1-4 SPECIFICATIONS

NOTE: The AN1840 requires 15 minutes of warm-up time to meet specifications.

Specifications only apply with TIME CALIBRATION set to ENABLE in the General Options Screen (accessed from the Analyzer Utility Menu) or immediately after manually activating a TIME CALIBRATION.

Specifications and features are subject to change without notice.

FREQUENCY

Tuning Range:	0 Hz to 26.5 GHz Band 0 (0 Hz to 2.9 GHz) Band 1 (2.6 to 12.0 GHz) Band 2 (11.5 to 26.5 GHz)
Tuning Resolution:	1 Hz, Frequency Span ≤200 Hz/Div; 25 Hz, Frequency Span >200 Hz/Div, ≤2 kHz/Div; 100 Hz, Frequency Span >2 kHz/Div, ≤20 kHz/Div; 1 kHz, Frequency Span >20 kHz/Div, ≤200 kHz/Div; 10 kHz, Frequency Span >200 kHz/Div, ≤2 MHz/Div; 100 kHz, Frequency Span >2 MHz/Div, ≤20 MHz/Div; 1 MHz, Frequency Span 20 MHz/Div, ≤200 MHz/Div; 10 MHz, Frequency Span >200 MHz/Div
Frequency Span Width:	
Center/Span Function:	100 Hz (10 Hz/Div) to 26.5 GHz (2.65 GHz/Div) continuously variable
ZERO Span:	0 Hz
BAND Span:	2.9 GHz (290 MHz/Div) in Band 0; 9.1 GHz (910 MHz/Div) in Band 1; 14.5 GHz (1.45 GHz/Div) in Band 2
FULL Span:	26.5 GHz (2.65 GHz/Div)
Start/Stop Function:	0 Hz to 26.5 GHz
Displayed Linearity:	±5% of indicated Span (±50% of selected Span/Div)
Readout Accuracy:	±(3% of Frequency Span Width + Frequency Standard Accuracy + 50% of RBW)
Frequency Counter:	
Resolution:	1 Hz, 10 Hz, 100 Hz, 1 kHz
Accuracy:	±(Frequency Standard Accuracy + Counter Resolution)
Sensitivity (at 120 MHz with 0 dB attenuation):	≤-85 dBm with 3 kHz RBW, ≤-65 dBm with 5 MHz RBW

Stability:

Residual FM (peak to peak in 20 ms) (Spans <1 MHz/Div) (100 Hz Video Filter):

<10 Hz, below 6 GHz;
<20 Hz, 6 to 12 GHz;
<40 Hz, 12 to 26.5 GHz

Noise Sidebands (Spans ≤100 kHz/Div):

FREQUENCY RANGE	10 kHz OFFSET	30 kHz OFFSET
0.1 to 1.0 GHz	-97 dBc/Hz	-101 dBc/Hz
1.0 to 2.8 GHz	-92 dBc/Hz	-95 dBc/Hz
2.8 to 6 GHz	-93 dBc/Hz	-100 dBc/Hz
6 to 12 GHz	-88 dBc/Hz	-95 dBc/Hz
12 to 26.5 GHz	-81 dBc/Hz	-88 dBc/Hz

System Related Sidebands (300 Hz RBW):

<-65 dBc, below 12 GHz;
<-60 dBc, 12 to 26.5 GHz

AMPLITUDE

Measurement Range

-135 to +30 dBm

Frequency Range:

9 kHz to 26.5 GHz

Average Displayed Noise Level (3 Hz RBW, Video Filter N/A) (300 Hz RBW, 10 Hz Video Filter):

FREQUENCY RANGE	RBW	
	3 Hz	300 Hz
9 to 100 kHz	≤-115 dBm	≤-95 dBm
100 kHz to 2.9 GHz	≤-135 dBm	≤-115 dBm
2.9 to 12 GHz	≤-130 dBm	≤-110 dBm
12 to 26.5 GHz	≤-125 dBm	≤-105 dBm

1 dB Gain Compression:

≥-5 dBm (0 dB attenuation)

Displayed Dynamic Range:

80 dB in 10 dB/Div log scale,
40 dB in 5 dB/Div log scale,
16 dB in 2 dB/Div log scale,
8 dB in 1 dB/Div log scale,
8 divisions with linear amplitude scale,
120 dB in Enhanced mode.

Amplitude Units:

Logarithmic Display Mode:

dBmW (dBm), dBmV or dBμV

Linear Display Mode:

Autoscaled with W, μW, dBmW (dBm), dBμW, V, μV, dBmV or dBμV

Display Linearity:

5 or 10 dB/Div:	±0.15 dB/dB, ≤±1.5 dB over 8 divisions
1 or 2 dB/Div:	±0.5 dB over 8 divisions
Linear:	
(≤5 MHz RBW):	±2% of Reference Level over 8 divisions
(10 MHz and 30 MHz RBW) (Attenuation coupled with Reference Level):	±10% of Reference Level over 8 divisions

Frequency Response (10 dB Attenuation) (after peaking >2.9 GHz) (referenced to REF OUT Connector output and to peak of RBW filter response):

±1.5 dB, 9 kHz to 2.9 GHz;
±2.0 dB, 2.9 to 12 GHz;
±3.0 dB, 12 to 18 GHz;
±4.0 dB, 18 to 26.5 GHz

Resolution Bandwidth (RBW):

Selection:

Standard:	3 Hz, 10 Hz, 30 Hz, 100 Hz (Digital Resolution); 300 Hz, 3 kHz, 30 kHz, 300 kHz and 5 MHz (at 3 dB); 10 and 30 MHz (at 3 dB) (Linear display and FM modes)
Bandwidth Filters (Option 08):	1 kHz and 1 MHz (at 3 dB); 200 Hz, 9 kHz and 120 kHz (at 6 dB)
Accuracy:	±20%, 300 Hz to 30 kHz; ±30%, 300 kHz to 30 MHz; ±10%, 200 Hz, 9 kHz and 120 kHz
Selectivity:	60 dB/3 dB ratio <5:1, 3 kHz, 30 kHz, 300 kHz, 1 MHz, 5 MHz; <12:1, 1 kHz
	60 dB/6 dB ratio <5:1, 9 kHz and 120 kHz
	50 dB/3 dB ratio <10:1, 300 Hz
	50 dB/6 dB ratio <10:1, 200 Hz
Flatness (referenced to Peak Filter response):	<1 dB_{P-P}, 200 Hz to 10 MHz <3 dB_{P-P}, 30 MHz

Switching Error (referenced to 30 kHz RBW):

±0.5 dB, 1 kHz to 5 MHz;
±1.0 dB, <1 kHz
±2.0 dB, 10 MHz, 30 MHz

Video Bandwidth (VBW):

Selection:	10 Hz to 1 MHz in decade steps or Full BW (no Video Filter activated [NONE])

Attenuator:

Range:	0 to 60 dB, selected manually or automatically coupled to Reference Level
Resolution:	10 dB steps
Accuracy (9 kHz to 2.9 GHz): (2.9 to 18 GHz): (18 to 26.5 GHz):	Greater of ±0.5 dB or ±2% of dB setting Greater of ±1 dB or ±4% of dB setting Greater of ±1.5 dB or ±7% of dB setting (% tolerance is the % of dB setting.)

Reference Level:

Range:

(≤5 MHz RBW, 0 dB Attenuation):	-95 to +30 dBm
(10 MHz or 30 MHz RBW):	-50 to +30 dBm
External Mixer:	-85 to -20 dBm

NOTE: The External Mixer Reference Level is the level required at the EXTERNAL MIXER IF Connector to place the signal at the top of the Display screen.

Resolution (≤5 MHz RBW):	0.1 dB steps
Accuracy:	Referenced to Frequency Response and REF OUT (Calibrator) Specifications with 10 dB Attenuation, -30 dBm Reference Level and <10 MHz RBW ±0.25 dB, -40 to -20 dBm Reference Level; ±0.5 dB, -85 to -40 dBm Reference Level; ±2 dB, 10 MHz or 30 MHz RBW
External Reference Offset:	-99.9 to +99.9 dB in 0.1 dB steps

NOTE: Negative numbers imply an external gain is connected to the ANALYZER INPUT Connector. Positive numbers imply an external attenuation is used, or external mixer conversion loss.

External Mixer Attenuation (CON LOSS):	0 to 99.9 dB (External Mixer function)
Residual Response (input terminated with 50 Ω, 0 dB Attenuation):	≤-90 dBm, 9 to 100 kHz; ≤-100 dBm, 100 kHz to 26.5 GHz
Harmonic Distortion (-30 dBm input and 10 dB attenuation):	≤-70 dBc, Band 0;
(-10 dBm input and 10 dB Attenuation):	≤-100 dBc, Bands 1 and 2

Intermodulation Distortion (3rd order) (-30 dBm input and 10 dB Attenuation):	≤-80 dBc
9 to 12 GHz only:	≤-75 dBc
Other Input Related Spurious (-30 dBm input and 10 dB Attenuation):	≤-70 dBc, <18 GHz; ≤-60 dBc, 18 to 26.5 GHz

SWEEP

Time (Frequency Span >200 Hz/Div): Frequency Span =0):	1 ms to 10 s/Div in 1-2-5 sequence 200 ns/Div to 10 s/Div in 1-2-5 sequence (resolution reduced <2 µs/Div)
Sweep Rate Accuracy:	±1% of Full Scale, ≥2µs/Div
Trigger:	
Source:	Internal (video), External (front panel), External (rear panel) or Line (ac input)
Mode:	Free Run, Auto, Normal or Single Sweep
Coupling:	ac, dc, High-Pass Filter, Low-Pass Filter, TV line or TV field
Bandwidth:	≥5 MHz (-3 dB) (at EXTERNAL INPUT Connector)
Level:	
Video:	Adjustable over 8 divisions, positive or negative polarity
External Front:	-2.5 V, -1.0 V, -0.5 V, 0.0 V, 0.5 V, 1.0 V, 2.5 V; nominal
External Rear:	+2.5 V nominal
Sensitivity:	
Internal:	1 division
External Front:	200 mV_P
External Rear:	+2 V_{P-P} (TTL)
Delay (Frequency Span =0):	Lesser of 0 to ±300 divisions at Sweep Time/Div (Trigger Delay field setting) or 200 seconds

DISPLAY

Type:	≈6.4" (16 cm) color VGA TFT LCD
Digital Resolution:	640 pixels x 480 (total Display) 500 pixels x 256 lines (graticule area)

Marker Modes:	Single, Dual, Delta, Peak Search, Peak Track, Marker Track, Marker to center, Marker to reference, Marker to Start Frequency, Marker to Stop Frequency
Bandwidth:	
Linear display mode:	≥5 MHz (-3 dB), 30 MHz RBW; ≥2.5 MHz (-3 dB), 5 MHz RBW; at ≤2µs/Div Sweep Time
Logarithmic display mode:	≥1 MHz (-3 dB), 5 MHz RBW; at ≤10µs/Div Sweep Time

MEMORY

Trace Storage Capacity:	99 traces (including user defined traces and test limits)
Recall to Display at one time:	4 traces
Setup Storage Capacity:	99 setups
Macro Storage Capacity:	64 kbytes

INPUTS

ANALYZER INPUT:	
Connector:	Planar Crown™ with 0.14" (≈3.5 mm) Female, 50 Ω nominal
Impedance (VSWR) (≥10 dB input attenuation):	<1.3:1, <2.9 GHz; <1.5:1, 2.9 to 8 GHz; <2.0:1, 8 to 18 GHz; <2.5:1, 18 to 26.5 GHz
Maximum Input Level:	0 Vdc, +20 dBm, +30 dBm CW or +40 dBm peak; (<10 µs, <1% duty cycle) with ≥10 dB input Attenuation
EXTERNAL MIXER IF:	
Connector:	Type SMA Female, terminated in 50 Ω when not in use
Signal Characteristics:	410.7 MHz at -30 dBm (±3 dB) top of screen
1 dB Gain Compression:	≥-5 dBm
EXTERNAL INPUT:	
Connector:	Type BNC Female
Impedance:	1 MΩ and 27 pF nominal
Coupling:	ac, dc, Ground

Time Domain (Scope):

Amplitude:	5 mV/Div to 5 V/Div (±3% of Full Scale) in 1-2-5 sequence (1 kHz input)
Frequency Range:	dc to ≥5 MHz (-3 dB) at ≤2µs/Div Sweep Time
Trigger Use:	Selectable external trigger (time-gate) capabilities
Pulse Width:	≥100 ns

Frequency Domain (FFT):

Amplitude:	
Gain:	0 to 20 dB in 0.1 dB steps
Attenuation:	0 to 60 dB in 20 dB steps
Range:	2.23 mV to 22.3 V Full Scale (-40 to +40 dBm/50 Ω reference voltage)
Response:	+0/-3 dB (0 Hz to 20 kHz)
Display Range:	80 dB
Average Noise Level:	<1 µV
Spurious:	<7 µV
Frequency Range:	0 to 20 kHz
Span:	10 to 200 Hz/Div continuously variable
Bandwidths:	3, 10, 30 or 100 Hz

FUNCTION (Auxiliary [External] Trigger, pin 8): 10 kΩ nominal

EXT REF IN:

Connector:	Type BNC Female
Signal Characteristics:	10 MHz at 1 to 10 V_{P-P}, 1 kΩ nominal

OUTPUTS

PHONES:

Connector:	1/8" (≈3.5 mm) phone jack
Signal Characteristics:	Mono sound applied in parallel to both left and right channels

EXTERNAL MIXER LO:

Connector:	Type SMA, 50 Ω nominal (must be terminated when not in use)
Frequency:	3 to 13 GHz
Amplitude:	≥+8 dBm

REF OUT (Calibrator):

Connector:	Type BNC Female, 50 Ω nominal
Frequency:	100 MHz
Accuracy:	Same as Frequency Standard
Amplitude:	-30 dBm
Accuracy:	±0.5 dB

10.7 MHz IF OUT:

Connector:	Type BNC Female, 50 Ω nominal
Frequency:	10.7 MHz nominal
Active:	≤5 MHz RBW

410.7 MHz IF OUT:

Connector:	Type BNC Female, 50 Ω nominal
Frequency:	410.7 MHz nominal
Active:	>5 MHz RBW

EXT DISPLAY:

Connector:	HD-15 pin D-sub
Signal:	VESA-VGA color display compatible/31.5 kHz scan rate

VIDEO OUT:

Connector:	Type BNC Female
Signal Characteristics:	100 mV/Div (±10%) into 1 MΩ

FUNCTION:

(Auxiliary Video, pin 7):	100 mV/Div (±10%) into 1 MΩ
(Sweep, pin 14):	0 to +5 V ramp (±0.5 V)
(Sweep Hold [Pen Lift], pin 6):	TTL Level

INTERFACE CONNECTORS

IEEE-488 GPIB:

Conforms to:	IEEE-Standard 488-1987
Implemented Subsets:	SH1, AH1, T1, TE0, L2, LE0, SR1, RL2, PP0, DC1, DT1 and C0
Compatibility:	IEEE-488.3 Command Set. High Speed waveform transfer supported.
Plotter Output:	HPGL Compatible

RS-232:

Type:	Full or Half-Duplex RS-232 (operates as slave to controller [DTE])
Baud Rate (bits per second):	110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 or 38400
Handshake Modes:	XON/XOFF (Software), CTS/RTS (Hardware)
Parity Check:	Odd, Even or None
Data Bits per Word:	7 or 8
Stop Bits per Word:	1 or 2
Plotter Output:	HPGL Compatible

PRINTER:

Operation:	Parallel (standard 25 pin D-sub connector)
Compatible Printers:	Epson 24 pin, Epson 9 pin, IBM ThinkJet, HP LaserJet, HP DeskJet

FREQUENCY STANDARD

Standard:

Temperature Stability:	±0.2 ppm
Aging:	
First Year:	±2 ppm
Thereafter:	±1 ppm

High Stability Time Base (Option 09):

Temperature Stability:	±0.02 ppm
Aging:	
First Year:	±0.2 ppm
Thereafter:	±0.1 ppm/yr $\pm 5 \times 10^{-10}$/day

RECEIVER

Frequency Range:	Same as Frequency Tuning Range Specification
Frequency Resolution:	Same as Frequency Tuning Resolution Specification
Sensitivity (Typical at room temperature):	5 µV at 121 MHz (30 kHz RBW, 3 kHz Video Bandwidth, 5 kHz deviation FM at 1 kHz rate, 10 dB SINAD) (10 dB IF Gain)
Bandwidths:	Available analyzer RBW between 200 Hz and 30 MHz
Demodulation:	AM, FM (ac or dc)
AM Scales (≤5 MHz RBW):	10%, 20%, 50%
FM Scales (≤5 MHz RBW): (≥10 MHz RBW):	1 kHz to 100 kHz 200 kHz to 5 MHz in 1-2-5 sequence

TRACKING GENERATOR (OPTION 02)

Frequency Range:	100 kHz to 2.9 GHz
Flatness (at -10 dBm):	±2.0 dB, 100 kHz to 1 MHz; ±1.5 dB, 1 to 2.9 MHz
Output Level:	0 to -70 dBm in 1 dB steps
Attenuator Accuracy:	±1 dB or 0.05 dB/dB
Nonharmonic Spurious:	<-30 dBc
Harmonics:	<-20 dBc
Leakage (Dynamic Range):	-120 dBm

QUASI-PEAK DETECTOR (OPTION 08)

SELECTED BANDWIDTH	RECOMMENDED FREQUENCY RANGE	CHARGE TIME (ms)	DISCHARGE TIME (ms)	DISPLAY TIME (ms)
200 Hz	10 to 150 kHz	45 ±20%	500 ±20%	160 ±20%
9 kHz	150 kHz to 30 MHz	1 ±20%	160 ±20%	160 ±20%
120 kHz	30 MHz to 1 GHz	1 ±20%	550 ±20%	100 ±20%

GENERAL CHARACTERISTICS

Dimensions:	≈16" (406 mm) wide (including handle); ≈7.5" (191 mm) high ≈22" (559 mm) deep
Weight:	≤39.8 lbs (18.0 kg) without options, with lid and RS-232 cable ≤36.8 lbs (16.7 kg) basic unit only
Warm-up Time:	
Operation:	≥1 minute
For Specified Accuracy:	≥15 minutes

POWER REQUIREMENTS

Source Voltage and Frequency:	100 to 120 VAC at 50-60/400 Hz 220 to 240 VAC at 50-60 Hz
Power Consumption:	170 W Maximum 132 W Nominal at 110 VAC, 60 Hz 138 W Nominal at 110 VAC, 400 Hz 121 W Nominal at 230 VAC, 50 Hz
Nominal Input Current:	1.85 A at 110 VAC 1.03 A at 230 VAC

FUSE REQUIREMENTS

F1 and F2:

220 to 240 VAC:	3.15 A, 250 V, Type F
100 to 120 VAC:	3.15 A, 250 V, Type F

ENVIRONMENT

Use:	Indoors
Temperature/Humidity:	
Operating Temperature:	0° to 50° C
Storage Temperature:	-25° to 71° C
Temperature Change:	1° C per minute for specified accuracy
Relative Humidity:	80% at <11° C, ≤95% (non-condensing) at 11° to 31° C, decreasing linearly to 50% at 40° C
Vibration/Shock:	Designed to retain specified functionality, accuracy and structural integrity following the tests specified in MIL-T-28800E for Type 2, Class 5, Style E equipment. Equipment calibration may be required following tests. This product is not required to function accurately or to retain calibration accuracy during or immediately following the physical acceleration imposed in the tests.
Altitude:	
Operational:	10,000 feet (3,048 meters)
Nonoperational:	40,000 feet (12,192 meters)

ELECTRO-MAGNETIC COMPATIBILITY (EMC)

RF Emissions:	Complies with EN 55011: 1991 Group 1 Class B
RF Immunity:	Complies with EN 50082-1: 1992
Power Line Disturbance:	Complies with EN 60555-2: 1987

SAFETY

Product Safety:	Complies with EN 61010-1
Supplemental Environmental Conditions:	
Mains Supply Voltage Fluctuations:	≤±10% of the nominal voltage
Transient Overvoltages:	According to Installation Category II
Pollution Degree:	2