ML8720C

Area Tester

W-CDMA: 2110 to 2170 MHz
GSM: 925 to 960 MHz, 1805 to 1880 MHz

For W-CDMA and GSM Base Station Area Investigation and Maintenance

For Performing Area Tests and Maintenance of W-CDMA and GSM Base Stations

The ML8720C Area Tester is a convenient battery powered measuring instrument with an 8.4-inch color display used for standalone measurements such as coverage area and other indoor measurements. Because of its excellent hardware performance, it can be used to for accurate area-coverage tests even in severe measurement environments with high interference because it can obtain radio wave carrier characteristics with high reliability.

When used in combination with the optional Two Carrier Measurement Function and GSM Measurement software, either two W-CDMA base stations on different frequencies or a W-CDMA plus a GSM base station can be measured simultaneously. The data collection efficiency for functions such as coverage testing is greatly improved compared to earlier products, and since the radio wave environment can be analyzed at the same time, the ML8720C is also very useful for fault analysis.

Furthermore, installing the BCH Demodulation Software option permits confirmation of cell traffic data and base station settings, offering support for discovering base stations with insufficient traffic capacity, and preventing configuration errors.

Simultaneous W-CDMA and GSM Measurement
Installing the optional ML8720C-03 Two Carrier Measurement Function and the MX872004C GSM Measurement software enables simultaneous W-CDMA and GSM measurement. The data collection efficiency for functions such as coverage testing is greatly improved compared to earlier products, and since the radio wave environment can be analyzed at the same time, the ML8720C is also very useful for fault analysis.

Simultaneous Measurement of Two Carrier Frequencies and Diversity function
By using the ML8720C-03 Dual Channel Measurement Function option, two carrier frequencies can be measured simultaneously.

The diversity function separates W-CDMA transmission diversity formatted signals for each transmission antenna so that the RSCP of the CPICH can be measured.

Checking Broadcast Information by BCH Demodulation
For W-CDMA measurement, BCH data can be obtained via the MX872002B application software without using the UE. Since the uplink interference power corresponding to the measured CPICH value is displayed in real time, cell traffic data can be checked. And since all SIBs (System Information Blocks) are supported, it is possible to check whether the base station parameters are set as designed.

Standalone Operation
An external control PC is not required. Basic measurements and data collection can be performed by using only the ML8720C mainframe. Of course, the system can be extended in combination with area analysis software.

Handy Type
At only 4 kg, the ML8720C is easily portable for both outside and inside work. An 8.4-inch transparent color TFT-LCD display has been incorporated.

Indoor Measurement Support
Useful functions are provided for indoor measurement use: fixed-point measurements for saving the data of specific measured points, the addition of comments to measured data, and the automatic naming of data files before saving them.

3-hour Battery Operation
In the standard configuration, the lithium-ion battery pack provides 3 hours of operation and a spare battery pack solves even long-term measurement problems.

High-speed and High-accuracy Area Analysis
RSCP, Ec/No, and SIR can be measured at 30 cm intervals (using specified base station and single-channel measurements) while travelling at 100 km/h in a monitoring vehicle to provide fast and accurate area analysis.

High-speed Search with SCH
When SCH search is selected in unspecified base station mode, CPICH can be searched at high speed using the same SCH search method as a UE. As one measurement example, 10 channels are searched for 4 sec on average and then the measurement is started.
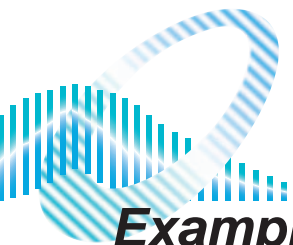
Correlation with GPS Positioning Data
The measured data can be correlated with GPS positioning data (latitude and longitude) and saved to a memory card. In addition, the measured data and positioning information can be downloaded in real time to an external PC via the RS-232C interface.
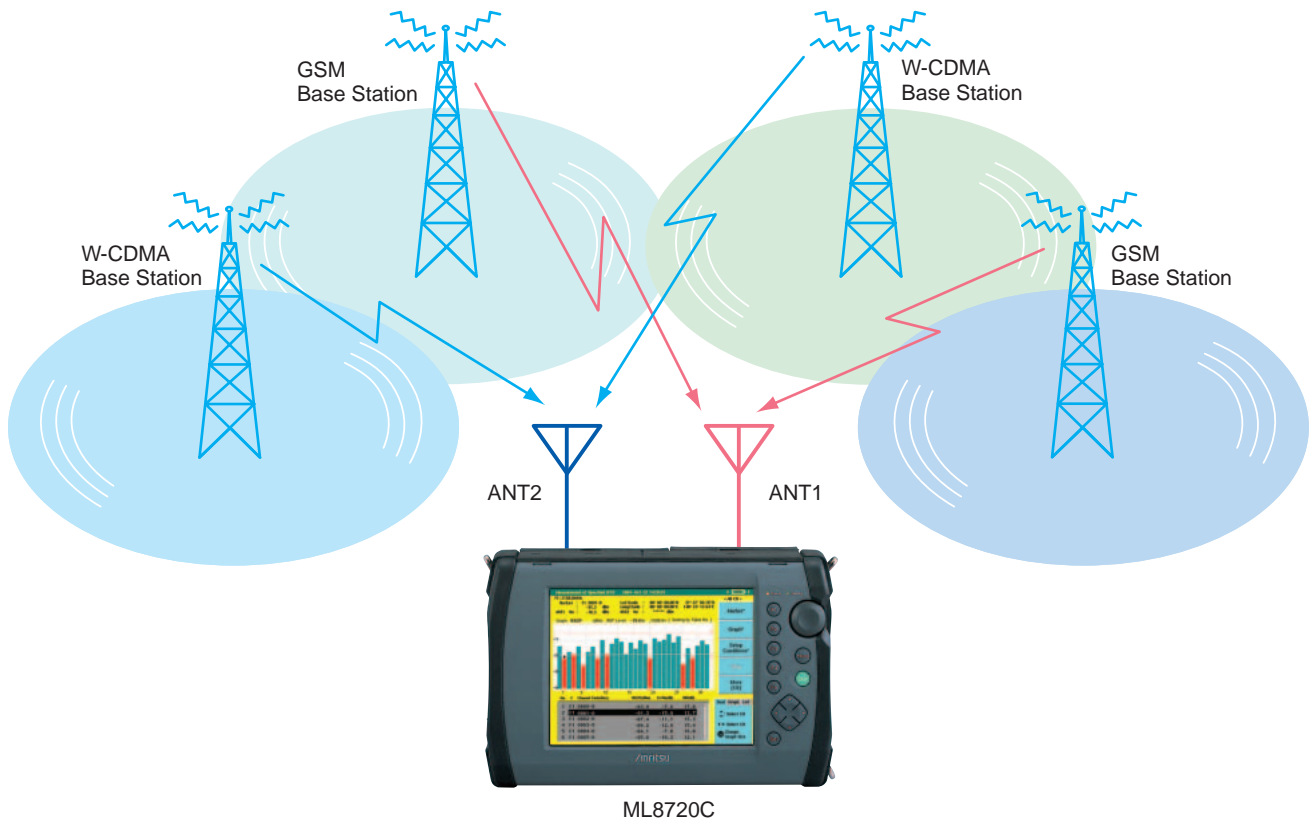
Specific Distance Measurement Using Car Speed Pulses
When a car speed pulse is used as an external trigger, measurements can be performed at specific distances. The measurement period can be designated by the pulse count or distance when measuring using the external trigger.
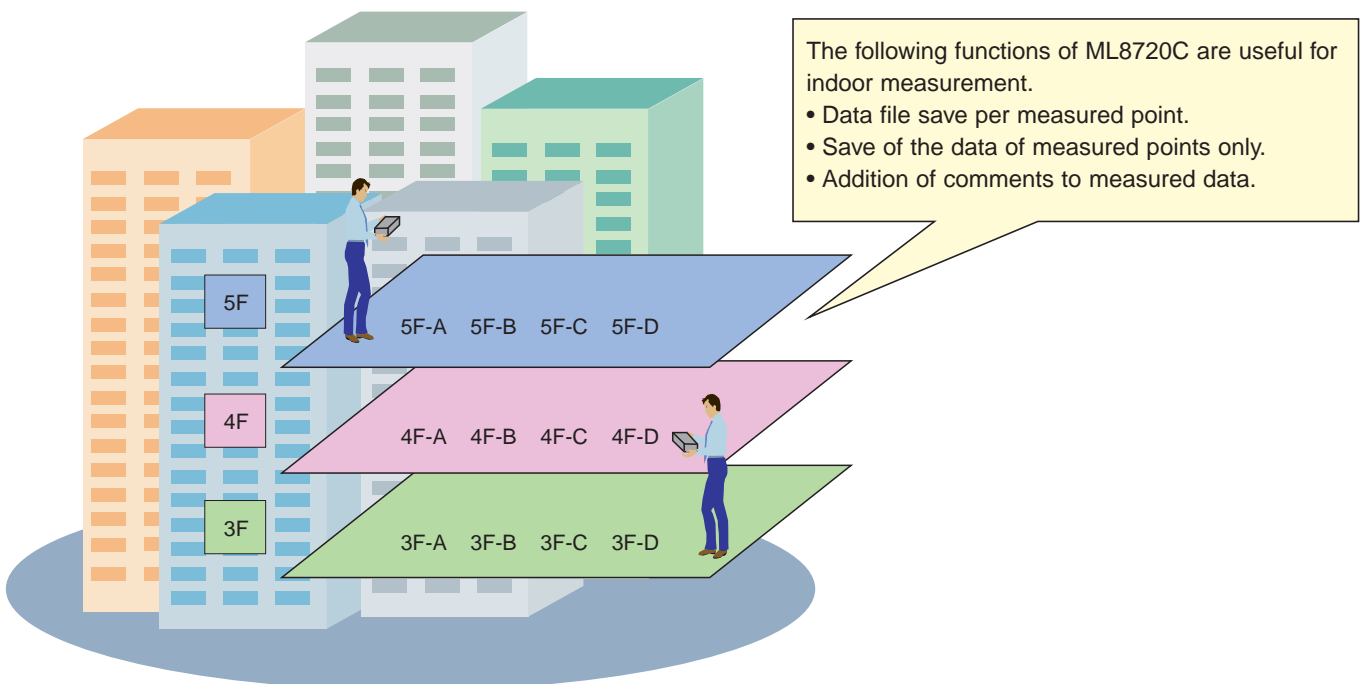
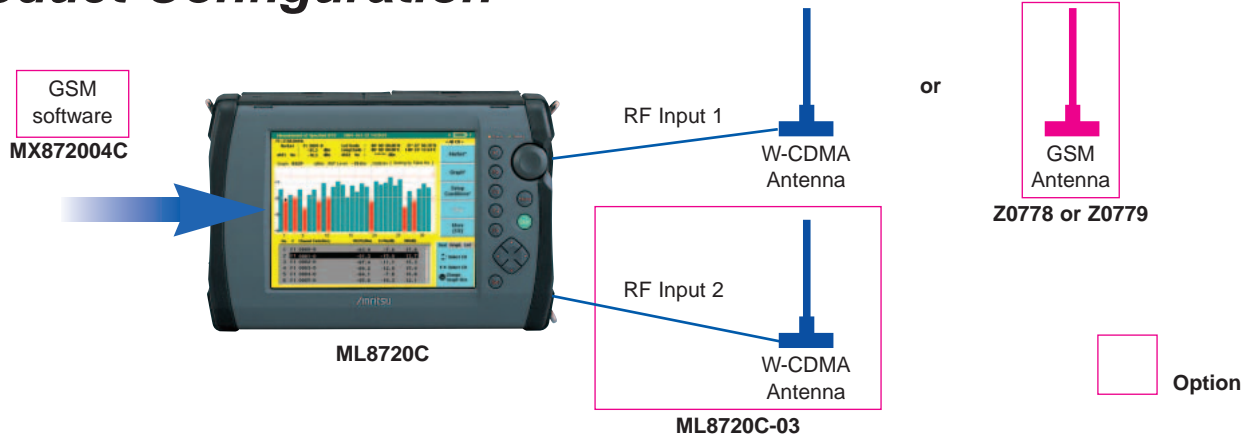# *Example of Use*

Simultaneous Measurement Image of W-CDMA, GSM

GSM
Base Station

W-CDMA
Base Station

W-CDMA
Base Station

GSM
Base Station

ANT2

ANT1

ML8720C

Indoor Measurement (Image)

The following functions of ML8720C are useful for indoor measurement.
- Data file save per measured point.
- Save of the data of measured points only.
- Addition of comments to measured data.

5F

4F

3F

5F-A 5F-B 5F-C 5F-D

4F-A 4F-B 4F-C 4F-D

3F-A 3F-B 3F-C 3F-D

Product Configuration

GSM
software
MX872004C

or

RF Input 1

W-CDMA
Antenna

GSM
Antenna

Z0778 or Z0779

ML8720C

RF Input 2

W-CDMA
Antenna

Option

ML8720C-03

Required option list

	ML8720C	ML8720C-03	MX872004C	Z0778 or Z0779
W-CDMA (1 carrier)	Required			
W-CDMA (2 carrier)	Required	Required		
W-CDMA or GSM selectable	Required		Required	Required
W-CDMA and GSM simultaneously	Required	Required	Required	Required

ML8720C　　　Area Tester
ML8720C-03　Two Carrier Measurement Option
MX872004C　GSM Measurement Software
Z0778　　　　900 MHz/1800 MHz Whip Antenna
Z0779　　　　900 MHz/1800 MHz Vehicle Antenna

W-CDMA + GSM Measurements

Simultaneous W-CDMA and GSM Measurements

When the optional ML8720C-03 Two Carrier Measurement
Function and the MX872004C GSM Measurement software
are installed, W-CDMA and GSM measurements can be
performed simultaneously with the measurement results
displayed on a single screen.
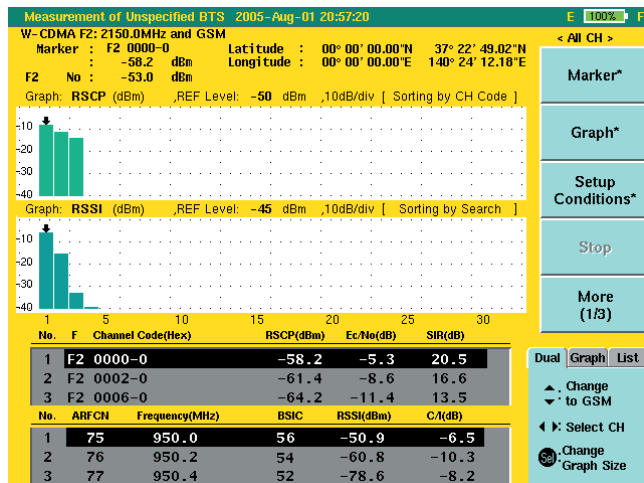
W-CDMA x 2 Measurements

### Two Carrier Measurement Screen Display (All Channels)

When the optional ML8720C-03 Two Carrier Measurement
Function is installed, up to 32 channels for two W-CDMA
base stations using different frequencies can be measured
separately.
Since multiple carriers of the same company can be mea-
sured simultaneously, the measurement efficiency is
improved. Moreover, carriers of other companies can be
measured simultaneously for benchmarking purposes.
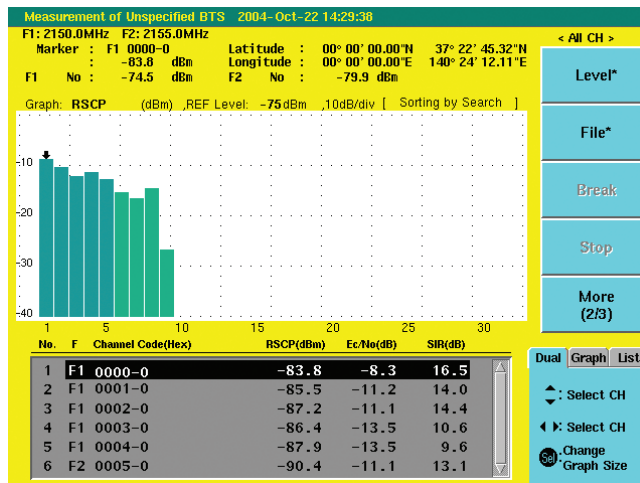
Unspecified Base Stations

Receiving CPICH channels are searched for and RSCP, Ec/No, and SIR are measured for a maximum of 32 channels. The search method can be either the same SCH method used by the UE or the Primary CPICH (P-CPICH) method, which searches up to 512 types of P-CPIC in sequence. Moreover, by using the hybrid measurement function for measuring the searched CPICH and preset scrambling code CPICH, known channels can be measured while discovering and measuring other receiving channels.
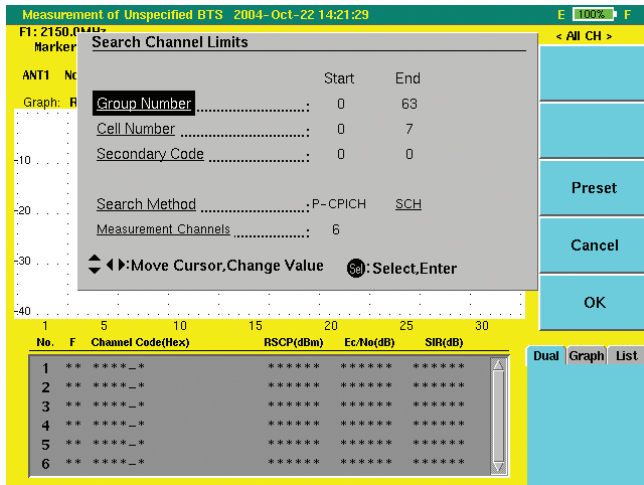

Specified Base Station

A maximum of 32 P-CPICH and Secondary CPICH (S-CPICH) channels can be specified and RSCP, Ec/No, and SIR can be measured in the same way as unspecified base stations.
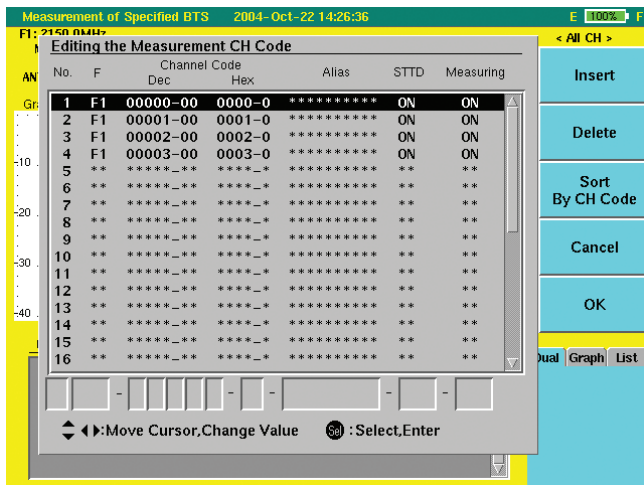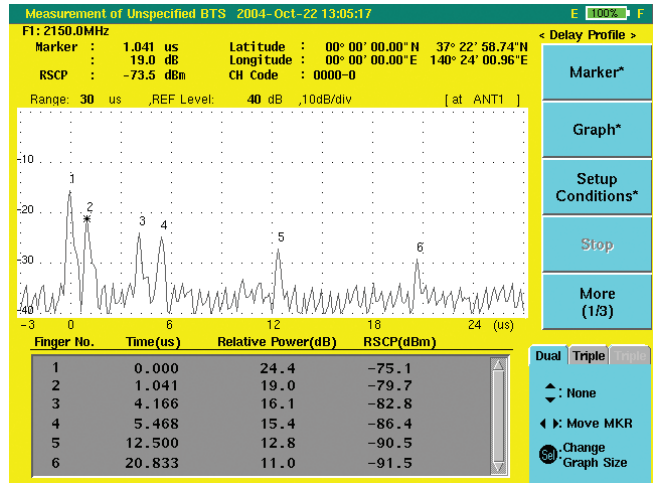

Channel Display

The measurement results for all receiving channels (32 max.) are displayed simultaneously as a graph and data table. In addition, it is possible to set both the measurement interval and the type of cumulative calculation (max., min., median, mean) for data saved within that interval.
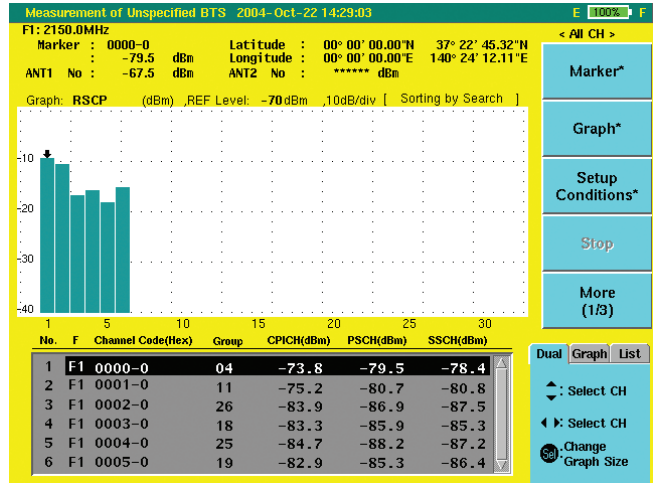

Delay Profile Display

This function measures the delay profile of the selected channel to confirm the multipath delay time and relative level.

Finger Display

This function displays the measurement results for each selected channel path (finger). When option 03 or 23 is installed, the RSCP of up to 12 paths can be evaluated simultaneously.

When each Finger data output is enabled and measured, the RSCP for each finger of all channels can be output during measurement. This is useful for analyzing multipath environments and for indoor simulation based on obtained data.
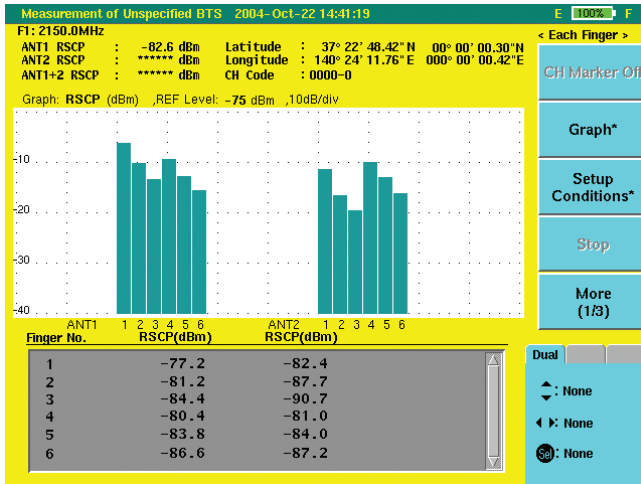

Time/Distance Variation Display

For measuring a specified base station, any of up to 6 channels can be selected. For unspecified base stations, the RSCP, Ec/No, or SIR time/distance variation can be displayed for the 6 channels with the highest reception level. The time variation is measured at 10-ms intervals and the max., min., median, and mean values are displayed for the results totalled over 10 ms to 500 s. The distance variation is measured using a speed pulse (external trigger) and the max., min., median, and mean values are displayed for the results totaled over 1 to 500 measurement times.
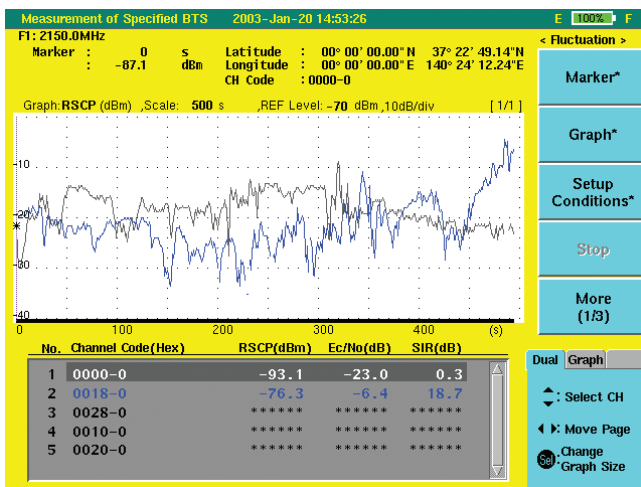

SCH Delay Profile Display

The relative delay condition between each base station is displayed by using the P-SCH correlation value. This can be used to check the frame timing delay between base stations and the overlap conditions. The group number is displayed at the top of the graph to identify the base station. The horizontal axis can display either time or chip count.
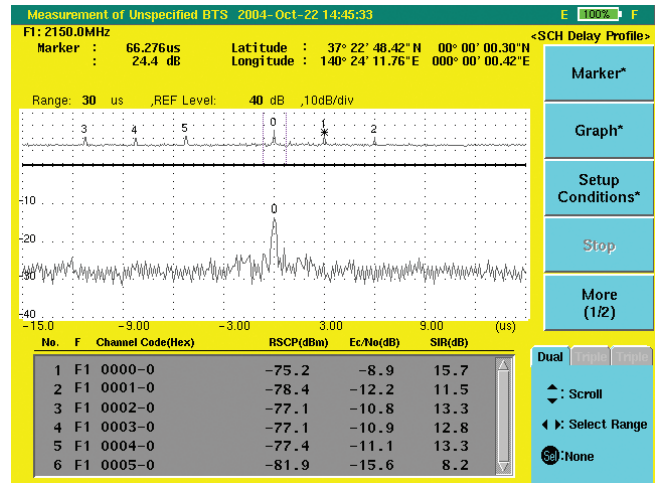
## Fixed Distance Measurement using Auto Speed Pulse

When the speed pulse from an automobile is used as an input trigger, measurement data can be obtained at fixed distance intervals. When the previous speed pulse generation interval is calibrated using the external trigger calibration function, the required distance interval for the measurement cycle can be set directly instead of setting the pulse count.
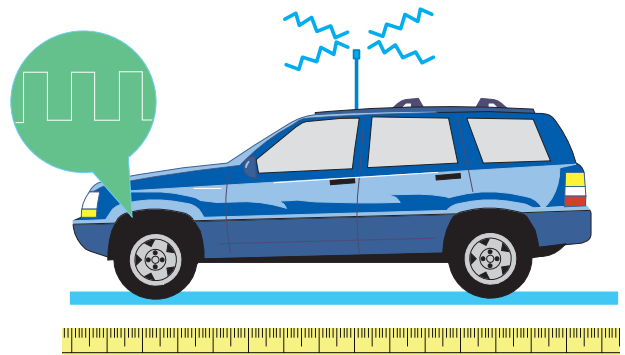
External Trigger Calibration

Using this function, the number of pulses input from the external trigger is counted and the pulse rate and pulse interval are computed from the run distance.
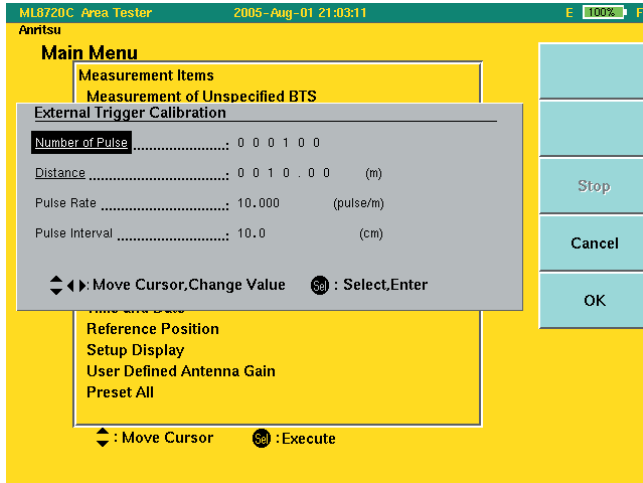
Measurement Cycle Distance Input

When the measurement distance and average distance are input, the required pulse for measurement (external trigger division ratio and measurement cycle) is calculated automatically.
Even if the drive test vehicle is changed, performing external trigger calibration allows new measurements to be performed under exactly the same conditions as previous measurements.
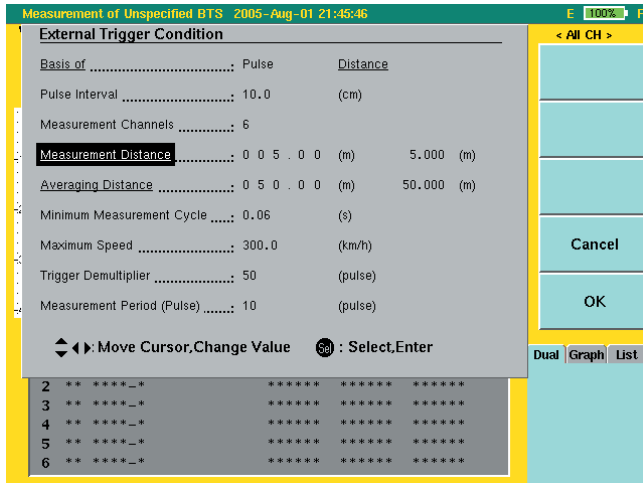
GSM Channel Code Search Range

Installing the MX872004C GSM Measurement software enables measurement of GSM base stations.
It is possible to measure either specified or unspecified base stations, or a combination of both specified and unspecified stations. The channel search range for unspecified stations is set using the GSM channel code search range.
Since up to 200 search conditions can be set, measurement of unnecessary channels such as TCH can be prevented by setting only BCH as the search range.
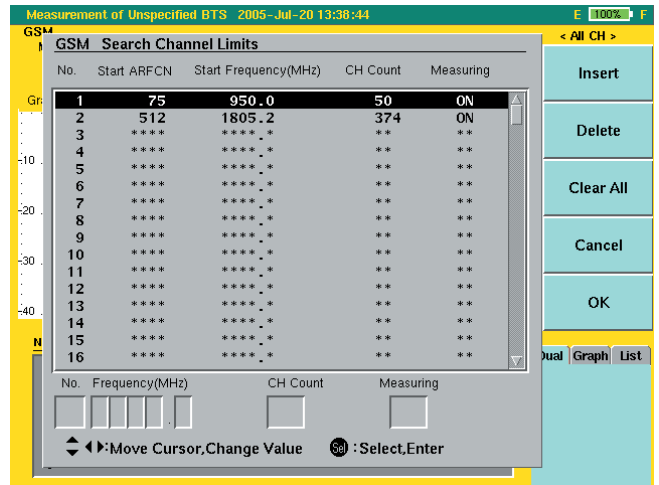
GSM Channel Code Editing

Channels set using GSM channel code editing can always be measured without performing a channel search. Up to 32 channels can be set.
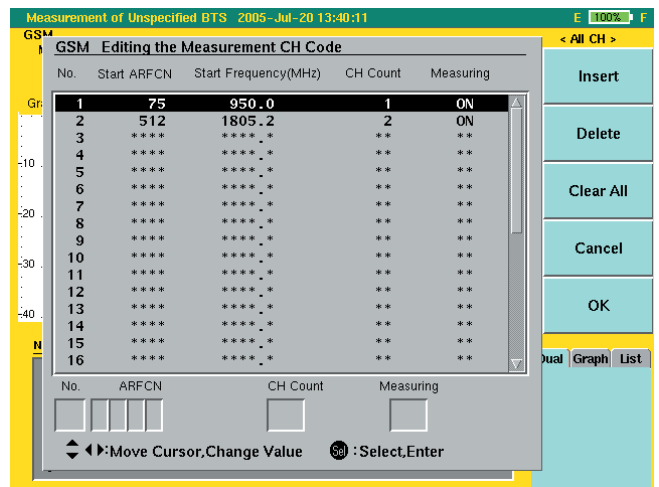
GSM Measurement Channel Display

All channels being measured are displayed as graphs and data simultaneously (32 channels max.)
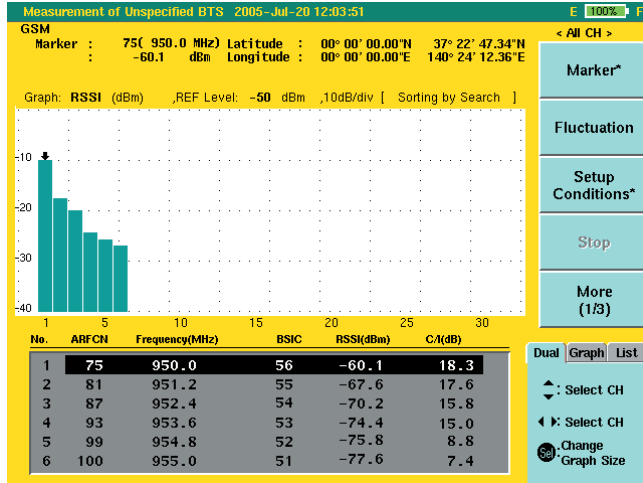
Spectrum Monitor

This function performs in-band spectrum analysis to check for interference waveforms. Either 4, 10, 30, or 60 MHz can be selected.
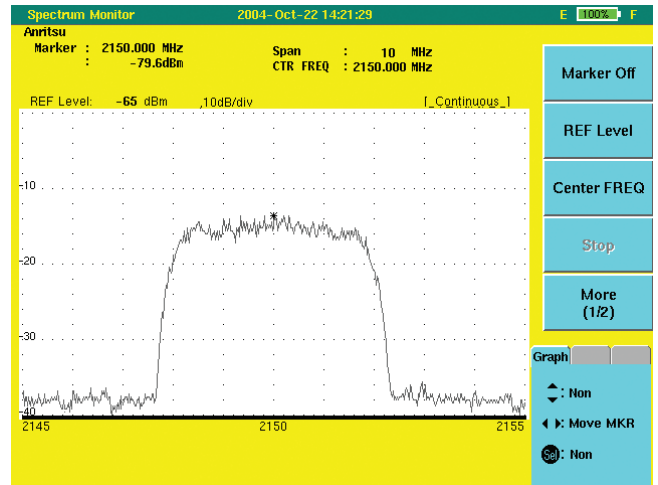
CW Measurement

Non-modulated signals can be measured with a resolution bandwidth of 15 kHz.
The minimum measurement period is 10 ms. The average and median values are output along with the measurement time and GPS positioning data to a connected PC.

Options

ML8720C-03 Two Carrier Measurement function

• Two Carrier Measurement function
Two carrier frequencies can be measured simultaneously for specified base station measurements and unspecified base station measurements.
When the MX872004C GSM Measurement software option is installed, it is possible to perform simultaneous measurement of both W-CDMA and GSM base stations.
• Diversity function
Signals from base stations supporting W-CDMA transmit diversity can be measured per transmit antenna for specified base station measurements. (The ML8720C-03 option and the ML8720C mainframe should be ordered together.)
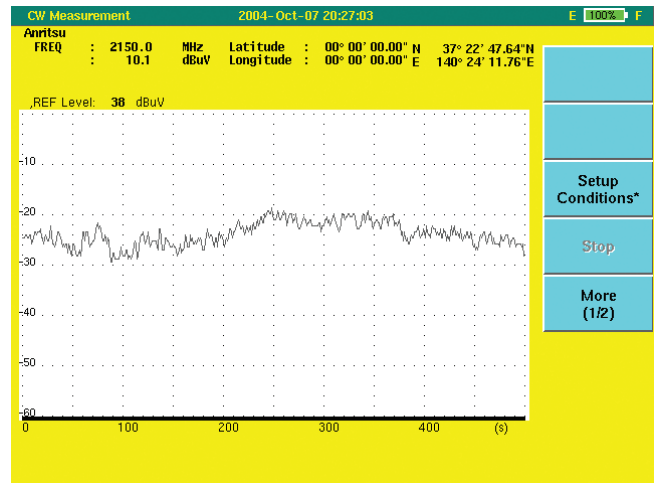
ML8720C-23 Two Carrier Measurement Retrofit

ML8720C-23 functionality is added to the ML8720C standard configuration (The mainframe is taken back for retrofitting ML8720C-23 to the ML8720C mainframe).

Application Software

MX872002B BCH Demodulation Software (sold separately)

This software adds a BCH demodulation function for W-CDMA base stations to the ML8720C.
The system information shown below can be displayed in text format conforming to the definition described in TS25.331 ASN.1.
 Information that can be demodulated:
   MIB, SB1, SB2, SIB1, SIB2, SIB3, SIB4, SIB5, SIB6, SIB7, SIB8, SIB9, SIB10, SIB11, SIB12, SIB13, SIB13-1, SIB13-2, SIB13-3, SIB13-4, SIB14, SIB15, SIB15-1, SIB15-2, SIB15-3, SIB15-4, SIB15-5, SIB16, SIB17, and SIB18.
During measurement, the above system information is saved to a memory card as a binary file.
When the accessory BCH Demodulation Tool is installed in a PC, saved binary-format files can be batch-converted to text files on the PC after measurement has been completed.
The BCH Demodulation Tool is supported by both Windows 2000 and Windows XP[*2].

MX872004C GSM Measurement Software (Sold Separately)

This option adds GSM measurement functions to the ML8720C. It provides RSSI and C/I measurements as well as BSIC decoding in the GSP900 (E-GSM) and DCS1800 bands.

MX872022B Data Conversion Software (sold separately)

This software is used to convert an ML8720C measured W-CDMA data file (∗.DAT) to the data format required by MapInfo Professional[*1].
This software operates with Windows 98SE/2000/XP[*2].

∗1: This is a registered trademark of MapInfo Corporation in the USA.
∗2: This is a registered trademark of Microsoft Corporation in the USA and elsewhere.

MX872002B BCH Demodulation Software

Setting Demodulation Conditions

The demodulation conditions can be set very precisely. When an SIB that needs to be demodulated is set to On, only that SIB will be demodulated. However, MIB, SB1, SB2, and SIB7 are unconditionally demodulated.

Demodulation Results Display

When demodulation is enabled, the demodulation results of the uplink interference power UL (dBm) are displayed with the measured data. The mark [V] on the right of the SIR data indicates that demodulation was completed for the corresponding scrambling code.

Image of BCH Demodulation

Broadcast Information

P-CPICH

Broadcast Information in BCH (on P-CCPCH) (SIB1, SIB2, …, SIB18)

Uplink Interference Power

Up Link

Up Link

UL Interference in BCH (SIB Type7)

Conventional

Proposal

+ MX872002B

Need no UE
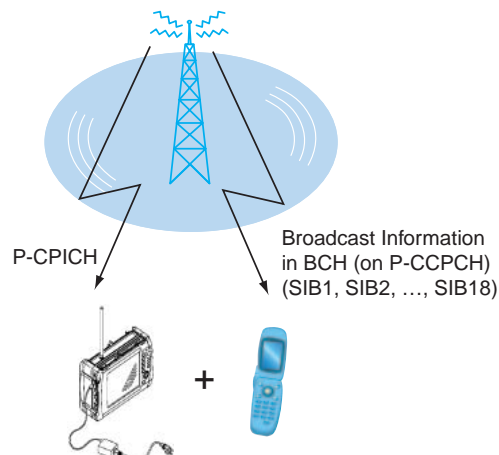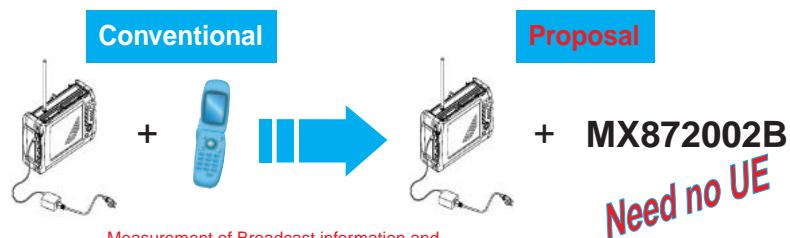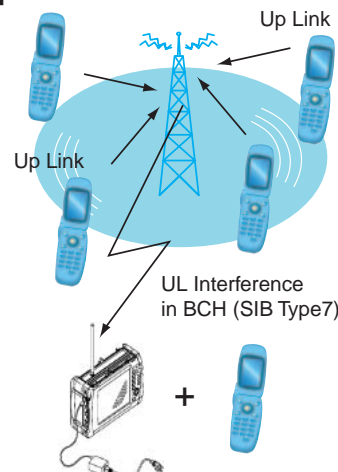
Measurement of Broadcast information and Uplink interference power is possible by the ML8720C single part.

10

Small and Lightweight with Excellent Operability
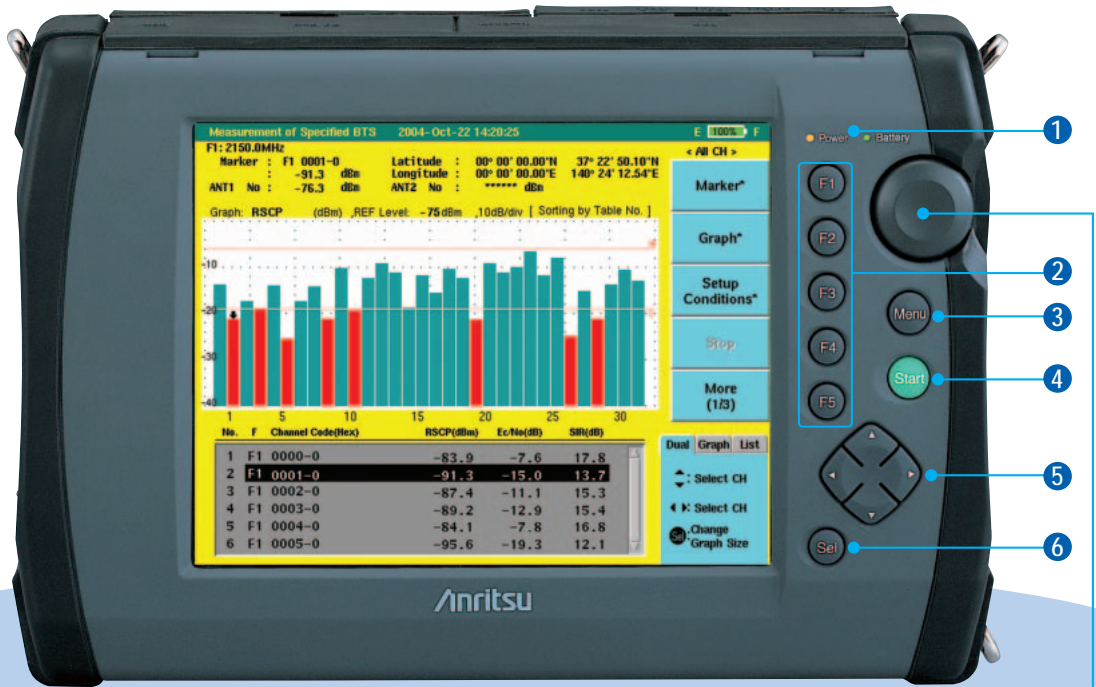
Easy-to-move markers using rotary knob
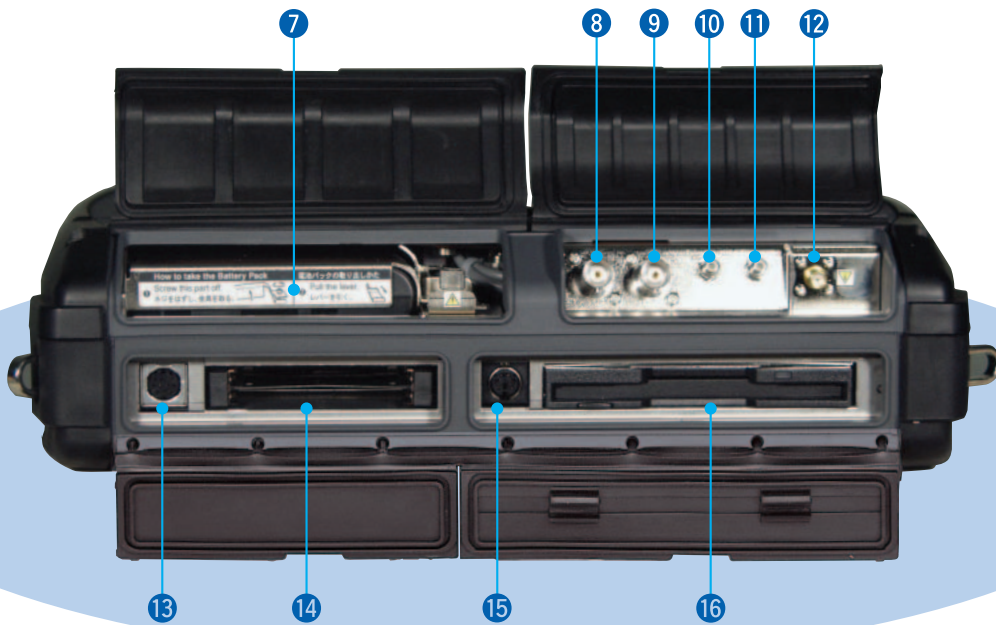
①	Status indicator	⑨ External trigger input connector	⑰ AC adapter connector
②	Function keys	⑩ External reference input connector	⑱ Power switch
③	Menu key	⑪ IF output connector	⑲ Backlight adjuster
④	Start key	⑫ RF input connector 1 (for connecting antenna)	⑳ RS-232C-1 connector
⑤	Up/Down, Left/Right key	⑬ External monitor (VGA) connector	㉑ Centronics connector
⑥	Select key	⑭ PC card slots: Two cards can be installed.	㉒ RS-232C-2 connector
⑦	Battery pack	⑮ External keyboard connector	
⑧	Sync output connector	⑯ FD drive	

ML8720C (Build in Option 03/23)

Specifications

Frequency range	RF input connecter 1:
	  925 to 960 MHz (CW, spectrum monitor and at the time of measuring GSM[*1])
	  1805 to 1880 MHz (CW, spectrum monitor and at the time of measuring GSM[*1])
	  2110 to 2170 MHz (CW, spectrum monitor and at the time of measuring W-CDMA)
	RF input connecter 2: 2100 to 2200 MHz (at the time of measuring W-CDMA with ML8720C-03/23 attached.)

Input impedance	50 Ω (SMA type connecter)
Frequency setting resolution	W-CDMA measurement mode: 200 kHz GSM measurement mode[*1]: 200 kHz Spectrum monitor: 1 kHz CW measurement mode: 100 kHz
Reference oscillator	Aging rate: $\pm 1 \times 10^{-6}$/year
Receive signals	W-CDMA measurement mode: P-CPICH, S-CPICH, P-SCH, S-SCH, P-CCPCH (At the time of BCH demodulation) GSM measurement mode[*1]: BCH

Power measurement	Measurement range
	  W-CDMA measurement mode: –117 to –33 dBm (RF input connecter 1, the end of RF input connecter 2)
	  GSM measurement mode[*1]: –110 to –40 dBm (the end of RF connecter 1)
	  Spectrum monitor: –123 to –33 dBm (the end of RF connecter 1)
	  CW measurement mode: –117 to –33 dBm (the end of RF connecter 1)
	  Note: When built-in divider of option ML8720C-03/23 is used, the level of minimum reception sensitivity is raised
	        due to the divider's loss (Typ. 4.0 dB).
	Resolution: 0.1 dB
	Display units: dBm, dBμ, dBμV/m (CW measurement mode and spectrum monitor mode)
	W-CDMA measurement accuracy
	  CPICH_RSCP: ±1 dB (Typ.) (23°C ±5°C)
	   CPICH_SIR: ±2 dB (Typ.) (23°C ±5°C)
	  SCH_RSCP: ±2 dB (Typ.) (23°C ±5°C)
	GSM measurement accuracy[*1]
	  RSSI: ±1 dB (Typ.) (23°C ±5°C)
	Spectrum monitor
	  Accuracy: ±1 dB (Typ.) (23°C ±5°C)
	  Noise level: –127 dBm (RBW 4 kHz)
	CW measurement accuracy: ±1 dB (Typ.) (room temperature)
	Dynamic characteristics: CPICH_RSCP, CPICH_SIR accuracy at 0 to 100 km/h (averaged distance: 50 m)

Measurement items	Specified base station, unspecified base station, spectrum monitor, CW measurement

Base station measurement	W-CDMA measurement items
	  Received signal code power (RSCP), ratio of desired receive power per chip to receive power density (Ec/No),
	  signal interference ratio (SIR)
	
	GSM measurement items[*1]
	  Receiving/sending power in band with (RSSI, RBW 200 kHz), Carrier vs. interference power rate (C/I)
	  Measurement modes: Time variation (internal trigger), distance variation (external trigger)
	Sampling interval
	  W-CDMA measurement: 10 ms/ch
	  GSM measurement[*1]: 20 ms/ch (specified channel measurement only, BSIC decode OFF)
	              50 ms/ch (unspecified channel included measurement, BSIC decode OFF)
	              100 ms/ch (BSIC decode ON)
	Measurement channels: 32 max.
	W-CDMA measurement sync acquisition time:
	  600 ms x the number of search channel (CPICH mode), 4 sec on average for TOP 10 display (SCH mode)
	  Search method of BTS: CPICH mode, SCH mode
	GSM measurement search time[*1]: 3.3 ms/ch (BSIC decode OFF), 20 ms/ch (BSIC decode ON)
	Data processing method: Average, median, max., min., 10%, 20%, 30%, 40%, 60%, 70%, 80%, 90%
	W-CDMA measurement display:
	  All channel, delay profile, each finger, fluctuation, SCH delay profile (unspecified base station measurement)
	GSM measurement display: All channel (GSM only or synchronous W-CDMA and GSM), fluctuation

Spectrum monitor function	Frequency span: 4, 10, 30, 60 MHz Resolution bandwidth: 4 kHz
CW measurement	Frequency setting resolution: 100 kHz, Resolution bandwidth: 15 kHz

Demodulation function	Demodulation channel: BCH
	Demodulation information:
	  MIB, SB1, SB2, SIB1, SIB2, SIB3, SIB4, SIB5, SIB6, SIB7, SIB8, SIB9, SIB10, SIB11, SIB12, SIB13, SIB13-1,
	  SIB13-2,SIB13-3, SIB13-4, SIB14, SIB15, SIB15-1, SIB15-2, SIB15-3, SIB15-4, SIB15-5, SIB16, SIB17, SIB18
	  When the demodulation function is enabled, MIB, SB1, SB2, and SIB7 are always demodulated, and others can
	  be selected for demodulation as desired. Although the uplink interference power (SIB7) is demodulated periodi-
	  cally, the demodulation period varies depending on the setting and environmental conditions.
	Demodulation processing time: 0,5 s (P-CCPCH 2 frame)
	Demodulation success rate:
	  >50%, 70%(Typ.) (P-CCPCH 2 frame, Ec/No ≥−14 dB, Dynamic response 0 to 100 km/h)

Other functions	Master/slave function: Daisy chain connection of multiple ML8720C, parallel measurement
	GPS connection: Supports NMEA-0183 format
	Remote control: Via RS-232C
	File I/O: Read measurement conditions, output measured results file
	Diversity function: Transmit diversity, receive antenna diversity (Option 03/23)
	Two carrier measurement function:
	  Two carrier frequencies can be measured simultaneously in the specified base station measurement and the
	  unspecified base station measurement (Option 03/23)
	RAKE diversity: Six fingers
	External trigger calibration:
	  Car speed pulse occurrence interval measurement and distance setting of measurement cycle are possible.
	Clock error detection: An alarm can be output when abnormal drifting of the base station clock is detected.
	Detection range: 4 to 8 ppm (typ.) for measurement of a specified base station

Interface	IF output: ≥10 dBμV (190 MHz), SMB connector External reference input: 2 to 5 Vp-p (10 MHz), SMB connector External trigger input: 1.5 Vdc ± (2 to 13 Vp-p), BNC connector Sync output: TTL level, BNC connector RS-232C-1: For external computer (max. 115.2 kbps), D-sub 9-pin connector RS-232C-2: For GPS (supports NMEA-0183 format), mini-DIN 8-pin connector Printer: 8-bit parallel I/F (conform to Centronics), D-sub 25-pin connector Keyboard: IBM US ENGLISH (101 keys) 106 supported, Mini-DIN 6-pin connector External monitor: VGA, mini-DIN 10-pin connector
Storage media	FDD (3.5", 2HD), ATA flash card
Display	640 x 480 dots, 8.4" color LCD

Environment conditions	Temperature and humidity: 0 to +40˚C/≤85% (operating), −25 to +60˚C/≤85% (storage)
	Vibration: MIL-T-28800E (Class 3)
	Shock: MIL-T-28800E
	Drop test: MIL-T-28800E (Style C)
	EMC
	  EN61326: 1997/A2: 2001 (Class A), EN61000-3-2: 2000 (Class A), EN61326: 1997/A2: 2001 (Annex A)
	LVD
	  EN61010-1: 2001 (Pollution Degree 2)

Power	DC: 10 to 24 V AC (rating): 100 to 240 V, 50/60 Hz (with AC adapter) Power Battery: Z0619 Lithium Ion Battery Pack Power consumption: 35 W max. (battery charge), Standard: 20 W, 30 W (with Option 03/23) Battery continuous operation time: 3 h (typical), 2 h (typical with Option 03/23)
Dimensions and mass	290 (W) x 194 (H) x 78 (D) mm, ≤4.5 kg (with battery pack) 290 (W) x 194 (H) x 124 (D) mm, ≤6.5 kg (with Option 03/23 and battery pack)

∗1: Function to which only installing MX872004C is effective

Ordering Information

Please specify the model/ order number, name and quantity when ordering.

Model/ Order No.	Name	Remarks
	– Main frame –	
ML8720C	Area tester	
	– Standard accessories –	
W2544AE	ML8720C operation manual: 1 copy	
Z0619	Lithium ion battery pack: 1 pc	
J1069	AC adapter: 1 pc	
J0979	A-2 (Japan) power cord: 1 pc	
Z0402A	Protective cover: 1 pc	
Z0403A	Belt with hook: 1 pc	
Z0516	Antenna: 1 pc (2 pcs)[*1]	With 5 m cable
Z0703	Antenna mount: 1 pc (2 pcs)[*1]	For connecting GPS (cross, 2 m)
J0977	Serial interface cable: 1 pc	For connecting GPS (straight, 3 m)
J1068	Serial interface cable: 1 pc	SMA plug-SMA jack
J1161	BL82-5133-02: 1 pc (2 pcs)[*1]	
J1248	SMA connection cable (Type L): (2 pcs)[*2]	
	– Options –	
ML8720C-03	Two Carrier Measurement	Selected when ordering a mainframe.
ML8720C-23	Two Carrier Measurement Retrofit	Retrofitted to the already-shipped main flame. (Main flame need to be taken back.)
	– Application software –	
MX872002B	BCH demodulation software	
MX872004C	GSM measurement software	Antenna for 900/ 1800 MHz is required separately.
MX872022B	Data conversion software	Data conversion output for MapInfo
	– Maintenance service –	
ML8720C-90	Extended three years warranty service	
ML8720C-91	Extended five years warranty service	
	– Application parts –	
P0020	Compact flash 64 MB	Requires J1254
P0021	Compact flash 128 MB	Requires J1254
P0022	Compact flash 256 MB	Requires J1254
P0023	Compact flash 512 MB	Requires J1254
J1254	Compact flash adapter	Conversion adapter
Z0436	Hand carrying case	560 (W) x 370 (H) x 220 (D) mm
Z0435	Soft carrying case	430 (W) x 300 (H) x 170 (D) mm, use with an option
B0442	Soft carrying case	440 (W) x 310 (H) x 110 (D) mm
Z0526	Case for installation	365 (W) x 300 (H) x 185 (D) mm
J0127D	BNC cable	For connecting external trigger
J0654A	Serial interface cable	For connecting IBM-PC/AT
J0978	VGA conversion cable	For connecting external monitor
J1117	DC power cable	For cigarette lighter, minus ground vehicle, 3 m
J1118	DC power cable	With arrow shaped chip, 3 m
Z0697	Battery charger	Two Z0619 batteries can be charged simultaneously.
Z0778	900 MHz/1800 MHz whip antenna	For direct connecting with main frame
Z0779	900 MHz/1800 MHz antenna for vehicle installation	Base, with cable
Z0705	Antenna mount	With 3.5 m cable, for Z0516 exclusive use
Z0780A[*3]	ML8720B → ML8720C modification	

*1: Antenna, Antenna mount and SMA Plug-SMA Jack are provided 2 packs when any of the option03/23 (ML8720C-03/ ML8720C-23) is equipped.

*2: Attached only when any of the option03/23 (ML8720C-03/ ML8720C-23) is equipped.

*3: When option01 (ML8720B-01) is equipped, required to detach.

Hand carrying case (Z0436)

Soft carrying case (B0442, Z0435)

Case for installation (Z0526)

Battery charger (Z0697)

Battery pack (Z0619)

Antenna (Z0516)
Antenna mount (Z0703)

/Anritsu

Specifications are subject to change without notice.

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Catalog No. ML8720C-E-A-1-(1.00)   Printed in Japan   2005-10 ddc/CDT