# **General Information**

## Model 3325A

# Table 1-1. Specifications.

#### FUNCTIONS AND FREQUENCIES

Sine Wave:

Signal Output (Front or Rear Panel): 0.000 001 Hz to 20 999 999.999 Hz

Auxiliary Output (Rear Panel): 21 000 000.000 Hz to 60 999 999.999 Hz Underrange to 19 000 000.001 Hz

Square Wave: 0.000 001 Hz to 10 999 999.999 Hz

Triangle: 0.000 001 Hz to 10 999.999 999 Hz

Positive and Negative Slope Ramp:

0.000 001 Hz to 10 999.999 999 Hz

## FREQUENCY RESOLUTION

1 nHz for frequencies below 100 kHz

1 mHz for frequencies 100 kHz and higher

## FREQUENCY ACCURACY (Standard Instrument)

 $\pm 5 \times 10^{6}$  of selected value (20° to 30°C)

FREQUENCY STABILITY (Standard Instrument)

 $\pm 5 \times 10^{6}$  per year (20° to 30°C)

### SIGNAL CHARACTERISTICS

#### Sine Wave:

Harmonic Distortion relative to the amplitude of the fundamental frequency at full output on each range

Fundamental	No Harmonic
Frequency	Greater Than
0.1 Hz to 50 kHz 50 kHz	-65 dB
to 200 kHz 200 kHz to 2	-60 dB
MHz	-40 dB
2 MHz to 15 MHz 15	-30 dB
MHz to 20 MHz	-25 dB

Spurious: All non-harmonically related output signals will be more than 70dB below the carrier (-60dB with DC offset), or less than -90dBm, whichever is greater.

Phase Noise: > -60dB (Option 001 Only) for a 30kHz band centered on a 20MHz carrier (excluding  $\pm$  1Hz about the carrier).

### Square Wave:

Rise/Fall Time: s 20 nanoseconds, 10% to 90% at full output

Symmetry: <, .02% of period + 3 nanoseconds

Overshoot: s 5% of peak to peak amplitude at full output Triangle:

Linearity, 10% to 90%, best fit straight line:  $\pm$  0.05% of full p-p output for each range

Ramps (Positive or Negative Slope):

Linearity, 10% to 90%, best fit straight line:  $\pm$  0.05% of full p-p output for each range

Retrace Time: <, 3 microseconds, 90% to 10% Ramp Period Variation: < ± 1 % of period, maximum

### AMPLITUDE

Amplitude Accuracy with no Attenuation (Attenuator range 1) into 50 ohm Load. (No D.C. offset)

Function and Tolerance relative to programmed frequency range amplitude

Sine Wave .001 Hz to 100 kHz	± 0.1 dB
Square Wave .001 Hz to 100 kHz	± 1.0%
Triangle .001 Hz to 2 kHz 2 kHz to 10 kHz	± 1.5% ± 5%
Ramps .001 Hz to 500 Hz 500 Hz to 10 kHz	± 1.5% ± 10%

Flatness with no attenuation Tolerance relative to programmed (Attenuator Range 1) into a amplitude at 1 kHz 50 Ohm load

Sine Wave 100kHz to 20 MHz	± 0.3 dB
Square Wave 100 kHz to 10 MHz	± 10%

Amplitude accuracy with D.C. offset and no attenuation (Range 1) into a 50 ohm load. Tolerance relative to programmed amplitude.

Sine Wave .001 Hz to 100 kHz	•± 0.3 dB
Square .001 Hz to 100 kHz	± 3%
Triangle .001 Hz to 2 kHz 2 kHz to 10 kHz	± 4% ± 6%
Ramps .001 Hz to 500 Hz 500 Hz to 10 kHz	± 4% ± 11%

Attenuator Accuracy (these Tolerance relative to errors are additive with the programmed amplitude. amplitude accuracy errors)

.001 Hz to 20 kHz Attenuator Range 1	No Error
.001 Hz to 100 kHz Attenuator ranges 2 through 8	± 0.1 dB
100 kHz to 10 MHz Attenuator ranges 2 through 8	± 0.2 dB
10 MHz to 20 MHz Attenuator ranges 2 through 4 Attenuator ranges 5 through 8	± 0.2 dB ± 0.5 dB

# Model 3325A

# **General Information**

# Table 1-1. Specifications (Cont'd).

Accuracy of DC Offset (into 50 ohms):

DC Only (No AC Function):  $\pm$  0.4% of full peak output for each range\*

"Except lowest attenuator range wheie accuracy is  $\pm \, 20$  /!V.

DC + AC, <, 1 MHz: ± 1.2%, Ramps ± 2.4% DC +

AC, > 1 MHz: ±3% AMPLITUDE MODULATION (of Sim

#### Function only)

Modulation Envelope Distortion: -30 dB to 80% modulation at 1 kHz, 0 V dc Offset

#### PHASE OFFSET

Range: ±719.9° with respect to arbitrary starting phase, or assigned zero phase

Resolution: 0.1 ° Stability: ± 1 ° phase/°C Increment Accuracy: ±0.2° PHASE MODULATION

Linearity (Sine Function): ±0.5%, best fit straight line

#### SYNC OUTPUT

Output Levels into 50 ohms: Square wave with V... a + 1.2V, V, < + 0.2V^ nigh ' low

### **X DRIVE OUTPUT**

Amplitude: 0 to + 1 0 V dc linear ramp proportional to sweep frequency (sweep up only)

Linearity, 10% to 90%, best fit straight line:  $\pm 0.1\%$  of final value. Specified for all linear sweep widths which are integral multiples of the minimum sweep width for each function and sweep time.

#### **OPTION 001**

## HIGH STABILITY FREQUENCY REFERENCE

Ambient Stability:  $\pm 5 \times 10^{"^8}$  (0° to 55°C referenced to  $\pm 30^{\circ}$ C)

Aging Rate:  $\pm 5 \times 10^{18}$  per week (after 72 hours continuous operation)  $\pm 1 \times 10^{17}$  per month (after 1 5 days continuous operation)

## **OPTION 002**

### HIGH VOLTAGE OUTPUT

Frequency Range: Sine and Square Wave: 1 >iHz to 1 MHz Triangle and Ramps: 1 /»Hz to 10 kHz

#### Amplitude:

Range: 4mVp-p to 40Vp-p (a 5000, < 500pF load) maximum output current,  $\pm$  40mA

Accuracy (at 2 kHz):  $\pm 2\%$  of full output for each range

Flatness: ± 10% of programmed amplitude

## DC Offset:

Range: 4 times the range of the standard instrument

Accuracy:  $\pm$  (1 % -I- 25 mV) of full output for each range

#### Signal Characteristics:

Sine Wave Harmonic Distortion (relative to the fundamental frequency at full output into > 500 ohms, <500 pF)

Fundamental Frequency	No Harmonic
10 Hz to 50 kHz 50 kHz to 200 kHz 200 kHz to 1	-65 dB -60 dB
MHz	-40 uD

#### Square Wave:

Rise/Fall Time: <. 125 nanoseconds, 10% to 90% at full output with 2: 500 ohm, < BOOpF load

Overshoot: <10% of peak amplitude with a: 500 ohm, < 500 pF load

# **Table 1-2 Supplemental Information**

MAINS	SIGNAL OL	ЛРUT	4	30	299.9 mV to 100.0 mV
			5	100	99.99 mV to 30.00 mV
50	0 Imped	dance	6	300	29.99 mV to 10.00 mV
	•		7	1000	9.999 mV to 3.000 mV
		BNC C	connector, switchable to front or rear panel (not	3000	2.999 mV to 1.000 mV
SW	vitchable	with Option 00	2)	1	
		•	DC Off	set Only:	
Ма	ay be flo	ated a maximu	m of ±42 V peak (ac + dc)	-	
fro	from chassis (earth) ground Amplitude				
			No.	Factor	(Peak-to-Peak)
Δn	nnlitude l	Manges.			5 000 X/1 4 500 X/
	All AC		Functions (with no dc offset):	1	5.000 V to 1.500 V
	Damma	Attenuetien	ے A rear life and a	3	1.499 V to 500.0 mV
. r	Range	Attenuation		10	
I	NO.	Factor	(Peak-to-Peak)	30	149.9 mV to 50.00 mV
			5	100	49.99  mV to $1.5.00  mV$
	1	1	10.00 V to 3.000 V	300	14.99 mV to 5.000 mV
	2	3	2.999 V to 1 .000 V	1000	4.999 mV to 1.500 mV
	3	10	999.9 mV to 300.0 mV	3000	1.499 mV to 1.000 mV
			8		

# **General Information**

Model 3325A

Table 1-2. Supplemental Information (Cont'd).

AC Function with BC Offset: Range Attenuation AC Function No.     Pactor       1     1     00 mV to 4.500 V     1.00 mV       1     1     00 mV to 4.500 V     1.00 mV       1     1     00 mV     0.000 mV       1     100 mV to 450 N     0.000 mV       1     3.33 mV to 450 N     0.000 mV       1     3.33 mV to 450 N     0.000 mV       1     100 mV to 430 N     0.000 mV       1     3.33 mV to 450 N     0.000 mV       1     100 mV to 430 N     0.000 mV       1     3.33 mV to 450 N     0.000 mV       1     100 mV to 450 N     0.000 mV       1     10				
1       1000 mV to 4.500 V       1.000 mV         2       100       3333       100       3333         3       100       3333       100       115.6         3       1000       3333       100       115.6       1000 mV         3       1000       3333       1000 mV       0.000mV         3       1000       3333       1000 mV       0.000mV         3       1000       3333       1000 mV       0.000mV         3       1000 mV       3333 mV to 45.00 mV       0.000mV         3       1000 mV       333 mV to 45.00 mV       0.000mV         3       1000 mV       0.000 mV       0.000 mV       0.000mV         3       1000 mV       0.000 mV       0.000 mV       0.000 mV         3       mminum Stepping       3.33 mV to 45.00 mV       0.000 mV       0.000 mV         Supping       1000 mV       1000 mV       1000 mV       1000 mV       0.000 mV         Standard harburnet       1100 mut bit 2000 kHz, tested at hul output diation frequency range: DC to 500 kHz, to to 200 mV       1000 mut bit 4500 mV       0.000 mU bit 4500 mV         Standard Instruments       Sweep Time       Minimum Sweep Width (Linear):       Modulation frequency Carage to 1 8.000 mV	AC Function with DC Offset: Range Attenuation AC Function No. Factor Amplitude (p-p)	Maximum DC Min. DC(+ or -) (+ or -)		
3       99.9         3       1.165 V 16 1.498 V       0.100mV         3       30.0       99.90         5       100       3.33 mV 16 4.00 mV       0.001mV         13.65 mV to 14.90 mV       0.001mV       0.001mV         3.33 mV to 4.50 mV       0.001mV       0.001mV         Standard Informaves       10 minum Sweep Width (Linear):       Modulation frequency Range: 21 to 5 kHz         Minimum Sweep Width (Linear):       Minimum Sweep Width (Linear):       Modulation Frequency Range: 21 to 50 ethrs         Minimum Sweep Width (Linear):       Sing Sing Sing Sing Sing Sing Sing Sing	1 1	1.000 mV to 4.500 V	1 .000 mV	
3     10     333.3     10     333.3     333.3 mV to 46.00 mV     0.00 mV       3     100     33.33     10     33.33 mV     11.65 mV to 14.03 mV     0.00 mV       11.66 mV to 14.03 mV     0.00 mV     0.00 mV     0.00 mV     0.00 mV       11.66 mV to 14.03 mV to 44.30 mV     0.00 mV     0.00 mV     0.00 mV       11.66 mV to 14.03 mV to 44.30 mV     0.00 mV     0.00 mV       11.66 mV to 14.03 mV to 46.00 mV     0.00 mV     0.00 mV       11.66 mV to 14.03 mV to 46.00 mV     0.00 mV     0.00 mV       Amplitude and Ranges: 4 thines the standard instrument amplitudes     Medulation fequency range: DC to 50 kHz (0 to 21 mHz carrier frequency)       Supers Wave 2: 01 me to 14.10 hz to 500 kHz, tested at full output with no load     10.00 mV     0.00 mV       Supers Wave 2: 01 second to 99.99 seconds     10.00 mV     0.01 mV     0.01 mV       Supers Wave 2: 01 second to 99.99 seconds     Function Depth     10.01 mV     10.00 mV       Minimum Sweep Width Lubpi: 1 the to maximum franumer of time full frequency Range: 20 kH     Medulation Frequency Range: 20 kHz       Minimum Sweep Width Lubpi: 1 decade     Function Depth     10 mV       Minimum Sweep Width Lubpi: 1 decade     Phase Modulation frequency ange: 20 kH     100 mV       Minimum Sweep Width Lubpi: 1 decade     Minimum Sweep Si on thine secontinuous over the full frequency range: 20 kHz	2 000 1/10 1 000 1/ 3 999.9	1.166 V to 1.499 V	O.IOOrnV	
4     30     99.99 5     116.5 mV to 14.9.0 mV     0.010mV       3.33 mV to 4.500 mV     0.001mV       High Voltage Output Option 002:     3.33 mV to 4.500 mV     0.001mV       Amplitude and Ranges: 4 times the standard instrumment amplitudes     0.001mV     3.33 mV     0.001mV       Output Impedance: < 2 U at DC to < 10 0 at 1 MHz	3 10 333.3	333.3 mV to 450.0 mV	O.IOOrnV	
5       100       33.33       33.33 mV to 45.00 mV       0.00 mV         High Voltage Output Option 002:       3.333 mV to 45.00 mV       0.00 mV       0.00 mV         Amplitude and Ranges: 4 times the standard instrumment amplitudes       4.500 mV       0.00 mV       0.00 mV         Super Varia Setting Time: 1 /r 5to settle to within .04% of tinal value for frequencies of 10 Hz to 500 kHz, tested at full output with no load       Modulation frequency range: DC to 500 kHz (0 to 21 MHz carrier frequency range: DC to 500 kHz (0 to 21 MHz carrier frequency)         Super Varia Setting Time: 1 /r 5to settle to within .04% of tinal value for frequencies of 10 Hz to 500 kHz, to 500 kHz, to 10 Variantia Sweep Time: 1 /r 5to settle to within setting at full output with no load       Modulation frequency range: DC to 500 kHz (0 to 21 MHz carrier frequency)         Super Varia Setting Time: 2 /r 7k to settle to within setting at full output with no load       Input Impedance: 10 kll         Sweep Time: 1 /r 5to settle to within setting Sweep: 0.1 second to 99.99 seconds       Modulation frequency Range: DC to 5 kHz         Marinium Sweep Width (Linear):       Minimum Sweep Width (Linear):       Function       Depth (4 - or -)         Minimum Sweep Width (Linear):       Sing & 800°       800°       Sing & 800°         Phase Continuity: Sweep is phase continuous over the full frequency range       1 myt Impedance: 20 kH       Frequency Cutput (ac coupled output):         Minimum Sweep Width (Ling): 1 decade       Frequency Cutput (ac	4 30 99.99	1 16.6 mV to 149.9 mV	O.OIOmV	
6       300       3.939         11.6 mV to 14.98 mV       0.001mV         Amplitude and Ranges: 4 times the standard instrument amplitude.       Amplitude and Ranges: 4 times the standard instrument amplitude.         Output Impedance: < 2 U at DC to < 1 0.0 at 1 MHz.	5 100 33.33	33.33 mV to 45.00 mV	O.OIOmV	
Amplitude and Ranges: 4 times the standard instrument amplitudes     3.333 mV to 4.300 mV     0.001 mV       Amplitude and Ranges: 4 times the standard instrument amplitudes     2 U d DC to <1 0 0 at 1 MHz	6 300 9.999	1 1.66 mV to 14.99 mV	O.OOImV	
High Voltage Output Option 002:       Amplitude and Ranges: 4 times the standard instrumm meni amplitudes       Amplitude Modulation Input (Sine Function Only):         Output Impedance: < 2 LJ at DC to < 1 0 0 at 1 MHz	7 1000 3.333 mV to 1.000 mV	3.333 mV to 4.500 mV	0.001 mV	
Amplitude and Ranges: 4 times the standard instrument amplitudes       Modulation depth at full output for each range: 0 to 100%         Output Impedance: 4 2 U at DC to < 10 0 at 1 MHz	High Voltage Output Option 002:	Amplitude Modulation Input (Sine	Function Only):	
Ment ampartodes       Output Impedance: < 2 LJ at DC to < 10 at 1 MHz	Amplitude and Ranges: 4 times the standard instru-			
Output Impedance: < 2 LJ at DC to < 10.0 at 1 MHz	ment amplitudes	Modulation depth at full outpu	t for each range:	
Square Wave Setting Time: 1 //s to settle to within .05% of final value for frequency: ange: DC to 500 kHz (0 to 21 MHz carrier frequency)         Square Wave Setting Time: Listed at hull output with no load         FREQUENCYSWEEP         Sweep Time: Linear Sweep: 0.01 second to 99.99 seconds (single or continuous)       Connector: Rear panel BNC         Log Sweep: Single Sweep: 2 seconds to 99.99 seconds Continuous Sweep Utith: 1 Hz to maximum frequency of the function selected       Depth (4- or -)         Maximum Sweep Width Sweep Time       Single Sweep Time       Single Standard Instrument: 20 minutes to within specified ac- curacy         Minimum Sweep Width (Ling): 1 decade       Phase Continuly: Sweep is phase continuous over the full frequency range       Auxiliary Frequency Output (ac coupled output): Frequency Range: 21 MHz to 60.999 999 999 MHz, with underrange coverage to 19.000 000 001 MHz Amplitude: 0 dBm         MAXULARY INFUTS (May be floated a maximum of 42 V peak loc + del from chassis kethir ground)       Output Impedance: 50 ohms Connector: Rear panel BNC         AUXILARY INFUTS (May be floated a maximum of 42 V peak loc + del from chassis kethir ground)       Output Impedance: 50 ohms Connector: Rear panel BNC         AUXILARY INFUTS (May be floated a maximum of 42 V peak loc + del from chassis kethir ground)       Auxiliary Frequency Standard Instruments to 3325A to an external frequency reference of 10 MHz, ar a subharmonic of 10 MHz down to 1 MHz, Level must be 0 dbm to 4 20 dBm into 50 ohms. Rear panel BNC connector:	Output Impedance: < 2 !J at DC to < 1 0 0 at 1 MHz	010100%		
0.05% of final value for frequencies of 10 Hz to 500 kHz, tested at Hull output with no load       Sensitivity: 5 V peak for 100%, modulation         RECLENCYSMEEP       Input Impedance: 1 0 kll         Sweep Time:       Linear Sweep: 2 seconds to 99.99 seconds         Log Sweep:       Single Sweep: 2 seconds to 99.99 seconds         Single Sweep: 1 second to 99.99 seconds       Connector: Rear panel BNC         Maximum Sweep Width       Linear Sweep: 2 seconds to 99.99 seconds         Maximum Sweep Width (Linear):       Minimum Sweep Width         Sweep Time       Sweep Time         Minimum Sweep Width       Sweep Time         Sweep Time       Sweep Time         Minimum Sweep Width       Sweep Time         Sweep Time       Sweep Time         Minimum Sweep Width       Sweep Time         Phase Continuity: Sweep is phase continuous over the full frequency range       Input Impedance: 20 kH         Minimum Sweep Width       Log) 'friangle data         Minimum Sweep Width       Sind ad Instrument: 20 minutes to within specified accuracy         Minimus Sweep Time       Sind ad Instrument: 20 minutes to within specified accuracy         Option 001 Hiph Stability Freq	Square Wave Settling Time: < 1 /is to settle to within	Modulation frequency range: 21 MHz carrier frequency)	DC to 500 kHz (0 to	
REQUENCYSMEEP       Input Impedance: 1 0 kII         Sweep Time: Linear Sweep: 0.01 second to 99.99 seconds or continuous       Connector: Rear panel BNC         Log Sweep: Single Sweep: 2 seconds to 99.39 seconds       Connector: Rear panel BNC         Maximum Sweep: 0.1 second to 99.99 seconds       Modulation Frequency Range: DC to 5 kHz         Maximum Sweep: 0.1 second to 99.99 seconds       Function         Minimum Sweep Width the function selected       Sine         Minimum Sweep Width Sweep Time       Sweep Time         Function       0.01 mHz         Phase Continuity: Sweep is phase continuous over the full frequency range       Input Impedance: 20 kH         Minimum Sweep Width (Log): 1 decade       Kettor and this specified ac- curacy         Phase Continuity: Sweep is phase continuous over the full frequency range       Auxiliary Frequency Output (ac coupled output): Frequency Range: 21 MHz to 60.999 999 999 MHz, with underrange coverage to 1 9.000 000 011 MHz Amplitude: 0 dBm         MAXIMARY INPUTS (May be foated a maximum of ±42 V peak lac + del from hasis leading upon)       Output Impedance: 50 ohms Connector: Rear panel BNC         Reference: For phase-locking the 3325A to an external frequency reference: For phase-locking the 0.42 or a subharmonic of 10 MHz, Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Connector: Rear panel BNC         Connector: Rear panel BNC       Connector: Rear panel BNC         Connector: Rear panel BNC       Marker O	.05% of final value for frequencies of 10 Hz to 500 kHz, tested at full output with no load	Sensitivity: 5 V peak for 100%	6 modulation	
Sweep Time:       Linear Sweep: 0.01 second to 99.99 seconds (single or continuous)       Connector: Rear panel BNC         Log Sweep:       Seconds to 99.99 seconds       Modulation:         Log Sweep:       Single Sweep: 0.1 second to 99.99 seconds       Modulation Frequency Range: DC to 5 kHz         Maximum Sweep:       D.1 second to 99.99 seconds       Function       Depth (4- or - )         Minimum Sweep:       Minimum Sweep Width       Sine       350°         Square       425°       Ramps       0.01 mHz       99.99 seconds         Ramps       0.01 mHz       99.99 seconds       Input Impedance: 20 kH       Muxiliary Frequency Output (ac coupled output):         Frequency range       0.01 mHz       99.99 mHz       With underrange coverage to 1 9.000 000 011 MHz         Minimum Sweep Width (Log): 1 decade       Minimum Sweep Width (Log): 1 decade       Standard Instrument: 20 minutes to within specified accuracy         VMEMENTIME       Standard Instrument: 20 minutes to within specified accuracy       Output Impedance: 50 ohms       Connector: Rear panel BNC         AUXILIARY INPUTS (May be floated a maximum of ±42 V peak kac + del from chasis leatifi ground)       Multic: 0 dBm       Output Impedance: 50 ohms         Connector: Rear panel BNC connector.       Connector: Rear panel BNC       Marker Output (Linear sweep only):         Marker Output (Lines 325A to an external frequency ref	FREQUENCY SWEEP	Input Impedance: 1 0 k!I		
Indext duration of a both to both a bo	Sweep Time:	Connector: Rear panel BNC		
Log Sweep: Single Sweep: 0.1 second to 99.99 seconds Continuous Sweep: 0.1 second to 99.99 seconds       Modulation Depth         Maximum Sweep Width (Linear): Minimum Sweep Width (Linear): Minimum Sweep Width Sweep Time Function       B50° Square 425° Triangle 42.5° Ramps       B50° Square 425° Triangle 42.5° Ramps         Ramps       0.01 mHz       99.99 seconds       Input Impedance: 20 k/l         Ramps       0.01 mHz       99.99 seconds         Ramps       0.01 mHz       99.99 seconds         Ramps       0.01 mHz       99.99 mHz         Minimum Sweep Width (Log): 1 decade       Frequency Range: 21 MHz to 60.999 999 999 MHz, with underrange coverage to 1 9.000 000 001 MHz Amplitude: 0 dBm         WapM eTwF       Output Impedance: 50 ohms Connector: Rear panel BNC         AUXILARY INPUTS (May be floated a maximum of ±42 V peak lac + del frequency: reference of 10 MHz or a subharmonic of 10 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Output Impedance: 50 ohms Connector: Rear panel BNC         Reference: For phase-locking the 3325A to an external frequency: reference of 10 MHz or a subharmonic of 10 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Output (Linear sweep only): Level: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.	or continuous)	Phase Modulation: Modulation Frequency Range	DC to 5 kHz	
Continuous Sweep: 0.1 second to 99.99 seconds       Function       Depth (4- or - )         Maximum Sweep Width (Linear):       Sine       \$25°         Minimum Sweep Width (Linear):       Minimum Sweep Width (Linear):       Sine       \$25°         Minimum Sweep Width (Linear):       Minimum Sweep Width       1       \$25°         Minimum Sweep Width       Sweep Time       \$29.99       \$100       \$25°         Ramps       0.01 second       99.99 seconds       \$100       \$25°         Ramps       0.01 mHz       \$9.99 mHz       \$425°       \$30°         Minimum Sweep Width (Log): 1 decade       Frequency Cutput (ac coupled output):       \$100       \$100 mHz       \$1000 000 001 MHz         Phase Continuity: Sweep is phase continuous over the full frequency range       \$100 mHz to 60.999 999 999 MHz, \$200       \$200         Maximum Fitter       Output Impedance: 50 ohms       \$200       \$200       \$200         Standard Instrument: 20 minutes to within specified accuracy       \$200	Log Sweep: Single Sweep: 2 seconds to 99.99 seconds	Modulation Depth		
Function       Depth (4- or - )         Maximum Sweep Width (Linear):       Sine       650°         Minimum Sweep Width (Linear):       Minimum Sweep Width       425°         Sweep Time       Sweep Time       85°         Munimum Sweep Width (Linear):       Input Impedance: 20 k/l         Ramps       0.01 mHz       99.99 seconds         Ramps       0.01 mHz       99.99 seconds         Minimum Sweep Width (Log): 1 decade       Frequency Output (ac coupled output):         Phase Continuity: Sweep is phase continuous over the full frequency range       with underrange coverage to 1 9.000 000 001 MHz         MapM IPTIME       Output Impedance: 50 ohms       Connector: Rear panel BNC         Standard Instrument: 20 minutes to within specified accuracy       Output Impedance: 50 ohms       Connector: Rear panel BNC         MILLARY INPUTS (Maybe floated a maximum of ±42 V peak lac + del from chassis learthl ground)       Output Impedance: 50 ohms       Connector: Rear panel BNC         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Connector: Rear panel BNC         Marker Output (Linear sweep only):       Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.         Connector: Rear panel BNC       Connector: Rear panel BNC	Continuous Sweep: 0.1 second to 99.99 seconds			
Maximum Sween Width 1 H2 to maximum fremiency of the function selected       Sine       \$30°         Minimum Sween Width (Linear):       Triangle       \$2.5°         Minimum Sweep Width       Sweep Time       Input Impedance: 20 kfl         Function       0.01 mHz       99.99 mHz         Minimum Sweep Width (Log): 1 decade       Frequency Output (ac coupled output):         Function       0.01 mHz       99.99 mHz         Minimum Sweep Width (Log): 1 decade       Frequency Cutput (ac coupled output):         Phase Continuity: Sweep is phase continuous over the full frequency range       with underrange coverage to 1 9.000 000 001 MHz         Marker DTMF       Output Impedance: 50 ohms         Standard Instrument: 20 minutes to within specified ac- curacy       Option 001 High Stability Frequency Reference: Reference will be within ± 1 x 10° of final value 1 5       Output Impedance: 50 ohms         minutes after turn-on at 25°C for an off time of less than 24 hours       Amplitude: 0 dBm       Output Impedance: 50 ohms         AUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthi ground)       Connector: Rear panel BNC       Marker Output (Linear sweep only):         Levels: High to Low TTL compatible voltage transition at 20 dBm into 50 ohms. Rear panel BNC connector.       Connector: Rear panel BNC         Marker Output (Linear sweep only):       Levels: High to Low TTL compatible voltage transition at selected marker fr		Function	Depth (4- or - )	
Minimum Sweep Width (Linear):       Minimum Sweep Width Sweep Time       Triangle Ramps       42.5° Ramps         Function       0.01 second       99.99 seconds         Ramps       0.01 mHz       99.99 mHz         Ramps       0.01 mHz       99.99 mHz         Minimum Sweep Width (Log): 1 decade       Frequency Cutput (ac coupled output): Frequency Range: 21 MHz to 60.999 999 999 MHz,         Minimum Sweep Width (Log): 1 decade       Frequency Range: 21 MHz to 60.999 999 999 MHz,         Minimum Sweep Width (Log): 1 decade       With underrange coverage to 1 9.000 000 001 MHz         MapM PTMF       Output Impedance: 50 ohms         Standard Instrument: 20 minutes to within specified accuracy       Output Impedance: 50 ohms         Option 001 High Stability Frequency Reference: Reference       1 MHz Reference Output (for phase-locking other instruments to 3325A):         minutes after tum-on at 25°C for an off time of less than 24 hours       Amplitude: 0 dBm         AUXILLARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthi ground)       Output Impedance: 50 ohms         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 Hz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Connector: Rear panel BNC         Marker Output (Linear sweep only):       Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only. <td>Maximum Sween Width: 1 Hz to maximum frequency of the function selected</td> <td>Sine</td> <td>850°</td>	Maximum Sween Width: 1 Hz to maximum frequency of the function selected	Sine	850°	
Minimum Sweep Width       Minimum Sweep Width       Sweep Time       Sweep Time       Sweep Time       Start S	Minimum Swoon Width (Linger);	Square	425°	
Minimum Sweep Time       Sweep Time       Input Impedance: 20 kfl         Function       0.01 second       99.99 seconds         Ramps       0.01 mHz       99.99 mHz         Minimum Sweep Width (Log): 1 decade       4uxiliary Frequency Output (ac coupled output):         Minimum Sweep Width (Log): 1 decade       Frequency Range: 21 MHz to 60.999 999 999 MHz,         Minimum Sweep Width (Log): 1 decade       with underrange coverage to 1 9.000 000 01 MHz         Auxiliary Frequency Range: 21 MHz to 60.999 999 999 MHz,       with underrange coverage to 1 9.000 000 001 MHz         Mammu PTMF       Output Impedance: 50 ohms       Connector: Rear panel BNC         Standard Instrument: 20 minutes to within specified ac- curacy       Output Impedance: 50 ohms       Connector: Rear panel BNC         Option 001 High Stability Frequency Reference: Reference will be within ± 1 x 10 <sup>7</sup> of final value 15       1 MHz Reference Output (for phase-locking other instruments to 3325A):       Amplitude: 0 dBm         AUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)       Output Impedance: 50 ohms       Connector: Rear panel BNC         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Marker Output (Linear sweep only):       Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.	Mininum Sweep Width (Linear).	Ramps	42.5 85°	
Sweep Time       Sweep Time       Input Impedance: 20 kfl         Function       0.01 second       99.99 seconds         Ramps       0.01 mHz       99.99 mHz         Minimum Sweep Width (Log): 1 decade       Frequency Qutput (ac coupled output):         Phase Continuity: Sweep is phase continuous over the full frequency range       Frequency Range: 21 MHz to 60.999 999 999 MHz,         WARM IP TIME       With underrange coverage to 1 9.000 000 001 MHz         Standard Instrument: 20 minutes to within specified accuracy       Output Impedance: 50 ohms         Option 001 High Stability Frequency Reference: Reference will be within ± 1 x 10° of final value 15       Output Impedance: 0 dbm         minutes after turn-on at 25°C for an off time of less than 24 hours       Amplitude: 0 dBm         AUXILLARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learth ground)       Output Impedance: 50 ohms         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Output Impedance: 50 ohms         Connector: Rear panel BNC       Marker Output (Linear sweep only):         Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.         Connector: Rear panel BNC       Connector: Rear panel BNC	Minimum Sweep Width			
Function       0.01 second       99.99 seconds         Ramps       0.01 mHz       99.99 mHz       Auxiliary Frequency Output (ac coupled output):         Minimum Sweep Width (Log): 1 decade       Frequency Range: 21 MHz to 60.999 999 999 MHz,         Phase Continuity: Sweep is phase continuous over the full frequency range       with underrange coverage to 1 9.000 000 001 MHz         MARM IP TIME       Output Impedance: 50 ohms         Standard Instrument: 20 minutes to within specified accuracy       Output Impedance: 50 ohms         Option 001 High Stability Frequency Reference: Reference will be within ± 1 x 10 <sup>7</sup> of final value 15       1 MHz Reference Output (for phase-locking other instruments to 3325A):         minutes after turn-on at 25°C for an off time of less than 24 hours       Amplitude: 0 dBm         AUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)       Output Impedance: 50 ohms         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Connector: Rear panel BNC         Marker Output (Linear sweep only):       Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.         Connector: Rear panel BNC       Connector: Rear panel BNC	Sweep Time Sweep Time	Input Impedance: 20 kfl		
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Ramps0.01 mHz99.99 mHzAuxiliary Frequency Output (ac coupled output): Frequency Range: 21 MHz to 60.999 999 999 MHz, Frequency Range: 21 MHz to 60.999 999 999 MHz, with underrange coverage to 1 9.000 000 001 MHz Amplitude: 0 dBmMARME PTIMEOutput Impedance: 50 ohms Connector: Rear panel BNCStandard Instrument: 20 minutes to within specified ac- curacyOutput Impedance: 50 ohms Connector: Rear panel BNCOption 001 High Stability Frequency Reference: Reference will be within ± 1 x 10 7 of final value 1 51 MHz Reference Output (for phase-locking other instruments to 3325A):MUXILLARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthi ground)Output Impedance: 50 ohms Connector: Rear panel BNC Connector: Rear panel BNC Marker Output (Linear sweep only): Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.Output Impedance: 50 ohms Connector: Rear panel BNC Connector: Rear panel BNCLevels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.				
Minimum Sweep Width (Log): 1 decadeFrequency Range: 21 MHz to 60.999 999 999 MHz,Phase Continuity: Sweep is phase continuous over the full frequency rangewith underrange coverage to 1 9.000 000 001 MHz Amplitude: 0 dBmWARMINDETINGEOutput Impedance: 50 ohms Connector: Rear panel BNCOption 001 High Stability Frequency Reference: Reference will be within ± 1 × 10 7 of final value 1 50 MHz Connector: Rear panel BNCMUXLIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)0 MHz to a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.0 utput (Linear sweep only): Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.	Ramps 0.01 mHz 99.99 mHz	Auxiliary Frequency Output (ac co	oupled output):	
Phase Continuity: Sweep is phase continuous over the full frequency range       with underrange coverage to 1 9.000 000 011 MHz         MARMI IP TIME       Output Impedance: 50 ohms         Standard Instrument: 20 minutes to within specified accuracy       Connector: Rear panel BNC         Option 001 High Stability Frequency Reference: Reference will be within ± 1 × 10 <sup>7</sup> of final value 15       1 MHz Reference Output (for phase-locking other instruments to 3325A):         minutes after turn-on at 25°C for an off time of less than 24 hours       Amplitude: 0 dBm         AUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)       Output Impedance: 50 ohms         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Connector: Rear panel BNC         Marker Output (Linear sweep only):       Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.         Connector: Rear panel BNC       Connector: Rear panel BNC	Minimum Sweep Width (Log): 1 decade	Frequency Range: 21 MHz to	60.999 999 999 MHz,	
full frequency rangeAmplitude: 0 dBmWARPMI IPTIMEOutput Impedance: 50 ohms Connector: Rear panel BNCStandard Instrument: 20 minutes to within specified ac- curacyOutput Impedance: 50 ohms Connector: Rear panel BNCOption 001 High Stability Frequency Reference: Reference will be within ± 1 × 10 7 of final value 1 51 MHz Reference Output (for phase-locking other instruments to 3325A):minutes after turn-on at 25°C for an off time of less than 24 hoursAmplitude: 0 dBmAUXILLARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)Output Impedance: 50 ohms Connector: Rear panel BNCReference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.Marker Output (Linear sweep only): Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.	Phase Continuity: Sweep is phase continuous over the	with underrange coverage to	1 9.000 000 001 MHz	
WARM IP TIME       Output Impedance: 50 ohms         Standard Instrument: 20 minutes to within specified accuracy       Connector: Rear panel BNC         Option 001 High Stability Frequency Reference: Reference will be within ±1 x 10 <sup>7</sup> of final value 15       1 MHz Reference Output (for phase-locking other instruments to 3325A):         minutes after turn-on at 25°C for an off time of less than 24 hours       Amplitude: 0 dBm         AUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)       Output Impedance: 50 ohms         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz or a subharmonic of 20 dBm into 50 ohms. Rear panel BNC connector.       Output (Linear sweep only):         Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.       Connector: Rear panel BNC	full frequency range	Amplitude: 0 dBm		
Standard Instrument: 20 minutes to within specified ac- curacyConnector: Rear panel BNCOption 001 High Stability Frequency Reference: Reference will be within ± 1 x 10 7 of final value 1 51 MHz Reference Output (for phase-locking other instruments to 3325A):minutes after turn-on at 25°C for an off time of less than 24 hoursAmplitude: 0 dBmAUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)Output Impedance: 50 ohmsReference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.Output Linear sweep only): Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.		Output Impedance: 50 ohms		
Option 001 High Stability Frequency Reference: Reference will be within ± 1 x 10 7 of final value 1 51 MHz Reference Output (for phase-locking other instruments to 3325A):minutes after turn-on at 25°C for an off time of less than 24 hoursAmplitude: 0 dBmAUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)Output Impedance: 50 ohms Connector: Rear panel BNCReference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.Output (Linear sweep only): Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.Connector: Rear panel BNC	Standard Instrument: 20 minutes to within specified ac- curacy	Connector: Rear panel BNC		
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AUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)       Output Impedance: 50 ohms         Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.       Output Impedance: 50 ohms         Connector: Rear panel BNC       Marker Output (Linear sweep only):         Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.         Connector: Rear panel BNC	minutes after turn-on at 25°C for an off time of less than 24 hours	Amplitude: 0 dBm		
Non-outcode locating youndyConnector: Rear banel BNCReference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.Connector: Rear banel BNC Marker Output (Linear sweep only): Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.Connector: Rear banel BNCConnector: Rear banel BNC	AUXILIARY INPUTS (May be floated a maximum of ±42 V peak lac + del from chassis learthl ground)	Output Impedance: 50 ohms		
Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of 10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.Marker Output (Linear sweep only): Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.Connector: Rear panel BNCConnector: Rear panel BNC		Connector: Rear panel BNC		
10 MHz down to 1 MHz. Level must be 0 dBm to 4Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.20 dBm into 50 ohms. Rear panel BNC connector.Connector: Rear panel BNC	Reference: For phase-locking the 3325A to an external frequency reference of 10 MHz or a subharmonic of	Marker Output (Linear sweep only	):	
Connector: Rear panel BNC	10 MHz down to 1 MHz. Level must be 0 dBm to 4 20 dBm into 50 ohms. Rear panel BNC connector.	Levels: High to Low TTL compatible voltage transition at selected marker frequency, sweep up only.		
		Connector: Rear panel BNC		

## Model 3325A

# **General Information**

# Table 1-2. Supplemental Information (Cont'd).

X Drive Output (Sweep up only): Amplitude: 0 to + 1 0 V linear ramp proportional to sweep frequency

Connector: Rear panel BNC

Z Blank Output:

Levels (TTL compatible voltage levels):

Linear Sweep:

Single: Low at start of sweep, High at stop. Remains High until start of next sweep.

Continuous: Low during sweep up. High during sweep down.

Log Sweep: Single: Low at start of sweep, High at stop. Remains High until start of next sweep.

Continuous: Low during sweep. Goes High momentarily at stop frequency.

10 MHz Oven Reference Output, Option 001, for phase locking the 3325A to the optional high stability frequency reference:

Amplitude: 0 dBm, 50 ohms

Connector: Rear panel BNC. Must be connected to the rear panel EXT REF IN connector.

#### REMOTE CONTROL

Hewlett-Packard Interface Bus (HP-IB) Control: (HP-IB is Hewlett-Packard Company's implementation of IEEE Standard 488-1978). Time shown is in addition to programming time.

The following accessory options are also available for the Model 3325A:

Option 907 Front Handle Assembly Option 908 Rack Mount Flange Kit Option 909 Rack Mount Flange Kit/Front Handle Assembly Option 910 Additional Operating and Service Manual

# **1 17. ACCESSORIES SUPPLIED.**

1-18. A special connector is supplied with the High Stability Frequency Reference Option 001 for connecting the rear panel Reference Output to the Reference Input. This connector is Part No. 1250-1499.

Frequency Switching and Settling Time:\*

< 1 0 ms to within 1 Hz of final value for 100 kHz span

< 25 ms to within 1 Hz of final value for 1 MHz span

< 70 ms to within 1 Hz of final value for 20 MHz span

Phase Switching and Settling Time:\* < 1 5 ms to within 90° of phase lock for 20 MHz fre quency change

Amplitude Switching Time:" <30 ms to within amplitude specifications

"Times shown are in addition to programming time

#### GENERAL

**Operating Environment:** 

Temperature: 0° to 55°C Relative Humidity: <95%, 0° to 40°C Altitude: s 1 5,000 ft.

Storage Temperature: -50° to +75°C Storage Altitude: <; 50,000 ft.

Power Requirements:

100/120/220/240V+5%,-10%,48 to 66 Hz 60 VA, 100 VA with all options, 10 VA standby

Dimensions in millimeters and (inches):

132.6 (5<sup>1</sup>/4l high x 425.5 (16%) wide x 497.8 (19-5/8) deep

Weight in kilograms and (ibs):

Net weight: 9(20) Shipping Weight: 14.5 (32)

# 119. ACCESSORIES AVAILABLE.

1-20. The following accessories are available for use with the Model 3325A:

Number Description

- 11048C 50 ohm Feedthru Termination Ground
- 11356A Isolator
- 03325-80001 Oven Board Assy. (Converts 3325A to Option 001)
- 03325-80002 High Voltage Option (Converts 3325A to Option 002)
- 5061-0077 Rack Mount Flange Kit (Option 908)
- 5061-0083 Rack Mount Flange/Front Handle Kit (Optibn 909)
- 5061-0089 Front Handle Kit (Option 907)