

Agilent 8904A

Multifunction Synthesizer

Catalog



Agilent Technologies
Innovating the HP Way

Agilent 8904A Waveform Catalog

Introduction

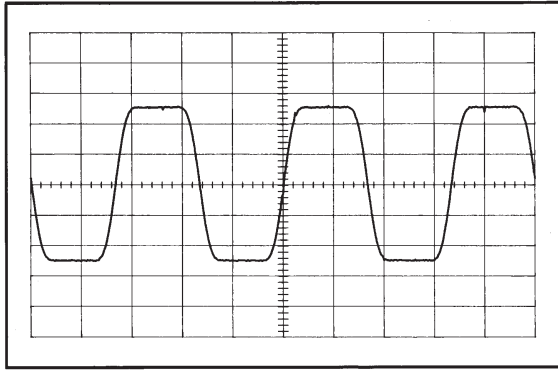
This catalog is a collection of waveforms created using the Agilent Technologies 8904A Multifunction Synthesizer. This catalog should not be considered a comprehensive list of waveforms possible with the 8904A Multifunction Synthesizer, but only a small sampling. The catalog is intended to give the 8904A user an indication of capabilities of the instrument and stimulate ideas for desired waveforms. In most cases, the waveforms shown can be altered to match an application by changing waveform, their amplitudes or phases, or by summing additional signals. All waveforms shown require Option 001.

For detailed instructions on the operation of the 8904A, see the *Agilent 8904A Multifunction Synthesizer Basic Operation and Application Guide*.

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No. 1. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Shaped pulse train with 50% duty cycle.

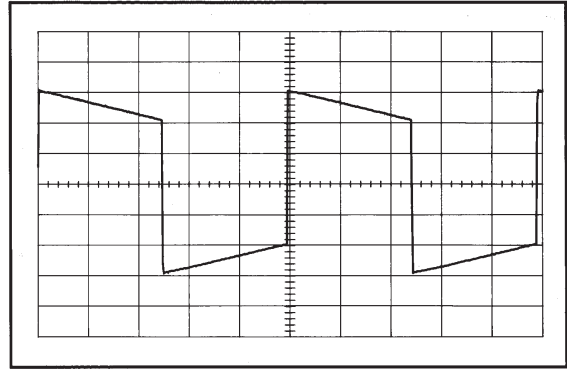
WAVEFORM APPLICATION: Bandwidth limited squarewave is used to test narrow bandwidth digital or analog communication channels.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.000 kHz | 2.00V | 0.0° | Sine |
| B | Out 1 | 3.000 kHz | 480 mV | 0.0° | Sine |
| C | Out 1 | 5.000 kHz | 140 mV | 0.0° | Sine |
| D | Out 1 | 7.000 kHz | 25 mV | 0.0° | Sine |

COMMENTS: This example creates a bandwidth limited squarewave with a frequency of 1 kHz. Channels B, C, and D are related to the desired frequency by ratios of 3, 5, and 7 respectively.

No. 2. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Tilted squarewave.

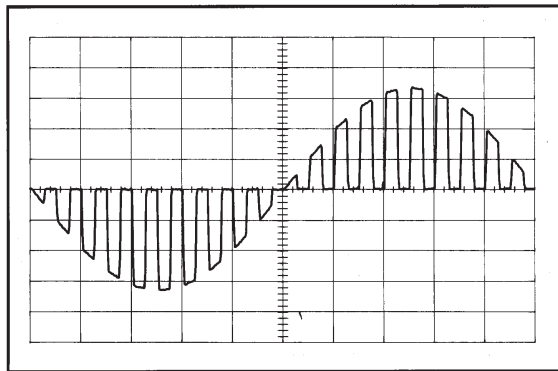
WAVEFORM APPLICATION: Approximate AC coupling of a squarewave.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Square |
| B | AM | 2 kHz | 20% | 0° | Ramp |
| C | — | | | | |
| D | — | | | | |

COMMENTS: Turn special #3 prior to entering waveform. With no special functions on, the waveform tilts up.

No. 3. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Chopped sinewave.

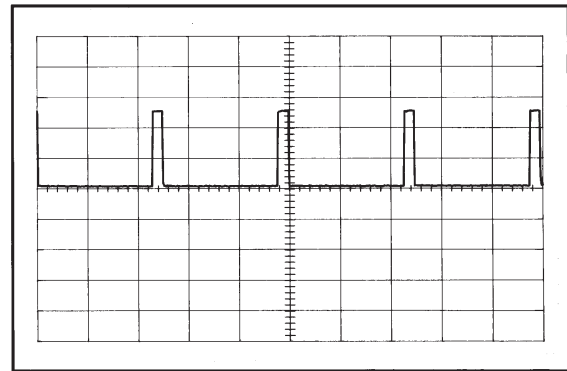
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | Pulse | 20.0 kHz | — | 0° | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS:

No. 4. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Variable duty cycle pulses—duty cycle 0% to 50%.

WAVEFORM APPLICATION:

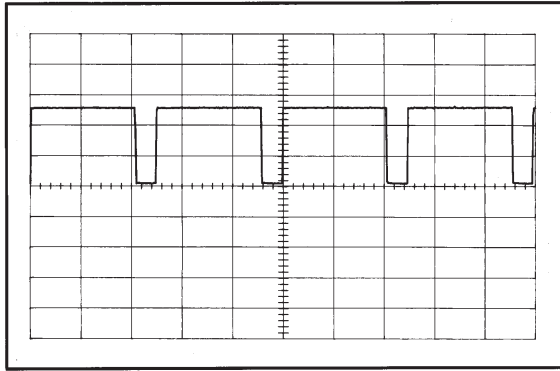
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|---------------------|----------|
| A | Out 1 | 0 Hz | 2.5V | 270° ^(A) | Sine |
| B | Pulse | 1.0 kHz | — | 0° | Square |
| C | Pulse | 1.0 kHz | — | 150° ^(B) | Square |
| D | — | | | | |

COMMENTS: ^(A) For negative going pulses set Channel A phase to 90°.

^(B) Duty cycle is set by the phase of Channel C - 180° phase equals 0% duty cycle, 0° phase equals 50% duty cycle.

No. 5. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Variable duty cycle pulses — duty cycles 50% to 100%.

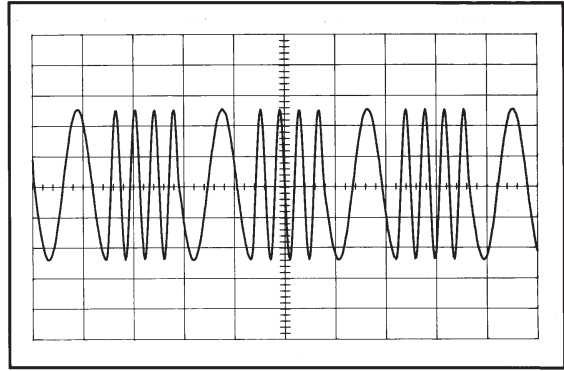
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|---------------------|----------|
| A | Out 1 | 0 Hz | 2.5V | 90° ^(A) | Sine |
| B | Out 1 | 0 Hz | 2.5V | 270° ^(A) | Sine |
| C | Pulse | 1 kHz | — | 0° | Square |
| D | Pulse | 1 kHz | — | 130° ^(B) | Square |

COMMENTS: ^(A) For negative going pulse set channel A phase to 270° and channel B to 90°. ^(B) Duty cycle is set by the phase of channel D — 0° phase equals 50% duty cycle, 180° phase equals 100% duty cycle.

No. 6. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Two-tone FSK with 50% duty cycle.

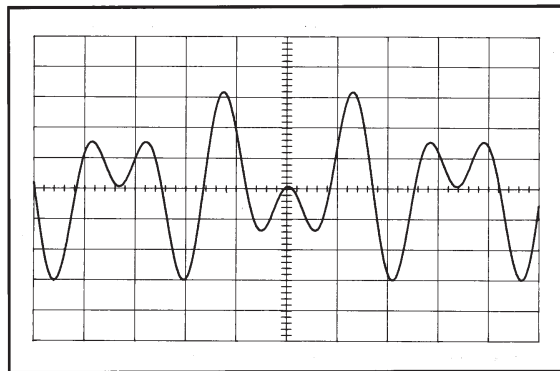
WAVEFORM APPLICATION: Modem testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 10 kHz | 2.5V | 0° | Sine |
| B | FM | 2.0 kHz | 5 kHz | 0° | Square |
| C | — | — | — | — | — |
| D | — | — | — | — | — |

COMMENTS: The frequencies of the two tones are the frequency of channel A plus or minus the amplitude of channel B. The symbol rate is set by the frequency of channel B.

No. 7. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: ILS two-tone composite signal.

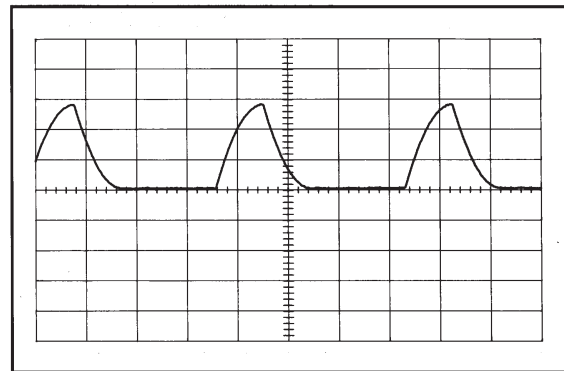
WAVEFORM APPLICATION: ILS receiver testing and metrology for ILS test equipment

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 90 Hz | 2.0V | 0° | Sine |
| B | Out 1 | 150 Hz | 2.0V | 0° | Sine |
| C | — | — | — | — | — |
| D | — | — | — | — | — |

COMMENTS: Difference in depth of modulation is set by the relative amplitudes of channel A and channel B.

No. 8. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Band-limited pulse simulation

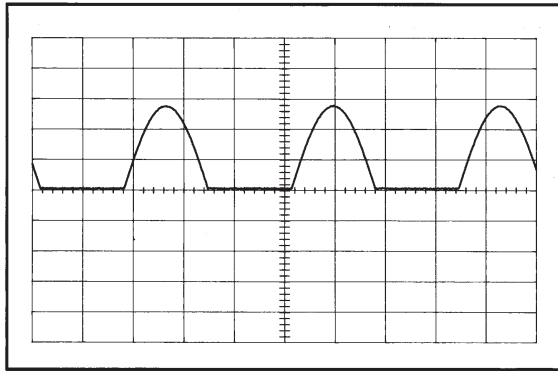
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------------------|----------|
| A | Out 1 | 1.0 kHz | 10.0V | 0° ^(A) | Triangle |
| B | AM | 1.0 kHz | 100% | 0° | Ramp |
| C | Pulse | 1 kHz | — | 0° | Square |
| D | — | — | — | — | — |

COMMENTS: Turn on special #3 prior to entering waveform. ^(A) To invert waveform, set channel A phase to 180°.

No. 9. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Half-wave rectified sine wave.

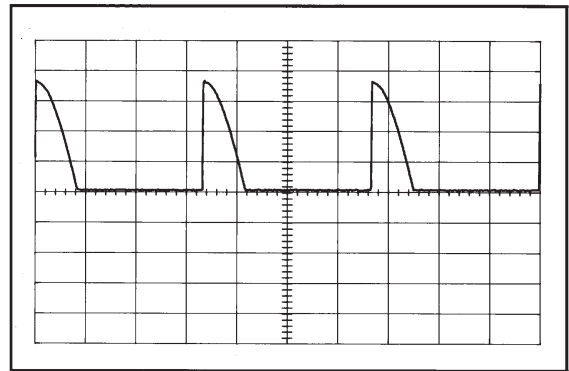
WAVEFORM APPLICATION: Power supply design.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|---------------------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | Pulse | 1.0 kHz | — | 180° ^(A) | Square |
| C | — | — | — | — | — |
| D | — | — | — | — | — |

COMMENTS: ^(A)To invert waveform, change channel B to 0°.

No. 10. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: SCR-triggered sine wave.

WAVEFORM APPLICATION: Power supply design.

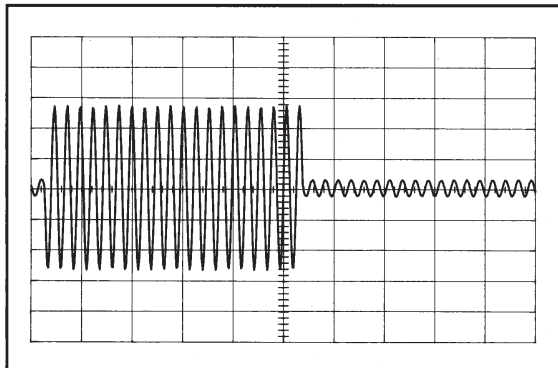
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|--------------------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° ^(A) | Sine |
| B | Pulse | 1.0 kHz | — | 180° | Square |
| C | Pulse | 1.0 kHz | — | 90° ^(B) | Square |
| D | — | — | — | — | — |

COMMENTS: ^(A)To invert waveforms set channel A phase to 180°.

^(B)Duty cycle is set by the phase of channel C; half-wave rectification is 180°, reducing phase reduces the duty cycle.

No. 11. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: IHF dynamic headroom burst.

WAVEFORM APPLICATION: Consumer audio testing.

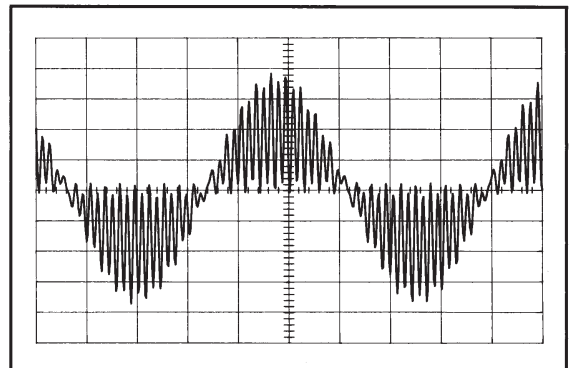
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|----------------------|-----------------------|----------|
| A | Out 1 | 1.0 kHz | 2.25V ^(A) | 0° | Sine |
| B | Out 1 | 1.0 kHz | 0.25V ^(A) | 0° | Sine |
| C | Pulse | 2 Hz | — | 0° | Square |
| D | Pulse | 2 Hz | — | 165.6° ^(B) | Square |

COMMENTS: ^(A)Channels A and B summed must be 20 dB greater than channel B above.

^(B)Phase of channel D determines the pulse width of burst. A phase of 165.6° results in 20 cycles of 1 kHz.

No. 12. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: FM broadcast stereo composite signal.

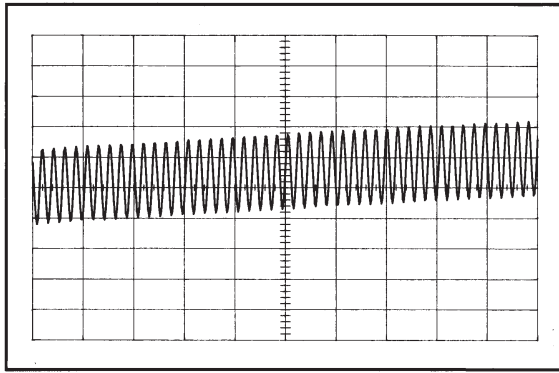
WAVEFORM APPLICATION: FM broadcast receiver testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|---------------------|----------|
| A | Out 1 | 39 kHz | 1.25V | 90° ^(A) | Sine |
| B | Out 1 | 37 kHz | 1.25V | 270° ^(A) | Sine |
| C | Out 1 | 19 kHz | 0.3V | 0° | Sine |
| D | Out 1 | 1 kHz | 2.5V | 0° | Sine |

COMMENTS: ^(A)These settings are for right channel only. For left channel only, set the phase of channel A to 270° and channel B to 90°.

No. 13. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: VHF omnidirectional range (VOR) composite signal.

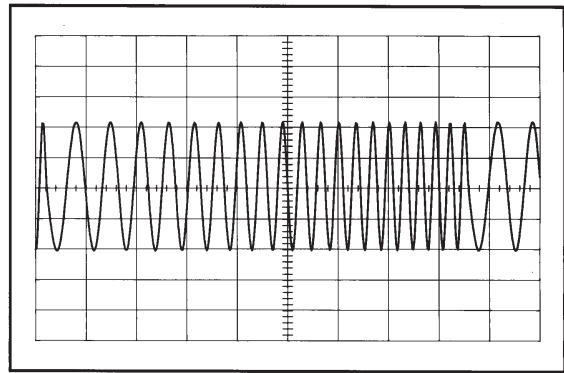
WAVEFORM APPLICATION: Avionics receiver test and metrology for VOR test equipment.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------------------|----------|
| A | Out 1 | 9960 Hz | 2.5V | 0° | Sine |
| B | Out 1 | 30 Hz | 2.5V | 0° | Sine |
| C | FM | 30 Hz | 480 Hz | 0° ^(A) | Sine |
| D | — | | | | |

COMMENTS: ^(A)The phase of channel C sets the bearing direction

No. 14. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Phase - continuous frequency sweep.

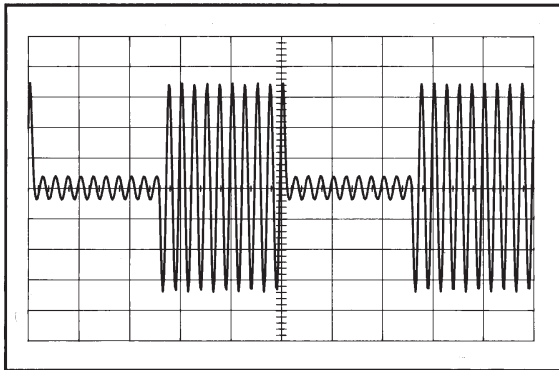
WAVEFORM APPLICATION: Frequency response testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|----------------------|-----------|-----------|-------|----------|
| A | Out 1 | 10 kHz | 5.0V | 0° | Sine |
| B | FM | 500 Hz | 5.0 kHz | 0° | Ramp |
| C | Out 2 ^(A) | 500 Hz | 2.0V | 0° | Ramp |
| D | — | | | | |

COMMENTS: Start frequency is the frequency of channel A less the amplitude of channel B. Stop frequency is frequency of channel A plus amplitude of channel B. Special #3 reverses ramp to high frequency to low frequency sweep. ^(A)Output 2 provides X-axis drive to measurement device.

No. 15. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Two-level sine wave burst with 50% duty cycle.

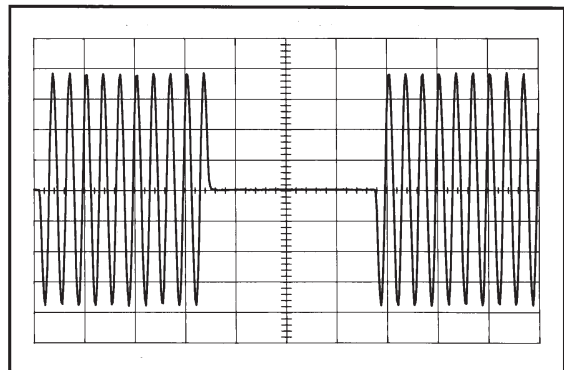
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 100 kHz | 2.5V | 0° | Sine |
| B | AM | 5 kHz | 80% | 0° | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS:

No. 16. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Gated sine wave burst with 50% duty cycle.

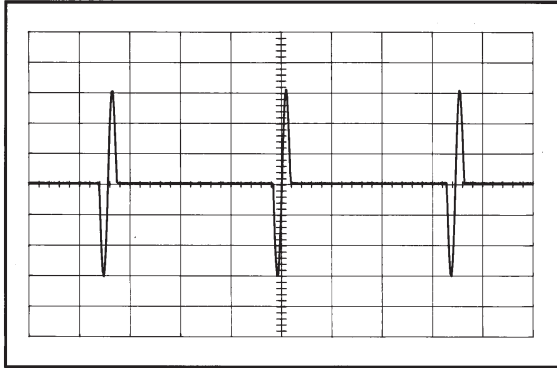
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 100 kHz | 2.5V | 0° | Sine |
| B | Pulse | 5 kHz | — | 0° | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS:

No. 17. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Single cycle sinewave burst.

WAVEFORM APPLICATION:

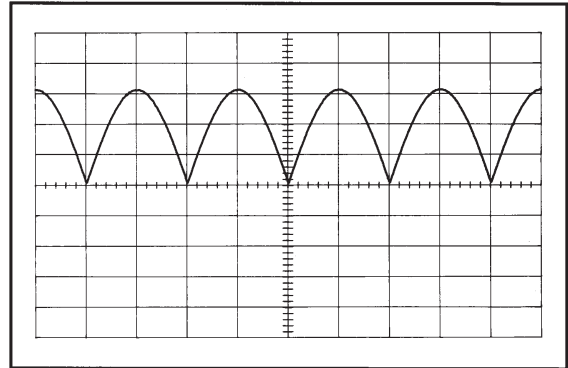
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|------------------------|-----------|---------------------|----------|
| A | Out 1 | 10 kHz | 2.5V | 0° | Sine |
| B | Pulse | 1.0 kHz ^(A) | — | 0° | Square |
| C | Pulse | 1.0 kHz ^(A) | — | 144° ^(B) | Square |
| D | — | | | | |

COMMENTS: ^(A)Frequency of channels B and C set the rate at which the bursts occur.

^(B)The phase of channel C determines the number of cycles in the burst. Phase of channel C = $180 - f_B/f_A \times 360 \times N$. f_A is the frequency of channel A, f_B is the frequency of channels B and C and N equals the number of desired cycles.

No. 18. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Full wave rectified sine wave.

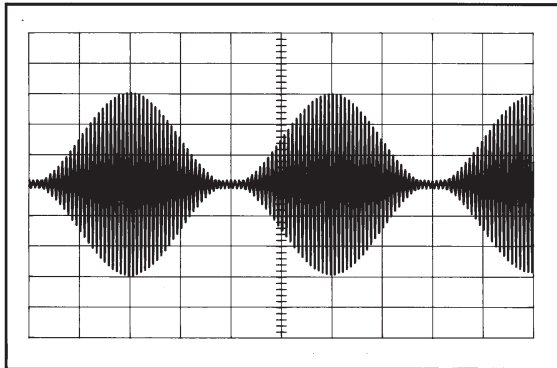
WAVEFORM APPLICATION: Power supply design and testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|--------------------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | φM | 1.0 kHz | 90° | 90° ^(A) | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS: ^(A)To invert wave form, set channel B phase to 270°.

No. 19. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Distorted AM due to capacitive coupling of carrier past the AM modulator.

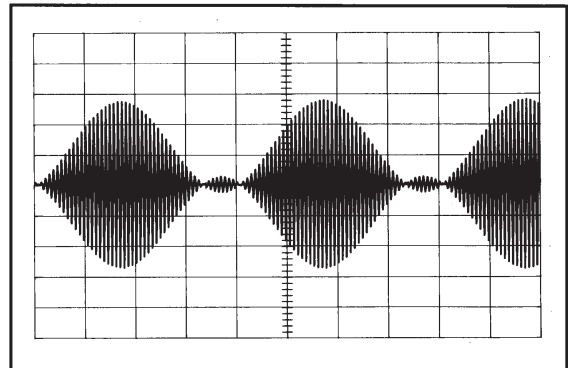
WAVEFORM APPLICATION: AM radio testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 50 kHz | 2.5V | 0° | Sine |
| B | Out 1 | 50 kHz | 0.1V | 90° | Sine |
| C | AM | 1.0 kHz | 100% | 0° | Sine |
| D | — | | | | |

COMMENTS: This signal also contains incidental phase modulation.

No. 20. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: AM signal with over 100% negative peak modulation.

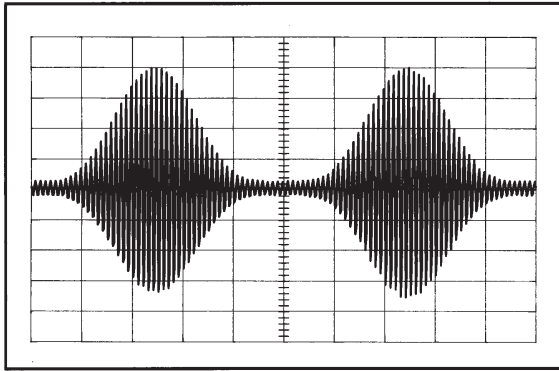
WAVEFORM APPLICATION: AM radio testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 50 kHz | 2.5V | 0° | Sine |
| B | Out 1 | 50 kHz | 0.2V | 180° | Sine |
| C | AM | 1.0 kHz | 100% | 0° | Sine |
| D | — | | | | |

COMMENTS: A 180° phase inversion of the carrier occurs at the trough of the modulating waveform.

No. 21. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Distorted AM due to inability of the AM modulator to cut off the carrier.**

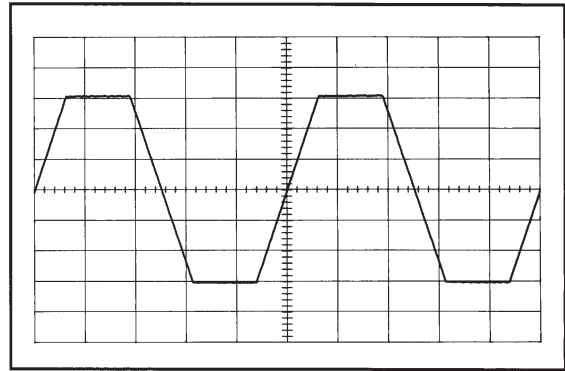
WAVEFORM APPLICATION: **AM radio testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 50 kHz | 2.0V | 0° | Sine |
| B | Out 1 | 50 kHz | 0.4V | 180° | Sine |
| C | AM | 1 kHz | 70% | 0° | Sine |
| D | AM | 2 kHz | 19% | 90° | Sine |

COMMENTS:

No. 22. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Trapezoid with variable percent of wave form flat.**

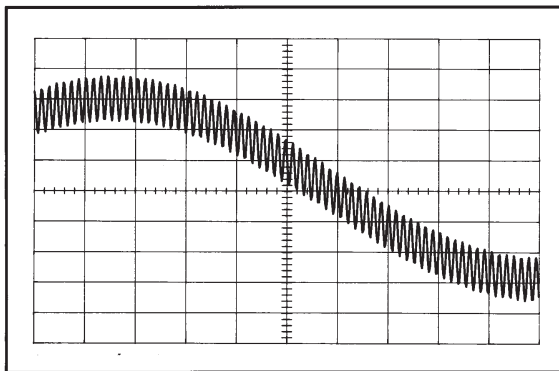
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|--------------------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Triangle |
| B | Out 1 | 1.0 kHz | 2.5V | 90° ^(A) | Triangle |
| C | — | | | | |
| D | — | | | | |

COMMENTS: ^(A)The phase of channel B affects both the peak amplitude and the percentage of the time the waveform is flat. 0° results in twice the amplitude of channel A and no flat period (triangle wave), 180° results in 0V amplitude and 100% of period flat.

No. 23. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **SMPTE 4 : 1 intermodulation test signal.**

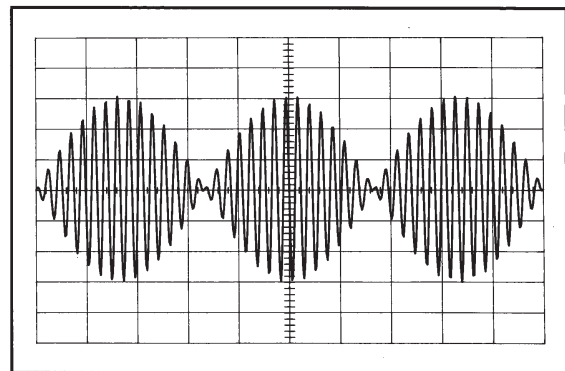
WAVEFORM APPLICATION: **Audio testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 60 Hz | 4.0V | 0° | Sine |
| B | Out 1 | 7.0 kHz | 1.0V | 0° | Sine |
| C | — | | | | |
| D | — | | | | |

COMMENTS: Typical IMD is -75 dB SMPTE has a 1 : 1 mode where 60 Hz and 7 kHz are of equal amplitude. DIN testing is at 250 kHz and 8 kHz or any frequency pair with the higher frequency five octaves above the lower frequency.

No. 24. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **CCIF intermodulation distortion test signal (second order difference frequency).**

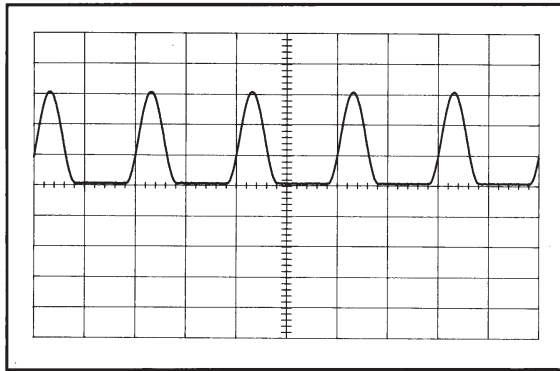
WAVEFORM APPLICATION: **Audio testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 14 kHz | 1.25V | 0° | Sine |
| B | Out 1 | 15 kHz | 1.25V | 0° | Sine |
| C | — | | | | |
| D | — | | | | |

COMMENTS: Typical IMD is -75 dB.

No. 25. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Haversine with 50% duty cycle.

WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

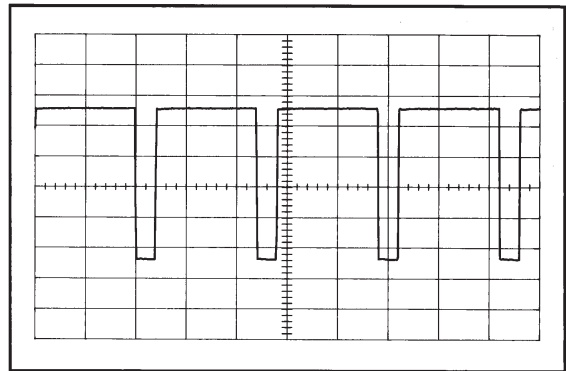
| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|----------------------|-----------|---------------------|---------------------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | Out 1 ^(A) | — | 2.5V ^(B) | — | dc |
| C | ϕ M | 1.0 kHz | 90° | 270° ^(B) | Triangle |
| D | — | | | | |

COMMENTS: After setup, initiate a phase reset (shift f_3)

^(A)Channel A optional to move baseline to zero volts.

^(B)To invert wave form, set channel C phase to 90° and channel B voltage to negative volts.

No. 26. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Variable duty cycle pulses with high and low voltage symmetrical about ground.

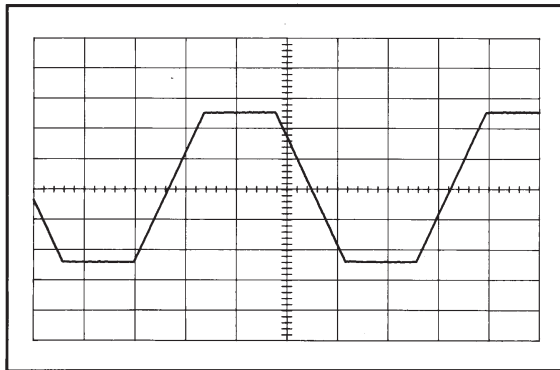
WAVEFORM APPLICATION: Low frequency mechanical and medical simulation.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|--------------------|----------|
| A | Out 1 | 1.0 kHz | — | 0° | Square |
| B | DSB | 1.0 kHz | 2.5V | 30° ^(A) | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS: ^(A)The phase of channel B determines the portion of time waveform is positive; 0° results in 100% of time positive, 180° results in 0% of time positive.

No. 27. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Trapezoid with amplitude up to 10V_{p-p} and 50% of waveform flat.

WAVEFORM APPLICATION:

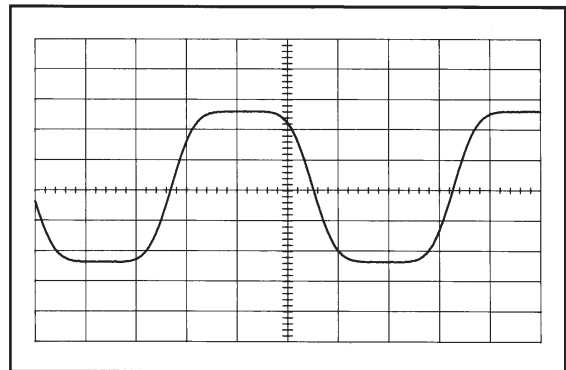
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|------------------------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Triangle |
| B | FM | 2.0 kHz | 1.0 kHz ^(A) | 270° | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS: After setup, initiate a phase reset (shift f_3).

^(A)Set the amplitude of channel B equal to the frequency of channel A.

No. 28. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Flattened sine wave.

WAVEFORM APPLICATION:

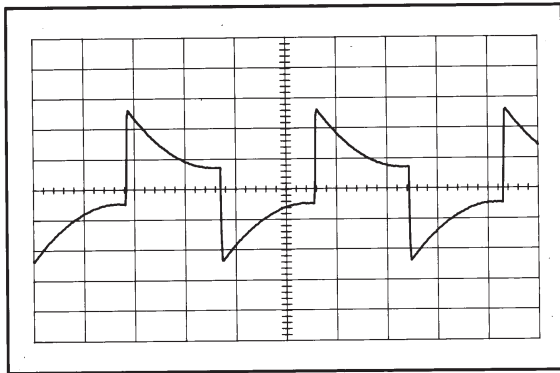
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|------------------------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | FM | 2.0 kHz | 1.0 kHz ^(A) | 270° | Sine |
| C | — | | | | |
| D | — | | | | |

COMMENTS: After setup, initiate a phase reset (shift f_3).

^(A)Set the amplitude of channel B equal to the frequency of channel A.

No. 29. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: High-pass filtered square wave.

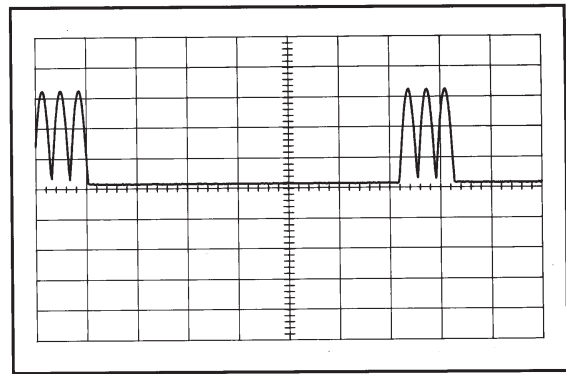
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 3.18 kHz | 2.0V | 90° | Triangle |
| B | Out 1 | 3.18 kHz | 1.0V | 0° | Square |
| C | AM | 6.36 kHz | 60.0% | 0° | Ramp |
| D | — | | | | |

COMMENTS: Turn on special #3 prior to entering waveform.

No. 30. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Gated full-wave rectified sine wave.

WAVEFORM APPLICATION:

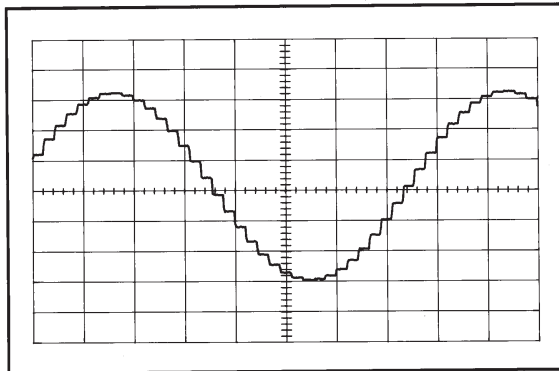
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|---------------------|----------|
| A | Out 1 | 10 kHz | 2.5V | 90° ^(A) | Sine |
| B | φM | 10 kHz | 90° | 180° | Square |
| C | Pulse | 1 kHz | — | | Square |
| D | Pulse | 1 kHz | — | 126° ^(B) | Square |

COMMENTS: ^(A)To invert wave form, set channel A phase to 270°.

^(B)The phase of channel D determines the number of cycles in the burst. Phase of channel D = $180^\circ - f_C/f_A \times 180^\circ \times N$ where f_A is the frequency of channels A and B, f_C is the frequency of channels C and D, and N is the number of desired cycles.

No. 31. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Sampled waveform.

WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-------------------------|----------------------|-------|----------|
| A | Out 1 | 1.26 kHz ^(A) | 2.5V | 0° | Sine |
| B | φM | 44.1 kHz ^(B) | 5.10° ^(C) | 0° | Ramp |
| C | — | | | | |
| D | — | | | | |

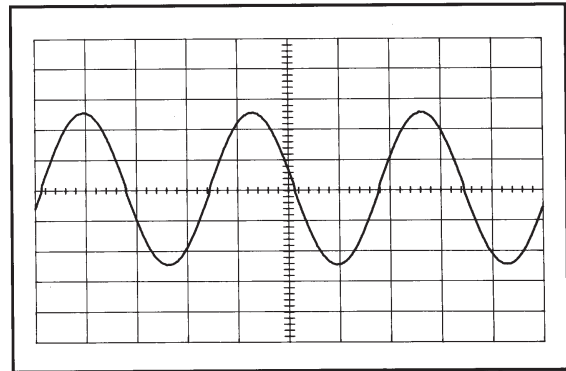
COMMENTS: Turn on special #3 prior to entering waveform.

^(A)Channel A sets frequency of waveform to be sampled.

^(B)Channel B sets sample rate.

^(C)The amplitude of channel C is set to $180^\circ \times f_A/f_B$ where f_A is frequency of channel A and f_B is frequency of channel B.

No. 32. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Sine wave with crossover distortion.

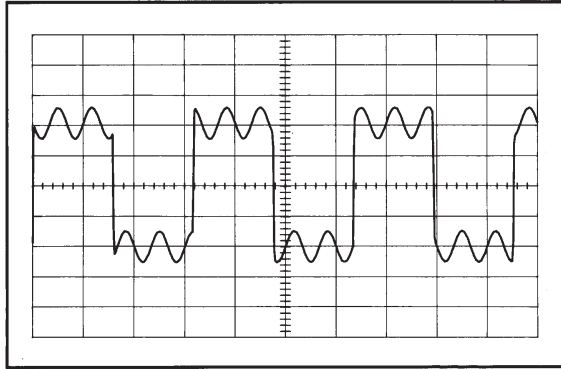
WAVEFORM APPLICATION: Audio testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|----------------------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.0V | 0° | Sine |
| B | Out 1 | 1.0 kHz | 65 mV ^(A) | 0° | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS: ^(A)Channel B amplitude determines the level of distortion, 65 mV.

No. 33. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Transient Intermodulation Measurement.**

WAVEFORM APPLICATION: **Audio measurements.**

INSTRUMENT SETTINGS

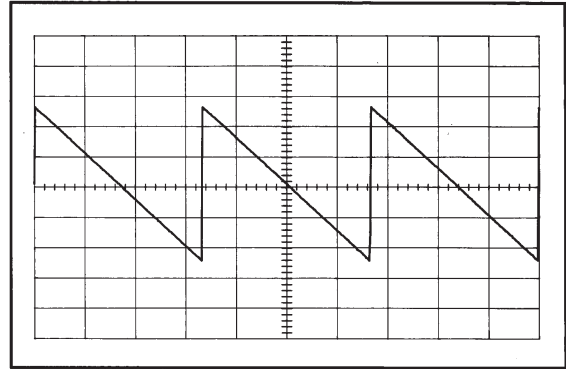
| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-------------------------|---------------------|-------|----------|
| A | Out 1 | 3.15 kHz ^(A) | 2.0V | 0° | Square |
| B | Out 1 | 15.0 kHz | 0.5V ^(B) | 0° | Sine |
| C | — | | | | |
| D | — | | | | |

COMMENTS: **Low-pass filtering this waveform with a 30 kHz or 100 kHz filter results in a Dynamic Intermodulation Measurement (DIM30 or DIM100, respectively).**

^(A)This frequency can also be 3.18 kHz.

^(B)The amplitude of channel B is one-fourth that of channel A.

No. 34. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Negative ramp.**

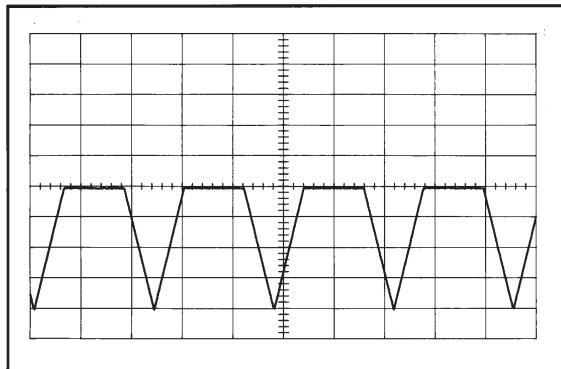
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 0 Hz | 2.5V | 0° | Triangle |
| B | φM | 1.0 kHz | 90° | 0° | Ramp |
| C | — | | | | |
| D | — | | | | |

COMMENTS:

No. 35. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Havertriangles.**

WAVEFORM APPLICATION: **Low frequency medical and mechanical simulation.**

INSTRUMENT SETTINGS

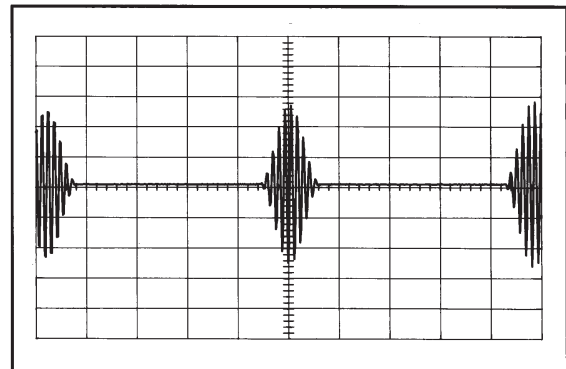
| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|------------------------|-------------------|----------|
| A | Out 1 | 1.0 kHz | 1.0V | 0° ^(A) | Triangle |
| B | Out 1 | — | -1.0V ^(A) | — | dc |
| C | FM | 1.0 kHz | 1.0 kHz ^(B) | 225° | Square |
| D | — | | | | |

COMMENTS: **After setup, initiate a phase reset (shift f₃).**

^(A)To invert the waveform, set the phase of channel A to 180° and set the amplitude of channel B to +1.0V.

^(B)Set the amplitude of channel C equal to the frequency of channel A.

No. 36. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Tone burst with sine wave envelope.**

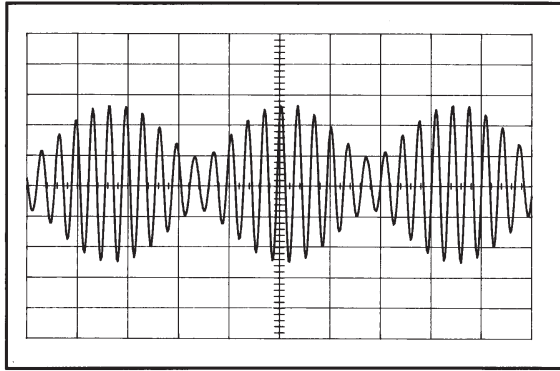
WAVEFORM APPLICATION: **Loudspeaker testing, acoustics.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|--------|----------|
| A | Out 1 | 10 kHz | 2.5V | 0° | Sine |
| B | AM | 1.0 kHz | 100% | 0° | Sine |
| C | Pulse | 250 Hz | — | 67.5° | Square |
| D | Pulse | 250 Hz | — | 157.5° | Square |

COMMENTS: **Channel A controls the frequency of the sine wave inside the bursts; channel B sets the envelope of the burst.**

No. 37. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Single-sideband with carrier present at 100% depth.

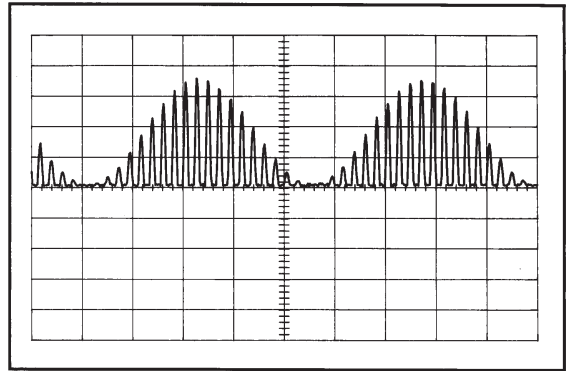
WAVEFORM APPLICATION: Radio testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 10 kHz | 2.5V | 0° | Sine |
| B | Out 1 | 11 kHz | 1.25V | 0° | Sine |
| C | — | | | | |
| D | — | | | | |

COMMENTS:

No. 38. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Half of AM signal.

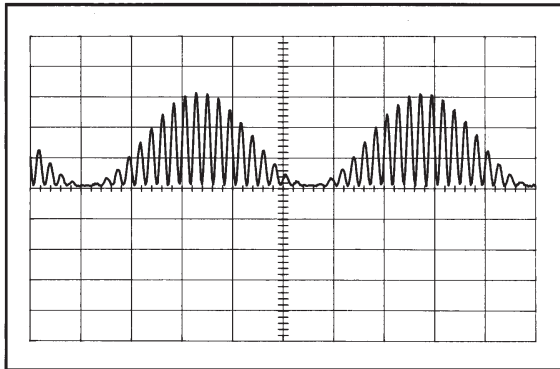
WAVEFORM APPLICATION: Detector testing.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|---------------------|----------|
| A | Out 1 | 10 kHz | 2.5V | 0° | Sine |
| B | AM | 500 Hz | 100% | 0° | Sine |
| C | Pulse | 10 kHz | — | 180° ^(A) | Square |
| D | — | | | | |

COMMENTS: ^(A)To invert wave form, set channel C phase to 0°.

No. 39. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: One-sided AM.

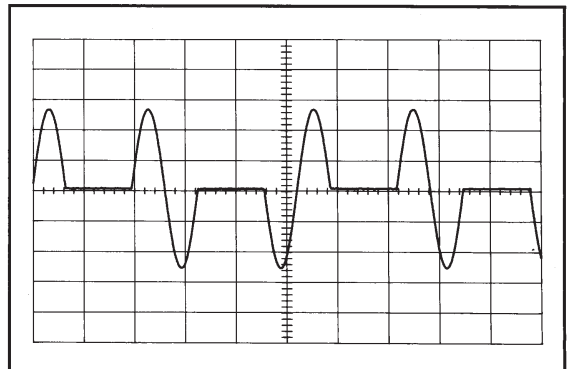
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|----------------------|-------------------|----------|
| A | Out 1 | 10 kHz | 2.5V | 0° | Sine |
| B | Out 1 | 500 Hz | 1.25V | 0° ^(A) | Sine |
| C | Out 1 | — | 1.25V ^(A) | 0° | dc |
| D | AM | 500 Hz | 100% | 0° | Sine |

COMMENTS: ^(A)To invert wave form, set the phase of channel B to 180° and the amplitude of channel C to -1.25V.

No. 40. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Phase alternating single-cycle sine wave.

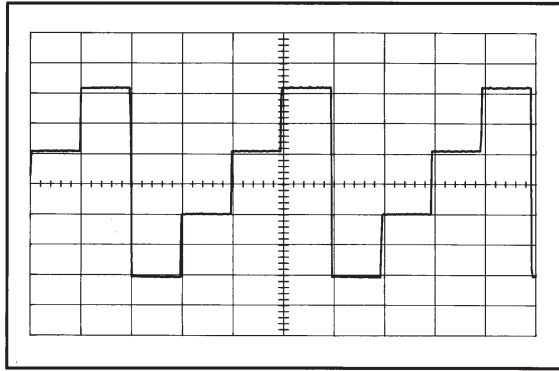
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | φM | 250 Hz | 90° | 0° | Square |
| C | Pulse | 500 Hz | — | 225° | Square |
| D | — | | | | |

COMMENTS:

No. 41. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Four-level stair-step.**

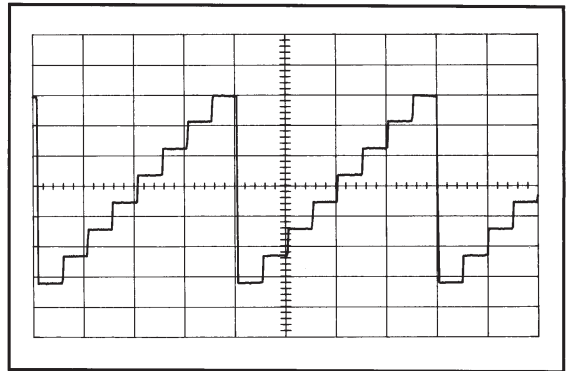
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.0V | 0° | Square |
| B | Out 1 | 2.0 kHz | 1.0V | 0° | Square |
| C | — | | | | |
| D | — | | | | |

COMMENTS: To invert the wave form, set the phase of all channels to 180°.

No. 42. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Eight-level stair step.**

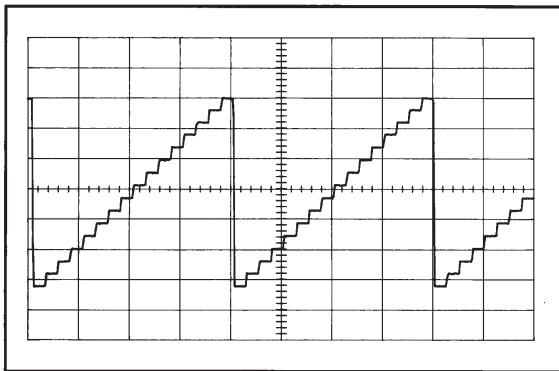
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.0V | 0° | Square |
| B | Out 1 | 2.0 kHz | 1.0V | 0° | Square |
| C | Out 1 | 4.0 kHz | 0.5V | 0° | Square |
| D | — | | | | |

COMMENTS: To invert the waveform set the phase of all channels to 180°.

No. 43. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Sixteen-level stair step.**

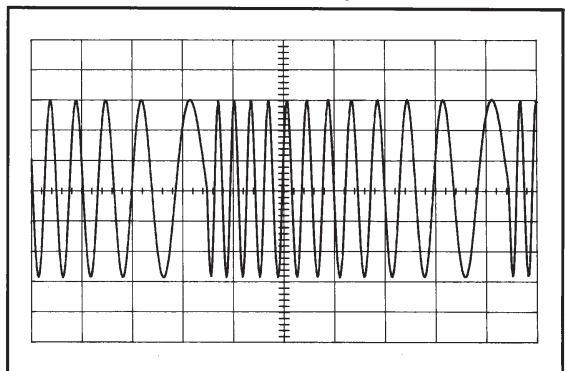
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.0V | 0° | Square |
| B | Out 1 | 2.0 kHz | 1.0V | 0° | Square |
| C | Out 1 | 4.0 kHz | 0.5V | 0° | Square |
| D | Out 1 | 8.0 kHz | 0.25V | 0° | Square |

COMMENTS: To invert the wave form, set the phase of all channels to 180°.

No. 44. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Negative phase-continuous frequency sweep.**

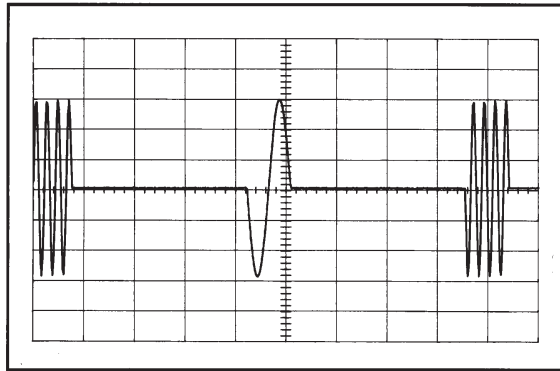
WAVEFORM APPLICATION: **Frequency response testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 6.0 kHz | 5.0V | 0° | Sine |
| B | FM | 500 Hz | 4.0 kHz | 0° | Ramp |
| C | — | | | | |
| D | — | | | | |

COMMENTS: Turn on Special #3 prior to entering waveform.

No. 45. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Alternating frequency tone bursts.

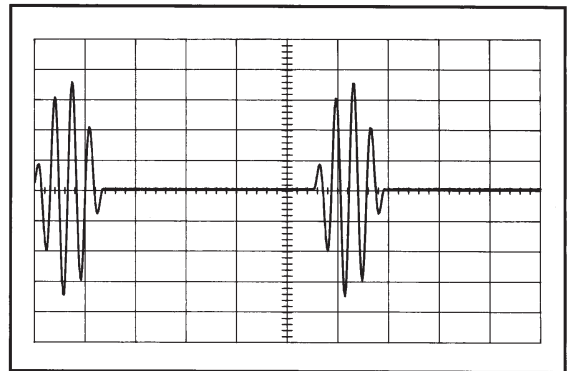
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 5.0 kHz | 2.5 | 0° | Sine |
| B | FM | 1.0 kHz | 3.0 kHz | 0° | Square |
| C | Pulse | 400 Hz | — | 0° | Square |
| D | Pulse | 400 Hz | — | 108° | Square |

COMMENTS:

No. 46. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Simultaneous bursts of two tones.

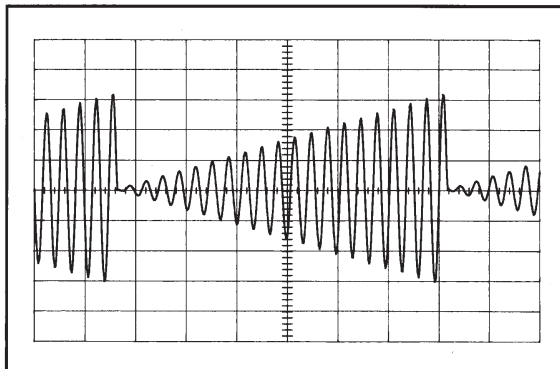
WAVEFORM APPLICATION: Testing tone identification circuits.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 8.0 kHz | — | 0° | Sine |
| B | DSB | 1.0 kHz | 2.5V | 0° | Sine |
| C | Pulse | 500 Hz | — | 0° | Square |
| D | Pulse | 500 Hz | — | 90° | Square |

COMMENTS: The two tones in the burst are channel A frequency plus and minus channel B frequency. The repetition rate is set by the frequency of channels C and D. The duty cycle is set by the phase of channel D. 0° equals 50%, 180° equals 0%.

No. 47. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Amplitude sweeps.

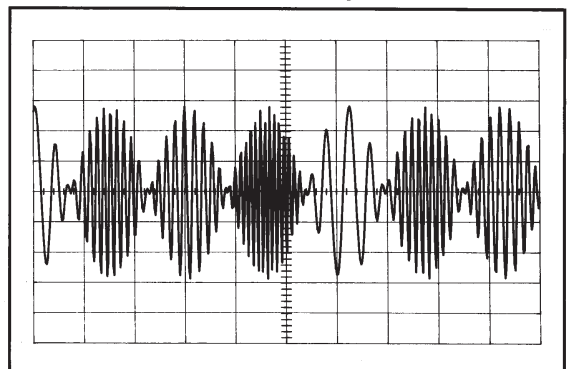
WAVEFORM APPLICATION: Audio device characterization.

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|----------------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | AM | 50 Hz | 100% | 0° | Ramp |
| C | Out 2 ^(A) | 50 Hz | 2.5V | 0° | Ramp |
| D | — | | | | |

COMMENTS: ^(A)Output 2 can be used as an optional drive for the X-axis of the measuring instrument.

No. 48. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Four frequency tone bursts.

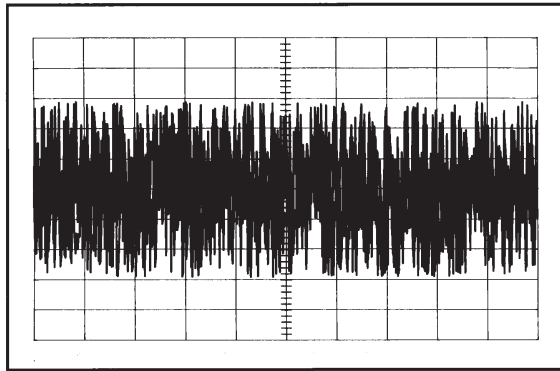
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 20 kHz | — | 0° | Sine |
| B | DSB | 1.0 kHz | 2.5V | 0° | Sine |
| C | FM | 500 Hz | 5.0 kHz | 0° | Square |
| D | FM | 1.0 kHz | 9.0 kHz | 0° | Square |

COMMENTS:

No. 49. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Band-limited digital noise.**

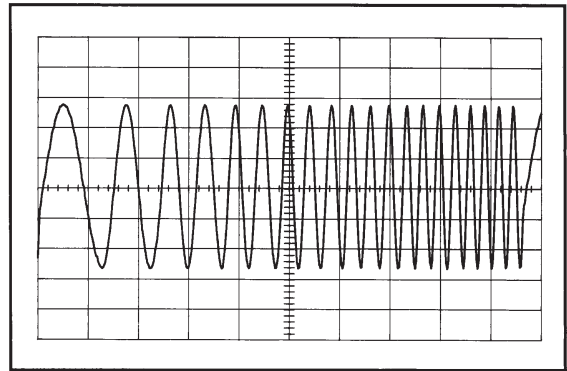
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 0 Hz | 2.5V | 0° | Square |
| B | ϕM | — | 30° | — | Noise |
| C | — | — | — | — | — |
| D | — | — | — | — | — |

COMMENTS: This noise is bandwidth limited to 200 kHz.

No. 50. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Stair-step frequency sweep.**

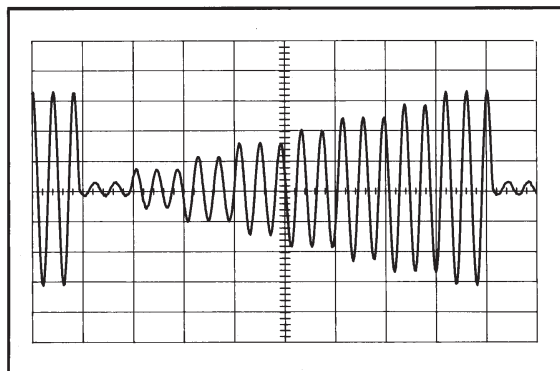
WAVEFORM APPLICATION: **Manual adjustments where dwell is required.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 20 kHz | 2.5V | 0° | Sine |
| B | FM | 1.0 kHz | 8.0 kHz | 0° | Square |
| C | FM | 2.0 kHz | 4.0 kHz | 0° | Square |
| D | FM | 4.0 kHz | 2.0 kHz | 0° | Square |

COMMENTS: This results in eight steps centered around the frequency of channel A with a peak-to-peak deviation of twice the sum of the amplitudes of channels B, C, and D. To reverse the ramp, set the phases of channels B, C and D to 180°.

No. 51. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Stair-step amplitude sweep.**

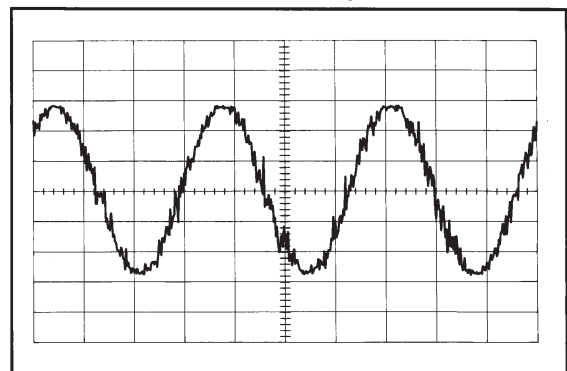
WAVEFORM APPLICATION: **Manual testing where dwell at each level is required.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 20 kHz | 2.5V | 0° | Sine |
| B | AM | 1.0 kHz | 50% | 0° | Square |
| C | AM | 2.0 kHz | 25% | 0° | Square |
| D | AM | 4.0 kHz | 12.5% | 0° | Square |

COMMENTS: To reverse the ramp set the phases of channels B, C and D to 180°.

No. 52. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Sine wave with added phase noise.**

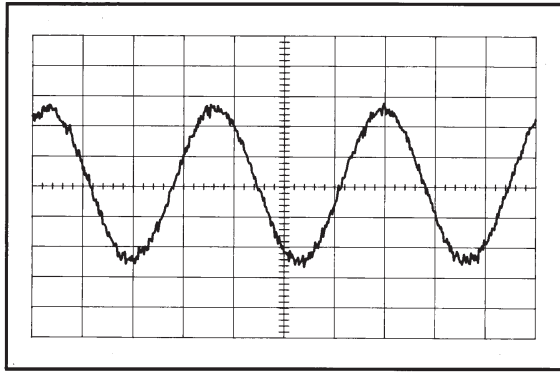
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | ϕM | — | 20° | — | Noise |
| C | — | — | — | — | — |
| D | — | — | — | — | — |

COMMENTS:

No. 53. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Sine wave with amplitude noise.

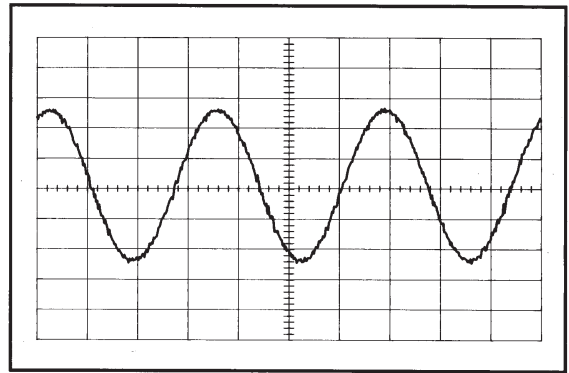
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | AM | — | 20% | — | Noise |
| C | — | | | | |
| D | — | | | | |

COMMENTS:

No. 54. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Sine wave with added noise.

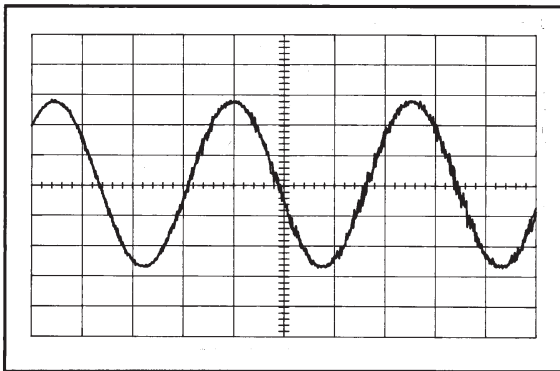
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | Out 1 | — | 0.2V | — | Noise |
| C | — | | | | |
| D | — | | | | |

COMMENTS:

No. 55. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Sine wave with FM noise.

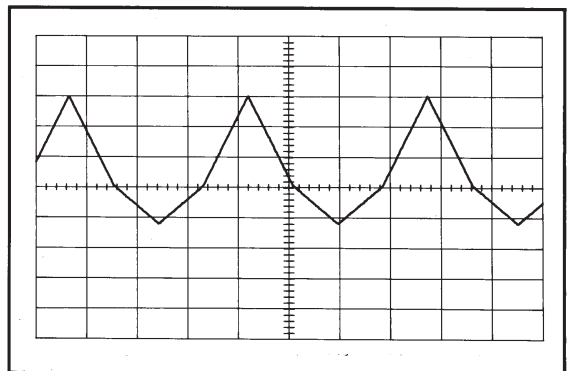
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Sine |
| B | FM | — | 800 Hz | — | Noise |
| C | — | | | | |
| D | — | | | | |

COMMENTS: FM noise is equivalent to phase noise with a 6 dB per octave roll-off (1/f noise).

No. 56. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Asymmetrical waveform with constant frequency.

WAVEFORM APPLICATION:

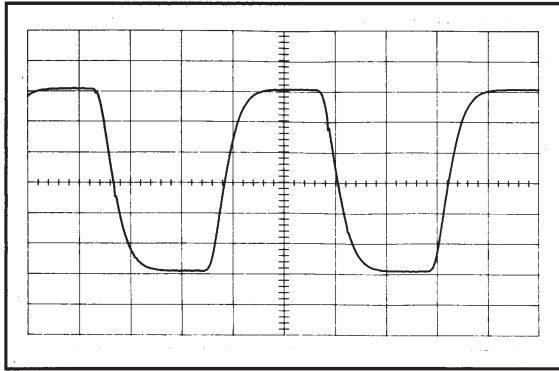
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|-------------------------|
| A | Out 1 | 1.0 kHz | 2.5V | 0° | Triangle ^(A) |
| B | AM | 1.0 kHz | 40% | 0° | Square ^(B) |
| C | — | | | | |
| D | — | | | | |

COMMENTS: ^(A) Sine waves can also be made asymmetrical.

^(B) Square wave causes the positive portion of the waveform to have a different amplitude than the negative. Sine wave modulation causes this to be smoother. Triangle results in a continuous linear gain change.

No. 57. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Square waves between 50 kHz and 100 kHz rates.

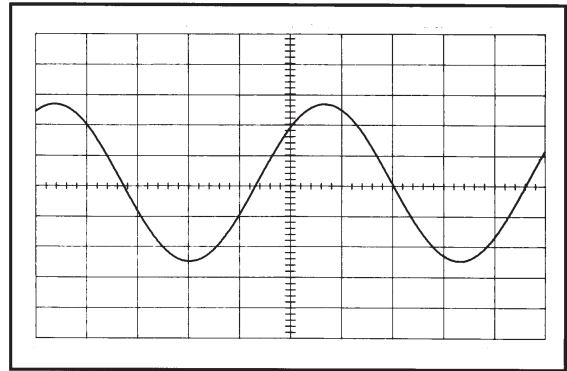
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-------------|-----------|-------|----------|
| A | Out 1 | 47.9349 kHz | — | 0° | Square |
| B | DSB | 47.9349 kHz | 2.0V | 90° | Square |
| C | | | | | |
| D | | | | | |

COMMENTS: The output frequency is twice the frequency of channels A and B. Because of the digital nature of the waveform generation, these high frequency square waves have very significant jitter.

No. 58. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Sine, square, ramp, and triangle waves with resolution better than 0.1 Hz.

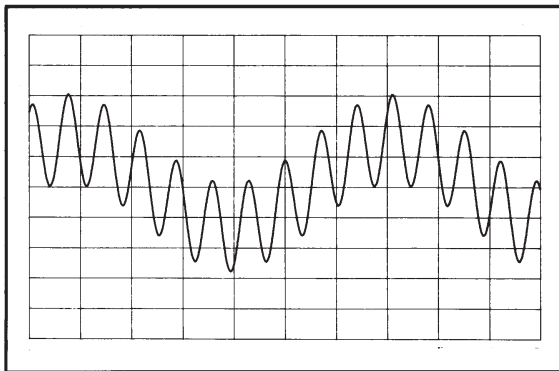
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|--------------------|-------|----------|
| A | Out 1 | 1 kHz | 2.5V | 0° | Sine |
| B | ϕ M | 0.1 Hz | 90° ^(A) | 0° | Ramp |
| C | | | | | |
| D | | | | | |

COMMENTS: This waveform has a phase discontinuity every 10 seconds. ^(A) The amplitude of channel B increases the frequency of channel A. The increase is equal to $A_B/180^\circ \times 0.1$ Hz where A_B is the amplitude of channel B. In this example the average frequency is 1000.05 Hz.

No. 59. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: TACAN Test Signal

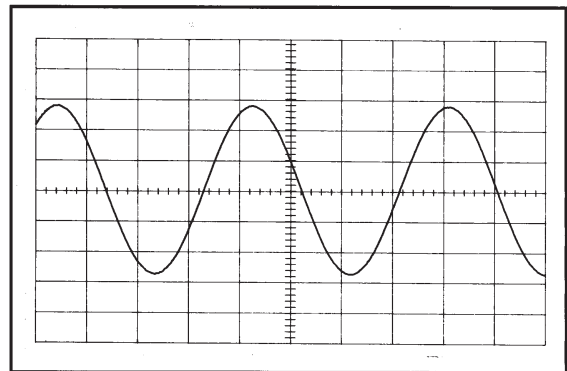
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 15 Hz | 2V | 0° | Sine |
| B | Out 1 | 135 Hz | 2V | 0° | Sine |
| C | | | | | |
| D | | | | | |

COMMENTS:

No. 60. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: Sinewaves to 700 kHz

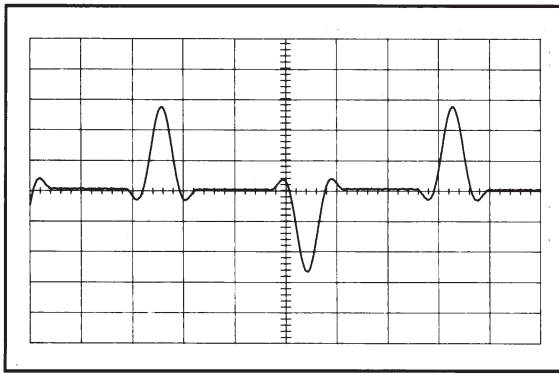
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|------------------------|-----------------------|-------|----------|
| A | Out 1 | 350 kHz ^(A) | — | 0° | Sine |
| B | Out 1 | — | -1.25V ^(B) | — | dc |
| C | DSB | 350 kHz ^(A) | 2.5V ^(B) | 0° | Sine |
| D | | | | | |

COMMENTS: ^(A) Channel A and C must be at the same frequency. The resulting output frequency is twice that frequency. Resolution is 0.2 Hz. ^(B) Channel B amplitude is set to half channel C amplitude. The output amplitude is half of channel C amplitude. The signal amplitude is typically attenuated less than 3 dB by 700 kHz.

No. 61. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Alternating polarity sinc pulses.**

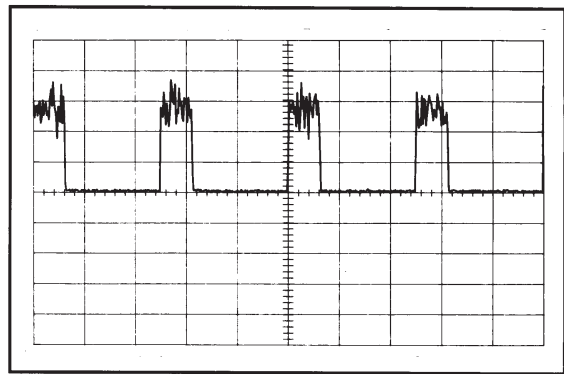
WAVEFORM APPLICATION: **Integrated circuit testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.0 kHz | 2.5V | 90° | Sine |
| B | AM | 1.0 kHz | 100% | 0° | Sine |
| C | Pulse | 500 Hz | — | 135° | Square |
| D | φM | 250 Hz | 90° | 300° | Square |

COMMENTS:

No. 62. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Variable duty cycle TTL true level noise pulses.**

WAVEFORM APPLICATION:

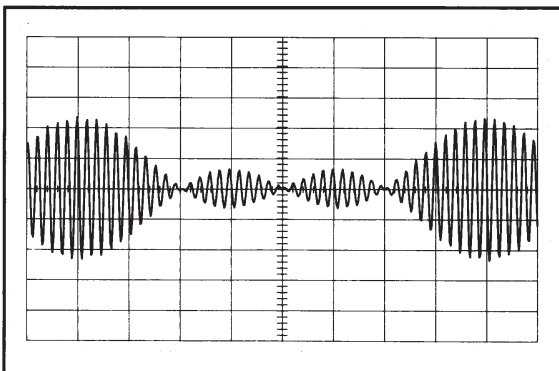
INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------------------|----------|
| A | Out 1 | 0.0 | 5V | 270° | Sine |
| B | AM | — | 100% | — | Noise |
| C | Pulse | 1 kHz | — | 0° ^(A) | Square |
| D | Pulse | 1 kHz | — | 90° | Square |

COMMENTS: Filter selection must be in sharp cutoff mode.

^(A) Duty cycle is changed by setting the phase of channel C — 0° = 50% duty cycle, 180° = 0%.

No. 63. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **PCM codec linearity test signal.**

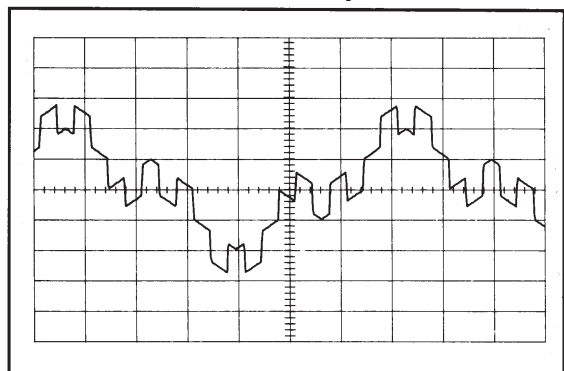
WAVEFORM APPLICATION: **Telecommunications**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1000 Hz | 0.25V | 0° | Sine |
| B | Out 1 | 1025 Hz | 0.25V | 0° | Sine |
| C | Out 1 | 1050 Hz | 0.25V | 0° | Sine |
| D | Out 1 | 1075 Hz | 0.25V | 0° | Sine |

COMMENTS: The codec is checked for proper output frequencies and spurious with four closely spaced input signals of equal level.

No. 64. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Digital oscilloscope trigger test signal.**

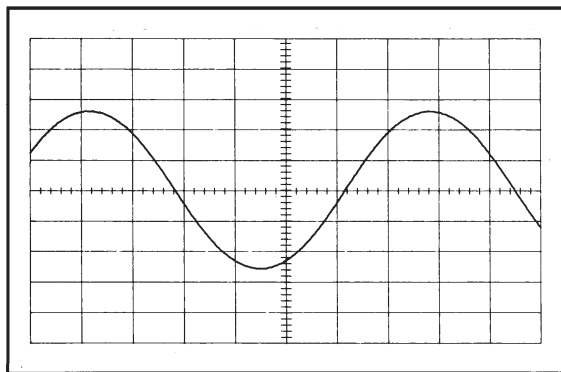
WAVEFORM APPLICATION: **Oscilloscope testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1 kHz | 1V | 0° | Square |
| B | Out 1 | 1 kHz | 500 mV | 90° | Square |
| C | AM | 10 kHz | 50% | 0° | Square |
| D | AM | 4 kHz | 50% | 90° | Triangle |

COMMENTS:

No. 65. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Distortion Analyzer Test Signal.**

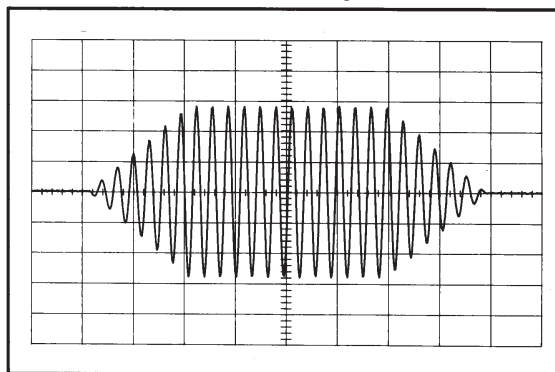
WAVEFORM APPLICATION: **Distortion analyzer accuracy verification.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1 kHz | 2.4V | 0° | Sine |
| B | Out 1 | 3 kHz | 24 mV | 0° | Sine |
| C | | | | | |
| D | | | | | |

COMMENTS: Accuracy at -40 dB distortion component is typically ± 0.15 dB, at -60 dB typically ± 1.65 dB. For best results, the summed level of all components should be close to the top of the attenuator range used. Ranges are 10V, 5V, 2.5V, 1.25V, .625V, etc.

No. 66. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Sine burst with trapezoid envelope.**

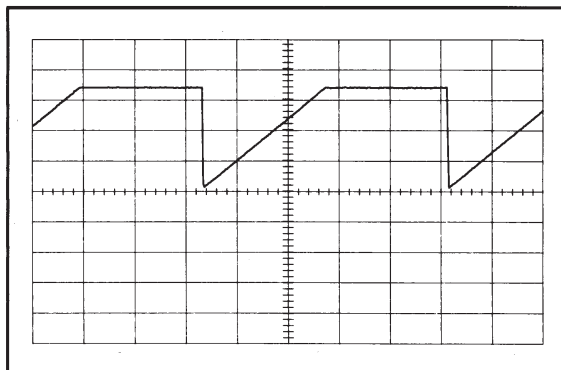
WAVEFORM APPLICATION: **Mechanical and medical testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 50 kHz | — | 0° | Sine |
| B | DSB | 1K | 2V | 0° | Triangle |
| C | DSB | 1K | 2V | 90° | Triangle |
| D | Pulse | 1K | — | 45° | Square |

COMMENTS:

No. 67. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Ramp with flat top.**

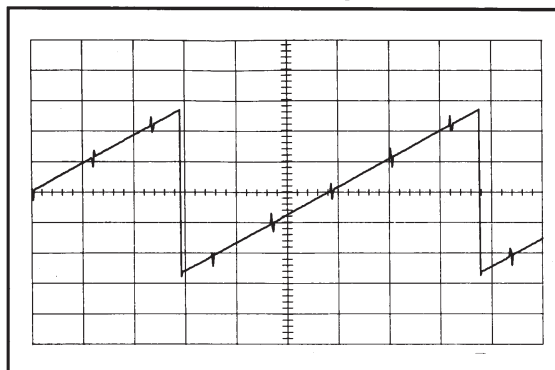
WAVEFORM APPLICATION: **Sweep with hold of final value.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1.00 kHz | 1V | 0° | Triangle |
| B | Out 1 | 1.00 kHz | 2V | 270° | Ramp |
| C | Out 1 | — | 3V | — | dc |
| D | | | | | |

COMMENTS:

No. 68. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Ramp with markers.**

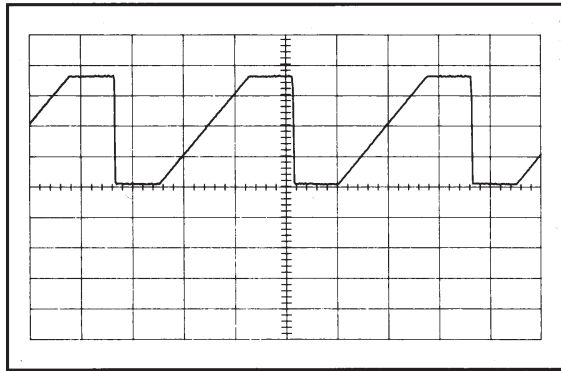
WAVEFORM APPLICATION: **Sweep drive signal.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 50 kHz | .25V | 0° | Sine |
| B | Out 1 | 100 Hz | 2V | 36° | Ramp |
| C | Pulse | 500 Hz | — | 0° | Square |
| D | Pulse | 500 Hz | — | 160° | Square |

COMMENTS: The number of markers per ramp is controlled by channel C and D frequency. Channel D's phase controls the width of the marker burst.

No. 69. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Symmetrical ramp with flat top.**

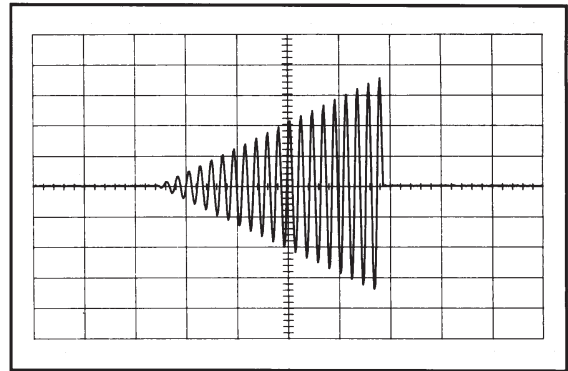
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 2 kHz | 1V | 0° | Triangle |
| B | Out 1 | 2 kHz | 2V | 0° | Ramp |
| C | Out 1 | — | 2V | — | DC |
| D | | | | | |

COMMENTS: Remove channel C to make waveform symmetrical around ground.

No. 70. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Swept amplitude sinewave with dead time.**

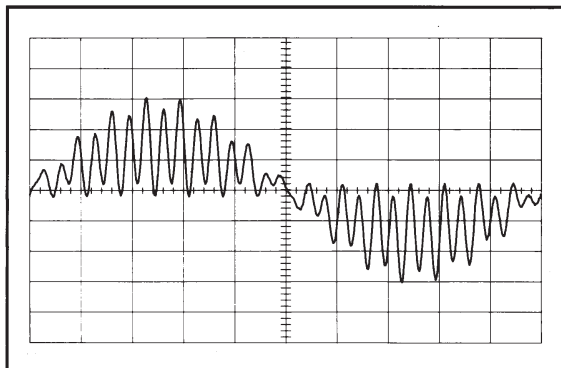
WAVEFORM APPLICATION:

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 20 kHz | 1V | 0° | Sine |
| B | AM | 1 kHz | 100% | 0° | Ramp |
| C | Pulse | 500 Hz | — | 0° | Square |
| D | | | | | |

COMMENTS:

No. 71. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **Sonobuoy composite signal.**

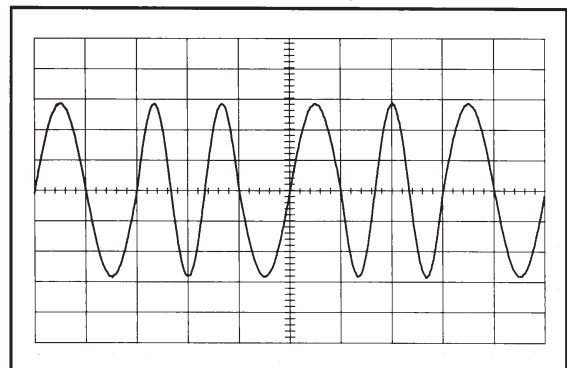
WAVEFORM APPLICATION: **Sonobuoy testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 31 kHz | .25V | 90° | Sine |
| B | Out 1 | 29 kHz | .25V | 270° | Sine |
| C | Out 1 | 1 kHz | .5V | 0° | Sine |
| D | Out 1 | 15 kHz | .1V | 0° | Sine |

COMMENTS: This is similar to FM broadcast stereo composite. See Product Note 8904-2 "Using the 8904A Multifunction Synthesizer as an FM stereo composite generator."

No. 72. 8904A Multifunction Synthesizer Waveform



WAVEFORM NAME/DESCRIPTION: **FFSK signal, 1200 baud rate, one-zero pattern.**

WAVEFORM APPLICATION: **Modem testing.**

INSTRUMENT SETTINGS

| CHANNEL | DESTINATION | FREQUENCY | AMPLITUDE | PHASE | WAVEFORM |
|----------|-------------|-----------|-----------|-------|----------|
| A | Out 1 | 1500 Hz | 2V | 0° | Sine |
| B | FM | 600 Hz | 300 Hz | 0° | Square |
| C | | | | | |
| D | | | | | |

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