



Bluetooth ISDN Base Station

INOV BT-ISDN BS V1 Preliminary Specification

REVISION HISTORY			
DATE	REV	BY	COMMENTS
01-03-01	A	José Gonçalves	Adding a Bluetooth module to the ISDN card via RS232
02-07-01	B	Ricardo Lascas	Product introduction. Bluetooth h/w integration. Bluetooth f/w status. ISDN Basecard V2 and v3 roadmap.

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2. INTRODUCTION

The arrival to the market of new and dazzling home/personal appliances like Ericsson's HBH-10 headset, R 520 mobile phone, Cordless Internet Radio, Cordless Web Screen H610, Motorola's Timeport 270 and a multitude of USB / PCCard / Cflash adapters, all carrying Bluetooth technology, creates the need to access the existing networks services and contents from these devices.

While others focus on ADSL/Bluetooth access points as bridges/routers of voice and data to the PSTN/GSM core networks and to the Internet, INOV BT-ISDN BS is ready to provide these functions using the wide spread ISDN access.

Based on a certified ISDN card developed by INOV and already used on commercial DECT-ISDN access point, also fully developed by INOV, the INOV BT-ISDN access point is a shortcut to the market.

The development roadmap ensures product continuity, higher integration and enhanced features in forthcoming product versions.

The development team at INOV has more than 10 years experience in ISDN product development, for several multinational companies from Europe, U.S.A. and Japan. INOV also has development teams working in several other fixed & wireless technologies including PSTN, ADSL, Ethernet, ATM, DECT, Bluetooth, 802.11b, TETRA, GSM, UMTS, etc.

INOV develops and licenses core technologies & products enabling its clients to achieve their goals in a secure and timely manner. We have what it takes to bring your ideas to market.

More information about INOV and all products & services is available upon request.

3. PRODUCT OVERVIEW

The INOV BT-ISDN BS V1 is a product belonging to INOV's ISDN BaseStation series, which at present comprises the following items:

- DECT ISDN BaseStation (INOV DECT-ISDN BS V1)
- Bluetooth ISDN BaseStation (INOV BT-ISDN BS V1)

Each of the above products share a common certified ISDN BaseCard (INOV ISDN BC V1) which in turn has a common open interface enabling it to connect to other communication modules, such as: data & voice DECT modules, Bluetooth module, etc., from several vendors. This modular approach facilitates new product development and fast time-to-market. All I.P.R. related to our ISDN BaseCard belong exclusively to INOV.

3.1. APPLICATION SCENARIO EXAMPLES:

- **Dialup networking**, enables the coverage of a indoor space such as a living room, meeting room, hotel room/hall to provide Portable PCs, PDAs, Handheld PCs, 2.5G devices (Motorola Timeport 270, Ericsson R570), 3G devices with WWW access. Billing and/or bandwidth control can be implemented.
- Indoor use of **Bluetooth enabled cell-phones as cordless phones** (Motorola Timeport 270, Ericsson R570). When you are at home or at work, your cell phone will act as a mobile extension to your ISDN line when you dial fixed numbers and as a GSM phone when you dial mobile numbers. In reverse, you can also pickup incoming calls with your cell phone either from the GSM network or the ISDN network.
- **Secure POS interface**. Pay with your phone! Bluetooth secure links enable safe commercial transactions. Cell-phones, PDAs, etc, can be used as electronic wallets, credit/debit cards holders. INOV BaseCard can provide digital interconnection to existing local ATM networks, such as SIBS in Portugal.

4. PRODUCT FEATURES

4.1. CAPABILITIES

WIRELESS DATA COMMUNICATIONS	723.2/57.6 Kbps Asymmetric or 430 Kbps symmetric
EXTERNAL DATA COMMUNICATIONS	2 x 64 Kbps (full-duplex)
WIRELESS VOICE COMMUNICATIONS	Max 3
EXTERNAL VOICE COMMUNICATIONS	Max 2

4.2. ISDN SUPPLEMENTARY SERVICES

4.2.1. NUMBER IDENTIFICATION SERVICES

DDI	Direct Dialing In
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLP	Connected Line Presentation
COLR	Connected Line Restriction

4.2.2. CALL OFFERING SERVICES

CFU	Call Forwarding Unconditional
CFB	Call Forwarding On Busy
CFNR	Call Forwarding On No-Reply

4.2.3. CHARGING SERVICES

AOC-S	Advice of Charge at Call Set-up
AOC-D	Advice of Charge During the Call
AOC-E	Advice of Charge at the End of the Call

4.3. INDICATORS AND CONNECTORS

LED INDICATORS	4 Red LEDs <ul style="list-style-type: none"> • Power • ISDN Line Activation • Data Call • Voice Call
CONNECTORS	RJ-45 ISDN S interface connector JACK power connector
POWER	9V DC - 280mA

5. ISDN BASE CARD

The ISDN BaseCard has an RJ45 physical interface and provides all the local functionalities for the system to behave like an ISDN TE (Terminal Equipment). The ISDN BaseCard provides both voice and data communications support. Data communications are based on a standard modem emulation firmware.

5.1. ISDN INTERFACE

ISDN CHARACTERISTICS	BRI (Basic Rate Interface) 2B+D
D-CHANNEL PROTOCOL	DSS1 (Euro-ISDN)
B-CHANNELS PROTOCOL	<i>Data:</i> Async to Sync PPP Conversion <i>Voice:</i> Transparent

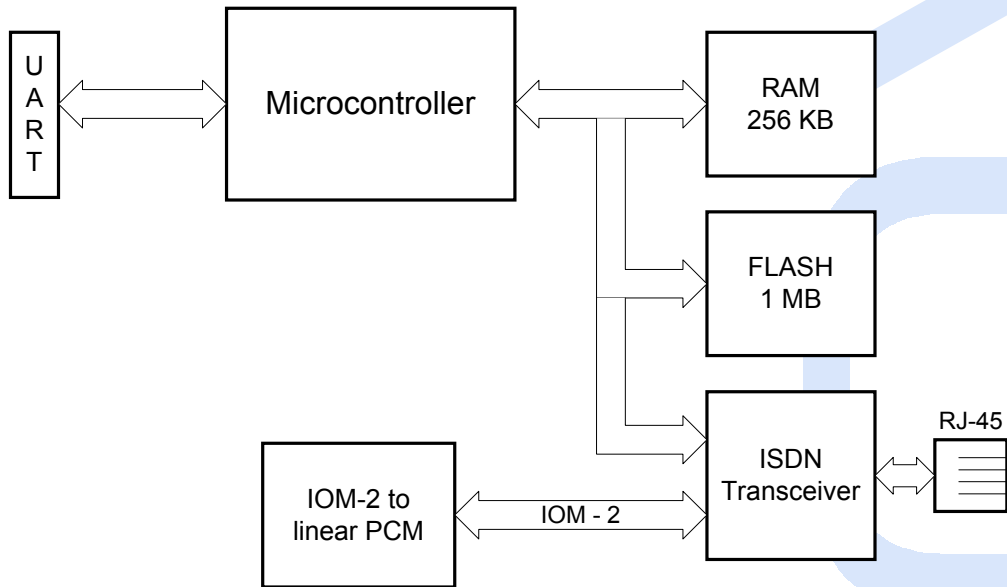
5.2. ISDN VOICE AND DATA MODEM

COMMAND SET	<i>Data:</i> AT command set (Modem Emulation) <i>Voice:</i> COMMON-ISDN-API (CAPI) 2.0
CAPABILITIES	2 simultaneous data or voice calls

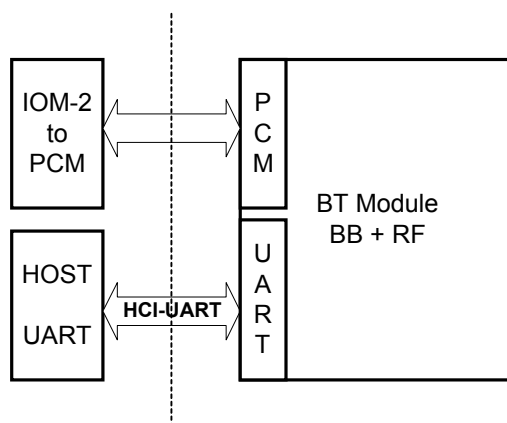
5.3. BASECARD ISDN HARDWARE REQUIREMENTS

BUST INTERFACE	An 80 pin modified ISA connector
PCB	4 layer design
CHIPSET	Infineon SAB C163 Microcontroller Infineon PSB 2115 ISDN PC Adapter Circuit (IPAC)
FLASH MEMORY	1 MB (512Kx16)
RAM	256 KB (128Kx16)
LINE INTERFACE	RJ-45

5.4. BASECARD BLOCK DIAGRAM



5.5. BLUETOOTH BLOCK DIAGRAM



5.6. HARDWARE OVERVIEW

The ISDN BaseCard is based on an Infineon (formerly Siemens Semiconductors) chipset. It uses the SAB C163 Microcontroller and the ISDN transceiver PSB 2115, commonly referred as IPAC (ISDN PC Adapter Circuit) on Infineon literature.

The BaseCard is ready to accept any Bluetooth module providing a UART interface and HCI functionality for data and control and PCM interface for voice. So far Ericsson and CSR's modules have been tested successfully, but no reason exists for using a different module providing similar capabilities. The ISDN BaseCard V3 will enable the usage of USB modules.

Motorola announced an interesting UART/PCM small module for direct soldering in the PCB. The BTMCM150.

ALPS as also already available an USB/UART/PCM small module for direct PCB integration based on CSR BlueCore01.

The ISDN and Bluetooth firmware executes directly from FLASH memory, except the FLASH update routines that are copied at startup to RAM. This copy is needed because of the limitation on FLASH memory technology that turns all the memory on the chip unreadable while erasing/programming any chip's portion (block).

The RAM is used for storing changeable data (buffers & operational data) and to execute FLASH update routines.

The ISDN chip integrates the S-transceiver, one D-channel and two B-channels HDLC protocol controllers. It uses the card's data-bus to transfer the data received both from D channel (signaling) and B channels to internal RAM. The data transfers on reception are interrupt driven. Data transmission could be on demand or also interrupt driven (when a transmit acknowledge is received). This chip contains 2 x 32 bytes D-channel FIFO buffers and 2 x 64 bytes FIFO buffers per B-channel. The firmware has the responsibility to segment and reassemble HDLC frames that are bigger than the FIFO dimensions. The internal B-channels controllers are only used for data calls. On voice (telephony) calls the data is transferred between the Bluetooth module and the ISDN chip through the IOM-2 interface, the USART only carries CAPI commands used for call control/signaling. In voice mode the chip is protocol transparent with respect to the Bearer Channels; what is received from the IOM-2 interface is sent to the ISDN B-channel and vice-versa.

5.7. FIRMWARE OVERVIEW

5.7.1. ISDN FIRMWARE

INOV has its own full-certified ISDN stack developed in SDL but still maintaining a small footprint.

5.7.2. BLUETOOTH FIRMWARE

INOV has developed its own Bluetooth upper stack version for the INOV BT-ISDN. At present development state the stack is ready for serial profile demonstration. INOV is working in an architecture independent Bluetooth upper-stack in C and SDL for use in the BT-ISDN BaseCard and others IAD devices.

It is also possible to easily port a third party Bluetooth upper-stack into the ISDN BaseCard architecture.

5.7.3. OTHER FIRMWARE

Several enhancements like a NAT module to provide IP masquerading (several mobile users can share a single PPP data connection over ISDN) are in final tests and will be incorporated soon. Dynamic multilink PPP is also being developed and will be ready for INOV BT-ISDN BS V3.

5.8. PRODUCT PICTURES

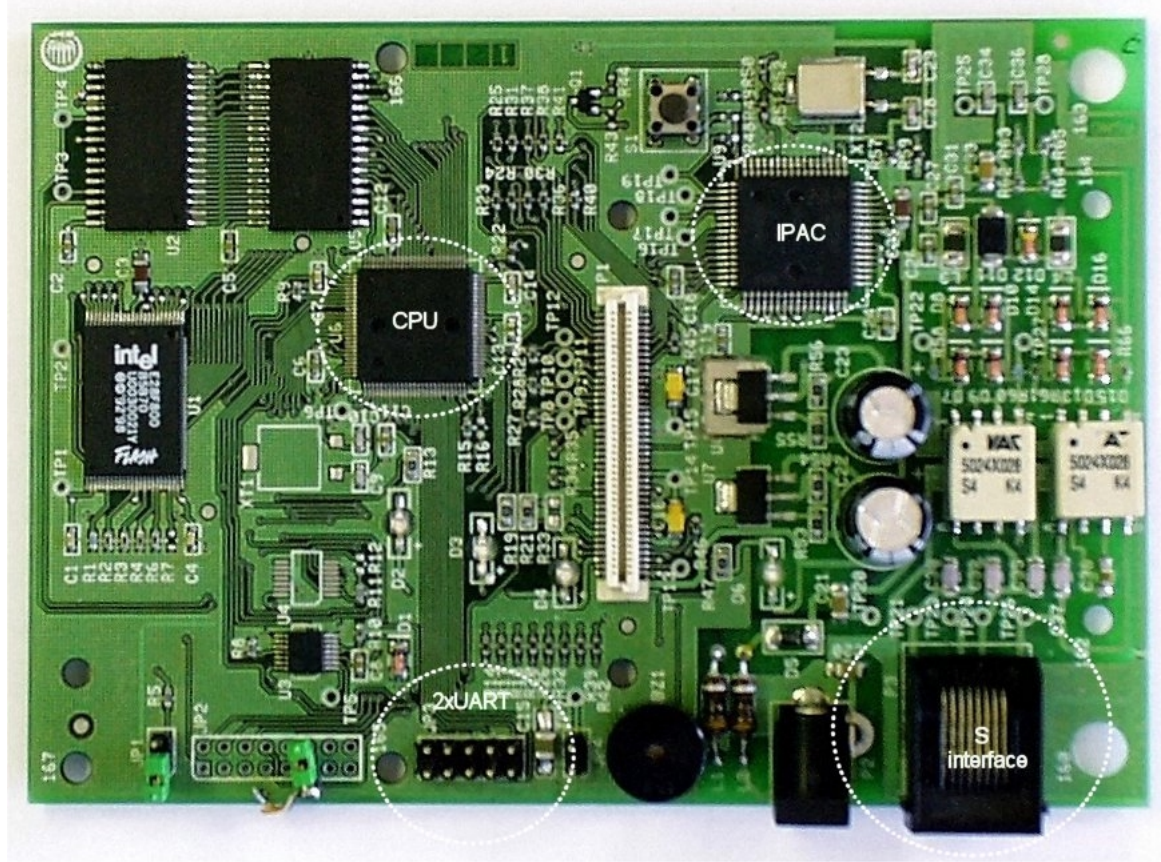


Figure 1: ISDN BaseCard

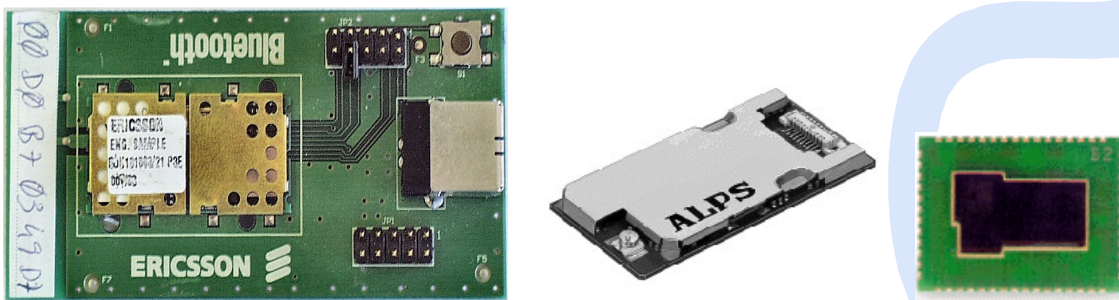


Figure 2: Ericsson Bluetooth sample Module, ALPS module, Motorola BTMCM150

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5.9. CONNECTORS BUTTONS AND LEDs

5.9.1. CONNECTORS

Power Connector: Jack 9V - Negative on center

S Interface: RJ-45

Name	Pin		Description
NC	1	-	Not connected
NC	2	-	Not connected
TX1	3	0	S-Bus Transmitter Output
RX2	4	1	S-Bus Receiver Input
RX1	5	1	S-Bus Receiver Input
X2	6	0	S-Bus Transmitter Output
NC	7	-	Not connected
NC	8	-	Not connected

5.9.2. BUTTONS AND JUMPERS

Registry Button:

The combined use of the registry button and jumper JP1 at BaseStation power up, selects also other system operation modes, resumed in the following table.

BASESTATION OPERATION MODES

Registry Button	Jumper JP1	BaseStation Operation Mode
OFF	OFF	Not used
OFF	ON	Bluetooth operation
ON	OFF	F/W Upgrade Mode
ON	ON	Development/Debugging Mode

5.9.3. LEDs

There are 4 LEDs on the BaseStation. Follows their description, indicated from case up to down:

- Voice** Lights whenever a voice call is active.
- Data** Lights whenever a data call is active.
- ISDN Link** Lights when ISDN physical layer is active (when signal INFO 4 is detected at RX1/RX2). Blinks when the registry button is pressed, indicating that portable register is allowed.

- **Power** Lights when system is powered up.

When in F/W upgrade mode the LEDs have a different functionality.

The power LED will blink when entering in F/W upgrade mode until a link is established with the download utility that runs in a PC. The physical link is established between a jumper in the basecard and a serial port on the PC, by using a custom supplied cable.

After link is established the Voice and Data LEDs will alternatively blink until the end of the download process. At the end, if download was successful, all LEDs will go OFF (including the Power LED). If some LED remains ON when download ends it's an indication that it has failed.

5.10. ELECTRICAL CHARACTERISTICS

INTERNAL RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Units
+5V	5 Volt Supply Voltage	4.5	5	5.5	V
+3.3V	3.3 Volt Supply Voltage	3.2	3.3	3.4	V
V _H	Input High Voltage	2.0	-	V _{CC} +0.3	V
V _L	Input Low Voltage	-0.3 ⁽¹⁾	-	0.8	V
Temp.	Ambient Temperature	0	-	+70	°C

NOTE 1: V_L (min) = -1.5V for pulse width less than 20ns

6. ROADMAP

6.1. V2 (1ST Q, 2002)

- BaseCard
 - DECT connector removal
 - Bluetooth module integration
- Extra f/w
 - NAT module (IP masquerading)
- Bluetooth f/w
 - SDP profile
 - Serial port profile
 - Dialup Networking Profile
 - Lan Access Profile

6.2. V3 (3RD Q, 2002)

- BaseCard
 - CPU upgrade to C165 (USB interface + IPAC on chip)
 - Bluetooth antenna enhancement
- Extra f/w
 - Multilink PPP
- Bluetooth f/w
 - TCS bin profiles
 - Headset profile
 - New Bluetooth v2 specs profiles
 - Voice over HCI