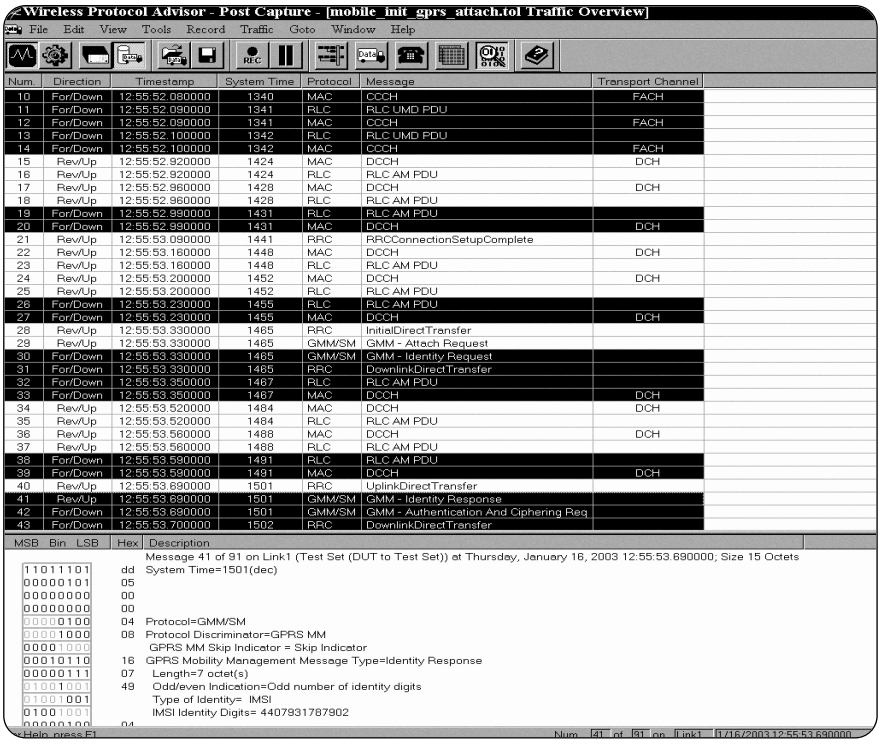
Agilent
E6701C GSM/GPRS Lab Application

Data Sheet

Use with the E5515B/C (8960) wireless communication test set and the E6785B GSM/GPRS/W-CDMA lab application to create your *network on a bench*



E6701C GSM/GPRS Lab Application Functionality

- Integrated GSM and GPRS functionality: switch between data and voice connections without losing camp or attach, send a short message service (SMS) message while on a voice call, suspend and resume packet-switched (PS) data transfers that are interrupted by a voice call
- Advanced protocol logging with the new multiformat E6584A wireless protocol advisor (WPA)
- GSM bad frame indication and frame erasure rate measurements
- Mobile-originated (MO) and mobile-terminated (MT) point-to-point GSM and GPRS SMS
- GSM circuit-switched (CS) and GPRS PS data connections for data transfer between a device under test (DUT) and a network
- A-GPS with RRLP layer configuration and logging
- All features from E1968A GSM/GPRS/EGPRS mobile test application such as
  - Multislot configurations for class 10 GPRS mobile devices
  - Additional GSM and multislot GPRS RF parametric measurements

Also Available

- With purchase of E6720A option 001 GSM/GPRS upgrade contract:
  - Frequency hopping
  - AMR voice echo
  - Binary SMS
  - Data throughput monitor

  See the preliminary E6701D GSM/GPRS lab application data sheet at **www.agilent.com/find/e6701d** for more information
- EGPRS integrated with GSM and GPRS with purchase of E6704A EGPRS lab application

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Audio Functionality

- **Choice of speech encoded on downlink TCH:** none, echo, 300 Hz sine, 1 kHz sine, 3 kHz sine, or PRBS-15
- GSM analog audio measurement (audio level, distortion, frequency, SINAD)

Receiver Measurements

- GSM bad frame indication (BFI)
- GSM FACCH frame erasure rate (FER)
- GSM burst-by-burst bit error ratio (fast BER)
- GSM bit error ratio (BER)
- GPRS multislot BER
- GPRS multislot block error ratio (BLER)

Transmitter Measurements

- Multislot-tolerant transmit power
- GSM/GPRS multislot-tolerant frequency error
- GSM/GPRS multislot-tolerant phase error (peak and rms with confidence limits)
- Multislot-power versus time (burst mask comparison with settable masks)
- Burst timing
- Multislot-tolerant output RF spectrum due to modulation and switching
- IQ tuning
- GSM decoded audio level
- Dynamic power

Instruments

- Audio generator
- General-purpose spectrum monitor
- GSM multi-tone audio

Protocol Functionality

- GPRS and EGPRS PS data channel
- GSM CS data channel
- GSM, GPRS and EGPRS SMS
- RRLP layer for A-GPS and E-OTD
- Protocol event trigger outputs
- Protocol logging with WPA software
- SACCH and PACCH measurement reports

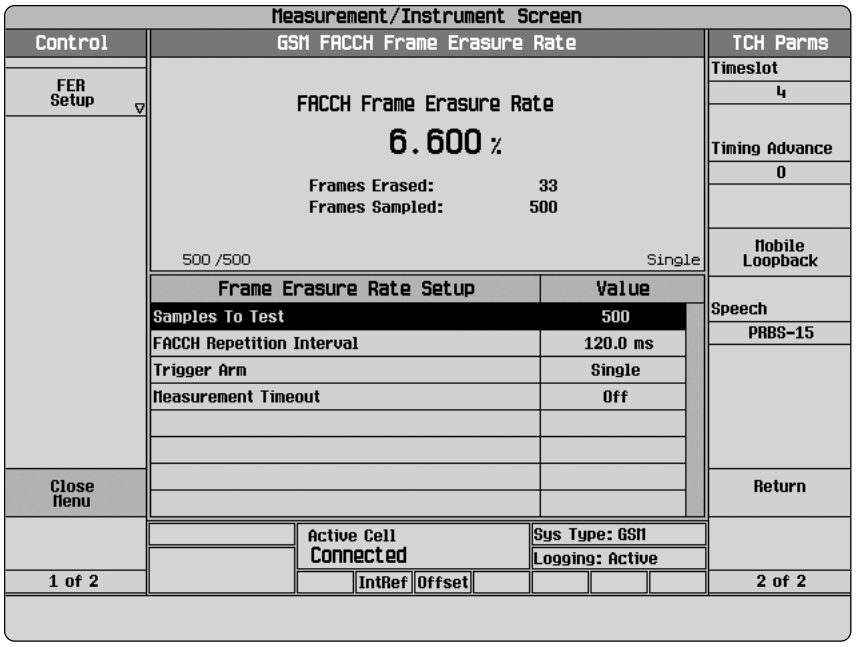

Figure 1. Verify your GSM wireless device's reference sensitivity on FACCH/F as per 3GPP 51.010-1.

IP Data Connection

- **Transfer of IP packet data between a DUT and a network with full PDP context activation**
- **Test your device's IP packet data functionality:** WAP or web browsing, FTP throughput rates, serial or USB modem functionality, e-mail, and data downloads to PC
- GSM CS and GPRS PS connections
- Change multislot configurations, coding schemes, power levels, and channel numbers during data transfer
- **Ping:** test set ping of DUT or other device on a network, network ping of test set or device

GSM CS data connection

- MO establishment of a CS data connection at 2.4, 4.8, or 9.6 kbps using a full-rate GSM channel
- Transparent data (raw rate-adapted bits directly to PPP) at 2.4, 4.8, and 9.6 kbps
- Non-transparent data (using RLP layer) at 4.8 and 9.6 kbps
- Full logging of RLP, PPP, and IP layers using WPA

GPRS PS data connection

- MO and MT establishment of a PS data connection using multislot configurations for class 10 devices
- **GPRS class B:** page voice and SMS during an active GPRS data transfer
- **GPRS suspend and resume:** active GPRS data transfer suspended upon acceptance of voice or SMS request, then resumed after voice call or SMS is complete
- Full logging of Layer 1 through IP layer with WPA

Trigger Output Functionality

- **Frame trigger outputs:** any combination of every frame, every frame except idle frames, every radio block, every BCH multi-frame, every PDTCH multiframe, or on a specific frame number (once per hyperframe)
- **Protocol event trigger output timing:** protocol events associated with an MS action can provide a trigger when the BS event occurs, when the MS is expected to receive, or when the MS is expected to transmit
- **RLC/RR layer protocol event trigger outputs:** any combination of Packet Uplink Assignment, Packet Downlink Assignment, Packet Timeslot Reconfigure, Packet Power Control and Timing Advance, and Packet Immediate Assignment messages
- **Upper layer protocol event trigger outputs:** any combination of Identity Request, Attach Accept, Detach Request, Request PDP Context Activation, and PDP Context Activation Accept messages

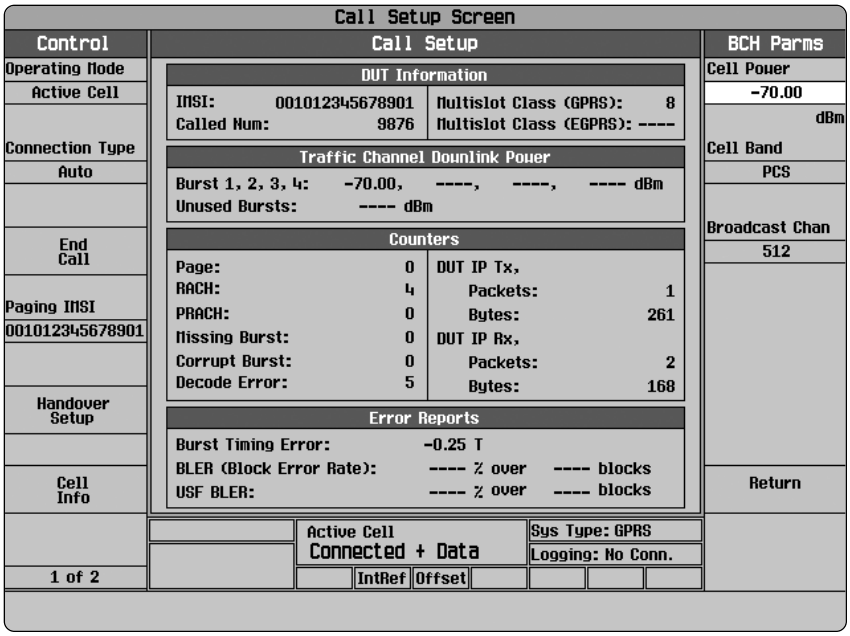

Figure 2. Test your device's Internet connectivity using CS data.

GSM and GPRS SMS

GSM and GPRS point-to-point SMS

- MO, MT, or loopback of MO message back to the mobile as a new message
- Choice of GSM or GPRS transportation mode
- Send one of two fixed ASCII text messages or configure a custom ASCII text message using GPIB

  Fixed message 1:
  0123456789ABCDEFGHIJKLMN OPQRSTUVWXYZabcdefghijklmn opqrstuvwxyz

  Fixed message 2: Agilent Technologies, your partner in wireless solutions

Cell broadcast SMS

- Send up to three messages simultaneously with settable channel, message code update number, and language
- Send one of two fixed ASCII text messages or configure a custom ASCII text message using GPIB

  Fixed message 1:
  The quick brown fox jumps over the lazy dog

  Fixed message 2:
  This instrument provides functional testing of broadcast SMS by sending up to three broadcast messages to the device under test. Two fixed messages and a user-defined message are available for selection. The second fixed message spans multiple pages.

E-OTD and A-GPS Functionality

- Partially customizable RRLP layer
- Configure and send Measure Position Request and Assistance Data messages from the test set
- Ensure Assistance Data messages are acknowledged by the DUT
- Receive and display RRLP Protocol Error messages
- Retrieve parameters from the last Measure Position Response message from the DUT
- GPIB access only
- The ESG series of RF signal generators and E4406A VSA transmitter tester also have E-OTD and A-GPS functionality that can be used with the 8960 test set
- ULTS UMTS Location Test System for A-GPS performance analysis of GSM/GPRS mobile devices available through Spirent Communications at **www.spirentcom.com**
- Application note available at **www.agilent.com/find/networkonabench** literature number 5988-8458EN

Integrated GSM and GPRS Functionality

- Switch between GSM and GPRS serving cells
- Switch between data and voice connections without losing camp or attach
- Establish a voice or data connection after initial GPRS attach
- Send SMS while on a voice call
- Send SMS while a PS data connection is active
- Initiate a voice call while a PS data connection is active; data transfer is suspended and resumes after the voice call is terminated

GSM Functionality

Mobile station power output level control: meets GSM phase one and phase two power control levels

Traffic channels: TCH/FS — FR, EFR, and HR speech modes

Broadcast channel configuration: BCCH + CCCH + SDCCH/4

Signaling protocol setup: FACCH audio speech echo with one-second fixed delay

GPRS Functionality

Multislot classes supported: 1 through 10

Control channels: BCH on timeslot 0 on any ARFCN in any band

Broadcast channel configuration: FCCH + SCH + BCCH + CCCH + SDCCH/4 (0-3) + SACCH/C4 (0-3)

Packet broadcast channel configuration: PBCCH + PCCCH + PDTCH + PACCH + PTCCH; PDTCH, PACCH, and PTCCH currently unused

Downlink PDTCH: one, two, three, or four on the same PDTCH ARFCN with one or two PDTCH amplitudes user-settable between 0 and 55 dB below BCH amplitude; amplitudes in unused timeslots selectable as off, PRL (power reduction level) one, or PRL two

Call Processing Functionality

- GSM 450 MHz, GSM 480 MHz, GSM 750 MHz, GSM 850 MHz, PGSM 900 MHz, EGSM 900 MHz, RGSM 900 MHz, DCS 1800 MHz, PCS 1900 MHz bands
- GSM MS and BS origination
- GSM MS and BS release
- GPRS mobile-initiated attach and detach
- GPRS network-initiated detach
- GPRS packet data transfers on uplink and downlink
- Intra-cell channel assignments
- Inter-cell handovers between all bands
- Handover from W-CDMA to GSM (with E6785B lab application)
- BA table with 16 settable neighbor cells

BCH setup and parameters

- PBCCH on or off
- PRACH length of 8 or 11
- Settable downlink power, band, and channel number
- Settable maximum control channel power used by the MS for access bursts of 0 to 31
- Settable maximum control channel power offset value for DCS 1800 MHz band of 0 to 3
- Band indication of DCS or PCS

GSM TCH parameters

- Settable downlink TCH power including power in unused bursts, uplink band, channel number, and power level
- Channel modes of FR, EFR and HR, plus HR subchannel of 0 or 1
- Settable uplink timeslot of 1 to 7
- Settable timing advance of 0 to 63
- Mobile loopback of off, type A, type B, or type C as defined in ETSI 04.14 or 3GPP 44.014
- Downlink TCH speech types of none, echo, 300 Hz sine, 1 kHz sine, 3 kHz sine, or PRBS-15

GPRS PDTCH parameters

- Settable downlink PDTCH power including power in unused bursts, uplink band, channel number, and power level
- GPRS coding schemes of CS-1, CS-2, CS-3, or CS-4
- GPRS multislot configurations of 1x1, 2x1, 3x1, 4x1, 2x2, 3x2 (downlink x uplink)
- Selection of which contiguous downlink bursts to loop back on the uplink with connection type GPRS ETSI type B
- Selection of which uplink burst to use for multislot-tolerant RF measurements

Cell parameters

- Three-digit MNC off or on in PCS 1900 MHz band
- Settable MCC, MNC, LAC, RAC, NCC, and BCC
- Option to get IMEI at call setup
- Mobile DTX on or off
- Paging mode reorganized or normal
- Settable paging multiframes of 2 to 9
- Repeat paging on or off
- Tx level FACCH signaling on or off
- Guard period length of 9 or 10
- Uplink frame segmentation of asymmetric or symmetric

Handover setup

- GSM traffic band, traffic channel, timeslot, channel mode, half-rate speech subchannel, MS Tx level
- GPRS traffic band, traffic channel, coding scheme, multislot configuration, P0 (power reduction reference), MS Tx level burst 1, MS Tx level burst 2, uplink state flag (USF)

DUT information

- International mobile subscriber identity (IMSI)
- International mobile equipment identity (IMEI) (when selected)
- GPRS multislot class
- Called number

Counters reported

- RACH count
- Corrupt burst count
- Page count
- Decode error count
- Missing burst count
- DUT IP Tx packet and byte counts
- DUT IP Rx packet and byte counts

Errors reported

- Burst timing error
- BLER
- USF BLER

Neighbor cell reports

- Channel number
- Base station color code (BCC)
- Rx level
- Network color code (NCC)

Last location information reported

- Location area code (LAC)
- Mobile country code (MCC)
- Mobile network code (MNC)

SACCH reports
(on a GSM voice call)

- Timing advance
- Tx level
- Rx level
- Rx qual

PACCH reports
(on a GPRS data connection)

- C value
- Rx qual
- Signal variance
- I level for timeslots 0 to 7

RLC/MAC protocol control

- **Allocation control:** medium access mode dynamic or fixed, settable USF value, settable maximum number of octets allocated
- **Handover control:** packet timeslot reconfigure off or on, packet power timing advance off or on
- **Block poll rate:** settable value from one to 32
- **Frame start position:** relative, absolute, or immediate
- **RLC/MAC header:** off or on in GPRS BCH+PDTCH operating mode

LLC protocol control

- **FCS for BLER:** valid or corrupt
- **Payload patterns in ETSI B or for BLER with corrupt FCS:** all zeros, all ones, alternate bits, alternate pairs, alternate quads, PRBS-15, fixed 2B (hex), GMM info for BLER

GMM protocol control

- **Attach Accept:** selectable GMM cause, reject IMSI for non-GPRS services off or on
- **Attach Reject:** selectable GMM cause, reject all attach attempts off or on
- **Detach Request:** selectable GMM cause
- **Identity Request:** IMSI, IMEI, IMEISV, TMSI

SM protocol control

- **Activate PDP Context Accept:** override requested reliability class off or on with selectable value, selectable subscribed reliability class, includes acknowledged LLC
- **Activate PDP Context Reject:** selectable SM cause

WPA logging software

Allows real-time protocol logging of GSM, GPRS, EGPRS, W-CDMA, and cdma2000 messages as well as post-capture analysis of signaling; please refer to the E6584A Wireless Protocol Advisor data sheet at **www.agilent.com/find/e6584a**

Technical Specifications

Specifications apply to the following hardware and software

- E5515B mainframes with serial numbers lower than US40350362 or lower than GB40470454 with GPRS upgrade installed (E5515BU 085)
- E5515B mainframes with serial numbers US40350362 and higher or GB40470454 and higher
- E5515C mainframes
- E6701C GSM/GPRS lab applications with firmware revision C.03
- E6785B GSM/GPRS/W-CDMA fast switching lab applications with firmware revision B.01

Transmitter and receiver measurement specifications

The time until a measurement times-out and returns control to the user can be set independently for each measurement. All measurements return a measurement integrity result indicating the accuracy and usefulness of each measurement's results.

Frequency coverage and amplitude range

Unless otherwise noted, all specifications apply to frequencies of 450 to 496 MHz, 700 to 960 MHz, and 1.7 to 1.99 GHz signals with peak input power at the test set's RF IN/OUT not higher than +37 dBm and temperatures of 0 to +55 °C. Input signal transmit power (defined as the average power over the useful part of the burst) at the test set's RF IN/OUT must be within ±3 dB of the test set's expected power for warranted performance.

Receiver measurement specifications

GSM bad frame indication (BFI) measurement

Standards reference: bad frame indication on TCH/FS as per 3GPP 51.010-1, section 14.1.1

Types of signals measured: GSM carrier (TCH/FS) modulated with random data sent at 11 dB above the reference sensitivity level, SACCH and silence descriptor (SID) frames sent at 20 dB above the reference sensitivity level with the mobile configured to signal bad frames and using discontinuous transmission (DTX)

Minimum input level: all uplink signals at test set's RF IN/OUT must have transmit power ≥ –30 dBm

Mobile loopback: type A as defined in ETSI 04.14 or 3GPP 44.014

Speech frames delay: settable between 1 and 15

Numerical results: undetected bad frame rate, number of frames sampled, number of SIDs sent, number of undetected bad frames, number of SIDs marked as BFI

Multi-measurement capabilities: 1 to 999,999 frames sampled

Concurrency capabilities: GSM BFI measurements can be made concurrently with all other measurements

Supplemental characteristics

Measurement resolution: *0.001 percent*

GSM FACCH/F frame erasure rate (FER) measurement

Standards reference: reference sensitivity on FACCH/F as per 3GPP 51.010-1, section 14.2.3

Types of signals measured: count of Layer 2 repeated frames when downlink stimulated with GSM Layer 3 MM Information message sent on the FACCH

Minimum input level: all uplink signals at test set's RF IN/OUT must have transmit power ≥ –30 dBm

FACCH repetition interval: settable from 120 ms to 1 s

Numerical results: FACCH FER, number of frames erased, number of frames sampled

Multi-measurement capabilities: 1 to 999,999 frames sampled

Concurrency capabilities: GSM FACCH FER measurements can be made concurrently with all other measurements

Supplemental characteristics

Measurement resolution: *0.001 percent*

Test Subscriber Identification Module (SIM) Cards

Test SIM cards are available for purchase from Agilent. Two types are available as follows

- **Programmed SIM card micro-size:** fits most current wireless devices (about 15 x 25 mm), part number 08922-61887
- **Programmed SIM card standard:** rarely used in current phones, fits older, large phones (about the size of a credit card), part number 08922-80047

Ordering Information

For the most up-to-date lab application ordering information, please visit the Agilent site at **www.agilent.com/find/networkonabench**

For more information on ordering test SIM cards, visit the Agilent site at **www.parts.agilent.com/**

For More Information

All other technical specifications and operating modes are included in the E1968A GSM/GPRS/EGPRS mobile test application data sheet on the web at **www.agilent.com/find/e1968a**

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(fax) (31 20) 547 2390
Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Korea:
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(fax) (82 2) 2004 5115
Latin America:
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(fax) (305) 269 7599
Taiwan:
(tel) 0800 047 866
(fax) 0800 286 331
Other Asia Pacific Countries:
(tel) (65) 6375 8100
(fax) (65) 6836 0252
Email:
tm_asia@agilent.com

Online Assistance:
www.agilent.com/find/assist

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