Agilent Technologies
E1962A IS-2000 Test Mode Requirements for Mobile Stations

Product Note

Agilent Technologies

Innovating the HP Way

Introduction

The test set contains an IS-2000 Base Station Emulator (BSE). The primary purpose of the BSE is to provide the signals necessary for parametric measurements of the RF performance of an IS-2000 mobile station (MS).

The operating mode controls the way in which the test set's BSE communicates with the mobile station. IS-2000 test mode is the only operating mode for the E5515T test set. When operating in test mode, the BSE provides necessary forward channel stimulus and makes reverse channel measurements. It does not provide over the air call processing.

Mobile station test mode for the IS-2000 system is not specified in the IS-2000 standard proposals. The requirements described in this document apply only to the mobile stations that are to be tested with the E5515T test set and E1962A test application.

The features of the test set and the standard for TIA/EIA IS-2000 are changing. Please refer to the following documents before designing a phone for IS-2000 test mode:

- TIA/EIA IS-2000 standard (or the latest published standard)

- E1962A IS-2000 mobile test mode specification (or preliminary specification)

- E1962A IS-2000 mobile test mode application documentation (when available)

Test mode setup

The most important thing to remember about test mode testing is that the MS does not receive call processing instructions directly from the test set. Basically, you must write a program to control the MS so that it can receive and transmit the appropriate signals so that the test set can test the MS. You must also write a test set control program to test the MS. Usually, both programs can be combined into one single program.

Since the E5515T does not have over the air call processing, the MS must be capable of demodulating the Forward Traffic (or Fundamental) Channel independent of communication with the BSE. This is described as test mode, and the MS must operate in test mode when it is being tested with the test set. Test mode operation typically means that a PC must control the MS. Additionally, the test set itself is often controlled by a PC. With proper design, the PC used to control the MS can also be used to control the test set. A GPIB controller is required to control the test set.

Figure 1 shows the connection diagram for testing a MS in test mode. Note that the MS Measures Sensitivity and FER in AWGN, not the test set.
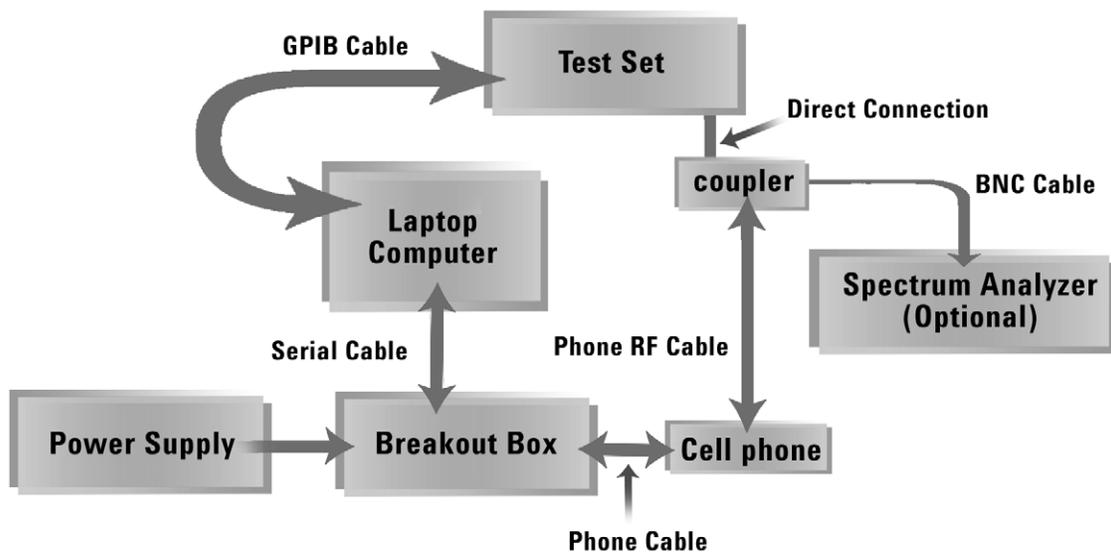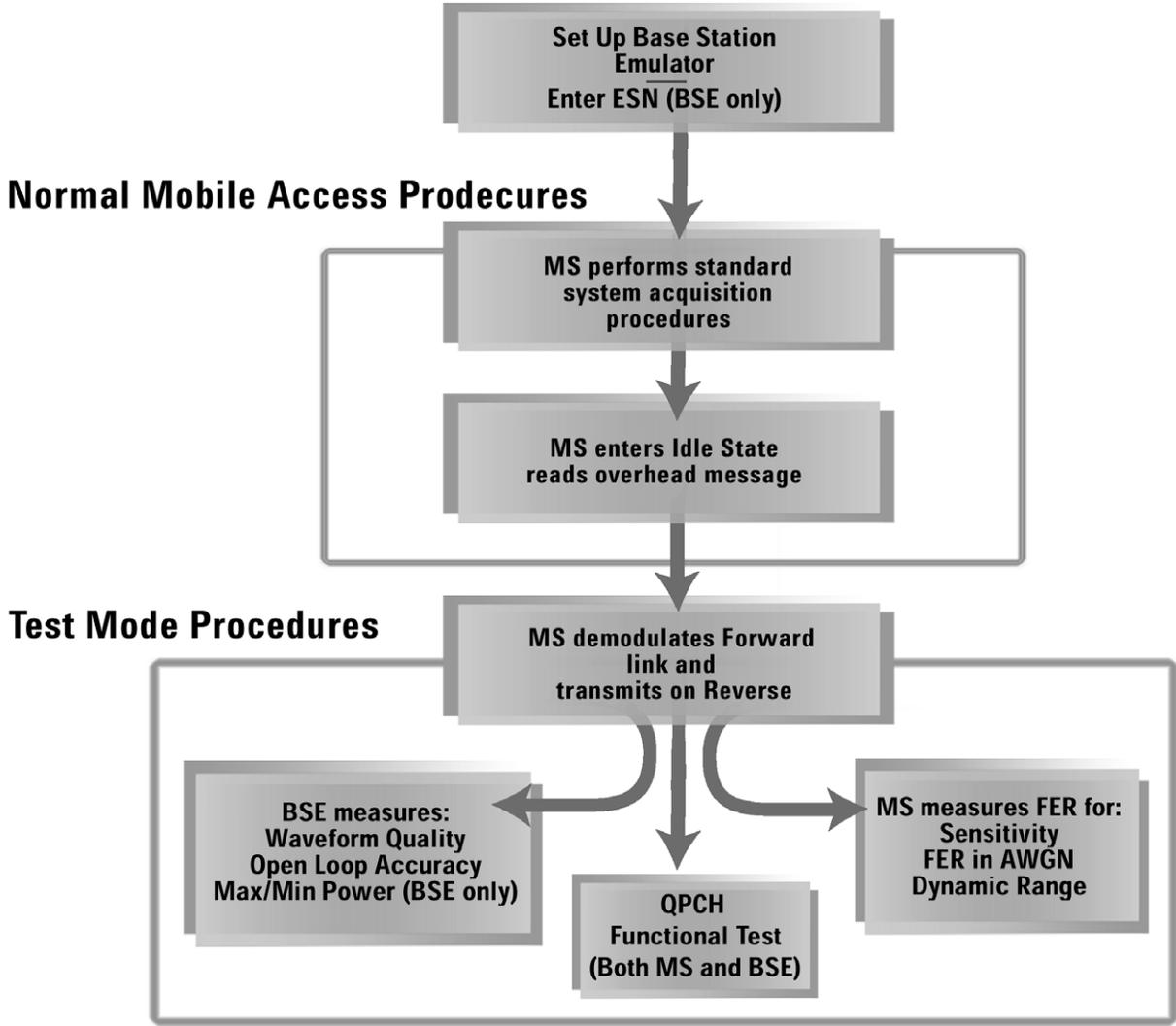

Figure 1. IS-2000 test mode setup diagram

Test mode flowchart

Figure 2 shows the basic flow for testing a mobile station in test mode.

Note: Both the MS and BSE make measurements, and that the QPCH test is a functional test only.

Figure 2. Basic flow for testing a mobile station in test mode

What the MS must do in test mode

The Mobile Station (MS) must perform several commands without the standard interaction with the Base Station (BS) or BSE. Typically, a computer will control both the MS and the test set. The computer must be able to read and set parameters on the test set and it must separately be able to read and control the MS.

In general, the MS must do the following:

- Perform the standard system acquisition procedure
- Read the Overhead messages of the Paging Channel
- Enter the Idle state
- Demodulate the forward link and transmit on the reverse link without call processing
- Count frame errors and report Frame Error Rate (FER) of the FCH/TCH and the SCH
- Either loop forward data back to reverse channel or generate data for reverse channel
- Disable and enable closed loop power control
- Perform open loop power control
- Change settings in the MS to match BSE state: FCH data rates, SCH data rates, RC, certain Walsh code settings
- Demodulate the SCH (can be simultaneous with FCH)

Detailed MS functions

These are the specific functions the MS must perform. These commands are not sent from the test set, but typically from a standalone computer via an interface (refer back to Figure 1 IS-2000 test mode setup diagram). The MS to computer interface is usually a serial port on the bottom of the MS.

Set channel and band

This command must set the MS's RF channel for system acquisition. The RF channel chosen must match the RF channel set on the test set. This function may also set the frequency band, if the phone is capable of multi-band operation.

Acquire system

This command must tell the MS to begin system acquisition on the previously set channel and band. This function can work as per the standard, since the test set sends enough information on the IS-2000 Pilot, Sync and Paging Channel (Overhead only on Paging Channel) to complete this task. The Acquire System function is complete when the MS appropriately enters the Idle state.

The MS must successfully go through three substates before it enters the Idle state. These states are:

Pilot Channel Acquisition Substate

Sync Channel Substate

Timing Change Substate

These substates are described more thoroughly in the IS-2000 standard.

Get ESN

This command must tell the MS to report its ESN to the computer. The computer must then send the ESN to the test set. The command for sending the MS's ESN to the test set is described in the Syntax Guide and the Reference Information (located on the test set's documentation CD-ROM).

Set F-FCH Walsh code

This command must tell the MS on which Walsh code the test set is transmitting the F-FCH.

Set FCH radio configuration

This command must tell the MS which radio configuration to expect on the FCH, and which to transmit on the R-FCH.

Set F-FCH data rate

This command must tell the MS which data rate is being sent on the F-FCH from the test set. This information is necessary when the MS measures its Frame Error Rate (FER).

Assign F-FCH

This command tells the MS to begin receiving the F-FCH from the test set. You must have set up the Radio Configuration and the Walsh code before this command is issued. After this command has been sent, it is possible for the MS to measure the FER. See Sensitivity, dynamic range and frame error rate (FER) in AWGN measurements for more information about the FER measurement.

Report F-FCH FER

This command directs the MS to report the FER to the computer. After receiving this command, the MS should report its FER every 100 frames.

Stop Reporting F-FCH FER

This command directs the MS to stop reporting the FER to the computer.

Similar commands must be executed for the SCH

If you are testing the SCH, you must also create the following commands for the SCH in the same way you created them for the FCH:

- **Set F-SCH Walsh code**
- **Set F-SCH radio configuration**
- **Set F-SCH data rate**
- **Assign F-SCH**
- **Report F-SCH FER**
- **Stop reporting F-SCH FER**

Transmit reverse channels

This command tells the MS to begin transmitting its reverse channels. At a minimum, this means the Pilot and R-FCH must be transmitted. If you wish, you may also transmit R-DCCH, R-SCH1, and R-SCH2.

Channel	Required?	Data
Pilot	Yes	Normal
R-FCH	Yes	Random or loopback
R-DCCH	No	Random
R-SCH1	No	Random or loopback
R-SCH2	No	Random or loopback

Note: The MS must maintain active time alignment with the F-Pilot channel transmitted by the test set. The test set expects that the reverse link is transmitted using real time long code spreading using the ESN of the MS.

Set reverse closed loop power control mode

This command tells the MS if it should respond to closed loop power bits on the F-FCH. There are two settings: ON and OFF. ON means it should respond to closed loop power bits. Most tests are made with the closed loop power control bits OFF. Maximum and Minimum TX Power measurements must have the closed loop power control bits set to ON.
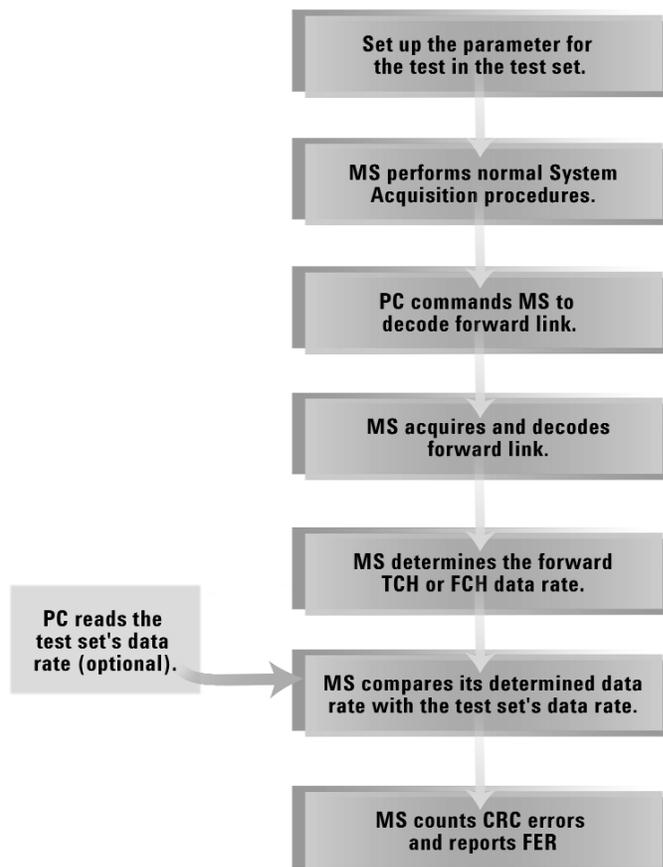
Set reverse open loop power control mode

This command tells the MS if it should respond to open loop power bits on the F-FCH. There are two settings: ON and OFF. ON means it should respond to open loop power bits. Most tests are made with the open loop power control bits ON.

Sensitivity, dynamic range and Frame Error Rate (FER) in AWGN measurements

The mobile station and the test set must work together to measure sensitivity, dynamic range and FER in AWGN. The test set must set the correct signals and levels needed for these measurements, then the mobile station must measure FER. This FER measurement is the sensitivity, dynamic range, or FER in AWGN test, depending on the setup. The standards contain many different potential setups for these measurements. Refer to the standard for the setups that meet your needs.

The test set can help you confirm the data rate being decoded. One method of measuring the FER is to decode for all possible data rates, then report CRC errors for all data rates. You can compare the Data Rate setting of the base station emulator to the CRCs for each MS reported rate. This way, you can deduce the correct Data Rate and measure the FER at the same time. See Figure 3 for this method.

Note: For radio configuration 1, the eighth and quarter rates do not have CRC, so it may be difficult to measure FER for these rates.

Set up the parameter for the test in the test set.

MS performs normal System Acquisition procedures.

PC commands MS to decode forward link.

MS acquires and decodes forward link.

MS determines the forward TCH or FCH data rate.

PC reads the test set's data rate (optional).

MS compares its determined data rate with the test set's data rate.

MS counts CRC errors and reports FER

Figure 3. Sensitivity, dynamic range and FER in AWGN Measurements

Base station emulator control

The base station emulator (BSE) contained in the test set will transmit the signals necessary to make test mode measurements for an IS-2000 MS. The BSE in test mode does not contain full call processing, so traditional call processing tests such as call setup, handoffs and registrations cannot be made.

The settings in Table 1 are required before the BSE and MS can communicate. The settings in Table 2 are fixed and cannot be changed. Settings in Table 3 may also be required, if the MS cannot use the default values.

Refer to the product specification and this paper's Appendix: Detailed field settings for BSE for more detailed information.

Table 1. Required BSE parameters

Parameter	Comment
ESN (Hex)	This number must be entered before demodulating the F-TCH, F-FCH, or F-SCH
Cell band	
Channel	Choose channel to test the MS
Protocol revision	IS-2000
Radio configuration	Choose the RC that corresponds to the test
PN offset	Selectable from 0 to 511
F-TCH or F-FCH	Set appropriate level for the test
F-Pilot	Must be on; level is variable
F-Sync	Must be on; level is variable
F-Paging	Must be on; level is variable
SID	Set to match MS
NID	Set to match MS
Cell MCC	Set to match MS
Cell MNC	Set to match MS
Paging data rate	Half or Full

Table 2. Fixed parameters for BSE

Parameter	Comment
Traffic data source	Data source is PRBS (CCITT 2^{15}-1 pattern)
F-SCH Walsh code	3
F-QPCH Walsh code	80
F-FCH Walsh codes	Choices: 10, 14, 26, 30, 42, 53, 62
F-OCNS Walsh codes	Choices: 5, 13, 21, 29, 37, 45, 53, 61
Reverse link closed loop bit rate	800 bits per second
Paging channel long code mask	001
Frame offset	0

Table 3. Other parameters

Parameter	Comment
Reverse Power Ctrl	
Receiver Power Ctrl	
Measurement frequency	Choose auto or manual
Receiver link frequency	Traffic data rate
F-QPCH	Data source: all on or all off
F-QPCH relative level	Level is relative to pilot

Detailed test flow

This describes in detail the actions to be made by both the BSE and the MS. Note that you will have to either write a test set control program to make the BSE perform the "User" and "BSE" actions, or perform the actions manually.

Table 4. System acquisition procedure and F-FCH demodulation

BSE action	MS reaction	Comment
User enters ESN for MS		
BSE sets FCH long code based on ESN		
User sets BSE required and optional cell parameters to match MS's characteristics		BSE defaults are set up for RC1
User sets desired cell power level		Receiver Power Ctrl bits must be at its default value of Alternating
BSE transmits Forward Channel Pilot, Paging and Sync channels	MS Powers on. MS follows standard System Acquisition procedure, except it shall not register. MS enters Mobile Station Idle State.	BSE in test mode does not perform registration.
BSE is continually transmitting the following messages: - System Parameters Message - CDMA Channel List Message - Extended System Parameters Message - Neighbor List Message (cellular band only) - Extended Neighbor List Message (PCS band only) - Access Parameters Message	MS reads and responds appropriately to these messages.	BSE does not transmit other messages in test mode
BSE is transmitting F-FCH	PC instructs MS to assign F-FCH, R-FCH, Data Rate, Radio Configuration	F-FCH data source is CCITT 2^{15}-1 pattern
	PC instructs MS to begin demodulating the F-FCH	
	MS begins demodulating F-FCH MS loops FCH data back to R-FCH MS transmits R-FCH using Open Loop Power Control	MS may also generate own data instead of using the F-FCH data

Test set is now ready to make measurements

Table 5. Waveform quality measurement

Step	BSE action	MS reaction	Comment
1	Start with the system acquisition procedure (see Table 4)		
2	User sets desired Radio Configuration User sets Data Rate to Full User sets F-FCH level to −15.6 dB User sets Cell Power to −104 dBm/1.23 MHz	PC instructs MS to turn closed loop control in MS OFF	
3	BSE measures Waveform Quality		Waveform Quality measurement Note: Waveform Quality can be measured even if all of the MS's allowable reverse channels are active.

Table 6. Open loop accuracy measurements

Step	BSE Action	MS Reaction	Comment
1	Start with the System Acquisition Procedure		
2	User sets desired Radio Configuration User sets Data Rate to Full User sets F-FCH level to −15.6 dB User sets Cell Power to −104 dBm/1.23 MHz	PC instructs MS to turn closed loop control in MS OFF MS adjusts power accordingly (properly vary the MS's TX level in response to the BSE's source power level changes)	MS is now operating under Open Loop Power control
3	BSE measures Channel Power		This measurement is Open Loop Accuracy at −104
4	User sets Cell Power to −65 dB	MS adjusts power accordingly	
5	BSE measures Channel Power		This measurement is Open Loop Accuracy at −65
6	User sets Cell Power to −25 dB	MS adjusts power accordingly	
7	BSE measures Channel Power		This measurement is Open Loop Accuracy at −25

Table 7. Maximum and minimum power measurements

Step	BSE action	MS reaction	Comment
1	Start with the System Acquisition Procedure		
2	User sets desired Radio Configuration User sets Data Rate to Full User sets F-FCH level to −15.6 dB User sets Cell Power to −104 dBm/1.23 MHz	PC instructs MS to turn closed loop control in MS ON	
3	User sets Rvs Power Ctrl to All Up Bits	MS adjusts power accordingly. It should go to maximum power.	Closed loop power control response. All up bits cause the MS to transmit maximum power.
4	BSE measures Digital Average Power		This measurement is Maximum Power test
5	User sets Cell Power to −25dB	MS adjusts power accordingly	Open loop power control response
6	User sets Rvs Power Ctrl to All Down Bits	MS adjusts power accordingly. It should go to minimum power.	Closed loop power control response
7	BSE measures Channel Power		This measurement is Minimum Power test

Table 8. Sensitivity and dynamic range measurements

| Step	BSE Action	MS Reaction	Comment
1	Start with the System Acquisition Procedure		
2	User sets desired Radio Configuration User sets Data Rate to Full User sets F-FCH level to Appropriate level User sets Cell Power to −104 dBm/1.23 MHz	PC instructs MS to turn closed loop power control in MS OFF	F-FCH is −15.6 (RC 1 and 3), and −12.3 (RC 2)
3		MS measures FER. PC reads FER from MS.	Sensitivity Measurement
	User sets Cell Power to −25 dB	MS adjusts power accordingly	
5		MS measures FER. PC reads FER from MS	Dynamic Range Test

Table 9. FER in AWGN measurement

Step	BSE action	MS reaction	Comment
1	Start with the System Acquisition Procedure		
2	User sets desired Radio Configuration User sets Data Rate to Full User sets F-FCH to desired level User sets Cell Power to –55 dBm/1.23 MHz	PC instructs MS to turn closed loop control in MS OFF	Levels vary with radio configuration and band class See appropriate standard for correct level
	User sets AWGN to –54 dBm/1.23 MHz		
3		MS measures FER. PC reads FER from MS.	FER in AWGN Test

Testing the QPCH

The function of the quick paging channel (QPCH) can be empirically verified by taking advantage of the QPCH definition.

The QPCH exists in order to increase the amount of standby time for a MS. An IS-95 MS must monitor its Paging channel slot in order to be ready to respond to messages from the system. This requires a relatively large amount of current to frequently monitor this channel. The IS-2000 QPCH starts transmitting an 80 ms slot that is positioned 100 ms before the Paging Channel slot. See Figure 4. This very short slot allows the MS to quickly discover if there is a relevant Paging Channel message. If not, then the MS can go back to standby (go to "sleep"), thus saving battery power.

**Figure 4. QPCH timing relative to paging channel**
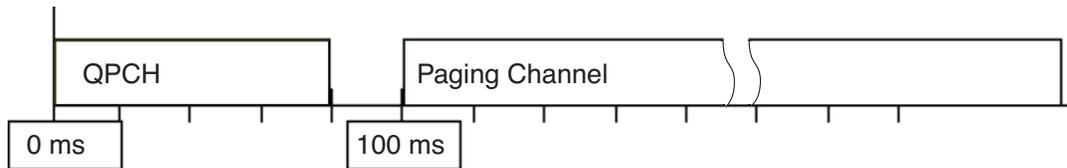
The QPCH function can be tested if the power supply used for the MS can do the following:

• Accurately supply the very low standby current

• Respond to the very low duty cycle of the QPCH

If both of these conditions are met, then monitoring the MS's supply current will test the QPCH function. Figure 5 shows an example of a power supply connection that can test this function, and Table 10 shows the steps the MS and BSE must take to activate the function. Power supplies that have these capabilities include the Agilent 66111 and Agilent 66311 fast transient dc sources. See also *Considerations When Selecting a System Power Supply for Mobile Communications Device Testing,* Application Note 1310, Agilent literature number 5968-2424E, and the Web site http://www.agilent.com/find/pscare for more information.

Figure 5. test setup diagram for testing QPCH
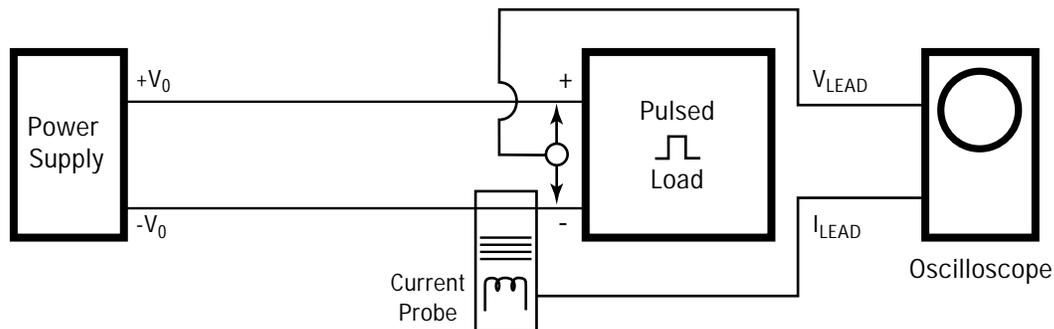
Table 10. QPCH functional measurement

Step	BSE action	MS reaction	Comment
1	Start with the System Acquisition Procedure		
2	User sets Data Rate to Full	MS responds normally to QPCH	F-QPCH Indicator Bits can be set to ALL ON or ALL OFF
	User sets Cell Power to a nominal level		
	User sets F-QPCH State to ON		
	User sets F-QPCH Indicator Bits to ALL OFF		
	Optional: set F-QPCH Relative Level		
3			User monitors MS supply current draw to confirm that MS goes back to standby after monitoring the F-QPCH.
4	User sets QPCH Indicator Bits to ALL ON		User monitors MS supply current for a higher or longer current draw. This confirms that the MS is reading the Paging Channel in response to a positive F-QPCH indicator.

Other measurements

Common variations on these measurements are the following:

- Measure using other Radio Configurations
- Vary the Data Rate
- Measure at different Cell Power levels
- Measure SCH for MSs that use the channel

Sample test procedure

The following procedure incorporates all tests described above. It takes advantage of common setups in the different tests to efficiently make several measurements.

This procedure can be used as a plan to write test set control software.

It is written in pseudo-code, with comments separated from actions by use of the common /* */ characters.

    /* Start the normal acquisition process */
Enter ESN for MS
    /*Set BSE required and optional cell parameters to match MS's characteristics */
Set Radio Configuration
Set desired Cell Power level /*-104 is used for first measurement */
Set Rvs Power Ctrl bits to Alternating
    /*BSE transmits Forward Channel Pilot, Paging and Sync channels */
    /* MS can start any of the following actions: */
    /*MS Powers on. */
    /*MS follows standard System Acquisition procedure, except it shall not register. */
    /*MS enters Mobile Station Idle State. */
    /* BSE is continually transmitting overhead messages */
    /*MS reads and responds appropriately to these messages. */
Set F-FCH to ON /*F-FCH is usually already on */
    /* PC instructs MS to Assign F-FCH Walsh Code
    /* PC instructs MS to Assign Traffic Data Rate
    /*BSE transmits F-FCH, Data Source is CCITT PRBS pattern */
    /* PC instructs MS to demodulate F-FCH on designated Walsh Code and Radio Configuration*/
    /* PC instructs MS to loop FCH data back to R-FCH*/
    /*MS transmits R-FCH*/
    /*Acquisition state is complete, and the MS and BSE are ready to begin testing */
Set Cell Power to –104
Set F-FCH level to –15.6
Set Data Rate to Full
    /* PC instructs MS to turn closed loop power control to OFF */
    /* PC instructs MS to start measuring FER. This is sensitivity test */
Measure Waveform Quality
Measure Channel Power /*Open Loop Accuracy at –104 */
    /* PC instructs MS to turn closed loop power control to ON */
Send Rvs Power Ctrl All Up Bits
Measure Digital Average Power /*Maximum Power test */
    /* PC instructs MS to turn closed loop power control to OFF */
Set Cell Power to –65
Measure Channel Power /*Open Loop Accuracy at –65 */
    /*Set up for QPCH test */

Set F-QPCH State to ON
Set F-QPCH Data to OFF
Optional: set F-QPCH Relative Level
 /* Monitor Power supply current to observe MS monitoring QPCH and returning to standby */
Set QPCH data to ON
 /* Monitor Power supply current for increased current draw. This confirms that the MS is */
 /*reading the Paging Channel in response to a positive F-QPCH indicator. */
Set F-QPCH State to OFF
Set F-QPCH Data to OFF
Set Cell Power to –25
Measure Channel Power /*Open Loop Accuracy at –25 */
 /* PC instructs MS to start measuring FER. This is Dynamic Range test */
 /* PC instructs MS to turn closed loop power control to ON */
Send Rvs Power Ctrl All Down Bits
Measure Channel Power /* Minimum Power Test */
 /* PC instructs MS to turn closed loop power control to OFF */
Set Cell Power to –55
Set AWGN to On
Set AWGN to –54
Set Data Rate to Full
Set F-FCH level to appropriate level as indicated in the standard
 /* PC instructs MS to start measuring FER. This is FER in AWGN test */
 /* End of test procedure. */

Appendix 1: Detailed field settings for BSE

Tables 11-14 contain the setup requirements for the BSE.

Notes on using these tables:

"Varies with test" means that you can make the tests several times, changing this field as you wish.

"Test-dependent" means different tests require different values

"Varies with MS" means this is a parameter which must be set to match the MS

Table 11. IS-2000 test operating mode, call setup screen

Field	Required (✔)	Where used	Common values
Cell Power	✔		All tests Varies with test and test-dependent
Cell Band	✔		Varies with MS
Channel	✔		Varies with MS and test-dependent
Protocol Rev	✔		IS-2000
Radio Config	✔		Varies with test
RF Gen Freq Control			Auto
Rvs Power Ctrl	✔	Max Min power	All values used
Rcvr Power Ctrl			Auto
Meas Frequency			Auto
Rev Link Frequency			Auto
Traffic Data Rate	✔	All tests	Varies with test, MS, and test-dependent
ESN (Hex)	✔	All tests	Must be entered by user
Max EIRP	✔	All tests	−7

Table 12. Cell parameter information, call setup screen

Field	Required (✔)	Where used	Common values
System ID (SID)	✔	All Tests	Varies with MS
Network ID (NID)	✔	All Tests	Varies with MS
Escape Mode			
Cell MCC	✔	All Tests	Varies with MS
Cell MNC	✔	All Tests	Varies with MS
Paging Data Rate	✔	All Tests	Varies with test
F-QPCH Data Rate		QPCH test	Used with QPCH test
F-QPCH Relative Level		QPCH test	Optional for QPCH test
RL Traffic to Pilot Gain			

Table 13. Generator information, Call Setup screen

Field	Required (✔)	Where used	Common values
AWGN Power		FER in AWGN	OFF, except ON in FER in AWGN test
PN Offset	✔	All tests	Varies with MS
F-Pilot Level	✔	All tests	
F-Sync Level	✔	All tests	
F-Paging Level	✔	All tests	
F-FCH/Traffic Level		All power tests, Waveform Quality, Sensitivity, FER in AWGN (not used in QPCH test)	
F-FCH/Traffic Walsh code		All power tests, Waveform Quality, Sensitivity, FER in AWGN (not used in QPCH test)	
F-SCH Level		SCH tests	Varies with test
F-OCNS Walsh code	✔	All tests	53

Table 14. Supplemental channel information, call setup screen

Field	Required (✔)	Where used	Common values
Data Rate		SCH tests	Varies with test, MS and is test-dependent
Encoder Type			Currently fixed at Convolutional

Acronyms and glossary

AWGN

Additive White Gaussian Noise

BSE

Base Station Emulator is the function of the Test Application and test set which provides signals similar to an actual base station.

CRC

Cyclic Redundancy Code Error detecting codes that generate parity check bits used for error detection.

EIRP

Effective Isotropic Radiated Power. The apparent power transmitted towards the receiver, if it is assumed that the signal is radiated equally in all directions.

Electronic Serial Number (ESN)

A number assigned by the mobile station equipment manufacturer to uniquely identify the mobile station equipment.

FCH

Fundamental Channel. This is the traffic channel for Rate Codes 3,4 and 5. TCH is the traffic channel for Rate Codes 1 and 2. The Forward Fundamental Channel is the F-FCH, and the Reverse Fundamental Channel is R-FCH.

FER: Frame Error Rate. This is a calculation made by the MS based on the number of CRC errors counted per frame. It is the ratio of Frames with errors to the total number of frames.

Forward channel

The channel from the base station to the mobile station.

IS-2000

One phase of cdma2000 defined in a standard known as 1X. It introduces 144 kbps packet data in a mobile environment and speeds beyond this in a fixed environment. Features available with 1X are a two-fold increase in both voice capacity and standby time, advanced packet data services, as well as greatly extended battery life and improved sleep mode technology. All of these capabilities will be available in an existing 1.25 MHz channel.

OCNS

Orthogonal Channel Noise Simulator. Use to simulate the behavior of a base station with other MSs active.

Pseudo-code

A normal language expression of what an actual program segment should do.

QPCH

Quick Paging Channel. A channel to notify a MS operating in slotted mode whether to receive the next Paging Channel frame.

Reverse channel

The channel from the mobile station to the base station. From the base station's perspective, the Reverse Channel is the sum of all mobile station transmissions on a frequency assignment.

Slotted mode

An operation mode of the mobile station in which the mobile station monitors only selected time slots on the Paging Channel when in the Mobile Station Idle State. The primary purpose of slotted mode is power conservation.

Acronyms and glossary (continued)

SR1

Service Release 1 of IS-2000

TCH

Traffic Channel. TCH is the traffic channel for Rate Codes 1 and 2. FCH is the traffic channel for Rate Codes 3, 4 and 5.

Test application

The Test Application is software designed to run on a test set to create test functions.

Test mode

Test mode is an operation mode designed to test a MS without over the air signaling.

Test set

The hardware used to run the Test Application software to create the BSE function.

Walsh code or Walsh function

Orthogonal binary function, typically used for channelization.

Agilent Technologies'

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Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlay Agilent's overall support policy: "Our Promise" and "Your Advantage."

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