DISCOVERY
telecom

DTT PRI/GSM Gateway™

an ISDN – GSM gateway

Connecting Office Phones Directly to Cellular Phones

Discovery Telecom Technologies

WARNINGS	1) High voltage transients, surges, and other power irregularities can cause extensive damage. It is the user's responsibility to provide a power protection system. 2) It is the user's responsibility to install, operate, and maintain the system in accordance with all applicable codes, regulations, and safety measures.

TRADEMARKS AND PATENTS	Without prior notice and without obligation, the contents of this manual may be revised to incorporate changes and improvements. Every effort has been made to ensure that the information is complete and accurate at the time of publication. Nevertheless, Discovery Telecom Technologies cannot be held responsible for errors or omissions. Trademarks, patents and copyrights apply.

Table of Contents

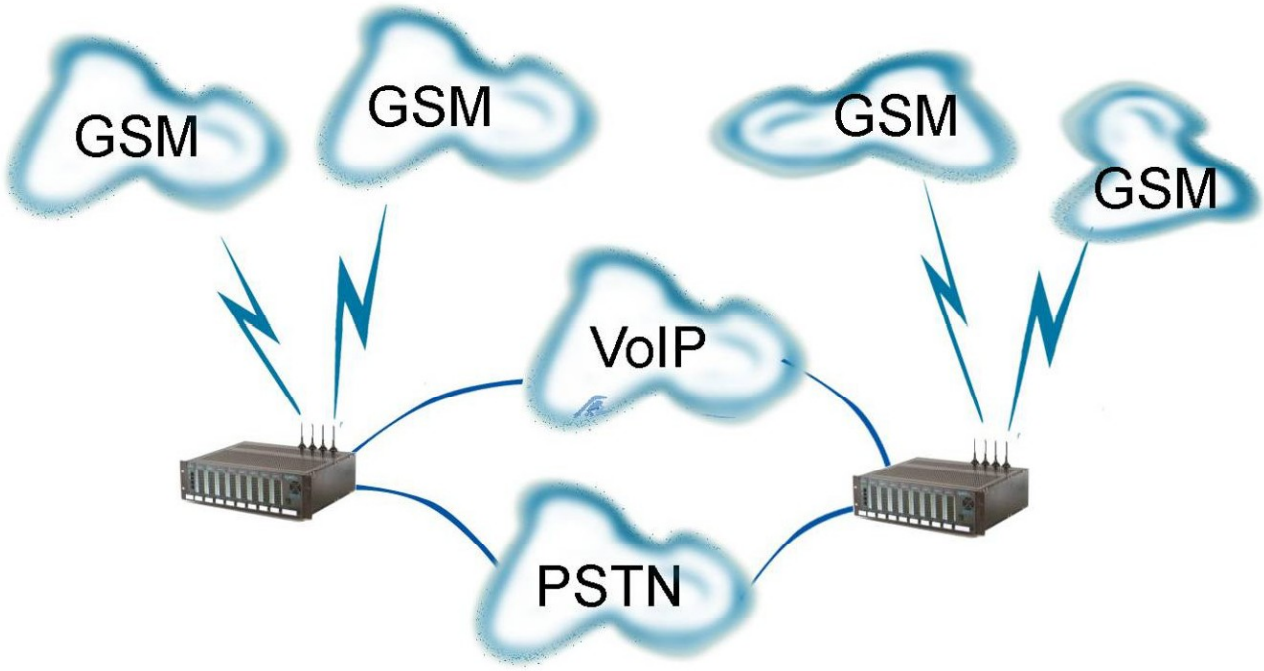
Contents of this Package

This package contains the following components:

- 1 Multi-Cell PRI gateway.
- 4 antennas.
- 1 *Multi-Cell* Manager CD.
- 1 Phone handset for testing ports manually.
- 1 Comport cable.
- 1 electric power cable.
- 1 *Multi-Cell* Installation Manual.

Introduction: What it is & How it Works

The *"Multi-Cell"* PRI gateway is a device that connects your office phones DIRECTLY to cellular phone networks. This gateway *completely bypasses* the local surface telephone company. 30 office phones can be connected to each *Multi-Cell* Gateway. Each port (phone connection) in the *"Multi-Cell"* gateway can hold four SIMs (smart cards defining the GSM network, phone number, etc.). You can configure each port so that the most economical SIM is active at any given time.

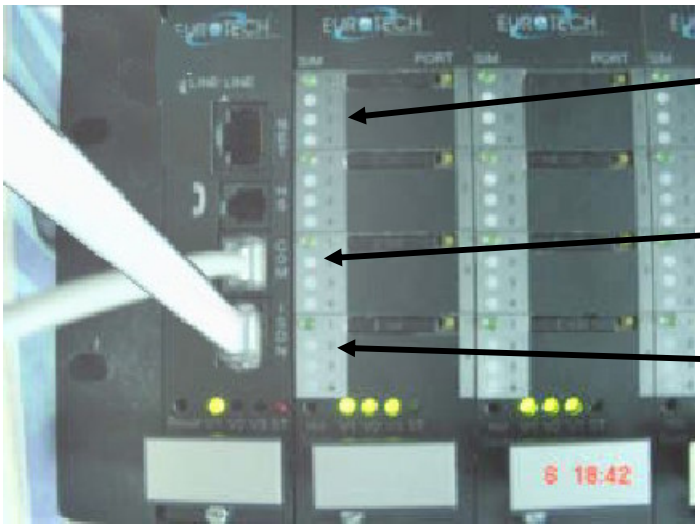


An auxiliary computer is used to make configurations when setting up the *Multi-Cell* system. If desired, after the *Multi-Cell* is configured, the computer may be disconnected. However, call operations (call reports, antenna reception, etc.) can be monitored from the computer. Therefore you may wish to leave a computer permanently connected to the *Multi-Cell*.

Chapter 1: Connecting Cables

Connect four cables: a power cable, a ground cable, an ISDN cable, and an auxiliary computer cable as described below.

1. Connect the ground wire to a suitable ground.
2. Connect a 120 V (North America), or 240 V (Europe) power supply cable to the *Multi-Cell* gateway.
3. Connect the ISDN telephone line from the telephone switching unit in your office to the Multi-Cell unit. Connect the ISDN line to the socket labeled "ISDN" in the back of the Multi-Cell unit, as shown below.



4. Connect the auxiliary computer to the Multi-Cell. The auxiliary computer can be connected to the *Multi-Cell* in either of two connections, which ever is most convenient.

   - Via a Com Port cable, from an available communication port in the computer to the Com socket in the Multi-Cell. This is the default setting. If using this type of connection:

     - Connect one end of an RS-232 cable to an available Com Port at the auxiliary computer.
     - Connect the other end of the cable to the socket labeled "Com" in the MultiCell.
     - Via a network connection, TCP/IP (at Net socket, in the back of the Multi-Cell).
       If the auxiliary computer is connected to the network, connect a network cable to the port labeled "NET" in the *Multi-Cell* unit.

After connecting cables, make settings for the *Multi-Cell* unit as described in the following chapters.

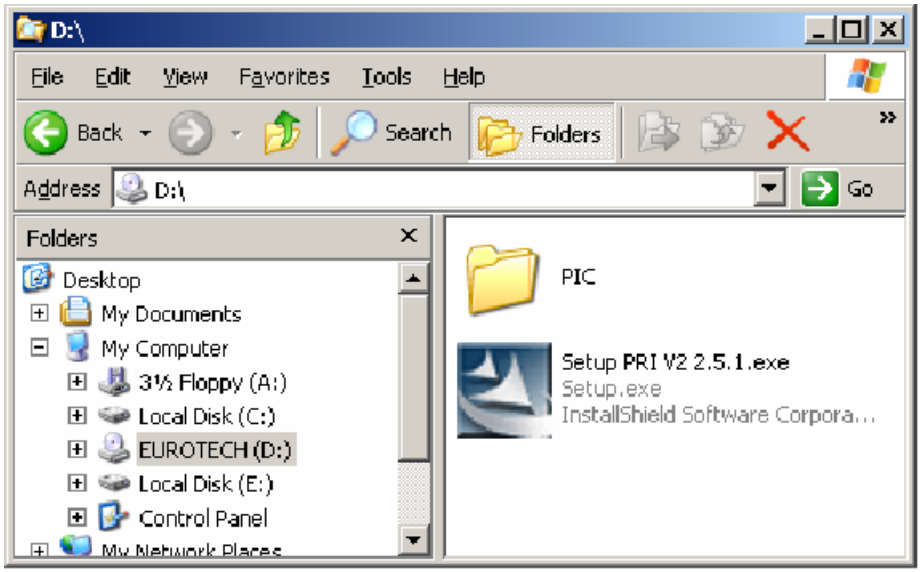
Chapter 2: Installing the Manager

Before operation, configuration settings must be made in the gateway. Configuration is done in an auxiliary computer.

Install the Multi-Cell Manager application into the Auxiliary Computer

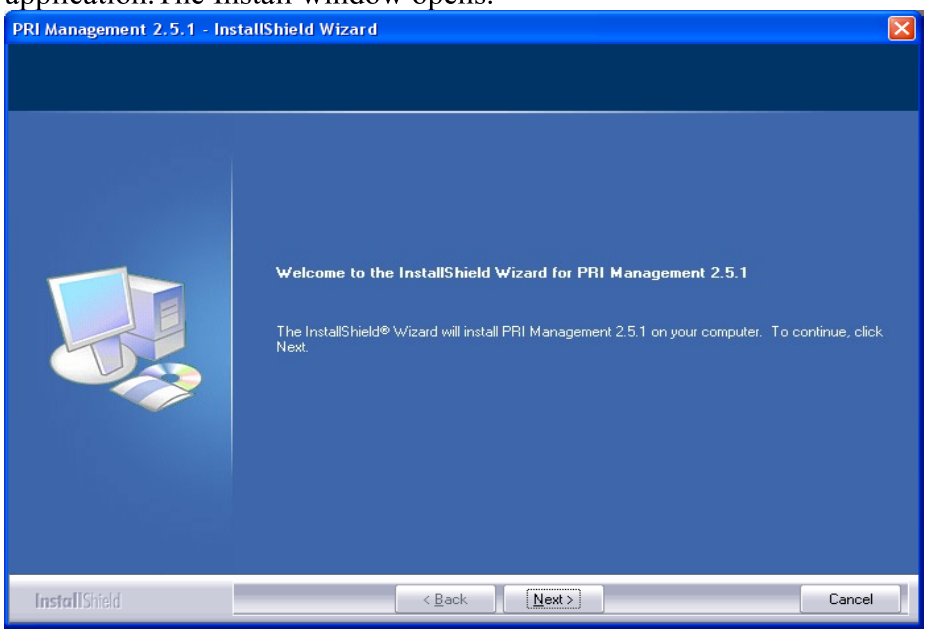
1. Insert the *Multi-Cell* compact disk into the CD drive of the configuration computer.
2. In Windows Explorer, navigate to 

in the compact disk.

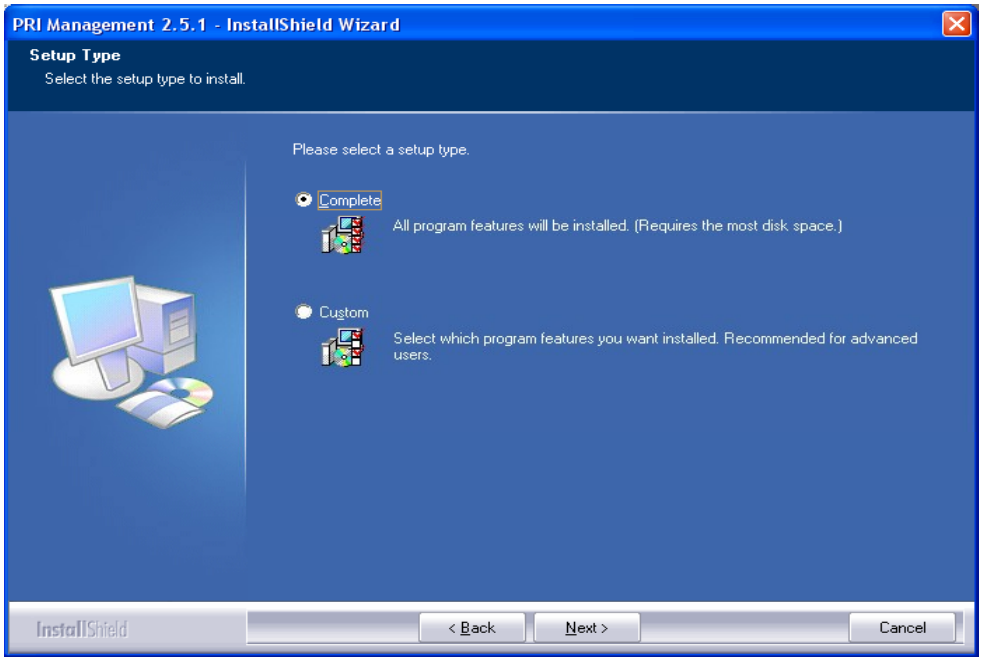


3. Double click 

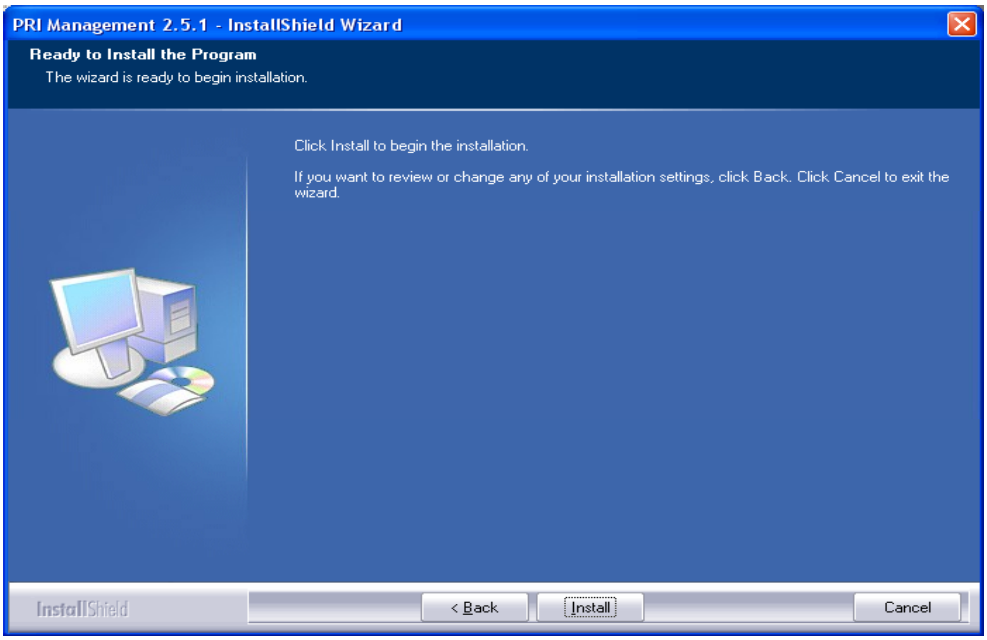
to install the *Multi-Cell* Manager application.The Install window opens.



4. Click Next.
5. The Setup Type window opens.



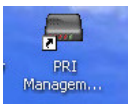
6. Select Complete and click next.
   The Begin Installation window opens.



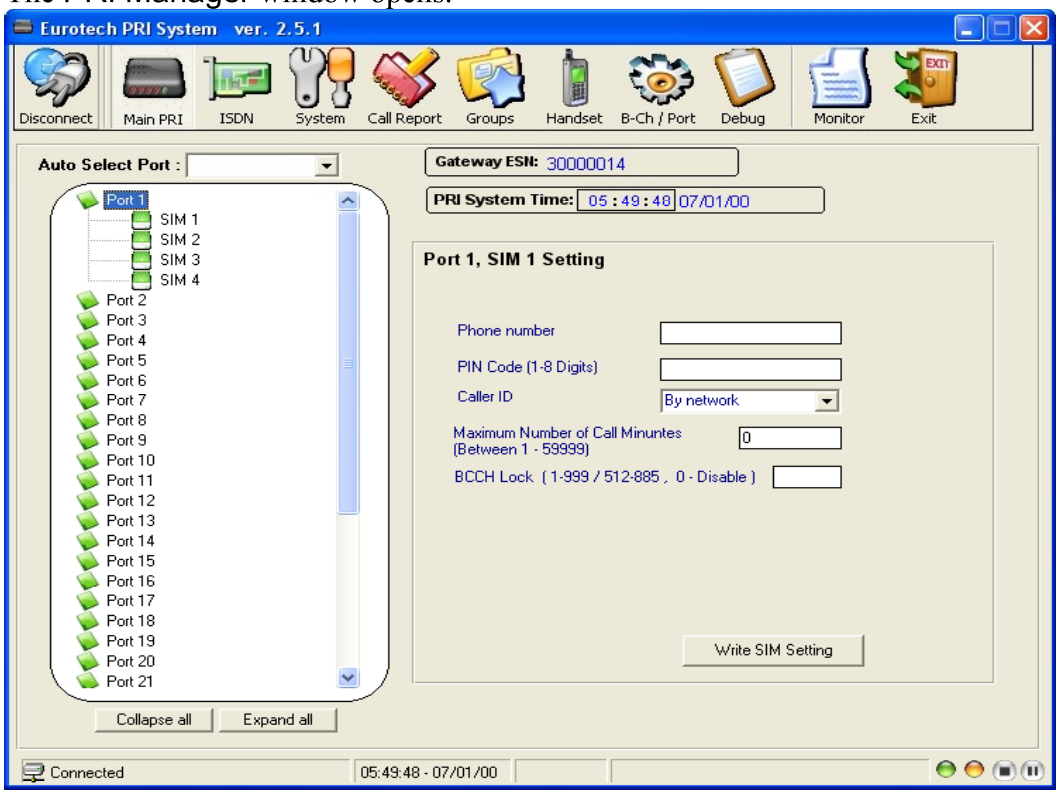
7. Click Install.
   The Multi-Cell Manager application installs itself.

Launch the Manager Application and Define the Type of Connection Between the Auxiliary Computer and the *Multi-Cell*

After installing the manager application, launch it and define the Type of Connection Between the Auxiliary Computer and the *Multi-Cel* as described below.

1. Launch the PRI Manager by pressing 

on your computer desktop, or by pressing **Start** > **Programs** > **EuroTech Communications** > **PRI Manager**. The PRI Manager window opens.



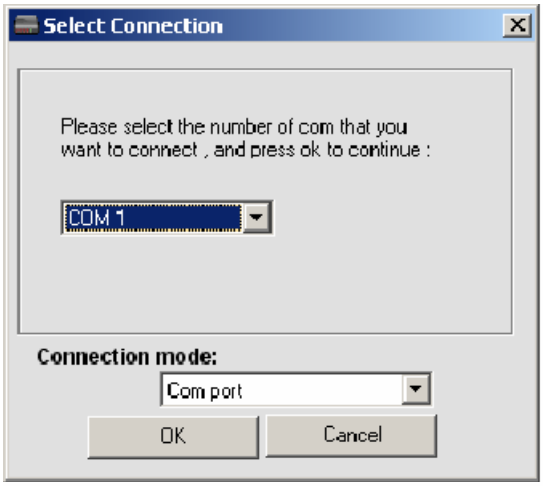
2. In the toolbar press 

.
The Select Connection window opens.

3. The configuration computer can be connected to the *Multi-Cell* in either of two connections, which ever is most convenient:

   - Via a Com Port cable, from an available communication port in the computer to the Com socket in the back of the Multi-Cell. This is the default setting.

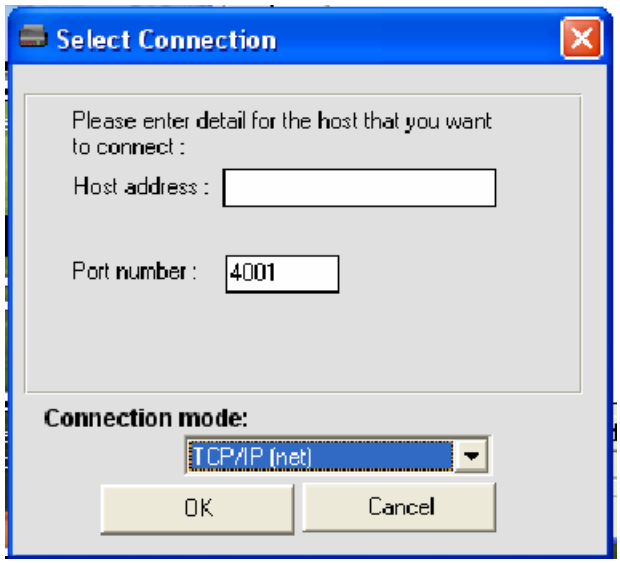
     If you are using this type of connection, select Com Port in the bottom frame of the window.



In the top frame, enter the computer Com Port that you are using.

- Via TCP/IP, connected to the Net socket, in the back of the Multi-Cell.

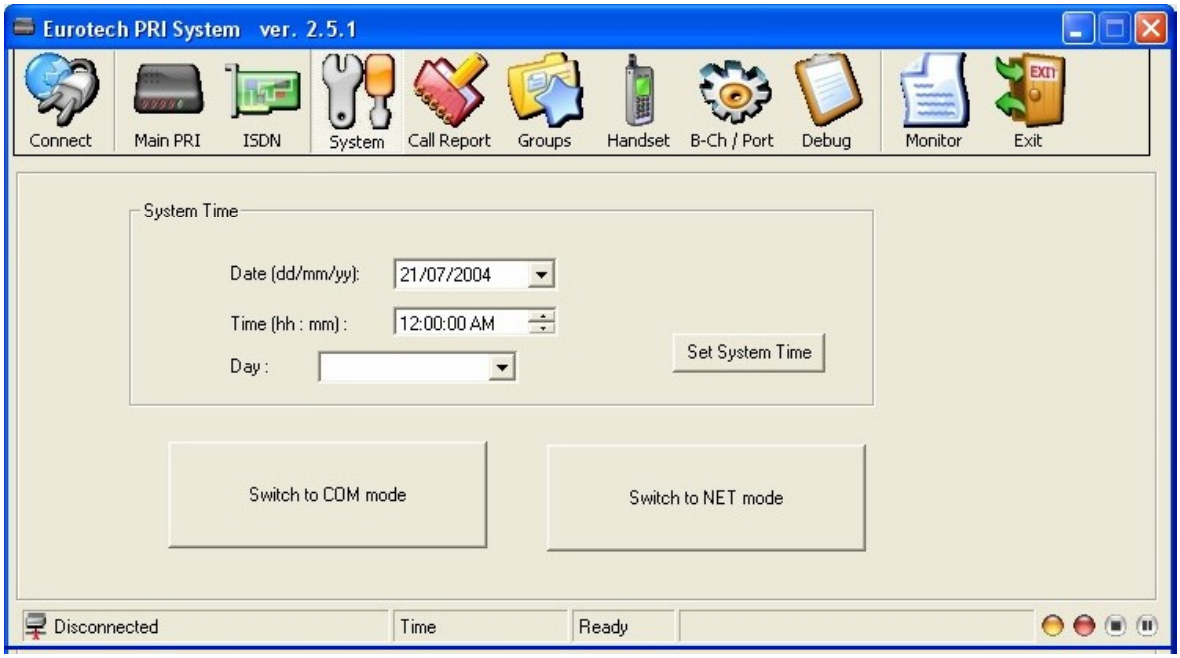
    1. If you are using this type of connection, select TCP/IP in the bottom frame of the window.

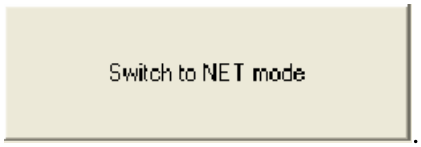


In the top frame, enter the Host address (Internet address of the Multi-Cell). Enter 4001 as the Port number.

2. Press 

. The System window opens.



3. Press  .

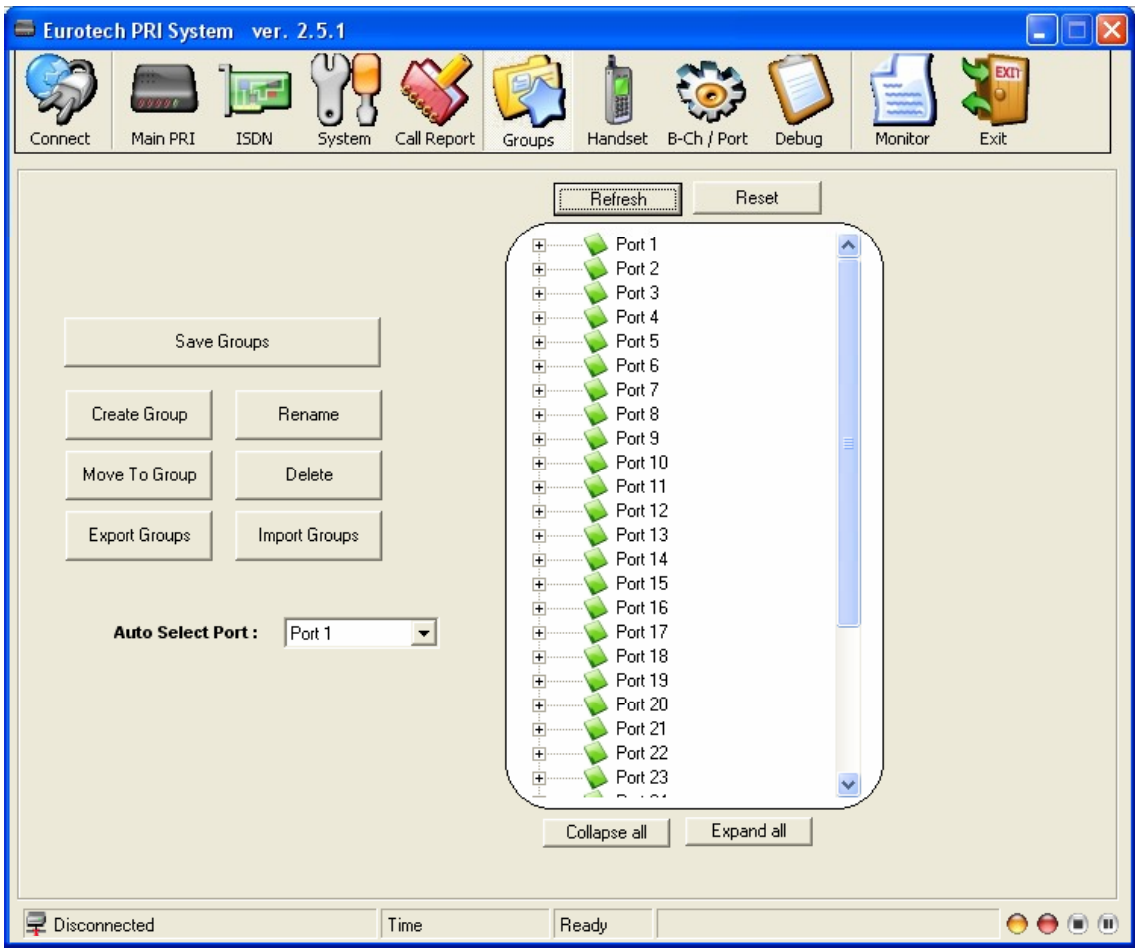
The system is set for TCP/IP communication between the auxiliary computer and the Multi-Cell unit.

Chapter 3: Defining Groups of Ports

The *Multi-Cell PRI* unit is a gateway for 30 telephones. Telephones may be divided into groups. For example, each department in your office may have different call patterns. Each port represents one telephone.

Define group settings as follows.

1. Press **Groups** on the Manager menu bar. The Groups window opens.



2. Press **Create Group**. A new group appears at the bottom of the Port list.

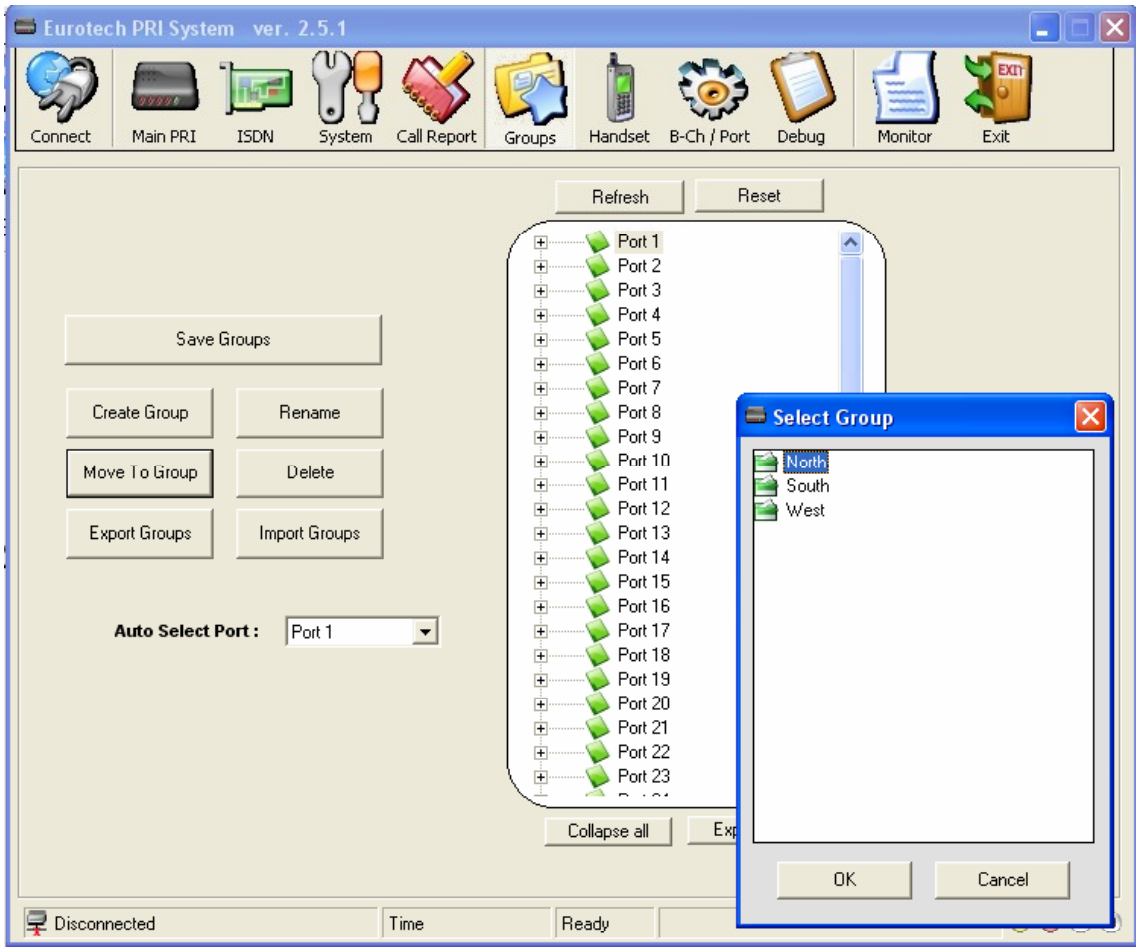
3. Type a name for the new group and click outside the selected area. A group can be renamed by selecting it and pressing **Rename**.

4. Define the ports in each group:

    a. Select a port.

    b. Press **Move to Group**. The Select Group window opens.

    c. Select the desired group of the port.



5. When finished defining groups, press **Save Groups** to send the group configuration to the *Multi-Cell* unit.

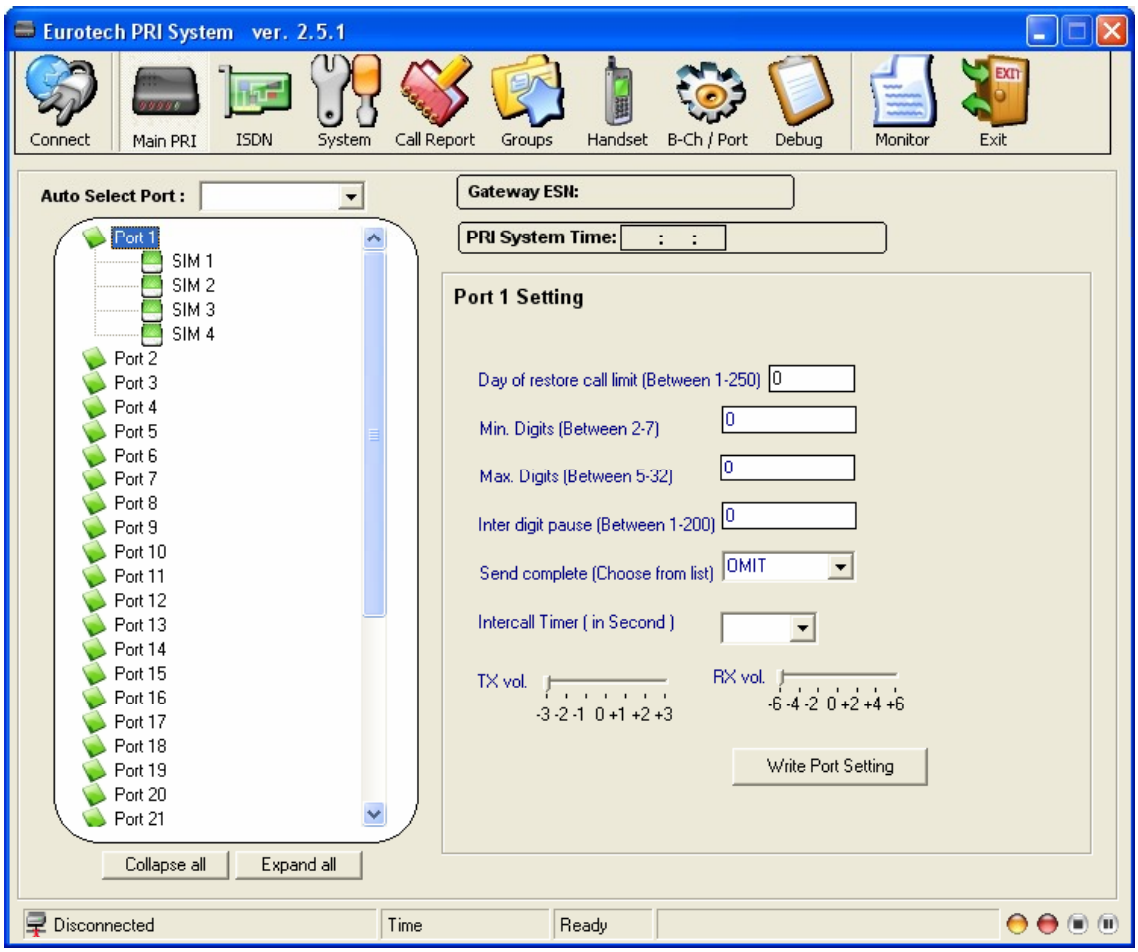
After defining groups, set time tables, make dial settings and define channel locks as described in the following chapter.

Chapter 4: Port and SIM Settings

This chapter details port dial settings, as well as time tables and channel locks for SIMs.

Define Dial Settings for Each Port

Press **Main PRI** to define dial settings for each port. The Port Setting window opens. To define port dial settings, click a port and proceed as described on the following pages.



Define Type of Dispatch: Manual or Automatic

Select the mode in which telephone numbers are dispatched to the GSM network.

- To dispatch phone numbers manually, in the Send Complete list, select HASH.

  In this mode, after the user has dialed all digits of a phone number, he or she presses 

 to send the phone number.

- To dispatch phone numbers automatically, in the Send Complete list, select OMIT. Then set three additional parameters:

  a. Define the length of phone numbers that will be dialed from the port (within a range).

     i. In the Min. Digits box, enter the number of digits of the shortest phone number that will be dialed from this port.

     ii. In the Max. Digits box, enter the number of digits of the *longest* phone number that will be dialed from this port

  b. Define the Inter Digit Pause. This parameter defines a waiting time, after a digit is pressed, before the number is automatically dispatched to the GSM network.

     If this parameter is set too low, then incomplete phone numbers may be dispatched if the user pauses briefly while dialing.

     If this parameter is set too high, then users would have to wait a long time before a number is dispatched.

     The inter digit pause is activated *after* the minimum number of digits have been dialed.

     In many situations, two or three seconds may be appropriate for this parameter.

     Each unit of this parameter is 50 milliseconds. For example, to set an inter digit pause of 3 seconds, enter a value of 60 in this box (60 * 50 milliseconds = 3,000 milliseconds = 3 seconds).

  When a port is set to auto-dispatch phone numbers, after the user has dialed the maximum number of digits, *or*, when an inter digit pause has occurred, then the number is dispatched automatically.

Define Minimum Amount of Time Between Outgoing Calls

Enter the minimum amount of time between outgoing calls in the Intercall Timer box. Set this parameter according to limitations of the GSM network. In many situations, two seconds may be an appropriate value for this parameter.

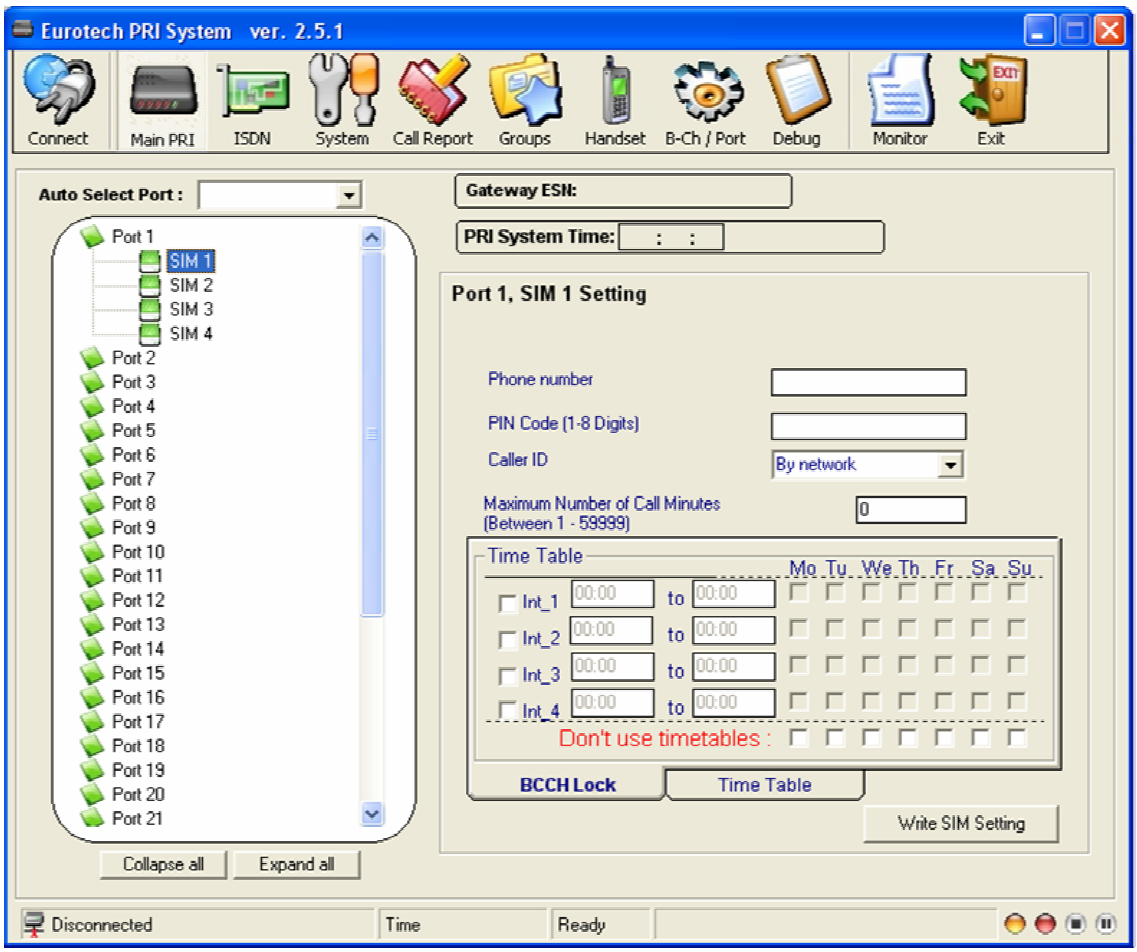
Define a Period Where SIM Time Limitations Will be Restored

In the Day of restore call limit box, enter the number of days desired to define a period where SIM time limitations will be restored. SIM time limitations are defined in the Maximum Number of Call Minutes box, in the Port Settings window.

After making port settings, press **Write Port Setting** to send the settings to the *Multi-Cell* unit. Then make settings for each SIM, as explained in the following section.

Define Settings of Each SIM

To define settings for a SIM, click a SIM icon. The SIM Setting window opens.



Define SIM Specifications

Enter SIM specifications:

1. Enter the SIM phone number in the Phone number box.
2. Enter the PIN code of the SIM in the PIN CODE box.
3. Select a caller identification option in the Caller ID list:
    - To enable the GSM network to set caller ID standards, select Network.

- To enable identification of the SIM, select CLIR Suppression.
- To disable identification of the SIM, select CLIR Invocation.

4. If desired, set an air-time limit at Maximum Number of Call Minutes.

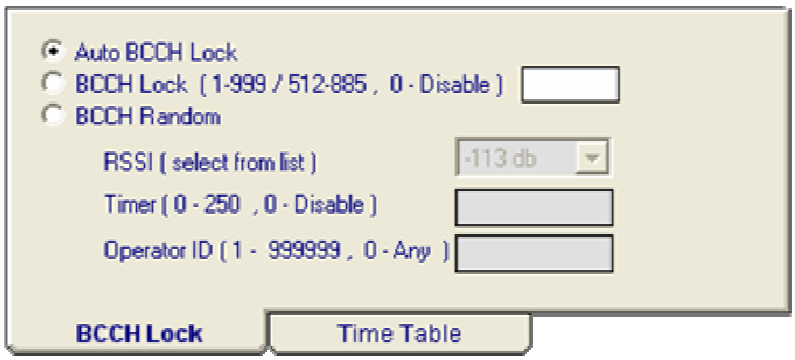
Set Hours and Days that SIM is Active

In the Time Table tab, define hours, and days, that the SIM is active. Days can be divided in up to four intervals.

1. Select an interval.
2. Enter the hours of the interval.
3. Select days that this interval will be activated. Select days of deactivation in the row Don't use timetables.

Define type of Channel Lock

To define the type of channel lock, click the BCCH Lock tab.



Define a channel lock:

- To lock the SIM to the channel with the strongest signal, Select Auto BCCH Lock. This is *not* recommended. If many SIMs are at this setting, the strongest channel may become overloaded.
- To permanently assign the SIM to a channel, select BCCH Lock, and enter a channel number between 1–124, or 512–885 (inclusive).
- To rotate the channel, select BCCH Random, and set the following parameters:
  - Select the minimum reception for a channel lock in the RSSI box.
  - At Timer, select a time limit that the SIM is locked to a channel. Select between 1–250 minutes.
  - To enable the GSM network to control channel locks, enter the identification number of the GSM network at Operator ID.

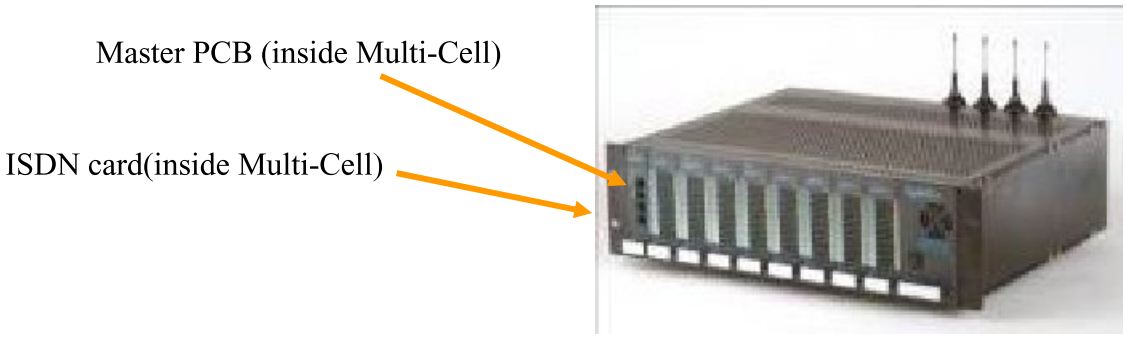
After SIM settings are completed, press **Write SIM Settings** to send the settings to the *Multi-Cell* gateway.

Chapter 5: ISDN Settings

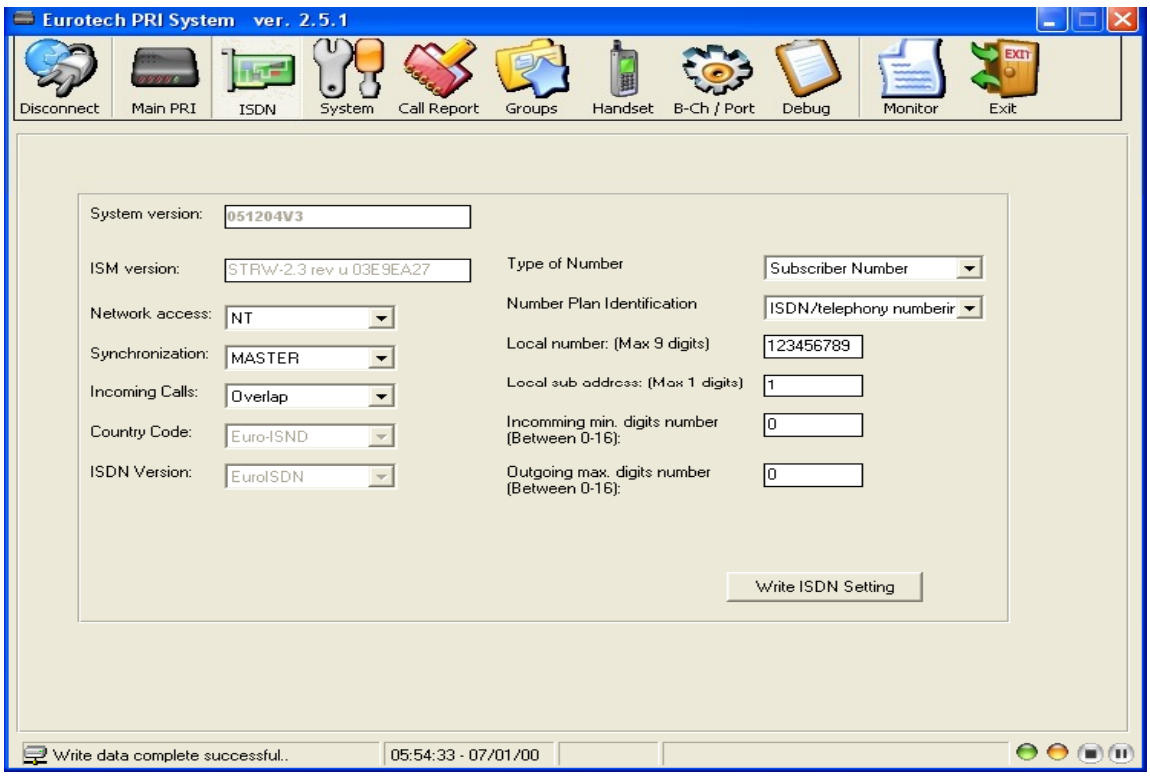
This chapter details ISDN settings.

Overview of the ISDN Card

Each *Multi-Cell* gateway has a master printed circuit board. The ISDN card is a small PCB mounted on the master PCB. The ISDN card is between ports in the *Multi-Cell* and the switching unit.



To define ISDN settings, press **ISDN**. The ISDN window opens. This window defines settings in the E1 line, between the switching unit and the ISDN card. Enter specifications as described on the following page. Ensure that settings are in conformity with settings in the switching box.



1. The control PCB has an EEPROM containing master card software. Enter the version of the master card software in System Version.

2. The ISDN module is a small PCB connected to the master PCB. The ISDN module has an EEPROM containing ISM software. Enter the ISM version in the ISM version box.

3. Set Network access as NT, (set the switching unit as TE).

4. Define the Master/Slave status in the Synchronization box. It is preferable to define the *Multi-Cell* unit as the Master, and the switching unit as the slave.

5. In the Incoming Calls box, select the interface of incoming calls (from the switching unit to the ISDN card), "Overlap" (pulse) or "In Block" (packet) in conformity with the setting in the switching unit.

    - If "Overlap" is selected, then proceed to step 6. (Do not place entries in the last two parameters.)
    - If "In Block" is selected, then place entries in the ring signal parameters:
        - Incoming Min. Digits Number
          This parameter determines when a ring signal will be initiated in calls coming *from* switching box, *to* the ISDN card. Enter the minimum number of digits of incoming phone numbers in this box (for example 050 787-444 = 10 digits).
        - Outgoing Max. Digits Number
          This parameter determines when a ring signal will be initiated in calls coming *from* the ISDN card, *to* the switching box. Enter the minimum number of digits of incoming phone numbers in this box (for example 6001 = 4 digits).

6. In the Type of Number box, select the type of number (TON) of calls (from the ISDN card to the switching unit), as defined in the switching unit.

7. The protocol of numbers (from the ISDN card to the switching unit) is set at Number Plan Identification (NPI). Set this parameter as defined in the switching unit.

8. Each Multi-Cell has a part number. Enter the part number of your *Multi-Cell* in the Local number box.

9. If you have more than one Multi-Cell on site, enter the sub address of each Multi-Cell unit in the Local sub address box.

10. Press **Write ISDN Setting** to send the ISDN settings to the *Multi-Cell* unit.

Chapter 6: B-Channel – Port Association

This chapter explains the assigning of B-channels to in-house phones and the allocation of calls to *Multi-Cell* ports.

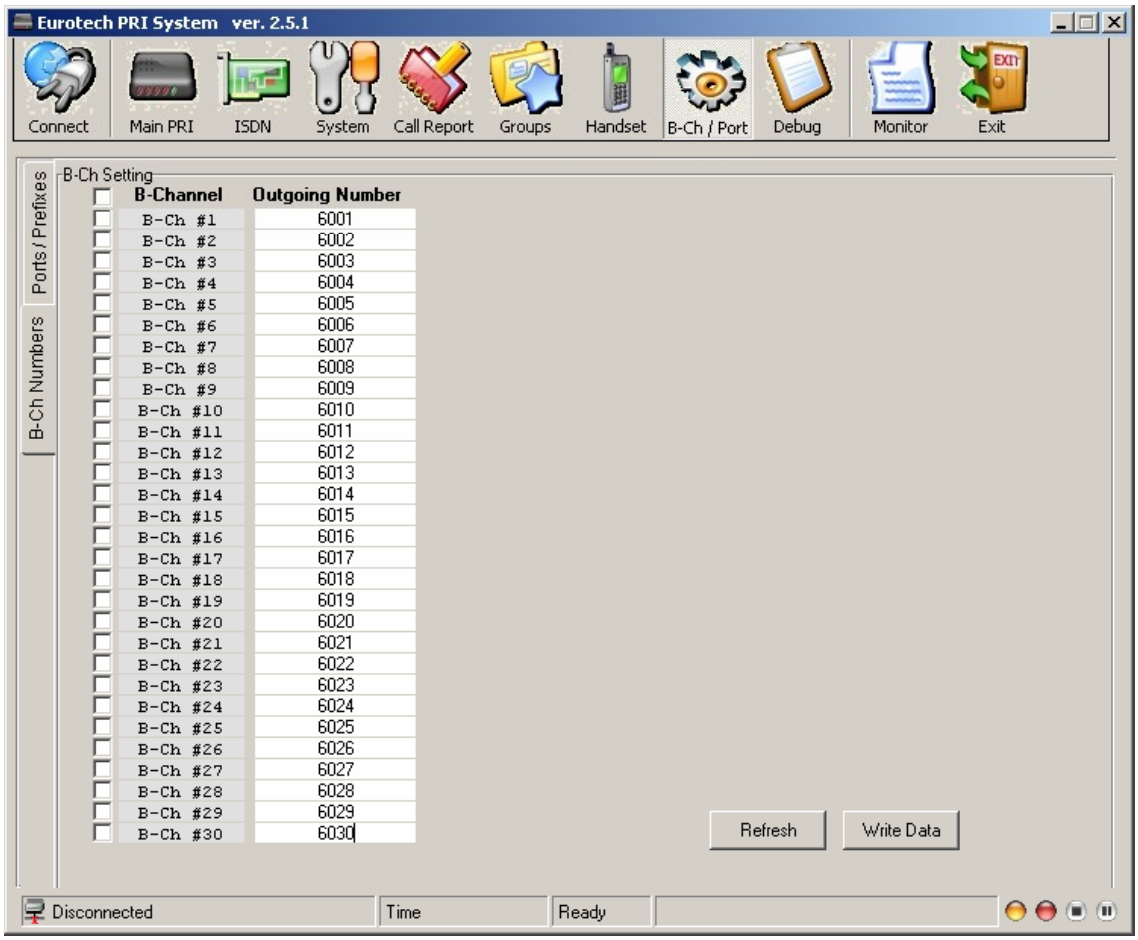
Assigning B-channels to In-house Numbers

Assigned B-channels to ports in the switching unit as follows:

1. Press 

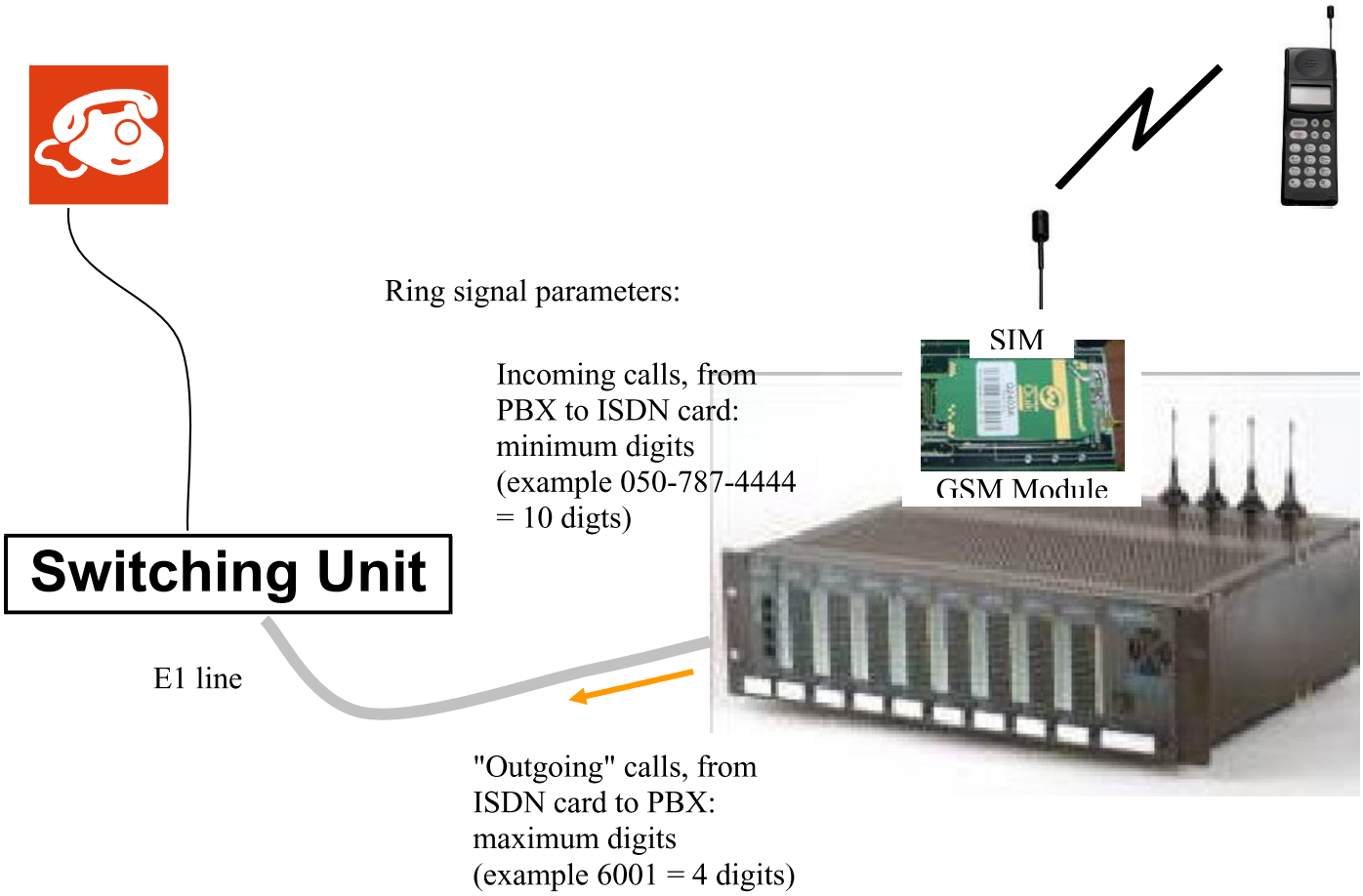
to open the B-Channel/Port window.

2. Press the **B-Ch Numbers** tab.



3. Mark **B-Ch setting**, in order to activate all B-channels. Unmark a B-channels to deactivate it.

The **Outgoing Number** column refers to calls from the *Multi-Cell*, *to* a phone extending from the switching unit, as illustrated on below.



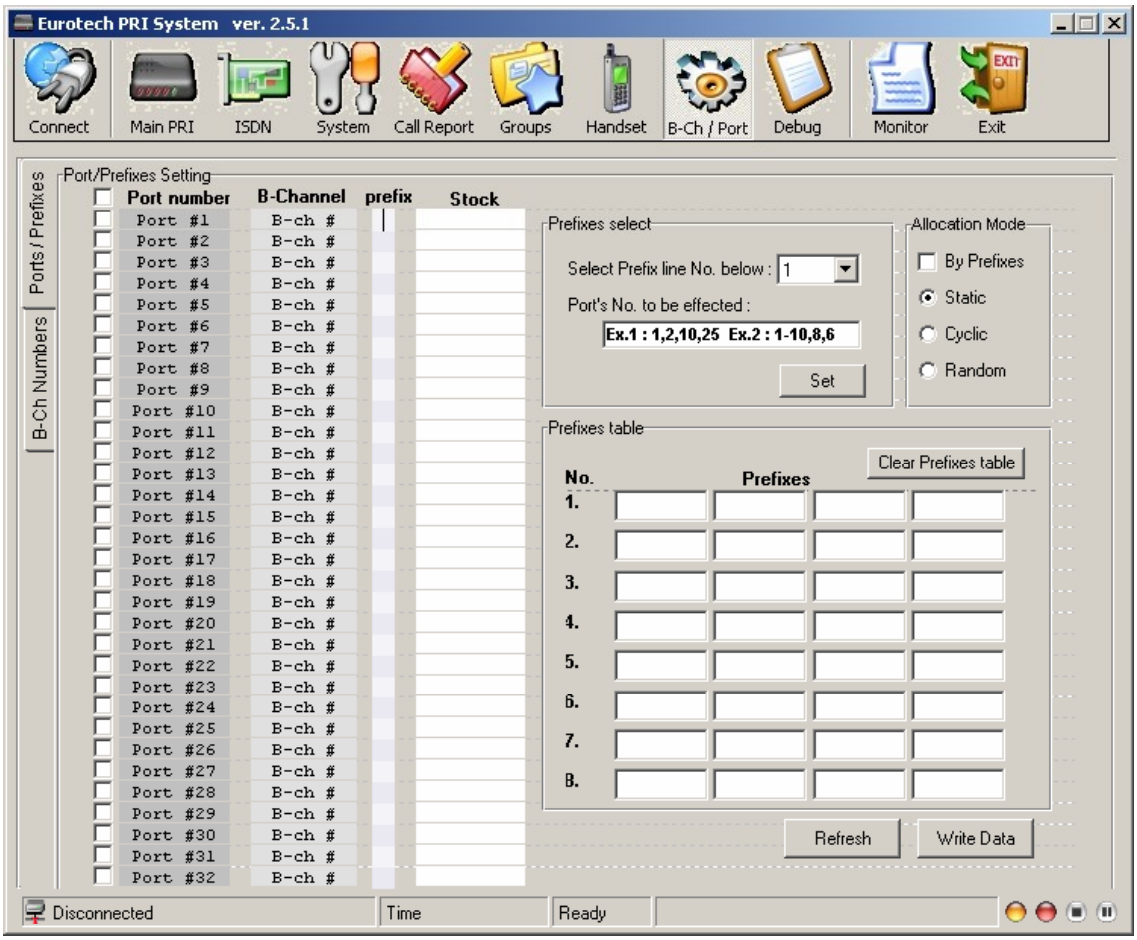
4. In the **Outgoing Number** column, for each B-channel, enter a number for a phone extending from the switching unit.

5. Press **Write Data** to send the B-channel settings to the Multi-Cell.

Assigning Ports and Defining Prefixes

This section explains how to assign a port allocation mode for the *Multi-Cell*. A port allocation mode determines the manner in which a port is selected when placing a call *from* a phone extending from the switching unit, *to* a GSM network phone.

1. In the B-Channel/Port window press the **Ports/Prefixes** tab. The default alignment of B-channels to ports is displayed. B-channels can be reassigned to different ports by dragging them. Use the **Stock** column as a buffer when reassigning ports.



2. Mark **Port number** to activate all ports. Deactivate individual ports by unmarking them.

3. In the Allocation frame, select the type of Allocation Mode desired.
    - Static allocation: Each B-channels is permanently assigned to a port (GSM module), as they are aligned in this tab.
    - Cyclic allocation: As each phone call is made, the next available port (GSM module) is assigned to the B-channel.
    - Random allocation: Any available port (GSM module) is assigned to the B-channel.
    - Allocation By Prefixes: The B-channel of the source call is assigned to a port (GSM module) by the prefix of the out-going telephone number.

      Up to eight groups of prefixes can be allocated. For example, eight different GSM networks, each with four prefixes, could be used.

        i. Enter prefixes, in their desired groups, in the Prefix Table.

        ii. In the Prefix Group column, assign each port a group of prefixes (groups 1 – 8).

4. After assigning ports, press **Write Data** to send the port settings to the *Multi-Cell* unit.

Chapter 7: Monitoring Calls and Reports

This chapter explains how to monitor calls and review reports.

Monitoring Calls

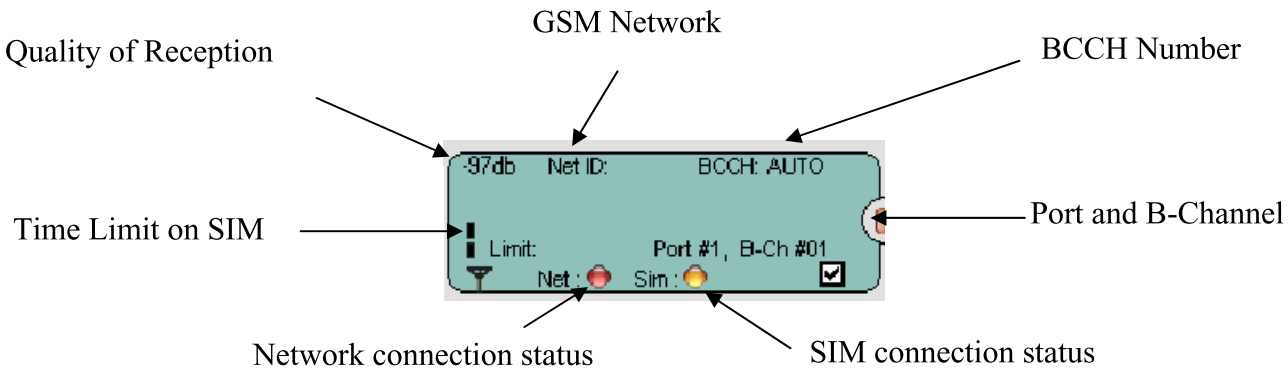
To monitor calls press 

. The monitor screen opens.

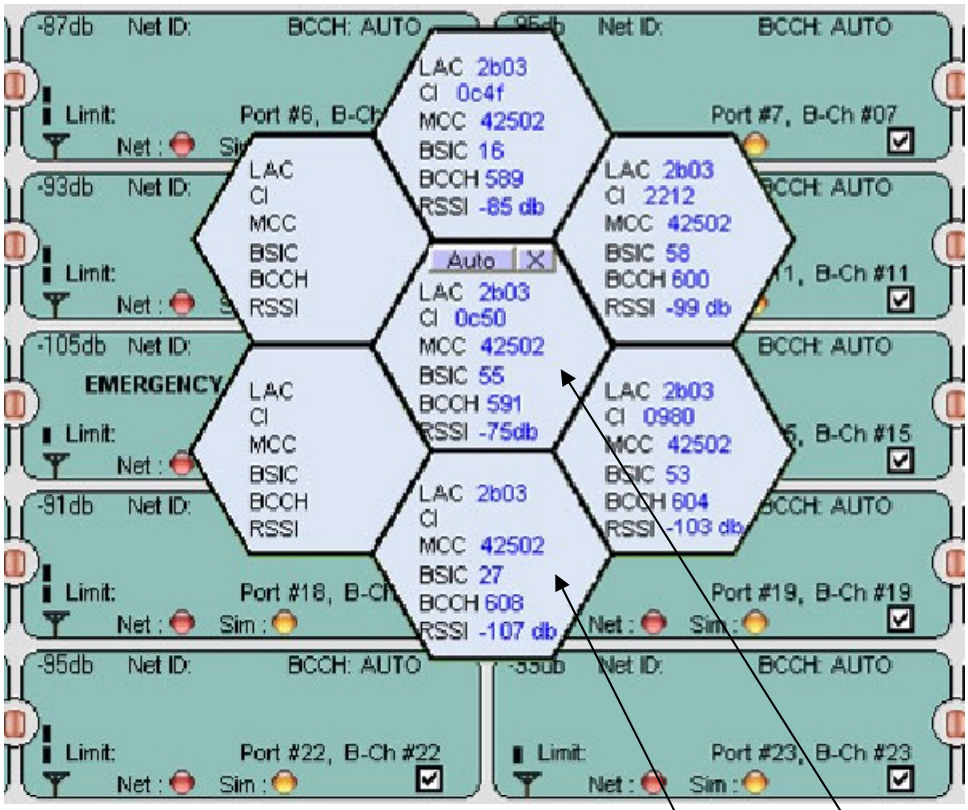
Press  to hide or view B-channel status, as well as the status of the following connections:

- Comport.
- Network.
- ISDN.

A red LED indicates there is no connection. A yellow LED indicates there is a connection, but no data transfer. A green LED indicates transfer of data.



Click inside a port block to view the antenna reception quality of surrounding antennas.



Legend:

- LAC Location Area Code.
- CI Cell ID
- MCC Mobile Country Code
- BSIC Basic Station Identity Code
- BCCH Broadcast Control Channel
- RSSI Receiver Signal Strength

Base Station

Surrounding Base Station

Call Reports

Press 

to review the call report.

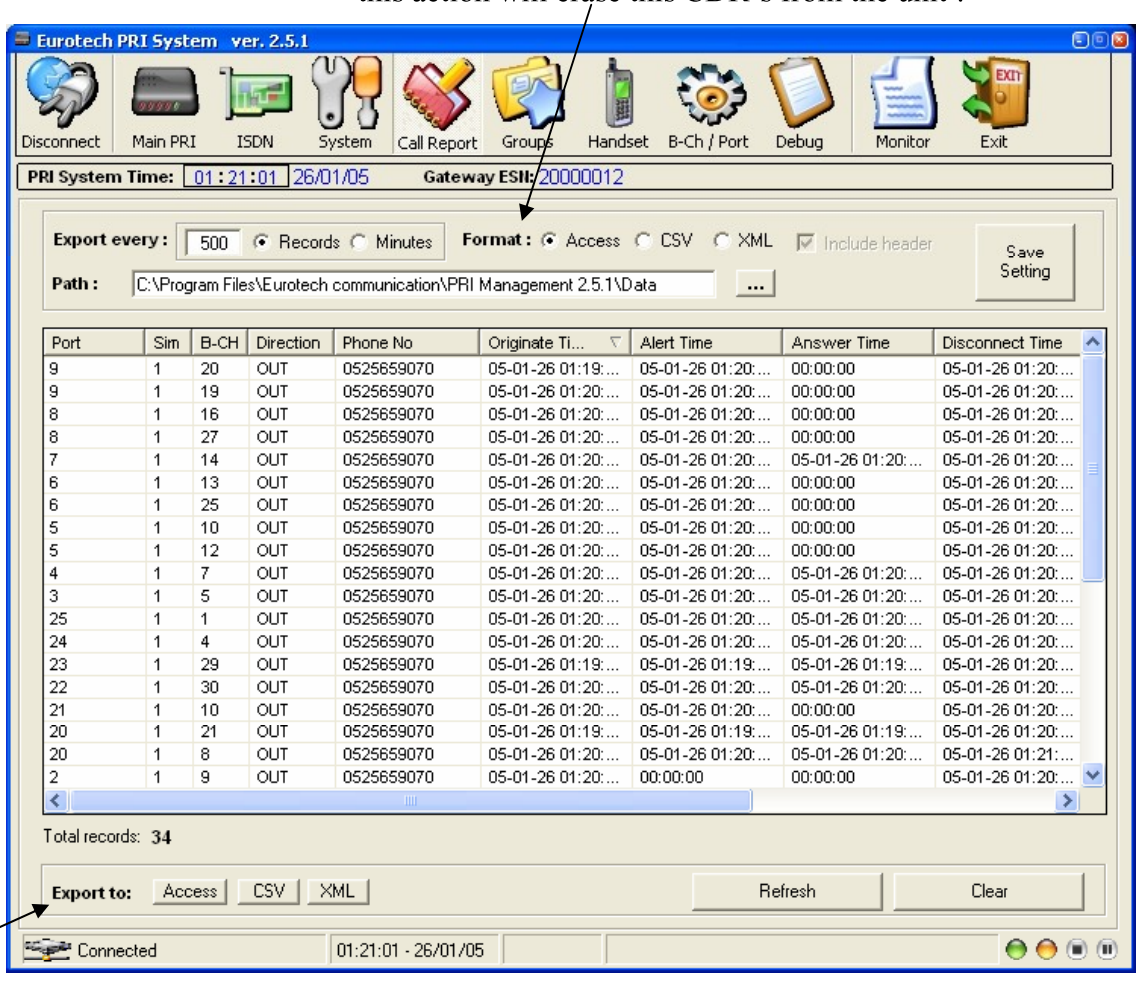
This screen defines the parameters for a successful or unsuccessful call.

The system may store 30,000 calls with full reports for 30 channels without PC !

The system may transfer this reports to Access, CSV(Excel) or XML format.

The export of call records may be based on # of records, calls or # of minutes operating.
A file of CDR's will be exported to the PC in the format defined in this screen.

Automatic CDR screen file to be moved to the PC,
this action will erase this CDR's from the unit !



Manual command to Export file of CDR to PC in the following format , Access, CSV (Excell) or XML. This action will not erase the current CDRs from the unit.

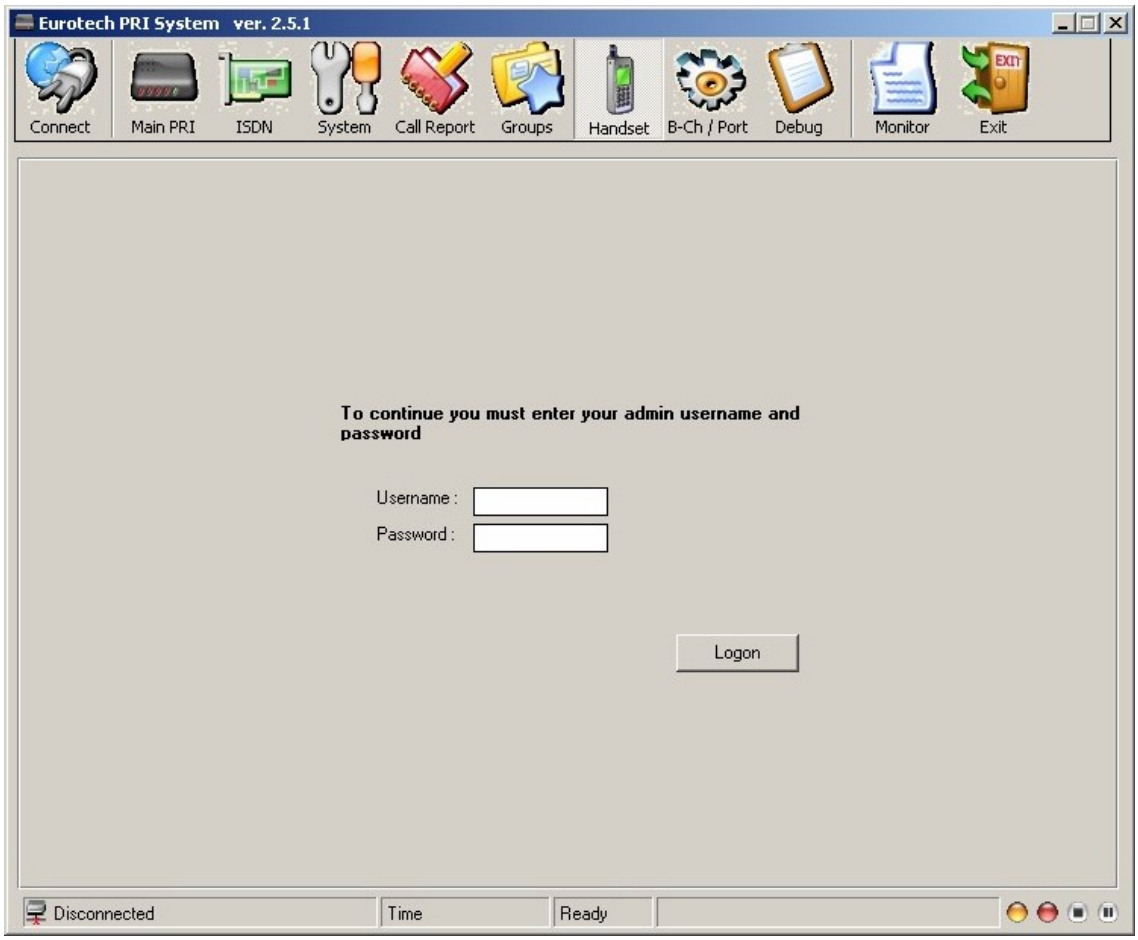
Chapter 8: Troubleshooting

Two tools may be used to improve connections; a handset, and the Debug screen.

The Handset

1. To use a handset, press 

. The Handset window opens.

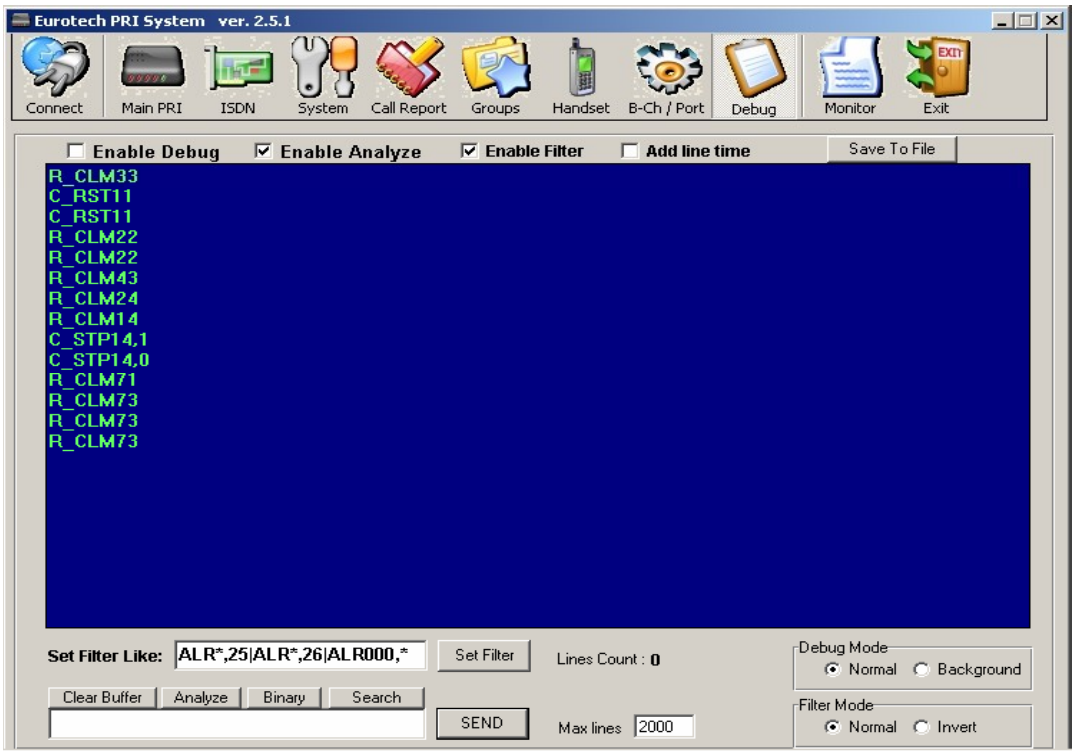


2. In the Username box, enter "admin."
3. In the Password box, enter "admin."
4. Press **Logon**.
5. Check connections with the handset.

The Debug Screen

1. To open the Debug screen, press 

. The Debug window opens.



2. Use this only when in contact with a support technician.

Appendix: RJ-45 Connector

Wiring of the RJ-45 connector is explained in this appendix.

Contacts are as follows:

Switching unit TE connector		*Multi-Cell* NT connector	
1	-RX	1	-TX
2	+RX	2	+TX
3	Not Used	3	Not Used
4	-RX	4	-RX
5	+RX	5	+RX
6	Not used	6	Not used
7	Not used	7	Not used
8	Not used	8	Not used