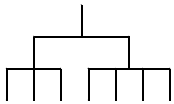
Agilent 33120A

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
```

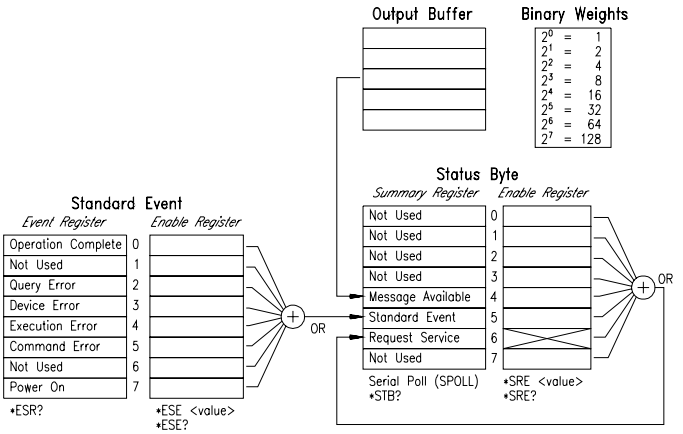
Calibration Commands

(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

*ESE <enable value>
*ESE?

*ESR?

*IDN?

*OPC

*OPC?

*PSC {0|1}
*PSC?

*RST

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

*SRE <enable value>
*SRE?

*STB?

*TRG

*TST?

*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	**Power-On/Reset State**
Function	Sine wave
Frequency	1 kHz
Amplitude (into 50 ohms)	100 mV peak-to-peak
Offset	0.00 Vdc
Output Units	Volts peak-to-peak
Output Termination	50 ohms
Modulation	**Power-On/Reset State**
AM Carrier Waveform	1 kHz Sine wave
AM Modulating Waveform	100 Hz Sine wave
AM Depth	100%
FM Carrier Waveform	1 kHz Sine wave
FM Modulating Waveform	10 Hz Sine wave
FM Peak Frequency Deviation	100 Hz
Burst Carrier Frequency	1 kHz Sine wave
Burst Count	1 cycle
Burst Rate	100 Hz
Burst Starting Phase	0 degrees
FSK Carrier Waveform	1 kHz Sine wave
FSK "Hop" Frequency	100 Hz Sine wave
FSK Rate	10 Hz
Modulation State	Off
Sweep Start / Stop Frequency	100 Hz / 1 kHz
Sweep Time	1 second
Sweep Mode	Linear
System-Related Operations	**Power-On/Reset State**
• Power-Down Recall	• Disabled
Display Mode	On
• Comma Separators	• On
Triggering Operations	**Power-On/Reset State**
Trigger Source	Internal
Input/Output Configuration	**Power-On/Reset State**
• GPIB Address	• 10
• Interface	• GPIB (IEEE-488)
• Baud Rate	• 9600 baud
• Parity	• None (8 data bits)
Calibration	**Power-On/Reset State**
Calibration 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.*