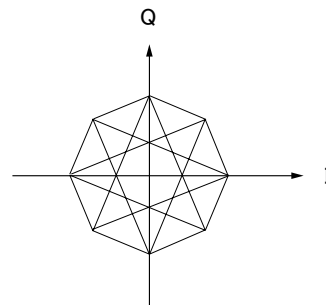


## Equipping with QPSK & ASK



ME9010 is based on ARIB STD-T75 and ARIB TR-T16.  
Moreover, ME9010 is RSU simulator equipping with QPSK and ASK modulation and supporting Profile 9 to 12.  
ME9010 is a necessary tool by all means to do Protocol test, Profile test, Dynamic motion test and Wireless system test of ASK OBE, QPSK OBE or ASK+QPSK OBE.



### Features

- ① ME9010 is based on ARIB STD-T75 and ARIB TR-T16 which are DSRC system regulations, and operates as a RSU (Road Side Unit).
- ② ME9010 is equipped with two modulations of ASK and QPSK.
- ③ ME9010 supports Profile 9 to 12 in ARIB STD-T75.
- ④ ME9010 is able to do a dynamic motion test and a wireless system test by controlling spectrum analyzer, fast programmable attenuator (MAT800), microwave AM detector (MMD850), digital oscilloscope and average power meter connected outside besides a basic operation test.
- ⑤ PC software MAS960 is used to control ME9010 and external equipment, and to display the test result.

## Specifications

### RF specifications

Item	ASK	QPSK	
Modulation form	ASK modulation by sprit phase code	$\pi$ /4QPSK modulation	
Transmission characteristics	Output level	-4dBm $\pm$ 2dB @CW "1", T12 output	-4dBm $\pm$ 2dB @all "1" at base band, average power, T12 output
	Output frequency	5.775, 5.780, 5.785, 5.790, 5.795, 5.800, 5.805GHz $\pm$ 5ppm	
	Occupied bandwidth	within 4.4MHz	
	Carrier off leakage power	less than 2.5 $\mu$ W	
	Adjacent channel power	less than -30dBc@5 $\pm$ 2.2MHz, less than -40dBc@10 $\pm$ 2.2MHz	
	Spurious radiation strength	less than 2.5 $\mu$ W	
	Signal transmission rate	1024kpbs $\pm$ 100ppm	4096kpbs $\pm$ 100ppm
	Radio wave strength emitted subordinately	less than 2.5 $\mu$ W	
	Modulation factor/accuracy	75 to 100%	less than 12.5%
Receiving characteristics	Receiving level range -32 to -53dBm@T6 input		

### Applicable test

Item	ASK	QPSK	Additional equipment	
Basic operation test	Protocol test (2-1-1) to (2-1-22)		ME8661A (with antenna)	
	Profile test communication profile 9 to 12			
Dynamic motion test	(2-2-1) to (2-2-3)		ME8661A (with antenna) MAT800 Average power meter	
Wireless system test (items relating to TRCC)	Antenna power	○	○	ME8661A (with antenna) Spectrum analyzer (with frequency counter) MAT800 Average power meter
	Carrier frequency	○	○	
	Occupied bandwidth	○	○	
	Carrier off leakage power	○	○	
	Adjacent channel power	○	○	
	Spurious radiation strength	○	○	
	Signal transmission rate	×	×	
	Radio wave strength emitted subordinately	○	○	
Wireless system test (items not relating to TRCC)	Modulation factor	○	×	ME8661A (with antenna) MMD850 Digital oscilloscope
	Modulation accuracy	×	○	ME8661A (with antenna) Spectrum analyzer (with modulation accuracy measurement)
	Receiving sensitivity	○	○	ME8661A (with antenna) MAT800 Average power meter
	Opening eye ratio	○	×	ME8661A (with antenna) MMD850 Digital oscilloscope

### General

Operating temperature	0 to 40°C (Guaranteed at 23 $\pm$ 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 60°C/80% RH
Power supply	90 to 110VAC, 50/60Hz
Dimensions	430(W) × 150(H) × 440(D)mm
Standard accessories	GP-IB cable (1), Power code (1), Fuse (1), Operating manual (1)

#### Note

- ※ **ME8661A** : Shield box, with transmission/receiving/reference antenna  
URL: <http://www.micronix-jp.com/english/Products/Electromagnetic%20anechoic%20box/me8661A/me8661A.html>
- MAT800** : Fast programmable attenuator  
URL: <http://www.micronix-jp.com/english/Products/Microwave%20series/MAT800/mat800.html>
- MMD850** : Microwave AM detector  
URL: <http://www.micronix-jp.com/english/Products/Microwave%20series/mmd850/mmd850.html>
- ※ TRCC : Technical Regulations Conformity Certification

◇ **Communication profile**

The contents about the communication profile of the profile test are shown in the table below.

It is important for OBE equipped with both of ASK and QPSK modulation to be able to be tested on the condition of Profile 11 at the basic operation test. ME9010 can perform this Profile 11.

Profile number		9	10	11	12
Modulation form	FCMC/ACTC	ASK	ASK	ASK	QPSK
	MDC/ACKC	ASK	ASK	QPSK	QPSK
Channel location		2	7	7	7

◇ **Measured frequency range of spurious radiation strength and radio wave strength emitted subordinately**

The measured frequency range of ME9010 itself at spurious radiation strength and radio wave strength emitted subordinately measurement is from 500MHz to 18GHz. However, when tested in the air connection in the shield box ME8661A, the measured frequency range is narrowed into the range of 2 to 18GHz due to the frequency characteristics of a spiral antenna.

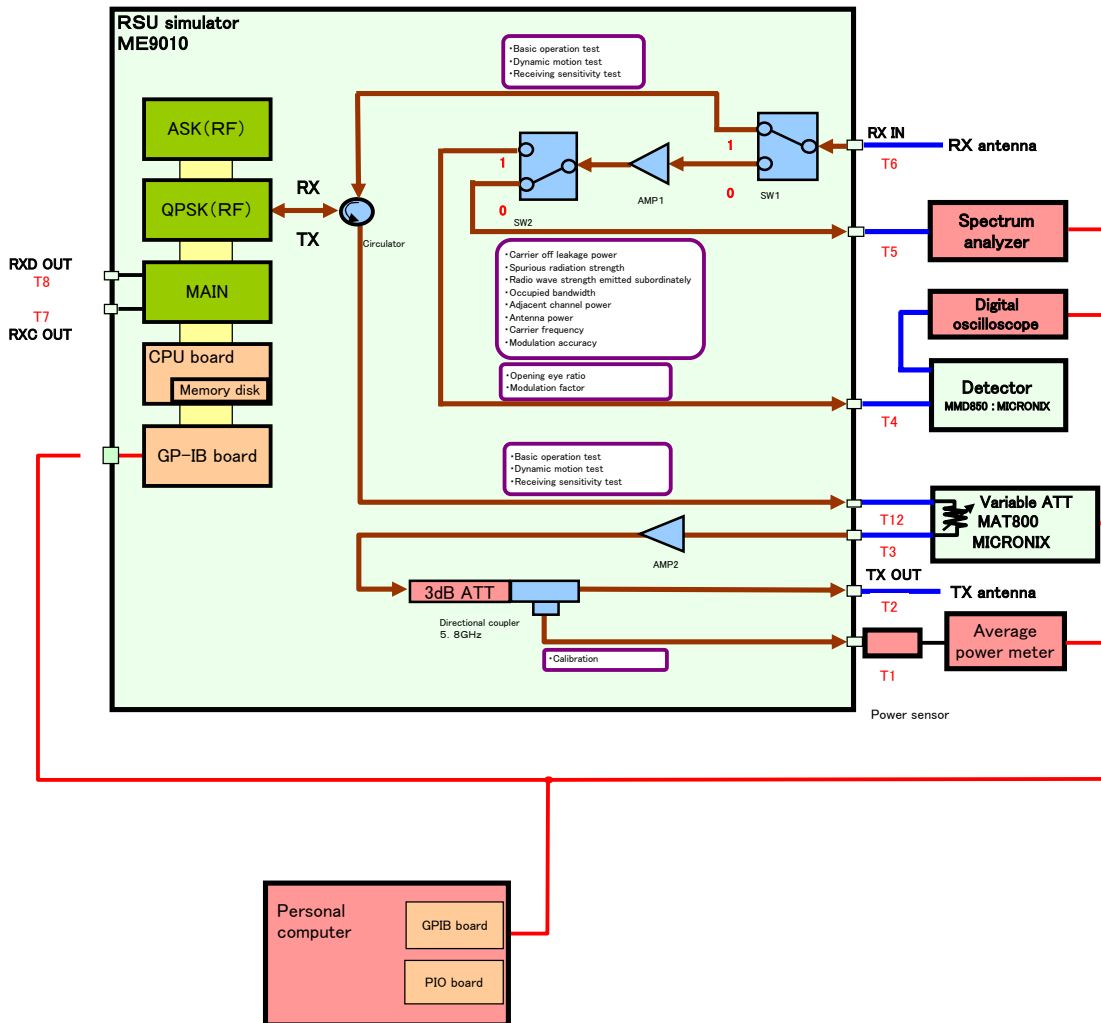
◇ **Receiving sensitivity measurement**

Through the sequence in which ME9010 transmits FCMC and receives ACTC correctly, the minimum transmission level is measured. A fast programmable attenuator (MAT800) is used to change the transmission level and an average power meter is used to calibrate the level. It should be noted that the receiving sensitivity measurement is not a method of BER (bit error rate) measurement.

## Explanation of equipment

The block diagram of ME9010 is shown in the figure below. According to the test items, some equipments are selected from among Spectrum analyzer, Digital oscilloscope, Microwave AM detector MMD850, Fast programmable attenuator MAT800 and Average power meter connected outside of ME9010. The details are described in "Additional equipment" of "Applicable test" in "Specifications".

The minimum system is for the basic operation test by the coaxial connection. The system is composed of ME9010, a personal computer and PC software MAS960.



ME9010 is equipped with the modulation/demodulation circuits of both of ASK and QPSK. ASK (RF), QPSK (RF) and MAIN shown in the block diagram correspond to these circuits. MAIN controls ASK (RF) and QPSK (RF).

The microwave relay SW1 and SW2 are switches to select the test item. SW1 is switched to "1" side at basic operation test, dynamic motion test and receiving sensitivity test. Don't care about "0/1" side of SW2 at these tests. At the wireless system test excluding receiving sensitivity test, SW1 is switched to "0" side. SW2 is switched to "1" side at opening eye measurement and modulation factor measurement, and "0" side at other tests or measurements.

The input level range of RX IN (T6 connector) at the basic operation test is  $-32$  to  $-53$ dBm, and the output level of T12 connector is  $-4$ dBm. The directional coupler is used to monitor the output level. At the self-check (refer to the ME9000), the gap from the calibration value is measured.

On the other hand, the communication with a personal computer is done through GP-IB. Therefore, it is necessary to install GP-IB board in a personal computer.

① Main screen for basic operation test

試験番号	試験項目	単試験	総合試験	結果
1	ACTC送信の確認	実行	○	OK
2	ACTC送信停止の確認-最大送信回数による停止	実行	○	OK
3	ACTC送信停止の確認-ACP1による停止	実行	○	OK
4	ACTC送信停止の確認-FCMC登録による停止	実行	○	OK
5	AIDによるアプリケーションの確認	実行	○	OK
6	ESTの受信	実行	○	OK
7	VSTの送信	実行	○	OK
8	通信プロファイルの確認	実行	○	OK
9	終了手順1	実行	○	OK
10	終了手順2	実行	○	OK
11	データの送受信	実行	○	OK
12	データの送受信-連続	実行	○	OK
13	データの送受信-重複リジェクト機能	実行	○	OK
14	データの送受信-OBE再送機能	実行	○	OK
15	データの送受信-OBE再送要求機能	実行	○	OK
16	WCNC送信機能	実行	○	OK
17	ぶくそ情報STAIによるACTCの制御	実行	○	OK
18	データの送受信-データの分割, 組立て処理	実行	○	—
19	終了手順3	実行	○	OK
20	リリスタイマ無効の制御	実行	○	OK
21	グループ同期の確認	実行	○	NG
22	一斉同期の確認	実行	○	NG

The single test is a mode that executes only one item of 22 items. When “Execute” of each test item arranged in the row of “Single test” is clicked, only the test item clicked is executed and the result is displayed.

Regarding the overall test, either of ○ mark (execute test) or × mark (not execute test) is selected in each test item, and then only the items with ○ mark are tested and the results are displayed when “Overall test start” or “Test start (T)” is clicked.

② Inspection data of basic operation test

試験項目	値	B	D	H
ACTC UW2(UW2A)	7cd2			
ACTC FID	01			
ACTC LID	71563412			
ACTC LRI	10			
ACTC CRC	c3d5			
周波数決定回数	4			
ACTC POS 1	4			
ACTC POS 2	1			
ACTC POS 3	3			
ACTC POS 4	2			
ACTC POS 5	1			
ACTC POS 6	4			
ACTC POS 7	1			
ACTC POS 8	0			
ACTC POS 9	5			
ACTC POS10	0			

The inspection data corresponding to each test item is displayed. B, D and H displayed at the right of the screen mean binary, decimal and hexadecimal number respectively.

The screen above shows the inspection data of the test number <2-1-1>(confirmation of ACTC transmission) as an example.