

SUPPORTING ETC AND ITS SPOT



■ **Save / Load of data**

Save each 100 data of WCN and electric field strength and load on screen.

■ **USB communication**

Transfer the save data to PC via USB communication.

■ **Easy operation**

There is no troublesome operation because of only one multidirectional switch.

Instrument description

The DSRC communication unit has four models as shown in the table below. Roughly, it can be classified into reading of WCN and electric field strength measurement. It also has the functions of save/load of data and USB communication.

Model	Function
ME9115A	Read WCN of On-board equipment (OBE) and display 12 digit ID number.
ME9115C	Measure the electric field strength of roadside unit (RSU) and OBE.
ME9115A+C	Compound instrument of ME9115A and ME9115C.
ME9115CN	Measure the electric field strength of RSU with the traveling vehicle. That of OBE can also be measured.

◆ **Reading of WCN**

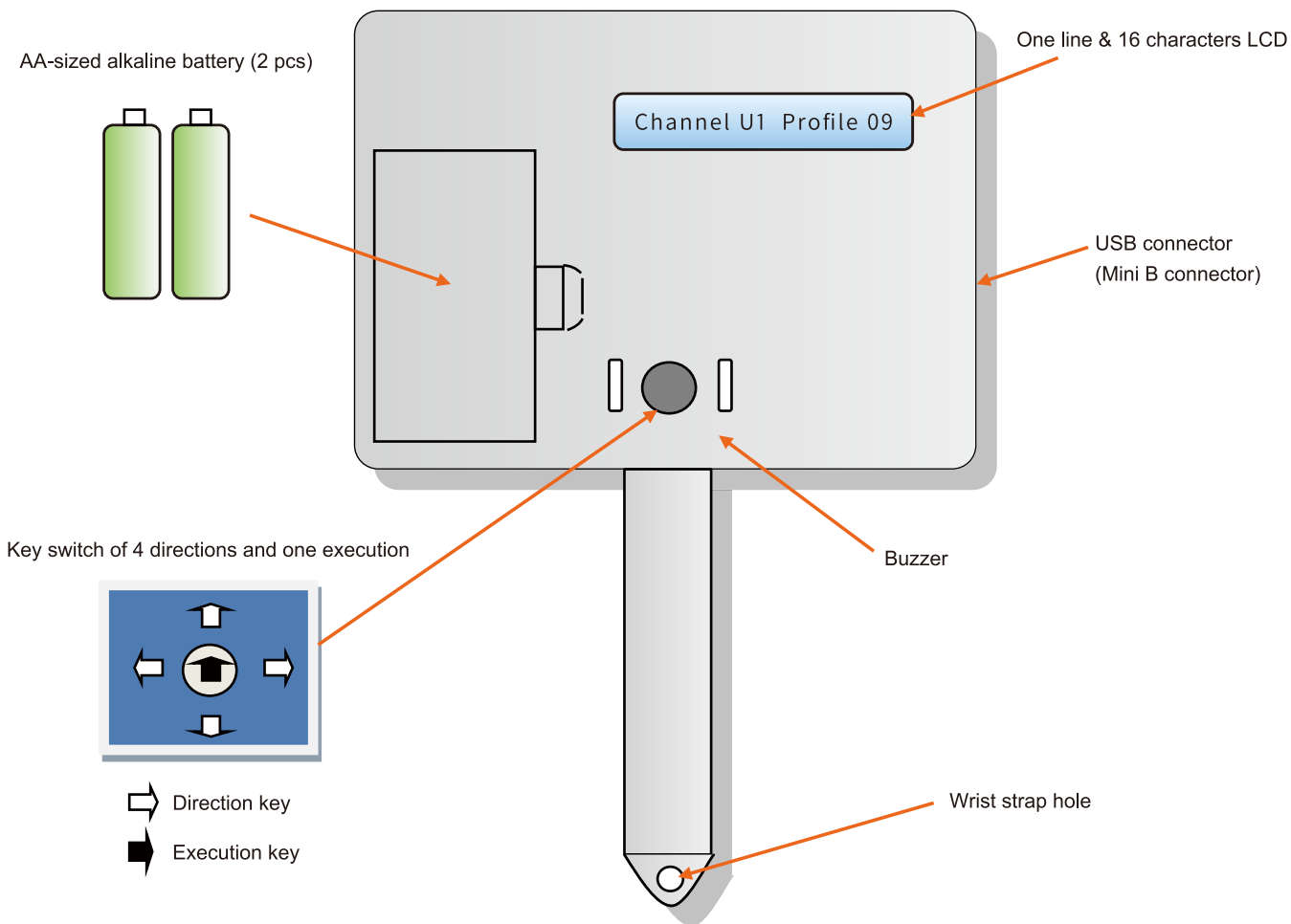
ME9115A and ME9115A+C have reading of WCN function. The following is a screen in which WCN is displayed. It can be applied to the parking lot management system and the visitor management system of automobile dealer.

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◆ **Electric field strength measurement**

ME9115C, ME911 A+C and ME9115CN have the electric field strength measurement function. It is possible to measure the electric field strength of RSU and OBE. The following is a screen in which the electric field strength is displayed.

U1 : -49.5dBmeirp



Electric field strength measurement

The electric field strength of both ASK and QPSK signal of both RSU and OBE can be measured.

Furthermore, the peak electric field strength at ASK and the average electric field strength in burst at QPSK can be measured even for burst wave which is operation wave. The measurement result is shown in the following screen.

U1 : -49.5 dBmeirp

Channel setting

Select one from each 7 channels of OBE or RSU.

OBE		RSU	
Channel	Carrier frequency(MHz)	Channel	Carrier frequency(MHz)
U1	5835	D1	5795
U2	5845	D2	5805
U3	5840	D3	5800
U4	5830	D4	5790
U5	5825	D5	5785
U6	5820	D6	5780
U7	5815	D7	5775

Profile setting

In the profile setting, select either ASK or QPSK. FCMC for RSU or ACTC for OBE is measured. Set one profile of P9 to P11 for ASK, and P12 for QPSK.

Item	P9	P10	P11	P12
RSU (FCMC measurement)	ASK	ASK	ASK	QPSK
OBE (ACTC measurement)	ASK	ASK	ASK	QPSK
Number of channels	2	7	7	7

Temperature setting

The measurement value of electric field strength depends on the temperature. By setting the ambient temperature, the correction by temperature is performed.

Temperature setting: $\leq 0^{\circ}\text{C}$, 0 to 15°C , 15 to 30°C , $> 30^{\circ}\text{C}$

It is 4 points above. Set according to the ambient temperature.

Electric field strength measurement for OBE

When measuring the electric field strength of OBE, ME9115 transmits FCMC and then the electric field strength of ACTC returned from OBE is measured. Therefore, it is not necessary to set the OBE to a special mode for measurement.

Electric field strength measurement by traveling vehicle

When measuring the ITS spot (RSU) while traveling by a vehicle on a highway, the measurement time such 3 seconds as ME9115C/A+C is too short.

In order to reliably measure the electric field strength with the traveling vehicle, ME9115CN continues the measurement from the start of the measurement until the next press of the execution key. However, the measurement time is 3 to 60 seconds, and the measurement is automatically terminated if the execution key is not pressed even after 60 seconds have passed.

Measured value

As for ME9115C/A+C, both RSU and OBE measure for 3 seconds, and as for ME9115CN, OBE measures for 3 seconds and RSU measures for maximum 60 seconds.

Tens of thousands of data are acquired during 3 seconds or 60 seconds, and then the maximum value among them is displayed. The maximum measured value can be obtained by measuring facing ME9115 to the object to be measured and changing direction or angle of it for 3 seconds or 60 seconds.

The measurement range is -35 to -80 dBmeirp. In addition, dBmeirp is used as unit of electric field strength according to ARIB standard. When converting the unit of electric field strength to $\text{dB}\mu\text{V}/\text{m}$, the following equation will be used.

$$\text{Electric field strength (dB}\mu\text{V}/\text{m)} = (\text{dBmeirp value}) + 152.5\text{dB} @ 5.81\text{GHz}$$

Reading of WCN

By using WCN (Wireless Call Number) which is the ID number attached to each OBE, it can be applied to parking lot management system, and visitor management system of car dealer and shopping center.

The read 12digit WCN is displayed as shown below.

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If it can't be read, it will be displayed as shown below.

Save / Load of data

Each maximum 100 data of WCN and electric field strength can be saved in nonvolatile memory.

The measurement data is automatically saved with either number of 00 to 99 each time of measurement.

As for WCN, if the same ID number has already been saved, it won't be saved. The load screen will be as follows.

38 -49.5dBmeirp

USB communication

Since ME9115 operates as a removable disk, the measurement data saved in the memory can be transferred to PC via USB interface. When ME9115 and PC are connected with USB cable, the following screen is displayed, and when the cable is removed, it returns to the original.

USB connected

In addition, the USB cable is attached as a standard accessory to all models of ME9115.

Buzzer sound

Regarding key operation, under test, test result or abnormality, the state can be confirmed with buzzer as shown in table below.

The state can be grasped by sound though the LCD screen is not watched during test.

State		Buzzer sound	
Key operation		One short sound	—
Under test		Short discontinuous sound	— — — — —
Test result	Pass	Soundless	
	Fail	Continuous sound	—————
Abnor-mal	Flat battery	Long discontinuous sound	— — — — —
	Carrier detection	Long & short discontinuous sound	— — — — —
	Equipment failure	3 short discontinuous sound and soundless	— — — — —

RSU carrier detection function

If there is a roadside unit (RSU) under operation nearby, it should not be affected from anything. So, ME9115 detects RSU carrier first, and the subsequent test will be stopped if a carrier exists.

The minimum carrier detection level is approx.-78dBmeirp. If a carrier is detected, the following screen is displayed. In this case, it should be confirmed whether RSU exists around. If it exists, the test should be performed further away.

However, in ME 9115 C/A + C/CN, this function does not operate only for RSU Electric field strength measurement.

Carrier sense

Battery remainder indication

The battery remainder is displayed at six levels on the right side of screen as shown in table below. Besides, the following screen is displayed in case of remainder 0%, and subsequent use is not available. Please exchange to new batteries. The alkaline battery will be recommended from a point of the capacity.

Battery exchange

Indication	Battery remainder
Battery exchange <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	0%
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	>0 to ≤10%
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	>10 to ≤35%
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	>35 to ≤60%
<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	>60 to ≤85%
<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	>85 to ≤100%

Self-check function

When execution key for test start is pressed, ME9100 performs read/write check of RAM in CPU and external RAM, and checksum of program ROM before test. If abnormal, the following screen is displayed and the subsequent operation is stopped.

Equipment failure

Setup power-off function

The setting values at the time of power-on are set to the values at the time of last power-off. Therefore, it is very convenient when carrying out test and measurement by the same setting.

Auto power-off function

The power supply is automatically turned off after approx.6 sec (approx.8 sec at DSRC OBE) from the test start. The battery life will be longer for this function. The number of test times is possible about 500 times with the alkaline dry battery.

Specifications

■ Transmission characteristics

Transmission frequency	5775, 5780, 5785, 5790, 5795, 5800, 5805MHz
Accuracy	within±5ppm
Transmission power	within -1.7±1.9dBmeirp@ASK : peak power, QPSK : average power within burst
Strength of spurious or unwanted emission	Spurious band : less than 2.5μW Out of band : less than 25μW Boundary frequency : carrier±12.2MHz
Occupied bandwidth	less than 4.4MHz
Adjacent channel leakage power	less than -30dBc@5±2.2MHz less than -40dBc@10±2.2MHz *ASK : peak power, QPSK : average power within burst
Carrier off leakage power	less than 2.5μW
Signal transmission rate	1024kbps@ASK 4096kbps@QPSK
Accuracy	within ±100ppm
Modulation factor /accuracy	more than 0.75@modulation factor(ASK) less than 10.0%@modulation accuracy(QPSK)

■ Receiving characteristics

Receiving frequency	5815, 5820, 5825, 5830, 5835, 5840, 5845MHz
Receiving sensitivity	approx.-48dBmeirp@front *ASK : peak power, QPSK : average power within burst only ME9115C/A+C/CN
Radio wave strength emitted subordinately	less than 2.5μW
Input damage level	+3dBmeirp@front

■ Communication characteristics

Modulation method	ASK, π/4QPSK
Communication profile	Supporting profile 9 to 12
Communication system	Half-duplex
Communication form	point-to-point(Communication with one OBE)
SAM	Without

■ Reading of WCN (only ME9115A/A+C)

Object of reading	OBE
Channel	7 channels
Profile	4 profiles

■ Electric field strength measurement (only ME9115C/A+C/CN)

Object of measurement	RSU and OBE
Measurement frequency	OBE : 5815, 5820, 5825, 5830, 5835, 5840, 5845MHz RSU : 5775, 5780, 5785, 5790, 5795, 5800, 5805MHz
Electric field strength	
Measurement range	-35.0 to -80.0dBmeirp @ front of ME9115
Measurement resolution	0.1dB

■ USB communication

Version	Corresponds to USB2.0
Transfer rate	Full speed
Connector	Mini B connector

■ Contents of test

A:Reading of WCN of OBE
C:Electric field strength measurement of RSU and OBE
A+C:Compound instrument of model A and model C
CN:Electric field strength measurement with the traveling vehicle

■ Other functions

• Save / Load of data
• Buzzer sound
• RSU carrier detection function
• Battery remainder indication
• Self-check function
• Setup power-off function
• Auto power-off function
• Temperature correction (only ME9115C/A+C/CN)

■ General

Display	One line & 16 characters LCD
Power supply	AA-sized alkaline battery(2 pcs)
Operating temperature	-10 to +45°C
Storage temperature	-20 to +65°C
Water resistance	JIS C0920 /class1equivalent (200mm height, precipitation 1mm / minute, 10 minutes dropping)
Dimensions	138(W)×101(H)×30(D)mm (excluding handle and projections)
Weight	approx.250g
Standard accessories	AA-sized alkaline battery(2 pcs), Operation manual