nt1 plus

Enhanced ISDN Network Termination
With Dual Analog Interface

(sw revision 6.1x)

installation and user's manual
rev. 0.2
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1 OPERATING PRINCIPLES

1.1 Power Supply

The NT1Plus has no batteries and is powered through an internal mains power supply or from the power supplied by the network over the telephone line.
Power consumption from the network is limited to 1.6 W in the worst case (one POTS interface powered under emergency conditions).

1.1.1 Normal Conditions

When a.c. power is supplied, the NT1Plus provides loop current to both POTS interfaces and normal power supply (PS1) to other terminals connected to the S bus.

1.1.2 Emergency Conditions

The ISDN exchange provides power to the NT1Plus through the local loop. This power can be used to provide power either to one POTS interface or to a “designated” terminal on the S bus.
When the NT1Plus is configured to provide emergency power to the POTS interfaces, the use of either POTS interface excludes the other one. During incoming calls, ringing voltage is provided to both POTS interfaces.
When emergency power is provided to the POTS interfaces, a maximum of 25 mW of dc power is guaranteed to terminals that require dc voltage to detect connection to the S0 bus (Detect Connect).

1.2 Supplementary Services

The NT1Plus supports a number of supplementary services.
Some of them do not require any user procedures:

- Multiple Subscriber Number
- Calling Line ID presentation (CLIP) and Connected Line ID presentation (COLP)

The NT1Plus also provides for the necessary mapping between procedures based on ETSI Generic Functional Protocol (ETS 300 196-1[i]) and user procedures, that can be activated using a DTMF phone with register recall (RR) or hook flash (HF) keys.
The NT1Plus also supports the Keypad Protocol (ETS 300 122). To access such services, key sequence starting with ***** or # must be entered immediately after going off-hook.
The following supplementary services are supported using the relevant ETSI standards:

– Call Waiting (CW)
– Call Hold (CH)
– 3-Pty Conference (3-PTY)
– Advice of Charge (AOC-D)
– Explicit Call Transfer (ECT)
– Restriction of Calling Line Identification (CLIR)
– Malicious Call Identification (MCID)

The following services are supported using the keypad protocols:

- Call Forwarding Unconditional (CFU), Call Forwarding No Reply (CFNR) and Call Forwarding Busy (CFB)

Voice messages ARE provided to alert users about possible results returned from the exchange.

!	These services may not be available on a general basis and may require a specific agreement with your ISDN service provider.

1.2.1 Multiple Subscriber Numbers (MSN)

If the MSN supplementary service has been subscribed, either POTS interface can be allocated one, two or three telephone numbers.
If numbers are properly allocated, the NT1Plus is able to route incoming calls to a specific extension, based on the called party number information contained in the SETUP message that indicates the incoming calls.
If an extension has no associated phone number, it will be offered incoming calls independently of the called party number included in the incoming SETUP.

Configuration procedures to enter MSN numbers are detailed in § 0

1.2.2 Calling Line Identification Presentation (CLIP)

For outgoing calls, the SETUP message contains the first number associated with the extension that originated the call. This number can be presented to the called party.

1.2.3 Connected Line Identification Presentation (COLP)

For incoming calls, the CONNECT message contains the first number associated with the extension that originated the call. This number can be presented to the calling party.

1.2.4 Call Waiting (CW)

The NT1Plus can inform the user of a "waiting call" through an audible signal. Such information is provided in two different situations:

- a call is offered by the network and both channels of the access are busy (***type I*** CW)
- a call is offered by the network, one channel is available but the extension is busy (***type II*** CW)

Different tones are used to alert the user of which type of call wating is occurring.
The call waiting function can be deactivated as it may be incompatible with terminals connected to the extension (audible signals may interfere with operation of modem or fax operation).

1.2.5 Call Hold and Retrieve (CH)

The NT1Plus allows the user to place an active call on hold and to retrieve it later. This service is on the basis of several other services available. See also § 0.

1.2.6 3-Party Conference (3-Pty)

This service allows a user with an active call and a call on hold to join both calls into a conference call.

1.2.7 Advice of Charge (AOC)

This service can be used to operate the internal metering pulse generator.

1.2.8 Explicit Call Transfer (ECT)

The explicit call transfer allows a user with an active call to user B and a call on hold to user C to join user B and user C into a single call. See § 0 for user procedures.

1.2.9 Restriction of caller's ID (CLIR)

The NT1Plus allows the user to invoke the Calling Line ID Restriction service on a call-per-call basis. When the user activates this feature (see § 0), then the NT1Plus will include in the subsequent outgoing call a request to the network to restrict the caller's ID.

1.2.10 Malicious caller ID (MCID)

The NT1Plus allows the user to invoke the Malicious Caller ID service during an incoming call, even after the caller's disconnection. When requested to do so, the network will register the identity of the disturbing user.

2 CONFIGURATION

2.1 Configuration Parameters

The NT1Plus has a number of user programmable configuration parameters, contained in a non volatile memory. Such parameters usually need not be altered after installation, although a limited set of parameters can be modified at any time without disrupting service.

The following parameters are specified for each extension:

- assignment of network numbers
- terminal deactivation or type of device connected
- activation of call waiting
- generation of metering impulses
- delayed clear back
- level setting

Each parameter is briefly described in the following paragraphs.

2.1.1 Multiple subscriber numbers

The ISDN allows multiple number to be assigned to the same access. The NT1Plus uses this service to associate one or more numbers to either extension. When such feature is programmed, an incoming call can be selectively routed to either extension based on the number dialled by the caller (see also § 0).
Up to three network numbers composed of a maximum of 25 digits can be programmed for each extension.
If an extension has no number associated, then it will be offered every (compatible) call.

2.1.2 Extension configuration

The following paragraphs describe configuration parameters relevant to each extension.

2.1.2.1 Deactivation

When required, (e.g. if no terminal is connected) an extension can be "deactivated". The NT1Plus will not offer incoming calls to a deactivated extension, so that the network and possibly the calling user will be informed that no phone is ringing. Nevertheless, it is possible to start a call from a deactivated extension.
Configuration procedures are described in § 0.

2.1.2.2 Type of terminal

Each extension can be set according to the type of analog terminals connected[1]. The following settings are possible:

- Speech/audio: if different types of terminals (e.g.: a phone and a modem) are connected to the extension
- Telephone: if only telephones are connected to the extension
- Fax: if only a fax machine is connected to the extension.

2.1.2.3 Metering pulses

The NT1Plus can use information provided by the exchange for the generation of metering pulses. This feature can be disabled if it interferes with the operation of terminals connected to the extension.
If the network provides AOC information based on local currency (i.e. the real amount of the charge incurred) the NT1Plus needs to translate this information into a number of "charging pulses" and uses a parameter that stores the amount of currency equivalent to a "charging unit".
If the network provides AOC information already based on charging units the NT1Plus directly transforms this information in charging pulses.

2.1.2.4 Delayed Clear-back

When delayed clear back is enabled and a called user goes on-hook, the NT1Plus "holds" the call for a certain amount of time, so that the user is allowed to move the phone to another socket or to resume the call from another phone.

2.1.2.5 Audio level selection

The NT1Plus provides for two sets of audio levels for each extension, one set being optimized for speech and the other for data modems.

3 SYSTEM DESCRIPTION

3.1 Composition

The NT1Plus is housed in a plastic container intended for wall-mounting.

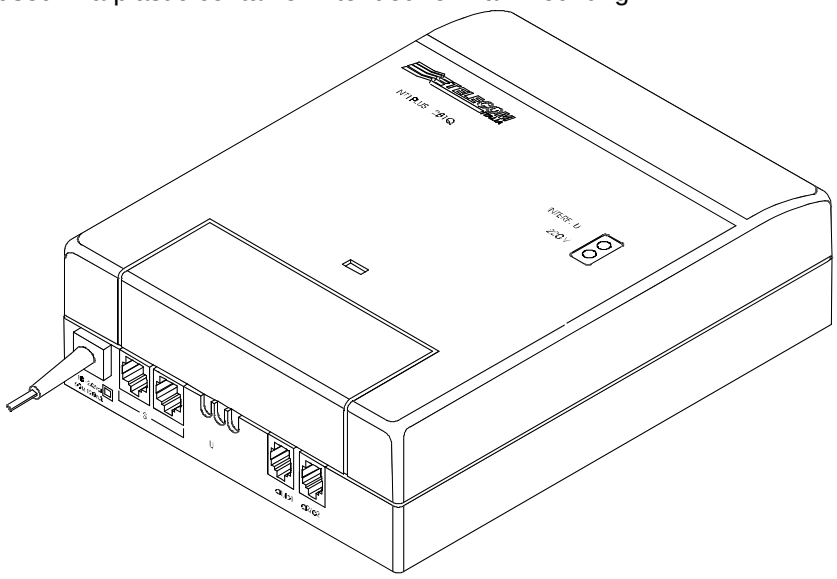


Figure 1

The bottom part of the unit is provided with:

– a cable for connection to the a.c. supply
– two paralleled RJ-45 modular plugs, for connection to ISDN terminals on the S bus
– two RJ-11 modular plugs, for connection to analog terminals

A cage clamp terminal block in parallel to RJ-11 plugs allows direct cabling of the extensions.
Another cage clamp block can be used for direct cabling of the S bus.
Three slots are also available for connecting cables to the user telephones and to telephone line.

3.2 User accessible compartment

A compartment with connection blocks and swtches can be accessed by removing the lid with a tool.

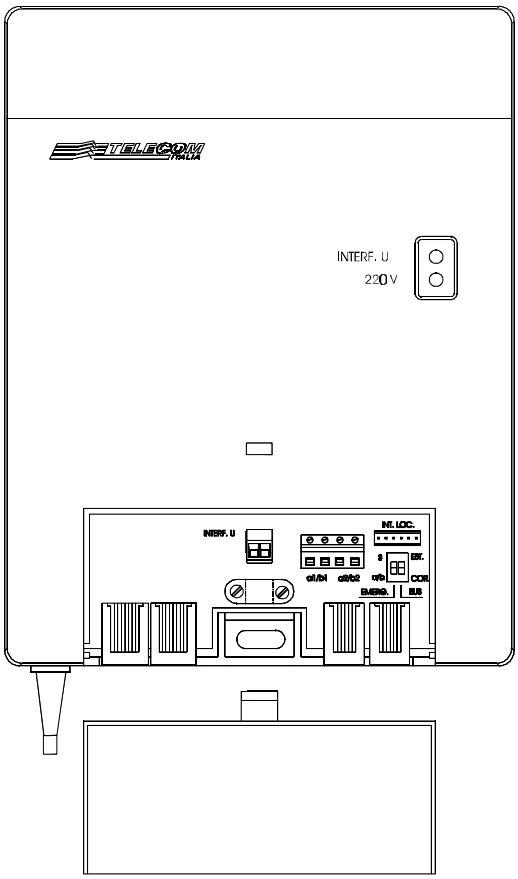


Figure 2

The compartment contains the switches indicated in § 0 and:

- a 4-pole cage clammp terminal block for the two extensions;
- a 4-pole cage clamp terminal block for the S bus
- a 2-pole removable screw terminal block for the telephone line

3.3 LEDS

Two LEDS are located on the front of the device and indicate the power supply state of the NT1Plus:

– a green LED ("230 V") indicates that the device is supplied with a.c. power.
– a red LED ("U INTERF.") indicates that the device is connected to the telephone line and a correct voltage is received.

3.4 Switch settings

The front panel has a removable cover to access three hardware switches:

- S bus configuration (short passive / extended)
- emergency power (one of the POTS interfaces or the S_0 bus)
- terminating resistors for the S bus

All other settings are made through configuration procedures.

3.4.1 Short/Extended Bus settings

Fig. 3-1 shows four possible configurations for the "S" BUS with the corresponding settings and maximum distances permitted.

3.4.2 Terminating resistors

The S bus must be properly terminated for correct operation. Figure 3 shows connection points of 100 Ω termination resistances for some S bus configurations.

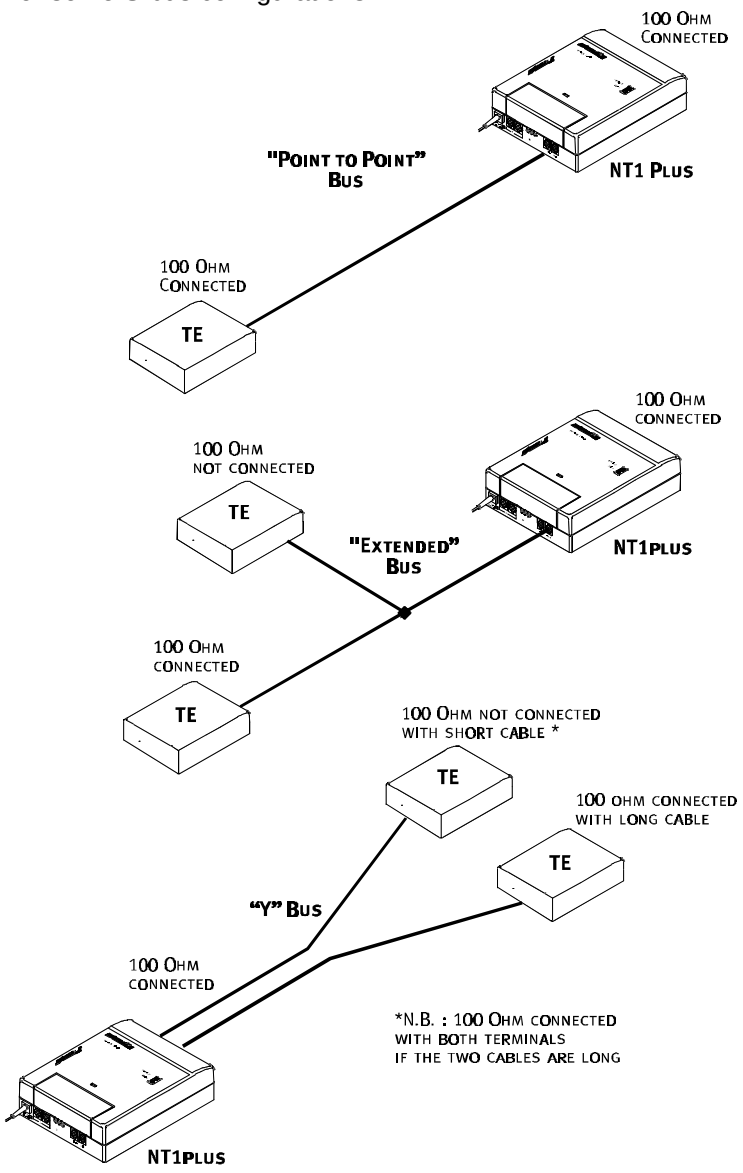


Figure 3

4 CONFIGURATION

4.1 Configuration Procedures

The configuration procedures allow the user to change the operating parameters of the device.
The configuration procedures can be carried out through:

- local commands
- remote programming

During the configuration stage the NT1Plus suspends the normal activity on the two telephone terminals.

> **!** a.c. supply must be supplied to the NT1Plus in order to enter any configuration mode.

Configuration commands consist of sequences of DTMF tones. During configuration, the user is guided by acoustic tones and voice messages. Commands must not be entered during voice messages.
Lack of a.c. power or a delay longer than 2 minutes between two operations will make the NT1Plus leave the configuration mode after executing the commands previously entered.

4.1.1 Local configuration

For the configuration procedures use the key pad of a DTMF phone connected to the a/b interfaces.

- a *reduced* user-accessible configuration mode provides access to a restricted set of configuration variables.

4.1.1.1 Reduced local configuration

To enter the reduced configuration mode:

- disconnect any existing call
- connect a DTMF phone to one of the extension and lift the handset

4.2 Configuration Commands

Configuration commands must be entered after the NT1Plus has completed sending the voice prompt. The message is repeated until the corresponding parameter has been entered.

> **!** Wait for voice prompts to be completely issued before entering commands

The following commands are used:

- *access command*, used to access the local configuration stage
- *assignment commands*, used for parameter configuration
- *direct commands*, used to:
  - check the current setting of a configuration parameter
  - request the software revision number of the device
  - restore all default values.

4.2.1 Access command

This command is used to enter the local configuration mode. It is represented by the key sequence

entered twice in a row.

> **!** when entering the access command, keep interdigit pauses to less than one second

4.2.2 Assignment commands

These commands are made up of two parts and have the following structure:

 <parameter address>  <parameter value> 

When the NT1Plus enters the configuration mode the device emits an audible tone.

When pressing the  , button, the NT1Plus stops the generation of the tone and prompts the user with the message:

"*enter the parameter address*":

The user enters a two digit code representing the parameter address and the presses the  key .
Only the last two digits entered are considered, so in case of an error the user simply re-enters the correct digits and press  .
If the entered address is not valid, the:

"*incorrect operation*"

message is generated, followed by the audible tone indicating the ready state.
If the entered address is a valid one, then the user is prompted with a message:

"*enter the parameter value*".

The new value can now be entered, followed by the  key.
Valid operations are confirmed via the message:

"*the value of the <x> parameter is <y>*"

where <x> and <y> represent the address and the assigned value.
If the assigned value is incorrect, the following message is given:

"*incorrect operation*"

The configuration mode can be interrupted at any time by going on-hook.

4.2.3 Direct commands

Direct commands have the following structure

 <address> 

and are shown in the table Table D
Execution of command *98# is confirmed by a voice message.

PARAMETER	ADDRESS	VALUES	DEFAULT
1° network number	N1	0....28 digits	Empty
2° network number	N2	0....28 digits	Empty
3° network number	N3	0....28 digits	Empty
dialling mode	N7	See Table C - Extension Service Parameter	0 0
extension service	N9	See par. 6.2.4	

Table A - Parameters affected by ***extended*** and ***restricted*** configuration

Separate commands are used for each extension:

- N = 1 holds for the 1st extension,
- N = 2 holds for the 2nd extension.

The *dialling mode* and the *extension service* parameters consist of a sequence of digits, with each digit position representing the value of a specific sub-parameter.
When entering values for the dialling mode and the extension service parameters, the digit 9 is used to skip the current digit position without altering the previous value of the sub-parameter.
It is not necessary to update all digit positions in the dialling mode and extension service parameters: e.g. if only digit position 1 and 2 have to be modified, then press  after entering the two digits to terminate the command.

4.2.4 Dialling mode

Command numbers 17 and 27

The dialling mode parameter contains two digits:

POSITION	SUB-PARAMETER	VALUES		DEFAULT
1	Tone dialling	pulse and tone dialling	0	0
		tone only	1	
2	Recall key	Enabled	0	0
		disabled	1	

Table B - Dialling Mode

4.2.5 Extension service parameters

Command numbers 19 and 29

The extension service parameter consist of a 5 digit sequence.

POSITION	SUB-PARAMETER	VALUE		DEFAULT
1	Type of terminal	extension deactivated	0	speech/audio
		speech/audio	1	
		telephone	2	
		fax	3	
2	Call Waiting	none	0	type I
		type I only enabled	1	
		both types enabled	2	
3	Generation of metering pulses	deactivated	0	deactivated
		Activated	1	
4	Delayed Clear Back	deactivated	0	activated
		Activated	1	
5	Audio level	high level (modem)	0	1
		low level (speech)	1	

Table C - Extension Service Parameter

4.2.6 Direct Commands

***00#**	a voice message indicates manufacturer name, hardware and software revision
***nn#**	a voice message indicates the current configuration value for parameter nn
***98#**	Reset all restricted configuration parameters to their default values.

Table D - Direct Commands

4.3 Configuration examples

4.3.1 Assigning network numbers

Network numbers are used by the NT1Plus to decide if an incoming calls is to be offered to the extension (i.e. the extension will ring).
The NT1Plus will offer an incoming call to an extension if either of the following conditions applies:

- no number has been programmed for that extension
- the calling party number indicated by the network matches with one of the numbers programmed for that extension

Furthermore, the first network number assigned to the extension is included as the "calling party number" in outgoing calls originated from that extension.
It is sufficient to program any number of digits as required to identify the number among those assigned to the access.
As an example, suppose that the ISDN service provider assigns the three numbers ***87654321***, ***87654322*** and ***87654323*** to the user's access. In this case it is sufficient to enter a single digit (***1***, ***2*** or ***3***) to differentiate among the numbers assigned to the access.
For example, the command:

*** 1 1 * 2 #**

will assign the ***87654322*** to extension 1 with the following effects:

- calls directed to the ***87654322*** to be offered to extension 1
- calls directed to the other numbers assigned to the access (i.e. ***87654321*** and ***87654323***) will ***not*** be offered to the extension
- ougoing calls originated from extension 1 will include 2 as the calling party number, coded with type "unknown"

4.3.2 Programming Extension Service parameters

4.3.2.1 Type of terminal

To deactivate extension 2 if not connected to any terminal (phone or modem):

*** 2 9 * 0 9 9 9 9 #**

or

*** 2 9 * 0 #**

To configure extension 1 as "speech/audio":

*** 1 9 * 1 9 9 9 9 #**

or

*** 1 9 * 1 #**

To configure extension 2 as "telephone" (i.e. only a phone is connected to the extension):

*** 2 9 * 2 9 9 9 9 #**

or

*** 2 9 * 2 #**

4.3.2.2 Call waiting

see also § 0
To deactivate both types of call waiting for extension 2:

*** 2 9 * 9 0 9 9 9 #**

or

*** 2 9 * 9 0 #**

To activate only type I call waiting function for extension 1:

*** 1 9 * 9 1 9 9 9 #**

or

*** 1 9 * 9 1 #**

4.3.2.3 Metering pulses

See also § 0

To activate the pulse generation for extension 1:

```
* 1 9 * 9 9 1 9 9 #
```

or

```
* 1 9 * 9 9 1 #
```

To deactivate the pulse generation for extension 2:

```
* 2 9 * 9 9 0 9 9 #
```

or

```
* 2 9 * 9 9 0 #
```

4.3.2.4 Programming the amount of currency per charging unit

See also § 0

This parameter contains four digits that represent the amount of currency that is equivalent to a charging unit and an additional digits that specifies the number of digits after the decimal point.

For example, to program a value of 6.05 units of local currency for a single pulse, either use:

```
* 0 8 * 6 0 5 0 3 #
```

or

```
* 0 8 * 0 6 0 5 2 #
```

4.3.2.5 Delayed clear back

see also § 0

To activate the clear-back feature for extension 2:

```
* 2 9 * 9 9 9 1 9 #
```

or

```
* 2 9 * 9 9 9 1 #
```

4.3.2.6 Audio level selection

To program extension 1 for high audio levels (recommended option when modems are used):

```
* 1 9 * 9 9 9 9 0 #
```

To program extension 1 with low audio levels:

```
* 1 9 * 9 9 9 9 1 #
```

4.3.2.7 An example of complete programming

The command

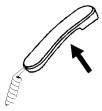
```
* 2 9 * 2 2 1 1 1 #
```

will program extension 2 as follows:

type of terminal	telephone
call waiting	type I and type II CW enabled
delayed clear-back	enabled
generation of metering pulses	enabled
audio levels	low

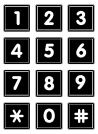
5 USER PROCEDURES

5.1 Placing a call



Lift the handset

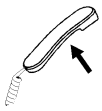
Wait for the dial tone



Dial the desired number

5.2 Restricting the Caller ID

see also § 0



Lift the handset

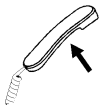
Wait for the dial tone, then dial

*** 3 1 #**

followed by the desired number.

5.3 Placing a call on HOLD

User can selectively activate or deactivate the indication of waiting calls by using the following procedures:
Lift the handset,



Lift the handset

and press

*** 4 3 #**

to activate, or

 # 4 3 #

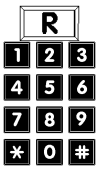
to deactivate the indication of waiting calls. Replace the handset before starting another call.

5.4 Call Hold and Retrieve (CH)

The service allows the user to put an active call (e.g. to user B) on hold, to start a new call to another user (e.g: user C).

!	This function can only be used if the HOLD supplementary service is supported by the network and the user has subscribed the service.

During a call:



wait for dial tone
Dial the number for connection B

NOTE: Pressing R before connection to B is completed (busy or no answer) restores the connection to A.
If the user does not start dialling within a few seconds, then the original call is resumed.

5.5 Handling two simultaneous calls

When the user has an active call to C and a call on-hold with user B the following procedures are available:

R **1** clears the active call and resume the call on hold

R **2** puts the active call on hold and resumes the call on hold

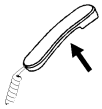
R **3** starts a three party conference

R **4** transfers the call (B is connected to C, the user is released)

!	to make it possible the call transfer, either B or C must be an incoming call

5.6 Disabling waiting calls

5.4.6.2 Call waiting), then the user can selectively activate or deactivate the indication of waiting calls by using the following procedures:
Lift the handset,



Lift the handset

and press

*** 4 3 #**

to activate, or

 # 4 3 #

to deactivate the indication of waiting calls. Replace the handset before starting another call.

5.7 Handling waiting calls

The user has an active call to B and is alerted of a waiting call. Different operations are possible (depending on the service provided by the network and subscribed by the user):

R **0** Clears the incoming call

R **1** Clear the active call and answer the waiting call

R **2** Puts the active call on hold and answer the waiting call

If the user puts the active call on hold and answers the waiting call, then the procedures indicated in §0 apply, with the following exception:

!	If Type II CW is accepted, it will not be possible to activate neither the 3-party conference (R3) nor or the explicit call transfer (R4).

After pressing R2, the waiting call enters the active state and the previously active call id held. Procedures described in §0 are in force.
If the user goes on-hook when a waiting call is present, the extension will ring.

5.8 3-party conference

After entering the 3-party conference, the following procedures are available

R **1** release the connection added on conference (the one previously on hold)

R **2** resume private conversation with the call added on conference

After pressing R2, you have one call in the active state and another call on hold, so the procedures described in §0 hold.

5.9 Delayed Clear Back

No specific user action is required.

5.10 Malicious caller ID

During the active phase of the call or after the calling user has gone on-hook, the user can request the MCID service by pressing

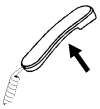
R then **9**

5.11 Call forwarding services

Three types of call forwarding services are avaliable through a keypad protocol. In order to activate or deactivate a service, the user dials a specific key sequence immediately after going off-hook.

5.11.1 Call forwarding unconditional

The activation procedure is as follows:

 Lift the handset

and press

*** 2 1 * Z Z Z Z Z Z * Y Y Y Y Y Y #**

Where

- ***ZZZZZZ*** represents the "forwarded-to number" (FTN), i.e. the number where you want the call to be transferred
- ***YYYYYY*** represents the "served user number" (SUN), i.e. in case of Multiple Subscriber Number (MSN), the number in the access for which the request holds; calls to other numbers in the access will ***not*** be transferred.

Alternative sequences are:

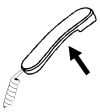
*** 2 1 * Z Z Z Z Z Z * 0 #**

or:

*** 2 1 * Z Z Z Z Z Z #**

to represent "all numbers".

To deactivate the service:

 Lift the handset

Then press

 # 2 1 * Y Y Y Y Y Y #

To decativate the service for the ***YYYYYY*** "served user number" (SUN), or:

*** 2 1 * 0 #**

or:

*** 2 1 #**

to deactivate the service to "all numbers".

5.11.2 Call forwarding no reply and call forwarding busy

The same activation and deactivation procedures as described in §0 for the CFU except that, ***instead of the *21…*** sequence the,

*** 6 1 … … …**

sequence shall be used for the CFNR, and the

*** 6 7 … … …**

sequence shall be used for the CFB service.

6 TECHNICAL SPECIFICATIONS

Dimensions	220 x 170 x 66 mm
Weight	1700 gr.
Mains Supply	230 Vac +10%-15%, 50 Hz
A.C. Power At Nominal Voltage	< 100 mA
Operating Conditions	ETS 300.019 - 1 - 3 - Cl. 3.2
Transport	ETS 300.019 - 1 - 2 Cl. 1.2
Storage	ETS 300.019 - 1 - 1 Cl. 2.2
U Interface	ETR 080
S Interface	ETS 300.012
Extensions	Q 552
Telephone Systems	Max 2 terminals For each terminal: 2 telephones 1 additional ring

AnnexesPARAMETER	VALUE		
	NT1PLUS	TERMINAL 1	TERMINAL 2
TEI assignment			
Activation of vocal messages			
Functioning modes			
Remote configuration number			
First network number			
Second network number			
Third network number			
Dialling Mode			
Extension Services			
Call Waiting			
Generation of metering impulses			
Delayed Clear Back			
Audio levels			