



High-Speed Programmable  
Attenuator  
**MAT800**

**Ideal for evaluating the communication quality of mobile phones, wireless LAN, WiMAX, RF-ID, ETC / DSRC, and other wireless communication devices.**



**Compatible with Windows 7 / 10**

GP-IB and RS-232C  
Attenuation program creation software  
standard equipment

# Multi-functional full-scale programmable attenuator

## ① The arbitrary attenuation programs is possible

- 128k words built-in program memory
- Maximum 2μs switching (readout) speed
- Three readout modes of FREE, BURST and GATE
- Setup of hold off period by the number of clocks or by time

## ② The software for making attenuation program is a standard accessory

## ③ GP-IB and RS-232C are equipped as standard accessories

## ④ Five models are prepared for every frequency band

- model A : 1.5 to 4.5GHz
- model B : 3.0 to 9.0GHz
- model C : 4.5 to 12.5GHz
- model D : 1.95 to 5.85GHz
- model E : 750MHz to 2.25GHz

## ⑤ The maximum attenuation is 80dB

## ⑥ The minimum step size of attenuation is 0.05dB

### Attenuation mode

Select either manual setup or programmed setup.  
\*Refer to "Setting of attenuation".

### Attenuation

Set the attenuation. It is valid in the manual mode. 0 to 80 dB in 0.05 dB steps.

### Filter

Select switching response time of attenuator.  
\*Refer to "About a filter".

### Program length

Set program memory length. 8 to 131,072 words in one word step.

### Readout clock

Set readout clock of program memory. External clock and manual clock are available.

### Pause time

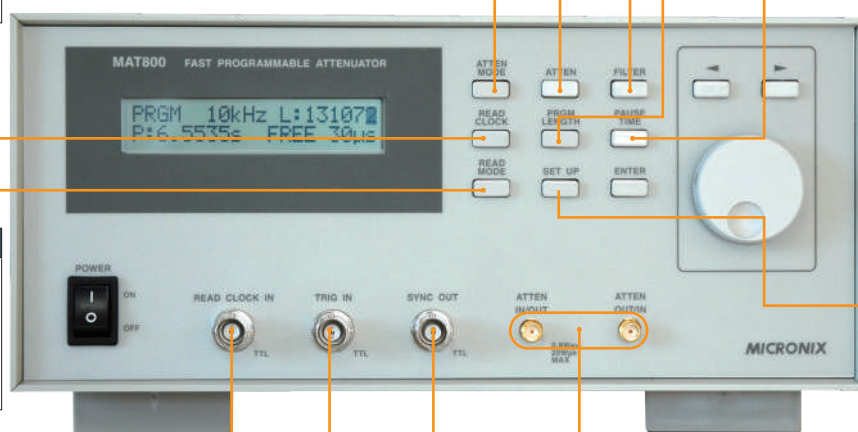
Set the pause period from reading the program memory once to the next reading.  
Set by the number of read clocks or time.  
\*Refer to "Setting of attenuation".

### Readout mode

Set readout method of program memory from Free, Burst and Gate.  
\*Refer to "Program readout mode".

### Setup

Set parameters of RS-232C or GP-IB.  
Performs level correction corresponding to the input frequency.



### Read clock input

A connector that inputs an external clock for reading program memory.

### Trig input

Connector for input of trigger signal for such read mode as Burst or Gate.  
\*Refer to "Program readout mode".

### Sync output

A signal synchronized with the top address of the program memory is output.  
\*Refer to "Program readout mode".

### Attenuator input / output

SMA connector for attenuator input / output.

## Setting of attenuation

Two methods are available for setup of attenuation ; manual or program. Select one by "ATTEN MODE".

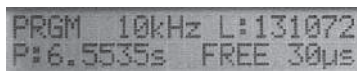
### Manual mode

Set the attenuation using the rotary encoder on the front panel. Alternatively, perform setup from outside using RS-232C or GP-IB. The setup parameters in manual mode are attenuation and filter only.

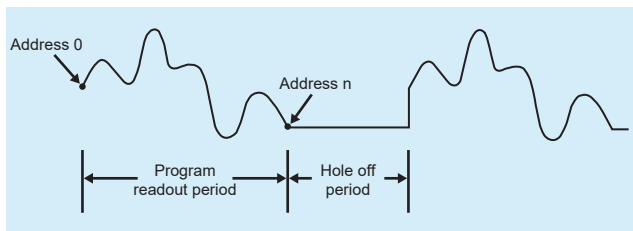


### Program mode

Read the memory storing attenuation data transferred from the computer. There are five parameters in the program mode ; readout clock, program length, hold-off period, readout mode and filter.



The program readout period is the period from address 0 of the memory to address n (set by program length). The program length can be set between 8 and 131072 words in one word step. When the program is read up to address n, the attenuation data at address n is held for the hold off period (set by number of readout clocks or by time), and on termination of hold off period, the memory is read out from address 0 again.



### About a filter

CR filter is inserted in the attenuation controlling line. Use when it is required to smooth the change at the moment of switching attenuation. However, it is necessary to pay attention to the relation with the readout clock. An appropriate filter value is normally 1/2 to 1/8 of the clock period.

## The method of a program

When it is necessary to use the program mode, input the program (waveform) on a Windows computer using "Software for making attenuation program", which is provided as a standard accessory. Then transfer this attenuation data to the memory of MAT800 using RS-232C or GP-IB. Readout clock, program length, hold off period, readout mode and filter are set from the computer. Of course it is possible to set by keys on the front panel. Connect external clock and trigger signal as required.

### ● Waveform creation

#### ① Standard waveforms input

The nine types of standard waveforms are prepared. They are sine wave, triangle wave, square wave, ramp wave,  $\sin X / X$ ,  $(1-\epsilon^{-\alpha X})$ ,  $\epsilon^{-\alpha X}$  white noise and DC.

#### ② Straight line input

Two specified points are linked together by means of a straight line.

#### ③ Arithmetic calculation input

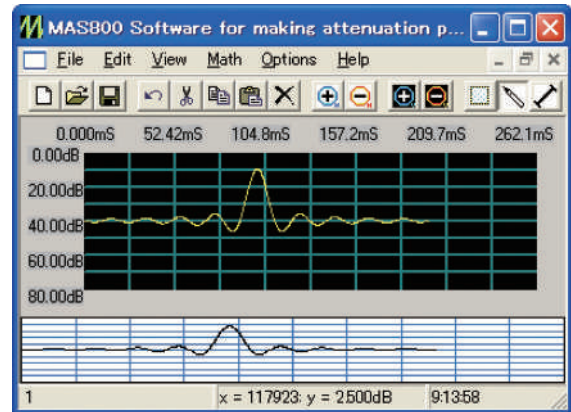
A waveform is created by arithmetic calculation of addition, subtraction, clipping, absolute, mirror, smoothing, resize and offset.

#### ④ One-point input

A waveform is created through input of one point at a time.

### ● Waveform editing and file management

Waveform editing and file management may be performed using CUT, COPY, PASTE and UNDO.



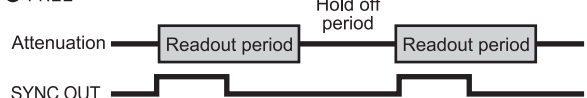
## Program readout mode

Three program readout modes are available ; Free, Burst and Gate. Readout is executed regardless of the trigger signal in the Free mode.

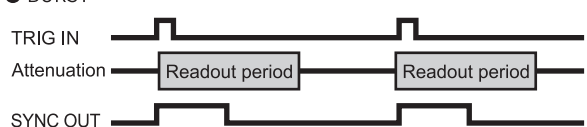
In the Burst mode, the readout of program memory is started at the rising edge of the trigger signal, the attenuation data of the terminating address is held until the next activation. Therefore, setup of the hold off period is not permitted in the Burst mode.

In the Gate mode, one set of the readout of program memory and hold off period is repeated while the trigger signal is of a high level. The last attenuation data is held when the trigger signal goes down to a low level and then address n of program memory is read out.

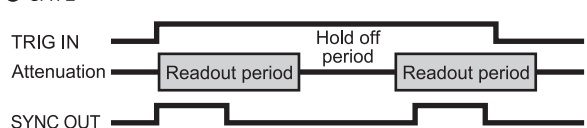
#### ● FREE



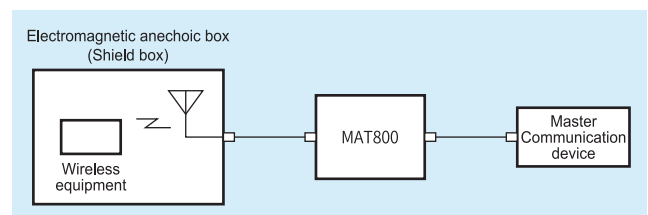
#### ● BURST



#### ● GATE



## Application - wireless communication quality test by changing transmission power



With wireless communication equipments, LTE, W-CDMA, CDMA, GSM, PHS, ETC/DSRC, Wireless LAN and Bluetooth, the transmission power changes due to obstacles and multi-paths besides theoretical space losses, when the radio wave is transmitted through the space. This changing pattern can be simulated using MAT800 and the communication quality can be evaluated. This changing pattern can be easily created using "Software for making attenuation program". It will be very convenient if our "Shielding box" is used for this test.

# Specifications

	model A	model B	model C	model D	model E
Frequency range	1.5 to 4.5GHz	3.0 to 9.0GHz	4.5 to 12.5GHz	1.95 to 5.85GHz	750MHz to 2.25GHz
VSWR (10dB ATT)	less than 1.5@2 to 4GHz less than 2.0@1.5 to 4.5GHz	less than 1.7@4 to 8GHz less than 2.2@3 to 9GHz	less than 1.8@6 to 12GHz less than 2.2@4.5 to 12.5GHz	less than 1.6@2.6 to 5.2GHz less than 2.1@1.95 to 5.85GHz	less than 1.5@1 to 2GHz less than 2.0@0.75 to 2.25GHz
Insertion loss (0dB setting)	less than 2.7dB@2 to 4GHz 2.9dB@1.5 to 4.5GHz (typical)	less than 3.5dB@4 to 8GHz 3.8dB@3 to 9GHz (typical)	less than 3.8dB@6 to 12GHz 4.8dB@4.5 to 12.5GHz (typical)	less than 2.8dB@2.6 to 5.2GHz 3.3dB@1.95 to 5.85GHz (typical)	less than 2.3dB@1 to 2GHz 2.6dB@0.75 to 2.25GHz (typical)

## Feature

Attenuator	
Setting range	0 to 80dB
Setting resolution	0.05dB
Accuracy	±0.5dB (0 to 10dB) <div> <div>at center of frequency range and +10dBm input</div> <div>           ±0.8dB (&gt;10 to 30dB)            ±1.0dB (&gt;30 to 50dB)            ±1.5dB (&gt;50 to 64dB)            ±2.0dB (&gt;64 to 74dB)            ±3.0dB (&gt;74 to 80dB)         </div> </div>
Impedance	50ohm nominal
Filter	1μs to 3ms, 1-3 step
Maximum input level	100mW @ CW or peak power
Input damage level	0.8W @ average power 20W @ peak power of 1μs pulse
Input / output connector	SMA
Readout clock input	
Input level	TTL level
Maximum frequency	500kHz
Input impedance	10kohm ±5%
Minimum pulse width	more than 200ns (both of high and low)
Input damage level	±20V (DC + ACpeak) max
Connector	BNC
Trigger input	
Input level	TTL level
Input impedance	10kohm ±5%
Minimum pulse width	more than 1μs
Input damage level	±20V(DC+ACpeak) max
Connector	BNC
SYNC output	
Output level	TTL level
Rise / Fall time	100ns以下
Output impedance	approx. 100ohm
Connector	BNC

## Functions

Attenuation mode	Manual and Program
Program mode	
Program length	8 to 131072words, (available for setting in one word step)
Readout clock	
Internal clock	100Hz to 500kHz, 1-2-5 step
External clock	DC to 500kHz
Manual clock	Due to pressing ENTER key
Hold off period	
Clock setting	0 to 65535 clocks of readout clock (available for each clock)
Time setting	0 to 6.5535sec (by 100μs step)
Read mode	Free, Burst, Gate
Backup of program	Program data is automatically saved when turning off.

## Software for making attenuation program

Effective OS	Windows 7/10
Making waveform	
Standard waveform	
Waveform type	Sine, Triangle, Square, Ramp, sinX / X, (1-ε <sup>-ax</sup> ), ε <sup>-ax</sup> , White noise and DC
Parameter	Data size, Attenuation (except DC), Offset, Cycle (except White noise and DC), Phase (°) (except White noise and DC), Duty ratio (%) (only Square wave), Zero cross (only sinX / X), Attenuation ratio ( (1-ε <sup>-ax</sup> ) and ε <sup>-ax</sup> )
Straight line	Link two points with line
Calculation	+, -, ×, Clipping, Absolute, Mirror, Smoothing, Resize, Offset
One point input	Input each point
Editing of waveform	Cut, Copy, Paste, Undo, Delete
File	New, Open, Close, Save, Save as, Data import, Data export, Print, Printer setup, Transmit, Exit

## Others

Display	LCD (20characters × 2columns)
Interface	
RS-232C	Standard Accessory
Baud rate	2400 to 57600bps
GP-IB	Standard Accessory
Address	0 to 30

## General

Operating temperature	0 to 40°C (Guaranteed at 23 ±5°C)
Operating humidity	less than 40°C / 80%RH (Guaranteed at less than 28°C / 80%RH)
Storage temperature	-10 to +60°C / less than 80%RH
Power Supply	90 to 132VAC / 180 to 250VAC (selectable by a switch located on rear panel)
Weight	approx. 4.5kg
Dimensions	260 (W) × 115 (H) × 360 (D) mm (excluding projections)

## Standard accessories

Instruction manual (1pc), Power cable (1pc), Fuse (1pc), CD for making attenuation program (1pc), RS-232C cable (1pc)

## Option

GP-IB cable	MI200 (2m)
Coaxial cable	MC201 (0.5m) MC202 (3m) MC203 (4m)
Attenuation data creation / control software & Trigger BOX	MAS801
BNC cable	MC314-1M

\*MICRONIX Corporation reserves the right to make change in design, specification and other information without prior notice.

**MICRONIX**  
MICRONIX CORPORATION

2987-2, KOBIKI-CHO, HACHIOJI-SHI, TOKYO 193-0934 JAPAN

TEL : +81-42-637-3667 FAX : +81-42-637-0227

URL : <http://micronix-jp.com>

E-mail : [micronix\\_e@micronix-jp.com](mailto:micronix_e@micronix-jp.com)

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