

# **PFG 5105/5505**

Programmable  
Pulse/Function  
Generator

Reference Guide

## INPUT/OUTPUT CONTROL COMMANDS

**AM ON|OFF**—Enables/disables use of the signal applied to the AM IN connector to amplitude-modulate the main output signal.

**AM?**—Returns the amplitude modulation mode status. Response: AM ON;, or AM OFF;

**FM ON|OFF**—Enables/disables the use of a signal applied to the VCO/FM IN connector to modulate the frequency of the main output signal.

**FM?**—Returns the frequency modulation mode status. Response: FM ON;, or FM OFF;

**OUTput ON|OFF**—Connects/disconnects the main output signal to the front-panel OUTPUT connector.

**OUTput FLOAT**—Disconnects the main output signal from the front panel OUTPUT connector and terminates it into a high impedance (floating).

**OUTput?**—Returns the output signal status (OUT ON;, OUT OFF;, or OUT FLOAT;).

## INSTRUMENT COMMANDS

### STORE/RECALL

**RECall <bufnum>**—Changes the instrument front panel settings to those recalled from the specified settings buffer (*bufnum*). Buffer 0 is a read-only buffer that contains the power-on settings. Buffer numbers: 0 - 99.

**SEND? <bufnum> [, <bufnum> ]...**—Returns the stored settings from the specified buffer(s). Query response: STORE<num> :<binblk> [, <num> :<binblk> ]...;

**SEND? ALL**—Returns the contents of all stored setting locations, beginning with buffer 0. Response: STORE ALL: <binblk> ...<binblk>;

**STORE <bufnum> [:<binblk> [, <bufnum> : <binblk> ]]**...—Saves the current front panel settings in a specified buffer(s) (<bufnum>) for later recall. Buffer 0 is a read-only buffer that contains the power-on settings; attempting to store settings in buffer 0 generates an error. Optionally stores the settings data defined in *binblk* in the specified buffer. <bufnum>: 1 - 99.

**STORE ALL:<binblk> ...<binblk>**—Sequentially stores each front panel setup defined in *binblk* in a settings buffer, beginning with buffer 1.

### FUNCTION

**FUNCTION SINE**—Selects sine waveform for output.

**FUNCTION SQUARE**—Selects the square waveform for output.

**FUNCTION TRIANGLE**—Selects the triangle waveform for output.

**FUNCTION DC**—Selects dc output at the current value of the DC parameter.

**FUNCTION SPULSE**—Selects the single pulse mode.

**FUNCTION DPULSE**—Selects the double pulse mode.

**FUNC?**—Returns the output waveform selection status. Response: FUNC SINE;, FUNC SQUARE;, FUNC TRIANGLE;, FUNC DC;, FUNC SPULSE; or FUNC DPULSE;.

**DC [<volts>]**—Selects dc output at the current value of the DC parameter, or at the level specified by the optional argument.

**DC?**—Returns the current setting of the DC output function. Response: DC <volts>;

### PARAMETER

**AMPLitude <volts>**—Sets the peak-to-peak output voltage (into 50 ohms) to the value specified by the argument.

**AMPL?**—Returns the current output amplitude. Response: AMPL <volts>;

**DISPlay <parameter>**—Changes the display to show the parameter specified in the argument. Parameters: FREQUENCY, AMPLITUDE, OFFSET, WIDTH, FRQ-START, DELAY, FRQSTOP, NBURST, or RATE.

**DISPlay?**—Returns the parameter that is currently shown in the display window. Response: FREQ;, AMPL;, OFFS;, WID;, FRQSTART;, DELAY;, FRQSTOP;, NBUR;, or RATE;

**FREQUENCY <freq> [:<units>]**—Sets the output frequency to the argument value.

**FREQ?**—Returns the current output frequency. Response: FREQ <freq>;

**NBURst [<# cycles>]**—Sets the number of cycles for output in burst mode.

**NBURst?**—Returns the current number of cycles set for the NBURST command. Response: NBURST <# cycles>;

**OFFSet <volts>**—Sets the open-circuit offset voltage to the argument value in volts. Argument 0 turns the offset off.

**OFFSet?**—Returns the current offset setting. Response: OFFS <volts>;

**PERIOD** <period>[:<units>]—Sets the pulse generator output. It is an alias for the frequency parameter.

**PERIOD?**—Returns the current period setting. Response: PERIOD <period>; or PERIOD 0; (Period mode off).

**PRELEVEL** <TTL|CMOS|ECL>—Sets predetermined output levels for TTL, CMOS, or ECL.

**RATE** <rate>[:<units>]—Sets the internal trigger interval. Units: S, MS, US.

**RATE?**—Returns the current internal trigger interval. Response: RATE <rate>;

### TRIGGER MODE

**FRQLck ON|OFF**—Enables/disables internal software control of the output frequency.

**FRQLck?**—Returns the status of the frequency lock mode. Response: FRQL ON;; or FRQL OFF;

**MODE CONT**—Selects continuous output mode.

**MODE TRIG**—Selects triggered output mode.

**MODE BURST**—Selects the burst trigger mode.

**MODE GATED**—Selects the gated trigger mode. Sending <GET> toggles the gate on or off.

**MODE SYNT**—Selects the frequency lock mode (Option 02), with continuous output only.

**MODE?**—Returns mode status. Response: MODE CONT;; MODE TRIG;; MODE BURST;; MODE SYNT;; or MODE GATE;

### TRIGGER SOURCE

**TRIG INT**—Selects the internal trigger as trigger source.

**TRIG EXT**—Selects the external trigger as trigger source.

**TRIG MANual**—Selects the manual trigger function as the trigger source.

**TRIG?**—Returns the trigger source setting. Response: TRIG INT;; TRIG EXT; or TRIG MAN;

### SWEEP FUNCTION

**FRQSTART** <freq>[:<units>]—Sets the sweep start frequency. Default units: Hz.

**FRQSTART?**—Returns the sweep start frequency setting in Hz. Response: FRQSTART <freq>;.

**FRQSTOP** <freq>[:<units>]—Sets the sweep stop frequency in Hz.

**FRQSTOP?**—Returns the stop frequency in Hz. Response: FRQSTOP <freq>;.

**RNGLCK ON|OFF**—Locks or unlocks the frequency range. When RNGLCK ON is executed, the frequency range is locked to the current range and the internal output frequency is set to 0 Hz (or the lowest frequency). Only RNGLCK OFF releases the frequency lock.

**RNGLCK?**—Returns the range lock status. Response: RNGLCK ON;; or RNGLCK OFF;

**SWEEP ON|OFF**—Turns the sweep on. The power-on setting is SWEEP OFF, which disables the sweep operation.

**SWEEP?**—Returns the selected sweep output status. Response: SWEEP ON;; or SWEEP OFF;;.

### PULSE

**DCYCLE** <% duty cycle>|0—Enters duty cycle mode. When a duty cycle of 10-80% is entered, the width will change to maintain the duty cycle as the period varies. Entering a new width parameter causes the instrument to exit duty cycle mode.

**DCYCLE?**—Returns the duty cycle mode status. Response: DCYCLE <% duty cycle>; or DCYCLE 0; (off).

**DELAY** <delay>[:<units>]—Sets the delay time from the trigger point to the first pulse, if the instrument is in single pulse mode; or sets the delay time between the first pulse and the second pulse, in double pulse mode.

**DELAY?**—Returns the value of the delay in seconds. Response: DELAY <delay>;

**WIDTH** <width>[:<units>]—Sets the width of the output pulses. Width value is calculated and set automatically in the duty cycle mode. Setting a new width value terminates the duty cycle mode.

**WIDTH?**—Returns the value of the width in seconds. Response: WID <width>;

### SYSTEM COMMANDS

**DT TRIG**—On receipt of a <GET> interface message, triggers the instrument to output a one-cycle waveform if in TRIG mode, or a burst of cycles if in BURST mode.

**DT GATE**—Toggles the gate setting ON or OFF on receipt of a <GET> interface message when in the MODE GATE trigger mode.

**DT SET**—Causes the instrument to wait for a <GET> interface message before updating the instrument settings.

**DT OFF**—Disables Trigger and Gate <GET> function; no response to <GET>; allows the instrument to update its settings without waiting for <GET>.

**DT?**—Queries the device trigger status. Response: DT GATE;, DT SET;, DT TRIG;, or DT OFF;

**ERRor? or EVENT?**—Returns an error code that matches the last SRQ that was polled with RQS ON, or the oldest error in the error queue if RQS is OFF. ERR 0 (nothing to report) indicates that there are no errors in the error queue. Response: ERR <num>; or EVENT <num>;

**ERRM?**—Returns the error code and the associated text shown in the front panel window that describes the current error. The returned code and text matches the last SRQ that was polled with RQS ON, or the oldest error in the error queue if RQS is OFF. ERR 0 (nothing to report) is returned if there are no errors in the error queue. Response: ERRM <error #>, <error message>;

**HELP?**—Returns all PFG 5105/5505 commands.

**ID?**—Returns the identification of the instrument in the form: ID TEK/<model number>,<Tek Codes and Format version>,<firmware version>,<installed options>;

**INIT**—Returns all settings to the power-on state, except stored settings.

**SET?**—Returns all instrument settings that can be set and queried except stored front panel settings.

**TEST?**—Executes internal checkout routines. Failure produces an error code in the response. A response of 0 indicates that the test was successful; 1 indicates a failure. Response: TEST <num>;

### STATUS COMMANDS

**RQS ON|OFF**—Enables/disables service request operation. If RQS is ON, errors are reported using SRQ at the end of command execution; if OFF, errors are queued until an error query is sent or until RQS is turned back on.

**RQS?**—Returns the RQS status. Response: RQS ON;, or RQS OFF;

**USEReq ON|OFF**—Enables/disables SRQ when the INST ID front panel key is pressed.

**USER?**—Returns the status of the USER REQUEST setting. Response: USER ON;, or USER OFF;

## ERROR QUERY AND STATUS INFORMATION (Bus Reportable)

Description	Error Query Response	Serial Poll Response <sup>a</sup>
<b>Abnormal Events</b>		
NOTHING TO REPORT	0	128 or 136 <sup>b</sup>
<b>Command Errors (100 Series)</b>		
Command header error	101	97 or 113 <sup>b</sup>
Header delimiter error	102	97 or 113
Command argument error	103	97 or 113
Argument delimiter error	104	97 or 113
Missing argument	106	97 or 113
Invalid message unit delimiter	107	97 or 113
Checksum error	108	97 or 113
Bytecount error	109	97 or 113
<b>Execution Errors (200 Series)</b>		
Command not executable in local	201	98 or 114 <sup>b</sup>
Settings lost due to rti	202	98 or 114
Output buffer full	203	98 or 114
Settings conflict	204	98 or 114
Argument out of range	205	98 or 114
<GET> ignored	206	98 or 114
AMPL/OFST conflict	250	98 or 114
Bad set buffer	255	98 or 114
Sweep operation error	261	98 or 114
Synthesizer option not installed	262	98 or 114
Pulse error	263	98 or 114
NBURST count out of range	270	98 or 114
RATE out of range	271	98 or 114
Frequency out of range	273	98 or 114
Amplitude out of range	274	98 or 114
Offset out of range	275	98 or 114
START out of range	276	98 or 114
STOP out of range	277	98 or 114
DC out of range	280	98 or 114
Width out of range	281	98 or 114
Delay out of range	282	98 or 114
Width + delay > (0.9 x period)	283	98 or 114
Period-(Width+delay) <= 40ns	284	98 or 114
Dbl pulse delay ≤ width	285	98 or 114
Dbl pulse delay ≤ width + NI	286	98 or 114
Synt illegal data	290	98 or 114
<b>Internal Errors (300 Series)</b>		
Synthesizer out of lock	350	99 or 115
Save RAM failure	340	99 or 115

### Normal Events

<b>System Events (400 Series)</b>		
Power on	401	65
Operation complete	402	66
User request	403	67
<b>Internal Warnings (600 Series)</b>		
Low battery condition	650	
Output overload	660	
<b>Stored Buffer Errors (800 Series)</b>		
Binary block packet error	801-899	

<sup>a</sup> If the instrument is busy, it returns a decimal number 16 higher than the number listed.  
<sup>b</sup> Busy bit set.



## POWER-ON DEFAULT SETTINGS

AM	OFF	MODE	CONT
AMPLITUDE	5 V	NBURST	2
DC	0 V	OFFSET	0 V
DCYCLE	0	OUTPUT	OFF
DELAY	0	PERIOD	1 ms
DT	OFF	RATE	10 $\mu$ s
FM	OFF	RNGLCK	OFF
FRQLCK	ON	RQS	ON
FRQSTART	1 Hz	SWEEP	OFF
FRQSTOP	1200 Hz	TRIG	MAN
FREQUENCY	1 kHz	USEREQ	OFF
FUNCTION	SINE	WIDTH	0.5 ms

## SPECIAL FUNCTIONS

- 100 Displays the instrument identification.
- 210 Selects period as frequency or time.
- 220 Changes display intensity and turns backlighting on/off.
- 230 Selects the frequency lock mode.
- 240 Changes the GPIB address.
- 241 Changes the GPIB message terminator.
- 260 Range lock mode on/off.
- 270 Downloads demo setting to buffers 90-99.
- 410 Enters duty cycle mode.
- 420 Enters predefined output levels (ECL, TTL, CMOS).
- 510 For use by qualified service personnel only.

## FRONT PANEL ERROR CODES

Error	Description
010	Incorrect syntax
011	Increment step error
012	Increment limit
013	Decrement limit
014	Increment/decrement error
015	SPCL Function/Mode does not exist
016	Mode conflict
020	Not Implemented
204	Settings conflict
205	Out of range
250	AMPL OFST conflict
255	Illegal settings
261	Sweep operation error
262	Synthesizer not installed
271	RATE out of range.
273	FREQ out of range
274	AMPL out of range.
275	OFFSET out of range
280	DC out of range
281	Width out of range
282	Delay out of range
283	Pulse mode. Width+delay > (0.9 x period)
284	Pulse mode. Period - (width+delay) < =40 ns
285	Double pulse. Delay $\leq$ width
286	Double pulse. Delay $\leq$ (width + NI)
290	Synt illegal data
302	System error
350	Synthesizer out of lock
650	Low battery
660	Output overload