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**TETRAPOL Specifications;
Part 5: Interface to Dispatch Centre;
Part 2: Speech Control Protocol Design on digital support**

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1. Scope

The TETRAPOL R6 interface to a dispatch centre is a network-to-network interface between one TETRAPOL switching and management infrastructure (SwMI) and one dispatch centre (DC).

The speech control protocol of the R6.11 is described in this document. It shall supply :

- speech support
- PTT service

This document corresponds to sub-part 5.2 of the TETRAPOL specification of the interface to a dispatch centre, which is divided into five sub-parts:

- Part 5.1 Technical requirements;
- **Part 5.2 Speech control protocol on digital interface protocol design;**
- Part 5.3 reserved
- part 5.4 Service control protocol design;
- part 5.5 Service control messages.

The speech related signalling protocol shall use protocol stack for interconnecting Private Integrated Services Network eXchanges (PINXs) to form Private Integrated Services Network (PISN).

This sub-part specifies and defines the signalling protocol for the support of the TETRAPOL connection control services, between the access gate (AG) functional entity of a TETRAPOL SwMI and the dispatch position switch (DPS) functional entity of a dispatch centre, both seen as private integrated network exchanges (PINXs) at the Q reference point.

This interface basically features a semi-permanent link between an access gate and a dispatch centre switch with speech control signalling between AG and DPS.

2. Normative references

This PAS 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.

- [1] PAS 0001-1-1: "TETRAPOL Specifications; General Network Design; Reference Model".
- [2] PAS 0001-5-1: "TETRAPOL Specifications; Interface to dispatch centre; technical requirements Specifications".
- [3] PAS 0001.5.4 : « TETRAPOL Specifications; Interface to dispatch centre; Service control protocol »
- [4] PAS 0001.5.5 : « TETRAPOL Specifications; Interface to dispatch center; Service control messages »
- [5] ETS 300 172 : "Private integrated services network (PISN); Inter-exchange signalling protocol; Circuit mode basic services".
- [6] ETS 300 239 : "Private integrated services network (PISN) Inter-exchange signalling protocol; generic functional protocol for the support of supplementary services".
- [7] ETS 300 170 "Private Telecommunication network (PTN) Data link layer protocol at the Q reference point for signalling channel between two private telecommunication network exchanges".
- [8] ETS 300 102 « Integrated Services digital Network (ISDN) : user-network interface layer 3. Specifications for basic call control ».

3. Definitions, symbols and abbreviations

3.1 Definitions

The definitions from the dispatch centre technical requirements [2] apply, including the following definitions:

Access gate (AG): Functional entity in the TETRAPOL SwMI, radio connected or line connected, that supplies voice and signalling facilities to the dispatch centre.

Additional Network Feature (ANF): A capability provided by a private services network exchange above the basic call. In this specification, the additional network features refer to the extra-capabilities provided above QSIG basic call in order to handle TETRAPOL services (for example PTT).

Base station (BS): Interface unit containing a set of radio transmitters/receivers providing access to communications with radio terminals and radio connected access gates. May also be wire connected (LABS).

DC-Organisation: A DC-organisation consists of a set of trunks. The DC-organisation serves for administrative purposes in the dispatch centre.

Dispatch Access Controller (DAC): Functional entity within the TETRAPOL system that acts as an Service Control Point (SCP) for the dispatch centre.

Dispatch Centre (DC): The dispatch centre shall include a dispatch control server (DCS) and a dispatch position switch (DPS) which connects dispatch positions (DPs) to the TETRAPOL network. The dispatch centre provides the dispatchers from one or several DC-organisations with incoming and outgoing TETRAPOL voice services and system monitoring. It may also supply call centre facilities, e.g. automatic call distribution, that are however out of the scope of the TETRAPOL system.

Dispatch control server (DCS): Functional entity within the dispatch centre that handles queries from the dispatch positions.

Dispatch Position Switch (DPS): Call control functional entity within the dispatch centre that handles voice connections over the R6.I1 interface to the TETRAPOL SwMI.

Dispatch Position (DP): Work position connected to the DPS and to the DCS where the dispatchers operate.

Dispatcher: A subscriber of the dispatch centre that uses a dispatch position.

Incoming call: Call from SwMI to DC

Outgoing call: Call from DC to SwMI

QSIG : Protocol at the Q reference point between private networks, used here at the R6.I1 TETRAPOL interface between the SwMI and the DC.

System Terminal: Service access reference point provided to the user by the system. System terminals (STs) are radio terminals (RTs), line connected terminals (LCTs).

System: The TETRAPOL system is composed of the large area fixed infrastructure (SwMI) called network and of the system terminals allowing user access to the available services.

Switching and Management Infrastructure (SwMI): The SwMI shall be a sub-system of the TETRAPOL network. It includes two sub-systems: the base station and the radio switch (RSW) network. The SwMI also includes one or several DACs, the operation and maintenance centre (OMC) and the key management centre (KMC). OMC and KMC are outside of the scope of the present specification.

3.2 Symbols

Not applicable.

3.3 Abbreviations

The abbreviations from document [2] apply, including the following abbreviations:

AG	access gate at SwMI side of the R6-I1 and R6.I3 interfaces
AH	Access handler
ANF	Additional network features
BRI	Basic rate interface
DAC	Dispatch access control functional entity in the SwMI
DC	Dispatch centre
DCS	Dispatch centre server functional entity in the DC
DPS	Dispatch position switch functional entity in the DC
IE	Information Element in a message
PDU	Protocol data unit
PICS	Protocol implementation conformance statement
PTT	Push to talk service
RD	Speech receive detection in the PTT service
R6	Reference point for the TETRAPOL SwMI-Dispatch centre interface
SwMI	TETRAPOL Switching and management infrastructure
TI	Speech transmit indication in the PTT service
TPI	Talking party identification

4. Description of the interface between SwMI and DC

4.1 Interface functional model

The functional model at R6 reference point shall consist of the following functional entities:

- AG Access gate
- DAC Dispatch access controller
- DPS Dispatch position switch
- DCS Dispatch control server

The allocation of the functional entities to physical equipments shall be as follows:

- AG and DAC shall be located in the TETRAPOL SwMI;
- DPS and DCS shall be located in the dispatch centre.

The R6 reference point from the TETRAPOL reference model [1] is split between two logical routes and related interfaces :

- one dedicated to circuit mode speech transmission and related signalling at network layer between AG and DPS, that is specified in this document.
- one dedicated to complementary call related services and non call related services provided to the DC, between DAC and DCS, that is specified in documents [3] and [4],

referred to as service control signalling at applicative layer between DAC and DCS.

The mapping of the R6 information flows on R6-I1 circuit related signalling and R6-I3 service control signalling are described hereafter.

The speech control protocol over R6.I1 takes the following assumptions upon the R6.I3 interface :

- allocates an access gate to each TETRAPOL call handled over R6 interface
- implements service control functions related to TETRAPOL calls;

The figure for DC signalling configuration shows the functional entities and their relationships.

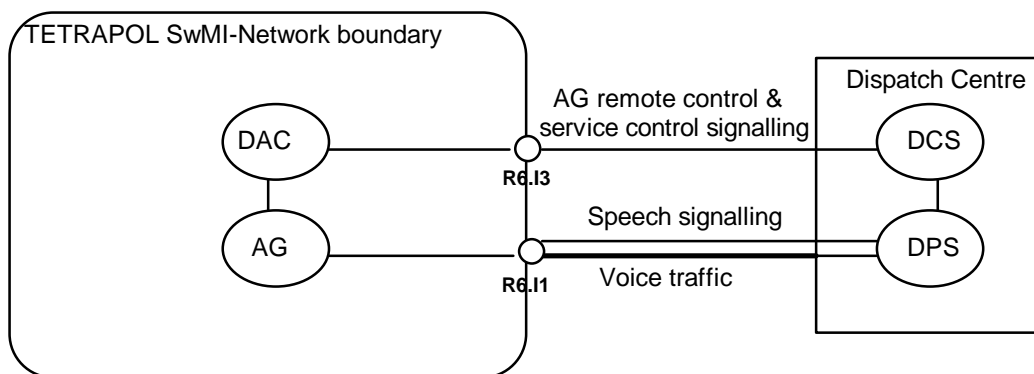


Figure 1: DC signalling over R6 interface:

For each call over the R6 interface, the logical access point instance at the SwMI side is referred to as an access gate (AG) instance. During a call involving one or several TETRAPOL subscribers and the DC, there shall be one AG instance per traffic channel used over R6-I1 interface. The AG shall be allocated by the DCS instance. The AG also provide the DAC with the control signalling from the SwMI.

4.2 Network layer protocol model

4.2.1 Protocol stack

The R6.I1 interface shall be based on a QSIG circuit mode protocol on basic rate interface.

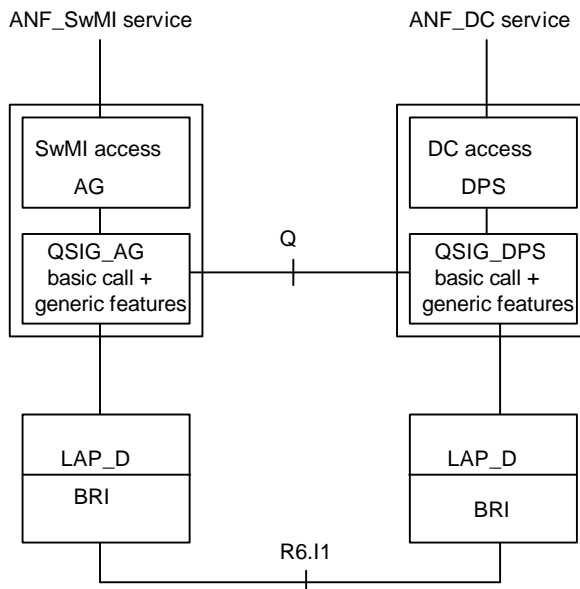


Figure 2: Protocol stack at R6-I1 interface

The normative references are listed as follows:

Link access protocol on channel D (LAP_D) :	[6]
Basic rate interface at physical layer (BRI) :	[7]

4.2.2 Services provided to higher layers

4.2.2.1 Service requirements

The list of services that are available to dispatchers is described in the technical requirements sub-part 5.1 of this specification [2].

The circuit related signalling is based on QSIG protocol and shall provide a semi-permanent connection between each AG and the DPS. Additional network functions provide the enhancements needed to support the TETRAPOL services.

The TETRAPOL SwMI and the dispatch position switch (DPS) shall be two independent networks, with their own numbering plan.

4.2.2.2 Service primitives

This clause describes the service primitives provided to higher layers at SwMI side and DC side of the R6-I1 interface.

The prefix of a primitive refers to the functional entity that owns the primitive, either AG_ or DPS_.

_REQ suffix applies to the requesting side, whereas _IND suffix applies to the receiving side of the interface.

Table 1: Primitives provided to higher layers at SwMI side

Primitive at AG side	Associated message	way	Primitive at DC side	meaning
AG_SETUP_IND	QSIG_SETUP	←	DPS_SETUP_REQ	line connection requested
AG_SETUP_CONF	QSIG_CONNECT	→	DPS_SETUP_CONF	line connection achieved
AG_CONNECT_IND	QSIG_CONNECT_ACK	←	DPS_CONNECT_CONF	line connected
AG_RELEASE_IND	QSIG_DISCONNECT	←	DPS_RELEASE_REQ	line release requested
AG_RELEASE_CONF	QSIG_RELEASE	→	DPS_RELEASE_CONF	line release achieved
AG_IDLE_IND	QSIG_RELEASE_COMPLETE	↔	DPS_IDLE_IND	line released
AG_TPI_REQ	QSIG_FACILITY	→	DPS_TPI_IND	parking party identity
AG_PTT_IND	QSIG_FACILITY	←	DPS_PTT_REQ	beginning of PTT
AG_PTT_RELEASE_IND	QSIG_FACILITY	←	DPS_PTT_RELEASE_REQ	end of PTT
AG_TI_ACT_REQ	QSIG_FACILITY	→	DPS_TI_ACT_IND	AG transmitting
AG_TI_DEACT_REQ	QSIG_FACILITY	→	DPS_TI_DEACT_IND	AG no more transmission
AG_RD_ACT_REQ	QSIG_FACILITY	→	DPS_RD_ACT_IND	AG receiving
AG_RD_DEACT_REQ	QSIG_FACILITY	→	DPS_RD_DEACT_IND	AG no more receiving

The AG shall be a slave of the DC regarding connection management. All speech-control flows shall be sent as remote operations in QSIG_FACILITY messages, once the link is established between the AG and DC.

The connection between the DPS and each AG is semi-permanent and shall be set-up during initialisation process.

The following primitives :

- AG_RELEASE_IND
- DPS_RELEASE_REQ
- DPS_RELEASE_CONF
- DPS_IDLE_IND

should not be used during operational service, except if the DC has a reason to release the connection (typically in action against protocol errors).

The primitive AG_IDLE_IND may be used by the AG in answer to some protocol errors.

4.2.3 Services required from lower layers

4.2.3.1 R6.I1 network layer

It shall use QSIG protocol [5] and [6].

The following rules shall apply to level 3 messages :

- messages shall not be segmented
- message length shall be limited to a single LAP-D segment (260 bytes)
- FACILITY messages length may contain in theory up to 255 bytes in the limit of the maximum message size.

Information elements Call Reference and Channel Identification shall be coded as described in document [5], even on BRI interface :

- Call Reference length = 3
- Channel Identification length = 5

4.2.3.2 R6.I1 Data link layer

The D channel and a single B channel shall be used at R6.I1 interface.

The network layer procedures shall use the data link layer (LAP-D) services and shall receive information from the data link layer by using the primitives designed for the link access protocol on D channel of the ISDN user-network interface, defined in [6].

The TETRAPOL R6.I1 AG interface side shall be configured as a terminal side equipment (TE1). The dispatch position switch functional entity of the dispatch centre shall be configured as a network side equipment (TN2).

The data link connection shall be established before any of the procedures defined in this specification can be performed.

The LAP-D shall be set up by the AG.

The requested LAP-D parameters shall be the following :

- TEI = 00h : value reserved to QSIG in recommendation [6]
- segment size = 260 bytes : minimum value foreseen in recommendation [6]

4.2.3.3 R6.I1 Physical layer

The voice interface shall be built upon B channels that shall handle bi-directional traffic.

The following rules apply for interface configuration:

- The TETRAPOL SwMI side of the R6-I1 interface shall be configured as the terminal side;
- The DPS shall be configured as the network side;
- Point to point connections shall be used;
- The clock shall be supplied by the DPS.

The following rules apply for power at R6-I1 interface:

- The TETRAPOL access gate equipments shall be locally powered;
- The interworking between TETRAPOL and dispatch centre equipments shall be possible with or without power feed detection by the TETRAPOL SwMI.

4.3 System parameters and dimensioning requirements

The traffic channels over R6-I1 shall be provided by an ISDN circuit mode bearer service with a basic rate interface and T0 basic rate interface shall be used over R6-I1 interface in this version of the specification.

The physical layer of the basic rate interface is defined in document [7].

The traffic channel with the lower channel number (B1) should be used exclusively, without channel negotiation.

The AG and DC additional network feature entities shall not be temporised, i.e. they shall not handle any own timer and they shall synchronise on QSIG timers and call control timers.

5. Operational requirements

5.1 Requirements on the TETRAPOL SwMI

Basic call procedures and connection oriented generic functions shall apply as specified in [5] and [6]. The Network Facility Extension shall be a mandatory part of all facility information elements.

5.2 Requirements on the Dispatch Centre

Basic call procedures and generic functions shall apply as specified in [5] and [6]. Addresses shall be provided in the addressing plan of the called system.

5.3 Requirements on a transit QSIG

There shall be not transit node between an AG and a DC.

6. Signalling procedures at R6-I1 interface

6.1 Introduction

This clause specifies in detail how:

- the access gates are handled at the dispatch centre interface,
- the semi-permanent connection is established over R6-I1 interface with QSIG protocol,
- how the speech related control operations flow over the connection.

6.2 Access gates management over R6-I1

6.2.1 Routing a call and selecting an access gate

Call routing and access gate selecting is handled over R6.I3 interface.

The DPS shall select the same access gate on R6.I1 interface for speech service.

6.2.2 Non-discrimination between subscribers in the dispatch centre

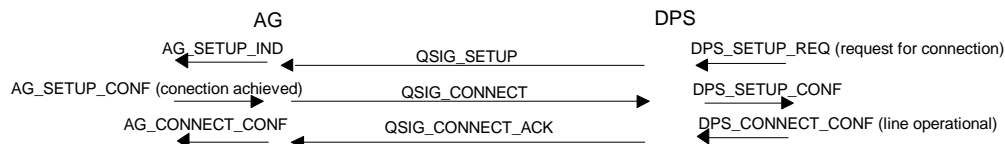
The protocol at R6-I1 shall be able to work regardless of the type of dispatch positions involved in a call may be basic telephone sets or computerised dispatch position, connected to the DC directly or via an external public or private network.

Nevertheless PTT and TPI service will not be available with a basic telephone set or a network line.

6.3 Connection establishment procedure

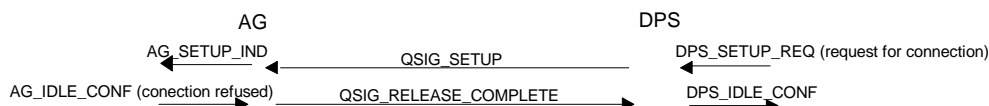
Connections between AG and DC shall be established prior and regardless to any TETRAPOL call.

The call shall be set up by the DCS in accordance with QSIG basic call protocol as described in [5].



6.4 Connection refused

In some cases, the AG may refuse to set up the call (typically, wrong called party address).

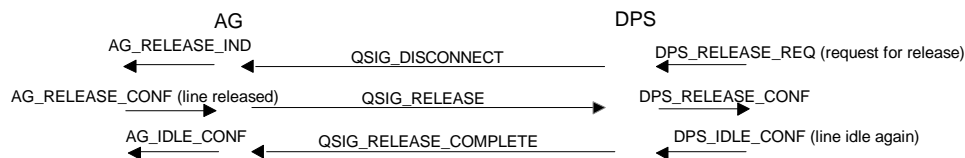


6.5 Connection release procedure

Connections between AG and DC shall be kept established regardless of any TETRAPOL call.

Nevertheless, it may be assumed that the DC, for its own purpose, needs to release the connection : the AG will not be available as long as the connection has not been restored.

The call shall be released by the DCS in accordance with QSIG basic call protocol as described in [5].



6.6 Speech control procedures

6.6.1 Introduction

The protocol over R6-I1 interface shall support speech control procedures for half duplex calls with push-to-talk (PTT) remote operation.

6.6.2 PTT service

6.6.2.1 Service description

After the connection has been set up, the Push-to-talk supplementary service shall enable a dispatcher, participating in an half duplex voice call over a traffic channel of the R6-I1 interface :

- to request permission to transmit from DC to SwMI
- to request the end of transmission from DC to SwMI
- to be informed that speech is being transmitted from DC to SwMI
- to be informed that speech is no longer transmitted from DC to SwMI
- to be informed that speech is being received from SwMI to DC
- to be informed that speech is no longer received from SwMI to DC.

When invoked, this supplementary service shall not have any interaction with other services.

The SwMI shall handle the push-to-talk arbitration.

If several dispatchers are engaged in a call with the same AG, the DC shall supply PTT arbitration in order to make sure that the speech of only one of them will be transmitted to the SwMI.

PTT priority level may be adjusted by the means of a command sent over R6.I3 interface

It is recommended to use two priority levels that shall have both an higher priority level than other TETRAPOL subscriber :

- Normal DC priority for call between a dispatcher and any type of TETRAPOL call
- Increased DC priority for calls that connect together two or more TETRAPOL group communications with a transit through the DC.

6.6.2.2 Information flows

The information flow from the DC to the SwMI across the interface shall be as follows:

- PTT_REQUEST shall be received by the SwMI as a request to transmit the speech signal from the DC to the SwMI.
- PTT_RELEASE shall be received by the SwMI as an order to cease transmitting from the DC to the SwMI.

The information flow from the SwMI to the DC across the interface shall be as follows:

- TI_ACT shall be sent by the SwMI when speech transmission from DC to the SwMI is beginning.
- TI_DEACT shall be sent by the SwMI to indicate that the speech transmission from the DC to the SwMI has ceased.
- RD_ACT shall be sent by the SwMI to indicate that speech reception from SwMI to DC is beginning
- RD_DEACT shall be sent by the SwMI to indicate that speech reception from SwMI to DC has ceased.

6.6.3 Talking party identification

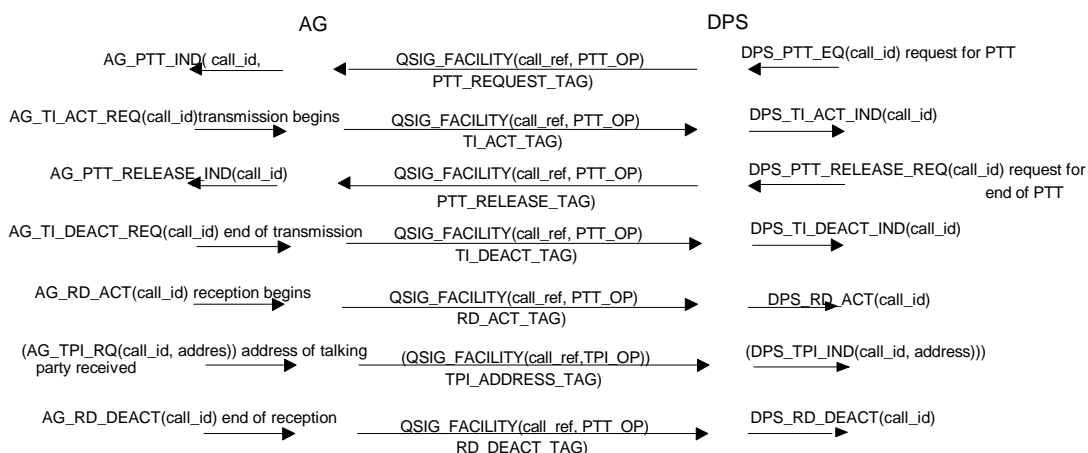
During an on-going communication, the identity of the talking TETRAPOL subscriber may be provided both on R6.11 and R6.13 interfaces. In some cases it may be unavailable.

Talking party identity is transmitted from SwMI to DC, never from DC to SwMI.

6.6.4 Global diagram for PTT and TPI service

Hereafter the following sequence :

- Speech transmitted from DC
- Speech received by DC, with talking party identity (optional).



6.7 Handling of protocol error conditions

The handling of QSIG protocol error conditions shall apply as defined in [5] with the following additions.

The DC shall be able to decide whenever the connection over R6-11 shall be released, when the QSIG protocol does not handle the event by itself. The call is not released on R6.13 interface but no speech is available anymore.

The AG shall be able to send RELEASE_COMPLETE by itself in all cases foreseen by the protocol, typically on SETUP error.

Both sides shall be able to send STATUS message with error cause.

7. Call states at R6-I1 interface

7.1 Introduction

The call control states that may exist at the AG side and at the DC side of the circuit mode R6-I1 interface are defined in the following informative sub-clauses.

The state of the call on R6.I1 interface conditions the availability of speech service on calls that shall be set up onto R6.I3 interface.

7.2 Call states at R6-I1 DC side

7.2.1 Connection states

The connection states shall include the following macro-states, which may be subdivided in more detailed states, including those defined in QSIG [5].

DPS_IDLE (DC 0)

This state shall exist when no connection control instance is allocated to handle the connection over R6-I1 interface.

The AG should not support any call. If any, speech service is not available.

DPS_CONNECTION_SETUP (DC 1)

This state shall exist during the connection establishment phase, from the initial request to set-up until the link is through-connected over R6.I1 or until the connection establishment over R6-I1 interface is aborted.

The AG should not support any call. If any, speech service is not available.

DPS_CONNECTED (DC 2)

The link is said to be in the connected state when it has been established over R6-I1 interface and no request to disconnect it has been received.

The AG may support a call. If any, speech service is available.

DPS_DISCONNECTING (DC 3)

This state shall exist when the link is being disconnected.

The AG should not support any call. If any, the speech service is not available.

7.2.2 PTT states

The PTT states shall be valid if the call state is DPS_CONNECTED with a traffic channel available and through-connected.

Nevertheless, it is ineffective if no call has been set up over R6.I3 interface.

SILENT (DC_PTT 0)

This state shall exist when no participant is talking. It may exist with or without an ongoing call over R6.I3 interface.

TRANSMIT_REQUESTED (DC_PTT 1)

This state shall exist when the DC has requested permission to transmit but has received no answer yet from the SwMI. It may exist with or without an ongoing call over R6.I3 interface but in this last case, PTT will not be granted.

TALKING (DC_PTT 2)

This state shall exist when the DC is transmitting speech on the traffic channel into the SwMI. It may exist only with an ongoing call over R6.I3 interface.

TRANSMIT_CEASE (DC_PTT 3)

This state shall exist when the DC has requested to cease transmitting but has received no answer yet from the SwMI. It may exist only with an ongoing call over R6.I3 interface.

LISTENING (DC_PTT 4)

This state shall exist when the DC is receiving speech on the traffic channel from the SwMI It may exist only with an ongoing call over R6.I3 interface.

7.3 Call states at R6-I1 SwMI side

7.3.1 Connection states

The connection states shall include the following macro-states, which may be subdivided in more detailed states, including those defined in QSIG [5].

AG_IDLE (AG 0)

This state shall exist when no connection control instance is allocated to handle the connection over R6-I1 interface.

AG_CONNECTION_SETUP (AG 1)

This state shall exist during the connection establishment phase, from the initial request to set-up over R6-I1 interface until the link is through-connected over R6 or until the establishment over R6-I1 interface is aborted.

AG_CONNECTED (AG 2)

The link is in the connected state when it has been established over R6-I1 interface and inside of the SwMI, and no request to release the connection has been received.

AG_DISCONNECTING (AG 3)

This state shall exist when the link is being disconnected.

7.3.2 PTT states

IDLE (AG_PTT 0)

This state shall exist when no call has been set up over R6.I3 interface.

SILENT (AG_PTT 1)

This state shall exist when a call has been set up over R6.I3 interface , but no participant is talking.

INCOMING (AG_PTT 2)

This state shall exist when a call has been set up over R6.I3 interface and when the speech is transmitted from the R6-I1 interface into the SwMI.

OUTGOING (AG_PTT 3)

This state shall exist when a call has been set up over R6.I3 interface and when speech is transmitted from the SwMI onto the R6-I1 interface.

8. Message coding requirements at R6-I1 interface

8.1 QSIG messages at R6-I1 interface

8.1.1 Use of QSIG messages

This clause defines the minimum requirements to the QSIG network messages [5] [6] for the support of the Additional Network Features between a TETRAPOL SwMI and a Dispatch Centre. The tables in this clause follow the QSIG conventions [5], with the following modification :

For each message a table indicates which standard information elements shall be inserted by the TETRAPOL SwMI for messages sent to the dispatch centre, and which standard optional information elements shall be recognised by the TETRAPOL SwMI for messages received from the dispatch centre. Other standard optional information elements may be ignored by the TETRAPOL SwMI. For each information element or field in the tables, it specifies whether inclusion status shall be:

- mandatory (M) for both TETRAPOL conformance and QSIG conformance;
- mandatory (TM) for TETRAPOL conformance, though optional for QSIG conformance;
- optional (O) for both QSIG and TETRAPOL conformance;
- optional (TO) for TETRAPOL conformance and not related to QSIG conformance;
- optional (TN) for QSIG conformance and not related to TETRAPOL conformance, i.e. ignored when received and not sent by the TETRAPOL SwMI;
- conditional (C) on the presence or value of another information element.

TETRAPOL conformance is described in the PICS proforma attached in annex A of this document. QSIG conformance is described in the PICS proforma of the QSIG specification [5] [6].

Whenever a message is sent over the R6 interface, according to the procedure defined above, it shall contain the mandatory information elements marked (M) or (TM), and optionally any combination of the optional information elements marked (O) or (TO). The TETRAPOL SwMI shall not send any information element marked (TN).

8.1.2 Applicable QSIG messages

QSIG basic call control messages are defined in [5]. The messages supporting TETRAPOL Application PDUs transportation are defined in [6] and may be supported over the interface as described in the following table for the purpose of this interface. It is mandatory to support at least the messages and the information elements described hereafter; support of other messages or other information elements is optional:

Table 2: QSIG messages used at the SwMI-DC interface

	TETRAPOL SwMI-DC interface support	Normative Reference
Call establishment messages		
QSIG_ALERTING	not used	[6]
QSIG_CALL PROCEEDING	not used	[5]
QSIG_CONNECT	SwMI->DC	[6]
QSIG_CONNECT ACKNOWLEDGE	DC->SwMI	[5]
QSIG_PROGRESS	not used	[6]
QSIG_SETUP	DC->SwMI	[6]
QSIG_SETUP ACKNOWLEDGE	not used	[5]
Call clearing messages		
QSIG_DISCONNECT	DC->SwMI	[6]
QSIG_RELEASE	SwMI->DC	[6]
QSIG_RELEASE COMPLETE	both ways	[6]
QSIG_RESTART	DC->SwMI	[5]
QSIG_RESTART ACKNOWLEDGE	SwMI->DC	[5]
Messages for call control information		
QSIG_INFORMATION	not used	[5]
QSIG_FACILITY	both ways	[6]
QSIG_NOTIFY	not used	[6]
QSIG_SEGMENT	not used	[5]
Messages for general procedures		
QSIG_STATUS	both ways	[5]
QSIG_STATUS ENQUIRY	DC->SwMI	[5]

8.1.3 Messages for general procedure

8.1.3.1 QSIG_STATUS

This message may be received by the SwMI to indicate a QSIG error condition. This message shall be sent by the SwMI as an answer to a status enquiry.

The QSIG specification [5] shall apply with the following indications:

Table 3: QSIG_STATUS protocol data unit

Message type: QSIG_STATUS		Direction: both	
Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Cause	8.4.12	M	4-32
Call state	8.4.7	M	3

8.1.3.2 QSIG_STATUS_ENQUIRY

This message shall not be sent over R6 interface.

8.1.4 Messages for circuit mode call control

8.1.4.1 QSIG_ALERTING

This message shall not be used.

8.1.4.2 QSIG_CALL PROCEEDING

This message may not be used.

8.1.4.3 QSIG_CONNECT

This message shall be sent during the establishment a QSIG bearer to indicate that the SwMI has accepted the bearer connection and shall then be through-connected.

The QSIG specification [6] shall apply with the following indications:

Table 4: QSIG_CONNECT protocol data unit

Message type: QSIG_CONNECT Direction: SwMI to DC

Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Channel identification	8.4.13	M	5

NOTE: Channel identification shall be mandatory because QSIG_CONNECT is the first response to a QSIG_SETUP message as a confirmation of traffic channel allocation.

Other fields, described in [5] are never sent by the SwMI.

8.1.4.4 QSIG_CONNECT_ACKNOWLEDGE

This message shall be sent as an acknowledgement for successful through-connection, when the traffic connection is end to end effective.

The QSIG specification [5] shall apply with the following indications:

Table 5: QSIG_CONNECT_ACKNOWLEDGE protocol data unit

Message type: CONNECT ACKNOWLEDGE Direction: DC to SwMI

Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1

8.1.4.5 QSIG_DISCONNECT

This message shall be sent as a request to disconnect the traffic channel. It shall be used to clear a bearer connection, which should never happen in normal cases for semi-permanent connections.

The QSIG specification [6] shall apply with the following indications:

Table 6: QSIG_DISCONNECT protocol data unit

Message type: QSIG_DISCONNECT Direction: both

Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Cause	8.4.12	M	4-32

8.1.4.6 QSIG_INFORMATION

This message shall not be used over R6 interface because overlap sending is not supported.

8.1.4.7 QSIG_PROGRESS

This message shall not be sent by SwMI over R6 interface and shall be ignored when received.

8.1.4.8 QSIG_RELEASE

This message shall be sent, when the local end of the traffic channel has been disconnected, in order to request the remote end to be released.

The QSIG specification [6] shall apply with the following indications:

Table 7: QSIG_RELEASE protocol data unit

Message type: QSIG_RELEASE Direction: SwMI to DC

Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Cause	8.4.12	O	4-32

8.1.4.9 QSIG_RELEASE_COMPLETE

This message shall be sent to indicate that the local end of the traffic channel has been disconnected and that the call reference has been locally deallocated, in order to request the remote end to deallocate the call reference.

The QSIG specification [6] shall apply with the following indications:

Table 8: QSIG_RELEASE_COMPLETE protocol data unit

Message type: QSIG_RELEASE_COMPLETE Direction: both

Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Cause	8.4.12	O	4-32

8.1.4.10 QSIG_SETUP

This message shall be sent from DC to SwMI to set up a bearer connection

Blocked sending procedure shall be used.

Called party number shall have a fixed value that points out semi-permanent link service. no subaddress has to be supplied.

The QSIG specification [5] shall apply with the following indications:

Table 9: QSIG_SETUP protocol data unit

Message type: QSIG_SETUP		Direction: DC to SwMI	
Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Sending complete	8.4.21	TM	1
Bearer capability	8.4.6	M	4-11
Channel identification	8.4.13	M	5
Progress indicator	8.4.18	TN	4
Calling party number	8.4.10	TN	4-*
Calling party subaddress	8.4.11	TN	4-23
Called party number	8.4.8	M	4-*
Called party subaddress	8.4.9	TN	4-23
Low Layer compatibility	8.4.17	TN	4-16
High layer compatibility	8.4.16	TN	4-5
Transit counter	8.4.23	TN	3
Party category	8.4.22	TN	3

8.1.4.11 QSIG_SETUP_ACKNOWLEDGE

This message may not be used over R6 interface.

8.1.5 Messages for layer management

8.1.5.1 QSIG_RESTART

This message requesting to reinitialise the channels of an interface shall not be sent by the SwMI.

The QSIG specification [5] shall apply with the following indications:

Table 10: QSIG_RESTART protocol data unit

Message type: QSIG_RESTART		Direction: DC to SwMI	
Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Channel identification	8.4.13	O	4-*
Restart indicator	8.4.19	M	3

8.1.5.2 QSIG_RESTART_ACKNOWLEDGE

This message shall be used over R6 interface in response of QSIG_RESTART message.

The QSIG specification [5] shall apply with the following indications:

Table 11: QSIG_RESTART_ACKNOWLEDGE protocol data unit

Message type: QSIG_RESTART ACKNOWLEDGE		Direction: SwMI to DC	
Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Channel identification	8.4.13	O	5
Restart indicator	8.4.19	M	3

8.1.6 Messages for additional network features

8.1.6.1 QSIG_FACILITY

This message shall be used to send information elements not related to the QSIG connection.

The QSIG specification [6] shall apply with the following indications:

Table 12: QSIG_FACILITY protocol data unit

Information element	Reference	Status	Length
Protocol discriminator	8.4.3	M	1
Call reference	8.4.4	M	3
Message type	8.4.5	M	1
Facility	8.2.2	TM	3-*

8.1.6.2 QSIG_NOTIFY

This message shall not be used over R6 interface.

8.2 PTT and TPI operations

8.2.1 Purpose

Above the QSIG connection, the PTT and TPI signalling flows that shall be encoded in conformance with the QSIG generic functional protocol defined in [6].

8.2.2 Facility information element

The TETRAPOL Application PDUs and operations to be transported over the interface shall be encoded in a Facility information element.

The coding is compatible with ROSE protocol but does not use ASN1 coding. All parameters values are compatible with a future ASN1 coding.

The Protocol Profile Coding shall be set to the value allocated to the discriminator for supplementary service applications when conveying additional network features or supplementary services.

As the PTT and TPI service is supplied point to point between an AG and an interface on the DC without transit, the elements destinationEntity and sourceEntity are not needed. As a consequence, the Facility IE shall not contain NetworkFacilityExtension field.

The InterpretationAdu shall be omitted and the procedure for unrecognised operations will be the default one.

The Facility information element shall have the general format as shown in Table 13:

Table 13: Facility information element coding

INFORMATION ELEMENT	bit length	Status	Remark
Facility IE identifier	8	M	:= 00011100b
Length of IE contents	8	M	
Ext	1	M	:=1b
Spare	2	M	:=00b
Protocol profile	5	M	:=10001 (supplementary)
NetworkFacilityExtension	3-*	TN	should not be used
InterpretationApdu	3-*	TN	should not be used
ComponentPart	3-*	O	one shall be included

NetworkFacilityExtension shall never be sent by the SwMI. When received by the SwMI, it shall be ignored.

InterpretationApdu shall never be sent by the SwMI. When omitted, the standard procedure shall be applied.

The component part of the Facility information element shall have the general format for invokePDU as shown in Table 14 :

Table 14: ComponentPart coding for TETRAPOL invokePDU

INFORMATION ELEMENT	Length	Status	Remark
Context specific tag := InvokePDU	1	M	:=0x01h
InvokePDU length	1	M	:=0x04h
Universal tag :=(integer, InvokeIDType)	1	M	:=0x02h
InvokeID length	1	M	:=0x01h
InvokeID	1	M	applicative reference value
Universal tag :=object identifier	1	M	operation value type := 0x06h
Object identifier length	1	M	:=0x07h+
level1:=iso identified organisation	1	M	:=0x02h
level2:=icd_ecma	1	M	:=0x0Ch
level3:=standard	1	M	:=0x00h
level4:=TETRAPOL_STD1	1	M	value attributed to TETRAPOL
level5:=TETRAPOL_STD2	1	M	value attributed to TETRAPOL
level6:=operation code	1	M	see related clause
operation argument	1-*	M	see related clause

The object identifier shall be set to ECMA approved TETRAPOL standard with appropriate TETRAPOL_STD1 and TETRAPOL_STD0 values allocated by Standardisation Instances.

The operation code shall identify the service (PTT, TPI) and shall be completed by an operation argument.

8.2.3 Other information elements

Any other information element shall be coded in accordance with the rules of [5] and [6].

8.3 Operations and operation arguments

8.3.1 Operation code

The code of the invokePDU operation for the TETRAPOL_STD1-TETRAPOL_STD2 standard used in the facility information element shall be set as described in the following table.

Table 15: Operation code

PTT_OP	0x0C
TPI_OP	0x11

8.3.2 PTT service

Purpose: This facility shall be used as a PTT request or release, transmit indication activation or deactivation, reception detection activation or deactivation, during the call active phase

Direction: DC to SwMI or SwMI to DC

Tetrapol_operation_code : PTT_OP

Associated QSIG basic call PDU: QSIG_FACILITY

Optional parameters: one of the optional parameters shall be used

Table 16: PTT operation argument

Element	Length	Status	Reference	Remark
Context specific tag := PTT_REQUEST_TAG	1	O.1	8.4.2	received by the SwMI as a request to transmit the speech signal issued by DC on a traffic channel of R6-I1 into the SwMI
Context specific tag := PTT_RELEASE_TAG	1	O.2	8.4.2	received by SwMI in order to cease transmitting into the SwMI the speech signal issued by DC on the traffic channel of R6-I1.
Context specific tag := TI_ACT_TAG	1	O.3	8.4.2	sent by SwMI to indicate speech transmission from DC on traffic channel into SwMI is granted
Context specific tag := TI_DEACT_TAG	1	O.4	8.4.2	sent by SwMI to indicate speech transmission ceased from traffic channel into SwMI
Context specific tag := RD_ACT_TAG	1	O.6	8.4.2	sent by SwMI to indicate that transmit is granted to another party and speech from SwMI is received on traffic channel of R6-I1 for DC reception
Context specific tag := RD_DEACT_TAG	1	O.5	8.4.2	sent by SwMI when speech reception by DC shall cease

NOTE: One of the optional fields O.1, O.2, O.3, O.4, O.5, O.6 shall be used

8.3.3 Talking party identification

Purpose: indicates the identity of the TETRAPOL subscriber presently sending a speech signal on a traffic channel over the interface

Direction: SwMI to DC

Tetrapol_operation_code : TPI_OP

Associated QSIG basic call PDU: FACILITY

Table 17: TPI operation argument

Element	Length	Status	Remark
Context specific tag := TPI_ADDRESS_TAG	1	O	Sent by SwMI to indicate the identity of the TETRAPOL speaking party when speech is being received over R6.I1 interface.
length	1	O	length of address element
address	1-*	O	mandatory if O.3

8.4 Information elements

8.4.1 Information element identifier

The information element identifier shall be coded as described in [5]:

8.4.2 Context specific tag

A context specific tag identifies the type of related field structure. a tagged structure shall be encoded as a context specific, implicit octet string.

The context specific tags used in the arguments of the invokePDU operations from the facility information elements are listed thereafter.

Table 18: Context specific tag

Tag	Value
PTT_REQUEST_TAG	0x80h+4
PTT_RELEASE_TAG	0x80h+5
TI_ACT_TAG	0x80h+6
TI_DEACT_TAG	0x80h+7
RD_ACT_TAG	0x80h+8
RD_DEACT_TAG	0x80h+9
TPI_ADDRESS_TAG	0x80h+2

8.4.3 Protocol discriminator

The protocol discriminator shall be coded as defined in QSIG [5]

8.4.4 Call reference

Call reference shall be coded as defined in QSIG [5] with message length = 3 bytes.

8.4.5 Message type

The message type shall be set according to QSIG [5] [6]

8.4.6 Bearer capability

Bearer capability information element shall be coded in accordance with [5] with the following values:

- coding standard = CCITT

- information transfer capability = speech, or unrestricted digital information
- transfer mode = circuit
- information transfer rate = 64kbit/s
- user information layer 1 = CCITT G711 A-law

8.4.7 Call state

The call state information element shall not be not used at the applicative level.

8.4.8 Called party number

Called party number information element shall be coded in conformance with [5] with the following values:

- type of number = unknown
- numbering plan identification = unknown
- address length := 0x01h (1 digit)
- address :=0x00h (semi permanent service)

8.4.9 Called party subaddress

This information element shall be not be used.

8.4.10 Calling party number

This information element may not be used.

8.4.11 Calling party subaddress

This information element may not be used.

8.4.12 Cause

The cause information element shall be user-coded according to QSIG [5] when referring to a QSIG cause. QSIG diagnostics should not be used for information of the higher layer.

When the 7 bit QSIG cause value is higher than 31, then the call may be released independently of the applicative cause.

8.4.13 Channel identification

Channel identification information element shall be coded in conformance with [5] with the following values :

- message length = 5 bytes
- interface type = other than basic interface
- preferred/exclusive = exclusive
- channel number = B1

8.4.14 Connected number

This information element shall not be used.

8.4.15 Connected subaddress

This information element shall not be used.

8.4.16 High layer compatibility

This optional information element may be set for telephony services as defined in [8].

8.4.17 Lower layer compatibility

This information element shall not be used.

8.4.18 Progress indicator

This information element shall never be sent by the SwMI. It may not be used.

8.4.19 Restart indicator

This information element shall not be used because the interface does not support message segmentation.

8.4.20 Segmented message

This information element shall not be used because the interface does not support message segmentation.

8.4.21 Sending complete

This information element shall coded in conformance with [5].

8.4.22 Party category

The information element shall never be sent by the SwMI and shall be ignored when received. be used.

8.4.23 Transit counter

The information element shall never be sent by the SwMI and shall be ignored when received. be used.

9. History

Document history		
Date	Status	Comment
06 June 1996	First Version	Version 0.0.1
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