



2G, 3G Network Planning and Optimization...

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4.10 Systematic Important Timers

4.10.1 T3101

I. Definition

T3101 is the BSC timer controlling time of immediate assignment process.

II. Format

T3101 ranges from 0 to 255s. The recommended value is 3s.

III. Configuration and Influence

In an immediate assignment process, the BSC requires BTS to provide SDCCH to set up signaling channel. When the BSC sends a channel activation message, T3101 starts timing. When the BSC receives the setup instruction sent by BTS, T3101 stops timing. When T3101 expires, the system releases corresponding SDCCH resources. Proper configuration of T3101 reduces congestion due to dual assignment SDCCH effectively.

The greater the T3101 is, the longer the inefficient time for using signaling resources is. For example, if the extended transmission delay is improperly configured (usually the sum of T and S is over small), the MS fails in responding to the network side, so the MS resends the random access request message.

Therefore, the network side will assign SDCCH (the network cannot distinguish the repeated sending access request from the first send). For better use of signaling resources, especially in activating queue function, you must configure T3101 to a smaller value. The minimum interval for sending channel activation message and receiving setup indicator is 600ms. For non-overload BSS, the maximum interval is 1.8s.

4.10.2 T3103

I. Definition

In inter- and intra-BSS handover, the BSC determines the time for keeping TCH both in handover-originated cell and target cell. When the time receives handover completion (intra-BSS) or clearing (inter-BSS) message, T3103 stops.

II. Format

T3103 ranges from 0 to 255s. The recommended value is 5s.

III. Configuration and Influence

The following paragraph is an example of inter-BSS handover.

When T3103 receives the handover command, it is reset and starts timing. When it receives clearing command, it is reset. This means that T3103 reserves two channels when it is timing, one channel for source BSC, and one channel for target BSC. If it is over long, two channels are occupied for a long time and resources might be wasted.

According to the tests, if the NSS timer is properly configured, the handover process occurs within 5s. Therefore, the recommended value is 5s.

4.10.3 T3105

I. Definition

See the protocol 0408 and 0858. When sending physical information, the network starts T3105. If the timer expires before receiving any correct frames from MS, the network resends physical information and restarts the T3105. The maximum repeated times is Ny1.

II. Format

T3105 ranges from 0 to 255, with unit of 10ms.

III. Configuration and Influence

The physical information is sent on FACCH. The time for sending four TDMA in a time on FACCH is about 18ms. If the next physical information is just sent 18ms after the first one, probably the first physical information is still being sent. The minimum time for sending physical information continuously and most quickly is 20ms.

IV. Precautions

T3105 is related to the timer NY1. If T3105 is small, configure NY1 to a greater value. If a handover trial fails and the T3105 of the target cell expires for Ny times before the original

cell receives the HANDOVER FAILURE message, the target BTS sends the CONNECTION FAILURE INDICATION message to the target BSC.

The counter of target BSC is renewed though MS might return to the original channel. To avoid this, the T3105 must meet the following formula:

$$N_y * T3105 > T3124 + \delta$$

Wherein, delta is the time between expiration of T3124 and receiving HANDOVER FAILURE message by original BSC.

4.10.4 T3107

I. Definition

T3107 is a BSC timer, restricting the time for executing TCH assignment instruction. It caters for TCH assignment of intracell handover and channel assignment of calling.

II. Format

T3107 ranges from 0s to 255s. The recommended values are as follows:

- 10s when channel resources are enough.
- 5s when channel resources are limited.

III. Configuration and Influence

T3107 starts after the BSC sends the ASS_CMD message to BTS. It stops after the BSC receives the ASS_CMP or ASS_FAIL message sent by BTS. If T3107 expires, the system judges that the MS disconnects to the network, so the occupied resource is released to other MSs. According to the measured statistics result of network, the channel assignment is complete within 2s. If the BSC does not receive ASS_CMP message after 2s, the assignment command fails.

If the radio link is bad and some information must be resent, the process might be prolonged to 5s. To avoid premature disconnection, configure T3107 to 10s. In this way, the MS can reuse the original channel when handover or assignment fails. Therefore the call drop due to intracell handover decreases or the system service quality of re-assignment is improved (if the system supports re-assignment function). However, the channel resource might be wasted for several seconds. When the network capacity is limited, you must save the resource as possible.

4.10.5 T3109

I. Definition

The BSC restricts the releasing resource of SACCH by T3109.

II. Format

T3109 ranges from 3s to 34s. The recommended T3109 is as follows:

$$T3109 = a + \text{RadioLinkTimeOut} \times 0.480s, a = 1s \text{ or } 2s.$$

III. Configuration and Influence

T3109 measures the time for channel releasing indicator after sending MS clearing instructions. It starts after the BSC sends DEACT_SACCH message to BTS. It stops after the BSC receives the REL_INC message sent by BTS. When T3109 expires, the BSC sends the CLEAR REQUEST message to MSC.

IV. Precautions

The sum of T3111 and T3109 must be greater than RadioLinkTimeOut. If T3109 is over small, the corresponding radio resources are re-allocated before RadioLinkTimeOut is due (radio link is not released).

4.10.6 T3111

I. Definition

T3111 is a connection release delay timer, used in deactivation of delayed channel after disconnection of major signaling link. T3111 aims to spare some time for repeated disconnections. When BSC receives the REL_IND message sent by BTS, T3111 starts. For time protection, T3111 stops until expiration and the BSC sends the RF_CHAN_REL message to BTS.

II. Format

T3111 ranges from 0s to 5s.

The recommended value is 2s.

III. Configuration and Influence

After the disconnection of major signaling link, T3111 delays the release of channels. It allows the base station to retransmit the instruction for releasing radio channels to MS within delayed time. After the base station sends a release request message, the radio resources remain for T3111 time.

If the system capacity is small, configure T3111 as short as possible. The minimum value of T3111 is 2s, over five multiples of the time for resending MS the instruction for releasing radio channel resources. A greater T3111 might be of no help, but affects congestion of SDCCH and TCH easily.

4.10.7 Parameter T3212

I. Definition

In a GSM network, the causes to location updating are as follows:

- The MS attach.
- The MS detects that its location area changes.
- The network forces MS to update location periodically.

The network controls how frequent the MS updates location, and the period for location updating is determined by the parameter T3212.

II. Format

T3212 ranges from 0 to 255, with unit of 6 minutes (1/10 hour). If T3212 = 1, it means that T3212 is 6 minutes. If T3212 = 255, it means that T3212 is 25 hours and 30 minutes. If T3212 = 0, it means that MS is not required for periodical location updating in the cell. The recommended T3212 is 240.

III. Configuration and Influence

As an important means, the periodical location updating enables network to connect to MSs closely. Therefore, the shorter the period is, the overall service performance of the network is. Anyhow frequent periodical location updating brings two negative aspects:

- The signaling flow of the network increases sharply and the utilization of radio resource declines. When the period is over long, the processing capability of network elements (NE, including MSC, BSC, and BTS) is directly affected.
- The MS must transmit signals with greater power, so the average standby time is shortened sharply.

Therefore, configure T3212 according to resource utilization in various aspects of network.

T3212 is configured by equipment room operators. Its value depends on the flow and processing capability of each NE. Configure T3212 as follows:

- Configure T3212 to a greater value (such as 16 hours, 20 hours, or even 25 hours) in areas with heavy traffic and signaling flow.
- Configure T3212 to a smaller value (such as 3 hours or 6 hours) in areas with low traffic and signaling flow.
- Configure T3212 to 0 in areas with traffic overrunning the system capacity.

To configure T3212 properly, you must permanently measure the processing capability and flow of each UE in the running network, such as:

- The processing capability of MSC and BSC
- A interface, Abis interface, and Um interface
- The capability of HLR and VLR

If any of the previously listed NEs is overloaded, you can consider increasing T3212.

IV. Precautions

T3212 cannot be over small. Otherwise, the signaling flow at each interface increases sharply and the MS (especially handset) consumes increasing power. If the T3212 is smaller than 30 minutes (excluding 0), the network will be fiercely impacted.

Configuring T3212 of different cells in the same location area to the same value is recommended. In addition, the T3212 must be consistent with related parameters of switching side (smaller than the implicit detach timer at switching side).

If the T3212 of different cells in the same location area is the same, in the cell reselection, the MS continues to time according the T3212 of the original cell. If the T3212 of the original and target cell in the same location area is different, the MS uses the T3212 of the original cell modulo that of the serving cell.

According to the actual tests of MS in the network, if the T3212 in the same location area is different, after the MS performs modulo algorithm based on behaviors of some users, the MS might power on normally. However, the MS fails in originating location updating, so the network identifies it as implicit detach. Now the MS powers on normally, but a **user has powered off** prompt appears when it is called.

4.10.8 T3122

I. Definition

T3122 defines the period that the MS must wait for before the second trial calling if the first trial calling fails. It aims to avoid congestion of SDCCH due to repeated trial calling by MS and to relieve system load.

II. Format

T3122 ranges from 0s to 255s. The recommended value is 10s.

III. Configuration and Influence

The value of T3122 is included in the immediate assignment reject message. After the MS receives the immediate assignment reject message (no channels for signaling, A interface failure, overload of central processing unit, namely, CPU), it can send new trial calling request after T3122. T3122 aims to relieve radio signaling and voice channel resources.

T3122 also help avoid systematic overload. When the CPU is overloaded, the system multiplies T3122 by a factor (determined by processorLoadSupconf) to increase T3122 through overload control. In peak load time, you can manage network access by increasing T3122. Namely, you can increase the interval between two continuous trial callings to relieve network load.

4.10.9 T3124

I. Definition

T3124 is used in occupation process in asynchronous handover. It is the time for MS to receive the physical information send by network side.

II. Format

Configure it to 675ms when the channel type of assigned channel for HANDOVER COMMAND message is SDCCH (+ SACCH). Configure it to 320ms in other situations.

III. Configuration and Influence

When the MS sends the HANDOVER ACCESS message on the primary DCCH, T3124 starts. When the MS receives a PHYSICAL INFORMATION message, the MS stops T3124, stops sending access burst, activates the PCH in sending and receiving mode, and connects to the channel if necessary.

If the assigned channel is a SDCCH (+ SACCH), you must enable MS to receive a correct PHYSICAL INFORMATION message sent by network side in any block. If T3124 expires (only in asynchronization) or the low layer link fails in the new channel before sending the HANDOVER COMPLETE message, the MS proceeds as follows:

- 1) Deactivate the new channel
- 2) Restart the original channel
- 3) Reconnect to TCH
- 4) Trigger to setup primary signaling link

Then the MS sends the HANDOVER FAILURE message on the primary signaling link and return normal operation before trial handover. The parameters for returning the original channel are those before response to the HANDOVER COMMAND message (such as in encryption mode).

4.10.10 T11

I. Definition

T11 is an assignment request queue timer.

II. Format

T11 is determined by equipment room operators. It indicates the maximum queuing delay for assignment request.

III. Configuration and Influence

When the BSC is sending the ASSIGNMENT REQUEST message, no TCHs are available. The ASSIGNMENT REQUEST message must be put to a queue and the BSC sends the QUEUING INDICATION message to MSC. Meanwhile, T11 starts timing.

When the BSC sends the ASSIGNMENT COMPLETE message (TCH is successfully assigned) or the ASSIGNMENT FAILURE message (TCH is not assigned) to MSC, T11 stops timing.

If T11 expires, the corresponding ASSIGNMENT REQUEST message is removed from queue and the BSC sends a CLEAR REQUEST message with the cause of **no radio resource available** to MSC to clear calling. Assignment queuing helps reduce service rejection times due to congestion, so enabling it is recommended in a network. Anyhow, T11 cannot be over great and it must be configured according to customer habits.

4.10.11 T200

I. Definition

T200 is important (both the MS and base station have T200) at Um interface in data link layer LAPDm. LAPDm has different channels, such as SDCCH, FACCH, and SACCH, and the transmission rate of different channel is different, so T 200 must be configured with different values. The type of the channels corresponding to T200 is the value of the T200.

II. Format

Different channels corresponds different values of T200. According to the protocol, when SAPI = 0 and SAPI = 3, the T200 of corresponding data link is dependently implemented, depending on delay of synchronous processing mechanism and process in layer 1 and layer 2.

Table 7-1 Value range and default of each type of T200

T200	Minimum	Maximum	Default
T200_SDCCH_SAPI0	50	100	60; /* = 60 * 5 ms */
T200_FACCH_Full_Rate	40	100	50; /* = 50 * 5 ms */
T200_FACCH_Half_Rate	40	100	50; /* = 50 * 5 ms */
T200_SACCH_TCH SAPI0	120	200	150; /* = 150 * 10 ms */
T200_SACCH_TCH SAPI3	120	200	150; /* = 150 * 10 ms */
T200_SACCH_SDCCH	50	100	60; /* = 60 * 10 ms */
T200_SDCCH_SAPI3	50	100	60; /* = 60 * 5 ms */

III. Configuration and Influence

T200 avoids deadlock in sending data in data link layer. The data link layer changes the physical link in which error occurs easily to data link with no errors. At the two ends of the data link communication system, a confirm-to-resend mechanism is used. Namely, receiving a message by the receiver must be confirmed by the sender.

If it is unknown that the message is lost, both two ends wait for messages, so the system confronts a deadlock. Therefore, T200 is used by the sender. When T200 expires, the sender judges that the receiver fails in receiving the message, so it resends the message.

When the sender needs to confirm whether the receiver has received the message, T200 starts. When the sender receives the response from the receiver, T200 stops. When T200 expires, the resending mechanism starts. If the sender receives no response from the receiver after multiple resendings, it sends ERROR INDICATION (T200 expiration) to layer 3.

IV. Precautions

T200 must be properly configured to ensure a predictable behavior at Um interface. The rules for configuring T200 include:

- The potentially-existing lost frames in radio link must be detected as possible.
- Necessary retransmission of frames must start at the earliest possible moment.
- If the response is delayed due to UE failure, the T200 cannot expire before receiving and processing the next frame from the opposite end.
- If T200 expires and no other frames are sent by preference, the related frames must be resent in the message block.
- T 200 starts immediately after next PH-READY-TO-SEND.

4.10.12 N200

I. Definition

N200 is the resending times after expiration of T200.

II. Format

To configure N200, follow rules below:

- 1) When SAPI = 0 or 3, N200 depends on the state and the channel used. When multiframe operation is set up, it ensures a common time value for layer 2 link failure in all channels. For layer 2 link establishment and release, configure N200 to 5.
 - ✓ 5 (SACCH)
 - ✓ 23 (SDCCH)
 - ✓ 34 (FACCH of full rate)
 - ✓ 29 (FACCH of half rate)
- 3) When SAPI is unequal to 0 or 3, configure N200 to 5, as shown in Table 1-6.

Table 7-2 Situations of SAPI unequal to 0 or 3

SAPI	Channel	Valid response delay	Minimum resending delay	Maximum resending delay
		Tresp	Tmin	Tmax Note 3
0	SDCCH	MS: 11 BSS: 32	51	51
0	FACCH/Full rate	9	26	39
0	FACCH/Half rate	10	34	44
3	SDCCH	MS: 11 BSS: 32	51	51 Note 1
3	SACCH(with TCH)	25/129 Note 2	312	416 Note 2
The TDMA frame is the measurement unit of values in this table, equal to 120/26ms (approximately 4.615ms)				
Note 1: It caters for the process without SAPI 0 transmission. Otherwise, it does not have a upper limit due to the priority of SAPI 0 transmission.				
Note 2: You can configure it to a greater value only when PCH is unavailable due to SAPI frame transmission if SAPI = 3.				
Note 3: It caters only for sending monitoring frames that are available and without F equal to 1.				

III. Configuration and Influence

If the BSC fails in receiving lay 2 response message after multiple resending, it sends the ERROR INDICATION message (T200 expires) to layer 3. The BSC takes statistics of ERROR INDICATION message by corresponding traffic measurement counter. When T200 or N200 is configured to an over small value, call drop occurs probably due to ERROR INDICATION.

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