

coM.s.a.t.  
**Multichannel PRA**

Description

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## Contents

Contents .....	2
List of figures .....	5
Literature references .....	8
1. Introduction .....	9
2. User safety information .....	10
2.1. Electrical safety .....	10
2.1.1. Air traffic safety .....	10
2.2. Environment with explosive materials .....	10
2.3. Road traffic safety .....	10
2.4. Non-ionizing radiation .....	10
2.5. Electronic medical equipment .....	10
2.6. Measures to be taken in case of loss/theft .....	10
2.7. Transport .....	11
2.8. Where to install the devices .....	11
2.9. Damage and repairs .....	11
3. Functional description .....	12
4. Installation and operating hints .....	16
4.1. Multichannel PRA in NT mode .....	16
4.2. Multichannel PRA in TE mode .....	18
4.3. Servicing / Remote servicing .....	20
4.3.1. Servicing .....	20
4.3.2. Remote servicing via GSM .....	20
4.3.3. Read out/Transmit configuration .....	21
4.3.4. Firmware update .....	22
4.3.4.1. Firmware replacement from the console window .....	22
4.4. Starting up the device .....	24
4.4.1. Cabling .....	24
4.4.2. Connections on the PRI board .....	24
4.4.3. Power switch .....	25
4.4.4. LED indicators on the PRI board .....	25
4.4.5. Connections on the CPU board .....	25
4.4.6. LED indicators and buttons on the CPU board .....	25
4.4.7. Connections on the IPG board .....	26
4.4.8. LED indicators on the IPG board .....	26
4.4.9. LED indicators on the GSM boards .....	26
4.4.10. Hot Swap Feature .....	27
4.4.10.1. Remove a GSM board .....	27
4.4.10.2. Insert a GSM board .....	28
4.4.11. Installing the SIM cards .....	28
4.4.12. Parameter configuration .....	29
5. Installation of the PRAC application .....	30
5.1. Installation of the program files .....	30
5.2. Installation of the Ethernet port on the CPU board .....	31
5.3. Installation of the virtual COM port driver .....	32
5.3.1. Installation for "IPG" boards (Using NPort, obsolete) .....	33
5.3.1.1. Step 1: Installation of the NPort Management Suite .....	33

# Multichannel PRA

---

5.3.1.2	Step 2: Setting of the IP address .....	33
5.3.1.3	Step 3: Assignment of a virtual COM port .....	34
5.3.2	Installation for "IPG2" boards (Using Network Enabler) .....	35
5.3.2.1	Step 1: Installation of the Network Enabler Software .....	35
5.3.2.2	Step 2: Setting of the IP address .....	35
5.3.2.3	Step 3: Setting of the Real COM Operating Mode .....	37
5.3.2.4	Step 4: Assignment of a virtual COM port .....	38
6	Configuration of the Multichannel PRA .....	39
6.1	Startup dialog of the PRAC application .....	39
6.2	Basic elements of the PRAC application .....	40
6.2.1	File cards .....	40
6.2.2	Toolbar .....	40
6.2.3	Status bar .....	41
6.2.4	Interface selection .....	42
6.2.5	Login .....	42
6.2.6	Load configuration from PRA .....	43
6.2.7	Send configuration to PRA .....	43
6.3	Configuration wizard .....	43
6.4	Editing general parameters with the PRAC application .....	44
6.4.1	Identification, Firmware .....	45
6.4.2	Maintenance .....	45
6.4.3	ISDN Operation Mode .....	46
6.4.4	Number Recognition .....	46
6.4.5	Calls from PSTN .....	47
6.4.6	Calls from PBX .....	47
6.4.7	Calls from GSM .....	48
6.4.8	Unconnected Calls to GSM .....	49
6.4.9	Black List / White List .....	51
6.4.10	Calls to PBX (Mobile Extensions) .....	52
6.4.11	Trunk Access from GSM/PSTN .....	53
6.4.12	Virtual PBX .....	53
6.4.12.1	Configuration .....	54
6.4.12.2	Call Hold .....	54
6.4.12.3	Call Retrieve .....	55
6.4.12.4	Call Transfer .....	55
6.4.12.5	Licensing .....	55
6.4.13	Fault handling .....	56
6.4.14	Call statistic parameters .....	57
6.4.15	Voice (Announcements) .....	57
6.4.16	Compatibility .....	59
6.4.17	SMS parameters .....	61
6.4.18	Service Parameters .....	62
6.5	Channel parameters .....	63
6.5.1	RSSI supervision .....	65
6.5.2	Virtual Private Network Support .....	65
6.5.2.1	Outgoing Calls .....	65
6.5.2.2	Incoming Calls .....	66
6.5.3	TDMA parameters .....	67
6.5.4	Service parameters .....	67

# Multichannel PRA

---

6.6	Calls statistic (CDRs)	68
6.7	Status	69
6.7.1	ISDN line status	69
6.7.2	GSM module status	70
6.7.3	Prepaid Balance	70
6.7.4	User Time Limits	71
6.8	SMS	73
6.8.1	Receive SMS	74
6.8.2	Send SMS	74
6.8.3	SMS Server	74
6.9	Routing tables	76
6.9.1	Table "Routing"	76
6.9.2	Table "Destination Prefix Groups"	77
6.9.3	Table "Periods of Time"	78
6.9.4	Table "Provider Description"	78
6.9.5	Which route will my call take?	78
6.9.6	AOC	79
6.10	Clock	80
6.11	Firmware	81
6.12	Monitor	81
6.12.1	Coloring	82
6.12.1.1	Header Row Coloring	82
6.12.1.2	Data Cell Coloring	83
6.12.2	Monitor Filter	83
6.12.3	Searching for Text in the Monitor	84
6.12.4	Storing Monitor Selection as HTML	84
6.13	Additional information	85
6.14	Networks	85
7	Security	85
7.1	Login Password	86
7.2	Configuration Password	86
7.3	Restriction of IP addresses	87
8	Questions and answers	89
8.1	Installation	89
8.1.1	Virtual COM port driver	89
8.2	GSM	90
8.2.1	Antennas	90
8.2.2	GSM Network Problems	92
8.3	ISDN	94
8.4	PRAC configuration software	96
8.5	Routing	97
8.6	SMS Server	97
8.7	Miscellaneous	98
8.8	Remote Servicing via analog modem	99
9	Technical data	101
9.1	Connector assignments	102
Appendix 1:	LED Function	103
Appendix 2:	Abbreviations	104

# Multichannel PRA

---

## List of figures

Figure 1: Functional groups .....	13
Figure 2: View of the Multichannel PRA, frontside (64 channel version, not hot-pluggable) .....	14
Figure 3: View of the Multichannel PRA, frontside (32 channel version, hot-pluggable) .....	14
Figure 4: Rearside of the Multichannel PRA (64 channel version) .....	14
Figure 5: NT Installation with PSTN and Stand alone NT Installation .....	16
Figure 6: NT Installation with synchronization from PSTN .....	17
Figure 7: NT Configuration .....	18
Figure 8: TE Installation .....	19
Figure 9: Router Installation (TE and NT) .....	19
Figure 10: TE Configuration .....	19
Figure 11: Remote Servicing .....	21
Figure 12: Firmware Update .....	22
Figure 13: PRI Connections .....	24
Figure 14: Switch off a board to remove it .....	27
Figure 15: SIM card holder assignment .....	28
Figure 16: Channel numbering relationship .....	29
Figure 17: PRAC Installation .....	30
Figure 18: PRAC program file .....	30
Figure 19: Setting the IP Address .....	31
Figure 20: Usage of the CPU ethernet port in the PRAC application .....	31
Figure 21: Connection between IPG and CPU board (non-hotplug backplane) .....	32
Figure 22: Usage of the virtual port in the PRAC application .....	33
Figure 23: Installation of virtual COM port driver (Nport) .....	33
Figure 24: Setting of the IP address (Nport) .....	34
Figure 25: Assignment of a virtual COM port (Nport) .....	35
Figure 26: Installation of virtual COM port driver (Network Enabler) .....	35
Figure 27: Locating the IPG board (Network Enabler) .....	36
Figure 28: Setting of the IP address and Netmask (Network Enabler) .....	37
Figure 29: Setting of the Real COM operating mode (Network Enabler) .....	37
Figure 30: Assignment of a virtual COM port (Network Enabler) .....	38
Figure 31: Startup dialog of the PRAC application .....	39
Figure 32: Right side of status bar .....	41
Figure 33: Connect to Multichannel PRA on COM1 serial PC port .....	42
Figure 34: Configuration Wizard .....	43
Figure 35: Groups of General Parameters .....	45
Figure 36: ISDN Parameters .....	46
Figure 37: Number recognition parameters .....	46
Figure 38: Parameters for calls from PSTN .....	47
Figure 39: Parameters for calls from PBX .....	47
Figure 40: Parameters for Calls from GSM .....	48
Figure 41: Unconnected Calls to GSM .....	50
Figure 42: Black and White List .....	52
Figure 43: Calls to PBX (Mobile Extensions) .....	52
Figure 44: Edit Diversion .....	52

# Multichannel PRA

---

Note: This feature is not supported in all networks.....	54
Figure 45: Virtual PBX parameters .....	54
Figure 46: License Dialog .....	56
Figure 47: Fault handling parameters .....	56
Figure 48: Call statistics parameter .....	57
Figure 49: Voice parameters .....	57
Figure 50: Voice files stored in PRA.....	58
Figure 51: Compatibility parameters.....	59
Figure 52: SMS parameters.....	61
Figure 53: GSM-Channel 1..64.....	63
Figure 54: Signal Level Supervision .....	65
Figure 55: RSSI threshold dialog.....	65
Figure 56: VPN Support .....	66
Figure 57: Statistic data .....	68
Figure 58: ISDN line status.....	69
Figure 59: GSM module status .....	70
Figure 60: Prepaid Balance .....	71
Figure 61: Announcements for Time Balance.....	71
Figure 62: Example of a list of authorized users.....	72
Figure 63: Example of a list of reference groups .....	72
Figure 64: Time Balance for Dial-Through.....	72
Figure 65: Time Balance after ADD to balance operation .....	73
Figure 66: Sending and receiving an SMS .....	74
Figure 67: Routing tables .....	76
Figure 68: AOC Information Dialog.....	80
Figure 69: Setting the time.....	80
Figure 70: Firmware Update .....	81
Figure 71: Trace monitoring.....	82
Figure 72: Monitor Configuration .....	83
Figure 73: Find Text dialog .....	84
Figure 74: Networks .....	85
Figure 75: Login password .....	86
Figure 76: Dialog Enter/Change Password .....	86
Figure 77: Configuration Password .....	87
Figure 78: Starting the NPort Configurator .....	87
Figure 79: IP Access Control .....	88
Figure 80: Real COM Installer message.....	90
Figure 81: Remote servicing via analog modem.....	99
Figure 82: Remote servicing via analog modem.....	100
Figure 83: Remote servicing using analog modem.....	100

# Multichannel PRA

## Versions

Ver	Software/ Firmware	Date	Description of the revision	Chapter	By
1.0		01.12.01	First issue	All	HH
1.1		06.06.03	Corrections and additions	All	SL
1.2		12.09.03	Corrections and additions, Q&A Section	All	SL
		8.10.03	AOC, Q&A	Routing, Q&A	SL
1.3		13.10.03	Update from Console	Firmware	SL
1.4.		10.12.03	SMS Server, Q&A	SMS, Q&A	SL
1.5.		06.02.04	Routing Tables	Routing	SL
1.6.		19.02.04	CDR items described	Call Statistics	SL
1.7		02.03.04	VPN Functionality described	Channel Parameters	SL
1.8		10.03.04	IPG Board Configuration with crossed ETH cable	Installation of the virtual COM port driver	SL
1.9		07.04.04	Antenna Cable Tables	Q&A	SL
2.0	1.21/1.00	14.04.04	Added Hot-Swap, Security. General update to Software 1.21 (Firmware: 0.92/1.00)	All	SL
2.1	1.29/1.07	24.05.04	CLIR Encoding Monitor Filter Call Counter Display	Channel Parameters/VPN Support Monitor LED indicator at CPU board	SL
2.2	1.32/1.11	08.06.04	RSSI supervision	Channel Parameters/RSSI	SL
2.3	1.48/1.19	26.07.04	Remote Login supports now non-GSM-modems New IPG-board (300.460b) Monitor Filter	Remote servicing via GSM  Installation of virtual COM Ports Monitor	SL
2.4	1.52/1.19	12.08.04	Description of some general parameters were missing Setting of the operating mode of the IPG-board 300.460b	General Parameters  Installation of virtual COM Ports	SL
2.5	1.67/1.25a	30.11.04	Remote access using an analog modem Routing strategy (exceptions in prefix groups) Mailbox detection Unconnected Calls Handling	Q&A  Routing  General parameters General parameters	SL
2.6		06.01.05	Technical Data completed Location codes	Technical data Call Statistics	SL
2.7	1.80/1.40	29.06.05	DDI diversion Prepaid support	Channel parameters, Status	SL
2.8	1.90/1.46	27.03.06	CPU Ethernet Port  Load Balancing	Installation of the Ethernet Port of the CPU Board General parameters/Calls from PBX	SL
2.9	1.91/1.47	31.03.06	BER Display	Status	SL
3.0	1.92/1.48	30.01.07	General revision	All chapters	SL
3.1	1.94/1.49	04.04.07	User Time Limits	Status	SL
3.2	1.95/1.50	06.06.07	Virtual PBX	General Parameters	SL
3.3	2.01/1.60	11.02.08	Unconnected Calls	General Parameters	SL

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Manual coMsat Multichannel PRA 3-3 eng.doc

*Note Protection Mark according to DIN 34!*

# Multichannel PRA

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## Literature references

Bergmann / Gerhardt	Taschenbuch der Telekommunikation Fachbuchverlag Leipzig
Kanbach / Körber	ISDN - Die Technik Hüthig Verlag
Siemens	TC35i - Manual MC75 - Manual

# Multichannel PRA

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## 1 Introduction

Multichannel PRA is a digital mobile phone adapter (TA), which uses suitable GSM modules and SIM cards for voice communications and SMS transmissions. Multichannel PRA is connected to one or two ISDN (S<sub>2</sub>m, PRI, E1) - ports on the ISDN PABX and/or directly to the PSTN. The Multichannel PRA mobile phone adapter can then be used to make calls via the favorable mobile phone tariff.

The Multichannel PRA is assembled in a 19" industrial housing and is suitable for installation in 19" systems.

Multichannel PRA is configured comfortably and user-friendly via the **PRAC** Windows application. The devices can also be serviced remotely with the aid of this application via LAN or GSM. The application can run under Windows® 98/2000/XP.

The performance characteristics, functions and interfaces of Multichannel PRA are described in this document. Due to the use of the Siemens Cellular Engines TC35/TC35i/MC75, the documentation is closely linked to the corresponding documentation's of Siemens.

Furthermore, this manual also includes information on installation, use and diagnostics.

Users are explicitly requested to read the user safety information first.

The manufacturer reserves the right to make technical changes that serve the safety of the device and improve its operation.

# Multichannel PRA

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## 2 User safety information

The following information applies to the Multichannel PRA. As the cellular engines used in this device are manufactured by Siemens (TC35/TC35i/MC75), we explicitly refer to Siemens' respective safety regulations and operating manuals.

### 2.1 Electrical safety

The Multichannel PRA works with a nominal mains supply voltage of 230VAC. Furthermore, the device is connected to the PRI (S<sub>2</sub>m, E1) port of TA or PSTN. The power supply cord (230VAC) must be connected to a plug socket with earth contact.

The housing must not be opened by the user.

#### 2.1.1 Air traffic safety

Use of cellular engines in aircraft can impair their navigation systems and interfere with the mobile radiophone network. Their use has therefore been forbidden by law. The Multichannel PRA must therefore not be used on board aircraft. Breach of requirement can cause temporary or complete suspension of the cellular engine services and / or legal steps to be taken against the offenders.

### 2.2 Environment with explosive materials

The Multichannel PRA is not approved for use in potentially hazardous atmospheres. The user is therefore advised not to use the TA close to such areas, which could be e.g. at petrol stations, in fuel depots, in chemical works or during blasting. Should this nevertheless be necessary, the user should take steps to ensure that no risk can occur.

### 2.3 Road traffic safety

If the devices are used in vehicles that are used in public road traffic, the national regulations for telephoning in vehicles applicable for the country in which the device is must be complied with.

### 2.4 Non-ionizing radiation

As in all radio transmission devices, the user should note that it is advisable for satisfactory use of the devices and safety of the user that the device is only used in its normal operating position.

### 2.5 Electronic medical equipment

The operation of radio transmitters, which includes cellular engines, can impair the function of medical devices that have not been properly shielded. Please ask advice of your doctor or the manufacturer of the medical device.

### 2.6 Measures to be taken in case of loss/theft

If the Multichannel PRA, the cellular engines or the SIM cards used are lost, inform your network provider immediately, to prevent any misuse.

# Multichannel PRA

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## 2.7 Transport

The packaging ex works is designed to protect against mechanical damage and should be stored for any later transports.

**Attention: Remove the holding angles if transporting the device in the packaging!**

To avoid moisture condensation, time must be allowed for the devices to slowly adapt to the ambient temperature (if they have been stored in an environment with differing temperature) before starting them up.

## 2.8 Where to install the devices

The devices should be installed so that they are protected against direct sunlight and heat. This increases both the reliability of the operation of the devices as well as their service life, as the components used are less thermally stressed.

The devices should also only be used with the power supplies that they are supplied with or an original spare part.

The cables to the devices should be installed so that they do not cause any physical risk. Power cables should be installed separate from the signal cables.

The devices should only be installed by adequately trained personnel.

## 2.9 Damage and repairs

For safety reasons, the device should not be used in case of noticeable damage or if it has been exposed to moisture.

Repairs to the device should preferably only be carried out by the manufacturer or their authorized agents. Should this not be possible at any time, the repair must be carried out by an adequately qualified person, whereby only original parts should be used.

The device must be disconnected from the power supply before each opening and repair.

# Multichannel PRA

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## 3 Functional description

The Multichannel PRA connects the telephone system (S<sub>2</sub>m, PRI, E1) to the GSM network. The device can be operated both in NT mode as well as TE mode. It is connected to the PRI (S<sub>2</sub>m, E1) local port of the telephone system and or to a PBX/SWITCH.

Multichannel PRA is available with 4..64 GSM channel design. It is intended for use in the GSM 900 and GSM 1800 network if suitable SIM cards are used.

The use of the Siemens TC35/TC35i/MC75 cellular engines, not only enables voice communications, but also the transmission of SMS. The most important user facilities of the TA are:

### GSM services:

TS11	Voice, full rate and enhanced full rate, DTMF
TS12	Emergency call function
TS21	SMS, text and PDU mode
TS61	FAX Group 3

### Supporting services:

CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CFU	Call Forwarding Unconditional
AoC	Advice of Charge
BAOC	Block All Outgoing Calls
BOIC	Block Outgoing International Calls
BAIC	Block All Incoming Calls
COLP	Connected Line Identification Presentation

### Hardware interfaces:

RS232	For programming, SMS, FAX and data dispatch	
Ethernet	For programming via remote access	
RJ45	for connection to the TC system (point-to-point)	ISO 8877
Cardholder	for small SIM cards	
N	RF link for the GSM antenna (up to 2)	
Power Supply Connector	for 230VAC power cord	

### Programming:

- Configuration of the device settings via the Windows application **PRAC**
- Remote servicing for changes to the programming or software updates
- Setting NT/TE mode via the configuration
- Channel analysis and output of the signal quality
- Loudness adjustment
- and more

# Multichannel PRA

To realize the above features, a microprocessors switching has been developed, which controls the interaction of the various functional groups of Multichannel PRA. These are illustrated in the following sketch.

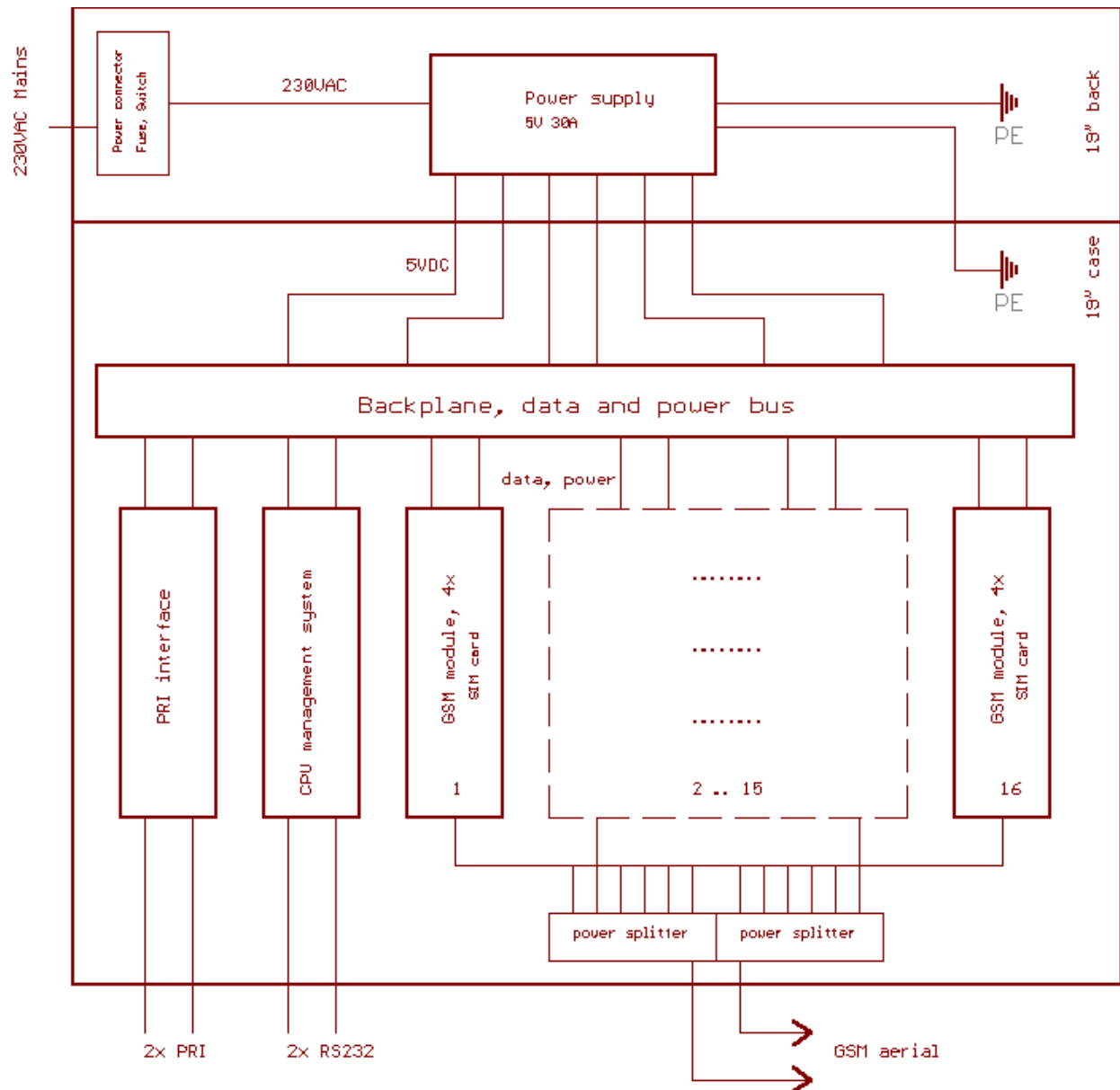


Figure 1: Functional groups

Due to the modular structure, the device can be delivered in 4..64 channel version (in 4 channel steps). The TA is constructed so that all the connection elements are located on the front- and backside of the device, while the plug in units for the SIM cards can be accessed only after removing the GSM-Boards from the system.

**Attention: GSM Boards must only be inserted in slots intended for it!**

**Insert GSM board to slot 6 to 21 in devices not hot-pluggable and to slot 3 to 18 in hot-pluggable devices**

# Multichannel PRA

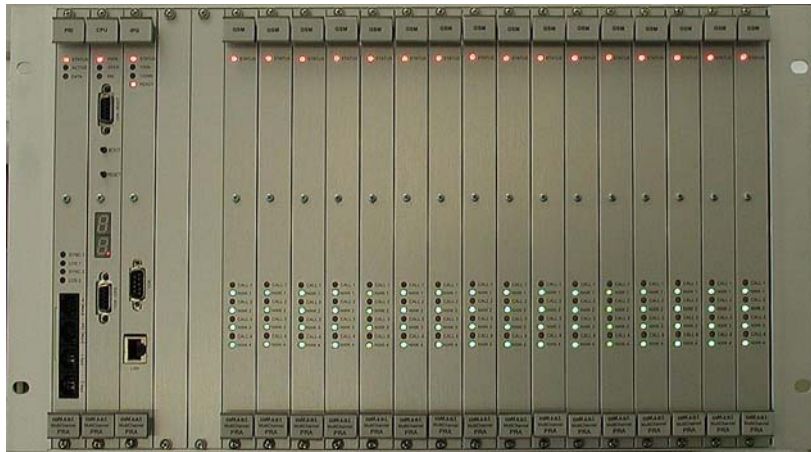


Figure 2: View of the Multichannel PRA, frontside (64 channel version, not hot-pluggable)

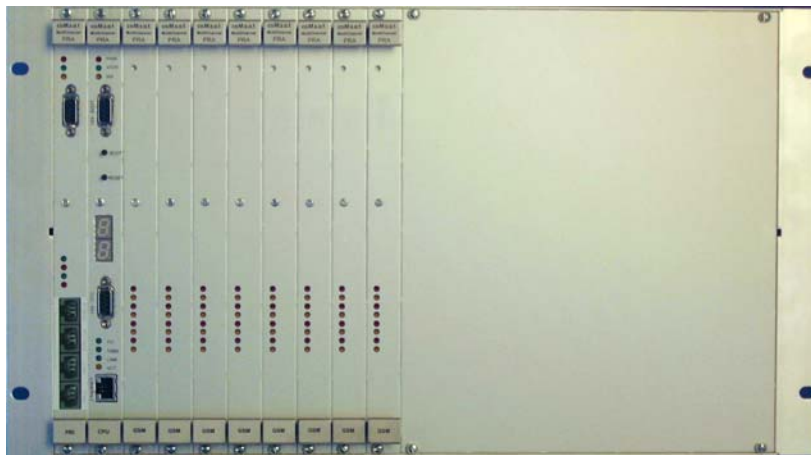


Figure 3: View of the Multichannel PRA, frontside (32 channel version, hot-pluggable)



Figure 4: Rearside of the Multichannel PRA (64 channel version)

# Multichannel PRA

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On the frontside are located:

- the LED control indicators of the system
- the jacks for the external synchronization (RJ45 “in” and “out”) (1<sup>st</sup> and 2<sup>nd</sup> from top)
- the jack for the PRI-1 connection (RJ-45) (3<sup>rd</sup> from top)  
*(Please notice: You can only use external synchronization or PRI-1)*
- the jack for the PRI-2 connection (RJ-45) (4<sup>th</sup> from top)
- the connector for the serial port for firmware update (upper D-SUB 9 “Boot”)
- the connector for the serial port for configuration (lower D-SUB 9 “CFG”)
- the jack for the Ethernet connection (RJ-45, on CPU board)

On the rearside are located:

- the connector for the power supply, 230VAC
- the on/off switch
- the 1 or 2 RF- (N) connectors for the GSM antennas

The connections and significance of the LED's are labeled to prevent errors. (see signaling description in the “Starting up” section” and at the end of this document)

# Multichannel PRA

## 4 Installation and operating hints

Due to the diverse settings possible using the PRAC configuration program there is a wide range of possible applications. As it is impossible to list and describe all these applications here, the following is limited to those currently considered the most important.

### 4.1 Multichannel PRA in NT mode

If a Multichannel PRA TA is to be operated in NT mode, the following connection schematic results. This can vary depending on the TC system used, although the principle arrangement is retained. In NT mode, the Multichannel PRA is installed as an exchange (NT) at the external E1 (PRI) bus.

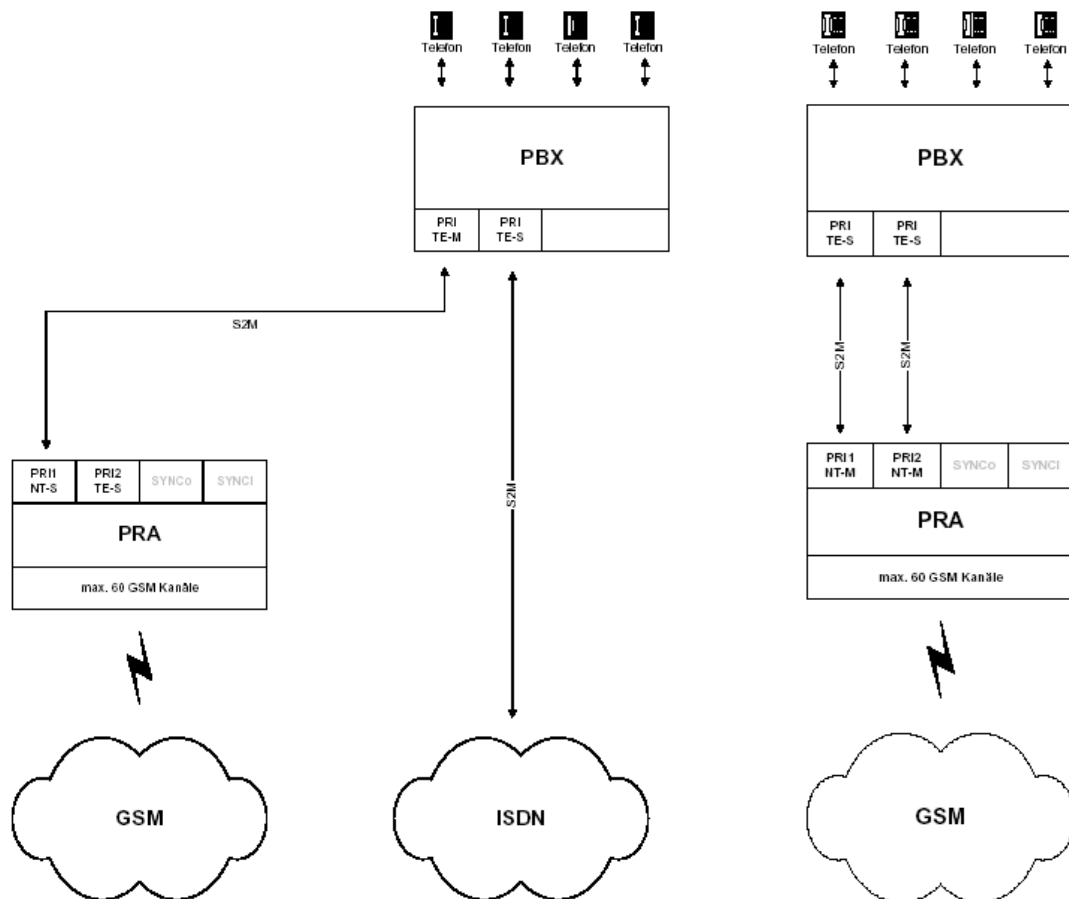


Figure 5: NT Installation with PSTN and Stand alone NT Installation

# Multichannel PRA

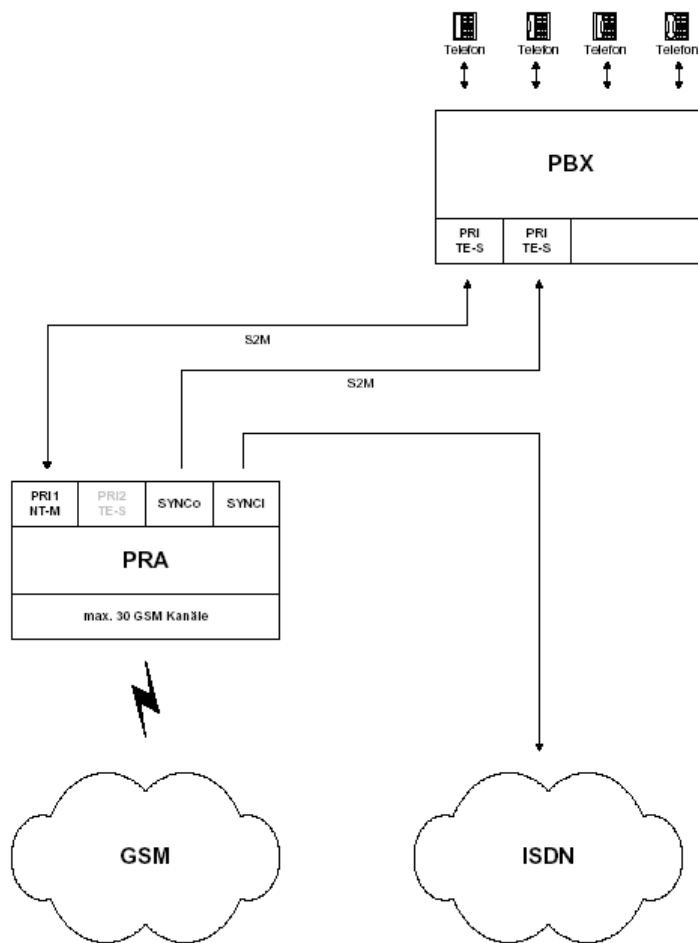


Figure 6: NT Installation with synchronization from PSTN

Correct installation of the TA can be identified from the LED's. If the GSM modules have booked into the respective network, the green LED's light up permanently. If one of the modules log off from the network during operation, the corresponding green LED of this channel begins to flash slowly. The yellow LED's are always off when no call is being made. While a connection is being set up they flash and they are permanently lit during a connection. If a channel is disabled by the user the green LED is always off, while the yellow LED stays always on.

Monitoring of the ISDN lines is switched on or off using the **Enable ISDN Watchdog** check box. If the box is checked, the monitoring is active on. A reset is then performed after about 100 seconds. If on the other hand the "**Enable ISDN Watchdog**" check box is not activated, there is no monitoring of the ISDN circuits and no reset will occur.

# Multichannel PRA

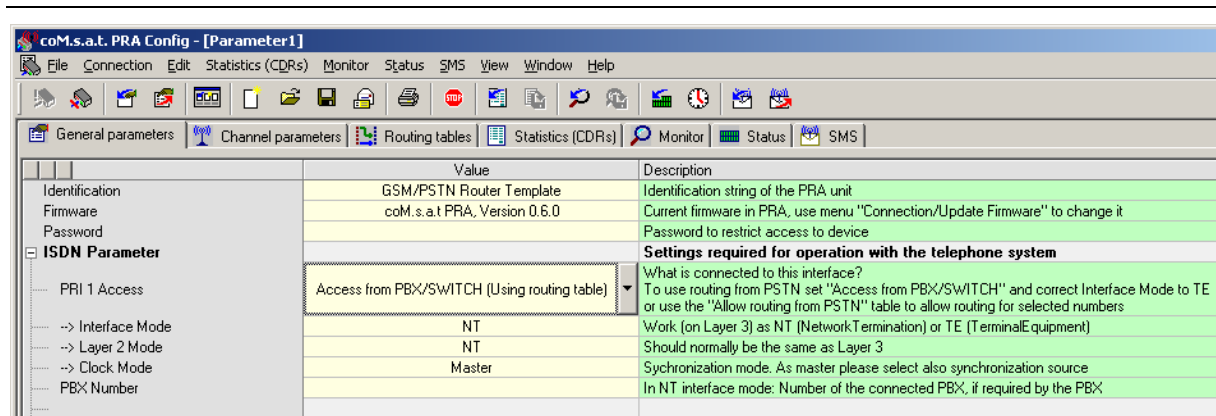


Figure 7: NT Configuration

To select NT mode, just select “**PRI x access**” option in the “General parameters” tab.

The remaining layers then automatically switch over to NT mode too. This is the correct setting for most applications. However, should there be problems with the TC system used, specific changes can be made in layer 2 and clock source to attempt to achieve better results.

## 4.2 Multichannel PRA in TE mode

If a Multichannel PRA TA is to be operated in TE mode, the following connection schematic results. This can vary depending on the TC system used, although the principle arrangement is retained. In TE mode, the Multichannel PRA is installed as an internal extension (TE), i.e. it is operated at the internal E1 bus. In this case, no synchronization via the basic link is necessary.

# Multichannel PRA

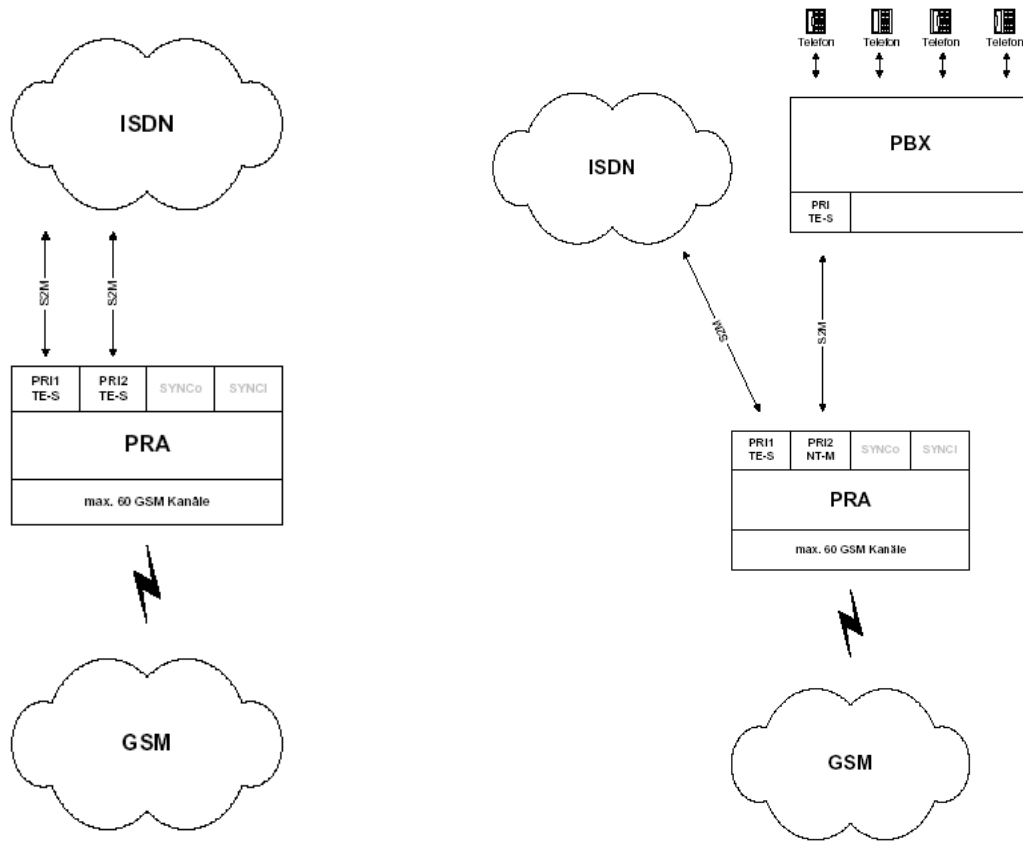


Figure 8: TE Installation

Figure 9: Router Installation (TE and NT)

The connection to the TC system is also monitored and displayed. Correct function in TE mode is indicated by the green LED labeled „Sync x“ being permanently lit. On the other hand, the red LED (Los x) is on if there is a malfunction.

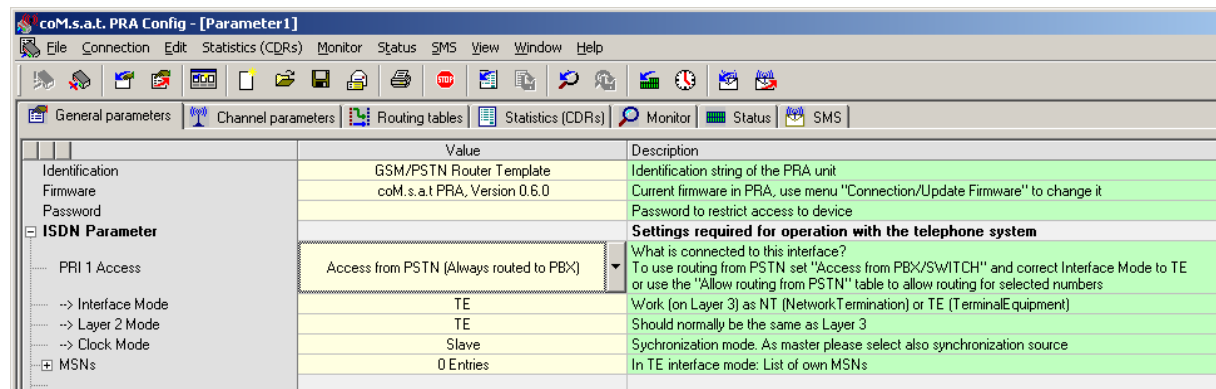


Figure 10: TE Configuration

# Multichannel PRA

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## 4.3 Servicing / Remote servicing

The Multichannel PRA TA configuration can be checked in several ways. The following methods are available.

- Servicing via the serial port of the TA
- Remote servicing via Ethernet
- Remote servicing via GSM

In both cases, a PC on which the PRAC Windows application has been installed is required.

### 4.3.1 Servicing

If a PC is available at the installation site, a serial link is established between the Multichannel PRA and the PC and after calling up the **PRAC** application, the link to the TA can be established by logging in for making authorised changes to the configuration. The next steps are then reading the configuration or updating the firmware.

### 4.3.2 Remote servicing via GSM

It is also possible to read the configuration without a direct interface to the TA, e.g. from a service center. In this case, a PC is required on which the PRAC application is installed and to which a modem is connected.

There are two contact modes to select from:

- “Call directly”: The number of the Multichannel PRA (e.g. of the SIM card of one of it’s modules) is called directly with a data call. To use this feature, the Multichannel PRA must have at least one SIM card with data transfer enabled installed.
- “Wait for call”: A SMS with the number of the modem is sent to the Multichannel PRA. As a reaction the Multichannel PRA calls the modem. In this case the SIM card of the modem used must have a SIM card with data transfer enabled inserted.

If “Wait for call” is selected there are two possibilities to send the SMS to the Multichannel PRA:

- “Send SMS” checked: The application sends the SMS to the Multichannel PRA. This is only possible if a GSM modem is connected to the PC and you have to specify the SMS Service Center
- “Send SMS” not checked: The SMS has to be sent by a mobile phone. This is especially useful if no GSM modem is connected.

The format of the SMS to send by the mobile is as follows:

!+?-!N

with N being the number of the modem, e.g.

!+?-!0150123456789

# Multichannel PRA

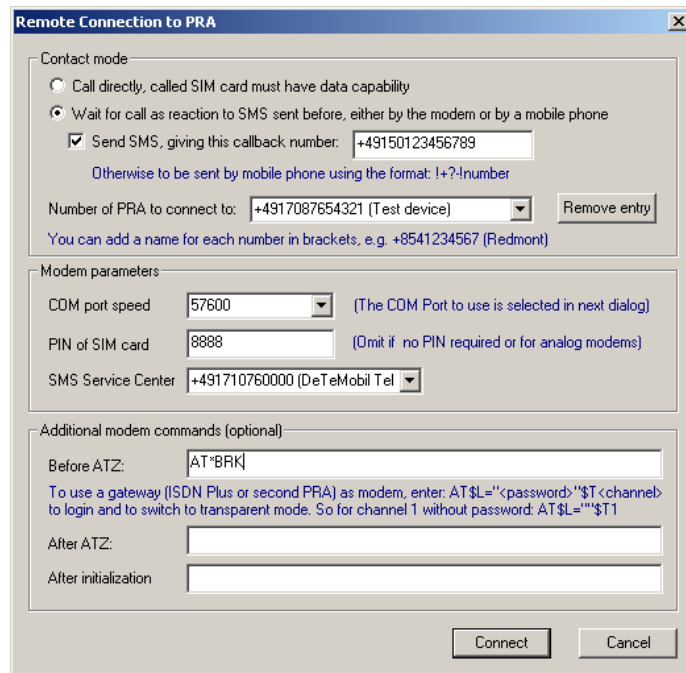



Figure 11: Remote Servicing

The modem connected to the PC is initialized using a standard procedure with AT commands originating from V.25ter and, for GSM modems, GSM 07.07/ 07.05. Since the trace window opens during the connection process you can see what commands are sent to the modem.

For special cases (e.g. using an ISDN Plus Gateway to do the connection) you may want to add some second commands. This is possible at three points:

- Before the first command (ATZ) is given, e.g. to switch an ISDN Plus to transparent mode
- As the first command after ATZ (and ATE to switch on the echo)
- As the last command of the initialization, just before the call origins or the SMS is sent, respectively.

The remote connection is taken down when the interface is closed with button  or menu "Connection/Close Interface (Go Offline)".

### 4.3.3 Read out/Transmit configuration

After logging into a Multichannel PRA, the configuration is read out by selecting **C**onnection and **L**oad configuration in the menu. The **PRAC** application can now be used, if required, to make the necessary changes. Then the configuration data are transferred back into the Multichannel PRA by selecting **C**onnection and **S**end configuration in the menu.

# Multichannel PRA

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## 4.3.4 Firmware update

After loading the configuration data from a Multichannel PRA the current status of the firmware is displayed in the entry **Firmware** in the General Parameters table. It can also be read out without loading the configuration by the menu command "Connection/Current Firmware Version".

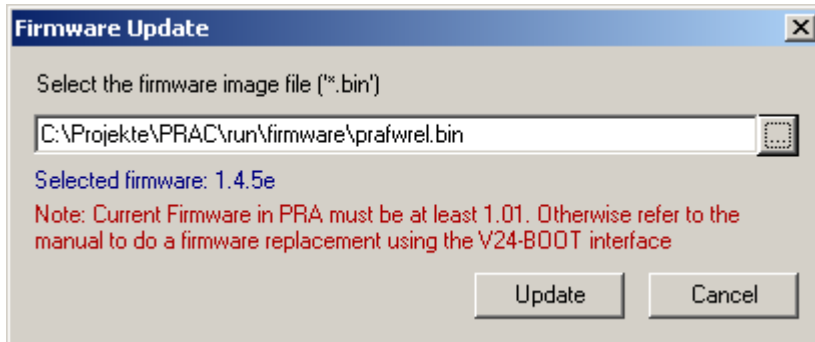


Figure 12: Firmware Update

The firmware is updated by the menu command "Connection/Update Firmware". First select the firmware file you want to load. This is named either relimg.bin or prafwrel.bin for GSM devices or dm15rel.bin for TDMA devices. After selecting the firmware file check the version of the selected firmware in the blue text field. Then click to the "Update" button.

**Note:** The firmware update can only be done directly from the PRAC application if the current firmware of the Multichannel PRA is at least 1.0.1. Otherwise follow the instructions in the next section.

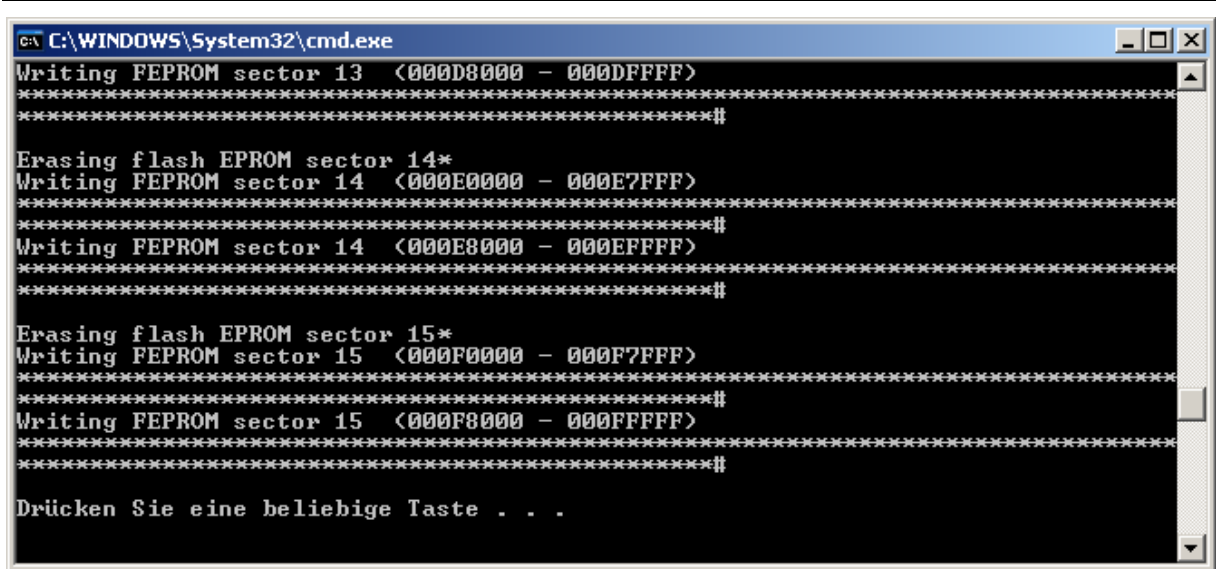
### 4.3.4.1 Firmware replacement from the console window

In case you encounter problems during the software update using the PRAC application (firmware updates skipping several versions are not tested) or if the current firmware version is lower than 1.0.1 you can (or have to) replace the current firmware using the BOOT interface (upper V.24 connector in the front of the Multichannel PRA).

Step-by-step instructions (To update a GSM device, for TDMA refer to the notes below):

- Connect the PC to the **upper** V.24 port of the PRA (BOOT Interface)
- Press BOOT button on PRA
- Open the PRAC folder (default C:\PRAC)
- Change to folder "firmware"
- Start the batchfile fwloadCOMx.bat (x=1..4, Number of COM Port)
- Wait until program is ready
- Switch the Multichannel PRA off and on again

# Multichannel PRA



```
C:\WINDOWS\System32\cmd.exe
Writing FEPROM sector 13 <000D8000 - 000DFFFF>
*****#
Erasing flash EPROM sector 14*
Writing FEPROM sector 14 <000E0000 - 000E7FFF>
*****#
Writing FEPROM sector 14 <000E8000 - 000EFFFF>
*****#
Erasing flash EPROM sector 15*
Writing FEPROM sector 15 <000F0000 - 000F7FFF>
*****#
Writing FEPROM sector 15 <000F8000 - 000FFFFF>
*****#
Drücken Sie eine beliebige Taste . . .
```

Now you can connect the PC to the lower V.24 port (CFG Interface) and start the PRAC application.

**Note:** If you want to update a TDMA device, open the fwloadCOMx.bat and replace the string **-Aprafwrel.bin** by the string **-Adm15rel.bin**

# Multichannel PRA

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## 4.4 Starting up the device

### 4.4.1 Cabling

The following cables are used:

- Power supply
- Connection(s) to the TC system as NT or TE.  
**Note:** The pinout of the PRI and SYNC ports are as TE. If you configure a port as NT you have to use a crossed cable (Pins 1 and 2 with Pins 4 and 5, respectively)
- Serial line to the PC's RS-232 C port on which the **PRAC** application is installed
- Optional Ethernet connection when IPG board is used to do remote access; in this case the serial cable is used to connect the IPG board to the CPU board
- Antenna cable(s)  
**Note:** If two antennas are used, these must be set up at least 1 m apart to keep their mutual interference at a minimum.

For the pin out of the cables see section "Connector assignments".

### 4.4.2 Connections on the PRI board



The PRI board provides the interfaces to the ISDN PRI lines.

There are two PRI ports, "PRI 1" and "PRI 2". See section "Connector Assignments" for pin out of the jacks.

The internal clock can be synchronized to either of the two PRI lines.

It is also possible to make a synchronization to an external PRI line without affecting its signals. This is made by looping the external PRI line through the SYNC in / SYNC out jacks. SYNC in/out are connected internally 1:1, so the signal is looped through. In addition "SYNC in" is connected to PRI 1 via high-ohm impedance's, so the clock of the external signal is present at the PRI 1 input and can be used to synchronize the "PRI 2" interface to the external PRI line.

**Note: Because of the connection of "SYNC in" and PRI 1 it is not possible to use both external sync and PRI 1 port at the same time!**

Figure 13: PRI Connections

# Multichannel PRA

## 4.4.3 Power switch

The device can be switched on/off via the main switch on the rear. This is indicated by the red LED, which is labeled „Pwr“ on the front panel of the CPU board.

## 4.4.4 LED indicators on the PRI board

The following LED's are present on the PRI board:

	COLOR	INDICATION
<b>STATUS</b>	Red	Board is ready to work (firmware transferred and booted)
<b>ACTIVE</b>	Green	<i>Rapidly flashing:</i> No PRI interface found or Layer 1 error, maybe due to improper cabling (if the interface is used in NT mode you have to use a crossed cable) <i>Slowly flashing:</i> Layer 2 is down <i>On:</i> At least one PRI port is active (layer 2 up)
<b>DATA</b>	Yellow	There is data in transfer from or to at least one PRI line
<b>SYNC 1</b>	Green	The respective interface line (PRI1 / PRI2) is synchronized
<b>SYNC 2</b>	Green	
<b>LOS1</b>	Red	(Loss of signal) No signal found on the respective channel
<b>LOS2</b>	Red	

## 4.4.5 Connections on the CPU board

The CPU board controls the functionality of the Multichannel PRA. It holds the firmware and configuration data and transfers it at boot time to the other boards. The CPU board has two serial interfaces, "V24 – BOOT" and "V24 – CFG". The upper interface is only used to make major firmware updates (replacements). The lower interface is used to connect to the configuration software **PRAC** to load and send configuration data, provide informational and statistical data, and make minor updates to the firmware.

## 4.4.6 LED indicators and buttons on the CPU board

The following LED's are present on the CPU board:

	COLOR	INDICATION
<b>PWR</b>	Red	Main power status. Switched on/off via the main switch on the rear.
<b>XFER</b>	Green	Data transfer from/to one of the other boards
<b>BM</b>	Yellow	Boot mode is active



The 2 seven-segment displays give the number of calls going over the ISDN line 1 or 2, respectively. The upper digit is the ten, the lower the one digit. The dot gives information about the PRI line that is currently displayed, the display changes every second. When the dot is at the ten digit, PRI 1 is displayed, when the dot is at the one digit PRI 2 is displayed.

When only one PRI port is used, only this port is displayed (not alternating).

# Multichannel PRA

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The following buttons are present on the CPU board:

<b>Reset</b>	Main power status. Switched on/off via the main switch on the rear.
<b>Boot</b>	Data transfer from/to one of the other boards

## 4.4.7 Connections on the IPG board

The optional IPG board provides a simple means to access the Multichannel PRA configuration interface via Ethernet. It is basically a translation between Ethernet and serial RS-232 line.

To use the IPG board connect the serial port "V.24" of the IPG board to the serial port "V.24 – CFG" of the CPU board and connect the "LAN" interface to the Ethernet.

The board can work on 10Mb or 100 Mb Ethernet. Detection is automatically.

For details see section "Configuration of the virtual COM port."

## 4.4.8 LED indicators on the IPG board

The following LED's are present on the IPG board:

	COLOR	INDICATION
<b>STATUS</b>	Red	Power indicator
<b>10 Mb</b>	Green	Data transfer indicator (10 Mb Ethernet)
<b>100 Mb</b>	Green	Data transfer indicator (100 Mb Ethernet)
<b>Ready</b>	Yellow	Board is ready to accept data

## 4.4.9 LED indicators on the GSM boards

The following LED's are present on the GSM board:

	COLOR	INDICATION
<b>STATUS</b>	Red	Board is ready to work (firmware transferred and booted)
<b>CALL1..4</b>	Yellow	<p><i>Rapidly flashing:</i> Channel disabled, GSM module error, configuration error, or configuration not yet transferred</p> <p><b>Note:</b> For more information about an error use the monitor function of the PRAC application. Get the monitor data from the Multichannel PRA, set the filter to the respective channel and look for the error report. For details refer to the help menu, item "List of GSM error codes"</p> <p><i>Slowly flashing (green LED on):</i> Call establishment or SMS transfer in progress</p> <p><i>On (green LED on):</i> Call is active</p> <p><i>On (green LED off):</i> Channel disabled by user</p>
<b>NWK1..4</b>	Green	<p><i>Rapidly flashing:</i> Initialization of GSM Module in progress</p> <p><i>Slowly flashing:</i> Net search in progress</p> <p><i>On:</i> GSM module is logged into network</p> <p><i>Off (yellow LED on):</i> Channel disabled by user</p>

# Multichannel PRA

## 4.4.10 Hot Swap Feature

With newer hardware versions of the Multichannel PRA it is possible to hot-swap the GSM boards, this means you can remove them and plug them in again without switching off the device.

### Attention:

#### To avoid damage to the device:

- **Make sure that your hardware already supports Hot Swap. Otherwise you have to switch off the device for changing boards.**
- **Do not take out a board that is not switched off properly**

If your hardware does not support Hot Swap you will get an according error message when you try to switch off a board. So in case of doubt try this function first before inserting a new board.

### 4.4.10.1 Remove a GSM board

Start the PRAC application and select in the menu “Hot-Swap”/”Remove Board...”

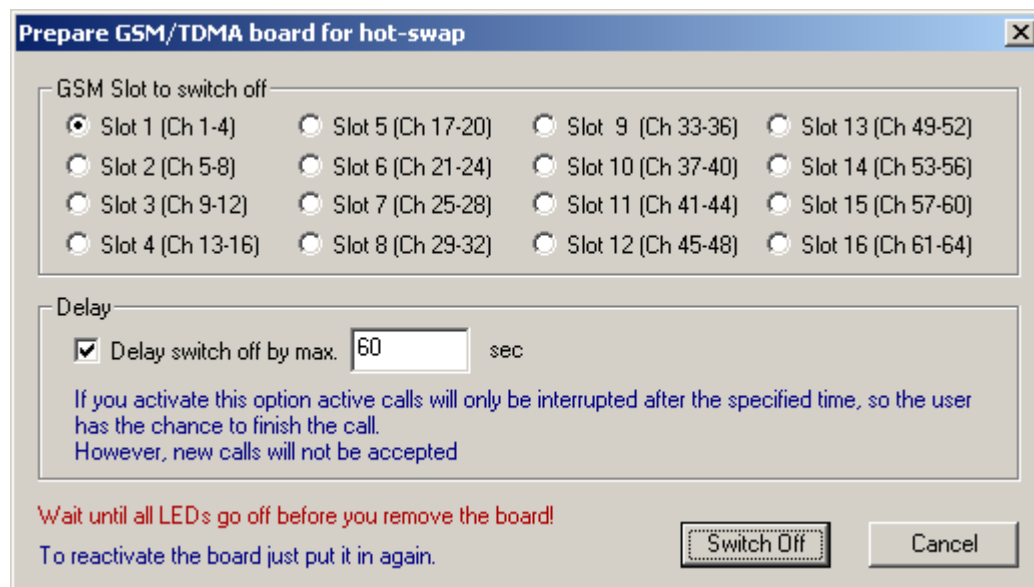


Figure 14: Switch off a board to remove it

Select the slot you want to remove and click to “Switch Off”.

**Wait until all LED’s of the board went off**, then remove it.

Active calls will be interrupted.

Optionally you can give a delay. The PRA will then wait for active calls to finish until timeout.

# Multichannel PRA

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## 4.4.10.2 Insert a GSM board

**If the hardware of your Multichannel PRA is not hot-swappable you have to switch the device off before inserting a board.**

Otherwise just insert the GSM board. It will be switched on and initialized automatically.

**Attention:** Be sure to plug in the GSM boards starting at **Slot 6** in non hot-swappable devices. Slot 4 and 5 are reserved and must be kept free.

In devices that support hot-swap the first GSM board is inserted in **slot 3**.

## 4.4.11 Installing the SIM cards

Before starting up the device, the SIM cards must be inserted into the provided holders on the GSM-Boards and the PIN's must be entered in the configuration. To insert the SIM cards this, make sure that the device is switch off and remove the respective GSM board. Four SIM holders are now accessible. The relationship between the SIM card holders and the channel numbers are as follows:

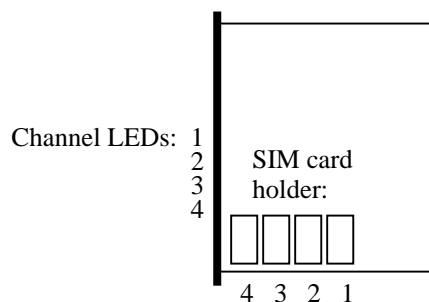


Figure 15: SIM card holder assignment

To insert the SIM cards to the holders, first push in the round yellow button next to the cardholder with a blunt, thin tool and then remove the cardholder. The SIM card is then placed in the cardholder and inserted into the card reader together with its holder.

**Note:** The GSM modules used in the Multichannel PRA for communication via the GSM network operate with an internal voltage of 3V. Therefore, for proper operation, SIM cards that can still operate with a working voltage of 3V must be used. All new SIM cards usually fulfil this requirement. If older cards (designed for a voltage of 5V) are used, the device possibly cannot log into the network - despite input of the correct PIN - because the SIM's cannot operate correctly at a voltage they weren't designed for.

After all SIM cards have been inserted into the respective SIM card holders and the GSM put back into the device, the front panels must be fixed by screws

**Attention:** Make sure that the PIN's of the SIM cards are correctly given in the

# Multichannel PRA

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configuration, or that no PIN's at all are given in the configuration (default). For details see section "Parameter configuration".

The relationship between the channel numbers 1..64 in the configuration program **PRAC** and the numbering of the boards are as follows (starting with GSM board 1 in slot 6 of the device):

Board \ Channel	1	2	3	4	...	15	16
1	1	5	9	13	...	57	61
2	2	6	10	14	...	58	62
3	3	7	11	15	...	59	63
4	4	8	12	16	...	60	64

Figure 16: Channel numbering relationship

## 4.4.12 Parameter configuration

All the relevant parameters in the device are deleted in the factory before delivering the Multichannel PRA so that it must be set for the individual installation.

Therefore, when installing the TA for the first time, it must be configured using the **PRAC** application. To do this, a serial data link must be established between the Multichannel PRA and the PC on which the application is installed.

Alternatively it is possible to access the Multichannel PRA via GSM (only after the first configuration) or Ethernet (using the IPG board).

The installation of the application is described in the next section.

# Multichannel PRA

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## 5 Installation of the PRAC application

### 5.1 Installation of the program files

The PRAC Windows® application is used to configure the Multichannel PRA. The installation is done by start of the self extracting file “SETUP.EXE” on the installation medium:

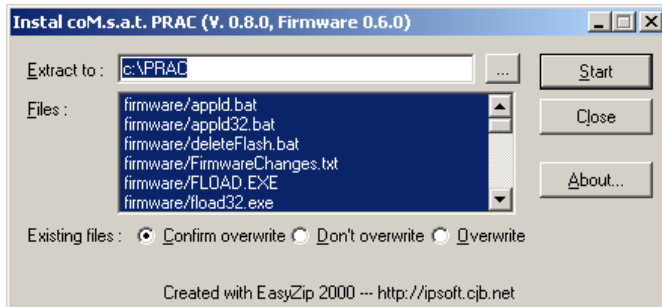


Figure 17: PRAC Installation

The installation directory can be changed by typing into the text field “Extract to”. By pressing the “Start” button the installation process is activated. All files are extracted to the specified folder. After that you are prompted whether shortcuts should be created on your desktop and in the system Start menu.

The **PRAC** application can then be started up from it’s directory, the desktop or the Start menu.

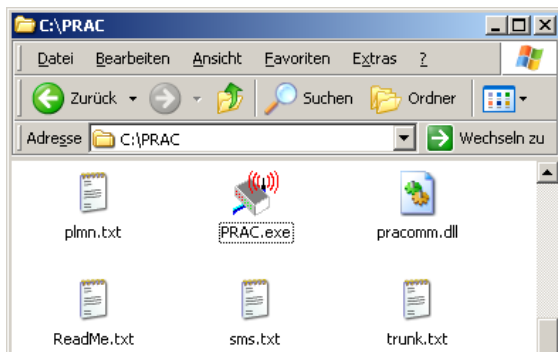


Figure 18: PRAC program file

A free serial port on the PC is required for trouble-free operation with the Multichannel PRA.

Accessing PRA via Ethernet (Internet) is possible by using the IPG board. See next section for details.

# Multichannel PRA

## 5.2 Installation of the Ethernet port on the CPU board

To gain remote access to the Multichannel PRA via Ethernet (LAN or Internet) the ethernet port (ETH) on the CPU board can be used. If a CPU board without integrated ethernet port is installed you can use an IPG board to translate traffic on the Ethernet to serial data and vice versa (see next section).

The standard IP address of the PRA is 192.168.127.254 with a net mask of 255.255.255.0. If you can map this address into your network you can access the PRA directly and can also change the IP address. Otherwise you have to set the IP address and net mask first using the serial port V.24-CFG.

To set the IP address go to the menu "Connection/Set IP-Address". (In the upcoming "Select Connection" dialog select the respective serial port if necessary.)

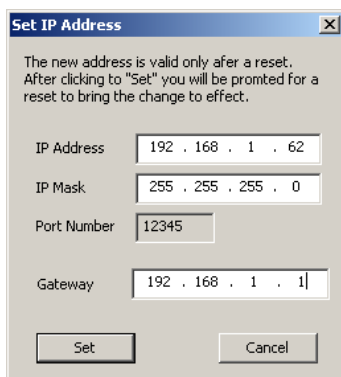


Figure 19: Setting the IP Address

Set IP Address, mask, and standard gateway as desired and click to set. Since the change is only valid after a reset of the Multichannel PRA you will be prompted for a reset. After the reset the software will go "Offline".

Wait until the Multichannel PRA finished booting. Now you can reach the Multichannel PRA using the new IP address.

E.g. select "Connection/Set Time". In the upcoming "Select Connection" dialog enter the address in the IP address field:

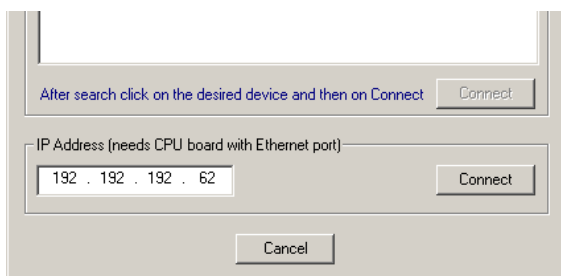


Figure 20: Usage of the CPU ethernet port in the PRAC application

# Multichannel PRA

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## 5.3 Installation of the virtual COM port driver

The IPG board translates traffic on the Ethernet to serial data and vice versa. It can be used to transport a serial connection over LAN.

The IPG board can be used in two cases:

- To gain remote access to the Multichannel PRA via Ethernet when a CPU board without integrated Ethernet port is installed.
- To connect a SMS Server to the Multichannel PRA over LAN

The board is connected by a standard RS-232 cable (Sub-D-9 connector) to the V24-CFG port of the CPU board and by a standard Ethernet cable (RJ-45 connector) to the Ethernet.

You can use for this connection the serial cable that is shipped with the Multichannel PRA.

The placement of the IPG board depends on the used backplane.



*Figure 21: Connection between IPG and CPU board (non-hotplug backplane)*

To access the IPG board from a PC that runs the configuration software or a SMS Server you have to set the desired IP address and install the virtual COM port driver. This driver simulates a COM port (e.g. COM4:) which can then be selected to connect to the Multichannel PRA.

**Note:** Until August 2004 the board was named "IPG". Afterwards the board was redesigned and needs now different software to install the virtual port, so it was renamed to "IPG2".

After installing the virtual COM port you can set it as the connection port in the SMS Server software or select the virtual COM port, respectively, when asked for the serial port to use in the "Select Connection" dialog of the configuration software **PRAC**:

# Multichannel PRA

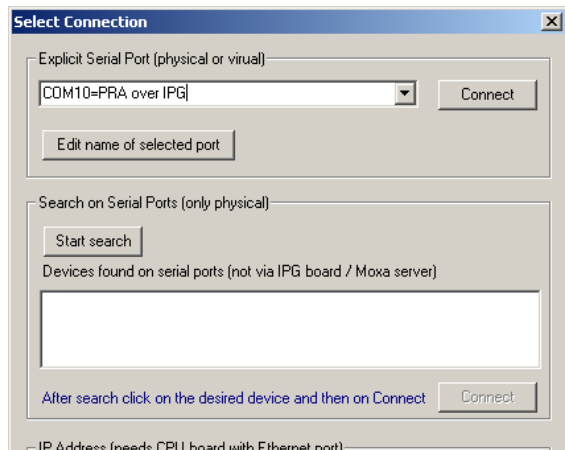


Figure 22: Usage of the virtual port in the PRAC application

## 5.3.1 Installation for “IPG” boards (Using NPort, obsolete)

### 5.3.1.1 Step 1: Installation of the NPort Management Suite

The installation is done by start of the installation file “DSSETUP.EXE” on the installation medium:

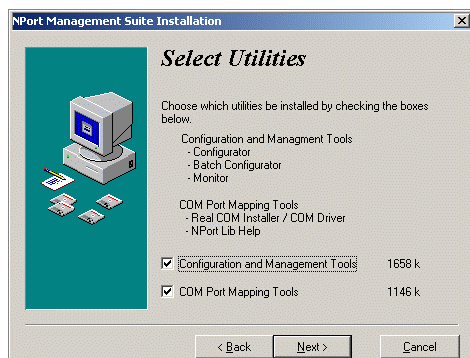
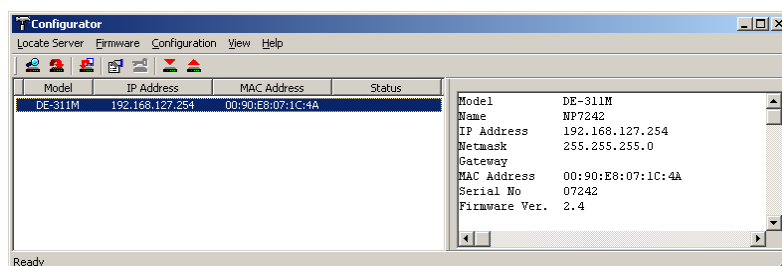


Figure 23: Installation of virtual COM port driver (Nport)

### 5.3.1.2 Step 2: Setting of the IP address

The default IP address of the IPG board is printed on the board, normally it is 192.168.127.254.

To change the IP address start the program “Configurator” from the “NPort Management Suite” entry in the Windows® Start menu.



# Multichannel PRA

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*Figure 24: Setting of the IP address (Nport)*

Make sure that the IPG board is installed correctly and connected to the Ethernet and that the power of the Multichannel PRA is switched on.

Click to “Locate Server” and “Broadcast Search”. If the board is not found click to “Locate Server” and “Specify by IP Address” and enter the IP address of the IPG board.

If the board can still not be detected there may be a conflict in the network. Connect the board with a crossed Ethernet cable directly to the PC and do again a broadcast search.

If this still does not work, the parameters of your LAN connection may make it impossible to reach the IPG module. For example: If you have an IP address 192.168.10.50 and a net mask 255.255.255.0 you can not reach the IP address 192.168.127.254.

For a temporary change of the IP settings close the Configurator software, go to the property dialog for your LAN connection, select TCP/IP protocol and click to the properties button.

In the dialog “Properties of Internet protocol (TCP/IP)” you have the possibility to set an explicit IP address and net mask.

Select as IP address something like “192.168.127.1” and as net mask 255.0.0.0

With these settings start again the NPort Management Suite Configurator and click to “Locate Server” and “Broadcast Search”.

Once the board is located click to “Configuration” and “Modify Configuration”.

Set the desired values on the dialog page “Network Settings”.

Leave the settings on the other dialog pages unchanged and click to “OK”.

Now you can access the IPG board at the new IP address. To use it with the configuration software PRAC you have to assign a COM port to this connection. See the following section for details.

### *5.3.1.3 Step 3: Assignment of a virtual COM port*

Note: If you changed the IP settings of your PC in step 2 don't forget to undo these changes.

Start the program “Real COM Installer” from the “NPort Management Suite/COM Port Mapping” entry in the Windows® Start menu.

# Multichannel PRA

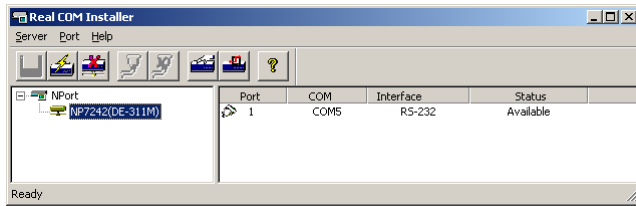


Figure 25: Assignment of a virtual COM port (Nport)

Click to “Server” and “Add Server Wizard”.

Choose automatic search or enter the IP address manually.

Select the server (IPG board) and select a COM port to assign in the next step.

*Note1:* If a server is already assigned, it will not be found again. You first have to remove it.

*Note2:* You can not select a COM port that is already installed on your machine.

## 5.3.2 Installation for “IPG2” boards (Using Network Enabler)

### 5.3.2.1 Step 1: Installation of the Network Enabler Software

The installation is done by start of the installation file “NESetup.exe” on the installation medium:

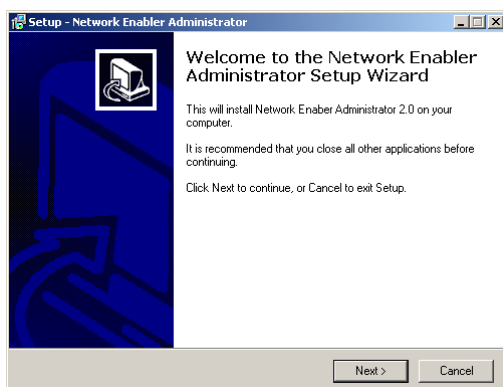


Figure 26: Installation of virtual COM port driver (Network Enabler)

### 5.3.2.2 Step 2: Setting of the IP address

The default IP address of the IPG board is normally (on delivery) 192.168.127.254.

To change the IP address start the program “Network Enabler Administrator” from the Windows® Start menu.

# Multichannel PRA

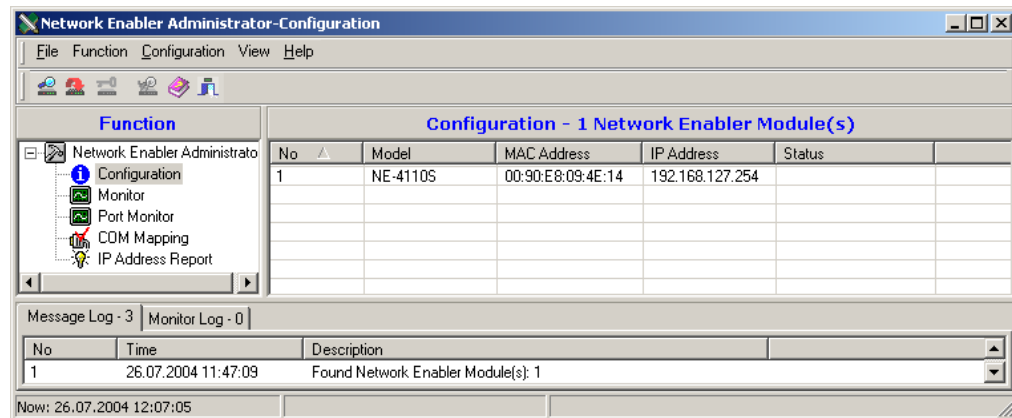


Figure 27: Locating the IPG board (Network Enabler)

Make sure that the IPG board is installed correctly and connected to the Ethernet and that the power of the Multichannel PRA is switched on.

Click to “Configuration” and “Broadcast Search”. If the board is not found click to “Configuration” and “Specify by IP Address” and enter the IP address of the IPG board.

If the board can still not be detected there may be a conflict in the network. Connect the board with a crossed Ethernet cable directly to the PC and do again a broadcast search.

If this still does not work, the parameters of your LAN connection may make it impossible to reach the IPG module. For example: If you have an IP address 192.168.10.50 and a net mask 255.255.255.0 you can not reach the IP address 192.168.127.254.

For a temporary change of the IP settings close the Network Enabler Administrator software, go to the property dialog for your LAN connection, select TCP/IP protocol and click to the properties button.

In the dialog “Properties of Internet protocol (TCP/IP)” you have the possibility to set an explicit IP address and net mask.

Select as IP address something like “192.168.127.1” and as net mask 255.0.0.0

With these settings start again the Network Enabler Administrator and click to “Configuration” and “Broadcast Search”.

Once the board is located click to “Configuration” and “Configure”.

Set the desired values on the dialog page “Network”, please check the “Modify” check boxes of the values you want to change (normally IP address and Netmask):

# Multichannel PRA

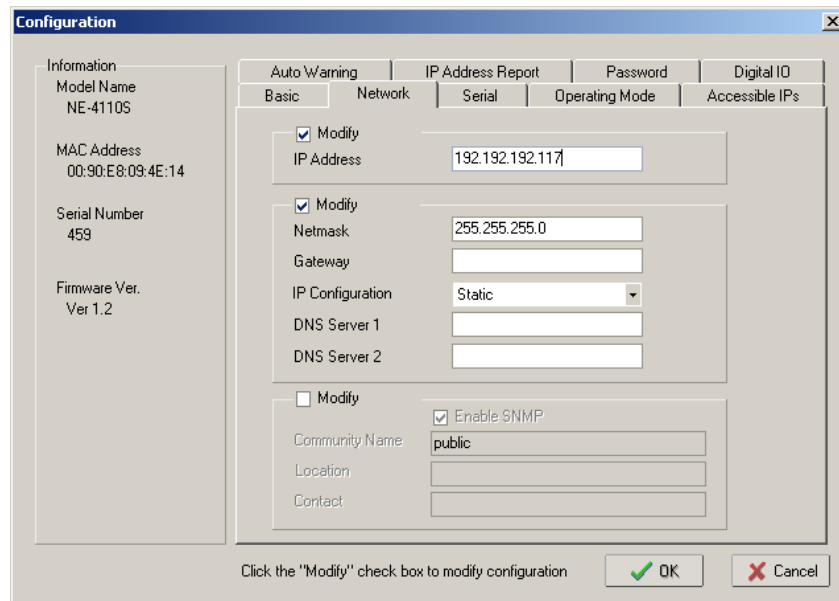


Figure 28: Setting of the IP address and Netmask (Network Enabler)

To use a dynamic IP address given by DHCP, change the “IP Configuration” parameter from static to DHCP.

### 5.3.2.3 Step 3: Setting of the Real COM Operating Mode

Go to the page “Operating Mode”, check the “Modify” check box, click to the “Settings” button and select as operating mode the “Real COM Mode”.

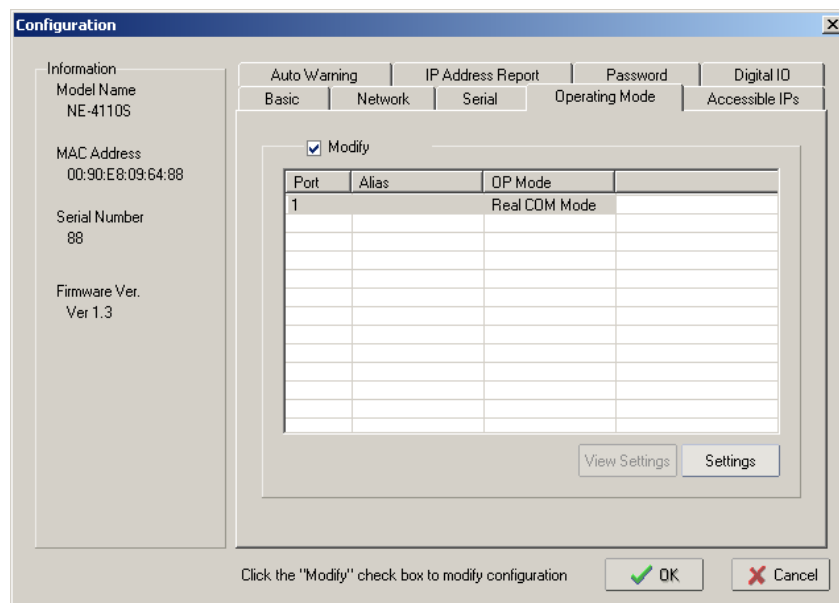


Figure 29: Setting of the Real COM operating mode (Network Enabler)

Leave all other settings and the other dialog pages unchanged and click to “OK”.

# Multichannel PRA

Now you can access the IPG board at the new IP address. To use it with the configuration software PRAC you have to assign a COM port to this connection. See the following section for details.

## 5.3.2.4 Step 4: Assignment of a virtual COM port

In the Network Enabler Administrator software click to “Function”/”COM Mapping”, then to “COM Mapping”/”Add Target”.

Select the device from the list and click to OK.

The selected device will now appear in the “COM Mapping” list. A default COM port will be assigned. If you want to change the assigned port double click the device and go to “Basic Settings”. There you can select the desired port (in the range from 1 to 256):

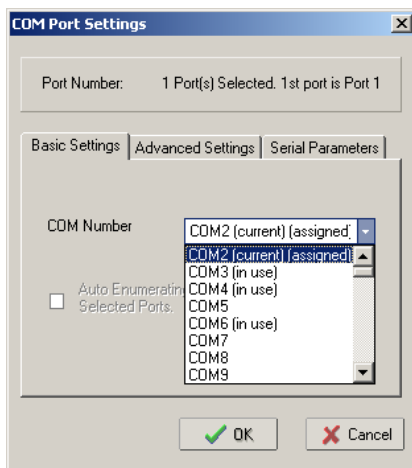


Figure 30: Assignment of a virtual COM port (Network Enabler)

Now click to “COM Mapping”/”Apply Change” to activate the settings and close the program.

## 6 Configuration of the Multichannel PRA

The **Multichannel PRA** is configured and supervised with the aid of the PRAC Windows® application.

### 6.1 Startup dialog of the PRAC application

After starting the application on the Windows® desktop by double-clicking the PRAC icon, the application starts with a dialog presenting the most common actions:

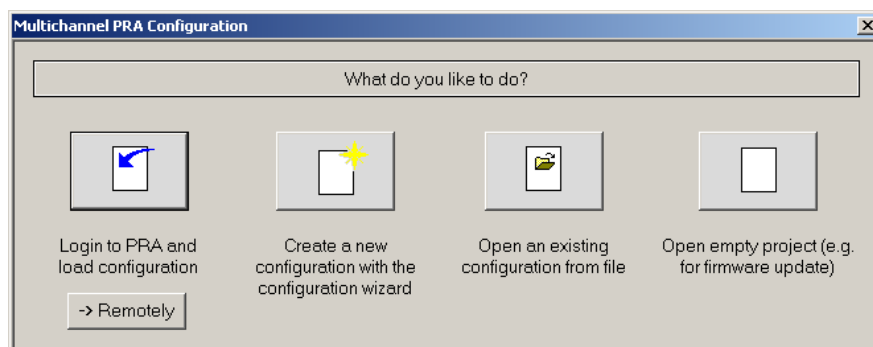


Figure 31: Startup dialog of the PRAC application

“**Login to Multichannel PRA and load configuration**” prompts for the serial/virtual port where the Multichannel PRA is connected. A login is performed and the current configuration data is loaded from the Multichannel PRA and displayed in a project window.

It can then be edited and send back to the Multichannel PRA using the “Connection/Send configuration” command.

With the button “**Remotely**” the Remote Login dialog is called. After establishing the remote connection the configuration is loaded automatically.

“**Create a new configuration**” calls up a wizard to select a template which will be used to create a new project from. By usage of templates for the most common applications of the Multichannel PRA there is only little configuration work left for the user.

Refer to section “Configuration wizard” for details

“**Open existing configuration**” opens a file selection dialog to load a configuration previously stored on disk into a new project window.

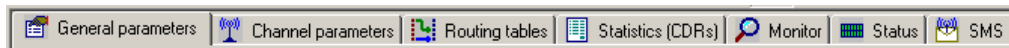
“**Open empty project**” just opens a new project window with default settings. This can be used if the configuration parameters are not of interest, for example if the firmware shall be updated or you want to look at historical CDR data.

# Multichannel PRA

## 6.2 Basic elements of the PRAC application

Several **file cards** are displayed via which the various functions can be configured. These are supplemented by the typical Windows® application **menus**, such as File, View, and Help and a toolbar for quick access to the mostly used commands.

### 6.2.1 File cards



Various function groups are arranged on the file cards so that they form meaningful units. These are:

For configuration:

- General parameters
- Channel parameters
- Routing tables









For maintenance:

- Call detail records
- Monitor
- Status
- SMS
















### 6.2.2 Toolbar



The toolbar gives quick access to the mostly used functions. These are from left to right:

	Open interface/Login
	Logout/Close Interface
	Load configuration
	Send configuration
	Call up startup dialog
	Create new configuration (call up wizard)
	Open existing configuration
	Save configuration

# Multichannel PRA

	Send monitor data and parameters via e-mail
	Print
	Abort the communication function in progress
	Load the CDR's (statistical data)
	Export the CDR's
	Load monitor data
	Save monitor data and parameters to disk
	Load and display status data
	Show/set time
	Test for new SMS
	Send a SMS manually (otherwise over e-mail)
	Start the SMS server with the current settings
	Display program information
	Direct help for a specific element
	Open the program trace window (not PRA trace)

## 6.2.3 Status bar

At the bottom of the **PRAC** window there is a status bar, which displays help at the left side and status of current actions at the right side, with the status display consisting of

- progress bar, if operation in progress
- current operation, if any, or last error
- Used interface (serial port)
- Login state

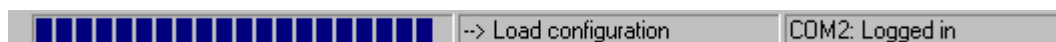


Figure 32: Right side of status bar

# Multichannel PRA

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## 6.2.4 Interface selection

To get contact to the Multichannel PRA you have to tell the software which serial port is to be used as interface.

The port selection dialog is coming up automatically at login but it can also be selected in advance via the “Connection” “Open Interface” menu.

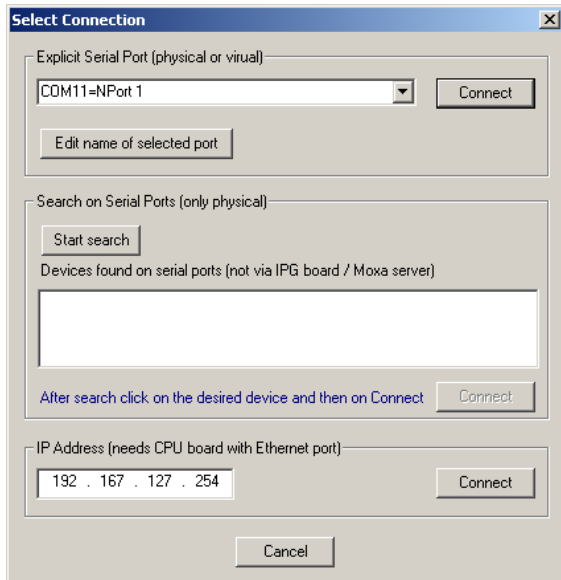


Figure 33: Connect to Multichannel PRA on COM1 serial PC port

The PC interface, via which the data link to the Multichannel PRA is to be made, is selected using the "COM port" list box. If a COM port does not appear in the list you can write it directly into the selection field.

You can give a name to the currently selected COM port. This name will then be displayed in the list. By that it is easier to find the right port, especially when there are several virtual ports installed.

It is also possible to let the application choose the port itself, using the search function by clicking on “Start search”. However, this may not work with virtual ports.

## 6.2.5 Login

Login to the Multichannel PRA is necessary prior to most communication functions. When such a function is called, a login is performed automatically but it is also possible to log in manually via the “Connection” “Login” menu or with the respective toolbar button:



# Multichannel PRA

## 6.2.6 Load configuration from PRA

Prior to editing the configuration data it should be fetched from the Multichannel PRA. This is done via the "Connection" "Load Configuration" menu. You can also use the respective button in the toolbar:



**Note:** The startup dialog offers a button to login and load configuration as first action. If you want to edit an existing configuration in your Multichannel PRA this is the normal way to go.

## 6.2.7 Send configuration to PRA

After editing the configuration it must be send to the Multichannel PRA to take effect. This is done via the "Connection" "Send Configuration" menu. You can also use the respective button in the toolbar:



## 6.3 Configuration wizard

(Called from startup dialog  or for a new configuration  )

By aid of the configuration wizard it is possible to quickly create a new configuration which meets the needs of the installation as far as possible. In the best case the Multichannel PRA will run without further changes to the configuration.

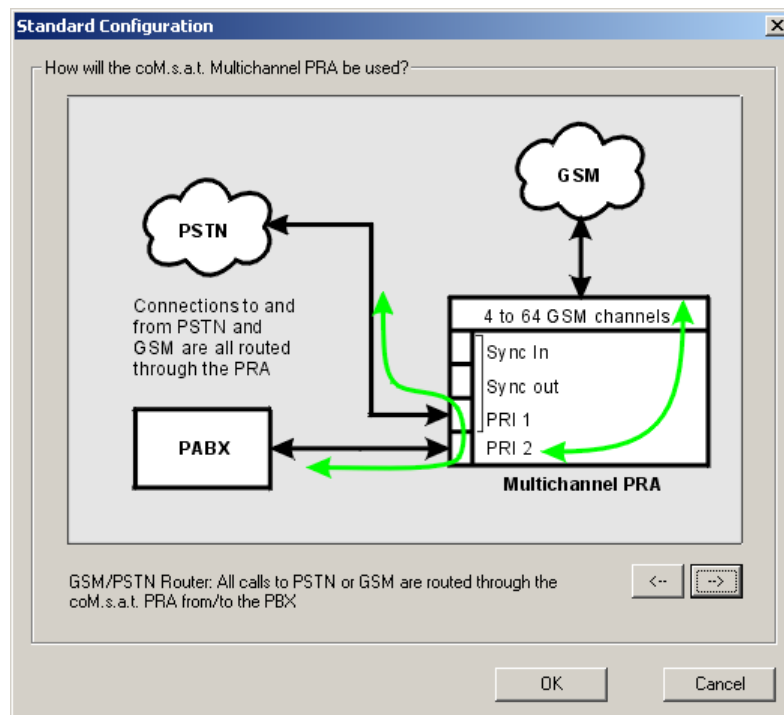


Figure 34: Configuration Wizard

# Multichannel PRA

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There are three major configurations:

- As a GSM Gateway:  
Calls are routed from ISDN into different GSM networks on up to 64 GSM channels.  
No calls are accepted from GSM.  
No calls are routed between the two PRI ports.
- As a GSM/PSTN Router:  
All calls to or from PSTN or GSM are routed through the Multichannel PRA to or from the PBX, depending on the entries in the routing table.  
This application of the Multichannel PRA needs editing of the routing table to decide whether to route a call to GSM or to PSTN.
- As GSM Adapter: Externally synchronized GSM adapter to handle the calls to or from the GSM network. To use with a PBX with additional fixed network interface(es).

All standard configurations have in common that no routing tables are configured, so if more than one GSM provider should be used the routing table must be edited. If the SIM cards used have PIN numbers assigned, these have to be entered on the "Channel parameters" page.

**Please notice:** Before taking effect the configuration has to be transferred to the Multichannel PRA with the menu command "Connection" "Send Configuration".

**Note:** The standard configurations are located in the folder <PRAC directory>\templates.

You can edit the templates by loading them to the PRAC application.

## 6.4 Editing general parameters with the PRAC application

The current configuration of the Multichannel PRA can be enquired by clicking on „Connection“ and “Load configuration” in the menu bar. Alternatively, the appropriated icons can be used.

After entering a new configuration or altering the current configuration, this can be saved via the „File“ menu on the PC or can be transferred to the Multichannel PRA via the established data link. This is done via „Send configuration“ in the „Connection“ menu.

A configuration file that has already been stored can be called up via the file menu and transferred to the device as described.

After fetching the configuration from the Multichannel PRA or loading it from a file, you see the general parameter page. All parameters are group in three levels. You can collapse these groups or expand them by clicking to the +/- signs, or you can collapse/expand all groups by using the buttons marked in the graphic.

# Multichannel PRA

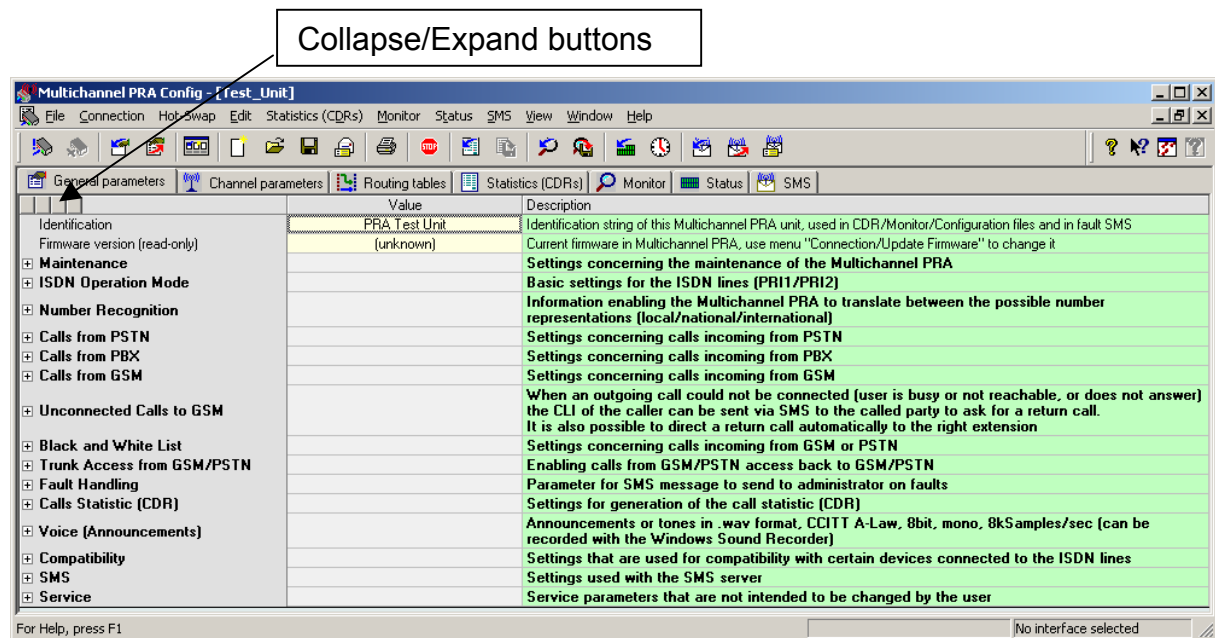


Figure 35: Groups of General Parameters

## 6.4.1 Identification, Firmware

There are two parameters that are not group members but stand alone:

- The Identification is for convenience. It I used to give files unambiguous names and to identify the Multichannel PRA in maintenance SMS. You can give any name you like.
- Firmware: Here appears the current firmware version of a connected Multichannel PRA after you loaded the configuration. This is important when you save the configuration together with monitor data in case of functional problems reported to the service.

## 6.4.2 Maintenance

**Login Password:** Here you can give a password to protect access to the Multichannel PRA. Please refer to the section "Security" for details.

**Remote Maintenance Numbers:** Data calls from this number are accepted as maintenance calls. Refer to section "Remote servicing" for details.

# Multichannel PRA

## 6.4.3 ISDN Operation Mode

First select the **Access** mode of the PRI lines. Once you select this, the layers are automatically set for operation in NT or TE mode.

- Access from PBX/SWITCH (Using routing table):
  - > The Interface operates in NT (Network Termination) mode by default
  - > Calls from this port are routed according to the routing table to GSM or PSTN
- Access from PSTN (Always routed to PBX):
  - > The Interface operates in TE (Terminal Equipment) mode by default
  - > Calls from this port are always routed to the PBX

If you want to connect a PRI port to a PBX in TE mode instead of the default NT mode, first select *Access from PBX/SWITCH* then correct the interface mode to *TE*.

ISDN Operation Mode		Basic settings for the ISDN lines (PRI1/PRI2)
PRI 1 Access	Access from PSTN (Always routed to PBX)	What is connected to this interface? To use routing from PSTN set "Access from PBX/SWITCH" and correct Interface Mode to TE or use the "Allow routing from PSTN" table to allow routing for selected numbers
-> Interface Mode	TE	Work (on Layer 3) as NT (NetworkTermination) or TE (TerminalEquipment)
-> Layer 2 Mode	TE	Should normally be the same as Layer 3
-> Clock Mode	Slave	Synchronization mode. As master please select also synchronization source
⊕ Main Number(s)	0 Entries	As TE: Main numbers that prefix DDIs and should be filtered
PRI 2 Access	Access from PBX/SWITCH (Using routing table)	What is connected to this interface? To use routing from PSTN set "Access from PBX/SWITCH" and correct Interface Mode to TE or use the "Allow routing from PSTN" table to allow routing for selected numbers
-> Interface Mode	NT	Work (on Layer 3) as NT (NetworkTermination) or TE (TerminalEquipment)
-> Layer 2 Mode	NT	Should normally be the same as Layer 3
-> Clock Mode	Master	Synchronization mode. As master please select also synchronization source
PBX Number		As NT: Main number of the connected PBX, will be prefixed to the extensions sent to the PBX
Synchronization Source	PRI1/Syncln	Where to synchronize the clock to (only for ports operating as clock master)

Figure 36: ISDN Parameters

As an additional feature the Layer 2 mode and the clock source can be changed independently of the interface mode.

The **Main Number(s)** in TE mode will be filtered if prefixing from a incoming DDI to get the extension number.

The **PBX Number** in NT mode will be used to prefix a extension to dial to get the DDI.

The **synchronization source** must only be selected if one of the PRI ports is configured to be Clock Master. Then the clock can either be generated internally or synchronized to PRI1/SYNC IN or PRI2. See section "Connections on the PRI board" for details.

## 6.4.4 Number Recognition

Number recognition		Information enabling the PRA to translate between the possible number representations (local/national/international)
Country code	+49 (Germany)	International dialling prefix (e.g. +49 for Germany)
National/International trunk prefix	0/00	Country specific prefixes for national/international calls, e.g. 0/00
Area code	621	The area code for national calls (e.g. the 621 in +49-621-7148140)

Figure 37: Number recognition parameters

# Multichannel PRA

These parameters enables the Multichannel PRA to handle dialed numbers in the local/national/international format.

Example: If you enter the Country Code +49 (automatically sets the trunk prefixes to 0/00) and the area code 621 you can dial the number +4962171481444 in the formats:

- International: +4962171481444
- National: 062171481444
- Local: 71481444

## 6.4.5 Calls from PSTN

<b>Calls from PSTN</b> Handling of calls from PSTN	Route to PBX	<b>Settings concerning calls incoming from PSTN</b> <small>Whether to accept incoming PSTN calls [Note: Handling of calls from GSM are set channel specific on the channel parameter page]</small>
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Figure 38: Parameters for calls from PSTN

The incoming calls from PSTN are normally always routed to the PBX, except when **Handling of calls from PSTN** is set to “Reject”, in which case all calls from PSTN are rejected (if not the caller’s number is in one the white/authorization lists).

## 6.4.6 Calls from PBX

<b>Calls from PBX</b> B-to-GSM-Channel Assignment Call Distribution to GSM Handling of Unmatched Prefixes Minimum Number Length Maximum Number Length Dial Timeout Reject Calls to... Free Calls	Free Balance Number of Calls Route to PSTN 0 20 5 0 Entries 0 Entries	<b>Settings concerning calls incoming from PBX</b> Select fixed channel assignment to do the routing with your PBX Balance either total air time or total number of calls between the GSM channels How to handle calls with prefixes that are not defined in the routing tables Minimum count of digits for valid numbers, shorter numbers are rejected Maximum count of dialled digits before call is immediately initiated (Seconds) Maximum time between two dialed digits before call is initiated Calls to these GSM numbers will be rejected Calls to these numbers are free of charge
--	--	--

Figure 39: Parameters for calls from PBX

The **B-to-GSM Channel Assignment** can be set to “Fixed” to allow the PBX complete control over the routing. Fixed assignment determines that the first B channel is assigned to the first GSM channel, the second B channel to the second GSM channel and so on.

Note: Fixed assignment allows the PBX complete control over the routing. However, the routing table is still referenced to check if the calls are allowed over a certain channel. Otherwise the call is rejected with the cause “No channel available”.

If you do not want this kind of verification you must define one single route which is valid for all prefixes (0,1,2,3,4,5,6,7,8,9) and routes to all channels (1-64) at all times (0:00-24:00).

If the channels are freely assigned, the call is routed according to the routing table.

If there are several GSM channels (more than one) by which a call from the PBX can be routed to GSM the **Call Distribution to GSM** can be made by two ways:

- Balance Number of Calls: The GSM channel with the least number of calls will get the next call
- Balance Air Time: The GSM channel with the least air time will get the

# Multichannel PRA

next call

Calls to numbers that have no match in the routing table will be rejected or routed to PSTN, according to the parameter **Handling of Unmatched Prefixes**.

Giving a **Minimum Number Length** you can block all calls to numbers that are shorter than this parameter, e.g. numbers of certain value-added services.

When the user dials the target number digit by digit (overlapped mode) the Multichannel PRA must decide when the number is complete and can be dialed to GSM. For that there are two parameters:

- **Maximum number length:** When the number of dialed digits reaches the maximum number the call is immediately initiated.
- **Dial timeout:** When this time passes after the last dialed digit the call is initiated. The default is 5 seconds. The time between dialing the last digit and hearing the dialing tone can be reduced by reducing this time.

**Note 1:** When selecting a dial timeout of “0” the number will never be dialed if not the maximum number length is reached.

**Note 2:** In some telephone systems, dialing can also be concluded by pressing the „#“ key. In this case there is no waiting time.

**Reject calls to:** Phone numbers that are not allowed to be dialed, e.g. value added services.

The comparison of the numbers begins at the first position. Up to **9 digits** are compared. Entries in this list should therefore preferably be prefixes.

**Free calls:** Phone numbers that allow free calls, e.g. the numbers that begin with the digits 0800. No AOC is generated for these numbers.

## 6.4.7 Calls from GSM

These settings concern all calls incoming from GSM (normally routed to the PBX).

Calls from GSM		Settings concerning calls incoming from GSM
Calls without calling number (CLIP)	Not special	How to handle calls from GSM without CLI (origin number)
Calling number (CLIP) forwarding	Disable CLIP	In TE interface mode: Send no. of caller to PBX (otherwise own MSN)
Two-step dialling mode	Overlapped	How to send digits to the PBX that are dialed as DTMF (On GSM channels that have the parameter "Dialling mode" set to "Dialling") Overlapped: Send every digit immediately to PBX, En-bloc: Send complete number when dial timeout of the respective channel is reached, or the maximum number length is full
Minimum number length (En-bloc)	0	Minimum number of digits that make a valid number for calls from GSM to PBX (Not applicable in overlapped dial mode)
Maximum number length (En-bloc)	0	Maximum count of dialed digits before call to PBX is immediately initiated (in overlapped dialling mode) (Not applicable in overlapped dial mode)
Direct calls from/to	0 Entries	Use to route special callers directly to the right extension Format A/B: Calls from GSM-number A will be directed to PBX-number B, separate the twonumbers by slash e.g. +491607654321/23

Figure 40: Parameters for Calls from GSM

First set up how **Calls without calling number (CLIP)** are dealt with. These calls can either be transferred to the Default Extension, which is determined during configuration of the GSM channel parameters, or rejected, or dealt with in the same

# Multichannel PRA

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way as all other calls (Not Special).

The **Calling number (CLIP) forwarding** determines on incoming calls what number should be sent to the PBX: The CLIP of the caller or the own MSN of the respective PRI port. This setting is only used for PRI ports operation in TE mode.

If the possibility of dialing an extension number is given to the caller (Channel parameter "Dialing mode" set to "Dialing") a **two-step dialing** is performed. The call is accepted and the Multichannel PRA waits for the caller to dial the extension via DTMF tones in one of two modes:

- Overlapped: The dialed digits are sent digit-by-digit to the PBX until the PBX signals CALL-PROCEEDING
- En-bloc: The dialed digits are collected. When the **maximum number length** is reached they are sent en-bloc.

In en-bloc mode also a **minimum number length** that makes a valid number can be given. When there are not enough numbers dialed during the channel specific dial timeout then the default extension is dialed instead.

The numbers of callers that are to be transferred directly to set extensions can be entered in the list **Direct Calls from / to**. The callers must have activated Calling Line Identification Presentation (CLIP) in their phone in order to utilize this feature. The entries must be entered in the form:

<international phone number><national dialing code><phone number>/<MSN>.

Example: +4962171481430 / 22

## 6.4.8 Unconnected Calls to GSM

Unlike in ISDN you can not change the CLI of the calling party in the GSM network. If you decide to transfer the calling number (CLIR not activated) it will always be the number of the GSM module that was used for the call.

This leads to problems when the call could not be connected (User busy or unavailable):

- Either the CLI is transferred, so the called person can call back. Most likely the call will go to the operator since the caller has no idea what extension did call him.
- Or the CLI is blocked, so the called person can not call back at all.

With the parameters in this section it is possible to transfer the CLI of the calling extension to the called person to make a return call possible.

# Multichannel PRA

Unconnected Calls to GSM		When an outgoing call could not be connected (user is busy or not reachable, or does not answer) the CLI of the caller can be sent via SMS to the called party to ask for a return call. It is also possible to direct a return call automatically to the right extension
CLI Transfer via SMS	Enable CLI Transfer	On an unconnected outgoing call to GSM send the CLI of the caller via SMS to the called party to ask for a return call
Max. Ring Duration	30	(Seconds) Timeout after which a CLI Transfer SMS will be send when the called party does not answer. Set to 0 to avoid CLI Transfer in this case
Confirmation of CLI Transfer SMS	Confirm CLI Transfer	Before sending the transfer SMS ask the user for confirmation (by DTMF tone '1') Note: If this is enabled the user can press '1' already during ringing
Confirmation Prompt	ZumSendenEinerSMSdie1Drueck.bch	Announcement to prompt for confirmation of the CLI-transfer SMS
Early ISDN Connect	ISDN Connect on GSM Connect	Signal CONNECT to the PBX when the GSM side is ringing, so the PBX can send the '1'. Not needed when the PBX supports transmission of DTMF in unconnected state. Note: This option may have an effect on billing
Report Sending of SMS	No Report	How to report the sending of the transfer SMS: "Report Sending" gives the user a beep and disconnects, then sends the SMS "Report Success" gives the user a beep and sends the SMS while staying connected On sending success it gives a long tone before disconnecting, on an error 5 short beeps
SMS Template for CLI Transfer	Bitte <+496204><no> anrufen	You can use placeholders: <no> where the CLI should be inserted, and optionally a PBX number in <> which will be inserted when the call originated from a PBX. Example: "Number <+4962171481><no> tried to reach you. Please call back" This will result for example (if call originated from DDI 20) in the SMS text: "Number +496217148120 tried to reach you. Please call back"
Return Call Handling	Handle Return Calls	When an outgoing call could not be connected (e.g. user busy) store the CLI of the caller together with the called party number in a temporary list and make a direct connect on a return call. Please note that this option is only available for GSM channels which have CLIR (Calling Line Identification Rejection) switched off.
Information Announcement	RueckrufWirdVerbunden.bch	Announcement to play on return call handling (if wanted)
Lifetime of assignment	60	(Minutes) Timeout after which an assignment in the temporary list is deleted Set to 0 to delete entries only when the list is full

Figure 41: Unconnected Calls to GSM

## a. CLI Transfer via SMS

On an unconnected call to GSM the CLI can be sent to the called person by a **SMS**. The SMS with the CLI will normally be send when the user is busy. You can also give a ring timeout after which the SMS is sent or press '1' during ringing to send the SMS immediately.

**Max. Ring Duration** gives the ringing time (in seconds) after which the SMS will be sent when the called person does not answer (without being busy). Set this to 0 to avoid the CLI transfer in this case.

**Confirmation of CLI Transfer SMS:** The Multichannel PRA can ask for a confirmation before actually sending the SMS. This can be done by an announcement to prompt the user to press the "1" (causing a DTMF tone). To load a **Confirmation Prompt** please refer to the section "Voice".

If the option "Confirmation of CLI Transfer SMS" is set the user can also press the '1' already during alerting. The SMS is then sent immediately. This works only if the PBX supports sending DTMF in unconnected state. If your PBX can send DTMF only in connected state you can use the option **Early ISDN Connect**. If this is set the Multichannel PRA will signal a Connect on the ISDN side when the GMS side signals Alerting (starts ringing). Please note that this option may have an effect on the billing.

**Report Sending of SMS:** The progress of sending the SMS can be reported to the user. There are two possibilities for a report:

- "Report Sending" gives the user a beep to confirm that the SMS will be sent, then hangs up
- "Report Success" gives also first a beep, but then stays connected until the SMS is sent to the service center. On sending success it gives a long tone before disconnecting, on sending failure five short beeps.

However, a successful delivery from the SMS service center to the user can not be reported.

# Multichannel PRA

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**SMS Template for CLI Transfer:** Here you can define the actual text to send via SMS. In the text there are two placeholders you can use:

- The CLI to be transferred <no>
- The PBX number <(number)>

When calling from an extension of a PBX, e.g. 104, this number alone would not be sufficient for a return call. Also the PBX number, e.g. 01237776, is needed, so the resulting DDI would be 01237776104. A sensible SMS text template would then be:

```
Number <01237776><no> tried to reach you. Please call back.
```

Which would result in the text actually sent:

```
Number 01237776104 tried to reach you. Please call back.
```

## b. Return Call Handling

*This option can only be used if the CLIR is deactivated in the channel parameters, so the number of the GSM module is transferred.*

**Note:** Users that have trunk access will always get the CLI. So, if you want to do return call handling only for staff members, activate CLIR in the channel parameter (CLI suppressed) and add the numbers of the staff members to the list "Allow routing from GSM" in the general parameters.

Set **Return Call Handling** to "Handle Return Calls". Then, when a called person makes a return call to the calling number presented to him or her, the call will automatically be forwarded to the extension that had been trying to call.

To signal the forwarding to the caller an announcement can be played. To load the **Information Announcement** please refer to the section "Voice".

**Note:** The return call handling is done by managing a list of temporary pairs of extensions/called numbers. For every called number only one extension can be assigned, so if a second extension tries to call the same number, a return call will be routed to the second extension.

**Lifetime of Assignment:** After the time specified (in minutes) the assignment between extension and called number times out and will be deleted. A return call coming in after this time will be handled as defined in the channel parameters (calling default or enabling dialing).

## 6.4.9 Black List / White List

The Multichannel PRA maintains two lists of numbers concerning the calls coming in from GSM or PSTN.

# Multichannel PRA

Black and White List		Settings concerning calls incoming from GSM or PSTN
Reject callers (from GSM/PSTN)	0 Entries	This Black List is used if calls are normally to be accepted. Calls from these GSM/PSTN numbers will then be rejected
Accept callers (from GSM/PSTN)	0 Entries	This White List is used if calls are normally to be rejected. Calls from these GSM/PSTN numbers will then be accepted

Figure 42: Black and White List

Numbers in the **White List** are allowed to call in from PSTN even if the parameter "Handling of calls from PSTN" is set to "Reject" as well as to call in using GSM channels whose parameter "Handling of calls from GSM" are set to "Reject".

Calls from numbers in the **Black List** are always rejected.

## 6.4.10 Calls to PBX (Mobile Extensions)

Call to PBX		Settings concerning calls to the PBX
Mobile Extensions / DDI Diversion	2 Entries	Definition of mobile extensions and diversion of calls to DDIs that are not available
	12->0174343977 (ext) after 5 s	
	13->01744344563 (ext) after 5 s	

Figure 43: Calls to PBX (Mobile Extensions)

With the parameter "Mobile Extensions / DDI Diversion" you can divert incoming calls that are not answered. The diversion can be either to another DDI or to a mobile phone. By diverting to a mobile phone you can create a mobile extension.

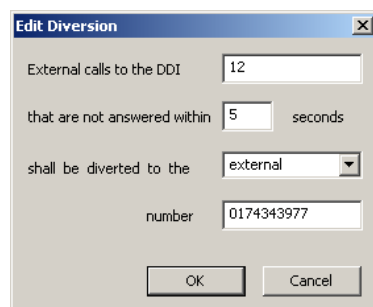


Figure 44: Edit Diversion

Click to one of the list fields and then on the appearing button to create or edit a DDI diversion.

Enter the DDI that will be affected, the time the DDI will be alerted before the diversion takes effect, the kind of the diversion destination (internal DDI or external number) and at least the destination number.

After clicking on OK the settings will be inserted in the list in the form

*DDI -> Destination (ext./int.) after Delay s*

# Multichannel PRA

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## 6.4.11 Trunk Access from GSM/PSTN

It is possible to give certain incoming callers, either from GSM or PSTN, the possibility to dial out again to GSM/PSTN.

Enter the authorized numbers in one or both of the lists **Allow routing from PSTN** or **Allow routing from GSM**.

If a call comes in from an authorized number it will be accepted and the announcement "Dial extension or access code" (refer to section "Announcements" for customization) gets played.

The caller has then the possibility to dial an extension of the PBX or to enter the **Trunk Access Extension**. With this the caller gets a second announcement "Dial number to route" or a dial tone for example.

The number the caller dials now will be handled as if dialed from the PBX.

The numbers in these lists have also the right to access the **Virtual PBX** features.

## 6.4.12 Virtual PBX

The Virtual PBX is a mobility solution that gives mobile users similar possibilities that local users have. The Virtual PBX features extend the gateway functionality by the supplementary services:

- call hold
- call retrieve and
- call transfer.

It can be used in combination with a dedicated PBX system or as a standalone solution. Unlike standard PBX applications the virtual PBX allows to configure certain GSM callers to be handled as internal callers\*, so that also the GSM caller can benefit from the supplementary services. Therefore the virtual PBX feature is also useful even if there is already a PBX available.

The supplementary services are invoked by dialling preconfigured key sequences as described in the next section.

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\* To be allowed to use the functionality of the Virtual PBX from GSM the number of the mobile user must appear in the list "Trunk Access from GSM".

# Multichannel PRA

## 6.4.12.1 Configuration

Three codes need to be specified which are used to invoke the call hold ("**Hold**"), call retrieve ("**Retrieve**") and call transfer service ("**Transfer**"). All ten digits (0, 1, ...9) and the \* or # signs are allowed. It is possible to configure multiple digits, so that an erroneous invoking of a virtual PBX function can be avoided. In this case, the desired function is activated if the configured digits are received in the order specified. The time between the dialling of the digits does not matter.

*Note: Since the # sign is used to terminate overlapped dialling you should be careful if using it for other functions.*

For transferring a call inside the GSM network, an additional setting, the "GSM transfer sequence", is needed. This is a string containing the digits that would be dialled manually on a cellular phone, followed by the send key (same as hook off). Usually these are three digits with "\*" in front and "#" behind them, like "\*199#". The network provider supplies this information.

*Note: This feature is not supported in all networks.*

If phones connected to the internal ISDN shall be able to call other internal ISDN phones, it is also necessary to add suitable routing information to the routing table. If e.g. internal phones have the phone numbers 10-29, an entry is needed that indicates local routing of numbers starting with "1" or "2" within the internal ISDN (PBX).

In router mode, a distinction of internal numbers and external numbers that may start with the same digits is needed. Therefore you should define a special number for external access or omit the area code (see "Number recognition" parameters).

<input type="checkbox"/> Virtual PBX		<b>The Virtual PBX allows numbers in the Trunk Access Lists to put calls on hold, switch calls and transfer calls in a similar way as a DDI could. You need a license for this (see menu "License")</b>
Key Code for "Hold"	*1	(One or more digits,;)#) Code to dial to put the active call on hold, e.g. *1 Be careful when using the # since this terminates a number
Key Code for "Retrieve"	*2	(One or more digits,;)#) Code to dial to retrieve a call that was put on hold, e.g. *2 Be careful when using the # since this terminates a number
Key Code for "Transfer"	*3	(One or more digits,;)#) Code to dial to connect the active call and a call put on hold before, e.g. *3 Be careful when using the # since this terminates a number
GSM transfer sequence		The sequence defined by the network provider to transfer a call inside the GSM network. Leave empty if the provider does not support call transfer
<input type="checkbox"/> Announcements		
"Call was put on hold"	CallWasPutOnHoldPlsWait.bch	Announcement played to the party that was put on hold: "Your call was put on hold, please wait". If not defined the march tone is played
"Holding Call"	CallIsPutOnHoldPlsDial.bch	Announcement played to the party that put the call on hold: "The call is put on hold, please dial". If not defined the dial tone is played

Figure 45: Virtual PBX parameters

## 6.4.12.2 Call Hold

During an active call, dialling the configured hold request digit(s) causes the audio connection to be disconnected. The held user gets the announcement "Call was put on hold, please wait" (or the march tone if no announcement was assigned) while the holding user hears the announcement "Call is put on hold, please dial" (or the dial tone if no announcement was assigned).

The user who has invoked the hold function now is able to dial any other number, i.e. an internal or external one. This number is dialled using DTMF tones. During dialling, it is not possible to retrieve the held call, because the retrieve digit(s) would be evaluated as part of the called party number. Only if the new called number is

# Multichannel PRA

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complete and the call proceeds, it is possible to hold (again), retrieve or transfer a call.

When there is a mistake during dialling, terminate dialling by use of the '#' character and hold it again to repeat dialling. It is not necessary to retrieve the held call before holding it again, but it is possible (e.g. to notify the calling person).

If the held user is connected via GSM, the call is held using the GSM hold service. The GSM user will hear the network specific call held announcement. If the holding party calls another GSM number, this new call uses the same GSM channel that was used by the first call. This ensures that the second channel is still available for other calls and it also allows to connect the two GSM users inside the GSM network on call transfer without occupying any of the gateway's GSM channels.

### 6.4.12.3 Call Retrieve

A held call can be retrieved if the call to the third party is proceeding or connected. In this case, dialling the preconfigured retrieve request digit(s) causes the third party to be disconnected and the audio connection to the held user to be reestablished.

A connection to the newly called user is not necessary. If the held call is retrieved during alerting, the alerting stops.

Note: It is not possible to toggle between the held and the active call, since the third party is disconnected on retrieve.

### 6.4.12.4 Call Transfer

A held call can be transferred to the third party either when the call to the third party is proceeding or connected. In this case, dialling the preconfigured transfer request digit(s) by the holding party causes the holding party to be disconnected and the audio connection between the held and the third user to be established. A connection to the newly called user is not necessary. If the call is transferred during alerting, the alerting continues and the held caller still gets the call held tone.

If the held user and the third user are both GSM users, they get connected by the GSM network internally, and the gateway's GSM channel is available for other calls again.

Note: A GSM network internal call transfer is not offered by all network providers. If it is offered, the service invoke string is not identical for all networks. Therefore it has to be configured properly ("GSM transfer sequence").

### 6.4.12.5 Licensing

To use the functions of the Virtual PBX you need a license key that matches the CPU-ID. Select in the main menu "License / Virtual PBX". Copy the CPU-ID and send it together with your order to coM.sat.

# Multichannel PRA

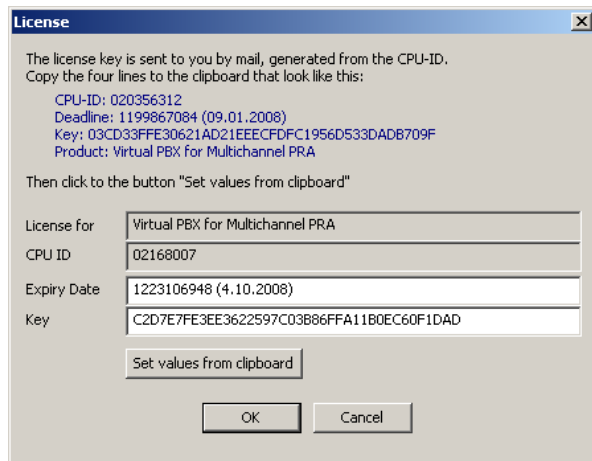


Figure 46: License Dialog

When you received the License mail copy the four lines with the CPU-ID, the Deadline, the Expiry Date, and the Key to the clipboard (Strg-C). Then call the License Dialog again and press "Set values from clipboard" and then OK.

## 6.4.13 Fault handling

In case of faults on the GSM channels a SMS can be sent.

The SMS is sent to all numbers in the **Fault SMS Target Numbers** list.

Fault Handling		Parameter for SMS message to send to administrator on faults
[-] Fault SMS Target Numbers	0 Entries	Numbers to send Fault SMS to, if no number is specified, no fault SMS will be sent Use international format (e.g. +491607654321)
Text of Fault SMS	Alarm: GSM channel <no> (<ci>) of PRA <pi> out of order. Cause: <er>	Use substitute symbols: <pi>=PRA ID, <ci>=Channel ID, <no>=Channel No., <er>=Error text
Repeat interval (in hours) of Fault SMS	0	Time interval to repeat a fault SMS until acknowledged (SMS sent back). 0=No repeat

Figure 47: Fault handling parameters

The text is given with the parameter **Text of Fault SMS**. In the text you can use several placeholders which are replaced when an error SMS is actually sent:

- <pi>: The identification string of the Multichannel PRA as given in the General Parameter "Identification"
- <no>: The number of the faulty channel
- <ci>: The identification string of the faulty channel as given in the Channel Parameter "Identification"
- <er>: The error string describing the fault. Currently there are two errors that will be reported:
  - "No stable log on network (N restarts)"
  - "Multiple (N) short calls indicate audio problem"

If the **Repeat interval of Fault SMS** is set to a value greater than 0, the fault SMS is repeated periodically until it is acknowledged. Acknowledgement means that the SMS is sent back by at least one of the recipients.

# Multichannel PRA

## 6.4.14 Call statistic parameters

These parameters concern the call statistics (CDRs).

**Note:** Additional parameters that are not specific for a Multichannel PRA but concern the way the PRAC application handles CDRs are found in the menu “Statistics”/”Parameter”.

<input type="checkbox"/> Calls Statistic (CDR)		<b>Settings for generation of the call statistic (CDR)</b>
Delete Digits	0	Number of digits to delete at the end of the called number
<input type="checkbox"/> Numbers (Prefixes) not Stored	0 Entries	Do not store numbers which start with these prefixes
ASR/ACD calculation window	100	Number of calls to calculate the channel specific ASR and the average call duration as shown on the status page

Figure 48: Call statistics parameter

**Delete digits** give the number of digits to delete at the end of the called numbers before the CDR is written. The deleted digits are replaced by stars (“\*”).

**Numbers not stored** give a list of numbers or prefixes that should not be stored in the CDRs.

**ASR/ACD calculation window:** The channel specific values ASR (Answer Seizure Rate) and ACD (Average Call Duration) as displayed on the status page are calculated over a certain number of the most recent calls. This number can be set here.

**Note:** If set to 0, also ASR and ACD will always be displayed as 0.

## 6.4.15 Voice (Announcements)

In certain operating situations voice announcements can be blended in to facilitate prompting of the user during call build-up or forwarding. 10 different announcements can be stored in the **coM.s.a.t Multichannel PRA** memory. Most of them can be found in this section. (The other two are in the section “Unconnected Calls”)

<input type="checkbox"/> Voice (Announcements)		<b>Announcements or tones in .wav format, CCITT A-Law, 8bit, mono, 8kSamples/sec (can be recorded with the Windows Sound Recorder)</b>
Voice Files Stored in Multichannel	Edit List	Voice files stored in Multichannel PRA to select from for announcements
March Tone	Use tone	Whether to use a standard tone to fill the silence while connecting to GSM
Marchtone/Announcement Timeout	10	(1/10 sec) Time to play the march tone or the "Calling..." announcements
<input type="checkbox"/> Calls from PBX		
"Please dial"	PleaseDial.bch	Request to dial the desired number, or a dial tone
"Calling in progress"	CallingInProgress.bch	Information that the dialled number will be called
<input type="checkbox"/> Calls from GSM/PSTN		
"Please dial"	PleaseDial.bch	Request to dial the number of the desired extension, or a dial tone
"Calling extension"	CallingExtension.bch	Information that the call is in progress (caller dialled suffix). Limited by Marchtone Timeout
"Calling operator"	CallingOperator.bch	Call is routed to default extension (no suffix dialled). Limited by Marchtone Timeout
"Busy, redial with star key (*)"	ExtensionBusy.bch	If the desired extension is busy press "*" to call another extension
<input type="checkbox"/> Calls from PSTN/GSM		<b>These are for numbers from the Allow routing from GSM/PSTN lists only</b>
"Dial extension or access code"	PleaseDialExtensionOrCode.bch	Request to dial the number of the desired extension or the routing table access code
"Dial number to route"	PleaseDialNumberToRoute.bch	After entering the access code; Request to dial the number to route

Figure 49: Voice parameters

The **March Tone** serves to bridge delays with a tone or sequence of tones in order to prevent the impression during the call buildup that the line is "dead". It will be played when one of the announcements “Calling in progress”, “Calling operator”, or “Calling

# Multichannel PRA

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Extension" is not assigned

The March-Root-Tone generated by the GSM module can be suppressed by selecting "Silence".

The duration of the march tone or the "Calling..." announcements, respectively is entered as **Marchtone/Announcement Timeout** in units of 1/10 seconds: 30 represents a tone of 3 seconds duration.

**Note:** This timeout is also used to limit the announcements "Calling in progress", "Calling operator", and "Calling Extension".

Two steps are necessary to assign announcements:

## Step 1: Load all voice files into the Multichannel PRA

A click on the button of the row "Voice Files" opens a dialog which shows the voice files stored in the Multichannel PRA (if any):

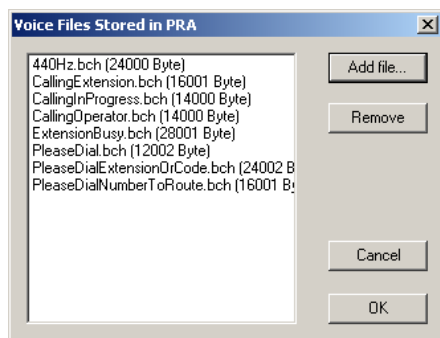


Figure 50: Voice files stored in PRA

The list box displays the files loaded into the device. The display is updated when opening the dialog or when a file was added or removed.

The **"Add"** button adds further files. The **"Remove"** button enables single files to be deleted. This button is only active if files have been loaded previously.

Regarding all announcements, please note that these should all together be no longer than 120 seconds (due to the limited memory space). Further these announcement .wav-files must be stored in the CCITT A-Law format, 8 bits and mono recording at 8000 cycles per second.

## Step 2: Assign the voice files to the respective situations

Once all files are loaded into the Multichannel PRA you can assign them by selecting them from the pull down lists.

The messages are intended for the following situations:

1. With incoming calls, reference can be made regarding a necessary postfix of the extension (Please dial; incoming call)
2. With incoming calls, reference can be made to the desired subscriber's extension being called (Calling; incoming call)

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58

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*Note Protection Mark according to DIN 34!*

# Multichannel PRA

3. With incoming calls, and no postfix dialed, reference can be made that the default extension is being called (Calling Telephone Exchange; incoming call)
4. With incoming calls, and the desired subscriber's extension being busy, reference can be made to another extension to be called (Busy; incoming call)
5. With outgoing calls, reference can be made to the necessary number to be dialed (Please dial; outgoing call)
6. With outgoing calls, reference can be made to the fact that the desired subscriber is being called (Calling; outgoing call)
7. With incoming calls and the caller being in one of the tables "Allow Routing from PSTN/GSM", reference can be made to the necessary extension number or *Routing Table Access Code*
8. With incoming calls and the caller having dialed the *Routing Table Access Code* reference can be made to the necessary number to be dialed

## 6.4.16 Compatibility

These are parameters which are used to reach compatibility to systems that are not 100% compatible to the standards, or to handle special requirements.

Compatibility		Settings that are used for compatibility with certain devices connected to the ISDN lines
PRI Frame Format	CRC4 / Multi Frame	Normally use CRC4/Multiframe. If there are low layer problems try Double Frame. The same format is used for both PRI ports
Send RESTART on Reset	Don't send RESTART	Send a RESTART message to ISDN after cold start or reset
Send ALERTING on calling	No ALERTING	Signal calling by sending ALERTING message
Send Immediate CONNECT	Normal	Answer a SETUP (with uncomplete called party number) immediately with CONNECT. (this enables suffix dialing by DTMF from analog phones).
GSM Mailbox Detection	0	If a call to GSM is answered within the given period (approx. multiples of 0.5 sec, switch off with 0) assume a mailbox accepted the call and hang up. Release Cause: No user responding (18)
Send Immediate CALL PROCEEDING	Normal	Answer a SETUP (with complete called party number) immediately with CALL PROCEEDING. Set to "Immediate" for Mediant 2000
Progress Indicator to use	8	Enter Value: 0=Don't send PI, 1="Call is not end-to-end ISDN", 8="In-band information now available"
Cause Translation Table	0 Entries	Translate release causes for PBX from/to, one pair per line. E.g.: 34/17 translates "Channel not available" to "User busy". For more information refer to the menu entry "Help/List of ISDN causes"
SETUP in TE Mode with CHID	No CHID	Whether to send a B-Channel Identification (CHID) also in TE-mode. Set to "Send CHID" for Siemens HiPath 4000
Allowed ITC	Speech and Audio	Information transfer capability for calls to GSM
SABME Delay	0	Time (sec) by which the SABME message is delayed after restart. Set to a value greater than zero (e.g. 10) if you have problems to reestablish the ISDN link after a reset
Dial Tone Delay	0	Time (in 1/10 sec) before a dial tone is generated
ISDN Watchdog	Don't reset	On faults in ISDN layers 1 and 2 carry out a reset approx. every 100 sec
Periodical Reset Time		If a time is entered, the Multichannel PRA will perform a periodical reset at that time. Format for daily reset: "hh:mm", hh=hour (00-23), mm=minute (00-59). Format for weekly reset: "hh:mm d", d=day (0-6, 0=monday)

Figure 51: Compatibility parameters

The **PRI Frame Format** is normally set to "CRC4/Multiframe". If there are low layer problems and the cabling is correct try "Doubleframe"

With the option **Send RESTART on Reset** you advise the system to send the ISDN layer 3 command RESTART to the connected devices after a reset or on re-establishing an interrupted PRI line. Otherwise the establishment only takes place on layer 2 (SABME command).

The **Send ALERTING on Calling** option is used to set whether the ALERTING protocol data element is generated by the Multichannel PRA for outgoing calls when the GSM networks signals the Alerting state.

If the option is not activated, ALERTING is omitted and only a CALL PROCEEDING protocol data element is generated.

# Multichannel PRA

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Use of this option depends on the properties of the connected telephone system: The Multichannel PRA transfers the ringing tone or the network provider announcements to the B-channel. Whether the ringing tone or the network provider announcements from the GSM network are used in the B-channel or the ringing tone generated by the telephone system is used may depend on whether the „Alerting“ option has been activated or is passive.

**Send Immediate CONNECT** is mainly used if an **analog** phone has set up a connection to the Multichannel PRA in TE mode. The suffix dialing into the GSM network is then done with the aid of the DTMF tones. Switch this parameter to “Normal” if you are using only ISDN phones (which are sending the digits using the INFO protocol data elements).

**GSM Mailbox Detection** is useful when you are using an automatic dialer and it is not wanted to be connected to a GSM mailbox. The parameter gives a minimum time period between the alerting state (as signalled from the GSM network) and the connection. If the call is answered quicker the Multichannel PRA assumes a mailbox and hangs up. The release cause that will be signalled to the ISDN side is: “No user responding (18)”

**Send Immediate CALL PROCEEDING** is needed for the Mediant 2000 PBX. An incoming SETUP (with complete called number) will be answered

**Progress Indicator to use:** To be able to get audio information over the B-channel even before a CONNECT protocol data element was sent (e.g. for network announcements) the Multichannel PRA can send a progress indicator. There are several values possible, the sensible values are 1 (with the meaning “Call is not end-to-end ISDN”) and 8 (In-band information now available). Enter the value 0 to omit the progress indicator.

**Cause translation table:** When a call could not be connected or a connected call ends the Multichannel PRA sends the appropriate Release Cause to the connected ISDN system. You can find a complete list of possible Release Causes in the help menu entry “List of ISDN causes”. These cause codes are standardized.

However, some PBX do not understand all defined causes and give an error. In this case you can translate all respective cause codes by another code.

Enter on code pair per line, with the codes separated by a slash.

Example: To replace the code 34 for “Channel not available” with the code 17 for “User busy” add the entry:

34/17

**SETUP in TE mode:** For PRI ports operation in TE mode the SETUP command normally does not specify the B-channel ID to use, because this decision is up to the NT side. However, some PBX (e.g. Siemens HiPath 4000) require this information also TE mode. For these set SETUP in TE mode to “Send CHID”.

**Allowed ITC** gives the type of allowed speech services (Speech/3.1kHz Audio/Both).

**SABME Delay** delays the SABME message after a reset by the specified time (in

# Multichannel PRA

seconds). Set this to a value of e.g. 10 if there are problems to re-establish the ISDN link after a reset.

The parameter "**Dial Tone Delay**" can be used in applications that rely heavily on block dialing. This terminates the dialed numbers with a hash "#". This results in the dialed numbers being input into the ISDN-Setup-Command or the ISDN-Information-Command as a block. If the numbers are transmitted with the Information-Command then the Setup-Command and the Setup-Acknowledge-Command have already been exchanged, a dialing without digits has been initialized and the dial tone is audible. As soon as the Information-Command with the digits follows, the dial tone is briefly interrupted. This can be prevented using Dial Tone Delay. Delaying dialing by about 0.5 seconds is an appropriate setting.

The **ISDN Watchdog** resets the whole system when there are Layer 1 or 2 faults on the PRI lines for more than approx. 100 seconds. In most cases this does not make sense.

**Periodical Reset Time:** In certain routing configurations some GSM channels may not be used for an extended period of time. Depending on the operator this can lead (after some days) to the effect that the channels are still logged into the network, but a call to these channels is rejected with an announcement saying that the user is not reachable.

To overcome this problem you can perform a periodical reset of the Multichannel PRA, so the modules will log in again and be reachable. Enter here the time when this should happen, e.g. at night when no calls are active.

## 6.4.17 SMS parameters

These parameters concern the operation of the SMS server. For details please refer to the SMS server manual.

SMS		Settings used with the SMS server
SMS Life Time	0:15 hours	How long to try to send outgoing SMS when temporary problems occur
SMS Handle Blocks	16	How many different SMS handle blocks (256 handles each) to use (1..64). Default is 16, in case of out of memory errors set to number of channels. In case of compatibility problems set to 1 (not recommended otherwise)
Replacement for @	42	The @ has the Code 00 in the GSM character set and can not be transferred in strings. It must be replaced by another code, default 42 (*)
Channel ID on AT-Interface	No Channel ID	Whether to send on the AT-Interface the IDs of the used GSM channel (not conform to GSM 03.40)

Figure 52: SMS parameters

**SMS life time:** The time period during which the SMS is tried to be sent. At timeout a error message will be sent via mail and displayed in the SMS list.

**SMS handle blocks:** This is a service parameter giving the number of blocks with 256 handles each to save SMS references. This is the maximum number of SMS that can be handled at the same time. In case a out-of-memory error occurs when trying to send a SMS increase this parameter up to the number of installed channels (max. 64).

If you are using the AT command interface and you encounter compatibility problems, set this parameter to 1.

**Replacement for @:** The character @ has the code 0 (zero) in the GSM character set. This means that it can come to errors when using it in certain string

# Multichannel PRA

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representations which take the 0 as end mark. For that, it should be replaced by another sign. The default is the asterisk (\*), which is also widely accepted by the short message service centers.

**Channel ID on AT-Interface:** Set to "Send Channel ID" to get informations about the channel that was actually used to send a certain e-mail. Please refer to the manual of the SMS server for details of the AT-Interface.

## 6.4.18 Service Parameters

These parameters are not intended to be changed by the user. They are for service purposes only.

# Multichannel PRA

## 6.5 Channel parameters

The card for the specific entries for Channel 1 to 64 is used for entering the necessary details for all channels.

For better handling the channels can be grouped by Slot Number, by Group Name (as entered in the first row) or all together. Furthermore the display can be restricted to the channels of only one group. A right click on the grid brings up a **context menu** with the available options.

It is possible to enter a string to identify the respective module/SIM card in the field **Identification**. This may be the phone number of the SIM card. The channel identification is used in fault SMS (placeholder <ci>).

Group and Identification are both referenced in the status display. Both are optional.

	6 Channels	6 Channels	11 Channels	41 Channels	Description
Group	Out	In			Group Identification
Identification	016090122315	016090122330			Identification string of the channel, e.g. IMEI or no.
Usage of this channel	Neglect	Neglect			Whether initialize/use this channel
<b>GSM</b>					
PINs of the SIM-Cards	1 Entry 8888	1 Entry 8888			Enter one PIN for each card to use
SMS service center	+491710760000	+491710760000			Number of the SMS service center to use
Allow roaming	No roaming	No roaming			Allow log in to networks which are not the home network
Allowed nets	0 Entries	0 Entries	0 Entries	0 Entries	Numbers of allowed nets
<b>Calls incoming from GSM</b>					
Handling of calls from GSM	Reject	Accept	Accept	Reject	Whether to accept or reject incoming GSM calls
Dialling mode	Dialling	Call default	Call default	Call default	Whether to accept call and wait for further dialling, or forward call to default extension
Default PBX extension	0	10			Where to forward incoming GSM calls by default (only possible to PBX)
Dial timeout	5	5	5	5	(Seconds) Max time to wait for further dialling before forwarding to default extension
CLIP handling	Forward	Forward	Forward	Forward	Whether to forward the number of the caller from GSM to ISDN
<b>Calls to GSM</b>					
Handling of calls to GSM	Allow	Refuse	Refuse	Refuse	Whether to allow or refuse outgoing GSM-calls
Allowed MSNs	0 Entries	0 Entries	0 Entries	0 Entries	The MSNs which are authorized to use this channel
CLIR mode	Suppress	Send number	Send number	Send number	Whether to suppress the GSM module number for calls to GSM. Note: The calling ISDN number can not be forwarded to GSM

Figure 53: GSM-Channel 1..64

The **Type of SIM Card** can be selected from "Normal" and "Prepaid". If a channel is set to have a prepaid SIM card the maximum call time can be limited to the balance of the card. This is done in the *Prepaid Balance* dialog (called from the Status menu, refer to the description of the Status page for details).

To handle the time limit there are two thresholds (in minutes):

**Minute Balance Low Limit:** If the balance of the card is lower than this limit the channel will only be used if no other ("better") channel is available.

**Minute Balance Too Low Limit:** If the balance of the card is lower than this limit the channel will not be used any more.

The current balance can be checked on the status page.

The possible count of SIM cards is always 1 with the current firmware. According to this, one **PIN** per SIM card must be entered in the appropriate list. This entry is mandatory if entry of a PIN is required by the SIM card used. In case the SIM cards used don't require such an entry, the entry remains blank.

# Multichannel PRA

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Furthermore, the number of the **SMS service center** must be entered on this card, which is provided by the respective network provider whose SIM cards are used. The respective SMS center can be selected from a list or entered directly.

Select whether „**Roaming**“ (booking into networks abroad) is allowed and specify the **Allowed Nets**.

Furthermore, the incoming and outgoing calls are also configured here. You first define whether **incoming and outgoing calls** are allowed.

**Note:** If both incoming and outgoing GSM calls are deactivated, the channel is blocked for GSM calls with the exception of numbers in the White List, Authentication List or the Maintenance Number.

With the parameter **Dialing mode** you can set whether consecutive dialing is permitted or whether the incoming call is transferred to a preset extension, the number of which has been entered under **Default Number** (see above).

If consecutive dialing has been allowed by setting **Dialing mode** to *Dialing*, it is possible to dial another extension during a certain time after a connection has been established. **Note:** The dialing mode settings may be overridden by the VPN settings for incoming calls.

The time, during which a consecutive number can be dialed, is configurable. The time span is pre-set to 5 seconds. This should suffice for most applications, but can be changed in the **Dial timeout** entry if necessary.

The **Default number** is the number of the extension that is called for incoming calls if *Call Default Number* has been selected, or no postfix is dialed during the Dial Timeout.

With **CLIP handling** you can set whether the phone number of the incoming call (CLIP) is to be transferred to the extension.

The permission to make outgoing calls to GSM can be restricted to certain MSN's as entered in the **Allowed MSNs** list.

If outgoing calls are allowed, you can select whether the caller number is to be transmitted or not (**CLIR mode**). Because the caller number would be the number of the calling module, and not the number of the original caller, it is normally sensible to *Suppress* the number. Refer also to the description of "Return call handling".

**Note:** Users that have trunk access will always get the CLI.

The sound volume of the microphone and handset for the GSM channel can also be adjusted using this card if the preset level is insufficient. The preset values for are 4 for „**Microphone Attenuation**“ and 4 for „**Speaker Volume**“. Both values can be altered between 0 - 7, whereby lower values represent lower volume and higher values higher volume.

# Multichannel PRA

The option "**Handle SMS**" determines the reaction to incoming SMS and whether this channel should be used by the SMS Server for sending SMS. If the option is set to "Ignore SMS", then SMS are not retrieved from the SMS center. In this case **remote maintenance** is only possible by direct calls.

## 6.5.1 RSSI supervision

With channels operating at low signal levels you risk to loose an active call due to instabilities in the reception. To avoid this the Multichannel PRA supports supervision of the receive signal levels.

Signal Level					
Signal weak under...	-89dB	-89dB	-89dB	-89dB	If the signal strength is lower than this value, the channel will only be used if no better channel is available
Signal too weak under...	-99dB	-99dB	-99dB	-99dB	If the signal strength is lower than this value, the channel will not be used any more until getting better

Figure 54: Signal Level Supervision

There are two thresholds:

- Signal weak under...: If the receive signal strength of a channel is lower than this value the channel will only be used for outgoing calls if no better channel is available in the respective routing level.
- Signal too weak under...: If the receive signal strength of a channel is lower than this value the channel will not be used for outgoing calls anymore until the signal is getting stronger.

To edit the values click to the respective field and then to the button that appears. In the upcoming dialog you can set the threshold by drawing the slide bar.

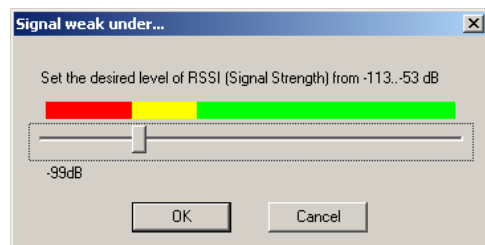


Figure 55: RSSI threshold dialog

## 6.5.2 Virtual Private Network Support

Use the VPN settings to control the transport of an extension number over the GSM network. The handling may be different on outgoing and incoming calls.

**Note:** These functions must be supported by the network operator to use them.

### 6.5.2.1 Outgoing Calls

On outgoing calls the **number to dial** can be constructed in several ways to transport the information about the dialing extension:

<Prefix><Called number><Separator><Calling extension><Length of extension>

All the fields are optional, only the <Called number> will always be sent.

# Multichannel PRA

First select the **Extension transfer mode** for outgoing calls:

- Deactivated: Only the Called party number will be sent
- Append extension: The called party number and the extension will be concatenated. Prefix and Separator will be added as given in the respective fields.
- Append extension and its length: The same as before, but the length of the extension is added as a single digit at the end of the string (after the extension)

The fields **Prefix** and **Separator** are used in the modes “Append extension” and “Append ext. and its length”.

**Note:** These fields may also be empty.

The maximum size of the resulting number is limited by the **Max. GSM No. Size** parameter. If the resulting length would be greater only the called number will be send.

VPN Support	Deactivated	Append extension	Append extension	Append ext. and its length	
Extension transfer mode, outgoing					Outgoing calls: Assemble number to dial as <Prefix><Called no><Separator><Extension><Ext.length>
Prefix			9999		The Prefix string to put at the beginning of the resulting number.
Separator		#			The Separator string to put between the Called No. and the Extension, may be empty
Max. GSM No Size		21	21	21	Maximum length of resulting GSM number. If exceeded, omit the
Extension transfer mode, incoming	Deactivated/Separator only	Constant CLI length	Constant Extension length	Constant CLI length	Interpret the caller ID of incoming calls as <CLI><Sep><Ext>, a composition of
Separator	#				If this character is part of the caller ID, the number will be split
Length of constant part		8	4	4	The length of the constant part (if any), the other part is variable
Prefix for CLI reconstruction			05	05	After splitting a CLI/EXT composition, prefix the CLI part with this
CLIR encoding	0	0	0	0	If the CLI equals to this string, the call is sent to the PBX as

Figure 56: VPN Support

**Example:** The extension 1234 calls the number 05498765. According to the settings in the above screen copy the four displayed channels 1 to 4 (left to right) will dial the following number:

- Channel 1: 05498765
- Channel 2: 05498765#1234
- Channel 3: **9999**054987651234
- Channel 4: 0549876512344

## 6.5.2.2 Incoming Calls

On incoming calls the number of the caller (CLI) can be interpreted as a composition of the original CLI of the caller and the called extension, where one part is of a constant length, or the to parts are separated by a special character (e.g. #) :

<Calling number><Separator><Called extension>

First select the **Extension transfer mode** for incoming calls:

- Deactivated/Separator only: If you gave a **separator** character and this character is in the CLI, the CLI will be interpreted as CLI and extension, separated by the respective character. Otherwise the number is taken as CLI.
- Constant CLI length: The first n digits are interpreted as the CLI, the rest as extension, where n is given in *Length of the constant part*

# Multichannel PRA

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- Constant Extension length: The last n digits are interpreted as the extension, the rest (to the left) as CLI, where n is given in *Length of the constant part*

After splitting the calling number into CLI and extension, the CLI will be prefixed by the **Prefix for CLI reconstruction** (if any is given) and sent together with the extension in a SETUP message to the PBX.

**Note:** The SETUP is sent immediately, independently from the settings in the **Dial mode** parameter.

**Example:** A call comes in from the number 05498765 to the extension 1234. According to the settings in the above screen copy the four displayed channels 1 to 4 (left to right) will expect the following CLI:

Channel 1: 05498765#1234  
Channel 2: **05498765**1234  
Channel 3: 498765**1234**  
Channel 4: **498765**1234

In all four cases the resulting SETUP to the PBX will have the Calling number (CLI) 05498765 and the Called number 1234.

The **CLIR Encoding** can be used by the network to signal a call with the CLI rejected to the Multichannel PRA. If a string is entered in this field and the CLI is equal to that string the call will be signaled to the PBX as PRIVATE by omitting the CLI in the SETUP message.

**Example:** A call comes in on channel 1 from 0#1234. The resulting CLI would be 0. Since this is given as CLIR Encoding string, the CLI is not sent to the PBX.

## 6.5.3 TDMA parameters

These parameters are for use with TDMA modules.

Normally you only have to give the **MIN** (directory number) of the module and the **SID** (System ID) of the home network.

If a TDMA module logs in to an analog AMPS network you can try enter 2 or 3 in the EDSS parameter to prevent this.

## 6.5.4 Service parameters

These parameters are not intended to be changed by the user. They are for service purposes only.

# Multichannel PRA

## 6.6 Calls statistic (CDRs)

The statistic functions (CDR = Call Detail Record) are intended for the storing of call data. Incoming and outgoing calls are registered. Due to the limited memory space in the Multichannel PRA, call data can only be stored without loss of data until the available memory is used up (CDR memory is 512kByte, can hold approx. 8000 CDRs. With a call every 2 minutes on 30 channels (15 CDRs/minute) this lasts around 8 hours).

The remote service PC with installed coM.s.a.t PRAC software (e.g. the central office) should then build up a connection to the coM.s.a.t Multichannel PRA and read out the statistical data.

Statistic data can be read out by clicking the **"Statistics"/"Load Statistics"** menu entry.

It is recommended to read out the CDRs periodically by setting the refresh interval in the parameter dialog ("Statistics"/"Parameters") to a value greater than 0, e.g. to 600 for refreshing the CDRs every 10 minutes.

The read-out data is stored in predefined files. The file name is composed by the Identification string as entered in General Parameters and the date of the CDR's to store. For each day a separate file is created.

The path to store the CDR files is selectable in the "Statistics/Parameter" dialog. The read-out data is stored in CSV format to be easily processed with standard worksheet applications like Microsoft Excel®.

Start Time	Calling No	Called No	Bill	Duration (sec)	Cause	Bearer cap.	Carrier	From ch.	To ch.	AOC	Pref
Current Data											
Active File: C:\PROJEKTE\PRAC\debug\coM_s_a_t_TEST1_2003-06-05.CSV											
141 Calls			ASH1: 54.6%	1 total billed: 21 min		Gross margin: 5/5		1 total AUL: U			
			ASR2: 54.6%	Avg billed: 16 sec				Average AOC: 0			
				Avg not billed: 6 sec							
2003-06-05 09:12:16	3311	15	-	0	Incompatible destination (88)	Speech (80)	-	GSM12		00	
2003-06-05 09:15:29	3311	15	-	0	Incompatible destination (88)	Speech (80)	-	GSM12		00	
2003-06-05 09:18:05	-	016090122330	+	4	Normal call clearing (16)	Speech (80)	26201	PRI2 BCH01	GSM01	00	
2003-06-05 09:18:05	-	016090122326	+	4	Normal call clearing (16)	Speech (80)	26201	PRI2 BCH02	GSM02	00	
2003-06-05 09:18:04	-	016090122323	+	5	Normal call clearing (16)	Speech (80)	-	GSM05	PRI2 BCH05	00	
2003-06-05 09:18:06	-	016090122323	+	3	Normal call clearing (16)	Speech (80)	26201	PRI2 BCH03	GSM03	00	
2003-06-05 09:18:06	-	016090122319	+	4	Normal call clearing (16)	Speech (80)	-	GSM06	PRI2 BCH04	00	
2003-06-05 09:18:05	4916090122312	11	+	4	Normal call clearing (16)	Speech (80)	26201	PRI2 BCH04	GSM04	00	
2003-06-05 09:18:05	4916090122309	12	+	5	Normal call clearing (16)	Speech (80)	-	GSM07	PRI2 BCH06	00	
2003-06-05 09:18:09	-	016090122326	-	1	Destination out of order (27)	Speech (80)	-	GSM07	PRI2 BCH07	00	
2003-06-05 09:18:09	-	016090122306	-	13	Normal call clearing (16)	Speech (80)	-	GSM08	PRI2 BCH08	00	
2003-06-05 09:18:09	-	016090122287	-	2	Invalid call reference value (81)	Speech (80)	26201	PRI2 BCH01	GSM09	00	
2003-06-05 09:18:09	-	016090122336	-	2	Invalid call reference value (81)	Speech (80)	26201	PRI2 BCH02	GSM10	00	
2003-06-05 09:18:09	-	016090122330	-	2	Invalid call reference value (81)	Speech (80)	26201	PRI2 BCH03	GSM01	00	
2003-06-05 09:18:23	3311	15	-	0	Incompatible destination (88)	Speech (80)	-	GSM12		00	
2003-06-05 09:19:07	4916090122306	12	-	0	Incompatible destination (88)	Speech (80)	-	GSM07		00	
2003-06-05 09:19:07	-	016090122330	+	4	Normal call clearing (16)	Speech (80)	26201	PRI2 BCH01	GSM02	00	
2003-06-05 09:19:07	4916090122312	10	+	4	Normal call clearing (16)	Speech (80)	-	GSM05	PRI2 BCH05	00	
2003-06-05 09:19:08	-	016090122326	+	3	Normal call clearing (16)	Speech (80)	26201	PRI2 BCH02	GSM03	00	
2003-06-05 09:19:08	-	016090122319	+	4	Normal call clearing (16)	Speech (80)	26201	PRI2 BCH04	GSM09	00	
2003-06-05 09:19:07	4916090122309	11	+	5	Normal call clearing (16)	Speech (80)	-	GSM06	PRI2 BCH06	00	

Figure 57: Statistic data

A line in the CSV file may look like this:

2003-12-05 00:00:02,+48598206000,098336xxx,-,23,10,80,21901,PRI1 BCH04,GSM01,05,-,-,F

Respective table column	Description
Date and time	When the call started (SETUP/CRING came in)
Calling number	Where the call originates

date:

15.02.2008 10:32

page:

68

file:

Manual coMsat Multichannel PRA 3-3 eng.doc

Note Protection Mark according to DIN 34!

# Multichannel PRA

Called number	The called destination. Depending on the settings there may be several digits hidden
Billing flag	'+' = bill (connected), '-' = don't bill
Duration	If the call was not connected this is the ring time, otherwise the talk time
Cause	The Disconnect/Release cause of the call
Bearer Cap.	Bearer Capability
Carrier	PLMN code of the selected provider
From Channel	The channel where the call came in (GSM or ISDN)
To Channel	The channel where the call was routed to (GSM or ISDN)
AOC	The AOC information generated for this call (from GSM to ISDN only)
Preferred Carrier	The carrier that was the favorite route. If a fallback route was used, this field is colored red
Location	The location that caused the release/disconnect:  Capital letters means that the cause came from external (either the "To", or the "From" channel), small letters mean that the PRA ended the call:  F: From Channel T: To Channel f: PRA (Reason concerning "From" Channel) t: PRA (Reason concerning "To" Channel)

## 6.7 Status

The state of the ISDN line and the GSM modules, which have been installed in the device, are queried via the „**Status**“ file card. The data is updated after selecting “Status” “Load status information” in the Status menu on the menu bar. Group and Identification of the GSM channels are referenced for convenience.

### 6.7.1 ISDN line status

Channel	Connected to	Layer status (L3,L2,L1)	Incoming calls	Outgoing calls	Signal	Sync	Layer 2
PRI 1	PSTN	TE,TE_Slave	0 in progress, 0 active	0 in progress, 0 active	Signal lost	Not synchronized	Down
PRI 2	PBX	NT,NT_Master	11 in progress, 0 active	0 in progress, 0 active	Signal detected	Synchronized	Up

Figure 58: ISDN line status

For both PRI lines the following information's are shown:

- Access mode (connected to...)
- Configuration of the three ISDN layers
- Number of incoming calls (from ISDN) and active (connected) calls
- Number of outgoing calls (to ISDN) and active (connected) calls
- Signal status
- Synchronization status
- Layer 2 status

# Multichannel PRA

## 6.7.2 GSM module status

Channel	Group	Identification	State	Module	Signal (RSSI)	Network	Location (LAC)	Cell ID	IMSI	Alarm	AirTime
Ch 1	Out	016090122315	Waiting for log in	SIEMENS TC35 REVISION 04.00	-89 dB	26201	6301	D304	262019031023310	Off (0 restarts,0 shortcalls)	1%
Ch 2	Out	016090122312	Call is active	SIEMENS TC35 REVISION 04.00	-85 dB	26201	6301	D304	262019031023311	Off (0 restarts,0 shortcalls)	3%
Ch 3	Out	016090122309	Call is active	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023312	Off (0 restarts,0 shortcalls)	0%
Ch 4	Out	016090122306	Outgoing call	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023313	Off (0 restarts,0 shortcalls)	0%
Ch 5	In	016090122306	Call is active	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023306	Off (0 restarts,0 shortcalls)	0%
Ch 6	In	016090122326	Call is active	SIEMENS TC35 REVISION 04.00	-85 dB	26201	6301	D304	262019031023307	Off (0 restarts,0 shortcalls)	0%
Ch 7	In	016090122323	Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023308	Off (0 restarts,0 shortcalls)	0%
Ch 8	In	016090122319	Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023309	Off (0 restarts,0 shortcalls)	0%
Ch 9	Out	016090122293	Outgoing call	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023317	Off (0 restarts,0 shortcalls)	0%
Ch 10	Out	016090122297	Ready for Calls	SIEMENS TC35 REVISION 04.00	-79 dB	26201	6301	D304	262019031023316	Off (0 restarts,0 shortcalls)	3%
Ch 11	In	016090122287	Call is active	SIEMENS TC35 REVISION 04.00	-83 dB	26201	6301	D304	262019031023319	Off (0 restarts,0 shortcalls)	0%
Ch 12	In	016090122336	Ready for Calls	SIEMENS TC35 REVISION 04.00	-83 dB	26201	6301	D304	262019031023304	Off (0 restarts,0 shortcalls)	0%
Ch 13	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-79 dB	26201	6301	D304	262019031023315	Off (0 restarts,0 shortcalls)	0%
Ch 14	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031000399	Off (0 restarts,0 shortcalls)	0%
Ch 15	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023305	Off (0 restarts,0 shortcalls)	0%
Ch 16	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262019031023301	Off (0 restarts,0 shortcalls)	0%
Ch 17	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262011246025552	Off (0 restarts,0 shortcalls)	0%
Ch 18	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262011246025551	Off (0 restarts,0 shortcalls)	0%
Ch 19	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262011246025550	Off (0 restarts,0 shortcalls)	0%
Ch 20	Neu		Disabled	SIEMENS TC35 REVISION 04.00	? dB	?	?	?	?	Off (0 restarts,0 shortcalls)	0%
Ch 21	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262011246025556	Off (0 restarts,0 shortcalls)	0%
Ch 22	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-79 dB	26201	6301	D304	262011246025553	Off (0 restarts,0 shortcalls)	0%
Ch 23	Neu		Ready for Calls	SIEMENS TC35 REVISION 04.00	-81 dB	26201	6301	D304	262011246025548	Off (0 restarts,0 shortcalls)	0%
Ch 24			PIN was wrong, reconfiguration necessary	SIEMENS TC35 REVISION 04.00	? dB	?	?	?	?	Off (0 restarts,0 shortcalls)	0%

Figure 59: GSM module status

For all installed GSM modules the following information's are shown:

- Group and identification as entered in the channel parameters (for convenience)
- Channel state. You can click to this field to force a channel reset or enter the PUK, if necessary.
- Call diversion state. To request/change the diversion click to the respective field
- Signal strength (RSSI, should be at least -90 dB, better -80 dB)
- Bit Error Rate (BER, only available during an active call)
- Answer seizure rate (ASR) for this channel.
- Average call duration (ACD) for this channel

Note: The number of referenced calls for ASR and ACD can be edited in the general parameter page. If it is zero also ASR and ACD will be zero.

- The balance (in minutes) for channels defined as using prepaid SIM cards
- Network, Location, and Cell ID of the current network
- IMSI of the installed SIM card
- Alarm status of this channel
- Description of the installed GSM module

## 6.7.3 Prepaid Balance

To set the balance of channels configured to use prepaid cards go to the *Status* menu and select *Prepaid Balance*.

In the upcoming dialog you see on the right side a list of all channels showing the IMSI and the current balance. (For non-prepaid cards there is only a '-' in the Balance-column.)

Select the channels you want to be affected. This can be done in two ways: Either click to one of the buttons on the left to select/deselect multiple channels or click to the checkboxes in the second column of the table to select/deselect single channels.

# Multichannel PRA

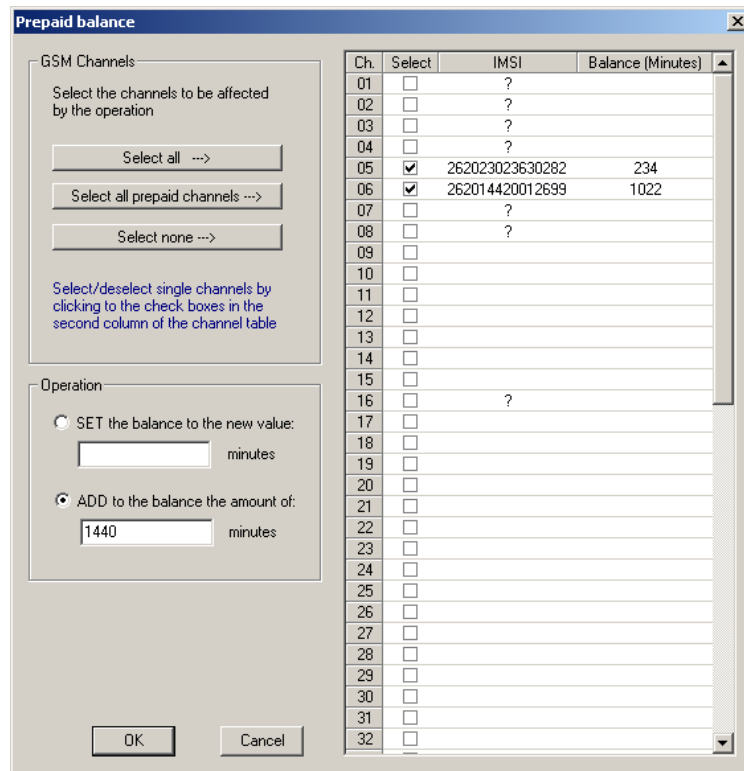


Figure 60: Prepaid Balance

Choose the operation to perform: Either SET the value to a fixed value (replacing the current balance) or ADD an amount to the current balance.

Start the process with OK. The data will be sent for each selected channel.

## 6.7.4 User Time Limits

All users who are authorized for dial through can have a time limit for calls to certain destinations or destination groups, identified by *reference groups*.

If a users balance is below 10% of the limit for a certain destination she of he will hear the announcement "Balance is getting low" (if one is defined) when calling that destination.

If a users current balance is at 0 for a certain destination she of he will hear the announcement "No Balance Left" (if one is defined) when calling that destination and the call will be rejected.

Announcements	
"Balance Is Getting Low"	BalancelGettingLow.bch
"No Balance Left"	NoBalanceLeft.bch

Figure 61: Announcements for Time Balance

# Multichannel PRA

To **authorize a user** for dial through her or his phone number must be in one of the lists "Trunk Access from GSM/PSTN" / "Allow Routing" on the general parameters page.

<b>Trunk Access from GSM/PSTN</b>	
Trunk Access Extension	99
Allow Routing from PSTN	0 Entries
Allow Routing from GSM	5 Entries
	+491743439734
	+491743439720
	+491743439726
	+491736774157
	+491743439725

Figure 62: Example of a list of authorized users

**Reference groups** can be defined on the routing page in the *Destination Prefix Groups* table. More than one prefix group can have the same reference group.

Destination Prefix Groups	Prefix Group Name	Destination Prefix	Leading Digits to Cut	Reference for User Times
Prefix Groups	11 Entries	11 Entries	11 Entries	11 Entries
	Vodafone	0152,0156,0162,0172,0173,0174	0	D2
	Base	0155,0157,0163,0177,0178	0	Eplus
	Festnetz	02,03,04,05,06,07,08,09	0	PTT
	Ausland	00	0	PTT
	T-Mobile	0151,0160,0161,0170,0171,0175	0	D1
	D2 über Festnetz	9901	4	D2
	D1 über Festnetz	9903	4	D1
	E-plus über Festnetz	9902	4	Eplus
	Ortsnetz	1,2,3,4,5,6,7,8,9	0	PTT
	SMS	9999	4	
	02	0176	0	02

Figure 63: Example of a list of reference groups

To set the balance and limits of User Times go to the *Status* menu and select *User Time Balance*.

Action	Select	D2	D1	Eplus	O2	PTT
ADD to balance	<input checked="" type="checkbox"/>	100	200	300	400	500
ADD to limit	<input type="checkbox"/>	0	0	0	0	0
SET new limit (and balance)	<input type="checkbox"/>	0	0	0	0	0
User CLI		D2	D1	Eplus	O2	PTT
+491624591879	<input type="checkbox"/>	880(1000)	680(1000)	449(1000)	980(1000)	870(1000)
+491624519670	<input type="checkbox"/>	690(1000)	590(1000)	1150(1000)	778(1000)	1000(1000)
+491624619672	<input checked="" type="checkbox"/>	400(500)	300(500)	200(500)	100(500)	0(500)
+4906204705022	<input type="checkbox"/>	200(200)	200(200)	200(200)	200(200)	0(0)
+4906204705051	<input type="checkbox"/>	190(500)	90(500)	650(500)	278(500)	500(500)

Figure 64: Time Balance for Dial-Through

In the upcoming dialog you see on the right side a list of all users who are authorized for dial through, their current balance for all reference groups, and their current balance limit for all reference groups.

The table structure will be compared with the configuration before opening the dialog. If there are differences (new or removed users, new or removed reference groups) you will be prompted for an adaption of the table structure. The balance and limit values for new fields will be preset to 0.

# Multichannel PRA

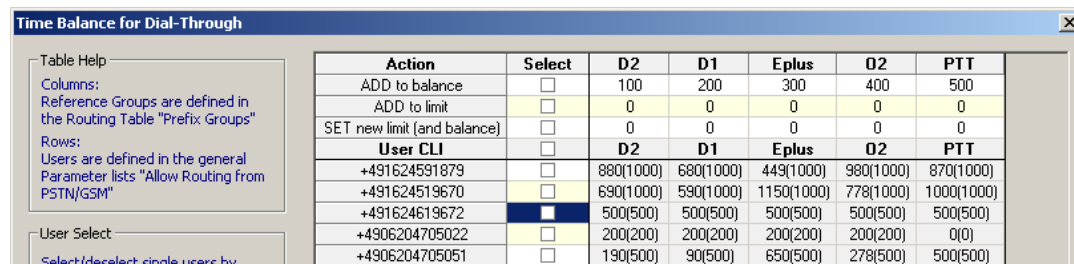
In the dialog first select the **operation** you want to take place:

- *ADD* an amount of minutes to the current balances, or
- *ADD* an amount of minutes to the current limits, or
- *SET* an amount of minutes as a limit, at the same time setting also the balance.

Then select the **users** you want to be affected by the operation, what can be done in two ways:

- Click to the select boxes of single users to select/deselect them, or
- Click to the select box of the User CLI line to select/deselect all users.

Then click to the *OK* button to accomplish the action. The data is transferred to the Multichannel PRA, then the dialog will reopen to reflect the changes and to give the possibility to take further actions.



Action	Select	D2	D1	Eplus	O2	PTT
ADD to balance	<input type="checkbox"/>	100	200	300	400	500
ADD to limit	<input type="checkbox"/>	0	0	0	0	0
SET new limit (and balance)	<input type="checkbox"/>	0	0	0	0	0
User CLI		D2	D1	Eplus	O2	PTT
+491624591879	<input type="checkbox"/>	880(1000)	680(1000)	449(1000)	980(1000)	870(1000)
+491624519670	<input type="checkbox"/>	690(1000)	590(1000)	1150(1000)	778(1000)	1000(1000)
+491624619672	<input checked="" type="checkbox"/>	500(500)	500(500)	500(500)	500(500)	500(500)
+4906204705022	<input type="checkbox"/>	200(200)	200(200)	200(200)	200(200)	0(0)
+4906204705051	<input type="checkbox"/>	190(500)	90(500)	650(500)	278(500)	500(500)

Figure 65: Time Balance after ADD to balance operation

If you are done just click the *Cancel* button.

## 6.8 SMS

SMS messages can be sent and received by the Multichannel PRA. This can be achieved via the SMS card.

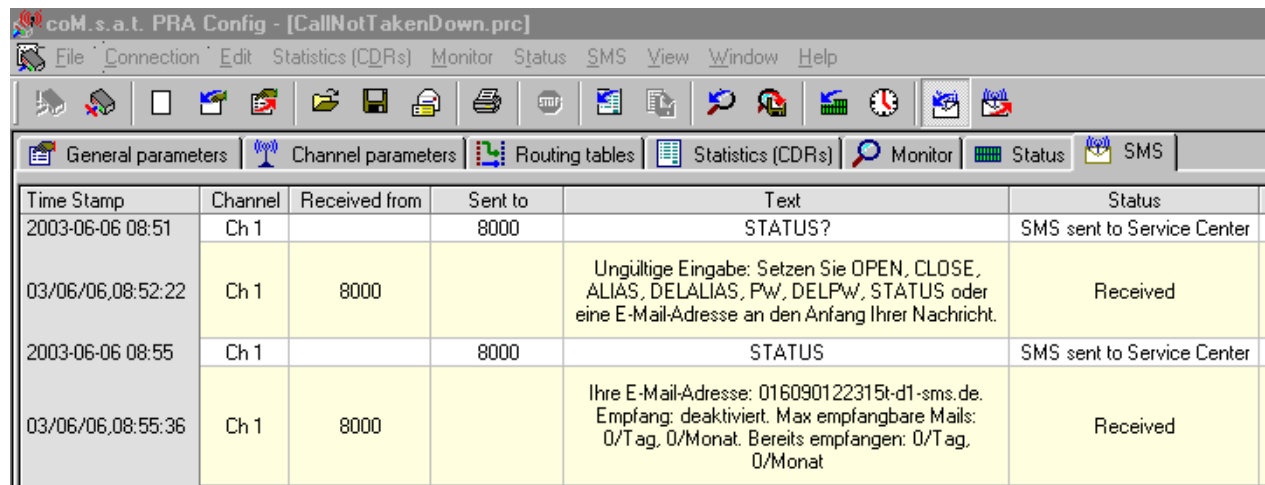
The card displays all SM (Short Messages) sent or received since the program started.

It shows the date and time, the used GSM channel, the number from which the SM was received or the number to which the SM was sent, respectively, the text of the SM, and the status.

SM's can be deleted or copied via the context menu (right mouse button).

Saving of the SM list is currently only possible by the file menu command "Export active grid to HTML".

# Multichannel PRA



The screenshot shows the 'coM.s.a.t. PRA Config - [CallNotTakenDown.prc]' application window. The interface includes a menu bar (File, Connection, Edit, Statistics (CDRs), Monitor, Status, SMS, View, Window, Help) and a toolbar with various icons. Below the toolbar is a tabbed interface with 'General parameters', 'Channel parameters', 'Routing tables', 'Statistics (CDRs)', 'Monitor', 'Status', and 'SMS' tabs. The 'SMS' tab is active, displaying a table of messages.

Time Stamp	Channel	Received from	Sent to	Text	Status
2003-06-06 08:51	Ch 1		8000	STATUS?	SMS sent to Service Center
03/06/06,08:52:22	Ch 1	8000		Ungültige Eingabe: Setzen Sie OPEN, CLOSE, ALIAS, DELALIAS, Pw, DELPw, STATUS oder eine E-Mail-Adresse an den Anfang Ihrer Nachricht.	Received
2003-06-06 08:55	Ch 1		8000	STATUS	SMS sent to Service Center
03/06/06,08:55:36	Ch 1	8000		Ihre E-Mail-Adresse: 016090122315t-d1-sms.de. Empfang: deaktiviert. Max empfangbare Mails: 0/Tag, 0/Monat. Bereits empfangen: 0/Tag, 0/Monat	Received

Figure 66: Sending and receiving an SMS

**Note:** SMS messages have a maximum length of 160 characters

**Note:** In order to be able to send and receive SMS, the **SMS Service Center Number** must be set in the "Channel parameters" tab.

## 6.8.1 Receive SMS

The PRAC Software automatically looks for new messages in the device when "Load SMS" in the SMS menu is activated. The message text then appears in the text field, the phone number of the sender is displayed in the „From“ field.

The following property must be noted for the receipt of SMS messages:  
As the received SMS messages are stored on the SIM card, the available memory is limited. However, to ensure access to the device via remote servicing, the oldest message is always deleted to ensure that sufficient memory space is available for a new incoming message. The precise remote servicing sequence is described in the Remote Servicing chapter.

## 6.8.2 Send SMS

If an SMS message is to be sent select the menu "SMS" and "Send SMS" and then enter the message text in the „Message Text“ box, whereby the message must not contain more than 160 characters. To send the message, enter the number of the recipient in the „Phone Number“ box and then press the „Send“ button. The message is then sent.

The channel to use can be selected if desired.

To sent a SMS again or to be able to quote a received SMS right click on the SMS in the list and select "Copy SMS".

## 6.8.3 SMS Server

# Multichannel PRA

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The SMS Server is a fast and comfortable interface between e-mail and SMS.  
The SMS Server runs as a standard mail client on a PC that is connected to the Gateway via serial connection (RS-232) or Ethernet.  
The PC must have access to a POP3/SMTP mail server.  
You must provide a mail address on the mail server that the SMS Server will use, for example smsserver@mycompany.com.

Before running the SMS Server, this address and some other settings must be entered in the SMS Server Settings dialog (Menu "SMS"/"SMS Server options")

Please refer to the **SMS Server Manual** for details.

# Multichannel PRA

## 6.9 Routing tables

Routing strategy can be set up in this tab.

The **Routing** table references the subtables *Destination Prefix Groups*, *Periods of time*, and *Provider description*.

Because of this, to fill out this page start from bottom to top.

Prefix Group	Period of Time	Provider to use	AOC (Billing)	
4 Entries	4 Entries	4 Entries	3 Entries	Which channel/provider to use on calls from PBX and how to bill - A look-up in the routing table searches always from top to bottom - Calls from PTT are always routed to the PBX - Calls from GSM are routed to the PBX according to the channel parameters - Note: For PTT Providers, the AOC entry is irrelevant
Prefix 1	Peak time	Provider 1		
Prefix 1	Non peak time	PSTN		
Prefix 2	Peak time	Provider 2		
Prefix 2	Non peak time	PSTN		
Prefix Group Name	Destination Prefix			
2 Entries	2 Entries			Group several number prefixes which are equal to route Separate prefixes by comma, e.g.: 017,0160,0151
Prefix 1	0170,0171			
Prefix 2	0172			
Period Name	Time on Working Days	Time on Holidays		
2 Entries	2 Entries	1 Entry		Define time periods with different billing Use 24h-Format Example: 0:00-8:00,18:00-24:00
Peak time	8:00-18:00			
Non peak time	0:00-8:00,18:00-24:00	0:00-24:00		
Kind	Day			
4 Entries	4 Entries			Days to use the Holiday column of the Time Periods List
Day of Week	Saturday			
Day of Week	Sunday			
Day of Year	25.12.			
Day of Year	26.12.			
Provider Name	Kind (GSM/PRI)	Channels/Prefix		
3 Entries	3 Entries	2 Entries		Group Channels by provider or specify PRI providers Any combination of channels is allowed, e.g.: 1-5,8,13-15
Provider 1	GSM	1-24		
Provider 2	GSM	25-64		
PSTN	PRI1			

Figure 67: Routing tables

### 6.9.1 Table "Routing"

The main (uppermost) table **Routing** consists of a list of routes (*Provider to use*) depending on the prefix of the called number and the time. For each row or route (combination of Prefix/Time/Route) an AOC can be defined (see section AOC), and for each route it is possible to limit the maximum call duration.

Note: The maximum call duration is exact in minutes. For that, the resulting maximum call duration may be up to 59 seconds shorter than given.

The lookup to the *Routing Table* occurs always from the top to the bottom. This enables the user to define one or more **fallback routes** if no channels are available for the favorite group.

# Multichannel PRA

## 6.9.2 Table "Destination Prefix Groups"

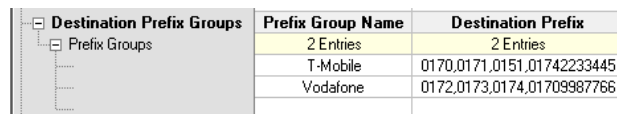
The **Destination Prefix Groups** table gives the user the possibility to group and name the prefixes of the dialed number. This is for convenience during editing and better readability of the main routing table. To enumerate prefixes separate them by commas.

This table is NOT evaluated from top to down. *Please note that this behavior was only introduced with the firmware version 1.23. Older firmware versions evaluated this table from top to bottom.*

If there is more than one group that matches a certain number, all matching groups are used to find a route as long as the prefixes are of the same length. Otherwise the longest prefix that matches a number determines the prefix group that is used to find a route.

By that mechanism it is possible to handle number portability of not too much numbers, e.g for some cell phones of a company.

Example:



Destination Prefix Groups	Prefix Group Name	Destination Prefix
Prefix Groups	2 Entries	2 Entries
	T-Mobile	0170,0171,0151,01742233445
	Vodafone	0172,0173,0174,01709987766

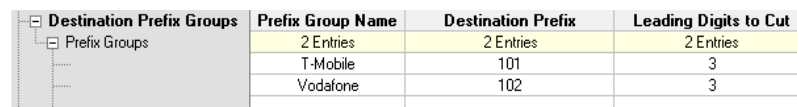
With these group definitions a call to 01742233445 is handled as belonging to the group T-Mobile, though it starts with 0174, which would belong to Vodafone.

**Note:** Write longer numbers in such a comma separated list *after* the shorter ones.

**Note:** The Multichannel PRA evaluates the number according to the settings in the General Parameters "Number Recognition", so also national numbers in international formats are found even if only the national format is in the list. However, entries that match a number in exactly the form in which it comes are preferred.

Beside the routing by provider prefixes it is also possible to evaluate routing hints added by a switch. For that, the switch prefixes the destination number by a well defined number for each mobile provider. Since this prefix must not be dialed when going out via GSM it must be cut. Set **Leading Digits to Cut** to the length of the prefixes.

Example:



Destination Prefix Groups	Prefix Group Name	Destination Prefix	Leading Digits to Cut
Prefix Groups	2 Entries	2 Entries	2 Entries
	T-Mobile	101	3
	Vodafone	102	3

If you plan to enter a fallback route where all calls should be routed to that could not be routed otherwise, you can enter a Prefix Group with an empty *Destination Prefix* field.

# Multichannel PRA

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## 6.9.3 Table “Periods of Time”

The table **Periods of Time** gives the possibility to define time periods with different billing.

The same period can have different times on *Working Days* and *Holidays*. The distinction between these days is made by the table *Holiday*.

Time format is 24 hour.

A certain period name can have more than one time period assigned, separate the single periods by commas.

A period must not cross 0:00, for example 22:00-4:00 is not valid, you have to write that as 22:00-24:00,0:00-4.00

All entries of this table are taken into account at once if looking for a route. (Not evaluated from top to bottom.)

## 6.9.4 Table “Provider Description”

The **Provider Description** table describes the providers (routes) available. The different kinds are:

- GSM: One of the GSM channels specified in the column *Channels*
- PTT: The PRI configured as PSTN
- PBX: The PRI configured as PBX/SWITCH
- PRI1: The PRI1
- PRI2: The PRI2
- SMS only: This route is only valid for SMS, not for voice calls (GSM is for voice *and* SMS)

If you specify a Provider to be of type **GSM**, you have to specify the channels used for this group. You can combine the channels by ranges (chx-chy) and you can enumerate single channels and ranges, separated by commas.

Example: “1-3,7,8-10” would specify the channels 1,2,3,7,8,9,10.

If you specify a Provider to be of type **PTT,PBX,PRI1, or PRI2** you may enter a Prefix to dial before the destination number, or leave the prefix field free to dial the number as it comes in.

## 6.9.5 Which route will my call take?

Sometimes it may be difficult to plan routing, especially if you want to use fallback routes. Following are some guidelines:

1. The *Routing Table* is always evaluated from top to bottom.
  - The first entry that fits a *Prefix Group* **and** one of the *Periods of Time* matching the current time is taken.
  - If no channel of the corresponding *Provider Group* is available, the routing table is searched for the next entry that fits *Prefix Group* and *Period of Time*

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date:

15.02.2008 10:32

page:

78

file:

Manual coMsat Multichannel PRA 3-3 eng.doc

*Note Protection Mark according to DIN 34!*

## Multichannel PRA

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- If no possibility is found to route the call according to the routing table the call will be handled as given by the General Parameter "*Handling of unmatched prefixes*" (*Reject* or *Route to PSTN*)
- 2. In the table *Destination Prefix Groups* the same prefix can belong to several groups, as long as the length is the same. Otherwise the group with the longest match is taken. The order of the entries in this table has no effect.
- 3. Number representations can be translated according to the *Number Recognition* settings in the general parameters, e.g. 06204... to 00496204... However, if a *Destination Prefix Group* is found that matches the dialed number in the form it comes in, this will be preferred to a *Destination Prefix Group* that matches the number only after representation translation.
- 4. Since the table *Periods of Time* is **not** evaluated from top to bottom, all entries that fit the current time are considered as "hits".
- 5. If more than one channel is available to match a certain call, the Multichannel PRA will take the channel with the least Air Time (as displayed on the Status page).
- 6. Channels are only used when calls outgoing to GSM are allowed in the channel parameters
- 7. Channels may not be available due to initialization problems, or due to bad GSM signal strength, or when disabled by the user (in the channel parameters or switched off for hot-plug)
- 8. To use a dedicated route for SMS use a Provider Description with type "SMS only" and assign this to the respective GSM prefixes *above* the routes for voice.

### 6.9.6 AOC

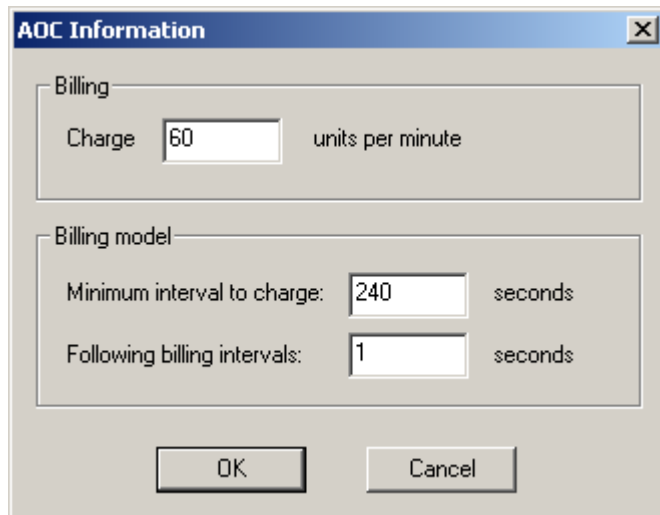
The ISDN Charging Supplementary Service Advise of Charge (AOC) is used to send billing information to the calling party on the ISDN (PRI) lines, normally to the PBX.

**Note:** To generate AOC the respective PRI port must operate in NT mode (Parameter "General"/"Interface Mode").

**Note:** This information is also used to handle the balance for prepaid SIM cards.

The AOC are defined separately for each route in the *Routing Table*.

# Multichannel PRA



Example (see dialog):

- Calls up to 4 minutes will be charged with 240 units.
- Calls longer than 240 seconds will be charged with 1 unit per second.

Figure 68: AOC Information Dialog

The number of units to charge per minute is normally set to 60 (to count seconds).

The billing model consists of a minimum charge interval (that will always be charged when the link is established) and the length of the following charge intervals (after the minimum interval).

AOC information can be sent during the call (AOC-D) and at the end of the call (AOC-E).

AOC-S is not supported by the Multichannel PRA.

## 6.10 Clock

The "**Clock**" icon (or menu Connection/Set Time) is used to set the device's real time clock. The respective time for the real time clock is then assigned to the entries in the trace memory and the statistics to be able to follow the timing of the events entered there.

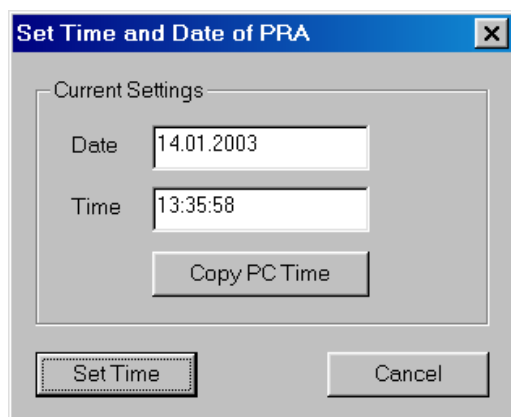


Figure 69: Setting the time

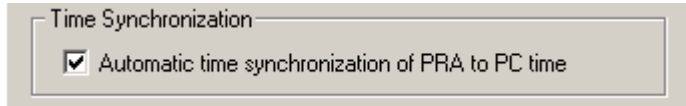
The current time is set entering the date in „**dd.mm.yy**“ format in the **Date** box and the time in „**hh:mm:ss**“ format in the **Time** box. The time is updated by clicking on

# Multichannel PRA

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the „Set Time“ button.

Note: The time can be set automatically by checking the corresponding checkbox in the Options dialog (Menu “Connections”/”Options...”)



If this is checked the time is automatically synchronized on Login and certain operations like send/fetch configuration, load status, load sms, etc. but not more often than once every 15 minutes.

Note: A difference of up to 30 seconds will not be corrected.

## 6.11 Firmware

The current version of the firmware used in Multichannel PRA is displayed in the “Current firmware” entry of the general parameters after fetching the configuration. In addition it can be fetched with the menu command “Connect/Current Firmware Version”

A new version of the firmware can be transferred to the device with the menu command “Connection/Update Firmware”:

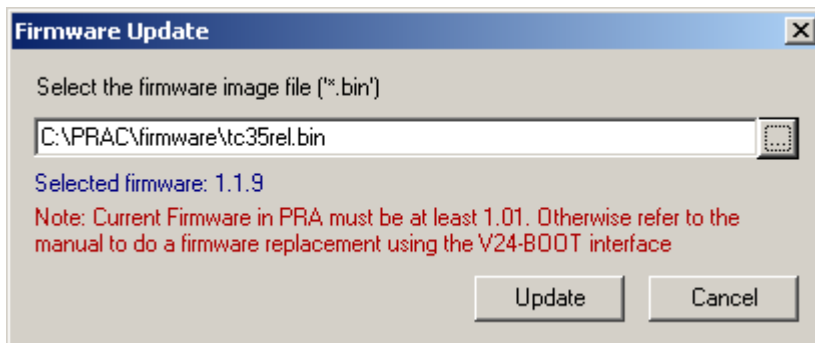


Figure 70: Firmware Update

## 6.12 Monitor

The activities between the NT, TE, Multichannel PRA and GSM#1 to GSM#64 are recorded on the „Monitor“ tab, i.e. a „trace“ of the D-channel protocol and the commands to the GSM modules as well as their responses performance are recorded.

This data protocol is used both for in situ analysis when it is viewed in the monitor window as well as for analysis in another environment in that a selection can be stored as an HTML file and is then transferred to another computer.

# Multichannel PRA

#	Time	ISDN	ISDN sent	ISDN received	GSM	GSM sent	GSM received	Debug
193	08:38:29.920				Ch.24		.... +CRING: VOICE +CLIP: "+491743439730",145,...,0 RING .... RING ....	
11	08:38:29.990	1:NT						
			PD 08 Q.931 CR 100, 2 octet(s), Orig SETUP Bearer capability 04 03 80 90 A3 Channel identification 18 03 A9 83 81 B1 channel Calling party number 6C 0E 11 80 34 39 31 37 34 33 34 33 39 37 33 30 Number = '491743439730'					
16	08:38:30.020	1:NT						
			PD 08 Q.931 CR 100, 2 octet(s), Dest SETUP-ACKNOWLEDGE Channel identification 18 03 A9 83 81 B1 channel					
197	08:38:30.100				Ch.24	ATA		

Figure 71: Trace monitoring

Should certain installations induce the need for questions to the manufacturer, it is a good idea to store trace results as well the current configuration (Menu: "Monitor" "Save Monitor Data". Please give an expressive file name).

The **Monitor** entry menu provides options on what to do with the trace memory of the Multichannel PRA. It can be read out (Menu: **Monitor / Load Monitor Data**), cleared in the display, deleted in the Multichannel PRA without reading, and saved to file.

**Note:** An additional possibility to save the monitor data is to a HTML file with the menu command **File / Export active Grid to HTML**. This gives the possibility to display the monitor data without installing the PRAC software, e.g. for forwarding it to the technician of a PBX in case of compatibility problems.

To copy parts of the monitor see section "Storing Monitor Selection as HTML"

The trace memory in the device occupies a defined memory area, which cannot be increased. Thus, an exact storage duration cannot be given. It depends on the quantity of calls that are passed via the TA. The larger the number of calls the shorter the recording duration and vice versa. The record duration can therefore range between a few minutes and approx. 1 hour. If such a trace is to be used for analysis, one should first be certain that the event actually occurred within the recording period. Otherwise, you should try to repeat the recording to „catch“ the event. Surplus data in the memory can be deleted by (multiple) selection of the **Clear** menu entry in the Monitor menu.

## 6.12.1 Coloring

Some coloring is used to make the monitor more readable.

### 6.12.1.1 Header Row Coloring

- Green: All information is presented in this column
- Yellow: Some information is not presented, e.g. Layer 1/2 of ISDN
- Blue: A text filter is active for this column
- Red: No information is displayed in this column

# Multichannel PRA

## 6.12.1.2 Data Cell Coloring

Data Rows are either yellow or white:

- Yellow: The row contains received data
- White: The row contains sent data

In addition ISDN cells may be grayed from the top of the table to a certain row.

In this area no ISDN information is present.

Explanation: This comes due to the fact that every board has its own monitor memory. However, the PRI board must save the data for 64 channels while the GSM boards must only save the data for 4 channels each. So most likely the GSM monitor data reached more in the past than the ISDN data. To avoid confusion why, for example, an incoming call on GSM does not result in an outgoing call on ISDN, the area where the ISDN information is not yet present is grayed.

## 6.12.2 Monitor Filter

The content of the traces displaced via the „**Monitor**“ tab are configured in the „**Filter view**“ menu. It is accessible via the menu command “Monitor/Filter Parameters” or by a right click to the monitor page.

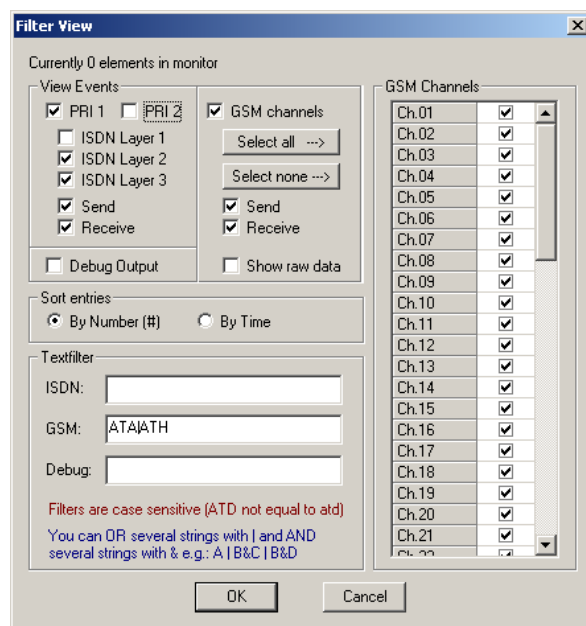


Figure 72: Monitor Configuration

The filter can be used to hide information that is not important at present from the trace. However, it continues to be available for calling up and can be unhidden as needed. Also, when saving the monitor data all information will be stored.

Various details can be selected:

- GSM Channel 1..64 (Show Raw Data displays also the multiplex information)
- ISDN Layer 1,2,3
- ISDN PRI 1,2
- Sent/Received data for ISDN/GSM
- Debug Output
- Text filter for ISDN/GSM/Debug.

# Multichannel PRA

**Attention:** The text filters are always **case sensitive**. That means when filtering for “at+cops” an entry “AT+COPS” would be filtered (not shown).

In the text filters several strings can be combined using the special characters | (for OR) and & (for AND).

- Since the & has precedence you can AND several strings inside of strings that are OR-ed.
- Parenthesis are not supported.
- Be sure not to add additional spaces.

**Example:** To look for the dialing (ATH command) of one of the two numbers 1243567 or 7654321 you can enter

```
ATH&1234567|ATH&7654321
```

## 6.12.3 Searching for Text in the Monitor

To quickly locate a text string in the monitor data, e.g. a certain phone number, you can use the “Edit” “Find” function (short key Ctrl-F, repeat search with short key F3, repeat search backwards with Shift-F3).

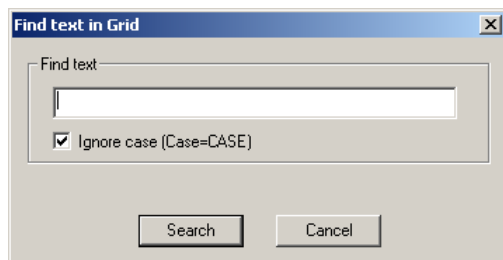


Figure 73: Find Text dialog

## 6.12.4 Storing Monitor Selection as HTML

Sometimes it is desirable to quote parts of the monitor data. Especially when sending an error report or making a request concerning some actions of the Multichannel PRA it would be easier to refer to parts of the monitor data.

This can be done by selecting the concerned part of the monitor with the mouse and copy it to the clipboard with either the menu item “Edit” “Copy” or by pressing Ctrl-C.

874	08:27:22.610				Ch.08		\r\nOK\r\n
876	08:27:22.660				Ch.08	AT+CSCA="+491710760000"\r	
879	08:27:22.800				Ch.08		\r
880	08:27:22.840				Ch.08		\r\nOK\r\n
882	08:27:22.870				Ch.08	AT+CPMS?\r	
							\r\n+CPMS:

# Multichannel PRA

Then it can be pasted to the mail program by the appropriate command, most commonly by pressing Ctrl-V:

876	08:27:22.660			Ch.08	AT+CSCA="+491710760000"\r			
879	08:27:22.800			Ch.08		\r		
880	08:27:22.840			Ch.08		\nOK\r\n		

Please keep in mind that this is only intended for better reference in the e-mail text. Always save the complete monitor data using the "Save Monitor Data" menu command and attach it to the mail or use the "File" "Send Parameters/Monitor as mail..." menu command.

## 6.13 Additional information

The „File“ menu lists the „New“, „Open“, „Save“ and „Save As“ menu items usually available under Windows. These are used by the standard Windows conventions and do not require any further explanation. As usual in Windows, the last active configurations are listed in order (most recent first). The program can be quit by selecting the last menu entry „Exit“.

The „Toolbar“ with icons can be used to get a fast access to often used functions. The „Help“ menu item is available to query the current version of the PRAC application give reference to lists of ISDN release causes and GSM error codes and so on.

## 6.14 Networks

Within the "Channel parameters" tab, the list boxes „Allowed Nets“ display Network providers, into whose network the SIM cards may log into. These can be designated by selecting from the drop down list. They can be removed from the selection list by marking them and then pressing the DEL button.

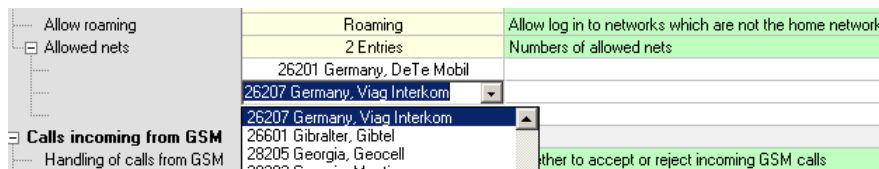


Figure 74: Networks

## 7 Security

Access to the Multichannel PRA can be restricted in several ways:

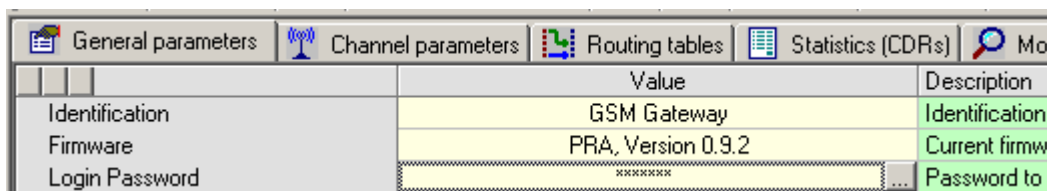
# Multichannel PRA

- You can give a password that is saved inside the PRA, preventing any login without this password (also remotely)
- You can give a password in the PRAC application, preventing changes in the configuration, but allowing reading access
- For IP access you can restrict the allowed IP addresses

## 7.1 Login Password

Since the login password is saved in the Multichannel PRA you have to give it in the configuration parameters.

Go to the General Parameters page and look for the parameter Password:

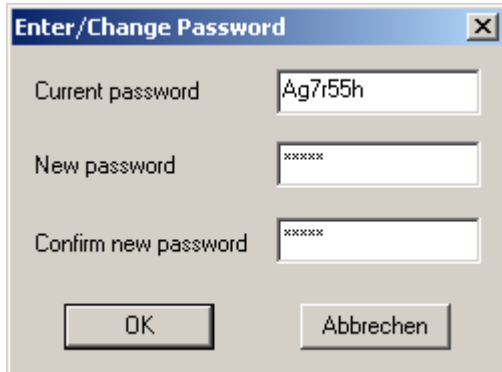


	Value	Description
Identification	GSM Gateway	Identification
Firmware	PRA, Version 0.9.2	Current firmw
Login Password	*****	Password to

Figure 75: Login password

If there is a password entered, it will be replaced by \*\*\*\*

To change the password or enter a new one click to the button at the right. A dialog to change the password or enter a new one will appear:



Enter/Change Password

Current password: Ag7r55h

New password: \*\*\*\*\*

Confirm new password: \*\*\*\*\*

Buttons: OK, Abbrechen

Figure 76: Dialog Enter/Change Password

**Attention:** When you changed the password, this change will only take effect after you sent the configuration to the Multichannel PRA. If you are asked for the password during the send process you still have to enter the **old one!**

**Note:** When you save the configuration data to disk, the password is not saved together with the configuration.

## 7.2 Configuration Password

# Multichannel PRA

If you want to allow access to the Multichannel PRA also to other people, but want to be sure that nobody but you changes the configuration data you can give a password in the PRAC application that prevents sending of the configuration.

This is done in the menu “Connection”/“Options...”:

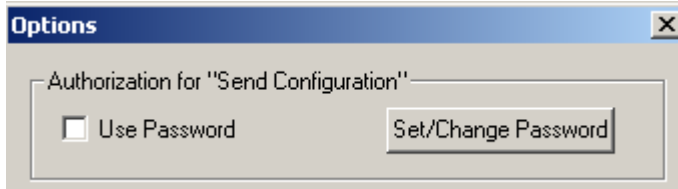


Figure 77: Configuration Password

The password is entered/changed with the same dialog as the login password.

**Note:** This password is saved together with the other program settings on the PC where the PRAC application runs. It does not protect the access to the Multichannel PRA from another PC.

## 7.3 Restriction of IP addresses

When accessing the Multichannel PRA via LAN you have to install a virtual COM port. The settings of this port are given by means of the NPort Configurator (In the Windows Start menu after installation):

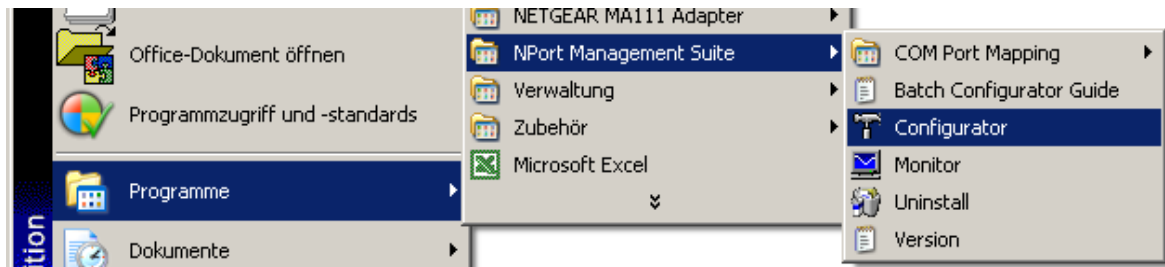


Figure 78: Starting the NPort Configurator

In the Configurator application first locate the Multichannel PRA (Menu “Locate Server”).

Then select it in the list and go to “Configuration”/“Modify Configuration”.

In the configuration dialog go to the page “Access Control”. Here you enter the IP addresses that are allowed to access the device.

# Multichannel PRA

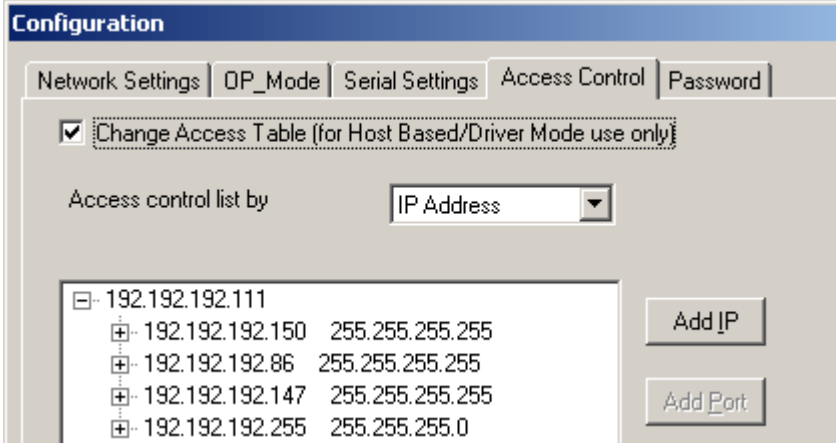


Figure 79: IP Access Control

## 8 Questions and answers

### 8.1 Installation

#### 8.1.1 Virtual COM port driver

*Question:* What is the standard IP address of the IPG board when delivered?

*Answer:* The default IP address of the IPG board is printed on the board, normally it is 192.168.127.254.

*Question:* “Broadcast Search” is used to search for all NPort Servers on a LAN. The IP address of a particular NPort Server shows up in the “Broadcast Search” window, but after the search is complete, this NPort Server does not appear in the list of servers displayed in the left pane of the Configurator window. Why is that?

*Answer:* This happens in the following situation: The NPort Server and PC Host are physically attached to the same LAN, but are set up to belong to different subnets. For example, suppose both devices are connected to the same hub, and the NPort Server and PC Host network settings are as follows:

	IP Address	Netmask	Gateway
NPort Server	192.168.1.1	255.255.0.0	192.168.1.10
PC Host	192.167.1.1	255.255.0.0	0.0.0.0

Under the above conditions, since “Broadcast Search” searches by MAC address, the PC Host can certainly find the NPort Server, but since the network settings place it on a different subnet, it will not be displayed in the Configurator window list after the search is done. To solve this problem, change the Host IP address so that it resides on the same subnet as the NPort Server, or use the reset button to reset NPort Server configuration to default values.

*Question:* I have installed a Multichannel PRA with IPG board before and accessed it over the default IP address. Now I want to install a second Multichannel PRA with IPG board. Can I use the already installed COM port?

*Answer:* You can not use two IPG boards with the same IP address in the same network at the same time, so normally it is necessary to disconnect one of the Multichannel PRA and give the other one different IP address. However, If the two Multichannel PRA are not connected to the network at the same time you can use the same virtual COM port for both. Note: When you already have installed a IPG port with default IP address and start the “Real COM Installer” application you will get a message like this:

# Multichannel PRA

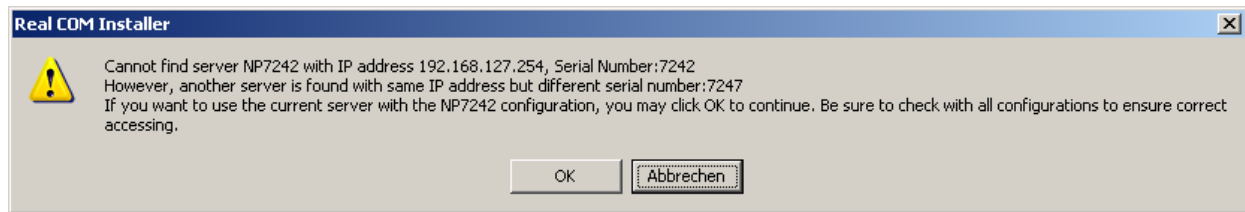


Figure 80: Real COM Installer message

## 8.2 GSM

### 8.2.1 Antennas

**Question:** Are the antennas affected if they are set up too close?

**Answer:** Yes, if two antennas are used, they must be set up at least 1 m apart to keep the effect they have on each other to a minimum.

**Question:** Each GSM module has an output power of up to 2 watts (GSM 900) and the Multichannel PRA uses a power splitter/combiner to connect one antenna to 32 channels.

**Answer:** Does this result in a total power of 64 watts per antenna? No, the power combiner has an attenuation of approx 15 dB, this means that the maximum average of total power radiation at the antenna is not higher than the power of one channel, i.e. 2 watts for GSM 900 or 1 watt for GSM 1800.

**Question:** How can I get the EIPR of an antenna?

**Answer:** The EIRP (Effective Isotropic Radiated Power) is given by the radiated power P multiplied with the antenna gain G. Because the gain is given in dBi you have to calculate the factor G by the formula

$$G = 10^{G(\text{dBi})/10} \quad \text{e.g. 6dBi} = \text{factor of 4}$$

The maximum average radiated power is 2 watt per antenna for 900 MHz and 1 Watt per antenna for 1800MHz.

**Question:** How long may the antenna cable be?

**Answer:** That depends on the signal level. The resulting level at the modules should be higher than approx. -85dB. Taking into account the 15dB loss by the power splitters you should have a signal of at least -75dB at the antenna input.

With the following tables you can calculate the maximum length of the antenna cable. In most cases it makes sense to use a directional antenna.

# Multichannel PRA

Typical cable loss over 100 m				
Frequency	Aircomm Plus Ø 10,3 mm	RG213 Ø 10,3 mm	RG223 Ø 5,5 mm	RG58 Ø 5 mm
900MHz	11,8dB	21,3dB	53dB	51,8dB
1800MHz	20dB	37dB	75dB	82dB

Typical gain of antennas		
Antenna	Omni directional	Directional
Gain	2dBi	6dBi..12dBi

If the level is too low you can insert a booster in the antenna cable to add e.g. 15dB. Put the booster next to the antenna. For long antenna cables it may be necessary to use a booster at both ends to achieve a good signal quality. Note: If the quality of the signal is poor because of interferences, the booster will also amplify these. Check the BER (Bit Error Rate) on the "Status" page for signal quality. (Only available during an active call.)

For your convenience here is an additional table you can use to "measure" the signal level using a mobile phone. You see that at the location of the antenna you should have a full 5-bar level, taking into account the 15 dB attenuation of the power splitter.

Typical signal level at a 5-bar level display of mobile phone					
Bars	1	2	3	4	5
Level	≤ -99dB	-98..-92dB	-91..-85dB	-84..-78dB	≥ -77dB

**Problem:** On the status page of the PRAC application a channel shows a very high RSSI level. The configuration of the channel parameters (PIN, network) are correct. However, the channel does not log in to the network.

**Solution:** As long as the module is not logged in to its network the level shown is the level of the network to make emergency calls to. If the home network is very weak the channel may not log in and so always show the level of the foreign network.

**Question:** The antenna signal is very poor at my location, so I can not afford the 16dB attenuation of the power splitters/combiners. Is there a possibility to get a lower attenuation?

**Answer:** First think about using an antenna with a higher gain, or if you are already using an antenna with a gain higher than 2,15dBi try to change the orientation of the antenna.

If this is not applicable you can use single antennas for each GSM board (with 4 channels each).

If you open the back of the case of the Multichannel PRA you see the 8-channel power splitter that combines 8 GSM boards to one antenna. By unscrewing the antenna connectors you can connect single antennas to each GSM board using an adapter from N-plug to N-plug.

# Multichannel PRA

This increases the antenna signal by approx. 9 dB.  
Keep in mind to place the antennas at least 1 m apart.

## 8.2.2 GSM Network Problems

**Question:** One GSM channel does not log in, the respective NWK-LED is rapidly flashing. Because other channels do log in the signal seems to be ok.

**Answer 1:** Be sure that the respective channel is not disabled by the configuration. (at "Channel parameters" "Channel usage")

**Answer 2:** Look at the "Status" page in the column "State"  
This may give a clue, for example



If the SIM is locked, click to the cell and then to the button at the right side of the cell:



A dialog appears where the PUK and the new PIN can be entered.

**Answer 3:** If the state field shows only "Disabled" fetch the monitor data from the Multichannel PRA for more information.  
Set the filter ("Monitor"/"Filter") to the respective channel and look for one of the strings "+CME ERROR:", "+CMS ERROR:" or "+CEER" in the column "GSM received". You can use the search function (Ctrl-F) for this.

An example follows:

GSM	GSM sent	GSM received
Ch.02	AT+CPIN?\r	
Ch.02		\r\n+CME ERROR: 10\r\n

Refer to the "Help" "List of GSM Errors" menu to find out what error is reported.

In this case the module reports that no SIM card is inserted when the module asks for the PIN status.

**Answer 4:** If no error message is found or none seems to be appropriate, set the monitor filter to the respective channel and look for the string "+CREG:" in the column "GSM received".

- It has either the format +CREG: <n>, <stat> as answer to the "AT+CREG?" command (n is not of interest) or +CREG: <stat> with stat being in both cases:

# Multichannel PRA

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- 0 not registered, and **not** currently searching for a new operator at which to register
- 1 registered, home network
- 2 not registered, but currently searching for a new operator at which to register
- 3 registration denied
- 4 unknown
- 5 registered, roaming

An example follows:

GSM	GSM sent	GSM received
Ch.01	AT+CREG?\ <r< td=""> <td></td> </r<>	
Ch.01		\\n+CREG: 1,1\\n
Ch.01		\\nOK\\n
Ch.01		\\n+CREG: 3\\n
Ch.01		\\n+CREG: 2\\n
Ch.01		\\n+CREG: 1\\n

When the module requests the registration status the module first reports that it is registered in the home network. Later changes in the registration status are reported separately.

*Question:* A module shows a good signal level (green) on the status page during the initialization. But it does not log in, or when it logs in the level suddenly goes down and is very poor (red).

*Answer:* As long as the module did not log in to a network it shows the level of the strongest network present. This network would be used to do a emergency call.  
After the module logged in the signal strength of the home network is shown, which may be significantly lower. It may even be so low that the module can not log in at all.

*Question:* The module does not log in. Perhaps my network is not present or too weak. How can I get information about the networks present?

*Answer:* During the initialization of the GSM module a list of all available operators in the network is fetched if the module does not login or there are entries in the channel parameter "Allowed nets".

This list can be displayed in the monitor as follows:

- Load the monitor
- Set the monitor filter (right click) to the respective channel and look for the request "AT+COPS=?" in the column "GSM sent"
- The answer of the module is a list of all available operators in the network. The list of operators comes in the following order: Home network, networks referenced in SIM, and other networks.
- The format of the list items is as follows:
- (Status,Name,,PLMN-ID) with Status being:

- 0 unknown
- 1 operator available
- 2 operator current

# Multichannel PRA

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3 operator forbidden

An example follows:

GSM	GSM sent	GSM received
Ch.01	AT+CDPS=?\r	
Ch.01		\r\n+CDPS: (2,"T-Mobile D".."262
Ch.01		01"),(3,"Vodafone D2".."26202"),(3,"E-Plus".."26203")..(0-4),(0,2)\r\n
Ch.01		\r\nOK\r\n

**Question:** I want different GSM channels to log in to different GSM base stations. For example channels 1-8 should log in to base station A, channels 9-16 should log in to base station B. Are there any parameters to specify the preferred cell ID?

**Answer:** The selection of the cell is in the responsibility of the GSM network. The decision concerning handover procedures to other cells is made by measurements performed by the mobile equipment which may be manipulated to force the login to a pre-selected cell. Anyway, this may result in poor signal quality and is no good style. Such procedures are not supported by the Multichannel PRA.

Instead, you should use different directional antennas (see there).

## 8.3 ISDN

**Question:** How long can the connection cable between the PBX and the Multichannel PRA be? What cable should I use?

**Answer:** Using CAT 5 cable you can have a length of 100 meter. Refer to section "Connector Assignments" if you have to cross the cable or your PBX does not have standard assignment.

**Question:** I connected the PRI Interface of my PBX to the Multichannel PRA but the red LED "LOS" (Loss of signal) is on.

**Answer:** The pinout of the PRI lines of the Multichannel PRA is for use as TE (1,2=Rx, 4,5=Tx). When the PBX does use the same pinout you have to use a cross cable (1,2 crossed to 4,5 and vice versa). There are also devices on the market that use a pinout similar to the ISDN S0 (3,6/4,5). Check the pinout of the PBX and refer to section "Connector assignments".

**Question:** The PRI port of the Multichannel PRA is connected and the green LED "SYNC" indicates that the signal is present and the synchronization works.

Nevertheless the interface does not works properly. There seem to be problems in layer 2.

# Multichannel PRA

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**Answer:** Both the Multichannel PRA and the external device are in the same interface mode (NT or TE).  
Check the interface mode in the configuration of the Multichannel PRA ("General Parameters").

**Problem:** The Multichannel PRA works well with the PRI line connected, everything seems to be ok.  
Even so from time to time ISDN errors happen.  
(Maybe the line will even get down after a while)

**Solution:** Presumably this is a synchronization problem.  
If the Multichannel PRA is connected to a PBX that has one or more additional PRI ports, the Multichannel PRA should be configured as clock slave (refer to "General Parameters" page).  
If this is not possible you have to synchronize the Multichannel PRA to the clock of the other PRI(s). This can be done using the SYNC IN / SYNC OUT ports. Please refer to the chapter "Installation and operating hints" for details.

**Problem:** My PBX (TE) was directly connected to the PSTN (NT) and everything run ok.  
But with a Multichannel PRA as router between the two, all calls from PBX to PSTN are rejected with the cause "Identified channel does not exist (82)", location "T".  
However, incoming calls from PSTN, and calls between PBX and GSM in both directions work properly.

**Solution:** The switch of the fixed network provider may ask for the TE to do the ISDN channel handling, what is normally the responsibility of the NT side.  
Try to operate the PRI port connected to the PSTN as NT in layer 3.  
Note: Be sure to stay to TE in layer two and to clock slave. These settings are automatically switched when changing layer 3 mode.

**Question:** Can the Multichannel PRA be configured for the American standard T1?

**Answer:** The Multichannel PRA supports only the EDSS1 (European D-channel Signaling System No 1 with 30B+1D channel).  
The American T1 (which operates with 23B+1D channel) is not supported directly. You would have to use one of the several converter products that are on the market.  
Since we have not tested our device together with such a converter we recommend to make a test with all components involved.

**Question:** Does the PRA support R2?

**Answer:** The Multichannel PRA supports only the EDSS1 (European D-channel Signaling System No 1 with 30B+1D channel).  
The R2 standard (as used e.g. in Brazil) is not supported directly. You would have to use one of the several converter products that are on the market.  
Since we have not tested our device together with such a converter we recommend to make a test with all components involved.

# Multichannel PRA

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**Question:** Does the Multichannel PRA support CAS or CSS?  
**Answer:** The Multichannel PRA operates with an UNI (User-Network-Interface), the EDSS1.  
CAS and CSS both refer to NNI (Network-Network-Interface) Signaling. NNI Signaling is not supported.

## 8.4 PRAC configuration software

**Question:** Access to the device from the PC running the **PRAC** application is apparently not possible.  
**Answers:** - The wrong port (COMx) has been selected in the connection dialog in the PRAC application  
- When using the IPG board (access over LAN) check if the connection between the serial ports on the IPG board and the CPU board is made and the virtual COM port has been installed correctly

**Question:** I started an operation but the PRAC application seems not to work, there is no progress bar running. How can I see what the program is doing right now? Can I restart the operation?  
**Answer:** All operations are traced in the Trace window. Open that with "Window/Show Trace Window".  
Go to the menu "Connection" "Abort:...". If the menu entry shows "Abort: No operation" the interface is idle.  
Otherwise you can stop the operation in progress with this menu entry.  
**Note:** This will also stop all auto load functions (like auto load CDRs).

**Question:** How many entries are possible in a certain number list, e.g. "Allow routing from GSM"?  
**Answer:** There is no limit despite the total size of the configuration data which is limited to 64 kByte. If you have only one list to fill with many entries, up to 3000 entries should be ok.

**Question:** On the Status page there is an ASR (Answer Seizure Rate) for every GSM channel. But this is zero for all channels though there are calls going over the channel.  
**Answer:** The ASRs for the channels are calculated over a certain number of calls, for example the last 100 calls. If this number is 0, the ASR will also be zero.  
Set the parameter ("General parameters"/"Number of calls to calc ASR/ACD") to a number greater than 0, e.g. 100.

**Question:** I can load the configuration data and CDRs but when I switch to the Status page or try to load the status the PRAC application always crashes.  
**Answer:** Most likely you inserted a GSM board in slot 4 or 5 with a hardware that is not hot-pluggable.

# Multichannel PRA

Be sure that the boards are inserted in the right places. These are different for devices that support hot-plug of the GSM boards and devices that are not hot-pluggable.

Not hot-pluggable hardware version									
Slot	1	2	3	4	5	6	7	8	...
Board	PRI	CPU	IPG	-	-	GSM	GSM	GSM	...

Hot-pluggable hardware version										
Slot	1	2	3	4	5	...	18	19	20	21
Board	PRI	CPU	GSM	GSM	GSM	...	GSM	-	-	IPG

## 8.5 Routing

**Question:** I made a routing table, but the Multichannel PRA seems not to take notice of it. In addition calls are often refused with the cause “No channel available”

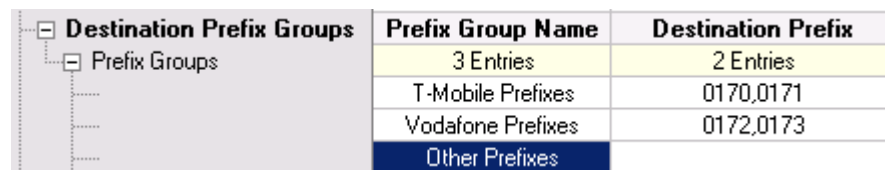
**Answer:** Please go to the “General Parameter” page and make sure that the parameter “B-To-GSM-Channel Assignment” is set to “Free”.

**Problem:** Many or all calls are rejected with the cause “Destination out of order” though the GSM channels are logged in

**Solution:** Presumably you made routing to one of the PRI ports and there is no active line on this port.

**Question:** How can I make an entry in the *Prefix Group Table* to handle all the entries not yet handled by the other groups?

**Answer:** Add a prefix group at the end of the *Prefix Group Table* and leave the entry *Destination Prefix* empty.  
An example follows:



Prefix Group Name	Destination Prefix
3 Entries	2 Entries
T-Mobile Prefixes	0170,0171
Vodafone Prefixes	0172,0173
Other Prefixes	

## 8.6 SMS Server

**Problem:** I want to use some GSM channel for SMS only, the rest of the channels for voice only.

**Solution:** For the dedicated SMS channels set the channel parameter “Handling of calls from GSM” to “Reject”, “Handling of calls to GSM” to “Refuse” and “SMS Handling” to “Handle SMS”

For the dedicated Voice channels set the channel parameter “Handling

# Multichannel PRA

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of calls from GSM” to “Accept” (or to Reject, if only outgoing calls are allowed), “Handling of calls to GSM” to “Allow” and “SMS Handling” to “Ignore SMS”.

## 8.7 Miscellaneous

*Question:* Does the Multichannel PRA support VoIP?

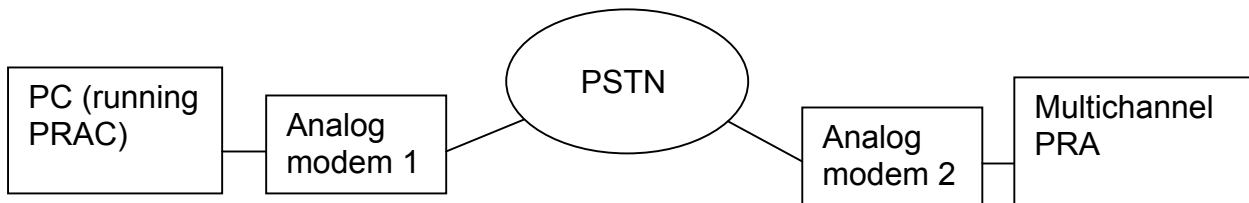
*Answer:* There are many different VoIP Standards on the market, e.g. H.248/Megaco, MGCP, SIP, SIP+, and H.323. In addition many manufacturers of PABXs implement proprietary extensions to the standards to offer the user the features he is used to from “normal” system phones. So there is no point in implementing a VoIP interface into the GSM gateway, at least for the time being. Instead it makes sense to rely on the well-standardized ISDN interface (EDSS1 ) and use external VoIP gateways that fit perfectly to the VoIP implementation in use.

# Multichannel PRA

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## 8.8 Remote Servicing via analog modem

The Remote Login can also be used to access the serial configuration port of the PRA transparently by means of an analog modem on both sides.



*Figure 81: Remote servicing via analog modem*

On the PC side the modem is to be connected to an arbitrary serial port of the PC using a standard RS-232 cable. The Initialization is done by the PRAC application.

On the PRA side the modem is to be connected to the V.24 Config socket (lower socket on the CPU board).

### Settings for Analog Modem 2

The analog modem on the PRA side of the connection must be prepared with the following settings to be able to work without the need of additional commands from the PRAat connection time.

To enter the preparation commands use a terminal program (e.g. HyperTerminal). The commands in brackets may differ for your modem, check your modem manual for details or differences:

- Auto Answer mode activated (ATS0=1)
- Do not check DTR (AT&Q0, AT&D0)
- Hold DSR always on (AT&S0)
- Hardware flow control activated for TxD (AT&H1) and RxD (AT&R2)
- Set serial speed to fixed (AT&B1). There is usually no way to explicitly set the serial speed. The modem usually uses the speed used for the AT&W command.
- Select reset configuration (AT&Y0, if more than one possible)
- Save the settings (AT&W0 or AT&W when only one configuration possible)

### Cable between Analog Modem 2 and PRA

Since both the modem and the Multichannel PRA are equipped with a TA pinout you have to use a crossed cable. However, you can not use a standard null-modem cable, since both sockets are female. Standard null-modem cable are intended to connect two PC with male sockets both.

*Auto answer considerations:* The modem will accept an incoming call automatically after the first ring and establish a connection to the calling modem.

# Multichannel PRA

This process **must not** be interrupted by messages from the Multichannel PRA. For that, the RxD (Received Data, coming from Multichannel PRA) signal must be controlled by the DCD (Data Carrier Detect, coming from the modem) signal. This is done with a resistor and a diode to have TxD of the modem pulled down (low voltage) as long as DCD is down (low voltage):

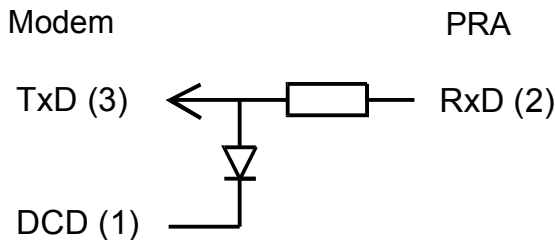


Figure 82: Remote servicing via analog modem

Modem			PRA	
Signal Name	DB-9 Pin		DB-9 Pin	Signal
DCD (Data Carrier Detect, Out)	1	*		
TxD (Transmit Data, In)	3	*	2	RxD (Out)
RxD (Receive Data, Out)	2		3	TxD (In)
RTS (Request To Send, In)	7		8	CTS (Out)
CTS (Clear To Send, Out)	8		7	RTS (In)
SG (Signal Ground)	5		5	SG

\*=see auto answer considerations

## Dial settings

To connect to the PRA use the menu command “Connection”/“Remote Login”. Set the Contact Mode to “Call directly” and give the number of the analog modem 2 in the field “Number of PRA to connect to”:

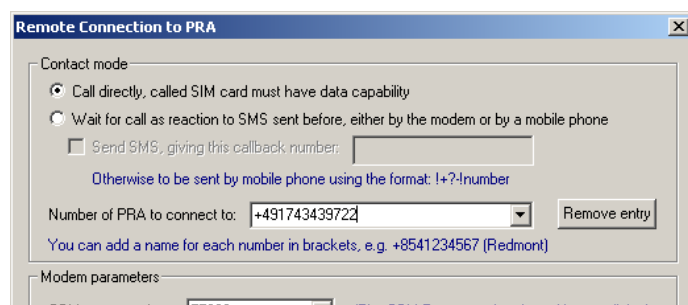


Figure 83: Remote servicing using analog modem

# Multichannel PRA

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## 9 Technical data

Power supply unit	internal 5 V DC supply, max 30 A, Power cord 230VAC 50Hz Max 150VA
GSM 900/1800 Standard	GSM Phase II / prepared for GSM Phase III Voice GSM Phase II+ SMS (Receive / Send)
Transmitter power	max. 2 Watt per channel (GM 900) max. 1 Watt per channel (GSM1800)
Antenna	50 $\Omega$ impedance, N-socket connector
Antenna output power	max. 2 Watt per antenna (32 channels, GSM 900) max. 1 Watt per antenna (32 channels, GSM1800)
SIM Card	3V SIM card
Interfaces	V 24/RS232 interface as D-SUB 9 connector for programming and monitor operation 2 PRI (S <sub>2</sub> m, E1) interface (NT or TE, EDSS-1 protocol, impedance 120 $\Omega$ as RJ 45 jack, also available with 75 $\Omega$ .)
ISDN Protocol	E-DSS1
Synchronization	- Synchronize clock to signal on PRI1 or PRI2 - Get clock from additional sync input - Generate clock internally - Also interfaces operating in NT mode can be configured as clock slave
Signaling:	- CALL-PROCEEDING, ALERTING, CONNECT - User selectable Progress Indicator - Bidirectional Cause Forwarding between ISDN and GSM - Cause Translation Table for GSM and ISDN causes - User free CLIP and CLIR - Programmable AOC Generation
Dimensions (B x D x H)	485 x 340 x 270 mm
Weight	approx. 13,4 kg (with 64 Channels and IPG Option)
Temperature range	0 °C to 45° C (free air circulation, non-condensing)

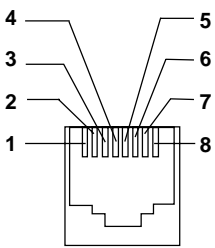
# Multichannel PRA

## 9.1 Connector assignments

Serial interface (CFG and Boot):

D-SUB 9	PIN	EIA	Description
RS 232	1	DCD	not used
	2	RxD	Receive Data
	3	TxD	Transmit Data
	4	DTR	not used
	5	GND	Signal Ground
	6	DSR	not used
	7	RTS	Request to send
	8	CTS	Clear to send
	9	RI	not used

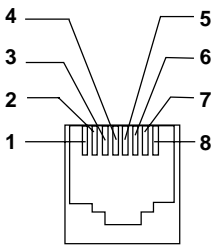
PRI 1 Connection and Sync in:

PRI 1	PIN	EIA	Description
	1	Rx-	Receive Data -
	2	Rx+	Receive Data +
	3	nc	Unassigned
	4	Tx-	Transmit Data -
	5	Tx+	Transmit Data +
	6	nc	Unassigned
	7	nc	Unassigned
	8	nc	Unassigned

SYNC out:

The sockets SYNC in and SYNC out are internally connected 1:1 for looping through of an external PRI signal

PRI 2 Connection:

PRI 2	PIN	EIA	Description
	1	Rx-	Receive Data -
	2	Rx+	Receive Data +
	3	nc	Unassigned
	4	Tx-	Transmit Data -
	5	Tx+	Transmit Data +
	6	nc	Unassigned
	7	nc	Unassigned
	8	nc	Unassigned

# Multichannel PRA

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## Appendix 1: LED Function

The **Multichannel PRA** features altogether LED's in different colours on each Board, intended to display the different operating conditions. An imprint on the housing allows for the identification of the LED's function.

The following description of displays at the **Multichannel PRA** front panel requires the prior programming by the PRAC application. If the device is in an unprogrammed state, the yellow and green LED's will flash simultaneously and quickly.

Name	LED colour	Status	Meaning
Power	red	on	device ready, on (only CPU board)
		off	board inactive, out of order
Xfer	green	on (flashing)	transfer of data in process (only CPU board)
BM	yellow	on	device in boot mode, firmware update (only CPU board)
Status	red	on	board is activated and working
		off	board inactive, out of order
Active	green	on	(only PRI/REL board)
		off	
Data	yellow	on (flashing)	Transmission of data on PRI/E1/S2m line
Sync x	green	on	Synchronization present (only PRI board)
		off	Sync fault
Los x	red	on	Line fault
		off	Line OK
Nwk x Network	green	off	GSM module not present, faulty, or disabled (only GSM board)
		flashing quickly	GSM channel not ready (no SIM card, no or incorrect PIN, ...) or initializing
		flashing slowly	GSM channel presently logging into network
		on	GSM channel currently logged into network
		off	Channel is disabled (Call x on)
Call x	yellow	off	no connection via channel
		flashing	connection is being established
		on	GSM connection is established (Nwkx ON) or Channel is disabled by user (Nwk x OFF)

# Multichannel PRA

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## Appendix 2: Abbreviations

AOC	Advice of Charge: Performance characteristic of the EDSS1. Display of the connection charges incurred as tariff units according to the network provider's tariff at the beginning (AOC-S) during (AOC-D) and at the end (AOC-E) of a link that has been made.
ASR (ASR1)	Answer Seizure Rate: The ratio of the number of connected calls to the total number of calls. Normal values are 50% to 60%, depending on the kind of calls (national/international, etc.). Values lower than 40% may indicate serious system problems.
ASR2	The ratio of the number of "good" calls to the total number of calls. "Good" means either connected, or terminated before connection with a release cause which does not indicate any problems in the system, e.g. "Normal call clearing" during the call establishing. Normal values are 70% to 90%. <i>The terms ASR1 and ASR2 are not standardized. Sometimes they are even used the other way around.</i>
CDR	Call Detail Records: Statistical data for each call. Parts of the records are usually: Start time, Calling party number, called party number, call duration. The Multichannel PRA gives additional information: Billing flag, Release cause, Bearer capability, Used Carrier and preferred carrier, Used channels, number of generated AOC.
EDSS1	Name of the Euro-ISDN protocol (European D-channel Signaling System No 1); was introduced with the transition of national ISDNs to the whole of Europe, whereby a data link protocol was introduced, which is supported by all the connected states. This protocol contains the mandatory performance characteristics, which control the establishment and clearance of a link, as well as providing several supplements. National network providers can extend these performance characteristics.
EEPROM	<b>E</b> lectrical <b>E</b> rasable <b>P</b> rogrammable <b>R</b> ead <b>o</b> nly <b>M</b> emory: Memory circuit, which can be deleted by applying an electric voltage.
GSM	<b>G</b> lobal <b>S</b> ystem for <b>M</b> obile <b>C</b> ommunications
I <sup>2</sup> C - Bus	<b>I</b> nter - <b>I</b> C <b>B</b> us
ISDN	<b>I</b> ntegrated <b>S</b> ervices <b>D</b> igital <b>N</b> etwork
MSN	<b>M</b> ultiple <b>S</b> ubscriber <b>N</b> umber: multiple subscriber number for a multiple device connection.
NT - Mode	<b>N</b> etwork <b>T</b> ermination: in this case, the device is operated as a network terminal (NT), whereby both the electrical and physical parameters (Layer 1) are adapted as well as the accepting the data link service and addressing tasks for layers 2 and 3.
P - P	<b>P</b> oint - to <b>P</b> oint: direct communication between two points in a

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15.02.2008 10:32

page:

104

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Manual coMsat Multichannel PRA 3-3 eng.doc

*Note Protection Mark according to DIN 34!*

# Multichannel PRA

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	network with each other. Communication is solely via this connection. The point-to-point connection is a variant of the wiring of the S <sub>0</sub> interface, if only one terminal is available.
PBX	Private Branch Exchange
PMP	Point-to-Multipoint, the point to multipoint connection is the other variant of the configuration for the S <sub>0</sub> bus. In this case several terminals (max 8) can be connected to the same connection. Of these 8 devices, 2 can establish a connection at any one time.
PRI	<b>Primary Rate Interface</b> , (S <sub>2m</sub> , E1)
PSTN	Public Switched Telephone Network
RJ45	RJ45 is the name given to the eight-pole connector technique, which has a very simple but effectively working configuration. This connector technique is used in the ISDN wire range for the S <sub>0</sub> connection. The connector is standardised in ISO 8877.
S <sub>0</sub>	The S <sub>0</sub> interface is an internationally standardised interface for ISDN installations. This interface is made available by the NTBA on the line side. On the customer side, the interface is provided both for the connection of a telecommunications switching system (→ system connection) as well as for the connection of up to 6 ISDN devices (→ multiple device port).
SIM	<b>Subscriber Identity Module</b>
SMS	<b>Short Message Service</b>
SMSC	<b>Short Message Service Centre</b>
TC System	Private telecommunications switching system
TE - Mode	<b>Terminal Equipment</b> : In this case the device is operated at the TC system like a TE2 device i.e. like an ISDN - compatible terminal.