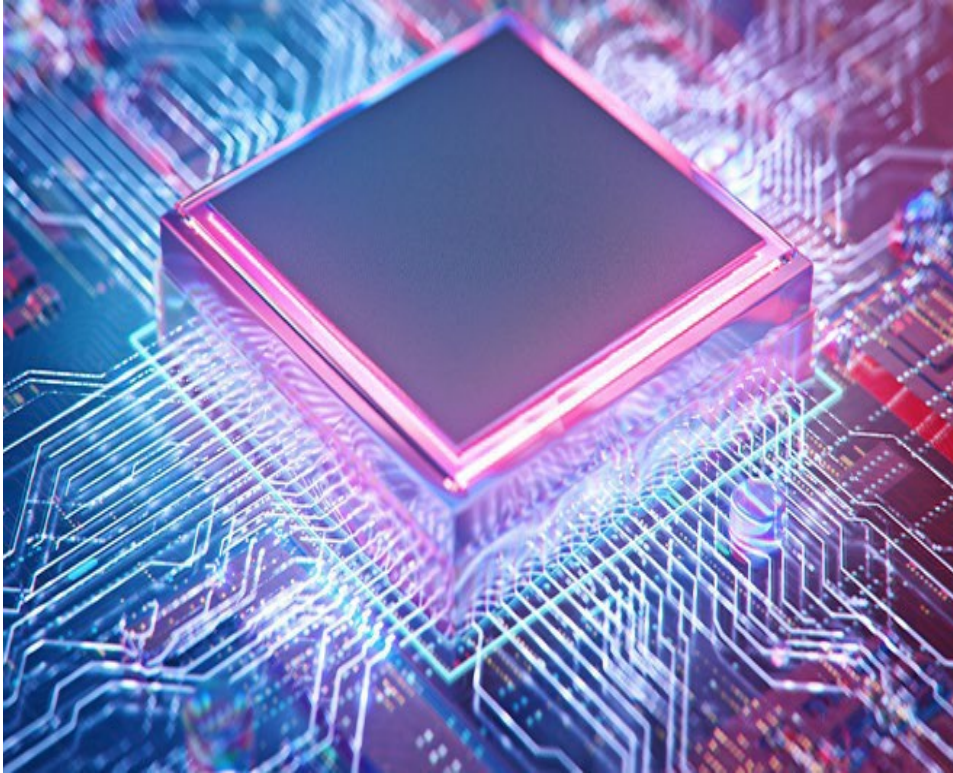


Model 685C | 3 GS/s 16 Bit Vertical

High Performance Arbitrary Waveform Generator



Features

- 2, 4 or 8 Analog Channels
- 3 GS/s / 16-bit Vertical Resolution
- 320 ps Rise/Fall Time
- Up to 4 Gpts Waveform Memory per Channel
- Up to 32 Digital Channels in Synchronous with Analog Generation

Applications

- Aerospace and Defense
- Institute and University Research
- Semiconductor Tests
- Automotive
- IoT



Model 685C

Arbitrary Waveform Generator

Model 685C Arbitrary Waveform Generator

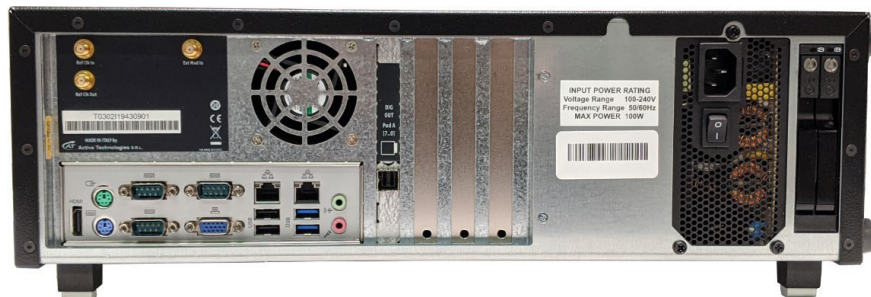
Features & Benefits

- Sample rate can be programmed in from 1 S/s to 3 GS/s with 16-bit vertical resolution, ensures exceptional signal integrity.
- Arbitrary waveform memory up to 4 Gpts for each analog channel
- Mixed Signal Generation – 2, 4, or 8 Analog channels with 8, 16, or 32 synchronized Digital Channels for debugging and validating digital design.
- Digital outputs provide up to 750 Mb/s data rate in LVDS format. LVDS to LVTTTL adapter is available
- Advance sequencer with up to 16384 user-defined waveforms provides the possibility of generating complex signal scenarios with the most efficient memory usage
- Windows-based platform with 7in touchscreen, front panel buttons and knob
- Compact form factor, convenient for bench top and fully fit with 3U – 19” rack-mount standard
- LAN,USB-TMC and GPIB interfaces for remote control

Model 685C Front



Model 685C Back



Model 685C Arbitrary Waveform

Model 685C User Interface

Simple Rider AFG: Function Generator Mode Interface

Simple Rider AFG UI is designed using a touchscreen interface; it has been developed to put all the capabilities of modern Waveform Generators right at your fingertips. All instrument controls and parameters are accessible through an intuitive UI that recalls the simplicity of modern tablets and smartphones. Scientists and engineers can use gestures and touch commands to create advanced waveforms or digital patterns with ease.

- The swipe gesture gives easy access to the output waveform parameters.
- A touch-friendly virtual numeric keypad has been designed to improve the user experience with regard to entering data.
- Time-saving shortcuts and intuitive icons simplify the instrument setup.



Simple Rider TrueArb: AWG and DPG Mode Interface

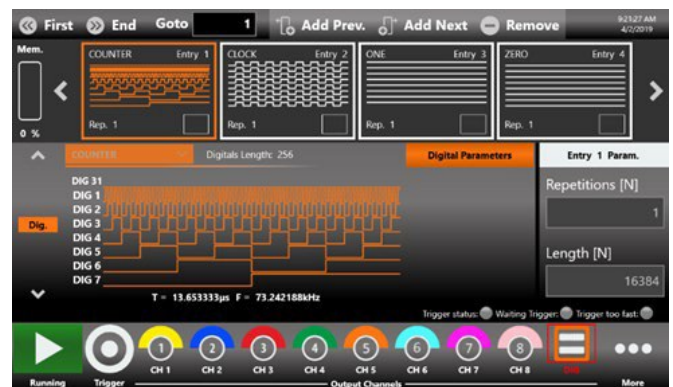
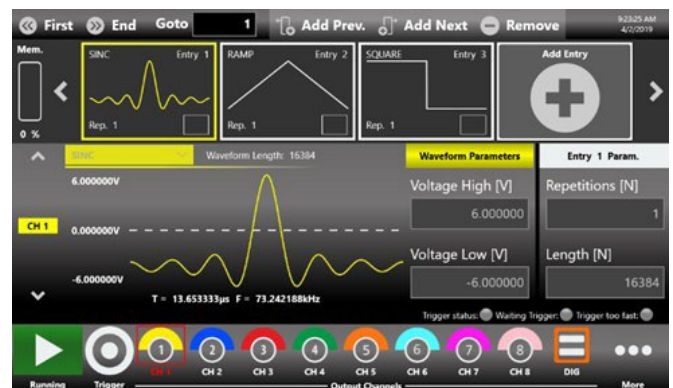
In the **Simple Rider True-Arb** interface, the users can define complex waveforms with up to 16,384 sequence entries of analog waveforms and digital patterns, define their execution flow by means of loops, jumps, and conditional branches.

Digital output combined and synchronized with analog output signals is an ideal tool to troubleshoot and validate the digital design. The waveform memory length of up to 4 GSamples on each channel combined with up to 16,384 and up to 4,294,967,294 repetitions, make the Model 685C the ideal generator for the most demanding technical applications.

Thanks to the intuitive and easy waveform sequencer user interface, you can create the most complex waveform scenarios with just a few screen touches.

Up to 4 instruments can be synchronized together in order to obtain a 32 analog – 128 digital channel generator. A dedicated synchronization bus guarantees intra-chassis synchronization.

Model 685C supports the standard Ethernet interface for remote control and easy customized instrument programming.

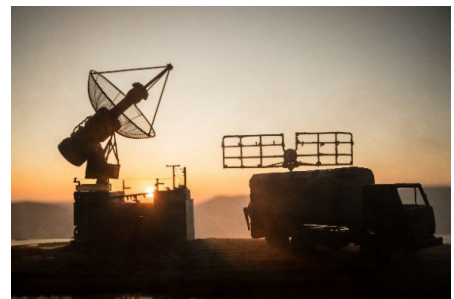
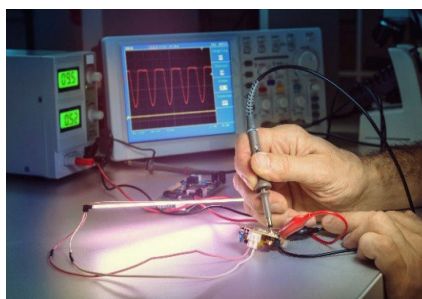
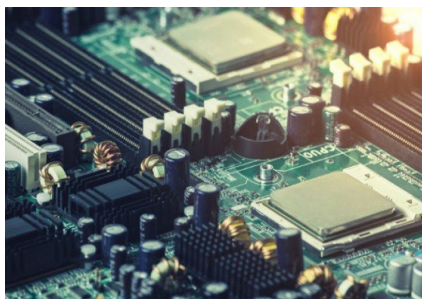


Model 685C Arbitrary Waveform

Model 685C Applications Automotive

Today's cars include highly sophisticated and electronically controlled units with sensitive electronic components. The Model 685C combines a 3 GSa/s sampling rate with a 16-bit vertical resolution. It represents an ideal and a successful tool for addressing the new testing challenges in the automotive industry. It includes these features:

- EMI debugging, troubleshooting, and testing
- Electrical standards emulation up to 5V



Semiconductor Testing

Emulation of complex signals generated with inclusion of noise or distortions may become an excellent way to provide Compliance Components Test to help semiconductor engineers. The fast edges and pulse generation can be used to provide characterization in fast power devices.

Research Applications

Research centers and Universities are key users of the Model 685C. Complex waveform and/or sophisticated Pulses emulation based on variable edges or multilevel could be perfectly created. The combination of fast edge generation, excellent dynamic range and easy-to-use user interface meet perfectly for scientists and engineers working on Quantum Research or on large experiments such as Accelerators, Tokamak, or synchrotrons to emulate signals without creating specific test boards.

Aerospace and Defense Applications

The Model 685C works perfectly with electronic warfare signals, such as those produced by radar or sonar systems. It can create pulses useful in pulse electron beams, X-ray sources, flash X-ray radiography, lightning pulse simulators, and high-power microwave modulators. These features of Model 685C are useful in the aerospace and defense industry.

Model 685C Arbitrary Waveform Generator

Model 685C Specifications

All specifications are typical unless noted otherwise. The guaranteed performances are referred to a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature range of 5°C to 40°C and after a 45-minute warm-up period. Within $\pm 10^\circ\text{C}$ after auto-calibration.

General Specifications			
Operating Mode	AFG Mode True Arb Mode		
Number of Channels	Model 685C-2C	Model 685C-4C	Model 685C-8C
Analog	2	4	8
Digital Out	0/8 optional	0/8/16 optional	0/8/16/24/32 optional
Marker Out	1	2	4
	Model 685C-2C Model 685C-4C Model 685C-8C		
Output Channels			
Output Type	Differential DC coupled		
Output Impedance	Single ended: 50 Ω Differential: 100 Ω		
Connectors	SMA on front panel		
DC Amplitude			
Amplitude Range	± 0.75 V Se. (into 50 Ω) ± 1.5 V Diff. (into 100 Ω)		
Resolution	100 μV (nom), 5 digits		
Amplitude Accuracy (guaranteed)	$\pm (1\% \text{ of } \text{setting} + 2\text{mV})^1$		
DC Baseline Hardware Offset (Common mode offset)			
Resolution	< 4 mV or 4 digits		
Range (50 Ω into 50 Ω)	-2 V to +2 V		
Range (50 Ω into High Z load)	-4 V to +4 V		
Accuracy (50 Ω into 50 Ω) (guaranteed)	$\pm (1\% \text{ of } \text{setting} + 5 \text{ mV})$		
AC Accuracy (1 kHz sine wave, 0 V offset, > 5 mVp-p amplitude, 50 Ω load) (guaranteed)	$\pm (1\% \text{ of setting } [V_{pp}] + 5\text{mV})^1$		

True Arb - Baseband Mode Specifications	Model 685C-2C Model 685C-4C Model 685C-8C
General specifications	
Operating Mode	Variable clock (True Arbitrary) – Baseband mode
Sample Rate	1 S/s to 3 GS/s
Sin(x)/x	1.32 GHz @ 3 GS/S
Run Modes	Continuous, Triggered Continuous, Single/Burst, Stepped, Advanced
Vertical Resolution	16 bit
Waveform Length	2G samples per channel (up to 4G samples optional)
Waveform Granularity	1 if the entry length is > 416 samples 32 if entry length is ≥ 128 and ≤ 416 samples
Sequence Length	1 to 16384
Sequence Repeat Counter	1 to 4294967294 or infinite

¹ The specification is guarantee in the range 0% to 90% of full sale output

Model 685C Arbitrary Waveform Generator

Timer Range Resolution	20 ns to 1.39 seconds ± 1 sampling clock cycle
Analog Channel to Channels skew	
Range	0 to 2.63 us
Resolution	100 fs
Accuracy	±(1% of setting + 20 ps)
Initial skew	< 20 ps
Calculated bandwidth (0.35 / rise or fall time)	≥ 1.1 GHz
SFDR @ 100 MHz (Fsa= 6 Gsa/s, measured across DC to Fs/2, excluding fsa - 2*fout and fsa- 3*fout and excluding harmonic)	< - 90 dBc
SFDR (Fsa= 6,16 Gsa/s, measured across DC to Fs/2, excluding fsa - 2*fout and fsa- 3*fout and excluding harmonic) ¹	1 μHz to < 100 MHz: < -90 dBc 100 MHz to ≤ 600 MHz: < -82 dBc 600 MHz to ≤ 1.5 GHz: < -75 dBc 1.5 GHz to ≤ 2 GHz: < -70 dBc 2 GHz to ≤ 3 GHz: < -62 dBc
Rise/fall time (1 Vp-p single-ended 10% to 90%)	≤ 320 ps
Rise/fall time (1 Vp-p single-ended 20% to 80%)	≤ 200 ps
Overshoot (1 Vp-p single-ended)	<6%
Random jitter on clock pattern (rms, typical)	< 2 ps

AFG Mode Specifications	Model 685C-2CD Model 685C-4CD Model 685C-8CD
General Specifications	
Amplitude	0 to 3 Vpp Diff. (into 100 Ω) 0 to 1.5 Vpp Se. (into 50 Ω)
Resolution	100 μV (nom), 5 digits
Operating Mode	DDS mode
Standard Waveforms	Sine, Square, Pulse, Ramp, more (Noise, DC, Sin(x)/x, Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine
Run Modes	Continuous, modulation, sweep, burst
Arbitrary Waveforms	Vertical resolution: 16-bit Waveform length: 16,384 points
Internal Trigger Timer Range Resolution Accuracy	10.4 ns to 88 s 80 ps ±(0.1% setting + 5 ps)
Sine Waves	
Frequency Range Sine (50 Ω into 50 Ω) ²	1 μHz to ≤ 1 GHz: 3 Vpp Diff. 1 μHz to ≤ 1 GHz: 1.5 Vpp Se.
Flatness	DC to 2 GHz: ±0.5 dB (1 Vpp diff., relative to 1 kHz)
Spurious (measured across DC to Fs/2) ³	1 μHz to ≤ 250 MHz: < -85 dBc 250 MHz to ≤ 500 MHz: < -80 dBc 500 MHz to ≤ 1.5 GHz: < -70 dBc 1.5 GHz to ≤ 2 GHz: < -60 dBc
Phase Noise (1 Vp-p, 10 kHz offset)	20 MHz: < -127 dBc/Hz typ. 100 MHz: < -123 dBc/Hz typ. 1 GHz: < -105 dBc/Hz typ.

² Amplitude doubles on HiZ load

³ SFDR is evaluated @ 1Vpp differential nominal output amplitude provided to the spectrum analyzer through a Minicircuit TC1-1-13M+ balun

Model 685C Arbitrary Waveform Generator

Square Waves	
Frequency Range	1 μ Hz to \leq 385 MHz
Rise/fall Time (10% to 90%)	800 ps
Rise/fall Time (20% to 80%)	600 ps
Overshoot (1 Vp-p)	<2%
Jitter (rms)	<2 ps
Pulse Waves	
Frequency Range	1 μ Hz to \leq 385 MHz
Pulse Width	1 ns to (Period – 1 ns) ⁴
Pulse Width Resolution	20 ps or 15 digits
Pulse Duty	0.1% to 99.9% (limitations of pulse width apply)
Leading/trailing edge transition time (10% to 90%)	800 ps to 1000 s
Leading/trailing edge transition time (20% to 80%)	600 ps to 1000s
Transition Time Resolution	2 ps or 15 digits
Overshoot (1 Vp-p)	< 2%
Jitter (rms, with rise and fall time \geq 400ps)	<2 ps
Double Pulse Waves	
Frequency Range	1 μ Hz to \leq 192.5MHz: 6Vpp Diff. 1 μ Hz to \leq 192.5 MHz: 3Vpp Se.
Other Pulse Parameters	Same as Pulse Waves
Ramp Waves	
Frequency Range	1 μ Hz to 37.5 MHz
Linearity (< 10 kHz, 1 Vp-p, 100%)	\leq 0.1%
Symmetry	0% to 100%
Other Waves	
Frequency Range Exponential Rise, Exponential Decay Sin(x)/x, Gaussian, Lorentz, Haversine	1 μ Hz to 37.5 MHz 1 μ Hz to 75 MHz
Additive Noise	
Bandwidth (-3 dB)	2 GHz
Level	0 V to 0.75 V Single Ended - abs(carrier max value [V _{pk}]) 0 V to 1.5 V Differential - abs(carrier max value [V _{pk}])
Resolution	1 mV
Arbitrary	
Number of Samples	2 to 16384
Frequency Range	1 μ Hz to \leq 385 MHz
Analog Bandwidth (-3 dB)	470 MHz
Rise/Fall Time (10% to 90%)	800 ps
Rise/Fall Time (20% to 80%)	600 ps
Jitter (rms)	< 2 ps
Frequency Resolution	
Sine, Square, Pulse, Arbitrary, Sin(x)/X	1 μ Hz or 15 digits
Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine	1 μ Hz or 14 digits
Frequency Accuracy	
Non-ARB	\pm 2.0 ppm of setting \pm 500 ppb of setting (Opt.)
ARB	\pm 2.0 ppm of setting \pm 1 μ Hz \pm 500 ppb of setting \pm 1 μ Hz(Opt.)

⁴ Below 1ns width, the pulse amplitude will have some reduction respect to the set value

Model 685C Arbitrary Waveform Generator

Modulations	
Amplitude Modulation (AM)	
Carrier Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation Source	Internal or external
Internal Modulating Waveforms	Sine, Square, Ramp, Noise, ARB
Modulating Frequency	Internal: 500 μ Hz to 61 MHz, External: 10 MHz maximum
Depth	0.00% to 120.00%
Frequency Modulation (FM)	
Carrier Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation Source	Internal or external
Internal Modulating Waveforms	Sine, Square, Ramp, Noise, ARB
Modulating Frequency	Internal: 500 μ Hz to 61 MHz, External: 10 MHz maximum
Peak Deviation	DC to 1 GHz
Phase Modulation (PM)	
Carrier Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation Source	Internal or external
Internal Modulating Waveforms	Sine, Square, Ramp, Noise, ARB
Modulating Frequency	Internal: 500 μ Hz to 61 MHz, External: 10 MHz maximum
Phase Deviation Range	0° to 360°
Frequency Shift Keying (FSK)	
Carrier Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation Source	Internal or external
Internal Modulating Waveforms	Square
Key Rate	Internal: 500 μ Hz to 61 MHz, External: 10 MHz maximum
Hop Frequency	DC to 1 GHz
Number of Keys	2
Phase Shift Keying (PSK)	
Carrier Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal Modulating Waveforms	Square
Key Rate	Internal: 500 μ Hz to 61 MHz, External: 10 MHz maximum
Hop Frequency	0° to +360°
Number of Keys	2
Pulse Width Modulation (PWM)	
Carrier Waveforms	Pulse
Modulation Source	Internal or external
Internal Modulating Waveforms	Sine, Square, Ramp, Noise, ARB
Modulating Frequency	Internal: 500 μ Hz to 61 MHz, External: 10 MHz maximum
Deviation Range	0% to 50% of pulse period
Sweep	
Type	Linear, Logarithmic, staircase, and user defined
Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Sweep Time	30 ns to 2000 s
Hold/return Times	0 to (2000 s - 30 ns)
Sweep/Hold/Return Time Resolution	15 ns or 12 digits
Total Sweep Time Accuracy	\leq 0.4%
Start/Stop Frequency Range	Sine: 1 μ Hz to 1 GHz, Square: 1 μ Hz to 385 MHz
Trigger Source	Internal/External/Manual
Burst	
Waveforms	Standard waveforms (except DC and Noise), ARB
Type	Trigger or gated
Burst Count	1 to 4,294,967,295 cycles or Infinite

Model 685C Arbitrary Waveform Generator

Timing and Clock	
Sampling Rate	
Range	1 S/s Up to 3GS/s
Resolution	32 Hz
Accuracy	± 2.0 ppm ± 500 ppb (Opt.)
Output Channels	
Connectors	Mini-SAS HD connector on rear panel (custom pin-out)
Number of Connectors	1, 2, 4
Number of Outputs	8-bits, 16-bits, 32-bits
Output impedance	100 Ω differential
Output type	LVDS
Rise/fall time (10% to 90%)	< 1 ns
Jitter (rms)	20 ps
Maximum update rate	750 Mbps per channel
Memory depth	512M Samples per digital channel (up to 1G optional)
8 bit LVDS to LVTTTL Converter Probe (Optional AT-DTLL8)	
Output Connector	20 position 2.54 mm 2 Row IDC Header
Output Type	LVTTTL
Output Impedance	50 Ω nominal
Output Voltage	0.8 V to 3.8 V programmable in group of 8 bits
Maximum Update Rate	125 Mbps@0.8V and 400 Mbps@3.6V
Dimensions	W 2in x H 0.9in x D 3in [52mm x 22mm x 76mm]
Input Connector	Proprietary standard
Cable Length	1 meter
Cable Type	Proprietary standard
Proprietary Mini SAS HD to SMA cable (Optional)	
Output Connector	SMA
Output Type	LVDS
Number of SMA	16 (8 bits)
Cable Type	Proprietary standard
Cable Length	1 meter

Auxiliary Input and Output Characteristics

Sync in/out	
Connector Type	Infiniband 4X connector on rear panel (custom pinout)
Master to Slave Delay (typical)	TBD
Marker Output	
Connectors	SMA on Front Panel
Number of Connectors	1 2 4
Output Impedance	50 Ω

Output level (into 50 Ω)	
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Model 685C Arbitrary Waveform Generator

Voltage Window	-0.5 V to 1.65 V
Amplitude	100 mVpp to 2.15 Vpp
Resolution	1 mV
Accuracy	±(5% setting + 25 mV)
Switching characteristics	
Max Update Rate (True Arb Mode)	3 Gbps
Max Data Rate (True Arb Mode)	3 Gbps @ 1Vpp swing
Max Frequency (AFG Mode)	96.5 MHz (continuous mode)
Rise/fall time (10% to 90%, 2 Vpp)	<150 ps
Jitter (rms)	<10 ps
Marker out to analog channel skew	
Range	True Arb Mode: 0 to 2.3µs AFG Mode: 0 to 100 sec. in Contin. Mode, 0 to 2.25 µs in Trig. Mode
Resolution	1/32 of DAC sampling period AFG Mode: 5 ps
Accuracy	±(1% of setting + 5 ps)
Initial skew	< 20 ps
Trigger/Event Inputs	
Connector	SMA on the Front Panel
Number of Trigger Inputs	2 (Trig.in 1, Trig.in 2)
Input Impedance	50 Ω / 1 kΩ
Slope/Polarity	Positive or negative or both
Input Damage Level	< -15 V or > +15 V
Threshold Control Level	-10 V to 10 V
Resolution	50 mv
Threshold Control Accuracy	±(10% of setting + 0.2 V)
Input Voltage Swing	0.5 Vp-p minimum
Minimum Pulse Width (1 Vp-p)	3 ns
Trigger/gate input to Analog Output Delay	Slow (synchronous) trigger AFG mode: < 355 ns (< 405 ns in triggered sweep mode) True Arb mode: <1550 * DAC clock period(ns) + 10 ns Fast (asynchronous) trigger AFG mode: < 335 ns (< 385 ns in triggered sweep mode) True Arb mode: <1360 * DAC clock period(ns) + 27 ns
Trigger In to Output Jitter (rms)	AFG mode: < 20 ps True Arb mode: 0.29*DAC clock period
Trigger In Programmable Delay Range	0 ps to 2418 ps
Trigger In Programmable Delay Resolution	78 ps
Maximum Frequency	AFG: 65 MTps on Rising/Falling Edge, 80 MTps on Both Edges True Arb mode: 1/ (Period of the Analog Waveform + 48 DAC Clock period) MTps = Mega Transitions per second
Reference clock input	
Connector Type	SMA on Rear Panel
Input Impedance	50 Ω, AC coupled
Input Voltage Range	0.2 Vpp to 2 Vpp
Damage Level	Maximum Input voltage: -0.3 V to 3.6 V Maximum input power: 30 dBm (50 Ω)
Frequency Range	5 MHz to 200 MHz
Frequency Resolution	1 Hz

Model 685C Arbitrary Waveform Generator

Reference clock output	
Connector Type	SMA on Rear Panel
Output Impedance	50 Ω, AC coupled
Frequency	10 MHz TCXO 100 MHz VCOCXO (Optional)
Initial Accuracy @ 25 °C	± 1.0 ppm ± 500 ppb (Opt.)
Aging	± 1.0 ppm/year ± 500 ppb/year (Opt.)
Stability vs. Temperature	± 1 ppm ± 50 ppb(Opt.)
Amplitude	1.65 Vpp
Phase Noise @ 20 MHz Carrier	-120 dBc/Hz at 100 Hz ; -140 dBc/Hz at 1 KHz; -150 dBc/Hz at 10 KHz
Phase Noise @ 100 MHz Carrier(Opt.)	-120 dBc/Hz at 100 Hz ; -145 dBc/Hz at 1 KHz; -150 dBc/Hz at 10 KHz
External Clock Input	
Connector Type	SMA on Rear Panel
Input Impedance	50 Ω, AC coupled
Frequency ⁵	<u>True Arb</u> : SampleRate / N where: N = 4, 8, 16, 32 for SampleRate = 5.0 ÷ 6.16 GHz N = 2, 4, 8, 16, 32 for SampleRate = 3.08 ÷ 5.0 GHz <u>AFG</u> : 192.5 MHz, 385 MHz, 770 MHz or 1540 MHz (selectable)
Input Power Range	+0 dBm to +10 dBm
Damage Level	15 dBm
Sync Clk Out	
Connector Type	SMA on Rear Panel
Output Impedance	50 Ω, AC coupled
Frequency	2 * Sampling Rate/N, N=16, 32,..., 2048
Amplitude	1 Vpp into 50 Ohm
External Modulation input	
Connector Type	SMA on Rear Panel
Input Impedance	10 KΩ
Number of Inputs	1
Bandwidth	10 MHz with 50 MS/s sampling rate
Input Voltage Range	-1 V to +1 V (except FSK, PSK). FSK, PSK: 0 V ÷ 3.3 V with 1.65V fixed threshold
Vertical Resolution	12-bit
Pattern Jump In (optional)	
Connector Type	DSUB15
Input Signals	DATA[0..7] + Data Select + Load
Internal Data Width	14 bit, multiplexed using Data_Select
Number of Addressable Entries	16384
Data Rate	DC to 1 MHz
Input Range	VIL = 0 V to 0.8 V / VIH= 2 V to 3.3 V
Impedance	Internal 1 kΩ pull-up resistor to Vcc (3.3 V)
Power	
Source Voltage and Frequency	100 to 240 VAC ±10% @ 45-66 Hz

Model 685C Arbitrary Waveform Generator

Max. Power Consumption	Max. 100W Max. 200W Max. 300W
Environmental Characteristics	
Temperature (operating)	+41 °F to 104 °F [+5 °C to +40 °C]
Temperature (non-operating)	-4 °F to 140 °F [-20 °C to +60 °C]
Humidity (operating)	5% to 80% relative humidity with a maximum wet bulb temperature of 84°F (29°C) at or below +104°F (40°C), (upper limit de-rates to 20.6% relative humidity at +104°F (40°C)). Non-condensing.
Humidity (non-operating)	5% to 95% relative humidity with a maximum wet bulb temperature of 104°F (40°C) at or below +140°F (60°C), upper limit de-rates to 29.8% relative humidity at +140°F (60°C). Non-condensing.
Altitude (operating)	9,842 feet (3,000 meters) maximum at or below 77°F (25°C)
Altitude (non-operating)	39,370 feet (12,000 meters) maximum
EMC and Safety	
Safety	EN61010-1
Main Standards	EN 61326-1:2013 – Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
Immunity	EN 61326-1:2013
System Specifications	
Display	7", 1024x600, capacitive touch LCD
Operative System	Windows 10
External Dimensions	W 17.6 in – H 5.4 in – D 12.6 in (3U 19" rackmount) (445 mm – 135 mm – 320 mm)
Weight	Max. 26.45 lbs (12 Kg)
Front panel connectors	CH N OUTPUT (SMA) where N=2,4,8 depending on the model MARKER N OUT (SMA) where N=1,2,4 depending on the model TRG IN N(SMA) where N =1,2 2 USB 3.0 ports
Rear panel connectors	Ref. Clk. IN (SMA) Ref. Clk. Out (SMA) Ext. Mod. IN (SMA) Sync Clk Out (SMA) Ext Clk IN (SMA) Sync IN (Infiniband 4X) Sync OUT (Infiniband 4X) Pattern Jump In (DSUB15) (685-XC-FSS opt. only) POD X[7..0] where X=A,B,C,D depending on the model (Customized Mini SAS HD) External Monitor ports (one or more) 2 USB 2.0 ports or more 4 USB 3.0 ports Ethernet port (10/100/1000BaseT Ethernet, RJ45 port) 2 PS/2 keyboard and mouse ports 2 DPI ports 1 DVI port
Hard Disk	1 TB SSD or better
Processor	Intel® Pentium 3.7 GHz (or better)
Processor Memory	32 GB or better