

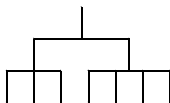
# Agilent 33120A

## Function / Arbitrary Waveform Generator

### Quick Reference Guide

#### Front-Panel Menu Reference

Use *Recall Menu* as a shortcut to recall the last command executed.



#### A: MODulation MENU

1: AM SHAPE ⇒ 2: AM SOURCE ⇒ ••• ⇒ 9: FSK RATE ⇒ 10: FSK SRC

- |               |  |
|---------------|--|
| 1: AM SHAPE   | Selects the shape of the AM modulating waveform.                     |
| 2: AM SOURCE  | Enables or disables the internal AM modulating source.               |
| 3: FM SHAPE   | Selects the shape of the FM modulating waveform.                     |
| 4: BURST CNT  | Sets the number of cycles per burst (1 to 50,000 cycles).            |
| 5: BURST RATE | Sets the burst rate in Hz for an internal burst source.              |
| 6: BURST PHAS | Sets the starting phase angle of a burst (-360 to +360 degrees).     |
| 7: BURST SRC  | Selects an internal or external gate source for burst modulation.    |
| 8: FSK FREQ   | Sets the FSK "hop" frequency.  |
| 9: FSK RATE   | Selects the internal FSK rate between the carrier and FSK frequency. |
| 10: FSK SRC   | Selects an internal or external source for the FSK rate.             |

#### B: SWP (Sweep) MENU

1: START F ⇒ 2: STOP F ⇒ 3: SWP TIME ⇒ 4: SWP MODE

- |             |   |
|-------------|---|
| 1: START F  | Sets the start frequency in Hz for sweeping.      |
| 2: STOP F   | Sets the stop frequency in Hz for sweeping.       |
| 3: SWP TIME | Sets the repetition rate in seconds for sweeping. |
| 4: SWP MODE | Selects linear or logarithmic sweeping.           |

#### C: EDIT MENU \*

1: NEW ARB ⇒ [ 2: POINTS ] ⇒ ••• ⇒ [ 6: SAVE AS ] ⇒ 7: DELETE

- |                   |   |
|-------------------|---|
| 1: NEW ARB        | Initiates a new arb waveform or loads the selected arb waveform.        |
| [ 2: POINTS ]     | Sets the number of points in a new arb waveform (8 to 16,000 points).   |
| [ 3: LINE EDIT ]  | Performs a linear interpolation between two points in the arb waveform. |
| [ 4: POINT EDIT ] | Edits the individual points of the selected arb waveform.               |
| [ 5: INVERT ]     | Inverts the selected arb waveform by changing the sign of each point.   |
| [ 6: SAVE AS ]    | Saves the current arb waveform in non-volatile memory.                  |
| 7: DELETE         | Deletes the selected arb waveform from non-volatile memory.             |

\* The commands enclosed in square brackets ( [ ] ) are "hidden" until you make a selection from the NEW ARB command to initiate a new edit session.

#### D: SYSTEM MENU

1: OUT TERM ⇒ 2: POWER ON ⇒ ••• ⇒ 5: COMMA ⇒ 6: REVISION

- |             |  |
|-------------|--|
| 1: OUT TERM | Selects the output termination (50Ω or high impedance).              |
| 2: POWER ON | Enables or disables automatic power-up in power-down state "0".      |
| 3: ERROR    | Retrieves errors from the error queue (up to 20 errors).             |
| 4: TEST     | Performs a complete self-test.                                       |
| 5: COMMA    | Enables or disables a comma separator between digits on the display. |
| 6: REVISION | Displays the function generator's firmware revision codes.           |

#### E: Input / Output MENU

1: HPIB ADDR ⇒ 2: INTERFACE ⇒ 3: BAUD RATE ⇒ 4: PARITY ⇒ 5: LANGUAGE

- |              |   |
|--------------|---|
| 1: HPIB ADDR | Sets the GPIB bus address (0 to 30).                  |
| 2: INTERFACE | Selects the GPIB or RS-232 interface.                 |
| 3: BAUD RATE | Selects the baud rate for RS-232 operation.           |
| 4: PARITY    | Selects even, odd, or no parity for RS-232 operation. |
| 5: LANGUAGE  | Verifies the interface language: SCPI.                |

#### F: CALibration MENU \*

1: SECURED ⇒ [ 1: UNSECURED ] ⇒ [ 2: CALIBRATE ] ⇒ 3: CAL COUNT ⇒ 4: MESSAGE

- |                  |  |
|------------------|--|
| 1: SECURED       | The function generator is secured against calibration; enter code to unsecure. |
| [ 1: UNSECURED ] | The function generator is unsecured for calibration; enter code to secure.     |
| [ 2: CALIBRATE ] | Performs individual calibrations; must be UNSECURED.                           |
| 3: CAL COUNT     | Reads the total number of times the function generator has been calibrated.    |
| 4: MESSAGE       | Reads the calibration string (up to 11 characters) entered from remote.        |

\* The commands enclosed in square brackets ( [ ] ) are "hidden" unless the function generator is UNSECURED for calibration.



- Square brackets ( [ ] ) indicate optional keywords or parameters.
- Braces ( { } ) enclose parameters within a command string. Default parameters are shown in **bold**.
- Triangle brackets ( < > ) indicate that you must substitute a value for the enclosed parameter.

## The APPLy Commands

(see page 138 in User's Guide)

APPLy

```
:SINusoid [<frequency> [, <amplitude> [, <offset>] ] ]
:SQUare [<frequency> [, <amplitude> [, <offset>] ] ]
:TRIangle [<frequency> [, <amplitude> [, <offset>] ] ]
:RAMP [<frequency> [, <amplitude> [, <offset>] ] ]
:NOISE [<frequency|DEF> [, <amplitude> [, <offset>] ] ]
:DC [<frequency|DEF> [, <amplitude|DEF> [, <offset>] ] ]
:USER [<frequency> [, <amplitude> [, <offset>] ] ]
```

APPLy?

## Output Configuration Commands

(see page 145 in User's Guide)

[SOURCE:]

```
FUNCTION:SHAPE {SIN|SQU|TRI|RAMP|NOIS|DC|USER}
FUNCTION:SHAPE?
```

[SOURCE:]

```
FREQUENCY {<frequency>|MIN|MAX}
FREQUENCY? [MIN|MAX]
```

[SOURCE:]

```
PULSE:DCYCLE {<percent>|MIN|MAX}
PULSE:DCYCLE? [MIN|MAX]
```

[SOURCE:]

```
VOLTage {<amplitude>|MIN|MAX}
VOLTage? [MIN|MAX]
VOLTage:OFFSet {<offset>|MIN|MAX}
VOLTage:OFFSet? [MIN|MAX]
VOLTage:UNIT {VPP|VRMS|DBM|DEF}
VOLTage:UNIT?
```

```
OUTPut:LOAD {50|INF|MIN|MAX}
```

```
OUTPut:LOAD? [MIN|MAX]
```

```
OUTPut:SYNC {OFF|ON}
```

```
OUTPut:SYNC?
```

## Modulation Commands

(see page 154 in User's Guide)

[SOURCE:]

AM:DEPTH {<depth in percent> | MIN | MAX}  
AM:DEPTH? [MIN | MAX]  
AM:INTERNAL:FUNCTION {**SIN** | SQU | TRI | RAMP | NOIS | USER}  
AM:INTERNAL:FUNCTION?  
AM:INTERNAL:FREQUENCY {<frequency> | MIN | MAX}  
AM:INTERNAL:FREQUENCY? [MIN | MAX]  
AM:SOURCE {**BOTH** | EXT}  
AM:SOURCE?  
AM:STATE {OFF | ON}  
AM:STATE?

[SOURCE:]

FM:DEVIATION {<peak deviation in Hz> | MIN | MAX}  
FM:DEVIATION? [MIN | MAX]  
FM:INTERNAL:FUNCTION {**SIN** | SQU | TRI | RAMP | NOIS | USER}  
FM:INTERNAL:FUNCTION?  
FM:INTERNAL:FREQUENCY {<frequency> | MIN | MAX}  
FM:INTERNAL:FREQUENCY? [MIN | MAX]  
FM:STATE {OFF | ON}  
FM:STATE?

[SOURCE:]

BM:NCYCLES {<# cycles> | INF | MIN | MAX}  
BM:NCYCLES? [MIN | MAX]  
BM:PHASE {<degrees> | MIN | MAX}  
BM:PHASE? [MIN | MAX]  
BM:INTERNAL:RATE {<frequency> | MIN | MAX}  
BM:INTERNAL:RATE? [MIN | MAX]  
BM:SOURCE {**INT** | EXT}  
BM:SOURCE?  
BM:STATE {OFF | ON}  
BM:STATE?

## FSK Commands

(see page 167 in User's Guide)

[SOURCE:]

FSKey:FREQUENCY {<frequency> | MIN | MAX}  
FSKey:FREQUENCY? [MIN | MAX]  
FSKey:INTERNAL:RATE {<rate in Hz> | MIN | MAX}  
FSKey:INTERNAL:RATE? [MIN | MAX]  
FSKey:SOURCE {**INT** | EXT}  
FSKey:SOURCE?  
FSKey:STATE {OFF | ON}  
FSKey:STATE?

## Sweep Commands

(see page 170 in User's Guide)

[SOURCE:]

FREQuency:START {<frequency>|MIN|MAX}  
FREQuency:START? [MIN|MAX]  
FREQuency:STOP {<frequency>|MIN|MAX}  
FREQuency:STOP? [MIN|MAX]

[SOURCE:]

SWEep:SPACing {**LIN**|LOG}  
SWEep:SPACing?  
SWEep:TIME {<seconds>|MIN|MAX}  
SWEep:TIME? [MIN|MAX]  
SWEep:STATe {OFF|ON}  
SWEep:STATe?

## Arbitrary Waveform Commands

(see page 174 in User's Guide)

[SOURCE:]

FUNcTION:USER {<arb name>|VOLATILE}  
FUNcTION:USER?  
FUNcTION:SHAPE USER  
FUNcTION:SHAPE?

DATA VOLATILE, <value>, <value>, . . .

DATA:DAC VOLATILE, {<binary block>|<value>, <value>, . . . }

DATA:ATTRibute:AVERAge? [<arb name>]

DATA:ATTRibute:CFACTOR? [<arb name>]

DATA:ATTRibute:POINTs? [<arb name>]

DATA:ATTRibute:PTPeak? [<arb name>]

DATA:CATalog?

DATA:COpy <destination arb name> [, **VOLATILE**]

DATA:DELeTe <arb name>

DATA:DELeTe:ALL

DATA:NVOLatile:CATalog?

DATA:NVOLatile:FREE?

FORMat:BORDER {**NORMAL**|SWAPped} *Specify Byte Order*

FORMat:BORDER?

## System-Related Commands

(see page 188 in User's Guide)

DISPlay {OFF|**ON**}

DISPlay?

DISPlay:TEXT <quoted string>

DISPlay:TEXT?

DISPlay:TEXT:CLear

SYSTem:BEEPer

SYSTem:ERRor?

SYSTem:VERSion?

\*IDN?

\*RST

\*TST?

\*SAV {0|1|2|3}      *State 0 is the power-down state.*

\*RCL {0|1|2|3}      *States 1, 2, and 3 are user-defined.*

MEMory:STATe:DElete {0|1|2|3}

## Triggering Commands

(see page 186 in User's Guide)

TRIGger:SOURce {**IMM**|EXT|BUS}

TRIGger:SOURce?

\*TRG

## Status Reporting Commands

(see page 209 in User's Guide)

SYSTem:ERRor?

\*CLS

\*ESE <enable value>

\*ESE?

\*ESR?

\*OPC

\*OPC?

\*PSC {0|**1**}

\*PSC?

\*SRE <enable value>

\*SRE?

\*STB?

\*WAI

## Calibration Commands

(see page 193 in User's Guide)

CALibration?

CALibration:COUNT?

CALibration

```
:SECure:CODE <new code>
:SECure:STATE {OFF|ON}, <code>
:SECure:STATE?
```

CALibration:SETup <0|1|2|3|...|84>

CALibration:SETup?

CALibration:STRing <quoted string>

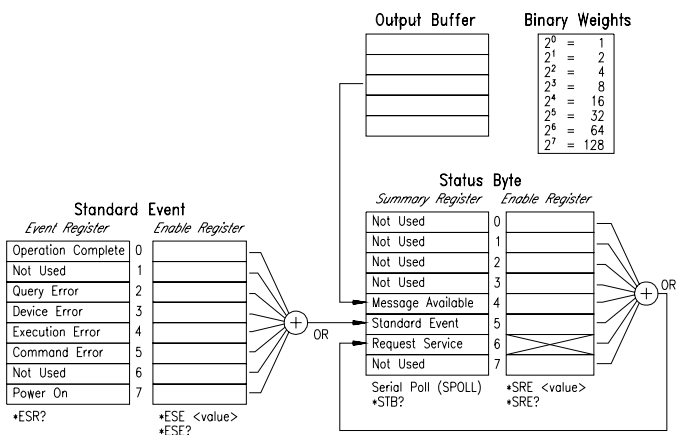
CALibration:STRing?

CALibration:VALue <value>

CALibration:VALue?

## SCPI Status System

(see page 201 in User's Guide)



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## IEEE-488.2 Common Commands

(see page 209 in User's Guide)

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

## RS-232 Interface Commands

(see page 200 in User's Guide)

SYSTem:LOCal

SYSTem:REMOte

SYSTem:RWLock

For RS-232 wiring and connection information,  
see page 195 in the User's Guide.

## Phase-Lock Commands (Option 001)

(see the 33120A Option 001 User's and Service Guide)

PHASe:ADJust <radians>

PHASe:ADJust?

PHASe:REFerence

PHASe:UNLock:ERRor:STATe {OFF|ON}

PHASe:UNLock:ERRor:STATe?

OUTPut:TRIGger:IMMediate

OUTPut:TRIGger:STATe {OFF|ON}

OUTPut:TRIGger:STATe?

## Simplified Programming Overview

### Using the APPLy Command

The APPLy command provides the most straightforward method to program the function generator over the remote interface. For example, the following statement outputs a 3 Vpp sine wave at 5 kHz with a -2.5 volt offset:

```
"APPL:SIN 5 KHZ, 3.0 VPP, -2.5 V"
```

### Using the Low-Level Commands

Although the APPLy commands provide the most straightforward method to program the function generator, the low-level commands give you more flexibility to change individual parameters. For example, the following statements output a 3 Vpp sine wave at 5 kHz with a -2.5 volt offset:

```
"FUNC:SHAP SIN"  
"FREQ 5.0 KHZ"  
"VOLT 3.0 VPP"  
"VOLT:OFFS -2.5 V"
```

### Reading a Query Response

Only the query commands (commands that end with "?") will instruct the function generator to send a response message. Queries return either output values or internal instrument settings. For example, the following statements read the error queue and print the most recent error:

```
dimension statement  
"SYST:ERR?"  
bus enter statement  
print statement
```

### Selecting a Trigger Source

When *burst modulation* or *frequency sweep* is enabled, the function generator will accept an immediate internal trigger, a hardware trigger from the rear-panel *Ext Trig* terminal, or a software (bus) trigger. By default, the internal trigger source is selected. If you want the function generator to use the external source or a bus trigger, you must select that source. For example, the following statements output a 3-cycle burst each time the *Ext Trig* terminal receives the rising edge of a TTL pulse:

```
"BM:NCYC 3"  
"TRIG:SOUR EXT"  
"BM:STAT ON"
```



## Error Messages

*This is a **partial listing** of error messages. See chapter 5 in the User's Guide for more information.*

**-102, "Syntax error"** Check for blank space before or after a colon in command header, or before a comma.

**-103, "Invalid separator"** Check for a comma used instead of a colon, semicolon, or blank space – or a blank instead of a comma.

**-108, "Parameter not allowed"** Check for extra parameters in the command string.

**-109, "Missing parameter"** Check for omitted parameters in the command string.

**-113, "Undefined header"** Check the spelling of the command or you may have used an invalid command.

**-221, "Settings conflict"** The requested setting is in conflict with the present configuration.

**-222, "Data out of range"** Check for a numeric parameter value that is outside the valid range for the command.

**-224, "Illegal parameter value"** Check for an invalid discrete parameter choice for the command.

**-330, "Self-test failed"** The \*TST? command failed.

**-350, "Too many errors"** More than 20 errors have occurred.

**-410, "Query INTERRUPTED"** The output buffer contains data from a previous command (the previous data is not overwritten).

**781, "Not enough memory to store new arb waveform"** Up to four user-defined waveforms can be stored in non-volatile memory. Use DATA:DEL to delete downloaded waveforms.

**783, "Arb waveform name too long"** The arb name can contain up to 8 characters. The first character must be a letter (A-Z), but the remaining characters can be number (0-9) or "\_".

**785, "Specified arb waveform does not exist"** The arb name specified has not been downloaded into VOLATILE memory.

**786, "Cannot delete a built-in arb waveform"** You cannot delete the five built-in arb waveforms.

**787, "Cannot delete the currently selected active arb waveform"** You cannot delete the arb waveform that is currently being output.

## Power-On and Reset State

The parameters marked with a bullet ( • ) are stored in **non-volatile** memory. The factory settings are shown.

### Output Configuration

Function  
 Frequency  
 Amplitude (into 50 ohms)  
 Offset  
 Output Units  
 Output Termination

### Power-On/Reset State

Sine wave  
 1 kHz  
 100 mV peak-to-peak  
 0.00 Vdc  
 Volts peak-to-peak  
 50 ohms

### Modulation

AM Carrier Waveform  
 AM Modulating Waveform  
 AM Depth  
 FM Carrier Waveform  
 FM Modulating Waveform  
 FM Peak Frequency Deviation  
 Burst Carrier Frequency  
 Burst Count  
 Burst Rate  
 Burst Starting Phase  
 FSK Carrier Waveform  
 FSK "Hop" Frequency  
 FSK Rate  
 Modulation State  
 Sweep Start / Stop Frequency  
 Sweep Time  
 Sweep Mode

### Power-On/Reset State

1 kHz Sine wave  
 100 Hz Sine wave  
 100%  
 1 kHz Sine wave  
 10 Hz Sine wave  
 100 Hz  
 1 kHz Sine wave  
 1 cycle  
 100 Hz  
 0 degrees  
 1 kHz Sine wave  
 100 Hz Sine wave  
 10 Hz  
 Off  
 100 Hz / 1 kHz  
 1 second  
 Linear

### System-Related Operations

- Power-Down Recall
- Display Mode
- Comma Separators

### Power-On/Reset State

- Disabled
- On
- On

### Triggering Operations

Trigger Source

### Power-On/Reset State

Internal

### Input/Output Configuration

- GPIB Address
- Interface
- Baud Rate
- Parity

### Power-On/Reset State

- 10
- GPIB (IEEE-488)
- 9600 baud
- None (8 data bits)

### Calibration

Calibration State

### Power-On/Reset State

Secured

**NOTE:** The power-on state will be different if you have enabled the power-down storage mode. See "Power-Down Recall Mode" on page 109 for more information.