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FFFS FOR

PRESENTATION OF FUNCTIONAL NUMBERS TO CALLED AND CALLING PARTIES

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1. SCOPE

This Form Fit Functional Specification (FFFS) specifies the functions required from the GSM-R network for the presentation of functional numbers to called and calling parties during normal call setup.

The presentation of functional numbers ensures a visual information about the destination to the calling subscriber and originator to the called subscriber. The functional numbers have to be interpreted by the MMI applications of called and calling party and the appropriate information has to be displayed.

The functional numbers are structured and unequivocally assigned. E.g. train functional numbers themselves already provide detailed information about the train and do not require additional interpretation.

Therefore, data base applications in charge of the textual interpretation of numbers are not considered in this specification.

2. REFERENCES

2.1. Normative References

[1] MORANE “Usage of the UUIE in the GSM-R Environment”, Ref H 22 T 0001
[2] MORANE FFFS for Functional Addressing E 10 T 6001
[3] MORANE FIS for Presentation of Functional Numbers to Called and Calling Parties F 12 T 6003
[4] 3GPP TS 24.087 3.0.0 User-to-User Signalling (UUS) - Stage 3
[5] 3GPP TS 24.007 3.3.0 Mobile Radio Interface Signalling Layer 3 - General Aspects
[6] 3GPP TS 24.008 3.3.0 Mobile radio interface layer 3 specification, Core Network Protocols - Stage 3.
[7] 3GPP TS 24.083 3.0.0 Call Waiting (CW) and Call Hold (HOLD) Supplementary Service - Stage 3
[8] MORANE “GSM-R SIM card specification”, Ref.: P38 T 9001
[9] ITU Recommendation Z.100: Specification and Description Language

2.2. Informative References

[10] MORANE SSRS A 04/02 T 6002
[11] ETSI EN 301 515 Requirements for GSM operation on Railways V2.3.0
[12] ETSI TR 102 281 Detailed requirements for GSM operation on Railways V2.0.0

3. ABBREVIATIONS

BSS	Base Station System
CC	Country Code
CLIP	Calling Line Identity Presentation
CoLP	Connected Line identification Presentation
cOTDI	compressed Originator To Dispatcher Information
CTRLFN	Controller Functional Number
FNUT	Fixed Network User Terminal
GCRef	Group Call Reference
GMSC	Gateway MSC
GSM	Global System for Mobile Communications
GSM-R	GSM Rail
IC	International Code
ISDN	Integrated Service Digital Network
MMI	Man Machine Interface
MOC	Mobile Originating Call
MS	Mobile Subscriber
MSC	Mobile Switching Centre
MSISDN	Mobile Station International ISDN Number
MT	Mobile Termination
MTC	Mobile Terminating Call
NDC	National Destination Code
NPI	Numbering Plan Indicator
OTDI	Originator To Dispatcher Information
PABX	Private Automatic Branch eXchange
SIM	Subscriber Identity Module
SM	Short Message
TFN	Train Functional Number
TON	Type Of Number
UUS1	User to User Signalling Service 1
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service
VLR	Visitor Location Register

4. MAIN CONCEPTS

For normal calls in the GSM-R network, trains and controllers may be called by using functional numbers instead of real MSISDN numbers. The functional numbers signifying train numbers, engine numbers, coach numbers and shunting or maintenance team members are managed by the GSM Follow-me service. Mobile stations are registered and de-registered with the Follow-me service using USSD control sequences, and facilities are also provided for the operator management of functional numbers, including the removal of the relationship between functional numbers and MSISDN Numbers. The functional number to be registered is the International EIRENE number, which must therefore include the International Code (IC). Refer to [2] FFFS *Functional Addressing*.

Dispatcher terminals may also be assigned functional numbers, on a permanent or temporary basis. The GSM Follow-me service is directly available only to mobile users, but dispatcher terminals may be registered and de-registered using alternative methods providing similar functionality. Wireless dispatchers may use such alternative methods, or the GSM Follow-me service as appropriate, provided the presentation of functional numbers is supported.

However functional numbers registered with the Follow-me service or other methods cannot be presented using the GSM supplementary services CLIP and COLP, because these are network services and only allow the presentation of the physical MSISDN or ISDN addresses to which the functional numbers have been translated.

The functional numbers have to be included in standard GSM transport mechanisms that support a transparent end-to-end information transfer. This is realized by using the end-to-end supplementary service UUS1. Furthermore, each GSM-R terminal is able to display on its own MMI the functional number which it presents as UUS1 to other parties.

In this specification the presentation of functional numbers to called and calling parties using the supplementary service UUS1 is described.

5. GENERAL ARCHITECTURE

When initiating a point to point call, the calling party has to provide the user-to-user information embedded in the SETUP message containing its functional number. The network has to transfer this user-to-user information transparently embedded in the set-up signalling towards the called party.

If there is more than one functional number forwarded to a particular MSISDN (several functional numbers per train) the application on the MS will use the currently selected functional number, as defined either by manual user input or by an automatic procedure. The automatic procedure will be based on selecting the latest successfully registered functional number. (Ref. [8]). The selected number will be packed inside the UUS1 data.

The connected party might send an ALERT message, or even a CONNECT message if no ALERT is to be sent due to an automatic answering mechanism. These messages are used to

provide the functional number inside the user-to-user information. The network has to transfer this user-to-user information transparently embedded in the alert/connect procedure towards the calling party.

The scenario mentioned above ensures that the functional number of the calling party reaches the destination during the set-up procedure and that the functional number of the connected party will be sent back to the originator of the call in the alerting/connecting phase. It is required on both sides for the MMI to be able to interpret the received user-to-user information and display the appropriate information on the screen.

Figure 1 shows an example of a MOC transferring the TFN inside the UUS1 data of a SETUP message and receiving the CTRLFN inside the UUS1 data of an ALERT/CONNECT message.

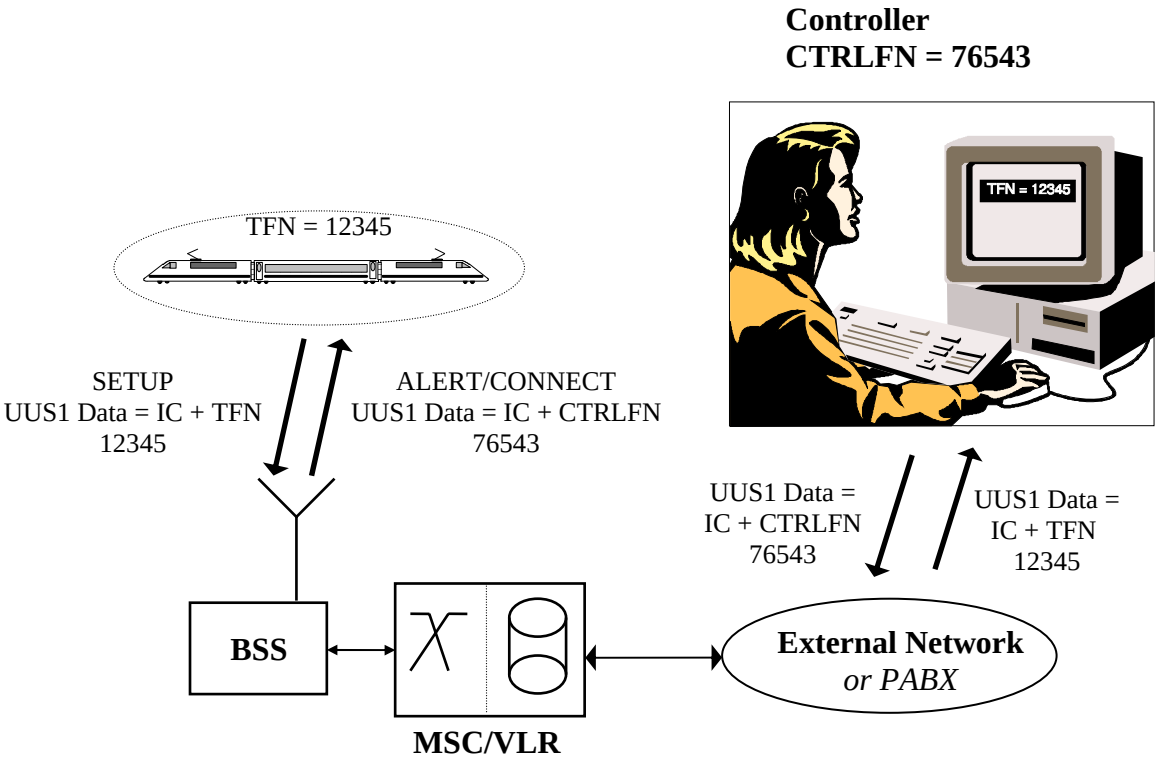


Figure 1: General architecture

Note: The controller may be connected as well to the MSC via a PABX.
The functional number to be transferred is the international EIRENE number and includes the IC

The international EIRENE number should be displayed to the user, unless the IC of the number to be displayed corresponds to the IC of the user's network. In this case it is permissible to display the national EIRENE number.

In the case of VGCS and VBS calls, the MSC inserts the group call reference of the call in the CLIP field of the SETUP message sent to the dispatchers involved in the call. The group call reference is displayed to the dispatcher terminal users.

Note: The originator of a VGCS or VBS call is not provided with any display of the numbers (functional or otherwise) of the respondents to the call.

In the case of mobiles invoking the VGCS service at railway emergency priority (Railway Emergency Calls), the originating mobile may send Originator To Dispatcher Information (OTDI) to the dispatchers involved in the call. This information is transmitted as compressed OTDI (cOTDI) from the mobile station to the MSC. The MSC must then convert the cOTDI to a UUIE containing decompressed OTDI for insertion in the SETUP messages sent to the dispatcher terminals.

The UUIE containing decompressed OTDI received by the dispatcher terminal can easily be distinguished from a UUIE containing a functional number, as a different protocol discriminator and format is used, see [1]. The OTDI string, which contains an abridged representation of the functional number of the originator, is displayed to the user of the dispatcher terminal, in addition to the group call reference.

Note: Due to limitations on the length of OTDI which are necessary to achieve the fast set-up times required in particular for Railway Emergency Calls, it is not in general possible to transmit the international EIRENE number as OTDI. See [1]

6. OVERVIEW OF SIGNALLING

In this overview the two scenarios are shown that are necessary to provide the functionality of presentation of functional numbers during a MOC and MTC. Figure 2 shows the message scenario for a mobile originating call and figure 3 shows the scenario of a mobile terminating call. The channel request and authentication as well as the ciphering procedures are not mentioned in these charts. The messages transferring the UUS1 data including the functional numbers (SETUP & ALERT/CONNECT) are printed in bold letters.

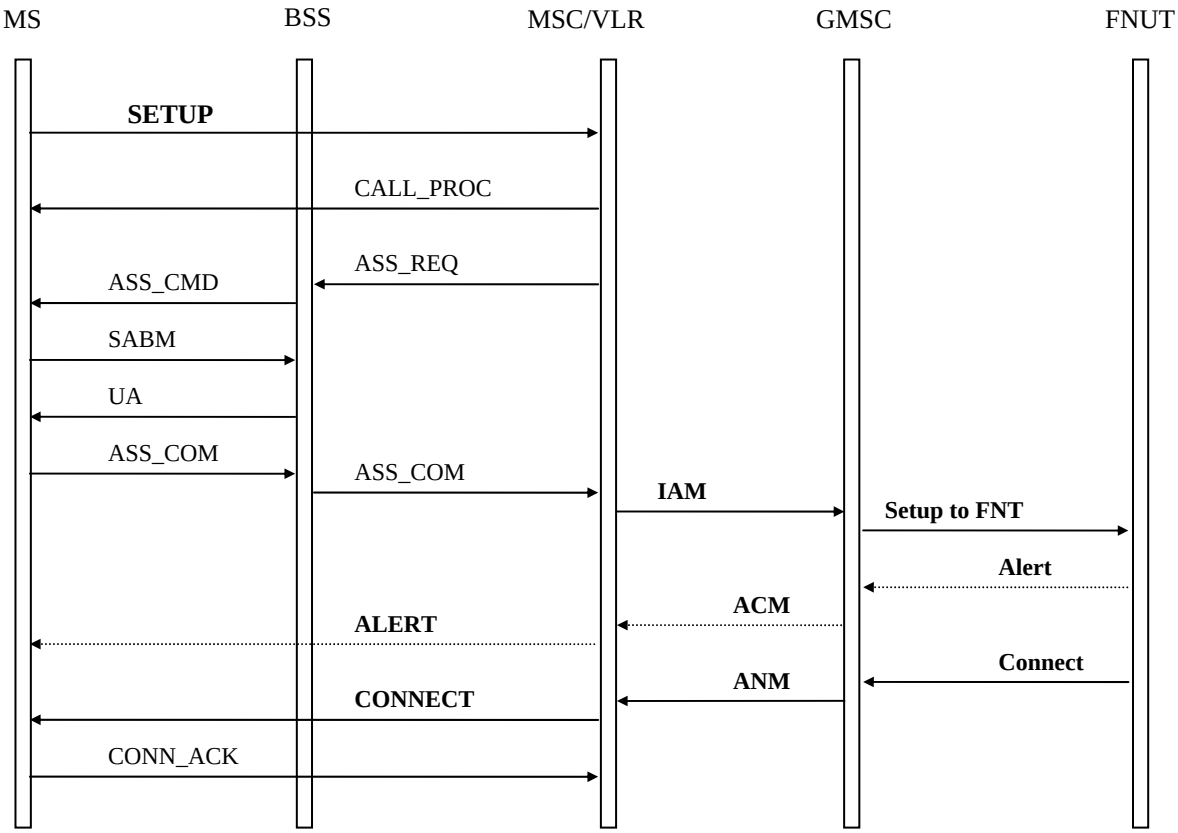


Figure 2: Signalling flow for a mobile originating call

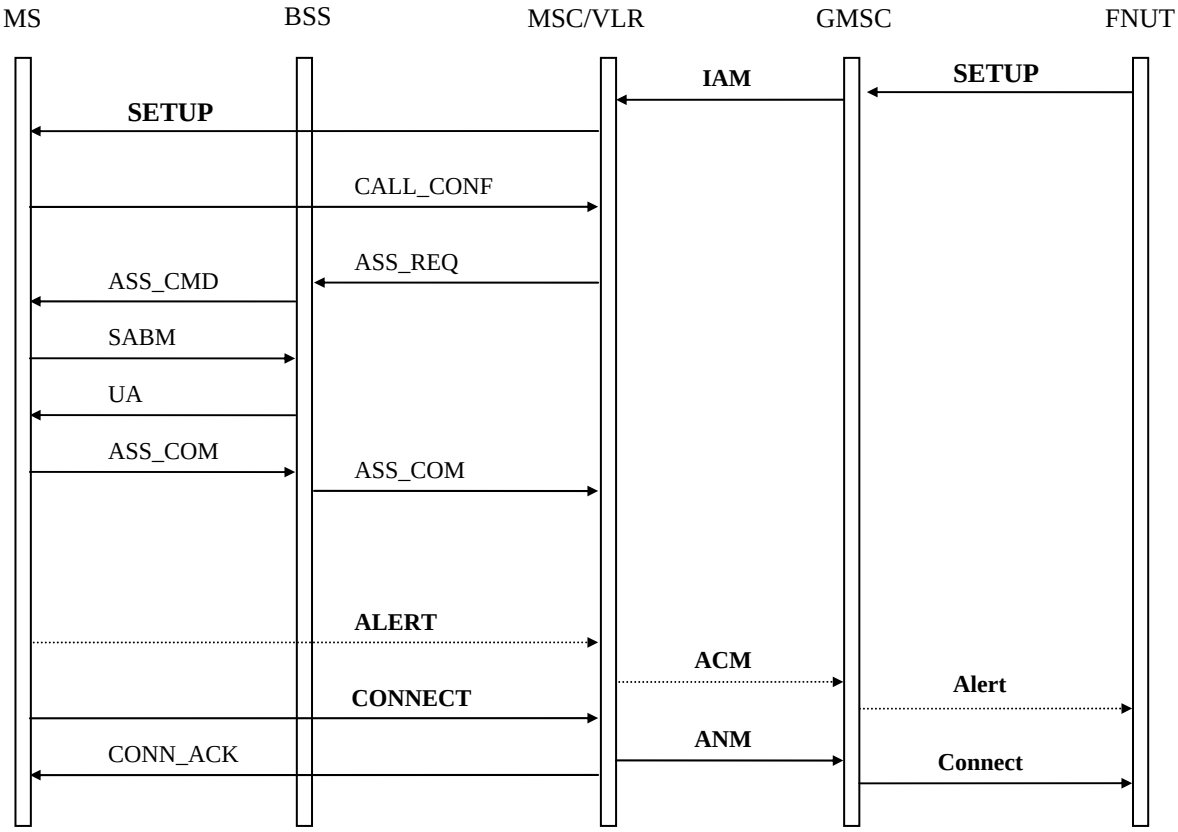


Figure 3: Signalling flow for a mobile terminating call

7. FUNCTIONAL MESSAGE DEFINITION

The SETUP and optionally the ALERT messages contain a User-User Information Element according to [4] used for the transfer of the international functional numbers towards the recipient of the message. If an ALERT message is present in a call set-up scenario, it should contain a User-User Information Element for presentation of functional numbers. A following CONNECT message may also contain the **same** User-User information as the ALERT message. If no ALERT message containing UUIE is present, the CONNECT message has to provide the appropriate User-User information. The receiving terminal always displays the functional number according to the last received User-User information contained in an ALERT or CONNECT message.

This implicitly invokes the UUS1 supplementary service. Despite this, the supplementary service UUS1 should be activated for all SIMs used on cab radios by default. The SETUP message from the originating subscriber shall always contain a User-User Information Element to support the network implementation which requires a User-User Information Element in the SETUP message to activate the UUS1 supplementary service.

If the originating GSM-R subscriber is not currently associated with any functional number, the User-User information contains a functional number of length zero as described in [1]

The structure of the international functional number follows the EIRENE numbering plan.

8. INTERACTION WITH OTHER GSM SUPPLEMENTARY SERVICES

If the supplementary services **CLIP** and/or **COLP** are implemented and activated, the mobile stations and the fixed network user terminals shall display the numbers provided by **CLIP** and **COLP** in case of absence of valid User-User information. Mobile stations and fixed network user terminals may also display the numbers provided by **CLIP** and **COLP** in addition to the functional number provided by UUS1. Mobile stations and fixed network user terminals may be equipped with a directory, relating the numbers provided by **CLIP** and **COLP** to textual names, and it is permissible to display the names corresponding to the numbers provided by **CLIP** and **COLP** in place of the numbers themselves. In all cases the display shall provide for each number an indication of whether it is a functional number or not.

In the case of VGCS and VBS calls, the CLIP supplementary service is used to transmit information concerning the identity of the call to dispatchers receiving the call. This information, which includes call type, group service area and group ID, is available for presentation to the dispatcher terminal users.

9. NORMAL OPERATION WITH SUCCESSFUL OUTCOME

In point to point calls, the User-to-User information is transferred transparently embedded in the signalling messages between mobile subscribers and/or fixed network user terminals (controller). The connected party will interpret the information received from the calling party inside the SETUP message and the calling party will interpret the information received from the connected party inside the ALERT or CONNECT message. The appropriate number has to be displayed on the corresponding MMI.

In the case of VGCS or VBS emergency calls from mobile users, the Originator To Dispatcher Information (OTDI) is transferred from the originating mobile as compressed OTDI to the MSC in the IMMEDIATE SETUP2 message. The MSC converts this information into decompressed OTDI which is inserted as UUS1 in the SETUP messages sent to notify the dispatcher terminals involved in the call. The dispatcher terminals interpret the OTDI received from the originator in the SETUP message and the display the result on the MMI. However, it should be noted that the CONNECT message of a VGCS or VBS call does not provide the originator with the functional identities of the parties responding to the call.

If an external network is used, it must support the transfer of user-to-user information.

10. EXCEPTIONAL PROCEDURES OR UNSUCCESSFUL OUTCOME

If there is no valid FN or no UUIE in the call establishment messages and the supplementary services **CLIP** and/or **COLP** are implemented and activated, the mobile stations and the fixed network user terminals shall display the numbers provided by **CLIP** and **COLP**, or their textual equivalents if a directory is available.

If there is no FN or no UUIE in the call establishment messages and the supplementary services **CLIP** and/or **COLP** are not implemented or activated, no indications are displayed on the MMI.

11. FUNCTIONAL DESCRIPTION USING SDL DIAGRAMS

SDL is used to specify the application behaviour that is represented by the model. The model does not represent necessarily the structure of the application. The service access points (SAP) according to [5] provide access to call control services relevant for the presentation of functional numbers:

- MOC and MTC establishment for normal calls
- Call related supplementary services (Call Wait , Call Hold, UUS1)
- Call Termination

The following sections describe the processes involved in the presentation of functional numbers from the point of view of a mobile station. The same logic is applicable to the presentation of functional numbers from the point of view of a fixed dispatcher terminal, provided the terms “Mobile Originated Call” and “Mobile Terminated Call” are replaced by the terms “Fixed Terminal Originated Call” and “Fixed Terminal Terminated Call” respectively.

Analogous processes are used in the presentation of OTDI on the dispatcher terminal.

11.1. Structure of functions

According to SDL conventions [9], an environment for the system to be specified has to be defined. For the railway applications a channel to the MMI and a channel to an instance controlling the access to the SAPs (mobile network layer MN) according to [5] is assumed. Each railway function can be represented by a functional block (PresFuncNum).

11.2. Channels to the environment

The channel to the MMI is assumed as unidirectional. This means no acknowledgement to PresFuncNum is given by the MMI. This is not necessary, because such an acknowledgement would not change the behaviour of PresFuncNum. The proper handling of display requests is

the task of the MMI. If the MMI does not receive any display requests from PresFuncNum after reaching the connected state, it shall indicate the absence of a functional number in an appropriate manner.

A proper operation of the mobile network layer is assumed. The call reference CR provides a unique identification of the calls currently managed in the mobile network layer. Signals containing an inconsistent CR value are not possible, if the mobile network layer controls call controls scenarios according to [6]. PresFuncNum ignores signals with inconsistent CR values (consistency check is not indicated in SDL diagrams).

11.3. Signals

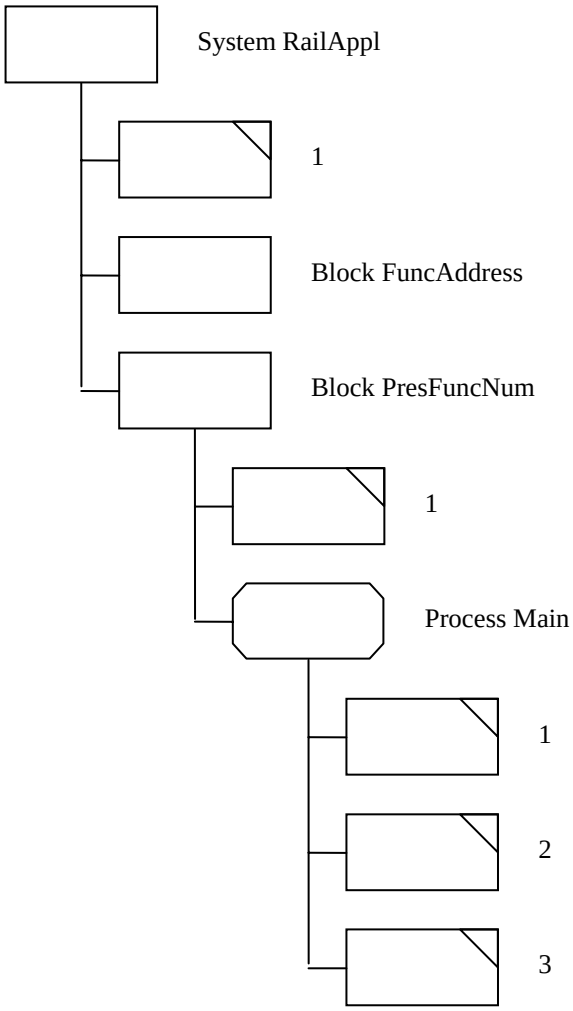
The signals from the environment to the block PresFuncNum on channel CH_MN are directly related to the reception and sending of corresponding call control messages.

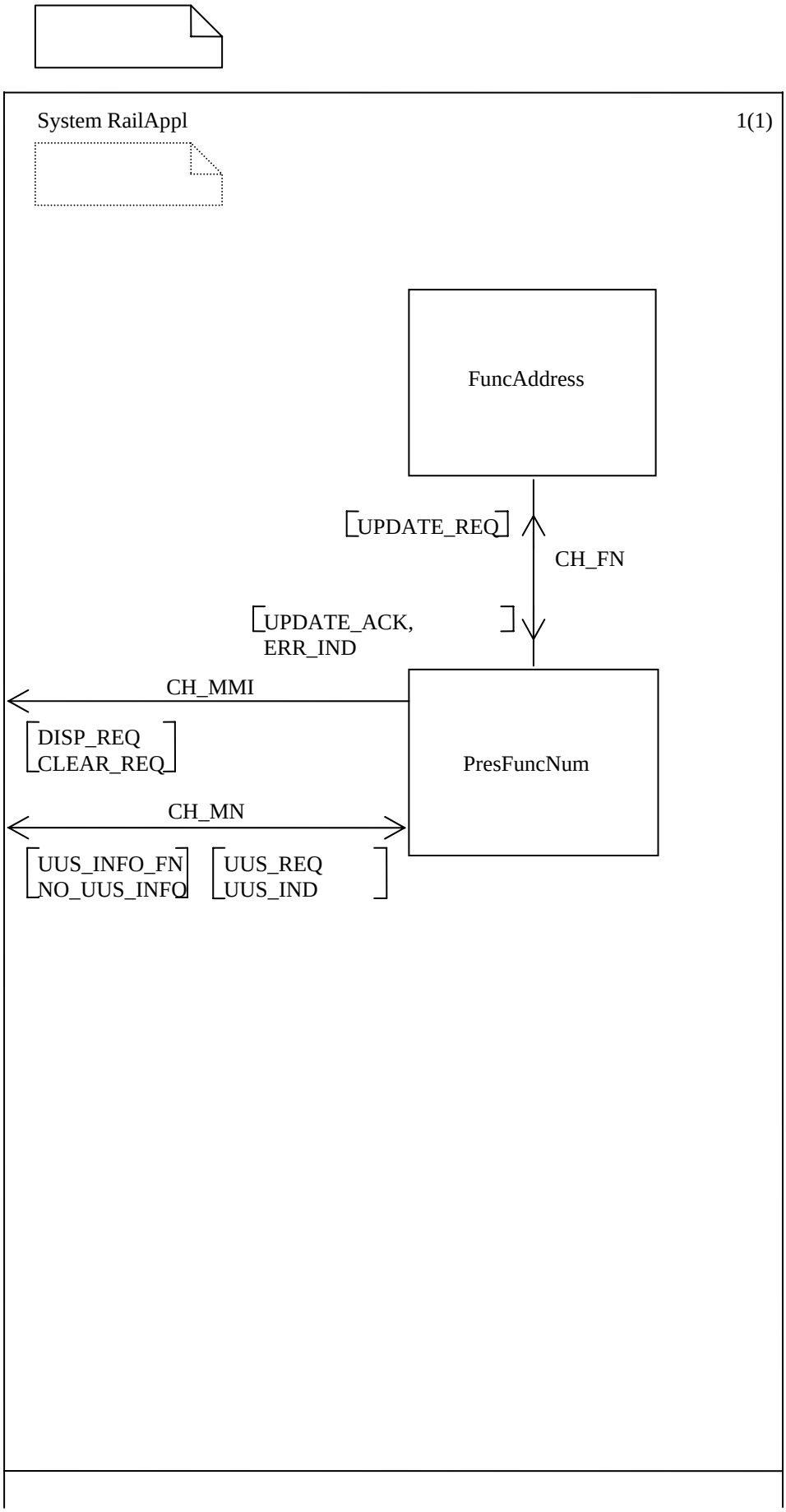
Signal	**Call control layer 3 message**
UUS_REQ	SETUP(MOC), ALERT(MTC), CONNECT(MTC)
UUS_IND	SETUP(MTC), ALERT(MOC), CONNECT(MOC)

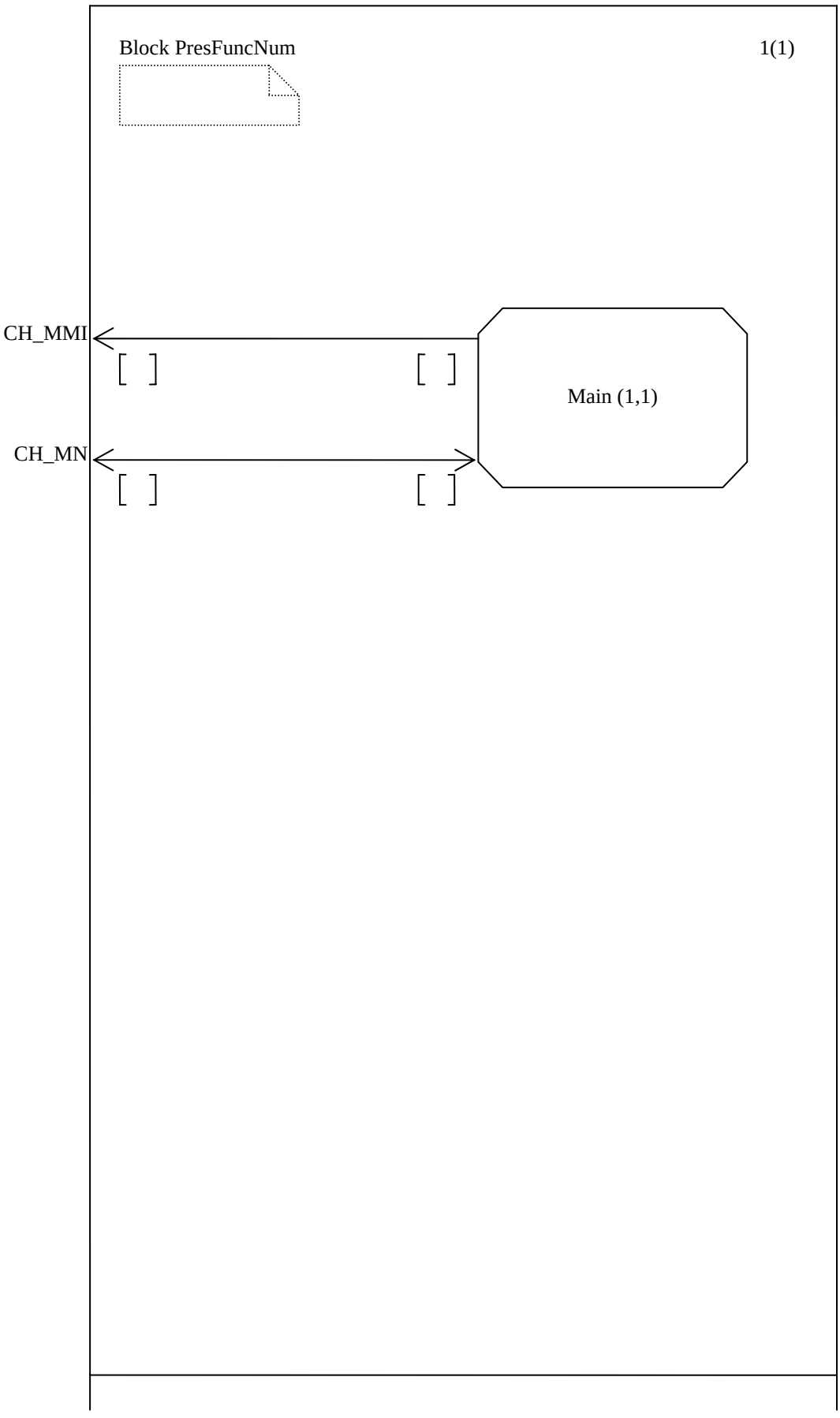
PresFuncNum is always called with UUS_REQ by the mobile network layer before sending a corresponding layer 3 message. On reception of every corresponding layer 3 message containing a UUS information element UUS_IND is used to trigger the extraction of the functional number.

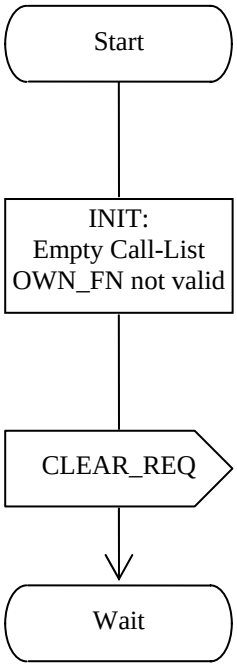
PressFuncNum administrates the calls to be handled by using a call reference (CR) provided by the mobile network layer in the signals towards PressFuncNum. The administration is done by updating a Call-List, which provides the relationship between call reference CR and the functional number FN to be displayed.

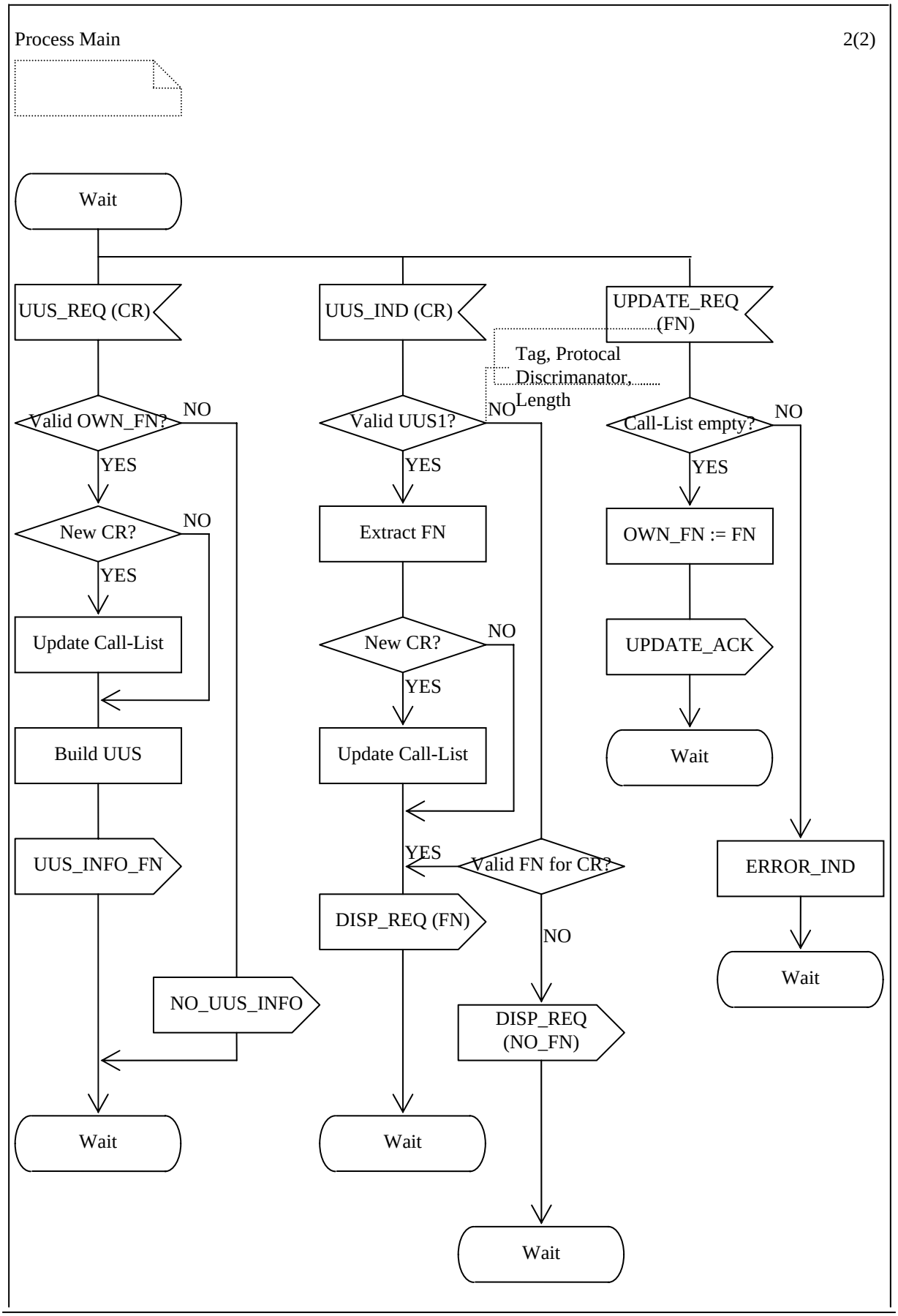
12. SDL DIAGRAMS




System RailAppl
1(1)
FuncAddress
[UPDATE_REQ]
CH_FN
[UPDATE_ACK,
ERR_IND]
CH_MMI
[DISP_REQ
CLEAR_REQ]
PresFuncNum
CH_MN
[UUS_INFO_FN
NO_UUS_INFO]
[UUS_REQ
UUS_IND]


Block PresFuncNum
1(1)
CH_MMI
[ ]
[ ]
Main (1,1)
CH_MN
[ ]
[ ]


Start
INIT:
Empty Call-List
OWN_FN not valid
CLEAR_REQ
Wait


Wait
UUS_REQ (CR)
UUS_IND (CR)
UPDATE_REQ (FN)
Tag, Protocal Discrimanator, Length
Valid OWN_FN?
NO
YES
Valid UUS1?
NO
YES
Call-List empty?
NO
YES
New CR?
NO
YES
Extract FN
OWN_FN := FN
Update Call-List
New CR?
NO
YES
UPDATE_ACK
Build UUS
Update Call-List
Wait
UUS_INFO_FN
YES
Valid FN for CR?
ERROR_IND
DISP_REQ (FN)
NO
Wait
NO_UUS_INFO
DISP_REQ (NO_FN)
Wait
Wait
Wait