

Appendix B: Specifications

This appendix lists the electrical, physical, and environmental characteristics of the analyzer, specifies the performance requirements for those characteristics. The specifications are common to the 3066 and 3086, unless otherwise noted.

Electrical Characteristics

Unless otherwise stated, the following tables of electrical characteristics and features apply to the spectrum analyzer after a 20 minute warm-up period (within the environmental limits) and after all normalization procedures have been carried out.

Table B-1: Input/memory mode related

Characteristic	Description
Input mode	RF, Baseband; Wideband, IQ (3086 only)
Input connector	N type (RF, Baseband, Wideband); BNC type (IQ)
Input impedance	50 Ω
VSWR (N type)	1.5 (Reference level ≥ -20 dBm)
Acquisition mode	Roll, Block
Acquisition memory size	16 Mbytes
Acquisition memory management	
RF, Baseband input	
Memory mode	Frequency, Dual, Zoom
FFT points	1024, 256 (Frequency mode)
FFT window	Rectangular, Hamming, Blackman-Harris
Block size	1 to 16,000 frames (Frequency mode, 256 points) 1 to 4,000 frames (Frequency mode, 1024 points) 1 to 2,000 frames (Dual, Zoom mode)
Minimum frame update time	20 μ s (Frequency mode, 256 points) 80 μ s (Frequency mode, 1024 points) 160 μ s (Dual, Zoom mode)
Wideband, IQ Input (3086 only)	
Memory mode	Zoom
FFT points	1024
FFT window	Rectangular, Hamming, Blackman-Harris
Block size	1 to 2,000 frames
Minimum frame update time	25 μ s

Table B-2: Trigger related

Characteristic	Description
Trigger mode	Auto, Normal, Quick, Delayed, Interval, Quick-interval, Timeout (RF (span \leq 6 MHz) and Baseband Input) Auto, Normal (Wideband and IQ Input; 3086 only)
Trigger source	Internal, External
Trigger domain	Frequency, Time
Trigger position	0 to 100 %
Frequency trigger mask	
Frequency resolution	1 bin
Trigger level range	0 dBfs to -70 dBfs
Time trigger mask	
Time resolution	1 data point
Trigger level range	0 dBfs to -40 dBfs
External trigger threshold level	1.6 V

Table B-3: Marker/Zoom Related

Characteristic	Description
Marker	
Marker type	Normal, Delta, Band-power
Search function	Peak Right, Peak Left, Maximum
Link between views	On/Off
Measurement Function	Noise power, Power within band, C/N, Adjacent channel power, Occupied bandwidth
Digital zoom	
Zoom ratio	2 to 1000
Maximum span in the Zoom mode	5 MHz (RF, Baseband); 30 MHz (Wideband, IQ; 3086 only)

Table B-4: Display/View related

Characteristic	Description
Data display	
Waveform	Frequency vs. Amplitude/Phase Frequency vs. I/Q voltage Time vs. Amplitude/Phase Time vs. I/Q voltage
Spectrogram	Time vs. Frequency vs. Amplitude/Phase
Waterfall	Time vs. Frequency vs. Amplitude/Phase Time vs. Frequency vs. I/Q voltage Time vs. Amplitude/Phase Multi-Frame Time vs. I/Q voltage Multi-Frame
AM demodulation	Time vs. Modulation depth
FM demodulation	Time vs. Frequency deviation
PM demodulation	Time vs. Phase deviation
FSK demodulation	Time vs Frequency deviation
Polar	Vector diagram, Constellation diagram
Eye pattern	I, Q, Torellis
Symbol table	Binary, Octal, Hexadecimal
Error vector	EVM, Magnitude error, Phase error, Waveform quality (ρ)
View	
Number of views	1, 2, 4
Settable views	8 maximum
Display traces	2 on waveform display
LCD Panel	
Size	12.1 inch
Display resolution	1024 x 768 pixels
Color	256 colors (maximum)

Table B-5: Frequency standard related

Characteristic	Description
Reference frequency	10 MHz
Initial frequency tolerance	± 0.1 ppm
Frequency stability	
Aging	± 0.0005 ppm/day
Temperature	± 0.002 ppm (5 to 40° C)

Table B-6: Controller/Data storage related

Characteristic	Description
Controller	
CPU	Pentium MMX 200 MHz
DRAM	64 Mbyte SIMM
OS	Windows 95
System bus	PCI, ISA
Sub system CPU	TMP68301 16MHz
Data Storage	
Hard disk	2.1 Gbyte 3.5 inch EIDE
Floppy disk	1.44 Mbyte 3.5 inch
Interface	
Printer	Centronics parallel
SCSI	SCSI-2
GPIB	IEEE488.1
Mouse	Serial mouse
Keyboard	PC/AT

Table B-7: IQ input related (3086 only)

Characteristic	Description
Frequency	
Range	± 15 MHz
Span	10 MHz, 20 MHz, 30 MHz
Vector span	10 MHz, 20 MHz, 30 MHz
Number of bins	501 (10 MHz and 20 MHz span) 751 (30 MHz span)
Amplitude	
Reference level	100 mV (amplitude of IQ signal)
Maximum nondestructive input power	± 5 V
Flatness within span	± 0.5 dB (25° C $\pm 5^{\circ}$ C)
Residual response	-60 dBfs (30 MHz span)
Alias suppression	55 dB
Spurious free dynamic range, typical (1 GHz CF, 0 dBm ref, sinusoidal signal at the center, spur apart more than 500 kHz from the signal)	65 dB at 10 MHz span 60 dB at 20 MHz and 30 MHz span

Table B–8: Wideband input related (3086 only)

Characteristic	Description
Frequency	
Range	50 MHz to 3 GHz
Center frequency settability	0.1 Hz
Span	10 MHz, 20 MHz, 30 MHz
Vector span	10 MHz, 20 MHz, 30 MHz
Number of bins	501 (10 MHz and 20 MHz span) 751 (30 MHz span)
Amplitude	
Reference level	–50 dBm to +30 dBm
Maximum nondestructive input power	+30 dBm
Flatness within span	± 0.5 dB (25° C \pm 5° C)
Input equivalent noise, typical	–140 dBm/Hz
3rd order distortion	–65 dBc (–10dBfs input, at 1GHz)
Residual response	–60 dBfs (0dBm ref, 30 MHz span)
Image suppression	70 dB
Spurious free dynamic range, typical (1 GHz CF, 0 dBm ref, sinusoidal signal at the center, spur apart more than 500 kHz from the signal.)	65 dB at 10 MHz span 60 dB at 20 MHz and 30 MHz span

Table B-9: RF input related

Characteristic	Description
Frequency	
Range	10 MHz to 3 GHz
Center frequency settability	0.1 Hz
Span	100 Hz to 3 GHz
Vector span	100 Hz to 6 MHz
Real-time span	100 Hz to 5 MHz
Number of bins	641 (100 Hz to 2 MHz span) 801 (5 MHz span) 481 (6 MHz span) $\text{Span}/6250 + 1$ (span ≥ 10 MHz)
Spectrum purity	-100 dBc/Hz (1 GHz CF, 200 kHz span, 0 dBm ref, 10 kHz offset)
Residual FM	3 Hz p-p
Amplitude	
Reference level	-50 dBm to +30 dBm
Maximum nondestructive input power	+30 dBm
Self gain-calibration accuracy	± 1.0 dB at 25 MHz within 5° C temperature variation
Flatness	± 2.0 dB (10 MHz to 3 GHz)
Input equivalent noise, typical	-140 dBm/Hz
3rd order distortion	-65 dBc (-10 dBfs input, at 1 GHz)
Residual response	-70 dBfs (0 dBm ref, 5 MHz span)
Image suppression	70 dB
Spurious free dynamic range, typical (1 GHz CF, 0 dBm REF, sinusoidal signal at the center, spur apart more than 10 kHz from the signal)	80 dB at 50 kHz span 75 dB at 100 kHz span 70 dB at 200 kHz and 500 kHz span 65 dB at 1/2/5 MHz span

Table B-10: Baseband input related

Characteristic	Description
Frequency	
Range	DC to 10 MHz
Center frequency settability	0.1 Hz
Span	100 Hz to 10 MHz
Vector span	100 Hz to 6 MHz
Real-time span	100 Hz to 5 MHz
Number of bins	641 (100 Hz to 2 MHz span) 801 (5 MHz and 10 MHz span) 481 (6 MHz span)
Spectrum purity	-100 dBc/Hz (5 MHz CF, 200 kHz span, 0 dBm ref, 10 kHz offset)
Residual FM	2 Hz p-p
Amplitude	
Reference level	-30 dBm to +30 dBm
Maximum nondestructive input power	+30 dBm
Reference level accuracy	± 0.5 dB at 5 MHz
Flatness	± 1.0 dB (1 MHz to 10 MHz)
Input equivalent noise	-150 dBm/Hz
2nd harmonic distortion	-70 dBc at 4.5 MHz
DC offset	-40 dBfs
Residual response	-70 dBfs (5 MHz CF, 5 MHz span, 0 dBm ref)
Alias suppression	65 dB
Spurious free dynamic range, typical (5 MHz CF, 0 dBm ref, sinusoidal signal at the center, spur apart more than 10 kHz from the signal)	85 dB at 50 kHz span 80 dB at 100 kHz span 75 dB at 200 kHz span 70 dB at 500 kHz span 70 dB at 1/2/5 MHz span

Table B-11: Digital demodulation related

Characteristic	Description
Demodulator	
Carrier type	Continuous, Burst
Modulation format	BPSK, QPSK, $\pi/4$ Shift DQPSK, 8PSK, OQPSK, 16QAM, 64QAM, GMSK
Measurement filter	Root Cosine
Reference filter	Cosine, Gauss
Filter parameter	α/BT : 0.0001 to 1, 0.0001 step
Maximum symbol rate	5.3 Msps (RF, Baseband); 20.48 Msps (Wideband, IQ; 3086 only)
Standard setup	PDC, PHS, NADC, TETRA, GSM, CDPD, IS-95, T-53
Display format	
Vector diagram	Symbol/locus display, Frequency error measurement, Origin offset measurement
Constellation diagram	Symbol display, Frequency error measurement, Origin offset measurement
Eye diagram	I/Q/Trellis display (1 to 16 symbols)
Error vector diagram	EVM, Magnitude error, Phase error, Waveform quality (ρ) measurement
Symbol table	Binary, Octal, Hexadecimal
Error measurement accuracy	10 frames averaged
PDC	EVM <1.2 %, Mag error <1.0 %, Phase error <0.8° (100 kHz span)
PHS	EVM <1.4 %, Mag error <1.2 %, Phase error <0.8° (1 MHz span)
GSM	EVM <1.8 %, Mag error <1.2 %, Phase error <1.0° (1 MHz span)
IS-95 reverse link, typical	EVM <2.0 % (5 MHz span)
QPSK, 4.096 Msps, 2 GHz, typical	EVM <2.5 % (20 MHz span)
QPSK, 16.384 Msps, 2 GHz, typical	EVM <3.0 % (30 MHz span, 25° C \pm 5° C)

Table B-12: Frame time related

Characteristic	Description
Frame time	Baseband input
10 MHz span	20 μ s (256 points), 80 μ s (1024 points)
Frame Time	RF, Baseband input
6 MHz span	20 μ s (256 points), 80 μ s (1024 points)
5 MHz span	40 μ s (256 points), 160 μ s (1024 points)
2 MHz span	80 μ s (256 points), 320 μ s (1024 points)
1 MHz span	160 μ s (256 points), 640 μ s (1024 points)
500 kHz span	320 μ s (256 points), 1280 μ s (1024 points)
200 kHz span	800 μ s (256 points), 3200 μ s (1024 points)
100 kHz span	1.6 ms (256 points), 6.4 ms (1024 points)
50 kHz span	3.2 ms (256 points), 12.8 ms (1024 points)
20 kHz span	8 ms (256 points), 32 ms (1024 points)
10 kHz span	16 ms (256 points), 64 ms (1024 points)
5 kHz span	32 ms (256 points), 128 ms (1024 points)
2 kHz span	80 ms (256 points), 320 ms (1024 points)
1 kHz span	160 ms (256 points), 640 ms (1024 points)
500 Hz span	320 ms (256 points), 1280 ms (1024 points)
200 Hz span	800 ms (256 points), 3200 ms (1024 points)
100 Hz span	1600 ms (256 points), 6400 ms (1024 points)
Frame Time	Wideband, IQ input (3086 only)
30 MHz span	25 μ s
20 MHz span	25 μ s
10 MHz span	50 μ s

Table B–13: Frame update time related

Characteristic	Description
Minimum frame update time 10 MHz span	Baseband input, Frequency mode 20 μ s (256 points), 80 μ s (1024 points)
Minimum frame update time 500 k to 6 MHz span	RF, Baseband input, Frequency mode 20 μ s (256 points), 80 μ s (1024 points)
50 k to 200 kHz span	200 μ s (256, 1024 points)
5 k to 20 kHz span	2000 μ s (256, 1024 points)
500 to 2 kHz span	20 ms (256, 1024 points)
200 Hz span	50 ms (256, 1024 points)
100 Hz span	100 ms (256, 1024 points)
Minimum frame update time 500 k to 6 MHz span	RF, Baseband input, Dual mode 160 μ s
50 k to 500 kHz span	400 μ s
5 k to 20 kHz span	4 ms
500 to 2 kHz span	40 ms
200 Hz span	100 ms
100 Hz span	200 ms
Frame update time 5 MHz span	RF, Baseband input, Zoom mode 160 μ s
2 MHz span	320 μ s
1 MHz span	640 μ s
500 kHz span	1.28 ms
200 kHz span	3.2 ms
100 kHz span	6.4 ms
50 kHz span	12.8 ms
20 kHz span	32 ms
10 kHz span	64 ms
5 kHz span	128 ms
2 kHz span	320 ms
1 kHz span	640 ms
500 Hz span	1280 ms
200 Hz span	3200 ms
100 Hz span	6400 ms

Table B-13: Frame update time related (Cont.)

Characteristic	Description
Frame update time	Wideband, IQ input (3086 only)
30 MHz span	25 μ s
20 MHz span	25 μ s
10 MHz span	50 μ s

Table B-14: Power requirements

Characteristic	Description
Line voltage	100 to 240 VAC
Line frequency	47 to 66 Hz
Line fuse	10 A, Fast
Primary circuit dielectric voltage withstand grounding impedance	1,500 Vrms, 50 Hz for 15 s, without breakdown. Verify continuity of grounding connection, by any suitable means, between a representative part required to be grounding and attachment– plug cap grounding pin. (0.1 Ω at 30 A)
Maximum power	250 W (3066); 280 W (3086)
Maximum line current	3.0 A rms at 50 Hz
Surge current, typical	15 A at 100 VAC; 30 A at 200 VAC

Physical Characteristics

Table B-15: Physical

Characteristic	Description
Width	430 mm
Height	270 mm
Length	600 mm
Net weight	24.0 kg (3066); 28.0 kg (3086)

Environmental Characteristics

Table B-16: Environmental

Characteristic	Description
Temperature	
Operating	+5° C to +40° C (floppy not used); +10° C to +40° C (floppy in use)
Non-operating	-20° C to +60° C
Humidity	
Operating and non-operating	80 % (no condensation); Maximum wet-bulb temperature 29° C
Altitude	
Operating	To 3,000 m (10,000 ft)
Non-operating	To 12,000 m (40,000 feet)
Random vibration	
Operating	0.27 g, 5 to 500 Hz, 10 minutes each axis
Non-operating	2.28 g, 5 to 500 Hz, 10 minutes each axis
Shock	
Non-operating	20 g half-sine, 11ms duration, 3 shocks per axis in each direction (18 shocks total)
Package product vibration and shock	
Vibration and bounce	Meets ASTM D999-75, Method A, Para. 3.1g, (NSTA proj. 1-A-B-1)
Drop	Meets ASTM D775-61, Method 1, Para. 5, (NSTA proj. 1-A-B-2)
Emissions	
Enclosure	EN55011 Class A limits for radiated emissions
AC main	EN61000-3-2 Power line harmonics EN55011 Class A limits for conducted emissions
Immunity	
Enclosure	EN61000-4-2 ESD (Up to 8 kV, 150 pF through 330 Ω) Internal terminals of connectors do not allow ESD test. EN61000-4-3 Radiation
AC main	EN61000-4-4 Fast Transient Burst EN61000-4-5 Surge EN61000-4-6 Conductive Immunity

Table B-17: Certifications and compliances

Characteristic	Description
EC Declaration of Conformity – EMC	<p>Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Union:</p> <p>EN 55011 Class A Radiated and Conducted Emissions</p> <p>EN 50081-1 Emissions: EN 61000-3-2 AC Power Line Harmonic Emissions</p> <p>EN 50082-1 Immunity: EN61000-4-2 Electrostatic Discharge Immunity EN61000-4-3 RF Electromagnetic Field Immunity EN61000-4-4 Electrical Fast Transient/Burst Immunity EN61000-4-5 Power Line Surge Immunity EN61000-4-6 Conducted Disturbances Induced by RF Fields EN61000-4-8 Power Frequency Electromagnetic Field EN61000-4-11 Power Line Interruption Immunity</p>
Australia/New Zealand Declaration of Conformity – EMC	<p>Complies with EMC provision of Radiocommunications Act per the following standard(s):</p> <p>AS/NZS 2064.1/2 Industrial, Scientific, and Medical Equipment: 1992</p>
EC Declaration of Conformity – Low Voltage	<p>Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:</p> <p>Low Voltage Directive 73/23/EEC, amended by 93/69/EEC</p> <p>EN 61010-1:1993 Safety requirements for electrical equipment for measurement control and laboratory use.</p>
U.S. Nationally Recognized Testing Laboratory Listing	<p>UL3111-1 Standard for electrical measuring and test equipment.</p>
Canadian Certification	<p>CAN/CSA C22.2 No. 231 CSA safety requirements for electrical and electronic measuring and test equipment.</p>
Additional Compliance	<p>ANSI/ISA S82.01:1994 Safety standard for electrical and electronic test, measuring, controlling, and related equipment.</p> <p>IEC61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.</p>
Installation (Overvoltage) Category	<p>Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:</p> <p>CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location.</p> <p>CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.</p> <p>CAT I Secondary (signal level) or battery operated circuits of electronic equipment.</p>

Table B-17: Certifications and compliances (Cont.)

Characteristic	Description
Pollution Degree	<p>A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.</p> <p>Pollution Degree 1 No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.</p> <p>Pollution Degree 2 Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.</p> <p>Pollution Degree 3 Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.</p> <p>Pollution Degree 4 Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.</p>
Safety Certification Compliance	
Equipment Type	Test and measuring
Safety Class	Class 1 (as defined in IEC 1010-1, Annex H) – grounded product
Overvoltage Category	Overvoltage Category II (as defined in IEC 1010-1, Annex J)
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1). Note: Rated for indoor use only.