

## SPECIFICATIONS

## Measurements

Items	Models	ME453K/L/M		ME538K/T/M	
		70 MHz Band		70 MHz Band	140 MHz Band
Amplitude (IF INPUT terminal)	Inherent Slope	$\pm 0.05$ dB/ $\pm 25$ MHz		$+0.05$ dB/ $+25$ MHz	$\pm 0.05$ dB/ $\pm 25$ MHz, $\pm 0.1$ dB/ $\pm 40$ MHz, $-0.2$ dB/ $-50$ MHz
	Measuring Range	0 to 16 dB			
	Max Sensitivity	0.01 dB/DIV (at Y2 Display)			
	IF INPUT Level	+10 to -20 dBm			
Amplitude (REF. LOSS INPUT terminal)	Inherent Slope	$\pm 1$ dB			
	Measuring Range	0 to 8 dB			
	Sensitivity	1 dB/DIV, 5 dB/DIV			
	INPUT Level	60 to -20 dBm			
Group Delay	Inherent Slope	0.3 ns/ $\pm 15$ MHz, 0.5 ns/ $\pm 25$ MHz	0.3 ns/ $\pm 15$ MHz, 0.5 ns/ $\pm 25$ MHz	0.3 ns/ $\pm 20$ MHz, 0.5 ns/ $\pm 30$ MHz, 1 ns/ $\pm 50$ MHz	
	Measuring Range	0 to 400 ns			
	Max Sensitivity	0.1 ns/DIV (at Y2 Display)			
	Noise	0.05 ns/Condition, $f_M = 200$ kHz ~ 278 kHz, Deviation 200 kHz rms, Using Average function.			
Linearity	Inherent Slope	0.2%/ $\pm 25$ MHz	0.2 %/ $\pm 25$ MHz	0.2 %/ $\pm 50$ MHz	
	Measuring Range	0 to 80 %			
	Max Sensitivity	0.05 %/DIV			
	Noise	0.01 %/Condition, $f_M < 1$ MHz, Deviation 200 kHz rms, Using Average function.			
Differential Phase	Inherent Slope*1	0.3°/ $\pm 15$ MHz, 0.5°/ $\pm 25$ MHz	0.3°/ $\pm 15$ MHz, 0.5°/ $\pm 25$ MHz	0.3°/ $\pm 20$ MHz, 0.5°/ $\pm 30$ MHz, 0.8°/ $\pm 50$ MHz	
	Measuring Range	0 to 40°			
	Max Sensitivity	0.2°/DIV			
	Noise	0.02°/Condition, $f_M = 5.6$ MHz, Deviation 500 kHz rms, Using Average function.			
*1: Specified frequency range = Carrier sweep width + 2 $f_M$					
Differential Gain	Inherent Slope*2	0.2 %/ $\pm 15$ MHz, 0.4 %/ $\pm 25$ MHz	0.2 %/ $\pm 15$ MHz, 0.4 %/ $\pm 25$ MHz	0.3 %/ $\pm 20$ MHz, 0.4 %/ $\pm 30$ MHz, 0.6 %/ $\pm 50$ MHz	
	Measuring Range	0 to 80 %			
	Max Sensitivity	0.05 %/DIV			
	Noise	0.01 %/Condition, $f_M = 5.6$ MHz, Deviation 500 kHz rms, Using Average function.			
*2: Specified frequency range = Carrier sweep width + 2 $f_M$					
11' Return Loss	Frequency Range	70 $\pm 25$ MHz	70 $\pm 25$ MHz	140 $\pm 50$ MHz	
	Measuring Range	10 to 50 dB accuracy depends on using bridge			
	Sensitivity	1 dB/DIV, 5 dB/DIV			
AM to PM Conversion	Residual PM	0.3°/dB/ $\pm 25$ MHz	0.3°/dB/ $\pm 25$ MHz	0.3°/dB/ $\pm 35$ MHz	
	Measuring Range	0.3°/dB to 16°/dB			
Spectrum	Center Frequency	70 $\pm 20$ MHz Auto tuning	70 $\pm 20$ MHz Auto tuning	140 $\pm 30$ MHz Auto tuning	
	Sweep Width	Approx. $\pm 700$ kHz			
	Max Sensitivity	Detects 0.1 dB change of modulating signal at carrier zero point.			
	Deviation	K type - 340 kHz rms at 200 kHz, L type - 472 kHz rms at 277.778 kHz, M type - 425 kHz rms at 250 kHz.			

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Deviation	Measuring Range	20 kHz to 999 kHz rms at built-in BB frequencies $\leq 8.2$ MHz.			
	Accuracy	10 % at built-in BB frequency $\leq 8.2$ MHz.			
	Calibration	Deviation meter is calibrated by easy key operation. Accuracy reaches 1 % theoretically at specified modulation frequency. Deviation is as shown in the following table by Bessel zero method.			
		Model	Modulation freq.	Key in factor	
		K type	200 kHz	340 kHz rms	
		L type	277.778 kHz	472 kHz rms	
		M type	250 kHz	425 kHz rms	
Modulator Sensitivity	Mod Signal Level	-50 to -10 dBm			
	Deviation	Use the DEVIATION meter function or use the carrier zero deviation with the SPECTRUM function.			
De-modulator Sensitivity	IF Signal	Calibrate the deviation with DEVIATION meter function or SPECTRUM function.			
	Demo BB Level	-50 to +10 dBm			
Inherent Noise (IF to IF) (Fc: all models)	Group Delay	Linearity	Differential Phase	Differential Gain	Detection Band: 3 kHz
	66 kHz to 93 kHz: 0.3 ns rms 200 kHz to 278 kHz: 0.1 ns rms 400 kHz to 556 kHz: 0.05 ns rms	0.02% rms	0.05 °rms	0.1% rms	
	Deviation: 200 kHz rms, $f_M < 1$ MHz		Deviation: 500 kHz rms, $f_M = 5.6$ MHz		

## BB (Baseband) measurement

BB to BB Measurements (For all models)	Item	Inherent slope	Measuring range	Max. sensitivity	Noise
	Group Delay	0.1 ns	0 to 400 ns	0.1 ns/DIV (at Y2)	0.2 ns
	Linearity	0.1 %	0 to 80 %	0.05 %/DIV	0.05 %
	Differential Phase	0.1 °	0 to 40 °	0.2 °/DIV	0.05 °
	Differential Gain	0.1 %	0 to 80 %	0.05 %/DIV	0.05 %
	Measuring Condition	BB level: -30 dBm			
BB Return Loss	Frequency	Built-in BB frequency or BB amplitude option			
	Range	10 to 40 dB, 1 dB/DIV (BB amplitude option)			
BB Amplitude (Option)	Frequency range: 60 kHz to 15 MHz, Level: +10 dBm to -50 dBm, Inherent slope: +0.5 dB/100 kHz to 15 MHz Measuring range: 0 to 8 dB, Max. sensitivity: 0.1 dB/DIV				
DC Input	Measuring range: 0 to 1400 mV, Max. sensitivity: 1 mV/DIV				

Receiver

<p>IF Input</p>	<p>Frequency Range (AFC capture and hold range)</p> <p>Level Range</p> <p>Level Display</p> <p>Level Accuracy</p> <p>Impedance</p> <p>Input Frequency Sweep Width</p> <p>    Maximum Sweep Width</p> <p>    Minimum Sweep Width</p> <p>Demodulation</p>	<p>70 MHz band: 45 to 95 MHz          140 MHz band: 90 to 190 MHz          When BB frequency is 55.6 kHz (or 27.8 kHz). *1          70 MHz band: 60 to 80 MHz          140 MHz band: 130 to 150 MHz</p> <p>+10 to -20 dBm</p> <p>3-digit LED display          Resolution: 0.1 dB</p> <p>±0.3 dB at +4 dBm</p> <p>75 Ω          Return Loss: &gt;30 dB at +4 dBm</p> <p>+25 MHz/center frequency 70 MHz          ±50 MHz/center frequency 140 MHz          When BB frequency is 55.6 kHz (or 27.8 kHz),          ±10 MHz/center frequency 70/140 MHz.</p> <p>The minimum sweep width required for reproducing the HOR signal on the CRT          +0.2 MHz</p> <p>66.6 kHz, 80 kHz to 8.2 MHz          *1 BB frequency 55.6 kHz (or 27.8 kHz) is demodulated when sweep frequency is only 18 Hz.</p>
<p>IF Return Loss Input</p>	<p>The return loss input is used with the same frequency applied to IF INPUT to lock the AFC loop.</p> <p>Input Level Range</p> <p>Flatness</p> <p>Impedance</p>	<p>-20 to -60 dBm</p> <p>±1 dB/45 to 95 MHz          ±1 dB/90 to 140 MHz</p> <p>75 Ω          Return Loss: &gt;28 dB</p>
<p>BB Input (BB + Sweep)</p>	<p>BB Frequency Range</p> <p>BB Level Range</p> <p>BB Level Display</p> <p>BB Level Accuracy</p> <p>Impedance</p> <p>Sweep Frequency Range</p> <p>Sweep Voltage Range</p> <p>X Phase Setting Range</p>	<p>66 kHz to 15 MHz</p> <p>+10 to -50 dBm</p> <p>3-digit LED display          Resolution: 0.1 dB</p> <p>±0.3 dB at 0 dBm</p> <p>75 Ω          Return Loss: &gt;28 dB at 0 dBm/frequency          66 kHz to 15 MHz</p> <p>18 to 100 Hz</p> <p>±50 mV to ±5 V</p> <p>0 to 360°</p>

\*1 Optional

Phase Detector	Input Frequency	The BB frequency is selected automatically.		
		K type	L type	M type
	f1	66.667 kHz	92.593 kHz	83.333 kHz
	f2	200 kHz	277.778 kHz	250 kHz
	f3	400 kHz	555.556 kHz	500 kHz
	f4	2 MHz	2.4 MHz	
	f5	3.58 MHz		
	f6	4.43 MHz		
	f7	5.6 MHz		
	f8	8.2 MHz		
	f9	12.39 MHz (ME538K/L/M)		
	f10	55.556 kHz <sup>1</sup> (option)		
		<sup>1</sup> 27.8 kHz can be supplied if specified.		
	Capture Range	$15 \text{ Hz} \leq 555.556 \text{ kHz}$ $5 \times 10^{-6} < 12.39 \text{ MHz}$ $*1 \pm 1 \text{ Hz} < 55.556 \text{ kHz}$		
Frequency Markers	Slide Marker	Variable side markers: 70 ± 25 MHz, 140 ± 50 MHz		
	Frequency Display	4-digit LED display Resolution: 10 kHz		
	Accuracy	±1 × 10 <sup>-6</sup> ±1 digit		
	2 MHz Comb + Slide	2 MHz Comb Markers + Variable side markers		
Center Frequency Counter	Counts the center frequency of the swept IF signal and displays it on the 5-digit LED display. The display to the LED display is made by selecting either the slide marker frequency or center frequency with a key.			
	Frequency Range	70 MHz band: 45 to 90 MHz 140 MHz band: 90 to 190 MHz		
	Frequency Display	4-digit LED display (ME453K/L/M) 5-digit LED display (ME538K/L/M) Resolution: 10 kHz		
	Accuracy	±1 × 10 <sup>-6</sup> ±1 digit		
IF Sweep Width Measurement	Measuring Range	70 MHz band: ±0.2 to ±25 MHz 140 MHz band: ±0.2 to ±50 MHz		
	Resolution	0.2 to 9.99 MHz: 10 kHz 10 to 50 MHz: 100 kHz		
	Accuracy	±5 × 10 <sup>-2</sup> ±1 digit		
BB Output (Rear Panel)	Level	-7 dBm, typical		
	Impedance	75 Ω, nominal		
Ext. Sweep Input (Rear Panel)	Frequency	18 Hz to 100 Hz		
	Level	1 Vpp		
	Impedance	>5 kΩ, nominal		
X-Y Recorder Output (Option)	Output	X: 0 to 4 V Y: 0 to 4 V Pen lift: Oper. Pen down: Ground		
	Sweep Speed	20 sec., 40 sec., nominal		

\*J Optional

Transmitter

IF Output	Frequency Range	70 MHz band: 45 to 95 MHz 140 MHz band: 90 to 190 MHz																																												
	Center Frequency Display	4-digit LED display (ME453K/L/M) 5-digit LED display (ME538K/L/M) Resolution: 10 kHz Accuracy: $\pm 1 \times 10^{-4}$ = $\pm 1$ digit/CW Stability: $< 100$ kHz at 70 MHz $\pm 200$ kHz at 140 MHz 5 hrs after 1/2 hr warm-up																																												
IF Sweep Width	Level Range	+10 to -73 dBm (1 dB step attenuator) Continuously variable range: $> +1$ dB																																												
	Level Accuracy	$\pm 0.3$ dB at +4 dBm Harmonics: $< -30$ dB Impedance: 75 $\Omega$ Return Loss: $> 30$ dB at +4 dBm																																												
IF Sweep Width	Sweep Width Range	70 MHz band: 0 to $\pm 25$ MHz 140 MHz band: 0 to $\pm 50$ MHz																																												
	Sweep Width Display	3-digit LED display Resolution: 0.1 MHz Auto Sweep Reduction: The sweep width is reduced by 2 x BB frequency $\pm 10\%$ when BB frequency $> 1$ MHz. This function can be reset with a switch.																																												
FM Deviation	Mod frequency	Same as BB frequency (item 6)																																												
	Deviation Range	5 to 1000 kHz rms Deviation Display: 4-digit LED display Resolution: 1 kHz rms																																												
AUX IF Output	Frequency Range	Same as IF OUTPUT specifications (item 1).																																												
	Output Level	+10 dBm Level Accuracy: $< +1$ dB Impedance: 75 $\Omega$ , nominal																																												
Crystal Output	Frequency	70 MHz band: 70 MHz 140 MHz band: 140 MHz																																												
	Output Level	+5 dBm Level Accuracy: $< +1$ dB Impedance: 75 $\Omega$ , nominal																																												
BB + Sweep Output	BB Frequency	<table border="1"> <thead> <tr> <th></th> <th>K type</th> <th>L type</th> <th>M type</th> </tr> </thead> <tbody> <tr> <td>f1</td> <td>66.667 kHz</td> <td>92.538 kHz</td> <td>83.333 kHz</td> </tr> <tr> <td>f2</td> <td>200 kHz</td> <td>277.778 kHz</td> <td>250 kHz</td> </tr> <tr> <td>f3</td> <td>400 kHz</td> <td>555.556 kHz</td> <td>500 kHz</td> </tr> <tr> <td>f4</td> <td>2 MHz</td> <td colspan="2">2.4 MHz</td> </tr> <tr> <td>f5</td> <td colspan="3">3.58 MHz</td> </tr> <tr> <td>f6</td> <td colspan="3">4.43 MHz</td> </tr> <tr> <td>f7</td> <td colspan="3">5.6 MHz</td> </tr> <tr> <td>f8</td> <td colspan="3">8.2 MHz</td> </tr> <tr> <td>f9</td> <td colspan="3">12.39 MHz (ME538K/L/M)</td> </tr> <tr> <td>f10</td> <td colspan="3">55.556 kHz<sup>1</sup> (option)</td> </tr> </tbody> </table>		K type	L type	M type	f1	66.667 kHz	92.538 kHz	83.333 kHz	f2	200 kHz	277.778 kHz	250 kHz	f3	400 kHz	555.556 kHz	500 kHz	f4	2 MHz	2.4 MHz		f5	3.58 MHz			f6	4.43 MHz			f7	5.6 MHz			f8	8.2 MHz			f9	12.39 MHz (ME538K/L/M)			f10	55.556 kHz <sup>1</sup> (option)		
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		<p><sup>1</sup> Can be changed to 27.778 kHz if so specified. Sweep frequency is automatically set to 18 Hz when f10 is selected.</p> <p>BB Frequency: <math>\pm 5</math> Hz <math>\leq 55.556</math> kHz Accuracy: <math>\pm 5 \times 10^{-6}</math> <math>\leq 12.39</math> MHz <math>\pm 1</math> Hz <math>\leq 55.556</math> kHz *1</p>																																												

\*1 Option

(Cont'd) BB + Sweep Output	BB Level	+10 to -50 dBm A 10 dB step attenuator and 0 to -10 dB continuously variable dial are provided for setting the level.
	BB Level Display	3-digit LED display Resolution: 0.1 dB
	BB Level Accuracy	+0.3 dB at 0 dBm
	BB Harmonics	<- 38 dB
	BB Impedance	75 $\Omega$ Return Loss: >28 dB at -10 dBm
	Sweep Frequency	Line (50/60 Hz), 70 Hz Option (select one frequency from 18 Hz to 100 Hz) Ext. (18 Hz to 100 Hz)
	Sweep Level	0 to 6.5 V <sub>p-p</sub> /75 $\Omega$
	Sweep Level Display	3-digit LED display Resolution: 0.01 V
	Sweep Level Accuracy	±10 % at 6 V <sub>p-p</sub>
	Sweep Harmonics	<- 35 dB
Sweep Impedance	75 $\Omega$ , nominal	
Sweep Output	Sweep Level	0 to 25 V <sub>p-p</sub> /10 k $\Omega$
	Sweep Level Display	3-digit LED display Resolution: 0.01 x 4 V
	Sweep Level Accuracy	±10 % at 24 V <sub>p-p</sub>
Ext. Sweep Input (Rear panel)	Frequency	18 to 100 Hz
	Level	2 V <sub>p-p</sub>
	Impedance	75 $\Omega$ , nominal
BB Sweeper (Option)	Frequency Range	60 kHz to 15 MHz
	BB Output Level	+10 dBm to -50 dBm (10 dB step attenuator) Continuously variable range: 0 to -10 dB
	BB Level Display	3-digit LED display Resolution: 0.1 dB
	Inherent slope	±0.5 dB/100 kHz to 13 MHz The value of the sum of the receiver and transmitter.
	Impedance	75 $\Omega$ Return Loss: >28 dB at -10 dBm

Low BB frequency (55.6 kHz or 27.8 kHz) specification (Option)

Group Delay	Inherent Slope	70 +10 MHz: 5 ns 140 +10 MHz: 5 ns
	Measuring Range	0 to 400 ns
	Max. Sensitivity	2 ns/div.
	Noise	1 ns. *1
Linearity	Inherent Slope	70 +10 MHz: 0.5 % 140 ±10 MHz: 0.5 %
	Measuring Range	0 to 80 %
	Max. Sensitivity	0.1 % div.
	Noise	0.1 %*

\* With deviation 100 kHz rms using average function.

General Specifications

Input and Output Connector	BNC or SP connector Other type of connector can be installed if requested by the user: e.g., WECO560A or equivalent.
Power Supply	260 VA Transmitter: 85 VA Receiver: 175 VA Voltages are available from 100 V AC to 254 V AC, at the request of the user. Tolerance +10 %
Ambient temperature (Rated range of use)	0° to 50°C
Dimensions and Weight	Receiver: 177H x 426W x 450D(mm), ≤18.5 kg Transmitter: 133H x 426W x 450D(mm), <13.5 kg