| | | |
|---|---|---|
| **REFERENCE** **I 13/2 T 7001 2** | | |
| **Name of WP/Activity** Group call (shunting mode) specification Act. 2 | | **Contract:** **WP/ACT:** |
| **Company/organisation** MORANE WP 22 | **Team** | **MORANE WP/ACTIV:** 22 |

# FFFIS for SHUNTING MODE

**ACCESS** :☑ Public ❒ Restricted ❑ Confidential

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| **Approval** | R. Sarfati | 11 August 2000 | |

# EVOLUTION SHEET

| Version | Date | Author | MODIFICATION |
|---|---|---|---|
| A | 27.05.97 | KAPSCH | first draft |
| B | 25.07.97 | KAPSCH | comments after review incorporated |
| C | 9.9.97 | KAPSCH | changes after discussion with users |
| D | 21.11.97 | KAPSCH | additional registration concept, link assurance modified |
| 1 | 27.11.97 | KAPSCH | first issue |
| 2a | 31/07/00 | WP 22 | Updated version following the WP22 decision. Introduction of VBS interrupter. |
| 2b | 03/08/00 | WP 22 | FN for LAS transmitter added |
| 2 | 11/08/2000 | WP 22 | Second issue |

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## 1 REFERENCE DOCUMENTS


[1] EIRENE Draft System Specification v9.0 AA385D011 14. July 97
[2] Shunting communications approach Doc no: UG015/96 5. February 96
[3] Shunting communications analyses of proposed approach
Doc no: UG021/96 25. March 96
[4] MORANE SSRS v2.0 19. March 97
[5] MORANE FFFS for functional addressing (Ref. E 10T60013)
[6] MORANE FIS for functional addressing (Ref. E 12T60013)
[7] MORANE FFFS for presentation of functional numbers (Ref. F10T60033)
[8] MORANE FIS for presentation of functional numbers (Ref. F12T60033)

[9] ETSI GTS GSM 02.68 Voice Group Call Service (VGCS) - Stage 1
[10] ETSI GTS GSM 03.68 Voice Group Call Service (VGCS) - Stage 2
[11] ETSI GTS GSM 04.68 Voice Group Call Service (VGCS) - Stage 3
[12] ETSI GTS GSM 02.69 Voice Broadcast Service (VBS) - Stage 1
[13] ETSI GTS GSM 03.69 Voice Broadcast Service (VBS) - Stage 2
[14] ETSI GTS GSM 04.69 Voice Broadcast Service (VBS) - Stage 3

## 2 TERMINOLOGY AND ABBREVIATIONS USED

| | |
|---|---|
| EIRENE | European Integrated Railway Radio Enhanced Network |
| ETSI | European Telecommunications Standard Institute |
| FA | Functional Addressing |
| FFFS | Form Fit Functional Specification |
| FIS | Functional Interface Specification |
| FN | Functional Number |
| GSM | Global System for Mobile communications |
| $HLR_f$ | Home Location Register - for Functional number |
| ID | Identity |
| MORANE | Mobile Radio for Railway Networks in Europe |
| PTT | Push-To-Talk (button) |
| PTT | as setting-variable 'push-to-transmit' |
| RTT | as setting-variable 'release-to-transmit' |
| Qty | Quantity |
| SIM | Subscriber Identity Module |
| SS | Supplementary Service |
| SSRS | Sub System Requirement Specification |
| LAS | Link assurance Signal |
| LAT | Link assurance transmitter |
| UUS | User to User Signalling |
| UU-IE | User to User Information element |
| VGCS | Voice Group Call Service |

**Railway Dispatcher** Controller for certain railway lines or areas, usually using a special kind of fixed network terminal, sometimes also using a mobile equipment.

**GSM Dispatcher** Any fixed network subscriber having the provision of joining group calls in a priorized way. In addition to that this subscriber can be entitled to originate and terminate group calls. The basic idea of the GSM specification is that Railway Dispatchers shall have this provisions.
But to have the provision of a (GSM) dispatcher does not necessarily mean to be a Railway Dispatcher.

For definition of **Shunting leader**, **shunting member**, **link assurance signal**
refer to chapter 4.2 (Summary of requirements).

# 3 SCOPE

The aim of this document is, to specify the behaviour of GSM-R mobiles when switched into shunting mode.

# 4 INTRODUCTION

## *4.1 General*

The multi-purpose concept of the envisaged railway communication system shall offer different possibilities of usage with a minimum of different equipment. According to this, different behaviour is requested in different operational modes. The aim is to get a solution as ergonomic as possible and to offer a maximum of convenience to the user.
One of this operational modes is '**shunting mode**' which will be described in detail here.

## *4.2 Summary of requirements*

A group of personnel involved in shunting directly or indirectly should have an easy to use way for communicating with each other

One person leading the actions the so called '**shunting leader**' is entitled to initiate and release this communication link(s).
Up to three additional persons may participate in this communication, the '**shunting members'.**
In addition to that one **driver** and one **dispatcher** shall be able to be part of the communication.
Drivers normally use a different kind of mobile equipment. Dispatchers normally are fixed network participants but may also use mobile equipment.
To stay in contact with external persons the shunting leader should be able to receive and send calls during an ongoing shunting communication. But in opposite the other members should not be interrupted by other incoming calls in order not to disturb them.
All mobile members of the shunting group, except the driver, can send a **'link assurance signal'**, but only one at one and the same time for a given pushing movement

For safety reasons all this shall not prevent from receiving or sending '**shunting emergency**' calls.

# 5 MAIN CONCEPTS

## 5.1 General

As a matter of principle for GSM-group calls (VGCS), the actual composition of groups is not known by the system. Activation of stored Group IDs on SIM allows listening to an actual Group Call. This is well suited for emergency calls but not for the envisaged use of group calls in shunting mode.
Shunting group calls need to be closed groups under control of the shunting leader who participates in the group call.
To overcome this problem and to provide the shunting leader with full control over the composition of his shunting team, the mechanism of functional addressing (FA) shall be used in parallel to the group call service.

For the GSM network this two services (VGCS and FA) are independent services. A fixed relationship of functional numbers and group call reference numbers is defined in the following chapters as a part of the railway numbering plan.

With this relationship of numbers, the application-part of the mobile equipment shall perform a procedure which is described in the following of this document.

Definition of relationship between Group Call Reference Numbers and Functional Numbers:

| Table of 6 Functional Numbers | ←••••••••→ fixed relationship | Group Call Reference |
|---|---|---|
| Shunting Leader | | |
| Member #1 | | |
| Member #2 | | |
| Member #3 | | |
| Driver | | |
| Link Assurance Transmitter | | |

The complete number for a group call, the so called GROUP CALL REFERENCE is composed of two parts, the GROUP CALL AREA ID and the GROUP ID.
On the SIM only the GROUP ID is stored. The mobile ( and its user) only references to this GROUP ID when joining a call thus making this kind of calls location dependent. VBS calls for link assurance signal interruption will carry the same GROUP CALL REFERENCE as given for the dedicated shunting group call.

| Group Call Reference | = | Group Call Area ID | Group ID |
|---|---|---|---|
| max. 8 digits (qty. defined in GSM 03.68) (values defined by network-operator) | | 4 digits (qty. Defined in MORANE numbering plan) (values defined by network-operator) | 3 digits (qty. Defined in MORANE numbering plan) (values defined in MORANE numbering plan) |

When the shunting mode is invoked, a set of functional numbers is deduced from the group call reference number of the specific region. The amount of necessary functional number entries in the $HLR_f$ of a network used for shunting can be figured out with the following formula:

| Qty. of FNs | = | Qty. of shunting areas | **x** | Qty. of dedicated group IDs (20) | **x** | 6 |
|---|---|---|---|---|---|---|

### *5.2 Numbering plan for shunting group-IDs*

For every area there shall be defined:

| Quantity | Name | Usage | Group ID | Type |
|---|---|---|---|---|
| 1 | Common Shunting Group | common initiation | 500 | VGCS |
| 20 | Dedicated Shunting Group | normal shunting | 501 ... 520 | VGCS |
| 1 | Emergency Shunting Group | emergency concerning all the area | 599 | VGCS |
| 20 | LAS interruption | Interrupt the LAS of the corresponding dedicated shunting group | 501 ... 520 | VBS |

### *5.3 Numbering scheme for functional numbers for shunting*

The structure of functional numbers used for shunting as defined in the MORANE numbering plan is the following:

| 6 YYYY S M XX |
|---|

where

**YYYY** is the 4 digit working area — this shall equal the **GROUP CALL AREA ID** (defined here),

**S** is the team type = **5** (defined here)

**M** is the member with the following values (defined here)

**0** **Shunting leader**
**1** **Shunting member 1**
**2** **Shunting member 2**
**3** **Shunting member 3**
**4** **Driver**
**5** **Link Assurance Transmitter**
6 reserved
7 reserved
8 reserved
9 reserved

XX is the team number which is equal the last two digits of the group ID s of the Dedicated Shunting Groups (XX=01...20).

### *5.4 SIM card subscription*

Shunting is based on the use of the VGCS. All GIDs used for shunting must be identified at the subscription in the SIM.

During the transmission of the link assurance signal, any member of the dedicated shunting group must be able to stop the transmission. The interruption of the LAS shall be achieved by initiating a higher priority VBS call of the same group ID.

Defining the subscription parameters in the GSM-R SIM card for a MS supporting shunting, the network operator will have to apply following rules:

1. Priorities for VGCS shunting group calls and VBS “LAS interruption” broadcast calls shall be subscribed. (mandatory rule)
2. VBS “LAS interruption” GID corresponding to the shunting GID (same value) must be subscribed. (mandatory rule)

3. All VBS “LAS interruption” GIDs shall be initially de-activated on the SIM card. (mandatory rule).
4. VBS&VGCS GID used for shunting should not be subscribed in the SIM card when the shunting functionality is not provided (recommendation)

The mandatory rules should be checked by the MS to provide the shunting services.

# 6 FUNCTIONAL DESCRIPTION

## 6.1 Procedure on operational radio

Every activation or de-activation of Group IDs mentioned in the following tables are to be performed on SIM.

If no shunting group ID is present on SIM, the shunting mode shall be unavailable.

### 6.1.1 Enter shunting mode

| user action | application action – progress | Remarks |
|---|---|---|
| switch on mobile | Determine if any VGCS and VBS Group ID for shunting is already activated on SIM | necessary e.g. after battery change |
| | if any Shunting Group ID (VBS) is activated:<br>de-activate VBS GID on SIM card and proceed with next step in this table | |
| | if any Shunting Group ID (VGCS) is activated:<br>proceed with 'shunting-mode ON after interruption' procedure | |
| | if no such VGCS Group ID is activated:<br>proceed with<br>'regular shunting-mode ON' procedure | |

'regular shunting-mode ON' procedure

| user action | application action progress | Remarks |
|---|---|---|
| select shunting mode<br>dial area ID (4 digits) | Store area ID in non-volatile memory | |
| | Display selection list:<br>* leader<br>* member<br>* exit - (leave shunting mode) | |
| | Activate VGCS Group ID 500 (common ID)<br>Activate VGCS Group ID 599 (shunting emergency)<br>de-activate Train emergency<br>assign emergency button to shunting emergency number | |
| | Join to VGCS 500 | |

Shunting leader

| user action | application action - progress | remarks |
|---|---|---|
| select leader +<br>dial team number +<br>dial amount of members | Register functional number of leader for selected team,<br>store team-number and leader function-code in non-volatile memory,<br>register spare members | |
| tell members to dial team-number plus member-number | | using common group call VGCS 500 |
| | Display selection list:<br>* ID 500<br>* ID 5<team-number><br>* Leave Shunting Mode | |
| switch to team-ID | Originate Dedicated Group Call | start of conversation on dedicated group |

Shunting member

| user action | application action - progress | remarks |
|---|---|---|
| | | |
| select member | | wait for information (via Common Group ID) which Dedicated Group call to switch to |
| dial team number and member number<br>(3 digits) | Register to related functional number | information given by shunting leader |
| | if unsuccessful:<br>indicate this to user (error message)<br>remain in Group 500, allow repetition | |
| | if successful:<br>store the team-number plus the member-functional code on non volatile memory<br>de-activate group ID 500<br>activate group ID related to team number | |

'shunting-mode ON after interruption' procedure

| user action | Application action - progress | remarks |
|---|---|---|
| | Return to previous state<br>(performing the necessary checks) | |

### 6.1.2 Leave shunting mode

'shunting-mode OFF' procedure for leader

| user action | Application action - progress | remarks |
|---|---|---|
| leave shunting mode | Display selection list:<br>* release group call<br>* maintain group call<br>* abort - (stay in shunting mode) | |

release group call

| user action | Application action - progress | remarks |
|---|---|---|
| select release | Release Dedicated Group call | the leader should inform his group members to de-register their member functional numbers before releasing the call |
| | de-activate all active shunting Group Ids excluding ID 599 (shunting emergency)<br>deregister as leader<br>activate train emergency Group ID<br>assign emergency button to train emergency number<br>de-activate shunting Group ID 599 (shunting emergency) | |

maintain group call

| user action | Application action - progress | remarks |
|---|---|---|
| select maintain | | |
| | de-activate all active shunting Group Ids excluding ID 599 (shunting emergency)<br>activate train emergency Group ID<br>assign emergency button to train emergency number<br>de-activate shunting Group ID 599 (shunting emergency) | leader remains registered to Dedicated Group call |

'shunting-mode OFF' procedure for member

| user action | Application action - progress | remarks |
|---|---|---|
| leave shunting mode | de-activate all active shunting Group IDs excluding ID 599 (shunting emergency)<br>de-register as member<br>activate train emergency Group ID<br>assign emergency button to train emergency number<br>de-activate shunting Group ID 599 (shunting emergency) | |

## *6.2 Procedure on cab radio*

Every activation or de-activation of Group IDs mentioned in the following tables are to be performed on SIM.

### 6.2.1 Enter shunting mode

| user action | Application action - progress | remarks |
|---|---|---|
| power on | Determine if any of Group IDs for shunting is already activated on SIM | necessary e.g. after engine battery change |
| | if any Shunting Group ID (VBS) is activated:<br>de-activate VBS GID on SIM card and proceed with next step in this table | |
| | if any shunting Group ID (VGCS) is active:<br>proceed with<br>'shunting-mode ON after interruption' procedure | |
| | if no shunting Group ID is active:<br>proceed with<br>'regular shunting-mode ON' procedure | |

'regular shunting-mode ON' procedure

| user action | Application action - progress | remarks |
|---|---|---|
| select shunting mode<br>dial area ID (4digits) | Store area ID in non-volatile memory | driver is never shunting leader |
| | Activate Group ID 500 (common ID)<br>activate Group ID 599 (shunting emergency)<br>de-activate Train emergency<br>assign emergency button to shunting emergency number | |
| | join to Group call 500 | |
| | | wait for information (via Common Group ID) which Dedicated Group call to switch to |
| dial team number<br>(2 digits) | register to related functional number | information given by shunting leader |
| | if unsuccessful:<br>indicate this to user (error message)<br>remain in Group 500, allow repetition | |
| | if successful:<br>de-activate group ID 500<br>activate Dedicated Group ID related to team number | |
| | join Dedicated Group Call | |

'shunting-mode ON after interruption' procedure

| user action | application action – progress | remarks |
|---|---|---|
| | return to previous state<br>(performing the necessary checks) | |

### 6.2.2 Leave shunting mode

'regular shunting-mode OFF' procedure

| user action | application action – progress | remarks |
|---|---|---|
| leave shunting mode | de-activate all active shunting Group IDs excluding ID 599 (shunting emergency)<br>de-register as driver<br>activate train emergency Group ID<br>assign emergency button to train emergency number<br>de-activate shunting Group ID 599 (shunting emergency) | driver can leave shunting mode irrespective the operational state |

### 6.2.3 Handling of shunting group calls

In order to save network resources the Common Group Call should be terminated automatically by the network, in case of no voice activity for a certain period, defined by the network operator. According to this the application action 'join Group 500' described in the tables above, means either join an existing call or originate it.
Additionally to that also Dedicated Group Calls may be terminated after a certain period of no voice activity, which is defined by the network operator. Mobiles registered to terminated Dedicated Group calls shall de-register themselves from their respective functional numbers automatically.

## *6.3 Link assurance*

### 6.3.1 General

For pushing shunting operations, a special procedure must be set up to provide a link assurance signal ensuring the integrity of the crew member at the head of the train being shunted.

### 6.3.2 Main Concept

As a precondition the mobile which is enabled to transmit the link assurance tone (Link assurance transmitter, LAT) shall have activated the VGCS GID and the VBS GID of the dedicated shunting group. E.g. in case the LAT MS takes part in the shunting group 01 (VGCS 501) the LAT MS SIM shall have activated the VGCS GID 501 and VBS GID 501. Furthermore, before entering the Link assurance transmitter mode the MS shall have successfully performed a registration as Link assurance transmitter for this shunting group. This ensures that every VBS call with a GID corresponding to the VGCS GID but an higher priority as the ongoing group call will force the LAT MS to leave the ongoing VGCS call and to join the VBS call. The LAS will be stopped within the VGCS call of the dedicated group. The LAT will, after it joined the VBS call, remain in the VBS call until the VBS call is closed (by the LAS interrupter) and returns into the VGCS as listening subscriber.

The registration as Link assurance transmitter as precondition prevents other MSs to be LAT at the same time.
The MS interrupting the LAS (LAS interrupter, LAI) will, immediately after VBS call establishment, release the VBS call and join the dedicated shunting group VGCS call.

Using this feature every member of a shunting group (including the leader) can interrupt an ongoing link assurance tone by simply pressing his push-to-talk button (PTT).

### 6.3.3 PTT - states in shunting mode (excluded mobiles registered as Link assurance transmitter')

| active Group ID | uplink state | action when PTT pressed |
|---|---|---|
| | | |
| common group ID ( 500 ) | Uplink – free | uplink-request (talk) |
| | Uplink - busy (other) | no effect (local error indication) |
| | | |
| any dedicated group ID (501 .... 520) not registered as link assurance transmitter | Uplink – free | uplink-request (talk) |
| | Uplink - busy (other) | • leave VGCS group call temporarily<br>• activate corresponding VBS GID on MS SIM card<br>• originate a VBS call with the corresponding GID and a higher prority.<br>• Terminate the VBS call immediately after successful establishment of VGCS call<br>• re-enter VGCS group call<br>proceed with uplink – free case when PTT remained pushed |

### 6.3.4 Using the service

Before it is possible to transmit the link assurance tone the respective mobile (in shunting mode) has to activate the corresponding VBS GID and successfully be registered to the functional number 'Link assurance transmitter' related to the group call reference in use.

### 6.3.5 Link assurance - version A

In this version the Link Assurance button is a mono-stable button (when released the button goes back to the OFF position automatically). The PTT button is not needed in the link assurance procedure version A, but can interrupt it.

Each time the link assurance button is pressed the mobile registers itself as 'Link Assurance Transmitter' and activates the corresponding VBS GID of the shunting group on the SIM card and transmits the link assurance signal after being granted to the VGCS uplink. In case the uplink request fails, a warning signal is given to the user allowing a retrial (by releasing and pushing again). If the uplink could not be accessed within 5 seconds after the last retrial, the MS shall de-register itself from the “Link Assurance Transmitter” FN. When the Link Assurance button is released the mobile stops the transmission of the link assurance signal,

releases the uplink of the VGCS call, de-register itself as 'Link Assurance Transmitter' and deactivates the corresponding VBS GID of the shunting group on the SIM card. Pushing the PTT when the link assurance is transmitted automatically stops the link assurance signal without releasing the uplink, giving the possibility to speak. In this case de-registration of the 'Link Assurance Transmitter' and the deactivation of the corresponding VBS GID on the SIM card is done automatically by the mobile, after the PTT button is released.

### 6.3.6 Link assurance - version B

The link assurance button in this version is a bi-stable switch (after activation, when released it remains in the ON position; in order to deactivate the button a further action is needed).
When the link assurance button is switched ON the mobile activates the corresponding VBS GID on the SIM card and registers itself as a 'Link Assurance Transmitter', but the link assurance signal is not yet emitted. The actual transmission of the link assurance signal starts when the PTT button is pushed. By pushing the PTT button an uplink request is send and the actual transmission of the link assurance signal starts after the reception of the VGCS uplink grant. In case of a uplink busy, a warning signal informs the user of the failure.

The pushing of the PTT button has to be done periodically in order to continue the transmission (refer to Chapter 'Alive Assurance').
When the link assurance button is switched off the mobile de-registers itself, deactivates the corresponding VBS GID and the function of the PTT button returns to normal (talk) operation.

### 6.3.7 Interruption of link assurance signal

Every member of a shunting group including the leader, can interrupt the transmission of the link assurance tone by simply pressing his PTT.
This is also applicable for the transmitter of the link assurance tone, except in version B, where he has to switch off the link assurance button first.

### 6.3.8 Incidentally pressed PTT

When the link assurance tone is transmitted every member has to take care not to press accidentally the PTT.

In case a listening member (MS A) of the shunting group presses the PTT button while the uplink is granted to another member of the group, MS A will activate corresponding VBS GID on the SIM card and perform a service subscriber initiated VBS call set-up without any further consequences to the shunting group, since there is no shunting group member with activated VBS GID.

In case the PTT is pressed unintentionally while the LAS is transmitted, the LAS transmission will be stopped due to the VBS call that triggers MS pre-emption on the LAT MS. All other shunting group members will remain in group call receive mode of the dedicated shunting group. The LAT MS will, immediately after the VBS call was released, return into group call receive mode of the dedicated shunting group.

### 6.3.9 Signalling procedure for interruption of link assurance signal

The mobile which set-up a high priority VBS call shall use Fast call set up procedures as defined in [13]. After successful set-up the originating mobile shall release the call immediately and return into the Dedicated Group ID as listening subscriber.
The receiver of this high priority call shall perform called party pre-emption in order to join the VBS call and, after the VBS call was released, return into group receive mode of the dedicated shunting group call.

### 6.3.10 Link assurance signal

The link assurance tone shall be an audible intermittent signal, with approximately two seconds on and one second off period. For the user it should be recognisable as a tone, similar to an 800-850 Hz sine-wave tone.

## *6.4 Alive assurance (applicable only for version B)*

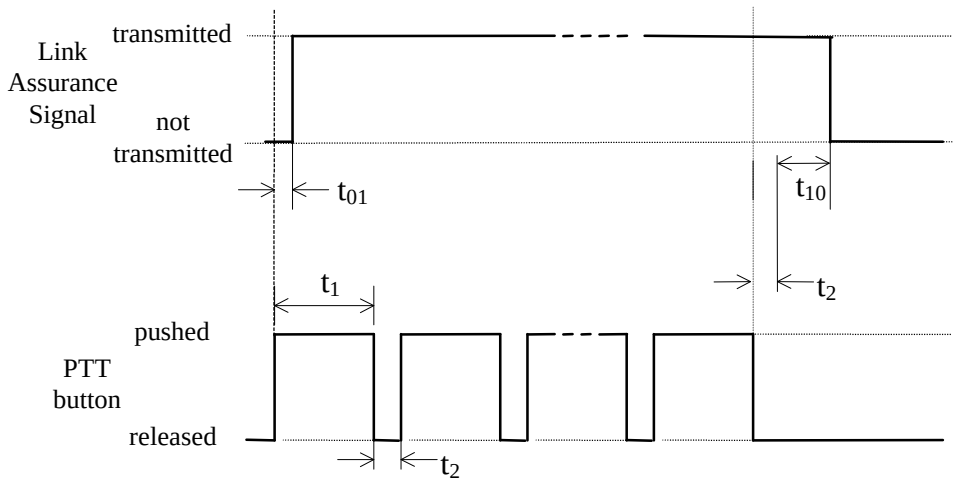
### 6.4.1 General

The link assurance procedure of version B ensures the integrity of the transmission excluding the person pressing the PTT. Defining a certain duty cycle for pressing the PTT ensures also the integrity of the personnel, assuming that this is very unlikely to happen automatically in case of any accident.

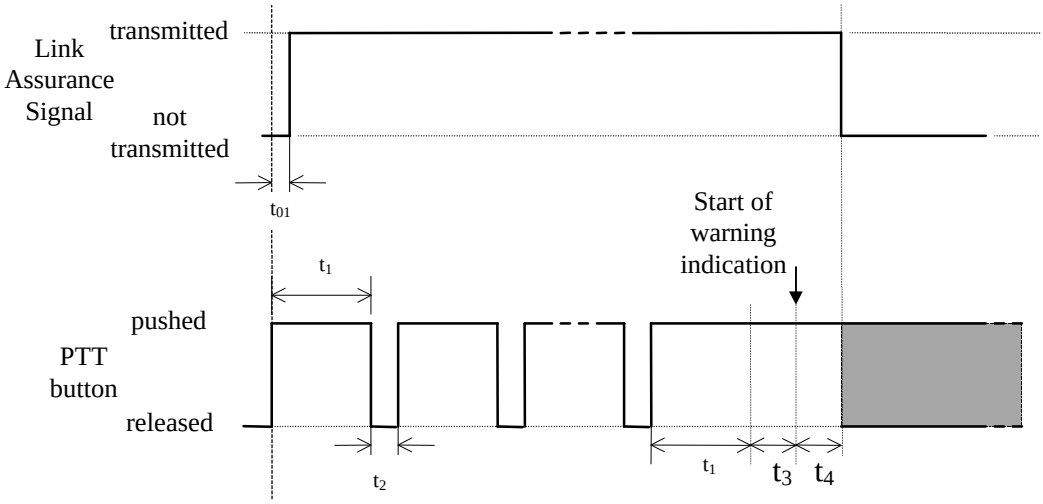
### 6.4.2 Functional description

As already described, the user has to press the PTT-button repetitively instead of continuously with a given duty-cycle.
When the set time expires a warning is given to the user, similar to the safety device for drivers. After a certain time without reaction the PTT-state is released irrespective of the position of the PTT-button. The following drawings shall illustrate this:

Timing for normal usage
Definition of $t_{01}$, $t_{10}$, $t_1$, and $t_2$



Timing for 'Transmission stopped, because PTT pressed continuously'
Definition of $t_3$ and $t_4$




| settings | time | usage |
|---|---|---|
| | $t_{01}$ | delay between pressed PTT and transmitted link assurance signal |
| | $t_1$ | nominal duration of pressed PTT |
| | $t_2$ | nominal duration of released PTT |
| | $t_3$ | time after which a local warning indication reminds the user to release PTT |
| | $t_4$ | time after which the transmission is stopped, regardless the PTT is pressed or not |
| | $t_{10}$ | time after which the transmission is stopped when the PTT remains released |
| | | |
| PTT-max | $t_1+t_3+t_4$ | max. duration of pressed PTT |
| PTT-min | $t_{1\ min}$ | min. duration of pressed PTT |
| | | |
| RTT-max | $t_2+t_{10}$ | max. duration of released PTT without stopping transmission |
| RTT-min | $t_{2\ min}$ | min. duration of released PTT without stopping transmission |

### 6.4.3 Timing values

The timing-values of the described function shall be settable by maintenance-staff and remain stored in the application part of the mobile. Every change of the PTT-position shall restart the timer accordingly.

| setting | | range of values | step size of values |
|---|---|---|---|
| PTT-max | $t_1+t_3+t_4$ | 1 - 10 seconds | 1/10 second |
| PTT-min | $t_{1\ min}$ | 0 - 9 seconds ( if 0 triggered with transition only) | 1/10 seconds |
| | | | |
| RTT-max | $t_2+t_{10}$ | 1 - 10 seconds | 1/10 seconds |
| RTT-min | $t_{2\ min}$ | 0 - 9 seconds ( if 0 triggered with transition only) | 1/10 seconds |