

# Anritsu

**Original**

Darf nicht verliehen werden.

KST 024 004

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**OPERATION MANUAL**  
**SPECTRUM ANALYZER**  
**MS710C/D/E/F**

**ANRITSU CORP.**

## SECTION 1

### GENERAL

The MS710 series Spectrum Analyzers are high-performance instruments that incorporate various advanced microwave and digital technologies using micro-processors. These spectrum analyzers are used for measuring a wide range of low to extremely high frequencies.

The major applications of this series include multiple testing for the development and production of high-frequency devices and components, analyzing spurious signals and spectrum distribution and the modulation characteristics of radio equipment, and monitoring spectrum and interference wave measurements at microwave radio stations (ground and satellite stations).

Digital memory and microprocessor control provides new functions (signal search, marker functions, measuring conditions and image data memory, and direct plotting) to facilitate simplified and effective manual measurements. In addition to the above, remote control and data output via the GP-IB is possible thus enabling the MS710 series Spectrum Analyzer to be used to construct automatic measurement systems in combination with personal computers and other measuring instruments.

The MS710 series is comprised of the following four models so that customers can select instruments according to specific requirements.

Model	Low frequency band: 10 kHz to 30 MHz	Standard frequency bands: 100 kHz to 2 GHz/1.7 to 23 GHz	External mixer bands: 18 to 140 GHz	Frequency accuracy (fundamental mixing mode)
MS710C	0	0	0	30 kHz
MS710D	-	0	0	1 MHz
MS710E	-	0	-	30 kHz
MS710F	-	0	-	1 MHz

The above table shows that the MS710C is the top-of-the-line model; the other models are lower-level and are not equipped with all the MS710C functions.

This manual describes all the MS710C functions. Consequently, as noted in each section, some functions are not applicable to other models.

In this manual, the MS710C/D/E/F models are referred to as the MS710[ ].

SECTION 2

COMPOSITION AND SPECIFICATIONS

2.1 Composition

Table 2-1 Standard Composition

Item	No.	Name	Qty.	Remarks
Equipment	1	MS710[ ] Spectrum Analyzer	1	
Accessories	2	Coaxial Cable	1	[BNC (P)] $\frac{RG-55/U}{1 \text{ m}}$ [N (P)]
	3	Power cord	1	
	4	Fuse	1 set	2 A ----- 1 1 A ----- 1 1.6 A ----- 1 *** A ----- 2
	5	Operation Manual	1	
	6	Service Manual	1	

## 2.2 Specifications

Table 2-2 Specifications

1. Frequency				
1.1 Measuring range				
	Frequency band	N*	1st IF Freq.	Remarks
	10 k - 30 MHz**	1	521.4 MHz	
	100 k - 2 GHz	1	2521.4 MHz	
	1.7 G - 23 GHz	1 to 4	521.4 MHz	Note
	18 G - 26.5 GHz***	6	521.4 MHz	with EXT MIXER
	22 G - 33 GHz***	6	521.4 MHz	with EXT MIXER
	26.5 G - 40 GHz***	8	521.4 MHz	with EXT MIXER
	40 G - 60 GHz***	10	521.4 MHz	with EXT MIXER
	60 G - 90 GHz***	16	521.4 MHz	with EXT MIXER
	90 G - 140 GHz***	26	521.4 MHz	with EXT MIXER
* N is the Harmonic Mixing Mode Number defined as follows				
$f = N \times f_{LO} \pm f_{IF}$				
f : Measuring Frequency      f <sub>LO</sub> : 1st Local Frequency				
f <sub>IF</sub> : 1st IF Frequency				
Note : N = 1 for f < 6.5 GHz, N = 2 for f < 12.5 GHz				
N = 3 for f < 12.5 GHz, N = 4 for f > 18.5 GHz				
1.2 Center frequency				
	Setting range	0 Hz to 140 GHz		
	Readout resolution	Freq. band	Readout resolution	
			MS710C/E	MS710D/F
		10 k - 30 MHz**	1 kHz	—
		100 k - 2 GHz	10 kHz	100 kHz
		1.7 G - 23 GHz	10 kHz	1 MHz
		18-26.5/22-33/***	100 kHz	1 MHz
		26.5-40 GHz***		
		40-60/60-90/90-140 GHz***	1 MHz	1 MHz
	Readout accuracy	±(following accuracy E + 20% of frequency span/DIV + 10% of resolution bandwidth)		
		E = 30 kHz x N (MS710C/E), 1 MHz x N (MS710D/F)		
		N: Harmonic mixing mode order number		
		E = 3 kHz (10 k - 30 MHz band only)		
	Setting	Number/unit keys, data-knob, peak center key, or half-screen shift key		
1.3 Frequency span				
	Setting range and resolution	Following and 0 Hz (fixed tuning) in number/unit keys and following in data knob:		
		1 kHz/div to 200 kHz/div in 1 kHz increments		
		210 kHz/div to 2 MHz/div in 10 kHz increments		
		2.1 MHz/div to 20 MHz/div in 100 kHz increments		
		21 MHz/div to 200 MHz/div in 1 MHz increments		
		For span up/down keys: 1 kHz div to 200 MHz/div in 1, 2, 5, 10 sequence		
	Readout accuracy	±5% (200 MHz/div to 6 kHz/div)		
		±10% (5 kHz/div to 1 kHz/div)		
	Setting	Number/unit keys, data knob, or span up/down keys		

\*\* : MS710C only      \*\*\* : MS710C/D only

Table 2-2 (Continued)

1. Frequency (cont.)		
1.4 Start frequency/ Stop frequency	Setting range	Same as Center frequency (stop frequency > start frequency)
	Readout resolution	Minimum 10 kHz (MS710C/E), 1 MHz (MS710D/F) Depends on the Span (Span = Stop frequency - Start frequency)
	Readout accuracy	±(Center frequency accuracy + 2.5% of span)
	Setting	Number/unit keys or data knob
1.5 Marker	Normal	Frequency of the marker position displayed.
	Δ(delta)	Frequency difference between two marker positions displayed.
	Peak	Marker shows Peak Position and frequency displayed.
	MKR-CF	Marker frequency set to center frequency.
1.6 Resolution		
Resolution bandwidth (6 dB bandwidth)	Setting range	100 Hz to 3 MHz in a 1, 3, 10 sequence
	Setting	May be selected manually or automatically coupled to frequency span.
Selectivity (60 dB/6 dB)	≤ 10 : 1	
1.7 Stability (for fundamental mixing; center frequency ≤ 6.5 GHz)		
	Drift (typical)	30 kHz/1 H (initial), 2 kHz/10 min (after 1.5 hours warm-up)
	Residual FM	≤ 100 Hzpp/0.1 s (Span ≤ 50 kHz/div, 10 k - 30 MHz Band) ≤ 200 Hzpp/0.1 s (Span ≤ 100 kHz/div, other Bands)
	Noise sidebands	≤ -75 dB (1 kHz resolution bandwidth, 10 Hz video bandwidth, 30 kHz from signal)

Table 2-2 (Continued)

2. Amplitude	
2.1 Measuring range	Average noise level to +30 dBm
2.2 Display	
Graticule	Vertical 8 division, reference level top line of graticule
LOG	
10 dB/div	0 to -70 dB from reference level
5 dB/div	0 to -40 dB from reference level
2 dB/div	0 to -16 dB from reference level
1 dB/div	0 to -8 dB from reference level
LIN	12.5%/div
Linearity	±0.2 dB/1 dB, ±1.5 dB/70 dB
2.3 Reference level	
Setting range	-109 dBm to +30 dBm
Calibration output accuracy	-10 dBm ±0.3 dB (100 MHz ±10 kHz)
Reference level accuracy	±2.0 dB (Reference level -99 dBm to -10 dBm, frequency 100 MHz, 0 dB input attenuator, after calibration using CAL OUTPUT)
Input attenuator accuracy	Setting range 0 dB to 70 dB, 10 dB step Manual or automatic coupling to reference level can be selected
Error between steps	±1 dB (0 dB to 60 dB, 10 kHz to 2 GHz) ±2 dB (0 dB to 40 dB, 10 kHz to 23 GHz)
Error of maximum accumulation	±2.2 dB (0 dB to 60 dB, 10 kHz to 2 GHz) ±3 dB (0 dB to 40 dB, 10 kHz to 23 GHz)
Frequency response	With 10 dB input attenuator, and Preselector tuned to maximum response by peaking adjustment. ±1.5 dB (10 kHz start frequency, 30 MHz stop frequency) ..... 10 kHz to 30 MHz band ±2.5 dB (100 kHz start frequency, 10 MHz stop frequency) ±1.5 dB (10 MHz start frequency, 2 GHz stop frequency) ..... 100 kHz to 2 GHz band ±2.5 dB (1.7 GHz start frequency, 5.478 GHz stop frequency) ±3 dB (5.478 GHz start frequency, 12.521 GHz stop frequency) ±4 dB (12.521 GHz start frequency, 23 GHz stop frequency) ..... 1.7 GHz to 23 GHz band

Table 2-2 (Continued)

2. Amplitude (cont.)			
2.4 Marker			
	Normal	Level of the marker position displayed.	
	$\Delta$ (delta)	Level difference between two marker positions displayed.	
	Peak	Marker shows peak position and level.	
2.5 Dynamic range			
2nd harmonic distortion	Input frequency	Value obtained by subtracting input attenuator value from input level	2nd harmonic distortion
	10 kHz to 300 kHz	-40 dBm	< -60 dB
	300 kHz to 15 MHz (10 kHz to 30 MHz band)	-40 dBm	< -70 dB
	100 kHz to 10 MHz	-40 dBm	< -60 dB
	10 MHz to 200 MHz	-30 dBm	< -70 dB
	200 MHz to 850 MHz (100 kHz to 2 GHz band)	-30 dBm	< -80 dB
	850 MHz to 11.5 GHz (1.7 GHz to 23 GHz band)	-10 dBm	< -100 dB*
Two-signal 3rd inter-modulation distortion	Input frequency	Frequency difference of two input signals/ Value obtained by subtracting input attenuator value from input total level	Two signals 3rd intermodulation distortion
	10 kHz to 30 MHz	$\geq 50$ kHz/-40 dBm	$\leq -70$ dB
	100 kHz to 2 GHz	$\geq 2.5$ MHz/-30 dBm	$\leq -80$ dB
	1.7 GHz to 12.5 GHz	$\geq 70$ MHz/-10 dBm	$\leq -100$ dB*
	12.5 GHz to 23 GHz	$\geq 100$ MHz/-10 dBm	$\leq -100$ dB*
Residual response	< -90 dBm (0 dB input attenuator, 10 MHz to 6.5 GHz fundamental mixing, and 50 $\Omega$ termination)		
Average noise level	< -95 dBm (100 kHz to 1 MHz)		
	< -115 dBm (1 MHz to 2 GHz)		
	< -110 dBm (1.7 GHz to 6.5 GHz)		
	< -100 dBm (6.5 GHz to 12.5 GHz)		
	< -95 dBm (12.5 GHz to 18.5 GHz)		
	< -88 dBm (18.5 GHz to 23 GHz)		
	1 kHz resolution bandwidth, 0 dB input attenuator, and 3 Hz video bandwidth		

\* Less than specified level or average noise level



Table 2-2 (Continued)

2. Amplitude (cont.)	
2.6 Video bandwidth	1 Hz to 3 MHz, 1, 3, 10 sequence Manual or automatic coupling to frequency span can be selected
2.7 Input	
Connector	N-type (nominal 50 $\Omega$ )
Maximum input level	+30 dBm, dc $\pm$ 0 V
3. CRT display	
3.1 CRT	Display area 80 H x 100 W mm Display item Graticule, signal traces, function setting value, error message, and title
3.2 Signal traces	
Memory capacity	Horizontal 501 points, vertical 801 points, A and B channels, backed-up by battery
Display	NORMAL, MAX HOLD, AVERAGE, A channel-B channel
4. Function setting memory	Up to 10 sets of each function setting value saved and recalled. Memory list displayed on CRT, backed up by battery.
5. Sweep	
5.1 Sweep time	2 ms/div to 10 s/div. Manual or automatic coupling to frequency span, resolution bandwidth, and video bandwidth can be selected For 0 Hz frequency span, 2 $\mu$ s/div to 10 s/div with manual setting. When span $\geq$ 2.01 GHz, previously given time set, time not manually settable.
5.2 Trigger	Single, free run, line, video, and external trigger
6. Remote control	GP-1B (IEEE488, IEC625-1, 24 pins) All front panel functions (except power switch, CRT intensity, frequency calibration, level calibration, and trigger level adjustment knob) remote-controlled.
7. Direct plotting	CRT information plotted by specified plotter or printer
8. Power	** Vac $\begin{matrix} +10 \\ -15 \end{matrix}$ %, 50/60 Hz, $\leq$ 200 VA
9. Dimensions and weight	177 H x 426 W x 451 D mm $\leq$ 27 kg