

# Protocol Test

## Two Way AIM

2 / 2.5G Network & Mobile Protocol Analyzer

**AEROFLEX**  
A passion for performance.



- GSM, AMR, GPRS and EGPRS 4+4 timeslots (MS Class 14) air interface protocol analyzer
- Passively decodes raw traffic and signaling between a BTS and Mobile terminal
- Capture and identification of "real world" interoperability issues
- Protocol regression testing and fault finding
- 3GPP Compliant representation of signaling
- Multiple scenarios for automatic and static channel following
- Monitoring of frequency hopping PDCH
- 850, 900, 1800 and 1900 MHz bands available
- Full training and support packages included

*Interoperability of network equipment and mobile terminals is a growing concern to operators and vendors alike as the wireless revolution continues to drive an exponential rise in system complexity.*

Increasingly the approach of testing on system simulators and then field trialling to check compliance, prior to a new terminal launch or BTS software release, is proving ineffective in identifying all the Interoperability Test (IOT) issues. The increase in GSM terminal vendors who don't have easy access to BTS test labs, also increases the likelihood that there will be small deviations in user performance between different network infrastructure manufacturers when using the same mobile device and vice versa.

When interoperability problems are found in the field it is difficult to exactly recreate that scenario in the initial development environment and even more difficult to analyze the level of data necessary to identify the cause, especially if the problem lies in the complex protocol stack.

### PRODUCT OVERVIEW

The Two Way AIM is a member of the ProCLAIME series of Protocol test solutions and provides GSM, AMR, GPRS and EGPRS protocol monitoring and analysis. It sits between a BTS and mobile terminal, passively monitoring all the protocol exchanges between the two devices on the Um interface, such as the signaling and the raw traffic frames.

This allows an IOT engineer to analyse in detail the actual information exchange between the BTS and Mobile terminal creating a quicker, repeatable and deterministic method of investigating and solving IOT issues.

The Two Way AIM system facilitates "real world" behaviour capture and analysis of Mobile stations performing against a lab based 'live network'. Conversely, it can be used to evaluate new Base Station Sub-System (BSS) software releases against a known good mobile terminal. Specific applications are

- Interoperability testing
- Regression testing
- New feature roll out
- Mobile Station evaluation prior to launch
- BSS evaluation prior to new software launch
- Post-deployment network modelling

## MODES OF OPERATION

User defined scripts control the operation of the system and allow one of two basic modes of operation:

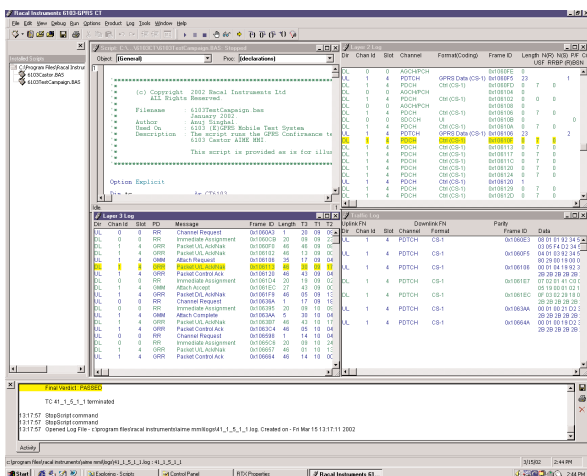
- "Follow on mode" - the Two Way AIM automatically follows a protocol flow. For example from a Channel Request (RACH) to a Channel Release.
- "Static mode" - monitors all traffic and/or signaling associated with a defined Radio Frequency (ARFCN), timeslot and a sub-slot.

## TWO WAY AIM FEATURES

The MMI is designed to be easy to use and provides a number of features to help in the identification of protocol IOT:

- Real time logging
- Decoding of detailed protocol signaling messages between the mobile and the network as per 3GPP specs.
- Filtering capability at Layers 2 and 3 to hide unwanted protocol messages from the MMI displays
- Generation of log files to allow off-line protocol analysis
- Colour coding of uplink and downlink protocol signaling to improve readability
- Ability to synchronise traffic, Layer 2 and Layer 3 frames
- Built-in Visual Basic script environment with coloured code types and auto-code complete facility

The MMI partitions the GSM transport layers into 3 separate windows, each displaying information structured appropriately for that layer.



For example, the layer 2 window emphasises the logical channel and Layer 2 header information, whereas the Layer 3 window is structured by Layer 3 message type.

A fourth major window displays the script that is being run. By using different colours for different types of code syntax and variables, script writing is simplified and thereby accelerated.

Activating a script is as simple as pressing the run button. Scripts start running in less than two seconds, speeding up both script development and the actual testing of a particular mobile station/network interaction. While a script is being executed, the log windows display the information exchange in real time allowing analysis to take place.

The filtering capability allows the user to reduce the amount of protocol shown in any window, facilitating fast analysis of the message flow of interest. The filtering does not affect data stored in the log file so that a user can adjust the filtering after the script has been run allowing different degrees of filtering to be used to isolate the message exchange of interest.

The log file contains all the protocol flow of the mobile and BTS during a test run. The logs can be saved for later analysis, or can be shared with colleagues or vendors/operators as appropriate to resolve the interoperability issue.

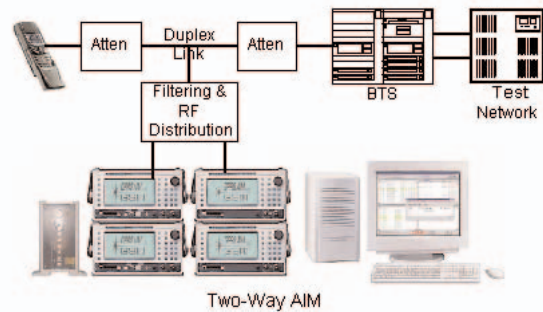
Post capture analysis may be performed remotely on other instances of the Two Way AIM MMI installed on separate PC's.

Alternatively the results may be analysed by loading emulation ("AIME") software onto the hardware to produce a reference Mobile or BTS emulation against which the captured message sequence can be assessed.

## PARTS OF THE SYSTEM - HOW IT HOOKS UP

The protocol monitoring process is carried out using the Racal Instruments Wireless Solutions (RIWS) 6103G and 6113G digital radio test sets connected through an RF assembly, providing a convenient duplex input point. The RF interface assembly accommodates a wide range of input levels from both the BTS and MS

The mobile phone is plugged into the RF assembly together with a simplex or duplex feed from the BTS. The signal path from the BTS to the mobile is unaffected however the Two Way AIM is able to demodulate and log everything



The 6103G and 6113G test sets are connected to a controlling PC through a GPIB connection. The MMI runs on the controlling PC commanding the hardware via the selected script.

The MMI can be installed on additional PCs at no extra cost in order to facilitate the analysis of log files as a separate session and log file sharing with partners. This allows the Two Way AIM to be used for more testing, thereby maximizing the return on investment and speeding up Interoperability testing.

## A SCALEABLE AND UPGRADEABLE SOLUTION

Aeroflex understands the importance to its customers of scaleable and upgradeable test systems and the benefits that this brings in terms of spreading expenditure over the development lifecycle and protecting investment made to date. For this reason, the GSM Two Way AIM can be upgraded quickly and simply to support AMR and GPRS/EGPRS with a straightforward upgrade path. So, as users move from one digital radio system to another, the test equipment can be adapted to meet those changing needs.

By developing its own hardware and software Aeroflex is able to deliver an optimum design that can be professionally supported without the need to rely on third parties. Total control over the design ensures that as requirements change, the underlying hardware and software can be kept up to date without having to worry about migrating to complete new platforms with the consequent expense of needing to repurchase hardware and software

The 6103G test set is also used in the acclaimed 6103 AIME and 6103 AIME/CT. The latter is a 3GPP Conformance Tester listed as platform 11 in both the GCF and PTCRB documentation, capable of running GSM, GPRS and EGPRS compliant test cases

The 6113 AIME is a protocol analyzer for the Base Station Sub-System used widely by the network equipment vendor community for the development of protocol stacks.

Software options allowing the 6103G and 6113G test sets to be configured into emulation and conformance test systems are available from Aeroflex at a reduced price for TWA customers, to recognize the investment made to date.

## CONFIGURATION INFORMATION

Typical configurations and relevant options numbers are shown in the table below

	<b>GSM</b>	<b>GPRS</b>	<b>EGPRS</b>	<b>AMR</b>
<b><u>HARDWARE</u></b>				
6103G Test Set	2	2	2	2
Option 15R – EDGE module	0	0	1	0
6113G Test Set	2	2	2	2
Option 15R – EDGE module	0	0	1	0
RFIU Interface Unit	1	1	1	1
<b><u>SOFTWARE</u></b>				
Option 356 – GSM AIM	1	1	1	1
Option 357 – GPRS AIM	1	1	0	0
Option 358 – EGPRS AIM	1	0	1	0
Option 359 – AMR AIM	0	0	0	1
<b><u>CONTROL PC</u></b>				
Option 39	1	1	1	1

## SUPPORT

Support of the system hardware is an essential element in maximizing efficiency and return on investment of the equipment. Aeroflex offers several comprehensive hardware support packages, which are tailored to typical usage profiles.

The Two Way AIM system is delivered with a comprehensive worldwide hardware and software support package. Three tiers of support packages are offered to the user: Standard, Silver and Gold. Regardless of the level of support chosen, users have access to a helpdesk facility where any faults or issues can be logged, and are guaranteed to receive a response from Aeroflex within the next working day.

The support also covers issues such as specification tracking and any changes in the 3GPP versions of the standard. To fulfil specific support needs, the user is able to customize any of the support packages.

Further details about support can be found in the support section on the Aeroflex website.

## SPECIFICATION

### FREQUENCY RANGES

*PCS 850 824 to 849 and 870 to 894 MHz*

*E-GSM 900 876 to 915 and 921 to 960 MHz*

*DCS 1800 1710 to 1785 and 1805 to 1880 MHz*

*PCS 1900 1850 to 1910 and 1930 to 1990 MHz*

### LEVELS

*Input Level Downlink Operating -50 dBm to -10 dBm*

*Input level Uplink Damage +5 dBm Maximum*

*GPIB Interface ANSI / IEEE 488.2 - 1987*

### UM INTERFACE

*GSM Phase 2+ logging*

*AMR Release 98 logging*

*GPRS Release 97/8/9 logging*

*EGPRS Release 99 logging*

*Hopping per TDMA frame*

*PBCCH support*

*Data services 2.4 -14.4 kbaud (transparent and non-transparent)*

*51 & 52 frame Multiframe support*

*GSM Full Rate Speech logging*

*GSM Phase 2 Enhanced Full Rate Speech logging*

*GSM Phase 2 Half Rate mobile logging*

*AMR Full Rate Speech logging*

*AMR Half Rate Rate Speech logging*

*(E)GPRS TBF logging*

*(E)GPRS PDP Activation logging*

*Ciphering A5/1 per timeslot*

*Ciphering A5/2 per timeslot*

*Session management logging*

## LAYER 2 TRACE

### Trace window reports

Direction (U/L, D/L) Slot

Channel (SDCCH / SACCH / FACCH / PDTCH / PTCCH)

Format (I / UI)

Frame ID (hex or decimal)

N(R), N(S), P/F, C/R, SAPI, USF, RRB, (R)BSN, TFI, BCS

Parity error (if applicable)

Full decode of all Layer 2 header

## LAYER 3 TRACE

### Trace window reports

Direction (U/L, D/L) Slot

Protocol Descriptor (RR / MM / CC / SS / OM / GRR / GMM)

Frame ID

N51 / N32 / N26

Full decode of all Layer 3 messages

## TRAFFIC TRACE

### Trace window reports

Direction (U/L, D/L) Slot

Channel (TCH / RLP / PDCH / PDTCH)

Format (Voice full / Voice half / Data 14.4 / 9.6 / 4.8 / 2.4)

Data H4.8 / Data H2.4 /

CS1...CS4 / MCS1...MCS9) all puncturing schemes

Frame ID

Full voice = 32.5 bytes

Half voice = 14 bytes

Data = 30, 15, or 9 bytes

Packet Data = 23...57 bytes

All AMR Full Rate and half Rate codecs

## DETAILED RLP DATA

Frame ID

Direction (U/L, D/L)

Channel Data

Decode of all RLP header

## ENVIRONMENTAL AND SAFETY

### Voltage Range

85 to 130V and 180 to 264V AC

### Frequency Range

47 to 66 Hz

### Operating Temp

10°C to 35°C

### Humidity

Complies with IEC60068

### Calibration

2 years

### EMC

Complies with EN61326-1 :1997+A1 : 1998 , Class A (emissions) , EN61326-1 :1997+A1 : 1998 Table 1 (immunity)

### Safety

Complies with EN61010-1: 2001

## VERSIONS AND ACCESSORIES

### 61X3G ORDERING OPTIONS

#### RF BAND OPTIONS

- Option 1 - 900 MHz
- Option 2 - 1800 MHz
- Option 3 - 1900 MHz
- Option 8 - 850 MHz

#### Permitted combinations

- 900/ 1900 MHz
- 850/1900 MHz
- 900/1800 MHz

Note the 6103G can support all 4 bands for AIME software

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