

Telecommunications equipment – Subscribers equipment – Technical requirements for connection of a digital cordless telephone, CT3

Telekommunikationsutrustning – Abonentutrustning – Tekniska krav för anslutning av digital sladdlös telefon CT3

Contents

	Page
0 Introduction	1
1 Scope	2
2 References	2
3 Technical telephone requirements	2
3.1 General requirements	2
3.2 Delay	3
3.3 Echo reduction	3
3.4 Sidetone	3
3.5 Terminal coupling loss (TCL _w)	3
3.6 Encoding	3
3.7 Connection of the cordless fixed part of a cordless telephone	4
3.8 Crosstalk	4
4 Technical radio system requirements	4
4.1 Abbreviations and definitions	4
4.2 Link control protocols	6
4.3 Operating strategy	7
4.4 Further technical requirements (for information)	9

0 Introduction

This edition results from a general review of Swedish Standards for attachment to a PSTN in order to align their mandatory content with the requirements of the teleterminal directive (91/263/EEC). A number of provisions have been deleted, some provisions have been transferred to informative parts of the standards and some other modifications have been made.

By this edition the Swedish language version of SS 63 63 68 is withdrawn. From now on the Swedish language version of standards for attachment to a PSTN will not be maintained.

1 Scope

This standard applies to analogue connection of a digital cordless telephone system CT3 to a public switched telephone network.

It also applies to analogue and digital connection of system sets to PBXs which are connected to a public switched telephone network. The common control fixed part, and also one radio fixed part, may be integrated in the PBX.

2 References

The following standards contain requirements, which through reference constitute requirements of this standard.

ITU-T Recommendations:

- G.712 (09/92) Transmission performance characteristics of pulse code modulation.
- G.726 (12/90) 40, 32, 24, 16 kbit/s adaptive differential pulse code modulation (ADPCM).
- P.34 (1993) Transmission characteristics of hands-free telephones.

Swedish standards:

- SS 63 63 27 Telecommunications equipment – Private Branch Exchanges (PBXs) – Common technical requirements.
- SS 63 63 28 Telecommunications equipment – Private Branch Exchanges (PBXs) – Transmission requirements for digital PBXs (A-law) having digital interfaces with exchange lines.
- SS 63 63 41 Telecommunications equipment – Subscriber equipment – Technical requirements for analogue handset telephony.

ETSI-document:

- TBR 8 Integrated Services Digital Network (ISDN) – Telephony 3,1 kHz teleservice – Attachment requirements for handset terminals.

3 Technical telephone requirements

3.1 General requirements

A system intended for 2-wire analogue connection to exchange lines shall fulfil SS 63 63 41 for the cordless fixed part and associated portable parts together.

For a system set connection to (or with a part of the system integrated in) a digital PBX, SS 63 63 28 clause 8.2 shall apply to the PBX, the cordless fixed part and the associated portable parts together. However, clauses 8.2.5 and 8.2.14 are replaced by clauses 3.4 and 3.2 below. Furthermore, clauses 8.2.7.1, 8.2.7.2, 8.2.8, 8.2.9 and 8.2.10 shall not apply to this type of equipment.

For measurement of the transmission properties, the cordless fixed part and the portable part shall be placed in a measurement environment which is practically free from reflections of the radio frequency signals. The distance between the parts shall be at least 50 % of the wavelength (which means that the receiver is outside the near field of the transmitter).

The distance between the parts shall not, however, be so great that noticeable additional noise occurs because of a too low signal level at the receiver.

Requirements for three-party conference are given in SS 63 63 27 clause 7.2.

3.2 Delay

The delay between the interface towards the network and the acoustic interface in the portable part shall not exceed 20 ms for each speech direction which is applicable for both analogue and digital connection. The principle test hookup according to TBR 8, clause A.2.9.

3.3 Echo reduction

The following echo reduction requirements shall be fulfilled if the one-way delay of the cordless fixed part and the cordless portable part exceeds 2,5 ms.

The echo from the telephone network shall be attenuated by an echo canceller for all echo delays (lowest delays in the speech band) up to 4 ms in the telephone network from the cordless fixed part via the reflection point back to the fixed part. The echo reduction shall be at least 24 dB. This requirement shall be fulfilled for acoustic levels in the MRP (Mouth Reference Point) between -23 dBPa and +7 dBPa.

For echo delays in the telephone network between 4 and 55 ms the echo shall be attenuated by at least $A = 9$ dB. The latter requirement may be taken care of by an echo suppressor having an attenuation in the range 9 to 13 dB in the speech direction from the cordless fixed part to the portable part. If such an echo suppressor is used, it shall be placed in the cordless fixed part between the echo canceller and the radio interface. Its switching characteristics shall fulfil the ITU-T Rec. P.34.

With an echo suppressor also reducing echo for short delays, the echo canceller requirement for echo reduction is reduced by the attenuation value of the echo suppressor.

3.4 Sidetone

If the one-way delay of the cordless fixed part and cordless portable part does not exceed 2,5 ms, STMR for a 2-wire connected equipment shall be at least 7 dB (the measuring method as it is set forth in SS 63 63 41 clause 4.4.3).

The following sidetone requirements shall be fulfilled if the one-way delay of the system exceeds 2,5 ms.

An artificial sidetone path shall be incorporated in the portable part. When the return channel is broken the Sidetone Masking Rating (STMR) shall be 13 ± 5 dB.

When measured with the direct sidetone path broken, with the echo canceller and a possible echo suppressor disabled, STMR for a 2-wire connected system shall be at least 7 dB (the measuring method as it is set forth in SS 63 63 41, clause 4.4.3). If the echo canceller reduces the echo X dB more than the requirement in clause 3.3 the latter STMR requirement may be reduced to $(7-X)$ dB. However, STMR shall always be at least 2 dB.

If a user-controlled receiving volume control is provided, the requirement shall be fulfilled at the setting where the RLR is equal to the nominal value.

3.5 Terminal coupling loss (TCL_w)

The value of TCL_w shall be at least $(30+SLR+RLR)$ dB at nominal setting of the volume control and at least $(24+SLR+RLR)$ dB at the highest gain. The loudness ratings refer to nominal values to and from the same measuring point as for the TCL_w measurement.

3.6 Encoding

The coding function shall give a mean opinion score (MOS), when tested subjectively between analogue interfaces, that does not fall below the MOS of 32 kbit/s ADPCM as specified in ITU-T G.726 when tested including A/D and D/A conversions as specified in ITU-T G.712.

3.7 Connection of the cordless fixed part of a cordless telephone

A single-line system shall be connected by a plug or an intermediate plug. Connection types are given in SS-ETS 300 001, clause 8.3(S)1. In the case of a cordless telephone combined with a standard telephone, the latter may be either integrated into the fixed part or connected by means of a plug to an intermediate plug or to a jack of the fixed part.

3.8 Crosstalk

Crosstalk requirements are set forth for a system which allows more than one conversation. The measurements shall be made with closed return channels. For a system with two-wire analogue interfaces the requirements in S 63 63 23 clause 8.2.11 shall apply (with relative levels $L_i = 0$ dBr, $L_o = -5$ dBr).

4 Technical radio system requirements

4.1 Abbreviations and definitions

For the purpose of this standard the abbreviations and definitions are the following.

4.1.1 Abbreviations

- CTA – Cordless Telephone Apparatus
- CPP – Cordless Portable Part
- SLFP – Single PSTN or PBX Line Fixed Part
- CCFP – Common Control Fixed Part
- RFP – Radio Fixed Part
- CFP – Cordless Fixed Part
- PBX – Private Branch Exchange
- PSTN – Public Switched Telephone Network
- TDMA – Time Division Multiple Access

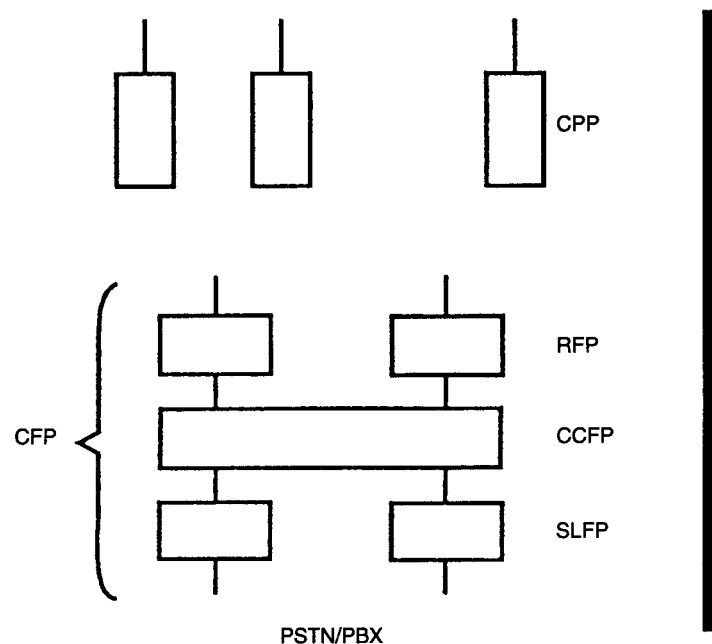


Figure 4:1 Cordless telephone, functional units.

4.1.2 Definitions

4.1.2.1 Cordless Telephone Apparatus (CTA)

Apparatus which permits, by radio means, at least the basic functions of normal telephone apparatus and comprises of one or more cordless fixed parts, one or more antenna systems and one or more cordless portable parts.

4.1.2.2 Cordless Portable Part (CPP)

A portable part of the cordless telephone apparatus which, by integral radio and aerial means and in conjunction with some parts of the cordless telephone apparatus, permits at least the basic functions of normal telephone apparatus including the manual or automatic initiation and termination of calls by a deliberate act.

4.1.2.3 Single PSTN or PBX Line Fixed Part (SLFP)

A fixed part of the cordless telephone apparatus providing the interface between a single PSTN or PBX line and the common control fixed part.

4.1.2.4 Common Control Fixed Part (CCFP)

A fixed part of the cordless telephone apparatus providing the common functions for one or more radio fixed parts and one or more single PSTN line fixed parts or one PBX interface. The connection to PBX can be made through one or more analogue or digital interface(s).

4.1.2.5 Radio Fixed Part (RFP)

A fixed part of the cordless telephone apparatus which interfaces between the common control fixed part and an antenna system.

4.1.2.6 Cordless Fixed Part (CFP)

A functional configuration of some or all of the fixed component (SLFP, CCFP, RFP) parts of a cordless telephone apparatus which, in conjunction with one or more cordless portable parts, permits at least the basic functions of normal telephone apparatus. See figure 4:1.

4.1.2.7 CPP Intercommunication

The condition where own cordless portable parts are in communication with a facility not actively involving the PSTN. See figure 4:1.

Note: It is a requirement that cordless portable parts shall not communicate with each other directly by use of the frequencies allocated.

4.1.2.8 Handshake

A coded signal, transmitted between the parts for the purpose of enhancing integrity of communication between the parts.

4.1.2.9 Radio Channel

Radio channel means a timeslot on a radio frequency (R.F.) carrier. This frequency carrier is located within the frequency band allocated for the digital cordless telephone service.

4.1.2.10 Free Radio Channel

A radio channel in digital cordless telephone service, which has the lowest signal strength of the radio channels as observed by the part of the CTA initiating the call.

4.2 Link control protocols

4.2.1 General

Note: In this clause, communication is taken to be the CFP and CPP interchanging any combination of control, speech and user data.

4.2.1.1 Test distance

The CTA shall be tested with the CFP and CPP separated by some distance, between 2 m and 10 m, in a substantially R.F. interference and reflection free environment.

4.2.1.2 Declaration

The supplier shall declare whether the CTA fulfils the requirements of clauses 4.2.2, 4.3.3, 4.2.4 and 4.2.5.

4.2.2 Handshake

4.2.2.1 Identity code series

This shall be a series of at least 10 million discrete codes. In a PBX connected system the code consists of a system part and a CPP or RFP part. At least the system part of the code is included in the handshake code.

4.2.2.2 Code allocation

Manufacturers shall allocate CPP codes either randomly from the range available and without duplication until the range is exhausted or sequentially starting at a random code in the range.

4.2.2.3 Code matching

The CFP and CPP shall use matching codes for handshake purposes. Only the system part is applicable, see clause 4.2.2.1.

Note: A CFP may be programmable to match the code(s) allocated to CPP(s). It is recommended that any user programming be a secure procedure and that the transmission of CPP's identity code is encrypted.

4.2.2.4 Code recognition

The CFP and CPP shall establish mutual recognition by means of the handshake code before permitting communication.

4.2.2.5 Communication state

The handshake code shall be transmitted both ways between the CFP and CPP at least once per second during communication.

4.2.2.6 Lack of incommunication handshake

If radio channel conditions are such that greater than 10 seconds has elapsed without any successful handshake, then the CTA shall disconnect the call.

4.2.3 Termination of the communication state

The procedure for terminating the communication state of a radio channel shall initiate an interchange over the radio channel of a clear down signal which includes the handshake except as provided in clause 4.2.2.6.

4.2.4 Radio channel scanning

4.2.4.1 Available channels

The CTA shall have access to all radio channels on at least one carrier.

4.2.4.2 Response times

The response times given in clauses 4.2.4.2.1 and 4.2.4.2.2 shall apply when at least one free radio channel is available.

4.2.4.2.1 Outgoing

The interval between the CPP requiring a connection to the PSTN or PBX and the CFP and CPP being on-line shall not exceed 1 second for 90 % of the cases.

4.2.4.2.2 Incoming

The interval between call arrival indication at the CFP and the CPP's ringing detector responding, if enabled, shall not exceed 1 second for 90 % of the cases.

4.2.5 Handover

4.2.5.1 Application

The handover function described in clause 4.2.5 is compulsory for business and telepoint applications.

Clause 4.2.5 is applicable to channel switching within one RFP as well as handover between separate RFP's belonging to one CFP.

4.2.5.2 Condition

In-communication CTA shall not change channels before 30 ms of either bad quality has been received due to poor radio channel conditions or another channel having higher signal strength.

4.2.5.3 Repetition

The time between two handovers shall be at least 3 seconds for 90 % of the cases.

Note: Clause 4.2.2.6 is still applicable during handover.

4.3 Operating strategy

4.3.1 General

The supplier shall declare whether the operating strategy of the CTA complies with each subclause of clause 4.3 of this standard.

4.3.2 Signalling strategy

The CTA shall have ultimate access to the full number of available channels on at least one carrier and make use of any free radio channel when signalling to establish a communication channel.

4.3.3 Dynamic channel allocation strategy

4.3.3.1 Incoming call

When an incoming call is detected by CFP, the CFP shall choose one or more free channels or channels in its own use over which to signal, using its handshake, to the CPP. In a system with more than one RFP at least one channel per RFP shall be chosen. The CPP upon detection and recognition of this handshake shall respond as when CPP makes an outgoing call, see clause 4.3.3.2. It shall then preferably use the chosen channel, if it is free.

4.3.3.2 Outgoing call

When a CPP is requested to make an outgoing call it shall choose one or more free radio channels over which to signal for a maximum period of 5 seconds, using its handshake, to the CFP. The CFP upon detection of this matching handshake shall respond on one or more of the chosen channels with a signal using its handshake. The CPP upon detection and recognition of this response, shall in conjunction with the CFP establish the communication link.

4.3.3.3 Monitoring

The decision as to whether a channel is free shall be made on the basis of monitoring for a period of time corresponding to at least 1000 bits distributed over at least 3 timeslots. One or more of the channels which have the lowest field strength (to a resolution of 6 dB) may be acquired. Both 1 ms and 0,5 ms timeslots shall be monitored.

4.3.4 TDMA frame

4.3.4.1 TDMA frame duration

The TDMA frame duration shall be 16 ms, see figure 4:2.

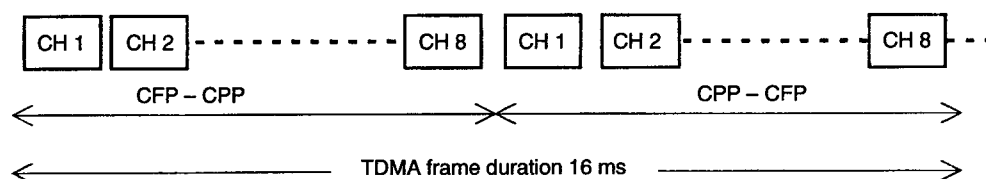


Figure 4:2 Example of a TDMA frame in a system using 8 duplex channels on one of the possible carriers.

4.3.4.2 Frame clock stability

The frame clock long term stability shall be better than 5 ppm.

4.3.4.3 Number of duplex channels and timeslot durations

The number of duplex TDMA channels per carrier shall be 8 or 16. The corresponding timeslot durations are 1 or 0,5 ms respectively.

4.3.4.4 Carrier frequencies

The nominal carrier frequencies are

$$f_n = 862 + 0,5 + (n - 1) * 1 \text{ MHz}$$

$$n = 1, 2, 3, 4.$$

The carrier frequency shall not deviate more than 100 kHz from the nominal carrier frequency.

4.3.5 Time division duplex

Duplex operation in the time domain is used on the radio channel.

The first half of the TDMA frame shall be allocated for transmission from CFP to CPP and the second half for the reversed transmission. The beginning of corresponding timeslots used for one duplex channel shall be separated by half the TDMA frame duration, see figure 4:2.

4.3.6 TDMA synchronisation

TDMA frame clock synchronization is required between RFPs belonging to the same CFP. Synchronisation between different CFPs is not mandatory.

It is recommended that the CCFP is provided with a TTL input/output port for TDMA frame synchronisation. The TDMA frame synchronisation pulse should have a duration of 0,5 to 5 μ s. It should be possible to delay the beginning of the TDMA frame by 0 to 8 μ s (adjustable) from the rear edge of the synchronisation pulse to align the transmission of TDMA frames at the antennas of neighbouring RFPs.

4.3.7 Burst time mask

4.3.7.1 Definitions

A burst is a period of R.F. carrier including its power ramp up and power ramp down parts. The burst is modulated at least with the valid data bits.

The power ramp up part is defined to begin at a level 60 dB below maximum permissible radiated peak power, and to end at a level 1 dB below average peak power during the transmission of valid data bits, measured in 1 MHz bandwidth. See figure 4:3.

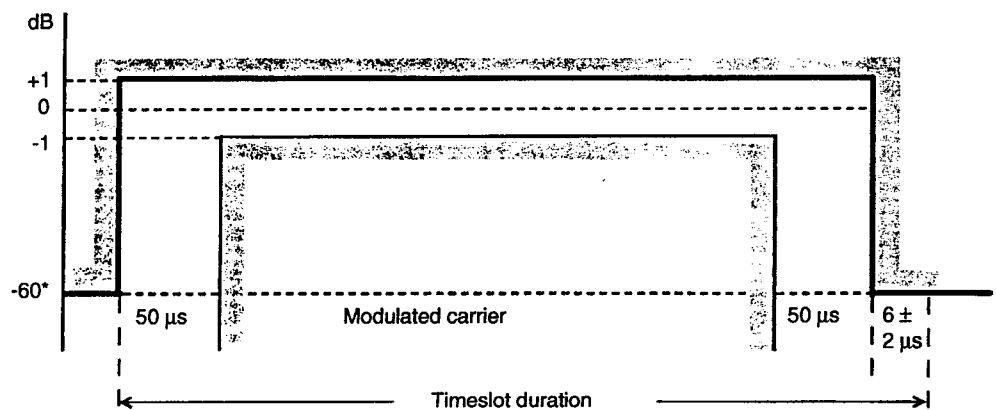
The power ramp down part is defined to begin at a level 1 dB below average peak power during the transmission of valid data bits, and to end at a level 60 dB below the maximum permissible radiated peak power, measured in 1 MHz bandwidth. See figure 4:3.

The guard period is defined to begin at a level 60 dB below maximum permissible radiated peak power during the transmission of valid data bits, and to end at the end of the actual timeslot, measured in 1 MHz bandwidth. See figure 4:3.

4.3.7.2 Requirements

The power ramp up part shall not exceed 50 μ s and the power ramp down part shall not exceed 50 μ s.

The guard period shall be 6 ± 2 μ s.



* Unwanted emissions limit

Figure 4:3 Burst time mask

4.4 Further technical radio requirements (for information)

Furthermore the equipment for digital cordless telephone shall fulfil the requirements in TVTFS 1989:103 and 1992:105.

Swedish Telecom code of statutes (official versions available only in Swedish):

TVTFS (Swedish telecom regulations on radio technical requirements in the frequency band 862–864 MHz.)
1989:103

TVTFS (Swedish telecom regulations on change in regulations TVTFS 1989:103)
1992:105