



Mobile ISDN Network Simulator (MINS) - 2G

Technical and Commercial Information

Livewire Digital Ltd

For further information:

Tristan Wood - tristan@livewire.co.uk

Livewire Digital Ltd.
Units 14 & 15, First Quarter
Blenheim Road
Epsom KT19 9QN
Surrey
ENGLAND

Telephone: +44 (0)1372-731400
Fax : +44 (0)1372-731420
Website : www.livewire.co.uk
Email : enquiry@livewire.co.uk

1. Mobile ISDN Network Simulator

The Inmarsat Mobile ISDN Network Simulator (MINS) offers an end-to-end simulation of the Inmarsat Mobile ISDN (M4) service and includes many unique features not available on existing ISDN or satellite link simulators.

The characteristics of an Inmarsat Mobile ISDN circuit are very different from a standard ISDN line. The conclusions drawn from application trials have highlighted the need to perform extensive testing on the simulator before commercially deploying an application over the satellite. The MINS-1 can verify the performance of applications over a range of possible circuit conditions. This provides valuable support to both established and new application developers, while saving on development time, customer support expenses, and reducing "live" airtime bills.

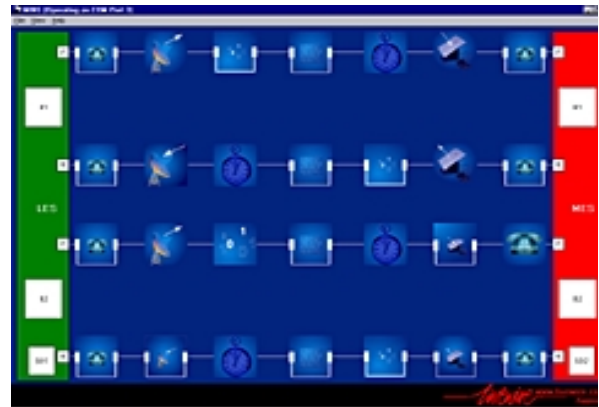


Figure 1 – Graphical User Interface MINS

The MINS was initially developed for the Inmarsat organization as a research and development tool during the design phase of the Inmarsat Mobile ISDN service, but was made available for use by LES operators and system integrators working on a wide range of ISDN based products, including terrestrial ISDN, Fleet and Swift-64 systems.

2. MINS-2G: The next generation

The ongoing demand of Inmarsat's corporate and vertical markets for robust and sophisticated applications has been the driver for the development of MINS-2G by Livewire Digital.

The MINS-2G is the 2nd generation applications validation product for Inmarsat and terrestrial ISDN services, and applications. The MINS-2G, based on the MINS-1, has been re-designed to offer a more advanced level of system functionality, including:

- Extended Interrupt structure
- Rationalized Internal design
- Upgraded OS infrastructure
- Upgraded oscillators - VCO with software calibration

While re-designed the MINS-2G maintains the solid performance of MINS-1, and backwards compatibility.

3. Configuring MINS-2

The MINS-2G operation and configuration is managed via a simple to use graphical user interface (Figure 1).

Individual operating parameters can be changed, and a range of complete configuration profiles can be saved or restored from file.

Configurable parameters include: The B-channel latency, bit error rates and patterns, audio coding conversions (G.711 A-to- μ law), Inmarsat carrier activation, signaling delays, B-channel availability, ISDN numbering schemes, and management of called and calling party number (Figure 2).

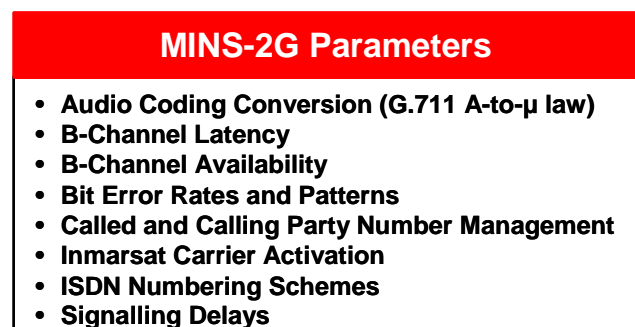


Figure 2 – MINS-2G Configurable Parameters

By presenting two ISDN interfaces, MINS-2G can represent the mobile terminal and the terrestrial endpoint. The system can be operating in two modes: *stand-alone* mode, and *transparent* mode.

In *stand-alone* mode the two ISDN devices are connected directly to the ISDN interfaces of MINS. One interface represents that of the terminal, the other the standard ISDN interface provided by a network operator or service provider. This configuration permits the user to test or demonstrate applications back to back.

In *transparent* mode one interface represents the terminal whilst the other is connected into an external ISDN network. Calls can be placed through the MINS (introducing all the requisite conditions), into the external network where it can be routed through to pre-installed or third party equipment, such as an Internet service provider, online services or corporate networks.

The results of the tests are presented in a clear overview, per channel, per direction, as shown in Figure 3.

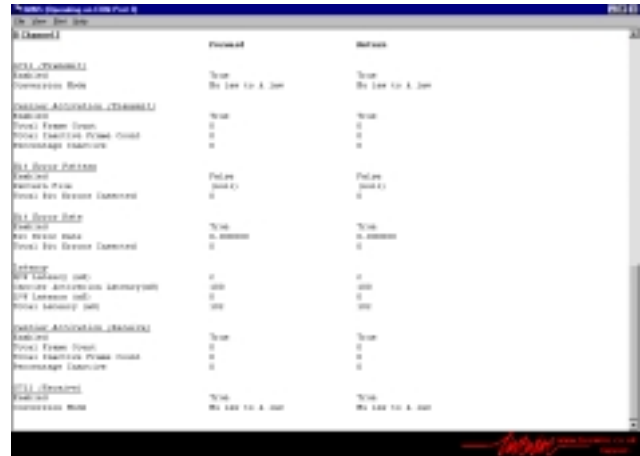


Figure 3 – Test Result Overview

4. Advantages of Using MINS

Much equipment requires complex configuration, both at the ISDN level (dialled numbers, MSN, CLI etc.) and at the application level (IP addresses, passwords, routing profiles, etc.). MINS-2G can provide a consistent test harness for the engineer that can save significant amounts of time and money and removes the need for an Inmarsat terminal or "line-of-sight" during this critical and often lengthy phase.

An important feature of MINS-2G is the ability to verify the "safety margins" of applications i.e. their sensitivity to long latency times, or medium-to-high bit error rates (BER). Experience has shown that these characteristics, do not allow the application performance to degrade gracefully, but simply reach a 'cut off' point where the applications fail to work at all.

This is the case with file transfer packages, routers, encryption systems and other applications that rely on built-in acknowledgement functions. And these (IP) applications are used most commonly over ISDN services.

Using the flexibility of MINS-2G (Figure 4) to validate your applications can ensure reliable operation in all ocean regions, including mobile-to-mobile links and international landlines, all of which can add significantly to the latency of an end-to-end connection. The clarity of the MINS reporting software can help to provide that necessary insight to optimize your applications in support of your customer's operational requirements (Figure 5)

Key Features

- **Easy-to-Use: Windows PC Based**
- **Complete simulation of all major Inmarsat Mobile ISDN Characteristics**
- **Modeling of different Satellite Link Conditions**
- **Configurable ISDN Switch Scheme**
- **Configurable Numbering Schemes**
- **Stand-Alone Mode - Self-contained network simulation for back-to-back equipment testing**
- **Transparent Mode - Test through public ISDN network to existing 3rd party ISDN equipment**
- **VCO with Software Calibration**

Figure 4 – Key Features MINS-2G



Figure 5 – Carrier Activation Statistics

5. The MINS-2G Package

The MINS-2G system is available as a fully integrated system. Operating on a Windows NT platform, these integrated systems are available in desktop or briefcase style PC's, as shown in Figure 6.

Livewire Digital offers a number of MINS-2G packages, including rental and support services, providing customers with a choice that will fit their requirements.

For long-term deployments, customer can purchase MINS-2G with a direct support contract, or rely on ad-hoc support services. For those organisations that require a MINS-2G for short period of time, Livewire provides a rental service, including telephone support and shipment to the customer. This has the advantage that the equipment will always have the latest software.

For large-scale, or reference installations, Livewire Digital can provide testbeds at Livewire Digital offices, fitted with a set of TA's and test analyzers. This provides the customer with the opportunity for quick turnaround troubleshooting in their specific environment backed up by Livewire engineering staff. Should you wish to use a specific set of TA's, a specific quote can be provided swiftly. Customers can buy, or rent a testbed on annual or quarterly basis.



Figure 6 – The Integrated MINS-2G

MINS-2G Pricing

MINS-2G Purchase and Rental

Recognising that not every organisation has the ongoing need for a large number of MINS, or those organisations that require a MINS-2G for short period of time, Livewire is happy to provide a rental service. This includes telephone support and shipment to the customer.

Purchase Price (per unit, £)	
1	6,250
2 - 4	6,000
> 5	5,600

Rental rates (per unit, £)	
Annual	8,000
Quarterly	2,500
Monthly	1,000

MINS-2G Testbed

Placed at Livewire Digital offices, fitted with ZyXEL TA's and test analyzers. Quick turnaround troubleshooting in their specific configuration backed up by Livewire engineering staff. Customers can buy, or rent a testbed on annual or quarterly basis. Should customers wish to use different TA's, a specific quote can be provided swiftly.

Testbed (per unit, £)	
Buy	7,600
Rent, Annual	4,500
Rent, Quarterly	1,300

MINS-1 Upgrade and Repair

Recognising the large number of MINS-1 in the field, Livewire Digital provides a 'Return to Base' policy, which supports software upgrade, repair, or complete MINS-1 to MINS-2G upgrade.

MINS-1 to MINS-2G (per unit, £)		
Software Upgrade	Free	Subject to support contract
MINS-1 Repair	500	Excluding card replacement
MINS-1 to 2G Upgrade	3,800	Hardware and Software

MINS Support

For support on large quantities of MINS units (including combination of MINS-1 and MINS-2G), Livewire Digital recommends the Annual Support Contract, which covers standard office hours support for up to 10 units.

Annual Support Contract (£)		
Annual Support Contract	6,000	Excluding card replacement

This would cover technical advice and trouble-shooting on the MINS-2G software. Bugs found within the software developed would be fixed free of charge, assuming that access to the specific unit is available from Livewire offices. Enhancements other than MINS software would not be covered by the support contract. Depending upon the nature of the work, this could be quoted for on a fixed price or hourly basis.

Additional Support

For additional support above standard office hours, multiple testbed installations and MINS modifications, Livewire can provide further information on request.

Ad-Hoc support is dependent upon the nature of the work undertaken and the associated personnel involved. In line with the MINS-2G support, the following are indicative of the rates charged for ad-hoc support.

Daily (8 Hrs).....	£ 660.00
Weekly (40 Hrs).....	£ 2730.00
Monthly (160 Hrs).....	£ 9672.00

The hourly totals include travel time to and from site and exclude all identifiable expenses such as hotel and travel costs.

Technical Specification MINS-2G

Signalling Simulation

- Two ETSI 300 102 specification ISDN NT endpoints
- User definable directory numbers, CLI and calling party number, and signalling delays
- Two independent B channels modelling the use of two terminals

Clock Slip Simulation

MINS-2G can simulate under- and over-run conditions associated with small variations in the MES ISDN and satellite network clock frequencies

Link Simulation

These parameters can be independently configured for the forward and return paths of each 64kbps circuit:

- **Latency**
The space segment latency can be defined for periods between 2ms and 2 seconds
- **Bit Error Patterns**
Bit error patterns are held as binary files on the PC and may be injected onto B-channel data streams to simulate fading characteristics or line of sight blockages
- **Bit Error Rates**
Stack bit error rates can be imposed on the circuits
- **A-to- μ and μ -to-A law PCM Conversion**
Conversion between μ -and-A law PCM streams can be performed at both the MES and LES endpoints
- **PCM Carrier Activation**
When the call type is 3.1Khz audio, the Inmarsat PCM carrier activation is modeled, with user definable threshold levels for both the MES and LES endpoints
- **UDI Carrier Activation**
When the call type is UDI, the Inmarsat UDI carrier activation is modeled.

Hardware

- Full length ISA card (Figure 7)
- Motorola MC68331 32 bit embedded microprocessor kernel
- Two ISDN S0 interfaces programmable NT/TE mode
- 40 Volt phantom power input mode
- Console serial port
- Plesiochronous buffers
- Memory expansion and on-board sockets for future add-on functions

On-board Software

- Microware OS-9 real-time operating system
- All B- and D-channel processing performed by the board
- ISDN API for future custom specific developments

PC Software

- Windows NT4.0 based graphical user interface (GUI)
- All user defined settings configurable through the GUI
- Visual representation of call program and carrier activation

ISDN Interface

- Programmable for NT or TE mode independently for each interface
- Euro ISDN D-channel protocol
- Support of ISDN supplementary services
- ISDN switch software



Figure 7 – MINS ISA card