1

GENERAL INFORMATION

DESCRIPTION

The Model 575B and Model 578B Source Locking Counters are multi-function microprocessor based devices. These counters are not only able to perform frequency and (optionally) power measurement, but can also tune and phase lock an external signal source over a wide frequency range. The basic frequency range of the 575B is 10 Hz to 20 GHz, while the 578B extends to 26.5 GHz. When the 578B is equipped with Frequency Extension Capability (Option 06) and used with the Model 590 and a Remote Sensor, the counter is capable of operating up to 110 GHz.

Frequency counting is divided into four bands. Band 1 is a high impedance input (1 MΩ/20 pF) and covers 10 Hz to 100 MHz. Band 2 is a 50Ω input operating from 10 MHz to 1 GHz. Band 3 is also a 50Ω input and covers the range of 1 GHz to 20 GHz using the 575B, and 1 GHz to 26.5 GHz using the 578B. Band 4 is an optional band and covers 26.5 to 110 GHz and is subdivided into 4 frequency ranges.

Band 4-1	26.5 - 40 GHz
Band 4-2	40 - 60 GHz
Band 4-3	60 - 90 GHz
Band 4-4	90 - 110 GHz

An optional power measurement capability (Option 02) is available to supplement Band 3. With this option, the counter can simultaneously display frequency to 100 kHz resolution, and power to 0.1 dB resolution from minimum sensitivity up to +10 dBm.

The other major feature of the 57XB counters is the ability to tune and phase lock virtually any frequency source that is capable of being electronically tuned. Two output ports are provided, one for coarse tune and one for phase lock With these outputs a source can be locked from 10 MHz up to the maximum operating frequency of the counter. Frequencies can be selected to a resolution of 10 kHz and maintain the long term accuracy and stability of the internal timebase crystal oscillator.

SPECIFICATIONS

General

Resolution	Front panel keyboard input select 0.1 Hz to 1 GHz (0.1 Hz resolution in Band 1 only; no frequency offset or multiplier in 0.1 Hz resolution).
Gate Time	1 ms for 1 kHz resolution; 1 s for 1 Hz resolution
Display	12 digit LED, sectionalized
Accuracy	±1 count ±time base error
Test	Front panel selected diagnostics
Sample Rate	Controls time between measurements variable from 100 ms typ. to 10 s. Switchable Hold position freezes display indefinitely.
Reset	Resets display to zero and initiates new reading
Offsets	Keyboard control of frequency offsets (standard) and power offsets (standard with power measurement Option 02). Displayed frequency (power) is offset by entering value to 1 Hz resolution (0.1 dB power).
Operation Temp.	0 to 50 °C
Power	100/120/220/240 VAC ±10% (selectable) 50 to 60 Hz
Weight, Net	26 lb (11.8 kg)
Weight, Shipping	32 lb (14.5 kg)
Size (H x W x D)	3.5" x 16.75" x 14" (89 mm x 425 mm x 356 mm)
Accessories Furnished	Power Cord and Operation Manual

Band 1

Frequency Range	10 Hz to 100 MHz
Sensitivity	25 mV rms
Impedance	1 MΩ/20 pF
Connector	BNC (female)
Max. Input Level	1 V rms
Damage Level	150 V rms (above 1 kHz, damage level will decrease at 6 dB/octave down to 3.0 V rms)

Band 2

Frequency Range	10 MHz to 1 GHz
Sensitivity	-20 dBm
Dynamic Range	30 dB
Impedance	50 Ω nominal
Connector	BNC (female)
Max. Input Level	+10 dBm

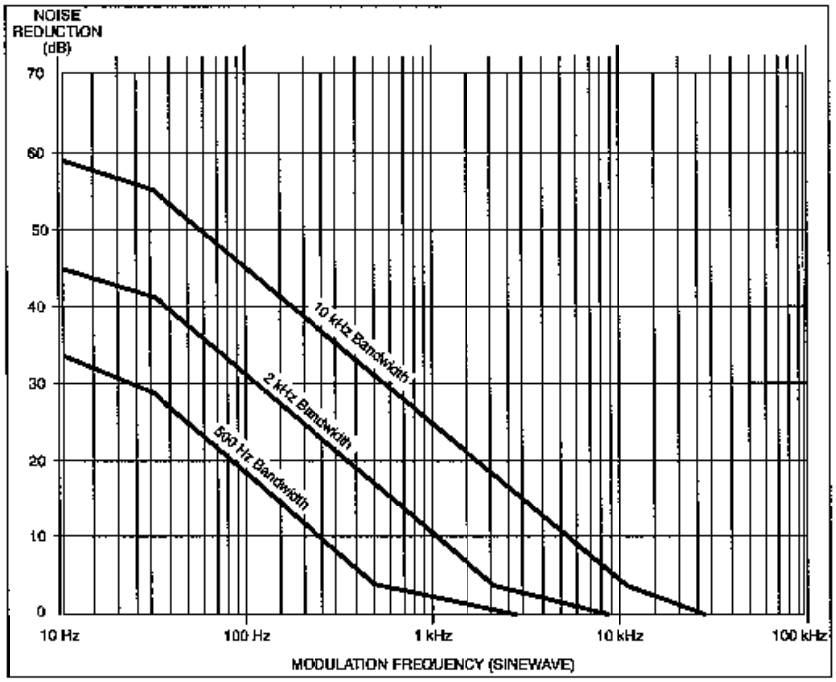
Band 2 (Continued)	
Damage Level	+27 dBm
Acquisition Time	<50 ms

Band 3	
Frequency Range	1 GHz to 20 GHz (26.5 GHz for Model 578B)
Sensitivity	-30 dBm (1 GHz to 12.4 GHz) -25 dBm (12.4 GHz to 20 GHz) -20 dBm (20 GHz to 26.5 GHz)
Dynamic Range	40 dB (1 GHz to 12.4 GHz) 35 dB (12.4 GHz to 20 GHz) 30 dB (20 GHz to 26.5 GHz)
Impedance	50 Ω nominal
Connector	Precision Type N (female) (Model 575B) APC 3.5 (female) (Model 578B)
Max. Input Level	±10 dBm
Damage Level	30 watts (+45 dBm)
Acquisition Time	<200 ms independent of frequency
Amplitude Discrimination	10 dB, if <10 dB, will count one signal accurately if separated by >200 MHz
FM Modulation	20 MHz p-p up to 10 MHz rate
VSWR	<2.5:1 typical
Frequency Limits	Keyboard control of desired limits (standard). Counter will measure largest signal within programmed limits. Signal outside operating band must be separated by at least 100 MHz from either limit. For signal more than 10 dB above desired signal, required separation is typically 200 MHz.

TCXO Timebase	
Frequency	10 MHz
Aging Rate	$<1 \times 10^{-7}$ per month, $<1 \times 10^{-6}$ per yea
Short Term	$<1 \times 10^{-9}$ rms for one second averaging time
Temperature	$<1 \times 10^{-6}$ 0 to 50 °C when set at 25 °C
Line Variation	$<1 \times 10^{-7}$ ±10% change
Warm-up Time	30 minutes
Output Frequency	10 MHz, square-wave, 1 V p-p minimum into 50 Ω
Ext. Timebase	Requires 10 MHz 1 V p-p minimum into 300 Ω
Phase Noise	-95 dBc/Hz at 10 Hz from carrier

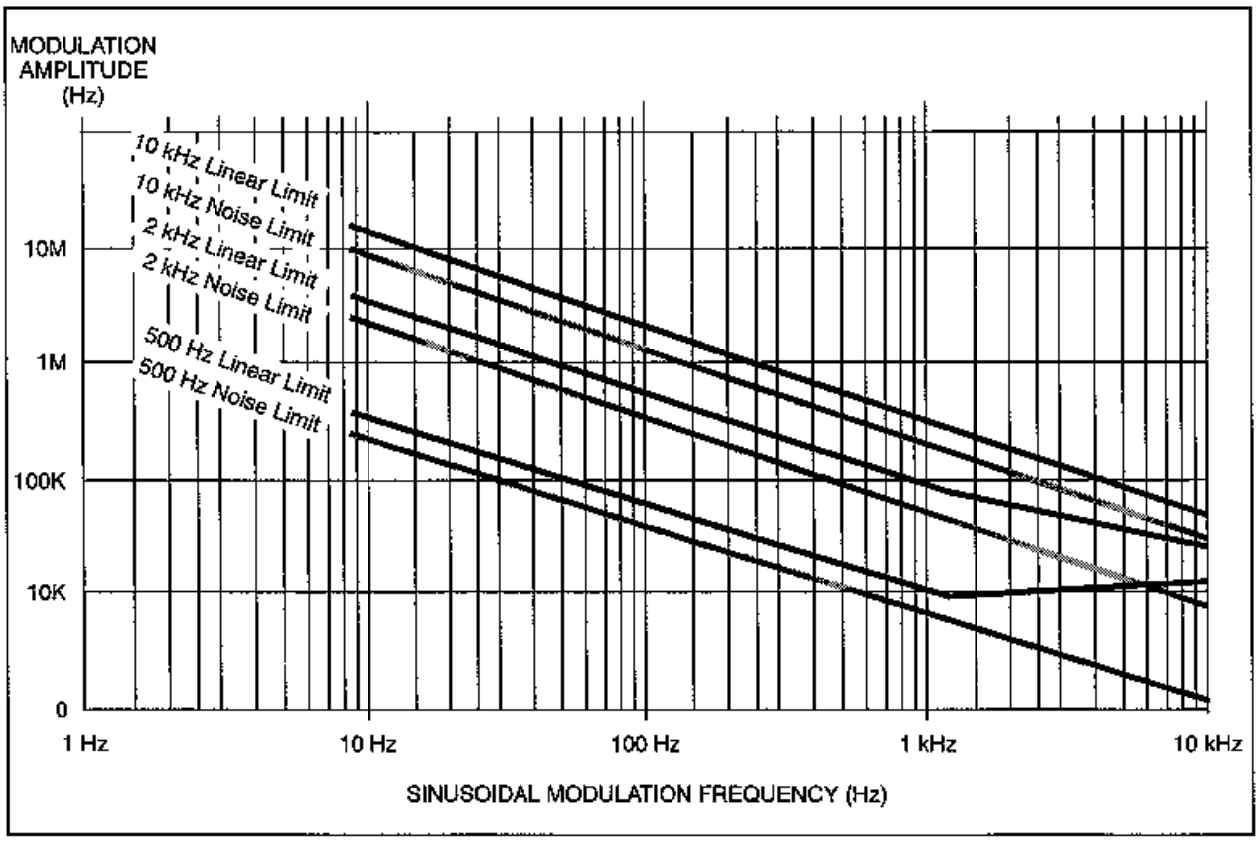
Source Lock

Frequency Range	10 MHz (to maximum capability of counter)
Resolution	10 kHz for phase lock frequency ≥50 MHz 2.5 kHz for phase lock frequency <50 MHz
Accuracy	Equal to counter's timebase
Long Term Stability	Equal to counter's timebase
Min. Phase Lock Signal Level	Equal to counter's sensitivity
Polarity	Automatically selected
Bandwidth	User selectable (10 kHz, 2 kHz, or 500 Hz) or automatically selects widest bandwidth capable of locking
Lock Time (Typ)	
Coarse Tune	50 ms +1 counter acquisition time for source bandwidth greater than 100 Hz. Limited by source tuning speed below 100 Hz.
Phase Lock	20 ms
Recalling Stored Data	1 counter acquisition +100 ms limited by source tuning speed
Output Drive (Max)	
Coarse Tune Output	+10 V into 5KΩ min.
Phase Lock Output	
Voltage Driven	±10 V into 5KΩ min. for source gain constant <64 MHz/V ±.6 V into 5KΩ min. for source gain constant ≥64 MHz/V



Source Lock (Continued)

Current Driven	±75 MA into 10 Ω max. for source gain constant <3.2 MHz/MA ±4.5 MA into 10 Ω max. for source gain constant ≥3.2 MHz/MA
Capture Range	
Coarse Tune	Entire range of selected counter band limited by maximum output drive
Phase Lock	Source gain constant X maximum output drive
Output Connector	Rear panel BNC (female)
Phase Locked Spectrum	
Noise Floor vs Input Frequency	The noise floor extends from the carrier to approximately the loop bandwidth. Beyond this, the noise floor decreases 12 dB/bandwidth octave. The noise floor is the greater of: 1. NOISE FLOOR = -70 dBc/Hz 2. NOISE FLOOR = [(20 log F) -6] dBc/Hz (where F = input frequency in GHz)



Source Lock (Continued)

Source Characteristics (required)	
Coarse Tune Input	
Bandwidth	5 Hz minimum
Tuning Sensitivity	10 MHz/V minimum 10 GHz/V maximum
Phase Lock (FM) Input	
Bandwidth	2 kHz minimum
Tuning Sensitivity	
Voltage Driven Input	±2 MHz/V minimum ±1000 MHz/V maximum
Current Driven Input	±0.1 MHz/mA minimum ±50 MHz/mA maximum
Maximum FM	The counter will still frequency stabilize if maximum FM is exceeded, but accuracy and long term stability will not equal the counter's time base.

Option 01 - Digital to Analog Converter

Output Voltage	0.000 V to 0.999 V
Accuracy (25 °C)	±0.5% ±1 mV
Temp. Stability (0 to 50 °C)	±0.01%/°C
Resolution	1 mV
Load Impedance	1 KΩ minimum
Connector	BNC female (on rear panel)
Protection	±10 V ac or dc applied to output connector will not cause damage. No damage will occur by any load.

Option 02 - Power Meter

Range	Entire operating range of Band 3
Accuracy	±1.2 dB typical 0 to 50 °C ±0.5 dB typical 25 °C
Resolution	0.1 dB from sensitivity to -10 dBm 0.2 dBm to maximum input
Power Offset	Math function. Allows displayed reading to be offset to 0.1 dB resolution.Selectable from front panel or via GPIB.
Conversion Time	1 gate time + 50 ms

Option 05 - Ovenized High Stability Time Base (SC-Cut)

Frequency	10 MHz
Aging Rate	$<5 \times 10^{-10}$/24 hrs (after 1 hour warm-up), 1×10^{-7}/year
Short Term Stability (1 sec avg)	$<1 \times 10^{-10}$ rms
0 to +50 °C Temperature Stability	$<3 \times 10^{-8}$
±10% Line Voltage Change	$<2 \times 10^{-10}$
Warm-up Time (at 25 °C)	Within $\leq 5 \times 10^{-9}$ of final value 10 min after turn-on Within 1×10^{-9} of final value 30 min after turn-on
Phase Noise	-120 dBc/Hz at 10 Hz from carrier

Option 06 - Frequency Extension (578B Only)

Frequency Range	26.5 GHz to 110 GHz
Sensitivity	-25 dBm
Dynamic Range	30 dB
Connector	As required by remote sensor
Max. Input Level	+5 dBm
Damage Level	+10 dBm
Amplitude Discrimination	20 dBm
Acquisition Time	<1 s

Remote Sensor	Band	Frequency Range (GHz)	Waveguide Size	Waveguide Flange	Power Range (dBm)	Damage Level (dBm)
91	4-1	26.5 - 40	WR-28	UG-599/U	-25/-20 to+5	+10
92	4-2	40 - 60	WR-19	UG-383/U	-25 to +5	+10
93	4-3	60 - 90	WR-12	UG-387/U	-25 to +5	+10
94	4-4	90 - 110	WR-10	UG-387/U	-25 to +5	+10
95	4-2 or 4-3	50 - 75	WR-15	UG-385/U	-25 to +5	+10
96	4-1 or 4-2	33 - 50	WR-22	UG-383/U	-25 to +5	+10
97	4-1 or 4-2	26.5 - 50	K-Connector*	N/A	-25 to +5	+10

* K-Connector is a registered trademark of the Wiltron Corporation.

Option 09 - Rear Panel Input Connectors

Band 1 Connector	BNC (female)
Band 2 Connector	BNC (female)
Band 3 Connector	Precision Type N (female) (Model 575B) APC 3.5 (female) (Model 578B)

OPTIONS AND ACCESSORIES

OPTIONS	DESCRIPTION
01	DAC Output
02	Power Measurement
05	SC-cut Ovenized High Stability Timebase (Aging Rate: 5×10^{-10}/day)
06	Band 4 Frequency Extension Module. Available on Model 578B only. Required for frequencies between 26.5 GHz and 110 GHz. Frequency Extension Cable Kit (590) and remote sensor are also required.
09	Rear Input Configuration
10	Chassis Slides

ACCESSORIES	DESCRIPTION
590	Frequency Extension Cable Kit
091	Remote Sensor 26.5 - 40 GHz
092	Remote Sensor 40 - 60 GHz
093	Remote Sensor 60 - 90 GHz
094	Remote Sensor 90 - 110 GHz
095	Remote Sensor 50 - 75 GHz
096	Remote Sensor 33 - 50 GHz
097	Remote Sensor 26.5 - 50 GHz

The accessories listed above are used in conjunction with Model 578B and require Option 06.

010	Transit Case
020	Rack Mount Kit
031	Operation Manual (one supplied with each instrument)
032	Service Manual (includes Operation Manual)
040	Service Kit
050	Sof-Pac Carrying Case