



# MODEL 371

Source Locking  
Autohet Microwave Counter

Operating & Service Manual

Serial Prefix/CCN Group beginning: ~~1201~~  
1203

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## CERTIFICATION

EIP Incorporated certifies that this instrument was thoroughly inspected and tested, and found to be in conformance with the specifications noted herein at time of shipment from factory.

## WARRANTY

EIP Incorporated warrants this counter to be free from defects in material and workmanship for one year from the date of delivery. Damage due to accident, abuse, or improper signal level, is not covered by the warranty. Removal, defacement, or alteration, of any serial or inspection label, marking, or seal, may void the warranty. EIP Incorporated will repair or replace at its option, any components of this counter which prove to be defective during the warranty period, provided the entire counter is returned PREPAID to EIP or its authorized service facility. In-warranty counters will be returned freight prepaid; out-of-warranty units will be returned freight COLLECT. No other warranty other than the above warranty is expressed or implied. EIP Incorporated and Danalab Incorporated, are not liable for consequential damages.

## ASSISTANCE

For assistance, contact the EIP representative in your area, or EIP Incorporated.

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# SECTION 1

## GENERAL INFORMATION & SPECIFICATIONS

### 1-1. DESCRIPTION

1-2. The EIP 371 Source Locking Autohet Microwave Counter automatically measures the frequency of any CW signal within the range of 20 Hz to 18.0 GHz. This frequency range is covered in three bands: 20 Hz to 300 MHz, 100 MHz to 850 MHz, and 825 MHz to 18 GHz.

1-3. Measurements in Band I (20 Hz to 300 MHz) are made with a 300 MHz direct electronic counter. Band II (100 MHz to 850 MHz) uses a prescaler to divide the input signal by a factor of four into the frequency range of the 300 MHz direct counter. Band III (850 MHz to 18.0 GHz) measurements are made by heterodyning the input frequency with an automatically selected harmonic of an internal 200 MHz comb generator, producing a difference frequency which falls within the range of the 300 MHz direct counter. The inaccuracy of the indicated reading by the counter, is directly related to the quality of the time base oscillator over the entire operating range of the counter (see Sections 1 and 6).

1-4. The display on the 371 Counter provides a direct readout of the measured frequency over the entire operating range of the counter. The 371 Counter also includes automatic suppression of leading zeros, except during a no signal input condition.

1-5. The frequency readout of the 371 Counter is displayed in a fixed position format that is conveniently sectionalized in GHz, MHz, kHz, and Hz. Four gate times:

1 ms, 10 ms, 100 ms, and 1 second, are automatically selected depending upon the setting of the RESOLUTION switch.

1-6. For applications where less resolution is required, pushbutton display blanking (RESOLUTION) is provided to simplify the readout.

1-7. To assure trouble-free performance, the EIP 371 Counter is completely solid-state. For ease of repair and maintenance, the major portion of the counter circuitry is contained on plug-in printed circuit boards or in easily removed modules. Special test points allow monitoring of critical circuit functions.

### 1-8. INSTRUMENT IDENTIFICATION

1-9. The 371 Counter is identified by two number sets: the Model and Configuration Control Number (e.g. 371-CCN 1201), and a specific Serial Number (e.g. 12345). BOTH SETS OF NUMBERS should be noted in any correspondence or parts orders regarding the counter.

### 1-10. SPECIFICATIONS

1-11. EIP 371 Source Locking Microwave Counter specifications are given in Table 1-1.

### NOTICE

"AUTOHET" is a registered trademark of EIP Incorporated.

**GENERAL:**

Frequency Range: 20 Hz - 18.0 GHz.  
 Accuracy:  $\pm 1$  count  $\pm$  time base accuracy.  
 Resolution: 1 Hz to 1 MHz in decade steps.  
 Gate Time: 1 sec (1 Hz), 0.1 s (10 Hz), 10 ms (100 Hz), 1 ms (1 kHz, 10 kHz, 100 kHz, 1 MHz). Band II gate times are expanded by four.  
 Sample Rate: Controls time between measurements. Variable, 100 ms - 1 s (typ).  
 Display: 11 digit light-emitting diode (LED); sectionalized to read: GHz, MHz, kHz, and Hz.  
 Operation: Completely automatic after setting input selector.  
 Acquisition Time: In Band III, comb line acquisition requires 10 ms/GHz plus 50 ms (nominal). Once locked, readings can be taken at rate determined by Sample Rate control and selected gate time.  
 Operating Temp: 0° to +50°C.  
 Power: 115/230 Vac  $\pm 10\%$ , 50-60 Hz, 90 watts (nominal).  
 Weight: Shipping: 30.0 lbs (13.6 kg); Net: 25.5 lbs (11.6 kg).  
 Access Furnished: Detachable power cord, 8 ft (241 cm) long, with plug; Operating & Service manual; extender card.  
 Access Available: Rack Mount Kit: P/N: 2010008. Carrying Case: P/N: 5700001. Calibration Kit: P/N: 2000005.

**CONTROLS:**

See Figures 3-1 and 3-2, and Tables 3-1 and 3-2.

**TIME BASE (STANDARD):**

Crystal Frequency: 10 MHz.  
 Stability:  
 Aging Rate:  $< | 3 \times 10^{-7} |$  /month.  
 Short Term:  $< 1 \times 10^{-9}$  rms for one second averaging time.  
 Temperature:  $< | 2 \times 10^{-6} |$  between 0° to +50°C.  
 Line Variation:  $\pm 10\%$  line voltage change results in a frequency shift of  $< | 1 \times 10^{-7} |$ .  
 Warm-up Time: None.  
 Output Freq: 10 MHz, square-wave, 1V p-p minimum into 50 ohms.  
 Ext. Time Base: Requires 10 MHz, 1V p-p minimum into 300 ohms.

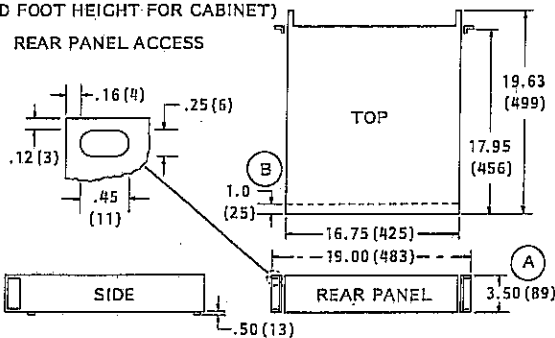
**SIGNAL INPUTS:**

**BAND IA:**  
 Frequency Range: 20 Hz - 135 MHz  
 Min. Sensitivity: 25 mV rms  
 Input Impedance: 1 megohm/20 pf  
 Maximum Input: 120 V rms (Note 1)  
 Max. Input without Damage: 150 V rms (Note 1)  
 Coupling: AC  
 Connector: BNC female  
 Note 1: Above 1 kHz maximum input decreases at 6 dB/octave rate to 3.0 V.

**BAND IB:**  
 Frequency Range: 10 MHz - 300 MHz  
 Min. Sensitivity: -20 dBm (22 mV rms)  
 Input Impedance: 50 ohms nominal  
 Maximum Input: +10 dBm (0.7 V rms)  
 Max. Input without Damage: +27 dBm (5.0 V rms)  
 Coupling: AC  
 Connector: BNC female

**DIMENSIONS (mm)**

- (A) E.I.A. RACK HEIGHT  
(ADD FOOT HEIGHT FOR CABINET)
- (B) REAR PANEL ACCESS



All specifications subject to change at manufacturers discretion.

TABLE 1-1. SPECIFICATIONS - 371 COUNTER



**SIGNAL INPUTS (CONTINUED):**

**BAND II:**

Frequency Range: 10 MHz - 850 MHz  
 Min. Sensitivity: 100 MHz - 150 MHz:  
 -15 dBm (40 mV rms).  
 150 MHz - 850 MHz:  
 -20 dBm (22 mV rms).  
 Maximum Input: +10 dBm (0.7 V rms)  
 Max. Input without  
 Damage: +27 dBm (5.0 V rms)  
 Input Impedance: 50 ohms nominal  
 Coupling: AC  
 Connector: BNC female

**BAND III:**

Frequency Range: 825 MHz - 18.0 GHz.  
 Min. Sensitivity: 825 MHz - 1.1 GHz:  
 -25 dBm (12 mV rms),  
 1.1 GHz - 12.4 GHz:  
 -30 dBm (7 mV rms),  
 12.4 GHz - 18.0 GHz:  
 -25 dBm (12 mV rms).  
 Maximum Input: +7 dBm, +20 dBm typ.  
 Max. Input without  
 Damage: +33 dBm (2 watts).  
 Input Impedance: 50 ohms nominal.  
 Coupling: AC.  
 Connector: Type N Precision female.  
 VSWR: 2.5 : 1 typical.  
 FM Tolerance: 40 MHz p-p, worst case, for  
 modulation rates from DC to  
 10 MHz.

**YIG Preset:**

Selection: Front panel keyboard input; in-  
 dicated on 6-digit LED display.  
 Settability: Set > 400 MHz below lowest fre-  
 quency to be measured. Sweep  
 begins at preset and measures  
 only frequencies > 400 MHz  
 above preset frequency.  
 Operation: Preset desired frequency on key-  
 board in MHz (or GHz) at 200 MHz  
 increments. Press PRESET button.

**SOURCE LOCKING SPECIFICATIONS:**

Freq. Coverage: 10 MHz - 18.0 GHz.  
 Resolution: 100 kHz (400 kHz in Band II).  
 Long Term Stability: Equal to counter time base osc.  
 Minimum Lock Level: Equal to counter sensitivity.  
 Lock Time: 0.1 - 3s; dependent on source.  
 Accuracy: Equal to counter.  
 Capture Range: ± 20 MHz min; ± 50 MHz typical  
 unless limited by source char-  
 acteristics or output current  
 capability.

**Bandwidth and**

Polarity: Fully automatic selection.  
 Output Drive  
 Capability: ± 10 V into 5 Kohm min, or  
 ± 40 mA into 10 ohms max.

**Output Connector:**

Rear panel BNC female.

**Residual FM**

Reduction: See graph below for typical  
 response.

**Required Source**

**Input Characteristics:**

Bandwidth: 4 kHz min for specified per-  
 formance.

**Modulation**

Sensitivity: Voltage input ( $R_{in} > 5 \text{ Kohm}$ ):  
 2 to 200 MHz/V. Current input  
 ( $R_{in} < 10 \text{ ohms}$ ): 0.1 to 10  
 MHz/mA.

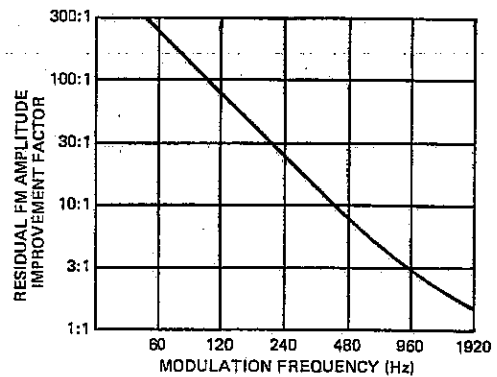


TABLE 1-1 (Continued). SPECIFICATIONS - 371 COUNTER