

Radiocommunication Testers

For PDC Mobile Radio Telephone, Income Testing and Production Line

R4860

- PDC standard, conforms to RCR-STD27B/C
- Characteristics tests of transmission and reception systems can be done with a single unit
- All-in-one unit is compact and lightweight (15kg)
- High speed measurements greatly reduce testing time
- One key operations and PASS/FAIL determination can be done by anyone
- Built-in function for providing detailed analysis when FAIL is generated
- Determination values can be freely set using user define function
- Common measurement interface equipped as standard



R4860

Digital Radiocommunication Tester

Car phones and portable phones are ushering in a new era through the appearance of digital systems.

Digital mobile radio which seeks to maintain talk channels and high service quality will become more than just a conventional communication method. Digital mobile radio systems are under investigation which make use of transmission speed features, to allow use as personal information terminals compatible with multimedia transmissions of data, pictures or other items. As this type of service becomes more and more intelligent, a rapidly increasing demand can be expected in future. R4860 Digital Radio Communication Tester is a compact and lightweight radio tester which can make automatic measurements of PDC telephone transmission and receiver system characteristics, both rapidly and with high precision.

■ Testing environment greatly improved by dedicated interface.

It has been developed so that it can be used by anyone, allowing complex operations to be done at the touch of a single key. The R4860 is ideal for all types of testing and troubleshooting of PDC telephones, such as in production, maintenance and income inspection.

■ Greatly improved test environment with the dedicated interface

The dedicated interface conforming to the "Digital Cellular Phone Common Measurement Interface Specifications Ver. 1.0" is built in as standard. This allows the R4860 main unit to execute measurements while controlling the PDC mobile phone, so that the test facility can be greatly simplified.

■ Main measurement specifications

<Tx measurement>

- Frequency error : $10 \text{ Hz} \pm \text{Reference source} \times \text{Set frequency}$
- Antenna power deviation : $\pm 0.5 \text{ dB}$
- Leakage power during carrier OFF : -65 dBm
- Power during rise/fall : $60 \text{ dB dynamic range}$
- Modulation accuracy measurement : $(1.0 + \text{read value} \times 3\%)\%$
- Adjacent channel leakage power : $-53 \text{ dB (50 kHz)}, -63 \text{ dB (100kHz)}$
- Signal transmission speed : $\pm 1 \text{ ppm}$

<Rx measurement>

- Receiver sensitivity (static)

<DC measurement>

- DC voltage, DC current, power measurement : $\leq \pm 2\%$

High speed measurement

The R4860 achieves high speed measurement and analysis of PDC digitally modulated signals through ADVANTEST's original signal processing technology.

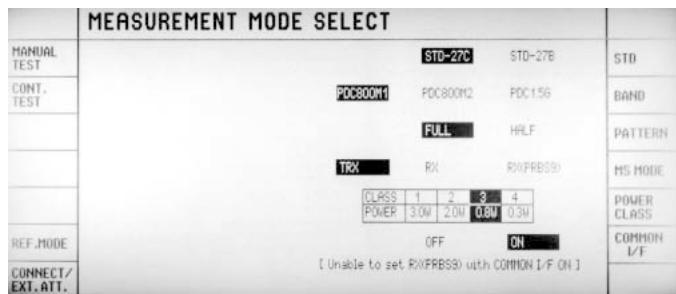
For example, measurement of the following 7 items is completed in approximately 10 seconds.

- Antenna power deviation
- Power leakage during carrier OFF
- Adjacent channel leakage power
- Occupied bandwidth
- Modulation accuracy (frequency, modulation accuracy)
- Transmitted signal rise/fall power

In addition to the measurement items above, Reception sensitivity it is also possible to measure the reception sensitivity, in-band spurious emission, signal transmission speed, original offset, and DC voltage/current.

Set to the PDC standard automatically

At power ON, the PDC standard RCR-STD27C basic conditions are automatic, so you can start measuring right away. You can change these conditions by using the STD, BAND, PATTERN, MS MODE and POWER CLASS software keys on the right of the display.



GO/NOGO test with PASS/FAIL display

Measurement results for each measurement item are compared with either the standard value, which is the initial setting or a user-specified value. If the values of all measurement items are within the values, PASS is displayed. If even one item is outside the specification range, FAIL is displayed. Also, measured results for all items are displayed as numerical values on the screen. The values of FAIL items are displayed in reverse.

START MEAS.	MANUAL TEST (Class 3 Max 29.0 dBm)	LISTOUT
POWER	POWER TX POWER: 27.8 dBm LEAK POWER: -72.5 dBm RAMP PROFILE: PASS	0 CH CHANNEL
ACP	ACP(-50kHz/+50kHz): -51.1 dB ACP(-100kHz/+100kHz): -64.7 dB	0 SLOT SLOT
SPURIOUS	OBW: 27.4 kHz SPURIOUS: DISABLE	CONNECT/EXT. ATT.
MODU.	MODULATION: FREQ. ERR. + VECT. ERR.: -573 Hz BIT RATE ERR.: -0.6 ppm	AUTO RANGING: OFF
RX TEST	RX TEST: BER: 0.22 % RSSI: 5.0 dBμ	MS INPUT LEVEL: 24.0 dBμ
DC MEAS.	DC MEAS.: DC VOLTAGE: 5.00 V RMS DC CURRENT: 0.995 A PEAK CURRENT: 1.00 A	MS INPUT LEVEL BER: 4.0 dBμ
		MS POWER CONTROL: 3W-8dB/2M-4dB

PASS/FAIL judgment value can be set freely

The user can set original determining values for all measurement items. This feature is extremely useful in tolerance tests of transmission/reception characteristics, shipping tests and acceptance inspections of radio main units. The set values are stored in the internal register when the unit power is turned off.

	MANUAL TEST	-CONFIG 1	
TX POWER REF.	29.0 dBm	(-5.0 * 35.0 ,0.1 dBm)	(20.0 * 50.0,0.1 kHz) 32.0 kHz
TX POWER UPP. LIMIT	0.8 dB	(0.0 * 20.0,1 dB)	(-70.0 * -60.0,0.1 dBc) -60.0 dBc
TX POWER LOW. LIMIT	-3.0 dB	(-5.0 * 0.0,0.1 dB)	(0 * 4000,1 Hz) +/- 280 Hz
LEAK POW. LIMIT	-6.0 dBm	(-6.5 * -6.0 ,1 dBm)	(0.0 * 20.0,0.1 %rms) 12.5 %rms
RAMP PROFILE			(0 * 10,1 ppm) +/- 5 ppm
ACP LIMIT (50kHz)	-45 dB	(-60 * -45,1 dB)	(0.0 * 10.0,0.1 %) 1.0 %
ACP LIMIT (100kHz)	-6.0 dB	(-6.5 * -6.0,1 dB)	
			OBW LIMIT
			SPURIOUS LIMIT
			FREQ. ERROR
			VECTOR ERROR
			BIT RATE ERROR
			BER LIMIT
			MORE

Measurement items can be changed arbitrarily

When doing automatic measurement, items to be measured can be freely selected. Items that are interrelated with other items or items whose reliability has already been established, for example, can be eliminated from measurement. Also, continuous measurement can be done of certain test items only.

	MANUAL TEST	-CONFIG 2	
TX POWER	POWER	TX POWER LEAK POWER RAMP PROFILE	BIT RATE ERROR
LEAK POWER	ENABLE DISABLE	ENABLE DISABLE	BER
RAMP PROFILE	SPECTRUM	ACP(-50kHz/+50kHz) OBW SPURIOUS	
ACP 50,100kHz	ENABLE DISABLE	ENABLE DISABLE	
OBW	MODULATION	FREQ. ERR. + VECT. ERR. BIT RATE ERR.	
SPURIOUS	ENABLE DISABLE	ENABLE DISABLE	
FREQ. ERR. VECT. ERR.	BER TEST	BER	

START MEAS.	DC SUPPLY MEASUREMENT	
	DC VOLTAGE: 5.00 V	PASS
	RMS DC CURRENT: 0.995 A	
	PEAK CURRENT: 1.00 A	

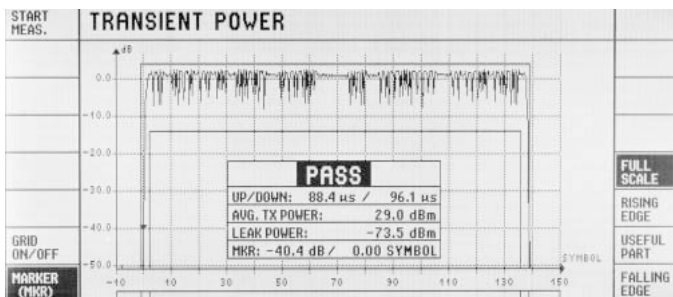
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R4860

■ Measures the power during the rise/fall time of a transmitted signal

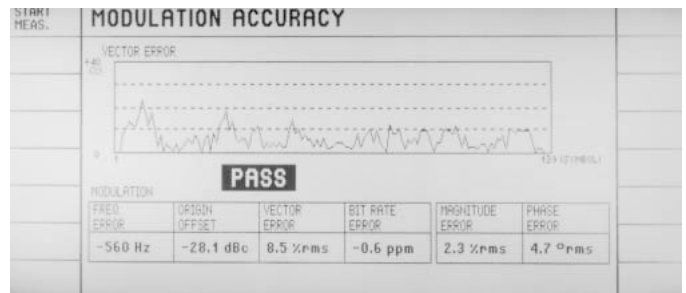
The R4860 does synchronous setting using the synchronous word demodulated from the RF burst modulated waveform of a PDC mobile radio. Using 1/4 symbols and a 0.1 dB resolution marker, precise waveform analysis is done. There is also a rise/fall expanded display function for more detailed analysis. Using the built-in measurement algorithm, rise and fall times can be read directly as numerical values.



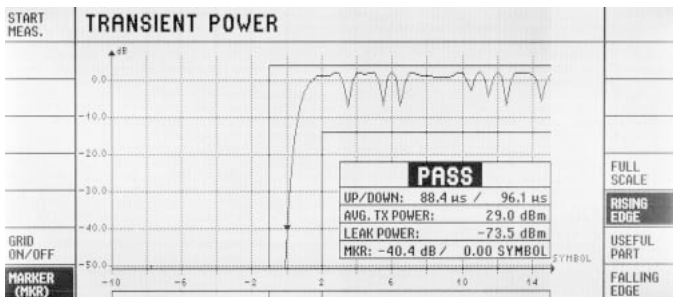
▲ TRANSIENT POWER measurement results

■ Measures modulation accuracy, frequency, origin offset and signal transmission speed.

Graphically displays the relation of symbol points and vector errors in the RF burst modulated waveform of a PDC mobile radio. At what part of the burst signal the characteristic deteriorating can be read directly. Also, for carrier frequencies that are within ± 4 kHz of the absolute frequency, measurement is done as a modulated wave.



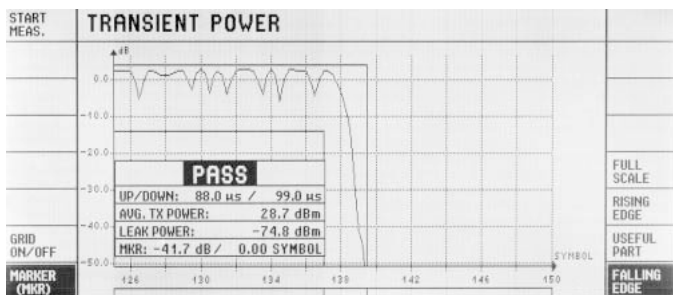
▲ MODULATION ACCURACY measurement results



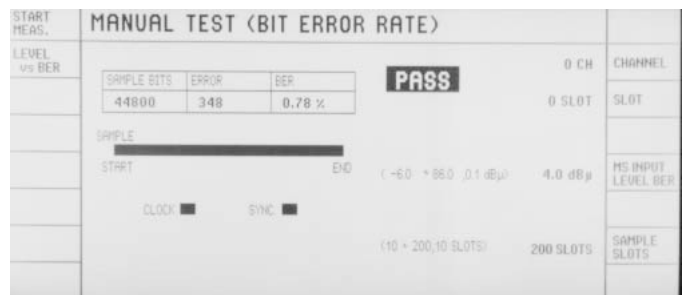
▲ Rise time expanded display

■ Measures the reception sensitivity.

For receiver tests, the evaluation bits can be set in the range from 2,240 to 44,800 bits. Wide range tests are possible, with a measurement range of 0 to 10%, and 0 to 25% after synchronization. By choosing the bit error rate per level function, measurement can be done automatically in the neighborhood of the standard sensitivity (+13 to -6dBuV) in 1dB steps. Since there are two output ports, testing of antenna 1 and 2 systems can be done at the calibrated level without using an external switching element.



▲ Fall time expanded display



▲ BIT ERROR RATE measurement results

Specifications

Receiver measurement port

RF Signal Generator

Frequency :

Frequency Range: 810 to 828 MHz
834 to 843 MHz
860 to 885 MHz
1477 to 1501 MHz

Frequency Resolution : 25 kHz

Frequency Accuracy : same as time base × setting frequency

Level :

Level Range: RF IN/OUT +86 to -6dBμ (-27 to -119dBm)

RF OUT2 0 to -70dBm

Level Resolution: RF IN/OUT 0.1dB

RF OUT2 0.1dB

Level Accuracy: RF IN/OUT ± 1.5dB

RF OUT2 ± 2.0dB

Modulation :

Carrier offset : ≤25dBc

Modulation Accuracy : ≤4.0% rms

Pattern : RCR STD27

Signal Purity :

Adjacent Leakage power :

	15 to 45°C	0 to 15°C
offset 50kHz	≤-53dB	≤-50dB
offset 100kHz	≤-63dB	≤-60dB

Harmonic : ≤-20dBc

Non Harmonic : ≥400MHz ≤-20dBc
<400MHz ≤-48dBc

Bit Error Rate

Synchronous Range : 0 to 10%

After Synchronous Range : 0 to 25%

Resolution : 0.01%

Bit Length : 2240 to 44800

Input Transmission Rate ≤50 kbps

Transmitter measurement port

Frequency :

Frequency Range : 889 to 898 MHz
915 to 958 MHz
1429 to 1453 MHz

Setting Frequency Resolution : 25kHz

Setting Frequency Accuracy : same as time base × setting frequency

Level :

Level Range : RF IN/OUT +5 to +37 dBm

RF IN2 -20 to -2 dBm

Level Accuracy : RF IN/OUT ± 0.5dB (+25 ± 10°C)

RF IN2 ± 1.0dB (+25 ± 10°C)

Leakage Power Measurement during carrier off period :

Measurement Range : -40 to -65 dBm RF IN/OUT
-50 to -75 dBm RF IN2

Measurement Accuracy : ± 2.0 dB

Measurement Resolution : 0.1 dB

Adjacent Leakage power measurement :

Measurement Range :

offset 50 kHz ≤-53dB

offset 100 kHz ≤-63dB

Measurement Accuracy : ± 2dB

Measurement Resolution : 0.1dB

Time Domain Measurement :

Measurement Resolution : 1/4 symbol (12μsec)

Dynamic range : 60dB (+4 to -56dB)

Modulation Measurement :

Frequency Measurement Range : ≤± 4kHz

Frequency Measurement Accuracy :

10Hz + same as time base × setting frequency

Frequency Measurement Resolution : 1Hz

Modulation Measurement Accuracy :

Reading ≥ 2%rms	(1.0+Reading × 3%)%rms
Reading <2%rms	(2.0+Reading × 3%)%rms

Modulation Measurement Range : 0 to 30%

Modulation Measurement Resolution : 0.1%

Origin Offset : ±2dB (at -25dBc)

Transmission Bit Rate Error Measurement :

Measurement Range : ≤ ± 5ppm

Measurement Accuracy :

± 1ppm + same as time base × setting frequency

Measurement Resolution : 0.1ppm

Input Impedance : 50 Ω VSWR ≤1.3

Spurious Measurement :

Measurement Frequency Range : 915 to 956 MHz

1429 to 1453 MHz

Measurement Level Range : ≥(-60 to -67 dBc)

Measurement Level Accuracy : ± 3.0dB

Measurement Resolution : 0.1dB

D.C Measurement

D.C Voltmeter :

Measurement Range : 0 to ± 30V

Measurement Resolution : 10mV

Measurement Error : ± 2% + Resolution

D.C Ammeter :

Measurement Range : 0 to ±10A

Resistance : 50mΩ

Measurement Resolution :

Averaging Measurement : 0.1mA

Peak Measurement : 0.1mA

Residual Indication : ≤10mA (at +25°C)

Measurement Error : ≤2% + Residual Indication + range error

Measurement Current	Range Error
0 to 1.0A	1mA (Averaging)
1.0 to 10.0A	10mA (Averaging)
0 to 10.0A	10mA (Peak)

Common-Mode Rejection : ± 30V

Time base OCXO

Frequency Drift in Temperature : ≤1 × 10⁻⁷ (0 to 50°C)

Aging : ≤2 × 10⁻⁷/year, ≤5 × 10⁻⁹/day

After 30days of operation

Warmup Time : Approx. 5min (at 25°C)

DISPLAY

Display : Large LCD (With Back Light)

640 × 200Dots (With Contrast)

EXT. INTERFACE

GPIB : IEEE-488

Centronics : 25pin

Data input : BNC, ≤50kbps

Clock input : BNC (CMOS Level)

GENERAL

Rated Temperature Range : 0 to 45°C

Storage Temperature Range : -40 to +60°C

Power Supply : 100 to 120V (AC) ± 10%

200 to 240V (AC) ± 10%

48 to 420Hz

Power Consumption : ≤145VA

Dimensions : 435mm(W) × 192mm(H) × 363mm(D)

Mass : ≤15.0kg