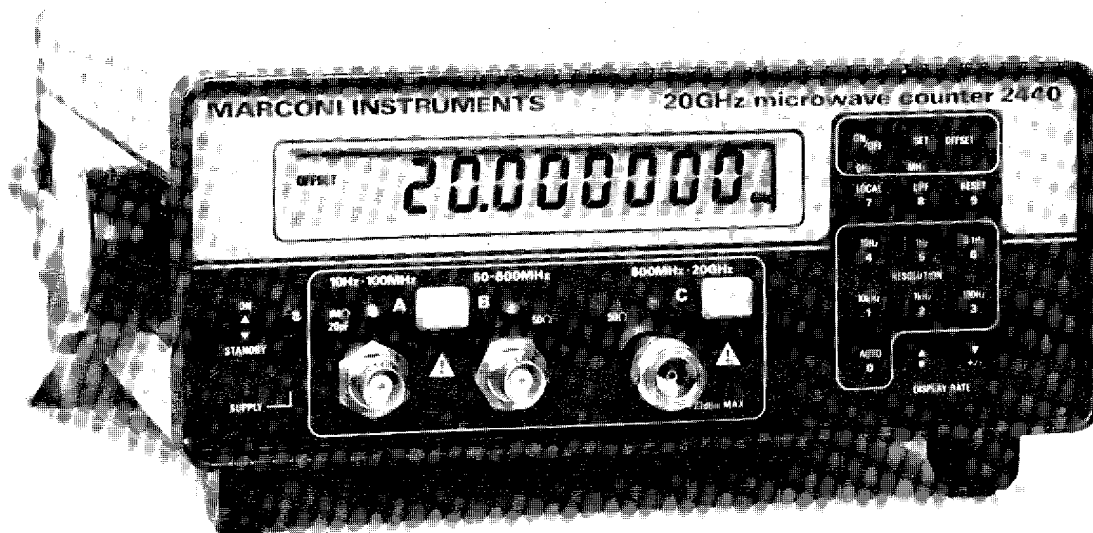




20 GHz Microwave Counter

2440



- Frequency range 10 Hz to 20 GHz
- High sensitivity
- Frequency offset facility
- High f.m. and a.m. tolerance
- Fast acquisition
- Compact for rack mounting
- Fully GPIB programmable
- Resolution to 0.1 Hz

The 2440 Microwave Counter provides three channel automatic frequency measurement from 10 Hz to 20 GHz in a small portable case style. The powerful and versatile microprocessor-controlled keyboard can perform offsets as a standard feature, as well as initiating diagnostic functions. Measurements and operational details are displayed as a 9-digit liquid crystal readout. Resolution to the full 9 digits is automatic or can be manually set for 0.1 Hz over the full range to 20 GHz. The display rate can be adjusted from 11 ms to 20 s independently of resolution, which is keyboard selected from 0.1 Hz to 10 kHz. The microwave acquisition time is typically 200 ms, giving fast response and measurement updates.

The ability of the 2440 to make measurements in the presence of wide f.m. and large depth a.m. modulations, is an important feature for applications in the communications industry. Frequency measurements can be made with up to 30 MHz peak-to-peak worst case f.m. and 40% a.m. depth.

The 2440 also features automatic amplitude discrimination. This allows the counter to measure the largest signal that is applied to one of the three input channels, at the same time ignoring other signals. In addition Channel A incorporates a switchable low-pass filter to increase the attenuation above 5 kHz, so improving noise immunity when measuring low frequency signals.

High input levels on all channels can be tolerated on the 2440 with a damage level at +27 dBm (0.5W). Input protection is available with an optional 10 or 20 dB attenuator up to a maximum rating of +37 dBm (5 W).

With the integral GPIB facility, the 2440 becomes a powerful wide ranging measurement instrument in automatic test systems. All front panel controls are fully programmable on the IEEE-488(78) bus interface, by means of simple single character commands, ensuring ease of use and programming. The compact size reduces rack or bench space to the minimum.

Small frequency changes can be easily seen using the built-in offset facility. Frequency values to 0.1 Hz resolution can be added or subtracted as fixed offsets to an applied signal. This allows very small changes, such as drift when testing oscillators, to be conveniently measured. Under

GPIB operation, the offset facility can be used to great advantage in setting up offsets, for production use or to mask a "classified" frequency.

For the very highest order of frequency standard the 2440 can be operated using an external standard. A choice of different oscillator stabilities is available as internal standards. The use of an external standard overrides the internal oscillator and EXT is displayed on the front panel. A rear panel control allows adjustments of the internal standard to compensate for ageing.

The easy-to-read liquid crystal display has 9 digits with annunciators of frequency units, external frequency standard, overflow, offset, remote GPIB operation and gate. The decimal point is automatically selected and leading zeros are suppressed. Overflow digits can be revealed in channel C by pressing C again.

KEYBOARD AND DISPLAYS	
Functions	
AUTO	Autoranges resolution.
DISPLAY RATE ▲ ▼	Doubles/halves display rate. 1 every 20 to 8 per second.
LOCAL	Displays GPIB address and returns to front panel control (if in remote and not in local lockout).
RESET	Resets instrument to power-up state and performs internal self-test.
LPF	Toggles between low-pass filter ON and OFF.
ON and OFF	Enables and disables offset frequency.
RESOLUTION	Six buttons select resolution in decade steps from 0.1 Hz to 10 kHz.
CHANNEL A/B or C	Toggles between channels A and B or C.
OFFSET ENTER	Displays and/or selects offset frequency.
ACCURACY	
	± 1 count \pm frequency standard error.
Residual stability	When counter and source use common timebase or counter uses external higher stability timebase; less than 4×10^{-11} r.m.s.
FREQUENCY STANDARD	
	Internal 10 MHz crystal oscillator or external input automatically selected.
TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR	
	(Versions 52440-301C and 52440-304K)
Temperature stability	Better than ± 1.5 p.p.m. over the operating temperature range of 0 to 50°C.
Ageing rate	Better than ± 1 in 10^5 per year; better than ± 3 in 10^9 per day after 1 month continuous use.
Short term stability	Better than ± 1 in 10^5 r.m.s. over 1 second period.

OVEN CONTROLLED CRYSTAL OSCILLATOR	
	(Versions 52440-302R and 52440-305A)
Temperature stability	Better than ± 0.1 p.p.m. over the operating range of 0 to 50°C.
Ageing rate	Better than ± 1 in 10^5 per year; better than ± 3 in 10^9 per day after 1 month continuous use.
Short term stability	Better than ± 1 in 10^{10} r.m.s. over 1 second period.
Warm-up time	Within 0.2 p.p.m. of final frequency within 10 minutes from switch on at 20°C ambient.
AUXILIARY OUTPUT	
Frequency	Internal 10 MHz standard available at 1 or 10 MHz via rear panel BNC socket.
Level	Greater than 100 mV p-p into 50Ω (approximately 4V p-p e.m.f.).
Impedance	Approximately 2 kΩ.
EXTERNAL FREQUENCY STANDARD	
Frequency	1 MHz or 10 MHz sinewave or squarewave.
Input level	150 mV r.m.s. minimum up to 3V r.m.s. maximum.
Input impedance	10 kΩ (approx), AC coupled.
INPUT CHANNELS	
	Three channels, switch selected, covering the frequency range 10 Hz to 20 GHz.
INPUT CHANNEL A	
Frequency range	10 Hz to 100 MHz direct count.
Sensitivity	30 mV r.m.s. sinewave from 10 Hz to 10 MHz. 50 mV r.m.s. sinewave from 10 MHz to 50 MHz. 100 mV r.m.s. sinewave from 50 MHz to 100 MHz.
Maximum input	250 V r.m.s. at 50 Hz, decreasing to 5 V r.m.s. at 100 MHz., @ 2.45 μV/Hz.
Input impedance	Greater than 1 MΩ in parallel with less than 25 pF. AC coupled via 0.1 μF.

Connector	Type BNC female.
Input filter	Switchable low-pass filter reduces sensitivity above 5 kHz to improve noise immunity when measuring l.f. signals. Attenuation is at least 18 dB above 1 MHz.
INPUT CHANNEL B	
Frequency range	50 MHz to 600 MHz direct count.
Sensitivity	-20 dBm (50 MHz to 500 MHz). -15 dBm (500 MHz to 600 MHz).
Maximum input	+13 dBm (1 V r.m.s. p.d. into 50 Ω).
Damage level	+27 dBm (5 V r.m.s. p.d. into 50 Ω).
Input impedance	50 Ω nominal.
Connector	Type BNC female. AC coupled via 1 nF.
VSWR	Less than 2:1 typical.

INPUT CHANNEL C	
Frequency range	600 MHz to 20 GHz.
Sensitivity	-25 dBm (600 MHz to 10 GHz). -20 dBm (up to 18 GHz). -15 dBm (up to 20 GHz).
Maximum input	+3 dBm (600 MHz to 2 GHz). +7 dBm (2 GHz to 20 GHz typical).
Damage level	+27 dBm.
Input impedance	50 Ω nominal.
Connector	Precision Type N female (except 52440-304K, and 52440-305A), then SMA).
VSWR	Less than 2.5:1 typical (600 MHz to 10 GHz). Less than 3:1 typical (10 GHz to 18 GHz).
FM tolerance	30 MHz p-p from 2 GHz to 20 GHz. For modulation frequencies up to 10 MHz.
AM tolerance	Up to 40% modulation depth for signals within the sensitivity range.
Acquisition time	200 ms typical (600 MHz to 20 GHz).
Selectivity	Automatic amplitude discrimination of 10 dB typical above any signal within 200 MHz; 20 dB typical above any signal in 600 MHz to 20 GHz.

GPIO INTERFACE	All functions except the supply switch are remotely programmable.
Capabilities	Complies with the following subsets as defined in IEEE 448-1978:- SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, CO and E1. (Marconi Instruments General Purpose Interface Bus is in accordance with IEEE Standard 488-1978 and IEC Publication 625-1, first edition).

RADIO FREQUENCY INTERFERENCE	Conforms with the requirements of EEC Directive 76/689 as to limits of r.f. interference.
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SAFETY	Complies with IFC348.
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OPERATING TEMPERATURE RANGE	
Rated range of use	0 to 50°C.
Limit range of operation	0 to 55°C.
CONDITIONS OF STORAGE AND TRANSPORT	
Temperature	-40 to 70°C.
Humidity	Up to 90% relative humidity.
Altitude	Up to 2500 m (pressurised freight at 27 kPa differential, i.e. 3.9 lbf/sq. in.)
POWER REQUIREMENTS	
AC supply	Switchable voltage ranges:- 105 to 120 V and 210 to 240 V ± 10%. 50 to 400 Hz ± 10%. 50 VA maximum.
DIMENSIONS AND WEIGHT	
	Height Width Depth Weight
	108 mm 256 mm 338 mm 5.5
	4.25 in 10.1 in 13.3 in 12 lb

VERSIONS AND ACCESSORIES
When ordering please quote all code numbers

Ordering numbers	Versions
52440-301C	20 GHz Microwave Counter 2440 with temperature compensated crystal oscillator and GPIB.
52440-304K	As 52440-301C with Channel C Connector SMA on rear panel.
52440-302R	20 GHz Microwave Counter 2440 with oven controlled crystal oscillator and GPIB.
52440-305A	As 52440-302R with Channel C Connector SMA on rear panel.
43129-003W 46881-486G	Supplied Accessories AC Supply Lead Operating Manual H52440-900N Vol. 1
43129-189U 46883-408K 54124-022L 46881-487V 46881-365R 46883-644C 46883-645R 54311-094M 54351-022X 54351-023M 54351-024C 6534-3 6534-4 46883-536P 46883-537X 46883-638P	Optional Accessories GPIO Lead Assembly, 1 metre IEEE/IEC Adapter Block Cover Assembly, Storage Service Manual H52440-900N Vol.2 GPIO Manual H554811-010P Extender Card, Processor Extender Card Adaptor N (m) to SMA (f) Cable N(m) to N(m), Flexible 0.5 m. Cable SMA(f) to SMA(f), Flexible 0.5 m. Cable BNC to SMC, Flexible 1.0 m. 10 dB 5W Attenuator 20 dB 5W Attenuator Rack Mounting Kit (Double Unit) Blank Frame Kit (For Double Unit) Rack Mounting Kit (Single Unit)