]CURRent:EXTernal:SOURce {NONE|VOLTage}

[SOURce:]CURRent:EXTernal:SOURce?
```

Parameter

Value	NONE	External control is not performed (default).
	VOLTage	External control is performed.

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns whether constant current is being controlled externally in CHAR format in response to CURR:EXT:SOUR?.

VOLT:EXT:SOUR

Sets whether constant voltage will be controlled externally.

Command

```
[SOURce:]VOLTage:EXTernal:SOURce {NONE|VOLTage}

[SOURce:]VOLTage:EXTernal:SOURce?
```

Parameter

Value	NONE	External control is not performed (default).
	VOLTage	External control is performed.

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns whether constant voltage is being controlled externally in CHAR format in response to VOLT:EXT:SOUR?.

CURR:EXT:RANG/ VOLT:EXT:RANG

Sets the CC or CV control range that is used during external control.

CURR:EXT:RANG and VOLT:EXT:RANG are aliases.

Command

```
[SOURce:]CURRent:EXTernal:RANGe {LOW|HIGH}

[SOURce:]VOLTage:EXTernal:RANGe {LOW|HIGH}

[SOURce:]CURRent:EXTernal:RANGe?

[SOURce:]VOLTage:EXTernal:RANGe?
```

Parameter

Value	LOW	A range of 0 V to 5 V is used.
	HIGH	A range of 0 V to 10 V is used.

Response

Returns the CC or CV control range in CHAR format in response to CURR:EXT:RANG? or VOLT:EXT:RANG?, respectively.

OUTP:EXT

Sets whether output will be turned on and off externally.

Command

```
OUTPut:EXTernal[:STATe] {ON|OFF|1|0}

OUTPut:EXTernal[:STATe]?
```

Parameter

Value ON (1) External control is performed.
OFF (0) External control is not performed (default).

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns whether output will be turned on and off externally in NR1 format in response to OUTP:EXT?.

OUTP:EXT:LOG

Sets the logic used to control the turning of output on and off using an external contact.

Command

```
OUTPut:EXTernal:LOGic {LOW|HIGH}

OUTPut:EXTernal:LOGic?
```

Parameter

Value	LOW	The output is turned on with a low signal.
	HIGH	The output is turned on with a high signal.

Response

Returns the logic used to control the turning of output on and off using an external contact in CHAR format in response to OUTP:EXT:LOG?.

SYST:CONF:SLAV:AMM

Sets whether or not the current or power on slave units is displayed on the panel during master-slave parallel operation.

Command

```
SYSTem:CONFigure:SLAVe:AMMeter {ON|OFF|1|0}

SYSTem:CONFigure:SLAVe:AMMeter?
```

Parameter

Value	ON(1)	Displayed
	OFF(0)	Not displayed

Response

Returns whether or not the current or power is displayed on the panel in NR1 format in response to the SYST:CONF:SLAV:AMM? query.

VOLT:TRIG

Sets the voltage that is applied when INIT:TRAN and a software trigger are sent.

When the PWX is set so that constant voltage is controlled externally (VOLT:EXT:SOUR VOLT), settings performed by this command are invalid.

Command

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

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

Parameter

Value A value in the range of the VOLT:LIM:LOW setting to 105 % of the rated output voltage (the default value is 0 V)

Unit V

A SCPI error (-222, "Data out of range") occurs if outside the range.

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns the voltage value that is applied when a trigger is received in NR3 format in response to VOLT:TRIG?.

CURR:TRIG

Sets the current value that is applied when INIT:TRAN and a software trigger are sent.

Command

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

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

Parameter

Value 0 % to 105 % of the rated output current
(The default value is 105 % of the rated output current.)

Unit A

A SCPI error (-222, "Data out of range") occurs if outside the range.

For the setting that is applied when *RST or *RCL is sent, see this table.

Response

Returns the current value that is applied when a trigger is received in NR3 format in response to CURR:TRIG?.

TRIG:TRAN:SOUR

Sets the condition (trigger source) for actually changing the setting after the PWX receives INIT:TRAN.

Command

```
TRIGger:TRANsient:SOURce {IMMediate|BUS}

TRIGger:TRANsient:SOURce?
```

Parameter

Value IMM The setting is changed immediately.
BUS The setting is changed when a software trigger is received (use the *TRG or TRIG:TRAN command to change the setting; default).

For the setting that is applied when *RST is sent, see this table.

Response

Returns the trigger source of the sequence 1 group in CHAR format in response to TRIG:TRAN:SOUR?.

TRIG:SOUR

The TRIG:SOUR command was changed to TRIG:TRAN:SOUR.

The TRIG:SOUR command still works, but when creating new programs, use TRIG:TRAN:SOUR.

INIT:TRAN

Starts the setting change (TRANsient) trigger function.

If trigger source is set to IMM, the change starts immediately. If set to BUS, the change starts after waiting for a software trigger.

Command

```
INITiate[:IMMediate]:TRANsient
```

INIT

The INIT command was changed to INIT:TRAN.

The INIT command still works, but when creating new programs, use INIT:TRAN.

TRIG:TRAN

Executes a software trigger.

Command

```
TRIGger:TRANsient[:IMMediate]
```

TRIG

The TRIG command was changed to TRIG:TRAN.

The TRIG command still works, but when creating new programs, use TRIG:TRAN.

MEAS:VOLT

Queries the measured value of the voltage output.

Command

```
MEASure[<n>][:SCALar]:VOLTage[:DC]?
```

When you are using the multichannel function, use <n> to specify the channel number.

Response

Returns the measured value of the voltage output in NR3 format in response to MEAS:VOLT?.

When you are using the multichannel function, this query returns the measured output voltage of the specified channel in NR3 format in response to MEAS<n>:VOLT?. If you omit <n>, the measured value of the channel that was specified by the INST command is returned.

Unit V

The measured voltage and the measured current are updated alternately at 25 ms intervals. If the measurement is not complete, this query returns the previous measured value in response to MEAS:VOLT?.

MEAS:CURR

Queries the measured value of the current output.

Command

```
MEASure[<n>][:SCALar]:CURRent[:DC]?
```

When you are using the multichannel function, use <n> to specify the channel number.

Response

Returns the measured value of the current output in NR3 format in response to MEAS:CURR?.

When you are using the multichannel function, this query returns the measured output voltage of the specified channel in NR3 format in response to MEAS<n>:CURR?. If you omit <n>, the measured value of the channel that was specified by the INST command is returned.

Unit A

The measured voltage and the measured current are updated alternately at 25 ms intervals. If the measurement is not complete, this query returns the previous measured value in response to MEAS:CURR?.

SYST:COMM:RLST

Sets the PWX to remote or local mode.

Command

```
SYSTem:COMMunicate:RLSTate {LOCal|REMote|RWLock}

SYSTem:COMMunicate:RLSTate?
```

Parameter

Value	LOCal	The PWX is set to local mode. This is the same as SYST:LOC, which is a substitute command for the IEEE488.1 ren FALSE (remote disable) command.
	REMote	The PWX is set to remote mode. All panel controls except the LOCAL key are locked. This is the same as SYST:REM, which is a substitute command for the IEEE488.1 ren (Remote Enable) plus address specification command.
	RWLock	The PWX is set to remote mode. All panel controls (including the LOCAL key) are locked. This is the same as SYST:RWL, which is a substitute command for the IEEE488.1 llo (Local Lock Out) command.

Response

Returns the current remote/local status of the PWX in CHAR format in response to SYST:COMM:RLST?.

SYST:ERR

Reads the oldest error information or event information from the error queue. The error queue can store up to 255 errors.-> Tutorial

Use the *CLS command to clear the error queue.

Command

```
SYSTem:ERRor[:NEXT]?
```

Response

Returns the oldest error or event information in the error/event queue in response to SYST:ERR? as follows:

(Example) When there are no errors or events

+0"No error"

(Example) When a command that cannot be executed under the current operating conditions has been received

-221,"Settings conflict"

SYST:KLOC

Sets and releases the panel operation lock.

Command

```
SYSTem:KLOCk {ON|OFF|1|0}

SYSTem:KLOCk?
```

Parameter

Value	ON (1)	The panel operation lock is set.
	OFF (0)	The panel operation lock is released.

Response

Returns the panel operation lock setting in NR1 format in response to SYST:KLOCk?.

SYST:LOC

Sets the PWX to local mode (Remote Disable; the REMOTE LED turns off). This is a substitute command for the IEEE488.1 ren FALSE (remote disable) command. The Remote Disable state enables both panel operations and commands.

Use SYST:REMor SYST:RWL to switch to remote mode (Remote Enable; the REMOTE LED lights).

If the communication monitoring timer is set, set the timer to off (OUTP:PROT:WDOG 0) before switching to local mode.

Command

```
SYSTem:LOCal
```

SYST:REM

Sets the PWX operation to remote mode. All panel keys except the LOCAL key are locked. This is a substitute command for the IEEE488.1 REN (Remote Enable) command and address designation.

Use the SYST:LOC command to return the PWX to local mode.

Command

```
SYSTem:REMote
```

SYST:RWL

Sets the PWX operation to remote mode. All panel keys are locked (the LOCAL key is also locked). This is a substitute command for the IEEE488.1 llo (Local Lock Out) command.

Use the SYST:LOC command to return the PWX to local mode.

Command

```
SYSTem:RWLock
```

SYST:VERS

Queries the version of the SCPI specifications to which the PWX conforms.

Command

```
SYSTem:VERSion?
```

Response

Returns 1999.0 in response to SYST:VERS?.

Status byte register

The status byte register stores STB and RQS (MSS) messages as defined by the IEEE488.1 standard. The status byte register can be read using IEEE488.1 serial polling or the IEEE488.2 common command *STB?.

When serial polling is carried out, bit 6 responds with the request service (RQS). The status byte value is not changed by serial polling.

*STB? makes the device transmit the contents of the status byte register and the master status summary (MSS) message.

*STB? does not change the status byte, MSS, or RQS.

Bit	Bit weight	Bit name	Description
0	1	Reserved	Reserved for future use by the IEEE488. The bit value is notified as zero.
1	2	Reserved	
2	4	Error/Event Queue	If data exists in the error or event queue, this bit is set to true.
3	8	Questionable Status Register (QUES)	This bit is set to true when a bit is set in the QUEStionable event status register and the corresponding bit in the QUEStionable status enable register is true.
4	16	Message Available (MAV)	This bit is set to true when a request is received from the digital programming interface and the PWX is ready to output the data byte.
5	32	Standard Event Status Bit Summary (ESB)	This bit is set to true when a bit is set in the event status register.
6	64	Request Service (RQS)	This bit is set to true when a bit is set in the service request enable register, and the corresponding bit exists in the status byte. The SRQ line of the GPIB is set.
		Master Status Summary (MSS)	This bit is set to true when a bit in the status byte register is set to 1 and the corresponding bit in the service request enable register is set to 1.
7	128	Operation Status Register (OPER)	This bit is set to true when a bit is set in the OPERation event status register and the corresponding bit in the OPERation status enable register is set.
8 to 15		Not Used	--

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Event status register

The event status register bits are set when certain events occur during PWX operation. All bits of the event status register are set by the error event queue.

The register is defined by the IEEE488.2 standard and is controlled by the IEEE488.2 common commands *ESE, *ESE?, and *ESR?.

See SYST:ERR? for the descriptions of the errors.

Bit	Bit weight	Bit name	Description	Error code
0	1	Operation Complete (OPC)	Set when an *OPC command is received and all operations in standby are complete.	-800 to -899
1	2	Request Control (RQC)	Not used	--
2	4	Query Error (QYE)	Set when an attempt is made to read data from the output queue when there is no output or the error queue is in wait status. Indicates that there is no data in the error queue.	-400 to -499
3	8	Device Dependent Error (DDE)	Set when there is a device-specific error.	-300 to -399 100 to 999
4	16	Execution Error (EXE)	Set when the PWX evaluates that the program data following the header is outside the formal input range or does not match the performance of the PWX. This indicates that a valid SCPI command may not be executed correctly depending on the conditions of the PWX.	-200 to -299
5	32	Command Error (CME)	Set when an IEEE 488.2 syntax error is detected, when an unidentifiable header is received, or when a group execution trigger enters the internal IEEE 488.2 SCPI command input buffer.	-100 to -199
6	64	Reserved	Not used	--
7	128	Reserved	Not used	--
8 to 15		Reserved	Not used	--

>top

OPERation status register

The OPERation status register is a 16-bit register that contains conditions that are part of the PWX normal operations.

Bit	Bit weight	Bit name	Description
0	1	NOT USED	--
1	2	NOT USED	--
2	4	NOT USED	--
3	8	NOT USED	--
4	16	NOT USED	--
5	32	WTG	Indicates whether the PWX is waiting for a trigger (TRIG)
6	64	NOT USED	--
7	128	NOT USED	--
8	256	CV	CV output
9	512	NOT USED	--
10	1024	CC	CC output
11	2048	NOT USED	--
12	4096	NOT USED	--
13	8192	INSTrument Summary	Summary bit of OPERation:INSTrument sub register
14	16384	NOT USED	--
15	32768	NOT USED	Always zero

>top

STAT:OPER

Queries the event of the OPERation status register.

A query clears the contents of the register.

Command

```
STATus:OPERation[:EVENt]?
```

Response

Returns the event of the OPERation status register in NR1 format.

STAT:OPER:COND

Queries the condition of the OPERation status register.

A query does not clear the contents of the register.

Command

```
STATus:OPERation:CONDtion?
```

Response

Returns the condition of the OPERation status register in NR1 format.

STAT:OPER:ENAB

Sets the enable register of the OPERation status register.

Command

```
STATus:OPERation:ENABle <NR1>

STATus:OPERation:ENABle?
```

Parameter

Value: 0 to 32767

Response

Returns the enable register setting of the OPERation status register in NR1 format.

STAT:OPER:NTR

Sets the negative transition of the OPERation status register.

Command

```
STATus:OPERation:NTRansition <NR1>

STATus:OPERation:NTRansition?
```

Parameter

Value: 0 to 32767

Response

Returns the negative transition of the OPERation status register in NR1 format.

STAT:OPER:PTR

Sets the positive transition of the OPERation status register.

Command

```
STATus:OPERation:PTRansition <NR1>

STATus:OPERation:PTRansition?
```

Parameter

Value: 0 to 32767

Response

Returns the positive transition of the OPERation status register in NR1 format.

QUEStionable status register

The QUEStionable status register is a 16-bit register that stores information related to the questionable events and status during PWX operation.These register bits may indicate problems with the measured data of the PWX.

Bit	Bit weight	Bit name	Description
0	1	OV (OVP)	Overvoltage protection has been activated
1	2	OC (OCP)	Overcurrent protection has been activated
2	4	PF (AC)	Low AC input protection has been activated
3	8	Not Used	--
4	16	OHP (OHP)	Overheat protection has been activated
5	32	SD	Shut down
6	64	OT2(OHP2)	Overheat protection2 has been activated
7	128	SENS	Incorrect sensing connection protection has been activated
8	256	FAN	Fan failure protection has been activated
9	512	INH	Output turned off through external control; OUTP command inhibit status
10	1024	UNR	Not operating in CV mode or CC mode (power limitation has been activated)
11	2048	I2C	I2C communication error
12	4096	OV2 (OVP2)	Overvoltage protection (120 % of the rated voltage) has been activated
13	8192	INSTrument Summary	Summary bit of QUEStionable:INSTrument sub register
14	16384	WDOG	Communication monitor has been activated
15	32768	Not Used	Always zero

>top

STAT:QUES

Queries the event of the QUEStionable status register.
A query clears the contents of the register.

Command

```
STATus:QUEStionable[:EVENt]?
```

Response

Returns the event of the QUEStionable status register in NR1 format.

STAT:QUES:COND

Queries the condition of the QUEStionable status register.

A query does not clear the contents of the register.

Command

```
STATus:QUEStionable:CONDition?
```

Response

Returns the condition of the QUEStionable status register in NR1 format.

STAT:QUES:ENAB

Sets the enable register of the QUEStionable status register.

Command

```
STATus:QUEStionable:ENABle <NR1>

STATus:QUEStionable:ENABle?
```

Parameter

Value: 0 to 32767

Response

Returns the enable register setting of the QUEStionable status register in NR1 format.

STAT:QUES:NTR

Sets the negative transition of the QUEStionable status register.

Command

```
STATus:QUEStionable:NTRansition <NR1>

STATus:QUEStionable:NTRansition?
```

Parameter

Value: 0 to 32767

Response

Returns the negative transition of the QUEStionable status register in NR1 format.

STAT:QUES:PTR

Sets the positive transition of the QUEStionable status register.

Command

```
STATus:QUEStionable:PTRansition <NR1>
STATus:QUEStionable:PTRansition?
```

Parameter

Value: 0 to 32767

Response

Returns the positive transition of the QUEStionable status register in NR1 format.

STAT:PRES

Resets the ENABle, PTRansition, and NTRansition filter registers of all status registers (including sub registers) to their default values. 32 bits registers are used by the multichannel function.

Default values (16 bits register):

STATus:ENABle = 0x0000

STATus:PTRansition = 0x7FFF

STATus:NTRansition = 0x0000

Default values (32 bits register):

STATus:ENABle = 0x7FFFFFFF

STATus:PTRansition = 0x7FFFFFFF

STATus:NTRansition = 0x00000000

Command

```
STATus:PRESet
```

>top

GLOB:CURR

Sets the current of all the channels.

Insert a wait of at least 200 ms after sending the GLOB:OUTP command.

Command

```
GLOBal:CURRent[:LEVel][:IMMediate][:AMPLitude] {<numeric>|MINimum|MAXimum}
```

Parameter

Value 0 % to 105 % of the rated output current
(The default value is 105 % of the rated output current.)

Unit A

A SCPI error (-222, "Data out of range") occurs if outside the range.

GLOB:OUTP

Turns output on or off for all the channels.

Insert a wait of at least 200 ms after sending the GLOB:OUTP command. -> For details

Command

```
GLOBal:OUTPut[:STATe] {ON|OFF|1|0}
```

Parameter

Value	ON(1)	Turns output on for all channels
	OFF(0)	Turns output off for all channels

GLOB:VOLT

Sets the voltage of all the channels.

Insert a wait of at least 200 ms after sending the GLOB:OUTP subsystem command.

Command

```
GLOBal:VOLTage[:LEVel][:IMMediate][:AMPLitude] {<numeric>|MINimum|MAXimum}
```

Parameter

Value A value in the range of the VOLT:LIM:LOWsetting to 105 % of the rated output voltage (the default value is 0 V)

Unit V

A SCPI error (-222, "Data out of range") occurs if outside the range.

INST:CAT

Queries the valid channels.

Command

```
INSTrument:CATalog?
```

Response

Returns the valid channels as a comma-separated list in response to *INST:CAT?. If the multichannel function is not in use, this query returns "+0."

For example, in a system consisting of three PWXs assigned to channels 0, 1, and 4, this query returns "+0,+1,+4."

INST

Specifies the channel to configure.

Insert a wait of at least 200 ms after sending the INST command.

Command

```
INSTrument[:SELect] <NR1>
INSTrument[:NSELect] <NR1>
INSTrument[:SELect]?
INSTrument[:NSELect]?
```

Parameter

Value: 0 to 30

Response

Returns the channel that is being configured in NR1 format in response to INST?.

STAT:OPER:INST

Queries the event of the OPERation:INSTrument subregister.

A query clears the contents of the subregister.

Command

```
STATus:OPERatio:INSTrument[:EVENt]?
```

Response

Returns the event of the OPERation:INSTrument subregister in NR1 format.

STAT:OPER:INST:COND

Queries the condition of the OPERation:INSTrument subregister.

A query does not clear the contents of the subregister.

Command

```
STATus:OPERationINSTrument:CONDtion?
```

Response

Returns the condition of the OPERation:INSTrument subregister in NR1 format.

STAT:OPER:INST:ENAB

Sets the enable register of the OPERation:INSTrument subregister.

Command

```
STATus:OPERation:INSTrument:ENABle <NR1>

STATus:OPERation:INSTrument:ENABle?
```

Parameter

Value: 0 to 2147483647

Response

Returns the enable register setting of the OPERation:INSTrument subregister in NR1 format.

STAT:OPER:INST:NTR

Sets the negative transition of the OPERation:INSTrument subregister.

Command

```
STATus:OPERation:INSTrument:NTRansition <NR1>
STATus:OPERation:INSTrument:NTRansition?
```

Parameter

Value: 0 to 2147483647

Response

Returns the negative transition of the OPERation:INSTrument subregister in NR1 format.

STAT:OPER:INST:PTR

Sets the positive transition of the OPERation:INSTrument subregister.

Command

```
STATus:OPERation:INSTrument:PTRansition <NR1>
```

```
STATus:OPERation:INSTrument:PTRansition?
```

Parameter

Value: 0 to 2147483647

Response

Returns the positive transition of the OPERation:INSTrument subregister in NR1 format.

STAT:OPER:INST:ISUM<n>

Queries the event of the OPERation:INSTrument:ISUMmary<n> subregister.
Use <n> to specify the channel number.
For example, to specify channel 2, send the "STAT:OPER:INST:ISUM2" command.
A query clears the contents of the subregister.

Command

```
STATus:OPERation:INSTrument:ISUMmary<n>[:EVENt]?
```

Response

Returns the event of the OPERation:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:OPER:INST:ISUM<n>:COND

Queries the condition of the OPERation:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:OPER:INST:ISUM2:COND" command.

A query does not clear the contents of the register.

Command

```
STATus:OPERation:INSTrument:ISUMmary<n>:CONDtion?
```

Response

Returns the condition of the OPERation:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:OPER:INST:ISUM<n>:ENAB

Sets the enable register of the OPERation:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:OPER:INST:ISUM2:ENAB" command.

Command

```
STATus:OPERation:INSTrument:ISUMmary<n>:ENABle <NR1>
```

```
STATus:OPERation:INSTrument:ISUMmary<n>:ENABle?
```

Parameter

Value: 0 to 32767

Response

Returns the enable register setting of the OPERation:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:OPER:INST:ISUM<n>:NTR

Sets the negative transition of the OPERation:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:OPER:INST:ISUM2:NTR" command.

Command

```
STATus:OPERation:INSTrument:ISUMmary<n>:NTRansition <NR1>

STATus:OPERation:INSTrument:ISUMmary<n>:NTRansition?
```

Parameter

Value: 0 to 32767

Response

Returns the negative transition of the OPERation:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:OPER:INST:ISUM<n>:PTR

Sets the positive transition of the OPERation:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:OPER:INST:ISUM2:PTR" command.

Command

```
STATus:OPERation:INSTrument:ISUMmary<n>:PTRansition <NR1>

STATus:OPERation:INSTrument:ISUMmary<n>:PTRansition?
```

Parameter

Value: 0 to 32767

Response

Returns the positive transition of the OPERation:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:QUES:INST

Queries the event of the QUEStionable:INSTrument subregister.

A query clears the contents of the subregister.

Command

```
STATus:QUEStionable:INSTrument[:EVENt]?
```

Response

Returns the event of the QUEStionable:INSTrument subregister in NR1 format.

STAT:QUES:COND

Queries the condition of the QUEStionable:INSTrument subregister.

A query does not clear the contents of the register.

Command

```
STATus:QUEStionable:INSTrument:CONDition?
```

Response

Returns the condition of the QUEStionable:INSTrument subregister in NR1 format.

STAT:QUES:INST:ENAB

Sets the enable register of the QUEStionable:INSTrument subregister.

Command

```
STATus:QUEStionable:INSTrument:ENABle <NR1>

STATus:QUEStionable:INSTrument:ENABle?
```

Parameter

Value: 0 to 2147483647

Response

Returns the enable register setting of the QUEStionable:INSTrument subregister in NR1 format.

STAT:QUES:INST:NTR

Sets the negative transition of the QUEStionable:INSTrument subregister.

Command

```
STATus:QUEStionable:INSTrument:NTRansition <NR1>
STATus:QUEStionable:INSTrument:NTRansition?
```

Parameter

Value: 0 to 2147483647

Response

Returns the negative transition of the QUEStionable:INSTrument subregister in NR1 format.

STAT:QUES:INST:PTR

Sets the positive transition of the QUEStionable:INSTrument subregister.

Command

```
STATus:QUEStionable:INSTrument:NTRansition <NR1>
STATus:QUEStionable:INSTrument:NTRansition?
```

Parameter

Value: 0 to 2147483647

Response

Returns the positive transition of the QUEStionable:INSTrument subregister in NR1 format.

STAT:QUES:INST:ISUM<n>

Queries the event of the QUEStionable:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:QUES:INST:ISUM2" command.

A query clears the contents of the register.

Command

```
STATus:QUEStionable:INSTrument:ISUMmary[:EVENt]?
```

Response

Returns the event of the QUEStionable:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:QUES:INST:ISUM<n>:COND

Queries the condition of the QUEStionable:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:QUES:INST:ISUM2:COND" command.

A query does not clear the contents of the register.

Command

```
STATus:QUEStionable:INSTrument:ISUMmary:CONDition?
```

Response

Returns the condition of the QUEStionable:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:QUES:INST:ISUM<n>:ENAB

Sets the enable register of the QUEStionable:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:QUES:INST:ISUM2:ENAB" command.

Command

```
STATus:QUEStionable:INSTrument:ISUMmary:ENABle <NR1>
```

```
STATus:QUEStionable:INSTrument:ISUMmary:ENABle?
```

Parameter

Value: 0 to 32767

Response

Returns the enable register setting of the QUEStionable:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:QUES:INST:ISUM<n>:NTR

Sets the negative transition of the QUEStionable:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:QUES:INST:ISUM2:NTR" command.

Command

```
STATus:QUEStionable:INSTrument:ISUMmary:NTRansition <NR1>

STATus:QUEStionable:INSTrument:ISUMmary:NTRansition?
```

Parameter

Value: 0 to 32767

Response

Returns the negative transition of the QUEStionable:INSTrument:ISUMmary<n> subregister in NR1 format.

STAT:QUES:INST:ISUM<n>:PTR

Sets the positive transition of the QUEStionable:INSTrument:ISUMmary<n> subregister.

Use <n> to specify the channel number.

For example, to specify channel 2, send the "STAT:QUES:INST:ISUM2:PTR" command.

Command

```
STATus:QUEStionable:INSTrument:ISUMmary:PTRansition <NR1>

STATus:QUEStionable:INSTrument:ISUMmary:PTRansition?
```

Parameter

Value: 0 to 32767

Response

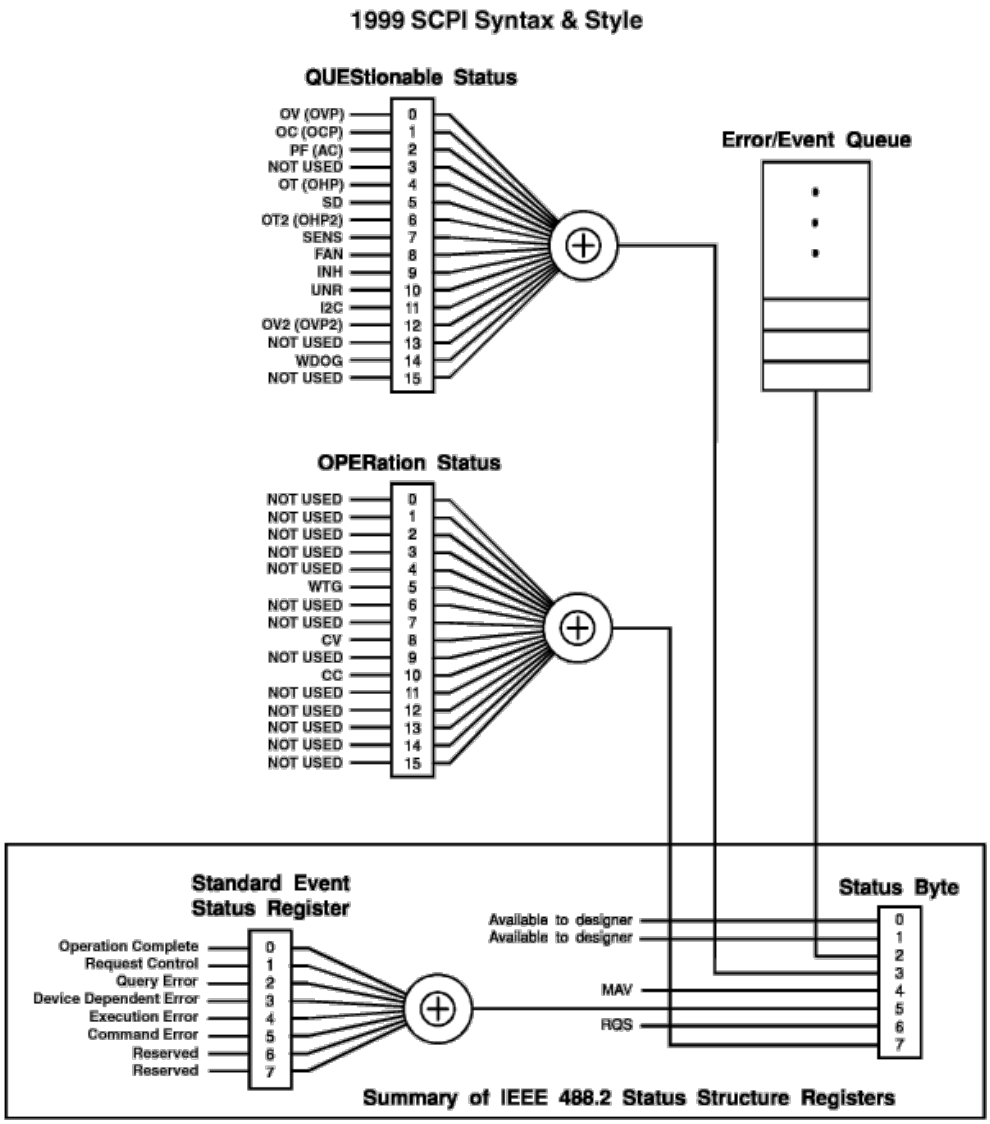
Returns the positive transition of the QUEStionable:INSTrument:ISUMmary<n> subregister in NR1 format.

Registers

Register Structure

Status report function

The SCPI status register structure is shown in the figure below. The character "+" represents the logical sum of the register bits.



Partially changed SCPII Standard 1999.0 Volume1 fig. 9-1.

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Multichannel

Multichannel Commands (Subsystem)

GLOBal subsystem

Insert a wait of at least 200 ms after sending a GLOBal subsystem command.

GLOB:CURR	Sets the current of all channels
GLOB:OUTP	Turns output on/off for all channels
GLOB:VOLT	Sets the voltage of all channels

INSTrument subsystem

INST:CAT	Checks the channel configuration
INST	Specifies the channel to configure

STATus subsystem

STAT:OPER:INST	OPER:INST subregister: event
STAT:OPER:INST:COND	OPER:INST subregister: register condition
STAT:OPER:INSTR:ENAB	OPER:INST subregister: enable
STAT:OPER:INST:PTR	OPER:INST subregister: negative transition
STAT:OPER:INST:NTR	OPER:INST subregister: positive transition
STAT:OPER:INST:ISUM<n>	OPER:INST:ISUM subregister: event
STAT:OPER:INST:ISUM<n>:COND	OPER:INST:ISUM subregister: register condition
STAT:OPER:INSTR:ISUM<n>:ENAB	OPER:INST:ISUM subregister: enable
STAT:OPER:INST:ISUM<n>:PTR	OPER:INST:ISUM subregister: negative transition
STAT:OPER:INST:ISUM<n>:NTR	OPER:INST:ISUM subregister: positive transition
STAT:QUES:INST	QUES:INST subregister: event
STAT:QUES:INST:COND	QUES:INST subregister: register condition
STAT:QUES:INST:ENAB	QUES:INST subregister: enable
STAT:QUES:INST:PTR	QUES:INST subregister: negative transition
STAT:QUES:INST:NTR	QUES:INST subregister: positive transition
STAT:QUES:INST:ISUM<n>	QUES:INST:ISUM subregister: event
STAT:QUES:INST:ISUM<n>:COND	QUES:INST:ISUM subregister: register condition
STAT:QUES:INST:ISUM<n>:ENAB	QUES:INST:ISUM subregister: enable
STAT:QUES:INST:ISUM<n>:PTR	QUES:INST:ISUM subregister: negative transition
STAT:QUES:INST:ISUM<n>:NTR	QUES:INST:ISUM subregister: positive transition

OPERation:INSTrument subregister

This is the subregister (32 bits) of bit 13 of the OPERation status register.

Bit	Bit weight	Bit name	Description
0	1	INSTrument0	Summary bit of channel 0(OPER:INST:ISUM0)
1	2	INSTrument1	Summary bit of channel 1(OPER:INST:ISUM1)
2	4	INSTrument2	Summary bit of channel 2(OPER:INST:ISUM2)
3	8	INSTrument3	Summary bit of channel 3(OPER:INST:ISUM3)
4	16	INSTrument4	Summary bit of channel 4(OPER:INST:ISUM4)
5	32	INSTrument5	Summary bit of channel 5(OPER:INST:ISUM5)
6	64	INSTrument6	Summary bit of channel 6(OPER:INST:ISUM6)
7	128	INSTrument7	Summary bit of channel 7(OPER:INST:ISUM7)
8	256	INSTrument8	Summary bit of channel 8(OPER:INST:ISUM8)
9	512	INSTrument9	Summary bit of channel 9(OPER:INST:ISUM9)
10	1024	INSTrument10	Summary bit of channel 10(OPER:INST:ISUM10)
11	2048	INSTrument11	Summary bit of channel 11(OPER:INST:ISUM11)
12	4096	INSTrument12	Summary bit of channel 12(OPER:INST:ISUM12)
13	8192	INSTrument13	Summary bit of channel 13(OPER:INST:ISUM13)
14	16384	INSTrument14	Summary bit of channel 14(OPER:INST:ISUM14)
15	32768	INSTrument15	Summary bit of channel 15(OPER:INST:ISUM15)
16	65536	INSTrument16	Summary bit of channel 16(OPER:INST:ISUM16)
17	131072	INSTrument17	Summary bit of channel 17(OPER:INST:ISUM17)
18	262144	INSTrument18	Summary bit of channel 18(OPER:INST:ISUM18)
19	524288	INSTrument19	Summary bit of channel 19(OPER:INST:ISUM19)
20	1048576	INSTrument20	Summary bit of channel 20(OPER:INST:ISUM20)
21	2097152	INSTrument21	Summary bit of channel 21(OPER:INST:ISUM21)
22	4194304	INSTrument22	Summary bit of channel 22(OPER:INST:ISUM22)
23	8388608	INSTrument23	Summary bit of channel 23(OPER:INST:ISUM23)
24	16777216	INSTrument24	Summary bit of channel 24(OPER:INST:ISUM24)
25	33554432	INSTrument25	Summary bit of channel 25(OPER:INST:ISUM25)
26	67108864	INSTrument26	Summary bit of channel 26(OPER:INST:ISUM26)
27	134217728	INSTrument27	Summary bit of channel 27(OPER:INST:ISUM27)
28	268435456	INSTrument28	Summary bit of channel 28(OPER:INST:ISUM28)
29	536870912	INSTrument29	Summary bit of channel 29(OPER:INST:ISUM29)
30	1073741824	INSTrument30	Summary bit of channel 30(OPER:INST:ISUM30)
31	2147483648	Not Used	Always zero

>top

OPERation:INSTrument:ISUMmary<n> subregister

This is the subregister of bit <n> of the OPERation:INSTrument subregister. This is a 16-bit register that contains information about the normal operating conditions of the PWX whose channel you specified.

Use <n> to specify the channel number.

For example, channel 2 is specified as "OPER:INST:ISUM2".

Bit	Bit weight	Bit name	Description
0	1	NOT USED	--
1	2	NOT USED	--
2	4	NOT USED	--
3	8	NOT USED	--
4	16	NOT USED	--
5	32	WTG	Indicates whether the PWX is waiting for a trigger (TRIG)
6	64	NOT USED	--
7	128	NOT USED	--
8	256	CV	CV output
9	512	NOT USED	--
10	1024	CC	CC output
11	2048	NOT USED	--
12	4096	NOT USED	--
13	8192	INSTrument Summary	--
14	16384	NOT USED	--
15	32768	NOT USED	Always zero

>top

QUEStionable:INSTrument subresigter

This is the subregister (32 bits) of bit 13 of the QUEStionable status register.

Bit	Bit weight	Bit name	Description
0	1	INSTrument0	Summary bit of channel 0(OPER:INST:ISUM0)
1	2	INSTrument1	Summary bit of channel v1(OPER:INST:ISUM1)
2	4	INSTrument2	Summary bit of channel 2(OPER:INST:ISUM2)
3	8	INSTrument3	Summary bit of channel 3(OPER:INST:ISUM3)
4	16	INSTrument4	Summary bit of channel 4(OPER:INST:ISUM4)
5	32	INSTrument5	Summary bit of channel 5(OPER:INST:ISUM5)
6	64	INSTrument6	Summary bit of channel 6(OPER:INST:ISUM6)
7	128	INSTrument7	Summary bit of channel 7(OPER:INST:ISUM7)
8	256	INSTrument8	Summary bit of channel 8(OPER:INST:ISUM8)
9	512	INSTrument9	Summary bit of channel 9(OPER:INST:ISUM9)
10	1024	INSTrument10	Summary bit of channel 10(OPER:INST:ISUM10)
11	2048	INSTrument11	Summary bit of channel 11(OPER:INST:ISUM11)
12	4096	INSTrument12	Summary bit of channel 12(OPER:INST:ISUM12)
13	8192	INSTrument13	Summary bit of channel 13(OPER:INST:ISUM13)
14	16384	INSTrument14	Summary bit of channel 14(OPER:INST:ISUM14)
15	32768	INSTrument15	Summary bit of channel 15(OPER:INST:ISUM15)
16	65536	INSTrument16	Summary bit of channel 16(OPER:INST:ISUM16)
17	131072	INSTrument17	Summary bit of channel 17(OPER:INST:ISUM17)
18	262144	INSTrument18	Summary bit of channel 18(OPER:INST:ISUM18)
19	524288	INSTrument19	Summary bit of channel 19(OPER:INST:ISUM19)
20	1048576	INSTrument20	Summary bit of channel 20(OPER:INST:ISUM20)
21	2097152	INSTrument21	Summary bit of channel 21(OPER:INST:ISUM21)
22	4194304	INSTrument22	Summary bit of channel 22(OPER:INST:ISUM22)
23	8388608	INSTrument23	Summary bit of channel 23(OPER:INST:ISUM23)
24	16777216	INSTrument24	Summary bit of channel 24(OPER:INST:ISUM24)
25	33554432	INSTrument25	Summary bit of channel 25(OPER:INST:ISUM25)
26	67108864	INSTrument26	Summary bit of channel 26(OPER:INST:ISUM26)
27	134217728	INSTrument27	Summary bit of channel 27(OPER:INST:ISUM27)
28	268435456	INSTrument28	Summary bit of channel 28(OPER:INST:ISUM28)
29	536870912	INSTrument29	Summary bit of channel 29(OPER:INST:ISUM29)
30	1073741824	INSTrument30	Summary bit of channel 30(OPER:INST:ISUM30)
31	2147483648	Not Used	Always zero

>top

QUEStionable:INSTrument:ISUMmary<n> subregister

This is the subregister of bit <n> of the QUEStionable:INSTrument subregister. This is a 16-bit register that stores information related to the status of and the questionable events that occur during operation of the PWX whose channel you specified.

Use <n> to specify the channel number.

For example, channel 2 is specified as "QUES:INST:ISUM2".

The QUEStionable status register bits may indicate that there are problems with the PWX's measured data.

Bit	Bit weight	Bit name	Description
0	1	OV (OVP)	Overvoltage protection has been activated
1	2	OC (OCP)	Overcurrent protection has been activated
2	4	PF (AC)	Low AC input protection has been activated
3	8	Not Used	--
4	16	OHP (OHP)	Overheat protection has been activated
5	32	SD	Shut down
6	64	OT2(OHP2)	Overheat protection2 has been activated
7	128	SENS	Incorrect sensing connection protection has been activated
8	256	FAN	Fan failure protection has been activated
9	512	INH	Output turned off through external control; OUTP command inhibit status
10	1024	UNR	Not operating in CV mode or CC mode (power limitation has been activated)
11	2048	I2C	I2C communication error
12	4096	OV2 (OVP2)	Overvoltage protection (120 % of the rated voltage) has been activated
13	8192	INSTrument Summary	--
14	16384	WDOG	Communication monitor has been activated
15	32768	Not Used	Always zero

Multi channel

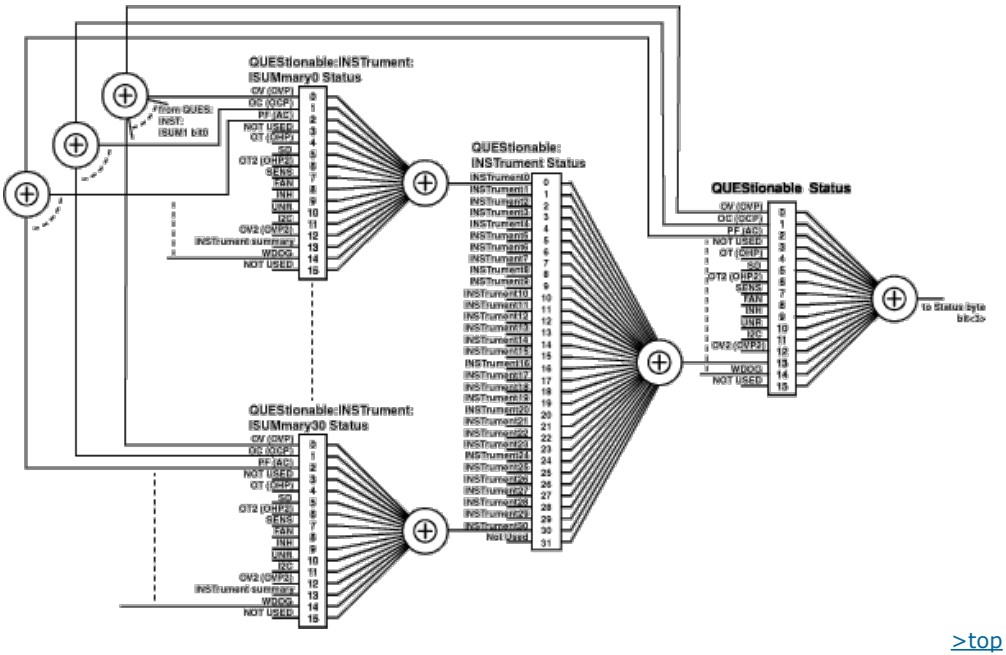
Registers

Status report function

The character "+" represents the logical sum of the register bits.

-> For more details, see the PDF.

The OPERation Status, OPERation:INSTrument Status, and OPERation:INSTrument:ISUMmary Status registers all operate the same way.



>top

Time offset between channels for the GLOB:OUTP command

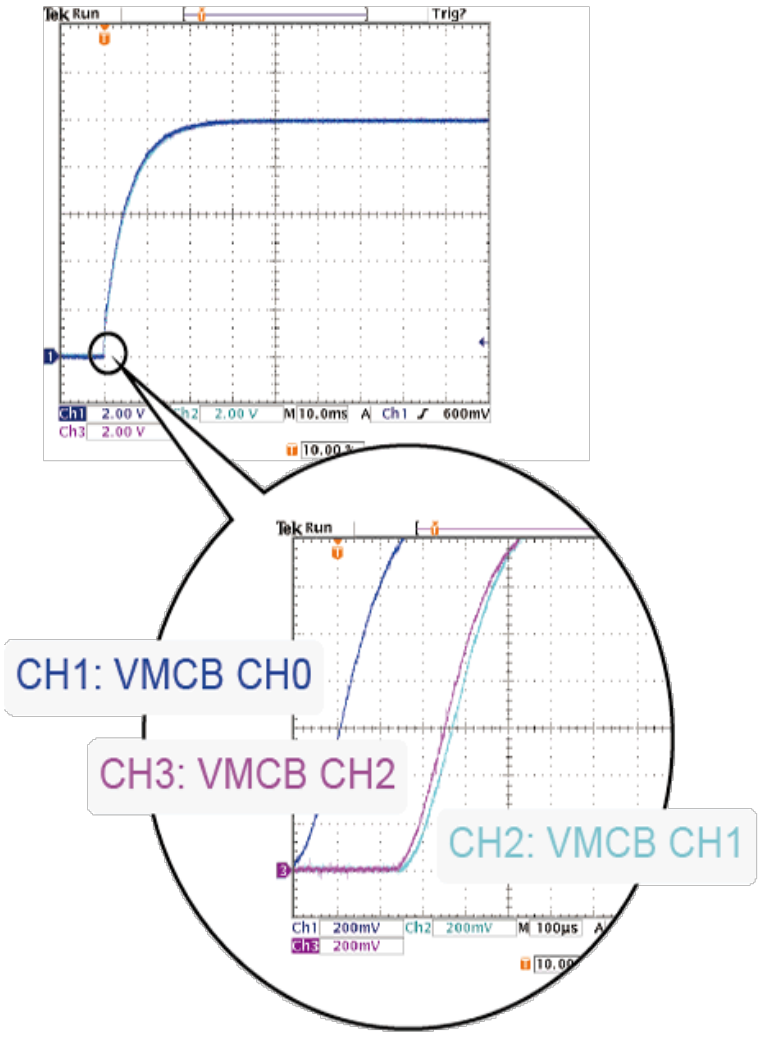
The GLOB:OUTP command turns on/off the output of all configured channels, but they are not turned on/off at the same time. There is a slight time offset between channels.

NOTE

The time offset varies depending on the number of PWX units in the multi-channel configuration and the network conditions.

As a reference, the waveforms are shown for the following measurement environment.

Measurement environment
Software： KI-VISA 5.0.4
PC：CoreDuo 1.66GHz WindowsXP(x86)
Interface: LAN
PWX750MLF: 3 units



OUTP:ISOL

Queries the isolation relay control setting. ON is always returned for the isolation relay control setting.

This command is valid when the emulation is set to DCS (SYST:COMM:EMUL DCS).

Command

```
OUTPut:ISOLation?
```

Response

Returns 1 in response to OUTP:ISOL?.

OUTP:SENS

Queries the sense relay signal setting. ON is always returned for the sense relay signal setting.

This command is valid when the emulation is set to DCS (SYST:COMM:EMUL DCS).

Command

```
OUTPut:SENSe?
```

Response

Returns 1 in response to OUTP:SENS?.

SYST:NET:TERM

Set the return string terminators to be used by the device.

This command is valid when the emulation is set to DCS (SYST:COMM:EMUL DCS).

Command

```
SYSTem:NET:TERM {1|2|3|4}
```

```
SYSTem:NET:TERM?
```

Parameter

Value 1 CR
2 LF (default)
3 CRLF
4 LFCR

Response

Returns the terminator that is being used in NR1 format in response to SYST:NET:TERM?.

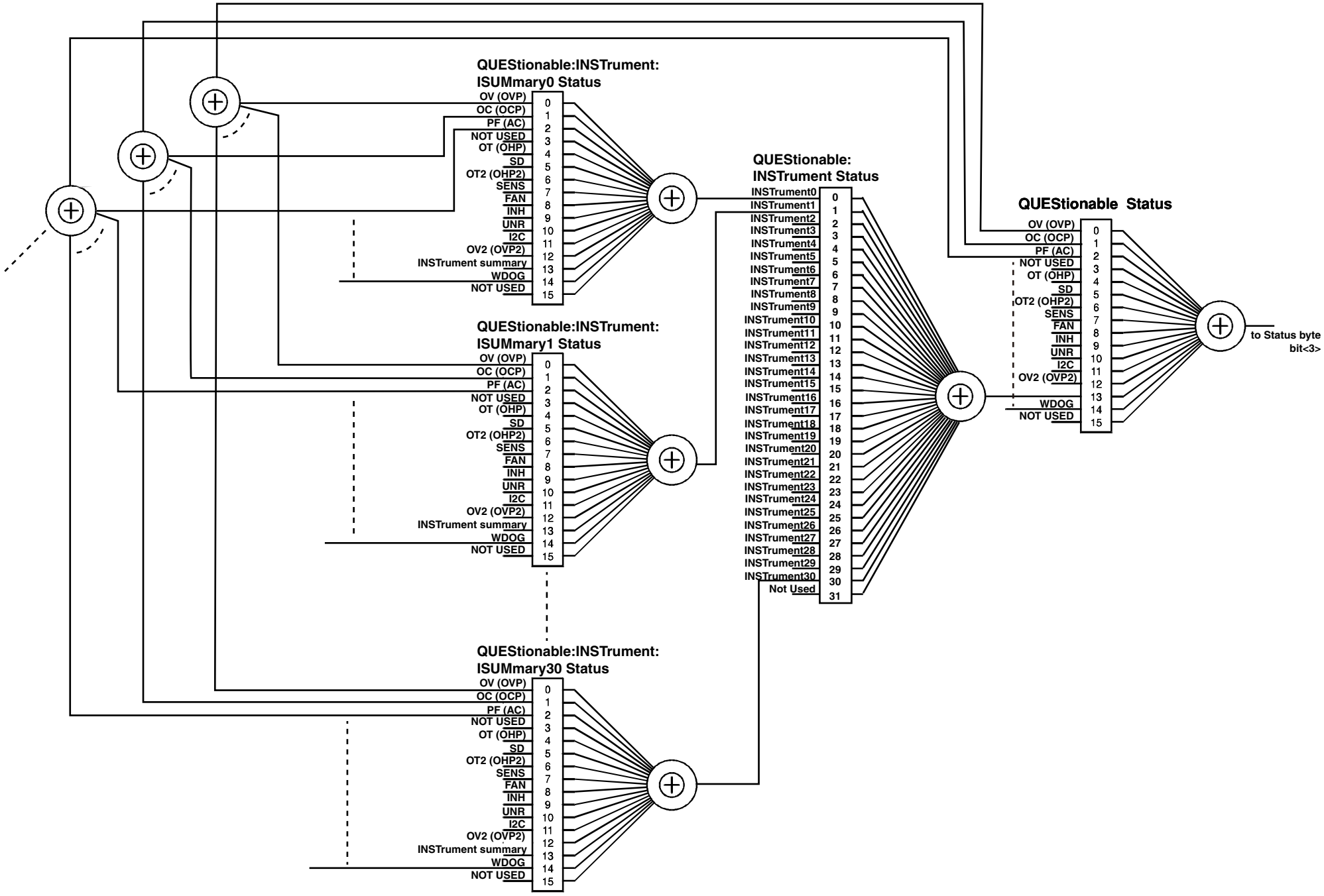
Legacy Languages and Emulation

PWX supports legacy languages. When you need to execute existing programs written for other instruments, for example, you can set the legacy language and emulation settings accordingly. By factory default, the language is set to SCPI (CF21 : SCPi), and emulation is turned off (CF22 : nonE). Normally, you do not need to cange the default settings.

These settings do not guarantee compatibility with all measuring instrument application software and drivers.

When you have selected the SCPI language, you can select to emulate the commands for 1) the N5700/N5800 series made by Agilent Technologies, 2) the Genesys series made by TDK-Lambda, or 3) the PAG series made by Kikusui.

When you have selected the RS232C language, you can select to emulate the commands for non-SCPI operation for 1) the Genesys series made by TDK-Lambda or 2) the PAG series made by Kikusui.


QUEStionable:INSTrument:
ISUMmary0 Status
OV (OVP)
OC (OCP)
PF (AC)
NOT USED
OT (OHP)
SD
OT2 (OHP2)
SENS
FAN
INH
UNR
I2C
OV2 (OVP2)
INSTrument summary
WDOG
NOT USED
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
QUEStionable:INSTrument:
ISUMmary1 Status
OV (OVP)
OC (OCP)
PF (AC)
NOT USED
OT (OHP)
SD
OT2 (OHP2)
SENS
FAN
INH
UNR
I2C
OV2 (OVP2)
INSTrument summary
WDOG
NOT USED
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
QUEStionable:INSTrument:
ISUMmary30 Status
OV (OVP)
OC (OCP)
PF (AC)
NOT USED
OT (OHP)
SD
OT2 (OHP2)
SENS
FAN
INH
UNR
I2C
OV2 (OVP2)
INSTrument summary
WDOG
NOT USED
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
QUEStionable:
INSTrument Status
INSTrument0
INSTrument1
INSTrument2
INSTrument3
INSTrument4
INSTrument5
INSTrument6
INSTrument7
INSTrument8
INSTrument9
INSTrument10
INSTrument11
INSTrument12
INSTrument13
INSTrument14
INSTrument15
INSTrument16
INSTrument17
INSTrument18
INSTrument19
INSTrument20
INSTrument21
INSTrument22
INSTrument23
INSTrument24
INSTrument25
INSTrument26
INSTrument27
INSTrument28
INSTrument29
INSTrument30
Not Used
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
QUEStionable Status
OV (OVP)
OC (OCP)
PF (AC)
NOT USED
OT (OHP)
SD
OT2 (OHP2)
SENS
FAN
INH
UNR
I2C
OV2 (OVP2)
WDOG
NOT USED
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
to Status byte
bit<3>