任意波形信号发生器

AFG-3000 系列

使用手册

固纬料号 NO.

ISO-9001 认证企业

GW INSTEK

2010.10

本手册所含资料在印制之前已经过校正，但因固纬电子实业股份有限公司不断改善产品，所以保留未来修改产品规格、特性以及保养维修程序的权利，不必事前通知。

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台湾台北县土城市中兴路 7-1 号

目录

安全说明

本章节包含操作和存储信号发生器时必须遵照的重要安全说明。在操作前请详细阅读以下内容，确保安全和最佳化的使用。

安全符号

这些安全符号会出现在本使用手册或 AFG-3000 上。

 警告	警告：产品在某一特定情况下或实际应用中可能对人体造成伤害或危及生命
 注意	注意：产品在某一特定情况下或实际应用中可能对产品本身或其它产品造成损坏
	高压危险
	注意: 请参考使用手册
	保护导体端子
	接地端子
	表面高温危险
	双层绝缘

勿将电子设备作为未分类的市政废弃物处理。请单独收集处理或联系设备供应商

安全指南

通常 注意	• 勿将重物置于仪器上 • 勿将易燃物置于仪器上 • 避免严重撞击或不当放置而损坏仪器 • 避免静电释放至仪器 • 请使用匹配的连接线，切不可用裸线连接 • 若非专业技术人员，请勿自行拆装仪器 (测量等级) EN 61010-1:2001 规定了如下测量等级，AFG-3000系列属于等级II。 • 测量等级 IV：测量低电压设备电源 • 测量等级 III：测量建筑设备 • 测量等级 II： 测量直接连接到低电压设备的电路 • 测量等级 I： 测量未直接连接电源的电路
电源 警告	• 交流输入电压: 100 ~ 240V AC, 50 ~ 60Hz • 将交流电源插座的保护接地端子接地，避免电击触电
保险丝 警告	• 保险丝类型: T0.63A/250V • 请专业技术人员更换保险丝 • 请更换指定类型和额定值的保险丝 • 更换前请断开电源插座和所有测试导线 • 更换前请查明保险丝的熔断原因
清洁仪器	• 清洁前先切断电源 • 以中性洗涤剂和清水沾湿软布擦拭仪器。不要直接将任何液体喷洒到仪器上 • 不要使用含苯，甲苯，二甲苯和丙酮等烈性物质的化学药品或清洁剂

操作环境	• 地点: 室内，避免阳光直射，无灰尘，无导电污染(下注)，避免强磁场 • 相对湿度: < 80% • 海拔: < 2000m • 温度: 0°C~40°C (污染等级) EN 61010-1:2001 规定了如下污染程度。AFG-3000 系列属于等级 2。 污染指“可能引起绝缘强度或表面电阻率降低的外界物质，固体，液体或气体(电离气体)”。 • 污染等级 1：无污染或仅干燥，存在非导电污染，污染无影响 • 污染等级 2：通常只存在非导电污染，偶尔存在由凝结物引起的短暂导电 • 污染等级 3：存在导电污染或由于凝结原因使干燥的非导电性污染变成导电性污染。此种情况下，设备通常处于避免阳光直射和充分风压条件下，但温度和湿度未受控制
存储环境	• 地点: 室内 • 相对湿度: < 70% • 温度: -10°C~70°C
处理 	勿将电子设备作为未分类的市政废弃物处理。请单独收集处理或联系设备供应商。请务必妥善处理丢弃的电子废弃物，减少对环境的影响

英制电源线

在英国使用信号发生器时，确保电源线符合以下安全说明。

注意: 导线/设备连接必须由专业人员操作

警告: 此装置必须接地

重要: 导线颜色应与下述规则保持一致:

绿色/黄色:	接地
蓝色:	零线
棕色:	火线(相线)

导线颜色可能与插头/仪器中所标识的略有差异，请遵循如下操作:

颜色为绿色/黄色的线需与标有字母“E”，或接地标志⏚，或颜色为绿色/黄绿色的接地端子相连；

颜色为蓝色的线需与标有字母“N”，或颜色为蓝色或黑色的端子相连；

颜色为棕色的线需与标有字母“L”或“P”，或者颜色为棕色或红色的端子相连；

若有疑问，请参照本仪器提供的用法说明或与经销商联系。

电缆/仪器需有符和额定值和规格的HBC保险丝保护：保险丝额定值请参照仪器说明或使用手册。如: 0.75mm^{2}的电缆需要 3A或 5A的保险丝。保险丝型号与连接方法有关，再大的导体通常应使用 13A保险丝。

在移动保险丝或保险丝座时连接器定会被损坏，然而将带有裸线的插头插入火线插座是非常危险的。若需重复连接，必须严格按照本手册说明操作。

产品介绍

本章节介绍了信号发生器的主要特点、外观、设置过程和开机。

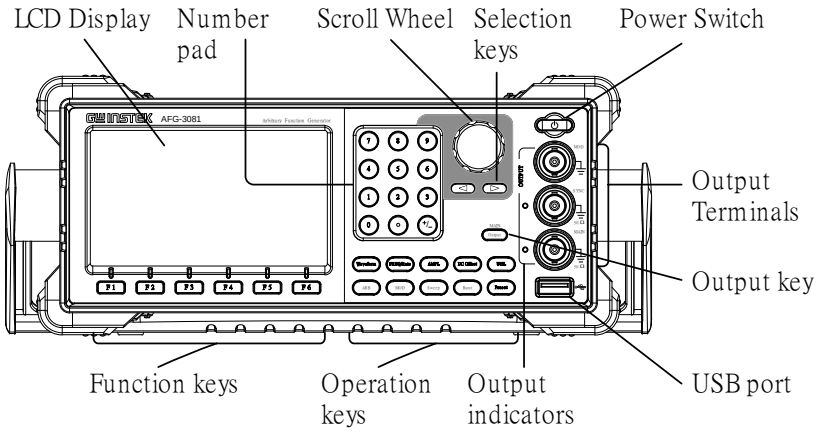
主要特点

型号	频宽
AFG-3081	80MHz
AFG-3051	50MHz
性能	• DDS 信号发生器系列 • 全频段 1μHz 高频分辨率 • 1ppm 频率稳定度 • 任意波形能力 • 200 MSa/s 采样率 • 100 MSa/s 重复率 • 1 M 点波形长度 • 16 位幅值分辨率 • 10 组 1M 的波形存储器 • 显示真实波形输出 • 用户定义输出部分 • 用户定义标记输出部分 • DWR(直接波形重建)能力 • 无需 PC 就可编辑波形 • 可选的 N 次循环和无限次输出模式 • -60dBc 低失真正弦波
特点	• 正弦波, 方波, 斜波, 脉冲波, 噪声波, Sinc 标准波形

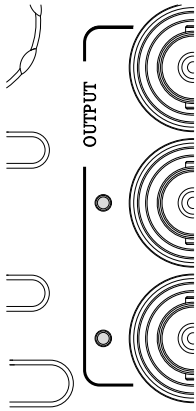
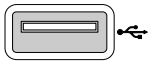
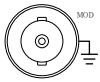
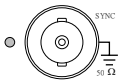
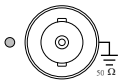
	• 内部和外部 LIN/LOG 扫描，带标记输出 • 内部/外部 AM, FM, PWM, FSK 调制 • 调制/扫描信号输出 • 内部和外部触发的脉冲串信号，无标记输出 • 存储/调取 10 组设置存储器 • 输出过载保护
接口	• GPIB, RS232, USB 标准接口 • 4.3’’彩色 TFT LCD (480 × 272)用户界面 • AWES (任意波形编辑软件) PC 软件

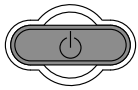
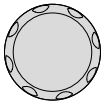
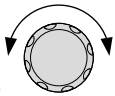
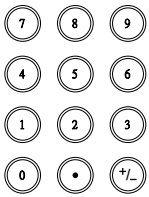
面板介绍

前面板

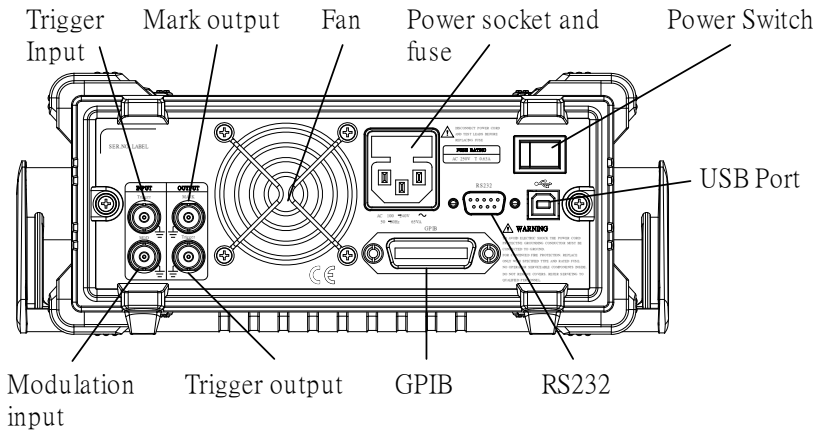


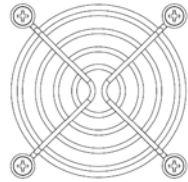
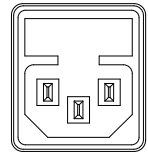
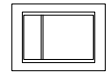
LCD 显示	TFT 彩色 LCD 显示, 480 x 272 分辨率	
功能键: F1~F6	F1	位于 LCD 屏的底部，用于功能激活
操作键	Waveform	用于选择波形类型
	FREQ/Rate	用于设置频率或采样率
	AMPL	用于设置波形幅值
	DC Offset	设置直流偏置
	UTIL	用于进入存储和调取选项、设置远程接口(USB, GPIB, RS232)、使用 DSO 连接、更新和查阅固件版本、 进入校正选项、输出阻抗设置、设置语言和进入帮助菜单

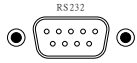
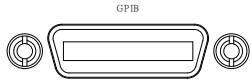
		用于设置任意波形参数
		MOD, Sweep 和 Burst 键用于设置调制、扫描和脉冲串选项和参数
		
		
复位键		用于调取预设状态
输出键		用于打开或关闭波形输出
输出指示灯		当输出指示灯变绿，输出激活
USB host 接口		用于存储、还原波形数据和图像，以及更新固件
输出端子		调制输出端子
		SYNC 输出端子。50Ω 输出阻抗。
		主输出端子。50Ω 输出阻抗。

待机键		使信号发生器处于开机(绿色)或待机模式(红色)
方向键		当编辑参数时，可用于选择数字
可调旋钮		用于编辑值和参数  减小 增加
数字键盘		用于键入值和参数，常与方向键和可调旋钮一起使用

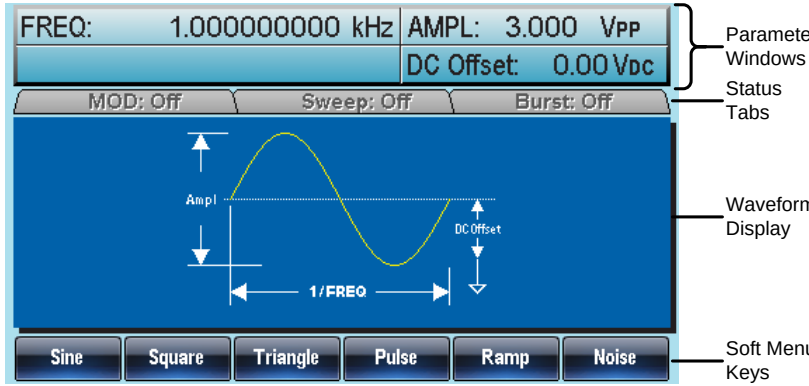
后面板



触发输入		外部触发输入。用于接收外部触发信号
MARK 输出		标记输出信号。仅用于扫描和 ARB 模式
风扇		风扇
电源插座 输入和保险丝		电源输入: 100~240V AC 50~60Hz. 保险丝: T0.63A/250V 有关保险丝的更换部分，详见 290 页
电源开关		主电源开关

USB 接口		Mini-B 类 USB 接口用于连接 PC 机和远程控制
RS232 接口		9 针母头 RS232 插孔用于 PC 远程控制
GPIB		24 针母头 GPIB 接口用于 PC 远程控制
触发输出		触发输出端子
MOD 输入		调制输入端子

显示



参数窗口	参数显示和编辑窗口
状态菜单	显示调制、扫描和脉冲串模式的状态
波形显示	用于显示波形
软菜单键	功能键(F1~F6)与下方的软菜单键对应

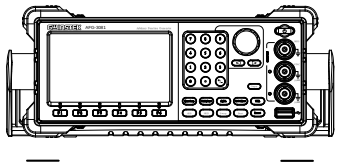
设置信号发生器

背景

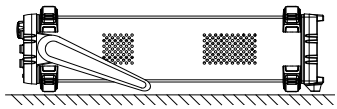
本章节介绍了如何调整信号发生器的把手以及如何开机。

调整把手

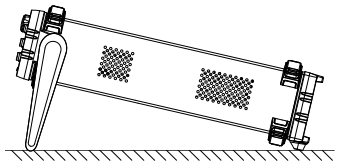
将把手拉至侧面并旋转



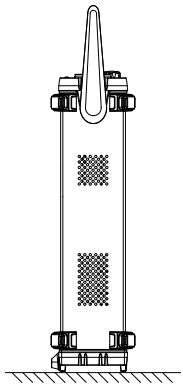
水平放置 AFG



或倾斜放置



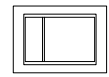
手把垂直放置以方便手提



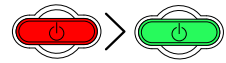
开机

1. 将电源线接入后面板插座

2. 打开位于后面板的电源开关



3. 按下前面板的待机键打开仪器，待机键将由红(待机)转绿(打开)



待机　　打开

4. 当待机键为绿色时，屏幕显示载入状态

此时，信号发生器已经可以使用。

快速操作

本章节介绍了 AFG-3000 的快捷方式、内置帮助和默认出厂设置，方便用户快速入门。有关参数、设置和限制的详细内容，参见操作章节(**錯誤! 尚未定義書籤。**页)或规格(291 页)。

如何使用数字输入

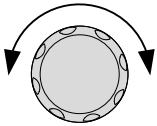
背景

AFG-3000 有三类主要的数字输入: 数字键盘, 方向键和可调旋钮。下面将为您介绍如何使用数字输入编辑参数。

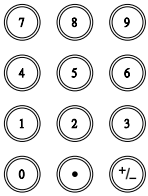
1. 按(F1~F6)对应功能键选择菜单项。例如，功能键 F1 对应软键“Sine”

2. 使用方向键将光标移至需要编辑的数字

3. 使用可调旋钮编辑数字。顺时针增大，逆时针减小



4. 数字键盘用于设置高光处的参数值



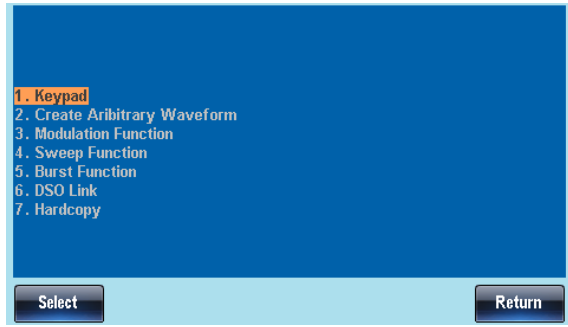
如何使用帮助菜单

背景 帮助菜单详细描述了每个键的含义和它的功能

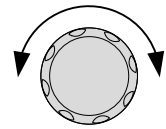
1. 按 UTIL

2. 按 System (F5)

3. 按 Help (F3)



4. 可调旋钮用于导航帮助菜单。按 Select 选择该项

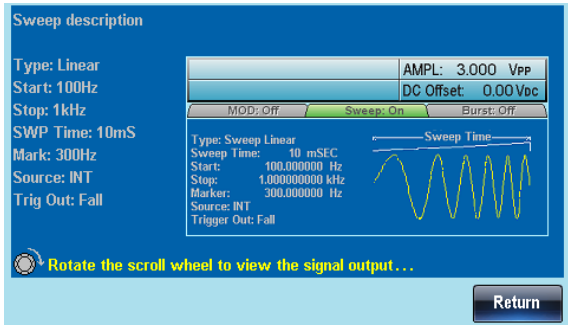


Keypad	用于解释任一前面板键
Create Arbitrary Waveform	解释如何创建任意波形
Modulation Function	解释如何创建调制波形
Sweep Function	解释扫描功能

Burst Function	解释脉冲串功能
DSO Link	提供 DSO 连接
Hardcopy	解释如何使用硬拷贝功能

5. 例如，选择项目 4 可以查看扫描功能

6. 可调旋钮用于导航帮助页面



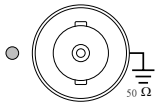
7. 按 F6 返回上级菜单

选择波形

方波

例子: 方波, 3Vpp, 75%占空比, 1 kHz

输出



输入: N/A

1. 按 Waveform 键, 选择 Square (F2)

2. 分别按(F1), 7 + 5 + %(F5)

3. 分别按 Freq/Rate, 1 + kHz (F5)

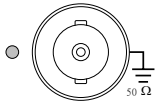
4. 分别按 AMPL, 3 + VPP (F6)

5. 按 Output 键

三角波

例子: 三角波, 5Vpp,10kHz

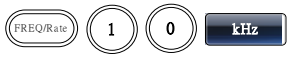
输出



输入: N/A

1. 按 Waveform 键, 选择 Triangle (F3)

2. 分别按 Freq/Rate 键, 1 + 0 + kHz (F5)



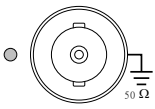
3. 分别按 AMPL 键, 5 +VPP (F6)

4. 按 Output 键

正弦波

例子: 正弦波, 10Vpp,100kHz

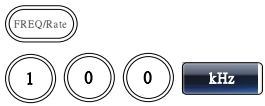
输出



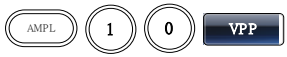
输入: N/A

1. 按 Waveform 键, 选择 Sine (F1)

2. 分别按 Freq/Rate 键, 1 + 0 +0 + kHz (F5)



3. 分别按 AMPL 键, 1 + 0 +VPP (F6)



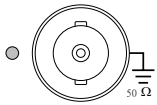
4. 按 Output 键

调制

AM

例子: AM 调制. 100Hz 调制方波. 1kHz 正弦载波. 80%调制深度

输出



输入: N/A

1. 按 MOD 键, 选择 AM (F1)

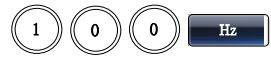
2. 按 Waveform, 选择 Sine (F1)

3. 分别按 Freq/Rate 键, 1 + kHz (F5)

4. 按 MOD 键, 选择 AM (F1), Shape (F4), Square (F2)

5. 按 MOD 键, 选择 AM (F1), AM Freq (F3)

6. 按 1 + 0 + 0 + Hz (F2)



7. 按 MOD 键, 选择 AM (F1), Depth (F2)

8. 按 8 + 0 + % (F1)

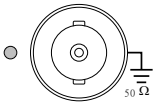
9. 按 MOD, AM (F1), Source (F1), INT (F1)

10. 按 Output 键 

FM

例子: FM 调制. 100Hz 调制方波, 1kHz 正弦载波, 100 Hz 频移, 内部源

输出



1. 按 MOD 键, 选择 FM (F2) 

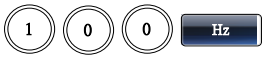
2. 按 Waveform, 选择 Sine (F1) 

输入: N/A

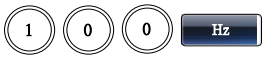
3. 分别按 Freq/Rate 键, 1 + kHz (F5) 

4. 按 MOD 键, 选择 FM (F2), Shape (F4), Square (F2) 

5. 按 MOD 键, 选择 FM (F2), FM Freq (F3) 

6. 按 1 + 0 + 0 + Hz (F2) 

7. 按 MOD 键, 选择 FM (F2), Freq Dev (F2) 

8. 按 1 + 0 + 0 + Hz (F3) 

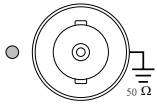
9. 按 MOD, FM (F2), Source (F1), INT (F1) 

10. 按 Output 键 

FSK 调制

例子: FSK 调制, 100Hz 跳跃频率, 1kHz 载波, 三角波, 10 Hz 频率, 内部源

输出



输入: N/A

1. 按 MOD 键, 选择 FSK (F3) 

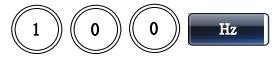
2. 按 Waveform, 选择 Triangle (F3) 

3. 分别按 Freq/Rate 键, 1 + kHz (F5) 

4. 按 MOD 键, 选择 FSK (F3), FSK Rate (F3) 

5. 按 1 + 0 + Hz (F2) 

6. 按 MOD 键, 选择 FSK (F3), Hop Freq (F2) 

7. 按 1 + 0 + 0 + Hz (F3) 

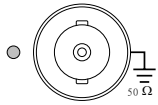
8. 按 MOD, FSK (F3), Source (F1), INT (F1) 

9. 按 Output 键 

PWM 调制

例子: PWM 调制, 800Hz 载波, 15 kHz 调制正弦波, 50%占空比, 内部源

输出

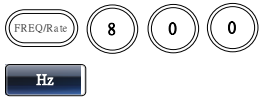


输入: N/A

1. 按 Waveform, 选择 Square (F2)

2. 按 MOD 键, 选择 PWM (F4)

3. 分别按 Freq/Rate 键, 8 + 0 + 0 + Hz (F4)



4. 按 MOD 键, 选择 PWM (F4), Shape (F4), Sine (F1)

5. 按 MOD 键, PWM (F4), PWM Freq (F3)

6. 按 1 + 5 + kHz (F3)

7. 按 MOD, PWM (F4), Duty (F2)

8. 按 5 + 0 + % (F1)

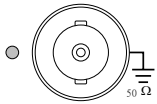
9. 按 MOD, PWM (F4), Source (F1), INT (F1)

10. 按 Output 键

扫描

例子: 频率扫描. 起始频率 10mHz, 截止频率 1MHz. Log 扫描, 1 s 扫描, 标记频率 550 Hz, 手动触发, 上升沿触发

输出



输入: N/A

1. 按 Sweep, Start (F3)

2. 按 1 + 0 + mHz (F2)

3. 按 Sweep, Stop (F4)

4. 按 1 + MHz (F5)

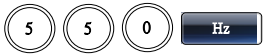
5. 按 Sweep, Type (F2), Log (F2)

6. 按 Sweep, SWP Time (F5)

7. 按 1 + SEC (F2)

8. 按 Sweep, More (F6), Marker (F3), ON/OFF (F2), Freq (F1)

9. 按 5 + 5 + 0 + Hz (F3)



10. 按 Sweep, More (F6), TRIG out (F4), ON/OFF (F3), Rise (F1)

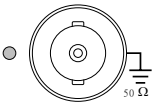
11. 按 Output 键 

12. 按 Sweep, Source (F1), Manual (F3), Trigger (F1) 

脉冲串

例子: 脉冲串模式, N 次循环(内部触发), 1kHz 脉冲串频率, 脉冲串数= 5, 10 ms 脉冲串周期, 0˚脉冲串相位, 内部触发, 10 us 延迟, 上升沿触发

输出



输入: N/A

1. 按 FREQ/Rate 1 kHz (F5) 

2. 按 Burst, N Cycle (F1), Cycles (F1) 

3. 按 5 + Cyc (F5) 

4. 按 Burst, N Cycle (F1), Period (F4) 

5. 按 1 +0 + msec (F2) 

6. 按 Burst, N Cycle (F1), Phase (F3) 

7. 按 0 + Degree (F5) 

8. 按 Burst, N Cycle (F1), TRIG Setup (F5), INT (F1) 

9. 按 Burst, N Cycle (F1), TRIG Setup (F5), Delay (F4)

10. 按 1 + 0 + uSEC (F2)

11. 按 Burst, N Cycle (F1), TRIG Setup (F5), TRIG out (F5), ON/OFF (F3), Rise (F1)

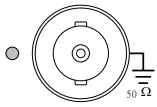
12. 按 Output 键

ARB

ARB–增加内置波形

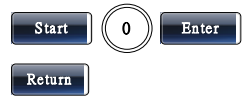
例子: ARB 模式, 上升指数函数. Start 0, Length 100, Scale 32767

输出

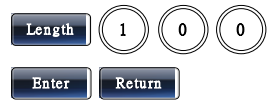


1. 按 ARB, Built in (F3), More (F5), Exp Rise (F1)

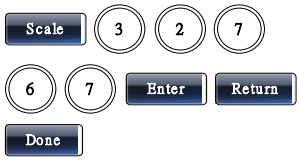
2. 按 Start (F1), 0 + Enter (F5), Return (F6)



3. 按 Length (F2), 100, Enter (F5), Return (F6)



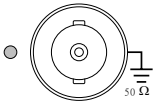
4. 按 Scale (F3), 32767, Enter (F5), Return (F6), Done (F4)



ARB–增加内置波形-脉冲

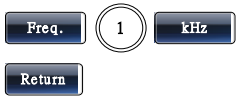
例子: ARB 模式, 脉冲波. Start 0, 频率 1kHz, 占空比 25%

输出



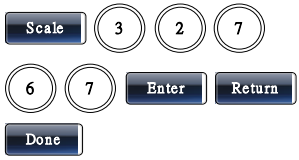
5. 按 ARB, Built in (F3), More (F5), Exp Rise (F1)

6. 按 Freq.(F1),1, kHz (F5), Return (F6)



7. 按 Duty (F2), 25, %(F5), Return (F6)

8. 按 Scale (F3), 32767, Enter (F5), Return (F6), Done (F4)

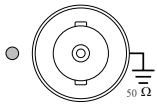


ARB-增加点

例子: ARB 模式, 增加点, 地址 40, 数据 30,000

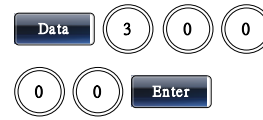
输出

1. 按 ARB, Edit (F2), Point (F1), Address (F1)



2. 按 4 + 0 + Enter (F5), Return (F6)

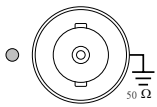
3. 按 Data (F2), 3+0+0+0+0, Enter (F5)



ARB-增加线

例子: ARB 模式, 增加线, 地址: 数据(10:30, 50:100)

输出



1. 按 ARB, Edit (F2), Line (F2), Start ADD (F1)

2. 按 1 + 0 + Enter (F5), Return (F6)

3. 按 Start Data (F2), 3 + 0, Enter (F5), Return (F6)

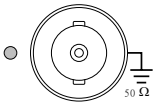
4. 按 Stop ADD (F3), 5 + 0, Enter (F5), Return (F6)

5. 按 Stop Data (F4), 1 + 0 + 0, Enter (F5), Return (F6), Done (F5)

ARB–输出部分

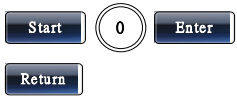
例子: ARB 模式, 输出 ARB 波形, Start 0, Length 1000

輸出



1. 按 ARB, Output (F6)

2. 按 Start (F1), 0 + Enter (F5), Return (F6)

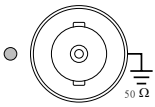


3. 按 Length (F2), 1 + 0 + 0, Enter (F5), Return (F6)

ARB–输出 N 次循环

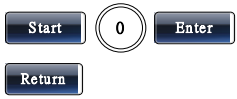
例子: ARB 模式, 输出 N 次循环, Start 0, Length 1000, N 次, 10

輸出

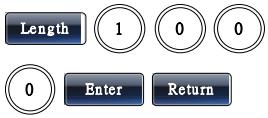


1. 按 ARB, Output (F6)

2. 按 Start (F1), 0 + Enter (F5), Return (F6)



3. 按 Length (F2), 1 + 0 + 0, Enter (F5), Return (F6)



4. 按 N Cycle (F4)

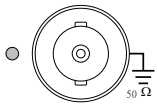
5. 按 Cycles (F1), 1 + 0

6. 按 Trigger (F5)，触发一次输出

ARB–输出无限次循环

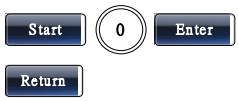
例子: ARB 模式, 输出 N 次循环, Start 0, Length 1000, 循环无限次

输出

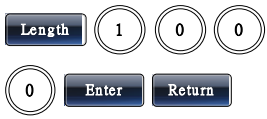


1. 按 ARB, Output (F6)

2. 按 Start (F1), 0 + Enter (F5), Return (F6)



3. 按 Length (F2), 1 + 0 + 0, Enter (F5), Return (F6)

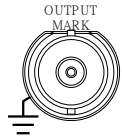


4. 按 Infinite (F5), Return (F6)

ARB–输出标记

例子: ARB 模式, 输出标记, Start 0, Length 80

输出



1. 按 ARB, Output (F6), Marker (F3)

2. 按 Start (F1), 3+0, Enter (F5), Return (F6)

3. 按 Length (F2), 8 + 0, Enter (F5), Return (F6)

工具菜单

存储

例子: 存储至内存文件#5

1. 按 UTIL, Memory (F1), Store (F1)

2. 使用可调旋钮和 Select (F1)选择文件，按 Done (F5)

调取

例子: 调取内存文件#5

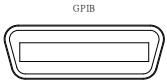
1. 按 UTIL, Memory (F1), Recall (F2)

2. 使用可调旋钮和 Select (F1)选择文件，按 Done (F5)

接口 GPIB

例子: GPIB 接口, 地址 10

GPIB



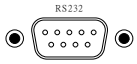
1. 按 UTIL, Interface (F2), GPIB (F1), Address (F1)

2. 按 1 + 0 + Done (F5)

接口 RS232

例子: RS232 接口, 波特率 115200, 无奇偶性, 8 位

RS232



1. 按 UTIL, Interface (F2), RS232 (F2)

2. 按波特率(F1), 115k (F5)

3. 按 UTIL, Interface (F2), RS232 (F2)

4. 按 Parity/Bits (F2), None/8Bits (F1)

接口 USB

例子: USB 接口

USB B

1. 按 UTIL, Interface (F2), USB (F3)

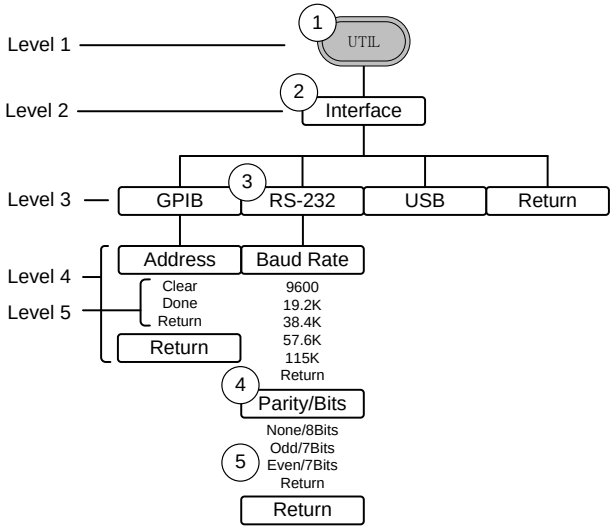
菜单树

常规

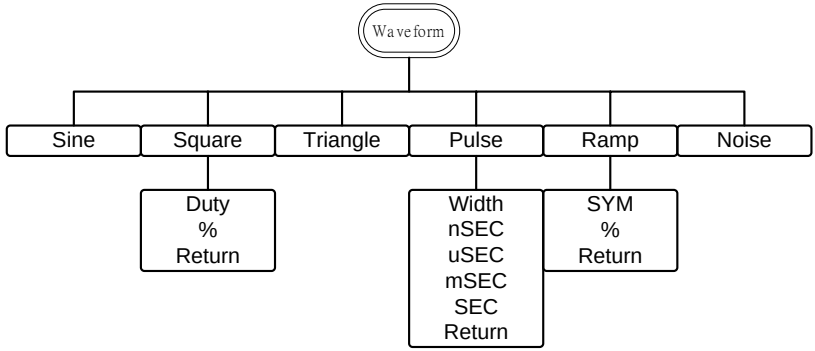
用户可以将菜单树用作对信号发生器的功能和特性的简易参考。AFG-3000 菜单系统逐层排列，每层都由操作或软键导航。返回软键用于返回上级菜单。

例子: 将奇偶性设置为偶数/7Bits;

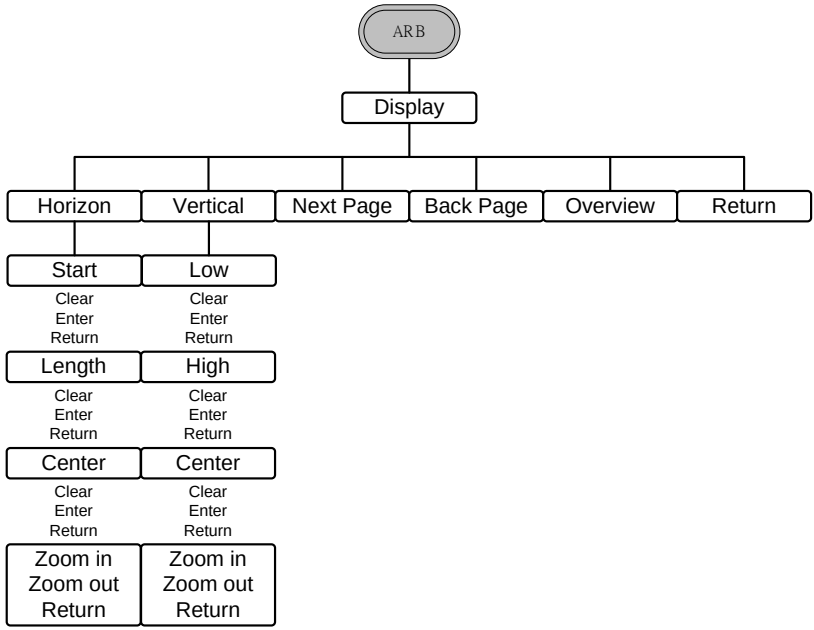
(1) 按 UTIL 键
(2) Interface 软键
(3) RS232
(4) 奇偶性/Bits
(5) 偶数/7Bits



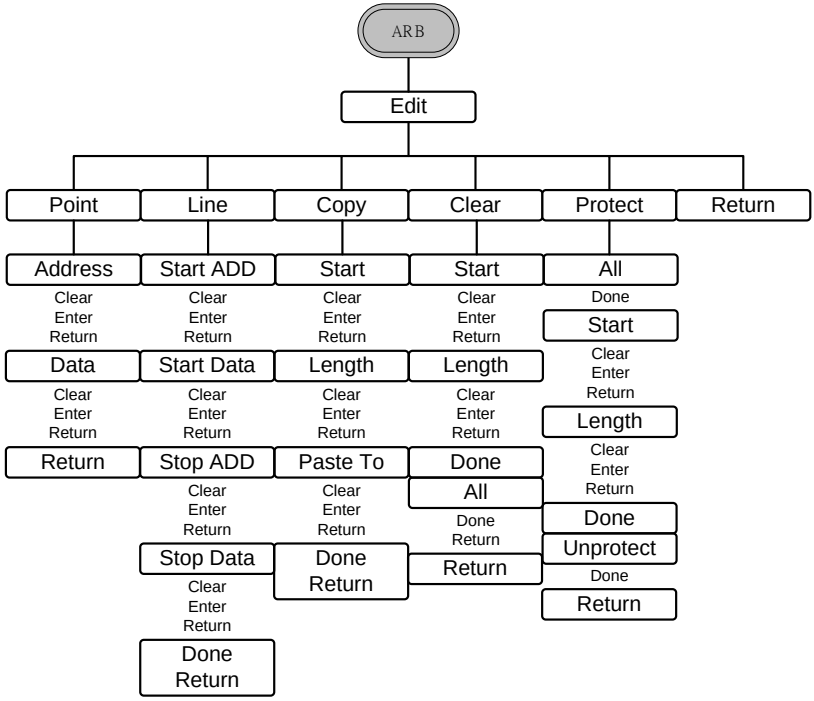
波形


Waveform
Sine
Square
Triangle
Pulse
Ramp
Noise
Duty
%
Return
Width
nSEC
uSEC
mSEC
SEC
Return
SYM
%
Return

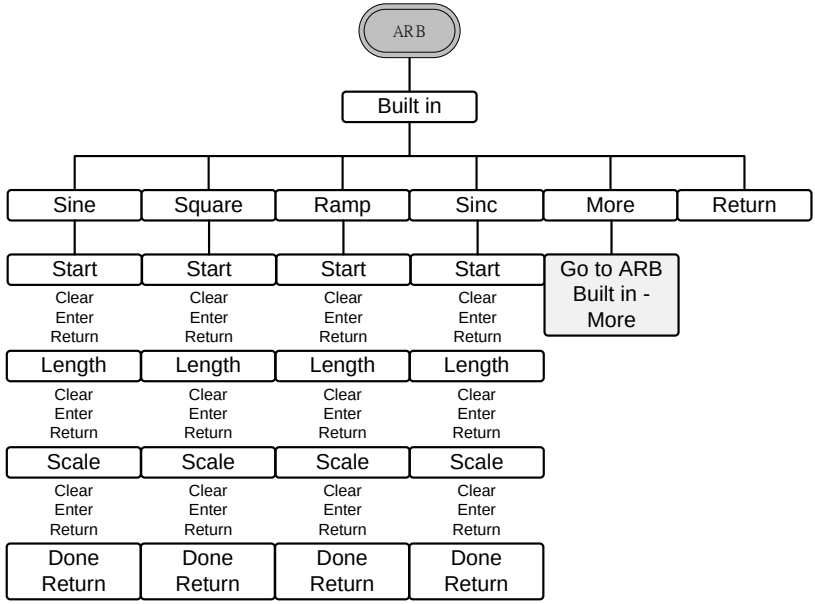
ARB-显示


ARB
Display
Horizon
Vertical
Next Page
Back Page
Overview
Return
Start
Clear
Enter
Return
Low
Clear
Enter
Return
Length
Clear
Enter
Return
High
Clear
Enter
Return
Center
Clear
Enter
Return
Center
Clear
Enter
Return
Zoom in
Zoom out
Return
Zoom in
Zoom out
Return

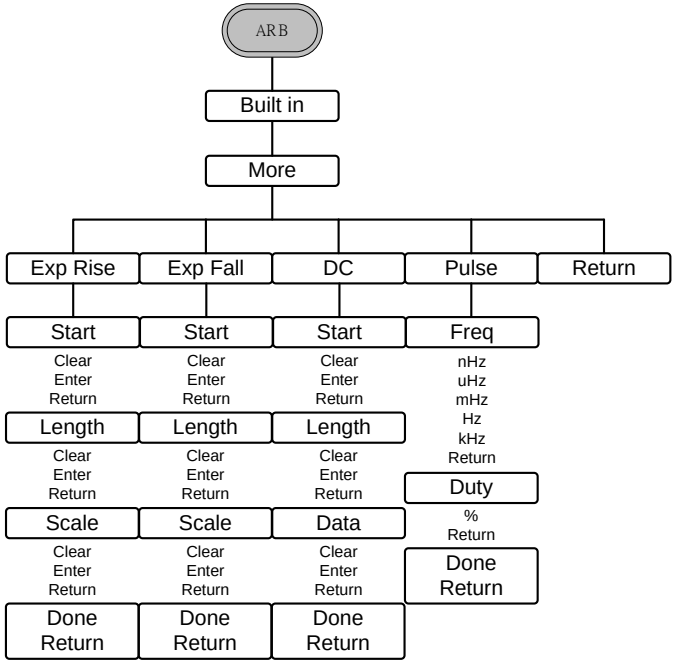
ARB-编辑


ARB
Edit
Point
Line
Copy
Clear
Protect
Return
Address
Clear
Enter
Return
Data
Clear
Enter
Return
Return
Start ADD
Clear
Enter
Return
Start Data
Clear
Enter
Return
Stop ADD
Clear
Enter
Return
Stop Data
Clear
Enter
Return
Done
Return
Start
Clear
Enter
Return
Length
Clear
Enter
Return
Paste To
Clear
Enter
Return
Done
Return
Start
Clear
Enter
Return
Length
Clear
Enter
Return
Done
All
Done
Return
Return
All
Done
Start
Clear
Enter
Return
Length
Clear
Enter
Return
Done
Unprotect
Done
Return

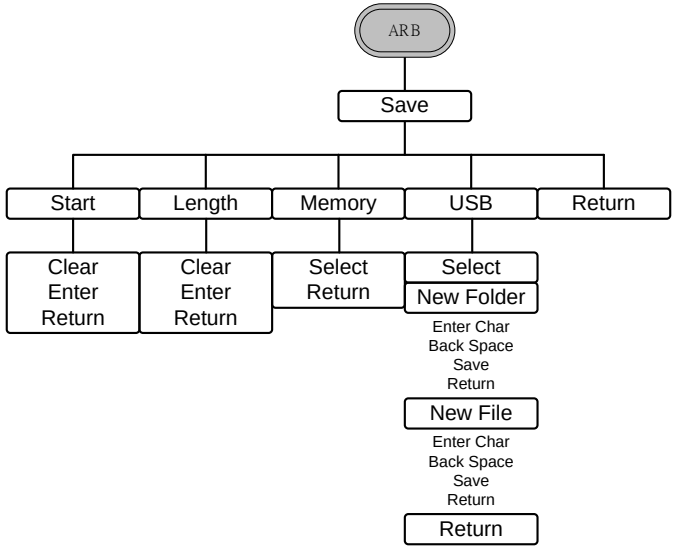
ARB–内置


ARB
Built in
Sine
Square
Ramp
Sinc
More
Return
Start
Start
Start
Start
Go to ARB Built in - More
Clear Enter Return
Length
Length
Length
Length
Clear Enter Return
Scale
Scale
Scale
Scale
Clear Enter Return
Done Return
Done Return
Done Return
Done Return

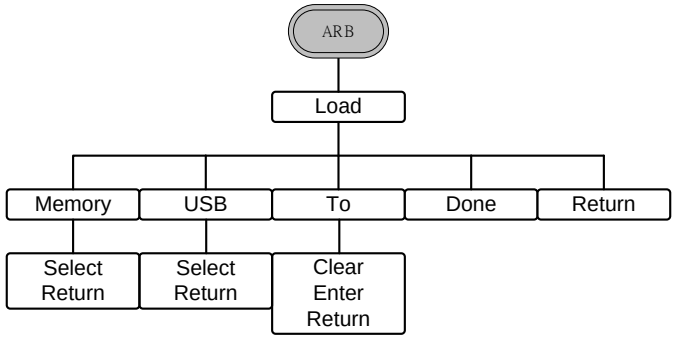
ARB–内置–更多


ARB
Built in
More
Exp Rise
Exp Fall
DC
Pulse
Return
Start
Start
Start
Freq
Clear
Enter
Return
Clear
Enter
Return
Clear
Enter
Return
nHz
uHz
mHz
Hz
kHz
Return
Length
Length
Length
Clear
Enter
Return
Clear
Enter
Return
Clear
Enter
Return
Duty
%
Return
Scale
Scale
Data
Clear
Enter
Return
Clear
Enter
Return
Clear
Enter
Return
Done
Return
Done
Return
Done
Return
Done
Return

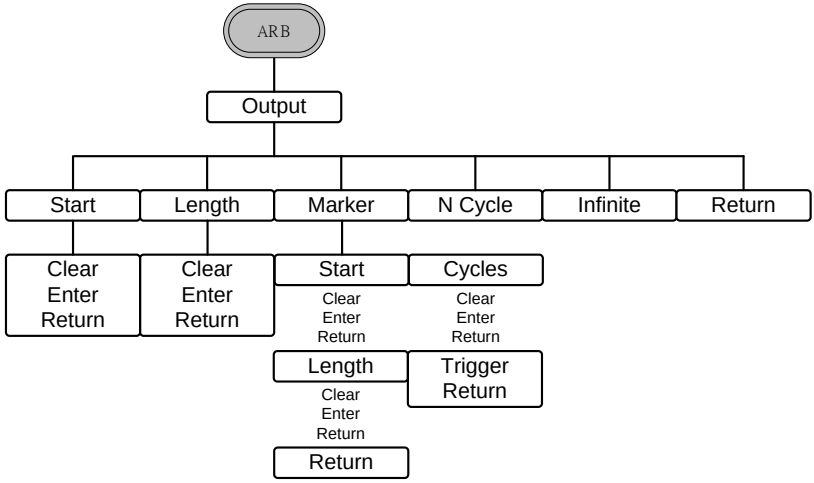
ARB–存储


ARB
Save
Start
Length
Memory
USB
Return
Clear
Enter
Return
Clear
Enter
Return
Select
Return
Select
New Folder
Enter Char
Back Space
Save
Return
New File
Enter Char
Back Space
Save
Return
Return

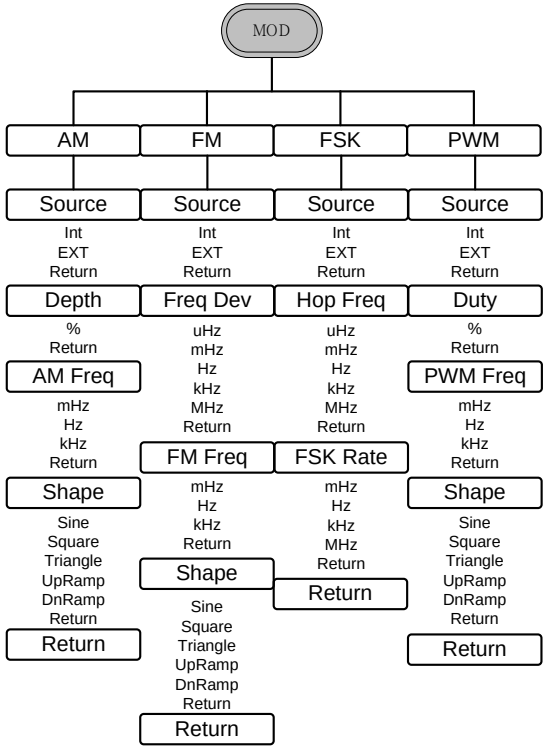
ARB-调取


ARB
Load
Memory
USB
To
Done
Return
Select
Return
Select
Return
Clear
Enter
Return

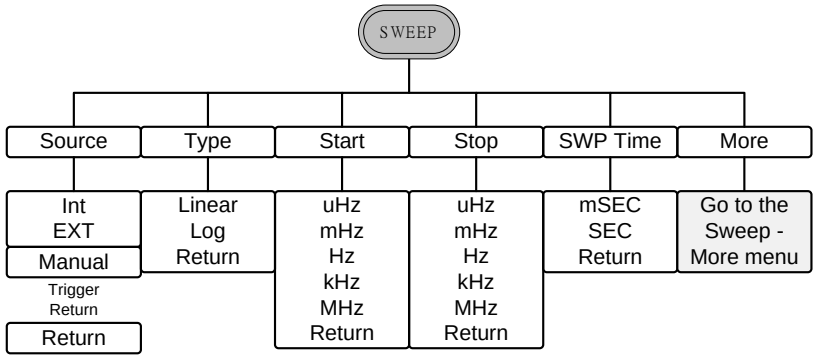
ARB-输出


ARB
Output
Start
Length
Marker
N Cycle
Infinite
Return
Clear
Enter
Return
Clear
Enter
Return
Start
Clear
Enter
Return
Cycles
Clear
Enter
Return
Length
Clear
Enter
Return
Trigger
Return
Return

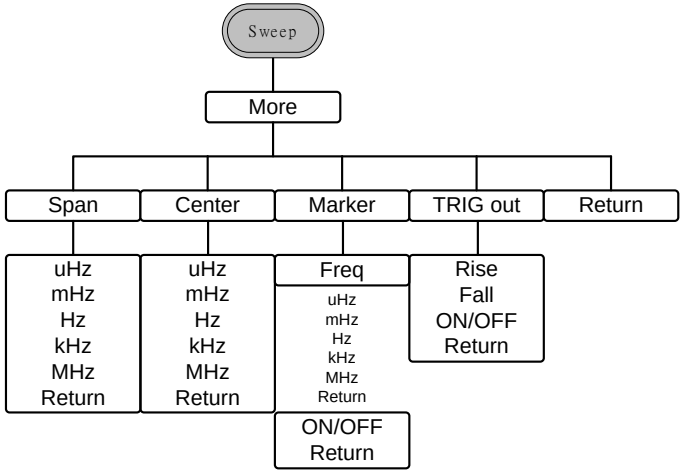
MOD


MOD
AM
FM
FSK
PWM
Source
Source
Source
Source
Int
EXT
Return
Int
EXT
Return
Int
EXT
Return
Int
EXT
Return
Depth
Freq Dev
Hop Freq
Duty
%
Return
uHz
mHz
Hz
kHz
MHz
Return
uHz
mHz
Hz
kHz
MHz
Return
%
Return
AM Freq
PWM Freq
mHz
Hz
kHz
Return
mHz
Hz
kHz
Return
FM Freq
FSK Rate
mHz
Hz
kHz
Return
mHz
Hz
kHz
MHz
Return
Shape
Shape
Sine
Square
Triangle
UpRamp
DnRamp
Return
Sine
Square
Triangle
UpRamp
DnRamp
Return
Shape
Return
Sine
Square
Triangle
UpRamp
DnRamp
Return
Return
Return
Return

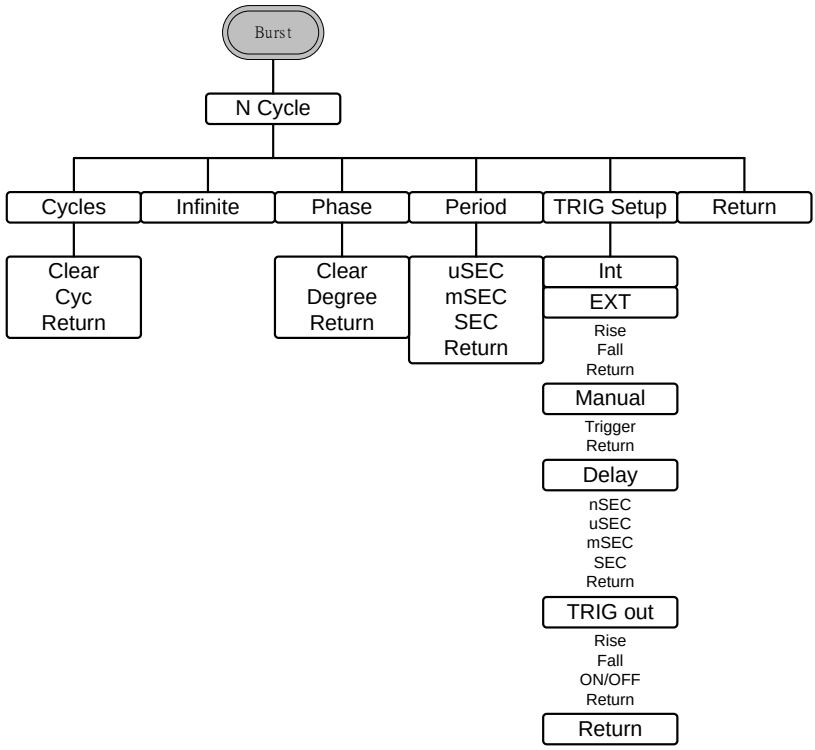
扫描


SWEEP
Source
Type
Start
Stop
SWP Time
More
Int
EXT
Manual
Trigger
Return
Return
Linear
Log
Return
uHz
mHz
Hz
kHz
MHz
Return
uHz
mHz
Hz
kHz
MHz
Return
mSEC
SEC
Return
Go to the
Sweep -
More menu

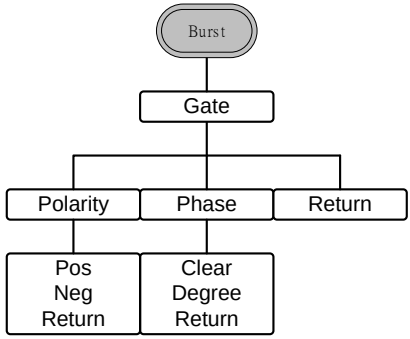
扫描-更多


Sweep
More
Span
Center
Marker
TRIG out
Return
uHz
mHz
Hz
kHz
MHz
Return
uHz
mHz
Hz
kHz
MHz
Return
Freq
uHz
mHz
Hz
kHz
MHz
Return
ON/OFF
Return
Rise
Fall
ON/OFF
Return

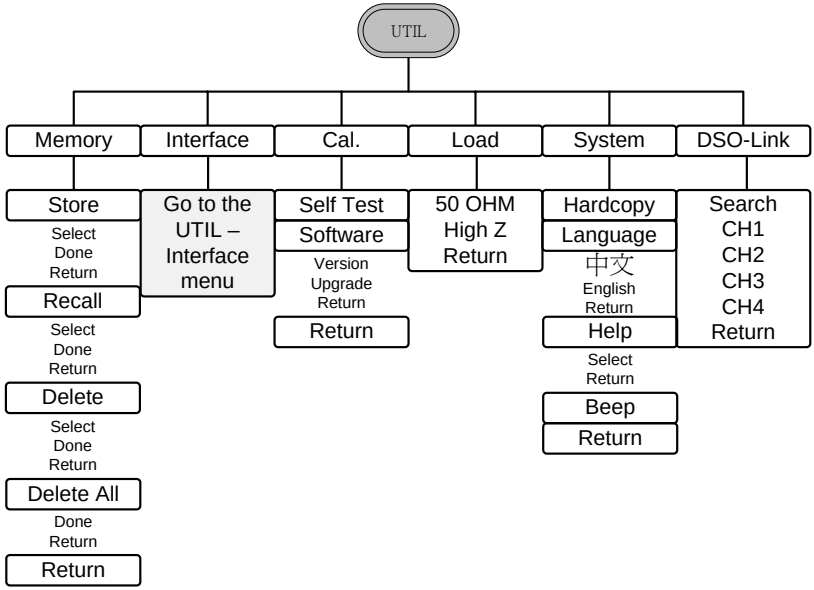
脉冲串–N 次循环



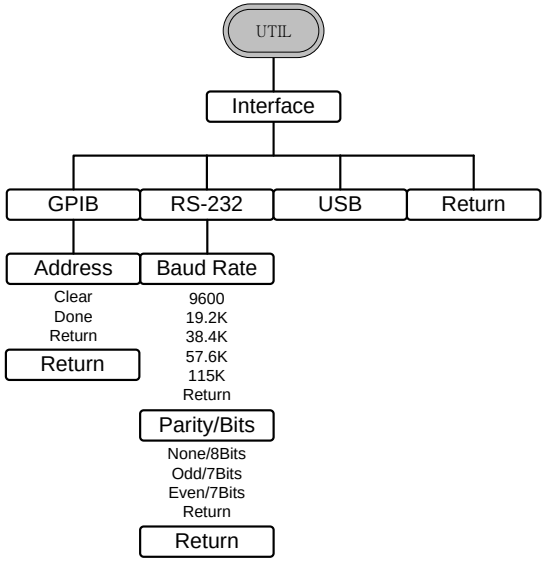
脉冲串–门控



UTIL


UTIL
Memory
Interface
Cal.
Load
System
DSO-Link
Store
Select
Done
Return
Recall
Select
Done
Return
Delete
Select
Done
Return
Delete All
Done
Return
Return
Go to the UTIL – Interface menu
Self Test
Software
Version
Upgrade
Return
Return
50 OHM
High Z
Return
Hardcopy
Language
中文
English
Return
Help
Select
Return
Beep
Return
Search
CH1
CH2
CH3
CH4
Return

UTIL–接口


UTIL
Interface
GPIB
RS-232
USB
Return
Address
Clear
Done
Return
Return
Baud Rate
9600
19.2K
38.4K
57.6K
115K
Return
Parity/Bits
None/8Bits
Odd/7Bits
Even/7Bits
Return
Return

默认设置

复位键用于恢复默认面板设置。

输出设置	功能	正弦波
	频率	1kHz
	幅值	3.000 Vpp
	偏置	0.00V dc
	输出单位	Vpp
	输出端	50Ω
调制 (AM/FM/FSK)	载波	1kHz 正弦波
	调制波形	100Hz 正弦波
	AM 深度	100%
	FM 偏移	100Hz
	FSK 跳跃频率	100Hz
	FSK 频率	10Hz
	PWM 占空比	50%
	PWM 频率	20kHz
	调制解调器状态	Off
扫描	起始/停止频率	100Hz/1kHz
	扫描时间	1s
	扫描类型	线性
	扫描状态	Off

脉冲串	脉冲串频率	1kHz
	N 次循环	1
	脉冲串周期	10ms
	脉冲串起始相位	0˚
	脉冲串状态	Off
系统设置	断电调用	On
	显示模式	On
	错误队列	已清除
	存储器设置	无更改
	输出	Off
触发	触发源	内部(立即)
接口设置	GPIB 地址	10
	接口	RS232
	波特率	115200
	奇偶性	无(8 个数据位)
校正	校正菜单	加密

操作

本章节介绍了如何输出基本波形。有关调制、扫描、脉冲串和任意波形的部分，详见**錯誤! 尚未定義書籤。**页和 131 页调制和任意波章节。

选择波形

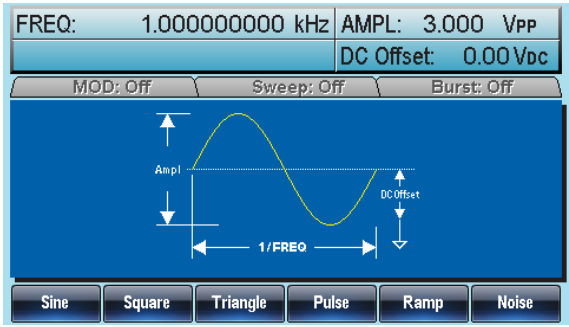
AFG-3000 可以输出六种标准波形: 正弦波, 方波, 三角波, 脉冲波, 斜波和噪声波。

正弦波

面板操作

1. 按 Waveform 键

2. 按 F1 (Sine)



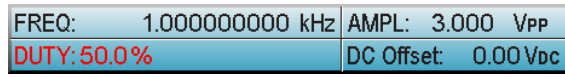
设置方波

面板操作

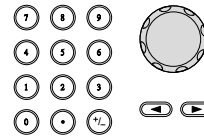
1. 按 Waveform 键

2. 按 F2 (Square)创建一个方波

3. 按 F1 (Duty)将使位于参数窗口处的占空比参数变亮



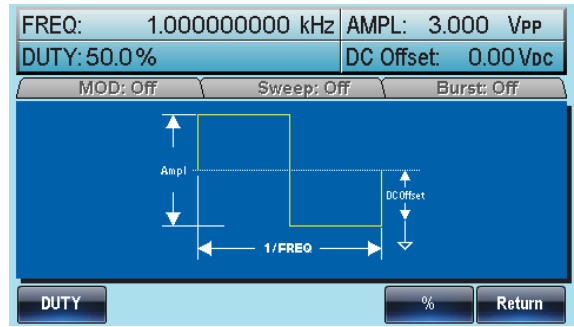
4. 使用方向键和可调旋钮或数字键盘输入占空比范围



5. 按 F5 (%)选择%单位

范围

频率	占空比范围
≤25MHz	20%~80%
25MHz~≤50MHz	40%~60%
>50MHz~80MHz	50% (固定的)

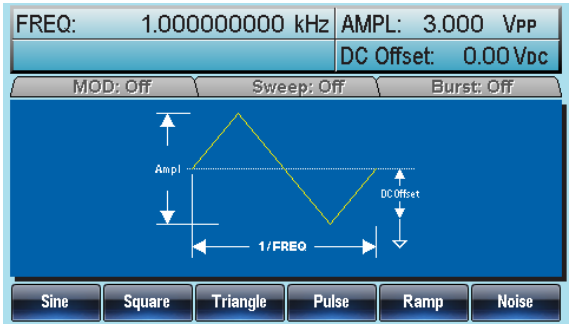


三角波

面板操作

1. 按 Waveform 键

2. 按 F3 (Triangle)



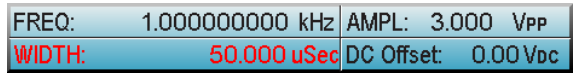
设置脉冲宽度

面板操作

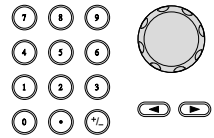
1. 按 Waveform 键

2. 按 F4 (Pulse)创建一个脉冲波

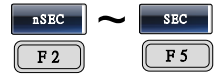
3. 按 F1 (Width)将使位于参数窗口处的脉宽参数变亮



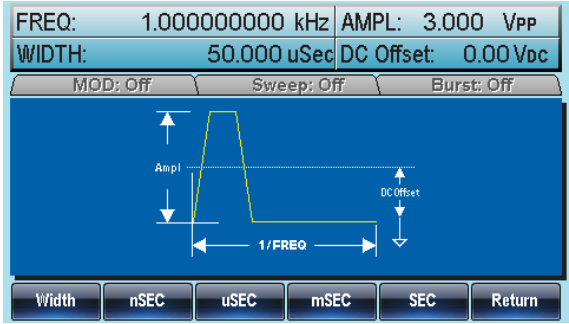
4. 使用方向键和可调旋钮或数字键盘输入脉冲宽度



5. 按 F2~F5 选择单位范围



范围	脉冲宽度	8ns~1999.9s
注意	最小脉冲宽度	频率 ≤ 50MHz: 8ns 脉冲宽度 频率 ≤ 6.25 MHZ: 5% 占空比
	分辨率	频率 ≤ 50MHz: 1ns 脉冲宽度 频率 ≤ 6.25 MHZ: 1% 占空比



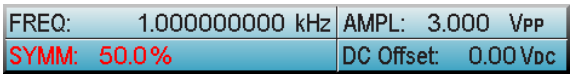
设置斜波

面板操作

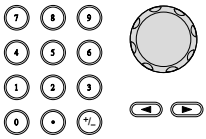
1. 按 Waveform 键

2. 按 F5 (Ramp)创建一个斜波

3. 按 F1 (SYM)将使位于参数窗口处的 SYMM 参数变亮

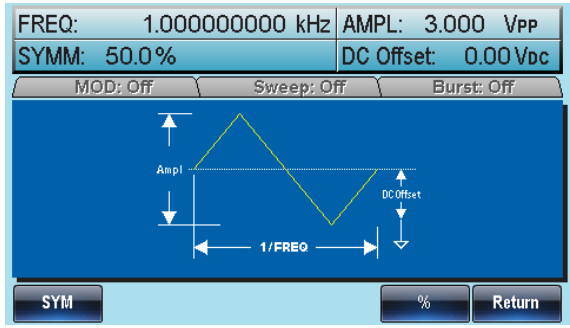


4. 使用方向键和可调旋钮或数字键盘输入对称百分比



5. 按 F5 (%)选择%单位

范围	对称	0%~100%

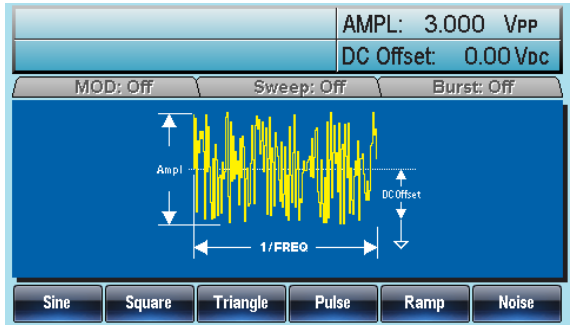


噪声波

面板操作

1. 按 Waveform 键

2. 按 F6 (Noise)



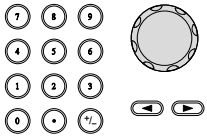
设置频率

面板操作

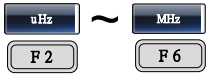
1. 按 FREQ/Rate 键

2. 位于参数窗口处的 FREQ 参数将变亮

3. 使用方向键和可调旋钮或数字键盘输入频率

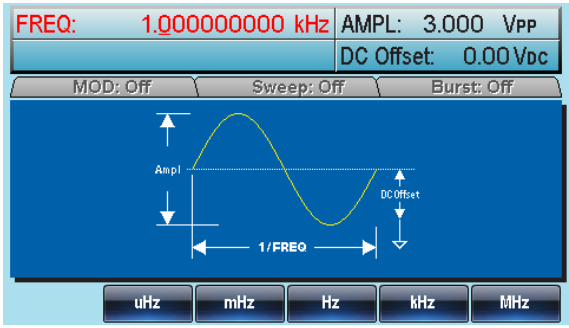


4. 按 F2~F6 选择频率单位



范围

正弦波	1μHz~80MHz(3081)/50MHz(3051)
方波	1μHz~80MHz(3081)/50MHz(3051)
三角波	1μHz~1MHz
脉冲波	500μHz~50MHz
斜波	1μHz~1MHz

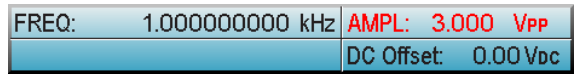


设置幅值

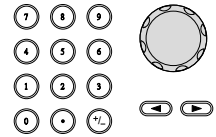
面板操作

1. 按 AMPL 键

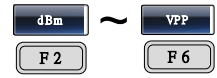
2. 位于参数窗口处的 AMPL 参数将变亮



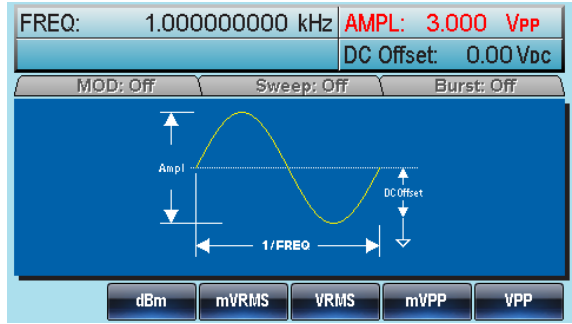
3. 使用方向键和可调旋钮或数字键盘输入幅值



4. 按 F2~F6 选择单位类型



	50Ω 负载	高阻抗
范围	10mVpp~10Vpp	20mVpp~20Vpp
单位	Vpp, Vrms, dBm	

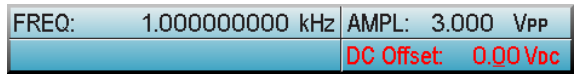


设置 DC 偏置

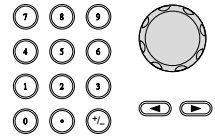
面板操作

1. 按 DC 偏置键

2. 位于参数窗口处的 DC 偏置参数将变亮

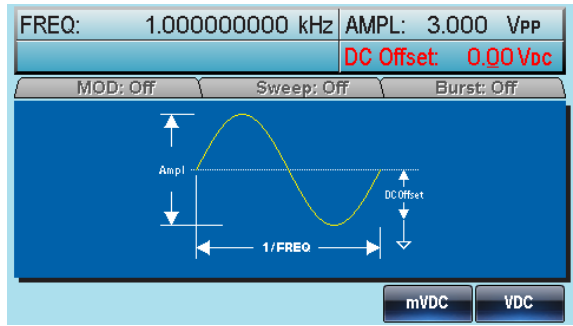


3. 使用方向键和可调旋钮或数字键盘输入 DC 偏置



4. 按 F5 (mVDC)或 F6 (VDC)选择电压范围

	50Ω 负载	高阻抗
范围	±5Vpk	±10Vpk

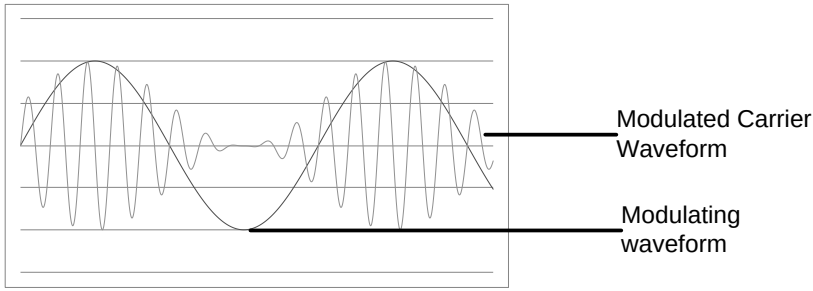


调制

AFG-3000 系列任意波形信号发生器能够产生 AM, FM, FSK 和 PWM 调制波形。调制类型不同，调制参数的设置也有所不同。无论何时，只允许激活一种调制模式，且扫描或脉冲串模式不能与 AM/FM 同时启用。一旦激活一种调制模式，就意味着关闭前一个调制模式。

幅值调制 (AM)

AM 波形由载波和调制波组成。载波幅值与调制波幅值有关。AFG-3000 信号发生器可以设置载波频率、幅值、偏置电压以及内部或外部调制源。

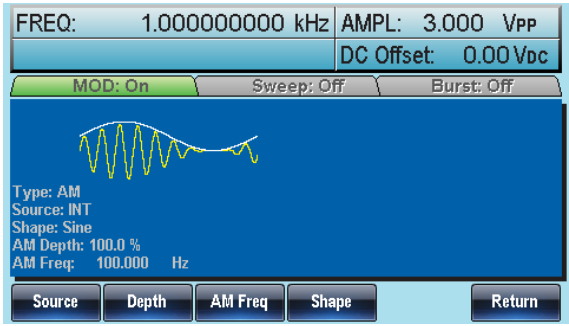


选择 AM 调制

面板操作

1. 按 MOD 键

2. 按 F1 (AM)



AM 载波波形

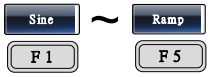
背景

AM 载波波形：正弦波、方波、三角波、斜波、脉冲波或任意波。默认情况为正弦波。不能使用噪声波作为载波波形。在选择载波波形前，请先选择 AM 调制模式，见 27 或 68 页

选择一个标准载波波形

1. 按 Waveform 键

2. 按 F1~F5 选择载波波形



选择一个任意波的载波波形

3. 有关任意波的使用部分，详见任意波快速指南或章节

33 页
131 页

范围	AM 载波波形	正弦波, 方波, 三角波, 上斜波, 下斜波, 任意波

载波频率

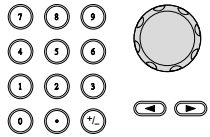
最大载波频率与载波波形的选择有关。默认载波频率为 1kHz。

面板操作

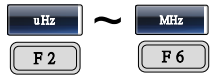
1. 对任一载波波形，按 FREQ/Rate 键

2. 位于参数窗口处的频率参数将变亮

3. 使用方向键和可调旋钮或数字键盘输入载波频率



4. 按 F2~F6 选择频率范围



范围

载波波形	Carrier Frequency
正弦波	1μHz~80MHz(3081)/ 50MHz(3051)
方波	1μHz~80MHz(3081)/ 50MHz(3051)
三角波	1μHz~1MHz
脉冲波	500μHz~50MHz
斜波	1μHz~1MHz

调制波形

信号发生器可以接收内部和外部源。AFG-3000 的调制波形包括正弦波, 方波, 三角波, 上斜波, 下斜波。默认波形为正弦波。

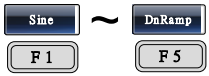
面板操作

1. 选择 MOD

2. 按 F1 (AM)

3. 按 F4 (Shape)

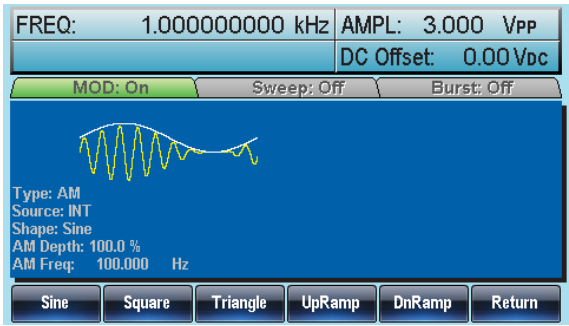
4. 按 F1~F5 选择波形



5. 按 F6 (Return)返回菜单

注意

方波	50% 占空比
上斜波	100% 对称
三角波	50% 对称
下斜波	0% 对称



AM 频率

调制波形的频率(AM 频率)可设为 2mHz~20kHz。

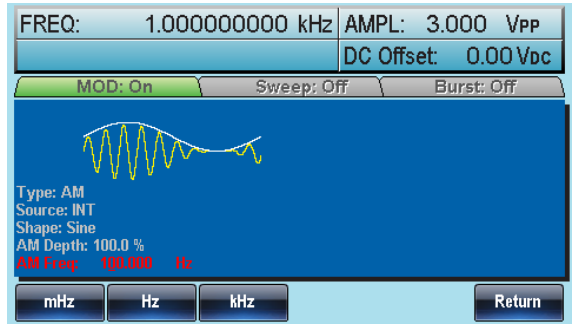
面板操作

1. 按 MOD 键

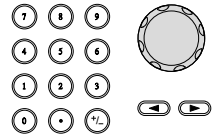
2. 按 F1 (AM)

3. 按 F3 (AM Freq)

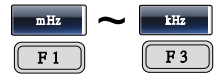
4. 位于波形显示区域处的 AM 频率参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入 AM 频率



6. 按 F1~F3 选择频率范围



范围		
	调制频率	2mHz~20kHz
	默认频率	100Hz

调制深度

调制深度为未调载波幅值与调制波形最小幅值偏差的比值(以百分比显示)。换句话说， 调制深度就是调制波形与载波波形的最大幅值之比。

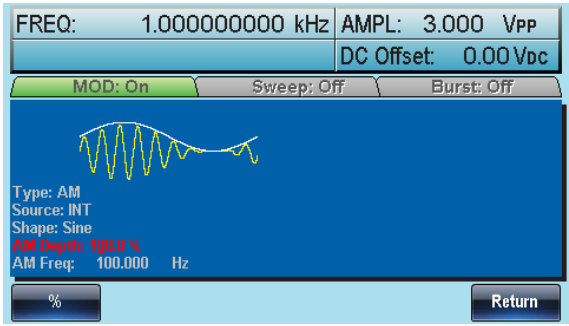
面板操作

1. 按 MOD 键

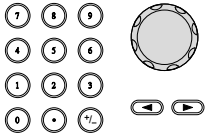
2. 按 F1 (AM)

3. 按 F2 (Depth)

4. 位于波形显示区域处的 AM 深度参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入 AM 深度



6. 按 F1 (%)选择%单位

范围	深度	0%~120%
	默认深度	100%

注意 即使调制深度大于 100%, 输出也不超过±5V 的峰值 (10kΩ 负载)

如果选择外部调制源, 那么调制深度将由后面板 MOD INPUT 上的± 5V 信号电压控制。例如, 如果调制深度设置为 100%, 那么最大幅值为+5V, 最小幅值为-5V

设置 (AM) 调制源

信号发生器将接受用于 AM 调制的内部或外部源。默认为内部源。

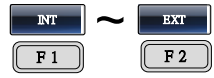
面板操作

1. 按 MOD 键

2. 按 F1 (AM)

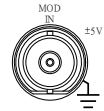
3. 按 F1 (Source)

4. 按 F1 (INT)或 F2 (EXT)选择调制源

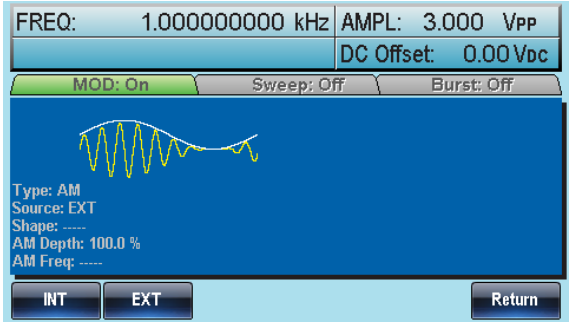


5. 按 F6 (Return)返回菜单

外部源 从后面板的 MOD 输入端子接收外部调制信号

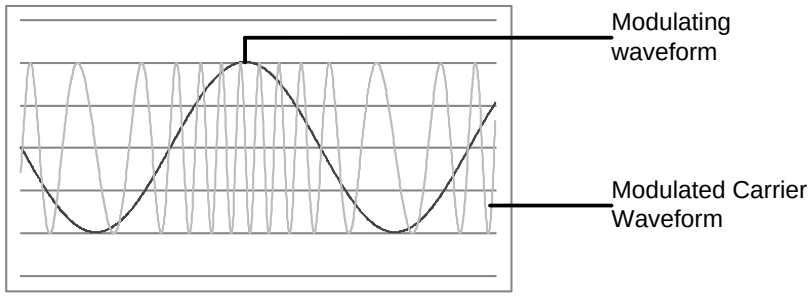


注意 如果选择外部调制源, 那么调制深度将由后面板 MOD INPUT 上的± 5V 信号电压控制。例如, 如果调制深度设置为 100%, 那么最大幅值为+5V, 最小幅值为-5V


FREQ: 1.000000000 kHz
AMPL: 3.000 VPP
DC Offset: 0.00 VDC
MOD: On
Sweep: Off
Burst: Off
Type: AM
Source: EXT
Shape: -----
AM Depth: 100.0 %
AM Freq: -----
INT
EXT
Return

频率调制 (FM)

FM 波形由载波和调制波组成。载波的瞬时频率随调制波形的幅值而变化。当使用 AFG-3000 时，无论何时只允许启用一种调制模式。



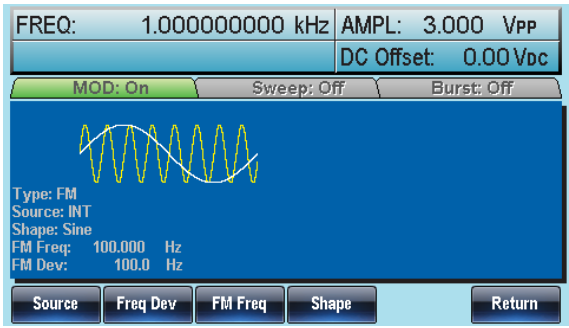
选择频率调制 (FM)

选择 FM 后, 调制波形由载波频率、输出幅值和偏置电压决定。

面板操作

1. 按 MOD 键

2. 按 F2 (FM)



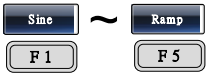
FM 载波波形

背景 FM 载波默认为正弦波。噪声波和脉冲波不能用作载波

面板操作

1. 按 Waveform 键

2. 按 F1~F5 选择载波波形(bar F4)



范围	载波波形	正弦波, 方波, 三角波, 斜波

FM 载波频率

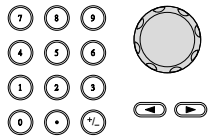
使用 AFG-3000 时，载波频率必须大于或等于频率偏移。如果频率偏移大于载波频率，函数发生器会自动将偏移调整到当前载波频率所允许的最大值。载波最大频率与所选波形有关。

面板操作

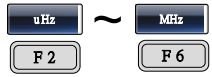
1. 按 FREQ/Rate 键选择载波频率

2. 位于参数窗口处的 FREQ 参数将变亮

3. 使用方向键和可调旋钮或数字键盘输入载波频率



4. 按 F2~F6 选择频率单位



范围

载波波形	载波频率
正弦波	1μHz~80MHz(3081)/ 50MHz(3051)
方波	1μHz~80MHz(3081)/ 50MHz(3051)
三角波	1μHz~1MHz
斜波	1μHz~1MHz
默认频率	1 kHz

FM 波形

信号发生器能接受内部和外部源。AFG-3000 的内部调制波形包括正弦波、方波、三角波、正和负斜波(UpRamp, DnRamp)。默认情况为正弦波。

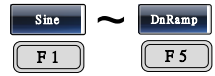
面板操作

1. 选择 MOD

2. 按 F2 (FM)

3. 按 F4 (Shape)

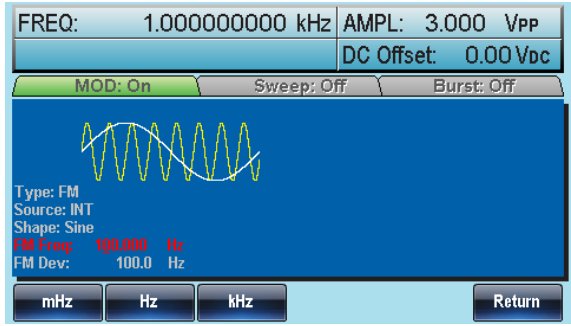
4. 按 F1~F5 选择波形



5. 按 F6 (Return)返回菜单

注意

方波	50% 占空比
上升波	100% 对称
三角波	50% 对称
下降波	0% 对称



频率调制波形

信号发生器将接受用于 FM 的内部或外部调制源。

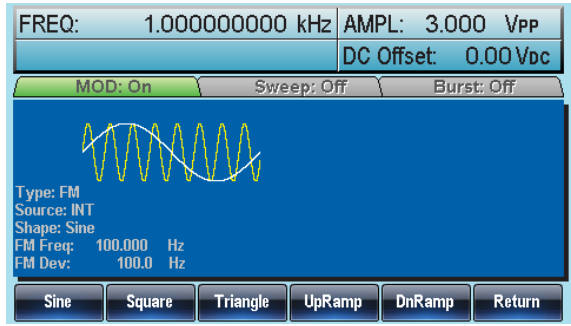
面板操作

1. 按 MOD 键

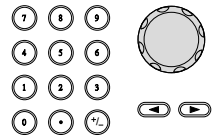
2. 按 F2 (FM)

3. 按 F3 (FM Freq)

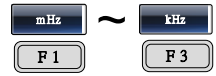
4. 位于波形显示区域处的 FM 频率参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入 FM 频率



6. 按 F1~F3 选择频率单位



范围		
	调制频率	2mHz~20kHz
	默认频率	100Hz

频率偏移

频率偏移是载波与调制波的频率最大偏差。

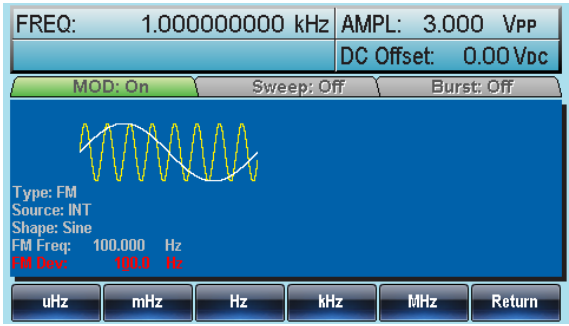
面板操作

1. 按 MOD 键

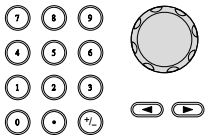
2. 按 F2 (FM)

3. 按 F2 (Freq Dev)

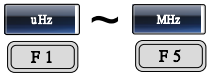
4. 位于波形显示区域处的 Freq Dev 参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入频率偏移



6. 按 F1~ F5 选择频率单位



范围	频率偏移	DC~80MHz (3081) DC~50MHz (3051) DC~1MHz (三角波)
	默认深度	100kHz

选择 (FM) 调制源

信号发生器将接受用于 FM 调制的内部或外部源。默认为内部源。

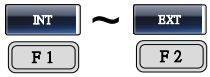
面板操作

1. 按 MOD 键

2. 按 F2 (FM)

3. 按 F1 (Source)

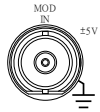
4. 按 F1 (INT)或 F2 (EXT)选择调制源



5. 按 F6 (Return)返回菜单

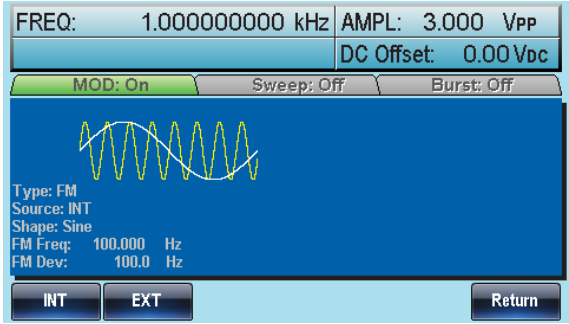
外部源

从后面板的 MOD 输入端子接收外部调制信号



注意

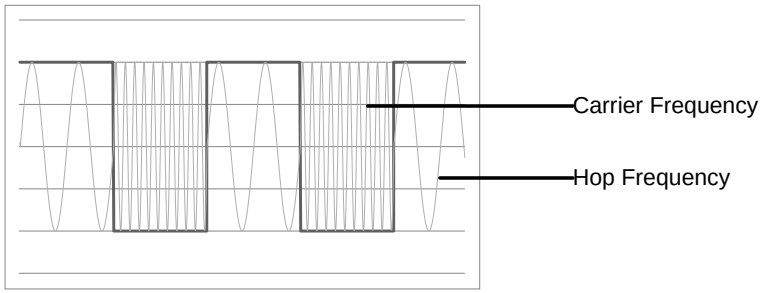
如果选择外部调制源, 那么频偏将由后面板 MOD INPUT 上的± 5V 信号电压控制。频偏与调制信号电平成比例。例如，如果调制电压为+5V，那么频偏将等于设置的频偏。外部信号电平越低，偏移就越小；而负信号电平将会使频偏频率降至载波频率之下。


FREQ: 1.000000000 kHz
AMPL: 3.000 VPP
DC Offset: 0.00 VDC
MOD: On
Sweep: Off
Burst: Off
Type: FM
Source: INT
Shape: Sine
FM Freq: 100.000 Hz
FM Dev: 100.0 Hz
INT
EXT
Return

频移键控 (FSK) 调制

FSK 调制用于在两个预设频率(载波频率和跳跃频率)间交替输出频率。内部频率发生器或后面板 Trigger INPUT 上的信号电平决定交替频率。

函数发生器一次只允许启用一种调制模式。当开启 FSK 调制时，其它调制模式将禁用。在启用扫描和脉冲串时不允许启用 FSK 调制。在启用 FSK 时，将关闭扫描或脉冲串模式。



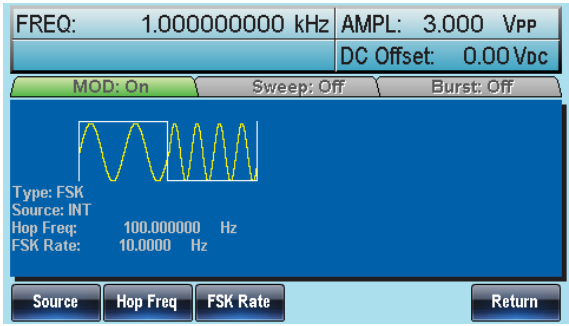
选择 FSK 调制

当使用 FSK 模式时, 输出波形使用默认载波频率、幅值和偏置电压。

面板操作

1. 按 MOD 键

2. 按 F3 (FSK)



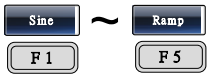
FSK 载波波形

背景 默认波形为正弦波。噪声波不能用作载波

面板操作

1. 按 Waveform 键

2. 按 F1~F5 选择载波波形(bar F4)



范围	载波波形	正弦波, 方波, 三角波, 斜波, 脉冲波

FSK 载波频率

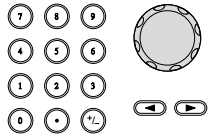
最大载波频率与载波波形有关。默认载波频率均为 1kHz。选择外部源时，Trigger INPUT 信号的信号电平控制输出频率。当信号为逻辑低电平时，输出载波频率；当信号为逻辑高电平时，输出跳跃频率。

面板操作

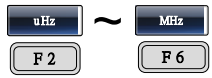
1. 按 FREQ/Rate 键选择载波频率

2. 位于参数窗口处的 FREQ 参数将变亮

3. 使用方向键和可调旋钮或数字键盘输入载波频率



4. 按 F2~F6 选择 FSK 频率单位



范围

载波波形	载波频率
正弦波	1μHz~80MHz(3081)/ 50MHz(3051)
方波	1μHz~80MHz(3081)/ 50MHz(3051)
三角波	1μHz~1MHz
斜波	1μHz~1MHz
脉冲波	500μHz~50MHz

FSK 跳跃频率

默认跳跃频率均为 100 Hz。内部调制波是占空比为 50%的方波。选择外部源时，Trigger INPUT 信号的信号电平控制输出频率。当信号为逻辑低电平时，输出载波频率；当信号为逻辑高电平时，输出跳跃频率。

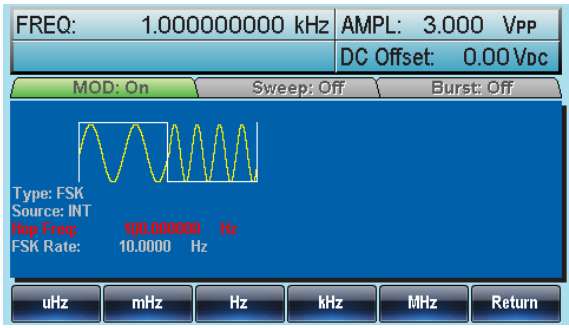
面板操作

1. 按 MOD 键

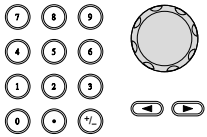
2. 按 F3 (FSK)

3. 按 F2 (Hop Freq)

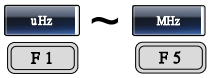
4. 位于波形显示区域处的 Hop Freq 参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入跳跃频率



6. 按 F1~F5 选择频率范围



范围　　波形　　载波频率

正弦波	1μHz~80MHz(3081)/ 50MHz(3051)
方波	1μHz~80MHz(3081)/ 50MHz(3051)
三角波	1μHz~1MHz
斜波	1μHz~1MHz
脉冲波	500μHz~50MHz

FSK 频率

FSK 频率是决定输出载波频率或跳跃频率的频率值。

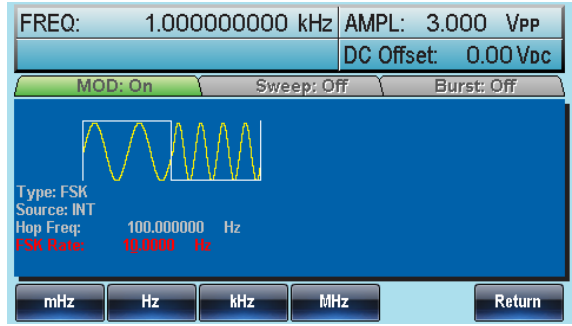
面板操作

1. 选择 MOD

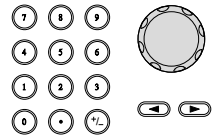
2. 按 F3 (FSK)

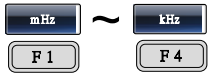
3. 按 F3 (FSK Rate)

4. 位于波形显示区域处的 FSK Rate 参数将变亮



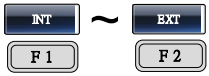
5. 使用方向键和可调旋钮或数字键盘输入 FSK 频率

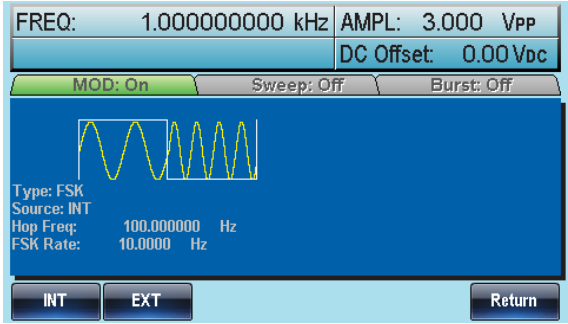


	6. 按 F1~F5 选择频率单位	
范围	FSK 频率	2mHz~100kHz
	默认	10Hz
注意	如果选择外部源，忽视 FSK 频率设置	

FSK 源

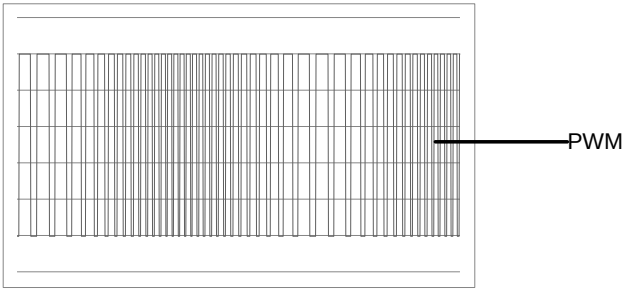
AFG-3000 接受内部和外部 FSK 源，默认为内部 FSK 源。当选择内部 FSK 源时，使用 FSK Rate 功能设置 FSK 频率。当选择外部源时，FSK 频率与后面板 Trigger INPUT 信号的频率一致。

面板操作	1. 按 MOD 键	
	2. 按 F3 (FSK)	
	3. 按 F1 (Source)	
	4. 按 F1 (Internal) or F2 (External)选择 FSK 源	
	5. 按 F6 (Return)返回菜单	
注意	Trigger INPUT 端子不能设置边沿极性	


FREQ: 1.000000000 kHz
AMPL: 3.000 VPP
DC Offset: 0.00 VDC
MOD: On
Sweep: Off
Burst: Off
Type: FSK
Source: INT
Hop Freq: 100.000000 Hz
FSK Rate: 10.0000 Hz
INT
EXT
Return

脉冲宽度调制

对于脉宽调制，脉冲宽度由调制波形的瞬时电压决定。无论何时仅允许启用一种调制模式。若使用 PWM，将禁用其它调制模式。此外不允许扫描和脉冲串模式与 PWM 同时使用。若使用 PWM，将关闭扫描和脉冲串模式。



选择脉冲宽度调制

选择 PWM, 需要考虑载波频率的当前设置、幅值调制频率、输出和偏移电压。

面板操作

1. 按 MOD 键

2. 按 F2 (Square)

3. 按 MOD 键

4. 按 F4 (PWM)

PWM 载波波形

PWM 仅使用方波作为载波波形，否则会弹出错误信息。

PWM 载波频率

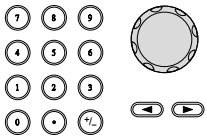
载波频率与方波有关。默认载波频率为 1kHz。

面板操作

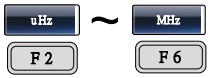
1. 按 FREQ/Rate 键选择载波频率

2. 位于参数窗口处的 FREQ 参数将变亮

3. 使用方向键和可调旋钮或数字键盘输入载波频率



4. 按 F2~F6 选择 PWM 频率单位



PWM 调制波形

调制波形(内部源)包括正弦波、方波、三角波、正斜波和负斜波。默认波形为正弦波。

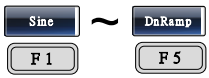
面板操作

1. 按 MOD 键

2. 按 F4 (PWM)

3. 按 F4 (Shape)

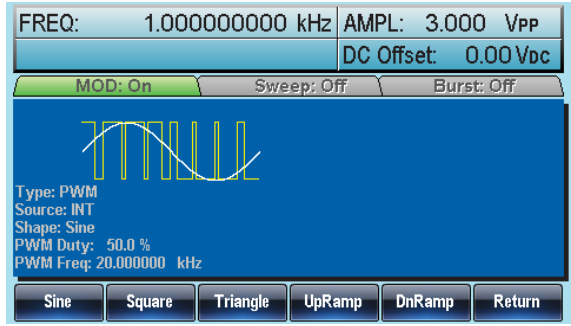
4. 按 F1~F5 选择波形



5. 按 F6 (Return)返回菜单

范围

波形	
方波	50%占空比
正斜波	100%对称
三角波	50%对称
负斜波	0%对称



调制波形频率

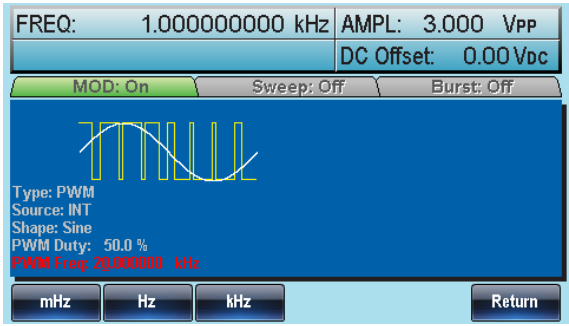
面板调制

1. 选择 MOD

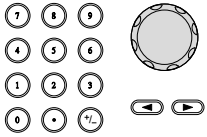
2. 按 F4 (PWM)

3. 按 F3 (PWM Frequency)

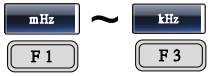
4. 位于波形显示区域处的 PWM Freq 参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入 PWM 频率



6. 按 F1~F3 选择频率单位



范围	PWM 频率	2mHz~20kHz
	默认	20kHz

调制占空比

用于设置占空比(%)

面板操作

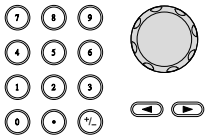
1. 按 MOD 键

2. 按 F4 (PWM)

3. 按 F2 (Duty)

4. 位于波形显示区域处的 Duty 参数将变亮

5. 使用方向键和可调旋钮或数字键盘输入占空比



6. 按 F1 (%)选择百分号

范围	占空比	0% ~ 100%
	默认	50%

注意 如果使用外部调制源，则脉冲波形由外部调制源调制。此时，MOD INPUT 端子上的±5V 电压控制脉宽。

PWM 调制源

AFG-3000 接受内部和外部 PWM 调制源。默认为内部调制源。

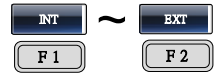
面板操作

1. 按 MOD 键

2. 按 F4 (PWM)

3. 按 F1 (Source)

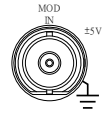
4. 按 F1 (INT)或 F2 (EXT)选择调制源



5. 按 F6 (Return)返回菜单

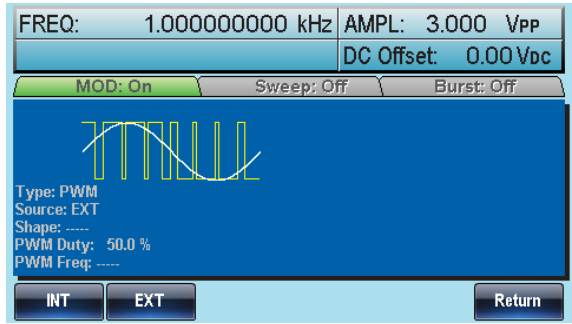
外部源

选择外部调制源时，需要使用后面板的 MOD INPUT 端子



注意

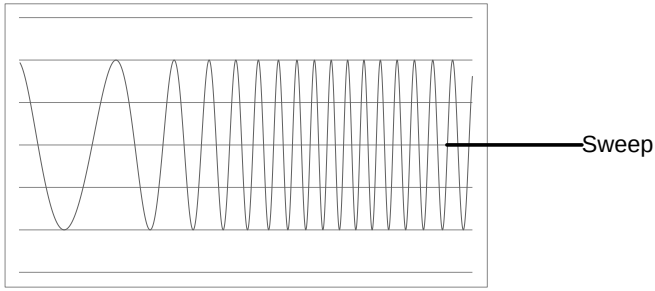
当您选择外部调制源时，脉宽调制由后面板 MOD INPUT 端子上的±5V 电压控制。例如：如果您已将调制深度设为 100%，则在调制信号为+5V 时，输出最大脉宽；在调制信号为-5V 时，输出最小脉宽。



频率扫描

除噪声波和脉冲波外，信号发生器可以对正弦波、方波或斜波产生一个扫频。在启动扫描模式时，将关闭脉冲串或其它调制模式。

在扫描模式下，信号发生器以指定步进从起始频率到停止频率扫描。您能够以线性或对数间隔由高频向低频扫描，或者由低频向高频扫描。您也可以配置信号发生器，使其用外部触发或手动触发输出单个扫描。



选择扫描模式

选择 Sweep 按钮，进入扫描模式。如果不预先设置，输出幅值、偏移和频率使用默认值。

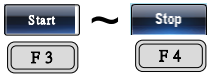
设置起始和停止频率

起始频率和停止频率定义扫描上限和下限。信号发生器从起始频率开始，一直扫描到停止频率，然后又复位回起始频率。在整个扫描范围内，相位连续(100μHz-80MHz: AFG-3081/50MHz: AFG-3051)。

面板操作

1. 按 SWEEP 键

2. 按 F3 (Start)或 F4 (Stop)选择起始或停止频率

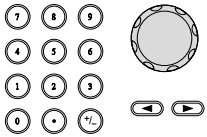


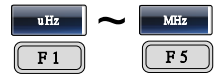
3. 位于波形显示区域处的 Start 或 Stop 参数将变亮

起始

停止

4. 使用方向键和可调旋钮或数字键盘输入 Stop/Start 频率



5. 按 F1~F5 选择 Start/Stop 频率单位 

范围	扫描范围	100μHz~80MHz(3081) 100μHz~50MHz(3051) (正弦波/方波) 100μHz~1MHz (三角波)
	起始 – 默认	100Hz
	停止 – 默认	1kHz

注意

从低频到高频扫描，设置起始频率＜停止频率。从高频到低频扫描，设置起始频率＞停止频率。关闭标记后，同步信号为 50%占空比的方波。在扫描开始时，同步信号处于 TTL 低电平，扫描中点上升到 TTL 高电平。同步信号频率与指定扫描时间相等。打开标记，在扫描开始时同步信号处于 TTL 高电平，到达标识频率处下降到 TTL 低电平。标记输出端输出同步信号。

中心频率和跨距

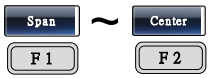
使用中心频率和跨距来设置扫描上限和下限(起始/停止)。

面板操作

1. 按 SWEEP 键

2. 按 F6 (More)

3. 按 F1 (Span)或 F2 (Center)选择跨距或中心

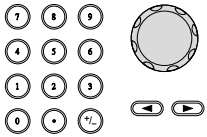


4. 位于波形显示区域处的 Span 或 Center 参数将变亮

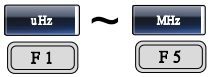
跨距

中心

5. 使用方向键和可调旋钮或数字键盘输入 Span/Center 频率



6. 按 F1~F5 选择 Start/Stop 频率单位



范围	中心频率	100μHz~80MHz(3081) 100μHz~50MHz(3051) (正弦波/方波)

		100μHz~1MHz (三角波)
	跨距频率	DC~80MHz(3081) DC~50MHz(3051) (正弦波/方波)
		DC ~1MHz (三角波)
	中心 – 默认	550Hz
	跨距 – 默认	900Hz

注意 从低频到高频扫描，设置正频率跨距。从高频到低频扫描，设置负频率跨距。关闭标记后，同步信号为 50%占空比的方波。在扫描开始时，同步信号处于 TTL 低电平，扫描中点上升到 TTL 高电平。同步信号频率与指定扫描时间相等。打开标记，在扫描开始时同步信号处于 TTL 高电平，到达标识频率处下降到 TTL 低电平。标记输出端输出同步信号。

扫描模式

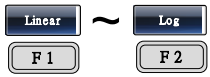
扫描模式用于选择线性或对数扫描。默认线性扫描。

面板操作

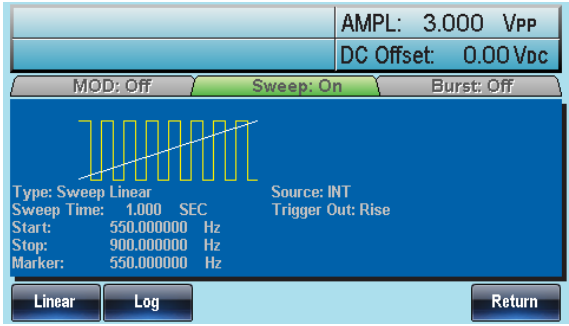
1. 按 SWEEP 键

2. 按 F2 (Type)

3. 按 F1 (Linear)或 F2 (Log)选择线性或对数扫描



4. 按 F6 (Return)返回菜单



扫描时间

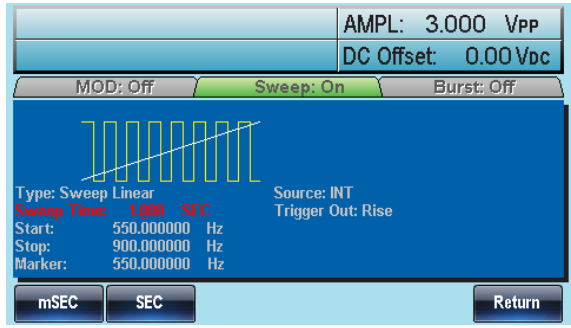
从起始频率到截止频率完成一次扫描所需的时间称为扫描时间。信号发生器自动限定扫描的离散频率点，该数目与扫描长度有关。

面板操作

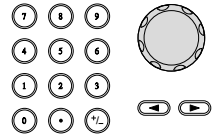
1. 按 SWEEP 键

2. 按 F5 (SWP Time)

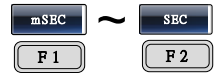
3. 位于波形显示区域处的扫描时间参数将变亮



4. 使用方向键和可调旋钮或数字键盘输入扫描时间



5. 按 F1~F2 选择时间单位



范围	扫描时间	1ms ~ 500s
	默认	1s

标记频率

标记信号变为低电平时的频率称为标记频率(扫描开始时标记信号都处于高电平)。后面板 MARK 端子输出标记信号。默认 550 Hz。

面板操作

1. 按 SWEEP 键

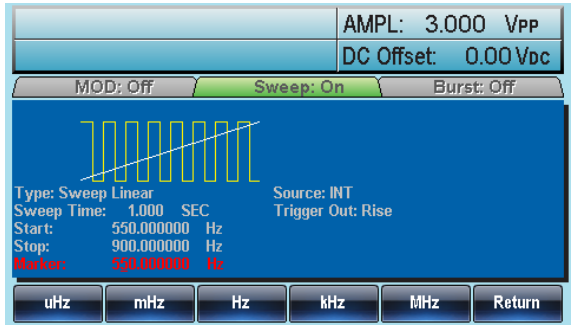
2. 按 F6 (More)

3. 按 F3 (Marker)

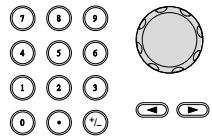
4. 按 F2 (ON/OFF)打开/关闭标记

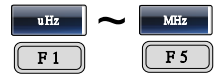
5. 按 F1 (Freq)选择标记频率

6. 位于波形显示区域处的频率参数将变亮



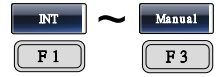
7. 使用方向键和可调旋钮或数字键盘输入频率



	8. 按 F1~F5 选择频率单位	
范围	频率	100μHz~80MHz(3081) 100μHz~50MHz(3051) 100μHz~1MHz (斜波)
	默认	550Hz
注意	标记频率必须设置在起始频率和停止频率之间。如果无设置，标记频率将等于起始频率和停止频率的均值。 启用扫描模式后，标记模式将忽略同步模式的设置。	

扫描触发源

扫描模式下，信号发生器在收到触发信号时输出一个扫描。扫描输出完成后，信号发生器输出起始频率，并等待下一次触发。默认内部触发源。

面板扫描	1. 按 SWEEP 键	
	2. 按 F1 (Source)	
	3. 按 F1 (Internal), F2 (External)或 F3 (Manual)选择触发源	
	4. 按 F6 (Return)返回菜单	

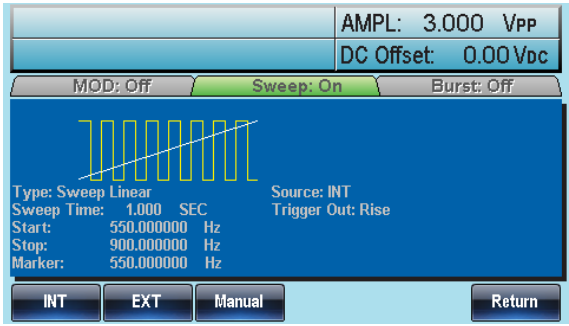
注意

选择内部源时，信号发生器输出一个连续的扫描，其频率由扫描时间决定。

选择外部源时，每收到一个从后面板 Trig Out 的 TTL 脉冲，信号发生器就输出一个扫描。

触发周期必须大于或等于扫描时间+1ms。

5. 如果选择手动触发，按 F1 (Trigger)执行手动扫描



触发输出

后面板的 Trig Out 端子输出触发输出信号(扫描和脉冲串模式)。默认在扫描开始时输出具有上升沿的 TTL 方波。信号也可以设为下降沿。

面板操作

1. 按 SWEEP 键

2. 按 F6 (More)

3. 按 F4 (TRIG out)

4. 按 F3 (ON/OFF)

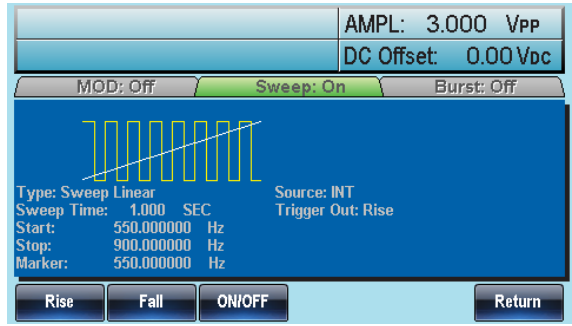
5. 按 F1 (Rise)或 F2 (Fall)选择触发沿

注意

选择内部触发源，在每次扫描开始时，信号发生器就从 Trig out 端输出占空比为 50%的方波。波形频率与扫描时间相等。

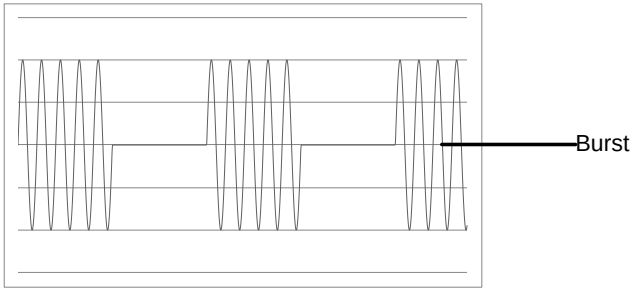
选择外部触发源时，信号发生器自动禁用触发输出信号。

选择手动触发，在每次扫描或脉冲串开始时，信号发生器从 Trig Out 端输出一个>1us 的脉冲。



脉冲串模式

信号发生器能创建一个具有指定循环数的波形脉冲串。脉冲串模式支持正弦波、方波、三角波和斜波。



选择脉冲串模式

选择脉冲串模式后，任何调制或扫描模式都将自动关闭。如果无设置，输出幅值、偏移和频率启用默认值。

脉冲串模式

触发(N 次循环模式)或门控模式可以设置脉冲串模式。在 N 次循环/触发模式下，每次接收触发时信号发生器都将输出一个指定循环次数的波形(脉冲串)。执行完成后，信号发生器将停止并等待下一次触发。默认为 N 次循环模式。内部或外部触发均可使用。

相比指定循环次数，门控模式使用外部触发打开或关闭输出。当触发输入信号为高电平时，波形持续输出。当触发输入信号为低电平时，信号发生器在输出最后一个完整波形后停止。输出电压电平仍与脉冲串波形的起始相位相同。

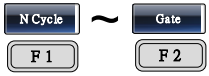
脉冲串模式	脉冲串计数	脉冲串周期	相位	触发源
Triggered (Int)	可用	可用	可用	立即
Triggered (Ext)	可用	不可用	可用	EXT, Bus
Gated pulse (Ext)	不可用	不可用	可用	不可用

门控模式下，关闭脉冲串计数、脉冲串周期和触发源。如果此时触发，将不会有任何效果，也不会产生任何错误。

面板操作

1. 按 Burst 键

2. 选择 N 次循环(F1)或门控(F2)



脉冲串频率

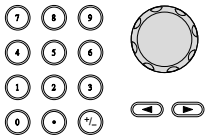
在 N 次循环和门控模式下，波形频率定义了脉冲串波形的重复率。在 N 次循环模式下，以指定循环次数输出波形。在门控模式下，当触发信号为高电平时输出波形频率。脉冲串模式支持正弦波、方波、三角波或斜波。

面板操作

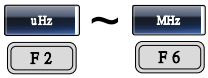
1. 按 FREQ/Rate 键

2. 位于参数窗口处的 FREQ 参数将变亮

3. 使用方向键和可调旋钮或数字键盘输入频率



4. 按 F2~F6 选择频率单位



范围	频率	2mHz~80MHz(3081)/ 50MHz(3051)
	频率 – 斜波	2mHz~1MHz
	默认	1kHz

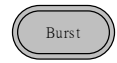
注意 波形频率不同于脉冲串周期。脉冲串周期指 N 次循环模式下脉冲串波形之间的时间间隔。

脉冲串循环/计数

脉冲串循环/计数是指脉冲串波形的循环次数。仅用于 N Cycle 模式(内部, 外部或手动触发)。默认 1 次循环。

面板操作

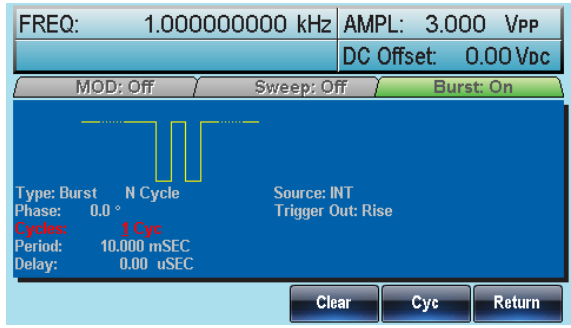
1. 按 Burst 键



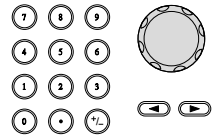
2. 按 F1 (N Cycle)

3. 按 F1 (Cycles)

4. 位于波形显示区域处的 Cycles 参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入循环数



6. 按 F5 选择 Cyc 单位

范围 循环 1~1,000,000

注意

选择内部触发源时，持续输出循环数。脉冲串周期决定脉冲串频率和脉冲串之间的时间间隔。

脉冲串计数须小于脉冲串周期和波形频率的乘积。

脉冲串计数 < (脉冲串周期 x 波形频率)

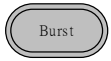
如果脉冲串计数超出上述限制，信号发生器将自动增大脉冲串周期，以满足条件。

选择门控脉冲串模式时，忽略脉冲串计数。如果从远程接口更改计数，信号发生器将记录新计数，并在下次使用。

无限脉冲串计数

面板操作

1. 按 Burst 键



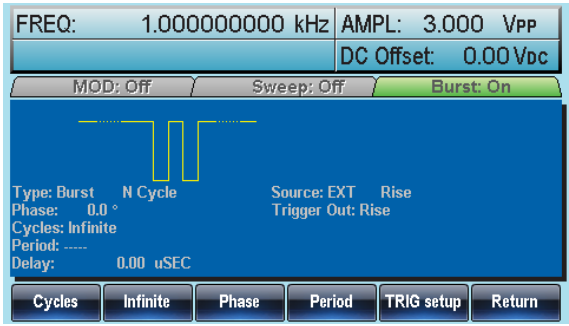
2. 按 F1 (N Cycle)

3. 按 F2 (Infinite)

注意

无限脉冲串仅用在手动触发模式

25MHz 以上，无限脉冲串仅适合方波和正弦波

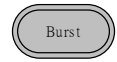


脉冲串周期

从一个脉冲串的开始至下一个脉冲串的开始所经历的时间称为脉冲串周期。仅用于内部触发脉冲串模式。

面板操作

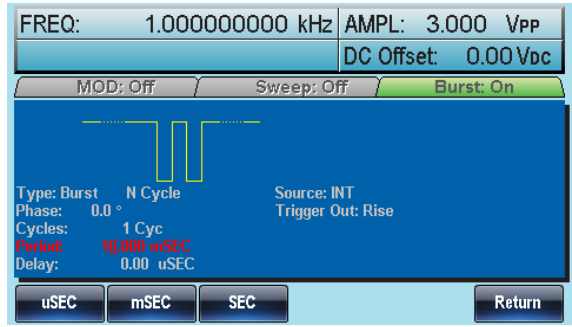
1. 按 Burst 键



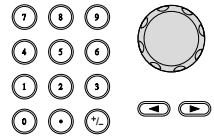
2. 按 F1 (N Cycle)

3. 按 F4 (Period)

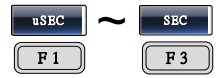
4. 位于波形显示区域处的周期参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入周期



6. 按 F1~F3 选择周期单位



范围	周期	1ms~500s
	默认	10ms

注意

脉冲串周期仅用于内部触发。当使用门控脉冲串模式或外部和手动触发时，关闭脉冲串周期设置。

脉冲串周期一定要够长，且满足如下条件:

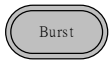
脉冲串周期>脉冲串计数/波形频率 + 200ns

脉冲串相位

脉冲串波形的起始相位称为脉冲串相位，默认 0°。

面板操作

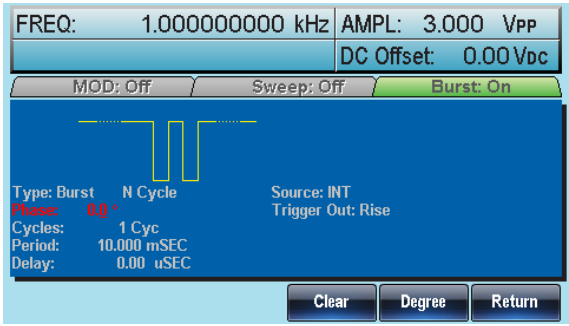
1. 按 Burst 键



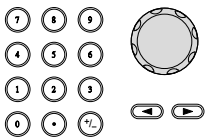
2. 按 F1 (N Cycle)

3. 按 F3 (Phase)

4. 位于波形显示区域处的相位参数将变亮



5. 使用方向键和可调旋钮或数字键盘输入相位



6. 按 F5 (Degree)选择相位单位

范围	相位	-360˚~+360˚
	默认	0˚

注意

当使用正弦波、方波、三角波或斜波时，0˚与波形 0V 点相对应。

0˚是波形的起始点。对于正弦波、方波或三角波、斜波，0˚对应 0V 电压(假设没有 DC 偏置)

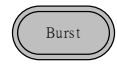
脉冲串相位用于 N 次循环和门控脉冲串模式。在门控脉冲串模式下，当触发 INPUT 信号下降到低电平时，信号发生器完成当前波形后停止输出。电压输出电平仍与起始脉冲串相位对应的电压值相同。

脉冲串触发源

触发脉冲串(N-Cycle)模式下，信号发生器在收到触发后输出一个波形脉冲串。脉冲串循环(脉冲串计数)指定每个脉冲串的波形数。输出完成后，信号发生器停止并等待下一次触发。默认启用内部触发的脉冲串(N-cycle)模式。

面板操作

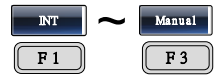
1. 按 Burst 键



2. 按 F1 (N Cycle)

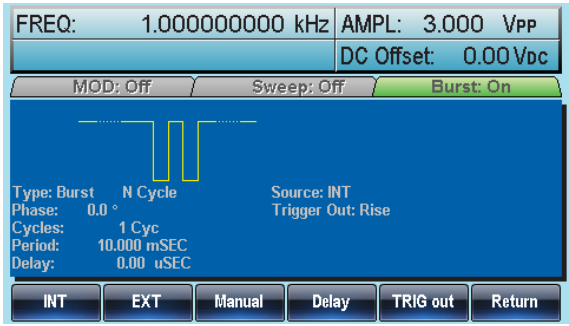
3. 按 F5 (TRIG setup)

4. 按 F1 (INT), F2 (EXT)或 F3 (Manual)选择触发类型



手动触发

如果选择手动触发，每按一次触发软键(F1)输出一个脉冲串



注意

选择内部触发源时，脉冲串以指定频率持续输出，该频率和脉冲串之间的时间间隔由脉冲串周期决定。

选择外部触发时，信号发生器接收后面板触发输入端的触发信号(TTL)。每收到一个触发信号，信号发生器就输出一个脉冲串(循环数已设)。输出脉冲串期间接收到的触发信号将被忽略。

若使用手动或外部触发，仅可用脉冲串相位和脉冲串循环/计数，脉冲串周期不可用。

在接收触发后、脉冲串开始之间可以插入时间延迟。

脉冲串延迟

面板操作

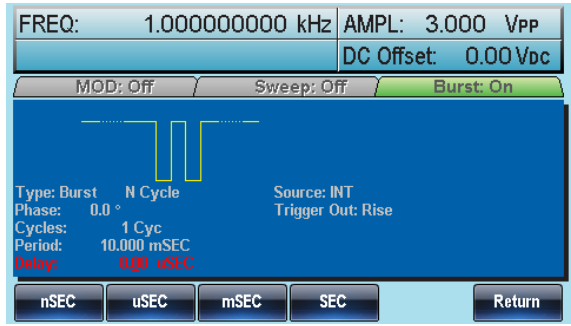
1. 按 Burst 键

2. 按 F1 (N Cycle)

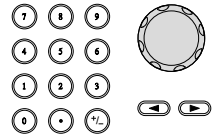
3. 按 F5 (TRIG setup)

4. 按 F4 (Delay)

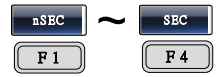
5. 位于波形显示区域处的 Delay 参数将变亮



6. 使用方向键和可调旋钮或数字键盘输入周期



7. 按 F1~F4 选择延迟时间单位



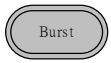
范围	延迟时间	0s~80s
	默认	0s

脉冲串触发输出

后面板的 Trig Out 端子提供触发输出信号(仅用于脉冲串和扫描模式)。在脉冲串开始时默认输出具有上升沿的 TTL 兼容触发信号。

面板操作

1. 按 Burst 键



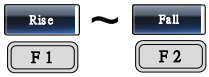
2. 按 F1 (N Cycle)

3. 按 F5 (TRIG setup)

4. 按 F5 (TRIG out)

5. 按 F3 (ON/OFF)打开/关闭触发输出

6. 选择 F1 (Rise)或 F2 (Fall)边沿触发

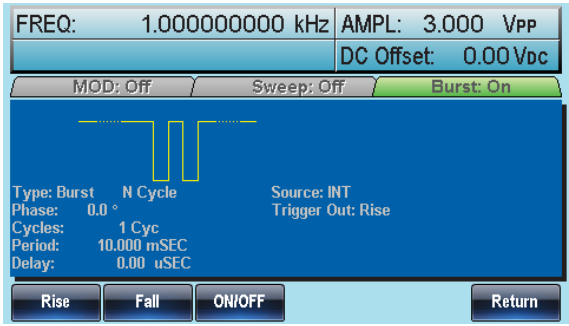


注意

选择内部触发源，在每个脉冲串开始时，信号发生器输出占空比为 50%的方波。

选择手动触发时，信号发生器自动禁用触发输出。

对于手动触发，在每个脉冲串开始时，信号发生器从 Trig Out 端输出一个>1us 的脉冲。



辅助系统功能设置

辅助系统功能设置包括存储和调取设置、RS232/USB/GPIB 设置、查看软件版本、更新固件、自我校准、输出阻抗设置、改变语言和 DSO 连接设置。

存储和调取

AFG-3000 的非易失性存储器有 10 个内存文件 0~9，可以保存仪器状态、波形数据(ARB)和设置。内存文件中的数据(ARB 或设置数据)以红色字体显示。若没有数据则呈现蓝色。

存储/调取内容

ARB

- 速率
- 频率
- 长度
- 显示水平位置
- 显示垂直位置
- 输出开始
- 输出长度

设置

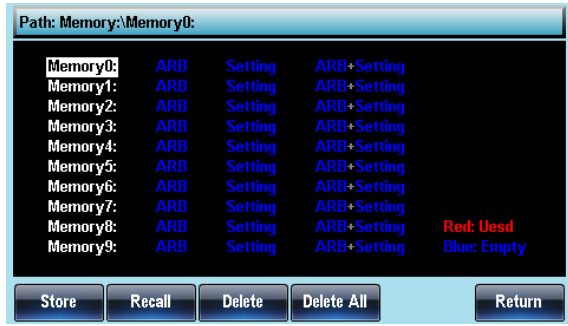
- 功能
  - 波形
  - 频率
  - 脉冲宽度
  - 方波占空比
  - 斜波对称性
  - 幅值
  - 幅值单位
  - 偏移
  - 调制类型
  - 蜂鸣器设置
  - 阻抗
  - 主输出
- 扫描
  - 源
  - 类型
  - 触发
  - 标记
- AM
  - 调制源
  - 波形
  - 深度
  - AM 频率
- FM
  - 调制源
  - 波形
  - 偏移
  - FM 频率
- FSK
  - 调制源
  - 波形
  - 速率
  - 跳跃频率
- PWM
  - 调制源
  - 波形

- 时间
- 起始频率
- 停止频率
- 中心频率
- 跨距频率
- 标记频率
- 占空比
- 频率
- 脉冲串类型
  - 源
  - 触发
  - 类型
  - 循环数
  - 相位
  - 周期
  - 延迟

面板操作

1. 按 UTIL 键

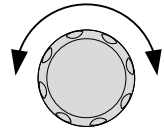
2. 按 F1 (Memory)



3. 选择文件操作:

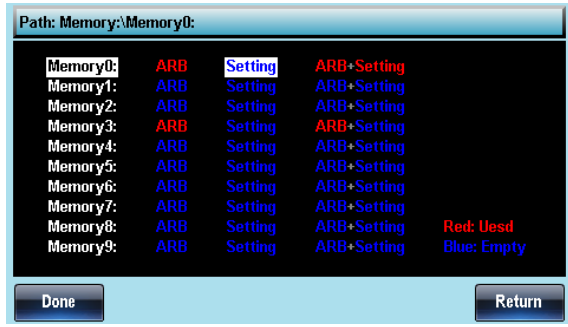
F1 存储文件, F2 调取文件, F3 删除文件

4. 使用可调旋钮选择一个内存文件。按 F1 (Select)确认



5. 使用可调旋钮选择数据类型。按 F1 (Select)确认

范围	内存文件	Memory0 ~ Memory9
	数据类型	ARB, 设置, ARB+设置



6. 按 F5 (Done)确认操作

删除所有

7. 按 F4 删除 Memory0 ~ Memory9 所有文件

8. 按 F1 (Done)确认删除

选择远程接口

AFG-3000 具有 RS232, GPIB 和 USB 接口，方便远程控制。一次仅可以使用一个远程接口。

GPIB 接口

背景　　使用 GPIB 接口必须指定 GPIB 地址。默认 GPIB 接口为 10

面板操作

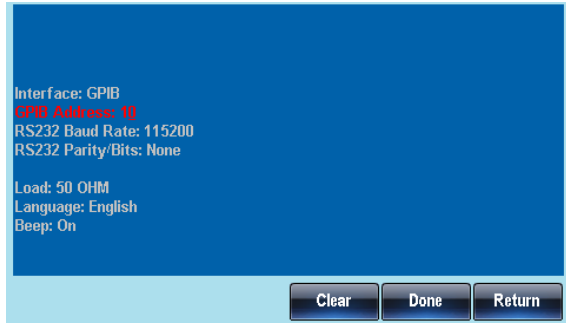
1. 按 UTIL 键

2. 按 F2 (Interface)

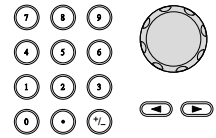
3. 按 F1 (GPIB)

4. 按 F1 (Address)

5. GPIB 将变亮



6. 使用方向键和可调旋钮或数字键盘输入 GPIB 地址



7. 按 F5 (Done)确认 GPIB 地址

范围	GPIB 地址	1~30

RS232 接口

背景 使用 RS232 接口必须指定波特率

面板操作

1. 按 UTIL 键

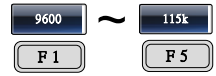
2. 按 F2 (Interface)

3. 按 F2 (RS-232)

4. 按 F1 (Baud Rate)

5. 位于参数窗口处的 RS232 Baud Rate 将变亮

6. 按 F1~F5 选择波特率



范围	波特率	9600, 19200, 38400, 57600, 115200

RS232 奇偶性/数据位设置

背景

RS232 用作远程接口时可以设置奇偶校验。默认无奇偶校验/8 个数据位

面板操作

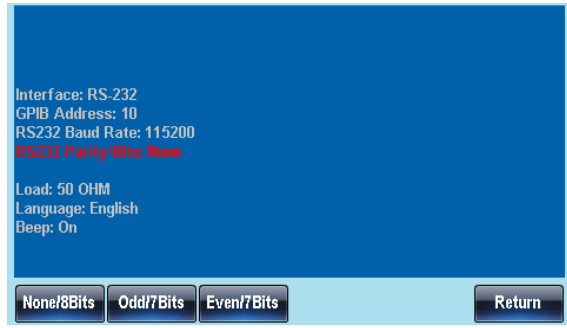
1. 按 UTIL 键

2. 按 F2 (Interface)

3. 按 F2 (RS-232)

4. 按 F2 (Parity)

5. 位于参数窗口处的 RS232 Parity/Bits 参数将变亮



6. 按 F1, F2 或 F3 选择奇偶性和数据位

范围 无奇偶校验/8 位, 奇校验/7 位, 偶校验/7 位

USB 接口

背景 用于远程控制

面板操作

1. 按 UTIL 键

2. 按 F2 (Interface)

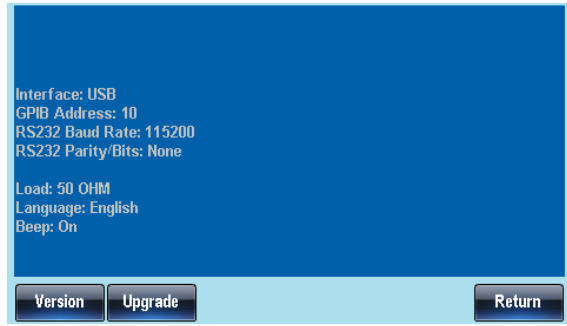
3. 按 F3 (USB)

系统和设置

用户也可以设置语言选项、输出阻抗、DSO 连接以及固件配置等。

查看和更新固件版本

面板操作	1. 按 UTIL 键	
	2. 按 F3 (Cal.)	
	3. 按 F2 (Software)	
查看版本	4. 按 F1(Version)查看固件版本	
	屏幕显示版本信息: 仪器, 版本, FPGA 版次, Bootload 版本	
更新固件	5. 将包含固件文件的 USB 闪盘插入 USB host 驱动中，按 F2 (Upgrade)更新固件	
注意	固件文件(*.bin)一定要放在 UPGRADE 目录下，直接使用 USB 根目录。UPGRADE 必须大写。	



设置输出阻抗

背景

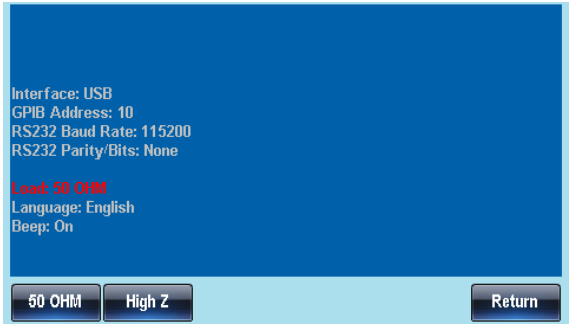
AFG-3000 提供可选输出阻抗: 50Ω(默认)或 High-Z。输出阻抗仅供参考，如果与实际负载阻抗不同，那么实际幅值和偏移也将相应改变。

面板操作

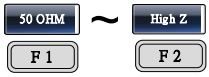
1. 按 UTIL 键

2. 按 F4 (Load)

3. Load 将变亮变红



4. 按 F1 (50 OHM)或 F2 (High Z)选择输出阻抗



语言选择

背景 AFG-3000 提供英语(默认)和简体中文两种语言操作环境。

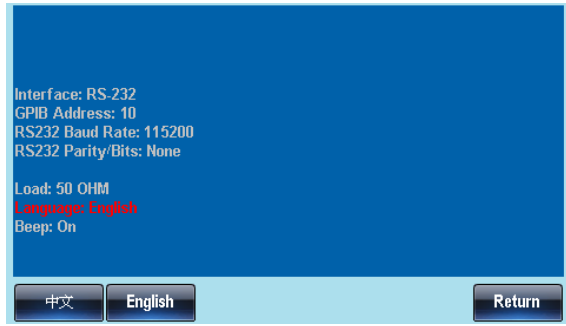
面板操作

1. 按 UTIL 键

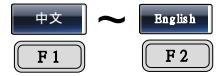
2. 按 F5 (System)

3. 按 F2 (Language)

4. Language 参数将变亮



5. 按 F1 (中文)或 F2 (English) 选择语言



设置蜂鸣器

背景　　打开或关闭蜂鸣器。

面板操作

1. 按 UTIL 键

2. 按 F5 (System)

3. 按 F3 (Beep)打开或关闭蜂鸣器

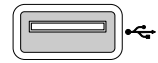
4. Beep 参数将变亮

屏幕截图

背景　　信号发生器能截取屏幕图像并将它们保存在 U 盘中

连接

1. 将 USB key 插入前面板的 USB 端子



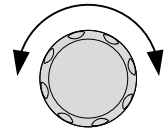
面板操作

2. 按 UTIL 键

3. 按 F5 (System)

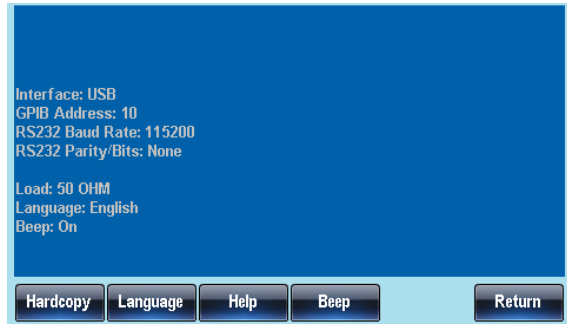
4. 按 F1 (Hardcopy)

5. 使用可调旋钮选择屏幕图像，每次截取一张



功能: 波形, ARB, MOD (AM, FM, FSK, PWM), Sweep, Burst, UTIL

6. 选择屏幕图像，按 F1 保存。2s 后再次出现 Utility 菜单，说明屏幕图像已经保存

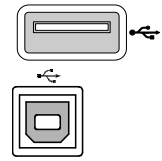


DSO 连接

背景

DSO 连接使 AFG-3000 和 GDS-2000 系列数字存储示波器之间进行无损数据传输。

1. 将 AFG-3000 USB host 接口与 GDS-2000 的 USB B device 接口相连



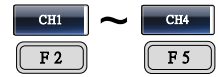
面板操作

2. 按 UTIL 键

3. 按 F6 (DSO Link)

4. 按 F1 (Search)

5. 按 F2 (CH1), F3 (CH2), F4 (CH3)或 F5 (CH4)选择 DSO 通道。屏幕显示捕获的数据



任意波形

AFG-3000 系列信号发生器能够创建自定义的任意波形，采样率 200MHz。每个波形 1M 数据点，垂直范围在±32767(65535)以内。

插入内置波形

AFG-3000 系列信号发生器可以创建一些常见波形，包括正弦波、方波、斜波、sinc、指数上升、指数下降和 DC 波形。

创建正弦波

面板操作

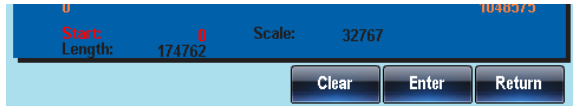
1. 按 ARB 键

2. 按 F3(Built in)

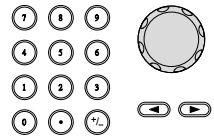
3. 按 F1 (Sine)

4. 按 F1 (Start)

5. Start 将变亮



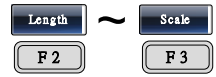
6. 使用方向键和可调旋钮或数字键盘输入起始地址



7. 按 F5 (Enter)确认 Start 点

8. 按 F6 (Return)返回上级菜单

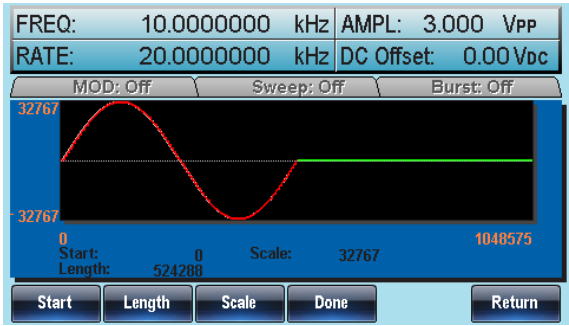
9. 重复 4~8 步完成 Length (F2)和 Scale (F3)设置



10. 按 F4 (Done)完成操作 

11. 按 F6 (Return)返回上级菜单 

如下创建一个正弦波，start:0, Length: 524288, Scale: 32767



创建方波

面板操作

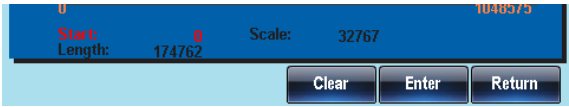
1. 按 ARB 键 

2. 按 F3 (Built in) 

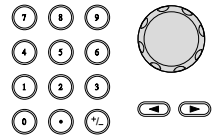
3. 按 F2 (Square) 

4. 按 F1 (Start) 

5. Start 变亮



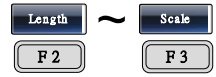
6. 使用方向键和可调旋钮或数字键盘输入起始地址



7. 按 F5 (Enter)确认 Start 点

8. 按 F6 (Return)返回上级菜单

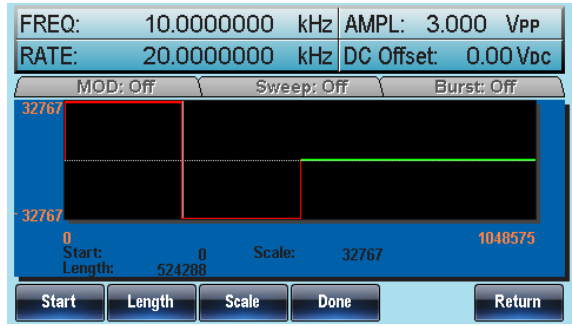
9. 重复 4~8 步完成 Length (F2)和 Scale (F3)设置



10. 按 F4 (Done)完成操作

11. 按 F6 (Return)返回上级菜单

如下创建一个方波，start:0, Length: 524288, Scale: 32767



创建斜波

面板操作

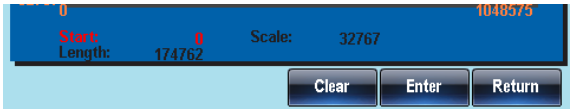
1. 按 ARB

2. 按 F3 (Built in)

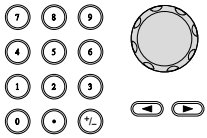
3. 按 F3 (Ramp)

4. 按 F1 (Start)

5. Start 呈现亮红色



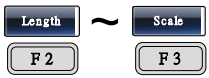
6. 使用方向键和可调旋钮或数字键盘输入起始地址



7. 按 F5 (Enter)确认起始点

8. 按 F6 (Return)返回上级菜单

9. 重复 4~8 步完成 Length (F2)和 Scale (F3)设置



10. 按 F4 (Done)完成操作

11. 按 F6 (Return)返回上级菜单

如下创建一个斜波，start:0, Length: 524288, Scale: 32767

创建 Sinc 波形

面板操作

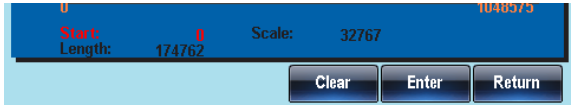
1. 按 ARB 键

2. 按 F3 (Built in)

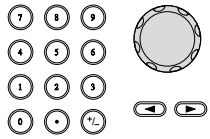
3. 按 F4 (Sinc)

4. 按 F1 (Start)

5. Start 呈现亮红色



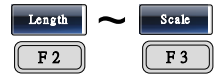
6. 使用方向键和可调旋钮或数字键盘输入起始地址



7. 按 F5 (Enter)确认起始点

8. 按 F6 (Return)返回上级菜单

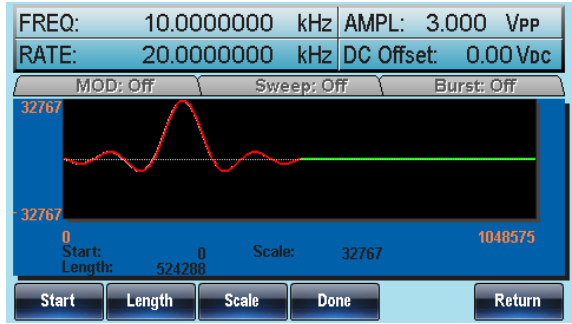
9. 重复 4~8 步完成 Length (F2)和 Scale (F3)设置



10. 按 F4 (Done)完成操作

11. 按 F6 (Return)返回上级菜单

如上创建一个 sinc 波形，start:0, Length: 524288, Scale: 32767



创建指数上升波形

面板操作

1. 按 ARB 键

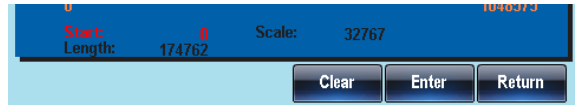
2. 按 F3 (Built in)

3. 按 F5 (More)

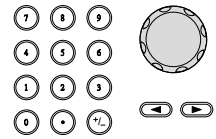
4. 按 F1 (Exp Rise)

5. 按 F1 (Start)

6. Start 呈现亮红色



7. 使用方向键和可调旋钮或数字键盘输入起始地址



8. 按 F5 (Enter)确认起始点

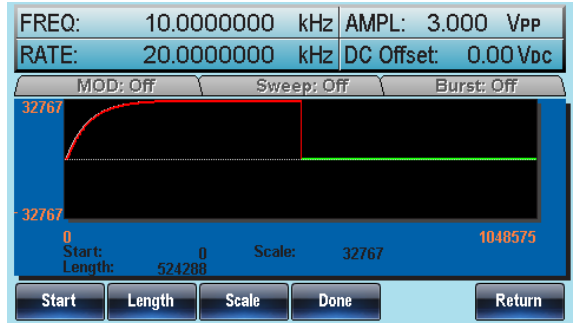
9. 按 F6 (Return)返回上级菜单

10. 重复 4~8 步完成 Length (F2) 和 Scale (F3)设置

11. 按 F4 (Done)完成操作

12. 按 F6 (Return)返回上级菜单 

如下创建一个指数上升波形，start:0, Length: 524288, Scale: 32767



创建指数下降波形

面板操作

1. 按 ARB 键 

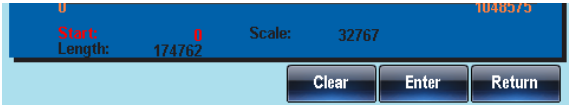
2. 按 F3 (Built in) 

3. 按 F5 (More) 

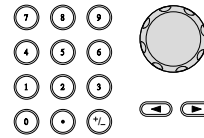
4. 按 F2 (Exp Fall) 

5. 按 F1 (Start) 

6. Start 呈现亮红色



7. 使用方向键和可调旋钮或数字键盘输入起始地址



8. 按 F5 (Enter)确认起始点

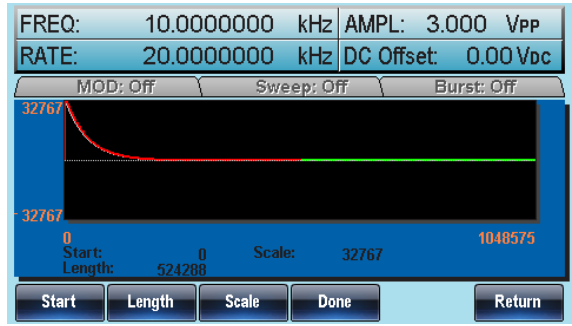
9. 按 F6 (Return)返回上级菜单

10. 重复 4~8 步完成 Length (F2)和 Scale (F3)设置

11. 按 F4 (Done)完成操作

12. 按 F6 (Return)返回上级菜单

如下创建一个指数下降波形，start:0, Length: 524288, Scale: 32767



创建 DC 波形

面板操作

1. 按 ARB 键

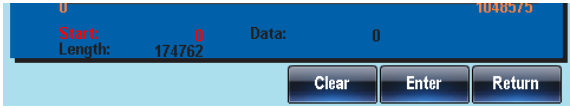
2. 按 F3 (Built in)

3. 按 F5 (More)

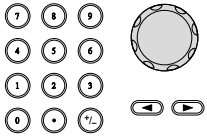
4. 按 F3 (DC)

5. 按 F1 (Start)

6. Start 呈现亮红色



7. 使用方向键和可调旋钮或数字键盘输入起始地址



8. 按 F5 (Enter)确认起始点

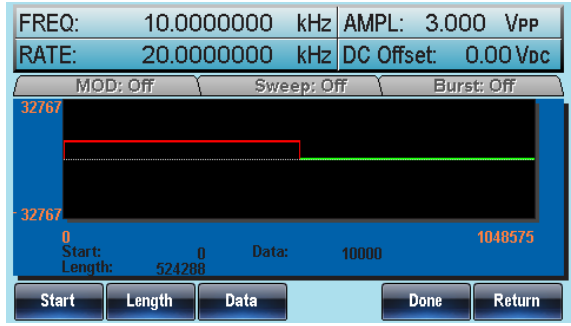
9. 按 F6 (Return)返回上级菜单

10. 重复 4~8 步完成 Length (F2) 和 Data (F3)设置

11. 按 F5 (Done)完成操作

12. 按 F6 (Return)返回上级菜单 

如下创建一个 DC 波形，start:0, Length: 524288, Data: 10000



创建脉冲波形

范围	频率	分辨率	占空比分辨率
	1pHz~5Hz	1pHz	0.0001%
	>5Hz~50Hz	1uHz	0.0001%
	>50Hz~500Hz	10uHz	0.001%
	>500Hz~5kHz	100uHz	0.01%
	>5kHz~50kHz	1mHz	0.1%
	>50kHz~500kHz	10mHz	1%

面板操作

1. 按 ARB 键 

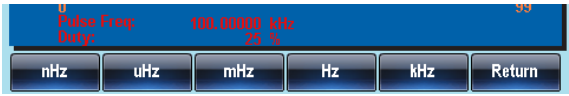
2. 按 F3 (Built in) 

3. 按 F5 (More) 

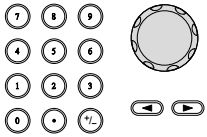
4. 按 F4 (Pulse) 

5. 按 F1 (Freq) 

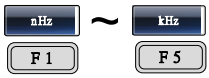
6. Pulse Freq 呈现亮红色



7. 使用方向键和可调旋钮或数字键盘输入脉冲频率

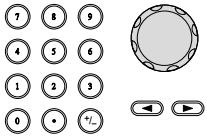


8. 按 F1~F5 选择频率单位



9. 按 F6 (Return)返回上级菜单

10. 按 F2 (Duty)并使用数字键盘或可调旋钮选择占空比



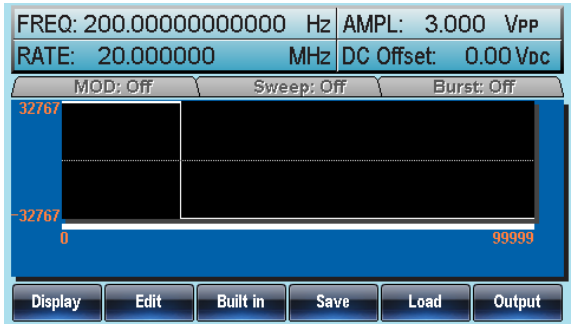
11. 按 F5 (%)完成操作

12. 按 F6 (Return)返回上级菜单

13. 按 F5 (Done)完成操作

14. 按 F6 (Return)返回上级菜单

如下创建一个脉冲波(200Hz 频率、25%占空比)



显示任意波形

设置水平显示范围

两种方式设置水平显示范围: 使用起始点和长度或者使用中心点和长度

面板操作

1. 按 ARB 键

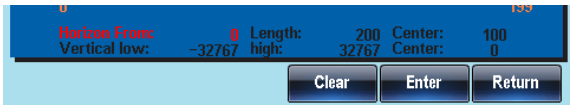
2. 按 F1 (Display)进入显示菜单

3. 按 F1 (Horizon)进入水平菜单

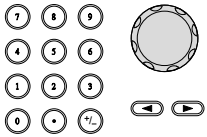
使用起始点

4. 按 F1(Start)

5. Horizontal From 参数变亮



6. 使用方向键和可调旋钮或数字键盘输入水平值



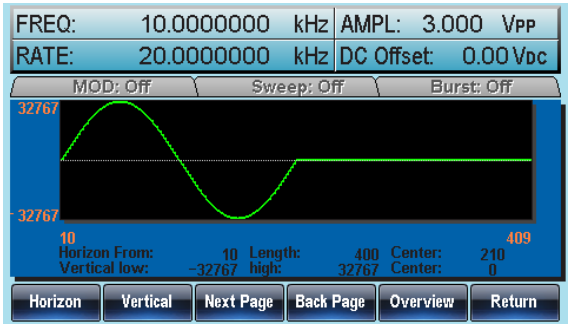
7. 按 Clear (F4, Not F1)取消

8. 按 F5 (Enter)保存设置

9. 按 F6 (Return)返回上级菜单

设置长度	10. 重复 4~9 步完成 Length (F2)设置	Length F2
使用中心点	11. 重复 4~9 步完成 Center (F3)设置	Center F3
Zoom in	12. 按 F4 (Zoom In)放大波形。长度每次减小一半。允许的最小长度为 3	Zoom in F4
Zoom out	13. 按 F5 (Zoom out)沿波形中点缩小。长度每次增加一倍。允许的最大长度为 1048576	Zoom out F5

如下任意正弦波：start 10、length 400、center 210



设置垂直显示范围

与水平窗口类似，两种方式设置垂直显示范围：设置高和低值，或者设置中心点。

面板操作

1. 按 ARB 键

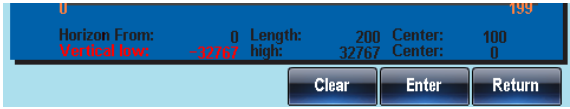
2. 按 F1 (Display)

3. 按 F2 (Vertical)

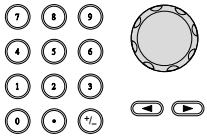
设置最低点

4. 按 F1 (Low)

5. Vertical Low 参数变亮



6. 使用方向键和可调旋钮或数字键盘输入垂直最小值



7. 按 Clear (F4)取消

8. 按 F5 (Enter)保存设置

9. 按 F6 (Return)返回上级菜单

设置最高点

10. 重复 4~9 步完成 High (F2)设置

设置中心点

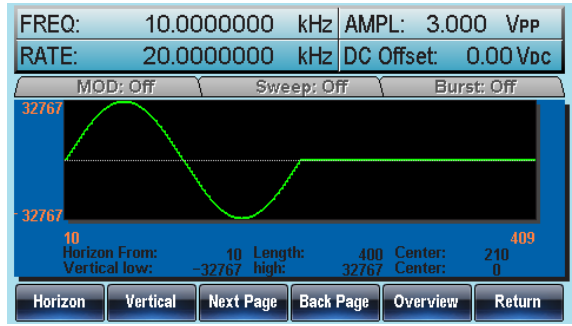
11. 重复 4~9 步完成 Center (F3) 设置

Zoom

12. 按 F4 (Zoom In)沿波形的中心放大。长度每次减小一半。允许的最小垂直低点为-2，最小垂直高点为 2

13. 按 F5 (Zoom out)缩小波形。长度每次增加一倍。允许的最大垂直低点为- 32767，最大垂直高点为+32767

如下正弦波：垂直最低点-32767、垂直最高点 32767、中心点 0



页面导航(前移)

背景

观察波形时，使用 Next/Back Page 功能可以向前/向后移动显示窗口。

面板操作

1. 按 ARB 键

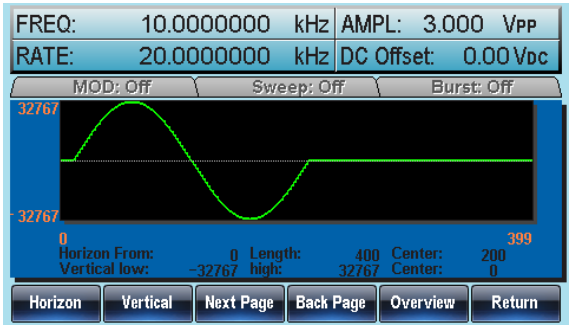
2. 按 F1 (Display)

3. 按 F4 (Back Page)将显示窗口向前移动一个观察长度

Horizon start*＝Horizon start - Length
Center*=Center – Length
*Length 不小于 0

选择 Back Page 后，屏幕显示如下：

Horizon From: 10 → 0
Length: 400
Center:210→ 200



页面导航(后移)

背景

观察波形时，使用 Next/Back Page 功能可以向前/向后移动显示窗口。

面板操作

1. 按 ARB 键

2. 按 F1 (Display)

3. 按 F3 (Next Page)将显示窗口向后移动一个观察长度

Horizon start*＝Horizon start + Length
Center=Center + Length
*Horizon start +Length≤1048576

选择 Next Page 后，屏幕显示如下：

Horizon From: 10 → 410
Length: 400
Center:210→ 610

显示

面板操作

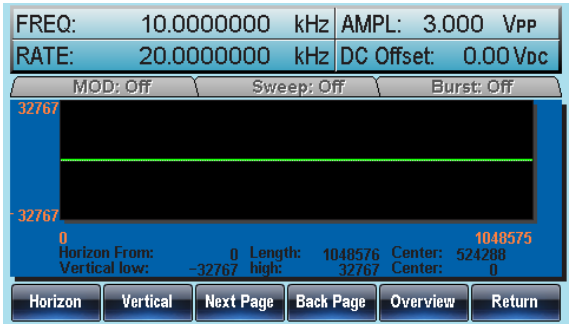
1. 按 ARB 键

2. 按 F1 (Display)

3. 按 F5 (Overview)显示整个波形

水平: 0~1048575,
垂直: 32767~ -328767

选择 Overview 后，屏幕显示如下：
Horizon From: 0 → 0
Length: 400→1048576
Center:200→ 524288
Vertical low/high: ±32767



编辑任意波形

增加一个点

背景 AFG-3000 提供强大的编辑功能，用户可以在波形的任何位置创建点或线

面板操作

1. 按 ARB 键

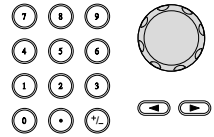
2. 按 F2 (Edit)

3. 按 F1 (Point)

4. 按 F1 (Address)

5. Address 参数呈现亮红色

6. 使用方向键和可调旋钮或数字键盘输入地址



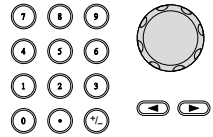
7. 按 F5 (Enter)保存设置

8. 按 F6 (Return)返回上级菜单

9. 按 F2 (Data)

10. Value 参数呈现亮红色

11. 使用方向键和可调旋钮或数字键盘输入 Data 值



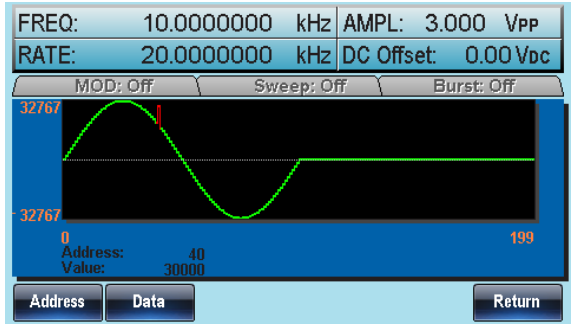
12. 按 F5 (Enter)保存设置

13. 按 F6 (Return)返回上级菜单

14. 再按 F6 (Return)返回 ARB 菜单

如下图，编辑区域显示红色：

Address 40，Data 30,000



增加一条线

背景

AFG-3000 提供强大的编辑功能，用户可以在波形的任何位置创建点或线

面板操作

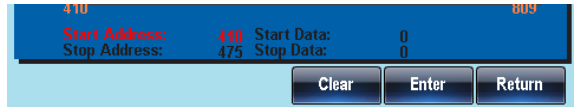
1. 按 ARB 键

2. 按 F2 (Edit)

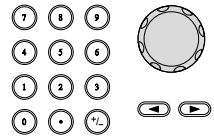
3. 按 F2 (Line)

4. 按 F1 (Start ADD)

5. Start Address 参数呈现亮红色



6. 使用方向键和可调旋钮或数字键盘输入起始地址



7. 按 F5 (Enter)保存设置

8. 按 F6 (Return)返回上级菜单

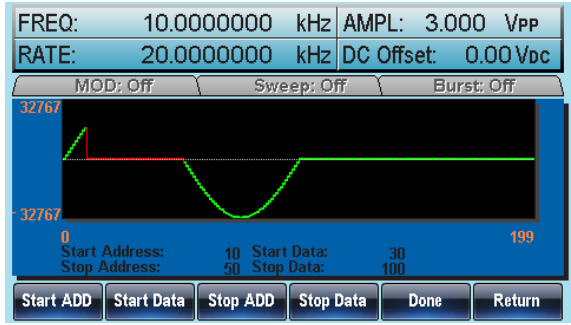
9. 重复 4~8 步，完成 Start Data (F2), Stop Address (F3)和 Stop Data (F4)设置

10. 按 F5 (Done)确认编辑

11. 按 F6 (Return)返回上级菜单

创建一条红线，参数如下:

Start Address: 10, Start Data: 30
Stop Address: 50, Stop Data: 100



复制波形

面板操作

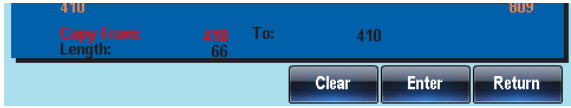
1. 按 ARB 键

2. 按 F2 (Edit)

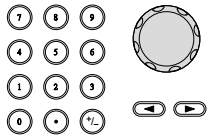
3. 按 F3 (Copy)

4. 按 F1 (Start)

5. Copy From 呈现亮红色



6. 使用方向键和可调旋钮或数字键盘输入复制波形的地址



7. 按 F5 (Enter)保存设置

8. 按 F6 (Return)返回上级菜单 

9. 重复 4~8 步完成 Length (F2)和 Paste To (F3)

10. 按 F5 (Done)确定选择 

11. 按 F6 (Return)返回上级菜单 

将点 50~80 内的波形复制到点 100~130:

Copy From: 50
Length: 30
To: 100

清除波形

面板操作

1. 按 ARB 键 

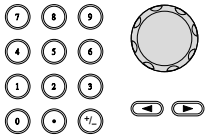
2. 按 F2 (Edit) 

3. 按 F4 (Clear) 

4. 按 F1 (Start) 

5. Clear From 呈现亮红色

6. 使用方向键和可调旋钮或数字键盘输入清除波形的地址



7. 按 F5 (Enter)保存设置

8. 按 F6 (Return)返回上级菜单

9. 重复 4~8 步完成 Length (F2) 设置

10. 按 F3 (Done)清除部分任意波形

11. 按 F6 (Return)返回上级菜单

---

12. 按 F5 (ALL)删除整个波形

删除所有

13. 再按 F5 (Done)确认删除

14. 按 F6 (Return)返回上级菜单

Start: 100, Length: 50.

清除部分波形后：

删除整个波形后：

ARB 保护

保护任意波形的某个区域不被改变。

面板操作

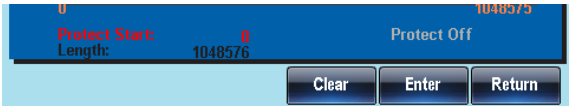
1. 按 ARB 键

2. 按 F2 (Edit)

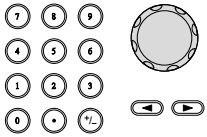
3. 按 F5 (Protect)

4. 按 F2 (Start)

5. Protect Start 呈现亮红色



6. 使用方向键和可调旋钮或数字键盘输入 Protect Start 地址



7. 按 F5 (Enter)保存设置

8. 按 F6 (Return)返回上级菜单

9. 重复 4~8 步完成 Length (F3) 设置

10. 按 F5 (Done)确认保护区域

11. 按 F6 (Return)返回上级菜单

12. 按 F4 (Done)保护所选区域或波形

保护整个波形

13. 按 F1 (ALL)保护整个波形

14. 按 F6 (Done)确认

15. 按 F6 (Return)返回上级菜单

解除保护

16. 按 F5 (Unprotect)解除保护波形

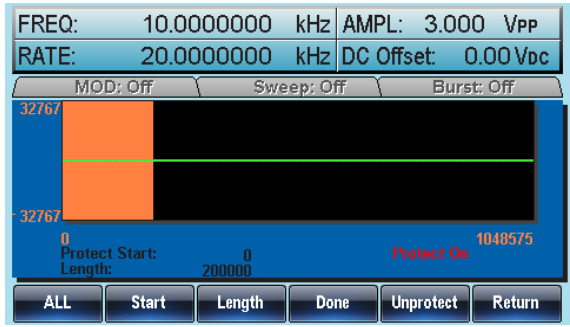
17. 按 F6 (Done)确认

18. 按 F6 (Return)返回上级菜单

19. 波形背景变回黑色。“Unprotected”呈灰色

波形保护区域以橘色背景显示，如下图：

Start:0, Length: 200000



输出任意波形

信号发生器能够输出高达 1 M(0~1048575)的任意波形，循环数可以指定也可以无限次循环。

输出任意波形

面板操作

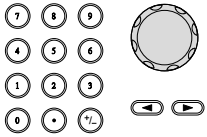
1. 按 ARB 键

2. 按 F6 (Output)

3. 按 F1 (Start)

4. Start 参数呈现亮红色

5. 使用方向键和可调旋钮或数字键盘输入起始地址



6. 按 F5 (Enter)确认起始点

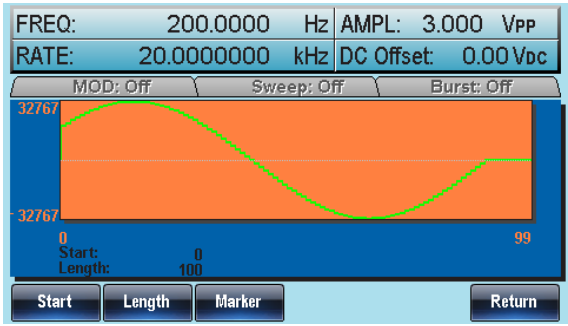
7. 按 F6 (Return)返回上级菜单

8. 重复 4~7 步完成 Length (F2) 设置

9. 按 F6 (Return)返回上级菜单

前面板端子输出如下波形：

position 0，length 100



输出 N 次循环的任意波形

背景	以指定循环次数重复输出任意波形。N Cycle 功能使用软件触发输出。
范围	1~1048575 次循环

面板操作

1. 按 ARB 键

2. 按 F6 (Output)

3. 定义任意波形输出的 Start 和 Length

錯誤! 尚未定義書籤。页

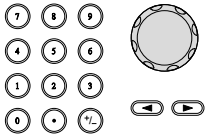
注意: 改变长度将改变脉冲波的占空比/频率。

4. 按 F4 (N Cycle)

5. 按 F1 (Cycles)

6. Cycles 参数呈现亮红色

7. 使用方向键和可调旋钮或数字键盘输入循环数



8. 按 F5 (Enter)确认循环数

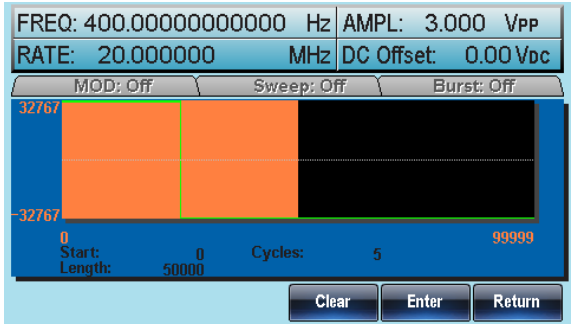
9. 按 F6 (Return)返回上级菜单

10. 按 Trigger (F5)内部触发输出(1 次)

注意: 按 F5 (Trigger)之前，请确保已经按下输出键并点亮 OUTPUT 指示灯。

11. 按 F6 (Return)返回上级菜单

前面板端子输出 5 次循环的脉冲波，如下图所示：



输出任意波形 – 无限循环

背景	无限次重复输出任意波形，创建一个循环波。

面板操作

1. 按 ARB 键

2. 按 F6 (Output)

3. 定义任意波输出的 Start 和 Length

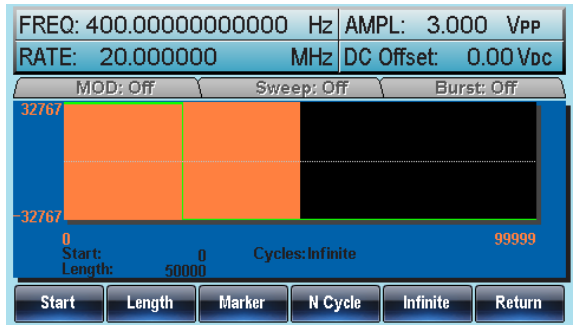
錯誤! 尚未定義書籤。页

注意: 改变长度将改变脉冲波的占空比/频率

4. 按 F5 (Infinite)无限次输出任意波形

5. 按 F6 (Return)返回上级菜单

从前面板端子输出无限次脉冲波，如下图所示：



输出标记

面板操作

1. 按 ARB 键

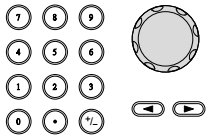
2. 按 F6 (Output)

3. 按 F3 (Marker)

4. 按 F1 (Start)

5. Start 参数呈现亮红色

6. 使用方向键和可调旋钮或数字键盘输入起始地址



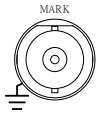
7. 按 F5 (Enter)确认起始点

8. 按 F6 (Return)返回上级菜单

9. 重复 4~8 步完成 Length (F2) 设置

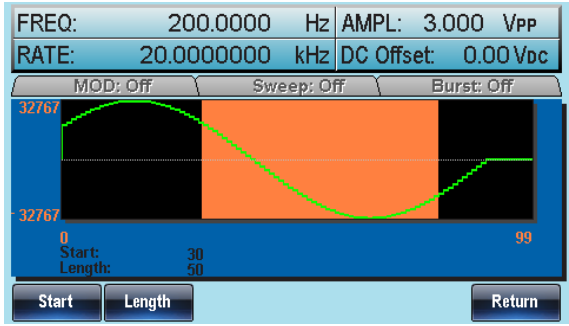
10. 按 F6 (Return)返回上级菜单

标记输出　　使用后面板的 MARK 输出端子



点 30~80 间的标记输出如下图所示：

(Start 30, Length 50)



存储/调取任意波形

AFG-3000 系列信号发生器可以创建一些常见波形，包括正弦波、方波、斜波、sinc、指数上升、指数下降和 DC 波形。

将波形保存至内部存储器

面板操作

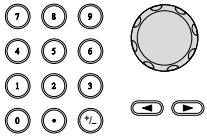
1. 按 ARB 键

2. 按 F4 (Save)

3. 按 F1 (Start)

4. Start 参数呈现亮红色

5. 使用方向键和可调旋钮或数字键盘输入起始地址



6. 按 F5 (Enter)确认起始点

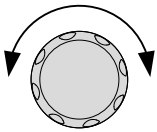
7. 按 F6 (Return)返回上级菜单

8. 重复 4~8 步完成 Length (F2) 设置

9. 按 F3 (Memory)

10. 使用可调旋钮选择内存文件

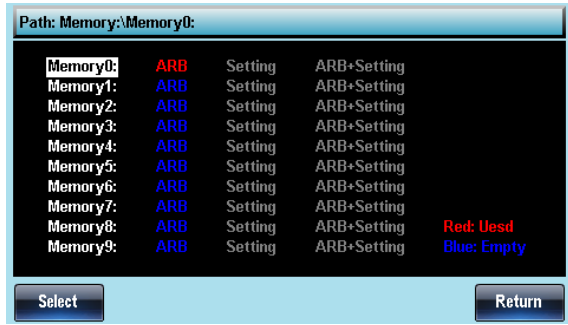
ARB0~ARB9



11. 按 F1 (Select)将波形保存至所选文件

12. 按 F6 (Return)返回上级菜单

使用可调旋钮选择 ARB1 文件，如下图所示：



将文件保存至 USB 存储器

面板操作

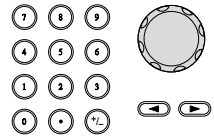
1. 按 ARB 键

2. 按 F4 (Save)

3. 按 F1 (Start)

4. Start 参数呈现亮红色

5. 使用方向键和可调旋钮或数字键盘输入起始地址



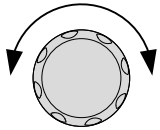
6. 按 F5 (Enter)确认起始点

7. 按 F6 (Return)返回上级菜单

8. 重复 4~8 步完成 Length (F2) 设置

1. 按 F4 (USB)

2. 使用可调旋钮查找文件系统

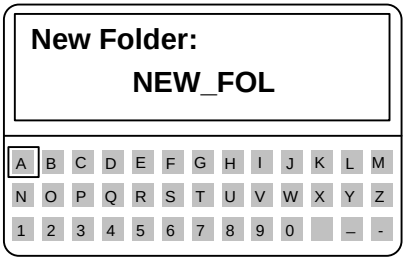


3. 按 Select 选择目录或文件名

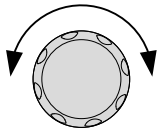
创建文件夹

4. 按 F2 (New Folder)

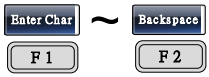
5. 显示默认文件夹名称“NEW_FOL”



6. 使用可调旋钮移动光标



7. 使用 F1 (Enter Char)或 F2 (Backspace)创建文件夹名称

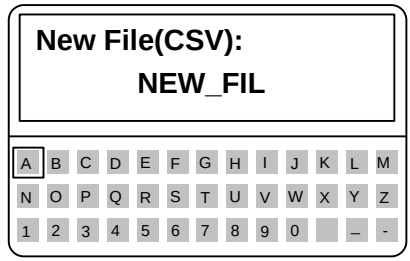


8. 按 F5 (Save)保存

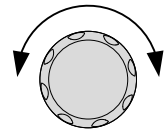
創建新文件

9. 按 F3 (New File)

10. 显示默认文件名“NEW_FIL”



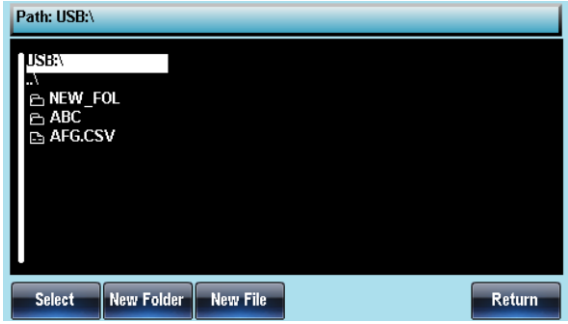
11. 使用可调旋钮移动光标



12. 使用 F1 (Enter Char)或 F2 (Backspace)创建文件名

13. 按 F5 (Save)保存

在根目录下创建 ABC 文件夹和 AFG.CSV 文件，如图所示：



从内部存储器调取波形

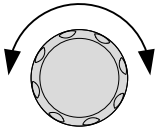
面板操作

1. 按 ARB 键

2. 按 F5 (Load)

3. 按 F1 (Memory)

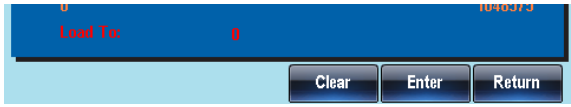
4. 使用可调旋钮查找文件系统



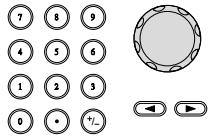
5. 按 Select 选择目录或文件名

6. 按 F3 (To)选择已调取波形的起始点

7. “Load To”呈现亮红色



8. 使用方向键和可调旋钮或数字键盘输入起始点

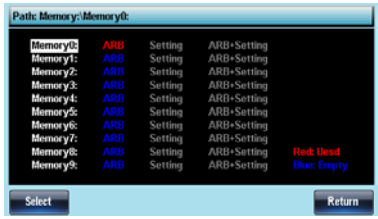


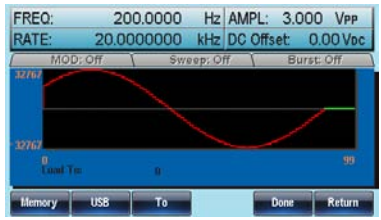
9. 按 F5 (Enter)确认起始点

10. 按 F6 (Return)返回上级菜单

11. 按 F5 (Done)

使用可调旋钮选择 ARB1 文件，调取波形的起始点为 0，如下图所示：





从 USB 调取波形

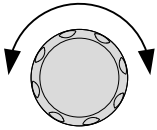
面板操作

1. 按 ARB 键

2. 按 F5 (Load)

3. 按 F2 (USB)

4. 使用可调旋钮选择文件名

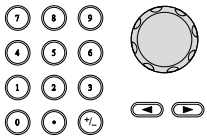


5. 按 F1 (Select)选择文件

6. 按 F3 (To)选择已调取波形的起始点

7. “Load To”呈现亮红色

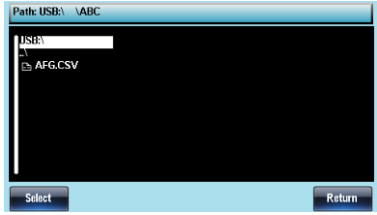
8. 使用方向键和可调旋钮或数字键盘输入起始点

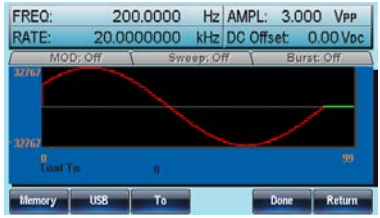


9. 按 F5 (Enter)确认起始点

10. 按 F5 (Done)

使用可调旋钮选择 AFG.CSV 文件，调取波形的起始点为 0，如下图所示：





远程接口

确立远程连接

The AFG-3000 supports USB, RS232 and GPIB remote connections.

Configure USB interface

USB configuration	PC side connector	Type A, host
	AFG-3000 side connector	Type B, slave
	Speed	1.1/2.0 (full speed)

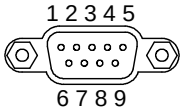
Panel Operation

1. Press the Utility key followed by Interface (F2) and USB (F3).

2. Connect the USB cable to the rear panel USB B (slave) port.

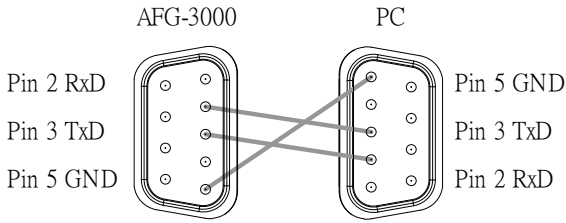
3. When the PC asks for the USB driver, select XXXXXXX.inf included in the software package or download the driver from the GW website, www.gwinstek.com.

Configure RS232 interface

RS-232C configuration	Connector	DB-9, Male
	Baud rate	9600, 19200, 38400, 57600, 115200
	Parity	None/8Bits, Odd/7Bits, Even/7Bits
	Stop bits	1 (fixed)
Pin assignment		2: RxD (Receive data) 3: TxD (Transmit data) 5: GND 4, 6 ~ 9: No connection

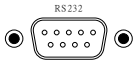
PC connection

Use the Null Modem connection as in the below diagram.



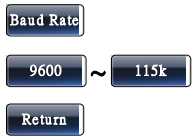
Panel Operation

1. Connect the RS-232 cable to the rear panel RS-232 port.

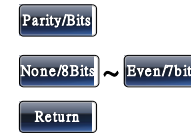


2. Press the Utility key followed by Interface (F2) and RS-232 (F2).

3. Press Baud Rate (F1) and choose a baud rate (F1)~(F5). Press return



4. Press Parity/Bits (F2) and choose a parity (F1)~(F3). Press return.



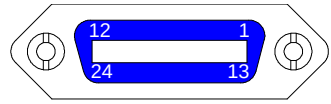
Configure GPIB interface

GPIB configuration	Connector	24 pin Female
	GPIB address	1-30

GPIB constraints

- Maximum 15 devices altogether, 20m cable length, 2m between each device
- Unique address assigned to each device
- At least 2/3 of the devices turned On
- No loop or parallel connection

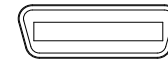
Pin assignment



Pin1	Data line 1	Pin13	Data line 5
Pin2	Data line 2	Pin14	Data line 6
Pin3	Data line 3	Pin15	Data line 7
Pin4	Data line 4	Pin16	Data line 8
Pin5	EOI	Pin17	REN
Pin6	DAV	Pin18	Ground
Pin7	NRFD	Pin19	Ground
Pin8	NDAC	Pin20	Ground
Pin9	IFC	Pin21	Ground
Pin10	SRQ	Pin22	Ground
Pin11	ATN	Pin23	Ground
Pin12	Shield (screen)	Pin24	Signal ground

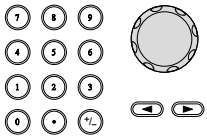
Panel Operation

1. Connect the GPIB cable to the rear panel GPIB port.



2. Press the Utility key followed by Interface and GPIB. Press Address (F1).

3. Use the scroll wheel or number pad to choose an address.



4. Press Done (F5) to confirm.

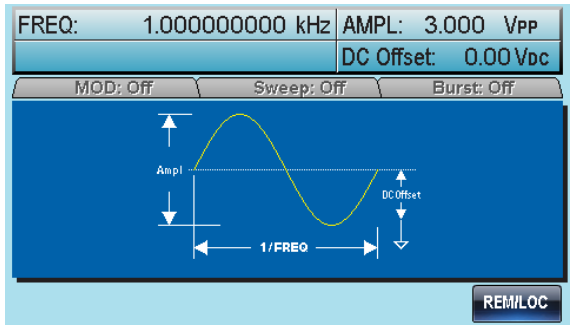
Remote control terminal connection

Terminal application	Invoke the terminal application such as MTTTY (Multi-Threaded TTY). For RS-232C, set the COM port, baud rate, stop bit, data bit, and parity accordingly. To check the COM port No, see the Device Manager in the PC. For WinXP, Control panel → System → Hardware tab.
Functionality check	Run this query command via the terminal. *idn? This should return the Manufacturer, Model number, Serial number, and Firmware version in the following format. GW INSTEK, AFG-3081, SN:XXXXXXXX,Vm.mm Note: ^j or ^m can be used as the terminal character when using a terminal program.
PC Software	The proprietary PC software, downloadable from GWInstek website, can be used for remote control.

Display

When a remote connection is established all panel keys are locked bar F6.

1. Press REM/LOCK (F6) to return the function generator to local mode.



指令语法

Compatible standard

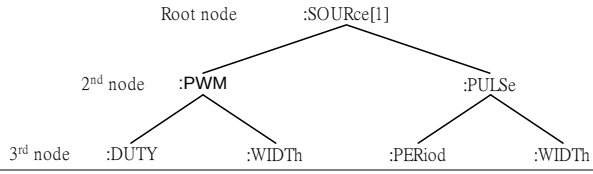
- IEEE488.2, 1992 (fully compatible)
- SCPI, 1994 (partially compatible)

Command Tree

The SCPI standard is an ASCII based standard that defines the command syntax and structure for programmable instruments.

Commands are based on a hierarchical tree structure. Each command keyword is a node on the command tree with the first keyword as the root node. Each sub node is separated with a colon.

Shown below is a section of the SOURce[1] root node and the :PWM and :PULSe sub nodes.



Command types

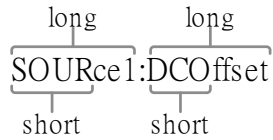
Commands can be separated in to three distinc types, simple commands, compound commands and queries.

Simple	A single command with/without a parameter
Example	*OPC
Compound	Two or more commands separated by a colon (:) with/without a parameter
Example	SOURce:PULSe:WIDTh

	Query	A query is a simple or compound command followed by a question mark (?). A parameter (data) is returned. The maximum or minimum value for a parameter can also be queried where applicable.
	Example	SOURce1:FREQuency? SOURce1:FREQuency? MIN

Command forms

Commands and queries have two different forms, long and short. The command syntax is written with the short form of the command in capitals and the remainder (long form) in lower case.



The commands can be written in capitals or lower-case, just so long as the short or long forms are complete. An incomplete command will not be recognized.

Below are examples of correctly written commands:

LONG	SOURce1:DCOffset
	SOURCE1:DCOFFSET
	source1:dcoffset
SHORT	SOUR1:DCO
	sour1:dco

Command Format		1: command header 2: single space 3: parameter 4: message terminator	
Square Brackets []	Commands that contain squares brackets indicate that the contents are optional. The function of the command is the same with or without the square bracketed items. Brackets are not sent with the command. For example, the frequency query below can use any of the following 3 forms: SOURce1:FREQuency? [MINimum|MAXimum] SOURce1:FREQuency? MAXimum SOURce1:FREQuency? MINimum SOURce1:FREQuency?		
Braces {}	Commands that contain braces indicate one item within the braces must be chosen. Braces are not sent with the command.		
Angled Brackets <>	Angle brackets are used to indicate that a value must be specified for the parameter. See the parameter description below for details. Angled brackets are not sent with the command.		
Bars |	Bars are used to separate multiple parameter choices in the command format.		
Parameters	Type	Description	Example
	<Boolean>	Boolean logic	0, 1/ON,OFF
	<NR1>	integers	0, 1, 2, 3
	<NR2>	decimal numbers	0.1, 3.14, 8.5
	<NR3>	floating point	4.5e-1, 8.25e+1
	<NRf>	any of NR1, 2, 3	1, 1.5, 4.5e-1

	<NRf+> <Numeric>	NRf type with a suffix including MINimum, MAXimum or DEFault parameters.	1, 1.5, 4.5e-1 MAX, MIN,
	<aard>	Arbitrary ASCII characters.	
	<discrete>	Discrete ASCII character parameters	IMM, EXT, MAN
	<frequency> <peak deviation in Hz> <rate in Hz>	NRf+ type including frequency unit suffixes.	1 KHZ, 1.0 HZ, MHZ
	<amplitude>	NRf+ type including voltage peak to peak.	VPP
	<offset>	NRf+ type including volt unit suffixes.	V
	<seconds>	NRf+ type including time unit suffixes.	NS, S MS US
	<percent> <depth in percent>	NRf type	N/A
Message terminators	LF CR	line feed code (new line) and carriage return.	
	LF	line feed code (new line)	
	EOI	IEEE-488 *EOI* (End-Or-Identify)	

Note	^j or ^m should be used when using a terminal program.	
Command Separators	Space	A space is used to separate a parameter from a keyword/command header.
	Colon (:)	A colon is used to separate keywords on each node.
	Semicolon (;)	A semi colon is used to separate subcommands that have the same node level. For example: SOURce[1]:DCOffset? SOURce[1]:OUTPut? →SOURce1:DCOffset?;OUTPut?
	Colon + Semicolon (:;)	A colon and semicolon can be used to combine commands from different node levels. For example: SOURce1:PWM:SOURce? SOURce:PULSe:WIDTh? →SOURce1:PWM:SOURce?:;SOURce:PULSe:WIDTh?
	Comma (,)	When a command uses multiple parameters, a comma is used to separate the parameters. For example: SOURce:APPLy:SQUare 10KHZ, 2.0 VPP, -1V

指令列表

系统指令

SYSTem:ERRor? System Query

Description	Reads an error from the error queue. See page 289 for details regarding the error queue.	
Query Syntax	**SYSTem:ERRor?**	
Return parameter	<string>	Returns an error string, <256 ASCII characters.
Example	**SYSTem:ERRor?** **-138 Suffix not allowed** Returns an error string.	

*IDN? System Query

Description	Returns the function generator manufacturer, model number, serial number and firmware version number in the following format: GW INSTEK,AFG-3081,SN:XXXXXXXX,Vm.mm	
Query Syntax	**IDN?**	
Return parameter	<string>	
Example	***IDN?** GW INSTEK,AFG-3081,SN:XXXXXXXX,Vm.mm Returns the identification of the function generator.	

*RST — System Command

Description	Reset the function generator to its factory default state.
Note	Note the *RST command will not delete instrument save states in memory.
Syntax	***RST**

*TST? — System Query

Description	Performs a system self-test and returns a pass or fail judgment. An error message will be generated if the self test fails.	
Note	The error message can be read with the SYST:ERR? query.	
Query Syntax	***TST?**	
Return parameter	+0	Pass judgment
	+1	Fail judgment
Example	***TST?** +0 The function generator passed the self-test.	

SYSTem:VERSion? — System Query

Description	Performs a system version query. Returns a string with the instrument, firmware version, FPGA revision and bootloader.
Query Syntax	**SYSTem:VERSion?**
Return parameter	<string>

Example	**SYST:VERS?** AFG-3000 VX.XXX_XXXX FPGA:XXXX BootLoad:XXXX Returns the year (2010) and version for that year (1).

*OPC — System Command

Description	This command sets the Operation Complete Bit (bit 0) of the Standard Event Status Register after the function generator has completed all pending operations. For the AFG-3000, the *OPC command is used to indicate when a sweep or burst has completed.
Note	Before the OPC bit is set, other commands may be executed.
Syntax	***OPC**

*OPC? — System Query

Description	Returns the OPC bit to the output buffer when all pending operations have completed. I.e. when the OPC bit is set.
Note	Commands cannot be executed until the *OPC? query has completed.
Query Syntax	***OPC?**
Return parameter	1
Example	***OPC?** **1** Returns a "1" when all pending operations are complete.

*WAI System Command

Description	This command waits until all pending operations have completed before executing additional commands. I.e. when the OPC bit is set.
Note	This command is only used for triggered sweep and burst modes.
Syntax	***WAI**

SYSTem:LANGuage System Command

Description	Sets or queries the display language. Select the language shown on the function generator front-panel display. Only one language can be enabled at a time. SYSTem:LANGuage? query returns "Chinese" or "English".	
Note	Only one language can be set.	
Syntax	**SYSTem:LANGuage {CHINese|ENGlish}**	
Example	**SYST:LANG ENG** Sets the display language to English.	
Query Syntax	**SYSTem:LANGuage?**	
Return Parameter	CHIN	Chinese
	ENG	English
Query Example	**SYST:LANG?** **ENG** The current language is English.	

状态寄存器指令

*CLS — System Command

Description	The *CLS command clears all the event registers, the error queue and cancels an *OPC command.
Syntax	***CLS**

*ESE — System Command

Description	The Standard Event Status Enable command determines which events in the Standard Event Status Event register can set the Event Summary Bit (ESB) of the Status Byte register. Any bit positions set to 1 enable the corresponding event. Any enabled events set bit 5 (ESB) of the Status Byte register.
Note	The *CLS command clears the event register, but not the enable register.
Syntax	***ESE <enable value>**
Parameter	<enable value> 0~255
Example	***ESE 20** Sets a bit weight of 20 (bits 2 and 4).
Query Syntax	***ESE?**

Return Parameter

Bit	Register	Bit	Register
0	Not used	4	Message Available
1	Not used	5	Standard Event
2	Error Queue	6	Master Summary
3	Questionable Data	7	Not used

Example	***ESE?** **4** Bit 2 is set.

*ESR? System Command

Description	Reads and clears the Standard Event Status Register. The bit weight of the standard event status register is returned.
Note	The *CLS will also clear the standard event status register.
Query Syntax	***ESR?**

Return Parameter

Bit	Register	Bit	Register
0	Operation Complete	4	Execution Error
1	Not Used	5	Command Error
2	Query Error	6	Not Used
3	Device Error	7	Power On

Query Example

***ESR?**

5

Returns the bit weight of the standard event status register (bit 0 and 2).

*STB? System Command

Description	Reads the Status byte condition register.
Note	Bit 6, the master summary bit, is not cleared.
Syntax	***STB?**

*SRE System Command

Description	The Service Request Enable Command determines which events in the Status Byte Register are allowed to set the MSS (Master summary bit). Any bit that is set to "1" can cause the MSS bit to be set.			
Note	The *CLS command clears the status byte event register, but not the enable register.			
Syntax	***SRE <enable value>**			
Parameter	<enable value>	0~255		
Example	***SRE 12** Sets a bit weight of 12 (bits 2 and 3) for the service request enable register.			
Query Syntax	***SRE?**			
Return Parameter	Bit	Register	Bit	Register
	0	Not used	4	Message Available
	1	Not used	5	Standard Event
	2	Error Queue	6	Master Summary
	3	Questionable Data	7	Not used
Query Example	***SRE?** **12** Returns the bit weight of the status byte enable register.			

接口设置指令

SYSTem:INTerface System Command

Description	Selects the remote interface. RS-232 is the factory default.
Note	There is no interface query.
Syntax	**SYSTem:INTerface {GPIB|RS232|USB}**
Example	**SYST:INT USB** Sets the interface to USB.

SYSTem:LOCal System Command

Description	Sets the function generator to local mode. In local mode, all front panel keys are operational.
Syntax	**SYSTem:LOCal**
Example	**SYST:LOC**

SYSTem:REMote System Command

Description	Disables the front panel keys and puts the function generator into remote mode (RS-232).
Syntax	**SYSTem:REMote**
Example	**SYST:REM**

应用指令

The APPLy command has 8 different types of outputs (Sine, Square, Ramp, Pulse, Noise, Triangle, DC, User). The command is the quickest, easiest way to output waveforms remotely. Frequency, amplitude and offset can be specified for each function.

As only basic parameters can be set with the Apply command, other parameters use the instrument default values.

The Apply command will set the trigger source to immediate and disable burst, modulation and sweep modes. Turns on the output command SOURce[1]:OUTP ON. The termination setting will not be changed.

As the frequency, amplitude and offset parameters are in nested square brackets, amplitude can only be specified if the frequency has been specified and offset can only be specified if amplitude has been set. For the example:

SOURce[1]:APPLy:SINusoid [<frequency> [,<amplitude> [,<offset>]]]

Output Frequency	For the output frequency, MINimum, MAXimum and DEFault can be used. The default frequency for all functions is set to 1 kHz. The maximum and minimum frequency depends on the function used. If a frequency output that is out of range is specified, the max/min frequency will be used instead. A “Data out range error will be generated” from the remote terminal.

Output Amplitude	When setting the amplitude, MINimum, MAXimum and DEFault can be used. The range depends on the function being used and the output termination (50Ω or high impedance). The default amplitude for all functions is 100 mVpp (50Ω). If the amplitude has been set and the output termination is changed from 50Ω to high impedance, the amplitude will double. Changing the output termination from high impedance to 50Ω will half the amplitude. Vrms, dBm or Vpp units can be used to specify the output unit to use with the current command. The VOLT:UNIT command can be used to set the units when no unit is specified with the Apply command. If the output termination is set to high impedance, dBm units cannot be used. The units will default to Vpp. The output amplitude can be affected by the function and unit chosen. Vpp and Vrms or dBm values may have different maximum values due to differences such as crest factor. For example, a 5Vrms square wave must be adjusted to 3.536 Vrms for a sine wave.
DC Offset voltage	The offset parameter can be set to MINimum, MAXimum or DEFault. The default offset is 0 volts. The offset is limited by the output amplitude as shown below. $\|V_{offset}\| < V_{max} - Vpp/2$ If the output specified is out of range, the maximum offset will be set.

The offset is also determined by the output termination (50Ω or high impedance). If the offset has been set and the output termination has changed from 50Ω to high impedance, the offset will double. Changing the output termination from high impedance to 50Ω will half the offset.

SOURce[1]:APPLy:SINusoid

Source Specific Command

Description	Outputs a sine wave from the selected channel when the command has executed. Frequency, amplitude and offset can also be set.	
Syntax	SOURce[1]:APPLy:SINusoid [<frequency> [,<amplitude> [,<offset>]]]	
Parameter	<frequency>	1μHz~80MHz(3081)/ 50MHz(3051)
	<*amplitude*>	10mV~10V (50Ω) (3.536 Vrms)
	<offset>	0~4.99V (50Ω)
Example	**SOUR1:APPL:SIN 2KHZ,MAX,MAX** Sets frequency to 2kHz and sets the amplitude and offset to the maximum.	

SOURce[1]:APPLy:SQUare

Source Specific Command

Description	Outputs a square wave from the selected channel when the command has executed. Frequency, amplitude and offset can also be set. The duty cycle is set to 50%.	
Syntax	SOURce[1]:APPLy:SQUare [<frequency> [,<amplitude> [,<offset>]]]	
Parameter	<frequency>	1μHz~80MHz(3081)/ 50MHz(3051)
	<*amplitude*>	10mV~10V (50Ω)
	<offset>	0~4.99V (50Ω)

Example	**SOUR1:APPL:SQU 2KHZ,MAX,MAX** Sets frequency to 2kHz and sets the amplitude and offset to the maximum.

SOURce[1]:APPLy:RAMP

Source Specific Command

Description	Outputs a ramp wave from the selected channel when the command has executed. Frequency, amplitude and offset can also be set. The symmetry is set to 100%.	
Syntax	**SOURce[1]:APPLy:RAMP [<frequency> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	1μHz~1MHz
	<*amplitude*>	10mV~10V (50Ω)
	<offset>	0~4.99V (50Ω)
Example	**SOUR1:APPL:RAMP 2KHZ,MAX,MAX** Sets frequency to 2kHz and sets the amplitude and offset to the maximum.	

SOURce[1]:APPLy:PULSe

Source Specific Command

Description	Outputs a ramp wave from the selected channel when the command has executed. Frequency, amplitude and offset can also be set.	
Note	The PW settings from the SOURce[1]:PULS: WIDT command are preserved. Edge and pulse width may be adjusted to supported levels. Repetition rates will be approximated from the frequency. For accurate repetition rates, the period should be adjusted using the SOURce[1]:PULS:PER command	
Syntax	**SOUR[1]:APPLy:PULSe [<frequency> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	500μHz~50MHz

	<*amplitude*>	10mV~10V (50Ω)
	<offset>	0~4.99V (50Ω)
Example	**SOUR1:APPL:PULS 1KHZ,MIN,MAX** Sets frequency to 1kHz and sets the amplitude to minimum and the and offset to the maximum.	

SOURce[1]:APPLy:NOISe

Source Specific Command

Description	Outputs Gaussian noise with a 50 MHz bandwidth. Amplitude and offset can also be set.	
Note	Frequency cannot be used with the noise function; however a value (or DEFault) must be specified. The frequency is remembered for the next function used.	
Syntax	**SOURce[1]:APPLy:NOISe [<frequency|DEFault> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	Not applicable
	<*amplitude*>	10mV~10V (50Ω)
	<offset>	0~4.99V (50Ω)
Example	**SOUR1:APPL:NOIS DEF, 3.0, 1.0** Sets the amplitude to 3 volts with an offset of 1 volt.	

SOURce[1]:APPLy:TRIangle

Source Specific Command

Description	Outputs a triangle wave from the selected channel when the command has executed. Frequency, amplitude and offset can also be set.	
Syntax	**SOURce[1]:APPLy:TRIangle [<frequency> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	1μHz~1MHz
	<*amplitude*>	10mV~10V (50Ω)
	<offset>	0~4.99V (50Ω)

Example	**SOUR1:APPL:TRI 2khz, 3.0, 1.0** Sets the frequency to 1 MHz with an amplitude of 3 volts and with an offset of 1 volt.

SOURce[1]:APPLy:DC

Source Specific Command

Description	Outputs a triangle wave from the selected channel when the command has executed. Frequency, amplitude and offset can also be set.	
Note	Frequency and amplitude cannot be used with the DC function; however a value (or DEFault) must be specified. The values are remembered for the next function used.	
Syntax	**SOUR[1]:APPLy:DC [<frequency|DEFault> [,<amplitude>|DEFault> [,<offset>]]]**	
Parameter	<frequency>	Not applicable
	<*amplitude*>	Not applicable
	<offset>	±5V (50Ω), ±10V (open)
Example	**SOUR1:APPL:DC DEF, DEF, 1.0** Sets the DC offset to 1 volt.	

SOURce[1]:APPLy:USER

Source Specific Command

Description	Outputs an arbitrary waveform from the selected channel. The output is that specified from the FUNC:USER command.	
Note	Frequency and amplitude cannot be used with the DC function; however a value (or DEFault) must be specified. The values are remembered for the next function used.	
Syntax	**SOURce[1]:APPLy:USER [<frequency> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	1μHz~100MHz
	<amplitude>	0~10V (50Ω)

	<offset>	0~5V (50Ω)
Example	**SOUR1:APPL:USER**	

SOURce[1]:APPLy?

Source Specific Command

Description	Outputs a string with the current settings.	
Note	The string can be passed back appended to the Apply Command.	
Syntax	**SOURce[1]:APPLy?**	
Return Parameter	<string>	Function, frequency, amplitude, offset
Example	**SOUR1:APPL?** SIN +5.0000000000000E+03,+3.0000E+00,-2.50E+00 Returns a string with the current function and parameters, Sine, 5kHz, 3 Vpp, -2.5V offset.	

输出指令

Unlike the Apply commands, the Output commands are low level commands to program the function generator.

This section describes the low-level commands used to program the function generator. Although the APPLy command provides the most straightforward method to program the function generator, the low-level commands give you more flexibility to change individual parameters.

SOURce[1]:FUNCtion

Source Specific Command

Description	The FUNCtion command selects and outputs the selected output. The User parameter outputs an arbitrary waveform previously set by the SOURce[1]:FUNC:USER command.
Note	If the function mode is changed and the current frequency setting is not supported by the new mode, the frequency setting will be altered to next highest value. Vpp and Vrms or dBm amplitude values may have different maximum values due to differences such as crest factor. For example, if a 5Vrms square wave is changed to a sinewave, then the Vrms is automatically adjusted to 3.536. The modulation, burst and sweep modes can only be used with some of the basic waveforms. If a mode is not supported, the conflicting mode will be disabled. See the table below.

	Sine	Squ	Tri	Ramp	Pulse	Noise	ARB
AM	✓	✓	✓	✓	✓	×	✓
FM	✓	✓	✓	✓	×	×	×
PWM	×	✓	×	×	×	×	×
FSK	✓	✓	✓	✓	✓	×	×
SWEEP	✓	✓	✓	✓	×	×	×
BRUST	✓	✓	✓	✓	×	×	×

Syntax	**SOURce[1]:FUNCtion {SINusoid|SQUare|RAMP|PULSe|NOISe|TRIAngle|DC| USER}**
Example	**SOUR1:FUNC SIN** Sets the output as a sine function.
Query Syntax	**SOURce[1]:FUNCtion?**
Return Parameter	SIN, SQU, RAMP, PULS, NOIS, DC, TRI, USER — Returns the current output type.
Example	**SOUR1:FUNC?** SIN Current output is sine.

SOURce[1]:FREQuency

Source Specific Command

Description	Sets the output frequency for the SOURce[1]:FUNCtion command. The query command returns the current frequency setting.
Note	The maximum and minimum frequency depends on the function mode.

Sine, Square	1μHz~80MHz(3081)/ 50MHz(3051)
Ramp, Triangle	1μHz~80MHz(3081)/ 50MHz(3051)
Pulse	50μHz~50MHz
Noise, DC	Not applicable

	User	1μHz~100MHz
	If the function mode is changed and the current frequency setting is not supported by the new mode, the frequency setting will be altered to next highest value. The duty cycle of square waveforms depends on the frequency settings. 20% to 80% (*frequency* < 25 MHz) 40% to 60% (25 MHz < *frequency* < 50 MHz) 50% (*frequency* > 50 MHz) If the frequency is changed and the set duty cycle cannot support the new frequency, the highest duty cycle available at that frequency will be used. A "settings conflict" error will result from the above scenario.	
Syntax	**SOURce[1]:FREQuency {<frequency>|MINimum|MAXimum}**	
Example	**SOUR1:FREQ MAX** Sets the frequency to the maximum for the current mode.	
Query Syntax	**SOURce[1]:FREQuency?**	
Return Parameter	<NR3>	Returns the frequency for the current mode.
Example	**SOUR1:FREQ? MAX** +1.0000000000000E+03 The maximum frequency that can be set for the current function is 1MHz.	

SOURce[1]:AMPlitude

Source Specific Command

Description	Sets the output amplitude for the SOURce[1]:FUNCtion command. The query command returns the current amplitude settings.
Note	The maximum and minimum amplitude depends on the output termination. The default amplitude for all functions is 100 mVpp (50Ω). If the amplitude has been set and the output termination is changed from 50Ω to high impedance, the amplitude will double. Changing the output termination from high impedance to 50Ω will half the amplitude. The offset and amplitude are related by the following equation. $\|V_{offset}\| < V_{max} - Vpp/2$ If the output termination is set to high impedance, dBm units cannot be used. The units will default to Vpp. The output amplitude can be affected by the function and unit chosen. Vpp and Vrms or dBm values may have different maximum values due to differences such as crest factor. For example, a 5Vrms square wave must be adjusted to 3.536 Vrms for a sine wave. The amplitude units can be explicitly used each time the SOURce[1]:AMPlitude command is used. Alternatively, the VOLT:UNIT command can be used to set the amplitude units for all commands.
Syntax	**SOURce[1]:AMPlitude {< amplitude> |MINimum|MAXimum}**

Example	**SOUR1:AMP MAX** Sets the amplitude to the maximum for the current mode.
Query Syntax	**SOURce[1]:AMPlitude? {MINimum|MAXimum}**
Return Parameter	<NR3> Returns the amplitude for the current mode.
Example	**SOUR1:AMP? MAX** +5.0000E+00 The maximum amplitude that can be set for the current function is 5 volts.

SOURce[1]:DCOffset

Source Specific Command

Description	Sets or queries the DC offset for the current mode.
Note	The offset parameter can be set to MINimum, MAXimum or DEFault. The default offset is 0 volts. The offset is limited by the output amplitude as shown below. $\|V_{offset}\| < V_{max} - Vpp/2$ If the output specified is out of range, the maximum offset will be set. The offset is also determined by the output termination (50Ω or high impedance). If the offset has been set and the output termination has changed from 50Ω to high impedance, the offset will double. Changing the output termination from high impedance to 50Ω will half the offset. When trying to set a DC voltage, the SOURce[1]: FUNC DC should be used prior to setting an offset.
Syntax	**SOURce[1]:DCOffset {< offset> |MINimum|MAXimum}**

Example	**SOUR1:DCO MAX** Sets the offset to the maximum for the current mode.
Query Syntax	**SOURce[1]:DCOffset? {MINimum|MAXimum}**
Return Parameter	<NR3> Returns the offset for the current mode.
Example	**SOUR1:DCO?** +3.0000E+00 The offset for the current mode is set to +3 volts.

SOURce[1]:SQUare:DCYCle

Source Specific Command

Description	Sets or queries the duty cycle for square waves only. The setting is remembered if the function mode is changed. The default duty cycle is 50%.
Note	The duty cycle of square waveforms depend on the frequency settings. 20% to 80% (*frequency* < 25 MHz) 40% to 60% (25 MHz < *frequency* < 50 MHz) 50% (*frequency* > 50 MHz) If the frequency is changed and the set duty cycle cannot support the new frequency, the highest duty cycle available at that frequency will be used. A "settings conflict" error will result from the above scenario. For square waveforms, the Apply command and AM/FM modulation modes ignore the duty cycle settings.
Syntax	**SOURce[1]:SQUare:DCYCle {< percent> |MINimum|MAXimum}**
Example	**SOUR1:SQU:DCYC MAX**

	Sets the duty cycle to the highest possible for the current frequency.	
Query Syntax	**SOURce[1]:SQUare:DCYCle? {MINimum|MAXimum}**	
Return Parameter	<NR3>	Returns the duty cycle as a percentage.
Example	**SOUR1:SQU:DCYC?** +5.00E+01 The duty cycle is set 50%.	

SOURce[1]:RAMP:SYMMetry

Source Specific Command

Description	Sets or queries the symmetry for ramp waves only. The setting is remembered if the function mode is changed. The default symmetry is 50%.	
Note	For ramp waveforms, the Apply command and AM/FM modulation modes ignore the current symmetry settings.	
Syntax	**SOURce[1]:RAMP:SYMMetry {< percent> |MINimum|MAXimum}**	
Example	**SOUR[1]:RAMP:SYMM MAX** Sets the symmetry to the 100%.	
Query Syntax	**SOURce[1]:RAMP:SYMMetry? {MINimum|MAXimum}**	
Return Parameter	<NR3>	Returns the symmetry as a percentage.
Example	**SOUR1:RAMP:SYMMetry?** +1.0000E+02 The symmetry is set as 100%.	

OUTPut

Source Specific Command

Description	Enables/Disables or queries the front panel output. The default is set to off.
Note	If the output is overloaded by an external voltage, the output will turn off and an error message will be displayed. The overload must first be removed before the output can be turned on again with output command. Using the Apply command automatically sets the front panel output to on.
Syntax	**OUTPut {OFF|ON}**
Example	**OUTP ON** Turns the output on.
Query Syntax	**OUTPut?**
Return Parameter	1 ON 0 OFF
Example	**OUTP?** **1** The output is currently on.

OUTPut:LOAD

Source Specific Command

Description	Sets or queries the output termination. Two impedance settings can be chosen, DEFault (50Ω) and INFinity (high impedance >10 kΩ). The output termination is to be used as a reference only. If the output termination is set 50Ω but the actual load impedance is not 50Ω, then the amplitude and offset will not be correct.
Note	If the amplitude has been set and the output termination is changed from 50Ω to high impedance, the amplitude will double. Changing

	the output termination from high impedance to 50Ω will half the amplitude. If the output termination is set to high impedance, dBm units cannot be used. The units will default to Vpp.	
Syntax	**OUTPut:LOAD {DEFault|INFinity}**	
Example	**OUTP:LOAD DEF** Sets the output termination to 50Ω.	
Query Syntax	**OUTPut:LOAD?**	
Return Parameter	DEF	Default
	INF	INFinity
Example	**OUTP:LOAD?** **DEF** The output is set to the default of 50Ω.	

SOURce[1]:VOLTage:UNIT

Source Specific Command

Description	Sets or queries the output amplitude units. There are three types of units: VPP, VRMS and DBM.
Note	The units set with the VOLTage:UNIT command will be used as the default unit for all amplitude units unless a different unit is specifically used for a command. If the output termination is set to high impedance, dBm units cannot be used. The Units will automatically default to Vpp.
Syntax	**SOURce[1]:VOLTage:UNIT {VPP|VRMS|DBM}**
Example	**SOUR1:VOLT:UNIT VPP** Sets the amplitude units to Vpp.
Query Syntax	**SOURce[1]:VOLTage:UNIT?**

Return Parameter	VPP	Vpp

	VRMS	Vrms
	DBM	dBm

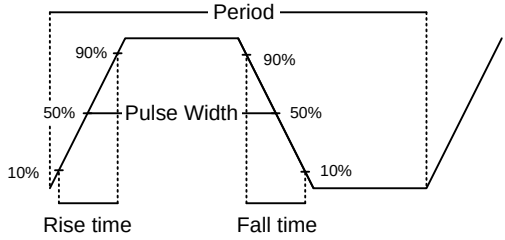
Example **SOUR1:VOLT:UNIT?**

VPP

The amplitude units are set to Vpp.

脉冲设置指令

The pulse chapter is used to control and output pulse waveforms. Unlike the APPLy command, low level control is possible including setting the rise time, fall time, period and pulse width.



SOURce[1]:PULSe:PERiod

Source Specific Command

Description	Sets or queries the pulse period. The default period is 1 ms.
Note	The pulse period must be greater than the pulse width and edge time(1.6x) combined. Pulse Width + (1.6 * Edge Time) < Period If the edge time or pulse width are too great, they will automatically be reduced to fit the period by the function generator. The PULSe:PERiod function will change the period for all functions, not just for the pulse waveforms. If a different function is chosen and the current period is out of range, the period will be automatically adjusted to suit the new function.
Syntax	**SOURce[1]:PULSe:PERiod {<seconds>|MINimum|MAXimum}**
Example	**SOUR1:PULS:PER MIN** Sets the period to the minimum time allowed.
Query Syntax	**SOURce[1]:PULSe:PERiod? [MINimum|MAXimum]**

Return Parameter	<seconds>	20 ns ~ 2000 seconds
Example	**SOUR1:PULS:PER?** +1.0000E+01 The period is set to 10 seconds.	

SOURce[1]:PULSe:WIDTh

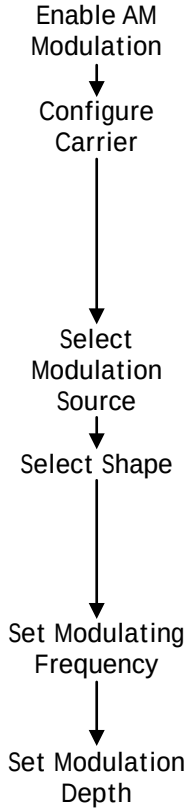
Source Specific Command

Description	Sets or queries the pulse width. The default pulse width is 100us. The minimum pulse width is affected by the period time. If the period is over 20 or 200 seconds, then the minimum pulse width is 1us and 10us, respectively. Pulse width is defined as the time from the rising to falling edges (at a threshold of 50%).
Note	The pulse width cannot be less than the edge time times 1.6. Pulse Width > 1.6 * Edge Time The pulse width must be less than the period minus the edge time (x1.6). Pulse Width < Period – (1.6 *Edge Time)
Syntax	**SOURce[1]:PULSe:WIDTh {<seconds>|MINimum|MAXimum}**
Example	**SOUR1:PULS:WIDT MAX** Sets the pulse width to the maximum allowed.
Query Syntax	**SOURce[1]:PULSe:WIDTh? [MINimum|MAXimum]**
Return Parameter	<seconds> 8 ns ~ 2000 seconds
Example	**SOUR1:PULS:WIDT? MIN** +8.0000E-09 The pulse width is set to 8 nanoseconds.

幅值调制(AM)指令

AM 介绍

To successfully create an AM waveform, the following commands must be executed in order.



1. Turn on AM modulation using the SOURce[1]: AM:STAT ON command
2. Use the APPLy command to select a carrier waveform. Alternatively the equivalent FUNC, FREQ, AMPl, and DCOffs commands can be used to create a carrier waveform with a designated frequency, amplitude and offset.
3. Select an internal or external modulation source using the SOURce[1]:AM:SOUR command.
4. Use the SOURce[1]:AM:INT:FUNC command to select a sine, square, upramp, dnramp or triangle modulating waveshape. For internal sources only.
5. Set the modulating frequency using the SOURce[1]: AM:INT:FREQ command. For internal sources only.
6. Set the modulation depth using the SOURce[1]: AM:DEPT command.

SOURce[1]:AM:STATe

Source Specific Command

Description	Sets or disables AM modulation. By default AM modulation is disabled. AM modulation must be enabled before setting other parameters.	
Note	Burst or sweep mode will be disabled if AM modulation is enabled. As only one modulation is allowed at any one time, other modulation modes will be disabled when AM modulation is enabled.	
Syntax	**SOURce[1]:AM:STATe {OFF|ON}**	
Example	**SOUR1:AM:STAT ON** Enables AM modulation.	
Query Syntax	**SOURce[1]:AM:STATe?**	
Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)
Example	**SOUR1:AM:STAT?** **1** AM modulation mode is currently enabled.	

SOURce[1]:AM:SOURce

Source Specific Command

Description	Sets or queries the modulation source as internal or external. Internal is the default modulation source.
Note	If an external modulation source is selected, modulation depth is limited to ± 5V from the MOD INPUT terminal on the rear panel. For example, if modulation depth is set to 100%, then the maximum amplitude is +5V, and the minimum amplitude is -5V.
Syntax	**SOURce[1]:AM:SOURce {INTernal|EXTernal}**
Example	**SOUR1:AM:SOUR EXT**

Sets the modulation source to external.

Query Syntax	**SOURce[1]:AM:SOURce?**	
Return Parameter	INT	Internal
	EXT	External
Example	**SOUR1:AM:SOUR?**	
	INT	
	The modulation source is set to internal.	

SOURce[1]:AM:INTernal:FUNCtion

Source Specific Command

Description	Sets the shape of the modulating waveform from sine, square, triangle, upramp and dnramp. The default shape is sine.			
Note	Square and triangle waveforms have a 50% duty cycle. Upramp and dnramp have a symmetry of 100% and 0%, respectively.			
Syntax	**SOURce[1]:AM:INTernal:FUNCtion {SINusoid|SQUare|TRIangle|UPRamp|DNRamp}**			
Example	**SOUR1:AM:INT:FUNC SIN**			
	Sets the AM modulating wave shape to sine.			
Query Syntax	**SOURce[1]:AM:INTernal:FUNCtion?**			
Return Parameter	SIN	Sine	UPRAMP	Upramp
	SQU	Square	DNRAMP	Dnramp
	TRI	Triangle		
Example	**SOUR1:AM:INT:FUNC?**			
	SIN			
	The shape for the modulating waveform is Sine.			

SOURce[1]:AM:INTernal:FREQuency

Source Specific Command

Description	Sets the frequency of the internal modulating waveform only. The default frequency is 100Hz.	
Syntax	**SOURce[1]:AM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	2 mHz~ 20 kHz
Example	**SOUR1:AM:INT:FREQ +1.0000E+02** Sets the modulating frequency to 100Hz.	
Query Syntax	**SOURce[1]:AM:INTernal:FREQuency? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the frequency in Hz.
Example	**SOUR1:AM:INT:FREQ? MIN** **+1.0000E+02** Returns the minimum frequency allowed.	

SOURce[1]:AM:DEPTh

Source Specific Command

Description	Sets or queries the modulation depth for internal sources only. The default is 100%.	
Note	The function generator will not output more than ±5V, regardless of the modulation depth. The modulation depth of an external source is controlled using the ±5V MOD INPUT terminal on the rear panel, and not the SOURce[1]:AM:DEPTh command.	
Syntax	**SOURce[1]:AM:DEPTh {<depth in percent>|MINimum|MAXimum}**	
Parameter	<depth in percent>	0~120%
Example	**SOUR1:AM:DEPT 50** Sets the modulation depth to 50%.	
Query Syntax	**SOURce[1]:AM:DEPTh? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Return the modulation depth as a percentage.

Example **SOUR1:AM:DEPT?**

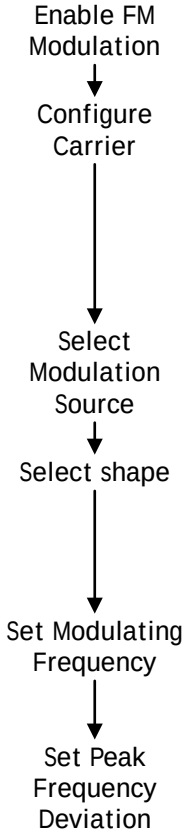
+1.0000E+02

The modulation depth is 100%.

频率调制(FM)指令

FM 介绍

The following is an overview of the steps required to generate an FM waveform.



1. Turn on FM modulation using the SOURce[1]: FM:STAT ON command.
2. Use the APPLy command to select a carrier waveform. Alternatively, the FUNC, FREQ, AMPl, and DCOffs commands can be used to create a carrier waveform with a designated frequency, amplitude and offset.
3. Select an internal or external modulation source using the SOURce[1]:FM:SOUR command.
4. Use the SOURce[1]:FM:INT:FUNC command to select a sine, square, upramp, dnramp or triangle modulating waveshape. For internal sources only.
5. Set the modulating frequency using the SOURce[1]: FM:INT:FREQ command. For internal sources only.
6. Use the SOURce[1]:FM:DEV command to set the frequency deviation.

SOURce[1]:FM:STATe

Source Specific Command

Description	Sets or disables FM modulation. By default FM modulation is disabled. FM modulation must be enabled before setting other parameters.	
Note	Burst or sweep mode will be disabled if FM modulation is enabled. As only one modulation is allowed at any one time, other modulation modes will be disabled when FM modulation is enabled.	
Syntax	**SOUR[1]:FM:STATe {OFF|ON}**	
Example	**SOUR1:FM:STAT ON** Enables FM modulation.	
Query Syntax	**SOURce[1]:FM:STATe?**	
Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)
Example	**SOUR1:FM:STAT?** **1** FM modulation mode is currently enabled.	

SOURce[1]:FM:SOURce

Source Specific Command

Description	Sets or queries the modulation source as internal or external. Internal is the default modulation source.
Note	If an external modulation source is selected, modulation depth is limited to ± 5V from the MOD INPUT terminal on the rear panel. For example, if modulation depth is set to 100%, then the maximum amplitude is +5V, and the minimum amplitude is -5V.
Syntax	**SOURce[1]:FM:SOURce {INTernal|EXTernal}**

Example	**SOUR1:FM:SOUR EXT** Sets the modulation source to external.			
Query Syntax	**SOURce[1]:FM:SOURce?**			
Return Parameter	INT	Internal		
	EXT	External		
Example	**SOUR1:FM:SOUR?** **INT** The modulation source is set to internal.			

SOURce[1]:FM:INTernal:FUNCtion

Source Specific Command

Description	Sets the shape of the modulating waveform from sine, square, triangle, upramp and dnramp. The default shape is sine.			
Note	Square and triangle waveforms have a 50% duty cycle. Upramp and dnramp have a symmetry of 100% and 0%, respectively.			
Syntax	**SOURce[1]:FM:INTernal:FUNCtion {SINusoid | SQUare | TRIangle | UPRamp | DNRamp}**			
Example	**SOUR1:FM:INT:FUNC SIN** Sets the FM modulating wave shape to sine.			
Query Syntax	**SOURce[1]:FM:INTernal:FUNCtion?**			
Return Parameter	SIN	Sine	UPRAMP	Upramp
	SQU	Square	DNRAMP	Dnramp
	TRI	Triangle		
Example	**SOUR1:FM:INT:FUNC?** **SIN** The shape for the modulating waveform is Sine.			

SOURce[1]:FM:INTernal:FREQuency

Source Specific Command

Description	Sets the frequency of the internal modulating waveform only. The default frequency is 10Hz.	
Syntax	**SOURce[1]:FM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	2 mHz~ 20 kHz
Example	**SOUR1:FM:INT:FREQ +1.0000E+02** Sets the modulating frequency to 100Hz.	
Query Syntax	**SOURce[1]:FM:INTernal:FREQuency? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the frequency in Hz.
Example	**SOUR1:FM:INT:FREQ? MAX** **+2.0000E+04** Returns the maximum frequency allowed.	

SOURce[1]:FM:DEViation

Source Specific Command

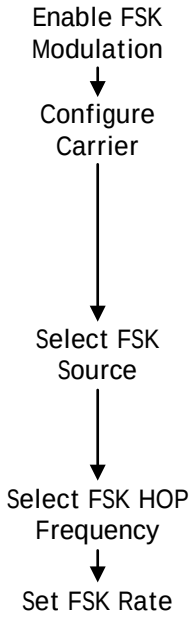
Description	Sets or queries the peak frequency deviation of the modulating waveform from the carrier waveform. The default peak deviation is 100Hz. The frequency deviation of external sources is controlled using the ±5V MOD INPUT terminal on the rear panel. A positive signal (>0~+5V) will increase the deviation (up to the set frequency deviation), whilst a negative voltage will reduce the deviation.
Note	The relationship of peak deviation to modulating frequency and carrier frequency is shown below. Peak deviation = modulating frequency – carrier frequency. The carrier frequency must be greater than or

	equal to the peak deviation frequency. The sum of the deviation and carrier frequency must not exceed the maximum frequency for a specific carrier shape. If an out of range deviation is set for any of the above conditions, the deviation will be automatically adjusted to the maximum value allowed and an "out of range" error will be generated. For square wave carrier waveforms, the deviation may cause the duty cycle frequency boundary to be exceeded. In these conditions the duty cycle will be adjusted to the maximum allowed and a "settings conflict" error will be generated.	
Syntax	**SOURce[1]:FM:DEViation {<peak deviation in Hz>|MINimum|MAXimum}**	
Parameter	<peak deviation in Hz>	DC~80MHz(3081)/ 50MHz(3051) DC~1MHz (Ramp)
Example	**SOUR1:FM:DEV MAX** Sets the frequency deviation to the maximum value allowed.	
Query Syntax	**SOURce[1]:FM:DEViation? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the frequency deviation in Hz.
Example	**SOURce[1]:FM:DEViation? MAX** **+8.0000E+04** The maximum frequency deviation for the current function is 80MHz.	

频移键控(FSK)指令

FSK 介绍

The following is an overview of the steps required to generate an FSK modulated waveform.



1. Turn on FSK modulation using the SOURce[1]: FSK:STAT ON command.
2. Use the APPLy command to select a carrier waveform. Alternatively, the FUNC, FREQ, AMPl, and DCOffs commands can be used to create a carrier waveform with a designated frequency, amplitude and offset.
3. Select an internal or external modulation source using the SOURce[1]:FSK:SOUR command.
4. Set the hop frequency using the SOURce[1]:FSK:FREQ command.
5. Use the SOURce[1]: FSK:INT:RATE command to set the FSK rate. The FSK rate can only be set for internal sources.

SOURce[1]:FSKey:STATe

Source Specific Command

Description	Turns FSK Modulation on or off. By default FSK modulation is off.
Note	Burst or sweep mode will be disabled if FSK modulation is enabled. As only one modulation is allowed at any one time, other modulation modes will be disabled when FSK modulation is enabled.
Syntax	**SOURce[1]:FSKey:STATe {OFF|ON}**

Example	**SOUR1:FSK:STAT ON** Enables FSK modulation	
Query Syntax	**SOURce[1]:FSKey:STATe?**	
Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)
Example	**SOUR1:FSK:STAT?** **ON** FSK modulation is currently enabled.	

SOURce[1]:FSKey:SOURce

Source Specific Command

Description	Sets or queries the FSK source as internal or external. Internal is the default source.	
Note	If an external FSK source is selected, FSK rate is controlled by the Trigger INPUT terminal on the rear panel.	
Syntax	**SOURce[1]:FSKey:SOURce {INTernal|EXTernal}**	
Example	**SOUR1:FSK:SOUR EXT** Sets the FSK source to external.	
Query Syntax	**SOURce[1]:FSKey:SOURce?**	
Return Parameter	INT	Internal
	EXT	External
Example	**SOUR1:FSK:SOUR?** **INT** The FSK source is set to internal.	

SOURce[1]:FSKey:FREQuency

Source Specific Command

Description	Sets the FSK hop frequency. The default hop frequency is set to 100Hz.

Note	For FSK, the modulating waveform is a square wave with a duty cycle of 50%.	
Syntax	**SOURce[1]:FSKey:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	1 μHz~ 80 MHz(3081)/ 50MHz(3051)
Example	**SOUR1:FSK:FREQ +1.0000E+02** Sets the FSK hop frequency to to 100Hz.	
Query Syntax	**SOURce[1]:FSKey:FREQuency? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the frequency in Hz.
Example	**SOUR1:FSK:FREQ? MAX** **+8.0000E+07** Returns the maximum hop frequency allowed.	

SOURce[1]:FSKey:INTernal:RATE

Source Specific Command

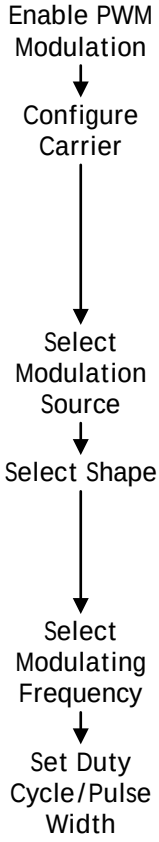
Description	Sets or queries the FSK rate for internal sources only.	
Note	External sources will ignore this command.	
Syntax	**SOURce[1]:FSKey:INTernal:RATE {<rate in Hz>|MINimum|MAXimum}**	
Parameter	<rate in Hz>	2 mHz~100 kHz
Example	**SOUR1:FSK:INT:RATE MAX** Sets the rate to the maximum (100kHz).	
Query Syntax	**SOURce[1]:FSKey:INTernal:RATE? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the FSK rate in Hz.
Example	**SOUR1:FSK:INT:RATE? MAX** **+1.0000E+05**	

Returns the maximum FSK rate allowed.

脉宽调制(PWM)指令

PWM 介绍

The following is an overview of the steps required to generate a PWM modulated waveform.



1. Turn on PWM modulation using the SOURce[1]: PWM:STATe ON command.
2. Use the APPLy command to select a pulse waveform. Alternatively, the FUNC, FREQ, AMPl, and DCOffs commands can be used to create a pulse waveform with a designated frequency, amplitude and offset.
3. Select an internal or external modulation source using the SOURce[1]:PWM:SOUR command.
4. Use the SOURce[1]: PWM:INT:FUNC command to select a sine, square, upramp, dnramp or triangle modulating waveshape. For internal sources only.
5. Set the modulating frequency using the SOURce[1]:PWM:INT:FREQ command. For internal sources only.
6. Use the SOURce[1]:PWM:DUTY command to set the duty cycle or Pulse Width.

SOURce[1]:PWM:STATe

Source Specific Command

Description	Turns FSK Modulation on or off. By default FSK modulation is off.	
Note	Burst or sweep mode will be disabled if PWM modulation is enabled. As only one modulation is allowed at any one time, other modulation modes will be disabled when FSK modulation is enabled.	
Syntax	**SOURce[1]:PWM:STATe {OFF|ON}**	
Example	**SOUR1:PWM:STAT ON** Enables PWM modulation	
Query Syntax	**SOURce[1]:PWM:STATe?**	
Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)
Example	**SOUR1:PWM:STAT?** **ON** FSK modulation is currently enabled.	

SOURce[1]:PWM:SOURce

Source Specific Command

Description	Sets or queries the PWM source as internal or external. Internal is the default source.	
Note	If an external PWM source is selected, the duty cycle/pulse width is controlled by the MOD INPUT terminal on the rear panel.	
Syntax	**SOURce[1]:PWM:SOURce {INTernal|EXTernal}**	
Example	**SOUR1:PWM:SOUR EXT** Sets the PWM source to external.	
Query Syntax	**SOURce[1]:PWM:SOURce?**	
Return Parameter	INT	Internal

	EXT	External

Example **SOUR1:PWM:SOUR?**

INT

The PWM source is set to internal.

SOURce[1]:PWM:INTernal:FUNction

Source Specific Command

Description Sets the shape of the modulating waveform from sine, square, triangle, upramp and dnramp. The default shape is sine.

Note Square and triangle waveforms have a 50% duty cycle. Upramp and dnramp have a symmetry to 100% and 0%, respectively.

Carrier must be a pulse or PWM waveform.

Syntax **SOURce[1]:PWM:INTernal:FUNction {SINusoid|SQUare|TRIangle|UPRamp|DNRamp}**

Example **SOUR1:PWM:INT:FUN SIN**

Sets the PWM modulating wave shape to sine. .

Query Syntax **SOURce[1]:PWM:INTernal:FUNction?**

Return Parameter				
	SIN	Sine	UPRAMP	Upramp
	SQU	Square	DNRAMP	Dnramp
	TRI	Triangle		

Example **SOUR1:PWM:INT:FUNC?**

SIN

The shape for the modulating waveform is Sine.

SOURce[1]:PWM:INTernal:FREQuency

Source Specific Command

Description Sets the modulating waveform frequency for internal sources. The default frequency is set to 10Hz.

Syntax	**SOURce[1]:PWM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	2 mHz~ 20 kHz
Example	**SOUR1:PWM:INT:FREQ MAX** Sets the frequency to the maximum value.	
Query Syntax	**SOURce[1]:PWM:INTernal:FREQuency?**	
Return Parameter	<NR3>	Returns the frequency in Hz.
Example	**SOUR1:PWM:INT:FREQ? MAX** **+2.0000E+04** Returns the modulating frequency. (20kHz)	

SOURce[1]:PWM:DUTY

Source Specific Command

Description	Sets or queries the duty cycle deviation. The default duty cycle is 50%.	
Note	The duty cycle is limited by period, edge time and minimum pulse width. The duty cycle deviation of an external source is controlled using the ±5V MOD INPUT terminal on the rear panel. A positive signal (>0~+5V) will increase the deviation (up to the set duty cycle deviation), whilst a negative voltage will reduce the deviation.	
Syntax	**SOURce[1]:PWM:DUTY {< percent>|minimum |maximum}**	
Parameter	<percent>	0%~100% (limited, see above)
Example	**SOUR1:PWM:DUTY +3.0000E+01** Sets the duty cycle to 30%.	
Query Syntax	**SOURce[1]:PWM:DUTY?**	
Return Parameter	<NR3>	Returns the deviation in %.

Example **SOUR1:PWM:DUTY?**

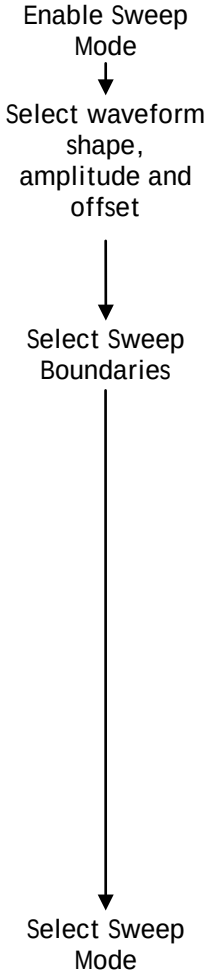
+3.0000E+01

The current duty cycle is 30%.

频率扫描指令

扫描介绍

Below shows the order in which commands must be executed to perform a sweep.



1. Turn on Sweep mode modulation using the SOURce[1]: SWE:STAT ON command.

2. Use the APPLy command to select the waveform shape. Alternatively, the FUNC, FREQ, AMPl, and DCOffs commands can be used to create a waveform with a designated frequency, amplitude and offset.

3. Set the frequency boundaries by setting start and stop frequencies or by setting a center frequency with a span.

   Start~Stop Use the SOURce[1]:FREQ:STAR and SOURce[1]:FREQ:STOP to set the start and stop frequencies. To sweep up or down, set the stop frequency higher or lower than the start frequency.

   Span Use the SOURce[1]:FREQ:CENT and SOURce[1]:FREQ:SPAN commands to set the center frequency and the frequency span. To sweep up or down, set the span as positive or negative.

4. Choose Linear or Logarithmic spacing using the SOURce[1]:SWE:SPAC command.

Select Sweep Time
↓
Select the sweep trigger source
↓
Select the marker frequency

5. Choose the sweep time using the SOURce[1]:SWE:TIME command.
6. Select an internal or external sweep trigger source using the SOURce[1]:SOUR command.
7. To output a marker frequency from the SYNC terminal, use The SOURce[1]:MARK:FREQ command. To enable marker frequency output, use the SOURce[1]:MARK ON command.

The marker frequency can be set to a value within the sweep span.

SOURce[1]:SWEep:STATe

Source Specific Command

Description	Sets or disables Sweep mode. By default Sweep is disabled. FM modulation must be enabled before setting other parameters.	
Note	Any modulation modes or Burst mode will be disabled if sweep mode is enabled.	
Syntax	**SOURce[1]:SWEep:STATe {OFF|ON}**	
Example	**SOUR1:SWE:STAT ON** Enables sweep mode.	
Query Syntax	**SOURce[1]:SWEep:STATe?**	
Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)
Example	**SOUR1:SWE:STAT?** **1** Sweep mode is currently enabled.	

SOURce[1]:FREQuency:STARt

Source Specific Command

Description	Sets the start frequency of the sweep. 100Hz is the default start frequency.	
Note	To sweep up or down, set the stop frequency higher or lower than the start frequency.	
Syntax	**SOURce[1]:FREQuency:STARt {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	100μHz~ 80MHz(3081)/ 50MHz(3051) 100μHz~ 1MHz (Ramp)
Example	**SOUR1:FREQ:STAR +2.0000E+03** Sets the start frequency to 2kHz.	
Query Syntax	**SOURce[1]:FREQuency:STARt? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the start frequency in Hz.
Example	**SOUR1:FREQ:STAR? MAX** **+8.0000E+07** Returns the maximum start frequency allowed.	

SOURce[1]:FREQuency:STOP

Source Specific Command

Description	Sets the stop frequency of the sweep. 1 kHz is the default start frequency.	
Note	To sweep up or down, set the stop frequency higher or lower than the start frequency.	
Syntax	**SOURce[1]:FREQuency:STOP {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	100μHz~ 80MHz(3081)/ 50MHz(3051) 100μHz~ 1MHz (Ramp)

Example	**SOUR1:FREQ:STOP +2.0000E+03** Sets the stop frequency to 2kHz.	
Query Syntax	**SOURce[1]:FREQuency:STOP? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the stop frequency in Hz.
Example	**SOUR1:FREQ:STOP? MAX** **+8.0000E+07** Returns the maximum stop frequency allowed.	

SOURce[1]:FREQuency:CENTer

Source Specific Command

Description	Sets and queries the center frequency of the sweep. 550 Hz is the default center frequency.	
Note	The maximum center frequency depends on the sweep span and maximum frequency: max center freq = max freq – span/2	
Syntax	**SOURce[1]:FREQuency:CENTer {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	100μHz~ 80MHz(3081)/ 50MHz(3051) 100μHz~ 1MHz (Ramp)
Example	**SOUR1:FREQ:CENT +2.0000E+03** Sets the center frequency to 2kHz.	
Query Syntax	**SOURce[1]:FREQuency:CENTer? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the stop frequency in Hz.
Example	**SOUR1:FREQ:CENT? MAX** **+8.0000E+06** Returns the maximum center frequency allowed, depending on the span.	

SOURce[1]:FREQuency:SPAN

Source Specific Command

Description	Sets and queries the frequency span of the sweep. 900 Hz is the default frequency span. The span frequency is equal to the stop-start frequencies.	
Note	To sweep up or down, set the span as positive or negative. The maximum span frequency has a relationship to the center frequency and maximum frequency: max freq span= 2(max freq – center freq)	
Syntax	**SOURce[1]:FREQuency:SPAN {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	100μHz~ 80MHz(3081)/ 50MHz(3051)100μHz~ 1MHz (Ramp)
Example	**SOUR1:FREQ:SPAN +2.0000E+03** Sets the frequency span to 2kHz.	
Query Syntax	**SOURce[1]:FREQuency:SPAN? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the frequency span in Hz.
Example	**SOUR1:FREQ:SPAN?** **+2.0000E+03** Returns the frequency span for the current sweep.	

SOURce[1]:SWEep:SPACing

Source Specific Command

Description	Sets linear or logarithmic sweep spacing. The default spacing is linear.
Syntax	**SOURce[1]:SWEep:SPACing {LINear|LOGarithmic}**
Example	**SOUR1:SWE:SPAC LIN**

	Sets the spacing to linear.	
Query Syntax	**SOURce[1]:SWEep:SPACing?**	
Return Parameter	LIN	Linear spacing
	LOG	Logarithmic spacing
Example	**SOUR1:SWE:SPAC?**	
	LOG	
	The spacing is currently set as linear.	

SOURce[1]:SWEep:TIME

Source Specific Command

Description	Sets or queries the sweep time. The default sweep time is 1 second.	
Note	The function generator automatically determines the number of frequency points that are used for the sweep based on the sweep time.	
Syntax	**SOURce[1]:SWEep:TIME {<seconds>|MINimum|MAXimum}**	
Parameter	<seconds>	1 ms ~ 500 s
Example	**SOUR1:SWE:TIME +1.0000E+00**	
	Sets the sweep time to 1 second.	
Query Syntax	**SOURce[1]:SWEep:TIME? {<seconds>|MINimum|MAXimum}**	
Return Parameter	<NR3>	Returns sweep time in seconds.
Example	**SOUR1:SWE:TIME?**	
	+2.0000E+01	
	Returns the sweep time (20 seconds).	

SOURce[1]:SWEep:SOURce

Source Specific Command

Description	Sets or queries the trigger source as immediate (internal), external or manual. Immediate (internal) is the default trigger source. IMMediate will constantly output a swept waveform. EXTernal will output a swept waveform after each external trigger pulse. Manual will ouput a swept waveform after the trigger softkey is pressed.
Note	If the APPLy command was used to create the waveform shape, the source is automatically set to IMMediate. The *OPC/*OPC? command/query can be used to signal the end of the sweep.
Syntax	**SOURce[1]: SWEep:SOURce {IMMediate|EXTernal| MANual}**
Example	**SOUR1: SWE:SOUR EXT** Sets the sweep source to external.
Query Syntax	**SOURce[1]: SWEep:SOURce?**

Return Parameter		
	IMM	Immediate
	EXT	External
	MANual	Manual

Example	**SOUR1:SWE:SOUR?** **IMM** The sweep source is set to immediate.

OUTPut[1]:TRIGger:SLOPe

Source Specific Command

Description	Configures the trigger output signal (TTL) as a positive or negative slope. A positive slope will output a pulse with a rising edge and a negative slope will output a pulse with a falling edge.

Note

The Trig out signal depends on the selected trigger source.

Trigger Source	Description
Immediate	A square wave is output from the Trig out terminal with a 50% duty cycle at the start of every sweep.
External	Trigger Output is disconnected.
Manual	A pulse (>1 us) is output from the Trig out terminal at the start of each sweep.

Syntax **OUTPut[1]:TRIGger:SLOPe {POSitive|NEGative}**

Example **OUTP1:TRIG:SLOP NEG**

Sets the Trig out signal as negative edge.

Query Syntax **OUTPut[1]:TRIGger:SLOPe?**

Return Parameter		
	POS	Positive edge
	NEG	Negative edge

Example **OUTP1:TRIG:SLOP?**

NEG

The Trig out signal is set to negative edge.

OUTPut[1]:TRIGger

Source Specific Command

Description Turns the trigger out signal on or off from the Trig out terminal on the rear panel. When set to on, a trigger signal (TTL) is output at the start of each pulse. The default is setting is off.

Syntax **OUTPut[1]:TRIGger {OFF|ON}**

Example **OUT OUTP1:TRIG ON**

Enables the Trig out signal.

Query Syntax **OUTPut[1]:TRIGger?**

Return Parameter		
	0	Disabled
	1	Enable

Example	**OUTP1:TRIG?** **1** The Trig out signal is enabled.

SOURce[1]:MARKer:FREQuency

Source Specific Command

Description	Sets or queries the marker frequency. The default marker frequency is 500 Hz. The marker frequency is used to output a SYNC signal from the SYNC terminal on the front panel. The SYNC signal goes logically high at the start of each sweep and goes low at the marker frequency.	
Note	The marker frequency must be between the start and stop frequencies. If the marker frequency is set to a value that is out of the range, the marker frequency will be set to the center frequency and a "settings conflict" error will be generated.	
Syntax	**SOURce[1]:MARKer:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	100 μHz ~ 80 MHz(3081) / 50MHz(3051)100 μHz ~ 1 MHz (Ramp)
Example	**SOUR1:MARK:FREQ +1.0000E+03** Sets the marker frequency to 1 kHz.	
Query Syntax	**SOURce[1]:MARKer:FREQuency? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the marker frequency in Hz.
Example	**SOUR1:MARK:FREQ? MAX** **+1.0000E+03** Returns the marker frequency (1 kHz).	

SOURce[1]:MARKer

Source Specific Command

Description	Turns the marker frequency on or off. The default is off.	
Note	MARKer ON	The SYNC signal goes logically high at the start of each sweep and goes low at the marker frequency.
	MARKer OFF	The SYNC terminal outputs a square wave with a 50% duty cycle at the start of each sweep.
Syntax	**SOURce[1]:MARKer {OFF|ON}**	
Example	**SOUR1:MARK ON** Enables the marker frequency.	
Query Syntax	**SOURce[1]:MARKer?**	
Return Parameter	0	Disabled
	1	Enabled
Example	**SOUR1:MARK?** **1** The marker frequency is enabled.	

脉冲串模式指令

脉冲串模式介绍

Burst mode can be configured to use an internal trigger (N Cycle mode) or an external trigger (Gate mode) using the Trigger INPUT terminal on the rear panel. Using N Cycle mode, each time the function generator receives a trigger, the function generator will output a specified number of waveform cycles (burst). After the burst, the function generator will wait for the next trigger before outputting another burst. N Cycle is the default Burst mode.

The alternative to using a specified number of cycles, Gate mode uses the external trigger to turn on or off the output. When the Trigger INPUT signal is high*, waveforms are continuously output (creating a burst). When the Trigger INPUT signal goes low*, the waveforms will stop being output after the last waveform completes its period. The voltage level of the output will remain equal to the starting phase of the burst waveforms, ready for the signal to go high* again.

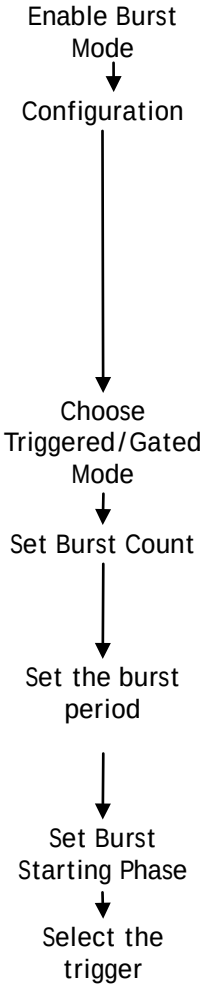
*assuming the Trigger polarity is not inverted.

Only one burst mode can be used at any one time. The burst mode depends on the source of the trigger (internal, external, manual) and the source of the burst.

	Function		
Burst Mode & Source	N Cycle*	Cycle	Phase
Triggered – IMMediate, BUS	Available	Available	Available
Triggered - EXTernal, MANual	Available	Unused	Available
Gated pulse - IMMediate	Unused	Unused	Available

*burst count

The following is an overview of the steps required to generate a burst waveform.



1. Turn on Burst mode using the SOURce[1]:BURS:STAT ON command.
2. Use the APPLy command to select a sine, square, ramp, pulse or triangle burst waveform*. Alternatively, the FUNC, FREQ, AMPl, and DCOffs commands can be used to create the burst waveform* with a designated frequency, amplitude and offset.

   *2 mHz minimum for internally triggered bursts.
3. Use the SOURce[1]: BURS:MODE command to select from triggered or gated burst modes.
4. Use the SOURce[1]:BURS:NCYC command to set the burst count. This command is only for triggered burst mode only.
5. Use the SOURce[1]:BURS:INT:PER command to set the burst period/cycle. This command is only applicable for triggered burst mode (internal trigger).
6. Use the SOURce[1]:BURS:PHAS command to set the burst starting phase.
7. Use the SOURce[1]:BURS:TRIG:SOUR command to select the trigger source for triggered burst mode only.

SOURce[1]:BURSt:STATe

Source Specific Command

Description	Turns burst mode on or off. By default burst mode is turned off.	
Note	When burst mode is turned on, sweep and any modulation modes are disabled.	
Syntax	**SOURce[1]:BURSt:STATe {OFF|ON}**	
Example	**SOUR1:BURS:STAT OFF** Turns burst mode on.	
Query Syntax	**SOURce[1]:BURSt:STATe?**	
Return Parameter	0	Disabled
	1	Enabled
Example	**SOUR1:BURS:STAT?** **OFF** Burst mode is off.	

SOURce[1]:BURSt:MODE

Source Specific Command

Description	Sets or queries the burst mode as gated or triggered. The default burst mode is triggered.	
Note	The burst count, period, trigger source and any manual trigger commands are ignored in gated burst mode.	
Syntax	**SOURce[1]:BURSt:MODE {TRIGgered|GATed}**	
Example	**SOUR1:BURS:MODE TRIG** Sets the burst mode to triggered.	
Query Syntax	**SOURce[1]:BURSt:MODE?**	
Return Parameter	TRIG	Triggered mode
	GAT	Gated mode

Example	**SOUR1:BURS:MODE?** **TRIG** The current burst mode is triggered.

SOURce[1]:BURSt:NCYCles

Source Specific Command

Description	Sets or queries the number of cycles (burst count) in triggered burst mode. The default number of cycles is 1. The burst count is ignored in gated mode.	
Note	If the trigger source is set to immediate, the product of the burst period and waveform frequency must be greater than the burst count: Burst Period X Waveform frequency > burst count If the burst count is too large, the burst period will automatically be increased and a "Settings conflict" error will be generated. Only sine and square waves are allowed infinite burst above 25 MHz.	
Syntax	**SOURce[1]:BURSt:NCYCles{< # cycles> |INFinity|MINimum |MAXimum}**	
Parameter	<# cycles>	1~1,000,000 cycles.
	INFinity	Sets the number to continuous.
	MINimum	Sets the number to minimum allowed.
	MAXimum	Sets the number to maximum allowed.
Example	**SOUR1:BURS:NCYCl INF** Sets the number of burst cycles to continuous (infinite).	
Query Syntax	**SOURce[1]:BURSt:NCYCles? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the number of cycles.

	INF	INF is returned if the number of cycles is continuous.
Example	**SOUR1:BURS:NCYC?** **+1.0000E+02** The burst cycles are set to 100.	

SOURce[1]:BURSt:INTernal:PERiod

Source Specific Command

Description	Sets or queries the burst period. Burst period settings are only applicable when the trigger is set to immediate. The default burst period is 10 ms. During manual triggering, external triggering or Gate burst mode, the burst period settings are ignored.	
Note	The burst period must be long enough to output the designated number of cycles for a selected frequency. Burst period > burst count/(waveform frequency + 200 ns) If the period is too short, it is automatically increased so that a burst can be continuously output. A "data out of range" error will also be generated.	
Syntax	**SOURce[1]:BURSt:INTernal:PERiod {<seconds>|MINimum|MAXimum}**	
Parameter	<seconds >	1 us ~ 500 seconds
Example	**SOUR1:BURS:INT:PER +1.0000E+01** Sets the period to 10 seconds.	
Query Syntax	**SOURce[1]:BURSt:INTernal:PERiod? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the burst period in seconds.
Example	**SOUR1:BURS:INT:PER?** **+1.0000E+01**	

The burst period is 10 seconds.

SOURce[1]:BURSt:PHASe

Source Specific Command

Description	Sets or queries the starting phase for the burst. The default phase is 0 degrees. At 0 degrees, sine square and ramp waveforms are at 0 volts. In gated burst mode, waveforms are continuously output (burst) when the Trig signal is true. The voltage level at the starting phase is used to determine the voltage level of the signal in-between bursts.
Note	The phase command is not used with pulse waveforms.
Syntax	**SOURce[1]:BURSt:PHASe {<angle>|MINimum|MAXimum}**
Parameter	<angle> -360 ~ 360 degrees
Example	**SOUR1:BURS:PHAS MAX** Sets the phase to 360 degrees.
Query Syntax	**SOURce[1]:BURSt:PHASe? [MINimum|MAXimum]**
Return Parameter	<NR3> Returns the phase angle in degrees.
Example	**SOUR1:BURS:PHAS?** **+1.2000E+01** The burst phase is 120 degrees.

SOURce[1]:BURSt:TRIGger:SOURce

Source Specific Command

Description	Sets or queries the trigger source for triggered burst mode. In trigged burst mode, a waveform burst is output each time a trigger signal is received and the number of cycles is determined by the burst count. There are three trigger sources for triggered burst mode:	
	Immediate	A burst is output at a set frequency determined by the burst period.
	External	EXTernal will output a burst waveform after each external trigger pulse. Any additional trigger pulse signals before the end of the burst are ignored.
	Manual	Manual triggering will output a burst waveform after the trigger softkey is pressed.
Note	If the APPLy command was used, the source is automatically set to IMMediate. The *OPC/*OPC? command/query can be used to signal the end of the burst.	
Syntax	**SOURce[1]:BURSt:TRIGger:SOURce {IMMediate|EXTernal|MANual}**	
Example	**SOUR1:BURS:TRIG:SOUR EXT** Sets the burst trigger source to external.	
Query Syntax	**SOURce[1]:BURSt:TRIGger:SOURce?**	
Return Parameter	IMM	Immediate
	EXT	External
	MANual	Manual
Example	**SOUR1:BURS:TRIG:SOUR?** **IMM**	

The burst trigger source is set to immediate.

SOURce[1]:BURSt:TRIGger:DELay

Source Specific Command

Description	The DELay command is used to insert a delay (in seconds) before a burst is output. The delay starts after a trigger is received. The default delay is 0 seconds.	
Syntax	**SOURce[1]: BURSt:TRIGger:DELay {<seconds>|MINimum|MAXimum}**	
Parameter	<seconds>	0~85 seconds
Example	**SOUR1:BURS:TRIG:DEL +1.0000E+01** Sets the trigger delay to 10 seconds.	
Query Syntax	**SOURce[1]:BURSt:TRIGger:DELay? [MINimum|MAXimum]**	
Return Parameter	<NRf>	Delay in seconds
Example	**SOUR1:BURS:TRIG:DEL** **+1.0000E+01** The trigger delay is 10 seconds.	

SOURce[1]:BURSt:TRIGger:SLOPe

Source Specific Command

Description	Sets or queries the trigger edge for externally triggered bursts from the Trigger INPUT terminal on the rear panel. By default the trigger is rising edge (Positive).	
Syntax	**SOURce[1]:BURSt:TRIGger:SLOPe {POSitive|NEGative}**	
Parameter	POSitive	rising edge
	NEGative	falling edge
Example	**SOUR1:BURS:TRIG:SLOP NEG** Sets the trigger slope to negative.	

Query Syntax	**SOURce[1]:BURSt:TRIGger:SLOPe?**	
Return Parameter	POS	rising edge
	NEG	falling edge
Example	**SOUR1:BURS:TRIG:SLOP NEG**	
	The trigger slope is negative.	

SOURce[1]:BURSt:GATE:POLarity

Source Specific Command

Description	In gated mode, the function generator will output a waveform continuously while the external trigger receives logically true signal from the Trigger INPUT terminal. Normally a signal is logically true when it is high. The logical level can be inverted so that a low signal is considered true.	
Syntax	**SOURce[1]:BURSt:GATE:POLarity{NORMal|INVertes}**	
Parameter	NORMal	Logically high
	INVertes	Logically low
Example	**SOUR1:BURS:GATE:POL INV**	
	Sets the state to logically low (inverted).	
Query Syntax	**SOURce[1]:BURSt:GATE:POLarity?**	
Return Parameter	NORM	Normal(High) logical level
	INV	Inverted (low) logical level
Example	**SOUR1:BURS:GATE:POL?** **INV**	
	The true state is inverted(logically low).	

SOURce[1]:BURSt:OUTPut:TRIGger:SLOPe

Source Specific Command

Description	Sets or queries the trigger edge of the trigger output signal. The signal is output from the trigger out terminal on the rear panel. The default trigger output slope is positive.	
Note	The trigger output signal on the rear panel depends on the burst trigger source or mode:	
	Immediate	50% duty cycle square wave is output at the start of each burst.
	External	Trigger output disabled.
	Gated mode	Trigger output disabled.
	Manual	A >1 ms pulse is output at the start of each burst.
Syntax	**SOURce[1]:BURSt:OUTPut:TRIGger:SLOPe {POSitive|NEGative}**	
Parameter	POSitive	Rising edge.
	NEGative	Falling edge.
Example	**SOUR1:BURS:OUTP:TRIG:SLOP POS** Sets the trigger output signal slope to positive (rising edge).	
Query Syntax	**SOURce[1]:BURSt:OUTPut:TRIGger:SLOPe?**	
Return Parameter	POS	Rising edge.
	NEG	Falling edge.
Example	**SOUR1:BURS:OUTP:TRIG:SLOP?** **POS** The trigger output signal slope to positive.	

OUTPut:TRIGger

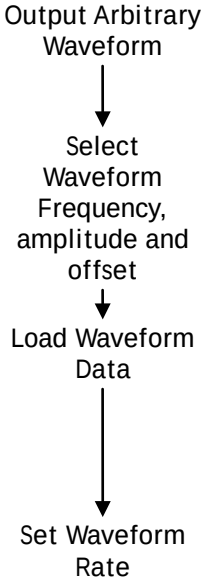
Source Specific Command

Description	Sets or queries the trigger output signal on or off. By default the signal is disabled. When enabled, a TTL compatible square wave is output. This function applies to sweep as well as burst mode.	
Syntax	**OUTPut[1]:TRIGger {OFF|ON}**	
Parameter	OFF	Turns the output off.
	ON	Turns the output on.
Example	**OUTP1:TRIG ON** Turns the output on.	
Query Syntax	**OUTPut[1]:TRIGger?**	
Return Parameter	0	Disabled
	1	Enabled
Query Example	**OUTP1:TRIG?** **1** The trigger output is enabled.	

任意波形指令

任意波形介绍

Use the steps below to output an arbitrary waveform over the remote interface.



1. Use the SOURce[1]:FUNCtion USER command to output the arbitrary waveform currently selected in memory.
2. Use the APPLy command to select frequency, amplitude and DC offset. Alternatively, the FUNC, FREQ, AMPl, and DCOffs commands can be used.
3. Waveform data (1 to 1,048,576 points per waveform) can be downloaded into volatile memory using the DATA:DAC command. Binary integer or decimal integer values in the range of ± 32767 can be used.
4. The waveform rate is the product of the number of points in the waveform and the waveform frequency.

Rate = Hz × # points

Range:	Rate:	10 μHz ~ 200MHz
	Frequency:	10 μHz ~ 100MHz
	# points:	1~1,048,576

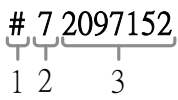
SOURce[1]:FUNCtion USER

Source Specific Command

Description	Use the SOURce[1]:FUNCtion USER command to output the arbitrary waveform currently selected in memory. The waveform is output with the current frequency, amplitude and offset settings.
Syntax	**SOURce[1]:FUNCtion USER**
Example	**SOUR1:FUNC USER** Selects and outputs the current waveform in memory.

DATA:DAC

Source Specific Command

Description	The DATA:DAC command is used to download binary or decimal integer values into memory using the IEEE-488.2 binary block format or as an ordered list of values.
Note	The integer values (±32767) correspond to the maximum and minimum peak amplitudes of the waveform. For instance, for a waveform with an amplitude of 5Vpp (0 offset), the value 32767is the equivalent of 2.5 Volts. If the integer values do not span the full output range, the peak amplitude will be limited. The IEEE-488.2 binary block format is comprised of three parts:  7. Initialization character (#) 8. Digit length (in ASCII) of the number of bytes 9. Number of bytes IEEE 488.2 uses two bytes to represent waveform data (16 bit integer). Therefore the number of bytes is always twice the number of data points.

Syntax	**DATA:DAC VOLATILE, <start>, {<binary block>|<value>, <value>, . . . }**	
Parameter	<start>	Start address of the arbitrary waveform
	<binary block>	
	<value>	Decimal or integer values ±32767
Example	**DATA:DAC VOLATILE, #216 Binary Data** The command above downloads 5 data values (stored in 16 bytes) using the binary block format. **DATA:DAC VOLATILE, 1000, 32767, 2048, 0, -2048, -32767** Downloads the data values (32767, 2048, 0, -2048, -32767) to address 1000.	

SOURce[1]:ARB:EDIT:COPY

Source Specific Command

Description	Copies a segment of a waveform to a specific starting address.	
Syntax	**SOURce[1]:ARB:EDIT:COPY [<start>[,<length>[,<paste>]]]**	
Parameter	<start>	Start address: 0~1048,576
	<length>	0 ~ 1048,576
	<paste>	Paste address: 0~1048,576
Example	**SOUR1:ARB:EDIT:COPY 1000, 256, 1257** Copies 256 data values starting at address 1000 and copies them to address 1257.	

SOURce[1]:ARB:EDIT:DELete

Source Specific Command

Description	Deletes a segment of a waveform from memory. The segment is defined by a starting address and length.	
Note	A waveform/waveform segment cannot be deleted when output.	
Syntax	**SOURce[1]:ARB:EDIT:DELete [<STARt>[,<LENGth>]]**	
Parameter	<STARt>	Start address: 0~1048,576
	<LENGth>	0 ~ 1048,576
Example	**SOURce1:ARB:EDIT:DEL 1000, 256** Deletes a section of 256 data points from the waveform starting at address 1000.	

SOURce[1]:ARB:EDIT:DELete:ALL

Source Specific Command

Description	Deletes all user-defined waveforms from non-volatile memory and the current waveform in volatile memory.
Note	A waveform cannot be deleted when output.
Syntax	**SOURce[1]:ARB:EDIT:DELete:ALL**
Example	**SOUR1:ARB:EDIT:DEL:ALL** Deletes all user waveforms from memory.

SOURce[1]:ARB:EDIT:POINt

Source Specific Command

Description	Edit a point on the arbitrary waveform.	
Note	A waveform/waveform segment cannot be deleted when output.	
Syntax	**SOURce[1]:ARB:EDIT:POINt [<address> [, <data>]]**	
Parameter	<address>	Address of data point: 0~1,048,576

	<data>	Value data: ± 32,767
Example	**SOUR1:ARB:EDIT:POIN 1000, 32767** Creates a point on the arbitrary waveform at address 1000 with the highest amplitude.	

SOURce[1]:ARB:EDIT:LINE

Source Specific Command

Description	Edit a line on the arbitrary waveform. The line is created with a starting address and data point and a finishing address and data point.	
Note	A waveform/waveform segment cannot be deleted when output.	
Syntax	**SOURce[1]:ARB:EDIT:LINE [<address1>[,<data>[,<address2>[,<data2>]]]]**	
Parameter	<addrress1>	Address of data point1: 0~1,048,576
	<data1>	Value data2: ± 32,767
	<address2>	Address of data point2: 0~1,048,576
	<data2>	Value data2: ± 32,767
Example	**SOUR1:ARB:EDIT:LINE 40, 50, 100, 50** Creates a line on the arbitrary waveform at 40,50 to 100,50.	

SOURce[1]:ARB:EDIT:PROTect

Source Specific Command

Description	Protects a segment of the arbitrary waveform from deletion or editing.	
Syntax	**SOURce[1]:ARB:EDIT:PROTect [<STARt>[,<LENGth>]]**	
Parameter	<STARt>	Start address: 0~1048,576
	<LENGth>	0 ~ 1048,576

Example	**SOUR1:ARB:EDIT:PROT 40, 50** Protects a segment of the waveform from address 40 for 50 data points.

SOURce[1]:ARB:EDIT:PROTect:ALL

Source Specific Command

Description	Protects the arbitrary waveform currently in non-volatile memory/ currently being output.
Syntax	**SOURce[1]:ARB:EDIT:PROTect:ALL**
Example	**SOUR1:ARB:EDIT:PROT:ALL**

SOURce[1]:ARB:EDIT:UNProtect

Source Specific Command

Description	Uprotects the arbitrary waveform currently in non-volatile memory/currently being output.
Syntax	**SOURce[1]:ARB:EDIT:UNProtect**
Example	**SOUR1:ARB:EDIT:UNP**

SOURce[1]:ARB:BUILt:SINusoid

Source Specific Command

Description	Creates a sinusoid with a specified start address, length and scale.	
Syntax	**SOURce[1]:ARB:BUILt:SINusoid [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 1,048,576	
Example	**SOUR1:ARB:BUIL:SIN 1000, 1000, 100** Creates a sin wave 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1]:ARB:BUILt:SQUare

Source Specific Command

Description	Creates a square wave with a specified start address, length and scale.	
Syntax	**SOURce[1]:ARB:BUILt:SQUare [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 1,048,576	
Example	**SOUR1:ARB:BUIL:SQU 1000, 1000, 100** Creates a square wave 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1]:ARB:BUILt:PULSe

Source Specific Command

Description	Creates a pulse wave with a specified frequency and duty.		
Syntax	**SOURce[1]:ARB:BUILt:PULSe [<FREQuency>[,<DUTY>]]**		
Parameter	<FREQuency>	1pHz~500kHz*	
	<DUTY>	0.0001%~99.9999%	
	*Frequency	Resolution	Duty Resolution
	1pHz~5Hz	1pHz	0.0001%
	>5Hz~50Hz	1uHz	0.0001%
	>50Hz~500Hz	10uHz	0.001%
	>500Hz~5kHz	100uHz	0.01%
	>5kHz~50kHz	1mHz	0.1%
	>50kHz~500kHz	10mHz	1%

Example	**SOUR1:ARB:BUIL:PULSe +1.00000002E+03, +1.002E+01** Creates a 1000.0002Hz pulse wave with a 10.02% duty cycle.

SOURce[1]:ARB:BUILt:RAMP

Source Specific Command

Description	Creates a ramp wave with a specified start address, length and scale.	
Syntax	**SOURce[1]:ARB:BUILt:RAMP[<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 1,048,576	
Example	**SOUR1:ARB:BUIL:RAMP 1000, 1000, 100** Creates a ramp wave 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1]:ARB:BUILt:SINC

Source Specific Command

Description	Creates a sinc wave with a specified start address, length and scale.	
Syntax	**SOURce[1]:ARB:BUILt:SINC [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 1,048,576	
Example	**SOUR1:ARB:BUIL:SINC 1000, 1000, 100**	

Creates a sinc wave 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1]:ARB:BUILt:EXPRise

Source Specific Command

Description	Creates an exponential rise wave with a specified start address, length and scale.	
Syntax	**SOURce[1]:ARB:BUILt:EXPRise [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 1,048,576	
Example	**SOUR1:ARB:BUIL:EXPR 1000, 1000, 100**	
	Creates a exponential rise wave 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1]:ARB:BUILt:EXPFail

Source Specific Command

Description	Creates a DC waveform with a specified start address, length and scale.	
Syntax	**SOURce[1]:ARB:BUILt:EXPFail [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 1,048,576	
Example	**SOUR1:ARB:BUIL:EXPF 1000, 1000, 100**	

Creates an exponential fall wave 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1]:ARB:BUILt:DC

Source Specific Command

Description	Creates an exponential fall wave with a specified start address, length and scale.	
Syntax	**SOURce[1]:ARB:BUILt:DC [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 1,048,576	
Example	**SOUR1:ARB:BUIL:DC 1000, 1000, 100** Creates an exponential fall wave 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1]:ARB:NCYCles

Source Specific Command

Description	The arbitrary waveform output can be repeated for a designated number of cycles.	
Syntax	**SOURce[1]:ARB:NCYCles {< #cycles> |INFinity|MINimum |MAXimum}**	
Parameter	<# cycles>	1~1,048,575 cycles
	INFinity	Sets the number of cycles to continuous.
	MINimum	Sets the number of cycles to the minimum allowed.

	MAXimum	Sets the number of cycles to the maximum allowed.

Example **SOUR1:ARB:NCYCl INF**

Sets the number of ARB waveform output cycles to continuous (infinite).

Query Syntax **SOURce[1]:ARB:NCYCles? [MINimum|MAXimum]**

Return Parameter	<NR3>	Returns the number of cycles.
	INF	INF is returned if the number of cycles is continuous.

Example **SOUR1:ARB:NCYC?**

+1.0000E+02

The number of ARB waveform output cycles is returned (100).

SOURce[1]:ARB:OUTPut:MARKer

Source Specific Command

Description Define a section of the arbitrary waveform for marker output. The marker is output from the SYNC terminal on the front panel.

Syntax **SOURce[1]:ARB:OUTPut:MARKer [<STARt>[,<LENGth>]]**

Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576

* Start + Length ≤ currently output arbitrary waveform

Example **SOUR1:ARB:OUTP:MARK 1000, 1000**

The marker output is for a start address of 1000 with a length of 1000.

SOURce[1]:ARB:OUTPut		Source Specific Command
Description	Output the current arbitrary waveform in volatile memory. A specified start and length can also be designated.	
Syntax	**SOURce[1]:ARB:OUTPut [<STARt>[,<LENGth>]]**	
Parameter	<STARt>	Start address*: 0~1048,576
	<LENGth>	Length*: 0 ~ 1048,576
	* Start + Length ≤ currently output arbitrary waveform	
Example	**SOUR1:ARB:OUTP 20 200**	
	Outputs the current arbitrary waveform in memory.	

存储和调取指令

Up to 10 different instrument states can be stored to non-volatile memory (memory locations 0~9).

*SAV		Instrument Command
Description	Saves the current instrument state to a specified save slot. When a state is saved, all the current instrument settings, functions and waveforms are also saved.	
Note	The *SAV command doesn't save waveforms in non-volatile memory, only the instrument state.	
	The *RST command will not delete saved instrument states from memory.	
Syntax	***SAV {0|1|2|3|4|5|6|7|8|9}**	
Example	***SAV 0**	
	Save the instrument state to memory location 0.	

*RCL	Instrument Command
Description	Recall previously saved instrument states from memory locations 0~9.
Syntax	***RCL {0|1|2|3|4|5|6|7|8|9}**
Example	***RCL 0** Recall instrument state from memory location 0.

MEMory:STATe:DELete	Instrument Command
Description	Delete memory from a specified memory location.
Syntax	**MEMory:STATe:DELete {0|1|2|3|4|5|6|7|8|9}**
Example	**MEM:STAT:DEL 0** Delete instrument state from memory location 0.

MEMory:STATe:DELete ALL	Instrument Command
Description	Delete memory from all memory locations, 0~9.
Syntax	**MEMory:STATe:DELete ALL**
Example	**MEM:STAT:DEL ALL** Deletes all the instrument states from memory locations 0~9.

错误信息

The AFG-3000 has a number of specific error codes. Use the SYSTem:ERRor command to recall the error codes. For more information regarding the error queue, see page 289.

Command Error Codes

-101 Invalid character

An invalid character was used in the command string. Example: #, $, %.

SOURce1:AM:DEPTh MIN%

-102 Syntax error

Invalid syntax was used in the command string. Example: An unexpected character may have been encountered, like an unexpected space.

SOURce1:APPL:SQUare , 1

-103 Invalid separator

An invalid separator was used in the command string. Example: a space, comma or colon was incorrectly used.

APPL:SIN 1 1000 OR SOURce1:APPL:SQUare

-108 Parameter not allowed

The command received more parameters than were expected. Example: An extra (not needed) parameter was added to a command

SOURce1:APPL? 10

-109 Missing parameter

The command received less parameters than expected. Example: A required parameter was omitted.

SOURce1:APPL:SQUare

-112 Program mnemonic too long

A command header contains more than 12 characters:

OUTP:SYNCHRONIZATION ON

-113 Undefined header

An undefined header was encountered. The header is syntactically correct. Example: the header contains a character mistake.

SOUR1:AMM:DEPT MIN

-123 Exponent too large

Numeric exponent exceeds 32,000. Example:

SOURce[1]:BURSt:NCYCles 1E34000

-124 Too many digits

The mantissa (excluding leading 0's) contains more than 255 digits.

-128 Numeric data not allowed

An unexpected numeric character was received in the command. Example: a numeric parameter is used instead of a character string.

SOURce1:BURSt:MODE 123

-131 Invalid suffix

An invalid suffix was used. Example: An unknown or incorrect suffix may have been used with a parameter.

SOURce1:SWEep:TIME 0.5 SECS

-138 Suffix not allowed

A suffix was used where none were expected. Example: Using a suffix when not allowed.

SOURce1:BURSt: NCYCles 12 CYC

-148 Character data not allowed

A parameter was used in the command where not allowed. Example: A discrete parameter was used where a numeric parameter was expected.

SOUR1:MARK:FREQ ON

-158 String data not allowed

An unexpected character string was used where none were expected. Example: A character string is used instead of a valid parameter.

SOURce1:SWEep:SPACing 'TEN'

-161 Invalid block data

Invalid block data was received. Example: The number of bytes sent with the DATA:DAC command doesn't correlate to the number of bytes specified in the block header.

-168 Block data not allowed

Block data was received where block data is not allowed. Example:

SOURce1:BURSt: NCYCles #10

-170~178 expression errors

Example: The mathematical expression used was not valid.

Execution Errors

-211 Trigger ignored

A trigger was received but ignored. Example: Triggers will be ignored until the function that can use a trigger is enabled (burst, sweep, etc.).

-223 Too much data

Data was received that contained too much data. Example: An arbitrary waveform with over 1,048,576 points cannot be used.

-221 Settings conflict; turned off infinite burst to allow immediate trigger source

Example: Infinite burst is disabled when an immediate trigger source is selected. Burst count set to 1,000,000 cycles.

-221 Settings conflict; infinite burst changed trigger source to MANual

Example: The trigger source is changed to immediate from manual when infinite burst mode is selected.

-221 Settings conflict; burst period increased to fit entire burst

Example: The function generator automatically increases the burst period to allow for the burst count or frequency.

-221 Settings conflict; burst count reduced

Example: The burst count is reduced to allow for the waveform frequency if the burst period is at it's maximum.

-221 Settings conflict; trigger delay reduced to fit entire burst

Example: The trigger delay is reduced to allow the current period and burst count.

-221 Settings conflict;triggered burst not available for noise

Example: Triggered burst cannot be used with noise.

-221 Settings conflict;amplitude units changed to Vpp due to high-Z load

Example: If a high impedance load is used, dBm units cannot be used. The units are automatically set to Vpp.

-221 Settings conflict;trigger output disabled by trigger external

Example: The trigger output terminal is disabled when an external trigger source is selected.

-221 Settings conflict;trigger output connector used by FSK

Example: The trigger output terminal cannot be used in FSK mode.

-221 Settings conflict;trigger output connector used by burst gate

Example: The trigger output terminal cannot be used in gated burst mode.

-221 Settings conflict;trigger output connector used by trigger external

Example: The trigger output connector is disabled when the trigger source is set to external.

-221 Settings conflict;frequency reduced for pulse function

Example: When the function is changed to pulse, the output frequency is automatically reduced if over range.

-221 Settings conflict;frequency reduced for ramp function

Example: When the function is changed to ramp, the output frequency is automatically reduced if over range.

-221 Settings conflict;frequency made compatible with burst mode

Example: When the function is changed to burst, the output frequency is automatically adjusted if over range.

-221 Settings conflict;frequency made compatible with FM

Example: When the function is changed to FM, the frequency is automatically adjusted to suit the FM settings.

-221 Settings conflict;burst turned off by selection of other mode or modulation

Example: Burst mode is disabled when sweep or a modulation mode is enabled.

-221 Settings conflict;FSK turned off by selection of other mode or modulation

Example: FSK mode is disabled when burst, sweep or a modulation mode is enabled.

-221 Settings conflict;FM turned off by selection of other mode or modulation

Example: FM mode is disabled when burst, sweep or a modulation mode is enabled.

-221 Settings conflict;AM turned off by selection of other mode or modulation

Example: AM mode is disabled when burst, sweep or a modulation mode is enabled.

-221 Settings conflict; sweep turned off by selection of other mode or modulation

Example: Sweep mode is disabled when burst or a modulation mode is enabled.

-221 Settings conflict;not able to modulate this function

Example: A modulated waveform cannot be generated with dc voltage, noise or pulse waveforms.

-221 Settings conflict;not able to sweep this function

Example: A swept waveform cannot be generated with dc voltage, noise or pulse waveforms.

-221 Settings conflict;not able to burst this function

Example: A burst waveform cannot be generated with the dc voltage function.

-221 Settings conflict;not able to modulate noise, modulation turned off

Example: A waveform cannot be modulated using the noise function.

-221 Settings conflict;not able to sweep pulse, sweep turned off

Example: A waveform cannot be swept using the pulse function.

-221 Settings conflict;not able to modulate dc, modulation turned off

Example: A waveform cannot be modulated using the dc voltage function.

-221 Settings conflict;not able to sweep dc, modulation turned off

Example: A waveform cannot be swept using the dc voltage function.

-221 Settings conflict;not able to burst dc, burst turned off

Example: The burst function cannot be used with the dc voltage function.

-221 Settings conflict;not able to sweep noise, sweep turned off

Example: A waveform cannot be swept using the noise function.

-221 Settings conflict;pulse width decreased due to period

Example: The pulse width has been adjusted to suit the period settings.

-221 Settings conflict;amplitude changed due to function

Example: The amplitude (VRM / dBm) has been adjusted to suit the selected function. For the AFG-3000, a typical square wave has a much higher amplitude (5V Vrms) compared to a sine wave (~3.54) due to crest factor.

-221 Settings conflict;offset changed on exit from dc function

Example: The offset level is adjusted on exit from a DC function.

-221 Settings conflict;FM deviation cannot exceed carrier

Example: The deviation cannot be set higher than the carrier frequency

-221 Settings conflict;FM deviation exceeds max frequency

Example: If the FM deviation and carrier frequency combined exceeds the maximum frequency plus 100 kHz, the deviation is automatically adjusted.

-221 Settings conflict;frequency forced duty cycle change

Example: If the frequency is changed and the current duty cannot be supported at the new frequency, the duty will be automatically adjusted.

-221 Settings conflict;offset changed due to amplitude

Example: The offset is not a valid offset value, it is automatically adjusted, considering the amplitude.

|offset| ≤ max amplitude – Vpp/2

-221 Settings conflict;amplitude changed due to offset

Example: The amplitude is not a valid value, it is automatically adjusted, considering the offset.

Vpp ≤ 2X (max amplitude -|offset|)

-221 Settings conflict;low level changed due to high level

Example: The low level value was set too high. The low level is set 1 mV less than the high level.

-221 Settings conflict;high level changed due to low level

Example: The high level value was set too low. The high level is set 1 mV greater than the low level.

-222 Data out of range;value clipped to upper limit

Example: The parameter was set out of range. The parameter is automatically set to the maximum value allowed.

SOURce[1]:FREQuency 80.1MHz.

-222 Data out of range;value clipped to lower limit

Example: The parameter was set out of range. The parameter is automatically set to the minimum value allowed.

SOURce[1]:FREQuency 0.1μHz.

-222 Data out of range;period; value clipped to …

Example: If the period was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range;frequency; value clipped to …

Example: If the frequency was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range;user frequency; value clipped to upper limit

Example: If the frequency is set to a value out of range for an arbitrary waveform using, SOURce[1]: APPL: USER or SOURce[1]: FUNC:USER, it is automatically set to the upper limit.

-222 Data out of range;ramp frequency; value clipped to upper limit

Example: If the frequency is set to a value out of range for a ramp waveform using, SOURce[1]: APPL: RAMP or SOURce[1]:FUNC:RAMP, it is automatically set to the upper limit.

-222 Data out of range;pulse frequency; value clipped to upper limit

Example: If the frequency is set to a value out of range for a pulse waveform using, SOURce[1]: APPL:PULS or SOURce[1]:FUNC:PULS, it is automatically set to the upper limit.

-222 Data out of range;burst period; value clipped to …

Example: If the burst period was set to a value out of range, it is automatically set to an upper or lower limit.

222 Data out of range;burst count; value clipped to …

Example: If the burst count was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range; burst period limited by length of burst; value clipped to upper limit

Example: The burst period must be greater than burst count divided by the frequency + 200 ns. The burst period is adjusted to satisfy these conditions.

burst period > 200 ns + (burst count/burst frequency).

-222 Data out of range; burst count limited by length of burst; value clipped to lower limit

Example: The burst count must be less than burst period * the waveform frequency when the the trigger source is set to immediate (SOURce[1]: TRIG:SOUR IMM). The burst count is automatically set to the lower limit.

-222 Data out of range;amplitude; value clipped to …

Example: If the amplitude was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range;offset; value clipped to …

Example: If the offset was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range;frequency in burst mode; value clipped to …

Example: If the frequency was set to a value out of range in burst mode. The burst frequency is automatically set to an upper or lower limit, taking the burst period into account.

-222 Data out of range;frequency in FM; value clipped to …

Example: The carrier frequency is limited by the frequency deviation (SOURce[1]: FM:DEV). The carrier frequency is automatically adjusted to be less than or equal to the frequency deviation.

-222 Data out of range;marker confined to sweep span; value clipped to …

Example: The marker frequency is set to a value outside the start or stop frequencies. The marker frequency is automatically adjusted to either the start or stop frequency (whichever is closer to the set value).

-222 Data out of range;FM deviation; value clipped to …

Example: The frequency deviation is outside of range. The deviation is automatically adjusted to an upper or lower limit, depending on the frequency.

-222 Data out of range;trigger delay; value clipped to upper limit

Example: The trigger delay was set to a value out of range. The trigger delay has been adjusted to the maximum (85 seconds).

-222 Data out of range; trigger delay limited by length of burst; value clipped to upper limit

Example: The trigger delay and the burst cycle time combined must be less than the burst period.

-222 Data out of range;duty cycle; value clipped to …

Example: The duty cycle is limited depending on the frequency.

Duty Cycle	Frequency
50%	> 50MHz
40%~60%	25 MHz ~ 50MHz
20%~80%	< 25 MHz

-222 Data out of range; duty cycle limited by frequency; value clipped to upper limit

Example: The duty cycle is limited depending on the frequency. When the frequency is greater than 50 MHz, the duty cycle is automatically limited to 50%.

-313 Calibration memory lost;memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the calibration data.

-314 Save/recall memory lost;memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the save/recall files.

-315 Configuration memory lost;memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the configuration settings.

-350 Queue overflow

Indicates that the error queue is full (over 20 messages generated, and not yet read). No more messages will be stored until the queue is empty. The queue can be cleared by reading each message, using the *CLS command or restarting the function generator.

-361 Parity error in program message

Indicates that there is a RS232 parity setting mismatch between the host PC and the function generator.

-362 Framing error in program message

Indicates that there is a RS232 stop bit setting mismatch between the host PC and the function generator.

-363 Input buffer overrun

Indicates that too many characters have been sent to the function generator via RS232. Ensure handshaking is used.

Query Errors

-410 Query INTERRUPTED

Indicates that a command was received but the data in the output buffer from a previous command was lost.

-420 Query UNTERMINATED

The function generator is ready to return data, however there was no data in the output buffer. For example: Using the APPLy command.

-430 Query DEADLOCKED

Indicates that a command generates more data than the output buffer can receive and the input buffer is full. The command will finish execution, though all the data won't be kept.

Arbitrary Waveform Errors

-770 Nonvolatile arb waveform memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the arbitrary waveform data.

-781 Not enough memory to store new arb waveform; bad sectors

Indicates that a fault (bad sectors) has occurred with the non-volatile memory that stores the arbitrary waveform data. Resulting in not enough memory to store arbitrary data.

-787 Not able to delete the currently selected active arb waveform

Example: The currently selected waveform is being output and cannot be deleted.

800 Block length must be even

Example: As block data (DATA:DAC VOLATILE) uses two bytes to store each data point, there must be an even number or bytes for a data block.

SCPI 状态寄存器

The status registers are used to record and determine the status of the function generator.

The function generator has a number of register groups:

Questionable Status Registers

Standard Event Status Registers

Status Byte Register

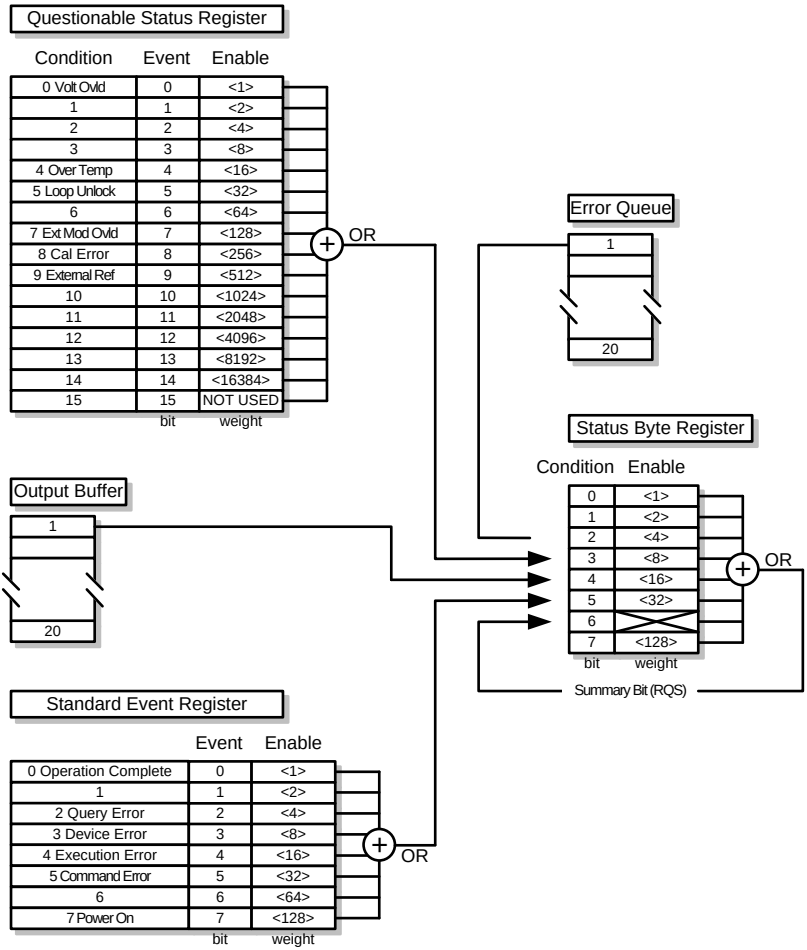
As well as the output and error queues.

Each register group is divided into three types of registers: condition registers, event registers and enable registers.

Register types

Condition Register	The condition registers indicate the state of the function generator in real time. The condition registers are not triggered. I.e., the bits in the condition register change in real time with the instrument status. Reading a condition register will not clear it. The condition registers cannot be cleared or set.
Event Register	The Event Registers indicate if an event has been triggered in the condition registers. The event registers are latched and will remain set unless the *CLS command is used. Reading an event register will not clear it.
Enable Register	The Enable register determines which status event(s) are enabled. Any status events that are not enabled are ignored. Enabled events are used to summarize the status of that register group.

AFG-3000 Status System



Questionable Status Register

Description

The Questionable Status Registers will show if any faults or errors have occurred.

Bit Summary

Register	Bit	Bit Weight
Voltage overload	0	1
Over temperature	4	16
Loop unlock	5	32
Ext Mod Overload	7	128
Cal Error	8	256
External Reference	9	512

Standard Event Status Registers

Description

The Standard Event Status Registers indicate when the *OPC command has been executed or whether any programming errors have occurred.

Notes

The Standard Event Status Enable register is cleared when the *ESE 0 command is used.

The Standard Event Status Event register is cleared when the *CLS command or the *ESR? command is used.

Bit Summary	Register	Bit	Bit Weight
	Operation complete bit	0	1
	Query Error	2	4
	Device Error	3	8
	Execution Error	4	16
	Command Error	5	32
	Power On	7	128

Error Bits		
	Operation complete	The operation complete bit is set when all selected pending operations are complete. This bit is set in response to the *OPC command.
	Query Error	The Query Error bit is set when there is an error reading the Output Queue. This can be caused by trying to read the Output Queue when there is no data present.
	Device Error	The Device Dependent Error indicates a failure of the self-test, calibration, memory or other device dependent error.
	Execution Error	The Execution bit indicates an execution error has occurred.
	Command Error	The Command Error bit is set when a syntax error has occurred.
	Power On	Power has been reset.

The Status Byte Register

Description

The Status Byte register consolidates the status events of all the status registers. The Status Byte register can be read with the *STB? query or a serial poll and can be cleared with the *CLS command.

Clearing the events in any of the status registers will clear the corresponding bit in the Status Byte register.

Notes

The Status byte enable register is cleared when the *SRE 0 command is used.

The Status Byte Condition register is cleared when the *CLS command is used.

Bit Summary

Register	Bit	Bit Weight
Error Queue	2	4
Questionable Data	3	8
Message Available	4	16
Standard Event	5	32
Master Summary / Request Service	6	64

Status Bits

Error Queue	There are error message(s) waiting in the error queue.
Questionable data	The Questionable bit is set when an "enabled" questionable event has occurred.
Message Available	The Message Available bit is set when there is outstanding data in the Output Queue. Reading all messages in the output queue will clear the message available bit.

Standard Event	The Event Status bit is set if an "enabled" event in the Standard Event Status Event Register has occurred.
Master Summary/ Service Request bit	The Master Summary Status is used with the *STB? query. When the *STB? query is read the MSS bit is not cleared. The Request Service bit is cleared when it is polled during a serial poll.

Output Queue

Description	The Output queue stores output messages in a FIFO buffer until read. If the Output Queue has data, the MAV bit in the Status Byte Register is set.

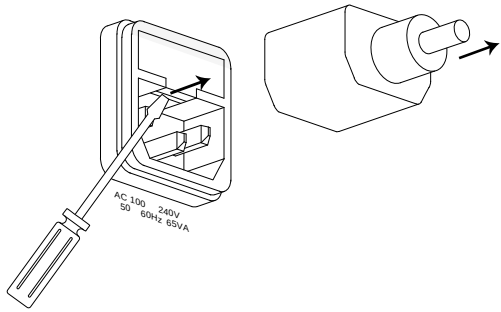
Error Queue

Description	The error queue is queried using the SYSTem:ERRor? command. The Error queue will set the "Error Queue" bit in the status byte register if there are any error messages in the error queue. If the error queue is full the last message will generate a "Queue overflow" error and additional errors will not be stored. If the error queue is empty, "No error" will be returned. Error messages are stored in the error queue in a first-in-first-out order. The errors messages are character strings that can contain up to 255 characters.

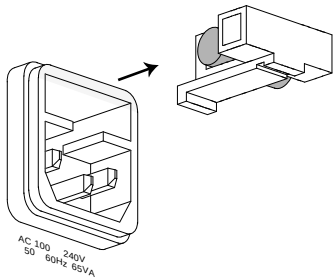
附录

保险丝更换

步骤 1. 拔去电源线并使用螺丝刀取出保险丝座



2. 更换保险丝



额定值 T0.63A, 250V

AFG-3000 系列规格

此规格适用条件：+20°C~+30°C，开机 30 分钟以上。

波形		AFG-3051	AFG-3081
		正弦波, 方波, 斜波, 脉冲波, 噪声波, DC, Sin(x)/x, 指数上升, 指数下降, 负斜波	
任意波形			
	ARB 功能	内置	
	采样率	200 MSa/s	
	重建率	100MHz	
	波形长度	1M 点	
	幅度分辨率	16 位	
	非易失性存储器	10 组 1M 波形(1)	
	用户定义输出部分	从 2~1M 点任选	
	用户定义标记输出	从 2~1M 点任选	
	输出模式	1~1048575 次循环或无限模式	
频率特性			
范围	正弦波	50MHz	80MHz
	方波	50MHz	80MHz
	三角波, 斜波	1MHz	
分辨率		1μHz	
精确度	稳定度	±1 ppm 0~50˚C ±0.3 ppm 18~28˚C	
	老化率	±1 ppm, 每年	
	容差	≤1 μHz	
输出特性(2)			
幅值	范围	10 mVpp~10 Vpp(接 50Ω) 20 mVpp~20 Vpp(开路)	
	精确度	± 1%设置值 ±1 mVpp (1 kHz,>10 mVpp)	
	分辨率	0.1 mV 或 4 位	
	平坦度	± 1% (0.1dB) <10 MHz ± 2% (0.2 dB) 10 MHz~50 MHz ± 10% (0.9 dB) 50 MHz~70 MHz ± 20% (1.9 dB) 70 MHz~80 MHz (正弦波 1 kHz)	

	单位	Vpp, Vrms, dBm,
偏移	范围	±5 Vpk ac +dc (接 50Ω) ±10Vpk ac +dc (开路)
	精确度	1%设置值 + 2 mV + 0.5%幅值
波形输出	阻抗	50Ω 典型值(固定) > 10MΩ (输出关闭)
	保护	短路保护 过载继电器自动禁用主输出
同步输出	范围	TTL-compatible into>1kΩ
	阻抗	50Ω 正常值
正弦波特性		
	谐波失真(5)	–60 dBc DC～1 MHz, Ampl＜3 Vpp –55 dBc DC～1 MHz, Ampl＞3 Vpp –45 dBc 1MHz～5 MHz, Ampl＞3 Vpp –30 dBc 5MHz～80 MHz, Ampl＞3 Vpp
	总谐波失真	< 0.2%+0.1mVrms DC~20 kHz
	伪波(非谐波)(5)	–60 dBc DC～1 MHz –50 dBc 1MHz～20MHz –50 dBc+ 6 dBc/octave 1MHz～80MHz
	相位噪声	＜-65dBc 典型值 10MHz, 30 kHz band ＜-47dBc 典型值 80MHz, 30 kHz band
方波特性		
	上升/下降时间	<8 ns(3)
	过激信号	<5%
	不对称性	1%周期 +1 ns
	可变占空比	20.0% to 80.0% ≤ 25 MHz 40.0% to 60.0% 25～50MHz 50.0%(固定) 50～80MHz
	抖动	0.01%+525ps ＜ 2 MHz 0.1%+75ps ＞ 2 MHz
斜波特性		
	线性度	＜ 0.1%峰值输出
	可变对称性	0%~100%
脉冲波特性		
	周期	20ns～ 2000s
	脉冲宽度	8ns～ 1999.9s 最小脉冲宽度: FREQ≦50MHz：8nS FREQ≦6.5MHz：5%周期值 分辨率: FREQ≦50MHz：1nS FREQ≦6.5MHz：1%周期值

	过激信号	<5%
	抖动	100 ppm +50 ps
AM 调制		
	载波波形	正弦波, 方波, 三角波, 斜波, 脉冲波, 任意波
	调制波形	正弦波, 方波, 三角波, 正/负斜波
	调制频率	2 mHz~20 kHz
	深度	0%~120.0%
	源	内部/外部
FM 调制		
	载波波形	正弦波, 方波, 三角波, 斜波
	调制波形	正弦波, 方波, 三角波, 正/负斜波
	调制频率	2 mHz~20 kHz
	峰值偏移	DC~50 MHz DC~80 MHz
	源	内部/外部
PWM		
	载波波形	方波
	调制波形	正弦波, 方波, 三角波, 正/负斜波
	调制频率	2 mHz~20 kHz
	偏移	0% ～ 100.0%脉冲宽度
	源	内部/外部
FSK		
	载波波形	正弦波, 方波, 三角波, 斜波, 脉冲波
	调制波形	占空比为 50%的方波
	内部频率	2 mHz~100 kHz
	频率范围	DC~50 MHz DC~80 MHz
	源	内部/外部
扫描		
	波形	正弦波, 方波, 三角波, 斜波
	类型	线性或对数
	方向	向上或向下
	起始/停止频率	100 μHz~50 MHz 100 μHz~80 MHz
	扫描时间	1 ms~500 s
	触发	单次, 外部, 内部
	标记	标记信号的下降沿 (可编程)
	源	内部/外部
脉冲串		
	波形	正弦波, 方波, 三角波, 斜波
	频率	1 μHz~50 MHz(4) 1 μHz~80 MHz(4)
	脉冲串计数	1~1000000 次循环或无限
	起始/停止相位	-360.0∘~+360.0∘

	内部周期	1 ms~500 s
	门电路源	外部触发
	触发源	单次, 外部或内部
触发延迟	N 次循环, 无限	0s~85 s
外部调制输入		
	类型	AM, FM, 扫描, PWM
	电压范围	± 5V 满刻度
	输入阻抗	10kΩ
	频率	DC~20kHz
外部触发输入		
	类型	FSK, 脉冲串, 扫描
	输入电平	TTL 兼容
	斜率	上升或下降(可兼容)
	脉冲宽度	>100ns
	输入阻抗	10kΩ, DC 耦合
等待时间	扫描	<10us (典型值)
	脉冲串	<100ns (典型值)
抖动	扫描	2.5 us
	脉冲串	1ns; 脉冲除外, 300 ps
调制输出		
	类型	AM, FM, 扫描, PWM
幅值	范围	≥1Vpp
	阻抗	> 10kΩ 典型值(固定)
触发输出		
	类型	脉冲串, 扫描
	电平	TTL Compatible into 50Ω
	脉冲宽度	>450 ns
	最大频率值	1 MHz
	扇出	≥4 TTL load
	阻抗	50Ω 典型值
标记输出		
	类型	ARB, 扫描
	电平	TTL Compatible into 50Ω
	扇出	≥4 TTL load
	阻抗	50Ω 典型值
存储/调取		10 组设置存储
接口		GPIB, RS232, USB
显示		4.3'' TFT LCD 480 × 3 (RGB) × 272

系统特性

	配置时间 (典型值)	函数改变: 标准---->102ms 脉冲-------->660ms 内置任意波形->240ms 频率改变: 24ms 幅值改变: 50ms 偏移改变: 50ms 选择用户定义的任意波形: < 2s，对于 1M 点 调制改变: < 200ms

任意波形下载时间(典型值)	二进制代码		ASCII 码
	GPIB/RS232 (115 Kbps)	USB Device	USB Host
1M points	189 sec	34 sec	70 sec
512K points	95 sec	18sec	35 sec
256K points	49 sec	9 sec	18 sec
64K points	16 sec	3 sec	6 sec
16K points	7 sec	830 ms	1340 ms
8K points	6 sec	490 ms	780 ms
4K points	6 sec	365 ms	520 ms
2K points	5 sec	300 ms	390 ms

通用规格		
	电源	AC100~240V, 50~60Hz
	功耗	65 VA
	操作环境	适合温度: 18 ~ 28˚C 操作温度: 0 ~ 40˚C 相对湿度: ≤ 80%, 0 ~ 40˚C ≤ 70%, 35 ~ 40˚C 安装等级：CAT Ⅱ
	海拔	2000m
	污染程度	IEC 61010 2 级, 室内使用
	存储温度	-10~70˚C, 湿度: ≤70%
尺寸(WxHxD)	台式	265 (W) x 107 (H) x 374 (D)
	重量	约 4kg
	安全性设计	EN61010-1
	EMC 测试	EN 55011, IEC-61326
	附件	测试线(GTL-110× 1), 使用手册 × 1, 光盘 × 1, 快速入门指导 × 1, 电源线 × 1

(1). 可存储 10 组波形(每组波形 1M 点)；
(2). 对于 0℃~28℃范围内的操作环境，每改变 1℃，输出幅值和偏移规格增加 1/10(1 年)；
(3). 高频时的边沿时间减小；
(4). 仅 25MHz 以上的正弦波和方波允许使用无限次脉冲串计数；
(5). -70dBm 层限制低幅值的谐波失真和伪噪声；

EC 符合性声明书

我们

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声明如下涉及的产品

AFG-3081, AFG-3051

符合理事会设立的关于成员国电磁兼容性(2004/108/EEC)和低电压指令(2006/95/EEC)的法律法规要求。对于评估有关电磁兼容性和低电压指令，适用下列标准：

◎ **EMC**

EN 61326-1 : **EN 61326-2-1:**	用于测量、控制和实验室使用的电子设备 — EMC 要求(2006)
传导&辐射排放 EN 55011: 2007+A2: 2007	静电释放 EN 61000-4-2: 2009
电流谐波 EN 61000-3-2: 2006+A1: 2009+A2: 2009	抗辐射度 EN 61000-4-3: 2006+A1: 2008
电压波动 EN 61000-3-3: 2008	电学快速瞬变模式 IEC 61000-4-4: 2004+Corr.1 : 2006+Corr.2 : 2007
----------	浪涌抗扰度 EN 61000-4-5: 2006
----------	传导敏感度 EN 61000-4-6: 2009
----------	工频磁场分布 EN 61000-4-8: 1993+A1: 2001
----------	电压下降/中断 EN 61000-4-11: 2004

◎ **安全**

低压设备规章 2006/95/EC
安全要求 **IEC/EN 61010-1: 2001**

索引