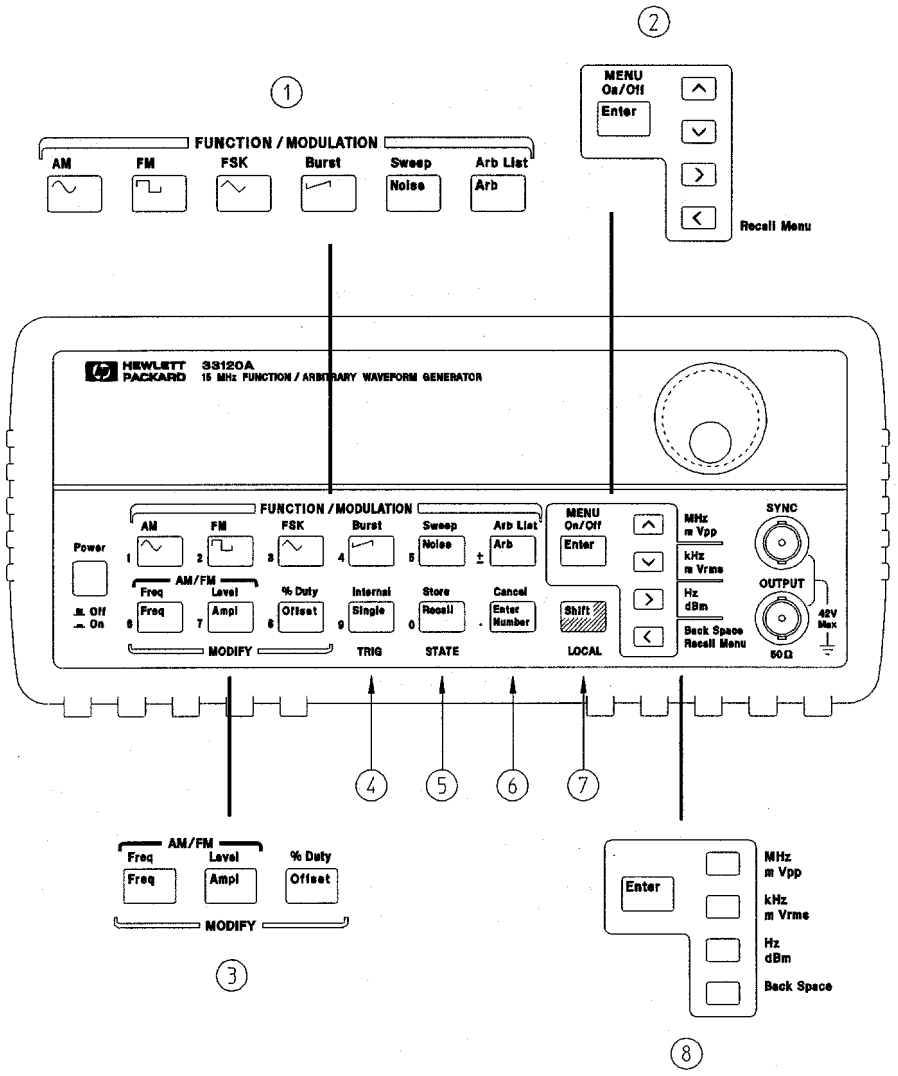
HP33120A Waveform Generator Operating Instructions

The Front Panel at a Glance

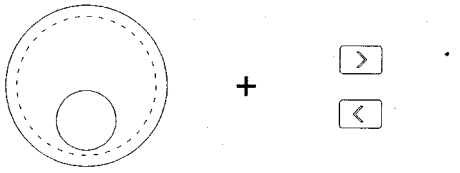


1 Function / Modulation keys
2 Menu operation keys
3 Waveform modify keys
4 Single / Internal Trigger key (*Burst and Sweep only)*
5 Recall / Store instrument state key
6 Enter Number key
7 Shift / Local key
8 Enter Number "units" keys

Front-Panel Number Entry

You can enter numbers from the front-panel using one of three methods.

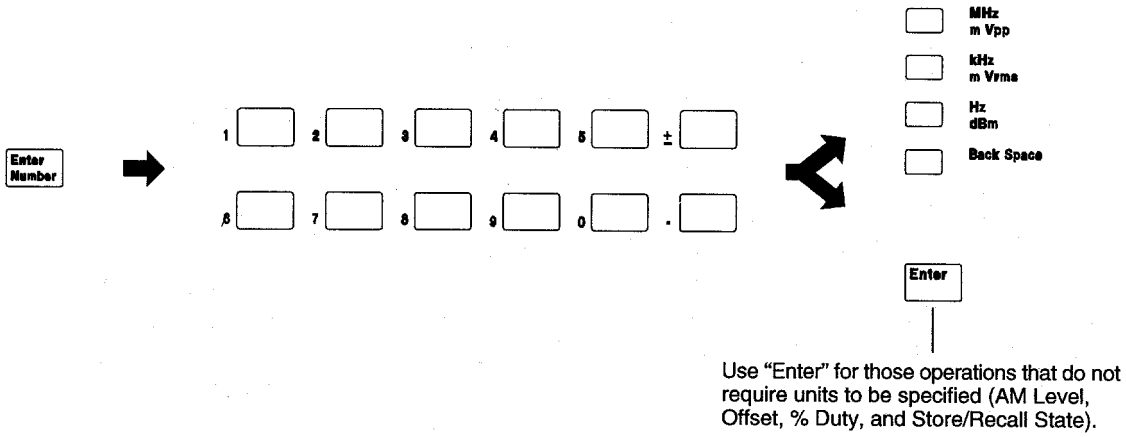
Use the knob and the arrow keys to modify the displayed number.



Use the arrow keys to edit individual digits.

^	**Increments** the flashing digit.
v	**Decrements** the flashing digit.
>	Moves the flashing digit **to the right.**
<	Moves the flashing digit **to the left.**

Use the "Enter Number" mode to enter a number with the appropriate units.



Use "Enter" for those operations that do not require units to be specified (AM Level, Offset, % Duty, and Store/Recall State).

Quick Start

One of the first things you will want to do with your function generator is to become acquainted with its front panel. We have written the exercises in this chapter to prepare the function generator for use and help you get familiar with some of the front-panel operations.

The front panel has two rows of keys to select various functions and operations. Most keys have a *shifted* function printed in *blue* above the key. To perform a shifted function, press [Shift] (the **Shift** annunciator will turn on). Then, press the key that has the desired label above it. For example, to select the AM (amplitude modulation) function, press [Shift] [AM] (the shifted version of the [~] key).

If you accidentally press [Shift], just press it again to turn off the **Shift** annunciator.

Most keys also have a number printed in *green* next to the key. To enable the number mode, press [Enter Number] (the **Num** annunciator will turn on). Then, press the keys that have the desired numbers printed next to them. For example, to select the number "10", press [Enter Number] [1] [0] (next to the [~] and [Recall] keys).

If you accidentally press [Enter Number], just press [Shift] [Cancel] to turn off the **Num** annunciator.

To set the output frequency

To set the output frequency

At power-on, the function generator outputs a sine wave at 1 kHz with an amplitude of 100 mV peak-to-peak (into a 50Ω termination).
The following steps show you how to change the frequency to 1.2 MHz.

Freq

1 Enable the *frequency modify* mode.

The displayed frequency is either the power-on value or the previous frequency selected. When you change functions, the same frequency is used if the present value is valid for the new function.

```
1.000,000,0 KHz
```

Enter Number

1 . 2

2 Enter the magnitude of the desired frequency. [1]

Notice that the **Num** annunciator turns on and "ENTER NUM" flashes on the display, indicating that the number mode is enabled.

```
1.2
```

To cancel the number mode, press Shift Cancel .

^ MHz m Vpp

3 Set the units to the desired value.

The units are selected using the arrow keys on the right side of the front panel. As soon as you select the units, the function generator outputs the waveform with the displayed frequency. *To turn off the flashing digit, move the cursor to the left of the display using the arrow keys.*

```
1.200,000,0 MHz
```

[1] *You can also use the knob and arrow keys to enter a number.*
See "Front-Panel Number Entry" on page 3 for more information.

To set the output amplitude

To set the output amplitude

At power-on, the function generator outputs a sine wave with an amplitude of 100 mV peak-to-peak (into a 50Ω termination).
The following steps show you how to change the amplitude to 50 mVrms.

Ampl

1 Enable the *amplitude modify* mode.

The displayed amplitude is either the power-on value or the previous amplitude selected. When you change functions, the same amplitude is used if the present value is valid for the new function.

```
100.0   mVPP
```

Enter Number

5 0

2 Enter the magnitude of the desired amplitude. [1]

Notice that the **Num** annunciator turns on and "ENTER NUM" flashes on the display, indicating that the number mode is enabled.

```
50
```

To cancel the number mode, press Shift Cancel .

Shift

v kHz m Vrms

3 Set the units to the desired value.

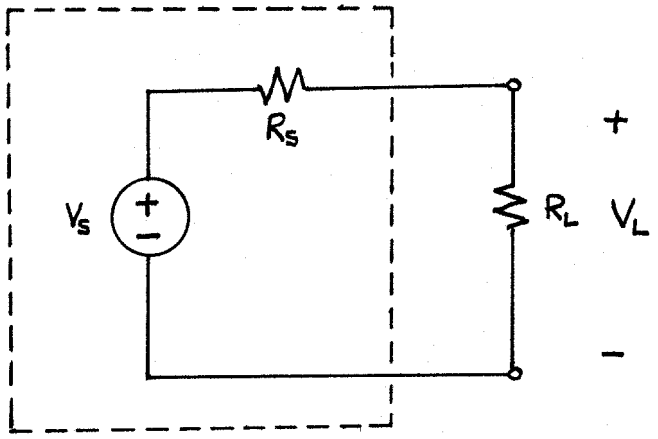
The units are selected using the arrow keys on the right side of the front panel. As soon as you select the units, the function generator outputs the waveform with the displayed amplitude. *To turn off the flashing digit, move the cursor to the left of the display using the arrow keys.*

```
50.00   mVRMS
```

[1] *You can also use the knob and arrow keys to enter a number.*
See "Front-Panel Number Entry" on page 3 for more information.

Output Amplitude Display

In order to interpret the displayed value of the output amplitude, it is necessary to understand the output stage of the function genator. The equivalent circuit for the output stage is:



The internal resistance R_s is 50 Ω. In the default state of the function generator, it is assumed that the termination, or load resistance R_L is also 50 Ω. From the voltage divider relationship, the load voltage $V_L = V_s/2$. The displayed voltage V_D is $V_s/2$ and thus, $V_D = V_L$.

If the output termination is an open circuit ($R_L \rightarrow \infty$), then $V_L = V_s$. The displayed voltage V_D is still $V_s/2$, but in this case, $V_D = 2V_L$. Thus, the displayed voltage is the same as the load voltage for a 50Ω termination, but the displayed voltage is twice the load voltage for an open circuit termination. As a user of the generator, you are usually most interested in the load voltage, so you must be aware that the displayed voltage is not the load voltage for an open circuit termination.

To further confuse matters, it is possible to change the state of the function generator through menu commands (not documented here), so that the displayed voltage V_D is V_s. In this case, $V_D = 2V_L$ for a 50Ω termination and $V_D = V_L$ for an open circuit termination. Thus, each time you use the function generator, you should note your termination resistance, connect the output to the oscillosope, and compare the displayed output amplitude with the oscilloscope display.

To set a dc offset voltage

To set a dc offset voltage

At power-on, the function generator outputs a sine wave with a dc offset voltage of 0 volts (into a 50Ω termination). *The following steps show you how to change the offset to –1.5 mVdc.*

Offset

1 Enable the *offset modify* mode.

The displayed offset voltage is either the power-on value or the previous offset selected. When you change functions, the same offset is used if the present value is valid for the new function.

```
+0.000    VDC
```

Enter Number

± 1 . 5

2 Enter the magnitude of the desired offset. [1]

Notice that the **Num** annunciator turns on and "ENTER NUM" flashes on the display, indicating that the number mode is enabled. Notice that ± toggles the displayed value between **+** and **–**.

```
-1.5
```

To cancel the number mode, press Shift Cancel .

Shift

∨ kHz m Vrms

3 Set the units to the desired value.

At this point, the function generator outputs the waveform with the displayed offset. Notice that the **Offset** annunciator turns on, indicating that the waveform is being output with an offset. The annunciator will turn on when the offset is any value other than 0 volts. *To turn off the flashing digit, move the cursor to the left of the display using the arrow keys.*

```
-01.50    mVDC
```

[1] *You can also use the knob and arrow keys to enter a number.*
See "Front-Panel Number Entry" on page 3 for more information.

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**
• HP-IB Address	• 10
• Interface	• HP-IB (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 recall mode. See "Power-Down Recall Mode" for more information.