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Willtek GSM-R

GSM-R provides new features to the GSM feature set

Voice Group Call Services (VGCS)

Voice Broadcast Services (VBS)

Enhanced MultiLevel Precedence
and Pre-emption services (eMLPP)



The 4202R service tester allows technicians to test the VGCS and some intrinsic aspects of eMLPP. The purpose for these new "signalling" features is to test security-related devices on the locomotive. The cab radio is connected to indicator lights or horns, which are activated upon receipt of an emergency call. This test ensures the accurate functioning of all alarm cables and components.

In order to completely test VGCS, a new test SIM card is required. The card contains a subdirectory for GSM-R where fields and parameters for railway related features are provided.

Understanding group and emergency calls

A group call is identified by its group identity, which is assigned by the operator and stored on the SIM card. On the Willtek test SIM, groups 200 and 515 to 520 are activated. The group ID for emergency calls is 299. Additionally, different priority levels indicate the importance of each call. Specifically, if no more radio resources are available, an ongoing low-priority call can be cancelled to allow access for a high-priority call. An urgent call preempts any other call. The priority levels range from A, B, 0 to 4. "A" indicates highest and "4" lowest priority. Emergency calls are usually assigned a priority of "0", standard group calls are level "4". Table 1 lists typical settings for group ID and priority level.

	Group ID	Priority level
Emergency call (Group 299)	299	0
Group 200	200	4
Group 520	520	4

Table 1. Typical settings of group ID and priority levels

If a GSM-R phone originates or receives an emergency call, it sends a status message to the network once the emergency call has been completed. The phone sends the status message in a normal call setup to a specific phone number (1612); the call is cleared immediately upon delivery of the message. The network (tester) must confirm this status message. The procedure used in this context is called "user-to-user" signaling, or "U2U" for short. Failure to do this results in the phone attempting to send this status message 10 times before giving up. This is an important feature for testing because subsequent to an emergency call the test set needs to expect additional signaling and respond accurately to the phone. Failure to do this will result in the phone attempting to send this status report repeatedly, thus blocking the phone, resulting in slow reaction, and the tests will proceed incorrectly.

This application note describes the procedure to be followed during testing in order to avoid this blocking.

Networks stored on the test SIM

Another interesting aspect is that the SIM card also lists networks which support certain features of GSM-R. If a network is not listed on the SIM card, the phone will not attempt to establish group calls in this network. There are two networks listed on the SIM card, which are the German Railway network (DB: MCC: 262; MNC: 10) and the test network (MCC: 001; MNC: 01). These networks are stored to support testing of VGCS, VBS and eMLPP. If the 4200 does not simulate one of these networks, the phone may simply not be able to perform group calls.

Preparing for testing

In the 4200, select "VGCS (GSM-R)" as your mode of choice (see Figure 1).

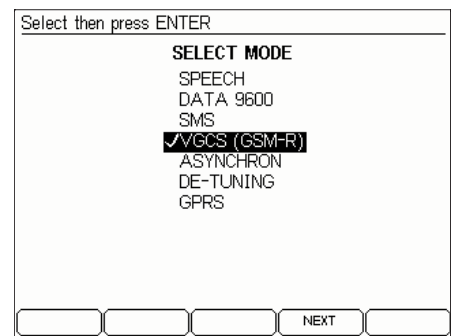


Figure 1. Mode Selection screen of 4200

After the VGCS mode has been selected, the basic Voice Group Call Service menu appears, as shown in Figure 2.

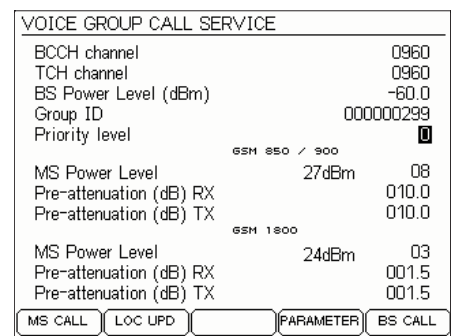


Figure 2. Basic menu for Voice Group Call Services

On the basic menu, the user can select the channel number (BCCH and TCH channel), the power level at which the tester transmits (BS Power Level), the Group ID and Priority Level to be used for calls to the mobile, and finally, the MS Power Level. If the user wants to simulate a different network, the mobile country code (MCC) and mobile network code (MNC) can be entered on the parameter screen, which is activated by pressing the "PARAMETER" button.

VGCS call from the tester

Operation of the 4200 is relatively simple. Pressing the "BS CALL" softkey will originate a group call to the terminal with the selected group ID and priority level. With the settings in Figure 2, the VGCS call will be an emergency call. If a different group ID and priority level is selected, the call can be a standard group call. Once the call is active, the 'VGCS BS Call active' menu will be displayed (Figure 3).

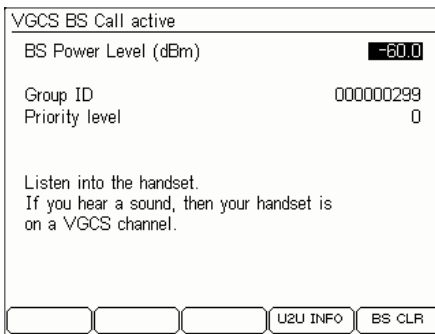


Figure 3: 'VGCS BS Call active' menu

The BS call is quite specific, as from the test set side there are no means of verifying whether the phone is actually listening to the group call or not. Therefore the 4200 transmits a pure sine wave signal on the traffic channel for the VGCS.

This means that in the successful case a signal is audible from the loudspeaker of the phone. A VGCS call is always disconnected from the tester side; this relates to the operation of the unit, since a call in a real network can be terminated either by the network or the user. The 'VGCS BS Call active' menu offers two different means of disconnecting the group call:

1. BS CLR; this will simply put down the call and return the screen to the basic menu. This button is used when a normal group call has been established.
2. U2U INFO; this will also put down the call, but then the tester will wait for a status message, as after an emergency call. Press this button to put down an emergency call!

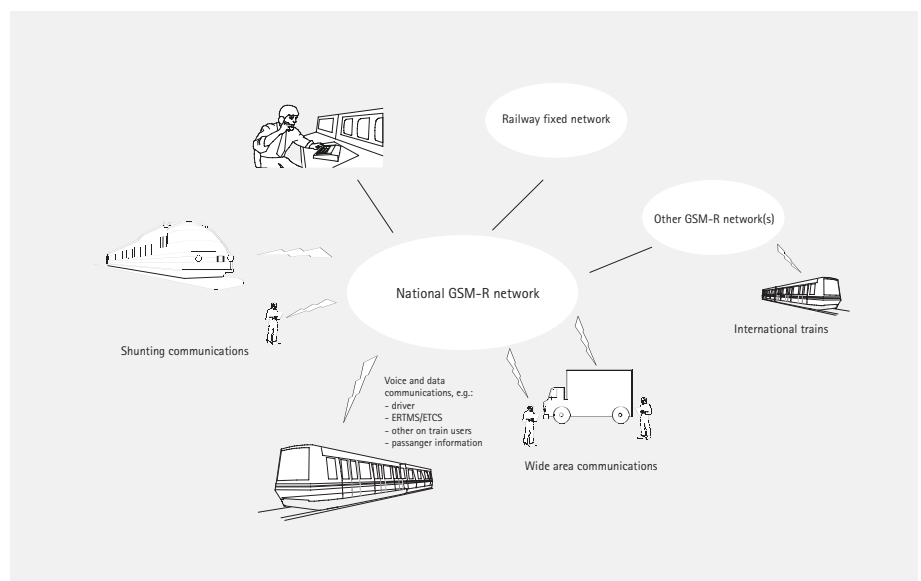
If the "U2U INFO" button has been pressed the tester will release the call and return to the basic VGCS menu. At the same time a "Wait" box opens and informs the user that "User to User Information is expected". This box will disappear once the phone has sent the User-to-User Information or Status message.

Note:

If the "U2U INFO" button has been pressed during a normal group call, it is sufficient to press the "Esc" key to resume normal operation.

If an emergency call is terminated without pressing the "U2U INFO" button, the phone will try to set up the status message as often as 10 times. This, of course, influences the phone's behaviour, making it react very slowly to additional commands. Switching the phone off and on does not help since the information whether the status message has been sent successfully is stored on the SIM! A good way to establish whether the phone is affected by problems of this type is to select "Speech" mode and select MS Call. If a phone call to the number 1612 is detected then the phone is still attempting to send the status message.

In this case, select BS Call (no Emergency Call) on the Voice Group Call Service menu and press "U2U Info" immediately after the VGCS BS Call active menu appears. Repeat this procedure until the "Wait" box appears and remains indefinitely; then hit Esc. This procedure will clear any outstanding status message in the GSM-R terminal and SIM.



VGCS call from the mobile

If the user has pressed "MS CALL" on the basic menu, the user is requested to set up a group call. It is important here that the user, after successfully setting up a call, continues pressing the "PTT" (push-to-talk) button of the terminal throughout the test! If the button is released, the phone tries to switch to listening mode. This procedure to switch from talker to listener mode and vice versa is not supported by the tester and will result in call termination. The phone keeps transmitting during the group call and as long as the "PTT" button is pressed. The measurement results are shown on the test set screen (Figure 4).

VGCS MS Call active	
TCH channel	0960
BS Power Level (dBm)	-60.0
MS Power Level	27dBm 08
Group ID:	000000516
Priority level:	4
MS Pwr:	27.4 dBm
Phase RMS:	2.19°
Phase Peak:	5.88°
Freq.Err:	15 Hz
Rx Level / Rx Qual.:	49 / 0
Power/Time Template:	Fail
Burst Length:	549

U2U INFO BS CLR

Figure 4. Measurement results of VGCS call from mobile

On the measurement screen, the tester shows the group ID, i.e. the group number that the user has selected and to which the call has been initiated. Furthermore the priority level is indicated, this is usually assigned by the phone and depends on the group. All other parameters are standard RF measurements as they are also reported back on standard measurement screens (please see the manual for additional details). To terminate the group calls, the same applies as for calls from the tester; there are two buttons available: "U2U INFO" and "BS CLEAR". The first one is used to clear down emergency calls; the second applies to standard group calls.

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