任意波形信号发生器

AFG-3021, 3022, 3031 & AFG-3032

使用手册

固纬料号 NO.

ISO-9001 认证企业

GW INSTEK

2016.2

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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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仪器上。

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
	信号接地。机壳接地
	信号接地。与其它通道和大地绝缘
	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 • 请勿将超过 42Vpk 的电压连接任何输入/输出接地或机壳接地 • 请勿将输出端接入电压 • 请勿将触发或 MOD 输入端接入超过±5V 的电压 (测量等级) EN 61010-1:2010 规定了如下测量等级，AFG-30XX 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	• AC 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: AFG-3032&3022: T1A/250V AFG-3031&3021: 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

接地 警告	• AFG-30XX 为浮地信号发生器；AFG-30XX 的之间电气隔离是机壳与各通道之间隔离 42Vpk（直流+交流）电压。超过 42Vpp 可能导致内部电路损坏。 • 如果机壳接地与 CH1(MAIN)或 CH2 的共地之间存在潜在的电压差，请勿将它们短路。否则可能损坏仪器或外部连接设备 • 如果 CH1 和 CH2 的共地之间存在潜在的电压差，请勿将它们短路。否则可能损坏仪器或外部连接设备
警告	• 为避免电击，确保输出电压和浮地电压总计不超过 42Vpk • 在仪器工作时，请勿触摸任何外露接口
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 61010-1:2010 规定了如下污染程度。该仪器属于等级 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
Class A 设备 警告	AFG-30XX 信号发生器属于 Class A 设备。Class A 等级为工业环境使用。由于传导和辐射干扰，Class A 设备在其它环境中可能存在潜在的电磁兼容性问题

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。

注：除特殊说明，本手册所涉及的“AFG-30XX”包含 AFG-3021、AFG-3022、AFG-3031 & AFG-3032。

主要特点

型号	频宽	通道
AFG-3021	20MHz	1(signal ground chassis isolation)
AFG-3022	20MHz	2 (signal ground chassis isolation and channel isolation)
AFG-3031	30MHz	1(signal ground chassis isolation)
AFG-3032	30MHz	2 (signal ground chassis isolation and channel isolation)

性能

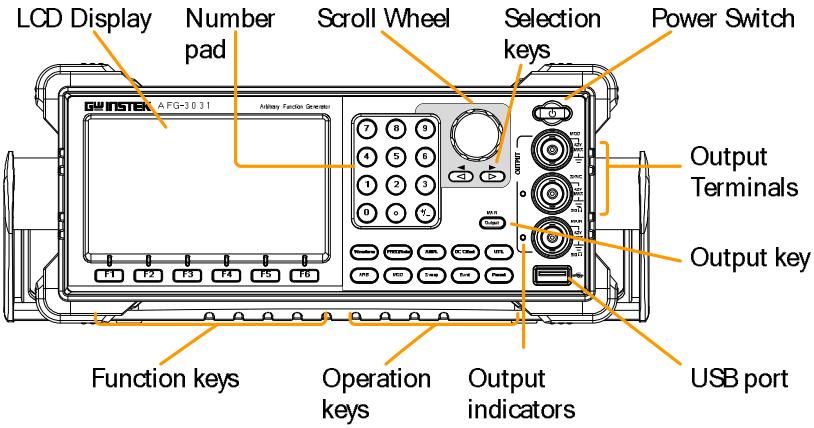
- DDS 信号发生器系列
- 全频段 1μHz 高频分辨率
- 1ppm 频率稳定度
- 任意波形能力
  - -250 MSa/s 采样率
  - -125 MSa/s 重复率
  - -8 M 点波形长度
  - -16 位幅值分辨率

	-10 组 8M 波形存储器 -显示真实波形输出 -用户定义输出部分 -D W R (直接波形重建)能力 -无需 PC 就可编辑波形 -可选 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、三角波、斜波、脉冲波、噪声波、DC 标准波形 • Int/Ext AM, FM, PWM, FSK, PM, SUM 调制 • 调制/扫描信号输出 • 带内部和外部触发的 Burst 功能 • 存储器存储/调取 10 组设置 • 输出过载保护 • 2 通道追踪(仅 AFG-3022/3032) • 42Vpk 信号与机壳地之间隔离和 42Vpk 通道隔离 • 多台同步控制 • DSO Link 功能将捕获的波形从 DSO 传送到信号发生器 • 谐波功能 • 上升时间&下降时间可设的脉冲波形 • 频率和幅值扫描
界面	• 接口: 标配: LAN, USB 选配: GPIB • 4.3’’彩色 TFT LCD (480 × 272) 图示用户界面 • AWES (任意波编辑软件)PC 软件

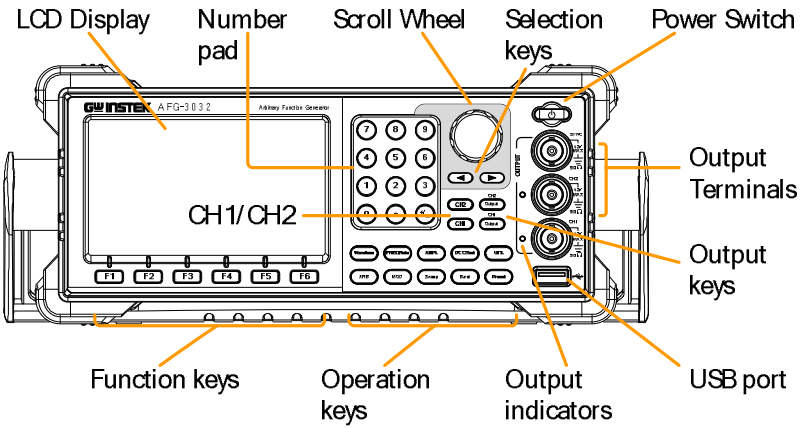
面板介绍

前面板

AFG-3021/3031

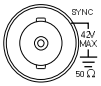
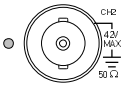
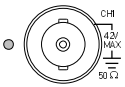
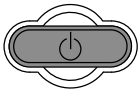
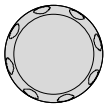
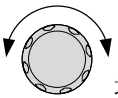
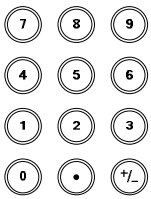


AFG-3022/3032



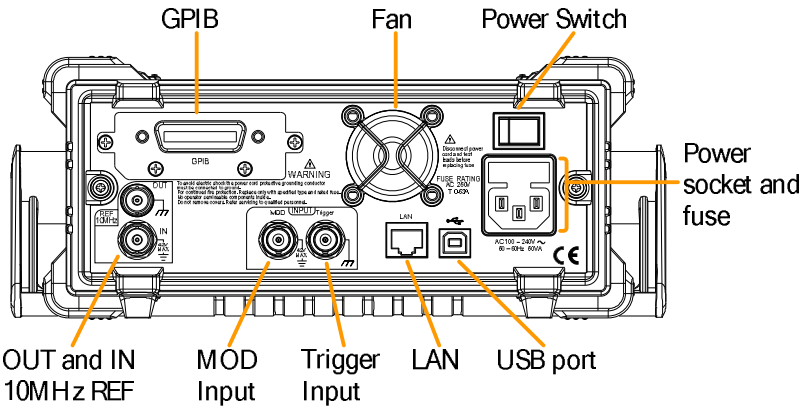
LCD display	TFT 彩色 LCD 显示器，480 x 272 分辨率	
Function keys: F1~F6	F 1	位于 LCD 屏下方，用于开启功能
Operation keys	Waveform	选择波形类型
	FREQ/Rate	设置频率或采样率
	AMPL	设置波形幅值
	DC Offset	设置直流偏移
	UTIL	进入存储和调取选项、设置远程接口(USB, GPIB, LAN)、使用 DSO 连接(AFG-3021/3031)、更新和查阅固件版本、进入校正选项、输出阻抗设置(仅 AFG-3021/3031)、设置语言和进入帮助菜单
	ARB	设置任意波形参数
	MOD Sweep Burst	MOD、Sweep 和 Burst 键用于设置调制、扫描和 Burst 选项和参数
Preset	Preset	调取预设状态

Main Output (AFG-3021/3031)	MAIN Output	开启或关闭波形输出
CH1/CH2Output (AFG-3022/3032)	CH1 Output	CH1/CH2 输出键。用于开启或关闭通道输出
CH1/CH2 (AFG-3022/3032)	CH1 CH2	AFG-3022 & AFG-3032 的 CH1/CH2 键用于进入 DSO link 功能、输出阻抗设置和相位设置
Output indicators	OUTPUT	当输出指示灯变绿，开启输出
USB host connector		存储、恢复数据，以及更新固件
Output terminals (AFG-3021/3031)	MOD 42V MAX	调制输出端子，用于 AM、FM、PWM、PM、SUM 或扫描功能
	SYNC 42V MAX 50 Ω	SYNC 输出端子输出一个 TTL 逻辑电平信号，与主输出的零相位同相。50Ω 输出阻抗
	MAIN 42V MAX 50 Ω	主输出端子。50Ω 输出阻抗

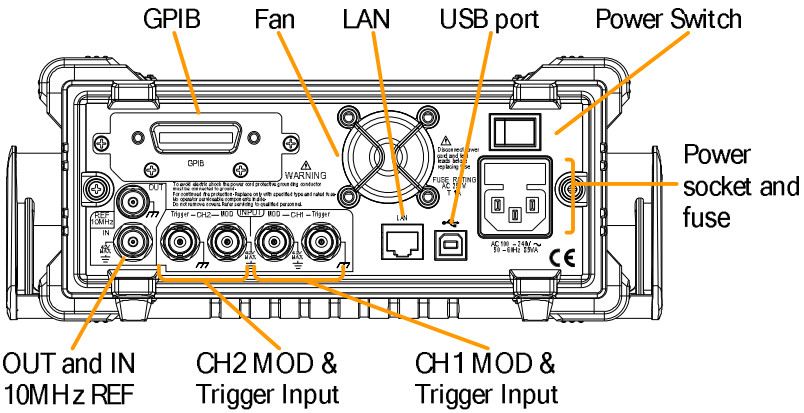
		注：MAIN 接地与 MOD 输出、SYNC 和 MOD 输入端子共地。他们与 10MHz REF IN 地是隔离并隔离电压为 42Vpk.
Output terminals (AFG-3022/3032)		SYNC 输出端输出一个 TTL 逻辑电平信号，与 CH1 输出的零相位同相。50Ω 输出阻抗
		CH2 输出端子。50Ω 输出阻抗
		CH1 输出端子。50Ω 输出阻抗
		注：CH1、CH2 和 10MHz REF IN 接地互相隔离，彼此相互隔离电压为 42Vpk CH1 接地与 MOD 输出、SYNC 和 CH1 MOD 输入端子共地 CH2 接地与 CH2 MOD 输入端子共地
Standby key		待机键使信号发生器处于开机(绿色)或待机(红色)模式
Selection keys		当编辑参数时，用于选择数位
Scroll Wheel		编辑数值和参数  减小 增加
Keypad		输入数值和参数，常与方向键和可调旋钮一起使用

后面板

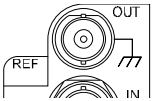
AFG-3021/3031



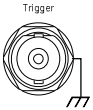
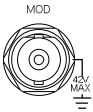
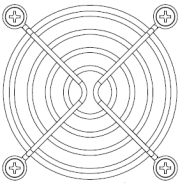
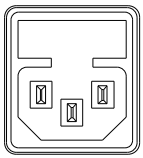
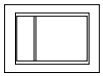
AFG-3022/3032



10MHz REF OUT

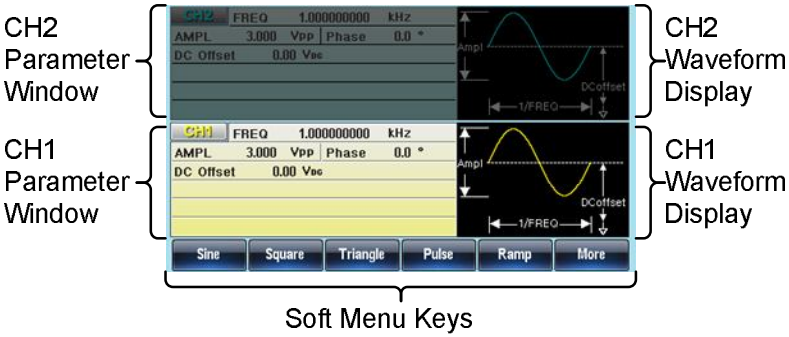


10 MHz 参考输出

10MHz REF IN		10 MHz 参考输入
Trigger Input		外部触发输入。用于接收外部触发信号。AFG-3022/3032 的 CH1 和 CH2 通道具有单独的触发输入
MOD input		调制输入端子。AFG-3022/3032 的 CH1 和 CH2 通道具有单独的调制输入 注：CH1 / CH2 MOD 输入终端相互隔离和机壳接地的隔离电压 42 vpk。 CH1 MOD 输入与 CH1 共地。 CH2 MOD 输入与 CH2 共地。
Fan		风扇
Power Socket Input and fuse		电源输入：100-240V AC 50-60Hz 保险丝： AFG-3022/3032: T1A/250V AFG-3021/AFG-3031: T0.63A/250V 保险丝更换见 458 页
Power Switch		主电源开关
USB B port		连接 PC，进行远程控制
LAN port		以太网远程控制(RJ45 接口)

GPIB		24 pin female GPIB 接口，PC 远程控制

显示

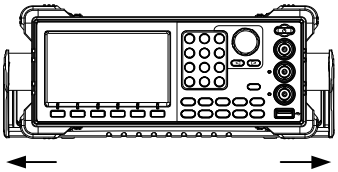


Parameter Windows	编辑 CH1 和 CH2 的参数值
Waveform Display	显示每通道波形
Soft Menu Keys	功能键(F1~F6)与下方的软菜单键对应

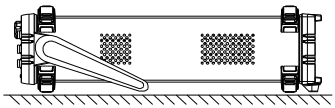
设置信号发生器

背景 本章节介绍了如何调整把手位置以及如何开机。

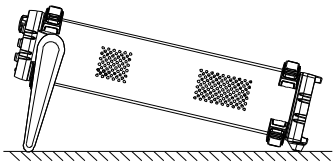
调整把手 向两侧拉把手并旋转



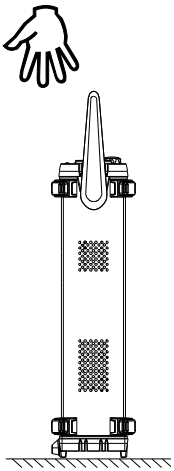
水平放置仪器



或倾斜放置

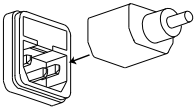


垂直放置方便手提

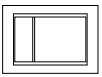


开机

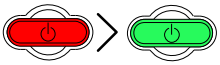
1. 将电源线接入后面板插座



2. 开启后面板的电源开关



3. 按前面板的 Standby 键开机，Standby 键指示灯由红(待机)变绿(开启)



4. 当 Standby 键变绿时，屏幕显示载入状态

此时信号发生器已准备就绪

快速操作

本章节介绍仪器的操作快捷方式、内置帮助和默认出厂设置，方便用户快速入门。有关参数、设置和限制详情见操作章节(见 70 页)、调制章节(见 90 页)、辅助系统功能设置章节(见 171 页)、双通道&多台操作章节(见 191 页)或规格(见 459 页)。

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如何使用数字输入

背景

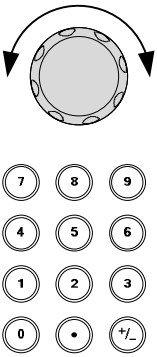
AFG-30XX 提供三种数字输入：数字键盘、方向键和可调旋钮。下面介绍如何使用数字输入编辑参数。

1. 按(F1~F6)对应的功能键选择菜单项。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位

3. 使用可调旋钮编辑数值。顺时针增大，逆时针减小

4. 或者使用数字键盘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按键的含义和功能。

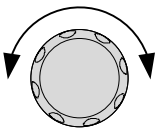
1. 按 UTIL

2. 按 System (F4)[AFG-3021/3031 按 F5]

3. 按 More (F5)

4. 按 Help (F2)

5. 可调旋钮浏览帮助菜单。按 Select 选择该项

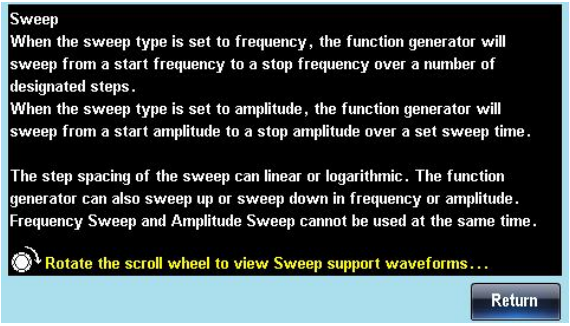


Keypad 介绍任一前面板键

Arbitrary Waveform	介绍如何创建任意波形
Modulation Function	介绍如何创建调制波形
Sweep Function	介绍扫描功能
Burst Function	介绍 Burst 功能
DSO Link	介绍 DSO link
Hardcopy	介绍如何使用 Hardcopy 功能
Dual Channel	介绍如何完成 AFG-3022/3032 的频率或幅值追踪

6. 例如选择项 5 查看扫描功能

7. 可调旋钮浏览帮助页面



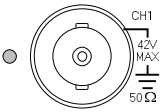
8. 按 F6 返回上级菜单

选择波形

方波

例如: 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 Duty (F1), 7 + 5 + %(F5)

3. 分别按 FREQ/Rate, 1 + kHz (F5)

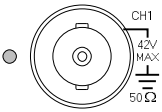
4. 分别按 AMPL, 3 + VPP(F6)

5. 按 Output 键

三角波

例如: 三角波, 5Vpp,10kHz

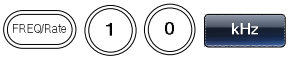
输出



输入: N/A

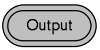
1. 按 Waveform 键, 选择 Triangle (F3)

2. 分别按 FREQ/Rate, 1 + 0 + kHz(F5)



3. 分别按 AMPL, 5 +VPP(F6)

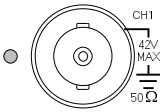
4. 按 Output 键



正弦波

例如: 正弦波, 10Vpp,100kHz

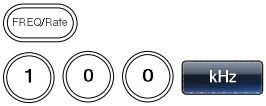
输出



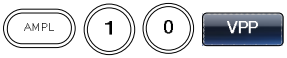
输入: N/A

1. 按 Waveform 键, 选择 Sine (F1)

2. 分别按 FREQ/Rate key, 1 + 0 +0 + kHz(F5)



3. 分别按 AMPL, 1 + 0 +VPP(F6)

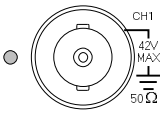


4. 按 Output 键

脉冲波

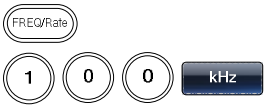
例如: 脉冲波, 10Vpp,100kHz, 5us 脉宽

输出



输入: N/A

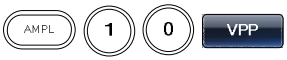
1. 分别按 FREQ/Rate, 1 + 0 +0 + kHz(F5)



2. 按 Waveform 键, 选择 Pulse (F4)

3. 分别按 Width (F1), 5 + uSEC (F3)

4. 分别按 AMPL, 1 + 0 +VPP(F6)

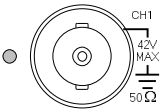


5. 按 Output 键

噪声波

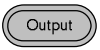
例如: 白噪声输出

输出



1. 按 Waveform 键, 选择 More (F6), Noise (F1)

2. 按 Output 键

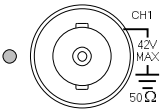


输入: N/A

谐波

例如: 10kHz 谐波正弦波, 奇&偶(all)谐波, 3rd order (2nd(5Vpp), 3rd(2Vpp), 0º 相位

输出



输入: N/A

1. 按 Waveform 键, 选择 More (F6), Harmonic (F2)

2. 分别按 Total (F1), 3 + Enter (F1)

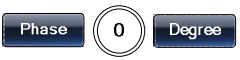
3. 分别按 Type (F2), ALL (F3)

4. 按 Order (F3)

5. 分别按 Order (F1), 2 + Enter (F1)

分别按 Amp(F2), 5 + VPP (F2)

分别按 Phase(F3), 0 + Degree (F1)

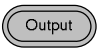


6. 分别按 Order (F1), 3 + Enter (F1)

分别按 Amp(F2), 2 + VPP (F2)

分别按 Phase(F3), 0 + Degree (F1)

7. 按 Output 键

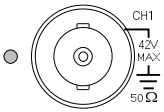


调制

AM

例如: 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)

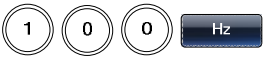
2. 按 Waveform, 选择 Sine (F1)

3. 分别按 Freq/Rate, 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)

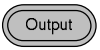
6. 按 1 + 0 + 0 + Hz(F2)



7. 按 MOD 键, 选择 AM (F1), Depth (F2)

8. 按 8 + 0 + % (F1)

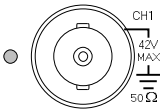
9. 按 MOD, AM (F1), Source (F1), INT (F1)

10. 按 Output 键 

FM

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

输出



输入: N/A

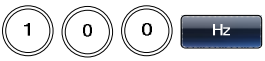
1. 按 MOD 键, 选择 FM (F2) 

2. 按 Waveform, 选择 Sine (F1) 

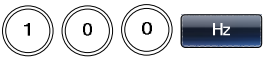
3. 分别按 Freq/Rate, 1 + kHz(F5) 

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

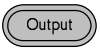
5. 按 MOD 键, 选择 FM (F2), FM Freq (F3) 

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) 

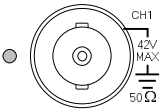
9. 按 MOD, FM (F2), Source (F1), INT (F1) 

10. 按 Output 键 

FSK 调制

例如: 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) 

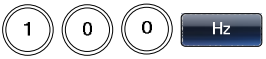
2. 按 Waveform, 选择 Triangle (F3) 

3. 分别按 Freq/Rate, 1 + kHz(F5) 

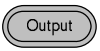
4. 按 MOD 键, 选择 FSK (F3), FSK Rate (F3) 

5. 按 1 + 0 + Hz(F2) 

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

7. 按 1 + 0 + 0 + Hz (F3 

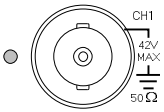
8. 按 MOD, FSK (F3), Source (F1), INT (F1) 

9. 按 Output 键 

PM

例如: PM 调制. 100Hz 相位频率. 正弦波形. 180°相位偏差. 1kHz 正弦载波

输出



输入: N/A

1. 按 MOD 键, 选择 PM (F4)

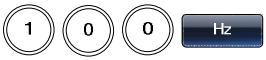
2. 按 Waveform, 选择 Sine (F1)

3. 分别按 Freq/Rate, 1 + kHz(F5)

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

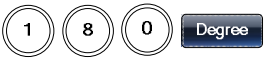
5. 按 MOD 键, 选择 PM (F4), PM Freq (F3)

6. 按 1 + 0 + 0 + Hz(F2)



7. 按 MOD 键, 选择 PM (F4), Phase Dev (F2)

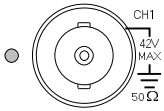
8. 按 1 + 8 + 0 + Degree(F1)



SUM 调制

例如: SUM 调制. 100Hz SUM 频率. 50% SUM 幅值. 1kHz 正弦载波. 三角波形. 内部源

输出



输入: N/A

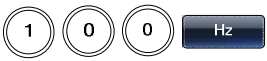
1. 按 MOD 键, 选择 SUM (F5)

2. 按 Waveform, 选择 Sine (F1)

3. 分别按 Freq/Rate, 1 + kHz(F5)

4. 按 MOD 键, 选择 SUM (F5), SUM Freq (F3)

5. 按 1 + 0 + 0 + Hz(F2)



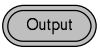
6. 按 MOD 键, 选择 SUM (F5), SUM Ampl (F2)

7. 按 5 + 0 + % (F1)

8. 按 MOD 键, 选择 SUM (F5), Shape (F4), Triangle (F3)

9. 按 MOD, SUM (F5), Source (F1), INT (F1)

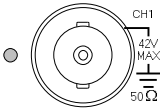
10. 按 Output 键



PWM 调制

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

输出

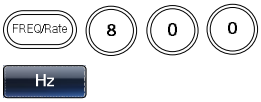


输入: N/A

1. 按 Waveform, 选择 Square (F2)

2. 按 MOD 键, 选择 PWM (F6)

3. 分别按 FREQ/Rate, 8 + 0 + 0+ Hz(F4)



4. 按 MOD 键, 选择 PWM (F6), Shape (F4), Sine(F1)

5. 按 MOD, PWM (F6), PWM Freq (F3)

6. 按 1 + 5 + kHz(F3)

7. 按 MOD, PWM (F6), Duty (F2)

8. 按 5 + 0 + %(F1)

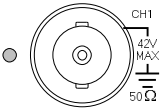
9. 按 MOD, PWM (F6), Source (F1), INT (F1)

10. 按 Output 键

扫描

例如: 频率扫描. 起始频率 10mHz, 截止频率 1MHz. Log 扫描, 1 s 扫描,手动触发

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)

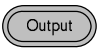
5. 按 Sweep, Type/MOD (F2), Functions (F3), Log (F2)

6. 按 Sweep, SWP Time (F5)

7. 按 1 + SEC (F2)

8. 按 Sweep, TRIG Type (F6), Manual (F3)

9. 按 Output 键

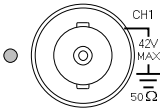


10. 按 Trigger (F1)

Burst

例如: Burst 模式, N 次循环(内部触发), 1kHz burst 频率, burst 个数= 5, 10 ms burst 周期, 0˚burst 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)

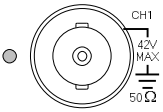
11. 按 Output 键

ARB

ARB –增加内置波形

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

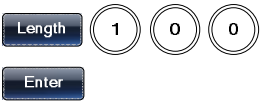
输出



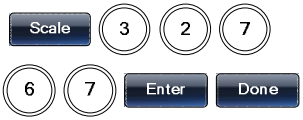
1. 按 ARB, Built in (F3), Basic (F1), More (F5), Exp Rise (F1)

2. 按 Start (F1), 0 + Enter (F5)

3. 按 Length (F2), 100, Enter (F5)



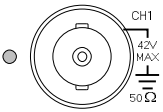
4. 按 Scale (F3), 32767, Enter (F5), Done (F4)



ARB –增加内置波形-脉冲

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

输出



1. 按 ARB, Built in (F3), Basic (F1), More (F5), Pulse (F4)

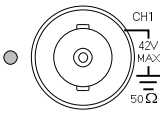
2. 按 Frequency (F1),1, kHz (F5)

3. 按 Duty (F2), 25, %(F5)

ARB -增加点

例如: ARB 模式, 增加点, 地址 40, 数据 30,000

输出



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

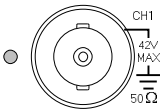
2. 按 4 + 0 + Enter (F5)

3. 按 Data (F2), 3+0+0+0+0, Enter (F5)

ARB -增加线

例如: ARB 模式, 增加线, 地址:数据(10:30, 50:100)

输出

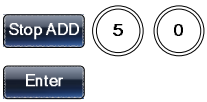


1. 按 ARB, Edit (F2), Line (F2), Start ADD (F1)

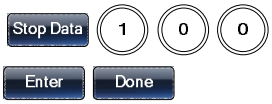
2. 按 1 + 0 + Enter (F5)

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

4. 按 Stop ADD (F3), 5 + 0, Enter (F5)



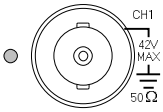
5. 按 Stop Data (F4), 1 + 0 + 0, Enter (F5), Done (F5)



ARB –输出部分

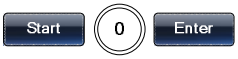
例如: ARB 模式, 输出 ARB 波形, Start 0, Length 1000

输出

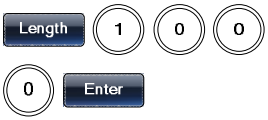


1. 按 ARB, Output (F6)

2. 按 Start (F1), 0 + Enter (F5)



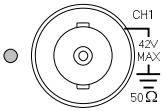
3. 按 Length (F2), 1 + 0 + 0 + 0, Enter (F5)



ARB –输出 N 次循环

例如: ARB 模式, 输出 N 次循环, Start 0, Length 1000, N Cycle 10

输出



1. 按 ARB, Output (F6)

2. 按 Start (F1), 0 + Enter (F5)

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

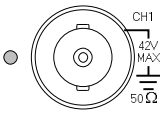
4. 按 N Cycle (F4)

5. 按 Cycles (F1), 1 + 0, Enter (F5)

6. 按 Trigger (F5),触发一次输出

ARB –输出无限次循环

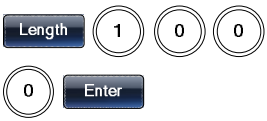
例如: ARB 模式, 输出 N 次循环, Start 0, Length 1000, 循环无限次输出



1. 按 ARB, Output (F6)

2. 按 Start (F1), 0 + Enter (F5)

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



4. 按 Infinite (F5)

Utility 菜单

存储

例如: 存储至内存文件#5

1. 按 UTIL, Memory (F1)

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

调取

例如: 调取内存文件#5

1. 按 UTIL, Memory (F1)

2. 使用可调旋钮选择文件,按 Recall (F2), 按 Done (F5)

接口 GPIB

例如: GPIB 接口, 地址 10

GPIB

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

2. 按 1 + 0 + Done (F5)

接口 LAN

例如: LAN 接口, DHCP IP 设置

LAN

1. 按 UTIL, Interface (F2), LAN (F3)

2. 按 Config (F2), DHCP (F1)

3. 按 Done (F3)

接口 USB

例如: USB 接口

USB B 

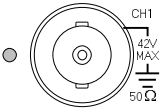
1. 按 UTIL, Interface (F2), USB (F2)

双通道– 频率耦合

例如: 1kHz 偏移耦合.仅 AFG-3022, 3032

输出

1. 按 UTIL, Dual Ch (F5), Freq Cpl (F1)

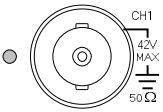


2. 按 Offset (F2), 1 + 0 + kHz (F4)

双通道– 幅值耦合

例如: 幅值耦合.仅 AFG-3022, 3032

输出



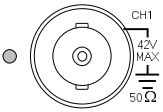
1. 按 UTIL, Dual Ch (F5), Ampl Cpl (F2)

2. 按 ON (F1)

双通道 – 追踪

例如: 反向追踪.仅 AFG-3022, 3032

输出



1. 按 UTIL, Dual Ch (F5), Tracking (F3)

2. 按 Inverted (F3)

菜单树

常规

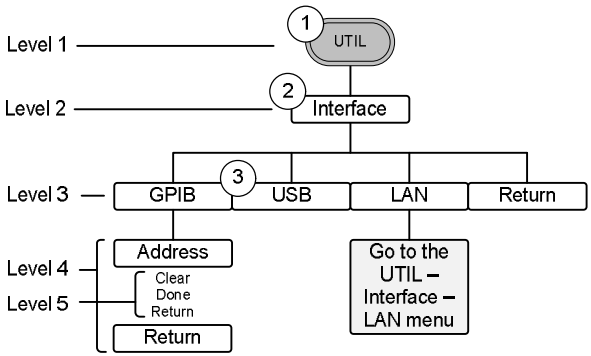
将菜单树作为信号发生器功能和特性的简易参考。AFG-3021/3022/3031/3032 菜单系统逐层排列，每层都可由操作键或软键浏览。按 Return 软键返回上级菜单。

例如: 设置 USB 接口;

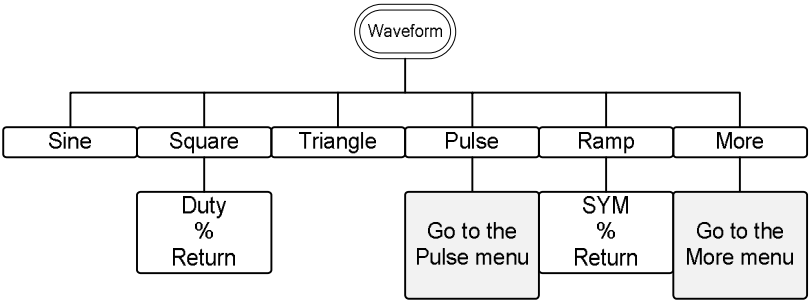
(1)按 UTIL 键

(2)接口软键

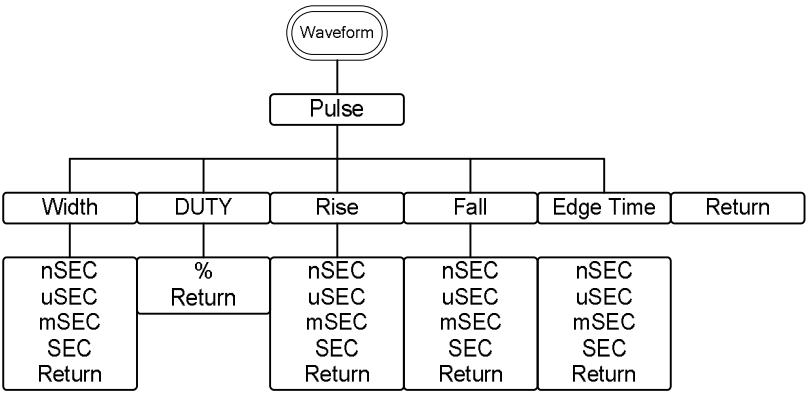
(3) USB



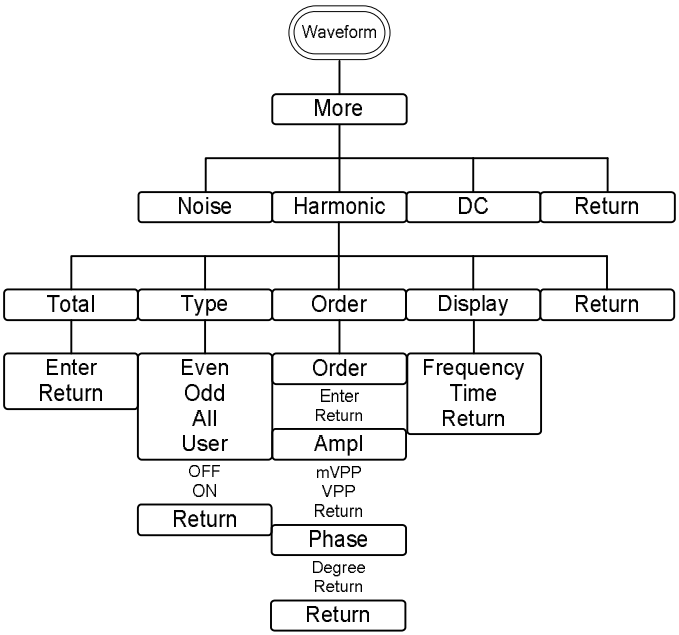
波形


Waveform
Sine
Square
Triangle
Pulse
Ramp
More
Duty
%
Return
Go to the
Pulse menu
SYM
%
Return
Go to the
More menu

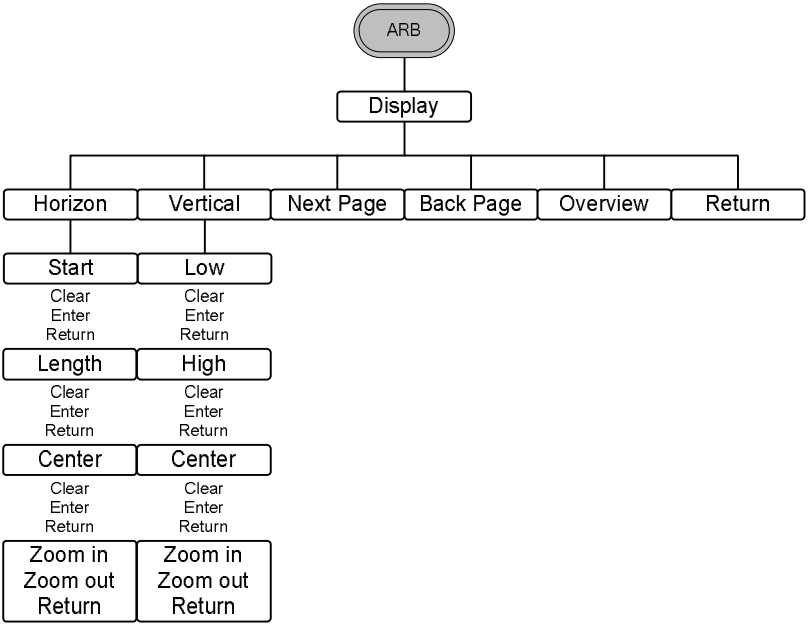
波形-脉冲


Waveform
Pulse
Width
DUTY
Rise
Fall
Edge Time
Return
nSEC
uSEC
mSEC
SEC
Return
%
Return
nSEC
uSEC
mSEC
SEC
Return
nSEC
uSEC
mSEC
SEC
Return
nSEC
uSEC
mSEC
SEC
Return

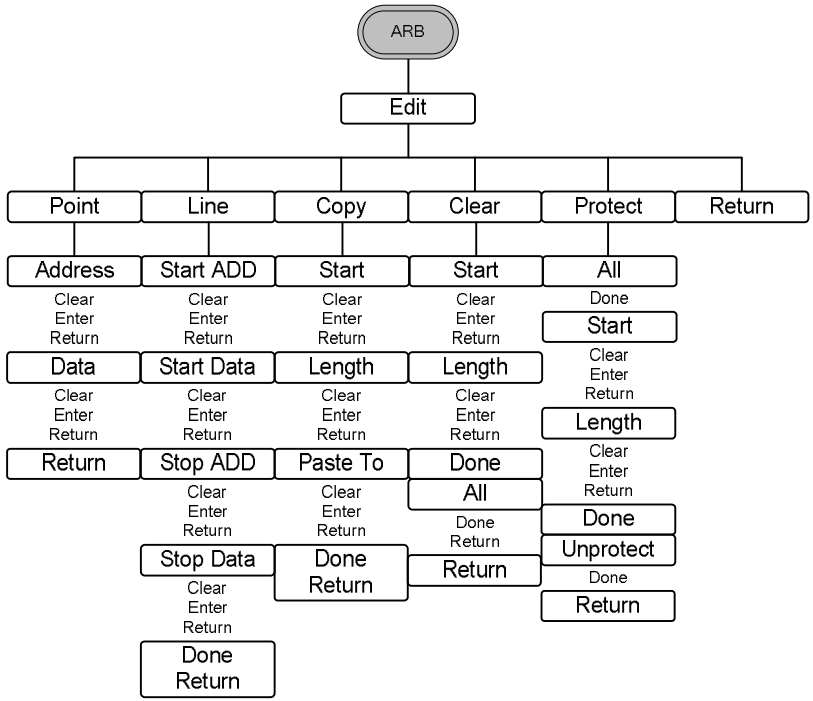
波形-更多


Waveform
More
Noise
Harmonic
DC
Return
Total
Type
Order
Display
Return
Enter
Return
Even
Odd
All
User
OFF
ON
Return
Order
Enter
Return
Ampl
mVPP
VPP
Return
Phase
Degree
Return
Return
Frequency
Time
Return

ARB-显示

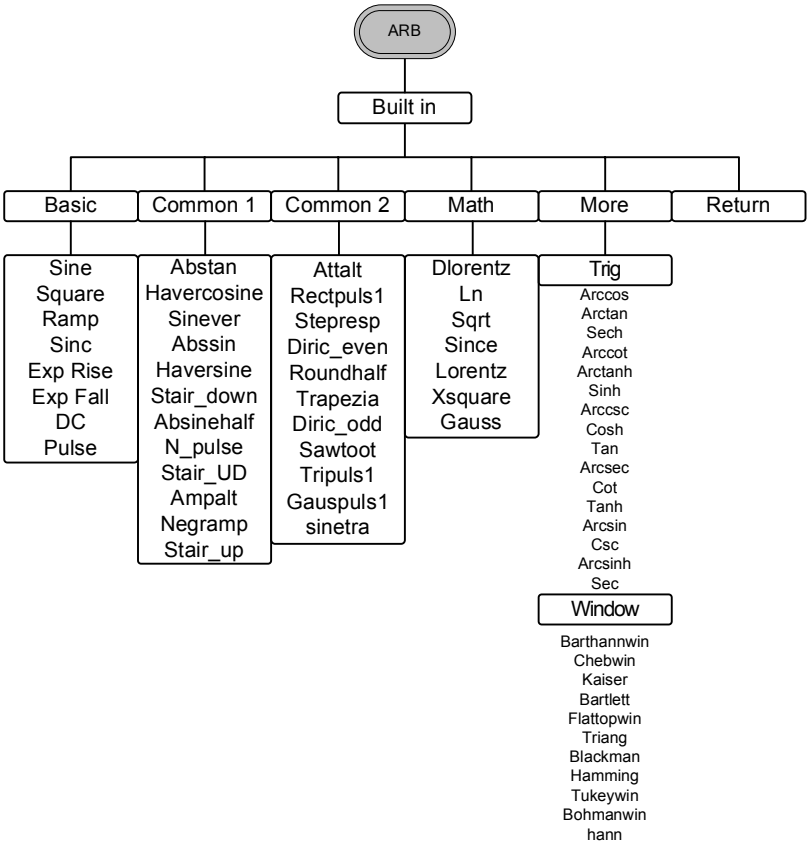

ARB
Display
Horizon
Vertical
Next Page
Back Page
Overview
Return
Start
Clear
Enter
Return
Low
Clear
Enter
Return
Length
Clear
Enter
Return
High
Clear
Enter
Return
Center
Clear
Enter
Return
Center
Clear
Enter
Return
Zoom in
Zoom out
Return
Zoom in
Zoom out
Return

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

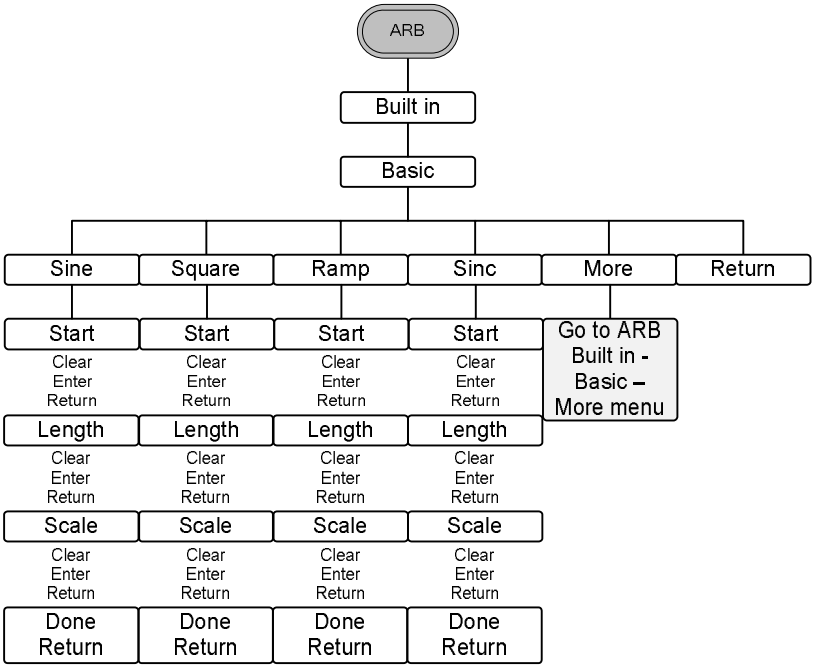
ARB-内置

注: 如下菜单树仅列出每个内置 ARB 波形的位置

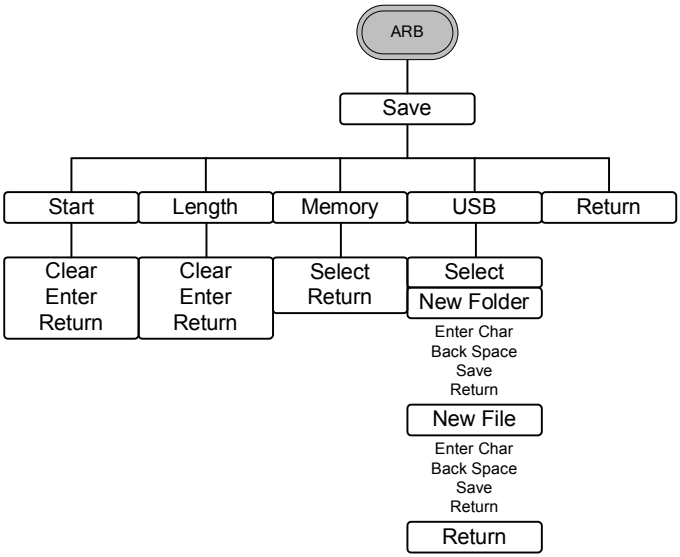


ARB-内置-基本

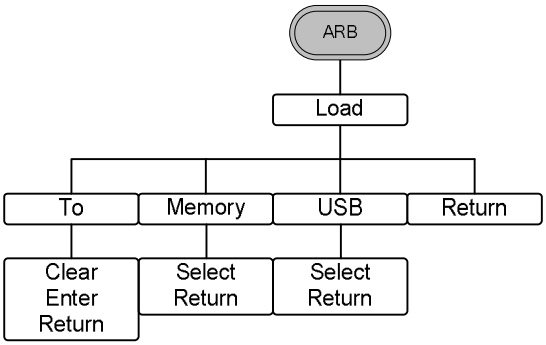
注: 仅将“Basic”菜单树列于 ARB > Built-in 菜单树系统中。其它内置 ARB 波形的操作菜单键几乎与下列内容一致



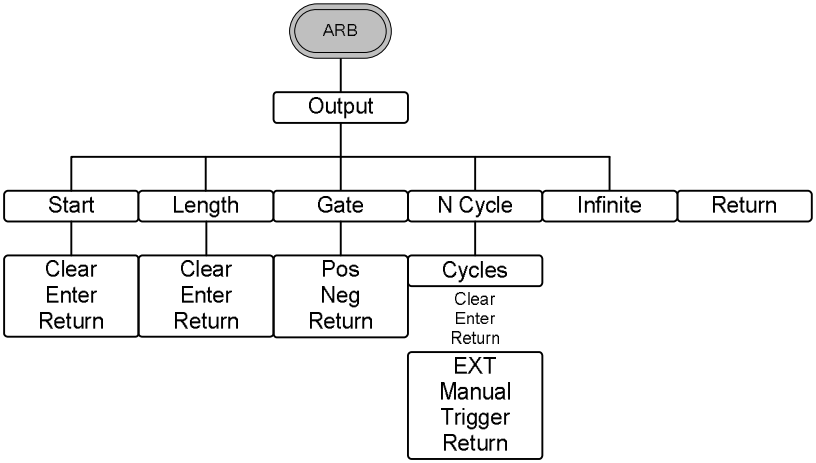
ARB-存储


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

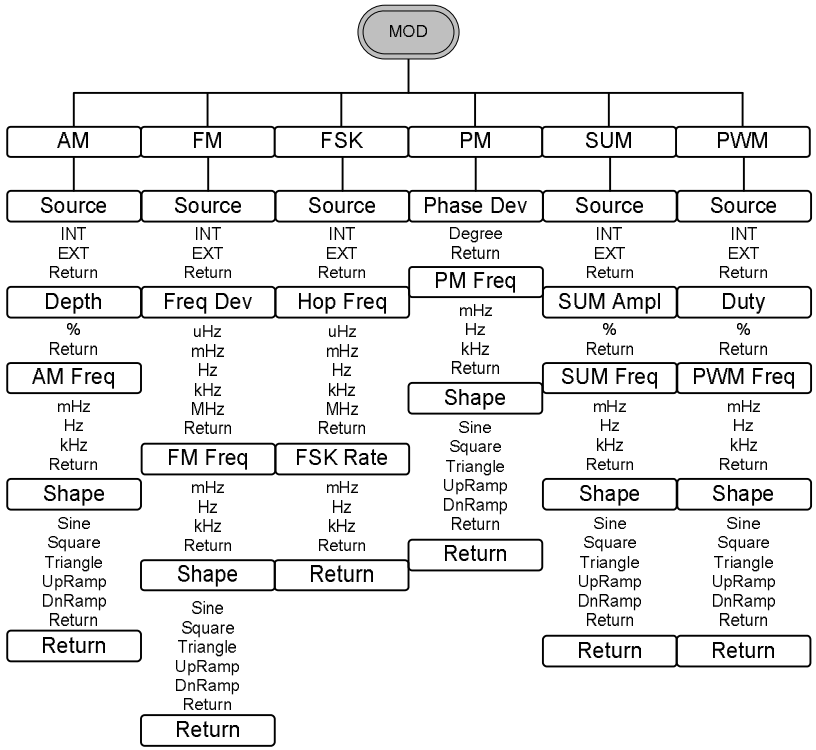
ARB-调取


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

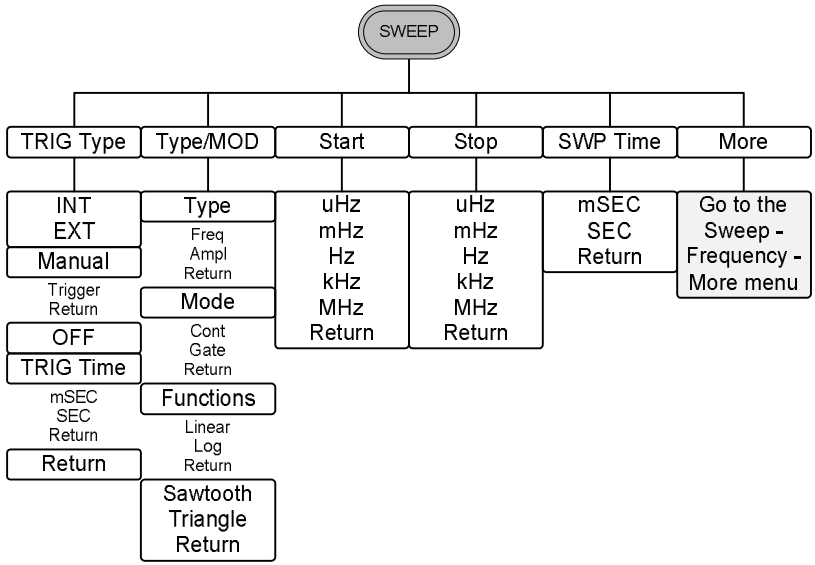
ARB-输出


ARB
Output
Start
Length
Gate
N Cycle
Infinite
Return
Clear
Enter
Return
Clear
Enter
Return
Pos
Neg
Return
Cycles
Clear
Enter
Return
EXT
Manual
Trigger
Return

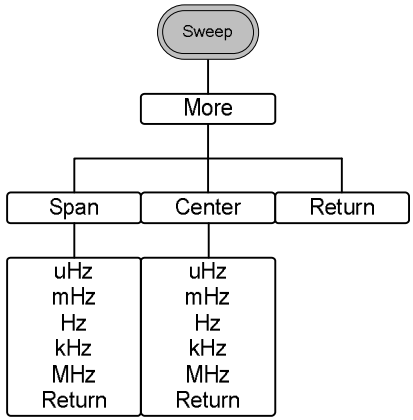
MOD


MOD
AM
Source
INT
EXT
Return
Depth
%
Return
AM Freq
mHz
Hz
kHz
Return
Shape
Sine
Square
Triangle
UpRamp
DnRamp
Return
Return
FM
Source
INT
EXT
Return
Freq Dev
uHz
mHz
Hz
kHz
MHz
Return
FM Freq
mHz
Hz
kHz
Return
Shape
Sine
Square
Triangle
UpRamp
DnRamp
Return
Return
FSK
Source
INT
EXT
Return
Hop Freq
uHz
mHz
Hz
kHz
MHz
Return
FSK Rate
mHz
Hz
kHz
Return
Return
PM
Phase Dev
Degree
Return
PM Freq
mHz
Hz
kHz
Return
Shape
Sine
Square
Triangle
UpRamp
DnRamp
Return
Return
SUM
Source
INT
EXT
Return
SUM Ampl
%
Return
SUM Freq
mHz
Hz
kHz
Return
Shape
Sine
Square
Triangle
UpRamp
DnRamp
Return
Return
PWM
Source
INT
EXT
Return
Duty
%
Return
PWM Freq
mHz
Hz
kHz
Return
Shape
Sine
Square
Triangle
UpRamp
DnRamp
Return
Return

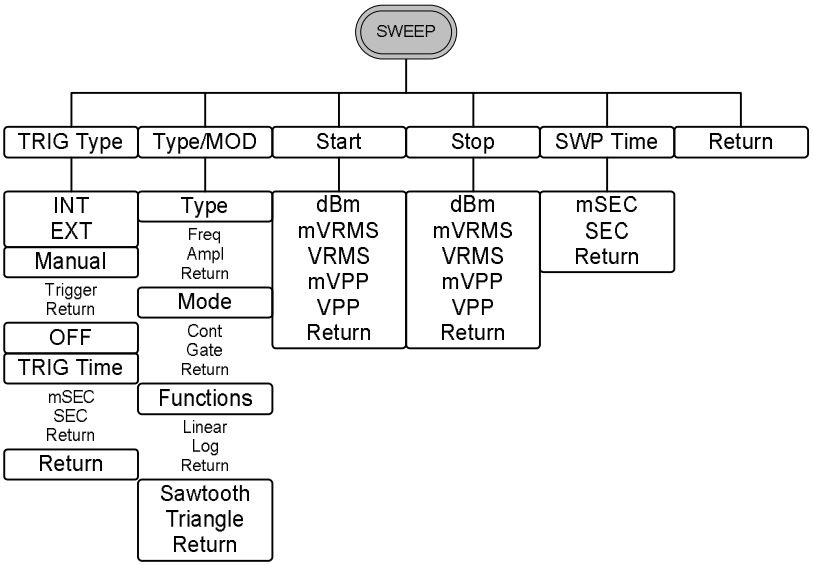
扫描 - Type/MOD = 频率



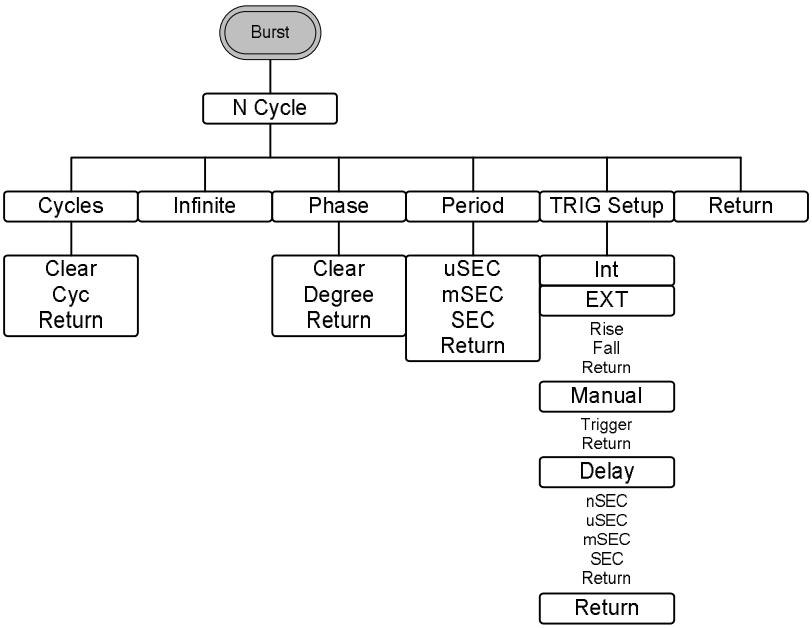
扫描–更多



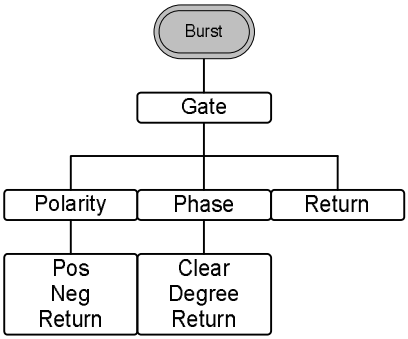
扫描 - Type/MOD = 幅值



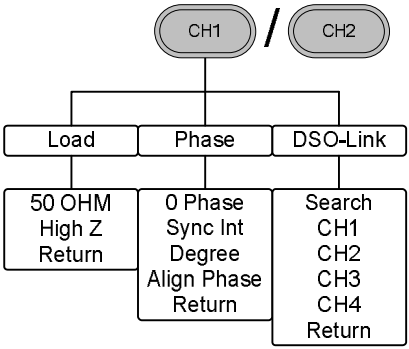
Burst - N 次循环



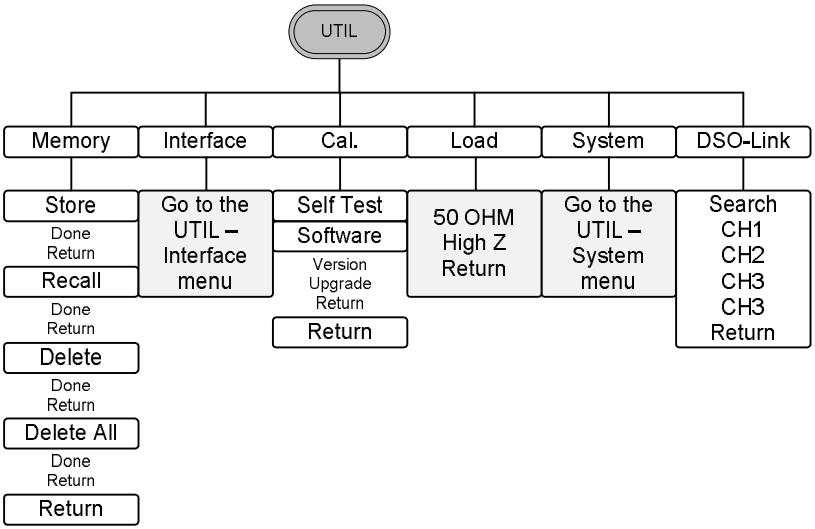
Burst -门限



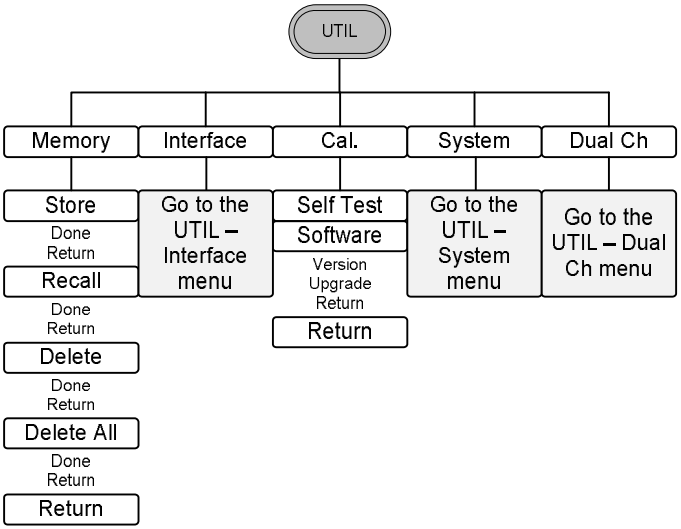
CH1 / CH2 (仅 AFG-3022/AFG-3032)



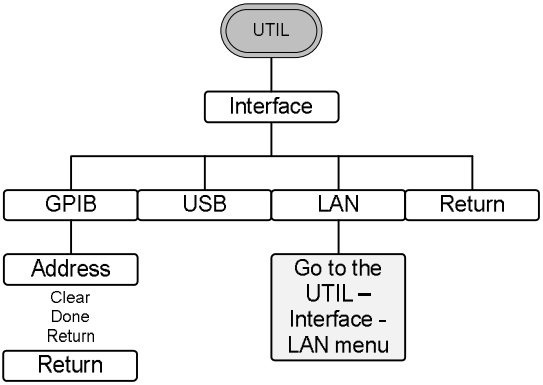
UTIL (AFG-3021/3031)



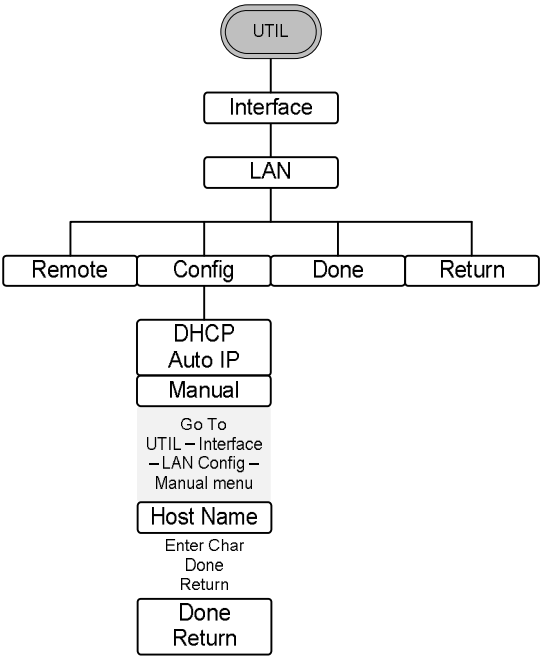
UTIL (AFG-3022/AFG-3032)



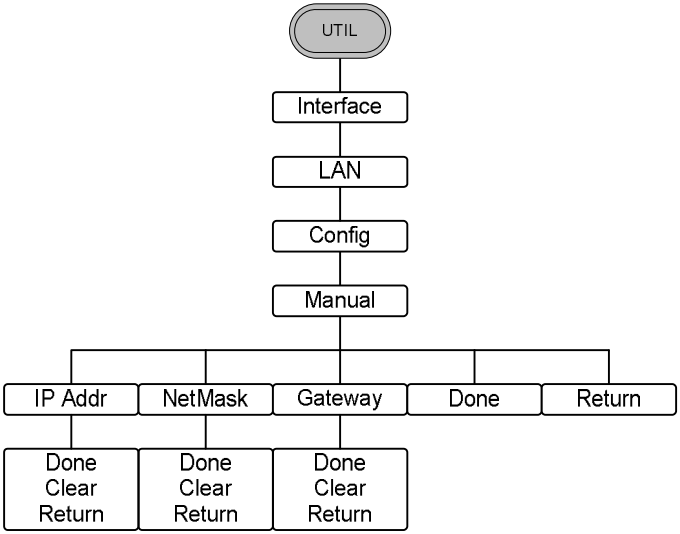
UTIL -接口



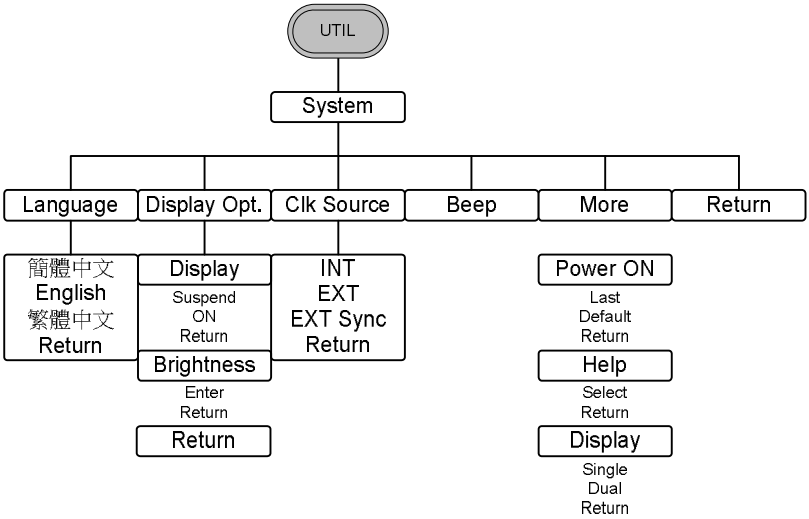
UTIL -接口 - LAN



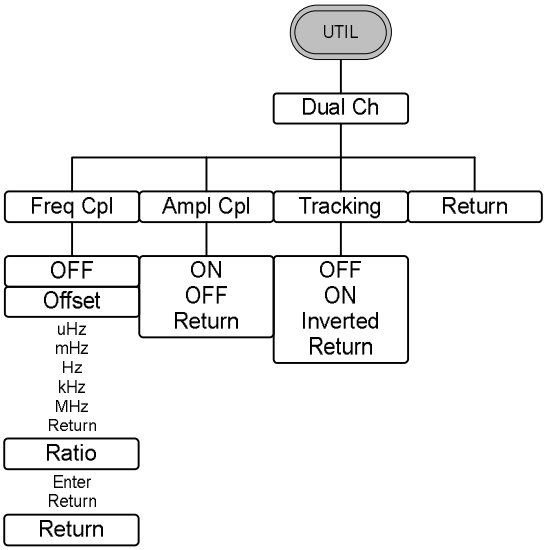
UTIL -接口 - LAN - Config - Manual



UTIL -系统


UTIL
System
Language
Display Opt.
Clk Source
Beep
More
Return
簡體中文
English
繁體中文
Return
Display
Suspend
ON
Return
Brightness
Enter
Return
Return
INT
EXT
EXT Sync
Return
Power ON
Last
Default
Return
Help
Select
Return
Display
Single
Dual
Return

UTIL -双通道


UTIL
Dual Ch
Freq Cpl
Ampl Cpl
Tracking
Return
OFF
Offset
uHz
mHz
Hz
kHz
MHz
Return
Ratio
Enter
Return
Return
ON
OFF
Return
OFF
ON
Inverted
Return

默认设置

按 Preset 键恢复默认面板设置。

输出设置	功能	正弦波
	频率	1kHz
	幅值	3.000 Vpp
	偏移	0.00V dc
	输出单位	Vpp
	输出端子	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/截止频率	100Hz/1kHz

	扫描时间	1s
	起始/截止幅值	1.000/3.000 Vpp
	扫描功能	线性
	扫描状态	Off
Burst	Burst 频率	1kHz
	N 次循环	1
	Burst 周期	10ms
	Burst 起始相位	0˚
	Burst 状态	Off
触发	触发源	内部(立即)
接口设置	GPIB 地址	10
	接口	USB
	LAN	DHCP
校准	校准菜单	加密

操作

本章节介绍如何输出基本波形。调制、扫描、burst 和任意波形详情见 90 页和 188 页调制和任意波章节。双通道和多台操作详情见 192&200 页。

选择通道 71

CH1/CH2 71

选择波形 72

正弦波 72

设置方波 73

三角波 74

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噪声波 81

谐波 81

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谐波特性 84

DC 波形 85

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设置 DC 偏移 89

选择通道

AFG-3022 或 AFG-3032 为双通道机型，操作前需选择输出通道。

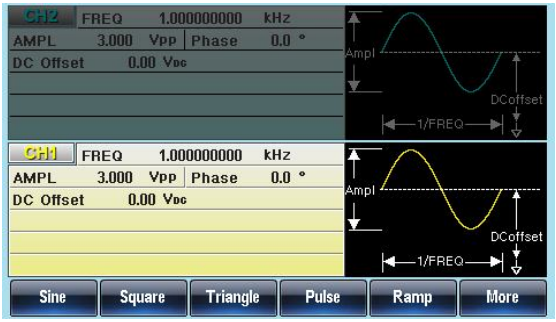
CH1/CH2

面板操作

1. 按 CH1 或 CH2 键

2. 已选通道呈亮色，未选通道呈灰色

屏幕截图如下，已选 CH1



选择波形

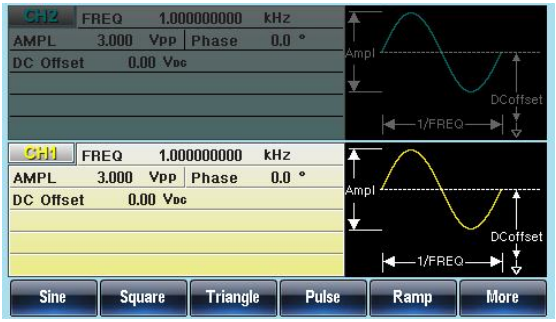
AFG-30XX 可以输出 8 种标准波形：正弦波、方波、三角波、脉冲波、斜波、噪声波、谐波和 DC 波形。

正弦波

面板操作

1. 按 Waveform 键

2. 按 F1 (Sine)



设置方波

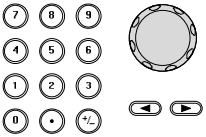
面板操作

1. 按 Waveform 键

2. 按 F2 (Square)创建一个方波

3. 按 F1 (Duty), 占空比参数指示灯变亮

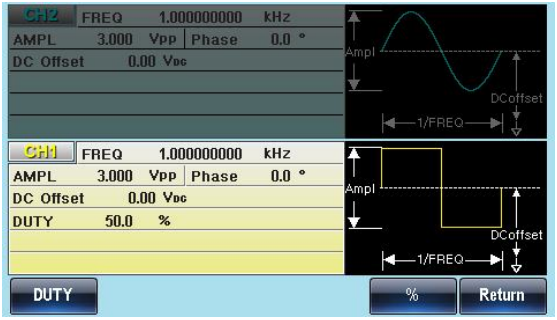
4. 使用方向键和可调旋钮或数字键盘输入占空比范围



5. 按 F5 (%)选择%单位

范围

频率	占空比范围
≤25MHz (20MHz AFG-3021/3022)	20%~80%
25MHz~≤30MHz	40%~60%

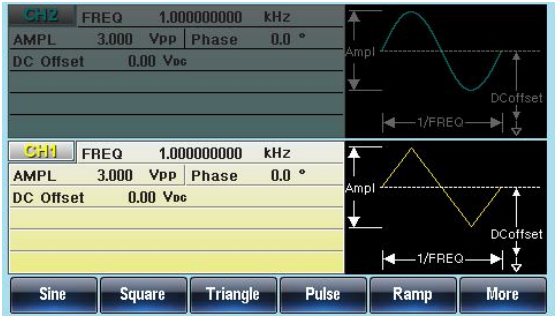


三角波

面板操作

1. 按 Waveform 键

2. 按 F3 (Triangle)



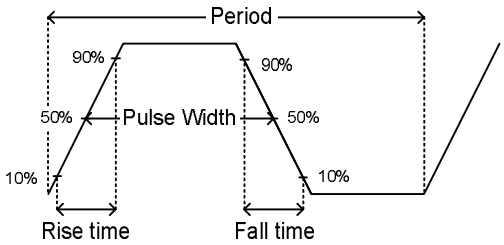
设置脉冲宽度

脉冲宽度设置与上升&下降时间设置或边沿时间设置和周期设置有关，公式如下：

脉冲宽度 - 0.625 * [(上升时间 - 0.6nS) + (下降时间 - 0.6nS)] ≧ 0

周期≧脉冲宽度+ 0.625 * [(上升时间- 0.6nS)+(下降时间- 0.6nS)]

脉冲宽度定义：在一个完整周期内，从 50%上升沿阈值到 50%下降沿阈值间的时间。



上升和下降时间设置见 76 页，边沿时间设置见 77 页。或通过设置脉冲占空比代替脉冲宽度，见 78 页。

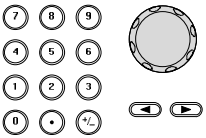
面板操作

1. 按 Waveform 键

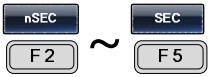
2. 按 F4 (Pulse)创建一个脉冲波

3. 按 F1 (Width), 脉宽参数指示灯变亮

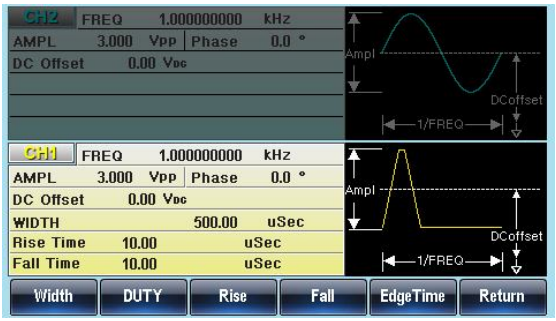
4. 使用方向键和可调旋钮或数字键盘输入脉冲宽度



5. 按 F2~F5 选择单位范围



范围	脉冲宽度	20ns~999.83ks
注意	分辨率:	Freq <25MHz (20MHz AFG-3021/3022): 0.01ns 脉冲宽度(或 3 位分辨率) Freq <8.5 kHZ: 0.0001%占空比



设置脉冲上升&下降时间

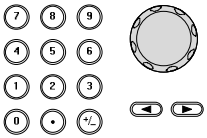
面板操作

1. 按 Waveform 键

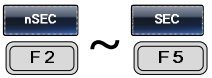
2. 按 F4 (Pulse)创建一个脉冲波

3. 按 F3 (Rise)或 F4 (Fall) , 上升或下降参数指示灯变亮

4. 使用方向键和可调旋钮或数字键盘输入上升或下降时间



5. 按 F2~F5 选择单位范围



6. 重复上述步骤设置相反的边沿时间

范围	最小上升/下降时间:	9.32ns ~ 799.9ks
⚠注意	占空比注意事项:	宽度 - 0.625 * [(上升时间 - 0.6nS) + (下降时间 - 0.6nS)] ≧ 0 周期≧宽度+ 0.625 * [(上升时间 - 0.6nS)+(下降时间- 0.6nS)]

设置脉冲边沿时间

边沿时间将上升和下降时间设为同一个值。边沿时间设置影响脉冲宽度时间的设置。

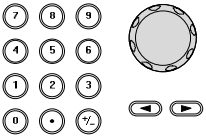
面板操作

1. 按 Waveform 键

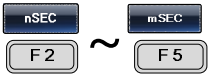
2. 按 F4 (Pulse)创建一个脉冲波

3. 按 F5 (Edge Time), 边沿时间参数指示灯变亮

4. 使用方向键和可调旋钮或数字键盘输入边沿时间



5. 按 F2~F5 选择单位范围



范围	边沿时间范围	9.32ns~799.9ks
⚠注意	占空比注意事项:	宽度 - 1.25 * (边沿时间 - 0.6nS) ≧ 0 周期≧脉冲宽度 + 1.25*(边沿时间 -0.6ns) 0.0001%占空比分辨率

设置脉冲占空比时间

也可以通过设置脉冲占空比代替脉冲宽度的设置。可调占空比与上升&下降时间设置有关，公式如下：

Duty ≧ 0.625×100×[上升时间- 0.6ns +下降时间 - 0.6ns]/周期

Or

Duty ≦ 100 - {62.5×[(上升时间- 0.6ns) + (下降时间- 0.6ns)]/周期}

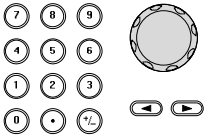
面板操作

1. 按 Waveform 键

2. 按 F4 (Pulse)创建一个脉冲波

3. 按 F2 (DUTY), DUTY 参数指示灯变亮

4. 使用方向键和可调旋钮或数字键盘输入占空比时间



5. 按 F1 选择%单位

范围	占空比范围	0.0170%~99.983% 分辨率 0.0001%

设置斜波

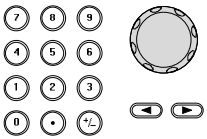
面板操作

1. 按 Waveform 键

2. 按 F5 (Ramp)创建一个斜波

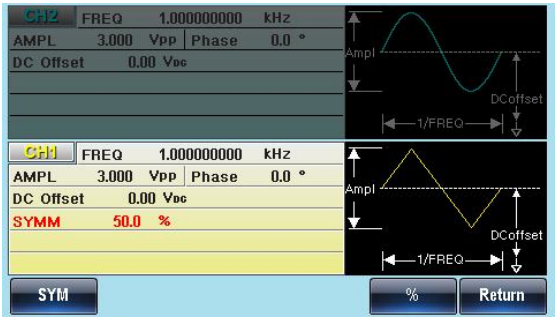
3. 按 F1 (SYM), SYM 参数指示灯变亮

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%



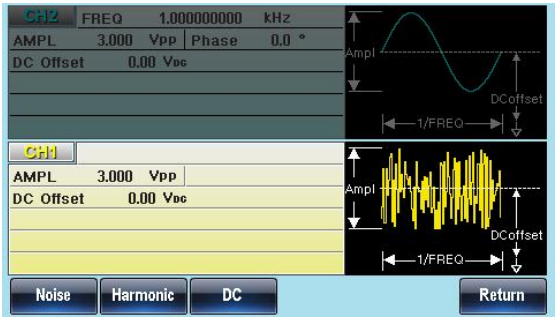
噪声波

面板操作

1. 按 Waveform 键

2. 按 F6 (More)

3. 按 F1 (Noise)



谐波

谐波功能创建一个谐波正弦波，并指定谐波数。

面板操作

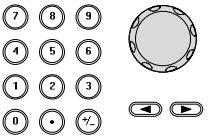
1. 按 Waveform 键

2. 按 F6 (More)

3. 按 F2 (Harmonic)

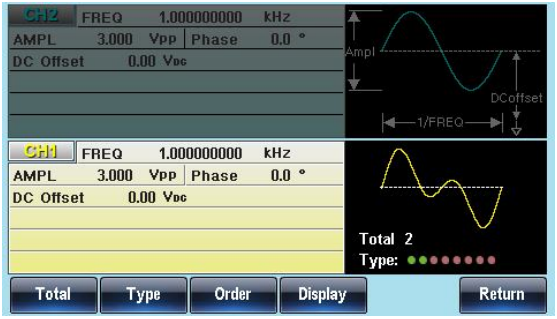
4. 按 F1 (Total)谐波总数。包含基波

5. 使用方向键和可调旋钮或数字键盘输入谐波数



范围	谐波数	2 ~ 8

6. 按 F1 (Enter)



谐波阶数

在选择谐波总数之后(上章节)，可以设置使用的谐波阶数：奇次、偶次、全部或自定义设置。

面板操作

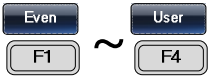
1. 按 Waveform 键

2. 按 F6 (More)

3. 按 F2 (Harmonic)

4. 按 F2 (Type)

5. 按 F1 ~ F4 选择谐波阶数，包含合成谐波



注：仪器处理波形需等待片刻

范围	谐波	偶次, 奇次, 全部, 自定义

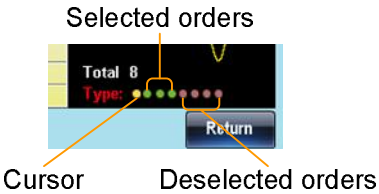
选择自定义阶数

1. 如果选择自定义设置，每阶均可以独立选择或取消

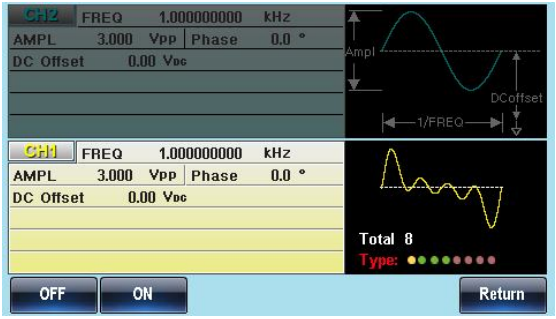
2. 开启或关闭自定义设置：

在波形显示屏的“Type”参数上，旋转可调旋钮将光标移至期望阶数

- 绿点表示可选阶数
- 灰点表示取消阶数
- 黄点表示光标位置
- 阶数从 1st (左)~8th (右)



3. 使用 F1 或 F2 软键开启或关闭所选阶数



谐波特性

每个谐波阶数的幅值和相位均可独立设置。默认情况下，幅值和基频是一样的，其中相位设置为 0°。

面板操作

1. 按 Waveform 键

2. 按 F6 (More)

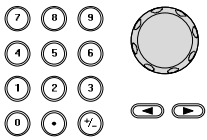
3. 按 F2 (Harmonic)

4. 按 F3 (Order)

5. 按 F1 (Order)

6. Order 参数指示灯呈亮红色

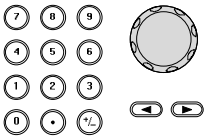
7. 使用方向键和可调旋钮或数字键盘输入阶数



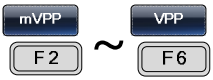
8. 按 F5 (Enter)

9. 按 F2 (Amplitude)

10. 使用方向键和可调旋钮或数字键盘输入预先所选阶数的幅值

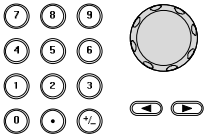


11. 按 F4~F5 选择幅值单位



12. 按 F3 (Phase)

13. 使用方向键和可调旋钮或数字键盘输入预先所选阶数的相位



14. 按 F5 (Degree)

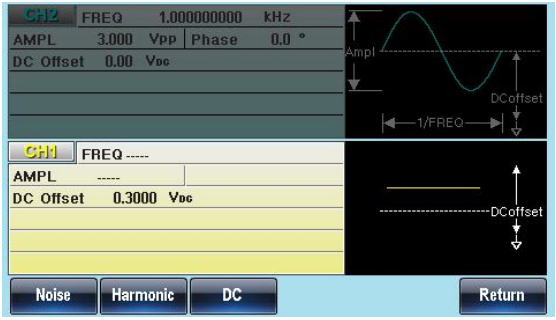
DC 波

面板操作

1. 按 Waveform 键

2. 按 F6 (More)

3. 按 F3 (DC)



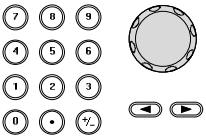
设置波形频率

面板操作

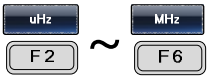
1. 按 FREQ/Rate 键

2. FREQ 参数指示灯变亮

3. 使用方向键和可调旋钮或数字键盘输入频率



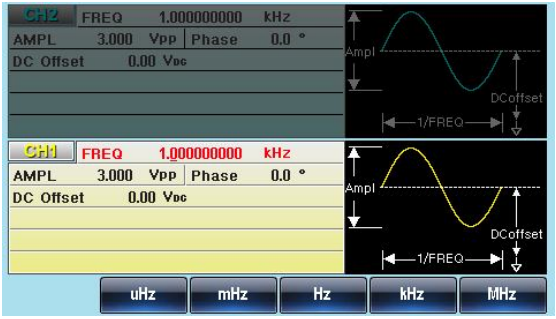
4. 按 F2~F6 选择频率单位



范围

正弦波	1μHz~30MHz (20MHz AFG-3021/3022)
方波	1μHz~30MHz (20MHz AFG-3021/3022)
三角波	1μHz~1MHz
脉冲波	1μHz~25MHz (20MHz AFG-3021/3022)

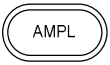
斜波 1μHz~1MHz


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 Vdc
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 Vdc
Ampl
DCoffset
1/FREQ
uHz
mHz
Hz
kHz
MHz

设置幅值

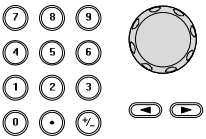
面板操作

1. 按 AMPL 键

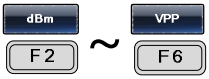


2. AMPL 参数变亮

3. 使用方向键和可调旋钮或数字键盘输入幅值

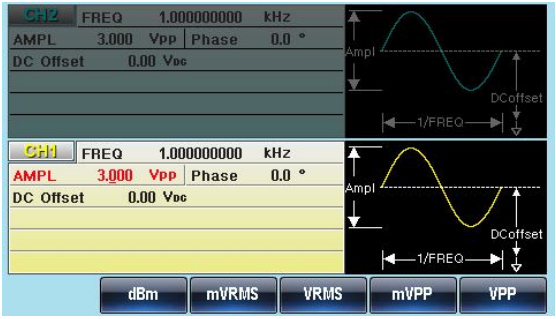


4. 按 F2~F6 选择单位类型



范围

	50Ω load	High Z
范围	1mVpp~10Vpp	2mVpp~20Vpp
单位	Vpp, Vrms, dBm	



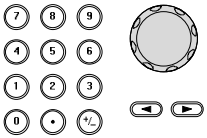
设置 DC 偏移

面板操作

1. 按 DC Offset 键

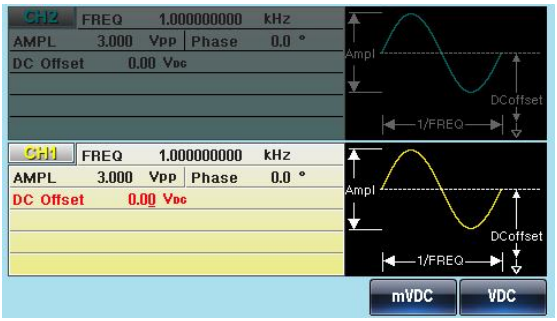
2. DC Offset 参数变亮

3. 使用方向键和可调旋钮或数字键盘输入 DC 偏移



4. 按 F5 (mVDC)或 F6 (VDC)选择电压范围

	50Ω load	High Z
范围	±5Vdc	±10Vdc



调制

AFG-3021, AFG-3022, AFG-3031 & AFG-3032 任意波形信号发生器可以产生 AM、FM、FSK 和 PWM 调制波形，以及扫描波形(频率, 幅值)和 burst 波形。波形类型不同，调制参数的设置也有所不同。AFG-3022 &AFG-3032 可以同时开启两种不同的调制模式。

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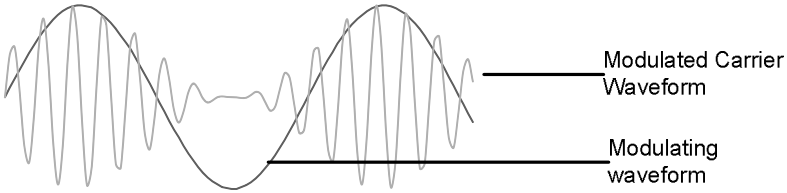
幅值调制(AM)

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-30XX 信号发生器可以设置载波频率、幅值、偏移电压以及内部或外部调制源。当使用信号发生器时，每个所选通道一次仅能创建一种调制波形。

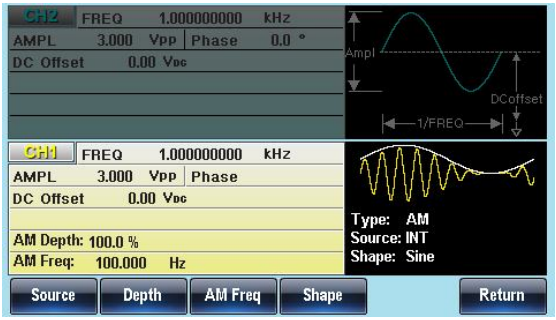


选择 AM 调制

面板操作

1. 按 MOD 键

2. 按 F1 (AM)



AM 载波波形

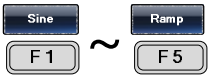
背景

AM 载波可用波形：正弦波、方波、三角波、斜波、脉冲波、噪声波或任意波。默认正弦波。不可将谐波和 DC 用作载波波形。在选择载波波形前，先选择 AM 调制模式，见 35 或 96 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



选择一个任意波作为载波波形	3. 见任意波快速指南或任意波章节	见 43 页 见 188 页

范围	AM 载波波形	正弦波, 方波, 三角波, 脉冲波,斜波, 任意波

载波频率

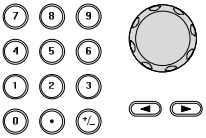
最大载波频率与所选载波波形有关。默认载波频率 1kHz。

面板操作

1. 按 FREQ/Rate 键

2. FREQ 参数指示灯变亮

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	载波频率
	正弦波	1μHz~30MHz (20MHz AFG-3021/3022)
	方波	1μHz~30MHz (20MHz AFG-3021/3022)
	三角波	1μHz~1MHz
	脉冲波	1μHz~25MHz (20MHz AFG-3021/3022)

斜波	1μHz~1MHz
噪声波	N/A
ARB	125MHz~1μHz

调制波形

信号发生器可以接收内部和外部源。AFG-30XX 的调制波形包括正弦波、方波、三角波、上斜波、下斜波。默认为正弦波。

面板操作

1. 选择 MOD

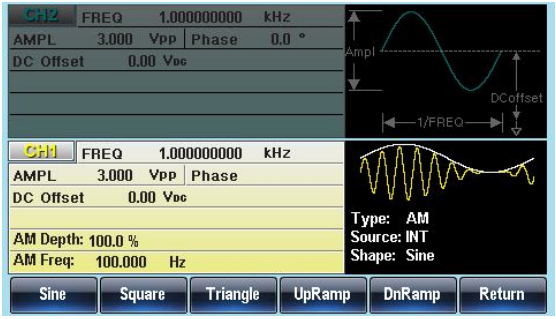
2. 按 F1 (AM)

3. 按 F4 (Shape)

4. 按 F1~F5 选择波形形状

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


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 Voc
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase
DC Offset 0.00 Voc
AM Depth: 100.0 %
AM Freq: 100.000 Hz
Type: AM
Source: INT
Shape: Sine
Sine
Square
Triangle
UpRamp
DnRamp
Return

AM 频率

调制波形频率(AM 频率)范围 2mHz~20kHz。

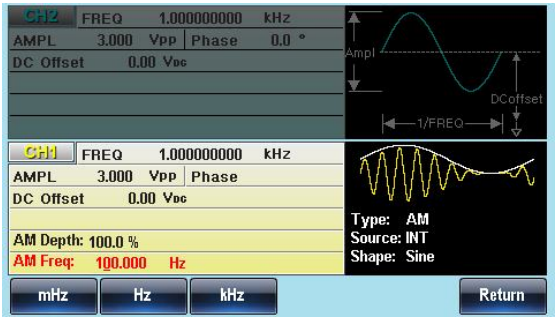
面板操作

1. 按 MOD 键

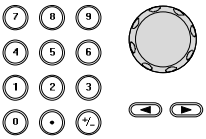
2. 按 F1 (AM)

3. 按 F3 (AM Freq)

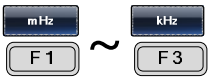
4. AM Freq 参数变亮



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

调制深度决定 AM 波形的最大和最小幅值。调制深度(百分比)定义为：调制波形电压与载波波形电压之比乘以 100：

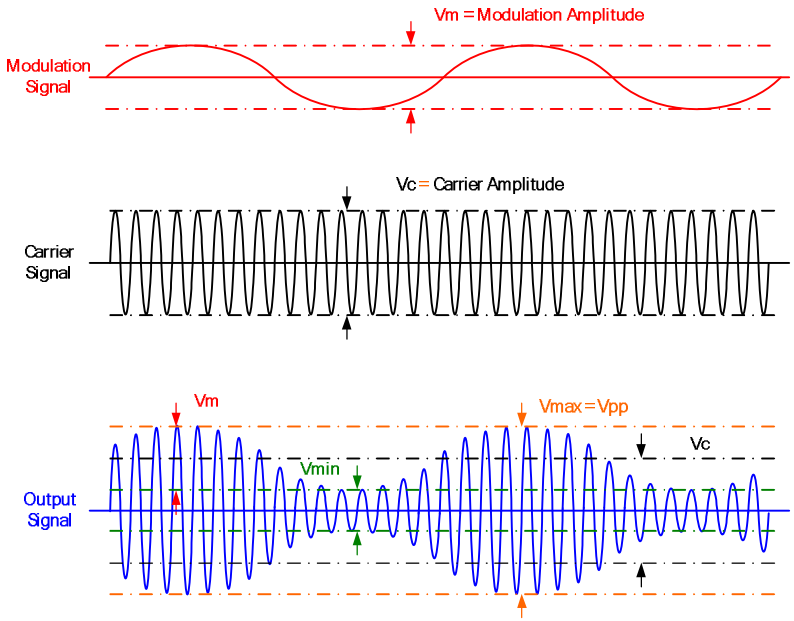
$$ModulationDepth = \frac{ModulatingWaveVoltage}{CarrrierWaveVoltage} x100$$

调制波形最大和最小峰峰值电压定义为：

$$V\max = \mathrm{Vpp} = Vc \times (1 + \frac{Depth}{100})$$

$$V\min = Vc \times (1 - \frac{Depth}{100})$$

下图解释了调制信号、载波信号和合成输出信号之间的关系。注：Vpp 为 AFG 的幅值设置



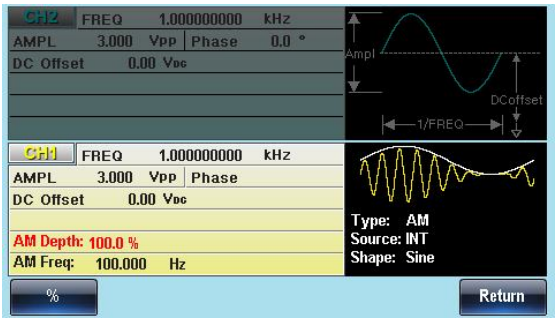
面板操作

1. 按 MOD 键

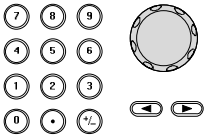
2. 按 F1 (AM)

3. 按 F2 (Depth)

4. AM Depth 参数变亮



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±5VPeak (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。

选择 (AM)调制源

信号发生器接受用于 AM 调制的内部或外部源。默认为内部源。

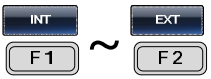
面板操作

1. 按 MOD 键

2. 按 F1 (AM)

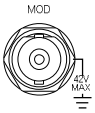
3. 按 F1 (Source)

4. 按 F1(INT)或 F2(EXT)选择调制源



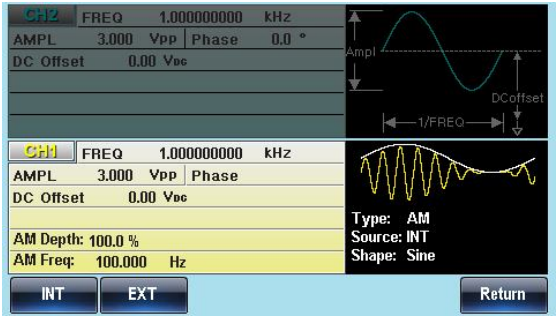
外部源

后面板 MOD INPUT 端子接收外部调制信号



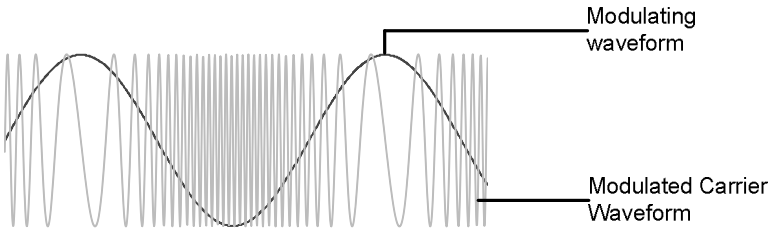
AFG-3022/3032 使用 CH1 或 CH2 MOD 输入与调制所用的通道有关。

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。



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。当使用信号发生器时，每个所选通道一次仅能创建一种调制波形。



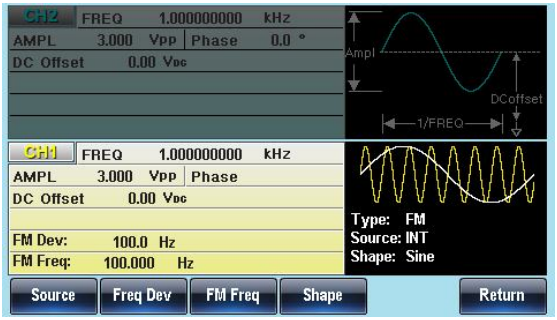
选择频率调制(FM)

选择 FM 后，调制波形与载波频率、输出幅值和偏置电压有关。

面板操作

1. 按 MOD 键

2. 按 F2 (FM)



FM 载波波形

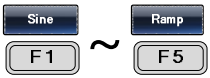
背景

默认载波为正弦波。载波可选波形：正弦波、方波、三角波或斜波。噪声波、脉冲波、ARB、DC 和谐波不能用作载波。

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

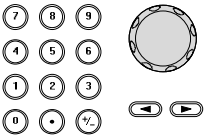
使用 AFG-30XX 时，载波频率必须大于或等于频率偏移。如果频率偏移大于载波频率，函数发生器会自动将偏移调整到当前载波频率所允许的最大值。载波最大频率与所选波形有关。

面板操作

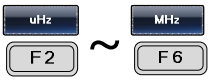
1. 按 FREQ/Rate 键选择载波频率

2. FREQ 参数指示灯变亮

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~30MHz (20MHz AFG-3021/3022)
	方波	1μHz~30MHz (20MHz AFG-3021/3022)
	三角波	1μHz~1MHz
	斜波	1μHz~1MHz
	默认频率	1 kHz

FM 波形

信号发生器可以接收内部和外部源。AFG-30XX 的内部调制波形包括正弦波、方波、三角波、正斜波和负斜波(UpRamp, DnRamp)。默认为正弦波。

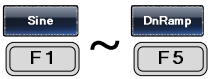
面板操作

1. 选择 MOD

2. 按 F2 (FM)

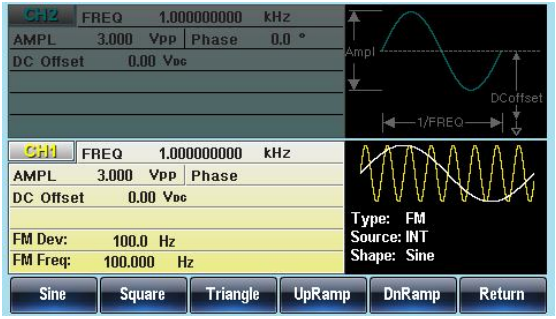
3. 按 F4 (Shape)

4. 按 F1~F5 选择波形



注意

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


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 VDC
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase
DC Offset 0.00 VDC
FM Dev: 100.0 Hz
FM Freq: 100.000 Hz
Type: FM
Source: INT
Shape: Sine
Sine
Square
Triangle
UpRamp
DnRamp
Return

调制频率

信号发生器将接受用于 FM(调频)的内部或外部调制源。

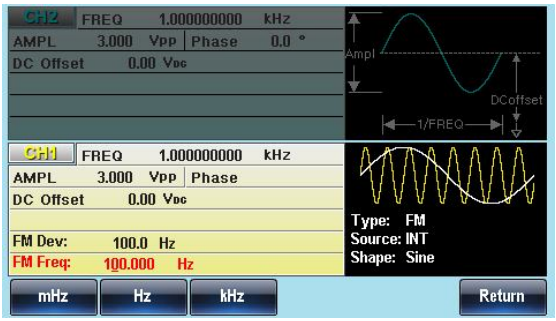
面板操作

1. 按 MOD 键

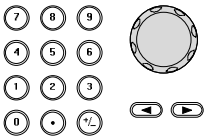
2. 按 F2 (FM)

3. 按 F3 (FM Freq)

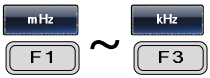
4. FM Freq 参数变亮



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峰值频率偏差。

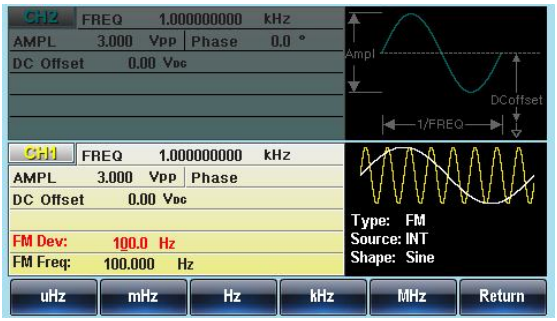
面板操作

1. 按 MOD 键

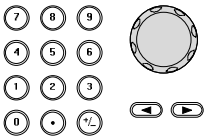
2. 按 F2 (FM)

3. 按 F2 (Freq Dev)

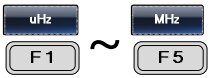
4. Freq Dev 参数变亮



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~30MHz(20MHz AFG-3021/3022) DC~1MHz(三角波)
	默认偏移	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。

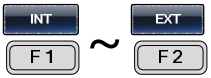
面板操作

1. 按 MOD 键

2. 按 F2 (FM)

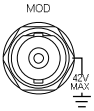
3. 按 F1 (Source)

4. 按 F1 (INT)或 F2 (EXT)选择调制源



外部源

后面板 MOD INPUT 端子接收外部调制信号

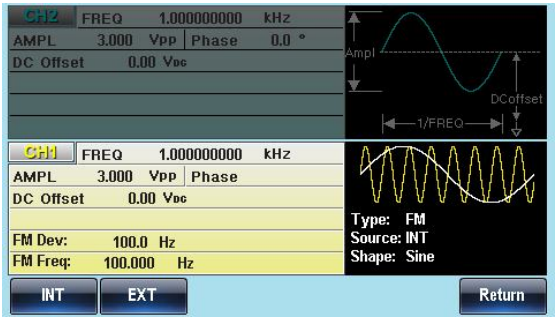


AFG-3022/3032 使用 CH1 或 CH2 MOD 输入与调制所用的通道有关

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。频偏与调制信号电压电平成比例。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

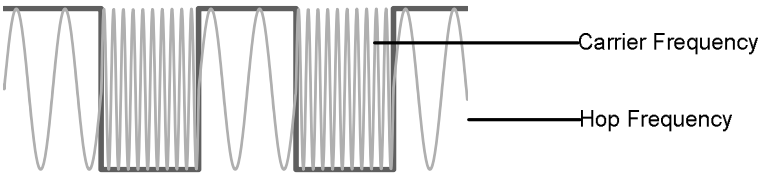
率之下


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 Vpc
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase
DC Offset 0.00 Vpc
FM Dev: 100.0 Hz
FM Freq: 100.000 Hz
Type: FM
Source: INT
Shape: Sine
INT
EXT
Return

频移键控 (FSK) 调制

频移键控调制在两个预设频率(载波频率,跳跃频率)间交替输出频率。内部频率发生器或后面板 Trigger INPUT 上的电压电平决定交替频率。

所选通道每次仅允许使用一种调制模式。当开启 FSK 调制时，其它调制模式将禁用。扫描和 Burst 模式不可使用 FSK 调制。在启用 FSK 时，关闭扫描或 Burst 模式。



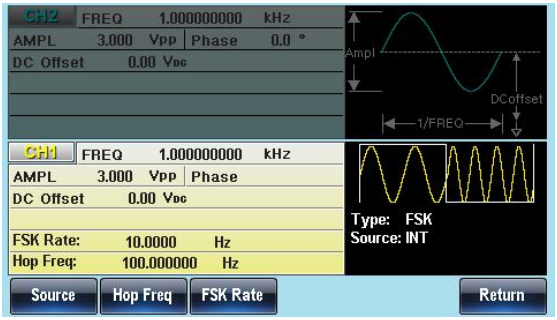
选择 FSK 调制

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

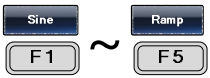
背景

载波波形包含：正弦波、方波、三角波和斜波。默认正弦波。脉冲波、噪声、斜波、DC 和 ARB 无法用作载波。

面板操作

1. 按 Waveform 键

2. 按 F1~F5 选择载波波形



范围	载波波形	正弦波, 方波, 三角波, 斜波

FSK 载波频率

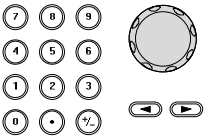
最大载波频率与载波波形有关。默认载波频率均为 1kHz。选择 EXT 时，TriggerINPUT 信号的电压电平控制输出频率。当 TriggerINPUT 信号为逻辑低电平时，输出载波频率；当信号为逻辑高电平时，输出跳跃频率。

面板操作

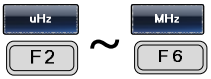
1. 按 FREQ/Rate 键选择载波频率

2. FREQ 参数指示灯变亮

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~30MHz (20MHz AFG-3021/3022)
	方波	1μHz~30MHz (20MHz AFG-3021/3022)
	三角波	1μHz~1MHz
	斜波	1μHz~1MHz

FSK 跳跃频率

默认跳跃频率均为 100 Hz。50% 占空比方波用作内部调制波。选择 EXT 时，TriggerINPUT 信号的电压电平控制输出频率。当 TriggerINPUT 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。

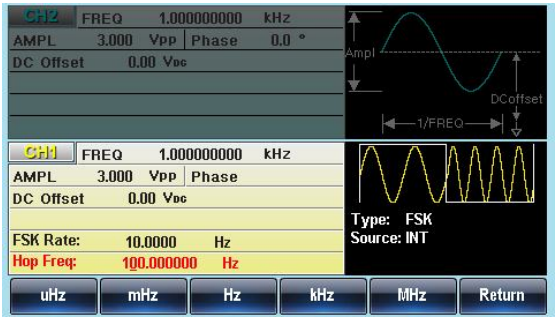
面板操作

1. 按 MOD 键

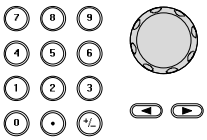
2. 按 F3 (FSK)

3. 按 F2 (Hop Freq)

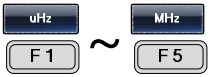
4. Hop Freq 参数变亮



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~30MHz (20MHz AFG-3021/3022)
	方波	1μHz~30MHz (20MHz AFG-3021/3022)
	三角波	1μHz~1MHz
	斜波	1μHz~1MHz

FSK 频率

FSK 频率是决定输出载波频率还是跳跃频率的频率值。FSK 频率功能仅适合内部 FSK 源。

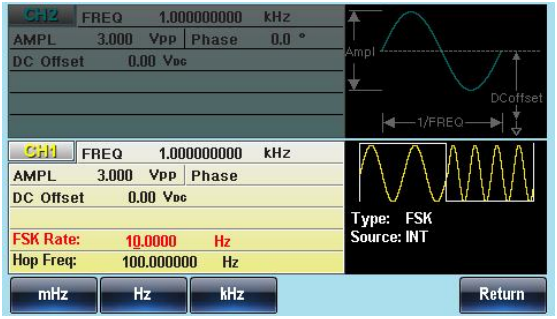
面板操作

1. 选择 MOD

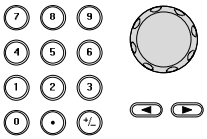
2. 按 F3 (FSK)

3. 按 F3 (FSK Rate)

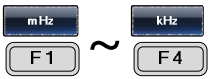
4. FSK Rate 参数变亮



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，忽略 FSK 频率设置	

FSK 源

AFG-30XX 接受内部和外部 FSK 源，默认为内部源。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 频率等于后面板 TriggerINPUT 信号频率。

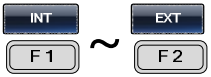
面板操作

1. 按 MOD 键

2. 按 F3 (FSK)

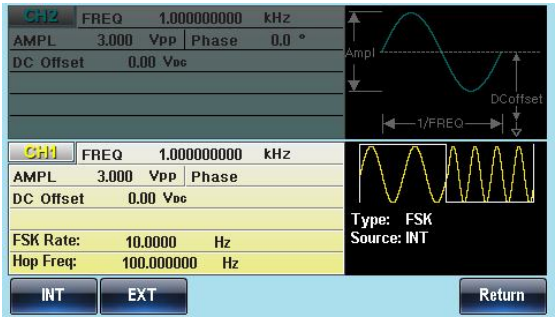
3. 按 F1 (Source)

4. 按 F1 (INT)或 F2 (EXT)选择 FSK 源



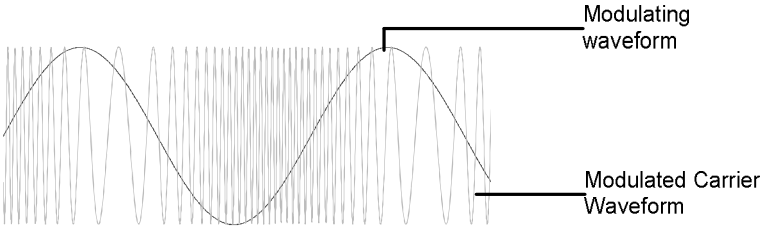
注意

Trigger INPUT 端子不能设置边沿极性



相位调制 (PM)

PM 波形由载波和调制波生成。调制波的量级决定载波相位。当使用信号发生器时，所选通道每次仅可以创建一种调制波形。



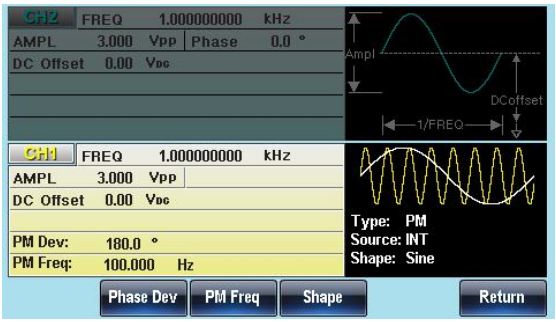
选择相位调制 (PM)

当选择 PM 时，调制波形与载波频率、输出幅值和偏移电压有关。

面板操作

1. 按 MOD 键

2. 按 F4 (PM)



PM 载波波形

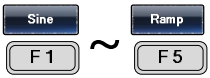
背景

默认正弦波。载波波形包含：正弦波、方波、三角波或斜波。脉冲波、噪声、ARB、DC 和谐波无法用作载波。

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

PM 载波频率

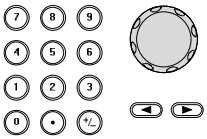
最大载波频率与所选载波波形有关。默认载波频率均为 1kHz。

面板操作

1. 按 FREQ/Rate 键选择载波频率

2. FREQ 参数指示灯变亮

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~30MHz (20MHz AFG-3021/3022)
	方波	1μHz~30MHz (20MHz AFG-3021/3022)
	三角波	1μHz~1MHz
	斜波	1μHz~1MHz
	默认频率	1 kHz

PM 波形

信号发生器可以接收内部和外部源。AFG-30XX 的内部调制波形包括正弦波、方波、三角波、正斜波和负斜波(UpRamp, DnRamp)。默认为正弦波。

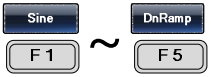
面板操作

1. 选择 MOD

2. 按 F4 (PM)

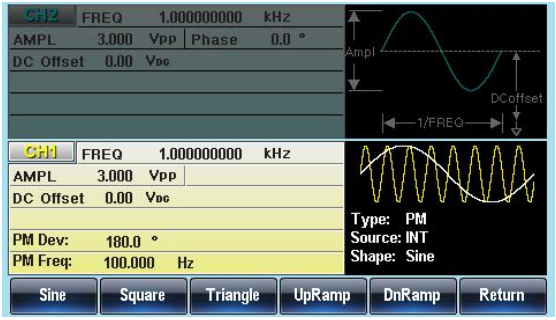
3. 按 F4 (Shape)

4. 按 F1~F5 选择波形形状



注意

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


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 VDC
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
DC Offset 0.00 VDC
PM Dev: 180.0 °
PM Freq: 100.000 Hz
Type: PM
Source: INT
Shape: Sine
Sine
Square
Triangle
UpRamp
DnRamp
Return

调制频率

使用内部源时，PM Freq 参数设置相位调制功能的调制频率。

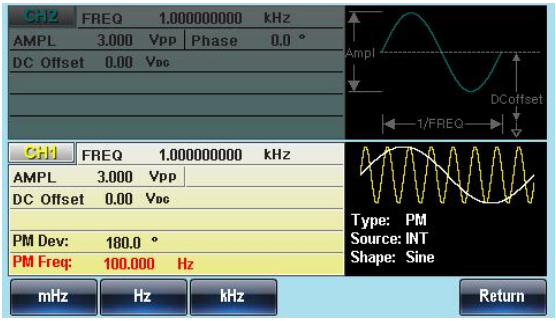
面板操作

1. 按 MOD 键

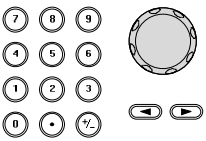
2. 按 F4 (PM)

3. 按 F3 (PM Freq)

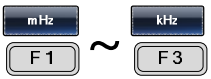
4. PM Freq 参数变亮



5. 使用方向键和可调旋钮或数字键盘输入 PM 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

相位调制偏移

相位调制偏移是调制波形与载波的峰值相位偏差。

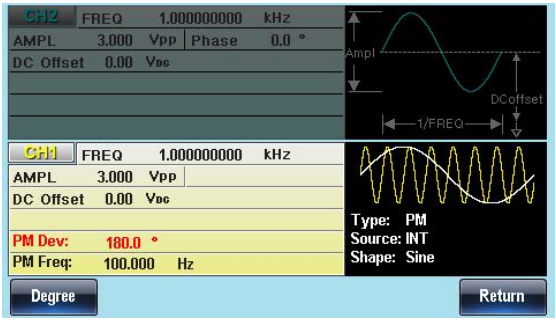
面板操作

1. 按 MOD 键

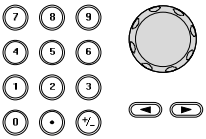
2. 按 F4 (PM)

3. 按 F2 (Phase Dev)

4. PM Dev 参数变亮



5. 使用方向键和可调旋钮或数字键盘输入相位偏移



6. 按 F1 选择单位

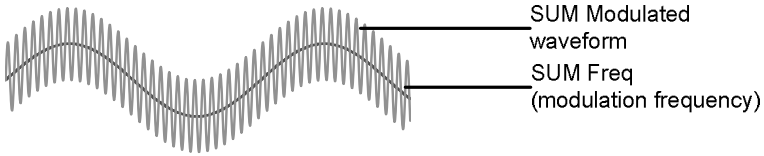
范围 PM 偏移 0~360°

默认	180°

SUM 调制

SUM 调制将调制波形加入载波波形。以载波幅值的百分比形式设置调制波形幅值。

所选通道每次仅能开启一种调制模式。如果开启 SUM，其它调制模式将关闭。同样的，burst 和扫描模式也不能与 SUM 调制一起使用，在开启 SUM 后关闭。



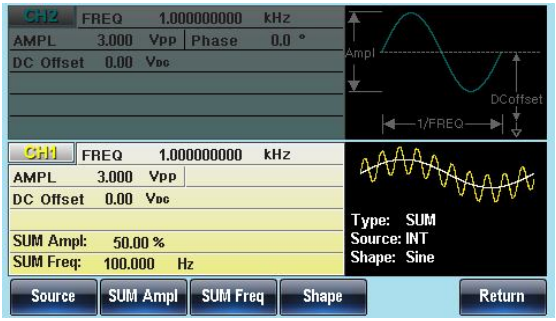
选择 SUM 调制

选择 SUM 时需考虑载波频率、幅值和频率。

面板操作

1. 按 MOD 键

2. 按 F5 (SUM)



SUM 载波波形

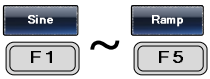
背景

SUM 载波可设为正弦波、三角波、脉冲波或斜波，默认正弦波。三角波、噪声波、脉冲、ARB、DC 和谐波不可用作载波。

面板操作

1. 按 Waveform 键

2. 按 F1~F5 选择载波波形(bar F3)



范围	载波波形	正弦波、三角波、脉冲波、斜波

SUM 载波频率

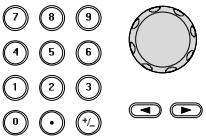
最大载波频率与所选载波波形有关，默认均为 1kHz。

面板操作

1. 按 FREQ/Rate 键选择载波频率

2. FREQ 参数变亮

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~30MHz (20MHz AFG-3021/3022)
三角波	1μHz~1MHz
斜波	1μHz~1MHz
默认频率	1 kHz

SUM 调制波形

内部调制波形包含正弦波、方波、三角波、正斜波和负斜波，默认正弦波。

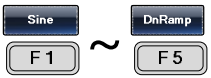
面板操作

1. 按 MOD 键

2. 按 F5 (SUM)

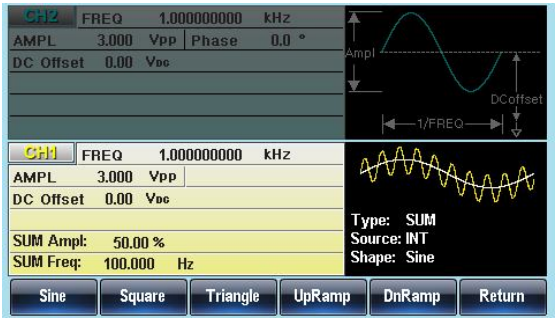
3. 按 F4 (Shape)

4. 按 F1~F5 选择波形



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



SUM 频率

设置调制波形的频率。

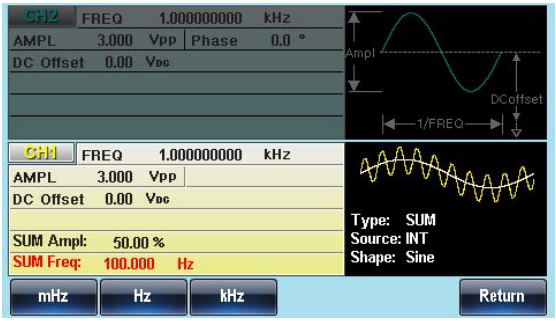
面板操作

1. 按 MOD 键

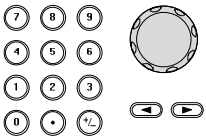
2. 按 F5 (SUM)

3. 按 F3 (SUM Freq)

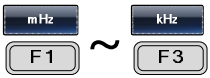
4. SUM Freq 参数变亮



5. 使用方向键和可调旋钮或数字键盘输入 SUM 频率



6. 按 F1~F3 选择频率单位



范围

SUM 频率	2mHz~20kHz
默认	20kHz

SUM 幅值

以载波幅值的百分比形式设置调制波形的幅值。

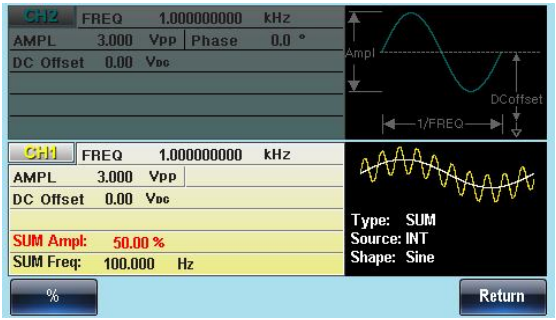
面板操作

1. 按 MOD 键

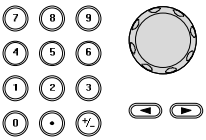
2. 按 F5 (SUM)

3. 按 F2 (SUM Ampl)

4. SUM Ampl 参数变亮



5. 使用方向键和可调旋钮或数字键盘输入 SUM 幅值



6. 按 F1 (%)选择百分比单位

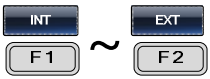
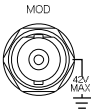
范围

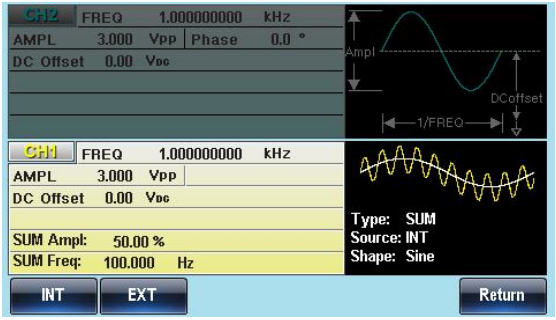
SUM 幅值	0% ~ 100%

默认	50%

SUM 调制源

AFG-30XX 接受内部或外部调制源，默认内部调制源。

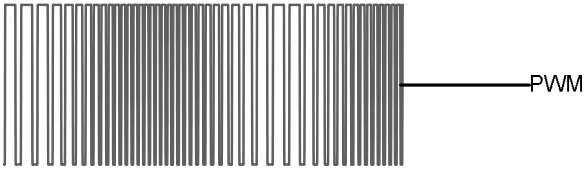
面板操作	1. 按 MOD 键	
	2. 按 F5 (SUM)	
	3. 按 F1 (Source)	
	4. 按 F1 (INT)或 F2 (EXT)选择调制源	
外部调制源	从后面板的 MOD INPUT 端子接收外部调制信号 AFG-3022/3032 使用 CH1 或 CH2 MOD 输入与使用哪一个调制通道有关	
注意	如果选择外部调制源，那么 SUM 幅值将由后面板 MOD INPUT 端子上的± 5V 信号电压控制。例如，如果 SUM 调制设为 100%，那么最大幅值限定在 +5V，最小幅值限定在-5V	


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 Vdc
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
DC Offset 0.00 Vdc
SUM Ampl: 50.00 %
SUM Freq: 100.000 Hz
Type: SUM
Source: INT
Shape: Sine
INT
EXT
Return

脉冲宽度调制

对于脉宽调制，调制波形的瞬时电压决定脉冲宽度。

所选通道每次仅允许启用一种调制模式。如果使用 PWM，其它调制模式关闭。同样的，burst 和扫描模式不可与 PWM 一起使用。启用 PWM 后关闭扫描和 burst 模式。



选择脉冲宽度调制

选择 PWM 时，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。

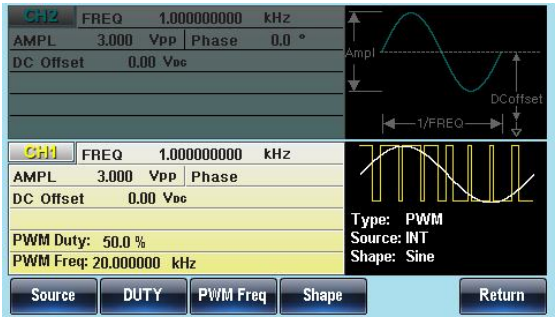
面板操作

1. 按 Waveform 键

2. 按 F2 (Square)

3. 按 MOD 键

4. 按 F6 (PWM)



PWM 载波波形

PWM 使用方波作为载波波形，否则会提示错误。

PWM 载波频率

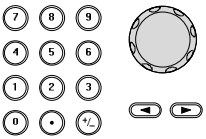
载波频率与方波有关。默认 1kHz。

面板操作

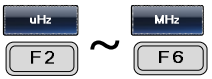
1. 按 FREQ/Rate 键选择载波频率

2. FREQ 参数变亮

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



范围	频率	1μHz~30MHz (20MHz AFG-3021/3022)

PWM 调制波形

内部调制波形包括正弦波、方波、三角波、正斜波和负斜波。默认正弦波。

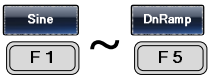
面板操作

1. 按 MOD 键

2. 按 F6 (PWM)

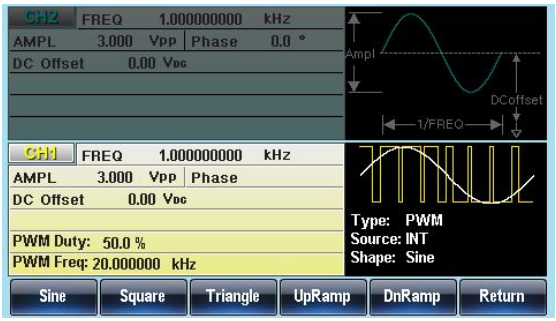
3. 按 F4 (Shape)

4. 按 F1~F5 选择波形



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

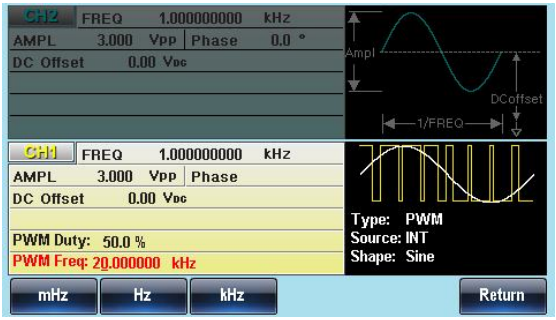
面板操作

1. 按 MOD 键

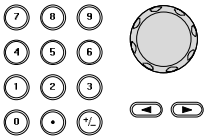
2. 按 F6 (PWM)

3. 按 F3 (PWM Frequency)

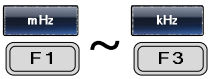
4. PWM Freq 参数变亮



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

设置占空百分比。

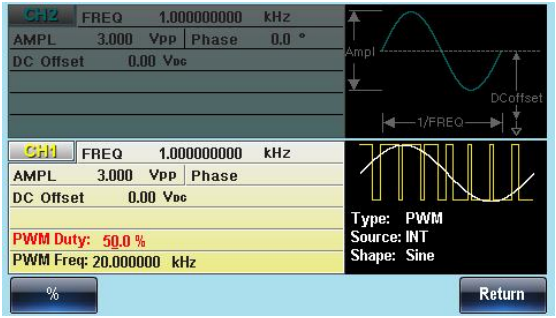
面板操作

1. 按 MOD 键

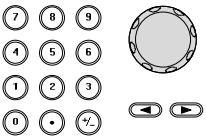
2. 按 F6 (PWM)

3. 按 F2 (Duty)

4. Duty 参数变亮



5. 使用方向键和可调旋钮或数字键盘输入占空比



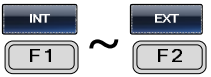
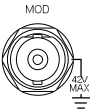
6. 按 F1 (%)选择百分号

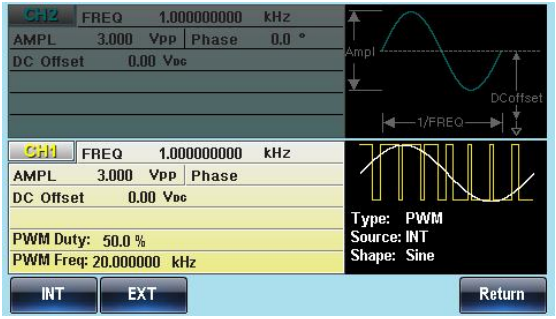
范围	占空比	0% ~ 100%
	默认	50%

注意　可以使用外部调制源调制脉冲波形。此时，MOD INPUT 端的±5V 电压控制脉宽

PWM 调制源

AFG-30XX 接受内部和外部 PWM 调制源。默认内部调制源。

面板操作	1. 按 MOD 键	
	2. 按 F6 (PWM)	
	3. 按 F1 (Source)	
	4. 按 F1 (INT)或 F2 (EXT)选择调制源	
外部调制源	从后面板的 MOD INPUT 端子接收外部调制信号 AFG-3022/3032 使用 CH1 或 CH2 MOD 输入与使用哪一个调制通道有关	
注意	如果选择外部调制源，那么脉宽调制由后面板 MOD INPUT 端子上的±5V 电压控制。例如：如果调制深度设为 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	


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 VDC
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase
DC Offset 0.00 VDC
PWM Duty: 50.0 %
PWM Freq: 20.000000 kHz
Type: PWM
Source: INT
Shape: Sine
INT
EXT
Return

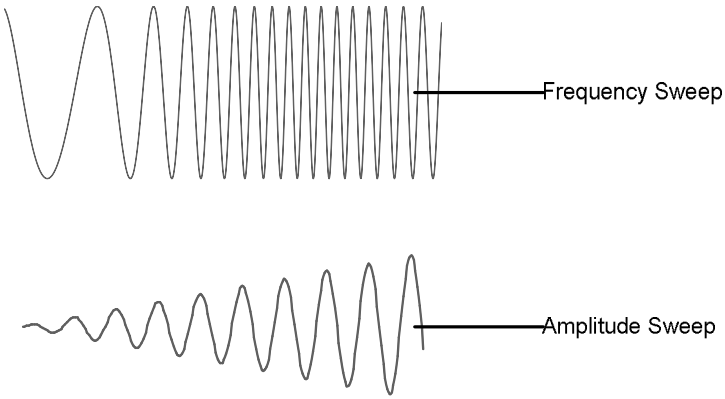
扫描

信号发生器可以对正弦波、方波、斜波和三角波完成频率扫描，或者对正弦波、方波、三角波、脉冲波、斜波、噪声波和 ARB 波完成幅值扫描。开启扫描模式后，该通道的 Burst 或其它调制模式关闭。

当扫描类型设为频率时，信号发生器以指定步进从起始频率到停止频率扫描。

当扫描类型设为幅值时，信号发生器以指定扫描时间从起始幅值到停止幅值扫描。

如果使用手动或外部调制源时，信号发生器可以输出一个单相扫描。扫描以线性或对数步进。函数发生器也可以以频率扫描或幅值扫描，频率扫描和幅值扫描不可同时使用。



选择扫描模式

按 Sweep 键进入扫描模式。如果不预先设置，使用默认的输出幅值、偏移和频率。

扫描类型

选择频率扫描或幅值扫描。

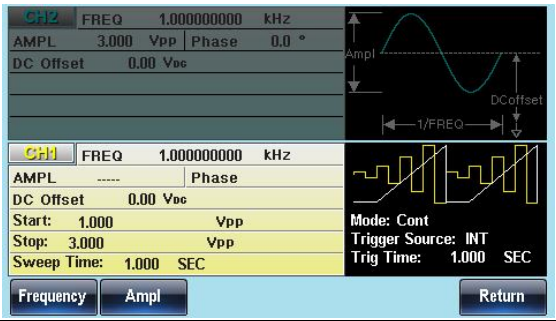
面板操作

1. 按 Sweep 键

2. 按 F2 (Type/MOD)

3. 按 F1 (Type)

4. 按 F1 (Frequency)或 F2 (Amptd)选择频率或幅值扫描



例如　　频率　　幅值


设置起始和停止频率/幅值

起始和停止频率/幅值定义扫描上下限。信号发生器从起始频率/幅值扫描至停止频率/幅值，然后又复位回起始频率/幅值。在整个扫描频率范围内(100μHz-30MHz)，相位连续。对于幅值扫描模式，幅值从1mVpp-10Vpp。

面板操作

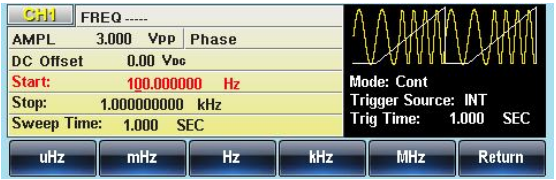
1. 按 Sweep 键

2. 按 F3 (Start)或 F4 (Stop)选择起始或停止频率/幅值

3. Start 或 Stop 参数变亮

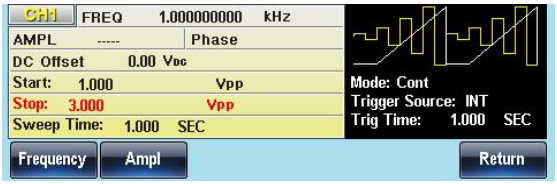
Start

(显示频率)

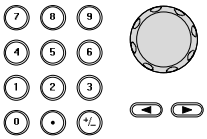


Stop

(显示幅值)



4. 使用方向键和可调旋钮或数字键盘输入 Stop/Start 频率/幅值



	5. 按 F1~F5 选择 Start/Stop 频率/幅值单位	uHz F1 ~ MHz F5
范围 (频率)	扫描范围	1μHz~30MHz(正弦波/方波) (20MHz AFG-3021/3022) 1μHz~1MHz (斜波/三角波)
	起始 – 默认	100Hz
	停止 – 默认	1kHz
范围(幅值)	扫描范围	1mVpp~10Vpp (into 50Ω)
	起始 – 默认	1Vpp
	停止 – 默认	3Vpp
注意	从低至高的频率/幅值扫描，设置起始频率/幅值＜停止频率/幅值。 从高至低的频率/幅值扫描，设置起始频率/幅值＞停止频率/幅值。	

中心频率和跨距

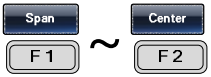
中心频率和跨距决定扫描上限和下限(起始/停止)。仅当扫描类型 = 频率时，才可以进行该设置。

面板操作

1. 按 Sweep 键

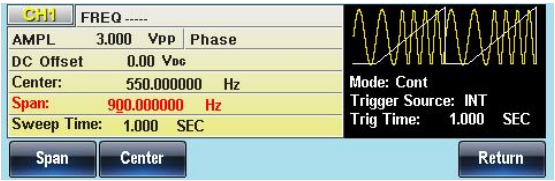
2. 按 F6 (More)

3. 按 F1 (Span)或 F2 (Center)选择跨距或中心频率

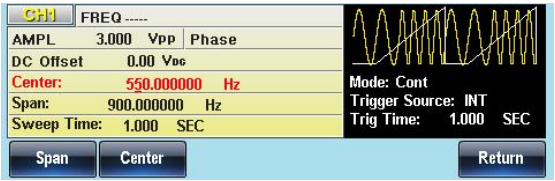


4. Span 或 Center 参数变亮

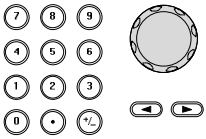
跨距



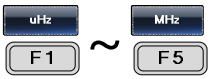
中心频率



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	1μHz~30MHz(正弦波/方波) (20MHz AFG-3021/3022) 1μHz~1MHz (三角波/斜波)
	跨距频率	DC~30MHz(正弦波/方波) (20MHz AFG-3021/3022) DC ~1MHz (三角波/斜波)
	中心频率 – 默认	550Hz
	跨距频率–默认	900Hz

注意 设置正频率跨距，从低频到高频扫描

设置负频率跨距，从高频到低频扫描

扫描模式

分持续扫描或门限扫描。当设为持续模式时，内部触发控制扫描功能的持续输出。当设为门限模式时，扫描输出同步于触发输入。

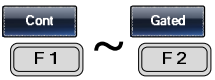
面板操作

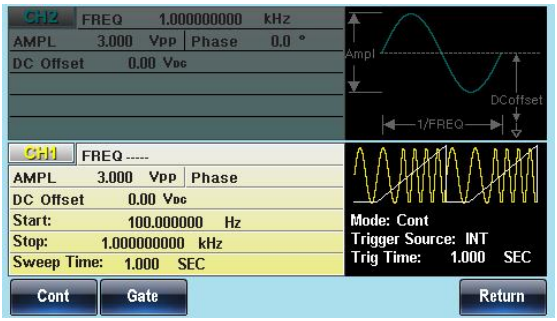
1. 按 SWEEP 键

2. 按 F2 (Type/MOD)

3. 按 F2 (Mode)

4. 按 F1 (Cont)或 F2 (Gated)选择持续或门限模式





扫描功能

可选择线性或对数扫描。默认线性扫描。

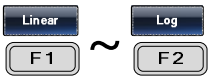
面板操作

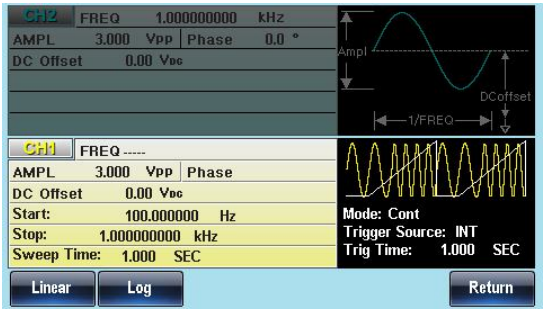
1. 按 SWEEP 键

2. 按 F2 (Type/MOD)

3. 按 F3 (Function)

4. 按 F1 (Linear)或 F2 (Log)选择线性或对数扫描

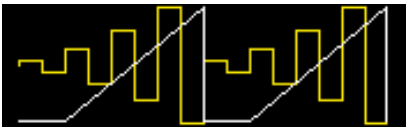




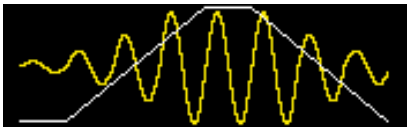
扫描波形

设置扫描波形。

锯齿波创建锯齿形状的扫描波形:



三角波创建羽毛球形状的扫描波形:

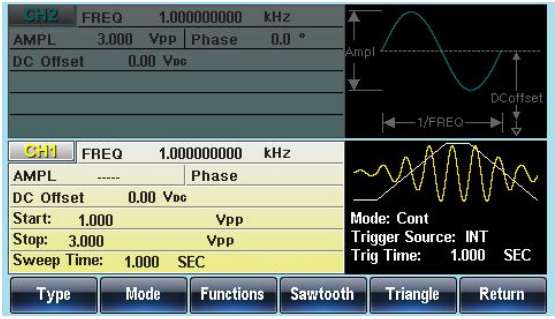


面板操作

1. 按 SWEEP 键

2. 按 F2 (Type/MOD)

3. 按 F4 (Sawtooth)或 F5 (Triangle)选择波形



扫描时间

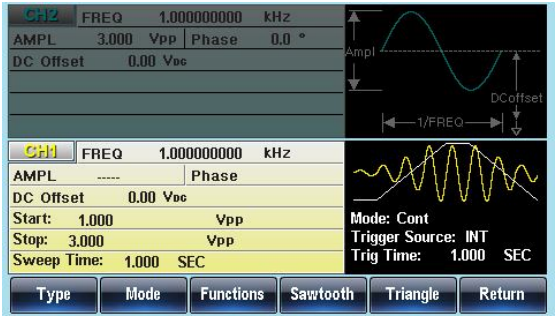
完成一次从起始到截止频率/幅值扫描所花费的时间称为扫描时间。
信号发生器根据扫描的持续时间，自动确定扫描的离散频率或幅值数。

面板操作

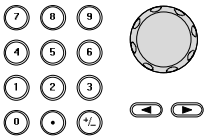
1. 按 SWEEP 键

2. 按 F5 (SWP Time)

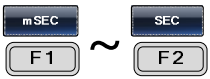
3. 扫描时间参数变亮



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

扫描触发源

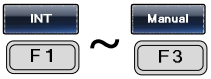
扫描模式下，信号发生器在收到触发信号后扫描一次。扫描输出完成后，信号发生器输出起始频率，并等待下一次触发。触发源可以是内部(可设触发间隔)触发、手动触发或外部触发。默认内部触发。

面板操作

1. 按 SWEEP 键

2. 按 F1 (TRIG Type)

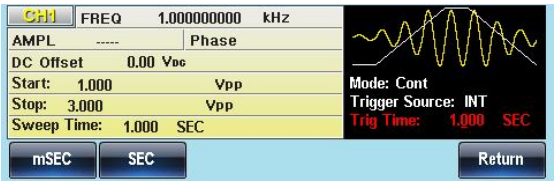
3. 按 F1 (INT), F2 (EXT)或 F3 (Manual)选择触发源



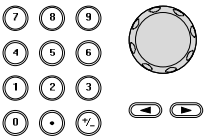
内部触发

1. 如果选择 INT (内部触发)，按 F5 (TRIG Time)设置内部触发的时间间隔

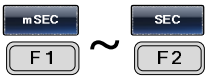
2. TRIG Time 参数变亮



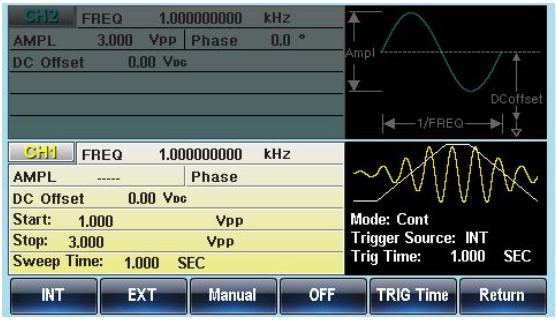
3. 使用方向键和可调旋钮或数字键盘输入触发间隔时间



4. 按 F1~F2 选择时间单位

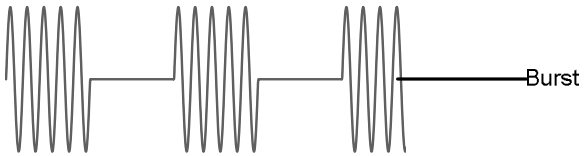


范围	内部触发间隔	1ms ~ 500s
手动触发	5. 如果选择手动触发，按 F1 (Trigger)手动开启每次扫描	
	6. 按 F6 (Return)返回菜单	
注意	根据触发时间的设定，使用内部触发源将产生一个持续的间隔扫描 如果使用外部触发源，后面板 Trigger INPUT 端每接收到一个触发脉冲(TTL)就输出一次扫描 触发周期必须等于或大于扫描时间+1ms	



Burst 模式

信号发生器能创建一个指定循环次数的 Burst 波形。Burst 模式支持正弦波、方波、三角波、脉冲波、斜波、噪声(仅门限 Burst 模式)波形*。



*ARB 功能也有一个 N-Cycle Burst 模式，但不可理解为 Burst 功能模式

选择 Burst 模式

选择 Burst 模式后，所选通道的任何调制或扫描模式都将自动关闭。如果没有设置，输出幅值、偏移和频率启用默认值。

Burst 模式

触发(N Cycle)或门限模式可以设置 Burst 模式。在 N Cycle /触发模式下，信号发生器每接收到触发时都将输出一个指定循环次数的波形(Burst)。执行完成后，信号发生器停止并等待下一次触发。默认为 N Cycle。触发模式可以使用内部或外部触发。

相比指定循环次数，门限模式使用外部触发开启或关闭输出。当 Trigger INPUT 信号为高电平时，波形持续输出。当 Trigger INPUT 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 Burst 波形的起始相位相同。

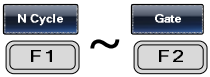
Burst 模式	Burst 计数	Burst 周期	相位	触发源
Triggered(Int)	可用	可用	可用	立即
Triggered (Ext)	可用	不可用	可用	EXT
Gated pulse (Ext)	不可用	不可用	可用	不可用

门限模式下，忽略 Burst 计数、Burst 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 Cycle (F1)或 Gate (F2)



Burst 频率

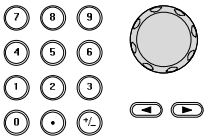
在 N Cycle 和门限模式下，波形频率定义了 Burst 波形的重复率。在 N Cycle 模式下，以指定循环次数作为波形频率。在门限模式下，当触发信号为高电平时输出波形频率。Burst 模式支持正弦波、方波、三角波或斜波。

面板操作

1. 按 FREQ/Rate 键

2. FREQ 参数变亮

3. 使用方向键和可调旋钮或数字键盘输入频率



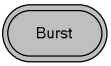
	4. 按 F2~F6 选择频率单位	
范围	频率	1uHz~30MHz (20MHz AFG-3021/3022)
	频率 – 斜波	1uHz~1MHz
	默认	1kHz
注意	波形频率不同于 Burst 周期。Burst 周期指 N-Cycle 模式下 Burst 之间的时间间隔	

Burst 循环/Burst 计数

Burst 循环(Burst 计数)指 Burst 波形的循环次数。仅用于 N Cycle 模式(内部, 外部或手动触发源)。默认 1 次循环。

面板操作

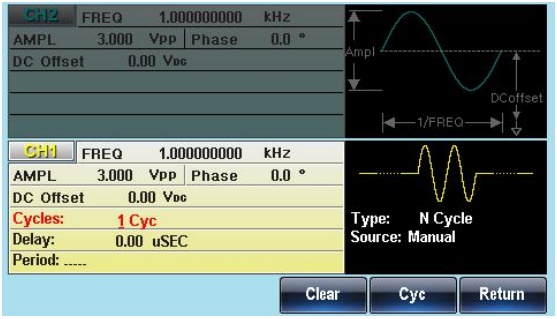
1. 按 Burst 键



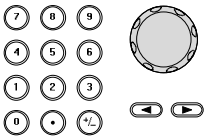
2. 按 F1 (N Cycle)

3. 按 F1 (Cycles)

4. Cycles 参数变亮



5. 使用方向键和可调旋钮或数字键盘输入循环次数



6. 按 F5 选择 Cyc 单位

范围	循环次数	1~1,000,000

注意

选择内部触发时，持续输出 Burst 循环。Burst 周期决定 Burst 频率和它们之间的时间间隔

Burst 计数必须小于脉冲串周期和波形频率的乘积。

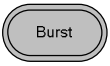
Burst Cycle< (Burst Period x Wave Frequency)

如果选择门限 Burst 模式，将忽略 Burst 计数。如果在门限模式同时远程改变 Burst 计数，信号发生器将记录新计数，并在下次使用。

无限 Burst 计数

面板操作

1. 按 Burst 键



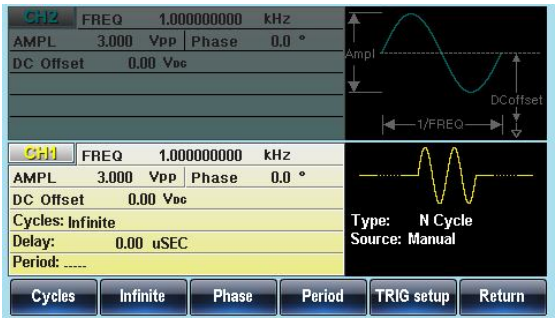
2. 按 F1 (N Cycle)

3. 按 F2 (Infinite)

注意

无限 Burst 仅用在手动触发模式

25MHz 以上, 无限 Burst 仅适合方波和正弦波

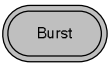


Burst 周期

两个相邻 Burst 起始时间之间的间隔称为 Burst 周期。仅用于内部触发 Burst 模式。

面板操作

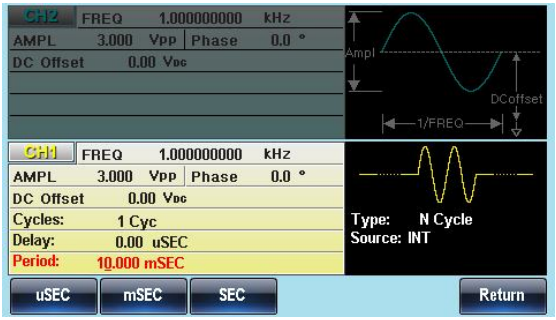
1. 按 Burst 键



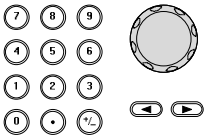
2. 按 F1 (N Cycle)

3. 按 F4 (Period)

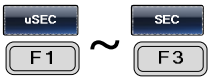
4. Period 参数变亮



5. 使用方向键和可调旋钮或数字键盘输入周期时间



6. 按 F1~F3 选择周期单位



范围	周期	1us~500s
	默认	10ms

注意

Burst 周期仅用于内部触发。当使用门限 Burst 模式或外部和手动触发时，关闭 Burst 周期设置

Burst 周期一定要够长，且满足如下条件：

Burst 周期>Burst 计数/波形频率 + 200ns

Burst 相位

Burst 波形的起始相位称为 Burst 相位，默认 0˚。

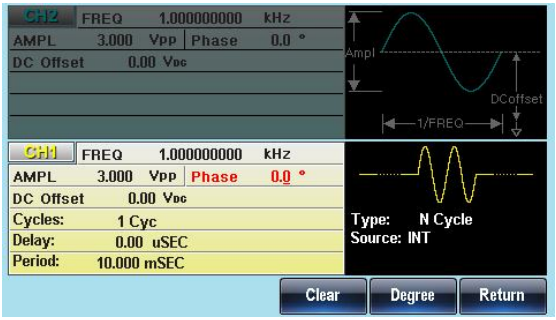
面板操作

1. 按 Burst 键

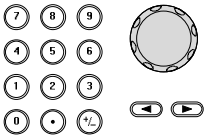
2. 按 F1 (N Cycle)

3. 按 F3 (Phase)

4. Phase 参数变亮



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˚点与波形 0V 点一致

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)

Burst 相位用于 N cycle 和门限 Burst 模式。在门限 Burst 模式下，当 TriggerINPUT 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 Burst 相位对应的电压值相同。

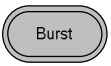
在 Burst 模式下使用方波，第一个和最后一个周期的占空比由于频率响应的原因，在指定相位设置下可能有一些误差。

Burst 触发源

触发 Burst (N-Cycle)模式下，信号发生器每收到一个触发输出一个波形 Burst。Burst 循环(Burst 计数)指定每个 Burst 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 Burst(N-cycle)模式。

面板操作

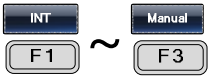
1. 按 Burst 键



2. 按 F1 (N Cycle)

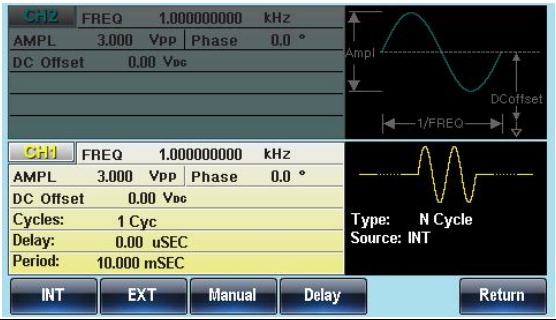
3. 按 F5 (TRIG setup)

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



手动触发

5. 如果选择手动触发，每按一次触发软键(F1)输出一个 Burst



注意

选择内部触发源时，Burst 以指定频率持续输出。Burst 周期决定 Burst 之间的时间间隔

选择外部触发时，信号发生器后面板 Trigger INPUT 端每收到一个触发信号(TTL)，输出一个 Burst(循环数已设)。输出 Burst 期间接收到的触发信号将被忽略

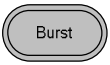
当使用手动或外部触发，仅可用 Burst 相位和 Burst 循环/计数，不可用 Burst 周期

在接收触发之后、脉冲串开始之前可以插入延迟时间。

Burst 延迟

面板操作

1. 按 Burst 键

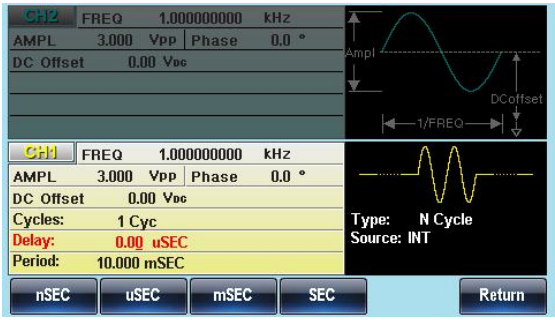


2. 按 F1 (N Cycle)

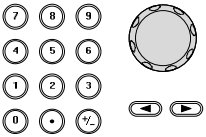
3. 按 F5 (TRIG setup)

4. 按 F4 (Delay)

5. Delay 参数变亮



6. 使用方向键和可调旋钮或数字键盘输入延迟时间



7. 按 F1~F4 选择延迟时间单位

范围	延迟时间	0s~100s
	默认	0s

门限触发极性

设置输入触发信号的极性。

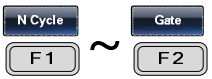
面板操作

1. 按 Burst 键

2. 按 F2 (Gate)

3. 按 F1 (Polarity)

4. 选择 Pos (F1)或 Neg (F2)



门限触发相位

设置输出 Burst 波形的起始相位。

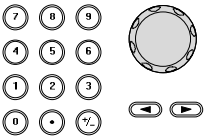
面板操作

1. 按 Burst 键

2. 按 F2 (Gate)

3. 按 F2 (Phase)

4. 使用方向键和可调旋钮或数字键盘输入相位



5. 按 F5 (Degree)选择相位单位

范围	相位	-360˚~+360˚
	默认	0˚

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、LAN/USB/GPIB 设置、查看软件版本、更新固件、自我校准、设置接口类型、改变语言、设置输出阻抗、设置 DSO 连接以及其它辅助功能。

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设置输出阻抗 - AFG-3021/3031 188

DSO 连接 - AFG-3021/3031 189

存储、调取或删除

AFG-3021、AFG-3022、AFG-3031 & AFG-3032 的非易失性存储器可以存储仪器状态和数据。10 组内存文件 0~9，保存任意波数据(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
	  • 脉冲上升时间
	  • 脉冲下降时间
	  • 方波占空比
	  • 斜波对称性
	  • 幅值
	  • 幅值单位
	  • DC 偏移(仅 DC 波形)
	  • 偏移
	  • 调制类型
	  • 蜂鸣器设置
	  • 阻抗
	  • 主输出
		• FM
		  • 调制源
		  • 波形
		  • 深度
		  • FM 频率
		• FSK
		  • 调制源
		  • 波形
		  • 频率
		  • 跳跃频率
		• PM
		  • 调制源
		  • 相位偏差
		  • PM 频率
		• SUM
		  • 调制源
		  • 波形

- 谐波阶数设置
- 谐波显示
- 扫描
  - 调制源
  - 类型
  - 时间
  - 起始频率
  - 停止频率
  - 中心频率
  - 跨距频率
  - 起始幅值
  - 停止幅值
- AM
  - 调制源
  - 波形
  - 深度
  - AM 频率
- SUM 幅值
- SUM 频率
- PWM
  - 调制源
  - 波形
  - 占空比
  - 频率
- Burst 类型
  - 调制源
  - 类型
  - 循环数
  - 相位
  - 周期
  - 延迟

其它

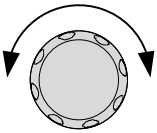
- 接口
- 显示
- 相位
- 双通道设置

面板操作

1. 按 UTIL 键

2. 按 F1 (Memory)

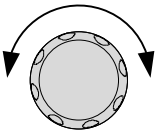
3. 使用可调旋钮选择内存文件 (M0 ~ M9)

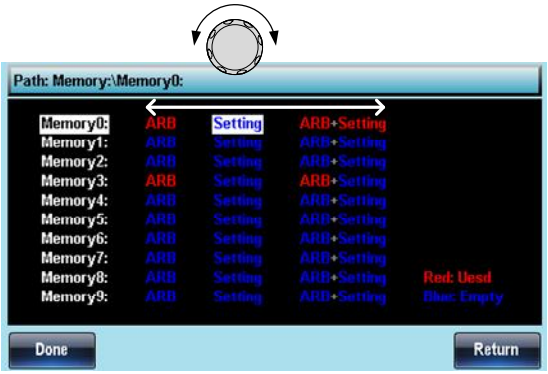


4. 选择文件操作：

   按 F1 存储文件，按 F2 调取文件，按 F3 删除文件

5. 使用可调旋钮选择存储/调取/删除的数据类型 (ARB, Setting, ARB+Setting)





6. 按 F5 (Done)完成操作

范围	内存文件	M0 ~ M9
	数据类型	ARB, Setting, ARB+Setting

全部删除

7. 按 F4 删除 M0~M9 所有文件

8. 按 F1 (Done)确认删除所有文件

选择远程接口

AFG-3021、AFG-3022、AFG-3031 & AFG-3032 提供 LAN、GPIB 和 USB 接口。每次仅可以使用一种远程接口。

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

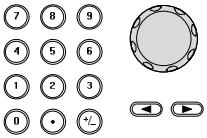
2. 按 F2 (Interface)

3. 按 F1 (GPIB)

4. 按 F1 (Address)

5. GPIBAddress 参数变亮

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

LAN 接口

背景　　使用 LAN 接口必须指定 IP(DHCP、Auto IP 或手动设置)。

面板操作

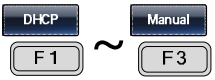
1. 按 UTIL 键

2. 按 F2 (Interface)

3. 按 F3 (LAN)

4. 按 F2 (Config)

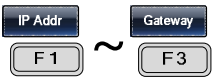
5. 按 F1(DHCP)、F2(Auto IP)或 F3(Manual)选择如何设置 IP 地址



范围

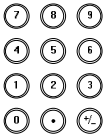
DHCP	使用 DHCP 自动设置仪器网络的 IP 地址
Auto IP	用以太网线直接连到 Host PC 后，使用 Auto IP 自动设置仪器的 IP 地址
Manual	手动设置 IP 地址

6. 如果选择手动，依次设置 F1 (IP Addr)、F2 (NetMask)和 F3 (Gateway)



7. IP address、net mask 或 gateway 参数设置变亮

8. 使用数字键盘输入 IP address、Net mask 或 gateway。小数点作为字段分隔符



9. 按 F5 (Done)确认设置

10. 最后，按 F5 (Done)设置所有 IP

LANHost 名称

背景　　介绍使用 LAN 接口时如何设置 Host 名称。

面板操作

1. 按 UTIL 键

2. 按 F2 (Interface)

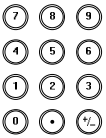
3. 按 F3 (LAN)

4. 按 F2 (Config)

5. 按 F4 (HostName)设置仪器的 Host 名称

6. Host Name 参数变亮

7. 使用可调旋钮切换字母



8. 按 F1 (Enter Char)选择字母并移至下一位置

9. 按 F5 (Done)确认 Host 名称

USB 接口

背景 介绍如何设置仪表远程控制。

面板操作

1. 按 UTIL 键

2. 按 F2 (Interface)

3. 按 F2 (USB)

系统和设置

用户也可以设置语言选项、屏幕选项、时钟、软件和固件设置。

注：单通道和双通道的“System”软键位置不同。AFG-3021/3031 的“System”软键对应 F4，AFG-3022/3032 对应 F5。

查看和更新软件&固件版本

面板操作	1. 按 UTIL 键	UTIL
	2. 按 F3 (Cal.)	Cal. F 3
	3. 按 F2 (Software)	Software F 2
查看版本	4. 按 F1(Version)查看软件和固件版本 屏幕显示版本信息： 仪器、版本、FPGA 版次、Bootload 版本、序列号	Version F 1
更新软件&固件	5. 将包含软件/固件文件的 U 盘插入 USB host 驱动中，按 F2 (Upgrade)更新软件&固件	Upgrade F 2
注意	软件/固件使用.bin (格式：AFG***.bin)	

语言选择

背景

AFG-3021、AFG-3022、AFG-3031 和 AFG-3032 支持英语、繁体中文、简体中文。默认英语。

面板操作

1. 按 UTIL 键

2. 按 F4 (System) [AFG-3021/3031 按 F5]

3. 按 F1 (Language)

4. Language 参数变亮

5. 选择 F1(简体中文)、F2(英文)或 F3(繁体中文)

设置蜂鸣器声音

背景　　打开或关闭蜂鸣器。

面板操作

1. 按 UTIL 键

2. 按 F4 (System) [AFG-3021/3031 按 F5]

3. 按 F4 (Beep)开启或关闭蜂鸣器

4. Beep 参数变亮

屏幕休眠

背景　　屏幕休眠。按任一前面板键，屏幕恢复。

面板操作

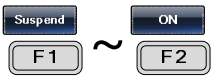
1. 按 UTIL 键

2. 按 F4 (System)[AFG-3021/3031 按 F5]

3. 按 F2 (Display Opt)

4. 按 F1 (Display)

5. 选择 F1(Suspend)或 F2(ON)开启或关闭屏幕休眠



屏幕亮度

背景 Utility 系统菜单设置屏幕亮度。

面板操作

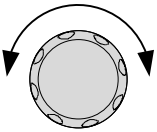
1. 按 UTIL 键

2. 按 F4 (System)[AFG-3021/3031 按 F5]

3. 按 F2 (Display Opt)

4. 按 F2 (Brightness)

使用可调旋钮设置屏幕亮度



范围	亮度	1(暗) ~ 10 (亮)

5. 按 F1 (Enter)完成设置

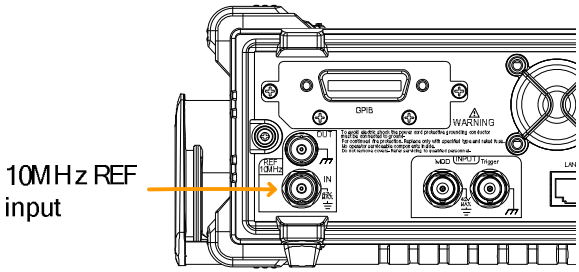
参考时钟

背景 外部 10MHz 参考信号可替代内部 10MHz 时钟信号。外部参考时钟用于增加时钟信号的精度或稳定性，也可使不同仪器同步工作在一个时钟下。详情见 200 页多台同步操作。

参考输入与机壳接地隔离，隔离电压 42Vpk。避免接地回路和其它相关干扰。

REF OUT 端提供一个内部参考时钟的同步信号，也可以同步其它设备。详情见 200 页多台同步操作。

连接



10MHz 参考输出规格	内容	规格
	输出电压	1Vp-p/50Ω 方波
	输出阻抗	50Ω, AC 耦合
	输出频率	10MHz

10MHz 参考输入规格	内容	规格
	输入电压	0.5Vp-p ~ 5Vp-p
	输入阻抗	1kΩ, 不平衡, AC 耦合
	最大允许输入	± 10Vdc
	输入频率	10MHz ±10Hz
	波形	正弦波或方波(50±5% 占空比)
	接地绝缘	42Vpk max

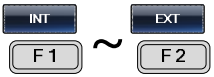
面板操作

1. 按 UTIL 键

2. 按 F4 (System)[AFG-3021/3031 按 F5]

3. 按 F3 (Clk Source)

4. 选择 F1(INT)或 F2(EXT)时钟



范围

INT	设置内部时钟为参考时钟
EXT	设置外部 10MHz 信号为参考时钟

5. 如果选择 F2(EXT)作为时钟，按 F3(EXT Sync)将仪器与外部参考信号同步

设置输出阻抗 - AFG-3021/3031

背景

AFG-3021/3031 的输出阻抗可选：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。

注意

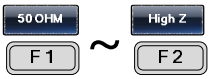
介绍如何设置 AFG-3021 和 AFG-3031 的输出阻抗。如何设置 AFG-3022 或 AFG-3032 的输出阻抗 见 193 页。

面板操作

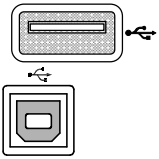
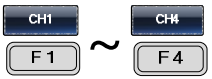
1. 按 CH1 或 CH2 键

2. 按 F4 (Load)

3. 选择 F1 (50 OHM)或 F2 (High Z)

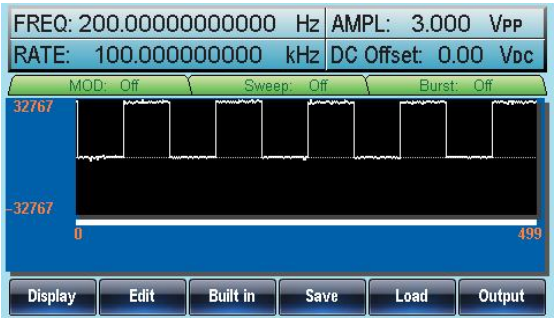


DSO 连接 -AFG-3021/3031

背景	DSO 连接使 AFG-3021/3031 和 GDS-2000 系列数字存储示波器之间进行无损数据传输。
注意	所有型号均支持 DSO 连接功能。但是单双通道机型的菜单树操作不同。此处操作仅适合 AFG-3021/3031。AFG-3022 和 AFG-3032 连接见 194 页。
面板操作	1. 将 AFG-3021/3031 的 USB host 接口连接 GDS-2000 的 USB B device 接口 
	2. 按 CH1 或 CH2 键 
	3. 按 F6 (DSOLink) 
	4. 按 F1 (Search) 
	5. 按 F1 (CH1)、F3(CH2)、F4(CH3)或 F5(CH4)选择 DSO 通道。然后屏幕显示获取的数据 

6. 片刻后 AFG-3021/3031 将自动切换至 ARB 功能，并描绘出 DSO 保存的波形

见 ARB 章节编辑或保存合成波形



双通道&多台操作

双通道章节介绍如何在双通道模式下操作仪器(仅 AFG-3022 & AFG-3032)，以及如何设置任一指定通道。多台操作章节介绍如何以主-从设置同步多台仪器。

双通道设置 192
通道相位设置 192
设置输出阻抗 193
DSO 连接 194
频率耦合 195
幅值耦合 197
通道追踪 198
多台同步 200
多台连接 200
多台设置 201

双通道设置

AFG-3022 和 AFG-3032 具有一些特殊的设置，如通道追踪、DSO 连接、输出阻抗设置和通道相位设置。

通道相位设置

背景

可以将一个通道的起始相位设成如下 4 种预设相位：

0 Phase	快速设置 0º 相位
Sync Int	同步两个通道的相位，并将相位设为 0º
Degree	设置所选通道的相位
Align Phase	对准两个通道的时基，但并不改变通道的相位偏差。换句话说，它重新校准两通道之间的相位差

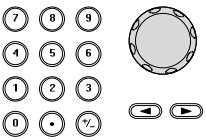
面板操作

1. 按 CH1 或 CH2 键

2. 按 F5 (Phase)

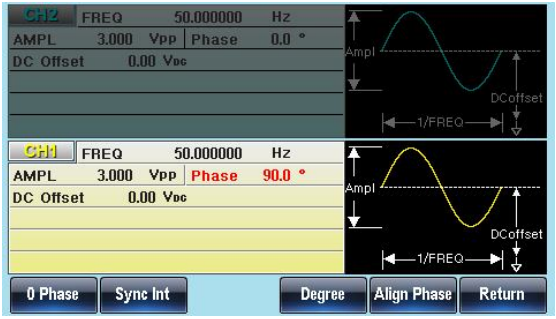
3. 按 F1 (0 Phase)、F2(Sync Int)、F4(Degree)或 F5(Align Phase)选择通道相位

4. 如果选择 Degree，使用方向键和可调旋钮或数字键盘输入相位



5. 再按 F5 (Degree)设置相位单位

范围 度数 -180 °~180° (设置所选通道的相位)



设置输出阻抗

背景 AFG-3022/AFG-3032 每个通道可选输出阻抗：50Ω 或高阻。默认 50Ω。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。

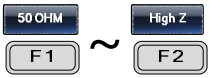
注意 如下介绍如何设置 AFG-3022 和 3032 的输出阻抗。AFG-3021/3031 的输出阻抗设置见 188 页

面板操作

1. 按 CH1 或 CH2 键

2. 按 F1 (Load)

3. 选择 F1 (50 OHM)或 F2 (High Z)

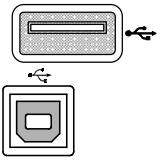


DSO 连接

背景	DSO 连接使 AFG-3022/3032 和 GDS-2000 系列数字存储示波器之间进行无损数据传输。
注意	所有型号均支持 DSO 连接功能。但是单双通道机型的菜单树操作不同。此处操作仅适合 AFG-3022 和 AFG-3032。AFG-3021/3031 连接见 189 页

面板操作

1. 将 AFG-3022/3032 的 USB host 接口连接 GDS-2000 的 USB B device 接口

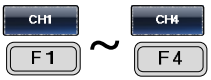


2. 按 CH1 或 CH2 键

3. 按 F6 (DSOLink)

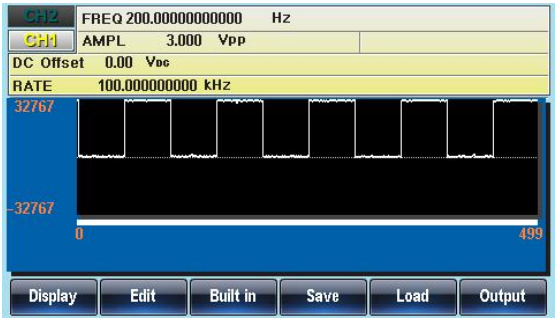
4. 按 F1 (Search)

5. 按 F1 (CH1)、F3(CH2)、F4(CH3)或 F5(CH4)选择 DSO 通道。然后屏幕显示获取的数据



6. 片刻后 AFG-30XX 将自动切换至 ARB 功能，并描绘出 DSO 保存的波形

   见 ARB 章节编辑或保存合成波形



频率耦合

背景

频率耦合：以所选通道的频偏或频率比值来表示未选通道的频率。

面板操作

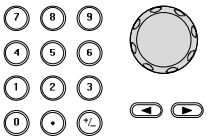
1. 按 UTIL 键

2. 按 F5 (Dual Ch)

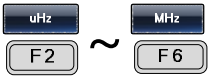
3. 按 F1 (Freq Cpl)

4. 按 F2 (Offset)，以所选通道的频偏来表示未选通道的频率

使用方向键和可调旋钮或数字键盘输入频偏

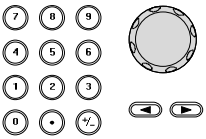


按 F2~F6 选择频偏单位



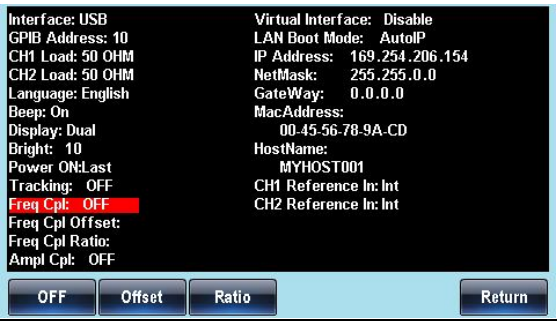
5. 按 F3 (Ratio)，以所选通道的频率比值来表示未选通道的频率

使用方向键和可调旋钮或数字键盘输入比值



按 F5 (Enter)确认

6. 或按 F1 (OFF)关闭频率耦合



范围	频偏范围	-30MHz ~ 30MHz (-20MHz ~ 20MHz)
	频偏分辨率	1uHz. 未选通道频率 = 所选通道频率 + 偏移，所选通道的频率为固定值
	比值范围	1000.000 ~ 0.001
	比值分辨率	0.001. 比值 =未选通道频率/所选通道频率，所选通道的频率为固定值

幅值耦合

背景

两个通道的幅值耦合。当一个通道的幅值设置发生改变，同样的设置将自动影响另一通道。

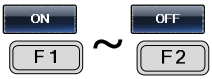
面板操作

1. 按 UTIL 键

2. 按 F5 (Dual Ch)

3. 按 F2 (Ampl Cpl)

4. 按 F1 开启幅值耦合或 F2 关闭幅值耦合



通道追踪

背景

通道追踪：一个通道的波形输出保持与另一通道设置一致。当该通道的设置发生改变，这些改变将反应到另一通道。该功能也可以完成反向追踪，即该通道的输出与另一通道正好相反。

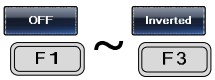
面板操作

1. 按 UTIL 键

2. 按 F5 (Dual Ch)

3. 按 F3 (Tracking)

4. 按 F1 (OFF)、F2 (ON)或 F3(Inverted)选择追踪功能




Interface: USB
GPIB Address: 10
CH1 Load: 50 OHM
CH2 Load: 50 OHM
Language: English
Beep: On
Display: Dual
Bright: 10
Power ON:Last
Tracking: OFF
Freq Cpl: OFF
Freq Cpl Offset:
Freq Cpl Ratio:
Ampl Cpl: OFF
Virtual Interface: Disable
LAN Boot Mode: AutoIP
IP Address: 169.254.206.154
NetMask: 255.255.0.0
GateWay: 0.0.0.0
MacAddress:
00-45-56-78-9A-CD
HostName:
MYHOST001
CH1 Reference In: Int
CH2 Reference In: Int
OFF
ON
Inverted
Return

多台同步

多台仪器与时钟同步，时钟信号可以是外部参考信号或来自主控 AFG-30XX 的内部参考输出。

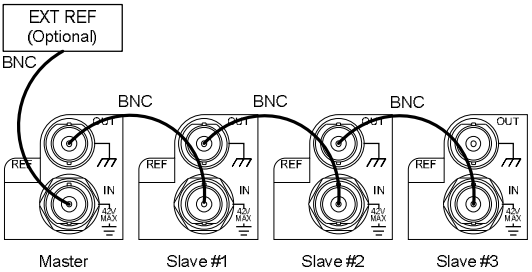
多台连接

背景

虽然不同的连接方式均可以完成多台同步操作，但所选方式决定了同步的仪器数量和同步时钟的传播时间。下面详细介绍两种连接方式：

菊花链

菊花链方式最多可以同步 4 台仪器。BNC 线连接主控机的 REF OUT 端和从属机#1 的 REF IN 端。从属机#1 的 REF OUT 端连接从属机#2 的 REF IN 端。同理直至接到从属机#3



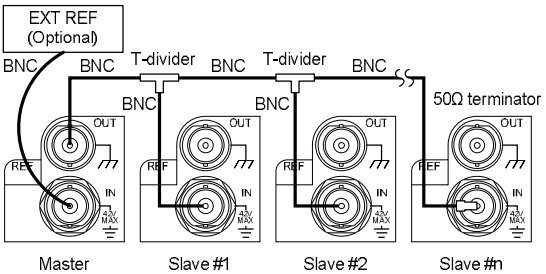
注：菊花链方式的最大相位延迟为：

最大相位延迟(ns)= 39+(N-2)*39 ±25nS

其中 N 为总连接台数，最多 4 台

并联连接

并联方式：BNC 线连接主控机的 REF OUT 端和 T-divider。T-divider 然后连接从属机#1 的 REF IN 端和第二个 T-divider。同理直至最后一个从属机。最后一个从属机的 REF IN 端接 50Ω。此方式最多可连接 6 台



注：并联方式的最大相位延迟为:

最大相位延迟(ns) = (N-1)*6 ±25nS

其中 N 为总连接台数，最多 6 台

注意

如果主控机使用外部参考信号，将外部参考信号接至后面板 REF IN 端

10MHz 参考输入规格：	
输入电压	0.5Vp-p~5Vp-p
输入阻抗	1kΩ, 不平衡, AC 耦合
最大允许输入	± 10Vdc
输入频率	10MHz ±10Hz
波形	正弦波或方波(50± 5%占空比) 10MHz, 幅值 0.5Vpp~5Vpp

多台设置

背景	设置相连的主控机和从属机，详情见 186 页。
注意	使用外部参考功能时，不支持 ARB 和双通道功能。详情见 186 页参考时钟章节

面板操作

1. 按 UTIL 键

2. 按 F4 (System)

3. 按 F3 (Clk Source)

4. 设置主控机：

内部信号，按 F1 (INT)

外部信号，按 F2 (EXT)

按 F3 (EXT Sync)，外部信号开始同步主机

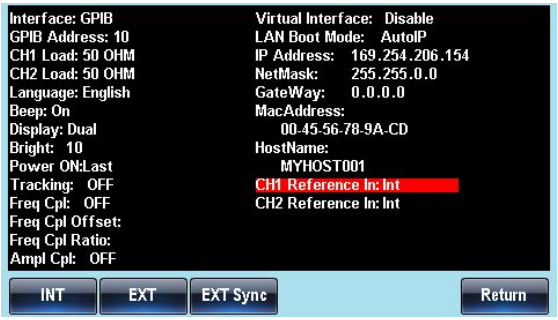
5. 设置从属机：

每台从属机按 F2 (EXT)*。从属机接收来自主控机的参考信号

每台从属机按 F3 (EXT Sync)

*返回独立操作

6. Clk Source 设为 F1 (INT)，从属机回到独立操作



任意波

AFG-30XX 系列能够创建自定义的任意波形。每个波形最多包含 8M 数据点。每个数据点垂直范围在 65535 (±32767)以内，采样率 250MSa/s。

插入内置波形 206

插入内置波形 206

插入 DC 波形 209

插入脉冲波形 211

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设置水平显示范围 214

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存储/调取任意波形 239
将波形保存至内存 239
将波形保存至 U 盘 240
从内存调取波形 243
从 U 盘调取波形 246

插入内置波形

AFG-30XX 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、sin(x)/x、指数上升、指数下降、脉冲波和 DC 波形。总计 65 种内置波形。波形图示见 469 页。

插入内置波形

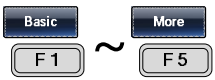
可按照如下步骤插入除 DC 和脉冲波以外的任何内置 ARB 波形。插入 DC 或脉冲波见 209 页&211 页。

面板操作

1. 按 ARB 键

2. 按 F3(Built in)

3. 按 F1~F5 选择内置波形



Basic	Sine, Square, Ramp, Sin(x)/x, Exponential Rise, Exponential Fall, Pulse, DC
Common 1	Absatan, Havercosine, Sinever, Abssin, Haversine, Stair_down, Abssinehalf, N_pulse, Stair_UD, Ampalt, Negramp, Stair_up

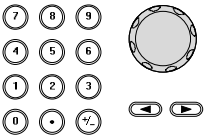
Common 2	Attalt, Rectpuls1, Stepresp, Diric_even, Roundhalf, Trapezia, Diric_odd, Sawtoot, Tripuls1, Gauspuls1, Sinetra
Math	Dlorentz, ln, Sqrt, Since, Lorentz, Xsquare, Gauss, Since
Trigonometric	Arccos, Arctan, Sech, Arccot, Arctanh, Sinh, Arccsc, Cosh, Tan, Arcsec, Cot, Tanh, Arcsin, Csc, Arcsinh, Sec
Window	Barthannwin, Chebwin, Kaiser, Bartlett, Flattopwin, Triang, Blackman, Hamming, Tukeywin, Bohmanwin, Hann

4. 所选内置波形以红色显示。其余 ARB 波形显示绿色

5. 按 F1(Start)

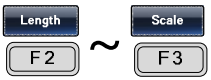
6. Start 参数变亮

7. 使用方向键和可调旋钮或数字键盘输入波形的起始地址



8. 按 F5 (Enter)确认起始点

9. 重复 Step 5~8，设置 Length (F2)和 Scale (F3)



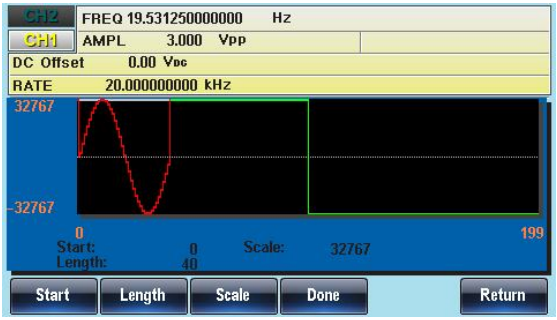
- Length 表示 x 方向拉伸多少个波形点
- Scale 表示以中心线为基准，波形的垂直刻度

范围	项	设置范围
	Start	0 ~ 8388606
	Length	2 ~ 8388608
	Scale	1 ~ 32767

10. 按 F4 (Done)完成操作

11. 按 F6 (Return)返回上级菜单

例如创建一个正弦波，start：0，Length：40，Scale：32767



插入 DC 波形

面板操作

1. 按 ARB 键

2. 按 F3 (Built in)

3. 按 F1(Basic)

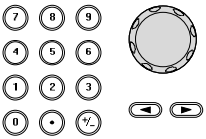
4. 按 F5 (More)

5. 按 F3 (DC)

6. 按 F1 (Start)

7. Start 参数变亮

8. 使用方向键和可调旋钮或数字键盘输入 DC 波形的起始地址



9. 按 F5 (Enter)确认起始点

10. 重复 Step 4~9，设置 Length (F2)和 Data (F3)

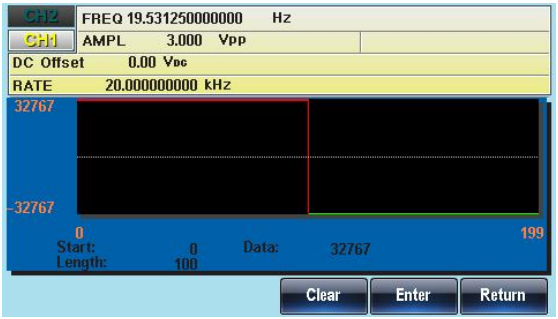
- Length 表示 x 方向拉伸多少个 DC 波形点
- Data 表示以零电平为基准，DC 波形的垂直准位

范围	项	设置范围
	Start	0 ~ 8388606
	Length	2 ~ 8388608
	Data	-32767 ~ 32767

11. 按 F5 (Done)完成操作

12. 按 F6 (Return)返回上级菜单

例如创建一个 DC 波形，start：0，Length：524288，Data：10000



插入脉冲波形

按照如下步骤插入脉冲波形。

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 F1(Basic)

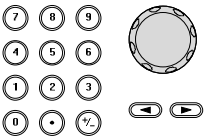
4. 按 F5 (More)

5. 按 F4 (Pulse)

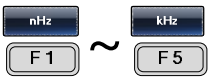
6. 按 F1 (Frequency)

7. Pulse Freq 参数变亮

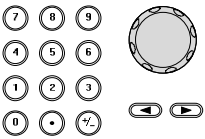
8. 使用方向键和可调旋钮或数字键盘输入脉冲频率



9. 按 F1~F5 选择频率单位



10. 按 F2 (DUTY)，使用数字键盘或可调旋钮选择占空比

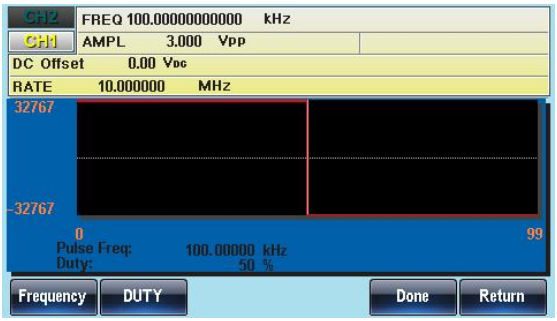


11. 按 F5 (%)选择单位

12. 按 F5 (Done)完成操作

13. 按 F6 (Return)返回上级菜单

例如创建一个脉冲波形，100kHz 频率，占空比 50%



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

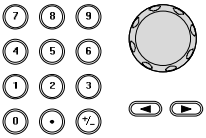
设置视窗边界

Length 设置决定显示视窗宽度。Horizontal Start 参数设置显示视窗的起始位置。Center 参数设置视窗中心点

4. 按(F2) Length

5. Length 参数变亮

6. 使用方向键和可调旋钮或数字键盘输入 Length 值
   - F4 (clear)取消数值

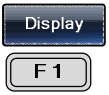
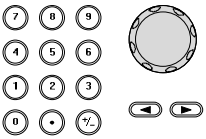


	7. 按 F5 (Enter)保存设置	Enter F5
设置起始点或中心点	8. 重复 Step 4~8，设置 Start (F1)或 Center F3 • Start 软键用于编辑水平参数	Start F1 ~ Center F3
Zoom in	9. 按 F4 (Zoom In)放大任意波形。每按一次长度减小一半。最小允许长度 3	Zoom in F4
Zoom out	10. 按 F5 (Zoom out)沿波形中心点缩小任意波形。每按一次长度增加一倍。最大允许长度 8388608	Zoom out F5

例如任意正弦波，start0，length40，center20

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：设置上下限或设置中心点。

面板操作	1. 按 ARB 键	
	2. 按 F1 (Display)	
	3. 按 F2(Vertical)	
设置下限	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下限 • F4 (clear)取消数值	
	7. 按 F5 (Enter)保存设置	
设置上限	8. 重复 Step 4~8，设置 High (F2)	
设置中心点	9. 如果需要，重复 Step 4~8，设置 Center (F3)	

Zoom

10. 按 F4 (Zoom In)沿波形中心放大任意波。每按一次幅值减小一半。最小允许垂直下限-2，最小垂直上限 2

11. 按 F5 (Zoom out)垂直缩小波形。每按一次幅值增加一倍。最大允许垂直下限-32767，最大垂直上限+32767

例如正弦波，垂直下限-16384，垂直上限 16384，center0。注：由于垂直显示边界限制，正弦波部分剪除

页面浏览(下页)

背景

观察波形时，使用 Next/Back Page 功能前/后移动显示窗口。

面板操作

1. 按 ARB 键

2. 按 F1 (Display)

3. 按 F3 (Next Page)向后移动一个观察长度

New Horizon From*=Horizon From + Length
New Center=Center + Length
*Horizon From +Length ≤ 8388608

按 Next Page 后，屏幕显示如下：

Horizon From: 0 → 45

Length: 45

Center:22→ 67

页面浏览(上页)

背景

观察波形时，使用 Next/Back Page 功能前/后移动显示窗口。

面板操作

1. 按 ARB 键

2. 按 F1 (Display)

3. 按 F4 (Back Page)向前移动一个观察长度

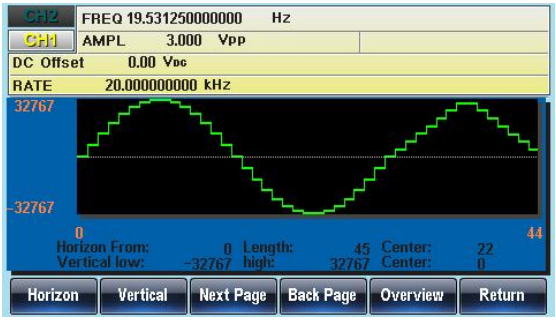
New Horizon From*＝Horizon From - Length
New Center*=Center– Length
*Length until 0

按 Back Page 后，屏幕显示如下：

Horizon From: 45→ 0

Length: 45

Center:67→ 22



显示整个波形

面板操作

1. 按 ARB 键

2. 按 F1 (Display)

3. 按 F5 (Overview)显示整个波形

水平：0~8388607
垂直：32767~ -328767

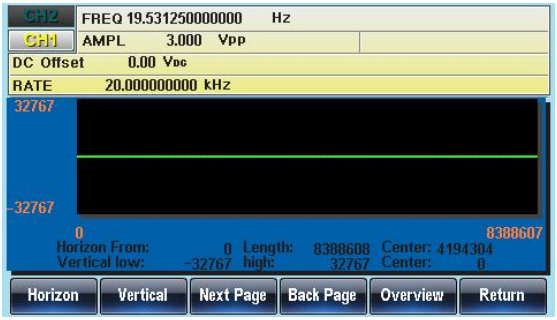
按 Overview 后，屏幕显示如下：

Horizon From: 0

Length: 8388608

Center: 4194304

Vertical low/high: ±32767



编辑任意波形

增加一个点

背景

AFG-30XX 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

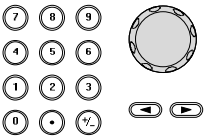
2. 按 F2 (Edit)

3. 按 F1 (Point)

4. 按 F1 (Address)

5. Address 参数变亮

6. 使用方向键和可调旋钮或数字键盘输入地址

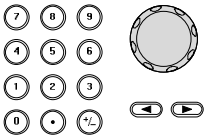


7. 按 F5 (Enter)保存设置

8. 按 F2 (Data)

9. Data 参数变亮

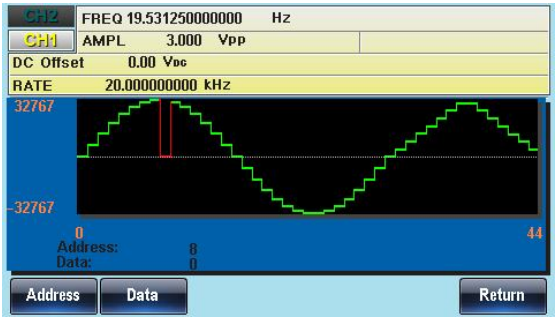
10. 使用方向键和可调旋钮或数字键盘输入数值



11. 按 F5 (Enter)保存参数

12. 按 F6 (Return)返回 ARB 菜单

如下图 Address8，Data0。编辑区域显示红色



增加一条线

背景

AFG-30XX 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

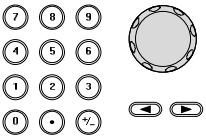
2. 按 F2 (Edit)

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)保存设置

8. 重复 Step 4~7，设置 Start Data (F2)、Stop Address (F3)和 Stop Data (F4)

9. 按 F5 (Done)确认编辑

10. 按 F6 (Return)返回上级菜单

创建一条红线，参数如下：

Start Address: 8, Start Data: 0

Stop Address: 15, Stop Data: 0

复制波形

面板操作

1. 按 ARB 键

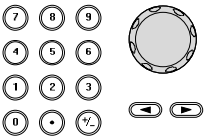
2. 按 F2 (Edit)

3. 按 F3 (Copy)

4. 按 F1 (Start)

5. Copy From 参数变亮

6. 使用方向键和可调旋钮或数字键盘输入复制的波形地址



7. 按 F5 (Enter)保存设置

8. 重复 Step 4~7，设置 Length (F2)和 Paste To (F3)

9. 按 F5 (Done)确认

10. 按 F6 (Return)返回上级菜单

点 30~45 的波形部分复制到点 0~15：

Copy From: 30

Length: 15

To: 0

清除波形

面板操作

1. 按 ARB 键

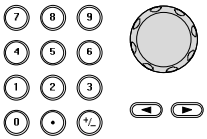
2. 按 F2 (Edit)

3. 按 F4 (Clear)

4. 按 F1 (Start)

5. Clear From 参数变亮

6. 使用方向键和可调旋钮或数字键盘输入需清除的波形地址



7. 按 F5 (Enter)保存设置

8. 重复 Step 4~8，设置 Length (F2)

9. 按 F3 (Done)清除部分任意波形

10. 按 F6 (Return)返回上级菜单

全部删除

11. 按 F5 (ALL)删除全部波形

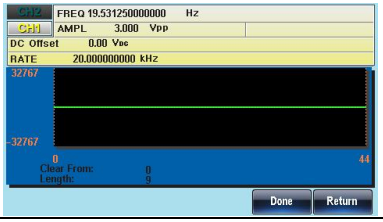
12. 再按 F5 (Done)确认删除

13. 按 F6 (Return)返回上级菜单

从 0 清除，长度 15

删除该部分后：

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

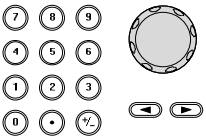
2. 按 F2 (Edit)

3. 按 F5 (Protect)

4. 按 F2 (Start)

5. Protect Start 参数变亮

6. 使用方向键和可调旋钮或数字键盘输入保护的起始地址



7. 按 F5 (Enter)保存设置

8. 重复 Step 4~8，设置 Length (F3)

9. 按 F5 (Done)确认保护区域

10. 保护区域显示橙色

全部保护

11. 按 F1 (ALL)保护整个波形

12. 按 F6 (Done)确认

撤销全部保护

13. 按 F5 (Unprotect)解除整个波形的保护

14. 按 F6 (Done)确认

15. 波形背景变回黑色。“Protect Off”参数呈灰色

波形保护区背景呈橘色，如图：

Protect Start:0, Length: 15.

输出任意波形

信号发生器最多可输出 8Mpts (0~8388607)的任意波形，可以指定循环次数也可以无限次循环。

输出任意长度的波形

面板操作

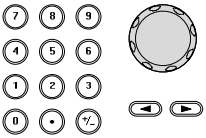
1. 按 ARB 键

2. 按 F6 (Output)

3. 按 F1 (Start)

4. Start 参数变亮

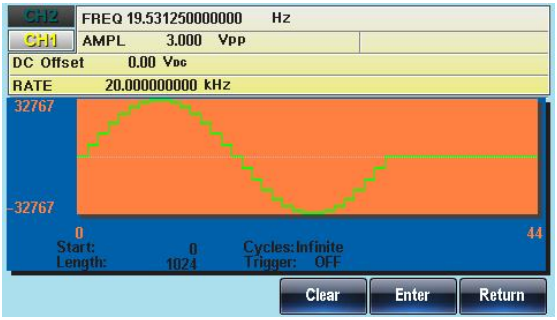
5. 使用方向键和可调旋钮或数字键盘输入起始地址



6. 按 F5 (Enter)确认起始点

7. 重复 Step 4~7，设置 Length (F2)

前面板端子输出 0~1024 长度的波形，如图：



任意波形的门限输出

背景

当设为门限触发时，使用后面板触发输入可以输出 ARB 波形。门限触发可在正或负触发准位输出任意波形。

面板操作

1. 按 ARB 键

2. 按 F6 (Output)

3. 定义任意波输出的 Start 和 Length 见 232 页

注：改变 length 将改变脉冲波的占空比/频率

4. 按 F3 (Gate)

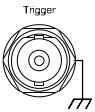
5. 选择正或负触发极性

- 选择门限模式时，禁用任何之前的触发输出
- 选择不同的输出模式均可关闭门限模式，如 Ncycle 或 Infinite

门限触发

6. 在后面板 TRIG 输入端接收高或低 TTL 准位输入之后，将输出 ARB 波形

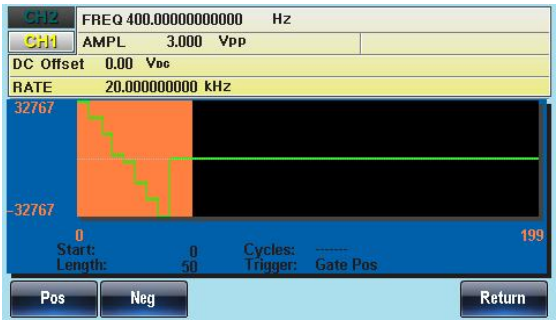
TRIG Input



注：在输入一个信号到触发输入端之前，请确认按下 Output 键，且 OUTPUT 指示灯变亮

7. 按 F6 (Return)返回上级菜单

触发设为 Gate Pos，如图：



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 功能使用手动触发或外部触发。
范围	1~8388607 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 见 232 页

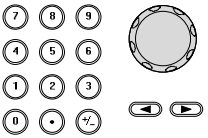
注：改变 length 将改变脉冲波的占空比/频率

4. 按 F4 (N Cycle)

5. 按 F1 (Cycles)

6. Cycles 参数变亮

7. 使用方向键和可调旋钮或数字键盘输入循环次数



8. 按 F5 (Enter)确认循环次数

手动触发

9. 按 Manual (F4)设置手动触发

10. 按 Trigger (F5)内部触发一次输出

注：在按 F5 (Trigger)之前，请确认按下 Output 键，且 OUTPUT 指示灯变亮

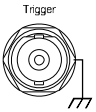
11. 按 F6 (Return)返回上级菜单

外部触发

12. 按 EXT (F3)，使用后面板 TRIG 输入端接收的外部信号触发

13. 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)

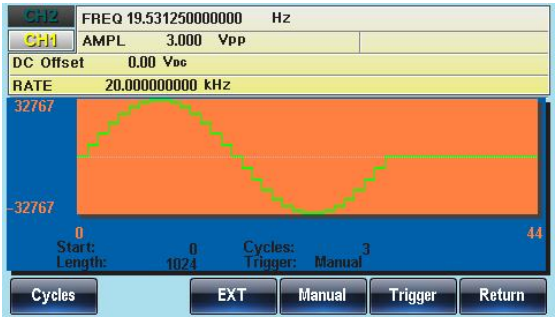
TRIG Input



注：在输入一个信号到触发输入端之前，请确认按下 Output 键，且 OUTPUT 指示灯变亮

14. 按 F6 (Return)返回上级菜单

前面板端输出 3 次循环波形，如图：



输出任意波形 – 无限循环

背景　　无限次重复输出任意波形。

面板操作

1. 按 ARB 键

2. 按 F6 (Output)

3. 定义任意波输出的 Start 和 Length　　见 232 页

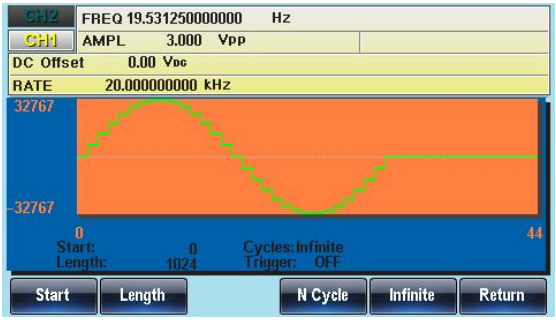
注：改变 length 将改变脉冲波的占空比/频率

4. 按 F5 (Infinite)无限次输出任意波形

注：按 Output 键输出 ARB 波形

5. 按 F6 (Return)返回上级菜单

前面板端输出无限次循环波形，如图：



存储/调取任意波形

AFG-30XX 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。

将波形保存至内存

面板操作

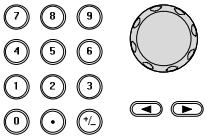
1. 按 ARB 键

2. 按 F4 (Save)

3. 按 F1 (Start)

4. Start 参数变亮

5. 使用方向键和可调旋钮或数字键盘输入起始地址



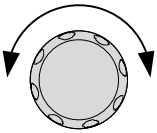
6. 按 F5 (Enter)确认起始点

7. 重复 Step 4~6，设置 Length (F2)

8. 按 F3 (Memory)

9. 使用可调旋钮选择内存

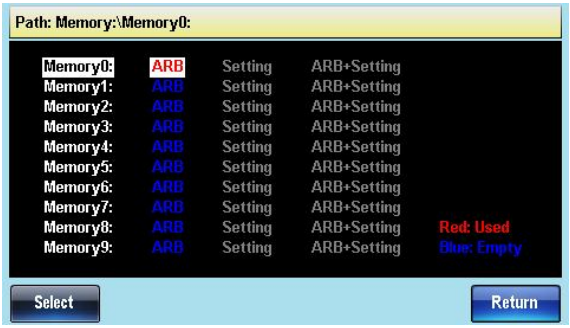
   ARB0~ARB9



10. 按 F1 (Select)将波形保存至所选文件

11. 按 F6 (Return)返回上级菜单

使用可调旋钮选择文件 ARB1，如图：



将文件保存至 U 盘

面板操作

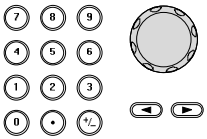
1. 按 ARB 键

2. 按 F4 (Save)

3. 按 F1 (Start)

4. Start 参数变亮

5. 使用方向键和可调旋钮或数字键盘输入起始地址

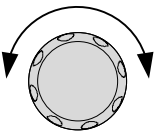


6. 按 F5 (Enter)确认起始点

7. 重复 Step 4~6，设置 Length (F2)

8. 按 F4 (USB)

9. 使用可调旋钮浏览文件系统

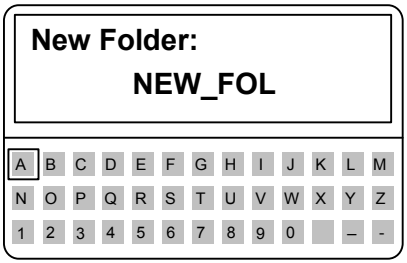


10. 按 Select 选择目录或文件名

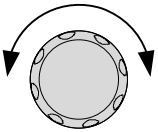
创建文件夹

11. 按 F2 (New Folder)

12. 文件编辑器显示默认文件夹名 “NEW_FOL”



13. 使用可调旋钮移动光标



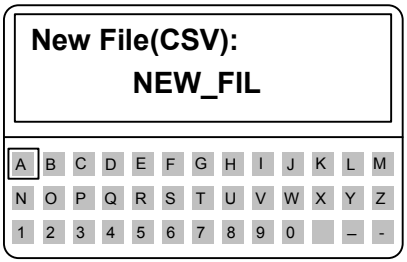
14. 使用 F1 (Enter Char)或 F2 (Backspace)创建文件夹名称

15. 按 F5 (Save)保存文件夹名称

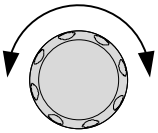
创建新文件

16. 按 F3 (New File)

17. 文件编辑器显示默认文件名“NEW_FIL”



18. 使用可调旋钮移动光标



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

20. 按 F5 (Save)保存文件名

在根目录下创建文件夹"ABC"和文件 AFG.CSV，如图：

从内存调取波形

面板操作

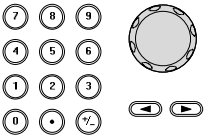
1. 按 ARB 键

2. 按 F5 (Load)

3. 按 F1 (To)选择需调取的波形起始点
   - 默认 0

4. Load To 参数变亮

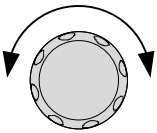
5. 使用方向键和可调旋钮或数字键盘输入起始点



6. 按 F5 (Enter)确认起始点

7. 按 F3 (Memory)

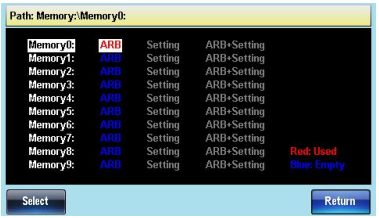
8. 使用可调旋钮浏览文件系统

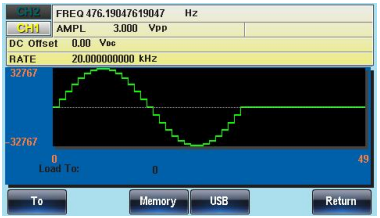


9. 按 Select 选择目录或文件名

立即调取 ARB 波形

使用可调旋钮选择文件 ARB1，调取位置 0，如图：


Path: Memory:\Memory0:
Memory0: ARB Setting ARB+Setting
Memory1: ARB Setting ARB+Setting
Memory2: ARB Setting ARB+Setting
Memory3: ARB Setting ARB+Setting
Memory4: ARB Setting ARB+Setting
Memory5: ARB Setting ARB+Setting
Memory6: ARB Setting ARB+Setting
Memory7: ARB Setting ARB+Setting
Memory8: ARB Setting ARB+Setting
Memory9: ARB Setting ARB+Setting
Red: Used
Blue: Empty
Select
Return


CH2
FREQ 476.19047619047 Hz
CH1
AMPL 3.000 Vpp
DC Offset 0.00 Vac
RATE 20.000000000 kHz
32767
-32767
0
49
Load To:
0
To
Memory
USB
Return

从 U 盘调取波形

面板操作

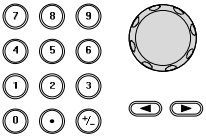
1. 按 ARB 键

2. 按 F5 (Load)

3. 按 F1 (To)选择需调取的波形起始点
   - 默认 0

4. Load To 参数变亮

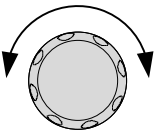
5. 使用方向键和可调旋钮或数字键盘输入起始点



6. 按 F5 (Enter)确认起始点

7. 按 F4 (USB)

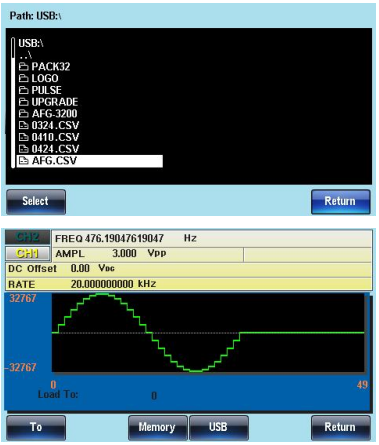
8. 使用可调旋钮选择文件名



9. 按 F1 (Select)选择需调取的文件

立即调取 ARB 文件

使用可调旋钮选择文件 AFG.CSV，调取位置 0，如图：



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建立远程连接

AFG-3021、AFG-3022、AFG-3031 和 AFG-3032 支持 USB、LAN 和 GPIB 远程连接。

设置 USB 接口

USB 设置	PC 接口	Type A, host

AFG-30XX 接口	Type B, slave
速度	1.1/2.0 (full speed)

面板操作

1. 从 GW Instek 网站下载和安装 USB 驱动 www.gwinstek.com。进入产品>信号发生器>任意波形信号发生器>AFG-30XX 页面找到 USB 驱动设置文件

   双击驱动文件，根据安装说明安装驱动

2. 按 Utility 键、Interface (F2)和 USB (F2)

3. USB 线连接后面板 USB B (slave)接口

设置 GPIB 接口

GPIB 设置	接口	24 pin Female
	GPIB 地址	1-30

GPIB 限制

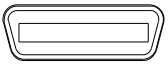
- 最多连接 15 台设备，电缆总长不超过 20m，每台设备间距 2m
- 每台设备具有独立地址
- 至少启动 2/3 的设备
- 不允许环状或并联连接

引脚分配

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

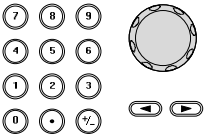
面板操作

1. 将 GPIB 线连接后面板 GPIB 接口



2. 按 Utility 键、Interface (F2)和 GPIB(F1)。按 Address (F1)

3. 使用可调旋钮或数字键盘选择一个地址



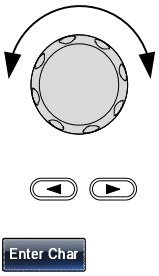
4. 按 Done (F5)确认

设置 LAN 接口

LAN 设置	MAC 地址 仪器名称 用户密码 仪器 IP 地址 HTTP Port 80 (固定)	域名 DNS IP 地址 网关 IP 地址 子网掩码
面板操作	1. 将 LAN 线连接后面板 LAN 接口 	
	2. 按 Utility 键、Interface (F2)和 LAN (F3) 	
DHCP 连接	对于使用 DHCP 服务器的网络，DHCP 自动设置 IP 地址	
	3. 按 Config (F2)、DHCP (F1)、Done(F5)。再按 Done(F5) 	

自动 IP 连接	当以太网线直接连接 Host PC 时，使用 Auto IP 自动设置 IP 地址	
	4. 按 Config (F2)、Auto IP (F2)、Done(F5)。再按 Done(F5)	Config AutoIP Done Done
手动 IP 连接	手动设置 IP 地址	
	5. 按 Config (F2)、Manual (F3)	Config Manual
	6. 按 IP Addr (F1)，使用数字键盘设置 IP 地址。按 Done (F1) 完成设置 IP 地址	IP Addr Done
	7. 按 NetMask (F2)，使用数字键盘设置 Mask 地址。按 Done (F1)完成设置	Net Mask Done
	8. 按 Gateway (F3)，使用数字键盘设置网关地址。按 Done (F1)完成设置	Gateway Done
	9. 按 Done (F5)设置手动 IP 地址，并返回 LAN 接口菜单。再按 Done(F5)	Done Done
设置 Host 名	10. 按 Host Name (F4)	Host Name

11. 使用可调旋钮、方向键和软键输入 Host 名。可调旋钮点亮字符，按 Enter Char (F1)选择字符

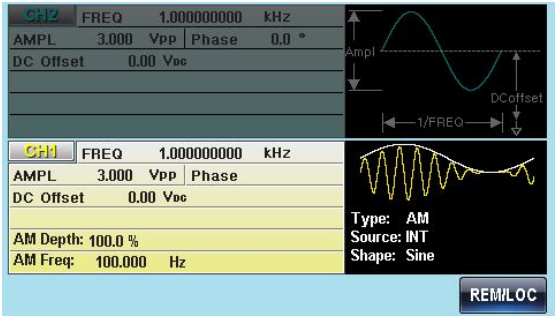


12. 按 Done (F5)完成设置。再按 Done(F5)

远程控制端口连接实例

AFG 设置	设置 USB 接口(见 249 页)，将 AFG 与 PC 相连。
终端应用	调用终端应用，如 MTTTY (Multi-Threaded TTY)。根据 AFG-30XX 的 COM 分配，设置 COM 口。 检测 COM 端口号，见 PC 的设备管理器。对于 WinXP，进入 Control panel → System → Hardware tab。
功能检测	在终端输入查询指令： *idn? 返回制造商、型号、序列号和固件版本，格式如下： GW INSTEK,AFG-3032,SN:XXXXXXXX,Vm.mm
显示	远程连接确立后，除 F6 之外所有面板键均被锁定。

1. 按 REM/LOCK (F6)，信号发生器返回本地模式


CH2
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase 0.0 °
DC Offset 0.00 VDC
Ampl
DCoffset
1/FREQ
CH1
FREQ 1.000000000 kHz
AMPL 3.000 Vpp
Phase
DC Offset 0.00 VDC
AM Depth: 100.0 %
AM Freq: 100.000 Hz
Type: AM
Source: INT
Shape: Sine
REM/LOC

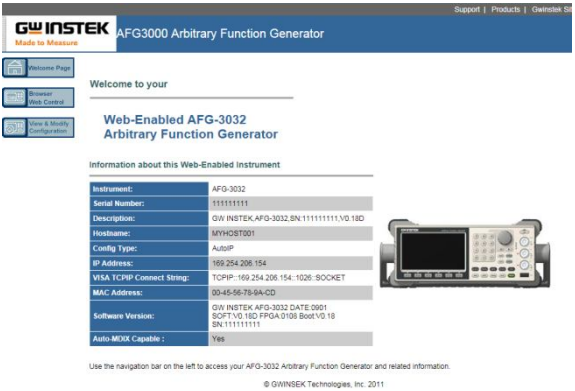
浏览器控制接口

AFG-30XX 提供一个远程控制的浏览器页面。

介绍

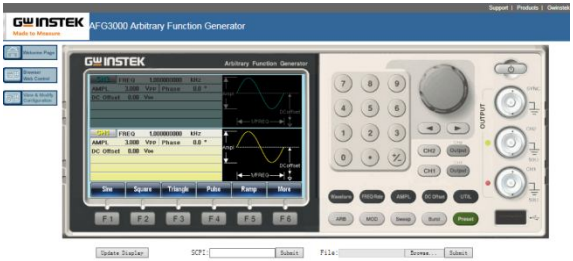
欢迎页面

欢迎页面为浏览器控制的主页面。该页列出仪器信息和 LAN 设置。它也可以链接到 Browser Web Control 和 View & Modify Configuration 页面。



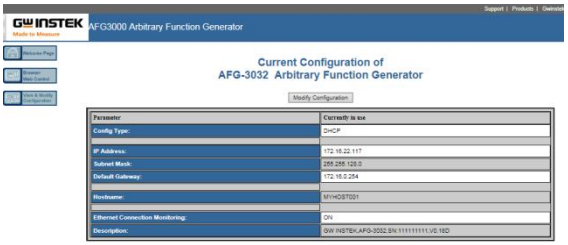
Browser Web Control

浏览器 Web 控制可以通过 LAN 远程控制和查看仪器。由鼠标控制虚拟面板进而达到控制仪器的作用。SCPI 控制通过 SCPI 命令输入或通过 SCPI 命令文件运行。



View & Modify Configuration

View & Modify Configuration 页面显示所有 LAN 设置和允许编辑的内容



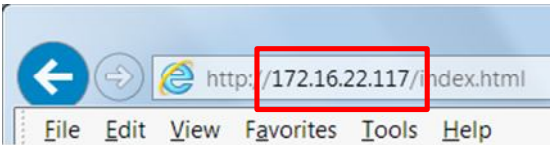
操作

1. 将 AFG-30XX 接口设为 LAN，并与 LAN 相连或直接与 PC 相连(如果 LAN 接口设为 Auto IP)

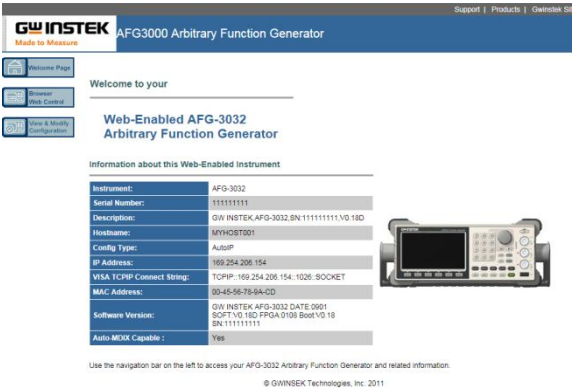
   详情见 252 页 LAN 设置

2. 下一步开启虚拟界面。按 Utility 键、Interface (F2)、LAN (F3)和 Remote (F1)，开启/关闭虚拟界面

3. 在浏览器的地址栏输入仪器的 IP 地址

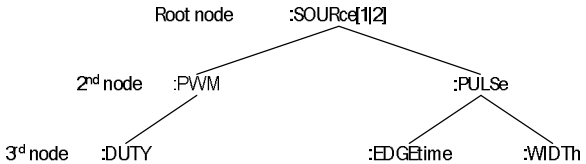


4. 浏览器显示欢迎页面



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 | 2] root node and the :PWM and :PULSe sub nodes.

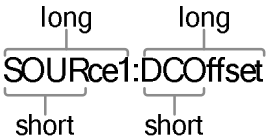


Command types	Commands can be separated in to three distinct types, simple commands, compound commands and queries.	
	Simple	A single command with/without a parameter
	Example	*OPC
	Compound	Two or more commands separated by a colon (:) with/without a parameter
	Example	SOURce1:PULSe:WIDTh

	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	SOURce1:DCOffset < *offset*>LF 1 2 3 4 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

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488.2 常见指令

*IDN? System Query

Description	Returns the function generator manufacturer, model number, serial number and firmware version number in the following format: GW INSTEK,AFG-3032,SN:XXXXXXXX,Vm.mm
Query Syntax	**IDN?**
Return parameter	<string>
Example	***IDN?** GW INSTEK,AFG-3032,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.	

*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-30XX, 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**

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	Operation complete bit	4	Execution Error

	1	Not Used	5	Command Error
	2	Query Error	6	Not Used
	3	Device Error	7	Power On

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

* The Master Summary (MSS) bit cannot be used to set itself.

Query Example ***SRE?**

12

Returns the bit weight of the status byte enable register.

*PSC System Command

Description

The Power-On Status Clear command is used to clear a number enable registers at power-on.

The following enable register groups are cleared when the *PSC command is enabled:

Questionable data enable register

Standard operation enabled register

Status byte condition enable register

Standard event enable register

Syntax ***PSC {OFF|ON}**

Parameter

OFF	Disables PSC.
ON	Enables PSC.

Example ***PSCOFF**

Disables the Power-On Status Clear function.

Query Syntax ***PSC?**

Return Parameter	0	PSC disabled
	1	PSC enabled

Example

***PSC?**

0

PSC is disabled.

STATus:QUEStionable:CONDition? System Command

Description	Reads the Questionable Status Condition register. The bit weight of the register is returned.
Note	This command will not clear the Status Questionable Condition register.
Query Syntax	**STATus:QUEStionable:CONDition?**

Return Parameter	Bit	Register	Bit	Register
	0	Voltage overload	4	Over temperature
	5	Loop unlock	7	Ext Mod Overload
	8	Cal Error	9	External Reference

Query Example

STAT:QUES:COND?

0

Returns the bit weight of the questionable status condition register (bit 0). Indicates that there are no errors.

STATus:QUEStionable:EVENt? System Command

Description	Reads and clears the Questionable Status Event register. The bit weight of the register is returned.
Query Syntax	**STATus:QUEStionable:EVENt?**

Return Parameter

Bit	Register	Bit	Register
0	Voltage overload	4	Over temperature
5	Loop unlock	7	Ext Mod Overload
8	Cal Error	9	External Reference

Query Example **STAT:QUES:EVEN?**

16

Returns the bit weight of the questionable status event register (bit 0). Indicates that an over temperature (bit 4) event has occurred.

STATus:QUEStionable:ENABle System Command

Description	This command determines which events in the QuestionableStatus Register group are allowed to set the Questionable Data bit in the Status Byte register.
Syntax	**STATus:QUEStionable:ENABle<enable value>**
Parameter	<enable value> 0~255

Example	**STAT:QUES:ENAB17** Sets a bit weight of 17 (bits 0 and 4). I.e, enables voltage overload and over temperature bits.
Query Syntax	**STATus:QUEStionable:ENABle?**

Return Parameter	Bit	Register	Bit	Register
	0	Voltage overload	4	Over temperature
	5	Loop unlock	7	Ext Mod Overload
	8	Cal Error	9	External Reference

Query Example	**STAT:QUES:ENAB?** **17** Returns the bit weight of the questionable status enable register.

STATus:PRESet System Command

Description	Clears the Questionable Status Enable registers.
Syntax	**STATus:PRESet**
Example	**STAT:PRES** Clears the Questionable Status Enable registers.

系统指令

SYSTem:ERRor? System Query

Description	Reads an error from the error queue. See page 457 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.	

SYSTem:INTerface System Command

Description	Selects the remote interface. USB is the factory default.
Note	There is no interface query.
Syntax	**SYSTem:INTerface {GPIB|LAN|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.
Syntax	**SYSTem:REMote**
Example	**SYST:REM**

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 "CHIN", "ENF" or "TRCH".
Note	Only one language can be set.
Syntax	**SYSTem:LANGuage {CHINese|ENGlish|TRCHinese}**
Example	**SYST:LANG ENG** Sets the display language to English.
Query Syntax	**SYSTem:LANGuage?**

Return Parameter	CHIN	Chinese
	ENG	English

	TRCH	Traditional Chinese

Query Example **SYST:LANG?**

ENG

The current language is English.

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-3032 VX.XXX_XXXX FPGA:XXXX BootLoad:XXXX

Returns the date and version for that date.

应用指令

The APPLy command has 8 different types of outputs (Sine, Square, Ramp, Pulse, Noise, Triangle, Harmonic, 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 OUTP[1|2] 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 ifthe frequency has been specified and offset can only be specified if amplitude has been set. For the example:

SOURce[1|2]: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 SOURce[1|2]: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|2]: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|2]:APPLy:SINusoid [<frequency> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	1μHz~30MHz (20MHZ AFG-3021/3022)
	<*amplitude*>	1mV~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|2]: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|2]:APPLy:SQUare [<frequency> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	1μHz~30MHz (20MHz AFG-3021/3022)
	<*amplitude*>	1mV~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|2]: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|2]:APPLy:RAMP [<frequency> [,<amplitude> [,<offset>]]]**	
Parameter	<frequency>	1μHz~1MHz
	<*amplitude*>	1mV~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|2]: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|2]:APPLy:PULSe [<frequency> [,<amplitude> [,<offset>]]]**
Parameter	<frequency> 1μHz~25MHz (20MHz AFG-3021/3022) *<amplitude>* 1mV~10V (50Ω) <offset> 0~4.99V (50Ω)
Example	**SOUR1:APPL:PULS 1KHZ,MIN,MAX** Sets the frequency to 1kHz, sets the amplitude to the minimum and the offset to the maximum.

SOURce[1|2]:APPLy:NOISe

Source Specific Command

Description	Outputs white noise (no set 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|2]:APPLy:NOISe [<frequency|DEFault> [,<amplitude> [,<offset>]]]**

Parameter		
	<frequency|DEFault>	Not applicable
	<*amplitude*>	1mV~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|2]: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|2]:APPLy:TRIangle [<frequency> [,<amplitude> [,<offset>]]]**

Parameter		
	<frequency>	1μHz~1MHz
	<*amplitude*>	1mV~10V (50Ω)
	<offset>	0~4.99V (50Ω)

Example	**SOUR1:APPL:TRI2khz,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|2]:APPLy:DC

Source Specific Command

Description	Outputs a DC signal from the selected channel when the command has executed. Amplitude and offset can also be set.
Note	Frequency cannot be used with the DC function; however a value (or DEFault) must be specified.
Syntax	**SOURce[1|2]::APPLy:DC [<frequency>|DEFault[,<amplitude> [,<offset>]]]**

Parameter		
	<frequency|DEFault>	1μHz~1MHz
	<amplitude>	1mV~10V (50Ω)
	<offset>	0~4.99V (50Ω)

Example

SOUR1:APPL:DCDEF,3.0,1.0

Sets the DC voltage to 4 volts (amplitude of 3V with an offset of 1 volt).

SOURce[1|2]:APPLy:HARMonic

Source Specific Command

Description	Outputs a sine wave with harmonic components from the selected channel when the command has executed. Frequency, amplitude and offset can also be set. The maximum frequency is limited by the highest order. Highest order n: maximum frequency is 30MHz/n or 20MHz/n for AFG-3021/3022)).
Syntax	**SOURce[1|2]:APPLy:HARMonic [<frequency> [,<amplitude> [,<offset>]]]**

Parameter	<frequency>	1μHz~30MHz (20MHz AFG-3021/3022)
	<*amplitude*>	1mV~10V (50Ω) (3.536 Vrms)
	<offset>	0~4.99V (50Ω)
Example	**SOUR1:APPL:HARM 2KHZ,MAX,MAX** Sets the frequency to 2kHz and sets the amplitude and offset to the maximum.	

SOURce[1|2]:APPLy:USER

Source Specific Command

Description	Outputs an arbitrary waveform from the selected channel. The output is that specified from the SOURce[1 | 2]:ARB:BUILt:ARB_waveform command (Example: SOURce[1 | 2]:ARB:BUILt:SQUare).
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~125MHz
	<amplitude>	0~10V (50Ω)
	<offset>	0~5V (50Ω)
Example	**SOUR1:APPL:USER**	

SOURce[1|2]:APPLy?

Source Specific Command

Description	Outputs a string with the current settings for the selected channel.	
Note	The string can be passed back appended to the Apply Command.	
Syntax	**SOURce[1|2]: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, 3Vpp, -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|2]:FREQuency

Source Specific Command

Description	Sets the output frequency for the selected channel and the query command returns the current frequency setting.	
Note	The maximum and minimum frequency depends on the function mode.	
	Sine, Square	1μHz~30MHz (20MHz AFG-3021/3022)
	Ramp, Triangle	1μHz~1MHz
	Pulse	1μHz~25MHz (20MHz AFG-3021/3022)
	Noise	Not applicable
	User	1pHz~125MHz

	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* ≤ 30 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|2]:FREQuency {<frequency>|MINimum|MAXimum}**
Example	**SOUR1:FREQ MAX** Sets the frequency to the maximum for the current mode.
Query Syntax	**SOURce[1|2]: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|2]:AMPLitude

Source Specific Command

Description	Sets the output amplitude or queries the current amplitude settings for the selected channel.
Note	The maximum and minimum amplitude depends on the output termination. The default amplitude for all functions is 3Vpp (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. $\lvert V_{offset} \rvert < V_{max} - Vpp/2$ 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, theSOURce[1|2]:VOLT:UNITcommand can be used to set the amplitude units for all commands.
Syntax	**SOURce[1|2]:AMPLitude {< amplitude> |MINimum|MAXimum}**

Example	**SOUR1:AMPLMAX** Sets the amplitude to the maximum for the current mode.	
Query Syntax	**SOURce[1|2]:AMPLitude? {MINimum|MAXimum}**	
Return Parameter	<NR3>	Returns the amplitude for the current mode.
Example	**SOUR1:AMPL? MAX** +5.0000E+00 The maximum amplitude that can be set for the current function is 5 volts.	

SOURce[1|2]:PHASe

Source Specific Command

Description	Sets or queries the output phase angle (-360°~360°) of the selected channel. The default phase is 0°.	
Syntax	**SOURce[1|2]:PHASe{<angle> |MINimum|MAXimum}**	
Example	**SOUR[1]:PHAS:MAX** Sets the output phase to the maximum.	
Query Syntax	**SOURce[1|2]:PHASe {MINimum|MAXimum}**	
Return Parameter	<NR3>	Returns the phase in degrees.
Example	**SOUR1:PHAS?** +1.2000E+01	

The phase is set to 12°.

SOURce[1|2]:PHASe:ALIGn

Source Specific Command

Description	Aligns the timebase of both channels but doesn't change the phase deviation of the channels. In other words it re-calibrates the phase difference between both of the channels.
Syntax	**SOURce[1|2]:PHASe:ALIGn**
Example	**SOUR[1]:PHAS:ALIG** Turns on the phase align function.

SOURce[1|2]: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. $\lvert V_{offset} \rvert < V_{max} - Vpp/2$ 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.

Syntax	**SOURce[1|2]:DCOffset {< offset> |MINimum|MAXimum}**	
Example	**SOUR1:DCO MAX** Sets the offset to the maximum for the current mode.	
Query Syntax	**SOURce[1|2]: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|2]: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* ≤ 30 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|2]: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|2]: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|2]: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|2]:RAMP:SYMMetry {< percent>|MINimum|MAXimum}**
Example	**SOUR1:RAMP:SYMM MAX** Sets the symmetry to the 100%.

Query Syntax	**SOURce[1|2]: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[1|2]

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 the output command. Using the Apply command automatically sets the front panel output to on.
Syntax	**OUTPut[1|2] {OFF|ON}**
Example	**OUTP1 ON** Turns the output on for channel 1.
Query Syntax	**OUTPut[1|2]?**

Return Parameter	1	ON
	0	OFF
Example	**OUTP1?**	

	1 The output is currently on for channel 1.

OUTPut[1]: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 50Ωbut 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[1]:LOAD {DEFault|INFinity}**	
Example	**OUTP1:LOAD DEF** Sets the output termination to 50Ω for channel 1.	
Query Syntax	**OUTPut[1]:LOAD?**	
Return Parameter	DEF	Default
	INF	INFinity

Example	**OUTP1:LOAD?** **DEF** The output is set to the default of 50Ω for channel 1.

OUTPut[1|2]:SYNC

Source Specific Command

Description	This command turns waveform gating on or off for the selected channel's output. When gating is turned on, it allows the output signal to be output when the trigger input is asserted. It does not turn the output on, change the phase or other timing characteristics. For example: When gating is turned on the waveform is output when the trigger signal goes high. When the trigger signal is low the waveform continues to be generated internally.The next time the trigger signal is high, the internally generated waveform is output at that particular point in time, instead of a newly generated waveform.
Syntax	**OUTPut[1|2]:SYNC {OFF|ON}**
Example	**OUTP1:SYNC ON** Turns gating on for channel 1.
Query Syntax	**OUTPut[1|2]:SYNC?**
Return Parameter	1 ON 0 OFF
Example	**OUTP1:SYNC?** **1** The sync output is enabled for channel 1.

SOURce[1]:VOLTage:UNIT

Source Specific Command

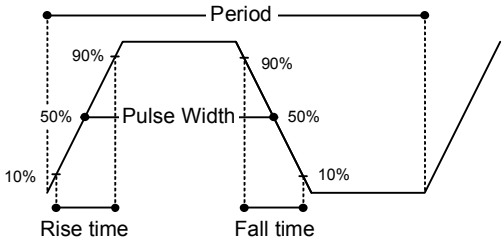
Description	Sets or queries the output amplitude units. There are three types of units: VPP, VRMS and DBM.
Note	The units set with the VOLTage:UNIT command will be used as the default unit for all amplitude units unless a different unit is specifically used for a command. If the output termination is 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 for channel 1.
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|2]:PULSe:WIDTh

Source Specific Command

Description	Sets or queries the pulse width. The default pulse width is 500us. Pulse width is defined as the time from the rising to falling edges (at a threshold of 50%).
Note	The pulse width is restricted to the following limitations: Pulse Width - 0.625 * [(Rise Time - 0.6nS) + (Fall Time - 0.6nS)] ≧ 0 Period ≧Pulse Width+ 0.625 * [(Rise Time - 0.6nS)+(Fall Time - 0.6nS)]
Syntax	**SOURce[1|2]:PULSe:WIDTh** **{<seconds>|MINimum|MAXimum}**
Example	**SOUR1:PULS:WIDT MAX** Sets the pulse width to the maximum allowed.

Query Syntax	**SOURce[1|2]:PULSe:WIDTh? [MINimum|MAXimum]**	
Return Parameter	<seconds>	20ns ~ 999.83ks
Example	**SOUR1:PULS:WIDT? MIN** +2.0000E-08 The pulse width is set to 20 nanoseconds.	

SOURce[1|2]:PULSe:DCYCle

Source Specific Command

Description	Sets or queries the pulse duty cycle.
Note	The duty cycle is limited by the rise/fall time as noted below: Duty ≧ 0.625×100×[rise time - 0.6ns +fall time - 0.6ns]/period Duty ≦ 100 - {62.5×[(rise time - 0.6ns) + (fall time - 0.6ns)]/period}
Syntax	**SOURce[1|2]:PULSe:DCYCle{<percent>|MINimum|MAXimum}**
Example	**SOUR1:PULS:DCYC MAX** Sets the duty to the maximum allowed.
Query Syntax	**SOURce[1|2]:PULSe:DCYCle? [MINimum|MAXimum]**

Return Parameter	<NR3>	0.0170%~99.983% Resolution 0.0001%
Example	**SOUR1:PULS:DCYC?**	

+1.0000E+01

The duty cycle is set to 10%

SOURce[1|2]:PULSe:EDGEtime

Source Specific Command

Description	Sets or queries the pulse edge time. The default edge time is 10us. This command will set the rise time = the fall time = edge time.
Note	The edge time is limited by the pulse width as noted below: Pulse Width - 0.625 * [(Rise Time - 0.6nS) + (Fall Time - 0.6nS)] ≧ 0 Period ≧Pulse Width+ 0.625 * [(Rise Time - 0.6nS)+(Fall Time - 0.6nS)]
Syntax	**SOURce[1|2]:PULSe:EDGEtime{<seconds>|MINimum|MAXimum}**
Example	**SOUR1:PULS:EDGE MAX** Sets the edge time to the maximum allowed.
Query Syntax	**SOURce[1|2]:PULSe:EDGEtime? [MINimum|MAXimum]**
Return Parameter	<NR3> 9.32ns ~ 799.9ks
Example	**SOUR1:PULS:EDGE? MIN** +9.3200E-09 The edge time is 9.32 nanoseconds.

SOURce[1|2]:PULSe:RISE

Source Specific Command

Description	Sets or queries the pulse rise time. The default rise time is 10us. The rise and fall time can be different.Range: 9.32ns~ 799.9ks
Note	The rise time is limited by the pulse width, period and fall time as noted below: Pulse Width - 0.625 * [(Rise Time - 0.6nS) + (Fall Time - 0.6nS)] ≧ 0 Period ≧Pulse Width+ 0.625 * [(Rise Time - 0.6nS)+(Fall Time - 0.6nS)]
Syntax	**SOURce[1|2]:PULSe:RISE{<seconds>|MINimum|MAXimum}**
Example	**SOUR1:PULS:RISE MAX** Sets the rise time to the maximum allowed.
Query Syntax	**SOURce[1|2]:PULSe:RISE? [MINimum|MAXimum]**
Return Parameter	<NR3> 9.32ns ~ 799.9ks
Example	**SOUR1:PULS:FALL? MIN** +9.3200E-09 The minimum rise time is 9.32 nanoseconds.

SOURce[1|2]:PULSe:FALL

Source Specific Command

Description	Sets or queries the pulse fall time. The default fall time is 10us. The rise and fall time can be different. Range: 9.32ns ~ 799.9ks
Note	The fall time is limited by the pulse width, period and rise time as noted below: Pulse Width - 0.625 * [(Rise Time - 0.6nS) + (Fall Time - 0.6nS)] ≧ 0 Period ≧Pulse Width+ 0.625 * [(Rise Time - 0.6nS)+(Fall Time - 0.6nS)]
Syntax	**SOURce[1|2]:PULSe:FALL{<seconds>|MINimum|MAXimum}**
Example	**SOUR1:PULS:FALL MAX** Sets the fall time to the maximum allowed.
Query Syntax	**SOURce[1|2]:PULSe:FALL? [MINimum|MAXimum]**
Return Parameter	<NR3> 9.32ns ~ 799.9ks
Example	**SOUR1:PULS:FALL? MIN** +9.3200E-09 The minimum fall time is 9.32 nanoseconds.

谐波指令

SOURce[1|2]:HARMonic:TOTAl

Source Specific Command

Description	Sets the highest order harmonic for the harmonic output. By default this is set to 2.
Syntax	**SOURce[1|2]:HARMonic:TOTAl{<id>|MINimum|MAXimum}**
Example	**SOUR1:HARMonic:TOTAl MAX** Sets the highest order harmonic to the maximum allowed.
Query Syntax	**SOURce[1|2]:HARMonic:TOTAl?[MINimum|MAXimum]**
Return Parameter	<NR1> 2 ~ 8
Example	**SOUR1:HARM:? MIN** 2 Returns the minimum harmonic.

SOURce[1|2]:HARMonic:TYPE

Source Specific Command

Description	Specifies which harmonics are output; odd, even, all or user specified.
Syntax	**SOURce[1|2]:HARMonic:TYPE {EVEN|ODD|ALL|USER,10000001}**

Parameter/ Return Parameter	<EVEN>	Output all even orders
	<ODD>	Output all odd orders
	<ALL>	Output all orders, subject to the number specified in "SOURce[1|2]:HARMonic: TOTAl" command.
	<USER, $X^1X^2X^3X^4X^5X^6X^7X^8$>	Outputs only the specified orders, where X = Boolean (0, 1) X^X = order number.

Example	**SOURce1:HARMonic:TYPE USER,11000001** Outputs only the 2nd and 8th harmonic. (1st harmonic is the fundamental frequency)
Query Syntax	**SOURce[1|2]:HARMonic:TYPE?**
Example	**SOUR1:HARM:TYPE?** EVEN 11000000 Returns EVEN harmonic (Limited to the 2nd harmonic).

SOURce[1|2]:HARMonic:ORDEr

Source Specific Command

Description	Sets or queries the amplitude and phase of each order. By default, each order is set to 3Vpp, with a phase of 0°.

Syntax	**SOURce[1|2]:HARMonic:ORDEr {<id>,<amplitude>,<phase>}**	
Parameter/ Return Parameter	<id>	<NR1>Order number: 2 ~8
	<amplitude>	<NR3>Amplitude of the selected order: 1mV ~ 10V (50ohm impedance)
	<phase>	<NR3>Phase: -360 ~ -360°
Example	**SOURce1:HARMonic:ORDEr 2,3.0,180** Sets the 2nd harmonic to 3.0Vpp and a phase of 180°.	
Query Syntax	**SOURce[1|2]:HARMonic:ORDEr? <id>** Returns the <id>:,<amplitude>,<phase>.	
Example	**SOUR1:HARM:ORDE? 2** 2:,3.000E+00,1.800E+02 Returns the 2nd harmonic settings as 3Vpp with a phase of 180°.	

SOURce[1|2]:HARMonic:DISPlay

Source Specific Command

Description	Sets or queries whether the screen shows the harmonics in the frequency or time domain. The default setting is time domain.

Syntax	**SOURce[1|2]:HARMonic:DISPlay {FREQuency|TIME}**	
Parameter/ Return Parameter	FREQuency	Sets the display to frequency
	TIME	Sets the display to time
Example	**SOURce1:HARMonic:DISPlay TIME** Sets the display to TIME.	
Query Syntax	**SOURce[1|2]:HARMonic:DISPlay?** Returns TIME or FREQ.	
Example	**SOUR1:HARM:DISP?** TIME Returns the display format as TIME.	

幅值调制 (AM)指令

AM 介绍

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

Enable AM Modulation
↓
Configure Carrier
↓
Select Modulation Source
↓
Select Shape

1. Turn on AM modulation using the SOURce[1|2]: AM:STAT ON command
2. Use the APPLy command to select a carrier waveform. Alternatively the equivalent 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|2]:AM:MOD:INP command.
4. Use the SOURce[1|2]: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|2]: AM:INT:FREQ command. For internal sources only.

Set Modulating Frequency

Set Modulation Depth

6. Set the modulation depth using the SOURce[1 | 2]: AM:DEPT command.

SOURce[1|2]:AM:STATe

Source Specific Command

Description	Sets or disables AM modulation for the selected channel. 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 on the same channel. As only one modulation is allowed on a channel at any one time, other modulation modes will be disabled when AM modulation is enabled.	
Syntax	**SOURce[1|2]:AM:STATe {OFF|ON}**	
Example	**SOUR1:AM:STAT ON** Enables AM modulation.	
Query Syntax	**SOURce[1|2]:AM:STATe?**	
Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)

Example	**SOUR1:AM:STAT?** **1** AM modulation mode is currently enabled.

SOURce[1|2]:AM:MODulation:INPut

Source Specific Command

Description	Sets or queries the modulation source as internal or external for the selected channel. 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|2]:AM:MODulation:INPut {INTernal|EXTernal}**
Example	**SOUR1:AM:MOD:INP EXT** Sets the modulation source to external.
Query Syntax	**SOURce[1|2]:AM:MODulation:INPut?**

Return Parameter	INT	Internal
	EXT	External

Example	**SOUR1:AM:MOD:INP?** **INT** The modulation source is set to internal.

SOURce[1|2]:AM:INTernal:FUNCtion

Source Specific Command

Description	Sets the shape of the modulating waveform from sine, square, triangle, upramp and dnramp for the selected channel. The default shape is sine.
Note	Square and triangle waveforms have a 50% duty cycle. Upramp and dnramp have a symmetryof 100% and 0%, respectively.
Syntax	**SOURce[1|2]: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|2]: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|2]:AM:INTernal:FREQuency

Source Specific Command

Description	Sets the frequency of the internal modulating waveform only for the selected channel. The default frequency is 100Hz.

Syntax	**SOURce[1|2]:AM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	2mHz~ 20kHz
Example	**SOUR1:AM:INT:FREQ +1.0000E+02** Sets the modulating frequency to 100Hz.	
Query Syntax	**SOURce[1|2]: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|2]:AM:DEPTh

Source Specific Command

Description	Sets or queries the modulation depth for internal sources only for the selected channel. 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|2]:AM:DEPTh {<depth in percent> |MINimum|MAXimum}**	
Parameter	<depth in percent>	0~120%

Example	**SOUR1:AM:DEPT50** Sets the modulation depth to 50%.	
Query Syntax	**SOURce[1|2]: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.

Enable FM Modulation
↓
Configure Carrier
↓
Select Modulation Source
↓
Select shape

1. Turn on FM modulation using the SOURce[1|2]: FM:STAT ON command.
2. Use the APPLy command to select a carrier waveform. Alternatively, the 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|2]:FM:MOD:INP command.
4. Use the SOURce[1|2]: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|2]: FM:INT:FREQ command. For internal sources only.

Set Modulating Frequency

Set Peak Frequency Deviation

6. Use the SOURce[1 | 2]:FM:DEV command to set the frequency deviation.

SOURce[1|2]:FM:STATe

Source Specific Command

Description	Sets or disables FM modulation for the selected channel. 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 on the same channel. As only one modulation is allowed at any one time on the same channel, other modulation modes will be disabled when FM modulation is enabled.
Syntax	**SOUR[1|2]:FM:STATe {OFF|ON}**
Example	**SOUR1:FM:STAT ON** Enables FM modulation.
Query Syntax	**SOURce[1|2]:FM:STATe?**

Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)

Example	**SOUR1:FM:STAT?** **1** FM modulation mode is currently enabled.

SOURce[1|2]:FM:MODulation:INPut

Source Specific Command

Description	Sets or queries the modulation source as internal or external for the selected channel. 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|2]:FM:MODulation:INPut {INTernal|EXTernal}**
Example	**SOUR1:FM:MOD:INP EXT** Sets the modulation source to external.
Query Syntax	**SOURce[1|2]:FM:MODulation:INPut?**

Return Parameter		
	INT	Internal
	EXT	External

Example	**SOUR1:FM:MOD:INP?** **INT** The modulation source is set to internal.

SOURce[1|2]:FM:INTernal:FUNCtion

Source Specific Command

Description	Sets the shape of the modulating waveform from sine, square, triangle, upramp and dnramp for the selected channel. 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|2]: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|2]: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|2]:FM:INTernal:FREQuency

Source Specific Command

Description	Sets the frequency of the internal modulating waveform only for the selected channel. The default frequency is 10Hz.	
Syntax	**SOURce[1|2]:FM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	2mHz~ 20kHz
Example	**SOUR1:FM:INT:FREQ +1.0000E+02** Sets the modulating frequency to 100Hz.	
Query Syntax	**SOURce[1|2]: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|2]:FM:DEViation

Source Specific Command

Description	Sets or queries the peak frequency deviation of the modulating waveform from the carrier waveform for the selected channel. 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|2]:FM:DEViation {<peak deviation in Hz>|MINimum|MAXimum}**

Parameter	<peak deviation in Hz>	DC~30MHz (20MHz AFG-3021/3022) DC~1MHz (Ramp)

Example

SOUR1:FM:DEV MAX

Sets the frequency deviation to the maximum value allowed.

Query Syntax

SOURce[1|2]:FM:DEViation? [MINimum|MAXimum]

Return Parameter	<NR3>	Returns the frequency deviation in Hz.

Example

SOURce1:FM:DEViation? MAX

+2.0000E+04

The maximum frequency deviation for the current function is 20MHz.

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.

Enable FSK Modulation
↓
Configure Carrier
↓
Select FSK Source
↓
Select FSK HOP Frequency
↓
Set FSK Rate

1. Turn on FSK modulation using the SOURce[1|2]: FSK:STAT ON command.
2. Use the APPLy command to select a carrier waveform. Alternatively, the 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|2]:FSK:MOD:INP command.
4. Set the hop frequency using the SOURce[1|2]:FSK:FREQ command.
5. Use the SOURce[1|2]: FSK:INT:RATE command to set the FSK rate. The FSK rate can only be set for internal sources.

SOURce[1|2]:FSKey:STATe	Source Specific Command

Description	Turns FSK Modulation on or off for the selected channel. By default FSK modulation is off.
Note	Burst or sweep mode will be disabled if FSK modulation is enabled on the same channel. As only one modulation is allowed at any one time on the same channel, other modulation modes will be disabled when FSK modulation is enabled.
Syntax	**SOURce[1|2]:FSKey:STATe {OFF|ON}**
Example	**SOUR1:FSK:STAT ON** Enables FSK modulation
Query Syntax	**SOURce[1|2]:FSKey:STATe?**
Return Parameter	0 Disabled (OFF) 1 Enabled (ON)
Example	**SOUR1:FSK:STAT?** **ON** FSK modulation is currently enabled.

SOURce[1|2]:FSKey:MODulation:INPut

Source Specific Command

Description	Sets or queries the FSK source as internal or external for the selected channel. 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|2]:FSKey:MODulation:INPut {INTernal|EXTernal}**

Example	**SOUR1:FSK:MOD:INP EXT** Sets the FSK source to external.	
Query Syntax	**SOURce[1|2]:FSKey:MOD:INP?**	
Return Parameter	INT	Internal
	EXT	External
Example	**SOUR1:FSK:MOD:INP?** **INT** The FSK source is set to internal.	

SOURce[1|2]: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|2]:FSKey:FREQuency {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	1μHz~30MHz (20MHZ AFG-3021/3022)
Example	**SOUR1:FSK:FREQ +1.0000E+02** Sets the FSK hop frequency to 100Hz.	
Query Syntax	**SOURce[1|2]: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|2]: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|2]: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|2]: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.	

相位调制 (PM) 指令

PM 介绍

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

Enable PM Modulation
↓
Configure Carrier
↓
Select shape
↓
Set PM Frequency
↓
Set Peak Phase Deviation

1. Turn on PM modulation using the SOURce[1|2]:PM:STAT ON command.
2. Use the APPLy command to select a carrier waveform. Alternatively, the FREQ, AMPl, and DCOffs commands can be used to create a carrier waveform with a designated frequency, amplitude and offset.
3. Use the SOURce[1|2]:PM:INT:FUNC command to select a sine, square, upramp, dnramp or triangle modulating waveshape.
4. Set the phase modulating frequency using the SOURce[1|2]:PM:INT:FREQ command.
5. Use the SOURce[1|2]:PM:DEV command to set the phase deviation.

SOURce[1|2]:PM:STATe

Source Specific Command

Description	Sets or disables PM modulation for the selected channel. By default PM modulation is disabled. PM modulation must be enabled before setting other parameters.
Note	Burst or sweep mode will be disabled if PM modulation is enabled on the same channel. As only one modulation is allowed at any one time on the same channel, other modulation modes will be disabled when PM modulation is enabled.
Syntax	**SOUR[1|2]:PM:STATe {OFF|ON}**
Example	**SOUR1:PM:STAT ON** Enables PM modulation.
Query Syntax	**SOURce[1|2]:PM:STATe?**

Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)

Example	**SOUR1:PM:STAT?** **1** PM modulation mode is currently enabled.

SOURce[1|2]:PM:INTernal:FUNCtion

Source Specific Command

Description	Sets the shape of the modulating waveform from sine, square, triangle, upramp and dnramp for the selected channel. 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|2]:PM:INTernal:FUNCtion {SINusoid|SQUare|TRIangle|UPRamp|DNRamp}**
Example	**SOUR1:PM:INT:FUNC SIN** Sets the PM modulating wave shape to sine.
Query Syntax	**SOURce[1|2]:PM:INTernal:FUNCtion?**

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

Example	**SOUR1:PM:INT:FUNC?** **SIN** The shape for the modulating waveform is Sine.

SOURce[1|2]:PM:INTernal:FREQuency

Source Specific Command

Description	Sets the phase modulation frequency for the selected channel. The default frequency is 100Hz.
Syntax	**SOURce[1|2]:PM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}**

Parameter	<frequency>	2mHz~ 20kHz

Example	**SOUR1:PM:INT:FREQ +1.0000E+02** Sets the phase modulation frequency to 100Hz.

Query Syntax	**SOURce[1|2]:PM:INTernal:FREQuency? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the frequency in Hz.
Example	**SOUR1:PM:INT:FREQ? MAX** **+2.0000E+04** Returns the maximum frequency allowed.	

SOURce[1|2]:PM:DEViation

Source Specific Command

Description	Sets or queries the peak phase deviation of the modulating waveform from the carrier waveform for the selected channel. The default peak deviation is 180.0°.	
Syntax	**SOURce[1|2]:PM:DEViation {<peak deviation in degrees>|MINimum|MAXimum}**	
Parameter	<peak deviation in degrees>	0° ~ 360°
Example	**SOUR1:PM:DEV MAX** Sets the phase deviation to 360°.	
Query Syntax	**SOURce[1|2]:PM:DEViation? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the phase deviation in degrees.

Example **SOURce1:PM:DEViation? MAX**

+3.600E+02

The maximum phase deviation is 360°.

SUM 指令

SUM 介绍

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

Enable SUM Modulation
↓
Configure Carrier
↓
Select Modulation Source
↓
Select shape

1. Turn on SUM modulation using the SOURce[1|2]:SUM:STATe ON command.
2. Use the APPLy command to select a carrier waveform. Alternatively, the 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|2]:SUM:MOD:INP command.
4. Use the SOURce[1|2]:SUM:INT:FUNCtion command to select a sine, square, upramp, dnramp or triangle modulating waveshape. For internal sources only.
5. Set the SUM frequency using the SOURce[1|2]:SUM:INT:FREQuency command. For internal sources only.

Set SUM Frequency

Set the SUM Amplitude

6. Use the SOURce[1 | 2]:SUM:AMP command to set the SUM amplitude.

SOURce[1|2]:SUM:STATe

Source Specific Command

Description	Sets or disables SUM modulation for the selected channel. By default SUM modulation is disabled. SUM modulation must be enabled before setting other parameters.
Note	Burst or sweep mode will be disabled if SUM modulation is enabled on the same channel. As only one modulation is allowed at any one time on the same channel, other modulation modes will be disabled when SUM modulation is enabled.
Syntax	**SOUR[1|2]:SUM:STATe {OFF|ON}**
Example	**SOUR1:SUM:STAT ON** Enables SUM modulation.
Query Syntax	**SOURce[1|2]:SUM:STATe?**

Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)

Example	**SOUR1:SUM:STAT?** **1** SUM modulation mode is currently enabled.

SOURce[1|2]:SUM:MODulation:INPut

Source Specific Command

Description	Sets or queries the modulation source as internal or external for the selected channel. Internal is the default modulation source.
Note	If an external modulation source is selected, the SUM amplitude is limited to ± 5V from the MOD INPUT terminal on the rear panel. For example, if SUM amplitude is set to 100%, then the maximum amplitude is +5V, and the minimum amplitude is -5V.
Syntax	**SOURce[1|2]:SUM:MODulation:INPut {INTernal|EXTernal}**
Example	**SOUR1:SUM:MOD:INP EXT** Sets the modulation source to external.
Query Syntax	**SOURce[1|2]:SUM:MODulation:INPut?**

Return Parameter	INT	Internal
	EXT	External

Example	**SOUR1:SUM:MOD:INP?** **INT** The modulation source is set to internal.

SOURce[1|2]:SUM:INTernal:FUNCtion

Source Specific Command

Description	Sets the shape of the modulating waveform from sine, square, triangle, upramp and dnramp for the selected channel. 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|2]:SUM:INTernal:FUNCtion {SINusoid|SQUare|TRIangle|UPRamp|DNRamp}**
Example	**SOUR1:SUM:INT:FUNC SIN** Sets the SUM modulating wave shape to sine.
Query Syntax	**SOURce[1|2]:SUM:INTernal:FUNCtion?**

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

Example	**SOUR1:SUM:INT:FUNC?** **SIN** The shape for the modulating waveform is Sine.

SOURce[1|2]:SUM:INTernal:FREQuency

Source Specific Command

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

SOURce[1|2]:SUM:AMPLitude

Source Specific Command

Description	The SUM amplitude command sets or queries the amplitude of the modulating waveform as a percentage of the carrier amplitude.
Syntax	**SOURce[1|2]:SUM:AMPLitude {<amplitude percent>|MINimum|MAXimum}**

Parameter	<amplitude percent>	0% ~ 100%
Example	**SOUR1:SUM:AMPL MAX** Sets the SUM amplitude to 100%.	
Query Syntax	**SOURce[1|2]:SUM:AMPLitude?**	
Return Parameter	<NR3>	Returns the amplitude in %.
Example	**SOUR1:SUM:AMPL?** **+1.0000E+02** The SUM amplitude is 100%.	

脉冲宽度调制 (PWM) 指令

PWM 介绍

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

Enable PWM Modulation
↓
Configure Carrier
↓
Select Modulation Source
↓
Select Shape

1. Turn on PWM modulation using the SOURce[1|2]: PWM:STATe ON command.
2. Use the APPLy command to select a pulse waveform. Alternatively, the 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|2]:PWM:MOD:INP command.
4. Use the SOURce[1|2]: 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|2]:PWM:INT:FREQ command. For internal sources only.

Select Modulating Frequency

Set Duty Cycle/Pulse Width

6. Use the SOURce[1 | 2]:PWM:DUTY command to set the duty cycle or Pulse Width.

SOURce[1|2]: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 on the same channel. As only one modulation is allowed at any one time, other modulation modes will be disabled when FSK modulation is enabled on the same channel.	
Syntax	**SOURce[1|2]:PWM:STATe {OFF|ON}**	
Example	**SOUR1:PWM:STAT ON** Enables PWM modulation	
Query Syntax	**SOURce[1|2]:PWM:STATe?**	
Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)

Example	**SOUR1:PWM:STAT?** **ON** FSK modulation is currently enabled.

SOURce[1|2]:PWM:MODulation:INPut

Source Specific Command

Description	Sets or queries the PWM source as internal or external. Internal is the default source.
Note	If an external PWMsource is selected, the duty cycle/pulse width is controlled by the MOD INPUT terminal on the rear panel.
Syntax	**SOURce[1|2]:PWM:MODulation:INPut {INTernal|EXTernal}**
Example	**SOUR1:PWM:MOD:INP EXT** Sets the PWM source to external.
Query Syntax	**SOURce[1|2]:PWM:MODulation:INPut?**
Return Parameter	INT — Internal EXT — External
Example	**SOUR1:PWM:MOD:INP?** **INT** The PWM source is set to internal.

SOURce[1|2]: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|2]: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|2]: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|2]: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|2]: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|2]: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|2]: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|2]: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|2]:PWM:DUTY?**	
Return Parameter	<NR3>	Returns the dutyin %.
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.

Enable Sweep Mode

↓

Select waveform shape, amplitude and offset

↓

Select Sweep Boundaries

1. Turn on Sweep mode modulation using the SOURce[1|2]: SWE:STAT ON command.

2. Use the APPLy command to select the waveform shape. Alternatively, the 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|2]:SWE:FREQ:STAR and SOURce[1|2]:SWE: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|2]:SWE:FREQ:CENT andSOURce[1|2]:SWE: 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 | 2]:SWE:FUNC command.

Select Sweep Mode

Select Sweep Time

5. Choose the sweep time using the SOURce[1 | 2]:SWE:TIME command.

Select the sweep trigger source

6. Select an internal or external sweep trigger source using the SOURce[1 | 2]:TRIG command.

SOURce[1|2]:SWEep:STATe

Source Specific Command

Description	Sets or disables Sweep mode. By default Sweep is disabled.

Note	Any modulation modes or Burst mode will be disabled if sweep mode is enabled on the same channel.
Syntax	**SOURce[1|2]:SWEep:STATe {OFF|ON}**
Example	**SOUR1:SWE:STAT ON** Enables sweep mode.
Query Syntax	**SOURce[1|2]:SWEep:STATe?**

Return Parameter	0	Disabled (OFF)
	1	Enabled (ON)

Example	**SOUR1:SWE:STAT?** **1** Sweep mode is currently enabled.

SOURce[1|2]:SWEep:TYPE

Source Specific Command

Description	Sets or queries the sweep type, frequency or amplitude sweep.By default, the sweep type is set to frequency.
Syntax	**SOURce[1|2]:SWEep:TYPE {FREQuency|AMPLitude}**
Example	**SOUR1:SWE:TYPE FREQ** Sets sweep mode to frequency.
Query Syntax	**SOURce[1|2]:SWEep:TYPE?**

Return Parameter	FREQ	Frequency sweep
	AMPL	Amplitude sweep

Example

SOUR1:SWE:TYPE?

FREQ

Sweep type is frequency.

SOURce[1|2]:SWEep:MODE

Source Specific Command

Description	Sets or queries the sweep triggering mode. The triggering mode can be set to continuous or gate. By default, the triggering mode is set to continuous.
Syntax	**SOURce[1|2]:SWEep:MODE {CONTinuous|GATE}**

Example

SOUR1:SWE:MODE GATE

Sets triggering mode to gate.

Query Syntax **SOURce[1|2]:SWEep:MODE?**

Return Parameter	CONT	Continuous mode
	GATE	Gated mode

Example

SOUR1:SWE:MODE?

GATE

The sweep trigger mode is set to gate.

SOURce[1|2]:SWEep:SHAPe

Source Specific Command

Description	Sets or queries the sweep waveform shape. The sweep can be set to a sawtooth or a shuttlecock-like shape. By default, the shape is set to sawtooth.	
Syntax	**SOURce[1|2]:SWEep:SHAPe{SAWtooth|TRIangle}**	
Parameter	SAW	Sawtooth shaped sweep
	TRI	Triangle (shuttle cock) shaped sweep.
Example	**SOUR1:SWE:SHAPe SAW** Sets the sweep shape to sawtooth.	
Query Syntax	**SOURce[1|2]:SWEep:SHAPe?**	
Return Parameter	sawtooth	Sawtooth shaped sweep
	triangle	Triangle (shuttle cock) shaped sweep.
Example	**SOUR1:SWE:SHAPe?** Sawtooth The sweep shape is set as sawtooth.	

SOURce[1|2]:SWEep:MANual:TRIGger

Source Specific Command

Description	Performs a manual trigger when the sweep trigger is set to manual for the selected channel.

Syntax	**SOURce[1|2]:SWEep:MANual:TRIGger**
Example	**SOUR1:SWE: MAN:TRIG** Performs a manual trigger.

SOURce[1|2]:SWEep:FREQuency:STARt

Source Specific Command

Description	Sets the start frequency of the sweep for the selected channel. 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|2]:SWEep:FREQuency:STARt {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	1μHz~ 30MHz (20MHz AFG-3021/3022) 1μHz~ 1MHz (Ramp, Triangle)
Example	**SOUR1:SWE:FREQ:STAR +2.0000E+03** Sets the start frequency to 2kHz.	
Query Syntax	**SOURce[1|2]:SWEep:FREQuency:STARt? [MINimum| MAXimum]**	
Return Parameter	<NR3>	Returns the start frequency in Hz.
Example	**SOUR1:SWE:FREQ:STAR? MAX** **+3.0000E+07**	

Returns the maximum start frequency allowed.

SOURce[1|2]:SWEep:FREQuency:STOP

Source Specific Command

Description	Sets the stop frequency of the sweep for the selected channel. 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|2]:SWEep:FREQuency:STOP {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	1μHz~ 30MHz (20MHz AFG-3021/3022) 1μHz~ 1MHz (Ramp, Triangle)
Example	**SOUR1:SWE:FREQ:STOP +2.0000E+03** Sets the stop frequency to 2kHz.	
Query Syntax	**SOURce[1|2]:SWEep:FREQuency:STOP? [MINimum| MAXimum]**	
Return Parameter	<NR3>	Returns the stop frequency in Hz.
Example	**SOUR1:SWE:FREQ:STOP? MAX** **+3.0000E+07** Returns the maximum stop frequency allowed.	

SOURce[1|2]:SWEep:FREQuency:CENTer

Source Specific Command

Description	Sets or queries the center frequency of the sweep for the selected channel. 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|2]:SWEep:FREQuency:CENTer {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	1μHz~ 30MHz (20MHz AFG-3021/3022) 1μHz~ 1MHz (Ramp)
Example	**SOUR1:SWE:FREQ:CENT +2.0000E+03** Sets the center frequency to 2kHz.	
Query Syntax	**SOURce[1|2]:SWEep:FREQuency:CENTer? [MINimum| MAXimum]**	
Return Parameter	<NR3>	Returns the center frequency in Hz.
Example	**SOUR1:SWE:FREQ:CENT? MAX** **+3.0000E+07** Returns the maximum center frequency allowed, depending on the span.	

SOURce[1|2]:SWEep:FREQuency:SPAN

Source Specific Command

Description	Sets or queries the frequency span of the sweep for the selected channel. 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|2]:SWEep:FREQuency:SPAN {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	1μHz~ 30MHz (20MHz AFG-3021/3022) 1μHz~ 1MHz (Ramp)
Example	**SOUR1:SWE:FREQ:SPAN +2.0000E+03** Sets the frequency span to 2kHz.	
Query Syntax	**SOURce[1|2]:SWEep:FREQuency:SPAN? [MINimum| MAXimum]**	
Return Parameter	<NR3>	Returns the frequency span in Hz.
Example	**SOUR1:SWE:FREQ:SPAN?** **+2.0000E+03** Returns the frequency span for the current sweep.	

SOURce[1|2]:SWEep:FUNCtion

Source Specific Command

Description	Sets linear or logarithmic sweep spacing. The default spacing is linear.	
Syntax	**SOURce[1|2]:SWEep:FUNCtion {LINear|LOG}**	
Example	**SOUR1:SWE:FUNC LIN** Sets the spacing to linear.	
Query Syntax	**SOURce[1|2]:SWEep:FUNCtion?**	
Return Parameter	LIN	Linear spacing
	LOG	Logarithmic spacing
Example	**SOUR1:SWE:FUNC?** **LOG** The spacing is currently set as linear.	

SOURce[1|2]: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|2]: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|2]:SWEep:TIME? {[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|2]:SWEep:TRIGger

Source Specific Command

Description	Sets or queries the trigger source as internal, external, manual or off for the selected channel. Internal is the default trigger source.INTernal will constantly output a swept waveform at a defined interval time. EXTernal will output a swept waveform after each external trigger pulse. Manual will ouput a swept waveform after the trigger softkey is pressed or the SOURce[1 | 2]:SWEep:MANual:TRIGger command is issued.The OFF setting is for continuous sweeping.
Note	If the APPLy command was used to create the waveform shape, the source is automatically set to INTernal. The *OPC/*OPC? command/query can be used to signal the end of the sweep.

Syntax	**SOURce[1|2]:SWEep:TRIGger {EXTernal|MANual|OFF| INTernal,<seconds>|MINimum|MAXimum}**	
Parameter	INTernal	Internal trigger
	EXTernal	External trigger
	MANual	Manual trigger
	OFF	No interval time, sweep continuously
	<seconds>	1ms~ 500s. Interval time in seconds for the internal trigger.
	MINimum	Sets the interval time to the minimum
	MAXimum	Sets the interval time to the maximum
Example	**SOUR1:SWE:TRIG EXT**	
	Sets the sweep source to external.	
Query Syntax	**SOURce[1|2]:SWEep:TRIGger?**	
Return Parameter	INT,<NR3>	Internal trigger, interval time in seconds
	EXT	External trigger
	MAN	Manual trigger
	OFF	Sweep continuously

Example	**SOUR1:SWE:TRIG?** **INT +1.00000E+00** The sweep source is set to an interval time of 1 second.

SOURce[1|2]:SWEep:AMPLitude:STARt

Source Specific Command

Description	Sets the start amplitude for when the sweep is set to the amplitude sweep type. By default the start amplitude is set to 1Vpp.	
Syntax	**SOURce[1|2]:SWEep:AMPLitude:STARt {<ampiltude>|MINimum|MAXimum}**	
Parameter	<NR3>	Sweep amplitude in volts. (range:1mV~10V @50Ω)
Example	**SOUR1:SWE:AMPL:STAR MIN** Sets the start sweep to the minimum level (1mVpp).	
Query Syntax	**SOURce[1|2]:SWEep:AMPLitude:STARt? {[MINimum|MAXimum]}**	
Return Parameter	<NR3>	Sweep amplitude in volts.
Example	**SOUR1:SWE:AMPL:STAR?** **1.000E+00** The start amplitude is set to 1Vpp.	

SOURce[1|2]:SWEep:AMPLitude:STOP

Source Specific Command

Description	Sets the stop amplitude for when the sweep is set to the amplitude sweep type. By default the stop amplitude is set to 3Vpp.	
Syntax	**SOURce[1|2]:SWEep:AMPLitude:STOP {<ampltude>|MINimum|MAXimum}**	
Parameter	<NR3>	Sweep amplitude in volts. (range:1mV~10V @50Ω)
Example	**SOUR1:SWE:AMPL:STOP 3** Sets the stop sweep to 3Vpp).	
Query Syntax	**SOURce[1|2]:SWEep:AMPLitude:STOP? {[MINimum|MAXimum]}**	
Return Parameter	<NR3>	Sweep amplitude in volts.
Example	**SOUR1:SWE:AMPL:STOP?** **3.000E+00** The stop amplitude is set to 3Vpp.	

Burst 模式指令

Burst 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	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.

Enable Burst Mode
↓
Configuration
↓
Choose Triggered/Gated Mode
↓
Set Burst Count
↓
Set the burst period

1. Turn on Burst mode using the SOURce[1|2]:BURS:STAT ON command.

2. Use the APPLy command to select a sine, square, ramp, pulse or triangle burst waveform*. Alternatively, the 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|2]:BURS:MODE command to select from triggered or gated burst modes.

4. Use the SOURce[1|2]:BURS:NCYC command to set the burst count. This command is only for triggered burst mode only.

5. Use the SOURce[1|2]: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|2]:BURS:PHAS command to set the burst starting phase.

↓

Set Burst Starting Phase

↓

Select the trigger

7. Use the SOURce[1|2]:BURS:TRIG command to select the trigger source for triggered burst mode only. For manual triggering, execute the SOUR[1]:BURSt:TRIGger:MANual for each trigger.

SOURce[1|2]:BURSt:STATe

Source Specific Command

Description	Turns burst mode on or off for the selected channel. By default burst mode is turned off.	
Note	When burst mode is turned on, sweep and any modulation modes are disabled on the same channel.	
Syntax	**SOURce[1|2]:BURSt:STATe {OFF|ON}**	
Parameter	OFF	Disabled
	ON	Enabled
Example	**SOUR1:BURS:STAT OFF**	
	Turns burst mode on.	
Query Syntax	**SOURce[1|2]:BURSt:STATe?**	
Return Parameter	0	Disabled
	1	Enabled

Example	**SOUR1:BURS:STAT?** **OFF** Burst mode is off.

SOURce[1|2]: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|2]:BURSt:MODE {TRIGgered|GATE}**	
Parameter	TRIGgered	Triggered mode
	GATE	Gated mode
Example	**SOUR1:BURS:MODE TRIG** Sets the burst mode to triggered.	
Query Syntax	**SOURce[1|2]:BURSt:MODE?**	
Return Parameter	TRIG	Triggered mode
	GATE	Gated mode
Example	**SOUR1:BURS:MODE?** **TRIG** The current burst mode is triggered.	

SOURce[1|2]:BURSt:NCYCles

Source Specific Command

Description	Sets or queries the number of cycles (burst count) in triggered burst mode for the selected channel. 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(not applicable for AFG-3021/3022).
Syntax	**SOURce[1|2]: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|2]: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|2]:BURSt:INTernal:PERiod

Source Specific Command

Description	Sets or queries the burst period for the selected channel. Burst period settings are only applicable when the trigger is set to immediate. The default burst period is 10ms. 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|2]: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|2]: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 10seconds.

SOURce[1|2]:BURSt:PHASe

Source Specific Command

Description	Sets or queries the starting phase for the burst for the selected channel. 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|2]: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|2]:BURSt:PHASe? [MINimum|MAXimum]**	
Return Parameter	<NR3>	Returns the phase angle in degrees.
Example	**SOUR1:BURS:PHAS?** **+1.2000E+01** The burst starting phase is 120 degrees.	

SOURce[1|2]:BURSt:TRIGger:MANual

Source Specific Command

Description	This command is used to manually trigger a burst waveform when the source trigger is set to manual for the selected channel. This command is the equivalent of pressing the trigger soft-key on the front panel for manual triggering.
Syntax	**SOURce[1|2]:BURSt:TRIGger:MANual**
Example	**SOUR1:BURS:TRIG:MAN** Manually triggers the burst waveform.

SOURce[1|2]:BURSt:TRIGger

Source Specific Command

Description	Sets or queries the trigger source for triggered burst mode for the selected channel. 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 SOUR[1]:BURSt:TRIGger:MANual command is executed or the trigger soft-key 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|2]:BURSt:TRIGger {IMMediate|EXTernal|MANual}**	
Example	**SOUR1:BURS:TRIG:SOUR EXT** Sets the burst trigger source to external.	
Query Syntax	**SOURce[1|2]:BURSt:TRIGger?**	
Return Parameter	IMM	Immediate

	EXT	External
	MANual	Manual

Example

SOUR1:BURS:TRIG?

IMM

The burst trigger source is set to immediate.

SOURce[1|2]:BURSt:TRIGger:DELay

Source Specific Command

Description

The DELay command is used to insert a delay (in seconds) before a burst is output for the selected channel. The delay starts after a trigger is received. The default delay is 0 seconds.

Syntax

SOURce[1|2]: BURSt:TRIGger:DELay {<seconds>|MINimum|MAXimum}

Parameter	<seconds>	0~100seconds

Example

SOUR1:BURS:TRIG:DEL +1.0000E+01

Sets the trigger delay to 10 seconds.

Query Syntax

SOURce[1|2]: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|2]: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 for the selected channel. By default the trigger is rising edge (Positive).	
Syntax	**SOURce[1|2]: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|2]:BURSt:TRIGger:SLOPe?**	
Return Parameter	POS	rising edge
	NEG	falling edge
Example	**SOUR1:BURS:TRIG:SLOP NEG** The trigger slope is negative.	

SOURce[1|2]:BURSt:GATE:POLarity

Source Specific Command

Description	In gated mode, for the selected channel, 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|2]: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|2]: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).	

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.

Output Arbitrary Waveform

↓

Select Waveform Frequency, amplitude and offset

↓

Load Waveform Data

↓

Set Waveform Rate

1. Use the SOURce[1|2]:ARB:BUILt:ARB_waveform command (Example: SOURce[1|2]:ARB:BUILt:SQUare) to output the arbitrary waveform currently selected in memory.

2. Use the APPLy command to select frequency, amplitude and DC offset. Alternatively, FREQ, FUNC, AMPl, and DCOffs commands can be used.

3. Waveform data (1 to 8388608 points per waveform) can be downloaded into volatile memory using the SOURce[1|2]: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.

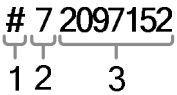
Rate = Hz × # points

Frequency:	1μHz ~ 125MHz μ
# points:	2~8,388,608

SOURce[1|2]:DATA:DAC

Source Specific Command

Description	The SOURce[1	2]: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 1	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:



1. Initialization character (#)
2. Digit length (in ASCII) of the number of bytes
3. 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.

Note 2	The data sent by the command is limited to 1MB. To overcome the 1MB limitation, use the <start> parameter to send data segments of 1MB or less. Do not send the command before the last transmission has finished. An example will be shown below.
Syntax	**SOURce[1|2]:DATA:DAC VOLATILE, <start>, {<binary block>|<value>, <value>, . . . }**
Parameter	<start> Start address of the arbitrary waveform

	<binary block> <value>	Decimal or integer values ±32767
Example1	**SOUR1:DATA:DAC VOLATILE, 0, #216 Binary Data** The command above downloads 8 data values (stored in 16 bytes) using the binary block format. **SOUR1:DATA:DAC VOLATILE, 1000, 32767, 2048, 0, -2048, -32767** Downloads the data values (32767, 2048, 0, -2048, -32767) to address 1000.	
Example2a (0~1M data points)	**SOUR1:DATA:DAC VOLATILE,0,#72097152 Binary Data** This command will send that first 0~1M data points to address 0. To send data to the next 1M data points, see below:	
Example2b (1M~2M data points)	**SOUR1:DATA:DAC VOLATILE,1048576,#72097152 Binary Data** This command will send the next 1M data points (1M~2M)	

SOURce[1|2]:ARB:EDIT:COPY

Source Specific Command

Description	Copies a segment of a waveform to a specific starting address.
Syntax	**SOURce[1|2]:ARB:EDIT:COPY [<start>[,<length>[,<paste>]]]**

Parameter	<start>	Start address: 0~8388606
	<length>	Length: 2~8388608
	<paste>	Paste address: 0~8388607

Example

SOUR1:ARB:EDIT:COPY 1000, 256, 1257

Copies 256 data values starting at address 1000 and copies them to address 1257.

SOURce[1|2]:ARB:EDIT:DELete

Source Specific Command

Description	Deletes a segment of a waveform from memory for the selected channel. The segment is defined by a starting address and length.
Note	A waveform/waveform segmentcannot be deleted when being output.
Syntax	**SOURce[1|2]:ARB:EDIT:DELete [<STARt>[,<LENGth>]]**

Parameter	<STARt>	Start address: 0~8388606
	<LENGth>	Length: 2~8388608

Example

SOURce1:ARB:EDIT:DEL 1000, 256

Deletes a section of 256 data points from the waveform starting at address 1000.

SOURce[1|2]:ARB:EDIT:DELete:ALL

Source Specific Command

Description	Deletes all user-defined waveforms from non-volatile memory and the current waveform in volatile memory for the selected channel.
Note	A waveform cannot be deleted when output.
Syntax	**SOURce[1|2]:ARB:EDIT:DELete:ALL**
Example	**SOUR1:ARB:EDIT:DEL:ALL** Deletes all user waveforms from memory.

SOURce[1|2]:ARB:EDIT:POINt

Source Specific Command

Description	Edit a point on the arbitrary waveform.	
Note	A waveform/waveform segment cannot be deleted when being output.	
Syntax	**SOURce[1|2]:ARB:EDIT:POINt [<address> [, <data>]]**	
Parameter	<address>	Address of data point: 0~8388607
	<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|2]:ARB:EDIT:PROTect

Source Specific Command

Description	Protects a segment of the arbitrary waveform from deletion/editing or returns the protection state and co-ordinates (if any).	
Syntax	**SOURce[1|2]:ARB:EDIT:PROTect [<STARt>[,<LENGth>]]**	
Parameter	<STARt>	Start address: 0~8388606
	<LENGth>	Length: 2~8388608
Example	**SOUR1:ARB:EDIT:PROT 40, 50**	
	Protects a segment of the waveform from address 40 for 50 data points.	
Query Syntax	**SOURce[1|2]:ARB:EDIT:PROTect?**	
Return Parameter	"UnProtect"	Returns the string "Unprotect" when protection is disabled.
	"Protect Start:"<STARt>" Protect Length:"<LENGth>	Returns a string showing the start of the protection and the protection length.
Example	**SOUR1:ARB:EDIT:PROT?**	
	Protect Start:0 Protect Length:10	
	Returns the protected segment of the ARB waveform.	

SOURce[1|2]:ARB:EDIT:PROTect:ALL

Source Specific Command

Description	Protects the arbitrary waveform currently in non-volatile memory/ currently being output.
Syntax	**SOURce[1|2]:ARB:EDIT:PROTect:ALL**
Example	**SOUR1:ARB:EDIT:PROT:ALL**

SOURce[1|2]:ARB:EDIT:UNProtect

Source Specific Command

Description	Unprotects the arbitrary waveform currently in non-volatile memory/currently being output.
Syntax	**SOURce[1|2]:ARB:EDIT:UNProtect**
Example	**SOUR1:ARB:EDIT:UNP**

SOURce[1|2]:ARB:BUILt:SINusoid

Source Specific Command

Description	Creates a sinusoid with a specified start address, length and scale for the selected channel.	
Syntax	**SOURce[1|2]:ARB:BUILt:SINusoid [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤8388608	
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|2]:ARB:BUILt:SQUare

Source Specific Command

Description	Creates a square wave with a specified start address, length and scale.	
Syntax	**SOURce[1|2]:ARB:BUILt:SQUare [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤8388608	
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|2]:ARB:BUILt:PULSe

Source Specific Command

Description	Creates a pulse wave with a specified frequency and duty.
Syntax	**SOURce[1|2]:ARB:BUILt:PULSe {[<frequency>|MINimum|MAXimum[,{<percent>|MINimum|MAXimum}]]}**

Parameter	<frequency>	Sets the pulse frequency
	<percent>	Sets the duty of the pulse as a percentage

*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|2]:ARB:BUILt:RAMP

Source Specific Command

Description

Creates a ramp wave with a specified start address, length and scale for the selected channel.

Syntax

SOURce[1]:ARB:BUILt:RAMP[<STARt>[,<LENGth>[,<SCALe>]]]

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608

	<SCALe>	Scale: ±32767
	* Start + Length ≤8388608	

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|2]:ARB:BUILt:SINC

Source Specific Command

Description

Creates a sinc wave with a specified start address, length and scale.

Syntax

SOURce[1|2]:ARB:BUILt:SINC [<STARt>[,<LENGth>[,<SCALe>]]]

Parameter

<STARt>	Start address*: 0~8388606
<LENGth>	Length*: 2~8388608
<SCALe>	Scale: ±32767

* Start + Length ≤8388608

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|2]:ARB:BUILt:EXPRise

Source Specific Command

Description	Creates an exponential rise wave with a specified start address, length and scale for the selected channel.	
Syntax	**SOURce[1|2]:ARB:BUILt:EXPRise [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤8388608	
Example	**SOUR1:ARB:BUIL:EXPR 1000, 1000, 100**	
	Creates anexponential rise wave 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:EXPFall

Source Specific Command

Description	Creates an exponential fall wave with a specified start address, length and scale.	
Syntax	**SOURce[1|2]:ARB:BUILt:EXPFall [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608

	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

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|2]:ARB:BUILt:DC

Source Specific Command

Description Creates a DC waveform with a specified start address, length and scale.

Syntax **SOURce[1|2]:ARB:BUILt:DC [<STARt>[,<LENGth>[,<Data>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<Data>	Data: ±32767
	* Start + Length ≤8388608	

Example **SOUR1:ARB:BUIL:DC 1000, 1000, 100**

Creates a DC waveform of 1000 points in length with a data of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:stair_ud

Source Specific Command

Description Creates anup& down staircase waveform(8 steps up, 8 steps down).

Syntax	**SOURce[1|2]:ARB:BUILt:stair_ud [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:stair_ud 1000, 1000, 100**	
	Creates an up & down staircase waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:stair_down

Source Specific Command

Description	Creates an 8-step down-staircase waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:stair_down [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:stair_down 1000, 1000, 100**	
	Creates a staircase waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:stair_up

Source Specific Command

Description	Creates an 8-step up-staircase waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:stair_up [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:stair_up 1000, 1000, 100**	
	Creates a staircase waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:absatan

Source Specific Command

Description	Creates an absolute atan waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:absatan [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example	**SOUR1:ARB:BUIL:absatan 1000, 1000, 100** Creates an absolute atan waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:abssin

Source Specific Command

Description	Creates an absolute sine waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:abssin [<STARt>[,<LENGth>[,<SCALe>]]]**
Parameter	<STARt> Start address*: 0~8388606 <LENGth> Length*: 2~8388608 <SCALe> Scale: ±32767 * Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:abssin 1000, 1000, 100** Creates an absolute sine waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:abssinehalf

Source Specific Command

Description	Creates an absolute half sine waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:abssinehalf [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:abssinehalf 1000, 1000, 100**	
	Creates an absolute sine half waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:ampalt

Source Specific Command

Description	Creates an amplifying oscillation waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:ampalt [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:ampalt 1000, 1000, 100**	
	Creates anamplifying oscillating waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:attalt

Source Specific Command

Description	Creates an attenuated oscillation waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:attalt [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:attalt 1000, 1000, 100**	
	Creates an attenuated oscillating waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:diric_even

Source Specific Command

Description	Creates an even Dirichlet kernelwaveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:diric_even [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:diric_even 1000, 1000, 100** Creates an even diric waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:diric_odd

Source Specific Command

Description	Creates an odd diric waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:diric_odd [<STARt>[,<LENGth>[,<SCALe>]]]**
Parameter	<STARt> Start address*: 0~8388606 <LENGth> Length*: 2~8388608 <SCALe> Scale: ±32767 * Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:diric_odd 1000, 1000, 100** Creates an oddDiric waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:gauspuls

Source Specific Command

Description	Creates a Gaussian-modulated sinusoidal pulse waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:gauspuls [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:gauspuls 1000, 1000, 100**	
	Creates a Gaussian-pulse waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:havercosine

Source Specific Command

Description	Creates a havercosine waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:havercosine[<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:havercosine 1000, 1000, 100**	
	Creates a havercosine waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:haversine

Source Specific Command

Description	Creates a haversine waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:haversine[<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:haversin 1000, 1000, 100**	
	Creates a haversine waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:n_pulse

Source Specific Command

Description	Creates a negative pulse waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:n_pulse[<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:n_pulse 1000, 1000, 100** Creates a negative pulse waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:negramp

Source Specific Command

Description	Creates a negative ramp pulse waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:negramp [<STARt>[,<LENGth>[,<SCALe>]]]**
Parameter	<STARt> Start address*: 0~8388606 <LENGth> Length*: 2~8388608 <SCALe> Scale: ±32767 * Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:negramp 1000, 1000, 100** Creates a negative ramp waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:rectpuls

Source Specific Command

Description	Creates a rectangular pulse.
Syntax	**SOURce[1|2]:ARB:BUILt:rectpuls [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:rectpuls 1000, 1000, 100**	
	Creates a rectangular pulse waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:roundhalf

Source Specific Command

Description	Creates a positive half circle (y=sqrt(1-x²)).
Syntax	**SOURce[1|2]:ARB:BUILt:roundhalf [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:roundhalf 1000, 1000, 100**	
	Creates a positive half circlewaveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:sawtoot

Source Specific Command

Description	Creates a sawtooth waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:sawtoot [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:sawtoot 1000, 1000, 100**	
	Creates a sawtooth waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:sinetra

Source Specific Command

Description	Creates a piecewise sine wave.	
Syntax	**SOURce[1|2]:ARB:BUILt:sinetra [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example	**SOUR1:ARB:BUIL:sinetra 1000, 1000, 100** Creates a piecewise sine waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:stepresp

Source Specific Command

Description	Creates a Heaviside step function(step response).
Syntax	**SOURce[1|2]:ARB:BUILt:stepresp [<STARt>[,<LENGth>[,<SCALe>]]]**
Parameter	<STARt> Start address*: 0~8388606 <LENGth> Length*: 2~8388608 <SCALe> Scale: ±32767 * Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:stepresp 1000, 1000, 100** Creates aHeaviside sine waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:sinever

Source Specific Command

Description	Creates piecewise sine wave (clipped to 0 at 0° to 90° and 180° to 270°).
Syntax	**SOURce[1|2]:ARB:BUILt:sinever [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:sinever 1000, 1000, 100**	
	Creates apiecewise sine wave waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:trapezia

Source Specific Command

Description	Creates atrapezoid waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:trapezia [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:trapezia 1000, 1000, 100**	
	Creates trapezoid waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:tripulsl

Source Specific Command

Description	Creates a triangular pulse waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:tripulsl [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:tripuls 1000, 1000, 100**	
	Creates triangular pulse waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:dlorentz

Source Specific Command

Description	Creates a derivative of the Lorentz function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:dlorentz [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:dlorentz 1000, 1000, 100** Creates a derivative of Lorentz function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:gauss

Source Specific Command

Description	Creates a gauss bell curve waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:gauss [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:gauss 1000, 1000, 100** Creates a gauss bell curve waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:ln

Source Specific Command

Description	Creates natural logarithm waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:ln [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:ln 1000, 1000, 100**	
	Creates a natural logarithm waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:lorentz

Source Specific Command

Description	Createsa Lorentz function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:lorentz [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:lorentz 1000, 1000, 100**	
	Creates a Lorentz function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:sinc

Source Specific Command

Description	Creates a cardinal sine function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:sinc [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:sinc 1000, 1000, 100**	
	Creates a cardinal sine function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:sqrt

Source Specific Command

Description	Creates a square root function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:sqrt [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:sqrt 1000, 1000, 100** Creates a square root function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:xsquare

Source Specific Command

Description	Creates a quadratic (x^2) function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:xsquare [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:xsquare 1000, 1000, 100** Creates a quadratic function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:arccos

Source Specific Command

Description	Creates aninverse cosine function waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:arccos [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:arccos 1000, 1000, 100**	
	Creates an inverse cosine function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:arccot

Source Specific Command

Description	Creates an inversecotangent function waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:arccot [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:arccot 1000, 1000, 100**	
	Creates an inversecotangent function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:arccsc

Source Specific Command

Description	Creates an inverse cosecant function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:arccsc [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:arccsc 1000, 1000, 100**	
	Creates an inverse cosecant function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:arcsec

Source Specific Command

Description	Creates an inverse secant function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:arccsc [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:arccsc 1000, 1000, 100** Creates an inverse secant function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:arcsin

Source Specific Command

Description	Creates an inverse sine waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:arcsin [<STARt>[,<LENGth>[,<SCALe>]]]**
Parameter	<STARt> Start address*: 0~8388606 <LENGth> Length*: 2~8388608 <SCALe> Scale: ±32767 * Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:arcsin 1000, 1000, 100** Creates an inverse sine waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:arcsinh

Source Specific Command

Description	Creates an inverse hyperbolic sine waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:arcsinh [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example

SOUR1:ARB:BUIL:arcsinh 1000, 1000, 100

Creates an inverse hyperbolic sine waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:arctan

Source Specific Command

Description

Creates an inverse tangent waveform.

Syntax

SOURce[1|2]:ARB:BUILt:arctan [<STARt>[,<LENGth>[,<SCALe>]]]

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example

SOUR1:ARB:BUIL:arctan 1000, 1000, 100

Creates an inverse tangent waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:arctanh

Source Specific Command

Description	Creates an inverse hyperbolic tangent waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:arctanh[<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:arctanh 1000, 1000, 100** Creates an inverse hyperbolic tangent waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:cosh

Source Specific Command

Description	Creates a hyperbolic cosine waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:cosh [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:cosh 1000, 1000, 100** Creates a hyperbolic cosine waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:cot

Source Specific Command

Description	Creates a cotangent waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:cot[<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:cot 1000, 1000, 100** Creates a cotangent waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:csc

Source Specific Command

Description	Creates a cosecant waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:csc [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:csc 1000, 1000, 100**	
	Creates a cosecant waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:sec

Source Specific Command

Description	Creates a secant waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:sec [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:sec 1000, 1000, 100**	
	Creates a secant waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:sech

Source Specific Command

Description	Creates a hyperbolic secant waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:sech [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:sech 1000, 1000, 100**	
	Creates a hyperbolic secant waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:sinh

Source Specific Command

Description	Creates a hyperbolic sine waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:sinh [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:sinh 1000, 1000, 100** Creates a hyperbolic sine waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:tan

Source Specific Command

Description	Creates a tangent waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:tan[<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:tan 1000, 1000, 100** Creates a tangent waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:tanh

Source Specific Command

Description	Creates a hyperbolic tangent waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:tanh [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:tanh 1000, 1000, 100**	
	Creates a hyperbolic tangent waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:barthannwin

Source Specific Command

Description	Creates a Bartlett-Hann window function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:barthannwin [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:barthannwin 1000, 1000, 100**	
	Creates a Bartlett-Hann window function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:bartlett

Source Specific Command

Description	Creates a Bartlett window function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:bartlett [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:bartlett 1000, 1000, 100** Creates a Bartlett window function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:blackman

Source Specific Command

Description	Creates a Blackman window function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:blackman [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:blackman 1000, 1000, 100** Creates a Blackman window function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:bohmanwin

Source Specific Command

Description	Creates a Bohmanwin window function waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:bohmanwin [<STARt>[,<LENGth>[,<SCALe>]]]**
Parameter	<STARt> Start address*: 0~8388606 <LENGth> Length*: 2~8388608 <SCALe> Scale: ±32767 * Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:bohmanwin 1000, 1000, 100** Creates a Bohmanwin window function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:chebwin

Source Specific Command

Description	Creates a Chebyshev window function waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:chebwin [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example

SOUR1:ARB:BUIL:chebwin 1000, 1000, 100

Creates a Chebyshev window function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:flattopwin

Source Specific Command

Description

Creates a flat top weighted window function waveform.

Syntax

SOURce[1|2]:ARB:BUILt:chebwin [<STARt>[,<LENGth>[,<SCALe>]]]

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example

SOUR1:ARB:BUIL:chebwin 1000, 1000, 100

Creates a flat top weighted window function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:hamming

Source Specific Command

Description	Creates a Hamming window function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:hamming [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:hamming 1000, 1000, 100**	
	Creates a Hamming window function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:hann

Source Specific Command

Description	Creates a Hann window function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:hann [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767

	* Start + Length ≤ 8388608
Example	**SOUR1:ARB:BUIL:hann 1000, 1000, 100** Creates a Hann window function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:kaiser

Source Specific Command

Description	Creates a Kasier window function waveform.	
Syntax	**SOURce[1|2]:ARB:BUILt:kaiser [<STARt>[,<LENGth>[,<SCALe>]]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	
Example	**SOUR1:ARB:BUIL:kaiser 1000, 1000, 100** Creates a Kaiser window function waveform 1000 points in length with a scale of 100 and a start address of 1000.	

SOURce[1|2]:ARB:BUILt:traing

Source Specific Command

Description	Creates a Triangle window function waveform.
Syntax	**SOURce[1|2]:ARB:BUILt:traing [<STARt>[,<LENGth>[,<SCALe>]]]**

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example

SOUR1:ARB:BUIL:traing 1000, 1000, 100

Creates a Triangle window function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:BUILt:tukeywin

Source Specific Command

Description

Creates a Tukey window function waveform.

Syntax

SOURce[1|2]:ARB:BUILt:tukey [<STARt>[,<LENGth>[,<SCALe>]]]

Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
	<SCALe>	Scale: ±32767
	* Start + Length ≤ 8388608	

Example

SOUR1:ARB:BUIL:tukey 1000, 1000, 100

Creates a Tukey window function waveform 1000 points in length with a scale of 100 and a start address of 1000.

SOURce[1|2]:ARB:OUTPut

Source Specific Command

Description	Marks a section of the ARB waveform to be output.	
Syntax	**SOURce[1|2]:ARB:OUTPut [<STARt>[,<LENGth>]]**	
Parameter	<STARt>	Start address*: 0~8388606
	<LENGth>	Length*: 2~8388608
Example	**SOUR1:ARB:OUTP100, 1000** Sets the ARB output section from point 100 to 1100.	
Query Syntax	**SOUR1:ARB:OUTP?**	
Return Parameter	Returns the following string: Start:<STARt>,Length:<LENGth>	
	<STARt>	0~8388606
	<LENGth>	2~8388608
Example	**SOUR1:ARB:OUTP?** **0, 1024** The output section starts at 0 and ends at 1024.	

SOURce[1|2]:ARB:RATE

Source Specific Command

Description	Sets or queries the sample rate of the ARB waveform.	
Syntax	**SOURce[1|2]:ARB:RATE {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	Sets the sample rate frequency in Hz.
	MINimum	1μHz
	MAXimum	250MHz
Example	**SOUR1:ARB:RATE 20000** Sets the ARB rate to 20kHz.	
Query Syntax	**SOUR1:ARB:RATE?**	
Return Parameter	<NRf>	Returns the rate in Hz.
Example	**SOUR1:ARB:RATE?** **+2.000000000000E+04** The rate is 20 kHz.	

SOURce[1|2]:ARB:GATE

Source Specific Command

Description	Sets or queries whether a high or low level TTL signal applied to the trigger input turns the output on or off when the ARB output trigger is in the Gated mode (for the selected channel). Using this command will set the ARB output trigger as Gate Pos or Gate Neg and disable the Ncycle or Infinite trigger settings.	
Syntax	**SOURce[1|2]:ARB:GATE {POSitive|NEGative}**	
Parameter	POSitive	Gated output when a high TTL level signal is applied.
	NEGative	Gated output when a low TTL level signal is applied.
Example	**SOUR1:ARB:GATE POS** Configures the CH1 ARB waveform to be output when a positive TTL signal is applied to the CH1 trigger input.	
Query Syntax	**SOURce[1|2]:ARB:GATE?**	
Return Parameter	OFF	Indicates that the trigger is in Ncycle mode.
	POSitive	Trigger gate polarity is negative.
	NEGative	Trigger gate polarity is positive.
Example	**SOURce1:ARB:GATE?** **OFF** The ARB output trigger is in Ncycle mode.	

SOURce[1|2]:ARB:NCYCles

Source Specific Command

Description	Sets how the ARB Ncycle mode is triggered	
Syntax	**SOURce[1|2]:ARB:NCYCles {INFinite|MANual|EXTernal}**	
Parameter	INFinite	Continuous cycles
	MANual	Manual trigger
	EXTernal	External trigger
Example	**SOUR1:ARB:NCYC INF** Sets the number of ARB waveform output cycles to continuous (infinite).	
Query Syntax	**SOURce[1|2]:ARB:NCYCles?**	
Return Parameter	OFF	ARB output trigger is in the Gate mode.
	INF	Continuous cycles
	MAN	Manual trigger
	EXT	External trigger
Example	**SOUR1:ARB:NCYC?** **INF** The ARB waveform output is set to infinite.	

SOURce[1|2]:ARB:NCYCles:CYCle

Source Specific Command

Description	The arbitrary waveform output can be repeated for a designated number of cycles.

Syntax	**SOURce[1|2]:ARB:NCYCles:CYCle {<cycles>|MINimum|MAXimum}**	
Parameter	<cycles>	1 ~ 8388607 cycles
	MINimum	Minimum number of cycles (1)
	MAXimum	Maximum number of cycles (8388607)
Example	**SOUR1:ARB:NCYC:CYCMAX** Sets the number of ARB waveform output cycles to the maximum.	
Query Syntax	**SOURce[1|2]:ARB:NCYCles:CYCle? {[MINimum|MAXimum]}**	
Return Parameter	<NR3>	Number of Ncycles.
Example	**SOUR1:ARB:NCYC:CYC?** **+8.388607E+06** Sets the number of ncycles to 8388607.	

SOURce[1|2]:ARB:MANual:TRIGger

Source Specific Command

Description	This command is used to manually trigger the ARB output for the selected channel. This command is the equivalent of pressing the trigger soft-key on the front panel for manual triggering.
Syntax	**SOURce[1|2]:ARB:MANual:TRIGger**
Example	**SOUR1:ARB:MAN:TRIG**

Manually triggers the ARB waveform.

追踪指令

SOURce[1|2]:COUPle:FREQuency:MODE

Source Specific Command

Description	Sets the frequency coupling mode for the AFG-3022 and AFG-3032 models. By default, frequency coupling is turned off.	
Syntax	**SOURce[1|2]:COUPle:FREQuency:MODE {OFF|OFFSet|RATio}**	
Parameter	OFF	Coupling off, independent output
	OFFSet	Holds the frequency difference at a constant offset value
	RATio	Holds the frequency ratio between each channel to constant ratio.
Example	**SOUR1:COUP:FREQ:MODE OFF** Turns frequency coupling off.	
Query Syntax	**SOURce[1|2]:COUPle:FREQuency:MODE**	
Return Parameter	OFF	Coupling off, independent output
	OFFS	Set to constant offset value
	RAT	Set to constant ratio value.
Example	**SOUR1:COUP:FREQ:MODE?** **OFF** Indicates that frequency coupling is turned off.	

SOURce[1|2]:COUPle:FREQuency:OFFSet

Source Specific Command

Description	Sets the frequency coupling offset value. The default value is 0Hz. Applicable for the AFG-3022 and 3032 only. Note: CH2 frequency = CH1 frequency + offset frequency. CH1 frequency is fixed regardless of whether the SOURce1 or SOURce2 command is used.	
Syntax	**SOURce[1|2]:COUPle:FREQuency:OFFSet {<frequency>|MINimum|MAXimum}**	
Parameter	<frequency>	Frequency difference in hertz. Range: -30MHz ~ 30MHz (20MHz AFG-3022) Resolution: 1uHz
	MINimum	Sets the frequency to the minimum.
	MAXimum	Sets the frequency to the maximum.
Example	**SOUR1:COUP:FREQ:OFFS 1000** Sets the frequency coupling to 1kHz.	
Query Syntax	**SOURce[1|2]:COUPle:FREQuency:OFFSet {[MINimum|MAXimum]}**	
Return Parameter	<NR3>	Offset frequency.
Example	**SOUR1:COUP:FREQ:OFFS?** **+1.000E+03**	

Indicates that the frequency coupling offset is 1kHz.

SOURce[1|2]:COUPle:FREQuency:RATio

Source Specific Command

Description	Sets the frequency coupling ratio value for the selected channel. The default value is 1. Applicable for the AFG-3022 and AFG-3032 only. The frequency ratio is defined as: CH2 frequency / CH1 frequency. CH1 frequency is fixed regardless of whether the SOURce1 or SOURce2 command is used.	
Syntax	**SOURce[1|2]:COUPle:FREQuency:RATio {<ratio>|MINimum|MAXimum}**	
Parameter	<ratio>	Range: 1000~0.001, resolution 0.001
	MINimum	Sets the ratio to the minimum (1000)
	MAXimum	Sets the ratio to the minimum (0.001)
Example	**SOUR1:COUP:FREQ:RAT 100** Sets the ratio value of CH1 to 100.	
Query Syntax	**SOURce[1|2]:COUPle:FREQuency:RATio {[MINimum|MAXimum]}**	
Return Parameter	<NR3>	Returns the ratio.
Example	**SOUR1:COUP:FREQ:RAT?** +1.000E+02	

Indicates that the ratio value for CH1 is 100.

SOURce[1|2]:COUPle:AMPLitude

Source Specific Command

Description	Sets or queries the amplitude coupling state. Amplitude coupling sets the amplitude of the selected channel to be the same as the other channel. By default amplitude coupling is turned off. Only applicable to the AFG-3022 and the AFG-3032.	
Syntax	**SOURce[1|2]:COUPle:AMPLitude {ON|OFF}**	
Parameter	ON	Turns amplitude coupling on.
	OFF	Turns amplitude coupling off.
Example	**SOURce1:COUP:AMPL ON** Turns amplitude coupling on.	
Query Syntax	**SOURce[1|2]:COUPle:AMPLitude?**	
Return Parameter	ON	Amplitude coupling is on.
	OFF	Amplitude coupling is off.
Example	**SOUR1:COUP:AMPL?** ON Indicates that amplitude coupling is on.	

SOURce[1|2]:TRACking:STATe

Source Specific Command

Description	Sets or queries the tracking state of the selected channel. Tracking will set the waveform shape, frequency and amplitude of one channel to be the same as the other channel. Only applicable to the AFG-3022 and the AFG-3032.	
Syntax	**SOURce[1|2]:TRACking:STATe {ON|INVerted|OFF}**	
Parameter	ON	Turns channel tracking on.
	INVerted	Turns inverted channel tracking on.
	OFF	Turns channel tracking off.
Example	**SOUR1:TRAC:STAT ON** Turns channel tracking on.	
Query Syntax	**SOURce[1|2]:TRACking:STATe?**	
Parameter	ON	Channel tracking is on.
	INV	Inverted channel tracking is on.
	OFF	Channel tracking is off.
Example	**SOUR1:TRAC:STAT?** ON Indicates that channel tracking is on.	

参考指令

SOURce[1|2]:REFerence

Source Specific Command

Description	Sets or queries the 10MHz reference source as internal or external.	
Syntax	**SOURce[1|2]:REFerence {INTernal|EXTernal}**	
Parameter	INTernal	Sets the reference to the internal source.
	EXTernal	Sets the reference to the external source.
Example	**SOUR1:REF INT** Sets the reference to the internal source.	
Query Syntax	**SOURce[1|2]:REFerence?**	
Parameter	INT	The reference is the internal source.
	EXT	The reference is the external source.
Example	**SOUR1:REF?** INT Indicates that reference is set to internal.	

SOURce[1|2]:REFerence:SYNChronous	Source Specific Command

Description	Allowsthe unit to synchronize with a 10MHz external reference signal. Equivalent to the setting the clock source to EXT Sync when using the front panel operation.
Syntax	**SOURce[1|2]:REFerence:SYNChronous**

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.

MEMory:STATe?

Source Specific Command

Description	Queries the memory state of memory locations 0 ~9 as "Valid" or "Empty".
Query Syntax	**MEMory:STATe?**
Return Parameter	Returns the following string: 0:<state>,1:<state>,2:<state>,3:<state>,4<state>,5: <state>,6:<state>,7:<state>,8:<state>,9:<state> <state> Where state is "Empty" or "Valid".

Example **MEMory:STATe?**

0:Valid,1:Empty,2:Empty,3:Empty,4:Empty,5:Empty,
6:Empty,7:Empty,8:Empty,9:Empty

Indicates memory 0 is valid and all other memory locations are empty.

错误信息

The AFG-30XX 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 457.

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 11000 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:SWE:TRIGON

-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:FUNCtion'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:CYCles#10

-170~177 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 8388708 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;amplitude units changed to Vpp due to high-Z load

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

-221 Settings conflict: made compatible with 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 reduced for triangle function

Example: When the function is changed to triangle, 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;not able to modulate this function

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

-221 Settings conflict;not able to sweep this function

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

-221 Settings conflict: Burst function can not be performed under current setting.

Example: The burst function cannot be used with harmonic waveforms.

-221 Settings conflict: ARB Ncycle function can not be performed under current setting.

nNcycle function will be disabled.

-221 Settings conflict: Sweep Gate function can not be performed under current setting.

Gate function will be disabled.

-221 Settings conflict: Function can not be performed under current setting.

Function is disabled.

-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-30XX, 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;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:frequency forced symmetrychange.

Example: This error occurs when SYM is set larger than 100%.

-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 30.1MHz.

-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.

-222Data out of range: pulse width limited by period.

Example: The pulse width is limited by the period according to the formula below.

Period ≧ Width+ 0.625 * [(Rise Time - 0.6nS)+(Fall Time - 0.6nS)]

To resolve the error, set the duty to the smallest possible value and then increase the frequency until the duty changes accordingly.

-222 Data out of range: pulse rise/fall time limited by pulse width

Example: The rise/fall time is limited by the pulse width according to the formula below.

Width - 0.625 * [(Rise Time - 0.6nS) + (Fall Time - 0.6nS)] ≧ 0

-222 Data out of range;period;

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;

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|2]: APPL: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|2]: APPL: 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|2]: APPL:PULS, it is automatically set to the upper limit.

-222 Data out of range;burst period;

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;

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|2]:BURSt:TRIGger IMM). The burst count is automatically set to the lower limit.

-222 Data out of range;amplitude;

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;

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;

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;

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;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;

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

Duty Cycle	Frequency
40%~60%	25 MHz ~ 30MHz
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 25MHz, the duty cycle is automatically limited to 60%.

-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.

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

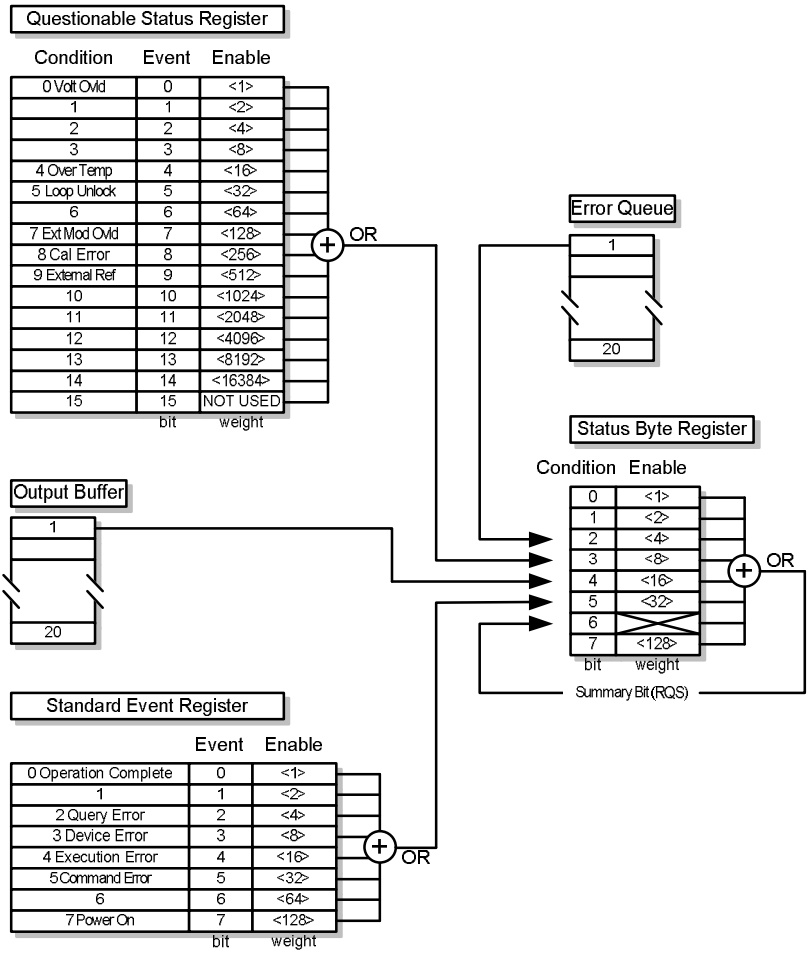
As well as the output and error queues.

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-30XX 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

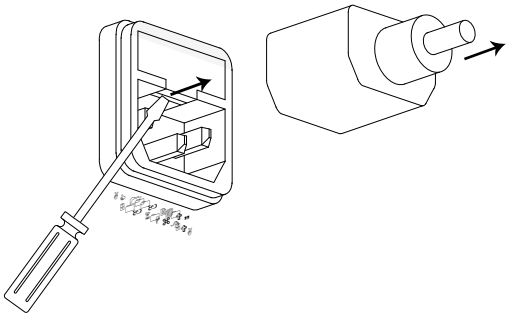
Description	The error queue is queried using the SYSTem:ERRor? command. The Error queue will set the "Error Queue"bit in the status byte register if there are any error messages in the error queue. If the error queue is full the last message will generate a "Queue overflow" error and additional errors 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

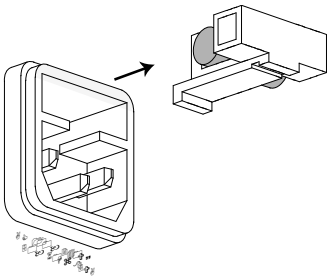
保险丝更换

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

AFG-3022 & AFG-3032: T1A/250V
AFG-3021& AFG-3031: T0.63A/250V

AFG-3021, AFG-3022, AFG-3031 & AFG-3032 规格

此规格适合+20°C~+30°C，热机 30 分钟以上。

一般规格		AFG-3021	AFG-3031	AFG-3022	AFG-3032
	通道	1	1	2	2
	仪器机壳	绝缘	绝缘	绝缘	绝缘
	信号接地	—	—	绝缘	绝缘
波形					
	标准波形	正弦波,方波,斜波,脉冲波,噪声波,DC, 谐波			
任意波形					
	ARB 功能	内置			
	采样率	250 MSa/s			
	重建率	125MHz			
	波形长度	8M 点			
	幅值分辨率	16 bits			
	非易失性存储器	10 组 8M 波形(1)			
	用户定义输出部分	从 2~8M 点任选			
	触发	外部			

	内置任意波	Sine, Square, Ramp, Sinc,ExpRise, ExpFall, DC, Pulse, Abstan, Havercosine, Sinever, Abssin, Haversine, Stair_down, Abssinehalf, N_pulse, Stair_UD, Ampalt, Negramp, Stair_up, Attalt, Rectpuls1, Stepresp, Diric_even, Roundhalf, Trapezia, Diric_odd, Sawtoot, Tripuls1, Gauspuls1, Sinetra, Dlorentz, Ln, Sqrt, Since, Lorentz, Xsquare, Gauss, Arccos, Arctan, Sech, Arccot, Arctanh, Sinh, Arccsc, Cosh, Tan, Arcsec, Cot, Tanh, Arcsin, Csc, Arcsinh, Sec, Barthannwin, Chebwin, Kaiser, Bartlett, Flattopwin, Triang, Blackman, Hamming, Tukeywin, Bohmanwin, Hann

频率特性					
范围	正弦波	20MHz	30MHz	20MHz	30MHz
	方波	20MHz	30MHz	20MHz	30MHz
	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/1 year			
	容差	≤1 μHz			
输出特性(2)					
幅值	范围	1 mVpp~10 Vpp(接 50Ω) 2 mVpp~20 Vpp(开路)			
	精确度	±1%设置值±1 mVpp (1 kHz/into 50Ω，无 DC 偏移)			
	分辨率	0.1 mV 或 4 digits			

	平坦度	±0.1dB: <10 MHz ±0.2 dB: 10 MHz~30 MHz (正弦波 1 kHz/into 50Ω)
	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
	接地绝缘	42Vpk max.
同步输出	电平	TTL-兼容(限 3031 / 3021) into>1kΩ
	阻抗	50Ω 标称
	接地绝缘	42Vpk max. (same ground as CH1 output)
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 ~ 30 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~30MHz(仅 AFG-3031/3032)
	相位噪声	< -110dBc/Hz (典型值), 15kHz offset, fc=10MHz
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%~ 80.0%: ≤ 20 MHz	20.0%~ 80.0%: ≤ 25 MHz 40.0%~ 60.0%: 25~ 30MHz	20.0%~ 80.0%: ≤ 20 MHz	20.0%~ 80.0%: ≤ 25 MHz 40.0%~ 60.0%: 25~ 30MHz
	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			
	可调对称性	0%~100% (0.1%分辨率)			
脉冲波特性					
	频率	1uHz ~ 20MHz	1uHz ~ 25MHz	1uHz ~ 20MHz	1uHz ~ 25MHz
	宽度	20ns ~ 999.83ks Width - 0.625 * [(上升时间 - 0.6ns) + (下降时间 - 0.6ns)] ≧ 0 Period ≧ Width+ 0.625 * [(上升时间 - 0.6nS)+(下降时间 - 0.6ns)]			
	占空比设置范围	0.017%~99.983%			
	周期	40ns ~ 1000000s			
	上升时间和下降时间	9.32ns ~ 799.9ks			
	分辨率	0.0001%			
	过激	< 5%			
	抖动	50ps 典型值 (<10kHz)			
噪声					
	噪声类型	高斯噪声			

	噪声带宽	100MHz 等带宽
谐波		
	谐波阶数	≤ 8
	谐波类型	偶次, 奇次, 全部, 自定义 所有谐波可设置幅值和相位
AM 调制		
	载波波形	正弦波、方波、三角波、斜波、脉冲波、Arb
	调制波形	正弦波、方波、三角波、正/负斜波
	调制频率	2mHz~20kHz
	深度	0%~120.0%
	调制源	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	2mHz~20kHz
	峰值偏移	DC~30MHz(1 uHz 分辨率) (AFG-3021/3022：DC~20MHz)
	调制源	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	2mHz~20kHz
	偏移	0% ~ 100.0%脉冲宽度, 0.1%分辨率
	调制源	内部/外部
FSK		
	载波波形	正弦波、方波、三角波、斜波
	调制波形	50%占空比方波
	内部频率	2mHz~100kHz
	频率范围	DC~20MHz　DC~30MHz　DC~20MHz　DC~30MHz

	调制源	内部/外部
Sum 调制		
	载波波形	正弦波、三角波、斜波、脉冲波、噪声
	调制波形	正弦波、方波、三角波、正/负斜波
	比例	0%~100%载波幅值, 0.01%分辨率
	调制频率	2mHz~20kHz
	调制源	内部/外部
PM		
	载波波形	正弦波、三角波、斜波
	调制波形	正弦波、方波、三角波、正/负斜波
	相位偏移设置范围	0°~360°, 0.1°分辨率
	调制频率	2mHz~20kHz
	调制源	内部
扫描		
	波形	频率扫描: 正弦波、方波、三角波、斜波 幅值扫描: 正弦波、方波、三角波、斜波、脉冲波、噪声、ARB
	类型	频率, 幅值
	功能	线性或对数
	方向	上或下
	起始/停止频率	波形范围内的任何频率
	扫描时间	1ms~500s (1ms 分辨率)
	保持时间	
	返回时间	
	触发模式	单次、外部、内部
	触发源	内部/外部
Burst		
	波形	正弦波、方波、三角波、斜波、脉冲波、噪声
	频率	1μHz~20MHz　1μHz~30 MHz(4)　1μHz~20MHz　1μHz~30 MHz(4)

	Burst 计数	1~1,000,000 次循环或无限
	起始/停止相位	-360.0º~+360.0º (0.1º 分辨率)
	内部周期	1us~500s
	门限来源	外部触发(脉冲波形仅用在门限模式)
	触发源	单次、外部或内部
	触发延迟	N-Cycle, 无限: 0us~100s(1us 分辨率)
外部调制输入		
	类型	AM, FM, PWM, Sum
	电压范围	± 5V 全量程
	输入阻抗	10kΩ
	频率	DC~20kHz
	接地绝缘	42Vpk max. (same ground as corresponding channel)
调制输出(AFG-3021/3031)		
	类型	AM, FM, PWM, PM, Sum, 扫描
	幅值	≥ 1Vpp
	阻抗	> 10kΩ 典型值
外部触发输入		
	类型	FSK, Burst, Sweep, N Cycle ARB
	输入电平	TTL 兼容
	斜率	上升或下降(可选)
	脉冲宽度	>100ns
	输入频率	DC~1MHz
	输入阻抗	10kΩ, DC 耦合
延迟	扫描	<10us (典型值)
	Burst	<100ns (典型值)
抖动	扫描	2.5 us
	Burst	1 ns; except pulse, 300 ps
10 MHz 参考输出		
	输出电压	1 Vp-p/50Ω 方波
	输出阻抗	50Ω, AC 耦合

	输出频率	10MHz
10 MHz 参考输入		
	输入电压	0.5Vp-p~5Vp-p
	输入阻抗	1kΩ, 不平衡, AC 耦合
	最大允许输入	± 10Vdc
	输入频率	10MHz ± 10Hz
	波形	正弦波或方波(50±5%占空比)
	接地绝缘	42Vpk max
外部同步		
	相位延迟(max.)	串联: 39+(N-2)*39 ±25nS 并联: (N-1)*6 ±25nS (其中 N=连接台数)
	最多连接台数	串联: 4 并联: 6
	适用功能	正弦波、方波、三角波、脉冲波、斜波、谐波、MOD、扫描、Burst

存储/调取	10 组内存空间
接口	GPIB(选配), LAN, USB
屏幕	4.3"TFT LCD, 480 × 3 (RGB) × 272

一般规格		
	电源	AC100 - 240V, 50 - 60Hz
	功率损耗	AFG-3032 & AFG-3022：85 VA AFG-3021& AFG-3031：50VA
	操作环境	温度: 18 ~ 28˚C 工作温度: 0 ~ 40˚C 相对湿度: ≤ 80%, 0 ~ 40˚C ≤ 70%, 35 ~ 40˚C 安装等级: CAT Ⅱ
	海拔	2000 m

污染程度	EN 61010 Degree 2, 室内使用
储存温度	-10~70˚C, 湿度: ≤70%
尺寸	265(W) x 107(H) x 374(D)
重量	约 3.5kg
Safety Designed to	EN61010-1
EMC Tested to	EN 61326, EN 55011
附件	测试线(AFG-3021/3031：GTL-110×1, AFG-3022/3032：GTL-110×2), 使用手册 CD × 1, 快速指南 × 1, 电源线 × 1

(1). 可存储 10 组波形(每组波形最多 8M 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 年规格)

(3). 高频时边沿时间缩短

(4). 25MHz 以上的正弦波和方波仅可以使用“无限次”burst 计数

(5).低幅值的谐波失真和伪噪声限定在-70 dBm floor

EC Declaration of Conformity

We
GOOD WILL INSTRUMENT CO., LTD.
No.7-1, Jhongsing Rd., Tucheng City, Taipei County 236, Taiwan

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
No. 69, Lushan Road, Suzhou New District Jiangsu, China

declares that the below mentioned product
AFG-3021, AFG-3031, AFG-3022, AFG-3032
Are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility(2004/108/EC & 2014/30/EU) and Low Voltage Equipment Directive (2006/95/EC &2014/35/EU). For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Directive, the following standards were applied:

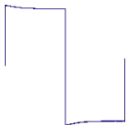
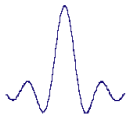
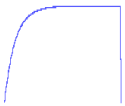
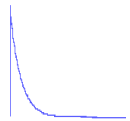
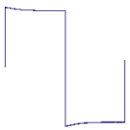
◎EMC

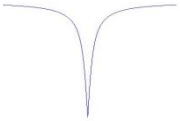
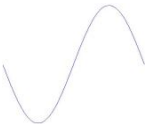
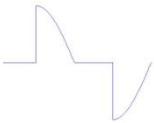
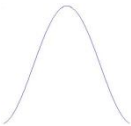
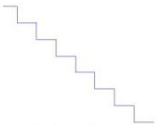
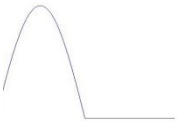
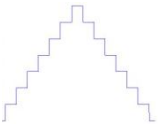
EN 61326-1 : **EN 61326-2-1:**	Electrical equipment for measurement, control and laboratory use — EMC requirements (2013)
Conducted and Radiated Emissions EN 55011:2009+A1:2010	Electrostatic Discharge EN 61000-4-2: 2009
Current Harmonic EN61000-3-2:2014	Radiated Immunity EN 61000-4-3:2006+A1:2008+A2:2010
Voltage Fluctuation EN 61000-3-3:2013	Electrical Fast Transients EN61000-4-4:2012
----------	Surge Immunity EN 61000-4-5: 2006
----------	Conducted Susceptibility EN 61000-4-6: 2014
----------	Power Frequency Magnetic Field EN61000-4-8:2010
----------	Voltage Dips/ Interrupts EN 61000-4-11: 2004

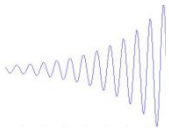
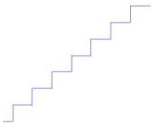
◎Safety

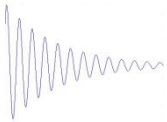
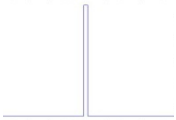
Low Voltage Directive 2006/95/EC &2014/35/EU
Safety Requirements **EN 61010-1:2010 (Third Edition)** **EN 61010-2-030:2010 (First Edition)**

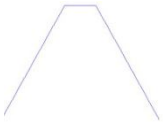
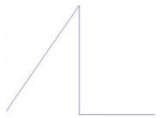
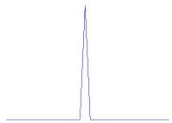
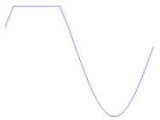
ARB 内置波形

基础		
正弦波	y= sin(x)	
方波	50%占空比方波	
斜波	50%对称	
Sinc	y=sinc(x)	
Exp Rise	指数上升	
Exp Fall	指数下降	
DC	DC 波	
脉冲	自定义频率和占空比	

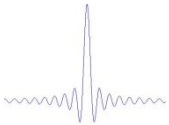
常见 1		
Absatan	y=|atan(x)| atan(x)的绝对值	
Havercosine	y=(1-sin(x))/2 Havercosine 功能	
Sinever	分段正弦功能	
Abssin	y=|sin(x)| sin(x)的绝对值	
Haversin	y=(1-cos(x))/2 Haversine 功能	
Stair_down	Step down	
Abssinehalf	y=sin(x),0<x<pi y=0,pi<x<2pi Half_wave 功能	
N_pulse	负脉冲	
Stair_ud	Step up 和 step down	

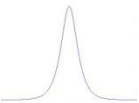
Ampalt	y=e(x).sin(x) 振荡上升	
Negramp	y=-x Line segment	
Stair_up	Step up	

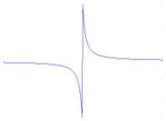
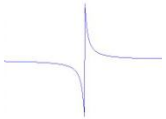
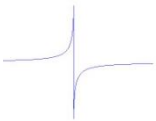
常见 2		
Attalt	y=e(-x).sin(x) 振荡下降	
Rectpuls	采样非周期矩形	
Stepresp	单位阶跃函数	
Diric	Even f(x)=-1^(x*(n-1)/2*pi) x=0,±2*pi,±4*pi,……	
Roundhalf	y=sqrt(1-x^2) 半圆	

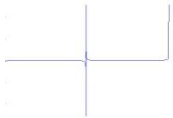
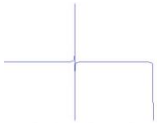
Trapezia	分段函数	
Diric	Odd f(x)=sin(nx/2)/n*sin(x/2) x=±pi,±3pi，……	
Sawtoot	锯齿或三角波	
Tripuls	采样非周期三角形	
Gauspuls	f(x)=a*e^(-(x-b)^2)/c^2) 高斯调制正弦脉冲	
Sinetra	分段函数	

Math		
Dlorentz	lorentz 功能的倒数 y=-2x/(k*x^2+1)	
Ln	对数功能	

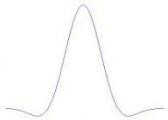
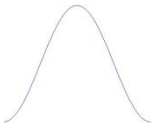
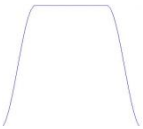
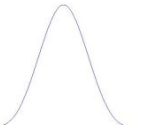
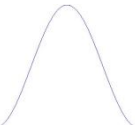
Sqrt	y=sqrt(x)	
Sinec	y=sin(x)/x	
Lorentz	Lorentz 功能 y=1/(k*x^2+1)	
Xsquare	抛物线	
Gauss	高斯贝尔曲线	

Trig		
Arccos	反余弦	
Arctan	反正切	
Sech	双曲正割	

Arccot	反余切	
Arctanh	双曲反正切	
Sinh	双曲正弦	
Arccsc	反余割	
Cosh	双曲余弦	
Tan	正切	
Arcsec	反正割	
Cot	余切	
Tanh	双曲正切	

Arcsin	反正弦	
Csc	余割	
Arcsinh	双曲反正弦	
Sec	正割	

视窗		
Barthannwin	Modified Bartlett-Hann 视窗	
Chebywin	Chebyshev 视窗功能	
Kaiser	Kaiser 视窗功能	
Bartlett	Bartlett 视窗与三角视窗非常相似，如三角函数	

Flattopwin	Flattopwin 视窗功能	
Triang	Triang 视窗功能	
Blackman	Blackman 视窗功能	
Hamming	Hamming 视窗功能	
Tukeywin	Tukey 视窗功能	
Bohmanwin	Bohman 视窗功能	
Hann	Hann 视窗功能	

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