

A system of transmitting the subscriber number of a calling subscriber to a subscriber terminal

5 The invention relates to telephone networks and especially to an arrangement for displaying the subscriber number of a calling subscriber on the display of a terminal equipment of a called subscriber.

10 Automatic exchanges have made it possible to provide different arrangements by which the subscriber number of a calling subscriber, subscriber A, can be shown on the display of a telephone or a separate peripheral unit of a called subscriber, subscriber B. The calling number detection is a facility of subscriber B. The facility has been developed to make
15 it possible for the called subscriber to decide, upon seeing the number of the calling subscriber, whether to answer the call or not, and thereby ignore undesired calls. Usually this facility is a service that the subscriber has to buy from an operator.

20 European Patent Specification No. 0,076,646 discloses a method of displaying the subscriber number of subscriber A on the terminal equipment of subscriber B when the network uses standard signalling. When the terminating exchange has checked that subscriber B is
25 authorized to use the service, it requests the exchange of subscriber A to supply identification signals and subsequently transfers the control of the calling process to a specific identification detector located in the exchange of subscriber B. The detector controls
30 the calling process until said identification signals have been received and the call has been completed. The detector thus controls the signalling protocol together with the exchange of subscriber A, whereby, alternately, the exchange sends a digit, the
35 identification detector requests for the next digit,

etc. It is characteristic of the method that the exchange knows what telephones have the number display facility, and as a call is destined to such a terminal equipment, the exchange transmits an interrogation message to the exchange of subscriber A, whereafter the control is transferred to a specific identification detector. The drawback of the method disclosed in the publication is that a specific identification detector is needed to signal directly with the exchange of the calling subscriber. Another major drawback is that the exchange always uses the same signalling technique to transmit the subscriber number to subscriber B, whereby the subscribers have to buy telephones that use the same signalling technique as the exchange concerned, i.e. equipment of the same manufacturer.

European Patent Specification No. 0,148,836 discloses a method and arrangement for sending a data message to subscriber B during a silent interval between a first and a second ringing signal. The message may be the subscriber number of a calling party. The arrangement comprises several line units, each of which is associated with an individual ringing circuit. Each line unit comprises a detector means that detects a first ringing signal and generates a status signal corresponding to the next silent interval. In response to the status signal, the transmitter generates a frequency-shift-keyed message, which is transmitted during the silent interval between ringing signals. It is characteristic of the method and apparatus that first a ringing signal supplied to subscriber B and then a silent interval between ringing signals must be identified, and it is not until after this that a potential message, such as the subscriber number of a calling party, is transmitted. Since the exchange always uses the same signalling technique to

transmit a subscriber number to subscriber B, the subscribers must buy telephones that use the same signalling technique as the exchange concerned, i.e. equipment of the same manufacturer.

5 European Patent Specification No. 0,150,181 describes a subscriber terminal, such as a telephone, that is able to receive a modulated or unmodulated signal transmitted from the exchange during a silent interval between ringing signals, to store the
10 information contained in the modulated signal and to show it on the display. To function correctly, a telephone must use the same signalling technique as the exchange, i.e. only telephones of a certain manufacturer can be connected to the exchange if the
15 CLIP service is to be used.

A drawback of the known methods is that they are bound to the signalling technique by which the subscriber number of a calling subscriber is transmitted to a called subscriber. There are two
20 signalling techniques: a subscriber number is either transmitted between ringing signals by modem signalling, as described in the so-called Bellcore standard, or transmitted before the first ringing signal by DTMF signalling (Dual Tone Multifrequency),
25 as described in the ETSI standard. The known methods thus require that the exchange should comprise separate equipment for call processing during the transmission of the calling number and for detecting silent intervals between ringing signals, during which the
30 subscriber number will be transmitted. It is a major drawback that the calling number detection facility added to the exchange is bound to the display technique selected by the manufacturer of the subscriber terminal, such as a telephone or separate number
35 display unit. In other words, the facility binds both

the telephone operator and the customer of the operator to display units of a certain manufacturer.

5 The object of the present invention is to provide a method of transmitting a calling subscriber number, avoiding all drawbacks of the known methods. The object is to provide a method that can be applied in an exchange of any manufacturer, that does not require separate peripheral equipment, and that allows a subscriber terminal of any manufacturer, with a
10 calling number display facility, to be connected to a telephone network system in which the method is used, independently of the signalling parameters used by the terminal. The system must enable the display of a calling number on the telephone of subscriber B of an
15 analogue or a MUX connection, or on a peripheral equipment connected to the telephone. It must also be possible to select the signalling technique, i.e. modem signalling or DTMF (Dual Tone Multifrequency), individually for each subscriber line. If the
20 signalling is modem signalling, it is possible to display on the subscriber terminal the date and time, as well as the subscriber number. If the signalling is DTMF signalling, only the subscriber number or numbers are displayed. Since there are various methods in which
25 DTMF signalling is used and which differ from one another with respect to the frame structure, the 'frame structure' needed in the transmission is also transmitted.

30 In call set-up, it must be possible to select the transmission moment individually for each subscriber line. It must also be possible to transfer the information either before a ringing signal is supplied to a subscriber line, between a first and a second ringing signal, or immediately after the answer.

35 The objects are achieved with a method of

claim 1 and a telephone network system of claim 6. The preferred embodiments of the system of the invention relating to the number transmission moment are disclosed in the attached dependent claims.

5 In the invention, data on the type of the number display unit of the subscriber, as well as conventional subscriber data, are first stored in the subscriber file of the exchange. Second, a specific calling number delivery file is added to the exchange.

10 The file contains, for each type of number display unit, all parameters needed to transmit the number of a calling subscriber from the exchange to a telephone of a called subscriber and to show the subscriber number on the display of the telephone or separate

15 display unit. Information on the display unit is stored in the subscriber data of the subscriber file as the subscriber joins the number display service. In practice, it is sufficient for the subscriber to inform the operator of the manufacturer and type of the

20 terminal equipment, whereby the operator stores the index of the equipment in the subscriber file, in the data of the subscriber concerned. As the exchange of a subscriber receives a request to transmit a call to a subscriber that has bought the number display service,

25 the subscriber file is searched, as usual, for subscriber data. The subscriber data indicate whether the subscriber has joined the number display service, and they also contain the index of the number display unit type of the subscriber. After this, the calling

30 number delivery file is checked to find which data correspond to the index concerned. The information shows what signalling technique the manufacturer of the subscriber number display unit has used, and the number of the calling subscriber is transmitted from the

35 exchange to the telephone of the called subscriber

using the same signalling technique. If the subscriber changes his terminal equipment to another type of terminal equipment, the subscriber file is updated by changing the index of the display unit type, whereby new data will correspond to the index in the calling number delivery file. If the information on the display unit used by the subscriber is not found in the calling number delivery file at all, the data on the new equipment is added thereto. A plural number of subscribers thus have the same index in the subscriber file, which means that they have a number display unit of the same type and that the index is stored in the same location in the calling number file, i.e. all necessary information about the number display unit concerned is stored in this location. The subscribers are thus free to select an equipment of any manufacturer, independently of the signalling technique used by the equipment, and it is always possible to transmit the number of the calling subscriber to the called subscriber.

If the information contains a parameter indicating that the subscriber number must be transmitted before the first ringing signal, the procedure according to the first embodiment of the invention is followed.

The second embodiment defines the procedure to be followed if the number is to be transmitted after the first ringing signal. This embodiment is characterized by time supervision. Here the subscriber number will be transmitted when a certain period of time has elapsed since the predetermined instant. Unlike in prior art arrangements, no special detectors are needed for ringing signals and for silent periods between them.

The third embodiment defines the procedure to

be followed when the parameters read from the file indicate that the subscriber number data must not be sent until after the answer.

5 In the following the invention will be described in greater detail by means of preferred embodiments and with reference to the attached drawings, in which

fig. 1 shows the functions of an exchange that are essential to the invention,

10 fig. 2 is a block diagram illustrating a method of the invention,

fig. 3 shows one possible file structure,

fig. 4 illustrates a procedure for displaying subscriber number information before a ringing signal,

15 fig. 5 illustrates a procedure for displaying subscriber number information after the first ringing signal, and

fig. 6 illustrates a procedure for displaying subscriber number information after the response.

20 All modern exchanges comprise some of the same functions, which can be divided into groups e.g. as follows:

- 1) call control,
- 2) signalling,
- 25 3) connections,
- 4) network and system maintenance,
- 5) charging.

Fig. 1 shows a known exchange, presenting the functions that are essential to the invention in accordance with the above grouping. Call control comprises a call control program block ICB on the input side, which performs call control functions in the call set-up and supervision steps. It also comprises a call control program block OCB on the output side, which performs call control functions in the call set-up and

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supervision steps, and a facility control program block FCB, which carries out procedures in which facility information is processed in the subscriber database.

5 The block that provides signalling services comprises a channel service program block ACSERV, which offers use services to MFC and PBR equipments. Channel services mean transmission of messages within an exchange on a PCM bus; MFC equipments are multifrequency transceivers receiving messages from a subscriber terminal; and PBR equipments are equipments receiving messages of a subscriber terminal that have been sent with the keys of the telephone. The subscriber signalling service block of a signalling service unit comprises program blocks offering subscriber signalling service, e.g. block SPB, which conducts call signalling functions in the call set-up and supervision steps, and further comprises block AIB, which controls subscriber signalling of an analogue subscriber line.

20 The service unit that processes subscriber data comprises a program block SFB for reading facility information, the block reading subscriber data from the subscriber database, and a supply block SUFA, through which the operator updates subscriber data.

25 The above functions are found in all exchange systems.

The present invention introduces a new block: Calling Number Delivery File CNDFIL. The file contains the signalling data of all the calling number displaying terminal equipments that are used by the subscribers connected to the exchange. For example, if three different types of terminal equipments are used, the file comprises three records, each of which contains all the parameters needed for transmitting a calling number to one type of terminal equipment of an

analogue connection. File CNDFIL thus contains both the signalling protocol information, which shows whether modem or DTMF signalling is used, and the transmission moment, i.e. whether the number is sent before the first ringing signal, during a silent interval between ringing signals, or not until after the answer. The file may also contain the allowed length of a digit sequence to be transmitted, the transmission order of such sequences, information about individual potentially deleted digits, information about different restrictions, etc.

Fig. 2 is a block diagram illustrating the basic idea of the invention. An index is added to the subscriber data of the subscriber database. As the call control requests for subscriber data, it appears from the data that the subscriber has subscribed to the calling number display service. The point 'index' in the subscriber data shows what type of display unit the subscriber uses. The information found in the record located under this index is then read from file CNDFIL, the information containing the parameters used by the display unit concerned. The subscriber number is transmitted to the called subscriber by using these parameters.

Fig. 3 shows one possible record structure for a terminal equipment. In addition to the above-mentioned matters, it comprises e.g. different start and stop signals. The file belongs to a system block for subscriber signalling services, which comprises a block SPB that performs signalling functions in the call set-up and supervision steps; the two blocks being connected by a bus R shown in fig. 1. Apart from the bus connection, the file is also connected to the supply block SUFA, through which the operator updates the subscriber file and thereby the index using a

suitable MML command. The subscriber data index of the subscriber file determines the type of the subscriber terminal, which is looked for in file CNDFIL, so when the subscriber terminal is changed, it suffices to
5 update the subscriber file through the supply block SUFA. If the subscriber starts to use a terminal whose information is not found in file CNDFIL, the data on the equipment must be added to the file as a new record. After this, if subscribers start to use more
10 equipments like this, it suffices to update the subscriber file.

With reference to fig. 4, we shall now study a situation where the exchange is to transmit a call from subscriber A to subscriber B and to display number
15 data before a ringing signal. The figure is relevant to both voice-frequency signalling and modem signalling. The exchange to which subscriber B is connected receives A-number signalling concerning an incoming call via a Common Channel CH. At first, establishment
20 of a call proceeds in the normal manner: the processing proceeds from the signalling program block on the input side to the call control block on the input side and further to the call control program block on the output side, the latter searching the subscriber database for
25 the basic data on subscriber B and performing a facility analysis. After this, through-connection is performed. The subscriber signalling block SPB fetches the data on the calling number display unit of subscriber B from the calling number delivery file
30 CNDFIL, the data showing the correct moment for transmitting the calling number. In this example, the transmission moment is found to be 'before the first ringing signal.'

After receiving a call set-up request, the
35 block SPB performing subscriber signalling sends a

service request to the channel service block ACSERV. The signalling technique, i.e. information showing whether modem or DTMF signalling is used, is obtained from the new file CNDFIL. Block ACSERV acknowledges the service request, whereby block SPB sends block ACSERV a request to send subscriber number data. The request message contains a sequence of characters that is transmitted by block ACSERV to a subscriber line and is to be shown on the display. The number of digits displayed is obtained from the new file CNDFIL.

If the call is a transferred call, the block SPB performing subscriber signalling reads instructions from file CNDFIL, the instructions stating whether to send the number of the original subscriber A or the number of the subscriber that has transferred the call (subscriber that has transferred first/last), or both, and in what order.

If the number data on the incoming call is not complete, if no number data is available, or if the calling subscriber has a number display barring facility, the signalling block SPB reads from file CNDFIL instructions stating what sequence of characters to send. Likewise, if the display of the subscriber terminal allows only a limited number of characters to be displayed and if the incoming number is longer than allowed, file CNDFIL indicates the sequence of characters that will be sent. The sending of the sequence of characters, whether the sequence is a complete subscriber number or some other sequence described above, is indicated in fig. 4 as 'transmission of calling subscriber number to subscriber line.' When the sequence of characters has been transmitted to subscriber B, the channel service block ACSERV acknowledges the transmission. When block ACSERV has acknowledged the transmission of the sequence of

characters or the request for service has not been granted, block SPB sends a call request to an analogue line adapter, whereafter establishment of a call proceeds in the normal manner.

5 We shall now refer to fig. 5, which illustrates a process in which subscriber number data is displayed after the first ringing signal. The beginning of the process is as described in connection with fig. 4, i.e. first a facility analysis and then
10 through-connection are performed. Information on the ringing moment is fetched from the new file CNDFIL, which in this example indicates that the transmission moment is 'after the first ringing signal,' i.e. during the first long silent interval. After receiving a call
15 set-up request, the subscriber signalling service block SPB sends a call request to module AIB and simultaneously sets time supervision for itself according to the type of ringing. A suitable length for time supervision is the length of a ringing period +
20 500 ms. When the time for time supervision elapses, block SPB sends a service request to the signalling control block ACSERV of the analogue subscriber line. Block ACSERV acknowledges the service request by sending an acknowledgement. After this, block SPB
25 requests block ACSERV to send the subscriber number, whereby it sends the number and acknowledges the transmission. After this, the call establishment proceeds in the normal manner.

 In the above embodiment, block SPB must know
30 the ringing periods. It is thus not applicable to subscriber modules in which ringing is implemented in ringing groups.

 Fig. 6 shows a third embodiment in which the information obtained from the new file CNDFIL indicates
35 that the calling subscriber number data must not be

displayed until after the answer. In the figure this is indicated by the block 'subscriber B answers.' The subscriber signalling block SPB hereby sends the voice frequency signalling service block ACSERV a service request message once it has received an 'off-hook' message from said block, the message indicating that the called subscriber has picked up the receiver. Before the digits are sent, the speech path is disconnected from the calling subscriber, silence is connected to said subscriber, and a short pause is made. The length of the pause is read from file CNDFIL before subscriber number data is sent. When the subscriber number data has been sent, silence is disconnected and the speech path is re-connected.

Where the above examples concern a transfer facility, file CNDFIL is searched for data showing whether to send the number of the original subscriber A, or that of the subscriber than has transferred the call, or both, and in what order.

The number display facility is activated in the same way as the subscriber activates other service facilities, i.e. by keying a defined sequence of characters. After this, the calling subscriber number of each call destined to the subscriber concerned is displayed, if possible. Inactivation is conducted in the same way, i.e. by keying a defined sequence of characters. The outgoing call control receives the activity/inactivity data of the facility from the basic data on subscriber B.

The facility of the invention is available for normal analogue and MUX connections of the exchange, including Centrex extensions and members of a hunting group. The subscriber number data of subscriber line A are delivered supplemented with a national or international area code. In local calls, a trunk prefix

and trunk code are also displayed in full. If the number data is incomplete, as much of the subscriber number is shown as possible, or the subscriber line is informed that the number of subscriber A is not
5 available. The number of digits to be sent can be set individually for each terminal equipment.

When the subscriber is a Centrex subscriber, the extension number of the calling subscriber is displayed on the subscriber equipment of subscriber B,
10 if the calling subscriber and the called subscriber are members of the same Centrex group. In an out-line Centrex call, no out-line number is added in front of the number to be transferred.

The above description and the associated
15 figures are to be understood only as illustrating the present invention. It is obvious to those skilled in the art that the invention can be varied and modified in different ways without deviating from the scope and spirit of the invention disclosed in the attached
20 claims.

Claims

1. A method of transferring a calling subscriber number to a subscriber terminal in a telephone network system comprising

at least one exchange with means for detecting calling subscriber number data and means for signalling the number data to a subscriber terminal of a called analogue subscriber line, and

subscriber terminals associated with an exchange, the terminals having number display units for displaying said data on the number,

characterized in that signalling parameter data used by different subscriber terminals are stored type-specifically in a file (CNDFIL) located in the exchange, and that when a connection is established from the exchange to a subscriber terminal, the file is searched for the signalling parameters used by the number display unit concerned, and the calling subscriber number data is transmitted using said signalling parameters.

2. A method according to claim 1, characterized in that information indicating what kind of number display unit the subscriber has is stored subscriber-specifically in the subscriber database, and that on the basis of this information the file (CNDFIL) is searched for signalling parameters used by this kind of number display unit.

3. A method according to claim 1, characterized in that the signalling parameter data of a subscriber terminal include data indicating the transmission protocol and transmission moment, and whether modem signalling or voice frequency signalling is used.

4. A method according to claim 3, characterized in that



a c t e r i z e d in that the transmission moment for the subscriber number data is before the first ringing signal.

5 5. A method according to claim 3, c h a r -
a c t e r i z e d in that the transmission moment for the subscriber number data is during a silent interval between ringing signals, and after a period of a constant length from the first ringing signal.

10 6. A method according to claim 3, c h a r -
a c t e r i z e d in that the transmission moment is after the subscriber has answered.

7. A telephone network system with at least one exchange, comprising

15 outgoing call control means (OCB), which perform call control functions in the call set-up, ringing and supervision steps, and which deliver the calling subscriber number,

20 signalling means (SPB), which perform signalling functions in the call set-up and supervision steps,

25 channel service means (ACSERV), which transmit messages between an exchange and a subscriber terminal, and analogue subscriber terminals associated with the exchange and connected to number display units for displaying the calling subscriber number data signalled from the exchange,

 c h a r a c t e r i z e d in that the exchange comprises

30 storing means (CNDFIL), in which are stored signalling parameter data used by different types of display units,

35 subscriber signalling means (SPB), which, in response to the number display unit type that has been read from the subscriber database by the call control, read from the storing means (CNDFIL) the signalling



parameter data of the number display unit type concerned,

channel service means (ACSERV), which transmit said subscriber number data using the signalling parameters at the moment defined by said parameters.

8. A system according to claim 7, characterized in that the signalling parameter data that has been read from the storing means (CNDFIL) indicates that the transmission moment for the subscriber number data is before the first ringing signal, whereby the exchange supplies a first ringing signal in response to an acknowledgement that has been received from the channel service means (ACSERV) and indicates that the subscriber number data has been transmitted to the subscriber terminal.

9. A system according to claim 7, characterized in that the signalling parameter data that have been read from the storing means (CNDFIL) indicate that the transmission moment for the subscriber number data is after the first ringing signal, whereby, in response to the first ringing signal supplied by the exchange, the subscriber signalling means (SPB) start a time counter and, when the time set in the counter has elapsed, send the channel service means (ACSERV) a request to transmit the calling subscriber number data.

10. A system according to claim 7, characterized in that the signalling parameter data that has been read from the storing means (CNDFIL) indicates that the transmission moment for the subscriber number data is after the answer of the called subscriber, whereby, in response to the subscriber picking up the receiver, the subscriber signalling means (SPRB) first disconnect the speech path and connect silence, and then send the channel



service means (ACSERV) a request to transmit the calling subscriber number data.

5 11. A system according to claim 7, c h a r -
a c t e r i z e d in that, in response to the
information received from the call control means
indicating that the subscriber number data of the
incoming call is incomplete, the subscriber signalling
means (SPB) read from the parameters stored in the
storing means (CNDFIL) what sequence of characters will
10 be sent.

