Technical Specification Group Services and System Aspects Meeting #10, Bangkok, Thailand, 11-14 December 2000

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Source: **TSG-SA WG4**

Title: **CR to TS 26.103**

Document for: **Approval**

Agenda Item: **7.4.3**

The following CRs were agreed at the TSG-SA WG4 meetings #13 and #14 and are presented to TSG SA #10 for approval.

Spec	CR	Rev	Phase	Subject	Cat	Ver	WG	Meeting	S4 doc
26.103	004		Rel-4	Introduction of Codec Type Bit-Map for Codec Negotiation	B	3.0.0	S4	TSG-SA WG4#13	S4-000522R
26.103	005		Rel-4	Introduction of Selected Codec Type for Codec Negotiation	B	3.0.0	S4	TSG-SA WG4#13	S4-000551
26.103	006		Rel-4	Clarification for the use of the Codec List Information Element	F	3.0.0	S4	TSG-SA WG4#14	S4-000592

3GPP TSG-S4#13
October 23-27, 2000, Osaka, Japan

Document S4-000522R
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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26.103	**CR**	**004**	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	3G RAN		3G CN	X

Source: TSG-SA WG4 **Date:** 11/Dec/00

Subject: Introduction of Codec Type Bit-Map for Codec Negotiation

Work item: AMR

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	
				Release 00	X

Reason for change:

1. Removal of the ICM from the list of AMR parameters sent in OoBTC, according to the decision reached at S4#9.
2. Addition of the Optimisation Mode field in the list of AMR parameter for OoBTC so that TFO can be activated by a Transcoder located at the edge of the PLMN.
3. Addition of section 6 defining the Codec Type Bit-map for Codec Negotiation at call set-up.
4. Introduction of the PDC EFR and TDMA (IS-136) EFR as Codec Type alternatives for UMTS.
5. Corrections, Editorial Modifications

Clauses affected: All Clauses

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

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1 Scope

The present Technical Specification outlines the Codec Lists in 3GPP including both systems, GSM and UMTS, to be used by the ~~Bearer Independent Call Control (BICC)~~Out of Band Transcoder Control (OoBTC) protocol to set up a call or modify a call in **Tr**anscoder **F**ree **O**peration (TrFO) and in "transcoder at the edge" scenarios. The TS further specifies the coding of the Codec Lists for both radio access technology, GSM and UMTS, for the Core Network Protocols in UMTS.
The Codec Lists include Codec_Types from TDMA and PDC, to support TFO between UMTS and TDMA, respectively UMTS and PDC.

2 Normative references

The present Technical Specification incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this TS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1] TS 26.090 : “AMR Speech Codec; Speech Transcoding Functions".

[2] TS 26.093 : “AMR Speech Codec; Source Controlled Rate Operation".

[3] TS 26.101 : “Mandatory Speech Codec Speech Processing Functions; AMR Speech Codec Frame Structure".

[4] GSM ~~0~~4 6.0xx : “Enhanced Full Rate Codec Recommendations".

[5] GSM ~~0~~2 6.0xx : “Adaptive Multi-Rate Codec Recommendations".

[6] “ITU Q.765.5: “Use of Application Transport Mechanism for Bearer Independent Call Control”

[7] TS 28.062 : "In-band Tandem Free Operation (TFO) of Speech Codecs, Stage 3 - Service Description".

[8] TS 23.153 : "Out of Band Transcoder Control - Stage 2".

[9] TS 24.008: "Mobile radio interface layer 3 specifications, Core Network Protocols"

3 Definitions and Abbreviations

3.1 Definitions

Codec Type: defines a specific type of speech Coding algorithms (e.g. GSM FR, GSM FR AMR).

Codec Mode: defines a specific mode of a Codec Type (e.g. 12,2 kBit/s Mode of the GSM FR AMR).

Organisation Identifier (OID): Identifies the standard organisation (e.g. 3GPP) producing a specification for a Codec List. ITU-T is responsible for maintaining the list of Organisation Identifiers.

System Identifier (SysID): Identifies the radio access technology (e.g. GSM or UMTS) for which the supported Codec List is defined.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

SCR	Source Controlled Rate operation (synonym to DTX)
DTX	Discontinuous Transmission
SID	Silence Descriptor
RX	Receive
TX	Transmit
OID	Organisation IDentifier (e.g. ITU-T, 3GPP)
CoID	Codec IDentifier
~~BICC~~	~~Bearer Independent Call Control~~
TFO	**T**andem **F**ree **O**peration (also sometimes called “Transcoder-Through” or “Codec-Bypass”)
TrFO	**Tr**anscoder **F**ree **O**peration
GSM	Global System for Mobile communication
UMTS	Universal Mobile Telecommunications System
SysID	System Identifier
TDMA	Time Division Multiple Access (synonym for ...)
PDC	Personal Digital Communication (synonym for ...)
OoBTC	Out of Band Transcoder Control

4 General

The present Technical Specification outlines the 3GPP internal Codec Lists for both, GSM and UMTS, to be used by the Out of Band Transcoder Control (OoBTC) ~~Bearer Independent Call Control (BICC)~~ protocol to set up a call or modify a call in Transcoder Free Operation (TrFO).

It further specifies the coding of these Codec Lists for both radio access technologies, GSM and UMTS, to be used by the Core Network Protocols on the radio interface.

Transcoder Free Operation allows the transport of speech signals in the coded domain from one user equipment (UE) to the other user equipment through the radio access network (RAN) and core network (CN), possibly through a transit network (TN). This enables high speech quality, low transmission costs and high flexibility.

The necessary Codec Type selection and resource allocation are negotiated out of band before and after call setup. Possible Codec (re-)configuration, Rate Control and DTX signalling may be performed after call setup by additional inband signalling or a combination of inband and out-of-band signalling.

Up to release ´99 GSM does not support Transcoder Free Operation, but specifies the Tandem Free Operation (TFO). Tandem Free Operation enables similar advantages, but is based on pure inband signalling after call setup.
The parameters defined in this Technical Specification allow interaction between TrFO and TFO. They further provide an evolutionary path for GSM towards Transcoder Free Operation.

The GSM and UMTS standards define currently eight different Codec Types: GSM Full Rate, GSM Half Rate, GSM Enhanced Full Rate, Full Rate Adaptive Multi-Rate, Half Rate Adaptive Multi-Rate, UMTS Adaptive Multi-Rate, TDMA EFR and PDC EFR. Within each radio access technology the following Codec Types may be used, see table 4.1:

Table 4.1: Support of Codec Types in Radio Access Technologies

	PDC EFR	TDMA EFR	UMTS AMR	FR AMR	HR AMR	GSM EFR	GSM HR	GSM FR
GSM	not defined	not defined	not possible	yes (4 modes)	yes (4 modes)	yes	yes	yes
UMTS	yes	yes	yes (8 modes)	yes (8 modes)	yes, but use FR AMR	yes	not defined	not defined

5 3GPP Codec List for ~~BICC~~ OoBTC

~~5~~Definition of the ~~ETSI~~3GPP ~~Codec List~~

~~The GSM and UMTS standards define currently six different Codec Types: GSM Full Rate, GSM Half Rate, GSM Enhanced Full Rate, GSM Full Rate Adaptive Multi-Rate, GSM Half Rate Adaptive Multi-Rate and UMTS Adaptive Multi-Rate.~~

The definition of the common Codec List for Out of Band Transcoder Control (TS 23.153, [8]) in 3GPP for GSM and UMTS follows the specifications given in ITU Q.765.5: The most preferred Codec Type is listed first, followed by the second preferred one, and so on. An informative example for a codec list for UMTS can be found in Annex A.

5.1 GSM Full Rate Codec Type (GSM FR)

The Codec IDentification (CoID) code is defined to be: FR_CoID := 0x0000.0000.

The GSM Full Rate Codec Type has no additional parameters.

For information (for exact details see GSM Recommendations):

The GSM Full Rate Codec Type supports one fixed Codec Mode with 13.0 kBit/s.

DTX may be enabled in uplink and in downlink independently of each other. DTX on or off is defined by the network on a cell basis and can not be negotiated at call setup or during the call. The DTX scheme uses one SID frame to mark the end of a speech burst and to start Comfort Noise Generation. Identical SID frames for comfort noise updates are sent in speech pauses about every 480 ms, aligned with the cell´s TDMA frame structure. The defined Tandem Free Operation allows the reception of GSM FR DTX information for the downlink direction in all cases. The TFO respectively TrFO partner is prepared to receive DTX information as well.

5.2 GSM Half Rate Codec Type (GSM HR)

The Codec IDentification (CoID) code is defined to be: HR_CoID := 0x0000.0001.

The GSM Half Rate Codec Type has no additional parameters.

For information (for exact details see GSM Recommendations):

The GSM Half Rate Codec Type supports one fixed Codec Mode with 5.60 kBit/s.

DTX may be enabled in uplink and in downlink independently of each other. DTX on or off is defined by the network on a cell basis and can not be negotiated at call setup or during the call. The DTX scheme uses one SID frame to mark the end of a speech burst and to start Comfort Noise Generation. Identical SID frames for comfort noise updates are sent in speech pauses about every 480 ms, aligned with the cell´s TDMA frame structure. The defined Tandem Free Operation allows the reception of GSM HR DTX information for the downlink direction in all cases. The TFO respectively TrFO partner shall be prepared to receive DTX information as well.

5.3 GSM Enhanced Full Rate Codec Type (GSM EFR)

The Codec IDentification (CoID) code is defined to be: EFR_CoID := 0x0000.0010.

The GSM Enhanced Full Rate Codec Type has no additional parameters.

For information (for exact details see GSM Recommendations):

The GSM Enhanced Full Rate Codec Type supports one fixed Codec Mode with 12.2 kBit/s.

DTX may be enabled in uplink and in downlink independently of each other. DTX on or off is defined by the network on a cell basis and can not be negotiated at call setup or during the call. The DTX scheme uses one SID frame to mark the end of a speech burst and to start Comfort Noise Generation. It is important to note that the Comfort Noise parameters for this start of the comfort noise generation are calculated at transmitter side from the previous eight speech frames. A DTX hangover period needs to be applied therefore at transmitter side before sending the first SID frame. SID frames with incremental information for comfort noise updates are sent in speech pauses about every 480 ms, aligned with the cell´s TDMA frame structure. The defined Tandem Free Operation allows the reception of GSM EFR DTX information for the downlink direction in all cases. The TFO respectively TrFO partner shall be prepared to receive DTX information as well.

5.4 Three Adaptive Multi-Rate Codec Types (FR AMR, HR AMR, UMTS AMR)

The Adaptive Multi-Rate Codec algorithm is applied in GSM and UMTS in three different Codec Types.
The Codec IDentification (CoID) codes are defined to be:
FR_AMR_CoID := 0x0000.0011.
HR_AMR_CoID := 0x0000.0100.
UMTS_AMR_CoID := 0x0000.0101.

The AMR may have several additional parameters. These parameters are optional at originating side, but mandatory for the terminating side:

Active Codec Set, ACS: eight bits.

~~In~~ When applied in GSM then for the FR AMR and the HR AMR up to four modes may be selected by setting the corresponding bits to “1”;

In HR AMR only four out of the lower six modes can be selected;

When applied in UMTS then for the ~~In~~ FR_AMR and UMTS AMR up to all eight modes may be selected.

If the ACS is not specified at originating side, then all modes are supported there.

~~The terminating side may then select freely.~~

If ACS is not provided, then SCS and MACS can not be provided as well.

Supported Codec Set, SCS: eight bits.

In FR AMR and UMTS AMR up to eight modes may be selected by setting the corresponding bits to “1”.

In HR AMR only the lower six modes may be selected.

If the SCS is not specified at originating side, then all modes are supported there.

~~The terminating side may then select freely.~~

If SCS is not provided, then MACS can not be provided as well.

Maximal number of Codec Modes, MACS: three bits.

~~In~~When applied in GSM then for the FR AMR and the HR AMR one to four Codec Modes are allowed within the ACS.

Coding: “001: one, “010”: two, “011”: three, “100”: four Codec modes allowed.

~~In~~ When applied in UMTS then for the FR AMR and the UMTS AMR one up to eight Codec Modes are allowed within the ACS.

Coding: “001: one, “010”: two, … “111”: seven, “000” eight Codec modes allowed.

If MACS is not specified at originating side, then the maximum of modes is supported there.

~~The terminating side may then select freely.~~

~~**Initial Codec Mode**: three bits; one of the Codec Modes within the ACS is indicated as starting mode.~~

~~Coding: “000”: 4,75 kBit/s Codec Mode; … “111”: 12,2 kBit/s Codec Modes is Initial Codec Mode.~~

~~If the ICM is not specified at originating side, then the terminating side may select freely.~~

Optimisation Mode for ACS , OM: two bits.

Coding: "0": Optimisation of the ACS not supported, "1": Optimisation supported by out-of-band signalling, "2": Optimisation supported by fast inband signalling, "3": reserved.
Codes "0", "1" and "2" are defined in GSM for AMR TFO (see TS 28.062, [7])
Codes "0" and "1" are defined in UMTS for AMR TFO, "2"and "3" are reserved in UMTS for AMR TFO.

The Optimisation Mode indicates in TFO, whether the sending side supports the modification (optimisation) of its ACS for the needs of the distant side. This parameter is necessary in UMTS OoBTCBICC to support TFO in "transcoders
at the edge" scenarios. In case the OM is set to "not supported" the offered ACS can not be altered.
Only Rate Control can then be used to restrict the modes within the ACS.
The use of the Optimisation Mode parameter for TrFO is defined in TS 23.153 [9].

The Length Indicator field (LI) is set to 3, 4, 5 or 6 at originating side, depending on how many parameters are specified. The terminating side shall return the selected Codec with a full set of parameters. Hence LI shall be set to 6 always by the terminating side. If any node in the path from originating side to terminating side does not support the parameter set offered by the originating side, it may restrict it. If necessary the missing, optional parameter octets may have to be inserted then.
The ”Single Codec” information element consists of 5 to 8 octets in case of the AMR Codec Types (table 5.4):

Table 5.4: Coding of “Single Codec” for the Adaptive Multi-Rate Codec Types

Octet	Parameter	MSB 8	7	6	5	4	3	2	1 LSB
1 m	Single Codec	Single Codec (see ITU-T Q.765.5)							
2 m	Length Indication	6							
3 m	Compat. Info	Compatibility Information							
4 m	OID	3GPPETSI OID (“non-ITU-T organisation according to reference [5]”, See ITU-T Q.765.5 [6])							
5 m	CoID	FR_AMR_CoID or HR_AMR_CoID or UMTS_AMR_CoID							
6 o	ACS	12.2	10.2	7.95	7.40	6.70	5.90	5.15	4.75
7 o	SCS	12.2	10.2	7.95	7.40	6.70	5.90	5.15	4.75
8 o	ICM, OM, MACS	(spare)	(spare)	ICM (spare)	(spare) (spare) OM		MACS		

with “m” = mandatory and “o” = optional

For information on GSM procedures (for exact details see GSM Recommendations):

The GSM AMR Codec Types comprise eight (Full Rate), respectively six (Half Rate) different Codec Modes: 12,2 … 4,75 kBit/s.

The active Codec Mode is selected from the Active Codec Set (ACS) by the network (Codec Mode Command) with assistance by the mobile station (Codec Mode Request). This Codec Mode Adaptation, also termed Rate Control, can be performed every 40 ms by going one Codec Mode up or down within the ACS. The Codec Modes in uplink and downlink at one radio leg may be different. In Tandem Free Operation both radio legs (A and B) are considered for the optimal selection of the active Codec Mode in each direction (uplink A and then downlink B, respectively vice versa) by the “Distributed Rate ControlDecision” algorithm. The worst of both radio legs determines the highest allowed Codec Mode, respectively the maximally allowed rate ("Maximum Rate Control"). Besides this “Maximum Rate Control” the active Codec Mode may sometimes be frozen to a fixed mode by any of the two radio legs to allow a smooth handover procedure (“Exact Rate Control”). All rate control commands are transmitted inband: on the radio interface, the BTS-TRAU interface and the TRAU-TRAU interface.

The Active Codec Set is configured at call setup or reconfigured during the call. It consists of one up to maximally four Codec Modes (MACS) at a given time, selected from the Supported Codec Set. The maximal number of Codec Modes and the Supported Codec Set may be constrained by the network to consider resources and radio conditions.
The Active Codec Sets in uplink and downlink are typically identical, but may be different as well (ffs).
First, at start up of Tandem Free Operation, both Active Codec Sets, the Supported Codec Sets, the MACSs and the OMs are taken into account to determine the optimal common Active Codec Set. In a later phase the Supported Codec Sets and MACSs the Codec Lists of both radio legs may be taken into account to find the optimum Common Active Codec Setconfiguration. For exact details see TS 28.062. All configuration data and update protocols are transmitted inband.

The DTX scheme of the Adaptive Multi-Rate Codec Type marks with a specific SID_FIRST frame the end of a speech

burst. SID_FIRST does not contain Comfort Noise parameters. This SID_FIRST starts the comfort noise generation with parameters that are calculated at receiver side (!) from the latest received seven speech frames. A DTX hangover period needs to be applied therefore at transmitter side before sending of this SID_FIRST.
Absolutely coded SID_UPDATE frames follow about every eighth frame (160 ms) in speech pauses. SID_UPDATE frames are sent independently of the cell´s TDMA frame structure and are related only to the source signal.
An ONSET frame (typically) precedes in uplink direction the beginning of a new speech burst. DTX on or off is defined by the network on a cell basis. The defined Tandem Free Operation allows the reception of GSM-AMR DTX information for the downlink direction in all cases.

Note: The DTX scheme of the Enhanced Full Rate Codec Type is not compatible with the DTX scheme of the Adaptive Multi-Rate Codec Type in Codec Mode 12.2 kBit/s, although the speech modes of these two Codec Types are bit exact identical.

For information on UMTS procedures (for exact details see ~~UM~~TS 28.062 (TFO~~, ffs~~) and 23.153~~x.yyy~~ (TrFO~~, ffs~~):

The UMTS AMR Codec Type comprises eight different Codec Modes: 12,2 … 4,75 kBit/s.

The active Codec Mode is selected from the Active Codec Set (ACS) by the network. This Codec Mode Adaptation, also termed Rate Control, can be performed every 20 ms by going to any arbitrary Codec Mode within the ACS. The Codec Modes in uplink and downlink at one radio leg may be different. In Tandem Free Operation or Transcoder Free Operation both radio legs (A and B) are considered for the optimal selection of the active Codec Mode in each direction (uplink A and then downlink B, respectively vice versa) by a “Distributed Rate Decision~~Control~~” algorithm. The worst of both radio legs determine the highest allowed Codec Mode, respectively the maximally allowed rate. Besides this “Maximum Rate Control” the active Codec Mode may sometimes be frozen to a fixed mode by any of the two radio legs to allow a smooth handover procedure (“Exact Rate Control”). All rate control commands are transmitted inband on the IU and A interface and out of band on the radio interface ~~(ffs)~~.

The Active Codec Set is configured at call setup or reconfigured during the call. It consists of one up to maximally eight Codec Modes (MACS) at a given time, selected from the Supported Codec Set. The maximal number of Codec Modes and the Supported Codec Set may be constrained by the network to consider resources and radio conditions.
The Active Codec Sets in uplink and downlink are typically identical~~, but may be different as well (ffs)~~.
At call setup the Originating Side sends the AMR parameter set (included in the Codec List). The Terminating side then selects a suitable ACS from the given information and sends it back. In case the terminating side does not support TrFO a transcoder is allocated in the path at a suitable position, preferably as close as possible to the terminating side. This transcoder may by inband signalling install a Tandem Free Operation after call setup. Then, at start up of Tandem Free Operation, both Active Codec Sets, the Supported Codec Sets, the MACSs and the OMs are taken into account to determine the optimal common Active Codec Set. In a later phase ~~the Supported Codec Sets and MACSs~~ the Codedc Lists of both radio legs may be taken into account to find the optimum ~~Common Active Codec Set~~configuration. All configuration data and update protocols are transmitted inband on the TFO interface, but ~~(possibly)~~ out of band within the UMTS network. For information on Tandem Free Operation see GSM 08.62, respectively TS 28.062 and TS 23.153 for OobTC ~~(ffs)~~.

The SCR scheme of the default Adaptive Multi-Rate Codec Type marks with a specific SID_FIRST frame the end of a speech burst. SID_FIRST does not contain Comfort Noise parameters. This SID_FIRST starts the comfort noise generation with parameters that are calculated at receiver side (!) from the latest received seven speech frames. A DTX hangover period needs to be applied therefore at transmitter side before sending of this SID_FIRST.
Absolutely coded SID_UPDATE frames follow about every eighth frame (160 ms) in speech pauses. SID_UPDATE frames are sent independently of the cell´s timing structure and are related only to the source signal.
An ONSET frame does (typically) not exist in UMTS networks, but may be received in TFO from the distant partner. It marks the beginning of a speech burst. "SCR on" ~~or off~~ is always defined by the network ~~on a cell or call (ffs) basis~~. The defined Tandem Free Operation and Transcoder Free Operation allows the reception of AMR SCR information for the downlink direction in all cases.

The SCR scheme of the UMTS AMR and FR_AMR Codec Types in UMTS are ~~is~~ fully compatible to the DTX scheme of FR AMR and HR AMR ~~of~~ in GSM.

For compatibility with other systems the UMTS AMR Codec application may optionally support various other DTX and Rate Control schemes: GSM EFR, TDMA EFR, PDC EFR. ~~GSM_EFR, TDMA_EFR, TDMA_US1, PDC_EFR~~.

The exact details of these Codec Types and their related procedures (DTX, Rate Control, etc) are described in the respective standard documentation.

Up to release ´99 it is not possible to establish a Transcoder Free Operation between UMTS and these other systems, but

it may soon be possible to establish Tandem Free Operation between UMTS and all these other systems.

5.5 TDMA Enhanced Full Rate Codec Type (TDMA EFR)

The Codec IDentification (CoID) code is defined to be: TDMA_EFR_CoID := 0x0000.0110.

The TDMA Enhanced Full Rate Codec Type has no additional parameters.

For information (for exact details see TDMA Recommendations):

The TDMA Enhanced Full Rate Codec Type supports one fixed Codec Mode with 7.4 kBit/s. This codec mode is bit exact identical with AMR codec mode at 7.4 kBit/s.

In a TDMA system DTX may be enabled in uplink, but not in downlink. The DTX scheme uses one SID frame to mark the end of a speech burst and to start or continue Comfort Noise Generation.

The defined Tandem Free Operation allows the reception of TDMA EFR DTX information for the downlink direction in all cases. In TDMA systems the transcoder has to generate comfort noise in speech like frames to be sent downlink.
In UMTS the downlink DTX shall always be supported and the transcoder can therefore stay transparently in TFO.

5.6 PDC Enhanced Full Rate Codec Type (PDC_EFR)

The Codec IDentification (CoID) code is defined to be: TDMA_EFR_CoID := 0x0000.0111.

The PDC Enhanced Full Rate Codec Type has no additional parameters.

For information (for exact details see PDC Recommendations):

The PDC Enhanced Full Rate Codec Type supports one fixed Codec Mode with 6.7 kBit/s. This codec mode is bit exact identical with AMR codec mode at 6.7 kBit/s.

In a PDC system DTX may be enabled in uplink, but not in downlink. The DTX scheme uses one SID frame to mark the end of a speech burst and to start or continue Comfort Noise Generation.

The Tandem Free Operation allows the reception of PDC EFR DTX information for the downlink direction in all cases.
In PDC systems the transcoder has to generate comfort noise in speech like frames to be sent downlink.
In UMTS the downlink DTX shall always be supported and the transcoder can therefore stay transparently in TFO.

6 ~~ETSI~~ Codec List for the Call Control~~ore Network~~ Protocol

For call control on the air interface the Codec Lists need to be specified for each radio access technology separately, because it can not be expected that an UE supports the same Codec Types in different radio access technologies.

TS 24.008 [9] *defines the call control signalling and how to use the "Supported Codec List* Information Element" (IE).
It contains Codec Lists (in form of Codec Bitmaps) for each supported radio access technology (identified by a SysID).

The coding of this is IE is given here. It is designed in a similar way as for TFO in TS 28.062 [7].

6.1 System Identifiers for GSM and UMTS

The system identifiers for the radio access technologies supported by this specification are:

SysID for GSM: 0x0000.0000 (bit 8 .. bit 1)

SysID for UMTS: 0x0000.0100 (bit 8 .. bit 1)

These values are selected in accordance with [7] (TS 28.062).

6.2 Codec Bitmap

The Codec Types currently defined are coded in the first octet of the Codec Bitmap as follows:

bit 8	7	6	5	4	3	2	bit 1
~~reserved~~ PDC EFR	~~reserved~~ TDMA EFR	UMTS AMR	HR AMR	FR AMR	GSM EFR	GSM HR	GSM FR

A Codec Type is supported, if the corresponding bit is set to "1". All reserved bits shall be set to "0".

Annex A (informative) : Example Codec List for UMTS

This Annex gives some informative examples how the Codec List for UMTS may look like for the ~~BICC~~ OoBTC protocol.
UMTS does support: UMTS AMR, FR AMR and HR AMR. It may support also GSM EFR, TDMA EFR and PDC EFR.~~.GSM_EFR, TDMA_12.2, TDMA_7.40 and PDC_6.70.~~
One list (with arbitrarily selected Codec Type preference) could look at Originating side like:

Octet	Parameter	MSB 8	7	6	5	4	3	2	1 LSB
1	Codec List	Codec List (see ITU-T Q.765.5)							
2	Length Indication (LI)	30							
3	Compat. Info	Compatibility Information							
4	Single Codec	Single Codec (see ITU-T Q.765.5)							
5	LI	6							
6	Compat. Info	Compatibility Information							
7	OID	~~3GPP~~ETSI OID (~~"non-ITU-T organisation according to reference [5]",~~ See ITU-T Q.765.5 [6])							
8	CoID	UMTS_AMR_CoID							
9 o	ACS	12.2	10.2	7.95	7.40	6.70	5.90	5.15	4.75
10 o	SCS	12.2	10.2	7.95	7.40	6.70	5.90	5.15	4.75
11 o	MACS	(spare)	(spare)	~~ICM~~ (spare)	~~(spare)~~ ~~(spare)~~ OM		MACS		
12	Single Codec	Single Codec (see ITU-T Q.765.5)							
13	LI	6							
14	Compat. Info	Compatibility Information							
15	OID	~~3GPP~~ETSI OID (~~"non-ITU-T organisation according to reference [5]",~~ See ITU-T Q.765.5 [6])							
16	CoID	FR_AMR_CoID							
17 o	ACS	12.2	10.2	7.95	7.40	6.70	5.90	5.15	4.75
18 o	SCS	12.2	10.2	7.95	7.40	6.70	5.90	5.15	4.75
19 o	MACS	(spare)	(spare)	~~ICM~~ (spare)	~~(spare)~~ ~~(spare)~~ OM		MACS		
20	Single Codec	Single Codec (see ITU-T Q.765.5)							
21	LI	6							
22	Compat. Info	Compatibility Information							
23	OID	~~3GPP~~ETSI OID (~~"non-ITU-T organisation according to reference [5]",~~ See ITU-T Q.765.5 [6])							
24	CoID	HR_AMR_CoID							
25 o	ACS	(spare)	(spare)	7.95	7.40	6.70	5.90	5.15	4.75
26 o	SCS	(spare)	(spare)	7.95	7.40	6.70	5.90	5.15	4.75
27 o	MACS	(spare)	(spare)	~~ICM~~ (spare)	~~(spare)~~ ~~(spare)~~ OM		MACS		
28	Single Codec	Single Codec (see ITU-T Q.765.5)							
29	LI	3							
30	Compat. Info	Compatibility Information							
31	OID	~~3GPP~~ETSI OID (~~"non-ITU-T organisation according to reference [5]",~~ See ITU-T Q.765.5 [6])							
32	CoID	EFR_CoID							

with "o" = optional octet

The Terminating Side selects one of the Codec Types and returns it, together with the selected codec attributes.

The three AMR Codec Types may have very similar, if not identical codec attributes at Originating side. The UMTS as Originating side can, however, already decide, which configuration would be preferred in case the Terminating side is UMTS, or GSM FR or GSM HR. A GSM as Originating side can not offer UMTS_AMR and the Codec attributes for FR AMR and HR AMR may be quite different.

3GPP TSG-S4#13
October 23-27, 2000, Osaka, Japan

***Document* S4-000551**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

26.103	CR	005	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	3G RAN		3G CN	X

Source: TSG-SA WG4 **Date:** 11/Dec/00

Subject: Introduction of Selected Codec Type for Codec Negotiation

Work item: AMR

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	
				Release 00	X

Reason for change:
The Call Control Protocol defined in TS 24.008 needs in addition the Selected Codec Type for Codec Negotiation at call set-up.
This Selected Codec Type is sent to the ME.
The coding shall be defined in TS 26.103.

Clauses affected: Clause 6

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR

6 Codec List for the Call Control Protocol

For call control on the air interface the Codec Lists need to be specified for each radio access technology separately, because it can not be expected that an UE supports the same Codec Types in different radio access technologies.

TS 24.008 [9] *defines the call control signalling and how to use the "Supported Codec List* Information Element" (IE). It contains Codec Lists (in form of Codec Bitmaps) for each supported radio access technology (identified by a SysID).

The coding of this is IE is given here. It is designed in a similar way as for TFO in TS 28.062 [7].

6.1 System Identifiers for GSM and UMTS

The system identifiers for the radio access technologies supported by this specification are:

SysID for GSM: 0x0000.0000 (bit 8 .. bit 1)

SysID for UMTS: 0x0000.0100 (bit 8 .. bit 1)

These values are selected in accordance with [7] (TS 28.062).

6.2 Codec List Bitmap

The Codec Types ~~currently defined~~ are coded in the first octet of the Codec List Bitmap as follows:

bit 8	7	6	5	4	3	2	bit 1
PDC EFR	TDMA EFR	UMTS AMR	HR AMR	FR AMR	GSM EFR	GSM HR	GSM FR

A Codec Type is supported, if the corresponding bit is set to "1". All reserved bits shall be set to "0".

6.3 Selected Codec Type

The Selected Codec Type is coded in accordance with [7] (TS 28.062) (long form).

Table 6.3-1: Coding of the selected Codec_Type (long form)

Bit 8…Bit 1 CoID	**Codec_Type**	**Name**
0000.0000	GSM Full Rate (13.0 kBit/s)	GSM FR
0000.0001	GSM Half Rate (5.6 kBit/s)	GSM HR
0000.0010	GSM Enhanced Full Rate (12.2 kBit/s)	GSM EFR
0000.0011	Full Rate Adaptive Multi-Rate (FR_AMR)	FR AMR
0000.0100	Adaptive Multi-Rate – HR (AMR_HR)	HR AMR
0000.0101	Adaptive Multi-Rate – UMTS (AMR_UMTS)	UMTS AMR
0000.0110	TDMA Enhanced Full Rate (7.4 kBit/s)	TDMA EFR
0000.0111	PDC Enhanced Full Rate (6.7 kBit/s)	PDC EFR
other codes	reserved for future use.	

3GPP TSG-SA4 Meeting #14
Bath, UK, 27. Nov - 1. Dec 2000

Tdoc S4-000692

CR-Form-v3

CHANGE REQUEST

⌘	Spec-Number 26.103	CR	CR-Num 006	⌘	rev	-	⌘	Current version:	3.0.0	⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	Clarification for the use of the Codec List Information Element
Source:	⌘	TSG-SA WG4
Work item code:	⌘	AMR
Date:	⌘	2000 / 12 / 11
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Correction/Modification in TS 24.008
Summary of change:	⌘	The Codec List IE is used for the UE capabilities of the UMTS radio access only.
Consequences if not approved:	⌘	Discrepancy between TS 26.103 and TS 24.008

Clauses affected:	⌘	1 and 4		
Other specs affected:	⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at:
http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

1 Scope

The present Technical Specification outlines the Codec List in 3GPP including both systems, GSM and UMTS, to be used by the ~~Bearer Independent Call Control (BICC)~~Out of Band Transcoder Control (OoBTC) protocol to set up a call or modify a call in **Tr**anscoder **F**ree **O**peration (TrFO) and in "transcoder at the edge" scenarios.

~~-~~The TS further specifies the coding of the Supported Codec List~~s~~ Information Elements for the UMTS ~~both~~ radio access technology~~., GSM and UMTS, for the Core Network Protocols in UMTS.~~
The Supported Codec List~~s~~ IE includes Codec_Types from the TDMA and PDC systems, to support TFO or TrFO between UMTS and TDMA, or ~~respectively~~ UMTS and PDC.

4 General

The present Technical Specification outlines the 3GPP internal Codec List~~s~~ for both, GSM and UMTS, to be used by the Out of Band Transcoder Control (OoBTC) ~~Bearer Independent Call Control (BICC)~~ protocol to set up a call or modify a call in Transcoder Free Operation (TrFO).

It further specifies the coding of ~~th~~~~eis~~e the Supported Codec List~~s~~ Information Elements as defined in 3G TS 24.008 for ~~both~~ the UMTS radio access technolog~~yies, GSM and UMTS, to be used by the Core Network Protocols on the radio interface in UMTS~~.