

## Model CE-24A Frequency Selective Levelmeter

### Features

- 200 Hz to 5 MHz Range
- -120 to +12 dBm Level Range
- AFC: Eliminates Errors due to Drift and Time Consuming Signal Peaking
- LED Frequency Readout with 10-Hz Resolution
- $1 \times 10^{-5}$  Frequency Accuracy
- Phase Lock Stability
- Residual Phase Jitter ( $1^\circ$  p-p): Permits Phase Jitter Measurements at Carrier Frequencies
- 1.74-kHz Equivalent or 3.1-kHz Wide Bandwidth for Channel Noise Measurements
- 45-Hz Narrow Bandwidth for Single Tone Measurements
- Five Switch-Selectable Impedances

Lightweight, rugged design, and battery operation make the CE-24A ideal for use at remote locations, as well as at equipment offices. Even where ac power is available, the battery operation is helpful because it avoids hum caused by ac power lines. Applications include measurement of tones, noise, crosstalk, and frequency response in cable, open wire, or radio multiplex systems.

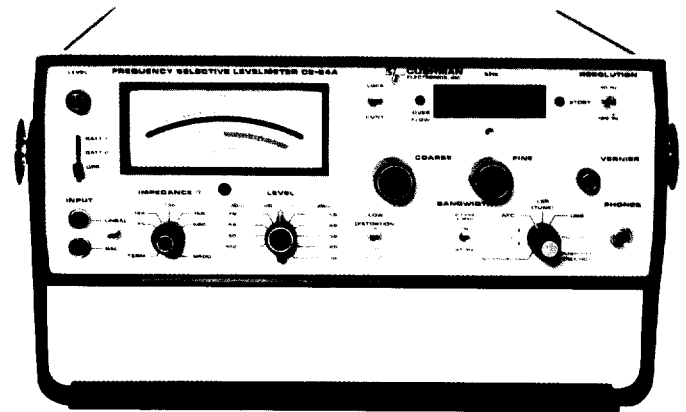
Measurements can be made on V-F systems or carrier systems with only a few channels or as many as 960 channels. Residual phase jitter performance makes the CE-24A ideal for phase jitter measurements on transmission systems carrying telemetry or other data signals.

#### Digital Frequency Display

Large, bright, five-digit LED display makes frequency easy to set and read. Overflow indicator allows frequency to be set to the maximum range of 5000 kHz with 10-Hz resolution.

#### Phase-Lock Stability

The CE-24A is phase locked in 100-kHz increments for greater stability. Accuracy is  $1 \times 10^{-5}$ . A continuous tuning mode for searching is also provided.



#### AFC (Automatic Frequency Control)

Measurement errors due to drift and troublesome signal peaking are virtually eliminated by AFC which automatically locks onto and tracks incoming signals.

#### Equivalent Noise Bandwidth

C-Message noise measurements are provided by a filter which has an equivalent noise bandwidth of 1.74 kHz.

#### Low Frequency Range

The CE-24A has a low frequency range of 200 Hz for narrowband measurements of V-F telemetry and supervisory control tones.

#### Built-In Speaker and Phone Jack

A built-in speaker and phone jacks are provided on the CE-24A for aural monitoring of carrier channels.

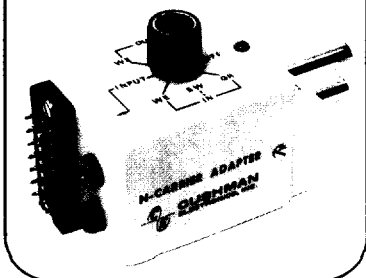
#### Phase Jitter

Accurate phase jitter measurements on carrier systems can be made by connecting a phase jitter meter to the audio output of the CE-24A. Residual phase jitter is approximately  $1^\circ$  peak-to-peak from this output.

## Model 241 N-Carrier Adapter

The Model 241 adapter plugs into the front panel of the Cushman CE-24A selective levelmeter to permit level and noise measurements on N and ON carrier systems. It has a Western Electric 20-pin connector that mates directly with N and ON carrier systems using that connector.

A switch on the Model 241 connects the appropriate pair of terminals on the input connector to the 135-ohm input of the Cushman levelmeter for W-E, E-W, and Group Out and W-E, E-W, and Group In measurement modes. General signal tracing is provided for by two banana jacks on the adapter input.



**Specifications:  
Model CE-24A**

<b>Frequency</b>	
Range	200 Hz to 5 MHz
Resolution	10 Hz
Accuracy	± 10 ppm ± 1 count
Display	5 digit, LED, continuous tuning
<b>Level Measurement</b>	
Range, Referred to 0 dBm on Meter:	
Low Noise (0.2-5000 kHz)	-80 to +10 dBm
Low Distortion (1-5000 kHz)	-100 to -10 dBm
Accuracy	
100 kHz at -40 dBm (Referred to 0 dBm on Meter)	± 0.2 dB
Frequency Response	
75, 124, 135, 150Ω (Referred to 100 kHz, 0.2-5000 kHz)	
25° C ± 10° C	± 0.2 dB
0° C to +55° C, Additional	± 0.2 dB
600Ω (Referred to 100 kHz, 0.2-650 kHz)	± 0.2 dB
Attenuator Referred to -40 dBm	± 0.2 dB
Meter Range	-20 to +2 dBm
<b>Input Impedance</b>	
Unbalanced	75, 124, 135, 150, 600Ω, and 10 KΩ shunted by approximately 24 pF
Balanced	75, 124, 135, 150, 600Ω, and 20 KΩ shunted by approximately 12 pF
Return Loss 75Ω	≥ 30 dB
Common Mode Rejection (Balanced)	≥ 35 dB
<b>Bandwidth</b>	
Wide	
3 dB	2.3 kHz (1.74 kHz equivalent noise bandwidth)
60 dB	≤ 5.1 kHz
Narrow	
3 dB	45 Hz
60 dB	≤ 450 Hz
Option M3 (in lieu of 2.3 kHz)	
3 dB	3.1 kHz
60 dB	≤ 6.5 kHz
<b>Option M5 (in lieu of 45 Hz)</b>	
3 dB	200 Hz
60 dB	≤ 1.4 kHz
<b>Internal Distortion Attenuation, Low Distortion (75Ω)</b>	
Harmonic	
For 60-dB Sensitivity Increase (Fundamental ≤ 0 dBm)	≥ 70 dB
Noise Power Ratio (Equivalent 600 Channel System)	
For 40-dB Sensitivity Increase	≥ 50 dB
<b>Internal Phase Jitter, Low Noise IF Rejection</b>	1° p-p (nominal)
<b>Image Rejection</b>	≥ 70 dB
<b>Output (Nominal)</b>	≥ 70 dB
Audio	
Demodulation	LSB, USB
Phones Jack	0 to 2 V rms
Power to Speaker	100 mW
Dc Recorder (BNC), Unloaded	1.0 Vdc (For 0 dB on meter)
Impedance, Nominal	1 kΩ
<b>Power</b>	
Ac	50-400 Hz, 115/230 V ± 10%, 14 watts
Batteries	
Operating Time	Approximately 10 hours
Recharge Time	14 hours minimum (at 25° C)
<b>Dimensions</b>	13.3 cm H x 35.6 cm W x 40.6 cm D (5¼ in. H x 14 in. W x 16 in. D)
<b>Weight</b>	11.4 kg (25 lbs.)
<b>Environmental</b>	
Temperature Operating	0° to 55° C
Temperature Storage	-40° to + 75° C

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**Specifications:  
Model 241**

<b>Equipment Compatibility</b>	CE-24A Frequency Selective Levelmeter
Model 241	
<b>Frequency Range</b>	1 kHz to 3.2 MHz
Model 241	
<b>Insertion Loss (135-ohm Bridging system)</b>	
1 to 650 kHz	0 dB
650 kHz to 1 MHz	≤ 0.1 dB
1 MHz to 3.2 MHz	≤ 0.2 dB
<b>Input Connectors</b>	
N-Carrier	WE 20 pin N-carrier type
Signal Trace	KS 14160-L1 or Cinch 213-20-00-116
<b>Crosstalk</b>	0.75 inch spaced banana jacks
(between terminated adjacent pairs)	≤ 40 dB to 1 MHz
<b>Output Connector</b>	
Model 241	Dual WE coaxial connectors. Mates with CE-24A input.
<b>Breakdown Voltage</b>	300 Vdc maximum from any input to ground
<b>Dimensions (excluding coaxial plugs)</b>	3.0 in. H x 2.1 in. W x 3.9 in. D (7.6 cm H x 5.3 cm W x 9.9 cm D)
<b>Weight</b>	1/2 lb. (.23 kg)

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Specifications subject to change without notice

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