










**AGILENT - TEKTRONIX- OR-X FUNCTION GENERATORS COMPARISON**

MODEL	OR-X 630	OR-X 640	OR-X 660	OR-X 662	Agilent 33220A	Agilent 33250A	Tek AFG3021 / 2	Tek AFG3101 / 2	Tek AFG3251 / 2
									

**SPECIFICATIONS**

Description Channels	Function and Arbitrary 1	Function and Arbitrary 1	Function and Arbitrary 1	Function and Arbitrary 2	Function and Arbitrary 1	Function and Arbitrary 1	Function and Arbitrary 1 or 2	Function and Arbitrary 1 or 2	Function and Arbitrary 1 or 2
Technology	Direct Digital Synthesis	Direct Digital Synthesis	Direct Digital Synthesis	Direct Digital Synthesis	Direct Digital Synthesis	Direct Digital Synthesis	Direct Digital Synthesis	Direct Digital Synthesis	Direct Digital Synthesis
Display	Graphic LCD	Graphic LCD	Graphic LCD	Graphic LCD	Graphic LCD	Graphic Color LCD	Graphic Color LCD	Graphic Color LCD	Graphic Color LCD

**Frequency Characteristics**

Sine	10 uHz ÷ 31 MHz	1 uHz ÷ 40 MHz	1 uHz ÷ 50 MHz	1 uHz ÷ 50 MHz	1 uHz ÷ 20 MHz	1 uHz ÷ 80 MHz	1 mHz ÷ 25 MHz	1 mHz ÷ 100 MHz	1 mHz ÷ 240 MHz
Square	10 uHz ÷ 31 MHz	1 uHz ÷ 40 MHz	1 uHz ÷ 50 MHz	1 uHz ÷ 50 MHz	1 uHz ÷ 20 MHz	1 uHz ÷ 80 MHz	1 mHz ÷ 12.5 MHz	1 mHz ÷ 50 MHz	1 mHz ÷ 120 MHz
Triangle and Ramp	10 uHz ÷ 500 KHz	1 uHz ÷ 5 MHz	1 uHz ÷ 5 MHz	1 uHz ÷ 5 MHz	1 uHz ÷ 5 MHz	1 uHz ÷ 5 MHz	1 mHz ÷ 250 KHz	1 mHz ÷ 1 MHz	1 mHz ÷ 2.4 MHz
Pulse	0.5 mHz ÷ 10 MHz	0.5 mHz ÷ 10 MHz	0.5 mHz ÷ 25 MHz	0.5 mHz ÷ 25 MHz	0.5 Hz ÷ 5 MHz	0.5 Hz ÷ 5 MHz	1 mHz ÷ 12.5 MHz	1 mHz ÷ 50 MHz	1 mHz ÷ 120 MHz
Resolution	10 digits	12 digits	12 digits	12 digits	10 digits	10 digits	10 digits	12 digits	12 digits
Accuracy	0.002%	0.001%	0.000%	0.000%	0.002%	0.0001%	0.0001%	0.0001%	0.0001%

**Arbitrary Characteristics**

Waveform Length	2 ÷ 500,000 points	2 ÷ 1,000,000 points	2 ÷ 4,000,000 points	2 ÷ 4,000,000 points	2 ÷ 64,000 points	2 ÷ 64,000 points	2 ÷ 64,000 points	2 ÷ 131,000 points	2 ÷ 131,000 points
Vertical Resolution	12 bits	14 bits	14 bits	14 bits	14 bits	12 bits	14 bits	14 bits	14 bits
Sample Rate	20 ns ÷ 50 s	12.5 ns ÷ 100 s	8 ns ÷ 100 s	8 ns ÷ 100 s	20 ns ÷ 100 s	5 ns ÷ 100 s	4 ns	4 ns	4 ns
Sample Resolution	4 digits	4 digits	4 digits	4 digits	4 digits	4 digits	4 digits	4 digits	4 digits
Max Frequency Rate	50 MHz	80 MHz	125 MHz	125 MHz	50 MHz	200 MHz	250 MHz	250 MHz	250 MHz

**Operating Modes**

Continuous	Repetitive	Repetitive	Repetitive	Repetitive	Repetitive	Repetitive	Repetitive	Repetitive	Repetitive
Triggered - Gated	5MHz in DDS	10MHz in DDS	10MHz in DDS	10MHz in DDS	6 MHz in DDS	25 MHz in DDS	10 MHz in DDS	10 MHz in DDS	10 MHz in DDS
Burst	1-99,999 cycles	1-999,999 cycles	1-999,999 cycles	1-999,999 cycles	1-50,000 cycles	1-1,000,000 cycles	1-1,000,000 cycles	1-1,000,000 cycles	1-1,000,000 cycles
Trigger Souce	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB	Int, Ext, Man, GPIB
Variable Phase	-360° ÷ 360°, 0.1° resol	-360° ÷ 360°, 0.1° resol	-360° ÷ 360°, 0.1° resol	-360° ÷ 360°, 0.1° resol	-360° ÷ 360°, 0.001° resol.	-360° ÷ 360°, 0.001° resol.	-180° ÷ 180°, 0.01° resol.	-180° ÷ 180°, 0.01° resol.	-180° ÷ 180°, 0.01° resol.

**Output Characteristics**

Amplitude Range	10 mV - 10 V p-p	10 mV - 10 V p-p	10 mV ÷ 10 V p-p	10 mV ÷ 10 V p-p	10 mV ÷ 10 V p-p	10 mV ÷ 10 V p-p	10 mV ÷ 10 V p-p	20 mV ÷ 10 V p-p	50 mV ÷ 5 V p-p
Resolution	3 digits (1000 counts)	3 digits (1000 counts)	3 digits (1000 counts)	3 digits (1000 counts)	4 digits	4 digits	4 digits	4 digits	4 digits
Accuracy	± 1% ± 20 mV	± 1% ± 20 mV	± 1% ± 20 mV	± 1% ± 20 mV	± 1% ± 1 mV	± 1% ± 1 mV	± 1% ± 1 mV	± 1% ± 1 mV	± 1% ± 1 mV
Units	Volts p-p	Vp-p, Vrms, dBm	Vp-p, Vrms, dBm	Vp-p, Vrms, dBm	Vp-p, Vrms, dBm	Vp-p, Vrms, dBm	Vp-p, Vrms, dBm	Vp-p, Vrms, dBm	Vp-p, Vrms, dBm
Offset Range	± 4.5 V	± 5 V	± 5 V	± 5 V	± 5 V	± 5 V	± 5 V	± 5 V	± 2.5 V
Offset Accuracy	± 1% ± 10 mV	± 1% ± 10 mV	± 1% ± 10 mV	± 1% ± 10 mV	± 2%	± 1% ± 2 mV+0.5% Ampl	± 1% ± 1 mV	± 1% ± 1 mV	± 1% ± 1 mV
Output Impedance	50 ?	50 ?	50 ?	50 ?	50 ?	50 ?	50 ?	50 ?	50 ?

**Waveform Characteristics**

Harmonic Distortion	-60 dBc, DC ÷ 100KHz -45 dBc, 100KHz ÷ 1MHz -35dBc, 1MHz ÷ 15MHz -25dBc, 15MHz ÷ 31 MHz	-65 dBc, DC ÷ 20KHz -60 dBc, 20KHz ÷ 100KHz -45dBc, 100KHz ÷ 5MHz -30dBc, 5MHz ÷ 40MHz	-65 dBc, DC ÷ 20KHz -60 dBc, 20KHz ÷ 100KHz -45dBc, 100KHz ÷ 5MHz -30dBc, 5MHz ÷ 50MHz	-65 dBc, DC ÷ 20KHz -60 dBc, 20KHz ÷ 100KHz -45dBc, 100KHz ÷ 5MHz -30dBc, 5MHz ÷ 50MHz	-70 dBc, DC ÷ 20KHz -60 dBc, 20KHz ÷ 100KHz -45dBc, 100KHz ÷ 1MHz -35dBc, 1MHz ÷ 20MHz	-55 dBc, DC ÷ 1MHz -45 dBc, 1MHz ÷ 5MHz -30dBc, 5MHz ÷ 80MHz	-60 dBc, DC ÷ 1MHz -50 dBc, 1MHz ÷ 5MHz -40dBc, 5MHz ÷ 25MHz	-60 dBc, DC ÷ 1MHz -50 dBc, 1MHz ÷ 5MHz -37dBc, 5MHz ÷ 25MHz	-60 dBc, DC ÷ 1MHz -50 dBc, 1MHz ÷ 5MHz -37dBc, 5MHz ÷ 25MHz
Spurious	<-60 dBc, DC ÷ 1 MHz	<-60 dBc, DC ÷ 1 MHz	<-60 dBc, DC ÷ 1 MHz	<-60 dBc, DC ÷ 1 MHz	<-70 dBc, DC ÷ 1 MHz	<-60 dBc, DC ÷ 1 MHz	<-60 dBc, DC ÷ 1 MHz	<-60 dBc, DC ÷ 1 MHz	<-50 dBc, DC ÷ 1 MHz
Square Rise/Fall times	< 12 ns	< 8 ns	< 6 ns	< 6 ns	< 13 ns	< 8 ns	< 18 ns	< 5 ns	< 2.5 ns
Variable Duty Cycle	20% ÷ 80%, to 5 MHz 40% ÷ 60% to 20 MHz	20% ÷ 80%, to 10 MHz 40% ÷ 60% to 30 MHz	20% ÷ 80%, to 10 MHz 40% ÷ 60% to 30 MHz	20% ÷ 80%, to 10 MHz 40% ÷ 60% to 30 MHz	20% ÷ 80%, to 10 MHz 40% ÷ 60% to 20 MHz	20% ÷ 80%, to 25 MHz 40% ÷ 60% to 50 MHz			

### Modulation Characteristics

AM	0 ÷ 100%	0 ÷ 100%	0 ÷ 100%	0 ÷ 100%	0 ÷ 100%	0 ÷ 100%	0 ÷ 120%	0 ÷ 120%	0 ÷ 120%
FM	< 100% deviation	< 100% deviation	< 100% deviation	< 100% deviation	< 100% deviation	DC to 10 MHz	DC to 80 MHz	2 mHz to 25 MHz	2 mHz to 25 MHz
FSK	0.01 Hz ÷ 1 MHz	0.01 Hz ÷ 1 MHz	0.01 Hz ÷ 1 MHz	0.01 Hz ÷ 1 MHz	0.01 Hz ÷ 1 MHz	0.02 Hz ÷ 100 KHz	0.02 Hz ÷ 1 MHz	0.002 Hz ÷ 1 MHz	0.002 Hz ÷ 1 MHz
Modulating Waveform	Sine, Square, Triangle	Sine, Square, Triangle	Sine, Square, Triangle	Sine, Square, Triangle	Sine, Square, Triangle	Sine, Square, Triangle	Sine, Square, Triangle	Sine, Square, Triangle	Sine, Square, Triangle
Internal Modulation Frequency	0.01 Hz ÷ 20 KHz	0.01 Hz ÷ 20 KHz	0.01 Hz ÷ 20 KHz	0.01 Hz ÷ 20 KHz	0.01 Hz ÷ 20 KHz	0.02 Hz ÷ 20 KHz	0.02 Hz ÷ 20 KHz	0.02 Hz ÷ 50 KHz	0.02 Hz ÷ 50 KHz
External Frequency	DC ÷ 20 KHz	DC ÷ 20 KHz	DC ÷ 20 KHz	DC ÷ 20 KHz	DC ÷ 20 KHz	DC ÷ 20 KHz	DC ÷ 20 KHz	DC ÷ 25 KHz	DC ÷ 25 KHz

### Sweep Characteristics

Sweep Shape	Linear and Logarithmic	Linear and Logarithmic	Linear and Logarithmic	Linear and Logarithmic	Linear and Logarithmic	Linear and Logarithmic	Linear and Logarithmic	Linear and Logarithmic	Linear and Logarithmic
Sweep Time	10 ms ÷ 500 s	10 ms ÷ 500 s	10 ms ÷ 500 s	10 ms ÷ 500 s	1 ms ÷ 500 s	1 ms ÷ 500 s	10 ms ÷ 100 s	10 ms ÷ 100 s	10 ms ÷ 100 s
Sweep Trigger	Int, Ext, Cont or Burst	Int, Ext, Cont or Burst	Int, Ext, Cont or Burst	Int, Ext, Cont or Burst	Int, Ext, Cont.	Int, Ext, Cont.	Int, Ext, Cont.	Int, Ext, Cont.	Int, Ext, Cont.

### Inputs and Outputs

Sync Output	TTL pulse, 50 ?	TTL pulse, 50 ?	TTL pulse, 50 ?	TTL pulse, 50 ?	TTL pulse, 50 ?	TTL pulse, 50 ?	TTL pulse, 50 ?	TTL pulse, 50 ?	TTL pulse, 50 ?
Trigger Input	TTL, 1K?	TTL, 10K?	TTL, 10K?	TTL, 10K?	TTL	TTL	TTL	TTL	TTL
Modulation Input	5Vp-p for 100%	5Vp-p for 100%	5Vp-p for 100%	5Vp-p for 100%	5Vp-p for 100%	5Vp-p for 100%	5Vp-p for 100%	5Vp-p for 100%	5Vp-p for 100%
Reference Input-Output	10 MHz, TTL levels	10 MHz, TTL levels	10 MHz, TTL levels	10 MHz, TTL levels	Optional only	10 MHz, TTL levels	10 MHz, to 5Vpp	10 MHz, to 5Vpp	10 MHz, to 5Vpp
ARB Marker Output	-	TTL Levels	TTL Levels	TTL Levels	-	-	-	-	-
External summing Input	-	5Vp-p for full output	5Vp-p for full output	5Vp-p for full output	-	-	-	+/- 1 V / 50 ?	+/- 1 V / 50 ?

### General

Interface	GPIB and RS-232	GPIB and RS-232	GPIB and RS-232	GPIB and RS-232	GPIB, USB, LAN	GPIB and RS-232	GPIB, USB, LAN	GPIB, USB, LAN	GPIB, USB, LAN
Power-off Store Memory	50 full instrument settings	50 full instrument settings	50 full instrument settings	50 full instrument settings	4 full instrument settings	4 full instrument settings	4 full instrument settings	4 full instrument settings	4 full instrument settings
Power-off Arbitrary Memory	500 K points	1M points	1 M points	1 M points	4 waves of 64,000 points	4 waves of 64,000 points	4 waves of 64,000 points	4 waves of 131,000 points	4 waves of 131,000 points

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