GSM-R (IVRS) Radio system

Handbook

RS/520 Issue 1
GSM-R (IVRS) Radio system Handbook

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You will need this GSM-R (IVRS) handbook if you use the IVRS radio system and carry out the duties of a:

- signaller
- driver.

This symbol indicates extra information or guidance regarding the instructions.
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GSM-R (IVRS) is the acronym used for Global System for Mobile Communications - Railways (Interim Voice Radio System).

IVRS has been introduced to provide emergency communications between the driver and signaller in areas where axle counter train detection has replaced conventional track circuits.

IVRS makes early use of the GSM-R network currently being introduced across Great Britain.

Signalboxes in an IVRS area are provided with a ‘dispatcher’ radio terminal. Drivers are provided with a portable handset known as an ‘Operational Portable Handheld’ (OPH) or may make use of fixed GSM-R equipment provided in train cabs.

Areas fitted with IVRS are shown in table A of the Sectional Appendix and it is within these areas that these instructions must be applied.

Lineside signs will indicate to the driver the entry to and the exit from each IVRS radio network area. No action is required on passing the signs.
IVRS provides basic voice communication from a driver to a signaller in the form of a group call in the event of an emergency by pressing a single ‘emergency’ button on an OPH.

The signaller cannot send an emergency call to a driver.

The IVRS system is not designed to support point-to-point calls between OPHs and individual numbers are not revealed to users.

IVRS cannot connect to the public mobile telephone network (GSM-P), neither can it connect to public or railway fixed networks for point to point calls. It can be used for 999/112 emergency calls: such calls are routed to the Railway Emergency Operator.

IVRS does not support the sending of text messages.

The SIM card provided with an OPH provides information for the system to identify the caller and it must not be removed or swapped with any other SIM card.

Routes fitted with IVRS are provided with Base Transceiver Stations (BTS) at intervals of approximately 3 miles or 5 km. The location of a BTS defines a ‘cell’ or area of radio coverage. Each BTS can handle up to 6 calls at the same time.

All calls made via IVRS are recorded.

IVRS must only be used for railway emergency calls. It must not be used for any other form of train control or movement authority.
Example of Sagem OPH 940
Example of Sagem TiGR 350
Example of Selex ROG 100
3.1 When a driver must have an OPH

You must have a working OPH when driving a train that is to pass through an IVRS area unless the train is fitted with working GSM-R radio, or a cab secure radio (CSR) and the train will remain in a CSR area.

3.2 When the OPH must be switched on

You are responsible for charging the OPH and you must check the battery level is sufficient.

You must make sure the OPH is switched on at the start of your journey and not just before you enter an IVRS area. You must make sure that the OPH is kept in a position in the cab where it can be heard. It must not be kept in a pocket or bag.

As the OPH is not designed to be safe to use in hazardous areas, you must not operate it within locations such as fuel depots and traction unit engine rooms.

3.3 When the OPH must be used

You must use the OPH whenever there is a requirement to give immediate advice to the signaller of the need to stop or caution trains in connection with an accident, obstruction or other emergency.

The IVRS equipment must not be used in any other circumstances or by unauthorised users.
3.4 Turning the OPH on

After being turned on the display will power up after about 5 seconds and the message ‘loading please wait’ appears. The handset will immediately perform a self test of the display and battery.

When switched on the display screen may display the words ‘Unknown Identity’ - this is normal and you need not take any action.

If, when you switch on the OPH a message ‘Group 299 call disabled’ appears on the display, you must press the cancel button C. The OPH will then switch on in the normal way.

In an area without IVRS coverage, the handset display will normally show the battery condition along with an indication that there is no available signal and a red flashing light located on the top of the handset.

When within an IVRS area, the display will normally show the battery condition, the signal strength along with a green flashing light located on the top of the handset. The screen will also display the words ‘Network Rail IVRS GB’ or 234 12 depending on the location.
3.5 Using the keypad lock

The keypad must be kept locked at all times to prevent inadvertent operation of buttons, unless the handset is being turned off. According to the type of handset, the keypad lock can be applied automatically or it may have to be set manually.

The keypad lock does not prevent operation of the emergency button or incoming calls being received or answered.

3.6 Switching between loudspeaker and earpiece

You may change an incoming call from loudspeaker (handsfree) to earpiece operation by pressing the green telephone button.

3.7 Altering the OPH volume

The incoming speech volume can be altered by using the buttons on the right hand side of the handset while a call is being made.

3.8 Turning the OPH off

The OPH must not be turned off until you have completed your turn of duty.
Example of Dicora S
Signaller’s terminal
4.1 Signal box equipment

Each signaller’s position in an IVRS area will be equipped with a dedicated desk-top terminal incorporating:

- a lift-off handset
- a volume control
- a loudspeaker device.

Where a GSM-R fixed terminal is provided, IVRS emergency calls can be received on it.

4.2 Using the signaller’s terminal

You must only use the signaller’s terminal for the purposes of emergency communication with train crews.

You must not use the signaller’s terminal for point-to-point calls except for the purpose of testing as described in section 9 of this handbook.
5.1 Initiating a railway emergency call

You must first visually check that the OPH is operational by observing the flashing green LED and the network code ‘234 12’ or ‘Network Rail IVRS GB’ is displayed. It may be necessary for you to leave the cab and go to track level, away from the train, in order to receive a network signal.

You must use the emergency button to send the emergency call in accordance with the individual handset instructions, either by pressing and holding the button until a double ‘beep’ is heard or by two separate presses of the button. Observe that the display indicates ‘EMERGENCY’ or ‘Emergency Call’.

You must wait until the signaller answers the emergency call. You will not hear a ring tone while you are waiting.

If there is a delay in connecting the call, the screen will change and the following words will be displayed ‘Emergency call in progress’.

If you are not connected to the signaller within 40 seconds, you must end the call as shown in 5.4 and contact the signaller by the quickest possible alternative means. You must not attempt a second railway emergency call using IVRS.

5.2 Routing of emergency calls

Railway emergency calls made from a registered OPH within the IVRS area will normally be routed automatically to the correct signaller.

If the call originates in the overlap between signaller boundaries it will be routed to more than one signaller. In this case either signaller could answer.
5.3 Talking to the signaller

When the signaller answers your emergency call, you must press the push-to-talk (PTT) button on the left hand side of the handset to talk to the signaller. The display will prompt you with an icon of a pointing finger. Wait one second after pressing the PTT before speaking to allow PTT to be established on the network.

You will not be able to use the PTT button if any numbers are displayed in the screen. Remove the numbers by using the cancel button C.

Speak using standard railway radio protocols and end your phrase with ‘over’.

You must then release the PTT button to hear the signaller.

Do not press the PTT button if you are not the person who initiated the railway emergency call, as doing so will prevent the driver who did from talking to the signaller.

5.4 Ending a railway emergency call

You must only end an emergency call that has been established when instructed to do so by the signaller.

When communication with the signaller is over, or you need to end the call as shown in 5.1, you must clear down the call as shown in 8.2.

5.5 Accidental emergency call

If an accidental railway emergency call is made from your OPH you must not clear down the call or switch off the OPH. Instead you must complete the call to the signaller explaining the circumstances and that there is no railway emergency taking place.
6.1 Railway emergency call configuration

The IVRS network is divided up into cells which may vary in size.

In the event of a railway emergency call being initiated, it will be received by the signaller and any other OPH that is registered on the IVRS network and is within the ‘service area’ of the call.

The ‘service area’ is the cell in which the call originates plus additional adjacent cells as determined by geography and permissible speeds.

Railway emergency call configuration

Any OPH registered on the network which subsequently enters the area after an emergency call has been established will automatically be included in the ongoing call.
6.2 Railway emergency call is received

When a railway emergency call is received you will hear the unique ‘emergency call’ tone on the OPH and the display will illuminate with ‘EMERGENCY CALL’.

After approximately three seconds the OPH will automatically answer the railway emergency call in loudspeaker mode and at maximum volume.

In most circumstances the first voice that you will hear will be that of the signaller.

You do not need to immediately stop your train upon receipt of an emergency call but you must listen carefully and follow the instructions given by the signaller.

You must not attempt to talk to the signaller if you did not initiate the emergency call unless the signaller specifically requests it. This is because you may prevent the originator from speaking to the signaller and may prevent you hearing the signaller’s instructions.

6.3 Railway emergency call is received but is not understood or is terminated early

If you receive an emergency call which is not understood for any reason, such as:

- no speech received
- poor reception
- call dropped out or timed out before any understanding reached

you must immediately reduce to a speed that will enable your train to be stopped short of any obstruction.

You must then proceed to the next location where you can contact the signaller.
7.1 Railway emergency call is received

When a driver initiates a railway emergency call you will hear the unique emergency call tone on your terminal and the display will illuminate with the message ‘EMERGENCY CALL’.

The name of the BTS in the cell where the call originated will also be displayed, for example ‘HEM HEATH’.

The name of the BTS will not be updated on the display if the train moves into another cell during the call.

You must answer the emergency call by lifting the handset and waiting one second to make sure the call is established.

You are expected to speak first, as soon as possible after connecting the call, as the driver will abandon the call if they do not hear you within 40 seconds.

Speak using standard railway radio protocols, clearly identifying your signalbox and end your phrase with ‘over’.

You do not need to use the PTT button to speak as its function is disabled on the signaller’s terminal.

You must establish the details from the call originator which as a minimum will include:

- train reporting number
- location
- nature of emergency
- lines affected.

You must immediately take the necessary action to protect the line in accordance with the relevant rule book modules. If for any reason you cannot provide signal protection you must instruct all trains that can hear the emergency call to stop immediately.
You must as soon as possible inform Operations Control of the incident including the details that you received from the driver, and request that an emergency NRN broadcast be made in the area concerned. Operations Control will determine in which NRN base station areas to broadcast based on the location that you give them.

**7.2 Railway emergency call is received by more than one signaller**

If a train is in the overlap area between cells or at a boundary between signallers’ areas then the emergency call could be routed to more than one signaller.

Both signallers, who may be in different signalboxes, will receive the emergency call tone and both can answer the call. The call will remain active on both signallers’ terminals unless action is taken to clear it.

If you are the first signaller to answer the emergency call and you determine that the call has been made from an OPH which is outside your area of control, you must immediately contact the correct signaller by the quickest possible means, sending the emergency alarm if necessary.

If you have made sure that the emergency does not involve you and that the correct signaller has received the call, you may exclude yourself from the emergency call.

**7.3 Railway emergency call is received from an OPH in a fringe area**

If a railway emergency call originates from an OPH in a fringe area which is provided with IVRS coverage but is not within your area of control, you must immediately contact the signaller concerned, sending the emergency alarm if necessary and give the relevant details.
### 7.4 Second railway emergency call is received

It is possible that while a railway emergency call is being dealt with, a second call is received. You will receive an audible alert and the display will show the location of the second call with a small mobile phone icon that tilts from side to side.

You must answer the second call within 30 seconds or the system will discard the call.

You must therefore finish the first call and answer the second call, or inform the driver who made the first call that they will be placed on hold whilst you answer another emergency call.

You can only place a call on hold for five minutes, after which time the system will clear it down.

### 7.5 Unable to establish the location of a railway emergency call

If you are unable to establish where a railway emergency call has originated from, you may use the navigation button to display the list of calls received. This will show the BTS that the call was received from.

If a driver with a connected call moves out of the area of IVRS coverage or moves out of the service area of the connected call then the call will be ended suddenly.
8.1 When a call may be cleared down

A railway emergency call may be cleared down by either the driver who originated the call, or by the signaller.

A driver must not clear down a railway emergency call that has been established unless instructed to do so by the signaller.

A railway emergency call cannot be cleared down by any other OPH user included in the call.

8.2 Driver clearing down a call

After you have been instructed to clear down the railway emergency call by the signaller you must press the red telephone button once, or press the appropriate softkey as detailed in individual handset operating instructions.

Do not hold the button in or you may turn off your OPH.

You must check that your OPH is still switched on after clearing down a call.
9.1 Weekly tests

Weekly testing will take place to prove the functionality of the system by a point-to-point call being made to a signaller’s terminal. The call will be made from a different Base Transceiver Station area each week according to local instructions. You must co-operate with these tests.

9.2 Other periodical tests

You must co-operate with any other periodical testing as shown by local instructions or any other exceptional testing as required.
10.1 Faulty or lost OPH

A lost, stolen or faulty OPH must be reported to the Help Desk at Network Rail Telecomms Support Centre Doncaster, telephone internal 085 32196 or external 01904 382184 which will make the necessary arrangements.

10.2 Faults to IVRS system

You must report revealed faults such as partial or complete loss of the IVRS system to Operations Control and any adjacent signalbox, if required.

You must also report incidents of system misuse.

You must implement any local instructions concerning train movements through the affected area.

The Operations Control will advise the Help Desk at Network Rail Telecomms Support Centre Doncaster, telephone internal 085 32196 or external 01904 382184, and train operators’ controls.