SubMenu

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TCSM Support in BSC

Contents

List of figures

Summary of changes

Changes between document issues are cumulative. Therefore, the latest document issue contains all changes made to previous issues.

Changes made between issues 5 and 4

A note about the BSC3i not supporting the first generation Transcoder Submultiplexer has been added.

Information on PCMs has been added in section *TCSM hardware configuration management*.

Information on optional features management has been added in section *TCSM configuration and optional features management*.

Changes made between issues 4 and 3

Combined ETSI and ANSI versions of this document.

Removed implementation chapters which described software architechture. Also removed lots of material because of information overlap with other documents.

The document has been revised throughout to comply with the latest documentation standards.

Changes made between issues 3 and 2

Chapter Introduction, section Purpose of the function class

Optional features management and TCSM routine testing added to supported features list. GSW is not supported in the BSC in S8.

Chapter Introduction, section Concepts

TCSM2 definition updated.

Chapter Introduction, section References

New references added.

Chapter Introduction, section Capacity

BCSU capacity has increased for transcoder PCMs.

Chapter TCSM Hardware configuration management, section Description of the feature

Information modified due to GSW not being supported. References to AS7-U plug-in unit replaced with more generic AS7 which covers all AS7 plug-in unit variants.

Four full rate A interface PCMs consist of 120 (not 116) 16 kbit sub-rate channels).

Figures have been updated.

Chapter TCSM Hardware configuration management, section User interface

Information on ET connection removed. Transcoder configuration added as new section.

Chapter TCSM Hardware configuration management, section Implementation

SFDATA removed from Equipment management implementation figure. Transcoder configuration added as new section.

Chapter TCSM Operation and Maintenance, section TCSM Supervision

Supervision period is 30 seconds.

Chapter TCSM Operation and Maintenance, section TCSM recovery

Partial diagnostics procedure slightly modified when TCSM changed to TE-EX. Alarm printout updated.

Chapter TCSM Operation and Maintenance, section General implementation

AS7ULAP changed to AS7 SW.

Chapter TCSM Configuration Management, section Description of the feature

TCSM unit requests the types of the TC_PCMs, optional features and through connections from the BSC, not vice-versa.

Chapter TCSM Routine Testing

New chapter.

1 Functionalities of TCSM Support in BSC

The second generation of the Transcoder Submultiplexer equipment (TCSM2) is supported in the BSC as a functional unit named TCSM. The O & M link between the BSC and the TCSM is a 16 kbit LAPD channel terminating to the AS7 plug-in unit of the OMU.

Note

The BSC3i does not support the first generation Transcoder Submultiplexer.

The BSC features that support the use of the TCSM are:

- TCSM hardware configuration management

  Hardware configuration management is needed for the TCSM when it is taken into use as a functional unit in the BSC system maintenance.

  The TCSM can be temporarily used as stand-alone equipment. If used in this way, the TCSM implements the transcoding function for the traffic channels. There is no O & M link to the BSC.

- TCSM operation and maintenance

  The TCSM has operating states and substates which are handled by the recovery system. In the working state the TCSM handles call traffic and runs other active application functions. The diagnostics report and starting of diagnostics are both available at the BSC as well as at Nokia NetAct sites. With the TCSM remote MMI the user can open a remote debugger session from the BSC to the TCSM and use the commands of the local user interface.

- TCSM software download

  TCSM2 software download means that a new software build of a second generation Transcoder Submultiplexer can be loaded from the BSC.

- TCSM configuration and optional features management

  The TCSM unit requests the BSC information about the TCSM configuration and carries out necessary procedures according to that information.

- TCSM routine testing

  During the normal operation of the TCSM unit the BSC runs loop tests for idle speech channels to find faulty ones.

The BSC support to the first generation Transcoder Submultiplexer (the 2 Mbit/s submultiplexer and three transcoder units) is described in BSS transmission network elements in Transmission Management in BSS. Refer to Product Description for TSCM2E or Product Description for TCSM2A for more information on the TCSM2 itself.

2 TCSM hardware configuration management

TCSM hardware configuration management consists of equipment management, unit connections, and transcoder configuration. Refer to Hardware Configuration Management overview for more information.

Functionality of TCSM hardware configuration management

The user can handle the hardware configuration of the TCSM with MML commands. The commands are used to create and delete racks, cartridges, functional units, and plug-in units in the BSC, as well as to output hardware data. Refer to Equipment Management (WT command group), for more information on the commands.

The user connects the Transcoder Controller plug-in unit (TRCO) to the BSC or disconnects it from the BSC. For more information, refer to Unit Connections Handling, (WU command group). By displaying the TRCO plug-in unit information the user can find out if the TRCO is connected. Refer to Equipment Management (WT command group) for more information on the command.

The user can display information on the working states of the O & M link and on the time slot the O & M link is created to. For more information, refer to Primary Rate Access D-channel Data Handling (DS command group). From the user's point of view, the O & M link has the following working states:

- working, WO-EX
- not in use, taken out of use by the system, BL-SY
- not in use, taken out of use by the user, BL-US

When the user changes the TCSM unit state to SE (= separate), the system takes the O & M link out of use. Refer to D-channels and LAPD protocol for more information.

The user creates, deletes, and modifies transcoder PCMs, sets the number of through connected channels, as well as adds, removes, and fetches through connections of a TCSM unit with MML commands. The user can also handle TCSM routine testing parameters and data. Refer to Transcoder Configuration (WG command group) for more information.

The transcoder PCMs are created in ascending order starting from the first transcoder PCM. The transcoder PCMs are deleted in the reverse order. Note that TCSM memory capacity causes restrictions on which kind of TC_PCM configuration can be created. For further information on these limitations, see Transcoder Configuration (WG command group).

Before creating transcoder PCMs that would overlap with through connected channels, the number of through connected channels must be set. The number of through connected channels tells how many time slots from the end of the Ater interface PCM will be left unrouted when transcoder PCMs are created.

The Equipment Database (EQUIPM) is updated when racks, cartridges, functional units, or plug-in units are created or deleted. The Working State and Configuration File (SCDFLE) is updated when functional units are created or deleted, and the PCM Configuration File (PCMCON) is updated when plug-in units with a PCM are created or deleted.

TCSM hardware configuration

Eight TCSM units can be placed in one TC2E rack. Normally this rack is at the MSC site. Each of the eight TCSMs can be connected to a different BSC.

The TCSM plug-in units are:

- Transcoder Controller (TRCO)
- Exchange Terminal (ET2E or ET2A)
- Transcoder (TR16 or TR12)
- Power Supply for Cartridge

The maximum number of plug-in units – TR16 plug-in units in ETSI and TR12 plug-in units in ANSI environment – in one TCSM is 14, and the number of ET2E/ET2A plug-in units is four. For more information on plug-in units, refer to Equipment Management (WT command group). The TRCO plug-in unit of the TCSM is connected to the AS7 plug-in unit in the BSC OMU with the LAPD-based O & M link. For more information on that, refer to Unit Connections Handling, (WU command group). In ETSI configuration the TCSM2 combines four full-rate A interface PCMs (120 16-kbit sub-rate channels) into one 2 Mbit highway in an Ater interface. In ANSI configuration TCSM2 combines four full-rate A interface PCMs (95 16-kbit sub-rate channels) to one 1.5 Mbit highway in an Ater interface. For more information, refer to Transcoder Configuration (WG command group).

An external PCM (ET_PCM) in the BSC is a PCM circuit coming from the Exchange Terminal (ET). The TCSM2 is created as a TCSM functional unit in which the transcoder PCMs (TC_PCM) are created. To create a TC_PCM the user gives the TC_PCM number and type and TC_PCM pool number as instructed in Configuring a new transcoderin BSS Transmission Management.

The pool number is dependent of the codec type the user wishes to activate, for example, codec type HS2 (High Speed Circuit Switched Data) is supported in pool 10. For more information on the pools and codec types and features they support, see table TCSM2 softwares and optional features supported in and after S10.

For more information about different pool types, refer to Circuit pool handling in Enhanced Speech Codecs in BSC, Half Rate in BSC, and HSCSD and 14.4 kbit/s Data Services in BSC.

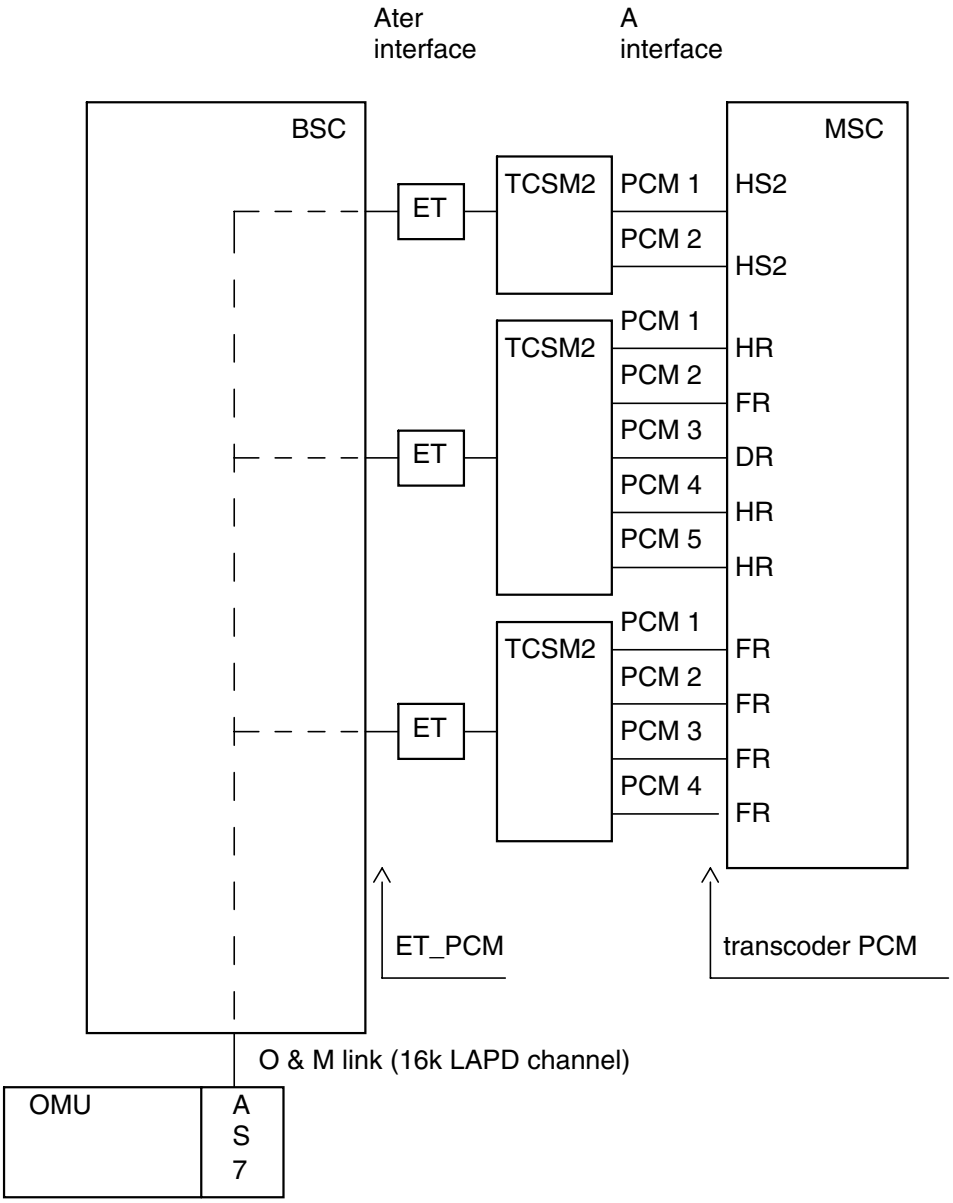

Figure 1. An example of the environment of the second generation TCSM

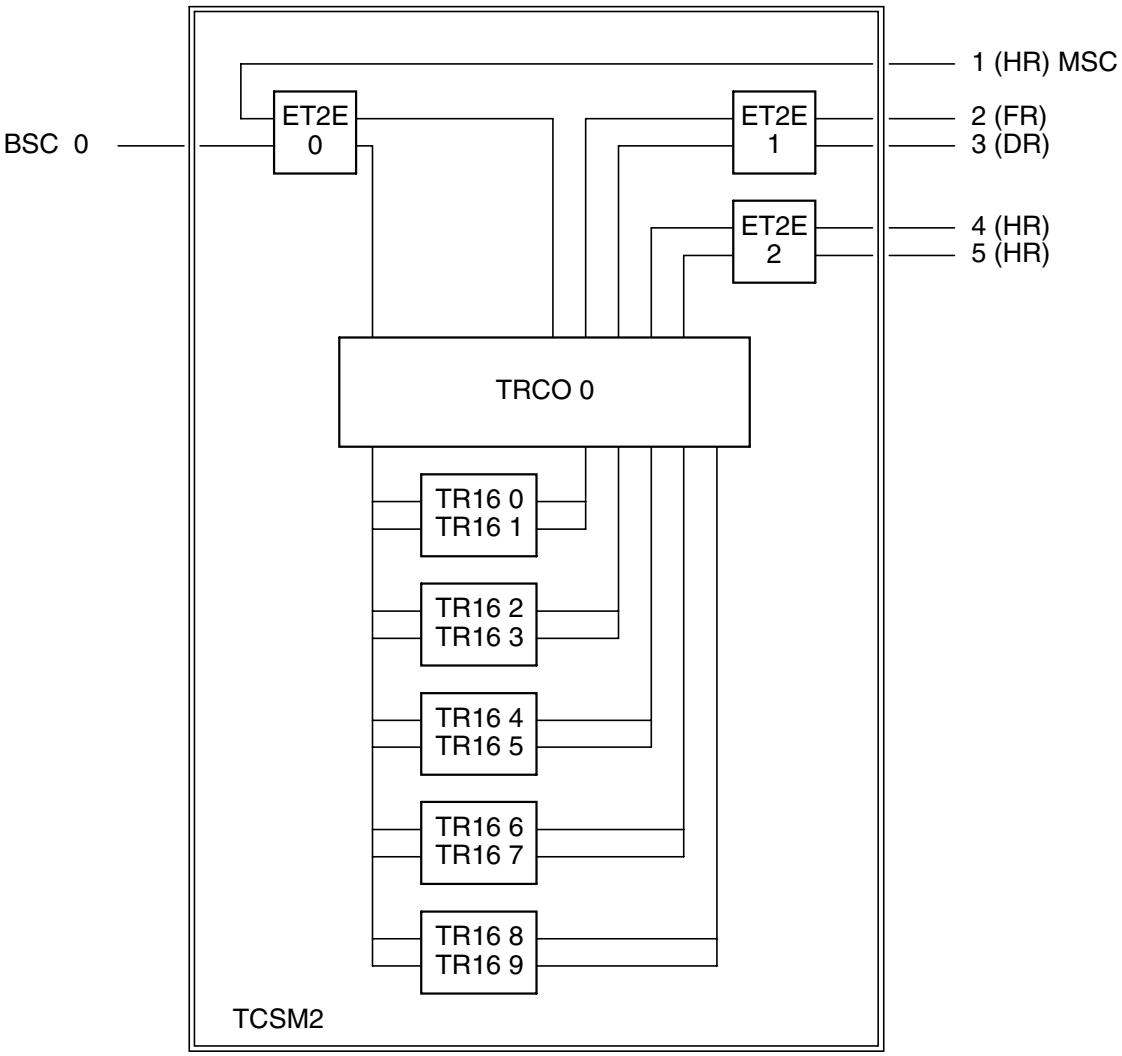

Figure 2. Configuration of the second TCSM (in Figure 1)

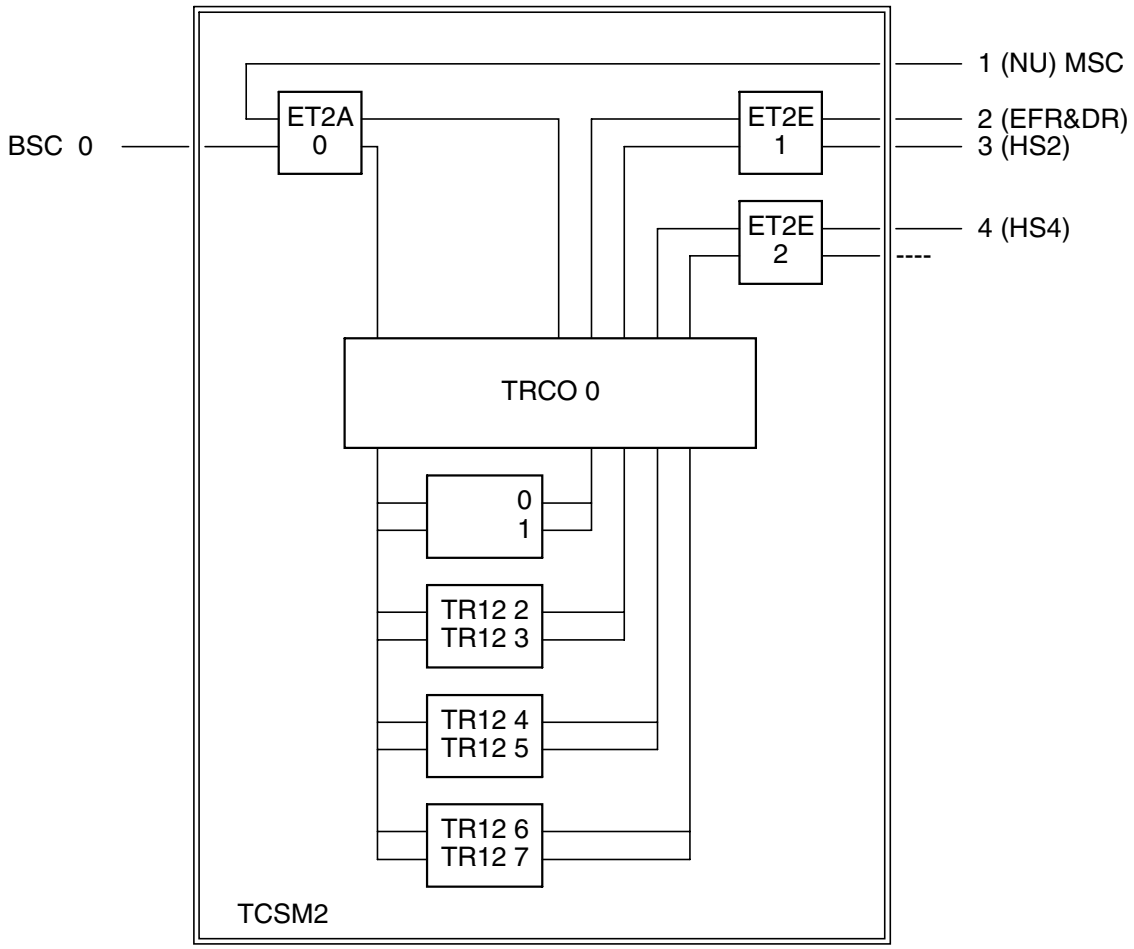

Figure 3. Example configuration of a TCSM when TCSM2A-C in use

Capacity

One Base Station Controller Signalling Unit (BCSU) can handle 12 (486 processor) or 23 (pentium processor) transcoder PCMs.

The maximum number of TCSM units is limited by the number of LAPD-channels available in the BSC OMU. When the OMU is equipped with an AS7-V plug-in unit, the maximum number of LAPD-channels available for TCSMs is 60.

Maximum channel capacity can be reached by using half-rate transcoding (seven transcoder PCMs and 210 8-kbit sub-rate channels in ETSI configuration, seven transcoder PCMs and 166 8-kbit sub-rate channels in ANSI configuration).

3 TCSM operation and maintenance

TCSM Operation and Maintenance consists of TCSM supervision, TCSM alarms, and TCSM recovery. Refer to System Maintenance for more information.

TCSM supervision

The BSC supervises the TCSM with periodic supervision messages. The supervision period is thirty seconds.

If a failure condition occurs in the TCSM O & M link, the LAPD protocols in the BSC try to recover from the failure by means of internal measures. If these measures fail, the LAPD protocols report the failures through the alarm system. The user can get information on overload and failure situations in the O & M link also from the LAPD statistics.

The trunk network maintenance in the BSC and in the MSC supervises trunk interfaces to the TCSM on the basis of the information it has received in time slot 0 (refer to Trunk network maintenance overview for more information). If the supervision detects a disturbance that exceeds the filtering limit of an alarm, it generates an alarm and isolates the connection from traffic (maintaining the present calls).

Statistics on trunk circuit disturbances are compiled daily on all operating trunk circuits. These statistics contain information on all functional disturbances detected by the supervision, including short disturbances that have not called forth maintenance activities. At the BSC site the user can open the Remote Debugger Session MML for reading values of statistics counters from the TCSM. For more information on that, refer to TCSM remote MMI.

The internal supervision in the TCSM finds local faults. The supervised objects are:

- checksums of the program blocks
- memory
- the submultiplexing function
- internal supervision messages to the program blocks
- LAPD channels between the TRCO and ET plug-in units

- synchronisation
- PCM interfaces
- signal processors
- memory and program of the signal processors
- synchronisation of the traffic channels

TCSM alarms

The alarms set by the TCSM supervision or recovery in the BSC are the following:

- 690 WORKING STATE CHANGE
- 1001 UNIT RESTARTED
- 1010 NO RESP TO UNIT SPV MES
- 1685 UNIT RESTART FAILURE
- 2692 INCORRECT WORKING STATE
- 2693 WO-EX UNIT FAULTY (faulty flag set by user)

The following faults are discovered by the TCSM internal supervision, and the alarms are set by the TCSM internal supervision. The alarms are sent to the BSC alarm system through the O & M link.

- 630 SYNCHRONIZATION SIGNAL CHANGED
- 1028 RESTARTED PROGRAM BLOCK IN PREPROCESSOR UNIT
- 1280 INTERNAL COMMUNICATION CHANNEL FAILURE
- 1900 DEGRADED SLIP FREQUENCY
- 1901 ET RESTARTED
- 2202 ET FAILURE
- 2204 EQUIPMENT LOOP
- 2205 ET2 FAILURE
- 2631 OPERATION MODE CHANGED TO PLESIOCHRONOUS
- 2632 OSCILLATOR FAILURE
- 2636 FAILURE IN OUTGOING CLOCK SIGNAL
- 2641 FAILURE IN SYNCHRONIZATION SIGNAL

- 2900 INCOMING SIGNAL MISSING
- 2902 PCM LINE REMOTE END ALARM
- 2909 AIS RECEIVED
- 2910 FRAMING ERROR
- 2912 BIT ERROR RATE OVER LIMIT
- 2915 FAULT RATE MONITORING
- 2923 CRC BIT ERROR RATIO OVER LIMIT
- 2924 REMOTE END CRC BIT ERROR RATIO OVER LIMIT
- 2925 SLIP FREQUENCY LIMIT EXCEEDED
- 2950 TRCO FAILURE
- 2951 LOCAL USER LOGGED IN
- 2952 TRANSCODER PLUG-IN UNIT FAILURE
- 2954 NO TRAU FRAME SYNCHRONIZATION
- 2955 TRANSCODER CHANNEL FAILURE
- 2956 PLUG-IN UNIT LOCALLY BLOCKED
- 2957 CHANNEL LOCALLY BLOCKED
- 2958 FAULTY TIME SLOT IN TESTING OF TCSM UNIT
- 2959 THROUGH CONNECTED CHANNEL FAILURE
- 2960 WIRED ALARM FROM ANOTHER TCSM UNIT
- 2962 SOFTWARE PACKAGE MISSING

The BSC blocks faulty channels according to the TCSM alarms.

The object class GSM Transcoder is defined in the Q3 interface for TCSM alarms.

The alarm history handling commands can be used to examine the TCSM alarms and their cancellations as well as the current alarm situation. Refer to Alarm History Handling (AH command group) for more information. General alarm printout layout is presented in Alarm printout in Alarm Structure.

Internal alarm limits for channel and PCM faults in the TCSM can be modified and displayed with the local user interface commands.

TCSM recovery

The possible functional states of the TCSM are WO-EX, WO-RE, BL-EX, BL-ID, BL-RE, TE-EX, SE-OU, and SE-NH.

The Working State and Restart Handling MML commands can be used for the following functions:

- changing the state of the TCSM
- interrogating the state of the TCSM
- outputting the units in a given state
- restarting the TCSM

When the user changes the state of the TCSM from WO-EX to BL-EX, all the traffic channels implemented by the TCSM are blocked. The ongoing calls are not released, and new calls cannot be established. After five minutes the recovery changes the TCSM to the state BL-ID.

When the user changes the state of the TCSM from BL-ID to TE-EX (test), the ongoing calls are not released. Calls are released when the TCSM unit is restarted.

When the user changes the state of the TCSM to SE-OU (separate), the O & M link is taken out of use.

In fault conditions of the trunk interface, the TCSM transcoder plug-in unit, and the TCSM channel, the system takes the connection out of use until the fault has been corrected. Calls to faulty connections are diverted to alternative connections.

TCSM diagnostics

From the BSC's point of view diagnostics can be divided into two groups — total and partial diagnostics.

The TCSM2 unit must be in the test state when diagnostics are run. The execution of the diagnostics test takes a few minutes, after which the results of the test are displayed. The user can also open a remote service terminal session from the BSC to the TCSM and start diagnostics by using the service terminal commands. The results of the test can also be displayed by the service terminal. When local diagnostics are run, the TCSM unit must also be in the test (TE-EX) state.

During the running of diagnostics the system takes the O & M link out of use and an alarm 2250 (FAILURE IN D-CHANNEL ACTIVATION OR RESTORATION) is set. After diagnostics, the system restores the O & M link to the WO-EX-state and the alarm is cancelled.

The alarm system sends an alarm to the recovery system when the gravity level of TCSM2 alarms reaches 64. The following alarms can cause total diagnostics:

- 2202 ET_FAILURE
- 2205 ET2_FAILURE
- 2950 TRCO_FAILURE
- 2952 TRANSCODER PLUG-IN UNIT FAILURE

TCSM remote MMI

The TCSM remote MMI is implemented as an extension to the existing Remote Debugger Session MML commands. With the Remote Debugger Session MML the user can open a remote service terminal session from the BSC to the TCSM.

4 TCSM software download

The TCSM2 loads its software build from the OMU of the BSC. The software build loading is always done after unit restart when the software version check fails or when the program code checksum fails.

Before any code can be loaded from the BSC, the LAPD link between the TCSM2 unit and the BSC has to be established. If the LAPD link to the BSC is not available and there is no TRCO software on the FLASH memory, the TCSM2 requests downloading via the local user terminal. If there is a valid TRCO program on the FLASH memory, the program execution is moved there via reset.

The user can obtain information about loading phases with the Working State and Restart Handling MML commands.

5 TCSM configuration and optional features management

The TCSM unit requests from the BSC the types of the TC_PCMs, existing through connections, and information about which optional features are enabled. This information is requested every time when the LAPD link to the TCSM unit is established.

The management of optional features developed before release S10 differs from that of the features developed in or after S10. The features developed before S10, for example, the Acoustic Echo Cancellation (AEC), the Tandem Free Operation (TFO), and the Noise Suppression (NS) are managed with the TCSM service terminal commands. The features developed in or after S10, for example the Text Telephone (TTY) feature, are managed with the BSC MML commands. For more information, see *Managing TCSM optional features*.

If the configuration in the TCSM2 unit is different from the one in the BSC, the TCSM2 unit creates or deletes the relevant plug-in units to or from its own supervision system.

If there are fewer physical plug-in units in the TCSM2 unit than the BSC supposes there are, the TCSM2 sets the necessary alarms 2202 (ET FAILURE) and 2952 (TRANSCODER PLUG-IN UNIT FAILURE) and sends these alarms to the BSC through the O & M link.

If the TCSM2 unit has more plug-in units than the BSC supposes there are, no alarms are set and these extra plug-in units are removed from configurations.

6 TCSM routine testing

The purpose of the TCSM routine testing is to find faulty speech channels by running a loop test for one idle speech channel at a time during normal operation of the TCSM unit.

Time slots to be routine tested are selected from the circuits that are found from the external circuit groups and are in the WO-EX idle state. The time slot will not be tested if it has been tested during the last 24 hours. The loop test is run for one time slot at a time. Both the routine tested speech circuit and the speech circuits that are submultiplexed into the same Ater interface time slot with the circuit to be tested are blocked during the testing of the speech circuit. After the testing is done, the circuits that passed the test are deblocked and the circuits that were found to be faulty are left blocked until testing of the next circuit is started.

The following conditions have to be met before a time slot will be routine tested:

- there must be enough free capacity available in the circuit group from which the time slot is found (circuit group capacity here means number of WO-EX idle time slots per number of all WO-EX time slots)
- the time slot has to be in the WO-EX idle state
- none of the neighbour time slots (time slots submultiplexed into the same Ater interface time slot) of the time slot to be tested can be in the WO-EX busy state
- the time slot has not been tested during the last 24 hours
- the time slots submultiplexed into the Ater time slot 1 will not be tested because the D-channel of the TCSM unit cannot be looped

The user can handle the TCSM routine testing parameters and data with the commands of the Transcoder Configuration MML.

The commands are used to set, clear and display circuit group specific routine testing parameters (`threshold value` and `enabling/disabling` routine test), as well as to output and clear routine testing data.

When a speech circuit is found to be faulty in the routine tests, the TCSM sets the alarm 2958 (FAULTY TIME SLOT IN TESTING OF TCSM UNIT) which causes the blocking of the circuit. The TCSM cancels the alarm when the loop test for the next speech circuit is started. The BSC deblocks the circuit when the alarm is cancelled. It is up to the user to block the circuit manually if the user wants to be sure the faulty speech circuit will not be used.

The routine testing parameters that the user can change are `threshold value` and whether routine testing is `enabled` or `disabled`. The parameters are circuit group -specific. If no parameters for a circuit group is set, the default values are used. The default values can be changed by changing the parameters of the circuit group number 0.

Routine testing for circuits in a circuit group will not be made, if the circuit group does not have enough free capacity, that is the circuit group does not have enough WO-EX idle circuits. The circuit group capacity here is defined as number of WO-EX idle circuits per number of all WO-EX circuits. If the threshold value for a circuit group is bigger than the capacity of the circuit group, circuits from the circuit group will not be tested.