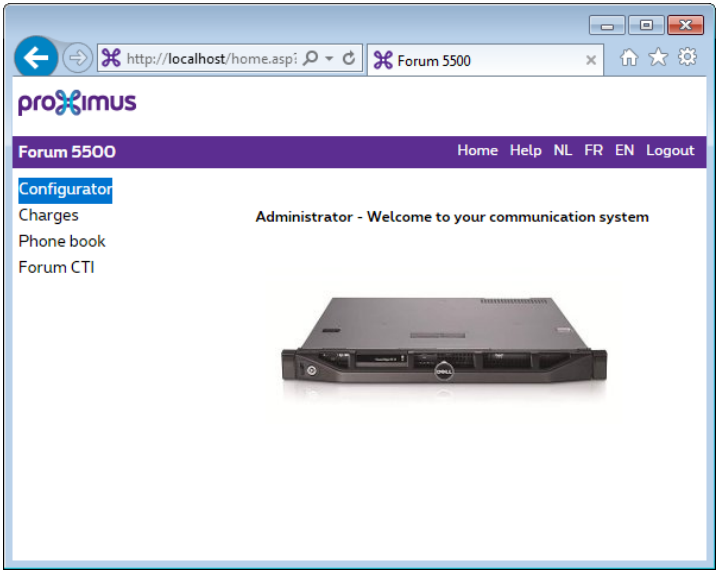
Forum™ 5500

Commissioning and Maintenance

Manual



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Welcome to Proximus

Thank you for buying this Proximus product. Our products meet the highest quality demands and are outstandingly designed.

The following instructions will guide you in the operation of your Forum™ 5500 and answer all important questions. Should you require further assistance or information, please contact the person responsible for your system or your retailer first.

Internet:
www.proximus.be/pabx

Forum™ 5000 and Forum™ 500

This user guide applies to the Forum™ 5000 and Forum™ 500 product families.

- The Forum™ 500 product family comprises the Forum™ 523/524, Forum™ 525/526 and Forum™ 550/560 communications systems.
- The Forum™ 5000 product family comprises the Forum™ 5500, Forum™ 5004, Forum™ 5008 and Forum™ 5012 communications systems.

We hope you enjoy using Forum™ 5500.

Nearly all hardware and software names mentioned in this user guide are also registered trademarks of their respective legal owners and as such underlie legal requirements.

Contents

About this Manual 9

Features 10

Factory Settings on Delivery 14

Telephony Basic Settings 14

Authorisations 14

LAN Settings / Internet Functions 21

Update Notes 22

Information on the serial number 22

Updating 24

Installation 25

Safety Precautions 25

System Prerequisites 25

Standard PC 25

Capacity Characteristics 26

Suggested PC Systems 27

LAN and Internet 27

Configuration of Operating System 28

Installing the Software 29

Setup Troubleshooting 32

Licensing 33

LAN Integration 33

Configuring a Fixed IP Address 34

Deactivating Competing Network Services 36

Deactivating Firewall 39

Configuring SNTP Time Service 40

Checking Internet Connection 41

Selecting LAN Connection 43

Power Failure 44

Ports and Connectable Devices **44**
a/b Ports 45

Forum Gateway 560 47

System Architecture **48**

Overview of Forum Gateway 560 Components **50**

Signalling and MGW Channels **51**

ISDN/DECT Synchronisation **52**

First-time Commissioning **53**

Operating a Forum Gateway 560 via Router **56**

Preliminary Information **61**
Construction of a Forum Gateway 560 61
Scope of Delivery 62

Forum Gateway 560 Installation **63**
Safety Precautions 63
Installation, Ambient Conditions 66
Installation in a 19" Rack 67
Installing Modules 68
Backplane 74
Uninterruptible Power Supply 76
Power Failure 76

Interfaces and Connectible Terminals **78**
S_0 Ports 79
U_{pn} Ports 83
a/b Ports 85
LAN Port 88

Forum Gateway 560 Modules **89**
Overview of Available Modules 90
Forum 550 Power Supply 90
Forum 550 Card main processor 93
Forum 550 Card PRA 96
Forum 550 Card 8 S0/T0 99
Forum 550 Card 8 digital extensions 101
Forum 550 Card 8 analogue extensions 103
Forum 550 Media Gateway Card 105

Forum Gateway 560 Connection via PCM-V Connection 107
Installation Steps 107
Configuration Steps 110
Notes 111

Forum 5500 Monitor 112

Overview Forum 5500 Service 112
Inspecting Windows Services 113
Starting Forum 5500 Monitor 114
"General" Tab 115
"Connections" Tab 117
"Setup" Tab 118
"Program" Dialogue 119
"Options" Dialogue 120

Configuration 121

Configuring the Forum 5500 121
Preparing the Configuration 121
Starting the Web Console 122
Finishing the Configuration 124
Saving and Loading the Configuration 124
Remote Configuration 125

Forum 5500 in Computer Networks 127
Introduction to TCP/IP 127
Codes for IP Configuration 128
E-Mail: Accounts and Notification 129
Receiving System Messages as E-Mail 129

Voice over IP (VoIP) 131

Quick Start 132
IP System Telephony 132
External SIP Line 133
Internal SIP Telephony 134

Fundamentals 135
Propagation Delay and Bandwidth 135
Latency and Packet Length 135

Voice Quality 136
Optimisation 138
Call Set-up 139
Useful Services 139
VoIP Profiles for SIP 140
Voice Activity Detection (VAD) 142

Media Gateway (MGW) 142

SIP Telephony 143
External SIP Connections 143
Internal SIP Subscribers 145
Forum IPhone 512 / Forum IPhone 545 SIP Telephones 149

VoIP System Telephones 153
Device Properties 153
VoIP System Telephone Configuration 154
LAN DHCP Server 155
Start Procedure 156
Local Configuration 157

Forum IPhone PC 160
Installation 161
Configuration 161

DECTover IP® 163

Properties 163
DECT Base Stations 163
Features 164

Configuration 165
Synchronisation 167
Setting up the WLAN Function 167
Configuring for a Remote Location 171

DECT Networks 174

DECT Areas 175

Signalling 177

Configuring DECT 179

PBX Networking 182

Connections 182

Point-to-Point Connection Technology 183
Protocol: Q.SIG or DSS1 183
Master/Slave 184
L1 Clock 184

Point-to-Point Connection Lines 185
Direct Connection 185
Connection via an Active Transmission System 186
Connection via the Public Network 187

IP Network Connections 187
Connection via Q.SIG.IP 188
Connection via SIP tie line 189

Configuration 190
Bundles 190
Routes 191
Numbering 191

Technical Details 192

Telephony 194

E.164 conversion 194
Configuration 194
Example 196
Further Information 197

Call Forwarding 198
Attributes 199
Loop Detection 199
Virtual Call Numbers 200
Hunt Groups 200
External Call Forwarding 201
Information on the Update 202

Busy Keys 203

PIN Code Telephony 204
Configuration 204
Implementation 205

Switch authorisation **206**
Configuration 206
Implementation 207

Generating Your Own MoH Files **207**

Team Functions 209

Introduction **209**
Explanation of Keys 209
Team Configuration 211

Examples of Use **211**
Executive/Secretary Team 211
Three-member Team 213
Unified Team 214
Toggle Team 215

Call Queue 218

Introduction **218**
Activation of Queues 219
Call Forwarding 219
Pickup 220
Hunt Groups 220

Examples of Use **220**
Enquiry Station for an Operator with Two System Telephones 220
Group of Three Enquiry Stations 222

Multi-Company Variant 224

Configuring the Multi-Company Variant **225**
Configuring and Managing Companies 225
Assigning Users 226
Assigning a Bundle/SIP Trunk 226
Allocating Routing Codes 227
Configuring the Company Exchange 227

Working with the Multi-Company Variant **228**
Company Telephone Book 228
Making Calls Between Companies 229
Billing Charges per Company 229

Configuring the PC Software 230
Browser for Forum CTI and Forum Hotel 230

Application Interfaces 232
Remote switching 232
Configuration 234
Applications 239
CSTA interface 241
Setting up TAPI Interface 243
LDAP Interface 245
Address Queries using LDAP 245
Querying External LDAP Server 246
SNMP Interface 249
Installing SNMP Agent 250
Configuring SNMP 251

Frequently Asked Questions 253
Telephony 253
PBX Networking 255
DECT 256
LAN 256
Internet 257

Forum IPhone 525/535: Extensions and Accessories 258
Power Supply Unit 258
Key Extensions 258
Headset 261

Technical Specifications 262

Environmental Information 264

Index 265

Support 269

About this Manual

The Forum 5500 communications system you have received is a comprehensive system which has already been configured consisting of a PC system with pre-installed telephony interface cards and operational, installed software.

This user guide is intended for the technician installing the Forum 5500 and putting it into operation. This will usually be the responsibility of your Proximus agent, who will prepare the Forum 5500 and hand over the configured, operational system.

The information on

- connecting terminals and putting them into operation, and
- installing and configuring the software of components

is intended for these persons only.

Please note: The Forum 5500 may be installed and serviced by qualified Proximus personnel only!

For users of the Forum 5500, this manual provides useful information with regard to routine tasks and procedures (e.g. configuring teams). In addition, a list of frequently asked questions will help the user to detect and eliminate faults that may arise.

Features

The **Forum 5500** communications system is a PC software for voice communication via VoIP. Using VoIP ("Voice over Internet Protocol"), telephony connections can be conducted via intranet and internet data lines. VoIP offers new applications and in many cases represents a distinct cost advantage.

The Forum 5500 communications system is installed and run under the Windows operating system. The software combination can be operated using standard PC hardware. After set-up, the Forum 5500 communications system provides comprehensive communication and application possibilities which fulfill both usual as well as advanced expectations with regard to today's voice communication.

Due to the high performance of today's PC hardware, you do not need to purchase, install and maintain specialized hardware systems for voice communication such as telephone systems (PABX) nor special telephone lines. You can also make full use of the usual features of such communications systems. Furthermore, you can use additional options such as VoIP networking with distant communications systems or the integration with programme systems which integrate VoIP for voice communication.

The following communication applications are available:

- Telephony with VoIP system telephones, SIP system telephones, standard SIP telephones or software telephones
- Telephony with DECT terminals or with DECT-GAP standard telephones via DECT over IP base stations

SIP Trunk Lines
The Forum 5500 communications system offers external SIP connections as "SIP trunk lines". Alongside several SIP individual connections with various SIP providers, direct-dialable SIP-DDI connections for external telephony. Configuration and assignment of external SIP connections is done for telephony users in a completely transparent manner. This facilitates a smooth introduction to using inexpensive internet telephony.

External Telephony Connections
In the basic version the Forum 5500 communications system supports external internet telephony and telephony connections on the conventional telephone network (PSTN) via SIP providers.

If the PC is equipped with the appropriate interface cards, analogue devices can also be operated on the internal ports (S_0 internal and a/b internal).

A licence is required to operate telephony interface cards on the Forum 5500 communications system. For further information on the supported cards please refer to the to the guide entitled “Forum 5500: Installing and Configuring Telephony Interface Cards”.

Further Telephony Features
With the Forum 5500 communications system, you can use CTI applications (Computer Telephony Integration). The TAPI (Telephony Application Programming Interface) and CSTA (Services for Computer Supported Telecommunications Applications) standards are supported to integrate CTI applications.

The Forum 5500 communications system also features browser-based CTI application, the Forum CTI. Users can access and use the telephony functions on their PC via the Forum CTI.

Furthermore, the Forum CTI Touch web application is a web-based solution available for controlling telephony functions with current smartphones.

Furthermore, additional programme packages can be activated and operated which provide extended and convenient telephony functions. These include, e.g. the Forum Voicemail and Forum Auto Attendant digital voice memory and voice information systems.

You can query the internal phone book of the Forum 5500 communications system via LDAP. It is also possible to integrate entries of an external directory via LDAP. Furthermore, integration into a network administration solution via SNMP is possible. For further information on the various application interfaces, please refer to *Application Interfaces* starting on page 232.

You can optimize telephone communication using the team functions and call-queuing function.

Gateways
You can operate one or multiple gateways with the Forum 5500 communications system. Forum 550/560 type communications systems are used as gateways which function in a special operation mode as a gateway.

A comprehensive solution for integrating TDM telephony can be operated using gateways with the Forum 5500 communications system. Via gateways

you can connect a large number of TDM terminals like corded system phones, analogue terminals and DECT base stations connected via U_{pn}. Via gateways you can also connect TDM lines such as external ISDN lines (S_0 or S_{2M}) and external analogue lines.

Setting up a high-performance communications system using gateways is described in a special chapter (see *Forum Gateway 560* starting on page 47).

Networking
For meeting rising demands, the Forum 5500 communications system can be networked with other communications systems via “Q.SIG-IP” or “SIP TIE Line”. This is possible in a LAN as well as via VPN (“Internet tunnel”). This enables you to connect distant locations and branches into a single, large telephony network. The number of simultaneous call connections between two communications systems is limited by the available connection bandwidth an also depends on the number of licenses you purchased for the “Network” feature. Via the Q.SIG IP / SIP TIE Line networking, the Forum 5500 communications system can serve as a subsystem or as a DECT server, for example.

Networking via permanent ISDN lines (“Q.SIG”) is also possible. This requires to install the appropriate telephony interface cards in the PC on which the Forum 5500 communications system is operated.

Networking is described in the chapter entitled *PBX Networking* starting on page 182.

DECT over IP®
The Forum 5500 communications system supports the set-up of a DECT network for mobile office communication. To do so, you use the DECT networking via VoIP, DECT over IP. Hooking up DECT over IP base stations is done via network lines. For larger offices, multiple DECT base stations increase wireless network coverage and provide a transparent handover between the base stations, during an ongoing telephony connection as well.

Handsets as system terminals with all the system telephony features are available for DECT telephony and handsets using GAP and CAP standards are also supported. The handover between the RFPs (Radio Fixed Parts) also functions with handsets using the GAP standard.

Call Charges Recording and Connection Data Recording
You can use an external programme in conjunction with the Forum 5500 communications system to record call charges. The connection data are sent to the external programme via CSTA (Computer Supported Telecommunications Application), where they can be analysed.

The separately licensable Forum Count web application enables you to record, store and analyse telephony connections using configurable filters. You will find more information on this topic in the Online Help of the web console.

LAN Integration
The PC computer that the Forum 5500 communications system is installed on is usually integrated with the existing network (LAN). The configuration and programming of the Forum 5500 communications system is done via a web browser (web console) that can be operated both from the same PC and from a PC hooked up via LAN. All telephony functions and the functions of the web console can be used at all workstation computers on the LAN network. VoIP integration and connection to an existing e-mail system are available.

Glossary
Please refer to the explanations in the Glossary (supplied as a PDF file on the system CD).

Factory Settings on Delivery

The following basic settings and features are active after you have installed the Forum 5500 communications system. We recommend that you configure the Forum 5500 communications system to suit your individual requirements before using it (see *Configuration* starting on page 121).

Telephony Basic Settings

- There are no pre-configured telephony terminals.
- The Forum 5500 is configured ready for use in Belgium.
- An inactive SIP trunk with the name “SIP” is configured. This SIP trunk is bound to the “External trunk” route using the line seizure code “0”. For external calls, you have to set up the SIP line.
- All newly configured terminals ring if there are incoming external calls.
- The password for the “Administrator” user is empty.
- The system PIN is set at “0000”.

Authorisations

The allocation of authorities regulates which functions terminals on Forum 5500 can use. These authorities are configured for so-called user groups, to which users and their terminals are then assigned.

Three user groups are preset: “Administrators”, “Standard” and “Guests”. “Administrators” can access all functions in Forum 5500 and have unlimited configuration rights. Users in the “Guests” group can not configure Forum 5500, may not make any external calls and can only use a limited range of Forum 5500 terminal functions. The “Standard” user group is well suited as a starting point for creating user groups for normal users of the system (e. g. the staff members of a company) because of its default settings.

Note: For more details on the configuration of user groups, refer to the online help in the chapter entitled “User Manager”.

The following functions are delivered preset for user groups:

User group settings

Function / Authorisation	Standard	Administrators	Guests
Service profile	User	Expert	View
Applications			
Costs	-	+	-
Phone Book	+	+	+
Forum CTI	+	+	-
Forum CTI - Busy lamp	+	+	-
Forum Count	+	+	-
Forum Hotel	+	+	-
Forum ACD SV	+	+	+
Forum ACD Info	+	+	+
Forum ACD Agent	+	+	+
Courtesy Service	off	off	off
Phone Book			
Use LDAP	+	+	+
Use central	+	+	+
Edit central	-	+	-
Use own company	+	+	+
Edit own company	-	-	-
Edit other companies	-	-	-
Entries (personal)	20	20	0
Dial in (outgoing)			
External	International	International	Incoming only
Immediate external line seizure	-	-	-
External line seizure over operator (only with Forum Gateway 560)	-	-	-

User group settings

Function / Authorisation	Standard	Administrators	Guests
LCR	+	+	-
Deactivate LCR	+	+	-
LCR at call forwarding to extern	-	-	-
VIP call	+	+	-
PIN dial	-	-	-
Announcement	+	+	-
Announcement accept	+	+	+
Intercom	+	+	-
Dialout for other phone	-	-	-
Instant connection	+	+	-
Callback on busy	+	+	-
Multiple seizure at the parallel terminal s	+	+	+
Switch authorization	-	-	-
Display phone number off (intern)	-	-	-
Display phone number off (extern)	-	-	-
Display phone number off/on per connection	+	+	-
Dial in (incoming)			
Pickup from group	+	+	-
Pickup selective	+	+	-
Take	+	+	+
Call removal	-	-	-
Calling suppression at the parallel terminal	-	-	-
Reaction: connection will be disconnected	-	-	-

User group settings

Function / Authorisation	Standard	Administrators	Guests
display phone number off (intern	-	-	-
Call queue	O	O	O
Call forwarding			
Call forwarding	+	+	-
Call forwarding to extern	+	+	-
Call forwarding of MSN groups	+	+	-
Call forwarding door call	+	+	-
Indicate call forwarding after time parallel	+	+	+
Call forwarding for other user	-	-	-
Prevent call forwarding by other user	-	-	-
Display: Call forwarding via	last forwarding	last forwarding	last forwarding
Connection			
Call record	-	-	-
Call record with beep	-	-	-
External to external	+	+	-
3-party conference	+	+	-
Park call	+	+	-
MOH at external connections	+	+	+
MOH at internal connections	+	+	+
Protection			
Call protection	ring-back tone	ring-back tone	off
Call waiting protection	Int. + ext. calls	Int. + ext. calls	off
Announcement protection	-	-	-

User group settings

Function / Authorisation	Standard	Admini-strators	Guests
Intercom protection	-	-	-
Pickup protection	-	-	-
Phone lock	+	+	-
Intercept (only with Forum Gateway 560)	+	+	-
Lists			
Black lists	empty	empty	empty
White lists	empty	empty	empty
Special lists	1	1	1
Call filter 1, 2, 3	empty	empty	empty
Manage intern call list	+	+	-
Manage extern call list	+	+	-
Manage busy call list	+	+	-
Manage door call lists	+	+	-
System phones			
Device busy	+	+	+
All keys locked	-	-	+
Programming function keys	+	+	+
Program busy keys	-	-	-
Menu and ABC keys	+	+	+
DECT trunc keys	-	-	-
Connection data			
Send incoming connections	-	-	-
Send outcoming connections	-	-	-
Recording incoming connections	-	-	-
Recording outgoing connection	-	-	-

User group settings

Function / Authorisation	Standard	Administrators	Guests
Number of suppressed digits	0	0	0
Incoming basic amount	0,000	0,0000	0,0000
Outgoing basic amount	0,0000	0,0000	0,0000
Cost factor	100%	100%	100%
Create costs	-	-	-
Network			
E-mail notification	+	+	-
Send E-mails	+	+	-
Forum ACD SV			
Agent can stop wrap-up time	+	+	+
Agent can activate pause	+	+	+
Agent can login/logout	+	+	+
Forum Conference			
User may make invitations	-	-	-
CSTA			
CSTA menu	-	-	-
CSTA key	-	-	-
CSTA data	-	-	-
Other			
Speed dialling	+	+	-
Door opener	+	+	-
Keypad dialling (only with Forum Gateway 560)	+	+	-
Time control	-	-	-
Booking number may be set up	+	+	-
Send short messages	+	+	-

The following important settings are active without further configuration:

- External authorisation: International numbers can be dialled from all configured terminals. External lines must be seized by entering a preset code.
- Call forwarding to internal and external numbers can be activated. Call forwarding after delay is performed after 20 seconds. and MSN groups Call diversions for other users and call diversions by other users are deactivated.
- The telephone lock can be activated. The terminal PIN is “0000”.
- The white list, black list and call filter are not preconfigured and therefore not active. If these lists are configured, they can be activated for user groups.
- Every standard user can change the configuration of Forum 5500.
- Every standard user can create a personal telephone book and edit entries in the central telephone book.
- Every standard user can read out the charges.
- Applications requiring a licence (e.g. Forum Count) can be used after being activated.

LAN Settings / Internet Functions

The Forum 5500 communications system does not have any own network settings. The settings of the PC that the Forum 5500 communications system is installed on are the ones considered valid.

The following addresses are assigned to the client computers by DHCP:

Description	Setting
DHCP server	Active in “Static address assignment” mode
DHCP addresses in the LAN	192.168.99.130 to 192.168.99.169
Net mask assigned via DHCP	255.255.255.0
Gateway assigned via DHCP	PC’s IP address
DNS server assigned via DHCP	PC’s IP address
Time-Server assigned via DHCP	PC’s IP address
Domain name assigned via DHCP	empty

- You can open the web console from the PC where the Forum 5500 communications system is running (“http://localhost/”). Moreover, you can open the web console via the LAN connection from another PC.
- Multiple e-mail account queries can be set up for every user. Every user with a system terminal can be automatically informed about incoming e-mails with this function. Subject and sender of the e-mail will be displayed. The e-mail remains on the e-mail-server where it can be queried with a standard e-mail programme.

Please note: A Windows PC normally has more than one LAN connection. For a correct function you need to select the desired LAN connection in the **Configurator** under **Network: LAN**. Select an entry which shows the desired IP address and a MAC address. Confirm your selection with **Change**.

Update Notes

If you are already operating an Forum 5500 communications system with an older version of the software, the following notes will help you update to the release 9.

The release 9 is published at the same time for all members of the Forum 500 / Forum 5000 product family. If you are operating multiple communications systems, for example, on TC system networking, updating all communications systems at the same time is a good idea to ensure optimal compatibility.

Information on the serial number

In earlier versions of the Forum 5500, the serial number of the system, that you need to activate licenses, was automatically compiled from several hardware parameters. Such serial number is formatted as follows: “AAAAA-BBBBB-CCCCC-DDDDD-EEEEE”.

In the current Forum 5500 version, the serial number is read from a dongle. This means that the number doesn't change any more when PC hardware is replaced, in parts or entirely.

To use the dongle, you have to install suitable access software first. Please, proceed as follows:

1. Install the application “CodeMeterRuntime”. You can find this application on the product CD.
2. Attach the dongle to a free USB port of the computer and wait until the drivers are installed.
3. Install the most recent software of the Forum 5500.
4. Look for the serial number of the connected dongle via the web console of the Forum 5500 communications systems. In the **Configurator**, open the page **System Info: Versions**. The new serial number has the following format “F5500-123456789ABCD”.
5. Use this serial number to activate your licenses. If you already purchased licenses for this system, your existing licences have to be transferred to the new serial number. Please, turn to your Proximus representative.

Please note: Only one Forum 5500 dongle must be installed per PC.

If it's not possible or desirable to attach the dongle to the same computer as the Forum 5500 communications system, it can also integrated via a network. In this case, please proceed as follows:

1. Install the application “CodeMeterRuntime” as described above on the computer of the Forum 5500 communications system.
2. Install the most recent software of the Forum 5500 communications system.
3. Install the application “CodeMeterRuntime” on the computer the dongle will be attached to.
4. Attach the dongle to the desired PC and wait until the drivers are installed. Then share the dongle in the network. To do so, open the CodeMeter control centre and click on **WebAdmin**. In the menu item **Einstellungen: Server** the dongle can now be shared with **Starte Netzwerk Server**.
5. Finally, in the **Configurator** of the Forum 5500 communications system, on the page **System: Common** enter the IP address of the PC that holds the dongle in the **Server for license dongle** field. Finalize by rebooting the Forum 5500 communications system.
6. Now you can access the serial number of your Forum 5500 communications system through the web console and use it to activate your licenses.

Notes

- If the dongle cannot be reached when the Forum 5500 communications system is switched on, (locally or through the network), the communications system cannot be used. Make the dongle available and reboot the communications system again.

If the connection with the dongle is interrupted during regular operation of the Forum 5500 communications system, the connection has to be re-established within 24 hours.

- From release 9 the IP telephones “Forum IPhone 520” und “Forum IPhone 530” are no longer supported. During an update, configured devices will be converted to “Forum IPhone 525” or “Forum IPhone 535” to retain the key data.
- Data backups < release 7.0 are no longer supported.

Updating

Updating is done in the following steps:

1. First install the dongle, as described in the chapter *Information on the serial number* starting on page 22.
2. Start the installation program for the Forum 5500 communications system which is saved on the the product CD .
3. Follow the installation assistant steps. This includes replacing the old version of the call-server software with the new version. Then open a browser and open the **Configurator**.
4. Optional: Then open the **System**: **Licences** page. Load the license file. Then a green tick mark should appear next to the Forum Upgrade entry in the **Status** column.

After updating, as needed, you can also load the online help file and the audio files for the additional programs Forum Voicemail and Forum Auto Attendant.

If you have been operating external SIP lines with customer-specific settings, you may have to adjust these settings to the extended SIP provider settings of release 9 (see online help topics “SIP Trunks”, “SIP Provider” and “Notes on SIP Providers”). As a result of the update, the configured password for the SIP lines may have been deleted.

Note: Please also note the information on updating telephony functions (see *Information on the Update* starting on page 202).

Installation

Safety Precautions

Please note: The Forum 5500 may be installed and operated by qualified personnel only.

Forum 5500 software is installed on a standard PC. Use a shielded Ethernet cable (STP cable, Shielded Twisted Pair cable) to connect this PC to a local network (LAN, Local Area Network).

Ensure that all cables of terminals operated on the Forum 5500 are laid in such a way that nobody can walk on or trip over them.

Outside cables and terminals may only be installed by qualified specialists observing the appropriate safety measures.

Repairs to the terminals and all accessories must be carried out by accredited specialists. Inappropriate repairs may damage them and will render any warranty claims invalid.

Keep the packaging of terminals and accessories out of reach of children!

Note: Please observe the safety precautions in the user guides of the operated terminals and the PC on which the Forum 5500 is installed.

System Prerequisites

Standard PC

You require a standard PC with a Windows or Windows Server operating system for the Forum 5500 communications system (see *Technical Specifications* starting on page 262). Other types of Windows operating systems are not permissible for the safe ongoing operation of the Forum 5500 communications system.

Furthermore, for the Forum 5500 communications system, you should use a separate PC (a “server computer”) reserved for this purpose only. This ensures that the response time of the Forum 5500 communications system is not

impaired by other programmes or server processes running simultaneously. Usually, the keyboard and monitor hooked up to the server computer are protected against unauthorized access and are only available for administrative purposes.

Furthermore, standard PC systems are possibly more likely to be optimised for more obvious features while information on system failure dependability and possible length of operation are not provided. There are system components available for purchase specialized towards increasing reliability of server operation. Using such system components is recommended.

Capacity Characteristics

The Forum 5500 communications system is based on system software that has been used reliably for years for hardware-based communications systems (PABX). These specialized devices generally provide less CPU capacity, less RAM memory and less hard-drive space than standard up-to-date PCs available in stores. However, standard store PC systems do not have specialized hardware components which have to be taken over by the PC's CPU for certain communication applications. The CPU will thus have to offer sufficient performance capacity.

One example: With the normal VoIP system telephony, the system terminals communicate with each other directly. The Forum 5500 communications system is only involved in switching the connection. This does not require much CPU capacity. For a conference call, the voice data of all conference users have to be processed by the CPU. This requires a substantially higher amount of CPU capacity.

Note: You can install the Forum 5500 communications system under Windows 7 or server 2008 R2 on a multi-core PC. When installing the software you can determine which of the CPU cores is use for what tasks.

Suggested PC Systems

You do not require any special PC hardware equipment for the Forum 5500 communications system. The systems described in the following are orientated towards the specifications of Microsoft, the operating system producer:

Small System

- suitable for up to 20 simultaneous calls
- PC with 1 GHz 32 bit CPU, 1 GB RAM
- 4 GB hard-drive
- 100 Mbit Ethernet port, suitable switch and Cat5 lines
- Microsoft Windows operating system

Large System

- suitable for 20 simultaneous calls and more
- PC with 3 GHz 32 bit-dual-core CPU, 1GB RAM
- 20 GB SSD (Solid State Drive)
- 1000 Mbit Ethernet port, suitable switch and Cat6 lines
- Microsoft Windows Server 2008 R2 operating system
- suitable emergency power supply optional
- suitable climate control in server room optional
- a switch with PoE, QoS and VLAN capability optional

Some hardware components take up even during operation substantial CPU capacity or impair the response capacity of the PC system in case of error. Be sure you do not use so-called WinModems, 3-D game graphic cards with poor quality drivers, TV cards, error-prone removable media (CDs/DVD-ROMs, CD/DVD burners) or other similar items.

LAN and Internet

The PC system running the Forum 5500 communications system needs to be connected to a local area network (LAN). While different LAN topologies exist, a LAN structured cabling and a central switch device (“star topology”) is recommended for use with VoIP. For VoIP, the LAN should be optimised for low latency packet transfer times, i.e. do not send VoIP data via unreliable or slow (< 100 Mbit/s) connections such as wireless links, multiple cascaded switches, or very long network cables. It is possible to optimize a LAN for VoIP

usage, for example if only measured and calibrated cabling is used or by using VLANs to separate bulk data transfers from VoIP data streams.

With the Forum 5500 communications system, external telephony connections are realized via VoIP as “SIP trunk lines”. The data rate necessary for an uncompressed SIP trunk slightly exceeds the data rate of a standard ISDN B-channel connection (64 kbit/s). For this reason, SIP trunk lines require a DSL broadband connection with a minimum data rate of 386/128 kbit/s. A DSL connection with the fastpath option enabled may help to increase the VoIP quality if you experience excessive echoes during telephony conversations. If you plan to use the same broadband connection for SIP trunks, Q.SIG-IP interconnections and standard internet data transfers concurrently, you may need a faster and QoS-enabled broadband connection. An enhanced DSL router, offering QoS (or “traffic shaping”) to prioritize VoIP data streams or VPN to secure Q.SIG-IP interconnections may be required also.

Configuration of Operating System

Configure the Windows operating system and after installation optimize it for usage with the Forum 5500 communications system. Please note the following items:

- Use the NTFS file system only. NTFS is the only system where access protection for Forum 5500 communications system files can be configured.
- The Forum 5500 communications system generally uses the network configuration managed by the Windows operating system. Configure the network card and the TCP/IP protocol stack in accordance with your LAN in the Windows Control Panel. Please note that the Forum 5500 communications system offers network services such as HTTP on port 80 and DHCP on port 67. Competing service programmes cannot be executed on the same computer. Furthermore, you should configure a static IP address.
- When you wish to use external SIP connections or external Q.SIG-IP connections, the server PC requires a direct internet connection. To establish RTP voice data connections, UDP connections on alternating ports from external sources must be available. This is the case if the server PC is directly connected to the internet, for example, via a connected DSL modem or another direct internet connection. In this case, you should protect the server PC via suitable firewall software. If you connect the server PC indirectly, for example, via a NAT router, the router product you

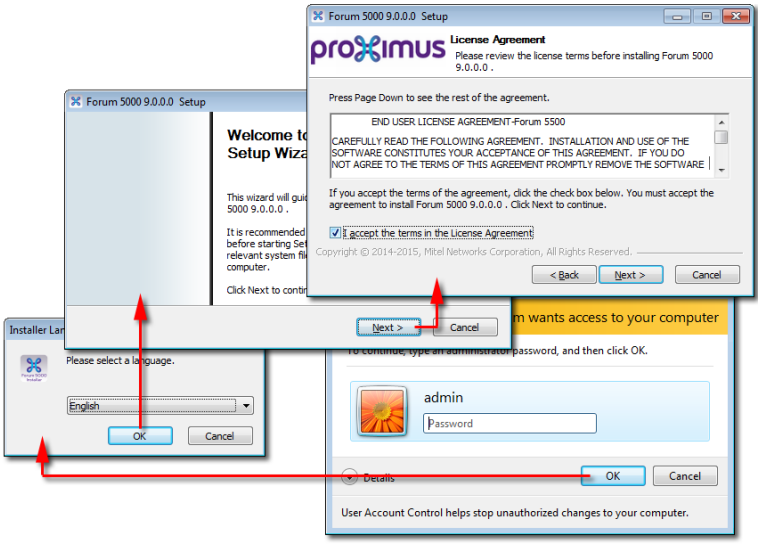
use must be SIP/RTP capable. Inexpensive router products frequently do not offer this as they do not have a setting for the required “Full Cone NAT” or suitable “UDP/RTP Port Forwarding” settings.

- The Windows operating system does not offer QoS or “Traffic Shaping” in the entry-level installation. To make optimal usage of an asymmetrical DSL connection and to ensure telephony connection quality – with simultaneous up- and downloads, for example – you should be sure to use suitable router products. These products offer QoS/traffic shaping and support extensive configuration of internet traffic flow.
- Depending on the performance capacity of the PC hardware it may be a good idea to adjust the Windows performance options. Go to the Windows control panel and select the **Performance and Maintenance** category. Click on the **System** icon. The **System Properties** dialogue opens. Select the **Advanced** tab. Under **Performance** click on the **Settings** button. The **Performance Options** dialogue opens. In the **Advanced** tab activate the **Adjust for best performance of: Background services** option. Click on the **Virtual memory: Change** button and review the settings for the virtual memory paging file. Please note the information provided in the **Virtual Memory** dialogue.

Installing the Software

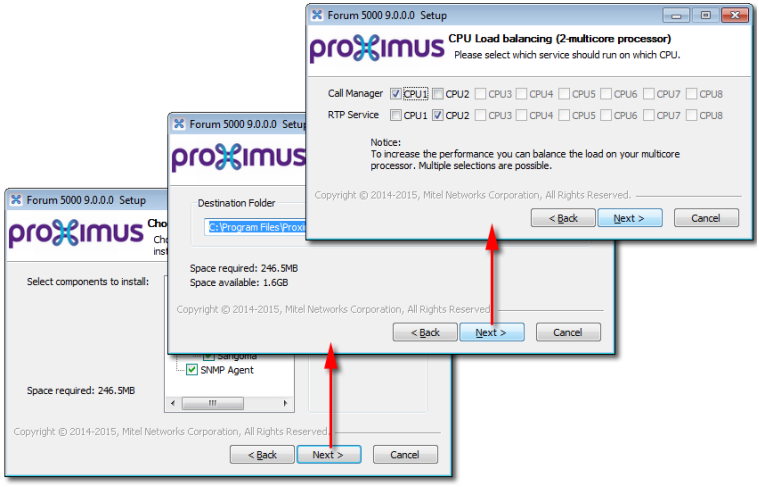
Provided, that the above requirements are met, the installation of the Forum 5500 software is straightforward. First install the necessary software for the dongle, that is needed for the serial number. You simply start the setup programme and follow the steps of the installation wizard: Keep in mind that you have to be logged in as a user with administration rights to install the software.

1. Start Windows Explorer. Double click the program file “CodeMeter-Runtime.exe”.
2. Attach the dongle to a free USB port and wait until the drivers are installed.
3. Start Windows Explorer. Double click the “Forum5000_Setup.exe” executable file.
4. Select the language for the installation wizard and confirm with **OK**. Click on the **Next** button to proceed to the next step of the wizard.



Read the licence agreement and accept the terms by activating the respective option in order to proceed.

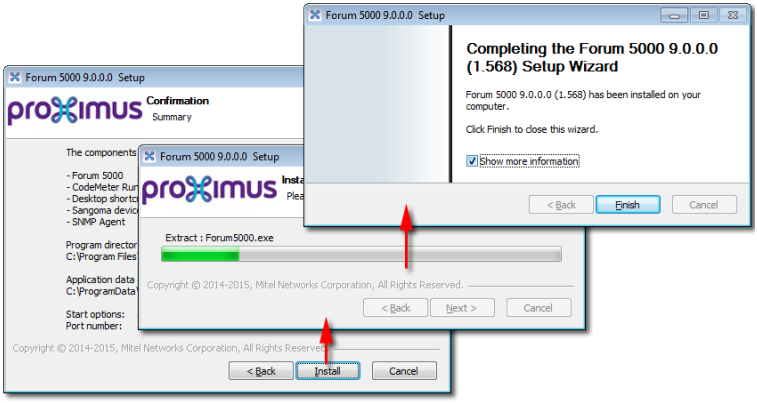
5. The next wizard steps allows you to disable the creation of a desktop icon, to change the default programme installation path, or to disable the automatic startup of the software. In standard cases you should accept the defaults.



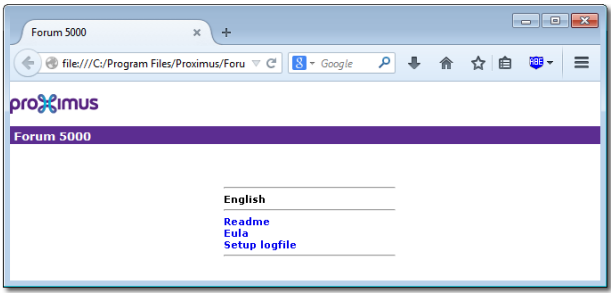
Windows 7 / server 2008 only: During installation the installation assistant offers fixed assignment of the existing CPU cores for load distribution. Reserve a CPU core for the **Call Server** components. Select one or more of the other CPU cores for the **RTP Service** components. This reserves certain CPU cores for converting RTP data (codecs).

Confirm the last wizard step with **Install** to start the Forum 5500 software installation.

6. During the software installation, the setup programme checks your system configuration, shows a message box and offers a report to notify you about potential problems.



7. It is likely, that your Windows system has additional DHCP enabled LAN connections and network adapters, which triggers the mentioned warning. Do not disable the **Show more information** option which displays the installation report if you click the **Finish** button. To redisplay the report later on, open the “C:\Programme\Proximus\Forum_5000\finish.html” in a web browser.



8. Click the “Setup logfile” link to check for potential issues found during the installation. Pay attention to text displayed on a red background (see *Setup Troubleshooting* starting on page 32 below).

Note: If you have been using an older version of the Forum 5500 software under Windows XP, the configuration data are moved into a Windows 7-compatible directory under “C:\Documents and Settings\All Users\Application data”.

Setup Troubleshooting

The following list has brief explanations about different setup logfile entries.

DHCP enabled: yes
If the listed network adapter/LAN connection should be used for running the Forum 5500 communications system, you need to switch it’s configuration to a static IP address (see *Configuring a Fixed IP Address* starting on page 34). You also need to select the LAN connection in the web console (see *Selecting LAN Connection* starting on page 43).

If the network adapter is unused and has another IP range than network adapter to be used for the Forum 5500 communications system, you may safely ignore this logfile message.

Note, that the same adapter may be listed more than once. This may be the case, if you have changed the network adapters hardware slot position. The former network adapter driver is still installed but hidden while the respective LAN connection has no assigned MAC address. These hidden network adapters can be ignored safely, too.

Virtual Environment: detected
The Forum 5500 communications system cannot run in virtual environment such as VmWare or VirtualPC. Install the Forum 5500 communications system on a real Windows PC.

Java Runtime Environment: too old
The installed Java Runtime Environment (JRE) is outdated. In order to run the Forum 5500 Monitor, visit http://www.java.com/ and install a newer version of the JRE. Detailed information on the Forum 5500 Monitor can be found in the chapter entitled *Forum 5500 Monitor* starting on page 112.

Concurrent Service
If the Forum 5500 communications system does not behave as expected – for example, the http://localhost/ link does not show the web console – you may need to remove additional server software which is blocking the necessary TCP/IP ports (see *Deactivating Competing Network Services* starting on page 36). Note, that the setup programme may not be able to detect a concurrent service.

Licensing

Operating the Forum 5500 communications system requires to purchase the necessary software licence. The Forum 5500 provides basic licences (see also the chapter entitled *Technical Specifications* starting on page 262) which cover basic features and are sufficient for many applications. If you need additional or enhanced features, you can purchase additional activation keys and activate them in the **Configurator** on the **System: Licences** page.

The serial number displayed on the **System: Extensions** page is tied to your dongle. Any activation keys entered are only valid for this serial number. You can obtain the activation keys from your Proximus agent.

LAN Integration

In order for VoIP telephony to function in a Local Area Network (LAN), the Forum 5500 communications system must be able to communicate with the VoIP devices hooked up to the LAN. To do so, the Forum 5500 communications system generally uses the network functions of the operating system used.

In an existing LAN, you usually already have the Internet Protocol (IP) for networking computers in use. The installation and commissioning of the Forum 5500 communications system on a running Windows operating system networked with IP can thus be done quickly and with little complication. This chapter explains the technical details that are important for operating the Forum 5500 communications system.

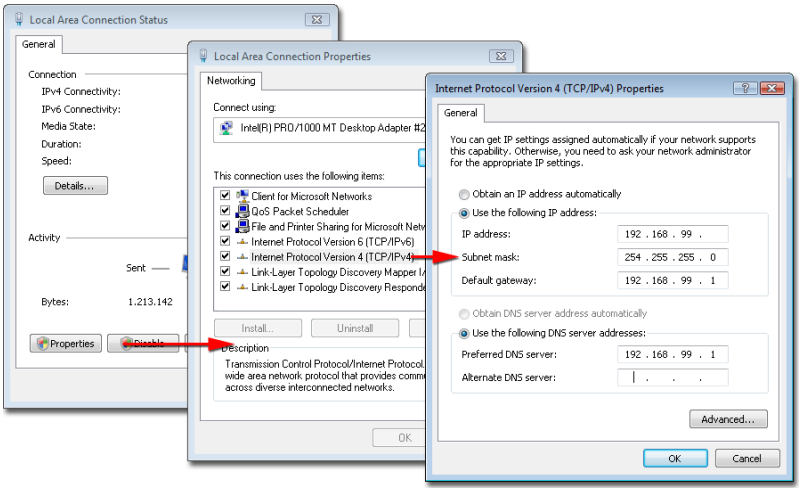
Configuring a Fixed IP Address

The server computer where the Forum 5500 communications system will be installed and run requires a LAN connection with the IP protocol. The fixed IP address of the LAN connection must be set manually. The IP address you have to use for the Forum 5500 communications system should be coordinated with the network administrator in charge.

Do not configure a **dynamic** DHCP-assigned IP address for the LAN connection. When an IP address change is initiated via DHCP on occasion, for example, all ongoing VoIP connections will be interrupted without prior warning. You may possibly have to even restart connected VoIP devices. During installation the installation programme of the Forum 5500 communications system checks whether a fixed IP address has been configured and displays a corresponding message accordingly.

Check over and, if necessary change the configuration of the LAN connection. To do so, you must be logged on as a user with administrator rights.

1. Select the **Network and Internet Connections** category in the Windows control panel.
2. Open the **Network Connections** window.
3. Click on the desired local area connection with the right mouse button. Select the **Properties** command from the context menu.
4. Select the **General** tab in the properties dialogue. Select the **Internet Protocol (TCP/IP)** entry from the list of connection items. Click on the **Properties** button.



Local Area Connection Properties: *TCP/IP*

5. Activate the **Use the following IP address** option. Enter the **IP address** for the Forum 5500 communications system. Enter the **Subnet mask** to be used in your LAN. Enter the IP address for the Internet access router under **Default gateway**.
6. Activate the **Use the following DNS server addresses** option. Enter at least the IP address for one DNS server.
7. Confirm your settings with **OK**.

Note: The settings for subnet mask, gateway and DNS server are usually the same for all computers in a LAN. The IP address for each computer in a LAN must be different. Do not use any IP addresses for the Forum 5500 communications system that may also be assigned to other computers with DHCP. When you are operating a local DNS server in your LAN, you should link the IP address of the Forum 5500 communications system with a DNS name in order to facilitate convenient access to the Web interface of the Forum 5500 communications system.

Tip: You can find out anytime what the IP settings are that are actually being used by the Windows operating system using the “ipconfig” programme. Select the **All Programs: Accessories: Command Prompt** command in the Windows start menu. Enter “ipconfig /all” and confirm with the enter key.

Deactivating Competing Network Services

The Forum 5500 communications system provides a range of network services. For each of these services, the Forum 5500 communications system listens on a specific TCP or UDP port number for incoming connections. The port numbers are predefined and cannot be changed by default. This means that, for example, the Web console of the Forum 5500 communications system can always be accessed from other computers at TCP port number 80.

No competing programmes or services can be executed on the server computer that are allocated to the same port numbers. If you have, for example, installed the “WWW service” subcomponent for the “Internet information services”, instead of accessing the Web console, visit the main page of the WWW service. The sequence in which the services were started determines which of the competing services is reached.

Uninstall or deactivate services allocated to the following ports. Port numbers in current use are listed on the **System Info: Network: Ports** page in the **Configurator** of the Web console.

Port Numbers

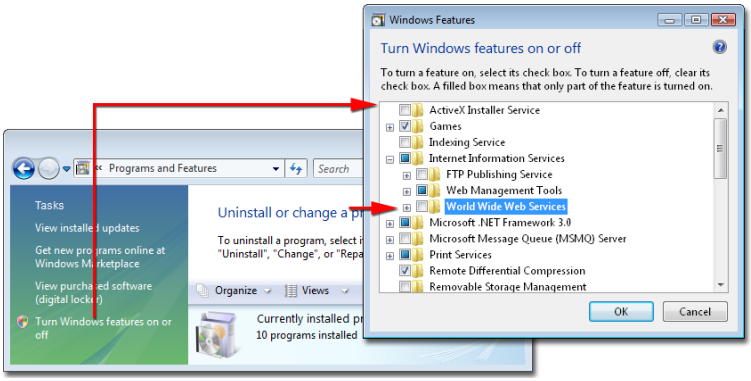
Transport	Port(s)	Description
TCP	67	DHCP and BOOTP service for IP configuration of VoIP terminals
TCP	80	HTTP service for operating the Web console and the Forum CTI application
TCP	389	LDAP service for querying the telephone book
TCP	8080	Forum CTI Touch
TCP	6113-6116	internal administrative services
TCP	7001	CSTA service
TCP	8099	IP-RFP system service (for DECT over IP)
TCP	8100	IP_L2_REGM, registration service for VoIP system telephones
TCP	8101	IP_L2, service for VoIP system telephones
TCP	8106	DECT monitor service

Port Numbers

Transport	Port(s)	Description
TCP	10000 -10010	predefined port numbers for a Q.SIG-IP bundle
TCP	14456	CTI control service (UDP also)
TCP	14457	CTI data service
TCP	27015	sysmon service (localhost only)
TCP	27016	autolog service (localhost only)
TCP	28015	supervisor system service (localhost only)
TCP	28016	supervisor admin service (localhost only)
TCP	59414	RM_RTP service
UDP	69	TFTP service for firmware file transfer to VoIP terminals
UDP	5060	signalling for SIP lines
UDP	40000	internal administration service
UDP	dynam- ically assigne d port number s	RTP calls

Among the programmes and components supplied for Windows, the only thing that may interfere with the functioning of the Forum 5500 communications system is the “Internet information services” – if installed, of course. Change the predefined port numbers or deinstall the “Internet information services” components using the following steps. To do so, you must be logged on as a user with administrator rights.

1. Select **Software** category in the Windows control panel.
2. Click on the **Add/Remove Windows Components** menu button.



Control Panel: *Add or Remove Programs*: *Deinstall IIS*

3. Deactivate the **Internet Information Services (IIS)** list option in the **Components** list.
4. Confirm with the **Next** and **Finish** buttons.

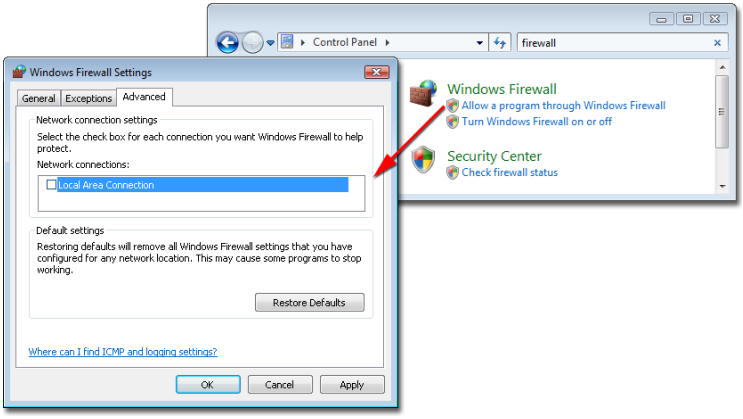
Note: Please keep in mind that in addition to the operating system, installed software may possibly set up other competing services. The installation programme of the Forum 5500 communications system monitors allocated ports and indicates them with a corresponding message. You may have to deactivate or deinstall the software affected.

Tip: You can determine which port numbers are actually allocated to services at any time using the “netstat” programme. Select the **All Programs: Accessories: Command Prompt** command in the Windows start menu. Enter “netstat -a -n” and confirm with the enter key. The command result shows all queried port numbers as well as any existing TCP and UDP connections. Enter “netstat -a -n -b” to display the executable file for the respective port number.

Deactivating Firewall

Software for protecting Internet communication (Firewall) supervises and blocks incoming as well as outgoing data traffic. This can as well interfere with data traffic triggered by the function of the Forum 5500 communications system. In particular, the dynamic assignment of UDP port numbers of new VoIP calls to be established is affected. The “Personal Firewall” of the Windows operating system cannot be used with this dynamic port assignment. Deactivate the “Personal Firewall” for the LAN connection being used with the Forum 5500 communications system. To do so, you must be logged on as a user with administrator rights.

1. Select the **Network and Internet Connections** category in the Windows control panel.
2. Open the **Network Connections** window.
3. Click on the desired local area connection with the right mouse button. Select the **Properties** command from the context menu.
4. Select the **Advanced** tab in the properties dialogue. Click on the **Settings** button in the **Windows Firewall** group.



Local Area Connection Properties: *Windows Firewall*

5. Select the **General** tab in the **Windows Firewall** dialogue. Activate the **Inactive (not recommended)** option.
6. Alternatively you can also activate the **Active (recommended) option**. In this case deactivate the **Allow no exceptions** option and go to the

Advanced tab. Deactivate the specific LAN connection used with the Forum 5500 communications system.

7. Confirm the settings with **OK**.

Note: You should never connect an unprotected computer directly with the Internet. Be sure to use an appropriate router for the Internet connection with an integrated Firewall function. When you use SIP lines with the Forum 5500 communications system, the router product used must be compatible with the SIP protocol and the related RTP connections.

Tip: To increase system security with a deactivated personal Firewall you can restrict the protocol connections of the LAN connection. Deactivate all elements not in use in the **Properties** dialogue of the LAN connection. The Forum 5500 communications system only requires the **Internet Protocol (TCP/IP)** element.

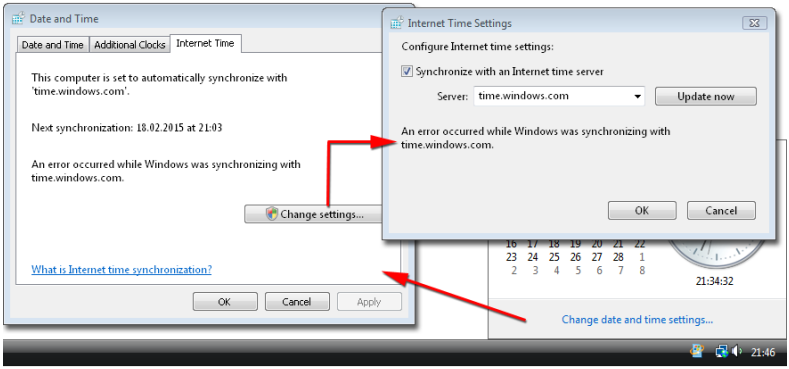
Configuring SNTP Time Service

VoIP terminals hooked up to the Forum 5500 communications system are set to the current time using the SNTP (Simple Network Time Protocol) time service. The SNTP service of the Windows operating system is used to do so. The server operation mode of the Windows time service of the Forum 5500 communications system installation programme is activated to enable VoIP terminals to query the current time.

Note: The server operation mode of the time service is usually deactivated in Windows. The time service is by default only for querying the time.

Check the Windows time service function and configure it if necessary. To do so, you must be logged on as a user with administrator rights.

1. Double-click on the time display in the system tray of the task bar.
2. Select the **Internet Time** tab in the **Date and Time Properties** dialogue.
3. Activate the **Automatically synchronize with an Internet time server** option.



Dialogue: *Date and Time Properties*

4. Enter the address of a valid NTP server into the **Server** field. This could be the “time.windows.com” server offered by Microsoft.
5. Click on the **Update Now** button. After a brief interval, the successful time synchronization should be displayed in the dialogue.
6. Confirm the settings with **OK**.

Note: If the time displayed is not the same as the actual local time, this is due to the time zone setting. Select the Time Zone tab in the **Date and Time Properties** dialogue and configure it for the current location. If you receive an error message, the Internet access router may be blocking communication at UDP port 123. In this case configure a NTP server in the LAN.

Tip: If the time service cannot be activated, the corresponding Windows service has not been started. Select the **Performance and Maintenance** category in the Windows control panel. Start the **Services** programme in the **Administrative Tools** folder. If necessary, restart the **Windows Timer Server** service.

Checking Internet Connection

The Forum 5500 communications system requires an Internet connection if you wish to operate SIP lines via SIP provider or external Q.SIG-IP bundles. Because the Forum 5500 communications system uses the Windows operating system network functions you have to configure the Internet connection for Windows.

Tip: For more information on this topic, please refer to the Windows help and support center. Select the **Help and Support** command in the Windows start menu. Click on **Networking and the Web** and select the desired subitem.

In your LAN you usually use an Internet access router that offers Internet access to all LAN computers. In this case it is sufficient if the IP address of the Internet access router is listed in the settings for the standard gateway and the DNS server (see *Configuring a Fixed IP Address* starting on page 34). Follow these steps to check the Internet connection:

1. Select **All Programs: Accessories: Command Prompt** in the Windows start menu.
2. Enter “route print” and confirm with the enter key. The IP address of the Internet access router must be shown in the “Standard gateway” line.
3. Enter “traceroute 1.1.1.1” and confirm with the enter key. Because this IP address is invalid on the Internet, the command output will stop when the first Internet border router is reached. Copy the IP address shown in the last line for the next step, for example “151.1.1.1”.
4. Enter “ping 151.1.1.1” and confirm with the enter key. Four ping responses should appear. If this does not happen, check the standard gateway Internet connection.
5. Enter “nslookup www.proximus.be” and confirm with the Enter key. The current IP address of the Proximus server should appear. If not, correct the DNS settings for the LAN connection.
6. Enter “start http://www.proximus.be” and confirm with the Enter key. The corresponding Web site should be displayed. If not, correct the proxy settings for the Web browser installed.

In many cases the Internet access router translates an IP address that is valid externally into multiple locally used IP addresses. This “Network Address Translation” (NAT) facilitates the use of one Internet connection for multiple computers with just one valid IP address in one LAN. Many inexpensive or older Internet access routers use what is referred to as “symmetrical NAT”. This NAT variant is frequently unsuitable for usage with SIP lines. This is why you should use Internet access routers that offer the “Full Cone NAT” function or alternatively that function as transparent SIP/RTP proxy. These kinds of products usually also offer VoIP call priorization (QoS) and configuration of VPN connections.

Note: Q.SIG-IP cannot be operated via a NAT connection. You will have to configure a VPN connection for a Q.SIG-IP connection.

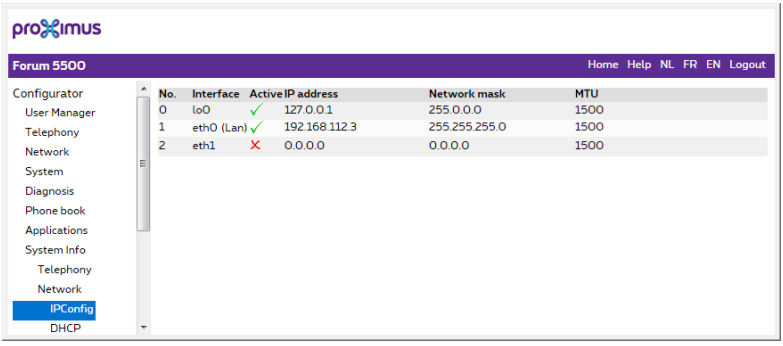
Selecting LAN Connection

The Windows operating system can manage multiple IP-capable network interfaces. Any additionally installed Ethernet adapters, Bluetooth devices, modem devices or virtual Ethernet adapters will appear as additional LAN connection in the Windows network environment. Furthermore, you can configure additional IP addresses for LAN connections with fixed IP address ("IP aliases").

The installation programme of the Forum 5500 communications system checks during installation whether there are multiple Ethernet adapters installed and displays a corresponding query if this is the case. Select the Ethernet adapter to be used for the VoIP communication in the LAN.

You may check the LAN connection selected at any time and alter it as necessary. Access the Web console of the Forum 5500 communications system to do so.

1. Select the **System Info: Network: IPConfig** page in the **Configurator**.



System Info: *Network*: *IPConfig*

The currently selected LAN connection appears as "eth0 (Lan)". The other entries in the display show other LAN connections and the assigned IP addresses.

2. To activate another LAN connection, you need to select it on the **Network**: **LAN** menu page. Click on the **Change** button. Select an entry for which a **MAC address** is displayed. Confirm with **Apply**.

Power Failure

In the event of a power failure, all configuration data, messages as well as account data are preserved. However, configuration changes or data sets changed just before the power failure may be lost.

Note, that a respective BIOS settings may prevent the PC system from restarting automatically if the power is restored.

Note also, that the Windows operating system checks the hard disks during the system restart. If the disk test programme determines severe errors, the Windows operating system - and thereby the Forum 5500 communications system – will not start without administrative intervention.

Please note: Do not reset the PC system by pulling the plug. Use the “shut down” or “restart” functions of the Windows operating system instead.

Ports and Connectable Devices

Without any additional hardware you can operate the following connections and devices:

- SIP accounts (via an external SIP provider)
- VoIP system phones Forum IPhone 525, Forum IPhone 535, Forum IPhone 512 and Forum IPhone 545
- VoIP system Softphones Forum IPhone PC
- Standard SIP Phones
- DECT over IP base stations
- DECT phones Forum Free 567/577/587, Forum Free 575/565
- Standard DECT GAP phones

It is also possible to directly connect the Forum 5500 communications system to the public telephone network (ISDN S_0 and ISDN S_{2M} ports). This requires to install telephony interface cards in the PC on which the Forum 5500 communications system is operated. If the PC is equipped with the appropriate interface cards, ISDN devices and analogue devices can also be operated on the internal ports (S_0 internal and a/b internal).

For further information on the supported cards please refer to the to the guide entitled “Forum 5500: Installing and Configuring Telephony Interface Cards”. This guide, in PDF format, can be found on the USB flash drive of the Forum 5500 communications system.

a/b Ports

The a/b ports are for operating analogue devices (e. g. fax, modem or analogue telephone). You can use devices for voice or data communication which use DTMF dialling, e.g.:

- analogue telephones,
- G3 fax machines,
- analogue modems,
- external mail systems.

Analogue Telephones
If you are using analogue telephones, we recommend you use phones with DTMF dialling, because the communications system’s advanced features can not be used with pulse dialling

Music on Hold
The Forum 5500 communications system provides a preset internal MoH, for which you can also use your own melody. that you can replace in the **Configurator** of the Web console, in the **System**: **Components** menu**.** Please see the online help for further details.

Voice Mail
If you are using an external voice mail system, it must be able to handle the number of digits used for internal telephone numbers, e. g. five digits, if you have set up the system to use 5-digit internal numbers.

The external voice mail system can be connected to the internal a/b ports or to the internal S_0 ports, but for both types of ports the voice mail system can send messages to system terminals using code procedures:
✱ 6 8 [Terminal] 0 : Message exists for this subscriber
✱ 6 8 [Terminal]: No message exists (without trailing “0”).

Intercom System (for a/b)
When connecting, please observe the following points:

- The intercom system can be connected to any a/b port, but you can only operate one intercom system using Forum 5500.
- In the **Telephony**: **Ports**: **a/b** menu in the Configurator, select **Doorstation 2-wire** as the **Type**.
- You can call the intercom system by using the code procedure ✱ 1 0 2 .
- The intercom system should only be connected by a skilled electrician, because sensor/actor contacts must be connected.

You will find information on installing and configuring the intercom system in the product's user guide.

Forum Gateway 560

The Forum 5500 communications system primarily communicates with internal and external subscribers via VoIP. Even though the network-based and packet-transmitted VoIP is a modern and high-performance technology, in many cases there is also the requirement to employ conventional, line-connected TDM telephony.

Although you can install a series of TDM interface cards on the Forum 5500 server PC, the number of possible TDM connections with such interface cards is limited. In particular, it is not possible to connect a large number of corded TDM terminals via these interface cards.

This is why the Forum 5500 communications system as of release 7 also offers the option of connecting with one or multiple gateways. Forum 5004 / 5008 / 5012 or Forum 550/560 type communications systems are used as Forum Gateways 560 and which function in a special operation mode as a gateway. Forum Gateway 560 hardware facilitates installing up to 12 interface cards which in turn respectively make available numerous ports for TDM terminals or TDM lines. Up to 1000 TDM terminals, for example, can be operated on the Forum 5500 communications system using multiple Forum Gateways 560.

This chapter provides an overview and a quick start for using and configuring Forum Gateways 560 on the Forum 5500 communications system. For a more detailed description, please read the respective in-depth chapters.

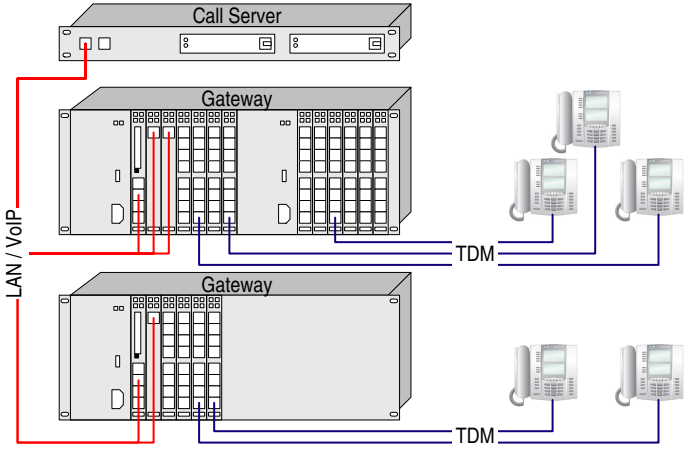
- *Preliminary Information* starting on page 61: describes the Forum Gateway 560 hardware and the scope of delivery.
- *Forum Gateway 560 Installation* starting on page 63: contains safety warnings and describes Forum Gateway 560 installation and mounting.
- *Interfaces and Connectible Terminals* starting on page 78: describes the possible ports, and terminals and lines which can be connected.
- *Forum Gateway 560 Modules* starting on page 89: describes the modules which can be installed in the Forum Gateways 560.
- *DECT Networks* starting on page 174: describes the structure of a multi-area DECT network with DECT base stations which are connected to Forum Gateways 560 via U_{pn} lines.

- *Forum Gateway 560 Connection via PCM-V Connection* starting on page 107: describes the connection of two Forum Gateways 560.

System Architecture

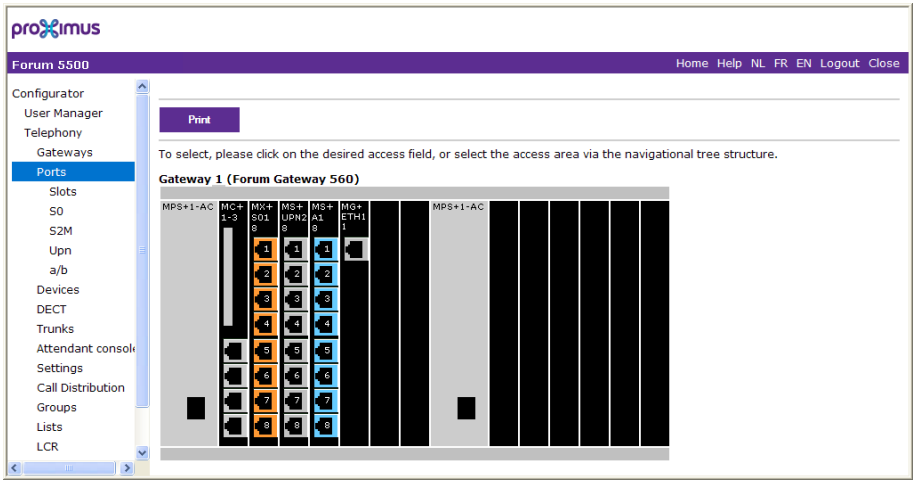
The following graphic shows a server PC where the call-server software of the Forum 5500 communications system is being executed. Two Forum Gateways 560 are connected on this server PC via a network line or via LAN. U_{pn} system telephones, for example, can be connected to each Forum Gateway 560 using interface cards.

This system architecture is also suitable for setting up an IP-based floorplan: in a multi-story building there is one Forum Gateway 560 per floor. The Forum Gateways 560 are connected to the central Forum 5500 communications system via Ethernet lines (LAN).



Forum 5500 call server and two Forum Gateways 560

The Forum Gateways 560 and all telephony functions are controlled by the Forum 5500 communications system. You manage the existing Forum Gateways 560, the interface cards installed in them and the TDM terminals and TDM lines connected to the interface cards using the web configurator of the Forum 5500 communications system.



Configurator: *Telephony*: *Ports*

The Forum 5500 communications system and a Forum Gateway 560 signal to one another via an IP-based protocol. In addition, other IP-based protocols are used, e.g. audio files are transferred via RTP.

The Forum 5500 communications system and all connected Forum Gateways 560 must be operated on a LAN. Lossless data transfer with low latency and 100 Mbit/s is the prerequisite for interference-free telephony. To ensure data transfer you should use suitable network technology, e.g. a switch with QoS, an own VLAN or wiring separate from the company LAN.

Routers can be used to connect the Forum 5500 communications system and the Forum Gateways 560. Using the web interface of the Forum Gateway 560 booter you have to define a fixed IP address and the standard gateway to be used (see *Operating a Forum Gateway 560 via Router* starting on page 56). Please note that due to the speed requirements a connection via internet is not supported.

Overview of Forum Gateway 560 Components

Forum 5004 / 5008 / 5012 or Forum 550 type communications systems are used as Forum Gateways 560 which function in a special operation mode as a Forum Gateway 560. Each Forum Gateway 560 consists of a frame which is equipped with at least one power supply and a central control module Forum 550 Card main processor. Each frame also offers 12 slots for interface cards and an available space for an additional power supply (see also *Forum Gateway 560 Modules* starting on page 89).

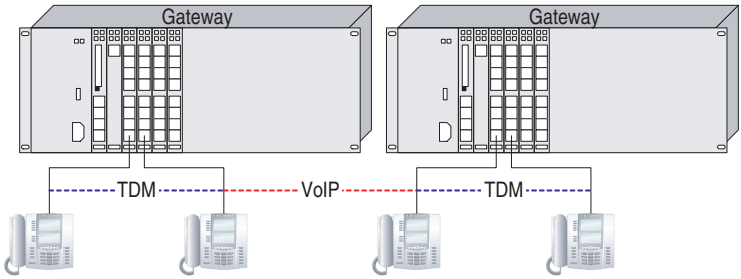
The central control module Forum 550 Card main processor executes the Forum Gateway 560 firmware provided by the Forum 5500 communications system. The central control module contains the following components for operating a frame as a Forum Gateway 560:

- A CompactFlash card with at least 128 Mbytes for saving the Forum Gateway 560 configuration and the Forum Gateway 560 firmware. The CompactFlash card must meet special requirements. This is why you use only the CompactFlash card that comes with the communications system.
- An Ethernet port to connect the Forum Gateway 560 and the Forum 5500 communications system via LAN.
- A PCM interface and a frame configuration switch on the motherboard for connecting 2 Forum Gateways 560 via PCM-V line (see also *Forum Gateway 560 Connection via PCM-V Connection* starting on page 107).
- Two serial ports which are not used for Forum Gateway 560 operation.

Please consult the *Forum Gateway 560 Installation* starting on page 63 chapter on mounting and installing a Forum Gateway 560.

Signalling and MGW Channels

Each Forum Gateway 560 requires at least one Media gateway interface card Forum 550 Media Gateway Card (see also *Forum 550 Media Gateway Card* starting on page 105). This interface card provides 16 VoIP audio channels which are realised as RTP data stream with the G.711 (A-Law) or G.729 codecs. The following applies generally: Each audio connection which leaves the Forum Gateway 560 via a VoIP connection requires a MGW channel.



TDM and VoIP Forum Gateway 560 connections

A MGW channel is seized when an audio connection between VoIP and TDM is to be established. Alongside call connections from VoIP telephones to TDM terminals or TDM lines, this comprises:

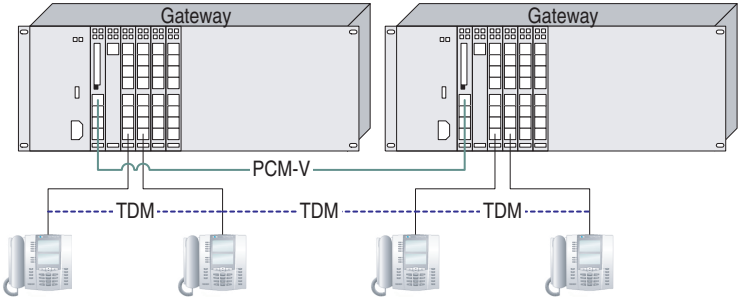
- call connections between 2 TDM terminals connected to different Forum Gateways 560. Exception: Both Forum Gateways 560 are connected via PCM-V line.
- Music on Hold: generated as VoIP data stream by the Forum 5500 communications system.
- Forum Voicemail and Forum Auto Attendant: Recording and playing as VoIP data stream via the Forum 5500 communications system.
- Audio tones such as ringing tone, busy signal, dialling tone, etc. are generated as VoIP data stream by the Forum 5500 communications system.

Seizure of MGW channels is (inasmuch as possible) optimised by the Forum 5500 communications system. Example: A call connection between an external TDM line and a TDM terminal on the same Forum Gateway 560 does not seize a MGW channel. This is additionally supported by a line selection which prioritises according to terminal type when seizing a bundle. This means that TDM terminals preferably seize external TDM lines on the same

Forum Gateway 560, while VoIP terminals preferably seize lines via interface cards on the PC of the Forum 5500 communications system.

Note: TDM terminals on the same Forum Gateway 560 do not seize a MGW channel during call mode, however, the terminals do briefly seize a MGW channel for the dial tones while establishing the call connection.

The number of required Media gateway interface cards Forum 550 Media Gateway Card depends on the possible call load at peak times and on the number of TDM terminals and TDM lines connected to the Forum Gateway 560.



TDM connections with connected Forum Gateways 560

One way of optimising the number of required Media gateway interface cards is connecting Forum Gateways 560 (see *Forum Gateway 560 Connection via PCM-V Connection* starting on page 107). This means that MWG channels on the MGW card of the connected Forum Gateway 560 can be seized. In addition, TDM calls between Forum Gateways 560 do not seize a MGW channel. Because the maximal length of a PCM-V cable must not exceed 50 cm, connecting Forum Gateways 560 cannot be used with a floorplan (see above).

ISDN/DECT Synchronisation

The IP-based connection between the Forum 5500 communications system and a Forum Gateway 560 does not allow transmission of a TDM synchronisation signal. The TDM synchronisation signal is, however, generally necessary for operating DECT base stations (TDM RFPs). This means that all

DECT base stations connected via U_{pn} have to be connected to the same Forum Gateway 560.

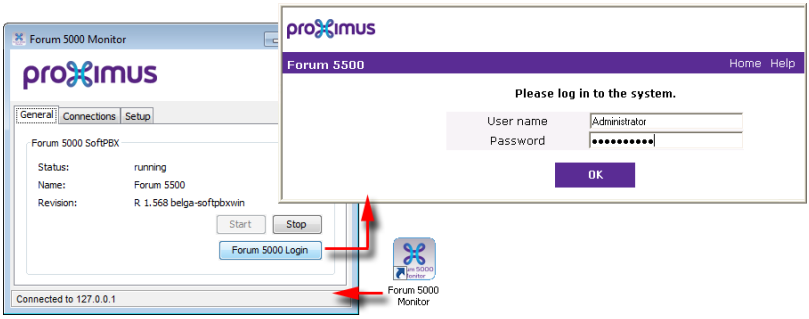
No ISDN data connections can be transmitted using IP-based network protocols either. If you wish to use ISDN data services (e.g. data transmission using an ISDN card) both the external S_0 or S_{2m} trunk line as well as the ISDN terminal have to be connected to the same Forum Gateway 560.

First-time Commissioning

If you wish to operate an existing Forum 550/560 communications system as a Forum Gateway 560, you have to update the existing system software to release 9 or higher. The booter ("Bootloader") is updated with the system software. The booter version must be up-to-date for operation as a Forum Gateway 560.

Note: A 256 MByte CompactFlash card is required to update system software.

After completing installation of the Forum 5500 communications system, configure the installed Forum Gateways 560 and interface cards as well as the available ports. The following offers configuration steps - the short version. Please consult the online help for details on respective configuration steps.



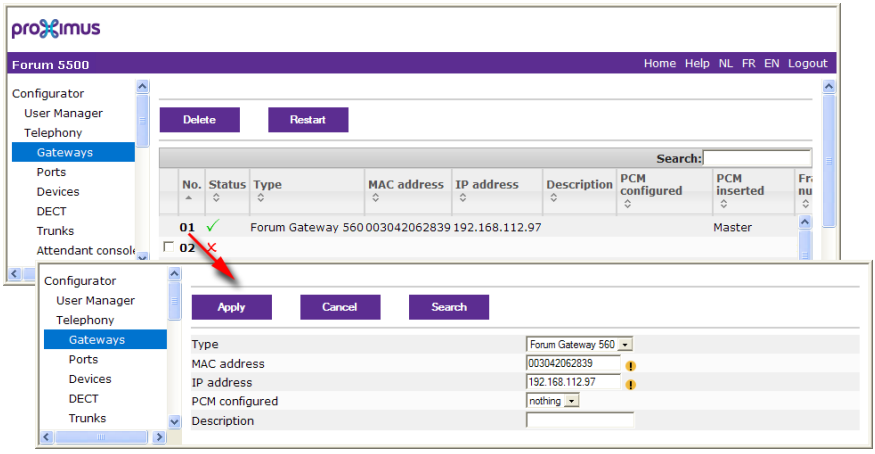
Forum 5500: Open web console

1. Log on to the PC where you installed the Forum 5500 communications system. Double-click on the **Forum 5000 Monitor** icon. The **Forum 5000 Monitor** program starts.

2. Click on the **Forum 5000 Login** button to open a web browser with the "http://127.0.0.1/" URL. The log-in dialogue for the web console of the Forum 5500 communications system appears in the web browser. For first-time commissioning enter "Administrator" for the **User name** and leave the **Password** blank.

Note: The first-time access dialogue opens for first-time commissioning. For security reasons you should set up a new administrator password in this dialogue!

3. A licence is required to operate Forum Gateways 560. The authorisation key for the licence contains the number of configurable Forum Gateways 560. To do so, open the **Configurator**. Go to the **System**: **Licences** menu. Enter the authorisation key generated.
4. Go to the **Telephony**: **Gateways** menu. The status page provides available configuration entries which you can assign to gateways as you please.

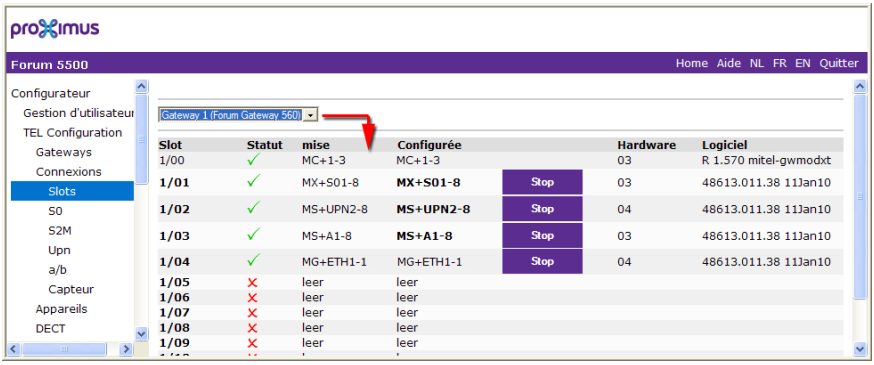


Configurator: *Telephony*: *Gateways*

Click on one of the available entries. Select the gateway's **Type** ("Forum Gateway 560"). Enter the **MAC address** and the **IP address** of the Forum Gateway 560. This information must correspond to the information on the type plate of the central control module Forum 550 Card main processor. If you are operating a gateway connection using a PCM-V line, you have to configure the connected Forum Gateway 560 under **PCM configured** (see *Forum Gateway 560 Connection via PCM-V Connection* starting on page 107). Confirm your entries with **Apply**.

Note: A static DHCP entry is configured for the Forum Gateway 560 on the Forum 5500 communications system for the entered combination of IP address and MAC address. If you have not configured a fixed IP address with the web interface of the gateway booter, in order for the Forum Gateway 560 to function correctly the **Status** setting has to be configured to **Static address assignment** or **Dynamic and static address assignment** on the **Network**: **DHCP** page.

5. After you have configured the Forum Gateways 560, go to the **Telephony**: **Ports**: **Slots** menu. For each Forum Gateway 560 configured the status page shows a table of the available slots.



Configurator: *Telephony*: *Ports*: *Slots*

Configure the 12 existing slots in correspondence with the interface cards installed in the Forum Gateways 560.

After you have configured the interface cards, configure the ports on the cards in the **Telephony**: **Ports**: **S0** / **S2M** / **Upn** / **a/b** menus. Configure the terminals and lines connected to these ports. For further information please consult the online help as well as the “Forum 5500: Commissioning and Maintenance” manual.

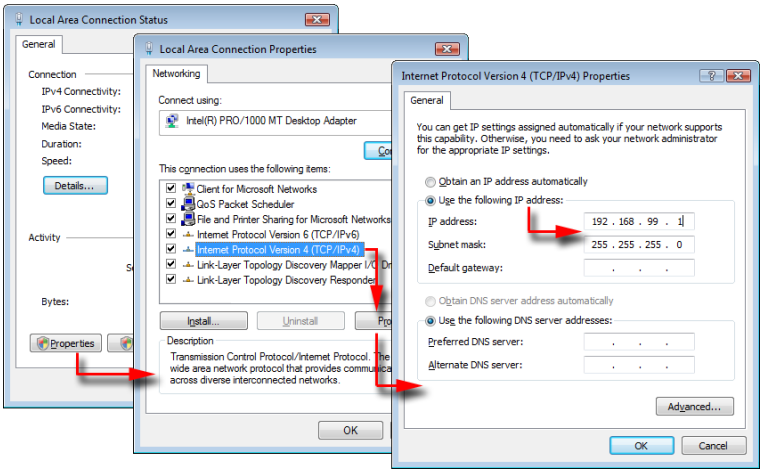
Operating a Forum Gateway 560 via Router

If the connection between Forum Gateway 560 and Forum 5500 communications system is via a router, automatic configuration via DHCP is not possible. This is why you have to manually switch the Forum Gateway 560 to the gateway operation mode for the first-time commissioning. This switch is done on the web interface of the booter. After starting the Forum Gateway 560, the web interface of the booter can be addressed under the fixed IP addresses 192.168.99.254 (PCM master) or 192.168.99.252 (PCM slave).

1. Ensure that each central control module is equipped with a CompactFlash card with a minimum of 256 Mb.
2. If you wish to configure multiple Forum Gateways 560, avoid an IP address conflict as all Forum Gateways 560 can be addressed under the same IP address shortly after starting. The following approaches are conceivable:

   – Single port: Using an Ethernet line, establish a direct connection between the PC Ethernet port and the Forum Gateway 560 Ethernet port. This avoids potential address conflicts.

   – Connection via switch/company LAN: The PC and a Forum Gateway 560 can also be indirectly connected via a switch or to the company LAN. Only switch on the respective Forum Gateway 560 you wish to configure.
3. In order to be able to start the web interface of the booter with a PC browser, the PC requires a suitable IP address configuration. Under Windows you have to log on as administrator and execute the following steps.



– Open the **Control Panel** and navigate to the **Network and Sharing Center**. Click on the **View Status** button next to the active LAN connection entry (e.g. “Local Area Connection”).

– Click on the **Properties** button in the **Local Area Connection Status** dialogue. Confirm the user account control query with **Continue**.

– Click on the **Internet Protocol Version 4 (TCP/IPv4)** element in the **Local Area Connection Status** dialogue. Click on the **Properties** button.

– Make a note of the settings in the **Internet Protocol Version 4 (TCP/IPv4) Properties** dialogue to be able to restore these later on. Activate the **Use the following IP address** option. In the **IP address** input field enter: “192.168.99.1”. In the **Subnet mask** input field enter: “255.255.255.0”. Confirm your entries with **OK**.

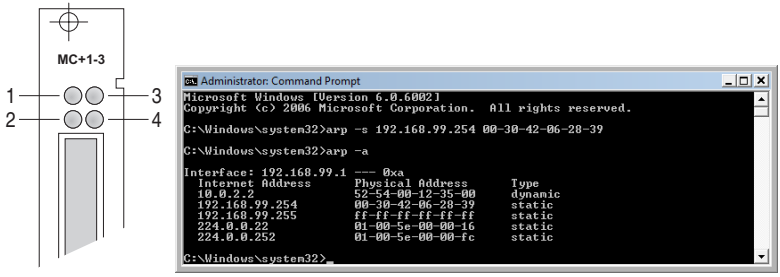
Tip: When restoring the original IP address configuration you have to restore the **Obtain DNS server address automatically** option as well.

4. Start up a browser on the PC. Enter an address into the address field of the browser *without* confirming entry. The address is determined by the frame coding of the Forum Gateway 560:

   PCM master frame coding: http://192.168.99.254/boot.asp
   PCM slave frame coding: http://192.168.99.252/boot.asp

   A single Forum Gateway 560 without PCM-V connection is always a “PCM master”.

5. Activate the power supply for the Forum Gateway 560. Wait 30 seconds until the LED 2 of the central control module Forum 550 Card main processor blinks green and yellow alternatingly. Now confirm the entry in the browser address field to call the web interface of the booter.



Forum 550 Card main processor: *LEDs and display of "arp" in the entry prompt*

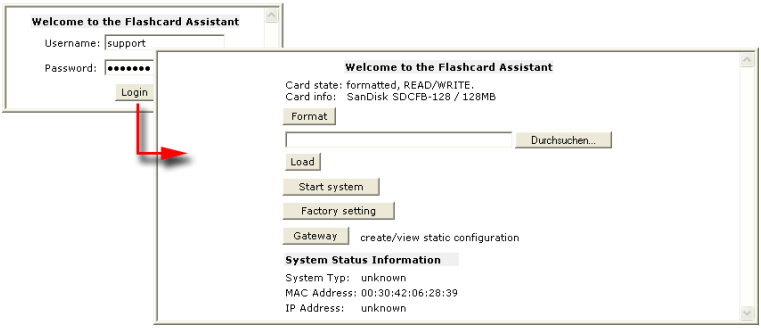
If you are not using a direct connection between the PC and the Forum Gateway 560 there may be an address conflict. You have just configured a Forum Gateway 560 under the IP address 192.168.254, e.g., and soon want to configure a second Forum Gateway 560 under the same IP address. The ARP cache for assigning MAC addresses to IP addresses on your PC prevents you from reaching the second Forum Gateway 560. In this case you have to delete the ARP clipboard. You can wait awhile; you can briefly separate the line with some Ethernet cards or you can enter a delete command. Alternatively you can also assign the desired MAC address statically.

To do so, right-click with the mouse in the Windows Start menu on the entry **All Programs**: **Accessories**: **Command Prompt**. Select the **Run as Administrator** context command. Confirm the query of the user account control with **Next** to open the entry prompt window (see screen shot on the previous paragraph). Read the MAC address off the type label of the central control module Forum 550 Card main processor. You can statically assign the MAC address written separated by dashes using the following command:

arp -s 192.168.99.254 xx-xx-xx-xx-xx-xx

Under "http://192.168.99.254/home.asp" you now always reach the Forum Gateway 560 designated by the MAC address. This assignment remains valid until the PC is re-started. Assignments which are current have "arp -a" displayed. Enter "arp -d *" to delete all assignments.

Tip: Start the “ping -t 192.168.99.254” command in a second entry prompt to be continually informed about the accessibility of this IP address.

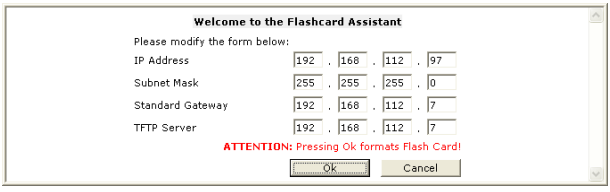


Forum Gateway 560: *Web interface of the booter*

6. The browser now shows the log-on page for the English version of the web interface of the booter. Enter “support” under **Username** and enter “support” as well under **Password**. Click on **Login**.

   The welcome page displays information on the CompactFlash card inserted and system information also. If needed, compare the MAC address displayed with the MAC address on the type label of the central control module Forum 550 Card main processor. If a CompactFlash card is not detected, you have to eliminate this situation before you can continue. In this case, contact support.

Note: The **Gateway** button has to appear on the welcome page. If there is no **Gateway** button displayed, the booter version installed is out of date. In this case, you have to install an update for the booter (see *First-time Commissioning* starting on page 53).



Web interface of the booter: *Gateway settings*

7. Click on the **Gateway** button to configure the gateway operation mode with statistical addresses. Enter the desired authorisation key:

   – **IP Address** and **Subnet Mask**: Enter the IP address and net mask which the Forum Gateway 560 is to use on the LAN.

   – **Standard Gateway**: Enter the IP address of the router which is used to reach the call server.

   – **TFTP Server**: Enter the IP address of the Forum 5500 communications system.

Note: Static address configuration is required for connecting a Forum Gateway 560 via a router or if no configuration via DHCP is possible.

8. Confirm your entries with **OK**. This formats the CompactFlash card and then writes a configuration file onto the card. This process takes a few seconds. Then the welcome page appears again. Click on the **Start system** button.

The Forum Gateway 560 starts. It uses the configured IP addresses to load new firmware and the Forum 5500 communications system configuration. Then you can restore the original IP configuration of the PC (see step 3 on page 56). Further Forum Gateway 560 configuration is done on the web interface of the Forum 5500 communications system (see *First-time Commissioning* starting on page 53).

Resetting to DHCP

You can simply format the CompactFlash card and re-start the Forum Gateway 560 if the Forum Gateway 560 is operated on the same network as the Forum 5500 communications system. The Forum Gateway 560 configuration comes via DHCP in this case.

Preliminary Information

Construction of a Forum Gateway 560

A gateway of the Forum Gateway 560 type is designed to be used in 19" rack systems. A Forum Gateway 560 comprises the following:

- A 19" mounting frame for the modules. In a fully configured system, the following modules will have been installed (and all slots will be occupied): 2 power supply units, 1 control module, 12 interface cards. The interface cards provide the system ports. The 19" frame of a Forum Gateway 560 is also referred to as the 1-12 frame (signifying the number of slots for interface cards).
- A backplane. The backplane provides the sockets for the control module and the interface cards; it supplies the modules/cards with the required power and system signals.

A Forum Gateway 560 comes fully assembled. By contrast with other systems, you will not need to assemble the frame and backplane yourself.

A power supply unit and the central control module are built into the frame before delivery. Interface cards must be installed separately.

Please note: Interface cards may be installed by qualified personnel only!

For further information on installing modules/cards, please refer to *Installation in a 19" Rack* starting on page 67 and *Installing Modules* starting on page 68.

Scope of Delivery

A Forum Gateway 560's scope of delivery comprises:

- 1 19" frame (1-12 frame) with slots for 1 control module and up to 2 power supply units and 12 interface cards

  The basic configuration of a 19" frame includes the following components:

  – 1 BPV+1-12 backplane

  – 1 Forum 550 Power Supply unit

  – 1 mains cable for connection to the mains supply

  – 1 control module Forum 550 Card main processor

  – 1 Compact Flash Card;
  the configuration and firmware of the gateway are stored on this card
- 1 set of mounting brackets and screws for installing the frame in a 19" rack
- 1 set of dummy covers for covering unused slots

Forum Gateway 560 Installation

Safety Precautions

The CE symbol on the product confirms that it meets the requirements of the technical guidelines on user safety and electromagnetic compatibility valid at the time of approval.

General Instructions

Please note: A Forum Gateway 560 may be installed and serviced by qualified personnel only. Opening the housing and carrying out unauthorised repairs may damage a Forum Gateway 560 and will invalidate the warranty.

DANGER! **Hazardous voltages inside the device!**

The Forum 550 Power Supply unit may not be opened as this may lead to exposure to hazardous voltage!

Defective power supply units must be sent to the manufacturer for repairs.

Always use the original packaging when packing Forum Gateway 560 components for transport or storage.

CAUTION!

Static charge can damage a Forum Gateway 560. Before and during work on the electrical components of a Forum Gateway 560, discharge any static electricity from your body and the tools you are using.

Notes on the Mains Supply

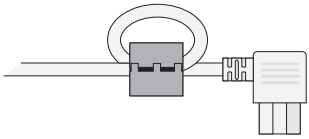
A Forum Gateway 560 may be connected only to mains sockets with a protective earth conductor.

Install a Forum Gateway 560 only near easily accessible, wall-mounted mains sockets.

Always use a dedicated circuit with 10 A protection to supply the 19" frame (1-12 frame).

If a Forum Gateway 560 is being powered by two Forum 550 Power Supply units, each of the two units must be plugged into its own mains socket. **It is not permissible** to use **multiway mains strips** to connect more than one power supply unit of a Forum Gateway 560 or a Forum Gateway 560 and other devices to the same mains supply together.

The mains cables of the Forum 550 Power Supply units must have ferrite rings fitted. The mains cables are factory-fitted with ferrite rings.



Mains cable with ferrite ring

Install an overvoltage protection device.

Notes on EMC and Earthing

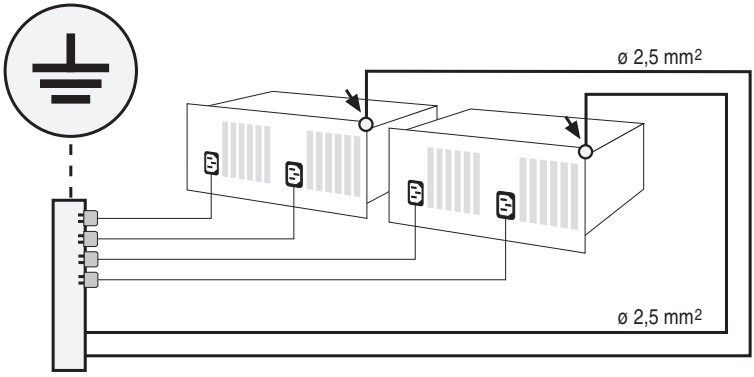
Please note: MOS modules:

Observe the regulations regarding modules and packaging carrying the MOS trademark!

Use earthing wrist straps connected to the appropriate points on the frame (see C in the illustration *Forum Gateway 560*: *1-12 frame mounting points* on page 67).

The mains socket's protective earth conductor and the telephone earth line must be connected to one reference point for potential equalisation. This is normally the Forum Gateway 560 housing.

Earthing and Potential
For the purpose of potential equalisation, all conductive parts of a Forum Gateway 560 must be connected to the protective earth conductor (earth bus-bar of the building's wiring system) by means of a solid or stranded wire of at least 2,5 mm^2 (yellow/green).



Forum Gateway 560: *Earthing arrangement*

The metal screens of the subscriber and trunk cables must be connected to the circuit common in the distributor or the patch field. The protective earth conductor of the 230 V mains cables is connected to the circuit common and the telephone earth line.

All metal parts of a Forum Gateway 560 are mechanically and thus electrically coupled in order to provide protection through the protective earth conductor and the telephone earth line.

Notes on Installing a Forum Gateway 560

Do not allow any fluid to enter a Forum Gateway 560 as this may cause electric shocks or short circuits.

Do not install a Forum Gateway 560 during a thunderstorm. Do not connect or disconnect any cables during a thunderstorm.

A Forum Gateway 560 is designed for indoor use only. Route the cables in such a way that they cannot be stepped on or tripped over.

Modules of a Forum Gateway 560 must be securely screwed into the frame when installation work on the system is interrupted or terminated. Unused slots must be covered with dummy covers (included in the scope of delivery).

Notes on Installing Terminals

Only devices that supply safety extra-low voltage (SELV) may be connected to a Forum Gateway 560. Proper use of standard terminals will satisfy this requirement.

The analogue interfaces may only be used to connect terminals that meet the appropriate technical requirements. For details, refer to *a/b Ports* starting on page 85.

Use a shielded Ethernet cable (STP cable, Shielded Twisted Pair cable) to connect a Forum Gateway 560 to a Local Area Network (LAN).

Installation, Ambient Conditions

The ambient temperature for operating a Forum Gateway 560 must be between +5 °C and +40 °C.

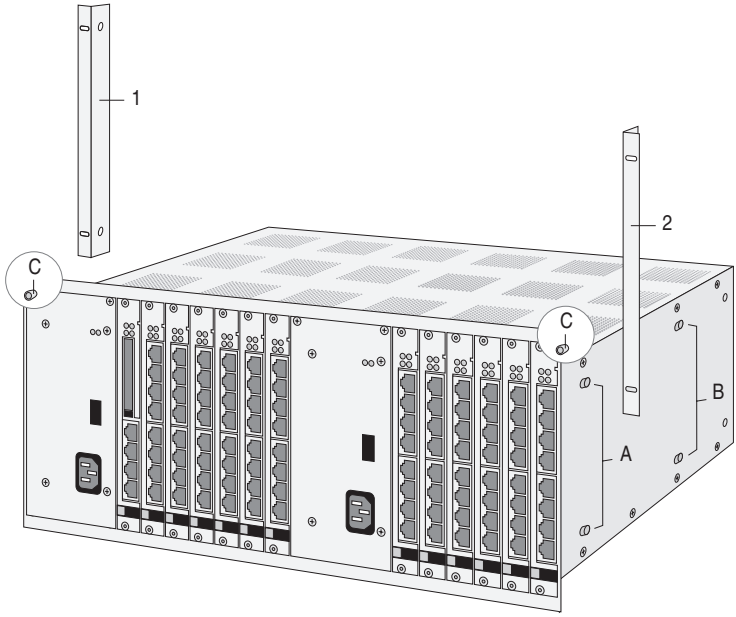
To maintain a safe ambient temperature, install a Forum Gateway 560 in a properly ventilated location, away from sources of direct heat.

Mount a Forum Gateway 560:

- not in front of or above heat sources such as radiators,
- not in direct sunlight,
- not behind curtains,
- not in small, unventilated, damp rooms,
- not near flammable materials,
- nor near high-frequency devices such as transmitter and radiotherapy or similar apparatus.

If a Forum Gateway 560 is to be installed together with other electronic equipment in a 19” cabinet, ensure that the air intake temperature for the Forum Gateway 560 does not exceed +40 °C.

Installation in a 19" Rack



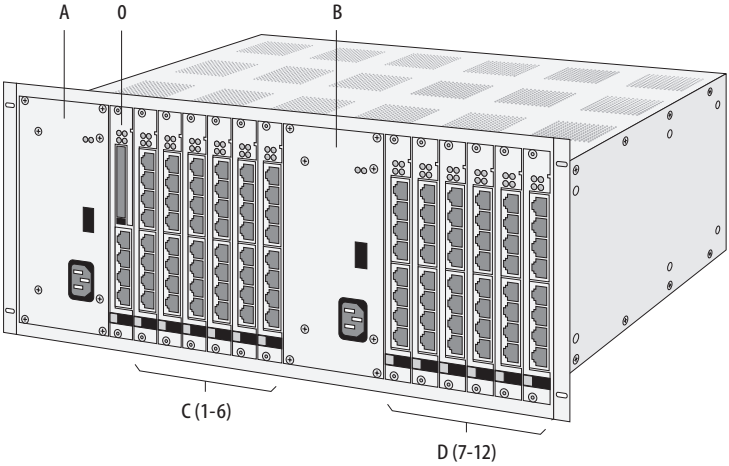
Forum Gateway 560: 1-12 frame mounting points

A Forum Gateway 560 is designed to be installed in 19" racks only.

The following mounting points for installation in a 19" rack can be found on the 1-12 frame:

1	Left mounting bracket
2	Right mounting bracket
A	Mounting bracket screw bolts for front mounting (approx. 132 mm) to the uprights of the 19" rack
B	Mounting bracket screw bolts for mid-mounting (approx. 400 mm) to the uprights of the 19" rack
C	Left and right screw points for earthing wrist strap or circuit common connection between 1-12 frame and 19" rack

Installing Modules



Forum Gateway 560: 1-12 frame slots

Slots

A Forum Gateway 560 1-12 frame can house up to:

- 2 power supply units
- 1 control module
- 12 interface cards (trunk or subscriber modules) split into 2 separate groups.

The following slots are provided for installing these modules:

Legend

A	Slot for group 1 power supply unit
B	Slot for group 2 power supply unit
0	Slot for central control module
C	Slots for group 1 interface cards (slots 1 - 6)
D	Slots for group 2 interface cards (slots 7 - 12)

Each of the two groups (1 or 2, or C and D, respectively, in the illustration) requires its own power supply unit. Power for the control module is always

supplied by the group 1 power supply unit. The group 1 power supply unit must therefore always be installed.

Modules can be installed either when the entire system is configured or as an upgrade at a later time.

Notes on Disconnecting the Mains Supply

DANGER! **Hazardous voltages inside the device!**

A Forum Gateway 560 *must* be disconnected from the mains supply for the following installation work:

- Installation of the central control module
- Installation of a power supply unit

If a 1-12 frame is being powered by two power supply units, it is de-energised by unplugging *both* mains cables.

DANGER! **Always unplug the mains cables of both power supply units when installing the central control module or a power supply unit.**

If you unplug the mains cable of the group 2 (B) power supply unit, the Forum Gateway 560 will still be operational! However, only the modules supplied by the group 1 (A) power supply unit, i.e. the central control module and the interface cards in slots 1 - 6, will be functional.

If you unplug the mains cable of the group 1 (A) power supply unit, the Forum Gateway 560 ceases to be operational. However, slots 7 - 12 (D) will still be supplied with operating voltage. (Refer to the illustration *Forum Gateway 560*: *1-12 frame slots* on page 68 to determine the location of the modules specified in parentheses above.)

The LEDs of each module indicate whether the respective module is operational. For further information on LED indicators, refer to *Forum Gateway 560 Modules* starting on page 89.

Installing the Central Control Module

A Forum Gateway 560 comes with the central control module installed. Should you need to exchange the central control module, proceed as follows:

DANGER! Hazardous voltages inside the device!

1. Unplug all of the mains cables of the Forum Gateway 560 to disconnect the device from the mains supply.

   The central control module must not be installed if the Forum Gateway 560 is switched on! Refer to *Notes on Disconnecting the Mains Supply* starting on page 69.
2. Remove the screws with which the central control module is secured in the 1-12 frame and pull the module out.
3. Unpack the central control module.

CAUTION!

Static charge can damage electronic devices. Observe the regulations regarding electrostatically sensitive components.

4. Carefully push the central control module into slot 0 (see also the illustration *Forum Gateway 560*: *1-12 frame slots* on page 68). The printing on the front of the module should be at the top.

   Ensure that the backplane plug of the central control module is securely plugged into the socket on the backplane.
5. Refit the screws to secure the module in the 1-12 frame.
6. Plug the desired cables into the corresponding RJ45 sockets on the central control module. Refer to *Forum Gateway 560 Modules* starting on page 89 for information on pin assignment.
7. Switch the Forum Gateway 560 on again. To do so, reconnect the group 1 power supply unit (see A in the illustration *Forum Gateway 560*: *1-12 frame slots* on page 68) with the mains supply (if you are powering a

Forum Gateway 560 with two power supply units, reconnect the second unit as well).

The Forum Gateway 560 will now start up and all modules (interface cards) will be re-initialised.

8. Observe the module LEDs during start-up of the Forum Gateway 560. Information on indicators can be found in *Forum Gateway 560 Modules* starting on page 89.

Note: The MAC address for the Forum Gateway 560 is assigned by the central control module and cannot be changed. If the central control module has to be exchanged, you may need to change the IP settings. For further information on MAC addresses, refer to the online help.

Installing Interface Cards

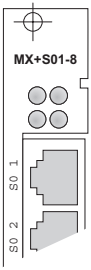
Interface cards can be installed or exchanged with the system powered up ("hot-plugging"). Proceed as follows:

1. If you want to exchange an interface card, the slot for this card needs to be deactivated first.

   Open the **Telephony: Ports: Slots** page in the **Configurator**. In the table row listing the card to be exchanged, click on **Stop**. The system then deactivates the slot. Any connections (telephone calls, data transfers) established through this card will be terminated. The LEDs of the deactivated are blinking red.

2. Remove the screws with which the interface card is secured in the 1-12 frame and pull the card out.

3. Unpack the interface card and check whether it is the desired type. The type designation is printed on the front of the card.



Detail: *Printing on the front of an "Forum 550 Card 8 S0/T0" type interface card*

CAUTION!

Static charge can damage electronic devices. Observe the regulations regarding electrostatically sensitive components.

4. Carefully push the interface card into the corresponding slot. The printing on the front of the module should be at the top (see illustration in previous instruction).

   Ensure that the backplane plug of the interface card is securely plugged into the socket on the backplane.
5. Refit the screws to secure the interface card in the 1-12 frame.
6. Plug the desired cables into the corresponding RJ45 sockets on the interface card. Refer to *Forum Gateway 560 Modules* starting on page 89 for information on the pin assignment for each interface card.
7. Cover any unused slots with dummy covers (included in the scope of delivery).

   The dummy covers must be securely screwed to the frame!
8. If you have exchanged the interface card, you will need to reactivate the slot for this card.

   Open the **Telephony: Ports: Slots** page in the **Configurator** again. In the table row listing the card that has been exchanged, click on **Start**.

9. Observe the LEDs on the card. Information on indicators can be found in the chapter *Forum Gateway 560 Modules* starting on page 89.

Checking the Status of the Interface Cards via the Web Console
You can also check the status of the *interface cards* via the Web console.

1. Open the **Telephony: Ports: Slots** page in the **Configurator**.
2. In the **Status** table row, check whether a green tick is displayed for the newly installed interface card. The tick indicates that the interface card is operational.

Installing a Power Supply Unit

Depending on the number of installed modules (interface cards), either one or two power supplies are required (see A and B in the illustration *Forum Gateway 560*: *1-12 frame slots* on page 68):

- The power supply unit for group 1 (A) must always be installed. It supplies the central control module and the interface cards in slots 1 - 6.
- The power supply unit for group 2 (B) is required if interface cards are to be installed in slots 7 - 12.

If you want to deinstall the second power supply unit or exchange a defective one, proceed as follows:

DANGER! Hazardous voltages inside the device!

1. Unplug all of the mains cables of the Forum Gateway 560 to disconnect the device from the mains supply.

   Power supply units must not be installed if the Forum Gateway 560 is switched on! Refer to *Notes on Disconnecting the Mains Supply* starting on page 69.
2. Unpack the power supply unit.

CAUTION!

Static charge can damage electronic devices. Observe the regulations regarding electrostatically sensitive components.

3. Carefully push the power supply unit into the corresponding slot (see also the illustration *Forum Gateway 560: 1-12 frame slots* on page 68). Seen from the front, the mains inlet socket should be on the bottom right.

   Ensure that the backplane plug of the power supply unit is securely plugged into the socket on the backplane.
4. Refit the screws to secure the power supply in the 1-12 frame.
5. Install further interface cards if required (see also *Installing Interface Cards* starting on page 71).
6. Switch the Forum Gateway 560 on. To do so, reconnect the power supply unit with the mains supply (if you are powering the system with two power supply units, connect the second unit as well).

   The Forum Gateway 560 will now start up and all modules (interface cards) will be re-initialised.
7. Observe the module LEDs during start-up of the Forum Gateway 560. Information on indicators can be found in the chapter *Forum Gateway 560 Modules* starting on page 89.

Backplane

The BPV+1-12 backplane of a Forum Gateway 560 supplies the modules installed in the 1-12 frame with the required power and system signals. The backplane is also used to provide access to the PCM highway (for transmitting utility data), the LAN (for exchanging signalling data) and to the system clock circuits.

The backplane has vertically arranged sockets for the backplane plugs of the modules:

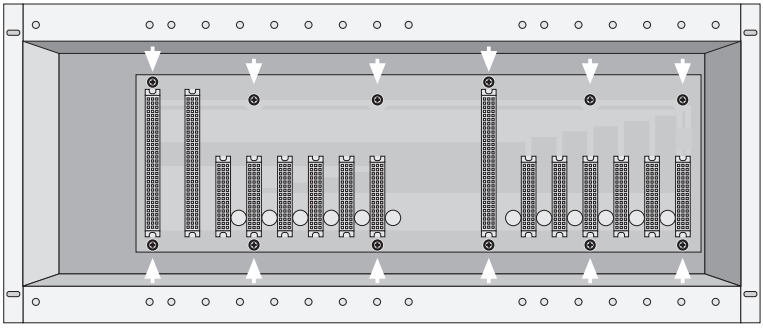
- The Forum 550 Power Supply units and the Forum 550 Card main processor central control module are each connected by means of a 96-pin spring contact strip.
- The interface modules are each connected by means of a 48-pin spring contact strip.

Should you need to exchange the backplane, proceed as follows:

DANGER! Hazardous voltages inside the device!

1. Unplug all of the mains cables of the Forum Gateway 560 to disconnect the device from the mains supply.

   Refer to *Notes on Disconnecting the Mains Supply* starting on page 69.
2. Uninstall all modules and power supply units from the 1-12 frame (see *Installing Modules* starting on page 68).
3. Remove the screws on the backplane (see arrows in the illustration *Backplane screws*). Carefully remove the backplane from the 1-12 frame, pulling it out of the frame towards the front.



Backplane screws

4. From the front, insert the new backplane into the 1-12 frame. Insert and tighten the screws to secure the backplane in the 1-12 frame.
5. Reinstall the modules in the designated slots.
6. Cover any unused slots with dummy covers (included in the scope of delivery).

   The dummy covers must be securely screwed to the frame!

7. Switch the Forum Gateway 560 on again. To do so, reconnect the power supply unit with the mains supply (if you are powering the system with two power supply units, connect the second unit as well).
8. Observe the module LEDs during start-up of the Forum Gateway 560. Information on indicators can be found *Forum Gateway 560 Modules* starting on page 89.

Uninterruptible Power Supply

If you are using uninterruptible power supplies (UPS), you must provide a separate UPS either for the power supply of each frame (cascaded PBXs, see *Forum Gateway 560 Connection via PCM-V Connection* starting on page 107) or for the power supply of both frames. If one UPS is used for both frames, it must be earthed separately.

The total leakage current must not exceed 3.5 mA per mains socket. Use the leakage current specified by the UPS manufacturer as a reference.

An Forum 550 Power Supply unit has a leakage current of < 0.5 mA.

A 900-watt UPS is entirely sufficient to power a Forum Gateway 560 (this also applies to a Forum Gateway 560 connection).

Power Failure

With multi-terminal access configurations, the Forum Gateway 560 provides an emergency service feature: In the event of a power failure, the $S_0$1 interface will be switched to the $S_0$8 interface, enabling you to make calls through a connected terminal.

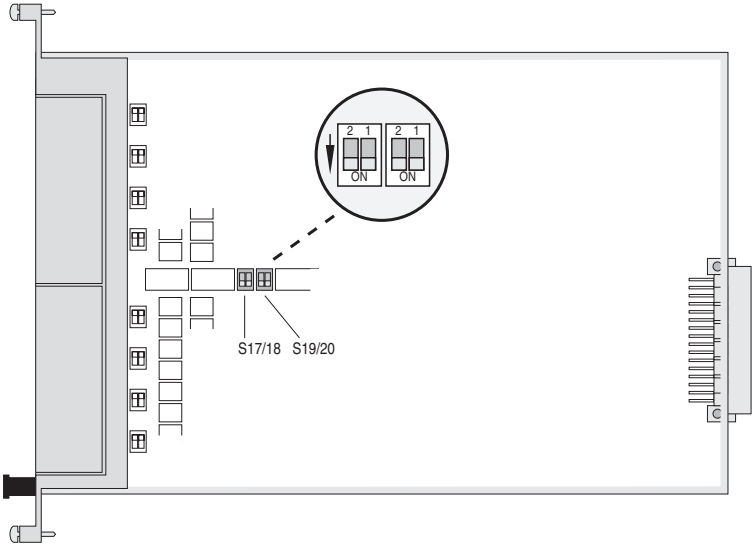
The following is required to enable emergency service:

- An Forum 550 Card 8 S0/T0 interface card must be installed.
- The power failure circuit of this interface card must be activated. To do so, set DIP switches S17 to S20 to “ON”. The interface card is delivered with the power failure circuit deactivated (default: off).
- Port $S_0$1 must be connected to an NTBA (multi-terminal access) and configured as an external connection.
- Port $S_0$8 must be configured as an internal connection. An ISDN telephone with emergency service capability must be connected to this port.

Note: Emergency service is not possible with system access configurations.

Testing the Power Failure Circuit
You can test the configuration as follows:

1. Disconnect the Forum Gateway 560 from the mains supply (see instructions in *Installing the Central Control Module* starting on page 70, steps 1 to 3).
2. Disconnect the NTBA from the mains supply.
3. It should now be possible to make external calls through the ISDN telephone connected to port $S_0$8.



Forum 550 Card 8 S0/T0: Location of the DIP switches for the power failure circuit

Interfaces and Connectible Terminals

The interfaces of a Forum Gateway 560 have been implemented as RJ45 sockets on the front of the interface cards and the central control module. No special proprietary cables are required. Patch panels can be connected by means of standard patch cables.

For technical information on the interfaces, refer to *Forum Gateway 560 Modules* starting on page 89.

Interface	Card	Properties	Page
S_0	Forum 550 Card 8 S0/T0	8 S_0 interfaces for either external or internal connections	99
S_{2M}	Forum 550 Card PRA	1 S_{2M} interface for connecting to digital networks (primary multiplex connections) or for cascading two PBXs	96
$U_{pn}2$	Forum 550 Card 8 digital extensions	8 U_{pn} interfaces, U_{pn} interfaces are DECT-capable ("$U_{pn}2$ interfaces")	101
a/b	Forum 550 Card 8 analogue extensions	8 a/b interfaces	103
LAN	Forum 550 Card main processor	1 Ethernet port (10/100 Mbits/s) (on central control module)	93

The following terminals and systems can be connected to the interfaces of a Forum Gateway 560:

Overview: Interfaces and Connectible Terminals

Interface	Terminals/Systems	Page
S_0 (internal)	ISDN terminals (DSS1 protocol): telephones, fax machines, base stations and handsets, ISDN cards for PCs	79
U_{pn}	Digital terminals (system telephones)	83
$U_{pn}2$	Digital terminals (system telephones and DECT base stations)	83

Overview: Interfaces and Connectible Terminals

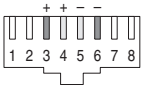
Interface	Terminals/Systems	Page
a/b	Analogue terminals: telephones, G3 fax machines, (external or internal) modems, external music-on-hold devices, external voice mail systems, external intercom systems	85
LAN	Connection to a LAN (local area network)	88
	Connection of VoIP terminals	131

S_0 Ports

All of the eight S_0 interfaces on the Forum 550 Card 8 S0/T0 interface card are switchable, i.e. they can be used either for external connections (ISDN basic access or a second PBX) or for internal connections (ISDN terminals). It is not possible to use these interfaces simultaneously for both types of connections.

The S_0 ports have been implemented as RJ45 sockets.

Pin Assignment



S_0 interface pin assignment

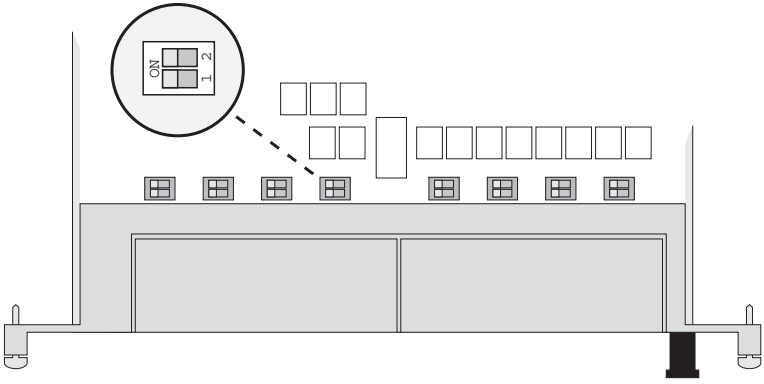
The following table explains the S_0 interface pin assignment.

Pin Number	Assignment
1	Not used
2	Not used
3	Send +
4	Receive +
5	Receive -
6	Send -

Pin Number	Assignment
7	Not used
8	Not used

Termination

Each interface card has 16 DIP switches (S1 to S16, two per S_0 interface). The DIP switches activate the required terminating resistors for the S_0 buses (100 ohms per S_0 bus). In the default setting, all terminating resistors are activated (Default: on).

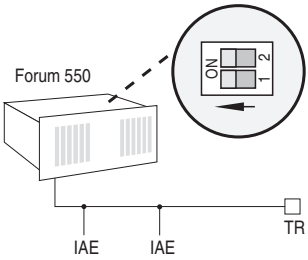


Forum 550 Card 8 S0/T0: Location of DIP switches S1 to S16

Note: The following configuration information applies to external as well as internal S_0 interfaces.

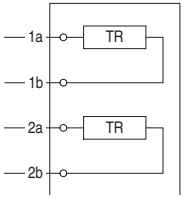
Bus Configuration: Forum Gateway 560 at the End of an S_0 Bus
If the Forum Gateway 560 is connected at the end of an S_0 bus, the terminating resistors of the relevant S_0 interface cards must be activated.

In a typical configuration, the Forum Gateway 560 will be connected to the network termination for basic access (NTBA) with an externally switched S_0 port; therefore, all terminating resistors of the interface card are activated in the default setting.



Forum 550 Card 8 S0/T0: Terminating resistors activated

One end of the S_0 bus is terminated by the Forum Gateway 560; the terminating resistors must be activated (DIP switches set to “on”).
IAE = ISDN socket (German: “ISDN Anschluss Einheit”) or ISDN terminal.
TR = Terminating Resistor, the S_0 termination. The TR must be at the termination of the line. This can also be done by an appropriately wired IAE.

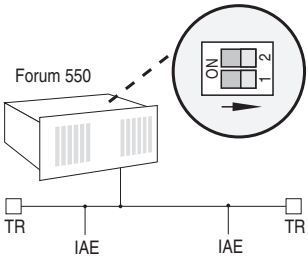


Termination on an ISDN socket

The illustration *Termination on an ISDN socket* shows an IAE with integrated terminating resistors.

Bus Configuration: Forum Gateway 560 in the Middle of an S_0 Bus
If a Forum 5500 is connected in the middle of an S_0 bus, the terminating resistors of the relevant S_0 interface cards must be deactivated.

1. Remove the interface card by following the instructions in *Installing Interface Cards* starting on page 71.
2. The DIP switches are protected by a plastic foil. Use a pointed tool such as a screwdriver to slide the DIP switches down (see arrow in the illustration *Forum 550 Card 8 S0/T0: Terminating resistors deactivated*).



Forum 550 Card 8 S0/T0: Terminating resistors deactivated

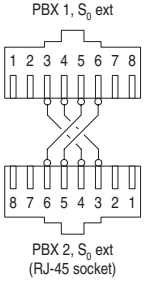
Both ends of the S_0 bus are terminated by terminating resistors; the terminating resistors must be deactivated (DIP switches set to “1 2”).

External ISDN Ports (S_0 External)

You can connect a Forum Gateway 560 to the NTBA or to a second PBX system for PBX networking (see also *PBX Networking* starting on page 182).

To connect the Forum Gateway 560 to the NTBA, wire pins 3, 4, 5, 6 of the NTBA and of the Forum 5500 1:1.

In order to establish a direct connection between a Forum Gateway 560 and another TC system via the external S_0 ports use the RJ45 sockets of the devices and connect them by means of a crossed twisted-pair cable. The distance between the two devices must not exceed 1000 metres.



Wiring for direct connection

Internal S_0 Ports

Up to eight ISDN terminals per bus can be connected to the internal S_0 ports by means of four-wire cables. Three of these terminals can be supplied with power from the bus; any additional terminals will require their own power

supply. The internal S_0 buses can be used for point-to-multipoint connections in accordance with the DSS1 protocol (Euro ISDN).

ISDN terminals can be connected to internal S_0 ports by means of a crossed ISDN cable. For the pin assignment of crossed ISDN cables, refer to the illustration *Wiring for direct connection* on page 82. If the terminal did not come with a suitable ISDN cable, contact your Proximus service centre.

The length of an internal S_0 bus cable must not exceed 150 m. Each internal S_0 bus has a power feed of approx. 3 W. The feed voltage is –42 V.

U_{pn} Ports

Terminals Connected to U_{pn} Ports

System telephones and Forum Base DECT v2 base stations can be connected to and U_{pn} port. The older Forum Base DECT base station cannot be connected.

The Forum Base DECT v2 base station can be used to connect the Forum Free DECT handsets. Note that handsets such as the Forum Free 567/577/587 can also be used in conjunction with base stations operating with the GAP/CAP standard.

Technical Information

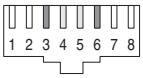
The U_{pn} ports have been implemented as RJ45 sockets.

Each of the devices listed above can be connected to the U_{pn} interface by means of a two-wire 1:1 cable. System terminals come with a suitable cable for connection to the RJ45 socket of the interface.

A two-wire cable connected to a U_{pn} port can be up to 1000 m long, provided it is a 0.6 mm twisted-pair cable.

Each U_{pn} port has a power feed of approx. 2.1 W. The short-circuit-proof feed voltage is –42 V.

Pin Assignment of the U_{pn} Interface on a Forum 550 Card 8 digital extensions Interface Card



U_{pn} interface pin assignment

The following table explains the U_{pn} interface pin assignment on a Forum 550 Card 8 digital extensions interface card.

Pin Number	Assignment
1	Not used
2	Not used
3	U_{pn} a *)
4	U_{pn} a
5	U_{pn} b
6	U_{pn} b *)
7	Not used
8	Not used

*) If the DIP switches are set accordingly (see also *Setting DIP Switches* on page 85), the conductors of the adjacent U_{pn} port will be connected here; use only the first U_{pn} port in this configuration.

DECT Base Station Connection Variants

A Forum Base DECT v2 base station can be connected to either one or two U_{pn} interfaces:

- If the DECT base station is connected to one U_{pn} interface, four simultaneous calls or connections can be made through the handsets.
- If the DECT base station is connected to two U_{pn} interfaces, eight simultaneous calls or connections can be made through the handsets.

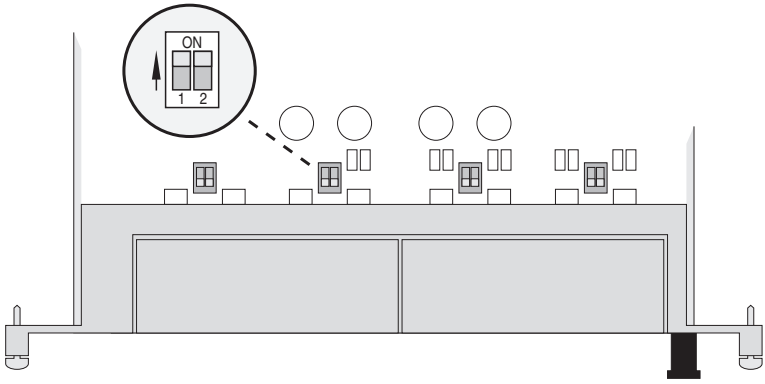
Please note that it is not possible to establish more simultaneous external connections than there are external B channels.

To connect a DECT base station to two U_{pn} interfaces, you can combine two U_{pn} ports on the Forum 550 Card 8 digital extensions interface card: U_{pn} ports

1+2, 3+4, 5+6 or 7+8 (U_{pn} port 2 is connected to U_{pn} port 1, U_{pn} port 4 to U_{pn} port 3 etc.). Ports are combined by setting the DIP switches on the card accordingly. In this configuration, the DECT base station must be connected to the first U_{pn} port of the pair by means of a 1:1 cable (system telephone cable).

Setting DIP Switches

1. Remove the interface card by following the instructions in *Installing Interface Cards* starting on page 71.
2. The DIP switches are protected by a plastic foil. Use a pointed tool such as a screwdriver to slide the DIP switches to the right (see arrow in the illustration *Location of the DIP switches on the Forum 550 Card 8 digital extensions card* on page 85).



Location of the DIP switches on the Forum 550 Card 8 digital extensions card

a/b Ports

Terminals Connected to a/b Ports

a/b ports can be used to connect analogue terminals, e.g. apparatus for speech and data communications using DTMF dialling, e.g.:

- analogue telephones,
- G3 fax machines,
- (external or internal) analogue modems,
  (data transmission not possible via VoIP connections)
- external voice mail systems,

- external intercom systems.

Please note: Observe the following notes on connecting analogue terminals. Terminals which do not fulfil the technical requirements can damage the Forum Gateway 560!

Analogue Telephones
Only analogue telephones supporting pulse dialling (MFV) can be used.

Modems
The maximum transmission rate for analogue modems is 33.6 kbits/s (V.34+). Analogue data transmission via VoIP audio connections is not supported.

Voice Mail
If you are using an external voice mail system, it must be capable of handling the number of digits used for internal telephone numbers, e.g. five digits if you have configured five-digit internal numbers.

The external voice mail system can be connected to internal a/b ports as well as to internal S_0 ports. For both port types the voice mail system can activate the notification for system terminals with the code procedures ✱ 6 8 resp. # 6 8.

Intercom System (for a/b)
The “Doorphone” intercom system can be connected to any a/b port. The “Doorphone” module provides the actor for the door opener contact.

Observe the following when connecting:

- The “Doorphone” should be set to its factory setting.
- In the **Telephony**: **Ports**: **a/b**: **Change** menu in the **Configurator**, select **Doorstation 2-wire** under **Type**.
- You can call the “Doorphone” intercom system by entering the code procedures ✱ 1 0 2 to ✱ 1 0 9 (multiple “DoorLine” intercom systems possible).
- The “Doorphone” intercom system can be connected to any a/b port. However, you can use only one intercom system of the “Doorphone” type with the Forum 5500 communications system.

For details on installing and configuring the “Doorphone” intercom system, refer to the product user guide.

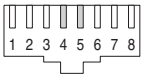
The intercom system should be installed by qualified personnel only as sensor/actor contacts will need to be connected to the “Doorphone” module.

Technical Information

The a/b ports have been implemented as RJ45 sockets. Each of the devices listed above can be connected to the a/b interface by means of a two-wire 1:1 cable. A two-wire cable connected to an a/b port can be up to 1000 m long, provided a 0.4 mm twisted-pair cable is used.

The 25 Hz / 40 V AC ringing voltage of the eight interfaces is supplied by the interface card.

Pin Assignment



a/b interface pin assignment

The following Table explains the a/b interface pin assignment.

Pin Number	Assignment
1	Not used
2	Not used
3	Not used
4	Channel a
5	Channel b
6	Not used
7	Not used
8	Not used

LAN Port

The LAN port (Ethernet interface) on the Forum 550 Card main processor central control module allows the integration of the Forum Gateway 560 into a company LAN (Local Area Network) with the use of a 10/100-Mbit hub or switch.

The Ethernet interface supports transmission rates of 10 Mbits/s and 100 Mbits/s in half duplex or full duplex mode. The transmission rate and mode are selected automatically (Auto Sensing function).

A LAN cable (twisted-pair in accordance with 10BaseT or 100BaseTX) must not be longer than 100 m. Safe operation with 100 Mbits/s requires the use of category 5 cables and sockets.
Use a shielded Ethernet cable (STP cable, Shielded Twisted Pair cable).

Forum Gateway 560 Modules

This chapter contains detailed technical information on the modules which can be operated in the Forum Gateways 560. You will find information on their respective fields of application, along with technical and operational information and notes on indicators.

The modules fulfil the following tasks:

- *Power supply units* supply power to a Forum Gateway 560. Each Forum Gateway 560 requires 2 power supply units max.
- A *central control module* is responsible for controlling a Forum Gateway 560. This module provides the memory card (Compact-Flash) among other things. The firmware necessary for operating the Forum Gateway 560 is saved on the CompactFlash card.
- *Interface cards* are used to connect the Forum 5500 to the telecommunications network (or to another communications system) and to connect terminals.
  A number of interface cards are available for these tasks. Depending on the interface card's functions, it may also be referred to as a trunk module or as a subscriber module.
- One or multiple Forum 550 Media Gateway Card media gateway modules are necessary for each Forum Gateway 560 to convert TDM voice channels into VoIP data streams. The VoIP data streams on the other hand realise voice connections between the Forum Gateway 560 and the Forum 5500 communications system.

For detailed information on installing modules, refer to the chapter *Forum Gateway 560 Installation* starting on page 63.

Please note: When installing modules, always observe the *Safety Precautions* starting on page 63!

Overview of Available Modules

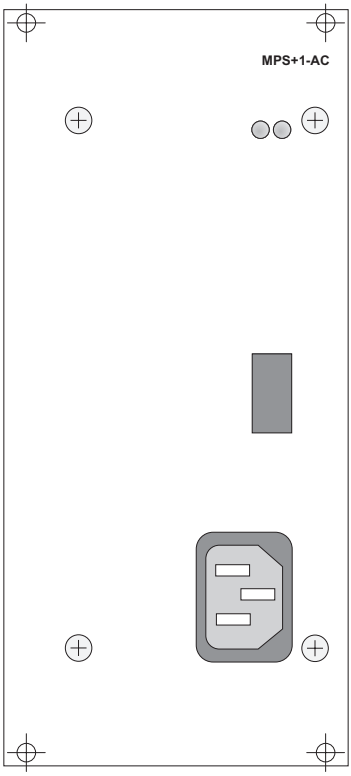
The following table provides an overview of modules available for the Forum 5500:

Name	Description	Page
Forum 550 Power Supply	Power supply with AC/DC transformer	90
Forum 550 Card main processor	Central control module with three interfaces	93
Forum 550 Card PRA	Trunk module with one S_{2M} interface for connecting to digital networks or for cascading two PBXs	96
Forum 550 Card 8 S0/T0	Trunk or subscriber module with eight S_0 interfaces for either external (trunk) or internal (subscriber) connections	99
Forum 550 Card 8 digital extensions	Subscriber module with eight $U_{pn}2$ interfaces for connecting digital terminals (ISDN terminals, system telephones and DECT base stations)	101
Forum 550 Card 8 analogue extensions	Subscriber module with eight a/b interfaces for connecting analogue terminals	103
Forum 550 Media Gateway Card	Media Gateway module for VoIP	105

Forum 550 Power Supply

Field of Application
The Forum 550 Power Supply unit supplies power to the first six slots (1 to 6) of a Forum Gateway 560. It converts the (220 V/110 V) AC input voltage into DC voltage +3.3 V and –42 V.

If the remaining slots (7 to 12) are to be used, a second Forum 550 Power Supply unit will need to be installed.



Forum 550 Power Supply: *Front view*

Technical Data

The following data refer to the supply of power to the first six slots.

Input Voltage

Rated voltage	230 V via standard IEC connector
Voltage range	95 V to 275 V
Rated current	2.0 A at 115 V 1.0 A at 230 V 0.9 A at 275 V
Efficiency at rated load	> 80 %

+3.3 V Output Voltage	
Rated voltage	+3.3 V
Voltage range	+3.2 V... +3.4 V
Rated current	10.0 A
Current limitation	12 A to 15 A
Short-circuit	Continuous short-circuit protection

–42 V Output Voltage	
Rated voltage	–42 V
Voltage range	–40 V... –44 V
Rated current	4.0 A
Current limitation	4.4 A to 5.5 A
Short-circuit	Continuous short-circuit protection

Indicators
There are two LEDs on the front of the Forum 550 Power Supply unit. The LEDs indicate the following:

- Left: If the left LED is constantly lit up green, the output voltage is +3.3 V.
- Right: If the right LED is constantly lit up green, the output voltage is –42 V.

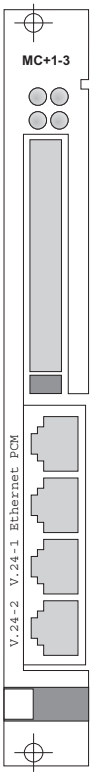
The LEDs only indicate that the voltage is present. They do not say anything about the voltage quality.

Operational Information
The Forum 550 Power Supply unit will be ready for operation as soon as it has been plugged into the designated slot (see *Slots* starting on page 68).

The mains voltage of 230 V is drawn through the standard IEC connector. The output voltages are fed to the BPV+1-12 backplane through the 96-pin spring contact strip (see *Backplane* starting on page 74).

In the event of a power failure, the power supply unit will generate a power failure signal.

Forum 550 Card main processor



Forum 550 Card main processor: *Front view*

Field of Application
The Forum 550 Card main processor module is the central control module of a Forum Gateway 560. It can be installed in slot 0 only (at the left end in a Forum Gateway 560; see *Slots* starting on page 68).

In addition to the control function, the Forum 550 Card main processor central control module provides a number of interfaces. These are:

- a slot for the CompactFlash card,
- a PCM interface for connecting two Forum Gateways 560,
- an external Ethernet interface.

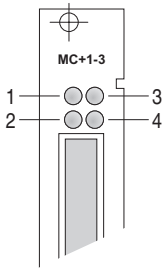
Both V.24 interfaces on the control module have no function.

Technical Information

- The Forum 550 Card main processor central control module is powered by the group 1 power supply unit.
- The central control module is equipped with a slot (MSUB-MFL, PCMCIA-interface) for a CompactFlash card. The firmware necessary for operating the Forum Gateway 560 is saved on the CompactFlash card.
- Each Forum Gateway 560 requires a central control module and a CompactFlash card installed on it.
- Two Forum Gateways 560 can be connected with one another via the PCM port (implemented as RJ45 socket). The necessary system signals between the central control modules are produced via the PCM interface. The PCM interface provides the system clocks and access to the 16 Mbit/s PCM highway and a 2 Mbit/s LAN (see also the chapter *Forum Gateway 560 Connection via PCM-V Connection* starting on page 107).
- A Forum Gateway 560 is connected to the LAN via the Ethernet port (10/100 MBit/s).

Indicators

There are four LEDs on the front of the Forum 550 Card main processor central control module.



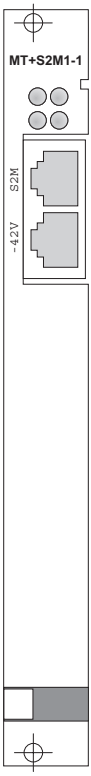
Forum 550 Card main processor: LEDs

The LEDs indicate the following:

LED 1:	Flashing yellow	New software is being loaded onto an interface card of the Forum Gateway 560 (the corresponding interface card's indicator will be constantly red).
LED 2:	Constantly green	The central control module is operational (flickering is normal).
	Flashing green/yellow	The gateway software (firmware) is starting up.
	Flashing yellow	The booter is reloading.
	Constantly yellow	The gateway is booting.
	Constantly red	System fault
LED 3:	–	Not used
LED 4:	Constantly green	An Ethernet connection has been established.

Operational Information
The CompactFlash card may **not** be extracted during operation as this may result in loss of data and defective functioning of the system!

Forum 550 Card PRA



Forum 550 Card PRA: *Front view*

Field of Application
The Forum 550 Card PRA interface card provides one ISDN S_{2M} interface for connecting the Forum Gateway 560 either to a primary rate access or to a second PBX (ISDN point-to-point connection).

The Forum 550 Card PRA interface card can be installed in any of the slots (1 to 12) of a Forum Gateway 560 (see *Slots* starting on page 68).

Technical Information

- The Forum 550 Card PRA interface card can – when operating multiple Forum Gateways 560 – be operated on any Forum Gateway 560. The

interface card should be installed in the Forum Gateway 560 that will handle most TDM connections.

- A maximum of ten Forum 550 Card PRA interface cards can be configured in the entire system.
- No settings need to be made on the Forum 550 Card PRA interface card.
- The Forum 550 Card PRA interface card runs on software acquired from the system. After the card has been installed it will automatically load the required software.
- The maximum range is 300 m.
- The short-circuit-proof feed voltage is –42 V/7 W. The feed is suitable to supply an NTPM with power.

Pin Assignment

The following table shows the pin assignment for the RJ45 connector of the interface (labelled "S2M"; see the illustration *Forum 550 Card PRA*: *Front view* on page 96):

Pin Number	Assignment
1	IN a
2	IN b
3	Not used
4	OUT a
5	OUT b
6	Not used
7	Not used
8	Not used

The following table shows the pin assignment for the RJ45 connector of the power feed cable (labelled "–42 V"; see the illustration *Forum 550 Card PRA*: *Front view* on page 96):

Pin Number	Assignment
1	Not used
2	Not used
3	–42 V

Pin Number	Assignment
4	0 V
5	0 V
6	–42 V
7	Not used
8	Not used

Indicators
There are four LEDs on the front of the Forum 550 Card PRA interface card.

The LEDs indicate the following:

LED 1:	Constantly yellow	At least one connection established through the interface card is active.
LED 2:	Constantly green	The interface card is operational; the slot has been activated (flickering is normal).
	Flashing yellow	The interface card is ready, but the slot has not been activated or the interface card has not been configured yet.
	Constantly red	New software is being loaded onto the interface card. If the LED lights up red for an extended period of time, there may be a fault.
LED 3:	Constantly green	The interface card provides the clock signal of the Forum Gateway 560 or of two connected Forum Gateways 560. This can only be displayed on the master gateway and then on only **one** interface card.
LED 4:	–	Not used

Operational Information
The Forum 550 Card PRA interface card can be exchanged during operation. However, the slot must first be deactivated in the **Configurator** in the web console (see *Installing Interface Cards* starting on page 71).

If the Forum 550 Card PRA interface card is operated on the master gateway, it can provide the reference clock for both gateways. S_{2M}-cards are given priority when selecting the clock. If no external trunk line is connected, the master gateway generates the reference clock.

Forum 550 Card 8 S0/T0

Field of Application
The Forum 550 Card 8 S0/T0 interface card provides eight 8 S_0 interfaces which can be used for either external connections, i.e. to connect the Forum Gateway 560 to a digital network (PSTN, Public Switch Telephony Network), or internal connections, i.e. to operate digital terminals (ISDN telephones, ISDN fax machines etc.) with the Forum 5500 communications system.

The Forum 550 Card 8 S0/T0 interface card can be installed in any of the slots (1 to 12) of a Forum Gateway 560 (see *Slots* starting on page 68).

Technical Information

- The Forum 550 Card 8 S0/T0 interface card can – when operating multiple Forum Gateways 560 – be operated on any Forum Gateway 560. The interface card should be installed in the Forum Gateway 560 that will handle most TDM connections.
- DIP switches S1 to S16 can be used to activate a 100-ohm terminal resistor (default: on).

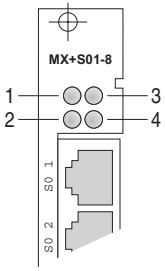
  For further information, refer to *Termination* starting on page 80.
- The power failure circuit can be activated by means of DIP switches S17 to S20 (default: off). If activated, the system will connect the first S_0 interface with the eighth S_0 interface in the event of a power failure; provided the system has been configured accordingly, external calls can be made using an emergency telephone.

  For further information, refer to *Power Failure* starting on page 76.
- All eight S_0 interfaces can be configured either as subscriber (internal) interfaces or as trunk (external) interfaces.

  For further information, refer to *S_0 Ports* starting on page 79.
- Forum Gateways 560The Forum 550 Card 8 S0/T0 interface card runs on software acquired from the system. After the card has been installed it will automatically load the required software.

Pin Assignment
For information on the S_0 interface pin assignment, refer to *S_0 Ports* starting on page 79.

Indicators
There are four LEDs on the front of the Forum 550 Card 8 S0/T0 interface card.



Forum 550 Card 8 S0/T0: LEDs

The LEDs indicate the following:

LED 1:	Constantly yellow	At least one connection established through the interface card is active.
LED 2:	Constantly green	The interface card is operational; the slot has been activated (flickering is normal).
	Flashing yellow	The interface card is ready, but the slot has not been activated or the interface card has not been configured yet.
	Constantly red	New software is being loaded onto the interface card. If the LED lights up red for an extended period of time, there may be a fault.
LED 3:	Constantly green	The interface card provides the clock signal of the Forum Gateway 560 or of two connected Forum Gateways 560. This can only be displayed on the master Forum Gateway 560 and then on only **one** interface card.

LED 4:	Constantly yellow	The interface card is running a combination of subscriber and trunk connections, i.e. both internal and external S_0 interfaces have been configured.

Operational Information
The Forum 550 Card 8 S0/T0 interface card can be exchanged during operation. However, the slot must first be deactivated in the **Configurator** in the web console (see *Installing Interface Cards* starting on page 71).

All three protocol layers can be individually configured as master or slave for each S_0 interface.

The S_0 interfaces can be configured as DSS1-PP, DSS1-PMP or Q.SIG lines.

Forum 550 Card 8 digital extensions

Field of Application
The Forum 550 Card 8 digital extensions interface card provides eight U_{pn} interfaces for connecting system telephones and Forum Base DECT v2 base stations.

The Forum 550 Card 8 digital extensions interface card can be installed in any of the slots (1 to 12) of a Forum Gateway 560 (see *Slots* starting on page 68).

Technical Information

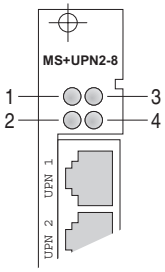
- The Forum 550 Card 8 digital extensions interface card can – when operating multiple Forum Gateways 560 – be operated on any Forum Gateway 560.
- A maximum of 176 U_{pn} RFPs (Radio Fixed Parts, DECT base stations) can be connected to the entire system. All U_{pn} RFPs operated on the system have to be installed on the same Forum Gateway 560, or on the two connected Forum Gateways 560.
- In order to connect RFPs, U_{pn} ports 1+2, 3+4, 5+6 or 7+8 can be combined by setting the DIP switches on the card accordingly.

  For further information, refer to *U_{pn} Ports* starting on page 83.
- The Forum 550 Card 8 digital extensions interface card runs on software acquired from the system. After the card has been installed it will automatically load the required software.

- The maximum range is 1000 m.

Pin Assignment
For information on the U_{pn} interface pin assignment, refer to *U_{pn} Ports* starting on page 83.

Indicators
There are four LEDs on the front of the Forum 550 Card 8 digital extensions interface card.



Forum 550 Card 8 digital extensions: *LEDs*

The LEDs indicate the following:

LED 1:	Constantly yellow	At least one connection established through the interface card is active.
LED 2:	Constantly green	The interface card is operational; the slot has been activated (flickering is normal).
	Flashing yellow	The interface card is ready, but the slot has not been activated or the interface card has not been configured yet.
	Constantly red	New software is being loaded onto the interface card. If the LED lights up red for an extended period of time, there may be a fault.
LED 3:	–	Not used
LED 4:	–	Not used

Operational Information
The Forum 550 Card 8 digital extensions interface card can be exchanged during operation. However, the slot must first be deactivated in the **Configurator** in the web console (see *Installing Interface Cards* starting on page 71).

Forum 550 Card 8 analogue extensions

Field of Application
The Forum 550 Card 8 analogue extensions interface card provides eight analogue interfaces for connecting analogue terminals.

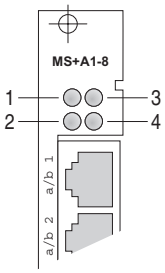
The Forum 550 Card 8 analogue extensions interface card can be installed in any of the slots (1 to 12) of a Forum Gateway 560 (see *Slots* starting on page 68).

Technical Information

- The Forum 550 Card 8 analogue extensions interface card can – when operating multiple Forum Gateways 560 – be operated on any Forum Gateway 560.
- The Forum 550 Card 8 analogue extensions interface card supports pulse dialling as well as dual-tone multi-frequency (DTMF) dialling.
- Calling line identification presentation (CLIP) is supported.
- Busy tone detection is not supported.
- The Forum 550 Card 8 analogue extensions interface card runs on software acquired from the system. After the card has been installed it will automatically load the required software.
- No settings need to be made on the Forum 550 Card 8 analogue extensions interface card.

Pin Assignment
For information on the a/b interface pin assignment, refer to *a/b Ports* starting on page 85.

Indicators
There are four LEDs on the front of the Forum 550 Card 8 analogue extensions interface card.



Forum 550 Card 8 analogue extensions: *LEDs*

The LEDs indicate the following:

LED 1:	Constantly yellow	At least one connection established through the interface card is active.
LED 2:	Constantly green	The interface card is operational; the slot has been activated (flickering is normal).
	Flashing yellow	The interface card is ready, but the slot has not been activated or the interface card has not been configured yet.
	Constantly red	New software is being loaded onto the interface card. If the LED lights up red for an extended period of time, there may be a fault.
LED 3:	–	Not used
LED 4:	–	Not used

Operational Information
The Forum 550 Card 8 analogue extensions interface card can be exchanged during operation. However, the slot must first be deactivated in the **Configurator** in the web console (see *Installing Interface Cards* starting on page 71).

Forum 550 Media Gateway Card

Field of Application
The Forum 550 Media Gateway Card interface card provides 16 media gateway channels for VoIP.

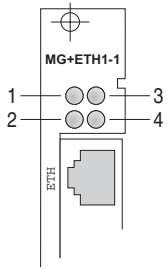
The Forum 550 Media Gateway Card interface card can be installed in any of a Forum Gateway 560 slots (1 to 12, see also the chapter *Slots* starting on page 68).

Technical Data

- The Forum Gateway 560 is connected to the LAN via the Ethernet port (10/100 MBit/s).
- The interface card supports: G.711 (A-Law) and G.729 codecs, silence detection, echo suppression and DTMF tone detection.
- The interface card can also be operated on a Forum Gateway 560 which is connected via a PCM-V line.
- The interface card acquires its software from the system. After the card has been installed it will automatically load the required software.
- No settings need to be made on the interface card.

Pin Assignment
The ethernet port's pin assignment is designed for a direct connection, via a RJ45 patch cable, to an ethernet Switch. You will need a cross-link cable ("Cross-over Cable") for connection to a PC.

Indicators
There are four LEDs on the front of the Forum 550 Media Gateway Card interface card.



Forum 550 Media Gateway Card: *LEDs*

The LEDs have the following meaning:

LED 1:	Constantly yellow	At least one call is being conducted via the interface card.
LED 2:	Constantly green	The interface card is operational; the slot has been activated (flickering is normal).
	Flashing yellow	The interface card is ready, but the slot has not been activated or the interface card has not yet been configured.
	Constantly red	New software is being loaded onto the interface card. If the LED lights up red for an extended period of time, there may be a fault.
LED 3:	–	Not used.
LED 4:	Constantly green	An ethernet connection is available.

Operational Information
The Forum 550 Media Gateway Card interface card can be exchanged during operation. The slot must first be disabled in the **Configurator** in the Web console (see also *Installing Interface Cards* starting on page 71).

Each Forum 550 Media Gateway Card interface card requires its own IP address. This can either be assigned statically or obtained via DHCP.

1. In the **Configurator**, open the **Telephony: Ports: Slots** page.
2. Click on the slot number in the table row containing the desired interface card.
3. Enter the desired IP address in the **IP address configured** field. Enter “0.0.0.0” to obtain an IP address via DHCP.
4. Confirm with **Apply**.

The configuration page displays the Forum 550 Media Gateway Card interface card’s MAC address. You will need this for the static assignment of an IP address via a DHCP server.

Forum Gateway 560 Connection via PCM-V Connection

All VoIP audio connections that originate with a Forum Gateway 560 and go to the Forum 5500 communications system (Call Server) are conducted via the RTP protocol and require one media gateway channel respectively. Audio tones, recording music on hold and also what is required for generating DTMF tones are controlled by the call server; each of these briefly seizes a media gateway channel. This is why a Forum Gateway 560 needs to be suitably equipped with a corresponding number of media gateway cards depending on the number of connected terminals and the level of expected audio traffic.

Media gateway channels can, however, be also seized in a second, neighbouring Forum Gateway 560. This requires that both Forum Gateways 560 are connected to one another via a PCM-V line. The PCM-V line transports both voice as well as administration data between the Forum Gateways 560. Connecting the Forum Gateways 560 also makes it possible to optimise the required number of media gateway cards.

Note: The central control modules of both Forum Gateways 560 must respectively have their own Compact Flash card for saving the operating software.

Installation Steps

The following installation steps described are necessary in order to connect Forum Gateways 560.

DANGER! Hazardous voltages inside the device!

1. Disconnect both Forum Gateways 560 from the power supply. If you are using two power supplies for a Forum Gateway 560, you must unplug **both** power supplies of the Forum Gateway 560!
2. One of the Forum Gateways 560 assumes the PCM master role. The other Forum Gateway 560 is the PCM slave. The Forum 5500 communications system detects the Forum Gateway 560 function as PCM master or as PCM slave via the frame number. The frame number of a Forum Gateway 560 is configured via the DIP switch on its central control

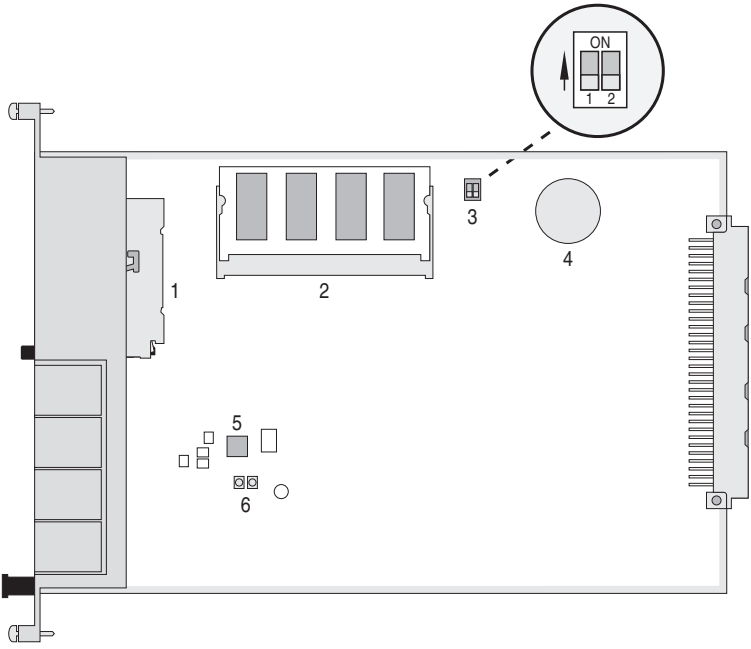
module. Remove the central control module from both Forum Gateways 560. Proceed as described in the chapter *Installing the Central Control Module* starting on page 70.

3. Set the DIP switch on both control modules to the appropriate position.

DIP Switch Settings

Forum Gateway 560 as Master	Forum Gateway 560 as Slave
S1: open (switch set at position 1)	S1: closed (switch set to “ON”) (switch set at position 1)
S2: open (switch set at position 2)	S2: open (switch set at position 2)

For the location of the DIP switches (S1and S2), refer to the illustration *Forum 550 Card main processor*: *Top view*.



Forum 550 Card main processor: *Top view*

4. Re-insert the central control modules in the Forum Gateways 560 (please refer to the chapter *Installing the Central Control Module* starting on page 70).

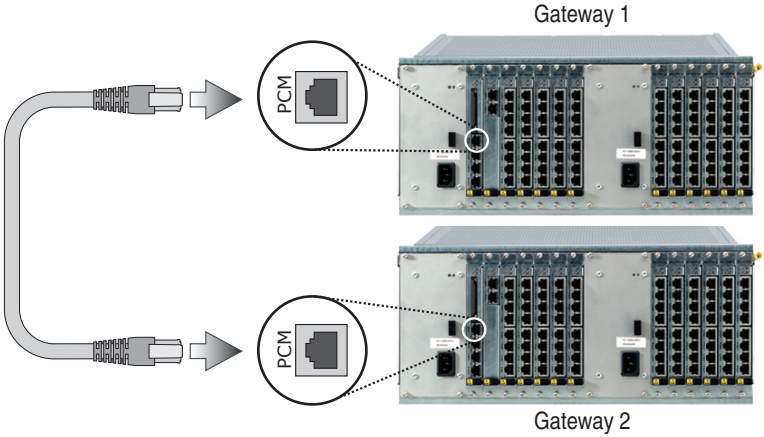
You require a screened CAT-5 Ethernet line with RJ45 plug for the PCM-V connection between two Forum Gateways 560. All 8 connection pins must be allocated and connected 1:1 for this line. The line may not be longer than 50 cm.

Please note: Use only the PCM-V line provided by Proximus for the gateway connection which fulfils the requirements described!

5. Mount both Forum Gateways 560 one above the other.

Note: Both Forum Gateways 560 have to be mounted one above the other as the permissible line length is so short. It is not possible to position them next to each other.

6. Connect the PCM-V line to the PCM ports on the two central control modules Forum 550 Card main processor of the Forum Gateways 560.



Forum Gateway 560 connection

7. Connect the two Forum Gateways 560 to the LAN via their Ethernet interfaces.
8. Activate the power supply for the two Forum Gateways 560 in any order you wish.

A Forum Gateway 560 is operational when the LED 2 on its central control module is lit green continuously. Whether or not the individual interface cards installed on the Forum Gateway 560 are operational is indicated by the card LEDs. For further information on the LED display, please refer to the chapter *Forum Gateway 560 Modules* starting on page 89.

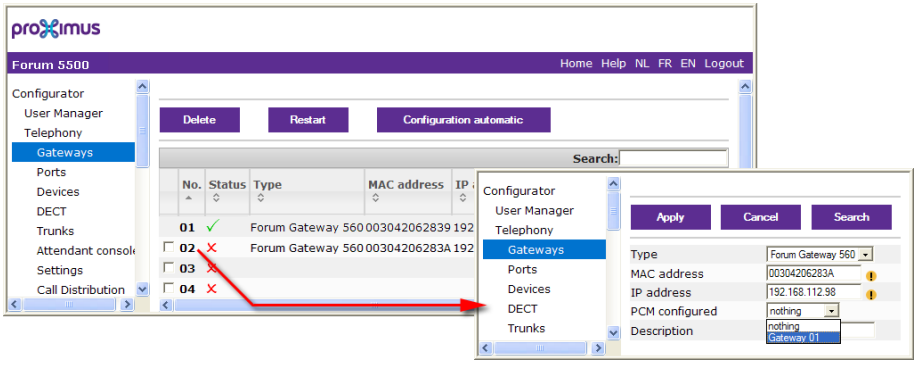
Configuration Steps

The following configurations have to be made for connected Forum Gateways 560 in the **Configurator** on the web console of the Forum 5500 communications system:

1. Forum Gateway 560 operation requires a licence. Go to the **System: Licences** menu to check the number of gateway licences. Enter the required authorisation key in this menu if you have installed one or two new Forum Gateways 560 due to connecting the gateways.

Note: The authorisation key contains the number of licenced frames. You thus require for both frames of a gateway connection one licence for at least 2 frames.

2. Go to the **Telephony: Gateways** menu. Create the new configuration entries for the two newly installed Forum Gateways 560 there.



Configurator: *Telephony*: *Gateways*: *PCM configured*

3. If both Forum Gateways 560 had already been configured as separate Forum Gateways 560, change their configuration. The following settings are important for two Forum Gateways 560 connected to one another:

   – The PCM slave Forum Gateway 560 has to have its PCM master Forum Gateway 560 configured by you. This is done via the **PCM configured** picklist in the configuration dialogue.

   – There is an overview of the current configuration on the Forum Gateways 560 status page. Check there to see whether the correct frame number is set for each Forum Gateway 560 in the **Frame number** column of the table. The PCM master has the frame number = “1”; the PCM

slave has the frame number = “2”. If the switches are set otherwise the Forum Gateway 560 is not operational!

Note: Please consult the online help for further information on gateway configuration.

Notes

Please note the following pointers regarding interface cards and ports when operating connected Forum Gateways 560:

- All U_{pn}, S_0 and a/b ports on interface cards of a PCM slave gateway can be used with corresponding telephones. All features for system phones on U_{pn} ports can be used without restriction.
- The S_0 ports of the slave system can also be used for trunk lines or for PBX networking (see *PBX Networking* starting on page 182).
- The ISDN-L1 reference clock is always passed on from the PCM master gateway to the PCM slave gateway. The reference clock thus has to be supplied by an S_0 port – or preferably by an S_{2M} port – on the PCM master gateway. If the Forum 5500 communications system is to be connected to the public TDM network via the connected Forum Gateways 560, there has to be at least one ISDN trunk line connected to the PCM master gateway. If no external trunk line is connected, the master gateway generates the reference clock.
- It is possible to operate an S_{2M} interface card Forum 550 Card PRA in the PCM slave gateway. Because the ISDN-L1 reference clock from an S_0 interface card is not precise enough, you require an S_{2M} interface card in the PCM master gateway as clock source.

Forum 5500 Monitor

The Forum 5500 Monitor is used to manage the service programmes of the Forum 5500 communications system. You can use the Forum 5500 Monitor to:

- start and stop the Forum 5500 communications system,
- configure the autostart settings,
- configure the reaction on failures.

You can read an introduction to the functionality of the Forum 5500 service programmes in the section *Overview Forum 5500 Service* starting on page 112. For information on starting and using the Forum 5500 Monitor, please refer to the section *Starting Forum 5500 Monitor* starting on page 114 and all subsequent topics.

Overview Forum 5500 Service

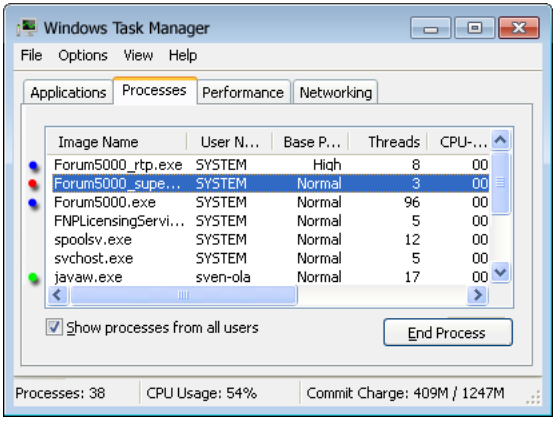
The Forum 5500 communications system is realized by several programmes which are running in the background. These programmes are controlled by a windows service named “Forum 5500 Supervisor Service”.

The windows service is active after the PC system is started, even if no user is logged in. Moreover, the windows service is executed using a specific user name – which for example prevents a standard user from unauthorized access.

Shortly after starting the Windows operating system, the Forum 5500 communications system is initialized as follows:

- The operating system starts the “Forum 5500 Supervisor Service” service. Now the respective service programme is running continuously in the background. The service programme should not be terminated normally.
- The “Forum 5500 Supervisor Service” in turn starts two sub-processes: the Forum 5500 main application (“Forum5000.exe”) with normal execution priority and the RTP service programme (“Forum5000_rtp.exe”) with a high execution priority.

- Both sub-processes now start their internal programme logic constituting of several execution threads, thereby providing the functionality of the Forum 5500 communications system.

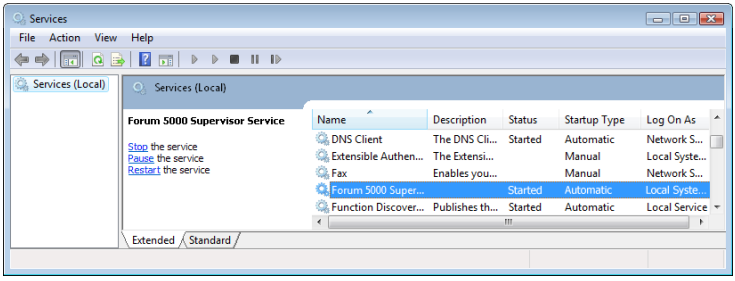


You can use the Forum 5500 Monitor (●) to change the configuration of the "Forum 5500 Supervisor Service" (●) or to send commands to the service, for example to end the sub-processes (●) in a coordinated way.

Inspecting Windows Services

The Windows services configuration is adapted accordingly to match the requirements of the Forum 5500 communications system. Under normal conditions, there is no need to change this configuration.

However, for maintenance or troubleshooting purposes it may be reasonable to check the Windows services configuration:



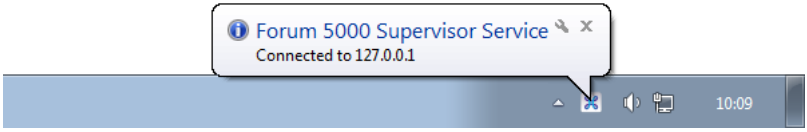
1. Login to Windows as user with administration rights.
2. Open the Windows control panel. Navigate to the **Performance and Maintenance** category. Open the **Administrative Tools** folder. Start the **Services** applet.
3. From the **Services** list, select the “Forum 5500 Supervisor Service” entry.
4. Verify that the service was started. You may also check if the properties page of the service shows the **Automatic** setting for **Startup type**.

Starting Forum 5500 Monitor

You can run the Forum 5500 Monitor as Windows user with administration rights:

1. In the Windows start menu, select the **All ProgramsForum 5500**: **Forum 5500 Monitor** command. Alternatively, double click the **Forum 5500 Monitor** icon on the desktop.

   The Forum 5500 Monitor starts and establishes a socket connection to the “Forum 5500 Supervisor Service” running on the same computer system. The successful connection is shown in the notification area of the task bar. In case of a connection failure, verify the status of the “Forum 5500 Supervisor Service” (see *Inspecting Windows Services* starting on page 113).



2. Right click the icon in the notification area of the task bar. From the context menu, select the **Hide Forum 5500 Monitor** command.

   The Forum 5500 Monitor hides and is now always available in the notification area of the task bar.
3. Double click the icon in the notification area of the task bar or select the **Show Forum 5500 Monitor** command from it’s context menu to show the Forum 5500 Monitor.

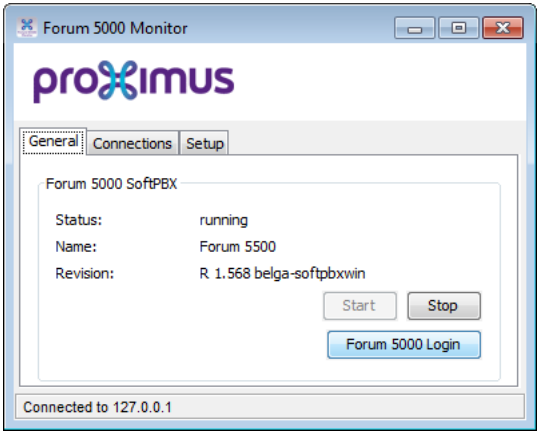
4. To end the Forum 5500 Monitor, click the **[X]** button of the window, press the **[Alt]+[F4]** key combination, or select the **Exit** command from the context menu of the task bar icon.

Tip: If the Forum 5500 Monitor was ended while in hidden mode, the application starts in this mode for the next time. To show the hidden Forum 5500 Monitor, double click the icon in the notification area of the task bar or select the **Show Forum 5500 Monitor** command of it’s context menu.

Note: The Forum 5500 Monitor is a java application. For this reason, the installation of a functional java runtime (“Sun Java 6” as of version 1.6 or higher) is a prerequisite for running the application. This software is installed during the installation of the Forum 5500 communications system.

“General” Tab

On the **General** tab, you can show or change the status of the Forum 5500 communications system.



1. The **SoftPBX** group box shows the current **Status** of the Forum 5500 communications system:

   Status: running: This display indicates that the Forum 5500 communications system is currently running and that you can use the provided communication services.

Status: stopped: This display indicates that the Forum 5500 communications system is unstarted or ended manually. You cannot use the provided communication services right now.

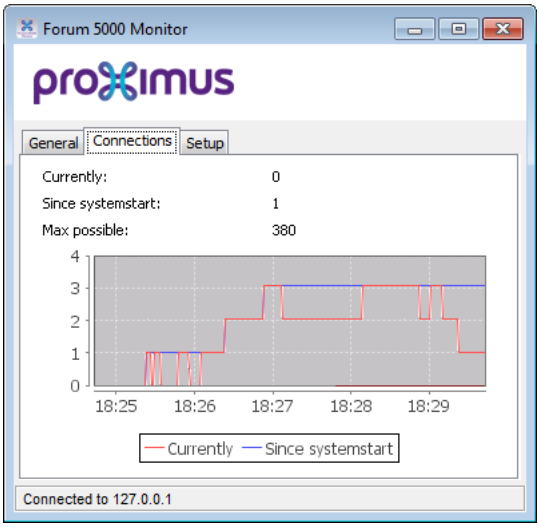
Name: Shows the product name of the Forum 5500 communications system.

Revision: Indicates the installed software version of the Forum 5500 communications system.

2. Click the **Stop** button to manually end the Forum 5500 communications system. This command is only available if the Forum 5500 communications system is currently running. Using this command ends the Forum 5500 main application as well as the RTP service programme in a coordinated way. Note that all communication services are interrupted by this command.
3. Click the **Start** button to manually start the Forum 5500 communications system. This command is only available if the Forum 5500 communications system is currently stopped.
4. Click the **Forum 5500 Login** button to start the Windows standard web browser to display the web console of the Forum 5500 communications system.

“Connections” Tab

On the **Connections** tab, you can view the voice connection statistic in a graphical display.



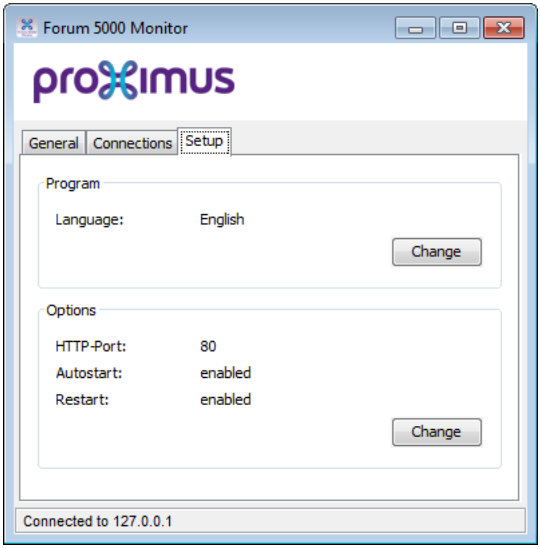
The display is refreshed continuously. The connection count axis will adapt automatically. The count of connections is displayed as follows:

- A blue line indicates the highest count of active voice connections encountered since the Forum 5500 communications system was started (numeric display: **Since systemstart**).
- A red line indicates how many voice connections are active at a given point in time (numeric display: **Currently**).

Additionally, the possible maximum of concurrent voice connections is indicated with the **Max possible** display.

“Setup” Tab

On the **Setup** tab, you can show or change the programme settings of the Forum 5500 Monitor and the startup configuration of the Forum 5500 communications system.



1. The **Program** group box shows the current language setting of the Forum 5500 Monitor user interface.

   Click the **Change** button to select another language (see *“Program” Dialogue* starting on page 119).

2. The **Options** group box shows the start settings of the Forum 5500 communications system:

   HTTP-Port: Shows the port number, that is occupied by the web server of the Forum 5500 communications system.

   Autostart: The “enabled” display indicates that the Forum 5500 communications system is automatically started if the Windows operating system starts. The “disabled” display indicates that you want to start the Forum 5500 communications system manually.

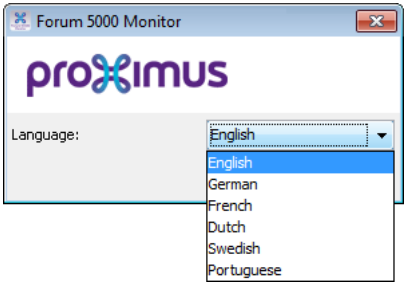
   Restart: The “enabled” display indicates that in case of a system fault the Forum 5500 main application as well as the RTP service programmes are automatically restarted (“watchdog function”). The “disabled” display indi-

cates that in case of a system fault you need to restart the Forum 5500 communications system manually.

3. Click the **Change** button to configure the start settings (see *“Options” Dialogue* starting on page 120).

“Program” Dialogue

The **Program** dialogue allows you to change the programme settings of the Forum 5500 Monitor.



1. In the **Setup** tab under the **Program** group box, click **Change**.

   The **Program** dialogue opens.

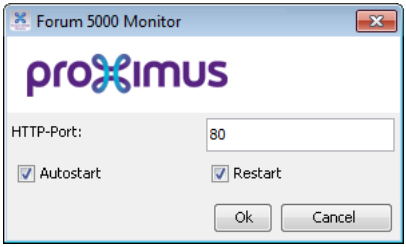
2. Select the desired entry from the **Language** drop down list.
3. Confirm with **OK**.

All programme settings of the Forum 5500 Monitor as well as the current display position are stored in an XML configuration file named “Forum5000_monitor.xml”.

Note: You need to restart the Forum 5500 Monitor to activate the changed user interface language.

“Options” Dialogue

The **Options** dialogue allows you to change the startup configuration of the Forum 5500 communications system. These settings change the behaviour of the “Forum 5500 Supervisor Service” during Windows startup and while the Windows service is running.



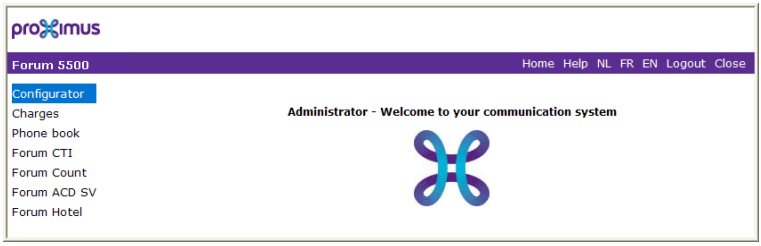
1. In the **Setup** tab under the **Options** group box, click the **Change** button.

   The **Options** dialogue opens.
2. In the **HTTP-Port**, you can change the port number of the web server of the Forum 5500 communications system. In standard cases, you should use the value “80”. If another web server is running on the computer system, change the port number for example to “8080”.
3. Activate the **Autostart** option to automatically start the Forum 5500 communications system during the Windows startup. This is the recommended setting. Deactivate this option to start the Forum 5500 communications system manually.
4. Activate the **Restart** option to automatically restart the Forum 5500 communications system in case of a failure. This is the recommended setting. Deactivate this option to manually start the Forum 5500 communications system in case of a system failure.
5. Confirm with **OK**.

The autostart settings are stored in a text configuration file named “supervisor_srv.ini”.

Configuration

Configuration and programming of the Forum 5500 is performed by the **Configurator**, a special software application integrated into the system. The **Configurator** is operated via the Web console.



The Forum 5500 Web console

Using the Web console, you can:

- perform the initial configuration of the Forum 5500,
- configure users of the Forum 5500 and authorise them to use certain system services,
- carry out further system maintenance,
- use PC-supported telephony functions,
- read out call charge information,
- access the Forum 5500 telephone book.

The Web console has an integrated online help function that offers comprehensive information on configuration and maintenance of the Forum 5500.

Configuring the Forum 5500

Preparing the Configuration

Before starting with the configuration, make sure you have the following documents at hand:

- An overview of the ports
- A list of the terminals to be connected

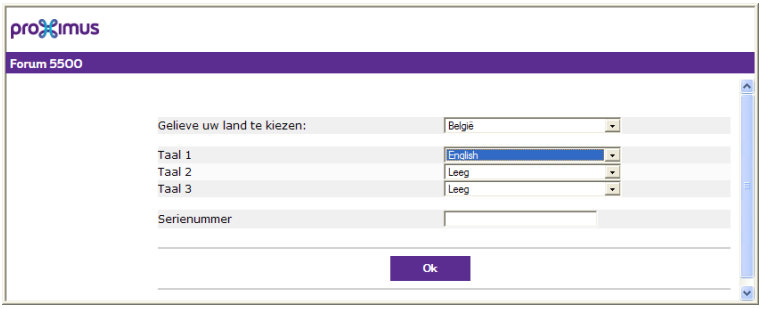
- A list of the IPEIs, if you wish to log on DECT terminals in the secure procedure
- A list of the users to be set up (staff entitled to use the services of the Forum 5500) with their names, departments, and the internal call numbers you want to allocate to them
- Data medium with current system software

Data not available for initial configuration can be updated or corrected at a later date.

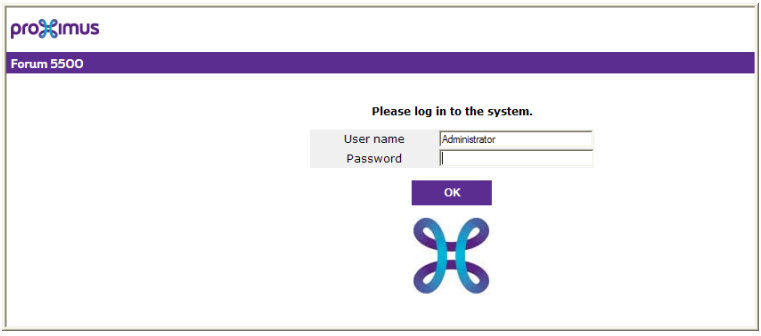
Starting the Web Console

1. Start your Web browser. Enter the Forum 5500 IP address in the "Address" box.

   The Forum 5500 Web console is started.



2. First set the country in which you are operating the Forum 5500, and in which language the Web console is to be displayed.

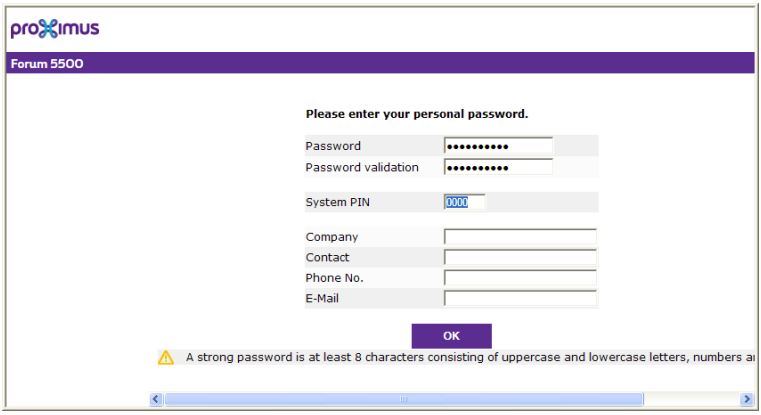


Forum 5500: log on dialogue box

3. To commence configuration, you must first log on. For the initial configuration, enter your:

   user name: “Administrator”
   password: for the initial configuration, leave this box blank.

4. Confirm this by clicking on **OK**.



Forum 5500: *dialogue box for initial access*

5. The software opens a dialogue for initial access. Determine an administrator password and enter it in this dialogue. Also fill in the other input fields.

   You have to enter a secure administrator password. The administrator has comprehensive configuration rights, which, for security reasons, must be restricted to the administrator. The administrator password can be seen and edited only by the administrator personally. Make a note of the password and keep it in a safe place.

   Since release 8 the communications system Forum 5500 distinguishes between safe and unsafe passwords. A safe password consists of:

   – at least eight characters

   – at least one capital letter, one small letter and one cipher

   – at least one special character (! " $ % & / ( ) = ? * + # - _ : , ; > < | @)

   – german umlauts do not match these criteria.

6. Confirm your input with **Apply**.

7. Click on the **Configurator** button on the home page.

Note: When the Forum 5500 is commissioned, all connected terminals are assigned to the “Administrators” user group. In your initial configuration, you should configure additional user groups with restricted authorisations and assign them terminals as required by your users.

To support your next configuration steps, you should activate the **Assistant** mode on the entry page of the **Configurator**. Please also pay attention to the online help.

Note: Deactivate any connection via a proxy server which has been configured. Open the Internet Explorer, go to the menu **Extras** and open the **Internet options** dialogue box. Select the **Connections** register and deactivate the **Proxy Server**.

You will find notes on using the **Configurator** and configuring **Ports**, **Users** and **User groups** in the online help. Click on **Help** in the menu bar or click on **TOC** to activate an overview of help topics.

Tip: Often a yellow exclamation mark symbol appears upon the first-time commissioning. Click on this symbol to obtain information on necessary configuration steps or on the communications system status.

Finishing the Configuration

1. When you have completed all the settings in the **Configurator**, you must save the configuration (see also *Saving and Loading the Configuration* on page 124).
2. Then select the **Log-off** command in the upper menu bar.

Saving and Loading the Configuration

Configurations are saved in a file archive and can be loaded to the Forum 5500 either locally from a connected configuration PC, or by remote configuration. The following configuration and customer data can be saved and loaded again:

- Telephony and network parameters
- User data
- Telephone book entries

- LCR tables
- Forum Voicemail: announcements / messages
- Forum Attendant / Forum ACD: announcements
- Forum CTI: PictureID images

Note, that for security considerations the passwords for external SIP trunks are not re-established if you restore a data backup from another (foreign) communication system. For further information, refer to the online help documentation under the topic **System: Data backup**.

Remote Configuration

The Forum 5500 configuration can be edited or updated by the Proximus Customer Service Centre via an Internet connection (reverse ssh tunnel). In the factory setting on delivery, two Proximus Remote Service Centre telephone numbers are preset, under which a system technician can dial into the Forum 5500.

Connection via Internet
The connection for remote configuration is established indirectly over the Internet. The connection session starts with a voice call from one of the registered phone numbers. During the call, connection parameters (IP address, keys) will be sent using a DTMF sequence. Afterwards, the Forum 5500 communications system establishes a secured SSH connection to an Internet server. The existing SSH connection allows to reverse-connect to the Forum 5500 communications system's configurator. For this type of connection, the Forum 5500 communications system utilizes your Internet account. Establishing an SSH connection via this Internet account must be allowed for this purpose.

The manual activation of the remote configuration activates the DTMF evaluation for the next voice call. You can add additional phone numbers for remote configuration on the configurator's Telephony: Extended: Remote service menu page. Activate the **IP** option for the desired phone numbers.

Note: You also need to activate the desired type of connection directly on the **Telephony**: **Extended**: **Remote service**.

Manual Activation
The following code number procedures activate or de-activate the remote configuration access. These code digits can be entered on any standard terminal or system telephone.

Remote Configuration ISDN On
✆ ✱ 1 9 ✱
⠿ (system PIN) #

Remote Configuration ISDN Off
✆ # 1 9 #

Remote Configuration IP On
✆ ✱ 1 9 1 ✱
⠿ (system PIN) #

Remote Configuration IP Off
✆ # 1 9 1 #

Please note: The system PIN is preset to “0000” and it is absolutely imperative that the system administrator changes it to prevent undesirable remote maintenance.

In order for the system technician to be able to log into the Forum 5500, he requires a user name and password. In this case, the solution would be to configure a “Service” user assigned to the “Administrators” user group.

Using remote configuration, all Forum 5500 settings (with the exception of the system PIN) can be edited or updated. It is not possible to control the PC systems via it’s user interface.

For security reasons, settings in the **Configurator**, **Network** menu should only be edited on site to avoid malfunctions or failures in the customer’s LAN (e.g. due to IP address conflicts).

Forced Logoff of Another User by the Administrator
If the user “Administrator” logs in and another user with administration rights is already logged in, then the administrator can forcibly log the other user off in order to configure. This functionality, for example can be used, when configuring remotely, when a user has forgotten to log out.

In order to forcibly log a user off:

1. The “Administrator” user logs-in with the administration password.

2. They open the **Configurator**.

   A message shows which user is currently configuring the system.

3. The administrator clicks on the **Take over config rights** button.

   The other user can make no further modifications of the configuration.

Forum 5500 in Computer Networks

One of the outstanding features of the Forum 5500 is the integration of telephony and computer networks. Connect the Forum 5500 via a computer network (LAN) with suitably configured workstations, and the configured users can use its network features from these workstations. Using a Web browser the users can access:

- the Forum 5500 Configurator
- call charge administration
- the Forum CTI, with which telephony functions can be used on a PC
- the Forum 5500 central telephone book and their personal telephone book as well as to the company telephone book (if the multi-company variant is activated).

Introduction to TCP/IP

In a single LAN it is possible to use various protocols for the transmission of data. The connection between a workstation computer and the Forum 5500 runs via the IP protocol (also named TCP/IP) used on the Internet. IP can be used together with other protocols (e.g. NetBEUI, AppleTalk or IPX/SPX) on the same network.

Every device participating in data transmission using IP requires a unique IP address. An IP address consists of four groups of digits from 0 to 255, each separated by a full stop. The supplementary protocols DHCP and PPP automatically assign IP addresses to devices. Class C networks normally use IP addresses in which the first three numbers are the same and the last number is uniquely assigned to a specific device in the LAN. On the Internet, unique

addresses assigned by a special organisation created for this purpose are used. Within a LAN, you can use addresses which are not unique world-wide:

IP Range	Common Netmask	Comment
192.168.0.0- 192.168.255.255	255.255.255.0	256 smaller networks
172.16.0.0- 172.31.255.255	255.255.0.0	16 medium networks
10.0.0.0- 10.255.255.255	255.0.0.0	1 large network

IP enables the establishment of connections via one or more intermediate stations. The decision whether to connect directly or indirectly to the partner device depends on the network mask. The network mask for a class C network is 255.255.255.0. If the IP address of the partner device does not fit the network mask, the connection is established via the default gateway. If a device knows several data routes to different intermediate stations, one speaks of a router.

The domain name system (DNS) resolves a plain text DNS name into an IP address. The DNS is a hierarchically structured database, distributed worldwide. A DNS server can supply information on the names and IP addresses for which it is responsible. For all other information, a DNS server contacts other DNS servers. For the establishment of every connection from the workstation, it is possible to give either an IP address, or a name that a DNS server resolves into an IP address.

Codes for IP Configuration

In the event that the IP configuration of the Forum 5500 has to be changed, you can also use a code digit procedure to change these basic settings. Entry can be made from ISDN telephones, analogue telephones and from system telephones.

Set IP Address

✆ ✱ 1 8 2 ⠿ (system PIN) ✱
⠿ (www) ✱ ⠿ (xxx) ✱ ⠿ (yyy) ✱ ⠿ (zzz) #

Set NET Mask
✆ ✱ 1 8 3 ⁞⁞ (system PIN) ✱
⁞⁞ (www) ✱ ⁞⁞ (xxx) ✱ ⁞⁞ (yyy) ✱ ⁞⁞ (zzz) #

Note: The IP configuration will be changed with the next restart of the communications system.

Example
Enter: ✆ ✱ 1 8 2
0 0 0 0 ✱ 1 9 2 ✱ 1 6 8 ✱ 9 9 ✱ 2 5 4 #
Initiate a system restart with the following procedure:

Trigger Restart
✆ ✱ 1 8 5 ⁞⁞ (system PIN) #

Use the PIN you entered in the dialogue box for initial access. The factory setting is “0000”.

E-Mail: Accounts and Notification

One of the most important services in the Internet is e-mail. E-mails are buffered in individual e-mail accounts on a mail server. With the Forum 5500 you can configure one or more e-mail accounts for every user. These e-mail accounts are then checked at regular intervals.

If there are new e-mails in an e-mail account, and the Forum 5500 has been configured for this function, the user specified in the Forum 5500 e-mail account is notified of the new e-mail on his system terminal. Forum IPhone 525/535 and Forum Free 567/577/587 system terminals can also display information such as the sender or the subject of the e-mail.

E-mail accounts are configured in the **Configurator**, **User Manager: E-mail accounts** menu.

Receiving System Messages as E-Mail

Important events and errors are kept by the Forum 5500 in an internal log book: the error store. To inform or alert the system administrators, entries in the log book (system messages) can be sent via e-mail.

In order not to notified of every error, the administrator can define corresponding log filters (in the **Configurator**, the **Diagnosis: Log Filter** menu). These filters define which errors (category, severity, number per time interval)

should be notified. The e-mails always include an internal event or error number, as well as an explanation of the message. Further, extra parameters (such as the port number when a trunk line drops out) are also provided.

The mail account for this service (**Account for LOG filter**) is configured in the **Configurator**, **Network: E-Mail** menu.

Voice over IP (VoIP)

The term “Voice over IP” describes the usage of IP-based data networks for telephony. It is possible to distinguish between two different types of VoIP:

- Telephony via Internet provides cheaper charge-models for telephone services. For telephony directly via the Internet, only the cost of data transmission is incurred. Various Gateway providers can provide crossover into the PSTN (“Public Switched Telephone Network”) for a fee. As well as standardised protocols such as SIP and H.323, proprietary protocols such as the Skype network, are used. Voice and service quality via Internet is often indeterminable because they are dependent on the communication lines of various service providers. which have been optimised for data communication
- Telephony via Intranet enables joint usage of existing infrastructure for telephony and for data communication. Integrating the two communication networks into a single communications network can provide considerable savings. The Forum 5500 gives users all the features of system telephony through its use of an IP-based protocol. Furthermore, the standardised SIP protocol can also be used on the intranet. The control of the data connections used makes it possible to define exactly the voice and service quality.

VoIP telephony over the Internet using the Forum 5500 provides you with the following options (see also *SIP Telephony* starting on page 143):

- You can use “SIP trunk lines” with your existing Internet connection
- You can use the services of a SIP gateway service provider to access the public telephone network (PSTN)
- Automatic fallback (bundle overflow) to ISDN connections in case of the breakdown or over-occupancy of the SIP connection

VoIP Telephony via intranet with the Forum 5500 offers the following possibilities:

- Use of IP-based system telephones and of SIP telephones connected to Cat5 twisted-pair ethernet cables
- Use of IP-based system telephones and of SIP telephones via VPN or WLAN connections

- Use of PC-supported system telephones (so-called “Softphones”) without extra hardware costs
- Operation of SIP-capable telephony software (see also *SIP Telephony* starting on page 143)
- TC system networking using Q.SIG-IP via VPN connections (see also *PBX Networking* starting on page 182)
- Setting up a DECT over IP network lets you use existing Ethernet cabling to set up a DECT network. The special DECT base stations designed for this purpose, can be handled using Forum 5500’s Web interface (see *DECT over IP®* starting on page 163).

Integrating voice and data communication within the Intranet can provide savings possible and a range of new possibilities. However joint usage of existing network infrastructure may also cause conflicts, with IP address configuration via DHCP for example (for details see *Start Procedure* starting on page 156). You should therefore always plan the use of VoIP in the Intranet together with your network administrator. In order to avoid possible conflicts please also note the information under *Fundamentals* starting on page 135.

Quick Start

IP System Telephony

VoIP system telephony can be quickly and easily set up using the Forum 5500.

1. Go to the page **Telephony**: **Devices**: **VoIP Telephone** and click on **New**. Enter the **MAC Address** printed on the underside of the IP system telephone. Select the **Type** and enter an internal **Number**. Option: enter an IP address from the Forum 5500 IP network which is not being used. Click on **Apply**.
2. Connect the IP system telephone’s LAN connection to the LAN and connect the phone to the mains power. Alternatively, activate Power-over-Ethernet function of your PoE-cable switch or attach a PoE injector.

Note: Use a shielded CAT-5 Ethernet cable (STP cable, Shielded Twisted Pair cable) to connect an IP telephone to a Local Area Network (LAN).

External SIP Line

If your Forum 5500 has access to the Internet, you can an easily and quickly set up a SIP line.

1. Request at least one SIP account from a SIP provider.
2. Call up the Configurator and go to the page **Telephony**: **Trunks**: **SIP Provider**. If your SIP provider is not listed, click on **New**. Otherwise select the preconfigured SIP provider. Enter the **Name** and **Domain**. Enter the SIP server's IP address under **Proxy/Registrar**. You can obtain more information on this from your SIP provider. Click on **Apply**.
3. On the **Telephony**: **Trunks**: **SIP Trunks** page, click on **New**. Activate the **Status** and enter a name for the account under **Name**. Select the **SIP Provider**. Enter the relevant account information under **User name**, **Password**, **Phone No.** and **SIP ID**. Click on **Apply**.

   The **SIP ID** setting will be used while logging in to the SIP provider. Die **Phone No.** setting denotes the external phone number used within the public phone network. You can enter this number here to support system administration.
4. Under **Telephony: Call Distribution: Incoming** or **Telephony: Call Distribution: Incoming DDI** route all incoming calls to the desired internal numbers.
5. To use the SIP account by default, call up the page **Telephony: Trunks: Route** and select the route **External trunk.** Under **Bundle/SIP trunks 1,** select the SIP account you have just set up.

   Otherwise, call up the **Telephony**: **Trunks**: **Route** page. Enter "SIP", for example, under **Name**, under **Code** the number "8" and select the SIP account that was just configured for **Bundle/SIP trunks 1**. The SIP account is now available with the dialling prefix "8".

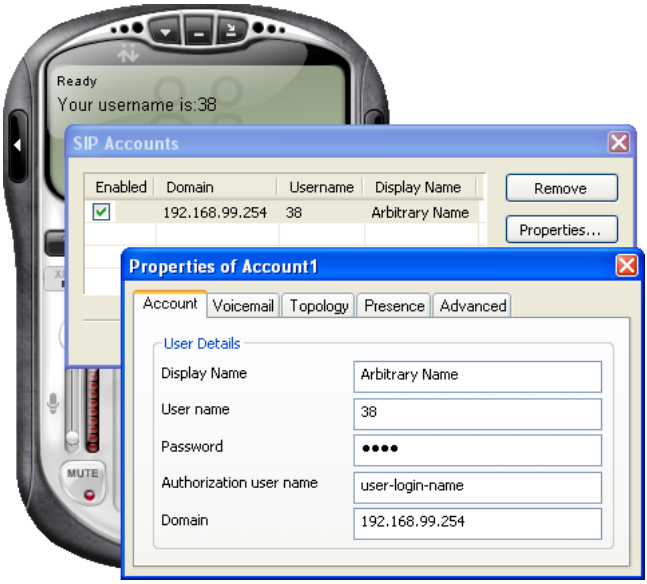
   Click on **Apply**.
6. Check that the SIP connection is active on the **System Info**: **Telephony**: **Trunks** page. Also check the SIP licence count on the **System: Licences** page.

Check the functionality by making an external call. You should assign the relevant external number of the SIP account to the internal numbers on the page **Telephony: Call distribution: Incoming**.

Internal SIP Telephony

SIP telephones connected via LAN or SIP telephony software on LAN workstation computers can also be operated with the Forum 5500.

1. Call up the **Telephony**: **Devices**: **VoIP Phones** page in the Configurator. Click on **New**. Select the "SIP" option under **Type** and enter an internal **Phone No.** Click on **Apply**.
2. Call up the **User Manager**: **User** page. Assign the new internal call number to a user.
3. An internal SIP telephone can be operated with a dynamically assigned IP address. If the SIP telephone has its own Web interface, for example, a static IP address can be practical. Click on **New** on the **Network**: **DHCP** page. Enter the **MAC address** of the SIP telephone and an available **IP address** and click on **Apply**.
4. Configure the SIP telephone or the SIP telephony software. Please also refer to the configuration help on the **Telephony: Devices: VoIP Phones** page. For the desired call number, click on **(Help)** and select a suitable help page under **Type**.



A configuration dialogue of SIP telephony software

5. The number of simultaneously active SIP registrations is limited. However, it is possible to register several SIP terminals for a specific SIP user resp. a specific SIP call number. The number licenced can be viewed on the **System**: **Licences** page. The number of SIP telephones currently licenced can be determined on the **System Info**: **Telephony**: **SIP phones** page. If you click on **Reset licences**, the available licences will be reassigned with the next incoming or outgoing calls.

Fundamentals

VoIP makes the transmission of voice and telephony signalling via IP ("Internet Protocol") possible. After a connection is established, the terminal collects voice data (PCM data), which is then sent to the receiver using an IP packet. PCM data can also be compressed to save bandwidth.

Propagation Delay and Bandwidth

IP-based data networks are generally not able to guarantee a specific minimum bandwidth and defined propagation delay. A synchronised 64 kbit/s ISDN line guarantees a fixed data rate as long as the connection exists. In an IP-based data network, the data rate and propagation delay can vary. Short-term bottlenecks or retransmission due to errors may be the cause. A data flow interruption of a few seconds is barely noticeable when fetching a Web page, but it can be seriously interfere with a telephone call.

A modern Intranet normally offers enough performance reserves and reliability to make good-quality VoIP telephony possible. Specific components can also be optimised; for example by using a modern switch which evaluates the TOS byte of IP packets, by replacing unreliable connections, or by using a separated VLAN for VoIP.

Latency and Packet Length

For technical reasons, there is always a delay ("latency") between the recording of voice data via the microphone and playback via the receiver. Voice data is recorded for a short period so that it can be sent in an IP packet. The IP packet also has a signal-propagation delay before the receiver can begin playback. For these reasons, the extra time required for voice-data encoding and decoding may be neglected.

An IP packet consists of protocol data and user data. Sending shorter voice-data packets causes the ratio between the user data and the protocol data to become unfavourable and increases the bandwidth required. Sending longer voice-data packets increases latency.

The length of the voice-data packets must therefore be adjusted to the requirements of the transmission medium. Shorter voice-data packets can be sent if a direct ethernet connection exists. If an 64 kbit/s ISDN line is to be used for transmission, then longer voice-data packets should be used.

Longer voice data packages are generally used for SIP telephony over the Internet.

The following table provides an overview of the required bandwidth for a telephone connection with various parameter settings. The values apply to half-duplex ethernet; for full-duplex the values can be halved.

Required bandwidth (kbit/s) with respect to Packet Length and Codec

Packet Length (ms)	G.711 (not compressed)	G.729A approx. 8 kbit/s
20	180.8	68.8
30		51.2
40		42.4
50		37.12
60		33.6
70		31.09
80		29.2

You will require a licence with which you can activate the G.729 codec for operation (in the **System**: **Licences** menu).

Voice Quality

The achievable voice quality depends on various factors. It is possible to optimise voice-data transmission on an existing network using the available configuration settings. Measuring the network quality may also help.

The following comparison provides a guide to voice quality with specific quality levels:

Quality Levels for Voice Transmission with VoIP

Level	Voice Comprehensibility	Comparable to
1	Very Good	ISDN
2	Good	DECT
3	Satisfactory	GSM
4	Limited	Defective GSM
> 4	Unacceptable	No Connection

When a call is set up, the terminals involved negotiate the voice-data compression ("codec") that will be used. This is the first factor that determines the achievable quality level:

- **G.711** A-Law or □-Law (Level 1, uncompressed): The audio data of a PCM channel (64 kbit/s) is adopted one-to-one. Every VoIP terminal must support this codec.
- **G.729A** (Level 2): Reduction to approximately 8 kbit/s.

Unfavourable packet length selection may reduce voice quality. The duration of the recording and not the data packet's byte count is relevant in making this selection:

- Duration <= 30 ms: optimal transmission
- Duration 40 - 60 ms: one quality-level depreciation
- Duration > 60 ms: two quality-levels depreciation

The achievable voice quality also depends on the packet propagation delay and the packet loss between the terminals involved. These parameters can be determined using the "ping" programme.

Note: Measurements made with "ping" are round-trip propagation delays. Divide the maximum value displayed by two.

Packet Propagation Delay and Packet Loss

Value	Quality Level	Value	Quality Level
Propagation delay < 50 ms	Optimal	Loss < 1 %	Optimal
Propagation delay 50-100 ms	0.5 level depreciation	Loss 1-2 %	0.5 level depreciation
Propagation delay 100-150 ms	1 level depreciation	Loss 2-3 %	1 level depreciation
Propagation delay 150-200 ms	2 level depreciation	Loss 3-4 %	2 level depreciation
Propagation delay 200-300 ms	3 level depreciation	Loss 4-6 %	3 level depreciation
Propagation delay > 300 ms	4 level depreciation	Loss > 6 %	4 level depreciation

Optimisation

If you detect a large fluctuation in the propagation delay during measurement, this may also cause the voice quality to deteriorate. This may indicate a defective or overloaded line caused by bit-error or collision correction resulting from retransmission by the transmission procedure.

An existing star-topology ethernet-network may uses a Hub as the central distributor of ethernet packets. A Hub repeats all ethernet packets received on all connected lines. This can cause substantial collisions and result in a high fluctuation in the propagation delay.

If this is the case, use a modern switch component. Selective forwarding of ethernet packets (“Layer 2 switching”) avoids collisions. Modern switch components also evaluate the TOS byte of IP packets, thereby providing the optimal prerequisites for VoIP telephony.

Note: The Forum 5500 uses a TOS byte ("Type of Service") value of 0xB8 for IP packets with VoIP data. This requests "Minimise Delay" and "Maximise Throughput" for IP packets marked with this value.

Call Set-up

Various IP-based protocols are used for system telephony via the Internet protocol ("IP") (see also *Start Procedure* starting on page 156). Multiple TCP connections are made between an IP telephone and Forum 5500 for the telephone's start procedure, registration and signalling.

All voice data are directly exchanged between IP telephones using the RTP ("Realtime Transport Protocol") protocol.

Channels on a *Media Gateway (MGW)* are allocated for making a telephone connection with an ordinary terminal or for dial tones. The MGW converts IP voice data into PCM data streams used with conventional telephony and vice versa. For this, IP voice data are exchanged between the IP telephone and the gateway.

Tip: Switching between voice data channels may cause a slight delay in some circumstances. For example: when accepting a call on an IP telephone, headset users should wait about one second before answering.

Useful Services

The type of data compression used for VoIP prevents these types of connections from using certain services. Take these notes into account especially if you want to use connections made via Q.SIG-IP or SIP:

- ISDN data services can not be used
- Faxes can only be sent using the uncompressed G.711 codec
- DTMF dial tones can be transmitted using the internet standard RFC 2833/4733 or by means of SIP-INFO. In the codec configuration section, under **Telephony: Extended: VoIP profile** the "DTMF (RFC 4733)" codec hast to be activated. As an alternative, DTMF dial tones can also be transferred "Inband". These DTMF dial tones are only received by the other party if the uncompressed G.711 codec is used.
- Analogue modems can not be used

Tip: Configure the actual usage for the a/b ports, e.g. set them to **Fax** or **Data (analogue)**. Connections from and to these a/b ports will then be made using uncompressed or ISDN connections where possible.

VoIP Profiles for SIP

While a call is being established and also during an ongoing connection, SIP terminals can negotiate amongst one another which codecs are to be used. SIP signalling is always being conducted via the Forum 5500 communications system. After successfully agreeing on a codec, the resulting RTP connection is established between the terminals directly. The Forum 5500 communications system can also serve as a proxy for the media data stream ("RTP Proxy function") if external SIP lines do not allow direct RTP data connection between the terminals.

Negotiating the codecs to be used takes place as follows:

1. One of the SIP terminals sends of list of supported codecs.
2. The second SIP terminal deletes the codecs from the list which are not supported and sends the shortened list back to the first SIP terminal.

The exchanged codec lists can be filtered by the Forum 5500 communications system, e.g. to limit bandwidth based on the VoIP profile activated for the connection or for the terminal. Please note that the negotiation regarding codecs supported also takes place for connections between SIP terminals and other terminals / subscribers. For example, the Forum 5500 communications system uses a pre-defined codec list for a connection between a SIP terminal and a TDM port:

G.711a	G.729 (if possible)	RFC 2833/4733 DTMF

IP system phones or DECT over IP base stations participate in codec negotiation with the VoIP profile configured respectively. If no common audio codec is determined during negotiation and automatic implementation (e.g. G.711 to G.729) is not possible, it will not be possible to establish the call connection.

Transparent codec interconnection
Transparent codec interconnection allows SIP terminals to use addition codecs even though the desired codec is not, or not directly supported by the Forum 5500 communications system. Some examples are:

- G.722 audio codec for HQ audio
- H.264 video codec for transmitting images

Transparent codec interconnection is supported for internal SIP subscribers as well as for external SIP lines and in the context of TC system networking with SIP tie line connections.

You have to create a special VoIP profile for completely unfiltered (transparent) codec negotiation:

1. Open the **Telephony**: **Extended**: **VoIP profile** page in the configurator of the Forum 5500 communications system.
2. Click on the **New** button to create a new VoIP profile.
3. Activate the **All codecs** option. Enter a designation into the **Profile name** input field. Use **Apply** to confirm.

Allocate this VoIP profile to the desired SIP terminal or to the desired SIP line / SIP tie line. Please note that bandwidth cannot be restricted for terminals or lines with this VoIP profile. This is suitable, e.g. for SIP terminals operating on a LAN.

Codec interconnection with bandwidth restriction
You can implement bandwidth restriction with additional VoIP profiles using an extended codec list. The extended codec list contains definitions for codecs which are used by the usual SIP terminals. The codecs on this list are for usage in VoIP profiles and are not directly supported by the Forum 5500 communications system.

You can load the extended list of codecs as a description file in the **Configurator** of the Forum 5500 communications system on the **System**: **Components** page. The extended codec list is also a part of data back-up.

Note: You can obtain the extended codec list as a description file from your Proximus agent. This file should not be edited which is why editing is not supported.

Create a VoIP profile with extended codec entries with the following steps:

1. Open the **Telephony**: **Extended: VoIP profile** page in the **Configurator** of the Forum 5500 communications system.
2. Click on the **Codecs** button. On the following page, select the codecs to be offered for defining a VoIP profile. Use **Apply** to confirm.

The list contains entries with various classes (“audio”, “image”, “text”, or “video”) as well as specific bandwidth information for many entries. Particularly suitable entries are indicated as “recommended”.

3. Click on the **New** button on the **VoIP profile** page. Enter a designation into the **Profile name** input field. Determine the permissible codecs in descending order in the 10 fields. Configure the desired codecs from the extended codec list in the uppermost fields. Close the list with a fall-back selection, e.g. with “G.711 A-Law (audio)” and “DTMF (RFC 2833/4733) (event)”. Use **Apply** to confirm.

Allocate this VoIP profile to the desired SIP terminal or to the desired SIP line / SIP tie line. Please note that any codecs not in the VoIP profile are filtered out by the Forum 5500 communications system during codec negotiation.

Voice Activity Detection (VAD)

You can change the codec configuration under **Telephony**: **Extended**: **VoIP profile**. You can also activate the **Voice Activity Detection** option for one or more codecs in so doing. If this option is active then pauses in the conversation will be replaced with empty packets. This can be better compressed by compression-codecs thus reducing the required bandwidth. This option must be deactivated if you want to assign the profile to a SIP trunk and if you have set the G.711 codec.

Note: If you want to allocate the VoIP profile to a Forum IPhone 512 / Forum IPhone 545 IP system telephone, the **Voice Activity Detection** option should be deactivated for all codecs.

Media Gateway (MGW)

The Media Gateway transforms VoIP voice data into PCM audio data. This function converts voice data between VoIP telephones and all other terminal types. Without the Media Gateway, VoIP telephones can only exchange call data directly with other VoIP telephones. Media Gateway functionality is also required for producing dial tones and making external phone calls with a VoIP telephone.

The number of media gateway channels of the Forum 5500 communications system is limited by the amount of computing power available on the server PC. This is why when installing the Forum 5500 communications system you

determine which of the existing CPU cores is to be occupied with this computing-intensive task via the RTP service program.

If you are using one or more gateways, the media gateway is realised here with at least one interface card Forum 550 Media Gateway Card.

A Media gateway card makes 16 channels available. One Media gateway channel should be available for a maximum of 3 terminals.

SIP Telephony

The SIP Internet (Session Initiation Protocol) protocol provides you with a low-cost, standardised option for telephoning via IP-based networks. The Forum 5500 enables you to use external SIP telephone connections ("SIP trunk lines"). The Forum 5500 communications system supports configuration of standard SIP lines with one call number for each as well as extension-capable SIP-DDI lines with base call number and extension.

Furthermore, internal SIP subscribers, SIP telephones or SIP telephony software are also supported (see also *Quick Start*: *External SIP Line* starting on page 133 and *Internal SIP Telephony* starting on page 134).

External SIP Connections

The **Telephony**: **Trunks**: **Route** menu gives you the option to configure a bundle overflow, which automatically occupies a second line in case of a breakdown or over-occupancy of the SIP connection. You can also set up your system to route certain types of calls, such as international calls, to a SIP connection.

You will also need a fast Internet connection such as DSL for SIP telephony.

You will also usually need the services of a SIP provider. A SIP provider operates a special server (the SIP Registrar) to handle connections. The SIP provider also operates a gateway to the ordinary telephone network which users pay to use and which enables the SIP provider to provide calls to the telephone network. A SIP connection can also accept incoming calls from the telephone network.

The same voice transmission techniques as those explained in *Fundamentals* starting on page 135 are used for SIP telephony. SIP telephony has the following distinctive features:

- Subscribers are identified through an e-mail-like “SIP ID” such as 12345@domain.net or name@sip-provider.com.
- SIP transmits dialling numbers always in a single data package (block dialling). Dialling can therefore be concluded with the hash key # on the system terminal, or the end of the number will be indicated by a time-out. The value for this time-out can be defined for each SIP provider separately.

Tip: The Forum 5500 communications system can have a clipboard for keeping track of the most recently dialled call numbers, optimising en-bloc dialling. To do so, activate the **Dial out cache** option for a SIP line or a SIP tie-line bundle.

- You must log on (“Login”) to the SIP registrar before you can use SIP telephony. Use the Forum 5500 to manage important information for the registration (user name and password) of one or more SIP accounts. It is possible to make several calls simultaneously using a single SIP account.
- A SIP connection causes constant Internet data traffic, so do not use SIP with Internet access which is paid for according to the time used.
- RTP call data is also exchanged directly between terminals for SIP telephony, so different codecs can be used for sending and for receiving. It is also possible to change codecs dynamically during a call. You should use every codec available in the VoIP profile at least once, because this will enable you to establish connections with as many SIP subscribers as possible.
- Fairly large packet lengths are quite normal on the Internet. They compensate for the longer packet propagation delay.
- A bidirectional RTP data stream with a dynamically-assigned UDP port number is used to set up calls between subscribers. For this reason, incoming RTP calls often fail to get past the Firewall or NAT configuration of the Internet gateway product used. The product should be compatible with SIP telephony. These products provide a “Full Cone NAT” setting for this application.
- To enable the use of multiple devices on a single Internet connection, the IP addresses used in a LAN (often 192.168.x.x) are translated to a valid IP address using address translation (NAT - Network Address Translation), but no status information is available for NAT on an incoming RTP connection. To avoid this problem, the IP address of a workstation computer or telephone visible on the Internet is determined using a STUN server (STUN: Simple Traversal of UDP over NAT). You can ask your SIP

provider for the STUN server's IP address and port number. If you don't need a STUN server, leave the **SIP Provider** field empty.

- For direct SIP telephony using Forum 5500, only SIP IDs consisting of numbers for identifying subscribers registered with the SIP provider specified can be addressed
- You can integrate an external SIP connection in the **Telephony**: **Trunks**: **Route** menu into the route configuration. You can use a network provider rule to specify the routing of numbers within a specific range to use SIP telephony as a preference (see also *PBX Networking*, under *Configuration* starting on page 190).

You can configure SIP connections in the **Configurator** on the pages **Telephony**: **Trunks**: **SIP provider** and **Telephony**: **Trunks**: **SIP trunks**. Enter the technical attributes of a specific SIP provider, such as the IP addresses for the registrar and the STUN server under **SIP provider**. Under **SIP trunks** enter the information for an existing SIP account, such as the user name, password, assigned call number and the maximum number of simultaneous calls possible.

For extension-capable SIP-DDI lines, you can, as needed, make additional settings on the **Telephony**: **Trunks**: **SIP Provider** page. Assigning extension call numbers and internal subscribers is configured on the pages under **Telephony**: **Call Distribution** (**Incoming DDI** or **Outgoing DDI**). Please note the explanations on these pages in the online help. Furthermore, assigning extensions using placeholders ("wildcards") is possible. The online help offers an explanation under the keyword **Call Number Mapping**.

Internal SIP Subscribers

The Forum 5500 becomes available as the SIP server for internal SIP subscriber telephony switching services. SIP telephones connected via LAN or SIP programmes installed on workstation computers can thus establish connections to all other devices or trunks connected to the Forum 5500.

Licence Assignment

The number of possible SIP subscribers is determined by the number of licences purchased. In order to provide you with the greatest possible flexibility regarding usage of available licences, licence assignment is dynamic via the "Floating licence". Using a user/password combination ("SIP log on") you can have several SIP subscribers under the same call number. Only every new SIP log-on occupies a new licence. The technical log-on process of a SIP

subscriber with a valid user name and correct password is always successful. If all licences are occupied currently, the SIP subscriber can only make emergency calls.

Note: If the technical log-on is not successful due to an incorrect user name or incorrect password, the SIP subscriber cannot establish any connections – no emergency calls either.

When a SIP subscriber logs off, when terminating the programme, for example, the associated licence will become available immediately. A licence is also made available when a SIP subscriber's regular status query is not conducted. The internal clock for automatic log-out is determined by the **Profile** assigned under **Telephony**: **Devices**: **VoIP Phones**. The (**Keepalive**) internal clock setting is located on the **Telephony**: **Extended**: **VoIP profile** page.

Detailed information on the current licence assignment and on logged-on SIP subscribers is located on the **System Info**: **Telephony**: **SIP phones** page. This page is where you can reset licence assignment at any time by clicking on **Reset licences**.

Technical Notes
The names of settings for the various SIP telephones or SIP programmes are not uniform unfortunately. Please refer to the **(Help)** on the **Telephony**: **Devices**: **VoIP Phones** page and the following notes when configuring SIP subscribers:

- The "REGISTER" SIP message must be sent to the IP address of the Forum 5500 using the 5060 destination port. For SIP subscribers, this setting is frequently located under "SIP Server" or "SIP Settings" with the terms "Domain", "Server IP" and "Server Port".
- The "REGISTER" SIP message must contain a valid user name and the appropriate password (the **User name** and **Password** fields in the **Configurator** under **User Manager**: **User**). For SIP subscribers, this setting is frequently located under "SIP User Settings" or "SIP Account" with the terms "Authorization User" and "Password".
- The "REGISTER" SIP message also contains a SIP-URI in the spelling for e-mail addresses, for example **"Displayname" <sip:123@192.168.99.254>**. The text portion of the SIP-URI ("Display Name") is not evaluated at log-on from the Forum 5500. The series of characters before "@" is the "User Name" or

"SIP Username". The internal call number of the user must always be used here (the **Ph.No.** field in the **Configurator** under **User Manager**: **User**). The series of characters after "@" is the "Domain Name" or the "SIP Domain". The IP address of the Forum 5500 must always be used here.

- A STUN server (Simple Traversal of UDP over NAT) or a SIP proxy is not required because internal SIP subscribers on the LAN are directly connected to the Forum 5500. Switch these functions off if possible.
- With a SIP terminal, you can enter an international phone number with a leading plus. When you enter a call number in the E.123 format, the plus char is substituted by the "00" number sequence and the immediate line seizure via the standard route is activated for the call. If you prefer to dial in this number format, you should activate the international call number conversion (see *E.164 conversion* starting on page 194).

Features

SIP subscribers can establish connections to all other terminals and trunks. The SIP protocol generally works with block dialling. This is why the selected call number is only activated after an internal clock has expired or activated immediately via the hash key ("#") when dialling. This is why code number procedures without the hash key and code number procedures with a concluding hash key can be used. An overview of code number procedures that can be used is located in the Configurator on the **System Info**: **Codes** page. Activate "SIP phones". Please also note the corresponding information in the "Forum 500 / Forum 5000 – Standard Terminals" user guide.

Alongside code number procedures, SIP subscribers can also use a series of functional features realized via the SIP protocol. The Forum 5500 is the ending for all SIP connections as opposed to what is usually the case on the Internet. This enables SIP subscribers to use Forum 5500 features. Direct data exchange is thus not possible between two SIP subscribers. The following table shows the possible features.

Features	Notes
Incoming and outgoing calls with call number display (CLIP)	A SIP telephone requires a call number display for CLIP.
Parallel connection of multiple SIP subscribers	SIP subscribers must be logged on under the same user identification.

Features	Notes
Enquiry, toggling, call waiting, three-way conference, reject	Operation or feature must be available on the SIP telephone or in the SIP software.
Call transfer	before and during a call; operation must be available.
Blind Transfer	SIP only: forwarding an incoming call without accepting the call; feature must be supported by SIP telephone or by the SIP software.
Keypad as “INFO” message	DTMF tones cannot be securely transferred “in band” via compression codecs. Digital “out band” transferral as “INFO” SIP message or via RFC 2833/4733 is supported. This feature must be available and activated on a SIP telephone or in the SIP software.

Forum IPhone 512 / Forum IPhone 545 SIP Telephones

You can operate the Forum IPhone 512 and Forum IPhone 545 SIP system telephones on the Forum 5500 communications system. The firmware of the communications system already includes the matching firmware files for the following SIP telephones:

Forum IPhone 512 and Forum IPhone 545 SIP telephones

Model	Short description
Forum IPhone 512	Basic level version, display with 3 lines, 8 programmable keys, 2 line keys, 802.3af (PoE) power supply, two Ethernet ports for PC and LAN, separate 48 volts wall power supply available
Forum IPhone 545	Premium version with graphic touchscreen display, 802.3af (PoE) power supply, two Gigabit-Ethernet ports for PC and LAN, 11 softkeys on 5 levels, 3 line keys, up to 3 key extensions with function keys or 3 key extensions with softkeys

The Forum IPhone 512 / Forum IPhone 545 SIP telephones provide, besides the VoIP telephony, additional system telephony features which you can configure conveniently and safely with the help of the Web configurator. The Forum IPhone 512 / Forum IPhone 545 SIP telephones support G.711 codec (a-Law and □-Law), the G.729 codec and the transmission of DTMF signals according to RFC 2833/4733.

The general commissioning takes place in the **Configurator** of the Forum 5500 communications system with the following steps:

1. Under **System**: **Licences**, activate the system devices.
2. Add a new entry under **Telephony**: **Devices**: **VoIP Phones**. Enter a call number and select the telephone type as Forum IPhone 512 / Forum IPhone 545. Optionally enter the MAC address and the IP address of the Forum IPhone 512 / Forum IPhone 545 (see *Forum IPhone 512 / Forum IPhone 545 DHCP* starting on page 151).

Note: If you want to allocate the VoIP profile to a Forum IPhone 512 or Forum IPhone 545 SIP system telephone, the **Voice Activity Detection** option should be deactivated for all codecs.

3. Under **Telephony**: **Devices**: **System phones** configure the common settings, the programmable keys and the softkeys for the Forum IPhone 512 / Forum IPhone 545 (see *Forum IPhone 512 / Forum IPhone 545 Setup* starting on page 150).
4. Connect the Forum IPhone 512 / Forum IPhone 545 to your network and plug in the power supply. Details about this can be found in the installation manual which is provided with the Forum IPhone 512 / Forum IPhone 545.

If the Forum IPhone 512 / Forum IPhone 545 has the factory default configuration, it will request an IP address configuration from the DHCP server of the Forum 5500 communications system. The IP address and the location for loading files from the TFTP server of the Forum 5500 is received as a part of the DHCP answer.

Now the Forum IPhone 512 / Forum IPhone 545 reads in the configuration files from the TFTP server. This includes a generic configuration file and a device specific configuration file for the given MAC address. During this process the Forum 5500 communications system transfers all settings and by this it configures the system telephony features for the Forum IPhone 512 / Forum IPhone 545. If necessary, The firmware stored in the Forum IPhone 512 / Forum IPhone 545 as well as the diverse language modules are updated also.

Note: The configuration files are sent using an encrypted format (file extension: *.tuz).

Forum IPhone 512 / Forum IPhone 545 Setup

You can change the configuration and function key settings for each Forum IPhone 512 / Forum IPhone 545 individually:

1. Call up the **Telephony**: **Devices**: **System phones** menu page in the **Configurator**.
2. In the **Devices** list, select the desired Forum IPhone 512 / Forum IPhone 545.

   The menu page shows the current configuration, the function key assignment and a device graphic.
3. Click on the **Change** button to determine general settings, e.g. the display language. Confirm the setting on the following page with **Apply**.

4. Depending on the terminal type, different lists with function keys will be shown:

   – **Programkeys**: You can label this function keys on the device using a paper strip.

   Click on the function key heading to call up the configuration dialogue for this function key. Select a function in the **Type** setting and optionally enter a label in the **Labelling** setting. Confirm the setting with **Apply**.

5. To transfer the settings to the Forum IPhone 512 / Forum IPhone 545, click the **Apply** button on the **Telephony**: **Devices**: **System phone** page.

   The Forum IPhone 512 / Forum IPhone 545 restarts and thereby takes over the new configuration.

Details on using the Forum IPhone 512 / Forum IPhone 545 SIP telephones as well as an overview about the possible function key assignments can be found in the “Forum IPhone 512” / “Forum IPhone 545” user guide.

Forum IPhone 512 / Forum IPhone 545 DHCP

The address and device configuration is transferred from the Forum 5500 communications system to the Forum IPhone 512 / Forum IPhone 545 SIP phone using the DHCP protocol. You can configure the necessary address settings while adding a device entry under **Telephony**: **Devices**: **VoIP Phones** differently:

- You can enter the MAC address of the Forum IPhone 512 / Forum IPhone 545 manually. Depending on the operation mode of the DHCP server, you can also enter the IP address manually. For this, change the **Status** setting on the **Network**: **DHCP** page to “Static address assignment”. Optionally, you can use the dynamic IP address assignment from the DHCP server. For this, change the **Status** setting on the **Network**: **DHCP** page to “Dynamic address assignment” and also change the **Devices** selection to the “All” setting or to the “with configured MAC only” setting.
- By using the “Easy Configuration / Hot-Desking” feature you can add a device entry without entering a MAC address and without entering an IP address. An unregistered Forum IPhone 512 / Forum IPhone 545 will show a login page after startup. A user can enter the desired call number and the matching user PIN which will establish the association of the user account to the device entry. For this, change the **Status** setting on the **Network**: **DHCP** page to “Dynamic address assignment” and also change

the **Devices** selection to the “All” setting or to the “with configured MAC only and all SIP system devices” setting.

If you want to use both features concurrently, change the **Status** setting on the **Network**: **DHCP** page to “Dynamic and static address assignment”.

If you operate another DHCP server in your network, the Forum IPhone 512 / Forum IPhone 545 can distinguish the different DHCP answers and will normally take its configuration data from the Forum 5500 communications system nevertheless. In a conflict situation, you may need to prevent the configuration of the Forum IPhone 512 / Forum IPhone 545 SIP phone by a foreign DHCP server. For example, add an exception rule for all MAC addresses starting with 00:08:5D.

Note: The Forum IPhone 512 / Forum IPhone 545 SIP telephones need to receive a configuration from the communications system at least once, before the described difference in the DHCP answer is activated.

The TFTP server of the Forum 5500 communications system will serve up to 100 concurrent data transfers. To avoid overloading the TFTP server (e.g. after a power failure), additional devices may get an IP address from the DHCP server with a delay. The allocation of IP addresses will restart if the TFTP server indicates the end of the overload situation.

Forum IPhone 512 / Forum IPhone 545 Hot Desking

The Forum IPhone 512 / Forum IPhone 545 SIP phones support the “Easy Configuration / Hot desking” feature. This feature allows a user to operate his personal configuration on any desired Forum IPhone 512 / Forum IPhone 545 of equal type.

To prepare a Forum IPhone 512 / Forum IPhone 545 for Hot Desking, you can configure a function key with the “Logout” function. If this function key is pressed, the currently assigned device entry will be marked as “Logged Out” and the Forum IPhone 512 / Forum IPhone 545 restarts. You can indicate logged out device entries in the Configurator on the **Telephony**: **Devices**: **VoIP Phone** page by their shortened MAC address.

After restart, the logged out Forum IPhone 512 / Forum IPhone 545 will show a login page. A user can enter his call number and his user PIN. If a device entry with this call number exists and has the same device type, the login procedure continues. If the device entry is currently active on another

device, the associated remote Forum IPhone 512 / Forum IPhone 545 will be logged out automatically and will show a login page on its part. The now logged in Forum IPhone 512 / Forum IPhone 545 starts and will get its configuration from the newly assigned device entry.

Note: When adding the device entry, it is also possible to activate the **Logged out** option.

VoIP System Telephones

The following telephones and software packages are available for VoIP system telephony:

- Forum IPhone 525: This system telephone can be extended with up to three key extensions (Forum 500 Keypad Paper FP 525/535).
- Forum IPhone 535: This system telephone can be extended with up to three key extensions (Forum 500 Keypad Paper FP 525/535 or Forum 500 Keypad Display FP 535).
- Forum IPhone PC: This VoIP software offers the functionality of an IP system telephone using Windows executable software (see *Forum IPhone PC* starting on page 160). This software also provides local answering machine functionality and can be integrated into CTI applications.

Device Properties

The VoIP system telephones offer the following specific device properties:

- Two RJ45 connector ports are available for ethernet connection. The ports are connected to one another via the telephone's internal switch. The switch supports 10 Mbit/s or 100 Mbit/s full-duplex with priority given to VoIP data transmission.

  LAN Port: Allows the telephone to connected to the LAN. Use a non cross-over RJ45 patch cable to connect to a Hub or Switch.

  PC Port: Allows the telephone to be connected to a workstation computer. Use a non cross-over RJ45 patch cable to connect to the PC's network port.
- The VoIP system telephone's power supply is provided by an extra plug-in power supply. It is also possible to provide a power feed via PoE ("Power

over Ethernet"). PoE requires special devices for power feeds, as well as a completely wired RJ45 connection line.

- You can also connect a standard headset via RJ45 sockets (DHSG standard) to VoIP system telephones.
- VoIP system telephone's audio signals are generated by the telephone itself. DTMF dial tones and Music on Hold are produced by the Media Gateway function.
- A VoIP system telephone can also be operated without a permanent connection to the communications system, for example via VPN connection.
- Signalling data for call control, call data during three-way conferences, connections to conventional terminals and external connections is exchanged between the VoIP system telephone and the communications system. During a call between two VoIP system telephones, call data is exchanged directly between the two VoIP system telephones.
- During the device's start procedure, the IP address is configured and the device software is requested via the DHCP and TFTP network protocols.

VoIP System Telephone Configuration

The VoIP system telephones Forum IPhone 525 and Forum IPhone 535 obtain the required IP address configuration and operating software via the DHCP, BOOTP and TFTP IP protocols. After the power supply is assured, the device's internal boot loader is started which controls the further start procedure.

Standard operating procedure is to contact the Forum 5500's DHCP server so that the start procedure can be concluded without problems. To register a new VoIP system telephone, proceed as follows:

1. Temporarily remove the VoIP system telephone's ethernet connection. Switch on the VoIP system telephone's power supply. Note the MAC address shown in the display, for instance "MAC: 00:30:42:00:00:00". Switch off the power supply.
2. In the **Configurator**, open the **Telephony: Devices: VoIP Phones** page. Click on the **New** button.
3. Select the VoIP system telephone's **Type** and enter the previously noted MAC address. Assign a **Name** and **Phone No.** Confirm with **Apply**.

4. Connect the ethernet connection with the VoIP system telephone's RJ45 connector. Switch on the power supply. Verify the correct start procedure on the display.

LAN DHCP Server

If the LAN already uses a DHCP server to configure workstation computers, there are various options for correctly responding to VoIP system telephones' DHCP, BOOTP and TFTP requests. A comparatively simple approach is described here.

1. Configure the LAN's DHCP server to ignore DHCP requests from the VoIP system telephones. With a Linux DHCP server programme, you must, for example, include the following lines in the system file "/etc/dhcpd.conf":

   ```
   group {
    deny booting;
    host 192.168.11.12 {
      hardware ethernet      00:30:42:00:11:22;
    }
   }
   ```

   Every DHCP service programme has similar options. You may need to reserve a free IP address for each VoIP system telephone. You will find more details in your DHCP service programme's online help or handbook. The MAC address of all VoIP system telephones always begins with 00:30:42.
2. Configure the Forum 5500's DHCP server to assign IP addresses. To do this, call up the **Configurator** and open the **Network: DHCP** page. Click on the **Change** button.
3. From **Status**, select the **address assignment** option. Confirm with **Apply**. The **DHCP** page is re-displayed.
4. Add the configured VoIP system telephones to the list of IP addresses. Click on the **New** button.
5. Enter the VoIP system telephone's **IP address** and **MAC address**. Enter the IP address reserved by the DHCP service programme. Confirm with **Apply**.

Restart the Forum 5500 and all connected VoIP system telephones.

Tip: Configuring multiple VoIP terminals can be facilitated by using dynamic address assignment.

Start Procedure

It may sometimes be useful to understand a VoIP system telephone's start procedure. Examples:

- A complex DHCP address assignment prevents the operation of the Forum 5500's DHCP server within the LAN.
- A VoIP system should be operated with a non-broadcast-capable IP connection. This may be an RAS connection, a VPN connection or another type of routed connection.

An external DHCP server can also control a VoIP system telephone's start procedure. In this case, system software matching the type of VoIP system telephone must be transferred via TFTP.

The file name is determined by the telephone type.

Telephone type	File name
Forum IPhone 525 Forum IPhone 535	/ram/ip_tel/opi7x.cnt
Forum Base DECT IP	/ram/ip_tel/ip_rfp.cnt
Forum Base DECT IP v2	/ram/ip_tel/ng_ip_rfp.cnt

After the VoIP system telephone has been connected to the mains power supply, the start procedure is as follows:

1. The boot loader starts and shows the VoIP system telephone's MAC address in the display. A DHCP request is sent simultaneously via broadcast on the 255.255.255.255 broadcast address.
2. An IP address, network mask and the default gateway for the start procedure are sent from the DHCP server. Via the "Next server" option, the DHCP server also provides the TFTP server's IP address and the operations software's file name. The DHCP server uses the MAC address to select the operations software file which matches the type of device.
3. The boot loader loads the approximately 2 MB operations software file from the specified TFTP server. The TFTP server's IP address and the file's name are shown in the display. The loaded operations software is started.
4. The operations software sends a DHCP request on the broadcast address 255.255.255.255. The VoIP system telephone now receives an IP address, network mask and default gateway for operations from the DHCP server.

Using “Option 43”, which is reserved for this purpose, the DHCP server also provides the IP address of the communications system and port number 8100 for registration.

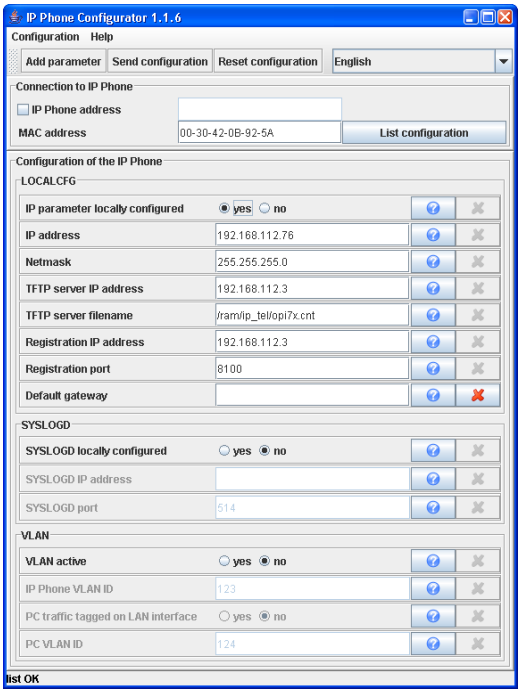
5. The VoIP system telephone creates a TCP connection to the supplied IP-address/port-number combination and sends a registration query. The Forum 5500 checks the MAC address sent with the registration and confirms the registration request if the VoIP system telephone is listed in the menu **Telephony: Devices: VoIP Phones**. The keep-alive time, port number (8101) for telephony signalling and the value to use for the TOS byte are also communicated in the registration answer.
6. The VoIP system telephone creates a second TCP connection using the signalling port number 8101 and sends a registration.
7. Extra connections are created using the IP protocol RTP (“Realtime Transport Protocol”) for call data when a call is created. For calls between two VoIP system telephones, port numbers above 8200 are used.

If you wish to operate a VoIP system telephone via a routed IP connection (for example VPN or RAS) it may be necessary to configure an external DHCP server accordingly. The operations software provided via TFTP must match the type of device and communications system. You may also need to configure BOOTP, DHCP and TFTP servers for the VoIP system telephone.

Local Configuration

In addition to automatic configuration via BOOTP/DHCP, it is possible to manually configure a Forum IPhone 525 or a Forum IPhone 535. This can make sense, for example, when you wish to connect a VoIP system telephone at a distant location via router. This local configuration is saved permanently in the non-volatile memory of the VoIP system telephone. To change the local configuration, use an additional programme, the Java-based “IP Phone Configurator”.

Note: Java programmes can be run on all common operating systems. To execute Java-based programmes, you must install a suitable Java runtime environment on your operating system (JRE). This can be downloaded under the following web address: http://www.java.com/.



1. The “IP Phone Configurator” can be started directly from the Product CD. Start Windows Explorer. Navigate to the Product CD. Double-click the “Forum\IpPhoneConfigurator.jar” file.

   The “IP Phone Configurator” dialogue opens. Select the desired language setting (“English” or “German”)from the drop-down menu.

2. Enter the network address of the VoIP system telephone. You have two connection types to choose from under **Connection to IP Phone**:

   – Deactivate the **IP Phone address** option to establish a broadcast connection via “UDP-Broadcast”. You have to select this type of connection if the VoIP system telephone has not yet been assigned an IP address. IP broadcasts cannot be transmitted via router. The VoIP system telephone thus has to be directly connected to your PC via a hub or via a switch.

   – Activate the **IP Phone address** option to establish a point-to-point connection via “UDP-Unicast”. Enter the IP address of the VoIP system telephone into the entry field. You can select this type of connection if the VoIP system telephone has already been assigned an IP address.

3. Enter the **MAC address** of the VoIP system telephone. You will find the MAC address on the underside of the device. Click on **List configuration**. The status bar at the bottom edge of the programme window displays “list OK”.
4. Change the desired settings under **Configuration of the IP Phone**. Click on **Reset configuration** to activate the standard settings for all entry fields.
5. Click on the **Send configuration** command to transfer the currently shown configuration to the VoIP system telephone. The status bar at the bottom edge of the programme window displays “send OK”.

Note: The VoIP system telephone receives the configuration and sends a response. The new configuration is only saved and activated once this has happened. This can result in the “IP Phone Configurator” not receiving the response of the VoIP system telephone.

Please note: If you are operating multiple network cards with active IP configuration in your PC, this may mean that the loading of configuration data fails. First you deactivate additional network cards or use a point-to-point connection. Sending configuration data with a broadcast connection functions even without a response from the VoIP system telephone.

You can implement the following settings:

IP parameter locally configured: Select the **yes** option to activate manual IP address configuration. Select the **no** option to activate automatic IP address configuration via BOOTP/DHCP.

IP address and **Netmask**: Enter an available IP address and the network mask to be used by the VoIP system telephone.

TFTP server IP address and **TFTP server filename**: Enter the IP address and the complete file name for the operating software of the VoIP system telephone (see table on page 156). For the Forum 5500, use always the IP address of the communications system.

Registration IP address and **Registration port**: This is where you usually enter the IP address of the Forum 5500 and the port number 8100.

Default gateway: Click on the **Add parameter** command to have this optional entry field displayed. Then enter the IP address of the router (“Default Gateway”). Click on the Delete button to remove the optional parameter.

SYSLOGD: For monitoring purposes, VoIP system telephone messages can be sent to a Syslog server. Activate the **yes** option and configure the **SYSLOGD IP address** and **SYSLOGD port** settings to activate this function.

VLAN (Expert option - do not change the “no” setting in standard cases): To improve transmission security or to enforce security guidelines, PC data transmission and VoIP data transmission can be separated using this method. Activate the **yes** option and enter the desired **IP Phone VLAN ID** for the VoIP data transmission. Enter a value ranging from 1-4094. Data will always be transmitted without a VLAN tag at the VoIP system telephone’s PC access. If you activate the **yes** option for **PC traffic tagged on LAN interface**, PC data will be labelled with the **PC VLAN ID** at the LAN access. Please note that to change the VLAN settings, the VoIP system telephone has to be restarted.

Forum IPhone PC

Besides the hardware VoIP system telephones, PC software for VoIP telephony can also be deployed. This software can be used with the operating system Windows.

Software VoIP System telephone Forum IPhone 535 PC with one key extension

As well as VoIP system telephony from workstation computers, the Forum IPhone PC includes the following features:

- Usage via Mouse/PC keyboard

- “Drag & Drop” call number selection
- Integrated answering machine / recording function
- Terminal control for the sight-impaired
- Selectable user interface (“Skins”)
- Display language modification

The workstation computer requires a full-duplex-enabled sound card as well as a suitable headset for audio recording and playback.

You will not need a licence to install Forum IPhone PC but you will require a licence to operate it with the Forum 5500. Unit licences, enabling the simultaneous operation of a certain number of Forum IPhone PCs, are available.

The licences are activated in the Forum 5500’s **Configurator** in the Menu **System: Licences**. The system software includes a licence for a demo version for temporary use (60 days). Please contact your Proximus agent if you wish to purchase a permanent licence. Licences can be combined. Each licence can be activated only once.

Installation

Installation is done using a setup programme (“IPCsetup.exe”). The Forum IPhone PC can also be installed without a user interface. The programme can then be used via a CTI application (Net-TAPI or Forum CTI).

Start the installation programme Forum IPhone PC from the product CD and follow the installation assistant’s instructions.

Configuration

Analogue to the VoIP system telephones, the Forum IPhone PC creates multiple IP connections to the Forum 5500. When you start the programme for the first time, the **Options** dialogue is automatically opened. Here you must configure the following values:

1. Enter in the **VoIP IP Address** field the Forum 5500’s IP address.
2. Enter six hexadecimal-digits into the **Device ID** field. This device ID is not a MAC address, so overlapping with existent MAC addresses is possible. The device ID is configured in the **Configurator**, on the **Telephony: Devices: VoIP Phones** page.
3. Confirm with **OK**.

Notes
VoIP system telephony requires an active IP connection to a workstation computer. If a Firewall is installed for your workstation computer, you may need to explicitly allow this connection.

If you log on to the workstation computer using a different user name, you must reconfigure these values.

You can use any arbitrary sequence of digits not already in use in the LAN for the device ID. Select a random device ID to secure telephone usage. The device ID can only be read on the Web console.

The displayed menu texts and parts of the operations software are elements of the Forum IPhone PC installation, but they can be loaded from the Forum 5500 via TFTP where necessary.

DECT over IP®

In order to achieve optimal network coverage, a DECT network with several DECT base stations can be operated. A DECT network is comprised of DECT terminals connected with the next respective base station (network cell). For users of a DECT terminal, the handover from DECT base station to base station is completely transparent. Even during a conversation, users are switched from one network cell to the next without any interruption. Administration of DECT terminals is done centrally via the Forum 5500 Configurator in the **Telephony: Devices: DECT Phones** menu.

Note: DECT over IP® is a registered trademark of Mitel Networks Corporation.

Properties

DECT Base Stations

DECT base stations can be connected to the Forum 5500 via network (TCP/IP). These DECT base stations are available:

IP-DECT

- Forum Base DECT IP indoor: Access via shielded CAT5 Ethernet cable (STP cable, Shielded Twisted Pair cable) with up to 100 metres of cable from the last Ethernet switch, integrated antennas; 8 voice channels
- Forum Base DECT IP outdoor: like the Forum Base DECT IP indoor; mounted outside enclosed areas (IP55); external antennas
- Forum Base DECT IP-WLAN indoor: Access via shielded CAT5 Ethernet cable (STP cable, Shielded Twisted Pair cable); offers simultaneous function of a WLAN Access Point conforming with the IEEE 802.11b/g protocol; external antennas; 8 voice channels

When started, the operating software for the DECT over IP base stations is transmitted via TFTP protocol from the Forum 5500. The configuration for the start sequence is transmitted by the DHCP server of the Forum 5500 to a DECT over IP base station for the start sequence.

IP-DECT (NG / New)

- Forum Base DECT IP indoor v2: Access via shielded CAT5 Ethernet cable (STP cable, Shielded Twisted Pair cable) with up to 100 metres of cable from the last Ethernet switch, integrated antennas; 8 voice channels
- Forum Base DECT IP outdoor v2: like the Forum Base DECT IP indoor v2; mounted outside enclosed areas (IP55); external antennas
- Forum Base DECT IP-WLAN indoor v2: Access via shielded CAT5 Ethernet cable (STP cable, Shielded Twisted Pair cable); offers simultaneous function of a WLAN Access Point conforming with the IEEE 802.11a/b/g/n protocol; external antennas; 8 voice channels

The operating software for these DECT over IP base stations is transferred from the Forum 5500 at the first-time start with the TFTP protocol. For later starts, the operating software in the memory of the device is used. The configuration for the start sequence is transmitted by the DHCP server of the Forum 5500 to a DECT over IP base station for the start sequence.

Note: You can simultaneously use older and newer DECT over IP base stations. In this case you have to select a newer DECT over IP base station Forum Base DECT IP v2 as DECT over IP Manager.

Transmission of telephony signalling and voice data via TCP/IP offers usage of existing network infrastructure and an increase in range using suitable methods. VPN connections, for example, can be used for data links to provide service to remote or hard-to-reach locations.

Note: The DECT base stations Forum Base DECT IP indoor (v1 & v2), Forum Base DECT IP outdoor (v1 & v2) and Forum Base DECT IP-WLAN indoor (v1 & v2) support the DECT encryption function. This feature is however, only available if all the DECT base stations support it.

Features

All DECT over IP base stations can be connected to a CAT5 Ethernet cable with a 10/100 Base T. Power is supplied either via Power-over-LAN (IEEE 802.3af) or via an additional power supply unit. A base station of the type Forum Base DECT IP outdoor can only be supplied via PoE.

Please note: The WLAN function of the Forum Base DECT IP-WLAN indoor is activated only when connected to the 100 Base T.

DECT terminals offer all system telephony features. DECT telephones supporting the GAP standard can also be operated. Transparent GAP device handovers are supported. DECT encryption of calls can be deactivated for the Forum Base DECT IP (v1 & v2) if desired.

VoIP audio communication between the DECT over IP base station and the Forum 5500 is made via the RTP/RTCP protocol. RTP voice data are directly converted into DECT voice data by the base station. The base stations support the following VoIP codecs:

G.711	uncompressed
G.729	compressed

Configuration

One of the DECT over IP base stations that is installed assumes coordination and configuration of the DECT over IP functions ("DECT over IP Manager", OMM). Select a base station that has a dependable data link to the Forum 5500.

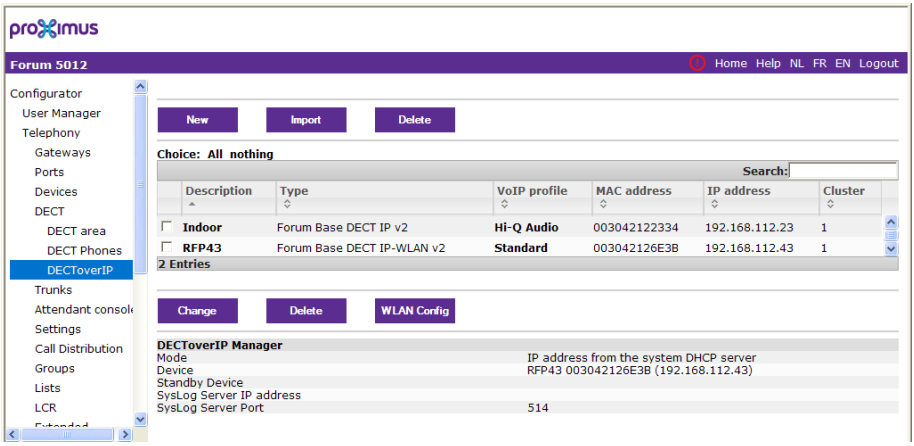
Note: You can determine a second base station as additional DECT over IP Manager ("Standby Device"). If the first DECT over IP Manager fails, the second base station takes over this critical function after some minutes and a reset of the DECT network.

Go to the **Telephony: Devices: DECT over IP** page in the **Configurator**. Click on **New**, to add a DECT over IP base station. Enter the **MAC address** of the base station that you have selected to be the DECT over IP Manager. The MAC address of the base station is located on its type label. Enter an **IP address** for this base station. Confirm with **Apply**. Now click **Change**, to determine the DECT over IP Manager. In standard cases, leave the **Mode** in the "IP address from the system DHCP server" setting. Select the desired DECT over IP base station with the **MAC address (IP address)** setting. Confirm with **Apply**.

If the Forum 5500's DHCP server is not configured for static address assignment, you first need to configure the IP address of the DECT over IP Manager with the help of an additional programme (see *Local IP Address Configuration* starting on page 172). Also change the **Mode** setting on the **Telephony: Devices: DECT over IP** page to "IP address configured local" and

enter there the configured IP address for the DECT over IP Manager. All other base stations can be operated using either a fixed IP address or an IP address assigned dynamically via DHCP. Please refer to the information given in the chapter entitled *LAN DHCP Server* starting on page 155.

Create a separate entry for each DECT over IP base station and for the DECT over IP Manager on the **Telephony: Devices: DECT over IP** page. You use these entries to determine the VoIP data compression ("Profile").



Configurator: *Telephony*: *Devices*: *DECT over IP*

User administration and set-up of DECT terminals is done in the Configurator of the Forum 5500 as well.

The DECT over IP Manager offers a separate web user interface to manage the settings of devices with WLAN functions. Therefore at least one WLAN-RFP has to be configured. If everything is configured correctly and the OMM as well as the WLAN-RFP are completely started, you will see the **WLAN Config** link. Login as the user "Administrator" with the currently set administrator's password of the Forum 5500.

Synchronisation

Transmissions of all DECT base stations at a single location must be synchronised in order that DECT terminals are able to receive multiple DECT base stations simultaneously. DECT over IP base stations are synchronised via wireless connection.

When planning a larger sized DECT network, it is advisable to take the following points into consideration:

- All DECT over IP base stations at a single location must be able to receive at least one, or even better, two neighbouring base stations. Synchronisation requires less signal strength than a voice connection does.
- Synchronisation range is increased using multiple base stations. To decrease the probability of a connection breakdown, base stations should not be arranged in chain formation. The signal should be distributed with a network that is as extensive as possible and where each base station is supported by multiple synchronisation partners.
- To re-synchronise, first wait for all current connections to be terminated.

You can operate a DECT network consisting of several remote locations (“clusters”). A cluster is a number of DECT base stations that operate synchronously with each other. No handover is possible between DECT base stations from different clusters. You should configure a second cluster for DECT base stations of a second location.

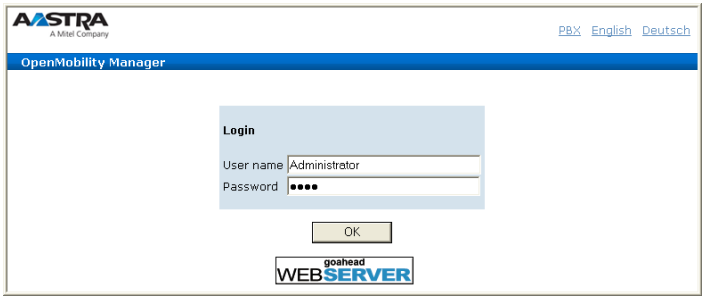
Setting up the WLAN Function

The Forum Base DECT IP-WLAN indoor (v1 & v2) DECT over IP base station provides the additional function of a Wireless LAN Access Point (WLAN-AP). WLAN refers to data transfer by means of radio waves in accordance with the IEEE 802.11 standard. This standard enables a wireless connection to be made to an Ethernet network (LAN) using suitably equipped user terminals. Data transfer via radio waves is very fast. Depending on the conditions of the operating environment, it can reach speeds of up to 54Mbit/s (gross, 802.11b/g) or higher (802.11a/b/g/n).

Forum Base DECT IP-WLAN indoor v2 (NG / New): The WLAN function and the function of the DECT over IP Manager can be used simultaneously on the same DECT over IP base station.

Forum Base DECT IP-WLAN indoor: The WLAN function and the function of the DECT over IP Manager cannot be used simultaneously on the same DECT over IP base station, so you will always need at least two DECT over IP base stations.

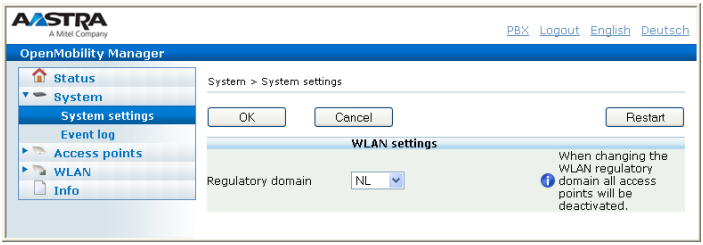
WLAN settings are configured centrally for all Access Points using a separate Web configurator, which can be found at the IP address of the DECT over IP Manager. You can reach this address by entering the IP address of the DECT over IP Manager directly into the address bar of your Web Browser. Alternatively, you can also go to the **Configurator**, to the page **Telephony: Devices: DECT over IP** and click on the **WLAN Config.** button. Log in under the **User Name** "Administrator" and enter the same password as for the Forum 5500.



DECT over IP/OpenMobility Managers Login Page

The WLAN settings are then made as follows:

1. Set up the existing DECT over IP base stations in theForum 5500's **Configurator**. Go to the DECT over IP Manager's Web Configurator.
2. Configure a system and select a suitable country setting.



3. On the **WLAN Profiles** page, configure at least one set of settings (see below under: *Setting up a WLAN Profile*). Note down the password you

have used (“Pre-Shared Key”), so that you will be able to use it again later when setting up wireless user terminals or notebooks.

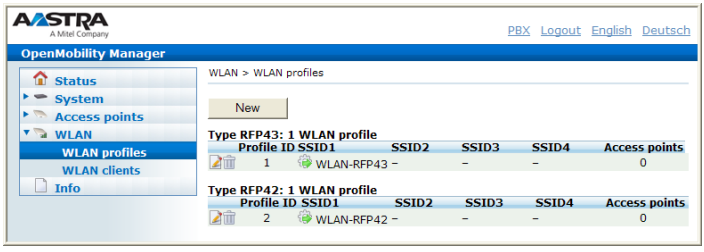
If you operate older Forum Base DECT IP-WLAN indoor v1 and more recent Forum Base DECT IP-WLAN indoor v2 simultaneously, you need at least 2 different profiles. Under **WLAN profile type**, select the **RFP42** (Forum Base DECT IP-WLAN) or **RFP43** (Forum Base DECT IP-WLAN indoor v2) setting. A common profile for both device versions is not possible due to different radio standards.

4. Assign the desired WLAN profile on the **Radio Fixed Parts** page. Click on spanner symbol (🔧) on the left next to the relevant DECT over IP base station. Under **WLAN Settings** select the number of the configured **WLAN Profile**. Confirm your settings with **OK**. You can use one profile for multiple DECT over IP base stations.

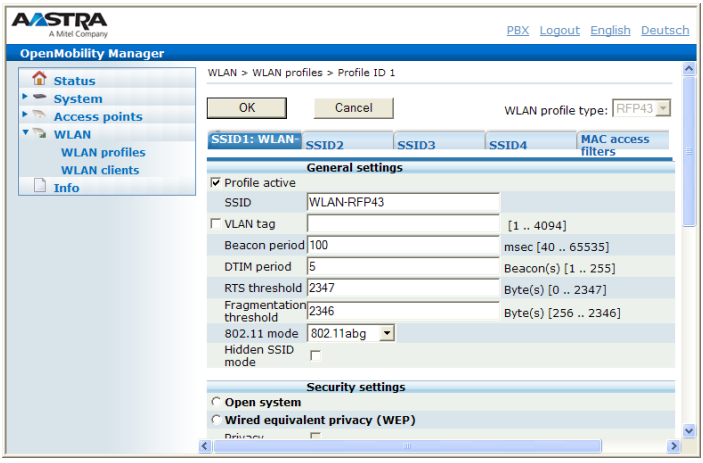
You can now use the WLAN function of your WLAN-enabled DECT over IP base stations and set up the user terminals as required.

Setting up a WLAN Profile

The WLAN function of the Forum Base DECT IP-WLAN indoor (v1 & v2) DECT over IP base station also includes such rarely-required features as networks for large company premises or airports. In this guide we will, for the sake of brevity and clarity, describe only those features required for secure standard operation.



DECT over IP/OpenMobility Manager: Overview WLAN profiles



DECTover IP/OpenMobility Manager: WLAN Profiles

Use the following settings for standard operations.

General Settings

- Select the desired **WLAN Profile** and activate the **Profile Active** option.
- Enter a **SSID** (Service Set Identifier, wireless network identification) to identify a network. This network identification is transmitted at regular intervals, making it easier to find the networks you're looking for, using the "View available wireless networks" function in Windows, for example.
- For standard operation you should leave the following settings at their default values: **VLAN Tag** at 0 (Off), **Beacon Period** at 100 ms, **DTIM Period** at 5, **RTS Threshold** at 2347 (Off), **Fragmentation Threshold** at 2346 (Off) and **Interference Avoidance** on "Off".

Tip: If you are using only modern WLAN cards with 802.11g, you can further speed up data transfer by configuring the setting **802.11 Mode** to "802.11g only".

- You can prevent the transmission of wireless network identification (SSID) with the **Hidden SSID Mode** setting. This will however make network identification difficult and does not generally increase data security, so it is preferable to leave this on the default setting of "Off".

Security Settings
On no account should you use **Open System** or **Wired Equivalent Privacy (WEP)** settings, whether out of convenience or in order to avoid configuration problems, unless of course you want to start up an Internet Cafe!

- Activate the **Wifi Protected Access (WPA)** option.
- Under **Type** select the "WPA v.2"setting.
- For standard operation select the **Pre-Shared Key** option. Enter a password in the **Value** input field and leave it set to **Text**. Use a password with the following characteristics:

  – No words or names that can be found in a dictionary

  – At least 8 characters long

  – It should also include numbers, a mixture of upper and lower case and special characters

  You could also use the **Generate** button to generate a password. Some WLAN configuration software does not convert text into hexadecimal values as a standard procedure. If this is the case, go to the **Hex Value** setting and select the **Generate** button.
- Leave the **Cipher Length** setting at 256 Bit and the **Distribution Interval** setting at 120 seconds. You will not usually need the settings for **WME** or for configuring **Multiple SSIDs** for standard operation.

Tip: If you are running an Internet-Cafe without using powerful encryption, you should, for the sake of your customers' security, prevent them from being able to access each others' computers. Activate the **BSS Isolation** option. You can also stop unpleasant guests from using the system with a **MAC Address Filter** – but this will not hold up users who know about this function for long.

Configuring for a Remote Location

If you are using a DECT over IP base station in the same LAN as the Forum 5500, the IP address configuration and software loading procedure which are run when a DECT over IP base station is started are handled by the Forum 5500 using the DHCP and TFTP protocols.

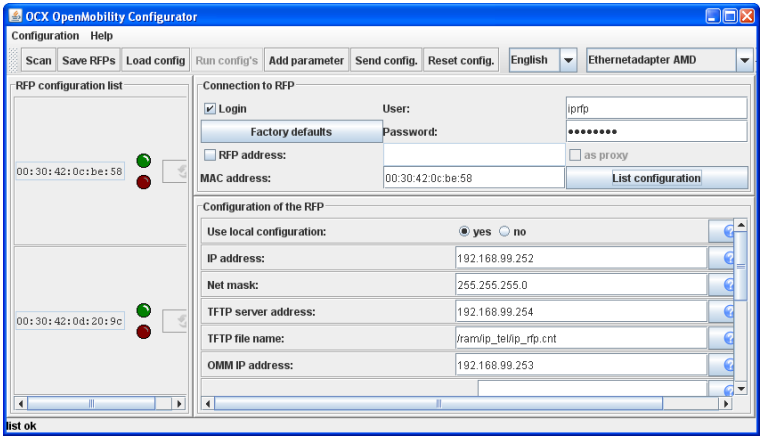
For the DHCP function to be available, the DECT over IP base station must be able to reach the Forum 5500 via a "Broadcast". In the case of a remote location this kind of access - via a VPN connection for example - will not be possible. As in the case of an IP system telephone, you will have to acquire the

necessary system software for the DECT over IP base station with the help of a TFTP server.

Local IP Address Configuration
The IP address configuration can be set up as a “local configuration” with the help of an additional programme.

1. Call up Windows explorer. Browse to the communications system’s product CD. In the “Forum” directory, double-click the “OM_Configurator.jar” file.

Note: You need a Java runtime library to be able to run Java programmes. If you don’t have one installed, you can download the installation programme from the http://www.java.com/ web site.



OpenMobility Configurator

2. To log in to the dialogue, you enter:

   Forum Base DECT IP v2 und Forum Base DECT IP
   User: “admin”, Password: “Admin”

   For RFPs in factory configuration, which are never connected to an Forum 5500 communications system, the login credentials are:

   IP-DECT (Forum Base DECT IP):
   User: “admin”, Password: “Admin”

   IP-DECT NG / New (Forum Base DECT IP v2)
   User: “omm”, Password: “omm”

3. Enter the **MAC address** of the DECT over IP base station. The MAC address will be printed on the label on the DECT over IP base station's casing. Click on **List configuration**.

   The DECT over IP base station's current configuration will be displayed.

4. Change the DECT over IP base station's IP address configuration. Activate the **Use local configuration** option ("yes") and enter the required details:

   – **IP address**: Static IP address of the DECT over IP base station

   – **Net mask**: Subnet mask of the DECT over IP base station

   – **OMM IP address**: IP address of the DECT over IP Manager. For the actual DECT over IP Manager simply repeat the entry from the **IP address** entry field.

   – **OMM port number;** Leave the default setting on "16321".

   – **PBX IP address**: IP address of the Forum 5500

   – **PBX port**: Leave the default setting on "8099".

5. Under **TFTP server address** enter the IP address the operating software is to be downloaded from. This will usually be the communications system's IP address. Leave the **TFTP file name** setting on the default setting ("/ram/ip_tel/ip_rfp.cnt") or "ng_ip_rfp.cnt".

6. For a remote location, the Forum 5500's LAN will usually be accessed via a (VPN) router. Click on **Router addresses**: **[+]**. Enter the router's IP address ("default gateway"). Confirm by clicking on **Add**.

7. To make sure RFP error messages receive correct time stamps, add an **NTP server address** with the **Add parameter** button. Then click **NTP server address**: **[+]**. Enter the IP address of the communications system. Confirm with **Add**.

8. Click on **Send config** to activate the desired IP address configuration.

DECT Networks

The Forum 5500 communications system supports setting up a DECT network for operating cordless DECT terminals. There are 2 different DECT system technologies available for doing so.

U-DECT
This technology is for connecting Forum Base DECT v2 base stations ("RFPs", Radio Fixed Parts) via DECT-capable U_{pn} Forum Gateway 560 ports. You require at least one Forum Gateway 560 which is equipped with a Forum 550 Card 8 digital extensions module (see *Forum 550 Card 8 digital extensions*). You can connect a number of DECT base stations to the U_{pn} interfaces of this module.

Note: The firmware of older Forum Base 500 type DECT base stations does not support alternating transmission of SARI and PARI. This means that these DECT base stations can only be operated on the gateway 01.

Setting up a DECT network using this technology is described in this chapter.

DECT over IP®
This technology is used to connect DECT base stations via network (TCP/IP) directly to the Forum 5500 communications system. You require a number of IP-capable DECT base stations.

Setting up a DECT network using this technology is described in the *DECT over IP®* starting on page 163 chapter.

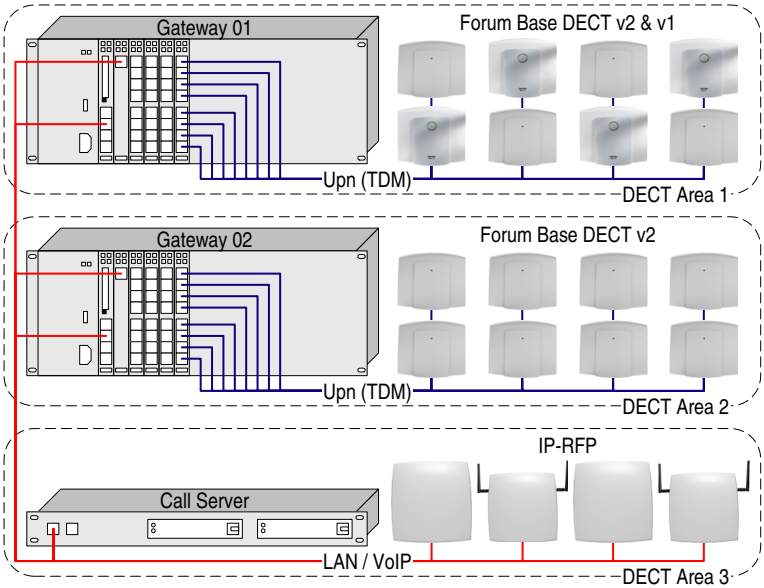
Note: You can operate both technologies at the same time with an Forum 5500 communications system. In this case, the IP-capable DECT base stations form a separate DECT area. Note the explanations in this regard in the following *DECT Areas* section.

DECT Areas

It is possible to operate a DECT network with multiple DECT areas on the Forum 5500 communications system. A DECT area (“DECT Area”) has the following properties:

- The DECT base stations of a DECT area are synchronous with one another. This means that when transferring an ongoing call from one DECT base station to another is without interruption (“Handover”). It is not possible to hand over a DECT call to a DECT base station from another DECT area.
- A DECT terminal must be checked in just once in order to be able to automatically connect with DECT base stations of various DECT areas (“Roaming”). To do so, a DECT terminal is checked in to one of the configured DECT areas. If the DECT terminal loses its radio connection to the DECT base stations of a DECT area, it can automatically connect to a DECT base station of another DECT area. When this happens, an ongoing call is disconnected.
- In principle, up to 256 DECT base stations can be operated in each DECT area. This maximum number is, however, limited by the number of available U_{pn} interfaces. Using 22 Forum 550 Card 8 digital extensions modules, up to 176 DECT base stations can be connected via 2 Forum Gateways 560 connected by a PCM-V line.
- Multiple DECT areas can be configured. Each DECT area uses its own separate PARK code. This code enables DECT terminals to identify the DECT base stations of a DECT area.

The following graphic illustrates the structure of a DECT network with multiple DECT areas.



DECT Network with three DECT areas (“Area 1” - “Area 3”)

DECT areas are only supported by current Forum Base DECT v2 type DECT base stations. You can also use older Forum Base 500 type DECT base stations, however, they can only be operated on the gateway 01 configured first (in the example: “DECT Area 1”). All other DECT areas require current Forum Base DECT v2 type DECT base stations (in the example: “DECT Area 2”). Each additional Forum Gateway 560 means you can operate a separate DECT area.

The DECT base stations of a DECT area are synchronised with one another via U_{pn} lines. The signalling necessary for synchronisation cannot, however be exchanged via the network connection between the Forum Gateways 560. This lack of synchronisation means that calls principally cannot be handed over (“Handover”) to a DECT base station from another DECT area. If you want to operate a larger number of DECT base stations in a DECT area or at one location, you can use 2 Forum Gateways 560 connected by a PCM-V line. When gateways are connected, the synchronisation signal is transmitted via the PCM-V line.

If you wish to additionally use DECT-over-IP base stations on the Forum 5500 communications system, all DECT-over-IP base stations must be operated in **one** separate DECT area (in the example: “DECT Area 3”).

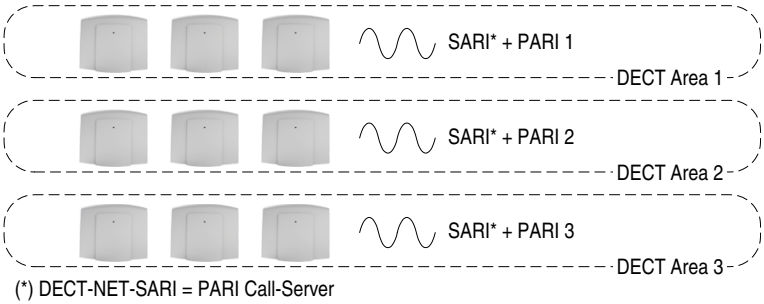
Please note that DECT-over-IP base stations synchronise via radio connection. This means that also on a DECT-over-IP network with multiple radio areas, you have to additionally assign 2 or multiple groups of DECT-over-IP base stations to separate clusters respectively (see *DECTover IP®* under *Synchronisation* starting on page 167). Synchronisation via radio connection must be possible within a cluster.

Please note: The reception or transmission area of DECT-over-IP base stations of one DECT area must not overlap with the reception or transmission area of DECT base stations of another DECT area. This prevents in reliable fashion any spontaneous roaming of DECT terminals into another DECT area and thus undesired interruptions of ongoing calls.

Signalling

The DECT base stations in a DECT network transmit a network code at regular intervals. This network code (PARK, Portable Access Rights Keys) is displayed in the **Configurator** of the Forum 5500 communications system on the **System Info**: **Versions** status page. The PARK designates the DECT network and can, e.g. be entered at the terminal when checking in a DECT terminal.

A separate PARK code is used for each DECT area in a DECT network with multiple DECT areas. The respective PARK to be used is randomly selected from a pool upon configuration of a new DECT area. When different PARK codes are used, each DECT terminal would have to be checked in once again for each DECT area. For this situation, the DECT-GAP standard defines a protocol for DECT networks with multiple DECT areas. This protocol makes it possible for DECT terminals checked in one DECT area to connect to a DECT base station from another DECT area without any additional checking-in.



DECT Areas: *SARI same, PARI different*

On a DECT network with multiple DECT areas, the DECT base stations transmit 2 different PARK codes alternately:

- PARI ("Primary Access Right Identity"): This code identifies the DECT area. All DECT base stations in a DECT area transmit the same PARI. This code is displayed in the **PARK** column on the **Telephony**: **DECT**: **DECT area** status page of the Forum 5500 communications system configurator.
- SARI ("Secondary Access Right Identity"): This code identifies the entire DECT network. All DECT base stations connected to the Forum 5500 communications system transmit the same SARI. This code is displayed in the Forum 5500 communications system configurator on the **System Info**: **Versions** status page under the header **System**: **PARK**.

Via the SARI, a DECT terminal can recognise that the PARI of another DECT area belongs to the same DECT network. If a DECT terminal leaves the reception area of a DECT area, it can connect to a DECT base station from another DECT area on the same DECT network using the SARI code.

The firmware of older Forum Base 500 type DECT base stations does not support alternating transmission of SARI and PARI. This means that these DECT base stations can only be operated on the gateway 01. The gateway 01 – the first gateway entry on the **Telephony**: **Gateways** status page – always uses the SARI as PARI. The DECT base stations of this DECT area thus only transmit one code.

Some older DECT terminals such as the basic GAP-compatible mobile telephones do not support, or insufficiently support operation with SARI and PARI codes necessary for DECT areas. In order to enable roaming between DECT base stations on the gateway 01 and DECT-over-IP base stations with these DECT terminals, the same code is also used for SARI and PARI in the IP-DECT

area. Older DECT terminals can be operated in any DECT area although roaming in another DECT area is not available with these terminals. In this case the DECT terminal is checked in with the PARK of the DECT area where the DECT terminal is located during check-in. The following table provides an overview of the DECT terminals supported.

Device compatibility with DECT areas

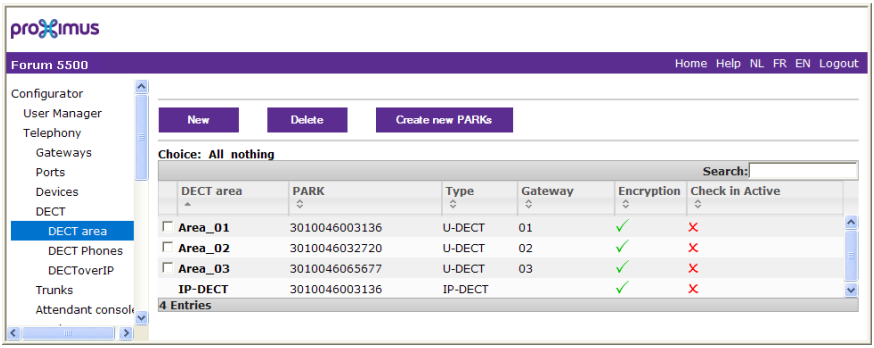
Feature	FF 5x7	FF 5x6	FF 560	FF 570	FF 565	FF 575	FF 585	GAP
checking in via PARI = SARI, Roaming GW 01 / IP-DECT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
checking in via PARI # GW 01	Yes	Yes	Yes	Yes	–	Yes	Yes	Yes
checking in via SARI	Yes	Yes	Yes	Yes	–	–	–	–
Roaming through DECT Areas	Yes	Yes	Yes	Yes	Yes *	–	–	–

*) Roaming only possible when check-in carried out on gateway 01

Configuring DECT

You can configure a DECT network with multiple DECT areas in the **Configurator** of the Forum 5500 communications system. Configuring this kind of DECT network requires having one or more previously configured and connected Forum Gateways 560. Alongside the obligatory media gateway interface cards Forum 550 Media Gateway Card, each Forum Gateway 560 with which you wish to connect DECT base stations also requires a Forum 550 Card 8 digital extensions module.

1. Open the **Telephony**: **DECT**: **DECT area** configuration page in the configurator.

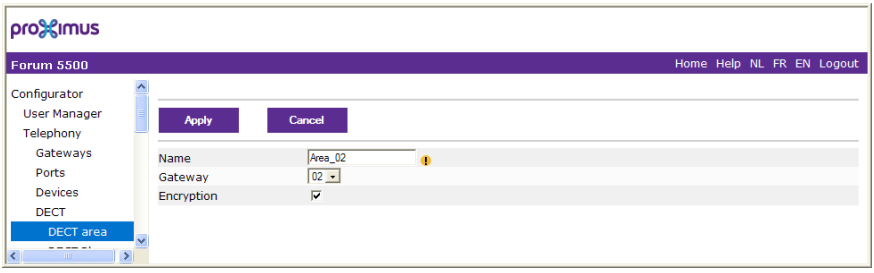


Configurator, Telephony: *DECT*: *DECT area*

The configuration page shows all DECT areas already configured. Note the code displayed in the **PARK** column. The number shown here corresponds with the PARK on the **System Info**: **Versions** page if the DECT area is linked with the Gateway 01 configured first as well as with the "IP-DECT" DECT area. All additional DECT areas use another code.

Note: The "IP-DECT" DECT area can be re-named but cannot be removed. This DECT area is used to operate all DECT-over-IP base stations.

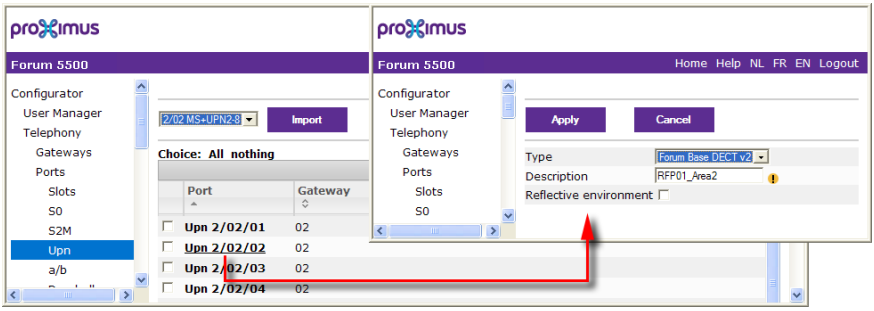
2. Configure a new DECT area for a Forum Gateway 560. Click on the **New** button to do so.



Configurator, Telephony: *DECT*: *DECT area*: *New*

Enter a name for the new DECT area into the **Name** input field. Leave the **Type** option at the "U-DECT" setting. Select a Forum Gateway 560 which has not yet been linked to a DECT area in the **Gateway** option. Determine whether communication between DECT base stations and DECT terminals is to be encrypted or not via the **Encryption** option. Use **Apply** to confirm.

3. The new DECT area has now been configured. Go over to the **Telephony**: **Ports**: **Upn** configuration page. Click on the table entry of the interface card to which you have connected a DECT base station.



Configurator, Telephony: *Ports*: *Upn*

Use the **Type** option to determine the type of DECT base station connected. Enter a standard designation into the **Description** input field. Use the **Reflective environment** option to activate support of the DECT-XQ communication mode as needed. Use **Apply** to confirm.

4. Repeat the steps described previously until all the Forum Gateways 560 needed are assigned to a DECT area and all the DECT base stations connected have been configured. Then begin checking in the required DECT terminals. To do so, go to the **Telephony**: **DECT**: **DECT Phones** configuration page.

   The **Check in** option determines which DECT areas you activate or de-activate checking in. Select the desired DECT area or select the entry **All**. Then click on the **On** button in order to enable checking in of the respective DECT areas. Click on the **Off** button to prevent any further checking in.

Now begin by checking in any of the DECT terminals. When the check-in function is activated, the type of DECT terminal determines the procedure. Please consult the respective descriptions in the guides of the DECT terminals.

Note: To check in, the DECT base stations of the selected DECT area must be operational. Please note that after linking a DECT area with a Forum Gateway 560 it takes a little while before the DECT area is operational.

PBX Networking

Forum 5500 provides all the features necessary for PBX networking. You need PBX networking in the following cases:

- To operate the Forum 5500 as a subsidiary system on another PBX. This will also allow you to use the Forum 5500 as a DECT server, for example.
- To network several Forum 5500s into a PBX system.
- To use flexible configuration possibilities of trunk lines for a Forum 5500.

All settings that affect the configuration of PBX networking can be found in the Configurator menu **Telephony: Trunks** and in the **Telephony: Settings** dialogue under **QSIG linking**. Refer also refer to the corresponding help topics in the Forum 5500 online help.

You can use ISDN point-to-point connections (Q.SIG or DSS1 protocol) or IP connections (Q.SIG-IP or SIP tie line protocol) for TK system networking.

Note: If you do not need the features of PBX networking, the simplified configuration is sufficient in most cases. For this purpose, assign the preconfigured truck group (bundles) **Multi-terminal access** or **System access** to the ports. The preconfigured route called **External trunk** now makes it possible to seize an external line immediately or by first dialling the prefix "0". You can rename the preconfigured bundle and the preconfigured route if required, but you cannot delete them.

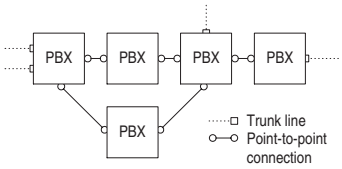
Connections

Networking two or more TK systems means interconnecting them. The Forum 5500 allows you to use the following connections:

- ISDN trunk lines
- ISDN point-to-point connections (Q.SIG) on external S_0 ports or on the S_{2M} port
- IP network connections (Q.SIG-IP or SIP tie line)

Note: ISDN networking requires a gateway with a Forum 550 Card PRA or Forum 550 Card 8 S0/T0 type interface card. You can

also use “Sangoma A500” (ISDN-BRI) or “Sangoma A100” (ISDN-PRI) type interface cards installed on the server PC.



Example of a PBX network

Various line types and transmission protocols can be used for point-to-point connections. The required network topology (distance, connection capacity) determines which type of point-to-point connection is most suitable.

An IP network connection with Q.SIG-IP or SIP tie line can be established either with a direct LAN connection or via a fast VPN connection. Q.SIG-IP or SIP tie line cannot be operated using a connection with NAT. When the connection is via VPN, encryption is advisable for security reasons.

Point-to-Point Connection Technology

Protocol: Q.SIG or DSS1

The Q.SIG protocol, designed for ISDN point-to-point connections, is the preferable choice as the transmission protocol; alternatively, the DSS1 protocol, designed for ISDN dial-up connections in the Euro-ISDN, can be used. Certain PBX networking features can only be used with the Q.SIG protocol, however. In particular, the connection designation as internal or external call and also the name of the caller cannot be transmitted via the DSS1 protocol.

Both protocols implement communication on several protocol layers:

- L1: Layer 1 defines the physical line properties and the electrical coding of signals.
- L2: Layer 2 enables communication via individual error-protected channels that are independent of each other.
- L3: Layer 3 defines the administration of the individual channels and implements the features designed for ISDN.

Master/Slave

For an ISDN connection, it is possible to determine which PBX is the protocol master and which the protocol slave. This relationship can be determined for all three protocol layers independently of one another.

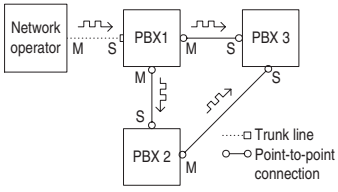
For each protocol layer, the PBX at the other end always has to be suitably configured. If one PBX is the protocol master for a layer, the other PBX must be the protocol slave for this same layer. Normally all three protocol layers are configured identically. In the case of a trunk line, the network operator is the protocol master for all three layers.

Note: In the case of an S_{2M} line, it is also possible to determine for each useful channel which end can administer a channel (master = internally seized or slave = externally seized). On S_0 lines this setting is determined by "L3 master" for both B-channels.

L1 Clock

To enable PBXs in the ISDN network to communicate with each other, they must be "clock-aligned". The L1 protocol master sets the clock for layer 1, and the L1 protocol slave adopts (synchronises to) this clock.

When planning a PBX networking scheme, you must make sure that the L1 clock propagates from a master via a number of PBXs.



Example: propagation of the L1 clock

If more than one port with the setting **L1 Type** = "Slave" is configured on an Forum 5500 and the setting **L1 sync possible** has been activated, then one of the ports is automatically defined as the L1 clock source. The Forum 5500 will automatically switch the clock source to another port configured as an L1 clock source (if a line fails, for example).

Please note: Reciprocal or circular application of the L1 clock is not allowed.

Example: In the above case you could reverse the L1 slave/master setting for the connection between PBX 1 and PBX 3. However, if you then activate the setting **L1 sync possible** for the port of PBX 1, this may cause parts of the PBX network to stop functioning temporarily.

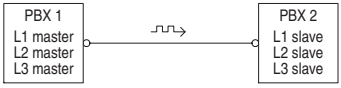
When applying the L1 clock of trunk lines, you can assume that the public network is “clock-aligned”. So, in the above example, you can connect additional trunk lines to one of the PBXs.

Point-to-Point Connection Lines

There are different types of lines available for a point-to-point connection between two PBXs, depending on the distance between them.

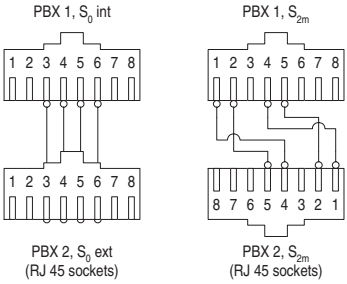
Direct Connection

This type of ISDN point-to-point connection joins the two systems directly to each other using a crossover twisted-pair cable. An S_0 connection can be used for distances up to 1,000 metres, while an S_{2M} connection can span up to 250 meters. Normally one PBX is the protocol master for all three layers, and the other PBX is the protocol slave for all three layers.



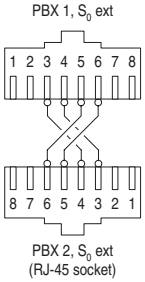
Direct connection

Use the RJ45 jacks on one of the external S_0 ports for an S_0 connection between two Forum 5500s. An S_0 connection requires to install the appropriate Sangoma telephony interface cards in the PC on which the Forum 5500 communications system is operated.



Wiring of a direct connection (Sangoma card)

Note: For a direct connection via the S_0-ports of a Sangoma card, you need to configure one side in NT mode (LED is green) and the other side in TE mode (LED is red).



Wiring of a direct connection
(Gateway + Forum 550 Card 8 S0/T0)

The external S_0-ports of a gateway can also be used for a direct connection.

Connection via an Active Transmission System

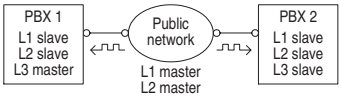
For distances exceeding the range of a direct connection, an active transmission system can increase the range to up to 50 km. Normally the L1 master is the transmission system for the two connected PBXs. For the protocol layers L2 and L3, one PBX is normally the protocol master and the other PBX is the protocol slave.

Connection by an active transmission system

Note: The active transmission system itself gets its L1 clock either from the network operator or from a clock generator connected by wire.

Connection via the Public Network

Point-to-point connections via the public network of a network operator can be used for bridging distances beyond 50 km. Due to the long distance involved, for technical reasons it is not possible to synchronise the L2 protocol. Consequently, the public network is normally the protocol master for protocol layers L1 and L2. One PBX is therefore the L3 master and the other PBX the L3 slave.



Point-to-point connection via a public network

IP Network Connections

If you are operating a fast and continuous network or internet connection at two or more sites, you can also network the PBX systems via a network connection.

There are two different protocols available for networking TC systems via network connections: Q.SIG-IP and SIP tie line. The various features of these protocols are summarised in the following table:

TC system networking via network connections

Feature	Q.SIG-IP	SIP tie line
Establishing a call (“basic call”) with call-number transmission	yes	yes
name information transmission	yes	yes
single number dial possible	yes	yes
transparent codec interconnection	no	yes
automatic feature detection	no	yes

Connection via Q.SIG.IP

The Forum 5500 communications system supports transmission of the Q.SIG protocol – intended for ISDN point-to-point connections – via network connection (Q.SIG-IP). Protocol and call data are exchanged using IP connections with Q.SIG-IP.

Note: A network connection between two Forum communications systems via Q.SIG-IP requires at least one license (Forum QSIG-IP). The number of purchased licenses defines the number of simultaneous calls.

The number of simultaneous calls depens – apart from the purchased number of licenses – also depends on the network or internet connection capacity and the compression procedure. A multiple S_{2M} point-to-point connection is simulated for each Q.SIG-IP bundle. This means that 5 virtual D channels and up to 120 voice channels are available. The Media Gateway software function is used for Q.SIG-IP (see *Media Gateway (MGW)* starting on page 142). Q.SIG-IP connection data are subject to codec compression (please refer to *Voice over IP (VoIP)* chapter regarding *Fundamentals* starting on page 135). Q.SIG-IP also transfers the voice data directly from terminal to terminal via the RTP protocol. In certain cases, for example, when an incoming external call is placed via multiple TK systems, one or more RTP proxies may be used to forward the connection.

Currently, there are no standards for the necessary extensions to the Q.SIG protocol. This means that you can only use Q.SIG-IP between Forum communications systems.

ForumGo to the **Telephony**: **Trunks**: **Trunk group** page in the **Configurator** to set up a Q.SIG-IP connection. Create a new bundle and select the **Access type** “System Access”. Select “Q.SIG-IP” under **Protocol**. Configure the IP address of the other system, the port numbers to be used, the number of possible voice connections. Select a VoIP profile for the codec selection. Please refer to the relevant help topics in the Online Help for the Forum 5500 as well.

Note: Q.SIG-IP cannot be operated using a connection with NAT. For a Q.SIG-IP connection, a branch connection is required.

Connection via SIP tie line

The Forum 5500 communications system supports connections using a SIP tie line for TC system networking. A SIP tie line is a SIP line which requires no login which can establish multiple call connections simultaneously. No SIP provider is required for establishing the connection via SIP tie line.

Note: A network connection between two Forum communications systems via SIP-Tie-Line requires at least one license (Forum SIP Tie line). The number of purchased licenses defines the number of simultaneous calls.

The number of simultaneous calls depens – apart from the purchased number of licenses – also depends on the network or internet connection capacity and the compression procedure. The function of the software media gateway card is used for a SIP tie line (see *Media Gateway (MGW)* starting on page 142).

The data of a SIP tie line connection is subjected to codec compression (see under *Fundamentals* starting on page 135 in the chapter *Voice over IP (VoIP)*). Call data is transmitted directly from terminal to terminal via the RTP protocol with SIP tie line as well. In certain cases, for example when an incoming external call is switched via multiple TC systems, there may be one or multiple RTP proxies involved.

One of the special features of a SIP tie line connection is using transparent codec interconnecting, for example to make use of HQ audio or video telephony with appropriate terminals (see *Transparent codec interconnection* starting on page 140). In addition, you can find out what features are supported by the other station via the SIP tie line protocol. This makes it possible to automatically adapt to the respective other station.

You can use SIP tie line connections between Forum communications systems. With SIP tie line connections to other manufacturers systems only basic call features may be used

ForumOpen the **Telephony**: **Trunks**: **Trunk group** page in the **Configurator** to configure a connection via SIP tie line. Create a new bundle and select **Access Type** “System access”. Select “SIP Tie-Line” under **Protocol**. Configure the IP address of the other system, the port number to be used (the same port number at both end points), the number of possible call connections. Select a VoIP profile for codec selection. Please note the corresponding help topics in the online help Forum 5500.

En-bloc dialling only is supported with a SIP tie line as with other SIP connections. To establish a call connection you have to first end call number entry with the hash key or wait a certain length of time. This length of time can be defined in the **Time to ready dial out** input field when configuring the SIP tie line (3-5 seconds are usual). In addition, you can activate a cache for accelerated dial out conclusion for the call numbers most recently dialled with the **Dial out cache** option.

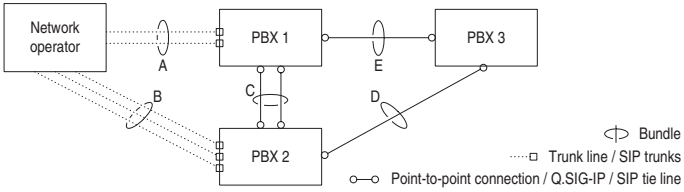
Note: A SIP tie line cannot be conducted via a NAT connection. A branch connection or another VPN connection is necessary for a connection via SIP tie line.

Configuration

The possible configurations described below can be set up in the Web console using the **Telephony: Trunks** menu.

Bundles

A **bundle** is a group of lines of the same type and direction. A line can only be assigned to one bundle.



Example of a PBX network with bundles

In the above example, the following bundles are configured for PBX 1:

- Two S_0 lines in a multi-terminal configuration / SIP lines to the network operator which are assigned to the “A” bundle.
- Two S_0 point-to-point connections / Q.SIG-IP lines / SIP tie lines to PBX 2 which are assigned to the “C” bundle.
- One S_0 point-to-point connection / Q.SIG-IP line / SIP tie line to PBX 3 which is assigned to the “E” bundle.

Note: A line or a bundle cannot be seized directly. It is always performed indirectly via a route.

Routes

A **route** is a group of bundles enabling a connection in one direction. If the first bundle of a route is fully utilized, the next bundle is seized ("bundle overflow"). One bundle can also be used for different routes.

In the above example, a route set up for PBX 1 allows a connection to PBX 2. Bundle "C," "E" and "A" are assigned to this route. If a user connected to PBX 1 wants to reach a party in PBX 2, lines will be seized in the following order:

- PBX 1 first searches for a free channel in the "C" bundle.
- If all the lines in bundle "C" are busy, the system tries to set up a connection via bundle "E". PBX 3 switches the connection through, provided it is appropriately configured (refer to *Numbering* starting on page 191).
- If it was not possible to set up an indirect connection via PBX 3, the system tries again via bundle "A". The "prefix" necessary for this can be configured with the route.
- The user does not get a busy signal until the attempt to set up an indirect connection via the network operator has also failed.

Note: If an internal connection is switched via a network operator, the call is signalled using the external number of the calling PBX.

For each route you can define a randomly selectable code digit for seizing the route. You can also configure whether a user is authorised to seize a particular route, whether LCR is to be used for one of the bundle and the criteria (business or private call, booking numbers) for evaluating call data.

Numbering

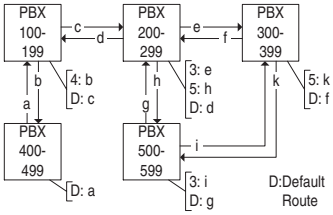
A user can seize a particular route by pre-dialling a specific code digit. With this "open numbering", a user must always dial this code digit and then the telephone number in order to reach a party in another PBX.

If none of the telephone numbers in your PBX network occur twice, you can also configure "closed numbering", allowing the same telephone number to be used for reaching each user within the PBX network.

With closed numbering, the Forum 5500 determines which route to seize from the telephone number dialled. The information needed for routing a call

can be configured in a numbering table. You use this table to assign telephone numbers and/or ranges of telephone numbers to a particular route.

A **default** entry in the numbering table makes it possible to seize a “default route” for all remaining unassigned numbers. In particular, this simplifies configuration of the Forum 5500 as a subsidiary system: the only entry you assign to the **default** entry is the route to the host system



Example of closed numbering tables

The automatic switching of call requests (i.e. routing) by means of bundle overflow or default numbering can lead to “circular switching”.

To avoid this, a “transit” counter is incremented whenever a connection is switched through on Q.SIG lines. When the configured maximum value is reached, further switching stops.

Technical Details

A different PBX number must be set for each Forum 5500 in a PBX network. This setting can be found in the Web console, in the menu **Telephony: Settings** under the heading **QSIG linking**. You can also set the maximum value for the transit counter there. This value depends on the topology of the PBX network and should allow the system to have the maximum number of further connections possible.

You can display the connection status of the lines at any time in the Configurator menu **System Info: Telephony: Trunks**. You should check this in particular after making changes to a configuration to see whether all the lines used for system networking are operable.

Not all options of some Q.SIG are supported by the Forum 5500, for example callback on busy within the Q.SIG network or route optimising. The call cate-

gories defined in Q.SIG (e.g. Emergency Call, Operator, Normal) and the Q.SIG name transmission feature (“user names”) are fully supported.

The code digits to be used for seizing a route with open numbering are not transmitted to the destination PBX and thus cannot be evaluated by it. To reseize a route (for example for a callback), you must set the appropriate digit prefixes in the bundle configuration for the routes to be reseized.

Tip: If, for example, you are configuring a route which can be seized using routing code “5” and have selected one or more bundles for this route, change the **Prefix for dest. call number at incoming internal** setting to “5” for this bundle in order to enable the route to be reseized.

Telephony

E.164 conversion

The Forum 5500 communications system supports two different types of call numbers when dialling external call numbers. Usually you enter the code for a route, e. g. a “0” for the “external line” route. Then you enter an external call number. The external call number can be either a local area code or a country area code.

The additionally configurable “E.164 conversion” feature enables you to enter the entire international call number. Using the international call number makes sense in the following applications:

- When dialling via a computer programme connected with TAPI where call numbers are often already in the international format due to synchronisation with a mobile telephone.
- When importing or comparing directory data when directory entries are in the international format.
- When networking communications systems with locations in different local areas or in different countries.

The “E.164 conversion” analyses an international call number. The analysis divides the call number into multiple parts: the international area code, the local area code, the access call number and if necessary the extension. The call number is respectively abbreviated, eliminating any unnecessary area codes. The abbreviated call number is then used, e. g. to execute a call.

Configuration

You can configure the “E.164 conversion” feature for each bundle separately. This is possible for point-to-point configured bundles (“system access with DSS1”), for point-to-multi-point configuration (“multi-terminal access”) and for SIP trunks:

1. Call the Forum 5500 communications system **Configurator**. On the introductory page, change the **Level** option to **Expert**.
2. This step is optional as the country code is preallocated due to the **Country** setting under **System**: **Common**.

Call the **Telephony**: **Settings** page. Click on the **Change** button. Enter the country code without a zero in front into the **International area code** field, e. g. “49” for Germany. The setting in the **Own area code** field is not relevant for the “E.164 conversion” feature. Confirm with the **Apply** button.

3. Call the **Telephony**: **Trunks**: **Trunk group** page or the **Telephony**: **Trunks**: **SIP trunks** page. Click on the desired bundle or desired SIP trunk. Activate the **E.164 conversion** option.

   The following setting is only relevant if the local area code is not part of the ISDN-MSN (Germany and Austria) in your national ISDN. If you have selected “Germany” or “Austria” under **System**: **Common** as the **Country** setting, you also have to enter the local area code into the **Area code** field for the bundle. The prefixed zero is not necessary.

   Confirm with the **Apply** button.

4. Call up the **Telephony**: **Trunks**: **Route** page. Check whether the **Type** setting for the used routes is set to “Private” or “Business”. For routes of the type “Internal” the “E.164 conversion” is not active.

The Q.SIG bundle used for networking communications systems cannot be used with the “E.164 conversion” feature. Please keep in mind that the differentiation between access call number and extension only takes place with system access or DDI-capable SIP trunks and also only when using direct extensions. With a call number allocated via call distribution there is no automatic differentiation between external and internal call numbers.

Note: For incoming calls via a bundle with the “E.164 conversion” feature each external call number (“CLIP”) appears converted into the international format and is also saved in this format e. g. in the caller list. Keep this in mind when entering call numbers used for authenticating (CLIP-Auth).

Example

The following example explains the “E.164 conversion” function on a terminal which is operated on an external line with the following configuration:

Attribute	Number
International area code (Country Code, CC)	32 (Belgium)
Local area code (National Destination Code, NDC)	2 (Brussels)
Access call number (Subscriber Number, SN)	4444 (company in Brussels)
Extension or internal call number (Direct Dialling, DDI)	999 (company extension)
Code for the “External trunk” route	0

Various call numbers are now dialled from this terminal:

Number dialled	Number actually used
0003311234567 (foreign country, Paris)	003311234567 The code for the route is not transmitted via ISDN / SIP DDI.
00032501234567 (domestic, Bruges)	0501234567 The international area code is replaced with a “0”.
0003221234567 (domestic, Brussels)	021234567 The international area code is replaced with a “0”. One's own local area code is not removed.
0003224444888 (Internal)	888 The international area code, the local area code and the access call number are deleted. The destination is called internally without using the ISDN connector / SIP trunk.

Number dialled	Number actually used
0024444888 (Internal)	888 The local area code and the access call number are deleted. The destination is called internally without using the ISDN connector / SIP trunk.
+3224444888	888 You can only enter the plus sign (after E.123) with a SIP telephone (see *Internal SIP Subscribers* starting on page 145). There is a “E.164 conversion” in this case also.

Further Information

Please note the following information when using the “E.164 conversion” feature:

- When all external lines are occupied, the “Congested” state is only indicated later on during the dialling process.
- Emergency calls are always executed without “E.164 conversion”.
- Call number assignments in the call distribution are not evaluated for the “E.164 conversion” feature. For an assigned phone number, e. g. no automatic internal dial is executed even when the destination could be reached this way.
- Depending on the telephony provider, you can possibly also use the area code of your own country without “E.164 conversion”. Differentiating between external and internal call numbers can only be done using the “E.164 conversion”.

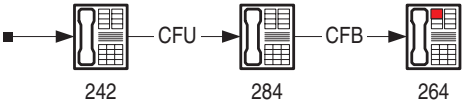
Number Handling with E.164 and Lists – Black List, White List, etc.
The combination of E.164 numbering scheme and black-, white, special lists requires explicit duplex/triplex handling of numbers in all eventually possible formats.

Example: 0-6104-1234, 0-030-6104-1234, 0-0049 30-6104-1234.

All these possible formats can be dialled and so work around the e.g. black list. That has to be considered in programming these features.

Call Forwarding

The current version of the Forum 5500 communications system also offers configuration of multi-level call forwarding. When you forward a call number that has already been forwarded, this results in a call forwarding chain.



Call Forwarding Chain

Multiple call forwarding is executed independent of the call forwarding type. An overview of the various call forwarding possibilities is nonetheless helpful for the following explanations.

Call Forwarding

Name	Description
Call forwarding immediately (CFU)	Immediate and unconditional call forwarding
Call forwarding on busy (CFB)	Call is forwarded only if user is busy
Call forwarding after time (CFNR)	Call forwarding is only executed after a definable time interval
Call Diversion (CD)	Is manually executed upon an incoming call from the user
Virtual call number	A virtual call number is always diverted to a destination call number
Call forwarding of a hunt group	Users of a hunt group can also configure respective call forwarding
Call forwarding to external	Call forwarding to an external call number or via remote-controlled dialling (Call Through)
Call forwarding by a system user	Call forwarding via Forum Auto Attendant (with the **Connect to phone number** and **Connect to voicebox** function) or via Forum Voicemail (with the secretarial function)

Attributes

A call forwarding chain can contain any call forwarding types and call forwarding users. There is no limit to the number of successive call forwarding instances.

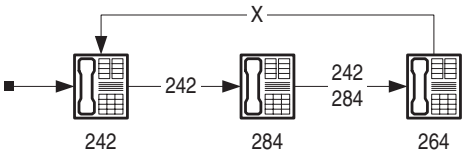
If the call forwarding destination is a system telephone, an incoming call is additionally indicated with the display **via...**. The caller list of a system telephone can also determine both the call number of the caller as well as the call number of the user doing the forwarding.

In the case of multiple forwarding, a setting in the user group of the call forwarding destination determines which of the “Via” call numbers is displayed. You can have either the last call forwarding user (default) displayed or the first call forwarding user in a chain displayed. The “Via” call number is, however, only displayed when the call number display is activated for the forwarding user.

Note: When call forwarding to the Forum Voicemail voicebox programme, the “Via” call number is evaluated in order to determine the owner of a voicebox. The last call forwarding user is used no matter what the user group setting. When call forwarding using the secretarial function of the voicebox programme, the call number of the voicebox owner is also shown as the “Via” call number.

Loop Detection

Loops can generally occur during a call forwarding chain, e. g. when the call forwarding destination refers back to the call forwarding source. This is why a forwarded call has a call forwarding history. When the next call forwarding destination is already included in the call forwarding history, a loop is detected and any further call forwarding is prevented. If no parallel call signalling takes place, e. g. by the **Indicate call forwarding after time parallel** setting in the user group, the call is cleared when there is a loop.



Loop Detection

A loop is also detected during call diversion. When you wish to divert an incoming call to a destination call number which is already part of the call forwarding chain, the display shows **NEG.** and call signalling is continued.

Note: The call forwarding history cannot be transmitted via Q.SIG connections. Chain detection is also deactivated when forwarding via the voice portal programme Forum Auto Attendant.

Virtual Call Numbers

A virtual call number is not assigned to any terminal. You always also enter an internal or an external destination call number directly when configuring a virtual call number. When the virtual call number is called this destination call number is signalled. This behaviour is handled as an immediate call forwarding and is thus the first call forwarding in a possible call forwarding chain.

You can include a virtual call number e. g. in call distribution. Using the possibility of multiple call forwarding, you can also use a virtual call number as an exchange ("Operator"). Furthermore, a user with the **Call forwarding for other user** authorisation can configure additional call forwarding for a virtual call number also.

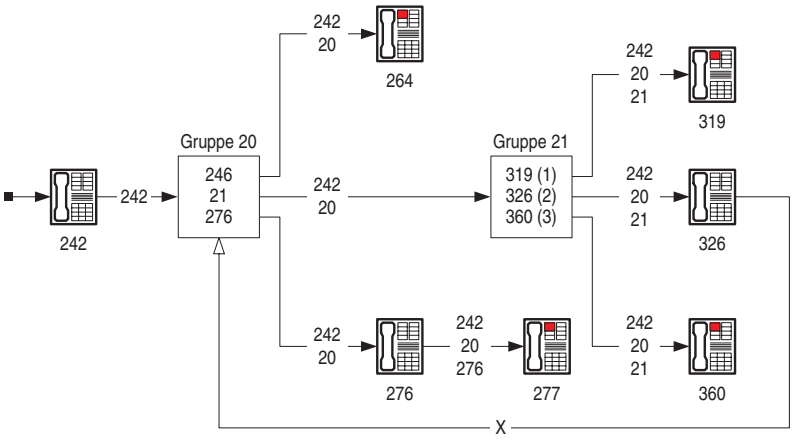
Hunt Groups

A hunt group is an internal call number which can reach multiple users. An incoming call is signalled to all users of a hunt group. A hunt group is configured in the **Configurator** in the **Telephony**: **Groups**: **Hunt groups** menu. Call signalling is independent of the **Type** setting in the hunt group:

- **Parallel** setting: all users of the hunt group are called simultaneously.
- **Linear**, **Cyclical** or **Statistical** setting: the users of a time-dependent hunt group are call successively. The user called first is determined by the respective setting.

The users of a hunt group can also configure their own respective call forwarding. For this, you need to activate the **Call forwarding of members possible** option for the desired hunt group on the **Telephony**: **Groups**: **Hunt Groups** page. The call forwarding history is forwarded to multiple users and continued separately respectively. When a call forwarding loop is detected for

a user, no further call signalling takes place for this user. This user is not called in a parallel hunt group. This user is skipped in a time-dependent hunt group.



Forwarding hunt groups

Using a call forwarding chain, you can include a further hunt group as a user in a parallel hunt group.

Note: Time-dependent hunt groups do not permit including any additional hunt groups.

In addition, you can also configure call forwarding on busy (CFB) for hunt groups. This call forwarding can be used for an internal or external destination call number. In addition, you can enter a back-up destination for time-dependent hunt groups when they cannot be reached. Using the **Forward after time** setting, you can instead configure a call number and a specific time interval in the **Telephony**: **Groups**: **Hunt Groups** menu.

External Call Forwarding

You can also forward calls to external destinations without restriction. However, the call forwarding history cannot be continued with external destinations. When multiple users of a parallel hunt group configure call forwarding to external destinations, a single call to the hunt group can also occupy multiple external lines.

Special rules apply for call numbers which are displayed upon an external call forwarding destination:

- If the call is originally initiated by an internal user, the external call number of the internal user is transmitted.
- If the call is originally initiated by an external user, this user's external call number can be transmitted using the“CLIP no screening” feature. If “CLIP no screening” is not available, the external call number of the last forwarding user is transmitted.

Information on the Update

It is possible to convert the configuration of an earlier firmware version to the current version within the context of an update. This happens automatically when you load a saved configuration after an update. Please note the following points:

- The previous behaviour is preserved with the conversion. When restoring a former configuration, the **Call forwarding one level only possible** option is switched off automatically on the **Telephony**: **Settings** page. Additionally, the **Call forwarding of members possible** option is deactivated for all restored hunt groups.
- Restored call forwarding instances can behave differently as call forwarding chains of earlier firmware versions (before the 6.0 release) are not supported. If necessary, use the trace function for call forwarding (the **Diagnosis**: **Log Trace** menu, **CF tracking** option in the **Configurator**).
- The call forwarding interval, previously only centrally definable, is adopted for all users as the default value.
- The “Show hunting group no. as via” option for hunt groups has been omitted. Instead, use the **Display: Call forwarding via** option in the **User Manager**: **User groups** menu.
- The “Courtesy Service” function used to be for directly determining whether a user was currently busy or not and the corresponding announcement played. The **Announcer at Incoming call** is always played when it is configured with the firmware version (7.0 release). Then **Announcer at busy** is played if this announcement is configured.

Note: Please note the explanations in chapter *Update Notes* starting on page 22 as well.

Busy Keys

You can configure busy keys on a system telephone or on a SIP system phone. Busy keys show the busy status of another subscriber (by means of an LED and depending on the configuration also with an acoustic signal) and can also be used for the one-touch dialling and pickup functions. You can set up busy keys on the system phone (authorisation: **Program busy keys**) as well as in the **Configurator** on page **Telephony: Devices: System phones**. When configuring a key on the system phone, in the **Type** list, select the **feature** entry and the key type **Busy lamp Phone No.** (busy indication of one single internal number) or **Busy lamp Device** (busy indication for the line keys of a device). For a SIP system phone, select **BLF** from the **Type** list.

In contrast to previous versions of the system software the type of busy key has been changed from **Trunk key** to **Function key** in release 7. This means that busy keys can be programmed on any number of devices in release 7. A previously existing configuration of busy keys is automatically converted when the system software is updated.

Tip: A busy key for virtual call numbers with destination call number is not supported (see *Virtual Call Numbers* starting on page 200). It is possible, however, to configure a busy key for a virtual call number without destination call number. When the virtual call number is called, the call is signalled by the busy key. The call can be retrieved with the busy key.

Busy keys on the system network
Busy keys on the Forum 5500 communications network are realised as a subscriber model. A busy key requests busy information to do so. The destination of a busy key keeps a dynamic list of terminals which have to be reported when there is a status change. This function mode is optimised for using busy keys on the system network (see *PBX Networking* starting on page 182). Please note the following points:

- Busy key information can be transferred via all connection types of a PBX system networking: Q.SIG-ISDN, Q.SIG-IP and SIP-Tie-Line. The **Protocol extension** option has to be activated in the bundle configuration for Q.SIG-ISDN.
- Busy keys only work between communications systems Forum 500 / 5000 with a system software version from Release 7 or higher.

- If there are multiple lines available in a bundle for PBX system networking, one of the lines is selected for busy-key signalling. If this line fails, it can take a few minutes until the dynamic subscriber list is updated.

Note: The “call number busy” busy-key function is the only one supported for PBX system networking. The “device busy” busy-key function is not supported by PBX system networking.

PIN Code Telephony

The users in a company normally use the existing terminals primarily for company-related communication. Now the users would like to also be able to make private calls in some cases. Private calls require:

- seizure of special external lines,
- changed and valid authorisations,
- recording separate charges and
- that destination call numbers not be saved for redialling.

This function can be realised using the “PIN Code Telephony” feature. To initiate a special call, the user on any terminal uses a special menu function or code procedure. After the user enters his/her own internal call number and associated user PIN, the desired attributes for the next call are activated.

When the call is finished, the previously active telephone configuration is restored. This external call number dialled is not recorded in a redial list.

Configuration

You can configure the “PIN Code Telephony” feature separately for each company. Configuration is done with the following steps:

1. Call the Forum 5500 communications system **Configurator**. On the introductory page, change the **Level** option to **Expert**.
2. Open the **User Manager**: **User groups** menu page. Click on the **New** button. Enter a designation into the **Group name** field and select an existing user group as a template. Confirm with **Apply**.
3. Then click on the **Change** button. Select the desired **Company**. Activate the **PIN dial** option for the time groups intended. Configure either external authorisation or recording of **Connection data**. Confirm with **Apply**.

4. Open the **Telephony**: **Extended**: **Companies** menu page. Click on the headline of the company desired (default: “Company 1”).
5. Under the **PIN dial** header, select the desired **Route**. Select the user group created by the previous steps for the **User group** setting. Confirm with **Apply**.

You can also use the “Standard” user group or the “External trunk” standard route for the “PIN Code Telephony” feature. If you configure a special route, you must also enter a seizure code for this route (**Telephony**: **Trunks**: **Route** menu, setting: **Code**).

Activate the **PIN dial** user group option for all terminals which are to have the “PIN Code Telephony” feature available to them. This can also be the “Guests” user group. Furthermore, you can also use the “PIN Code Telephony” feature for users who have no terminal assigned to them (“virtual users”).

Implementation

You would like to use the “PIN Code Telephony” feature from any telephone. To do so, the telephone belonging to another user is switched to your personal user account (“identity change”). Carry out the following steps:

1. Call the main menu on a system telephone. Select the **6 Connections**: **7 PIN dialling** menu entry. Enter your call number and your user PIN. If the entry is correct, **<PIN dialling>** now appears. Now select the desired external call number including the seizure route for the “External Trunk” standard route.

   You can also initiate PIN dialling with a code procedure:
   ☎ # 4 6 ⁞⁞ (your no.) * ⁞⁞ (user PIN) # ⁞⁞ (external no.)

   The route configured for the “PIN Code Telephony” feature is used to make a call in that the seizure code for the standard route is also replaced by another seizure code if applicable. Furthermore, the authorisations are activated for the user group designated for the “PIN Code Telephony” feature.
2. Make your call. Please note that the call number identity being used is displayed to the external caller even when you are calling from a different terminal. In addition, the call number identity being used is indicated as busy during the call. This is why the corresponding trunk key also lights up during this time on the respective system telephone.

The external call number dialled is not saved in any redial list: neither on the telephone used, nor one’s own telephone.

Switch authorisation

The “Switch authorisation” feature enables a user to switch the user group of another terminal for a single call. The user switching can receive a charge notification at the end of the call.

A typical application is the guest telephone in a hotel: the concierge on duty activates external dialling for a guest when desired. When the call is finished, the concierge is informed of call duration and relevant charges with a brief information display.

Configuration

You can configure the “Switch authorisation” feature separately for each company. Configuration is done with the following steps:

1. Call the Forum 5500 communications system **Configurator**. On the introductory page change the **Level** option to **Expert**.
2. Open the **User Manager**: **User groups** menu page. Click on the **New** button. Enter a designation into the **Group name** field (e. g. “Guest external seizure”) and select an existing group as a template. Confirm with **Apply**.
3. Then click on the **Change** button. Then select the desired **Company**. Configure the external authorisation and recording to **Connection data** as desired. Activate the **Immediate External line seizure** option as desired. Deactivate the **Switch authorisation** option to prevent authorisation from being activated for an additional call in an unauthorised manner. Confirm with **Apply**.
4. Click on the user group for the user who is to execute the “Switch authorisation” feature. Activate the **Switch authorisation** option. Confirm with **Apply**.
5. Open the **Telephony**: **Extended**: **Companies** menu page. Click on the header of the company desired (default: “Company 1”).
6. Under the **Switch authorisation** header, select the **User group** temporarily active due to switching (e. g. “Guest external seizure”). Activate the **Notify at end of call** option as desired. Confirm with **Apply**.

Devices to be switched (“guest telephones”) are generally configured in a user group without external authorisation. If desired, you can decline to assign

these terminals to a user. In this case, the “Guests” user group is automatically assigned.

Implementation

A hotel guest would like to make an external call. You fulfil this wish with the following steps:

1. Call the main menu on your system terminal. Select the **6 Connections: 6 Switch auth.** option. Enter the internal call number of the terminal where a temporary authorisation switch is to take place. Confirm with the **OK** key. Select the **On** option and confirm with the **OK** key.

   If the terminal to be switched is currently in the call state, the authorisation switch only takes place once the call is finished.

2. The next outgoing call on the switched terminal then is made with the changed authorisations. If, e. g. the **Immediate External line seizure** option was activated to do so, the external dialling tone is audible and an external call can be made without entering a code.

   If the next outgoing call is not made within 60 seconds, the authorisation switch expires automatically.

At the end of the call – when configured in this way – you receive a brief message regarding the call duration and the relevant charges incurred.

Generating Your Own MoH Files

The Forum 5500 comes with an internal MoH file for Music on Hold. The Forum 5500 product CD contains a number of MoH files with different volume levels, which you can load at a later time as necessary.

The file format for non-resident Music on Hold is *.wav. You can also save your own MoH in a *.wav file and load it into the Forum 5500.

If you have a Windows operating system, you can use the “Sound Recorder” programme to generate your own MoH file. This programme is usually located in the Windows directory called “Multimedia”.

The MoH file must be coded with 8000 Hz, 8 bit mono in accordance with CCITT, A-Law. This coding is required for the Forum 5500 and can be set in the “Sound Recorder” when you save the file under **Format** (CCITT, A-Law) and **Attributes** (8000 Hz, 8 bit mono). The maximum allowable size for a

MoH file is 4687 KB (approx. 600 sec. play time). The MoH capacity can be subdivided in a maximum of 5 files. These files can be used for different companies or for internal and external calls.

Note: If you don't have the Sound Recorder programme or the appropriate codec on your Windows operating system, you should install these components from your Windows CD.

Load your MoH file in the Web console's **Configurator**, in the **System: Components** menu.

Note: If you use foreign audio files in an MoH file, please note the manufacturer's licensing agreements. You may have to pay copyright-related fees for these audio files. The MoH files that come with your Forum 5500 can be used free of charge.

Team Functions

Introduction

With the team functions you can manage your telephone communication tasks by assigning lines with separate call numbers to the keys of different terminals. The terminal users, or team members, can thus pick up one another's calls or telephone each other using the configured keys.

Team functions can only be configured on the Forum IPhone 525 and Forum IPhone 535 system telephones because only these have the required features.

Explanation of Keys

The team functions are programmed on the call keys of the Forum IPhone 525 and Forum IPhone 535 telephones. Depending on the terminal, different numbers of call keys are available:

Number of available call keys

Telephone	Number of keys
Forum IPhone 525	Three keys with a display, five keys without a display
Forum IPhone 535	Nine keys with a display
Forum IPhone 525 or Forum IPhone 535 with an additional key extension Forum 500 Keypad Paper FP 525/535	36 additional keys without a display Up to three of these key extensions can be used with a Forum IPhone 525/ Forum IPhone 535.
Forum IPhone 535 with an additional key extension Forum 500 Keypad Display FP 535	20 additional keys with a display Up to three of these key extensions can be used with a Forum IPhone 535.

Note: Only one function or call number can be programmed for each call key.

The following keys can be used:

- **Trunk key**: Calls (for the programmed call number, e.g. 11) are signalled to this key, and you can make internal and external calls via this number. A trunk key can be programmed with a substitute function (with another team member acting as the substitute). Calls for you are then signalled to the terminal of another team member. A trunk key also provides functions for managing calls. For example, you can configure call protection if you do not want to be disturbed, or call diversion to another telephone.
- **Team key**: As with a trunk key, a team key can be used to receive or make calls. However, this key cannot be used to change the settings for managing calls; it is not possible, for example, to configure call diversion to another telephone. Calls made via a team key are signalled to all terminals with a trunk key that has been programmed with the same number. For example, the team key with the number 11 calls all trunk keys with the number 11.
- **Direct call key**: Only outgoing calls can be made with a direct call key; they are signalled to all terminals with the same number programmed to a trunk key. Calls via a direct call key are signalled to the destination terminal even if that terminal has been programmed with a substitution function or call protection. If the destination terminal has been configured for call diversion, the direct call is not diverted.

Which Key is Suitable for Which Purpose?

- **Trunk keys** can be assigned call numbers for managing central communication tasks, for example, customer support. If the call numbers of the support department are assigned to trunk keys on all of its terminals, then all members of the support department can receive and manage calls and use the substitute function.
- **Team keys**, for example, can be used to create a project group within a department. Calls from customers of this group can then be answered by any team member who is not busy. The team members can call each other by the team keys.
- **Direct call keys**, for example, can be configured at a terminal in a conference room to call the secretary.

Tip: A **busy key** can be used to configure an enquiry station showing the status of the individual users. The enquiry station sees the status of the users and can put calls through by simply pressing the key (see *Busy Keys* starting on page 203).

Team Configuration

You can create teams and programme call keys in the **Configurator** of the Forum 5500 (**Telephony: Groups** menu).
Call key 1 is preset as a trunk key on all system telephones. This setting can be changed by the system administrator.

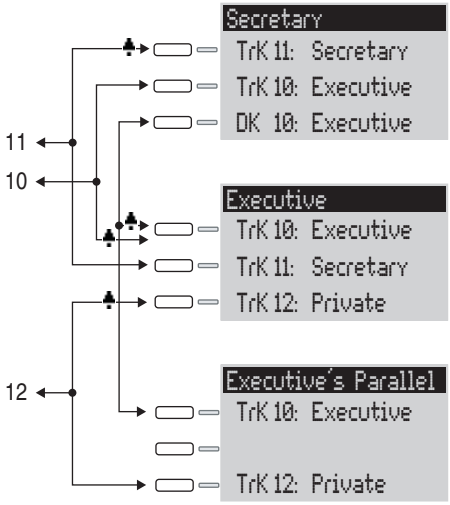
Examples of Use

The following examples illustrate the various uses of teams and team functions.

For information on the display texts and how to use the individual functions, refer to the chapter “Managing Calls in a Team” in the “Forum Phone 515, 525, 535” user guide.

Executive/Secretary Team

In this example, the executive/secretary team comprises two members: the executive and the secretary. The secretary has one Forum IPhone 525 system telephone, and the executive has two, one of which is used as a parallel telephone in a sofa suite.



Example: *executive/secretary team*

Line Seizure
The secretary can be reached on the call number 11 (trunk key TrK 11: secretary's office).

The executive can be reached on the call number 10 (trunk key TrK 10: executive's office). He can also answer calls from his parallel telephone. In addition, a private line is configured for both of the executive's telephones (trunk key TrK 12: private).

Call numbers 11 and 10 are both configured as a trunk key on the executive's and the secretary's terminal respectively. Thus the executive and the secretary can use either call number (for answering as well as making calls). Each can act as a substitute for the other.

The secretary's terminal also has the executive's call number configured as a direct call number (DK 10: executive's office). The secretary can therefore reach the executive and put through calls even if the executive has programmed a substitute.

Line Busy Indication
If a line is busy, e.g. TrK 11 secretary's office, the other terminal will indicate this. The executive's private calls via TrK 12 are not indicated on the secretary's terminal since no appropriate trunk key is configured on the latter's telephone.

Call Signalling
In this configuration example, calls to one's own call number are signalled acoustically on the following telephones:

- Call number 11 on the secretary's telephone
- Call numbers 10 and 12 on the executive's telephone.

Calls for the other team member's call number are indicated by an optical signal on one's own telephone (flashing trunk key LED).

The parallel telephone will indicate calls only by an optical signal.

Time-delayed acoustic signalling can be configured for TrK 10 on the secretary's telephone. If the executive, for example, does not answer a call within 10 seconds, the secretary's telephone will start to ring.

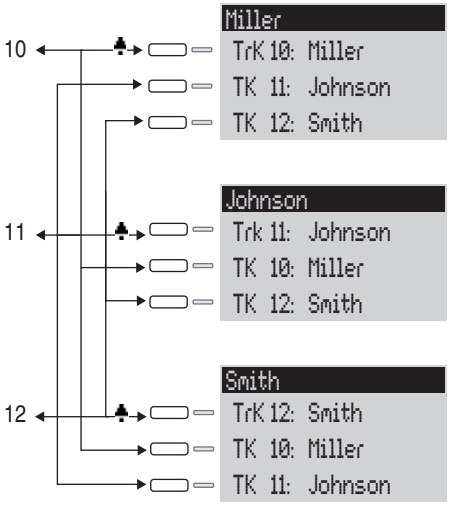
If the executive activates a substitute function with the secretary as the substitute, calls for call number 10 will be indicated on the executive's telephone by an optical signal only, but signalled acoustically on the secretary's

telephone. The secretary can also activate a substitute function. Calls for call number 11 are then signalled acoustically on the executive's telephone, and indicated by an optical signal on the parallel telephone and the secretary's telephone.

Three-member Team

The three-member team described here is an example of a team configuration within a project group, e.g. export sales.

Each team member has one Forum IPhone 525 system telephone with all call keys programmed as trunk and team keys.



Example: *three-member team*

Line Seizure
Each team member's call number, e.g. call number 10 for Miller, is programmed as a trunk key on his telephone.

On the other telephones in the team, this call number is programmed as a team key (e.g. TK 10 on Johnson's and Smith's telephones). The team members can thus see which number a call is for and can answer it by pressing the appropriate team key.

The team members can call each other via the team keys. For example, Miller can call number 12 by pressing TK 12; the call is then signalled to Smith's telephone on TrK 12.

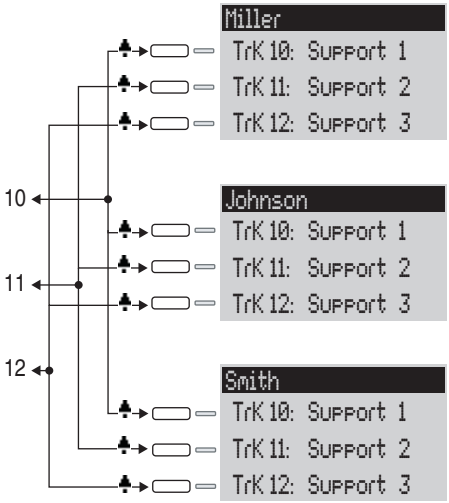
Line Busy Indication
If a line is busy, e.g. TrK 11 Johnson, the team keys 11 on Miller's and Smith's telephones will indicate this.

Call Signalling
In this example, calls via the trunk keys are signalled acoustically. Calls via the team keys are indicated by a visual signal (the team key LED flashes).

Unified Team

The unified team described here is an example of a team configuration within a department in which calls are to be managed quickly (e.g. support department).

Each team member has one Forum IPhone 525 system telephone with all call keys programmed as trunk keys.



Example: unified team

Line Seizure
Call numbers 10, 11 and 12 are programmed as trunk keys on each team member's telephone (TrK 10 to TrK 12.

All team members can use these numbers for answering as well as making calls.

Tip: In this team configuration it is useful to programme one of the function keys on each telephone with the “Hold” function. A call, e.g. for TrK 11, can then be put on hold by pressing the function key. If another team member then presses trunk key TrK 11 on his telephone, he can accept the call. For further information on function keys, refer to the “Forum Phone 515, 525, 535” user guide.

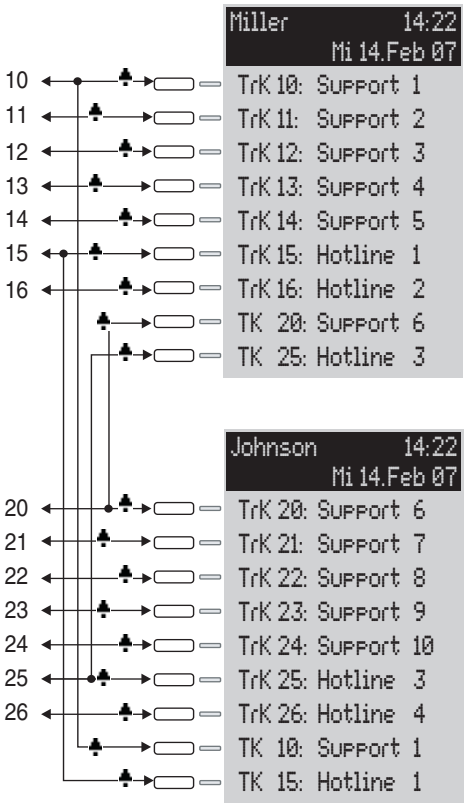
Line Busy Indication
If a line is busy, e.g. TrK 11 Johnson, the trunk keys on the other team telephones will indicate this.

Call Signalling
In this example, calls via all trunk keys are signalled acoustically.

Toggle Team

The toggle team described here illustrates how a large number of call numbers can be managed efficiently with the help of team functions.

Each team member has one Forum IPhone 535 system telephone with all call keys programmed as trunk and team keys.



Example: *toggle team*

Line Seizure
Each team member is assigned seven call numbers, each programmed as a trunk key (TrK 10 to TrK 16 and TrK 20 to TrK 26). For each member, these trunk keys are programmed either as support numbers or hotline numbers.

The first support number and the first hotline number of each team member is programmed as a team key on the other member's telephone, e.g. TrK 10 and TrK 15 on Miller's telephone as TK 10 and TK 15 on Johnson's telephone. The assumption here is that most calls will go to the respective first call numbers, and team members can thus help each other out by answering one another's calls.

On each telephone it is possible to toggle between the calls on individual lines, e.g. TrK 10 and TrK 11, by pressing the appropriate key (toggling).

Every call on a trunk key can be transferred to any other party by means of the R key. For more information, refer to the chapter entitled “Consultation, Toggling, Transfer and Conference” in the “Forum Phone 515, 525, 535” user guide.

Line Busy Indication
If a line is busy, e.g. TrK 10 on Miller’s telephone, the appropriate team key will indicate this, e.g. TK 10 on Johnson’s telephone.

Call Signalling
In this example, calls via trunk keys are signalled acoustically. Calls via team keys are indicated by a visual signal (the team key LED flashes).

Call Queue

Introduction

A queue can be activated for the telephone numbers of any type of telephone, i.e. for system, analogue, ISDN and DECT telephones. If a call number with a queue is busy, calls to this number enter the queue. The caller first hears an announcement (if function “Announcer at busy” is configured) and then a dial tone or Music on Hold, if the **Music on hold upon call transfer** setting is activated.

Calls which remain in the queue for too long are cleared from the queue. The caller then gets a busy tone. If all the positions in the queue are taken then any further calls also hear the busy tone. If the **Courtesy Service** setting is activated, calls will not be cleared from the queue!

The time until an external call is cleared from a queue is defined by the network operator. In the most European countries this is usually three minutes.

If more than one telephone number (e.g. trunk or team keys) has been configured for a telephone, separate queues are used for each number.

On the Forum IPhone 535 system telephone, additional calls are signalled by a brief tone in the loudspeaker and in the display. If calls are in the queue, a number at the beginning of the second line of the display on the Forum IPhone 535indicates how full the queue is. If more than one telephone number with a queue is configured on the telephone, the total number of entries are displayed.

Calls in a queue are handled by the Forum 5500 in the following order of priority: instant connection, door calls, automatic recalls, VIP calls, then other internal and external calls. Door calls thus have priority over other calls, for example. Calls of the same priority level are switched in the order of their arrival.

The system administrator sets the number of calls that can be placed in a queue individually for each user group. The value can lie between “0” and “99”. The “0” value deactivates the ”Call queue” function for a user group.

When the maximum number of calls in the queue is reached, further callers hear a busy tone.

Note: As calling fax machines often operate with the “voice” service indicator (e.g. on analogue ports), you should assign ports for fax machines on the Forum 5500 to a user group **without** a queue.

Queues can be combined with the “call forwarding,” “pickup” and “hunt group” functions, for example, in order to configure an enquiry station for an operator.

Activation of Queues

Queues can be activated on a per user group basis. On delivery the default set, for all preset groups, is **off**.

When using queues, it often makes sense to activate call waiting protection. For this purpose, **Call waiting protection** authorisation must be allocated to the user group, and call waiting protection must be activated on the terminal.

Furthermore it is sensible to combine queues with the **Announcer at busy** function. When a caller calls a subscriber who is busy then they will hear a “central welcoming text”, for example, “Here is company XYZ. You will be immediately connected”. The function **Announcer at busy** can be set in the **Telephony: Call Distribution: Incoming** or **Telephony: Call Distribution: Incoming DDI** menu. Central welcoming texts can be recorded using the programme package Forum Voicemail.

You should configure a new user group (e.g. “Operators”) and activate the authorisations **Call queue**, **Call waiting protection** and, if necessary, **Call forwarding**. If users belong to this group, a queue will be activated automatically for all telephone numbers assigned to them.

Call Forwarding

Forwarded calls of the forwarding type “Immediately” and “On busy” have priority over queues. The queue of the forwarding telephone is not used for forwarding calls in this manner.

During the configuration of this type of call forwarding, the contents of the queue are **not** transferred to the target terminal. If there are still calls in the

queue when the call forwarding function is activated, these calls can only be accepted on the source terminal.

If a call is to be forwarded “After delay”, it enters the queue. If the call has not been answered before the delay period expires, it will be forwarded to the target terminal and can then be answered there.

Pickup

The functions “Pickup from group” and “Pickup selective” can be used together with queues. A user who accepts a call using “Pickup from group” or “Pickup selective” picks up the next call from the queue.

Hunt Groups

Hunt groups of the “parallel” type are usually used together with queues, with the queues of each telephone in the group being synchronised to each other. When a call to the number of the hunt group arrives, the call enters all parallel queues. If a call from one of the queues is answered, it is removed from all other parallel queues.

Examples of Use

Enquiry Station for an Operator with Two System Telephones

The operator switches all incoming calls and can either work on the Forum IPhone 535 or the mobile terminal, the Forum Free 567/577/587.

Configuration

- Configure the system access or access for multiple terminals under **Telephony: Ports: S_0**.
- Configure the Forum IPhone 535 and e.g. a base station (RFP) under **Telephony: Devices**.
- Configure a trunk key for the Forum IPhone 535 under **Telephony: Devices: System telephones**.
- Configure the Forum Free 567/577/587under **Telephony: Devices: DECT phones** and assign the Forum Free its own telephone number. Check in the Forum Free.

- Under **Telephony: Call Distribution: Incoming** or **Telephony: Call Distribution: Incoming DDI** route all incoming calls to the number of the Forum IPhone 535trunk key.
- In the **Configurator**, create a new group called “Operators” under **User Manager: User groups**. Activate the **Call queue**, **Call waiting protection** and **Call forwarding** authorisations for this group and set the **Dial in (outgoing): External** option appropriately.
- Create a user called “Operator 1” under **User Manager: User**. Assign this user to the “Operators” user group. Assign the telephone numbers of the Forum IPhone 535 trunk key and the number of the mobile Forum Free 567/577/587 to this user.
- Activate **Call wait. prot.** (call waiting protection) on both terminals in the **Protection** menu.
- Configure a feature key on the Forum IPhone 535 which activates / deactivates a “call forwarding immediately” to the telephone number of the mobile Forum Free 567/577/587 (in the menu **Call diversion: Divert phone: Immediately**).

Use
Incoming calls are routed to the Forum IPhone 535 manned by the operator, who then puts the calls through. A queue is used so that callers do not get a busy signal. The display on the Forum IPhone 535 indicates how many calls there are in the queue.

If the operator wants to leave the workstation and take along the enquiry station, call forwarding to the Forum Free 567/577/587 is activated by pressing a feature key. Calls which are in the Forum IPhone 535 queue must still be answered on this telephone. New calls are signalled on the mobile Forum Free or enter its queue, allowing the Forum Free to be used as a mobile enquiry station.

On returning to the workstation, the operator deactivates call forwarding by pressing a feature key. Calls which are already in the queue are switched on the mobile Forum Free 567/577/587. New calls are signalled on the Forum IPhone 535 or enter its queue.

Group of Three Enquiry Stations

The enquiry stations switch all incoming calls. Incoming calls are administered in queues. Depending on the number of arriving calls, one to three enquiry stations in this group are manned. The enquiry stations are each equipped with a Forum IPhone 535.

Configuration

- Configure the multi-terminal access or the system access under **Telephony: Ports: S_0**.
- Configure the three Forum IPhone 535 telephones under **Telephony: Devices**.
- Configure a trunk key with its own telephone number for each of the Forum IPhone 535 telephones under **Telephony: Devices: System telephones**.
- Configure a hunt group of the **parallel** type under **Telephony: Groups: Hunt Group**, and include the three telephone numbers of the trunk keys in this hunt group.
- Under **Telephony: Call Distribution: Incoming** or **Telephony: Call Distribution: Incoming DDI** route all incoming calls to the number of the hunt group.
- In the **Configurator**, create a new group called “Operators” under **User Manager: User groups**. Activate the **Call queue** and **Call waiting protection** authorisations for this group.
- In the **User Manager**, configure a user for each of the three operators and assign these settings to the user group called “Operators”. Allocate each user the telephone number of the trunk key of their system telephone.
- Activate **Call wait. prot.** (call waiting protection) on all three terminals in the **Protection** menu.
- Programme a feature key with the function “Sign on / sign off from hunt group” on the three system telephones (in the menu **Calls: Hunt group**).

Use

Incoming calls are signalled in parallel to all signed-on enquiry stations. If the enquiry stations are busy, the incoming call joins the queue on each of the terminals in the hunt group. If one of the enquiry stations accepts a call from the queue, the call is removed from the queues of all the other enquiry

stations. The display at each enquiry station (Forum IPhone 535) indicates how full the queue is.

If attendants leave the station, they sign off from the hunt group by means of a feature key. In contrast to Example 1, further calls do not have to be processed after the sign-off, as the calls are also registered in the queues of the other signed-on enquiry stations.

Note: The last enquiry station remaining in the hunt group should not sign off, so that incoming calls can always be signalled to at least one station.

Multi-Company Variant

Communications systems are frequently shared by several companies. These companies want to jointly use the existing infrastructure (e.g. the existing lines and features of the system), while at the same time they wish to organise and pay for their communication completely independently of one another.

This “multi-company variant” can be implemented using the Forum 5500 within a shared office, for example.

In the multi-company variant, the companies are essentially completely independent of one another. This allows them to have their own trunk lines, which is useful for billing purposes. The Forum 5500 hardware and software are used equally by all the companies, however. It is possible to configure the Forum 5500 for each company and define the extent to which the features of the system may be used.

In brief, the features of the multi-company variant are as follows:

- Up to 20 companies can be configured at the same time.
- Every user of the Forum 5500 is assigned to a company.
- Each available bundle (trunk group) or SIP trunk is uniquely assigned to a company so that incoming external calls can be transferred to the correct internal subscriber.
- For each company, every route can have its own code. For example, it is possible to activate different routes with the code “0” for different companies. This enables separate connection data recording for outgoing external calls, for example.
- An individual exchange (“operator”) can be set up for each company.
- Each company can maintain the communication data of its business partners in its own company telephone book.
- The connection data can be recorded individually for each company.
- Different LCR routes can be configured for each company.

Configuring the Multi-Company Variant

The multi-company variant can be commissioned and configured by the system administrator of the Forum 5500 without any major effort. In the multi-company variant, the communications system behaves in exactly the same way as the single-company variant. This is particularly of interest to users who want to expand their own system and at the same time operate it in a group.

The process in brief:

1. The required companies must be set up (see *Configuring and Managing Companies* starting on page 225).
2. The users of the Forum 5500 are assigned to the individual companies (see *Assigning Users* starting on page 226).
3. In order that the Forum 5500 can transfer incoming calls to the corresponding company (or its staff) correctly, the existing bundles must be uniquely assigned to the companies (see *Assigning a Bundle/SIP Trunk* starting on page 226).
4. In the case of outgoing external calls, the lines via which the members of a company can make a call must be defined (see *Allocating Routing Codes* starting on page 227).
5. An exchange must be set up for each company so that the Forum 5500 can correctly process statuses in which a call should be routed to the exchange (see *Configuring the Company Exchange* starting on page 227).

Configuring and Managing Companies

Up to 20 companies can be configured in the Forum 5500. By default, one company with the name “Company 1” is predefined. All configuration settings, e.g. in the user groups or in the bundle configuration, apply to this predefined default company if not other company has been selected.

Companies are set up and managed in the **Telephony: Extended: Companies** menu:

- A new company is created in this menu using the command **New**. Each company can be given a name up to 20 characters long. This name is then

displayed in all configuration dialogue boxes in which company-specific settings can be defined.

- In this menu a company can be deleted again using the command **Delete**. If a company is deleted which is still used at other places (in the user groups, for example), the respective configuration is changed to the default company.
- The name of the default company can be changed, but the default company itself cannot be deleted.

Assigning Users

For each user you must define the company to which they belong. This assignment determines, for example, which company telephone book the user has access to and which company-specific configuration data apply to them.

As the Forum 5500 manages users in groups, the assignment “user > company” is also established this way. The company to which each user group belongs must be defined for each group. A user group can only belong to one company, i.e. not to several. However, a company can have several user groups. It is therefore possible, in the same way as in the entire system, to allocate a range of authorisation rights for the use and configuration of features for each company.

When setting up a new **User group** (in the **User Manager** menu), you will find that the default company is predefined; another company can be assigned as long as no other companies have been set up.

Assigning a Bundle/SIP Trunk

Connections of the same type and in the same direction are arranged in a bundle (e.g. S_0 multi-terminal connections). To be able to correctly transfer incoming calls to the members of the configured companies (the users) via the lines of a certain bundle of the Forum 5500, each of the available bundles must be assigned to one of the companies. This is necessary to be able to transfer incoming external calls to the correct company exchange in cases where the called internal subscriber cannot be reached, for example. SIP trunks can also be assigned to a company.

The assignment of bundles to companies is done in the **Telephony: Trunks: Trunk group** menu. The assignment of SIP accounts to companies is done in the **Telephony: Trunks: SIP trunks** menu.

Note: A bundle configured as a **System access** resp. a SIP trunk can however also be used jointly by multiple companies. Available direct dialling-in numbers can be assigned to the internal company call numbers via the **Telephony**: **Call Distribution**: **Incoming DDI** menu.

For outgoing external calls which users set up via the lines of their company's bundle/SIP trunk, the assignment of the bundle to the company is irrelevant: the charges are assigned according to the "source" principle.

Charges are billed to the company to which the user belongs who set up the connection. The Forum 5500 recognises this on the basis of the assignment between user groups and companies and on the basis of the routing code with which a line of the bundle/SIP trunk was seized. For more information, please see the following section.

Allocating Routing Codes

Routes are used for automatic and selective seizure of bundles or connections for external calls. It is possible to seize a route by predialling a code.

In the **Telephony: Trunks: Route** menu, you can define which company can seize each route. An individual **code** for the seizure is allocated per route for each company. The Forum 5500 ensures that during configuration no seizure code is allocated twice (for two different routes) for each company. If during configuration of a route no code is allocated for one of the configured companies, the route concerned cannot be seized by the members (user groups) of this company.

Configuring the Company Exchange

An internal telephone number must be set up for each company which represents the exchange, i.e. "the operator". The calls to specific extensions arriving at the exchange are routed to this number, for example, as are all external calls where the called subscriber (a user who belongs to this company) cannot be reached, as in the case of a timeout.

A company exchange is set up in the **Telephony: Operator** menu. In this menu, you can specify an internal telephone number for each company and time group which then represents the exchange for this company.

Working with the Multi-Company Variant

All the features of the Forum 5500 which the users may already be familiar with from the single-company variant are available in the multi-company variant. These features can be used to the same extent and can be used in exactly the same way.

The following section describes the features additionally available to the users in the multi-company variant.

Company Telephone Book

An individual company telephone book can be created for each company. In addition to this, “personal” and “central” telephone books exist:

- A personal telephone book is available for each user.
- The central telephone book can be used across the companies by all users of the Forum 5500.

The company telephone book is a central telephone book for the whole company. It is only available to the users/user groups who are assigned to this company. You can also define whether the members of each user group may edit the company telephone book or not.

The company telephone book is treated exactly the same way on the system terminals as the other types of telephone books. This means that the entries listed in the personal, central and company telephone books are displayed on the system phones at the same time.

Users can also use the telephone book of their company with the **Forum CTI** and **Phone Book** Web applications, assuming they are authorised to use these applications.

In addition, it is also possible to assign a user group with the authorisation to edit foreign company telephone books. This authorisation is useful if members of this group - e.g. the “Administrators” - service the entire system.

Foreign telephone books can only be edited in the **Configurator** in the **Phone Book** menu.

The number of entries in a company telephone book is unrestricted. The Forum 5500 can manage up to 4000 entries in *all* telephone books (in the central, personal and company telephone books).

Making Calls Between Companies

All users of the Forum 5500 can make internal calls to one another, irrespective of which company they belong to. Calls between users from the different companies are therefore not subject to any restrictions.

Billing Charges per Company

In the **Costs** Web application you can output the charges for each company.

Users who are authorised to use this application can view the charges for each company.

Configuring the PC Software

Further possibilities of use can be implemented on a workstation computer with the Windows operating system by installing drivers and programmes.You can find the installation programmes required for this on the product CD that comes with the Forum 5500.

Proceed as follows to install extra software:

1. Log on under Windows as the administrator.
2. Insert the product CD.

   If your PC is suitably configured, the CD will start automatically. Otherwise select **Run** from the Start menu. Click on the **Browse** button to look for the programme “cd_start.exe” on the CD. Confirm this with **Open** and **OK**.
3. Select the required option from the start interface. Follow the programme instructions.

Further instructions for various options that are available are given below.

Browser for Forum CTI and Forum Hotel

You can simplify the daily use of the **Forum CTI** and **Forum Hotel** Web applications using the Web browser especially adapted for the Forum 5500. Each time the workstation computer is restarted, this browser programme can automatically start and log you in. This means that the applications are always operational and can be accessed using the icon in the information area of the task bar.

Tip: You can open web applications also in your default browser by following a direct link. Copy the desired URL from the menu bar of the web console. Past the URL in the address field of your browser.

Installing the Browser

1. Call up the start mask from the product CD (see *Configuring the PC Software* on page 230).

2. Select **Software**: **Browser for Forum CTI** or **Software**: **Browser for Forum Hotel** from the start mask.
3. Follow the programme instructions.

After installing the browser, there is a new menu item in the Windows start menu under **Programs**: **Forum CTI Browser** respectively **Programs**: **Hotel Starter**.

Further information can be found in the online help of the browser programme. To view this, click the top left corner in the **Forum CTI**-browser's programme window on the system menu symbol or on the symbol in the information area of the task bar. Select the **Readme** command. You will find the **Forum Hotel**'s readme in the installation directory of this browser programme.

Note: Both browser programmes can be used simultaneously.

Application Interfaces

The Forum 5500 communications system supports a series of application interfaces which are used by external systems to access functions of the communications system. Communication between the external system and the Forum 5500 communications system is principally transported via the LAN connection or using the IP network protocol. The respective functions differ depending on the application interface. The properties, function and requirements of the various application interfaces are explained in the following sections.

Remote switching

The function **Remote switching** allows to display the state of several functions of the communication system Forum 5500 by means of external devices (e. h. light switches, emergency lights). In addition, these external devices can be controlled remotely by the communications system, e. g. a door station.

Field bus
The external devices and their functions are controlled via the KNX field bus of the building automation system. The communication system Forum 5500 is connected with a remote switching IP router, serving as a gateway to the field bus.

Bus participant
A bus participant refers to a device that participates in the field bus communication.

- External devices can be sensors (e. g. touch sensors) or actors (e. g. switching actors, dimming actors). Some bus participants combine both functions. Also, many bus devices offer separated channels. A quadruple switching actor, for instance, features 4 channels, that can specifically be activated from sensors on the field bus.

  Example: A sensor registers the brightness in the stairwell and sends this information on the field bus. The switching actors on the field bus receive this information and perform the “Switch light” action.

- The Forum 5500 communications system can participate in the field bus communication. This way, for instance, it is possible to make the occupied status of a terminal visible.

Bus participants are configured by means of a separate software, the ETS tool. This software can be purchased from the KNX Association.

Note: The Forum 5500 communications system does not have to be configured via the ETS tool.

Actions
The bus participants carry out actions by sending (sensors) or executing (actors) commands. The following action types can be configured on the Forum 5500 communications system:

- **Switch**: With this action, the communications system serves as a switch. This action can for instance be used to switch the light on or off by means of an appropriate actor.
- **Switch with timeout**: With this action, the system serves as a switch that returns to its initial position after a specified period of time (monoflop). It can for instance be used to switch a staircase light or a door opener.
- **Flashing indicator**: This action can for instance be suitable for alarm messages that are signalled using a flashing indicator.

You can set up any number of actions and assign these to the terminals and applications of the communications system.

Group address
The group address enables a logical connection between the bus participants (sensors and actors as well as single sensor / actor channels). Via the group address, information is routed to the single bus participant channels and the actions are bundled. Every action receives its own group address.

One group address consists of several number blocks, separated by slashes:

- 1/0 for a two-part group address (main group/subgroup)
- 1/0/1 for a three-part group address (main group/medium group/ subgroup)

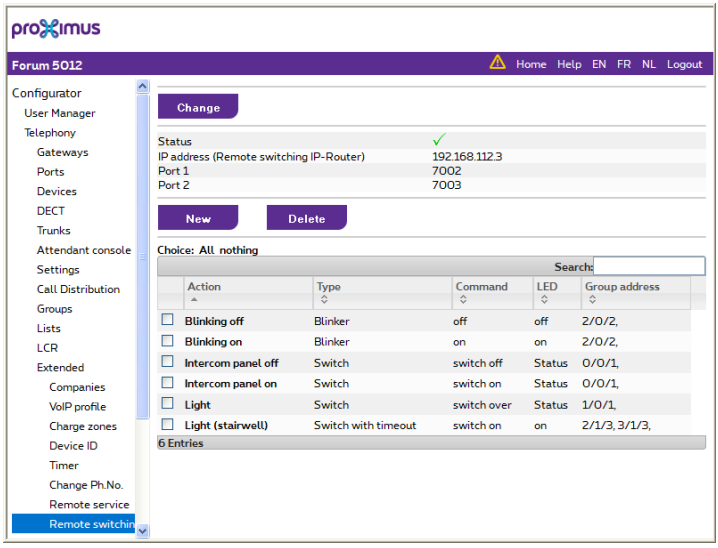
With this notation, the functions can be organised systematically, e. g. main group = floor, medium group = class“lighting”, sub group = functions.

Example: A sensor “A” sends the “Light on” command to the group address 1/0/1. All actors with group address 1/0/1 are switched on.

Sensors and actors can have several group addresses. Every action can be sent to a list of up to 10 group addresses. The group addresses used by the field bus are programmed via the ETS tool.

Configuration

You can configure the **Remote switching** function in the **Configurator**, menu **Telephony > Extended > Remote switching**.



Status page **Remote switching**

The status page shows the following information:

- current configuration of the remote switching IP router;
- current status of the connection between the Forum 5500 communications system and the remote switching IP router:
  - A tick indicates that the connection is established.
  - A cross indicates that the connection could not be established yet.
- table overview of configured actions and parameters.

Configuring the remote switching IP router

If necessary, you can change the configuration of the remote switching IP router.

1. On the **Remote switching** status page, click on the **Change** button.

   The configuration dialogue opens.

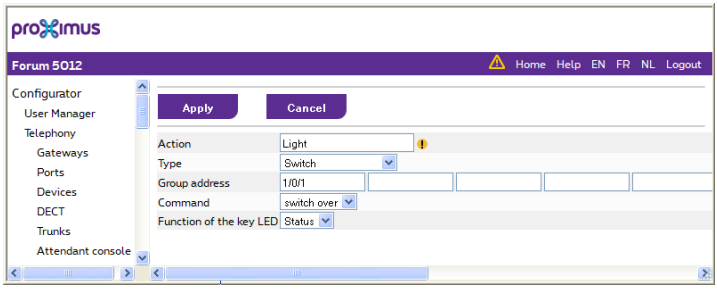
2. **IP address (Remote switching IP-Router)**: Enter the IP address of the remote switching IP router here. The web console menus will only display the configuration settings for the **Remote switching** function after the IP address has been entered here.

Note: To make sure the remote switching IP router always receives the same IP address, you can enter a DHCP entry for the remote switching IP router in the **Configurator**, menu **Network > DHCP**.

3. **Port 1**, **Port 2**: By default, the usual port numbers are set for the connection between the Forum 5500 communications system and the remote switching IP router. Usually, you can apply the default values.
4. Confirm the settings by pressing **Apply**.

Configuring switches

By means of a switch you can control lights or door openers.



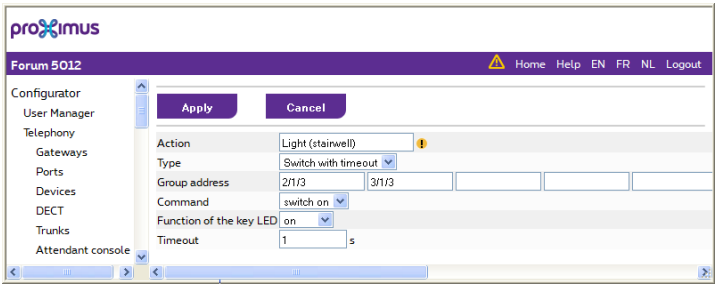
Configuration of an action **Switch**

1. **Action**: Enter a name for the action (max. 20 characters). This name serves as an assignment criterion for connecting the action with a terminal or an application of the Forum 5500 communications system.
2. **Type**: Select the **Switch** setting.
3. **Group address**: Enter the group addresses in these fields (refer to section *Group address* on page 233).

4. **Command**: Select one of the following commands from the list.
   – **switch on**: Switch is switched on
   – **switch off**: Switch is switched off
   – **switch off**: Switch status is changed.
5. **Function of the key LED**: If the action needs to be triggered with a function key on the system phone, select the desired setting for the behaviour of the key LED (also see the *Configuring the key LED function on the system phone* starting on page 238 chapter).
6. Confirm your settings with **Apply**.

Configuring switches with timeout

A switch with timeout functionality, for instance, allows you to control the light in the stairwell.



Configuration of an action **Switch with timeout**

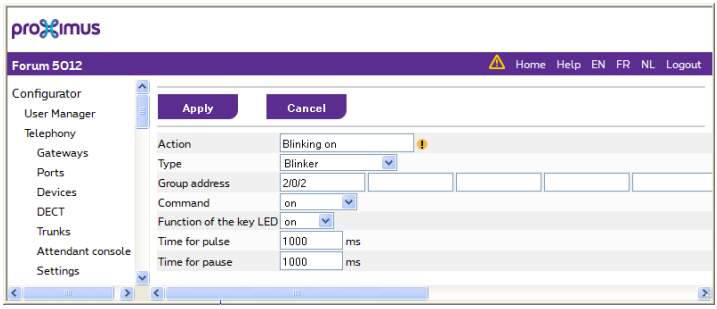
1. **Action**: Enter a name for the action (max. 20 characters). This name serves as an assignment criterion for connecting the action with a terminal or an application of the Forum 5500 communications system.
2. **Type**: Select the **Switch with timeout** setting.
3. **Group address**: Enter the group addresses in these fields (refer to section *Group address* on page 233).
4. **Command**: Select one of the following commands from the list.
   – **switch on**: Switch is switched on
   – **switch off**: Switch is switched off
5. **Function of the key LED**: If the action needs to be triggered with a function key on the system phone, select the desired setting for the

behaviour of the key LED (also see the *Configuring the key LED function on the system phone* starting on page 238 chapter).

6. **Timeout**: This timer controls the time span after which the Forum 5500 communications system sends the opposite command to bus participant.
7. Confirm your settings with **Apply**.

Configuring a flashing indicator

A flashing indicator allows you to control alarm messages, also refer to the *Perform action when ACD queue full* starting on page 240 chapter.



Configuration of an action **Flashing indicator**

1. **Action**: Enter a name for the action (max. 20 characters). This name serves as an assignment criterion for connecting the action with a terminal or an application of the Forum 5500 communications system.
2. **Type**: Select the **Flashing indicator** setting.
3. **Group address**: Enter the group addresses in these fields (refer to section *Group address* on page 233).
4. **Command**: Select one of the following commands from the list.

   – **on**: Flashing is switched on

   – **off**: Flashing is switched off

   – **switch over**: Flashing status is switched. Example: Permanent flashing is switched off.
5. **Function of the key LED**: If the action needs to be triggered with a function key on the system phone, select the desired setting for the behaviour of the key LED (also see the *Configuring the key LED function on the system phone* starting on page 238 chapter).

6. **Time for pulse** and **Time for pause**: With these time values, the Forum 5500 communications system controls the flashing rhythm when flashing is switched on (**Command** = **on** of **Command** = **switch over**):

   – **Time for pulse**: Flashing is on.

   – **Time for pause**: Flashing is off.

   If flashing is to be switched off, (**Command** = **off**) these fields are not displayed.

Note: Time values shorter than 1 second will cause an arrhythmical flashing pattern and should be avoided.

7. Confirm your settings with **Apply**.

Configuring the key LED function on the system phone

For actions that are controlled on a system phone, the behaviour of the key LED is configured using the **Function of the key LED** setting in the actions configuration dialogue. Please read the *Perform action with a function key on the system phone* starting on page 240 chapter for information on programming function keys.

The key LED behaviour can be configured as follows:

- **on**: The LED is switched on as soon as the action is triggered on the system phone.
- **off**: The LED is switched off as soon as the action is triggered on the system phone.
- **Status**: The LED indicates the current relay status. The communications system “listens” on the field bus and registers when another bus participant has issued the command to switch the actor.

  Example: Function keys for switching the staircase lights on and off have been set up on several system phones. If one of these phones issues the action “Light on” or “Light off” and the actor of the staircase light switches accordingly, the key LED on the system phone will indicate the status.

Note: The initial status of the actor can't be polled from the communications system. Rebooting the communications system can therefore cause erroneous LED indications.

Applications

Using the **Remote switching** function, the following applications can be set up on the Forum 5500 communications system:

- Perform action on Device free / Device busy
- Perform action if the ACD queue reaches a critical size (queue indication changes to red or from red to yellow or green).
- Perform action when a function key is pressed on the system phone

Perform action on Device free / Device busy

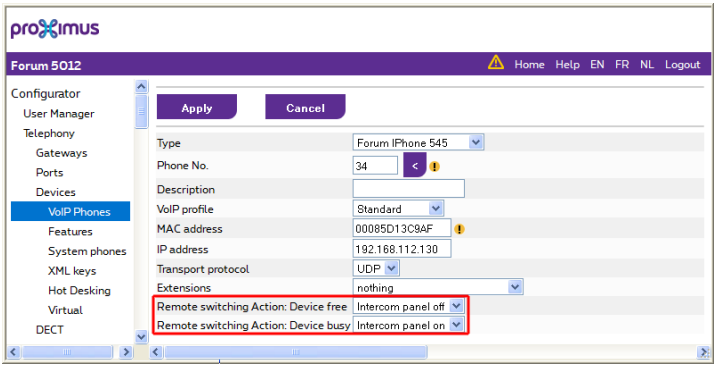
For every terminal, you can define actions for the states **Device free** and **Device busy**.

This function can be used for door station switching operations:

- The door station is automatically switched off when the device is free.
- The door station is automatically switched on when the device is busy.

You can set up these functions on **all** terminal types. As soon as an IP address for the remote switching IP router was entered, in the **Configurator** the required fields will appear in the terminal configuration menus:

- **Remote switching Action: Device free**
- **Remote switching Action: Device busy**



Example: Configuration on a Forum IPhone 545

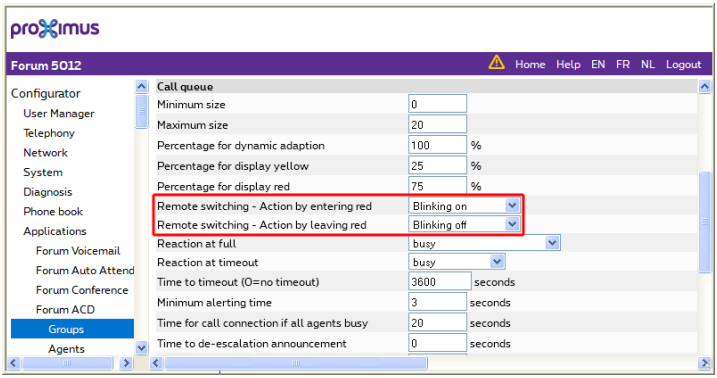
Perform action when ACD queue full

In combination with the integrated application **Forum ACD** the remote **Remote switching** function allows for an action if the ACD queue reaches a critical size. One application example would be to install a warning lamp in the agents' pause room, that starts flashing once the call queue indication turns to red.

You can configure the function in the **Configurator**, menu **Applications > Forum ACD** with the settings:

- **Remote switching - Action by entering red**
- **Remote switching - Action by leaving red**

Note: These input fields are displayed when an IP address has been entered for the Remote Switching IP router.



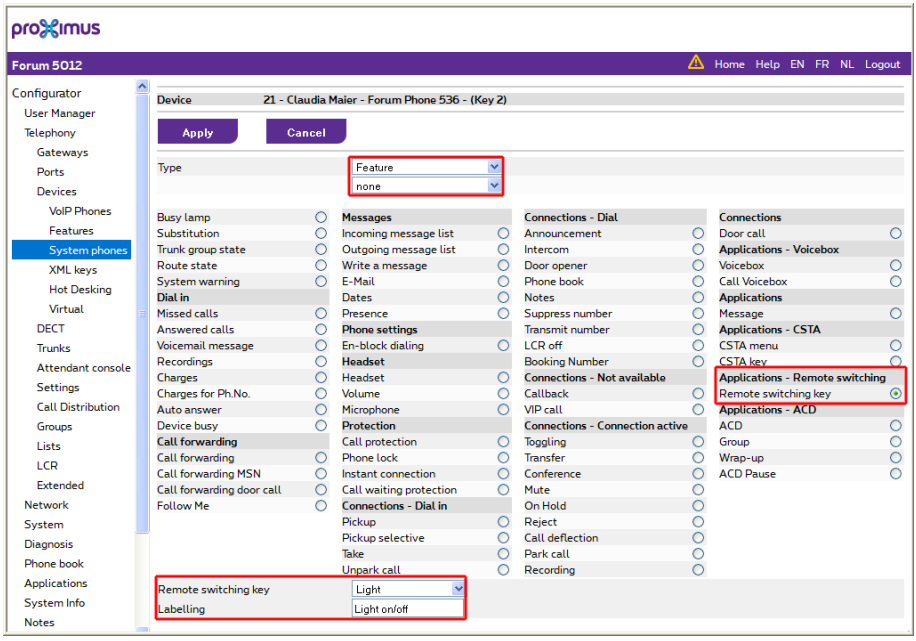
Configuring the remote switching action for an ACD queue

Perform action with a function key on the system phone

On the system phones, you can configure function keys that can perform actions, e. g.:

- Switch on / off or change the light in a room.
- Switch on stairwell light or - when the stairwell light is on - reset the time span until the light is switched off.
- Operating door opener

You can configure the function in the **Configurator**, menu **Telephony > Devices > System phones** with the **Applications - Remote switching** setting.



Configuring the remote switching action on a system phone

CSTA interface

Using the interface for “Computer Supported Telecommunications Applications” (CSTA, phase 3 based on ECMA-269 and ECMA-285 (BER) /ECMA-323 (XML), phase 2 based on ECMA-217 and ECMA-218) external programs and applications can access services of the Forum 5500 communications system via network connection. The CSTA interface provides an effective and universal connection option for Computer Telephony Integration (CTI) applications, for example:

- CTI functions for corded and cordless system terminals as well as SIP terminals
- Display paging and alarm messages on terminals
- Remote activation using terminals, e. g. function and status keys for device or building control.
- interactive menu control using telephony terminals possible

- Change administration information such as user groups, user names and display languages
- Calculating charges, wake-up calls, transparent keypad data with codes, transmitting charges, time group query, message calls and CTI for virtual subscribers, message calls and more.

The CSTA interface based on phase 2 with a limited range of functions available without licence, range of functions comparable with the TAPI basic functions. You can use the following CTI applications without a CSTA licence:

- A charging software can query and evaluate charge information via the CSTA interface. There is a CSTA to V.24 converter (“Count4CSTA”) available which is a standard part of the charging software for doing so.
- SNMP Agent This Windows service program facilitates integrating the Forum 5500 communications system into SNMP-based network management. You do not require a CSTA user log-on to operate this service programme.

To use the full CSTA interface performance, you have to activate the extended functions (CSTA phase 3 BER / XML) with a licence key. Activate the licence key in the **Configurator** on the **System**: **Licences** page.

CSTA interface access is also protected by the password a user account. You can configure a new entry in the **Configurator** on the **User Manager**: **User** page. When creating the user entry, you have to select the “Administrators” user group.

Authorisations can be assigned via user groups for using CSTA functions on terminals. To do so, configure the options under the **CSTA** header on the **User Manager**: **User groups** page. Please consult the notes in the online help regarding this page in the **Configurator**.

You can also develop your own CTI applications or adapt existing CTI applications for the CSTA interface. To do so, you need the developer documentation. Contact your Proximus agent if you need this CD-ROM.

Setting up TAPI Interface

With a TAPI (**T**elephony **A**pplication **P**rogramming **I**nterface) you can operate a CTI application (**C**omputer **T**elephony **I**ntegration). Here, the CTI application uses the services of the Forum 5500 with the help of the TAPI driver installed on a Windows PC.

Many telephony functions, such as enquiry, toggling, three-party conference, pick-up, call protection and call forwarding can be controlled using appropriate TAPI-compatible software.

Requirements
You require an active IP network connection between the PC and the communications system. CTI functions can be used only in conjunction with system terminals.

You must therefore have configured at least one user for a system terminal. In addition, you require a TAPI 2.1-compatible CTI application, for example the **Phone Dialer** included in the Windows operating system.

Note: You can also install the TAPI driver under Windows 7 / Windows 8 and under Windows Server 2008 R2 (x64) / Windows Server 2012. For Windows Server 2008 R2 (x64) an additional runtime library is required. Download and install the "Microsoft Visual C++ 2008 SP1 Redistributable Package (x64)" from the Microsoft web site under the following URL: http://www.microsoft.com/downloads/details.aspx?FamilyID=ba9257ca-337f-4b40-8c14-157cfdffee4e

Installing the TAPI Driver

1. Call up the start mask from the product CD (see *Configuring the PC Software* on page 230).
2. Select **Software**: **Install TAPI Service Provider** from the start mask.
3. Follow the programme instructions.

Configuring the TAPI Connection

Note: Under Windows you should log on as the user for whom you want to configure the TAPI connection.

1. In the Start menu, select **Settings**: **Control Panel**. Select the **Printers and other Hardware** (with Windows 7: **Hardware and Sound**, with Windows 8: via **Search Control Panel**) category. Double-click on the **Phone and Modem Options** icon.
2. Change to the **Advanced** tab.
3. From the list of installed driver software, select **Forum 500 Service Provider** and click on **Configure**.
4. In the following dialogue you will find a list with the configured connections for the user who is currently logged on. Click on **New**.
5. In the following dialogue you provide information for the new connection. In the **Connection name** box you can enter a descriptive name for the connection. In the **CTI server** box you must enter the DNS name or the IP address of the Forum 5500. Using the **[...]** button you can search for this in the LAN. In the boxes **Username** and **Password** you enter the user data of one of the users configured on the Forum 5500. This user must be allocated a system terminal. Confirm your entry with **OK**.
6. The new connection is now configured. Close the opened dialogues with **OK** and **Close**.

Testing the TAPI Function

1. Start the programme called **Phone Dialer**: press the [Windows+R] keyboard combination. The dialogue **Run** opens. Enter “dialer” and confirm with **OK**.
2. In the **Tools** menu, select the item **Connect using...** to select the system terminal that is to use the CTI application. Under Windows you select the item **Options** from the **Edit** menu. In the **Lines** tab you then select the system terminal from the **Phone calls** list.
3. Enter a telephone number in the **Number** box and confirm with **Dial**. Under Windows you first click on the **Dial** icon and in the subsequent dialogue activate **Phone call**.
4. The number you entered is displayed on the selected system terminal. Lift the receiver to start dialling.

Note: In order to guarantee correct operation with different TAPI applications, the block dialling function has to be disabled on the terminals.

LDAP Interface

Directory information can be transferred using the LDAP protocol. A central service (LDAP server) manages a comprehensive, hierarchically organised directory which can be queried by an LDAP client via LDAP. The Forum 5500 communications system supports two different LDAP applications:

- Forum 5500 communications system as LDAP client: an external directory can be queried via LDAP, for example, in order to display the information thus gathered when there is a call.
- Forum 5500 communications system as LDAP server: the telephone book managed by the Forum 5500 communications system can be accessed via LDAP.

Address Queries using LDAP

You can search the data of the central telephone book of the Forum 5500 from a workstation computer in the LAN using LDAP (Lightweight Directory Access Protocol). When configuring an LDAP-enabled programme, specify the IP address of the Forum 5500 as the address of the LDAP server.

LDAP with Outlook Express / Windows Mail
You can configure and operate the LDAP directory service with “Outlook Express” or “Windows Mail”, an e-mail programme, as follows:

1. Call up the **Accounts** command in the **Tools** menu.

   The **Internet Accounts** dialogue box will then open.
2. Click on **Add**. Select the **Directory Service** command from the pop-up menu.
3. Under **Internet directory (LDAP) server, enter the address of the** Forum 5500. It is not necessary to enter log-in data to query the central telephone book. You have to enter the log-in data for the account on the Forum 5500 communications system here if you wish to also query entries from the central telephone book or from the company telephone book additionally. Click twice on **Next**. Then click on **Finish**.
4. Check the function. In the **Edit** menu, call up the **Find**: **People** command.

   The **Find**: **People** dialogue box will then open.

5. In the **Look in** list, select the entry with the Forum 5500 address. Enter a user in the **Name** input field, Administrator for example. Then click on Find now.

   The list of entries found should now display the address from the central telephone book.

Querying External LDAP Server

The Forum 5500 communications system can also access external address directories. This means that alongside the internal telephone book entries, address information from external sources is also available. This information is used, for example, in a name search or for displaying a name for an incoming call.

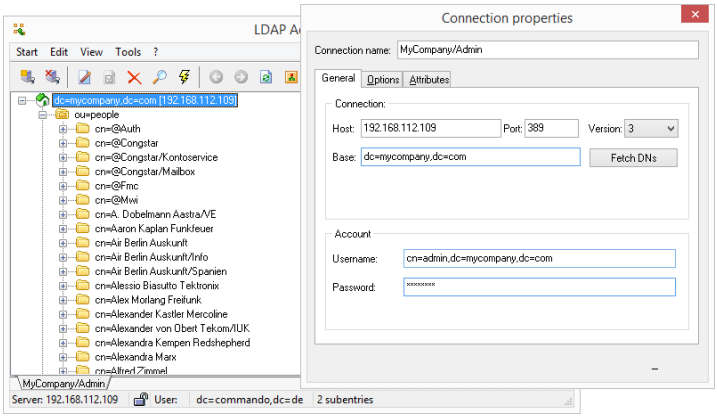
The external address directory is queried by the Forum 5500 communications system via the internet Lightweight Directory Access Protocol (LDAP). To do so, you require a server on the company network which makes address information available via LDAP version 2 or via LDAP version 3. The LDAP query requires either an anonymous LDAP directory access without a password or a LDAP directory access with user name and password.

Note: SSL encryption of LDAP communication is not supported.

You can configure a separate LDAP directory access for each company configured (see *Multi-Company Variant* starting on page 224):

1. Open the **Telephony**: **Extended**: **Companies** page in the web configurator. The list of companies configured is displayed. If you do not use the multiple company variant, “company 1” is the only entry.
2. Open the configuration page for the company desired. Activate the **Status** option under the **LDAP Server** header. Enter the IP address or DNS name of the LDAP server into the **Server** entry field. The online help of the Forum 5500 communications system provides detailed descriptions of the other entry fields.
3. Use **Apply** to confirm your settings.

An LDAP server can be configured to saved various types of information which are available in a tree-like data structure. Alongside querying address book entries, which should be saved in the “InetOrgPerson” schema, many companies also use a LDAP server for centrally organised management of user accounts, for instance. The following screenshot provides an example:



To configure the LDAP query you need to find out from the LDAP server administrator what part of the subtree contains the desired address information. The subtree is designated with a technical address (DN, “Distinguished Name”). This technical address (in the above example “ou=people,dc=mycompany,dc=com”) can be defined in the web configurator on the **Telephony**: **Extended**: **Companies** page with the **BaseDN** setting. If the LDAP server does not allow an anonymous query, configure the settings **User name** and **Password** for a LDAP user account with read authorisation.

Usage of address information queried via LDAP is activated as the default setting for all user groups. You can deactivate this function for individual user groups. To do so, deactivate the **Use LDAP** option in the web configurator on the **User Manager**: **User groups** page under the **Phone book** header.

After configuration, the information queried via LDAP is available on authorised system telephone, DECT system terminals and SIP system telephones as well as in the applications “ Forum 500 CTI” and “Forum CTI Touch”. Information queried via LDAP is considered for telephone book searches and for displaying names during incoming calls in addition to the information from the internal telephone book. Please note the following:

- When you have configured the LDAP query for a company, this changes the telephone book search for the DECT system terminals and corded system telephones. Instead of a continuous display of search results, you have to first enter a series of characters when entering for a search. Search results can only be displayed after starting the search.

- Each individual LDAP-queried record is reserved for a definable time in a Forum 5500 communications system cache (setting: **Delete cache** in minutes, 50 cache entries per company each with a separate time counter per entry). You should shorten this time (e. g. to 10 minutes) if, for example, the assignment of guests and room telephones in a hotel is managed via the LDAP server. If you set the **Delete cache** setting to 0 minutes the cache is not automatically deleted. Delete the cache as needed. Select the desired company entries on the **Telephony**: **Extended**: **Companies** page and click on the **LDAP Delete cache** button.
- Ideally, call numbers on the LDAP server are saved in the E.123 format beginning with a plus sign and country code. Furthermore, the bundles configured in the standard route of a company should have the setting **E.164 conversion** (see *E.164 conversion* starting on page 194). Special call numbers such as the emergency call number “110” should not be managed via LDAP, rather in the telephone book of the communications system.
- A call number queried via LDAP is adjusted before use. First of all, the characters in brackets beginning with “0” are deleted such as, e.g. “+49(030)1234”. Then all characters are deleted that are not numbers or plus signs.

  If the resulting call number is in the E.123 format, the initial plus sign is replaced with “00”. In addition, the seizure code of the company standard route is prefixed and (if configured, see *E.164 conversion* starting on page 194) the own prefix and the own base call number is deleted as necessary.

  If the resulting call number is not in the E.123 format the **Phone No.** option on the **Telephony**: **Extended**: **Companies** page determines how it is processed further:

  – Option **Phone No.** is set to **transparent**: The call number queried from the LDAP server is used without any further change.

  – Option **Phone No.** is set to **convert**: Select this option if the LDAP server provides call numbers without seizure codes. In addition, call numbers beginning with “0” have the seizure code of the company standard route prefixed and (if configured, see *E.164 conversion* starting on page 194) the own prefix and the own base call number is deleted as necessary.

  – Option **Phone No.** is set to **convert with trunc code**: Select this option if the LDAP server provides call numbers with seizure codes for the company standard route. In addition, for call numbers beginning with the seizure

code of the company standard route (if configured, see *E.164 conversion* starting on page 194) the own prefix and the own base call number is deleted as necessary.

- Via the LDAP server you can also query another communications system from the family / Forum 500 / Forum 5500. If, for example, you connect multiple communications systems into a network (see *PBX Networking* starting on page 182) you can then manage call number information on a central communications system. Please note that information queried via LDAP cannot be forwarded via the LDAP server of the same communications system.

Use the Forum Name program for more advanced LDAP configuration, for connecting additional data sources or for additional call number conversions. After authorisation via a license key, the Forum Name program offers a LDAP service which can be queried by the Forum 5500 communications system. The Forum Name program provides you with the following features:

- Bundling multiple data sources: Querying one or multiple LDAP servers and file sources in the CSV and LDIF formats.
- Rule-based call-number conversion, separate configurable rules for the call-numbers-to-name search and for conversion of call numbers for outgoing calls.

Note: The Forum Name program can be operated on the same computer as the Forum 5500 communications system. However, the LDAP port number 389 is occupied by the Forum 5500 communications system. This means that you have to configure a different port number for the LDAP service in the Forum Name program.

SNMP Interface

Components connected to the network are monitored using network management software in many companies. The management software ("SNMP-Manager") communicates with the network components via SNMP (Simple Network Management Protocol).

You can integrate the Forum 5500 communications system into the SNMP-based network management. There is a Windows service program for this ("SNMP Agent"). The SNMP Agent communicates with the Forum 5500 communications system via the CSTA interface. The status information

queried via the CSTA interface is forwarded by the SNMP Agent to the network management software.

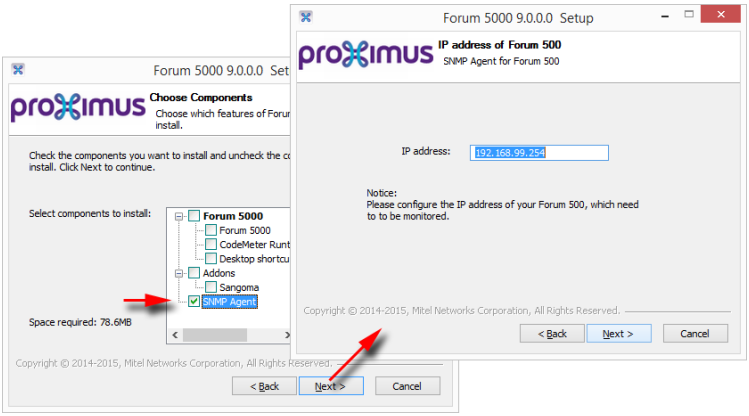
Note: The SNMP Agent uses the CSTA interface of the Forum 5500 communications system in an operating mode so designated. This is why no additional CSTA licence key is required for operation.

The SNMP Agent supports SNMP Traps after SNMP version 2. In case the SNMP Agent cannot be accessed, the Forum 5500 communications system stores up to 1000 error or status messages. Also note that there is a SNMP description file (MIB, Management Information Base) for the Forum 5500 communications system which can be found on the product CD.

Installing SNMP Agent

The standard configuration is installing the SNMP Agent when the Forum 5500 communications system is installed. If you leave the **SNMP Agent** component activated during the installation, the SNMP Agent has already been installed and automatically configured for communication with the 127.0.0.1 local IP address. Alternatively, it is also possible to install the SNMP Agent on another server PC. This is described in the following steps.

1. Log on to the PC as a user with administrator rights.
2. Start the installation program for the Forum 5500 communications system from the product CD.
3. Follow the steps of the installation assistant. In the **Choose Components** step deactivate all components except for the **SNMP Agent** component.



Installing the SNMP Agent

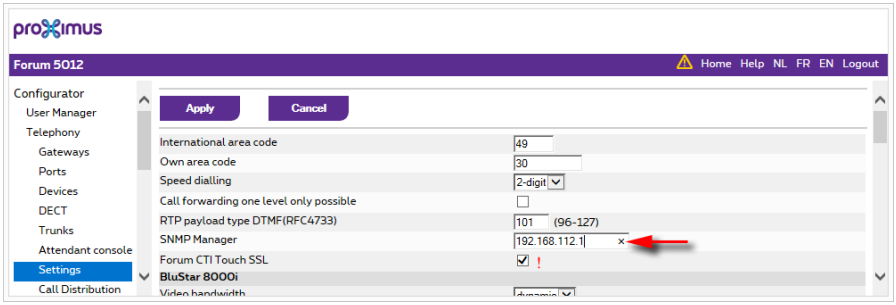
4. As you continue with the installation assistant the **IP address** step is now displayed. Enter the IP address of the Forum 5500 communications system.
5. Terminate the installation assistant with the **Next**, **Install** and **Finish** buttons.

During installation a Windows service “Forum 5000 Supervisor Service” is configured. This service starts the SNMP Agent. This means that the SNMP Agent is automatically started with Windows and runs in the background, even when no Windows user is logged on.

Configuring SNMP

The SNMP Agent requires the IP address of the SNMP Manager for operation. System messages in the form of SNMP Traps are sent to this IP address. You manage the IP address of the SNMP Manager in the Forum 5500 communications system configurator.

1. Start the web console of the Forum 5500 communications system.
2. Navigate to the **Telephony** page in the **Configurator**: **Settings**. Click on the **Change** button.



Telephony: *Settings*: *SNMP*

3. Enter the IP address of the SNMP Manager into the **SNMP Manager** input field.
4. Confirm with **Apply**.

The IP address of the SNMP Manager is made available to the SNMP Agent in a configuration file via the TFTP server of the Forum 5500 communications system.

Frequently Asked Questions

This chapter provides tips and information on how to deal with any malfunctions or faults you may experience with the Forum 5500.

Telephony

Question: It is not possible to make external calls.
Check the connection between the NTBA and the Forum 5500.

In the **Configurator**, check whether the external S_0 ports are configured correctly (**Telephony: Ports: S_0** menu):

– Configuration of System- / Multi-terminal access OK?
– Port is connected to the NTBA?
– Faultless Cabling?
– Terminating resistors properly configured?

Check the status of the trunks. In the Configurator, open the **System Info**: **Telephony**: **Trunks** page. For the **Trunks** used for the "External trunk" route the **Status** indicator should display a small green hook symbol.

Also check the Internet connection of the PC running the Forum 5500 communications system (for this, refer to *Checking Internet Connection* starting on page 41).

Question: The Forum 5500 is connected to an NTBA with a multi-terminal configuration. Why is it not possible to establish external connections?
With the original factory setting, an additional external S_0 port is set for an NTBA in the communications system configuration; this additional port will be used first to seize a trunk line.

Deactivate the corresponding S_0 port in the **Configurator** (**Telephony: Ports: S_0** menu).

Question: One of the telephones is not functioning at all.
Make sure the telephone has been properly connected.

Check also whether the appropriate port has been configured correctly in the **Configurator** (**Telephony: Ports** menu).

Question: It is not possible to make external calls with one of the telephones.
Check whether a user is configured for the telephone. Otherwise the settings of the Guests user group are valid for the telephone. To standard, this user group has no external call authorisation.

Make sure the user configured for this telephone belongs to a user group with external line access (**Configurator**, **User Manager: User groups** menu).

Check also whether the internal call number of this telephone has been configured for incoming call distribution (**Configurator**, **Telephony: Call Distribution** menu).

Question: One of the features (e.g. call diversion) on one of the telephones cannot be used even though the feature has been configured in the Configurator of the Forum 5500.
Make sure the user configured for this telephone belongs to a user group that has access to this feature (**Configurator**, **User Manager: User** and **User groups** menus). Some features cannot be used until the system PIN is changed.

Question: Calls can be made but not received with one of the ISDN telephones.
The internal call number that has been configured for this ISDN telephone in the **Configurator** (**Telephony: Ports: S0** menu) must also be configured as an MSN on the ISDN telephone itself. For further information, refer to the User Guide of your ISDN telephone.

Question: An ISDN telephone always rings, if another telephone on the S_0 bus is being called.
This case also requires configuring the MSN on the ISDN telephone (see above answer).

Question: It is not possible to configure Call Distribution: Outgoing for multi-terminal access.
You have configured multi-terminal access and system access in parallel. All outgoing calls are therefore established via system access, and outgoing call distribution can be configured for system access only in the **Configurator** (**Telephony: Call Distribution** menu).

A specific MSN can be seized for individual calls by means of a code number procedure. For further information, refer to the “Forum 500 / Forum 5000 – Standard Terminals” user guide.

Question: What are some of the causes for problems when sending and/or receiving faxes?
In frequent cases, the reason may be found in a problem with the ISDN-L1 reference clock distribution. The L1 clock is delivered from the network provider. An unclean L1 clock distribution and the introduced signalling jitter is overheard by the human ear. Nevertheless, data and fax transmissions may be disturbed by the jitter. Please check, which ISDN lines will deliver the L1 clock. Details can be found under *L1 Clock* starting on page 184.

The fax data transfer possibly is routed via a compressing VoIP connection. Please verify, if the a/b port is configured with the "Fax" setting. For the VoIP connection, select a VoIP profile which includes the non-compressing G.711 codec.

PBX Networking

Question: Why is it not possible to answer calls from another communications system via the missed calls list?
You get a call e.g. via a Q.SIG-IP / SIP tie line connection. Which line seizure codes you will need to dial for the callback is not included automatically in the information transferred with Q.SIG / SIP. Therefore, you need to setup the callback in the bundle configuration. Call up the **Telephony**: **Trunks**: **Trunk group** page. Change the desired Q.SIG / SIP bundle and enter the line seizure code for the callback in the **Prefix for source phone number at incoming internal** input field.

Question: Why is it not possible to reach a communications system indirectly via another communications system?
You have interconnected e.g. three communications system with two Q.SIG-IP / SIP tie line connections. While configuring the routes, you applied the default "Business" selection for the **Type** setting. Call-switching for internal calls is possible for the in-between communications system for internal routes only. Change the Type setting for all affected routes to "Internal".

Question: Why is it not possible to occupy an external line in transit through another communications system?
There is no configured central ("attendant console") on the transit communications system. Charges for external connections that are generated by transit traffic cannot be assigned to a user account on the transit communications system. For this reason, the charges are booked on the attendant console.

DECT

Question: Is it possible to increase the time for the enrolment procedure?
You must manually enter the IPEI of the DECT device in the **Configurator**. The enrolment time is then increased to one hour (**Telephony: Devices: DECT Phones** menu).

Question: Another manufacturer's DECT device is not functioning.
Check whether the DECT device supports the DECT GAP standard. In the **Configurator**, also make sure **GAP** is set for this DECT device (**Telephony: Devices: DECT Phones** menu). Possibly, the DECT device doesn't support SARI either. Check whether it's possible to update the software of the DECT device. Otherwise, the device can only be used with DECT over IP .

Question: The startup procedure of the DECT base stations take a long time? What is the reason?
This behaviour may indicate a problem with the reference clock. Refer also to *What are some of the causes for problems when sending and/or receiving faxes?* starting on page 255.

LAN

Question: Why is it not possible to establish a network connection with the Forum 5500?
Check whether the LEDs for the switch and the PC's network card are indicating a connection.

To check whether there is a network connection with your Forum 5500, enter the "ping IP address" command in "Run" in the Windows Start menu (e.g. ping 192.168.99.254).

Question: How can I determine the IP address of the Forum 5500?
To find out what the IP address is, enter the code number ✱ 1 8 2 on one of the connected system telephones.

The code-number procedure ✱ 1 8 3 also displays the network mask.

Question: The network connection is functioning, but nothing is displayed in the browser.
Enter the complete IP address of the Forum 5500 along with the protocol identifier, for example http://192.168.99.254/.

Check whether the browser has been configured for connection through a proxy server. If so, deactivate the “Connect through proxy server” setting.

Question: In our network the Forum 5500 dynamically issues the IP addresses by DHCP. Can I firmly assign the IP address for our internal server PCs (mail, Web)?
You need a static address assignment for these server PCs. Make the appropriate host assignment entries in the Configurator (**Network**: **Hosts** menu). Create a static DHCP entry for each host assignment in the **Network**: **DHCP** menu. Activate “Dynamic and static address” for the DHCP server.

Internet

Question: A SIP connection only passes unidirectional voice. What is the reason?
The STUN server of the SIP provider is unavailable. You need to activate the SIP support at your internet router, such as “SIP-ALG” or “Full Cone NAT” functions. Correct the STUN setting in the **Telephony**: **Trunks**: **SIP Provider** menu.

Question: Is it possible to use Q.SIG-IP / SIP tie line connections via an Internet access with dynamic IP address?
No. Q.SIG-IP / SIP tie line connections require (as with IP system telephones and SIP terminals) a fixed IP assignment and a connection without NAT for technical and security reasons. It is possible to tunnel a Q.SIG-IP / SIP tie line connection through a VPN connection. A VPN connection offers the possibility to determine the peer’s IP address with a DynDNS service during connection setup. VPN and DynDNS can be realized with external servers or routers.

Forum IPhone 525/535: Extensions and Accessories

With the Forum 5500 communications system, you can use the IP variants of the Forum IPhone 525/535 system telephones.

Power Supply Unit

Connecting the Power Supply Unit to an IP Telephone
The connector for the power supply unit is in the bottom of the telephone's casing and is indicated by the symbol .

1. Plug the power supply unit's RJ45 jack into the socket provided.
2. Pass the power supply unit's cable through the recesses on the underside of the IP system telephone.
3. Connect the power supply unit to the mains power supply (see *Connecting the Key Extension* starting on page 260).

Key Extensions

Up to three key extensions can be connected to system telephones: either three key extensions of the model Forum 500 Keypad Paper FP 525/535 or three key extensions of the model Forum 500 Keypad Display FP 535. A combination of these key extensions is, however, not possible.

The following equipment combinations are possible:

Key extension ...	... with the features	connectable to a system telephone
Forum 500 Keypad Paper FP 525/535	– 36 keys with LED indicator – Labelling on label strips	– Forum IPhone 525 – Forum IPhone 535
Forum 500 Keypad Display FP 535	– 20 keys with LED indicator – 3 keys with LED indicator to shift levels; enables programming of 60 storage locations on each key extension – Labelling of the keys over the display; each key is assigned to a display line	– Forum IPhone 535

The number of key extensions connected to a system telephone (up to three) can be set in the **Configurator** of the Forum 5500's Web Console (in the menu **Telephony**: **Devices**: **VoIP Phones**). Here the keys can also be programmed as call keys or assigned functions or destination call numbers. Users can change this programming as required.

You will need a plug-in power supply unit no. 90035810 to provide power. The power supply unit is plugged into the last in the series of key extensions.

Configuration	Needs Power Supply Unit
IP system telephone	Yes
IP system telephone with 1-3 key extensions	Yes
IP system telephone with PoE (Power over Ethernet)	No
IP system telephone with 1-3 key extensions and PoE	No

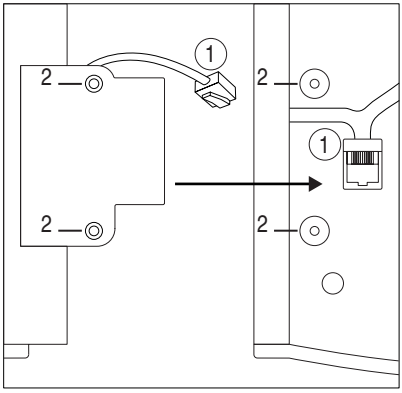
When using PoE, an IP system telephone requires no power supply unit.

Connecting the Key Extension

CAUTION! Guard against static charges!

Static charges can damage the Forum 5500's electronic components. Make sure you discharge yourself and your tools before and during any installation work on the Forum 5500 and any connected terminals. Use discharging underlays or antistatic mats where possible.

Please note: **Never** attach a key extension to a system telephone that is already connected to Forum 5500. Pull the network cable out of the socket before screwing the key extension onto it.



Underside of the device: key extension (left) and system telephone (right)

This symbol on the system telephone indicates the connector for the key extension. It is on the underside of the telephone. This symbol on the key extension indicates the connector for a further key extension.

This symbol on the key extension indicates the connector for the power supply unit and is on the underside of the device. This is the same connector which can be used instead of connecting an additional key extension.

1. Plug the key extension's RJ45 jack into the system telephone's RJ45 socket (1).
2. Screw the key extension onto the system telephone (2).

3. Plug the power supply unit's RJ45 jack into the socket provided on the right-hand side of the key extension.
4. Pass the power supply unit's cable through the recesses provided on the underside of the key extension and the system telephone.
5. Connect the power supply unit to the mains power supply.
6. Connect the system telephone with the ethernet port.

Headset

A headset can be connected to the Forum Phone 515/525/535 system telephones and to the Forum IPhone 525/535 IP system telephones.

The headset must comply with the DHSG standard (connection via RJ45 jack). The manufacturers Plantronics and GN Netcom make devices suitable for this purpose. Alternatively, you can connect a "normal" headset (RJ11 jack) using an adapter. The headset must comply with DIN Norm EN 60950-1 Point 6.2 ("Safety of information technology equipment including electrical business equipment").

Connecting a Headset to a System Telephone
The connector for the headset is in the bottom of the system telephone's casing and is indicated by this symbol .

1. Plug the RJ45 jack on the headset cable into the socket provided.
2. Pass the cable through the recesses provided on the underside of the system telephone.
3. Activate the headset on the system telephone in the menu **Phone settings: Headset** (see also the system telephone's user guide).

Technical Specifications

System prerequisites	
CPU	1 GHz or faster, 32-Bit (IA-32)
RAM memory	1 GB or larger
Mass storage	4 GB HDD/SSD or larger
Operating system	– Windows Server 2008 R2 – Windows 7
Network/LAN	100 Mbit/s or faster
Internet connection	DSL with 386/128 kbit/s or faster
Typical programme installation	200 MB
Available licences: *see Forum 5500 Web console*, **Configurator**, **System**: **Licences** *menu*	
Gateways	
Forum Gateway 560	– up to 4 – 12 slots for telephony interface cards in each gateway
Connectable devices	
IP System telephones	Forum IPhone 525 Forum IPhone 535 Forum IPhone 512 Forum IPhone 545
Software system telephones	Forum IPhone PC
Other SIP telephones	Standard SIP telephones Standard SIP softphones

DECT over IP base stations	Forum Base DECT IP (indoor) Forum Base DECT IP (outdoor) Forum 500(0) - Forum Base DECT IP ind. V2 Forum 500(0) - Forum Base DECT IP outd. V2 Forum Base DECT IP-WLAN (indoor) Forum 500(0) - Forum Base DECT IP+WLAN V2
U_{pn} base stations	Forum Base DECT v2 (indoor) Forum Base DECT v2 (outdoor) Forum Base DECT IP (indoor) Forum Base DECT IP (outdoor)
DECT system telephones [2)]	Forum Free 587 (colour display, outdoor) Forum Free 577 (colour display) Forum Free 567 (grayscale display) Forum Free 575 Forum Free 565
DECT standard telephones [2)]	Standard CAP telephones Standard GAP telephones
ISDN devices	Prerequisite: appropriate telephony interface cards have been installed
Analogue devices	Prerequisite: appropriate telephony interface cards have been installed
Communications systems	Forum 523/524 Forum 550/560 Forum 525/526

1) Manufacturing of this device has discontinued
2) Mobile telephones connectable via DECTover IP and U_{pn} base stations

Environmental Information

- The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances for the health and the environment.
- In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.
- The crossed-bin symbol invites you to use those systems.

- If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.
- You can also contact us for more information on the environmental performances of our products.

Index

Numerics

1-12 frame 67
19" frame 61, 67

A

a/b ports 85
Actor
  See Intercom system 87
Authorisations 14

B

Backplane 61
  Exchanging 74
Base station 163
Basic settings
  Authorisations 14
  Internet 21
Bundles 190
Busy keys 203

C

Call diversion 198
Call Forwarding 198
Call Forwarding Chain 198
Call key 209
CAP 12
CF tracking 202
Codec 136
Codecs 140
Configuration 121
  Initial configuration 121
  Preparation 121
  Remote configuration 125
  Saving and loading the configuration 124
  Starting the Web console 122
Control module 61
  Functional description 93
  Installation 70
Country area code 194
CSTA 11, 241
CTI 11

D

DDI lines 145
DECT
  encryption 164
DECT Network 174
DECT over IP 12, 163, 174
DHCP 155
DHCP server 150
Diagnosis
  Call forwarding 202
Direct call key 210
DSS1 183
DTMF 139

E

E.123 147
E.164 conversion 194
E-mail
  Accounts 129
  Notification 129
  System messages 129
Encryption 164

F

Factory settings 14
FAQs 253
Fax (codec with VoIP) 139

Features 10
Call charges recording 13
Communication applications 10
Connection data recording 13
DECT over IP 12
LAN integration 13
Networking 12
SIP trunk lines 10
Telephony 11
Telephony basic settings 14
Forum 500 Card 8 digital extensions 101
Forum 550 Card 8 analogue extensions 103
Forum 550 Card 8 S0/T0 79, 99
Forum 550 Card main processor 88, 109
see control module 93
Forum 550 Card PRA 96, 111
Forum 550 Media Gateway Card 105
Forum 550 Power Supply
see power supply units 90
Forum CTI 230
Forum Gateway 560 (see Gateway) 61
Forum Hotel 230
Forum IPhone 525/535 258
Forum IPhone PC 160

G

GAP 12
Gateway
construction 61
Gateway connection 107
Guest telephone 206

H

Handover 12
Headset 261
Hunt Groups
Call Forwarding 200

I

Installation 25, 61, 63, 150
Control module 70
Installation in a 19" rack 67
Interfaces 71
Mounting 66
Power supply units 73
Scope of delivery 62
Installation report (setup logfile) 32
Intercom system 86
Interface cards 61
Installation 71
Interfaces
a/b 85
Forum 550 Card 8 analogue extensions 103
Forum 550 Card 8 digital extensions 101
Forum 550 Card 8 S0/T0 99
Forum 550 Media Gateway Card 105
LAN 88
PCM 109
S0 79, 82
S2M 96
Upn 83
International call number 194
IP Phone Configurator 157

L

LAN integration 13
LAN port 88
LAN Settings 21
LCR 191
LDAP 245
Local area code 194

M

Media Gateway 142
MGW 142
Multi-terminal access 182
Music on Hold 45, 207

N

Networking 12
NTBA 253
Numbering 191

O

Outlook Express 245

P

PBX networking 182
PBX number 192
PBX system networking 203
Pin assignment
  a/b interface 87
  IAE 81
  S0 interfaces 79
  Upn interface 84
PIN Code Telephony 204
Point-to-point connection lines 185
Ports (see Interfaces) 78
Power failure 76
Power supply unit 258
Power supply units 61
  Functional description 90
  Installation 73
Private calls 204
Problem reports 32
PSTN 10

Q

Q.SIG 183
Q.SIG-IP 12, 28, 37, 43, 132
Quality of Service (QoS) 27, 28, 29, 42

R

Radio fixed part (RFP, see Base station) 163
Redial List 204
Remote configuration 125
Remote switching 232
Routes 191

S

S0 ports 79
  External 82
  Internal 82
S2M 184
Safety precautions 25, 63
Sensor
  See Intercom system 87
Setup logfile 32
SIP 140, 143
  External 133, 143
  Forum IPhone 512 149
  Forum IPhone 545 149
  Internal 134, 145
SIP tie line 189
SIP trunk lines 12
SIP-DDI 10, 145
Slots 68
Switch authorisation 206
System access 182

T

TAPI 11, 194, 243
TCP/IP introduction 127
Team functions 209
  Explanation of keys 209
  Introduction 209
Team key 210
Telephony 253
  basic settings 14
TFTP server 150
Three-member team 213
Toggle team 215
TOS byte 139
Traffic shaping 28, 29
Transparent codecs 140
Troubleshooting 32, 253
Trunk key 210

U

U-DECT 174
Unified team 214
Update
  Information 202
Upn ports 83

V

VAD 142
Virtual Call Numbers
  Call forwarding 200
Voice Activity Detection 142
Voice Mail 45, 86
Voice quality 136
VoIP 131
VoIP profile 140
VoIP system telephones 132, 153

W

Web console 13
Windows Mail 245

Support

You can contact our support on the following telephone numbers:

For configuration changes of your Forum™ 500 or Forum™ 5000 communications system

	SMEs and residential customers	Large companies
in Dutch:	0800 22 500	0800 22 200
in French:	0800 33 500	0800 33 200
in German:	0800 44 500	0800 44 200
in English:	0800 55 500	0800 55 200

For repairs

	SMEs and residential customers	Large companies
in Dutch:	0800 22 500	0800 14 888
in French:	0800 33 500	0800 14 888
in German:	0800 44 500	0800 14 888
in English:	0800 55 500	0800 14 888

For more information:

- Visit us in the Internet at www.proximus.be/pabx
- Contact your Proximus dealer

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