PTC Transmission Levels for private VoIP Network connected to the PSTN/ISDN Supplement to PTC109
DRAFT FOR COMMENT 23 November 2001

1 Scope

This Specification covers the requirements for transmission levels in a private voice over IP network which is connected as customer equipment to the Telecom PSTN/ISDN. The transmission plan is designed to allow good performance in an any to any call scenario, and the mixing of analogue and digital phones and interfaces.

2 Design Objectives

Proposed pads and levels are optimised for the long-term "all-digital" situation;

Ultimately, the circuit-switched public network will be replaced by an IP network which will directly connect into the private IP network with no FXO function;

Network planning and digital terminal design for voice functionality shall comply with the ITU Overall Loudness Rating objectives of 10 dB, with SLR of +8 dB, RLR of +2 dB and no circuit losses;

It is recognised that most traffic on a private network is usually "extension to extension", whether the terminals are all digital or mixed analogue and digital. As such, the FXS pad values are optimised for this situation and set at "standard values" for use in all circumstances;

This level/loss plan recognises that digital trunks should always be used between the digital PSTN and the private IP network. In this case, the zero level point is simply extended from the PSTN into the private IP network, with no pads or gains in the interface.

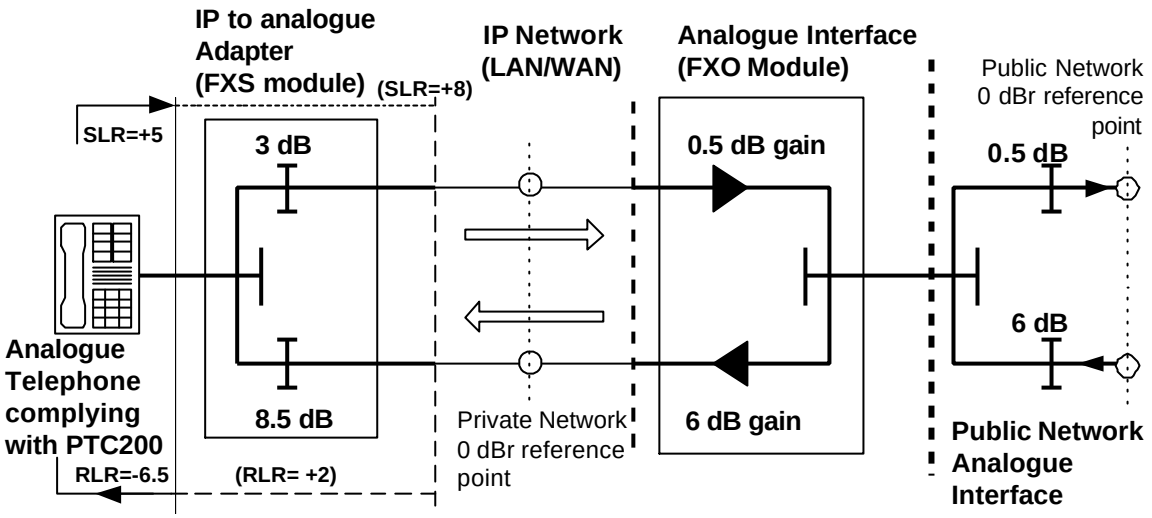
In the event that analogue trunks are the only option available. The default FXO settings are gains to compensate for the T and R pads used in the PSTN. This means that private IP networks interfacing with the PSTN via analogue trunks suffer a transmission level loss relative to the optimum. This loss would be exacerbated in cases where long analogue trunks have to be used. While the FXO gains may be adjusted to compensate for analogue trunk loss in such cases, it is unlikely that long analogue trunks will be encountered.

3 General

All level measurements shall be performed with G.711 A-law codecs utilised. Performance using other codecs cannot be measured using standard

techniques, and in the interim, the performance of non-waveform codecs should be determined by subjective comparison.
Any echo cancellers shall be turned on, and any silence suppression processes should be turned off.

4
Transmission Level Plans
4.1
Standard PTC200 phone port to analogue trunk



Loss from FXS port to FXO port: 1 to 5 dB, **Objective: 2.5 dB**
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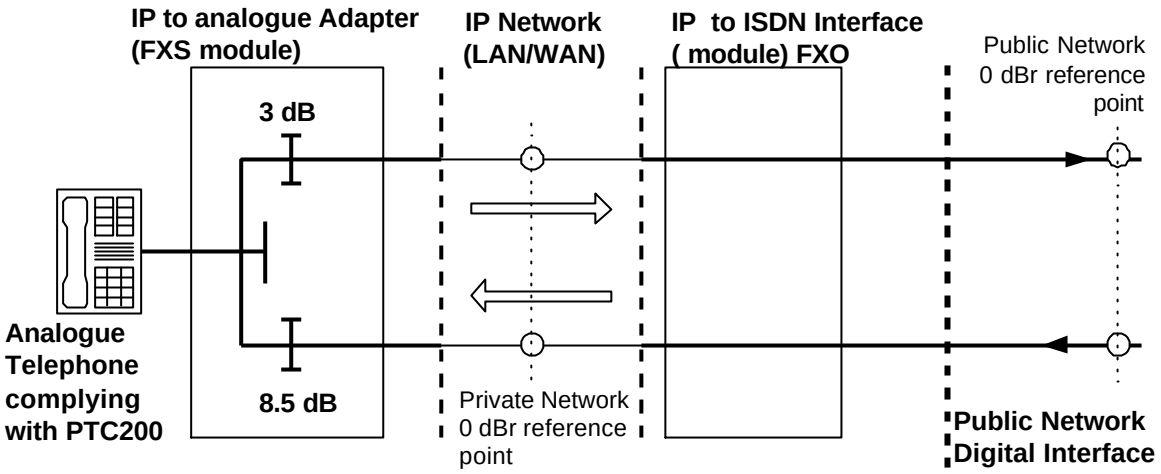
The losses/gains shall be measured at 1000Hz

The variation of gain/loss shall be not more than +/- 0.5dB of the 1000 Hz value across the frequency band 300 to 3400 Hz

4.2
Standard PTC200 phone port to digital (ISDN) trunk

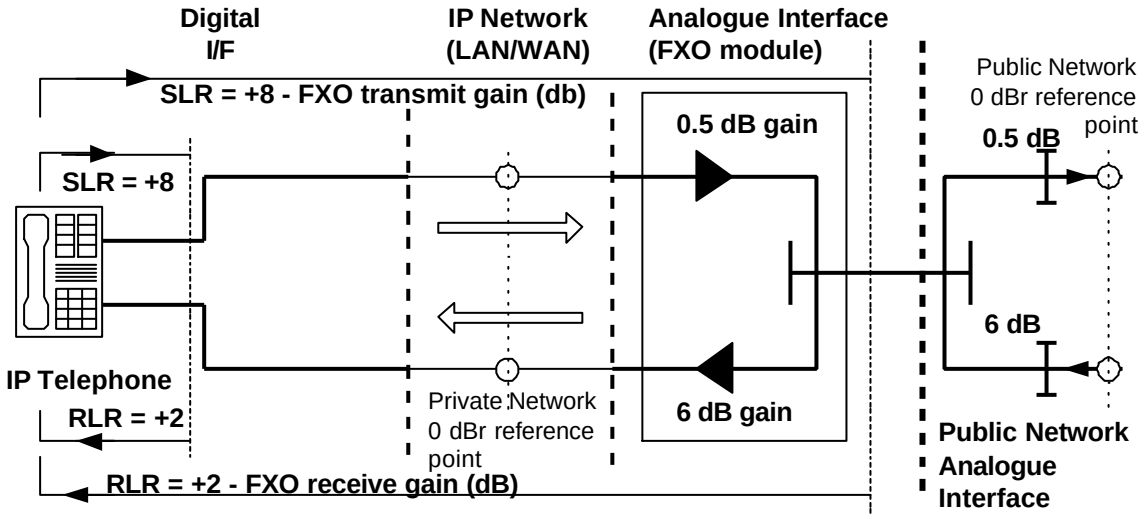


Loss from extension port to ISDN: 1 to 5 dB, **Objective: 3 dB**
Loss from ISDN to extension port: 6.5 to 10.5 dB, **Objective 8.5 dB**

The losses/gains shall be measured at 1000Hz

The variation of gain/loss shall be not more than +/- 0.5dB of the 1000 Hz value across the frequency band 300 to 3400 Hz

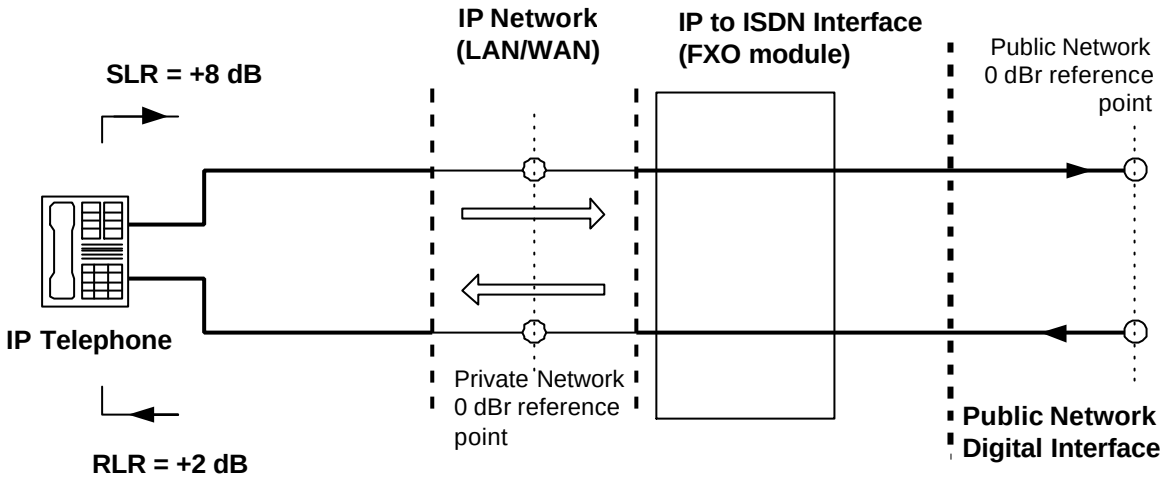
4.3
IP Phone to analogue trunk



Send and Receive Loudness Ratings to be measured between IP Phone handset and 2-wire analogue network interface
Send Loudness Rating (SLR) +11 dB to +2 dB, **Objective: +5 dB**

Receive Loudness Rating (RLR): -1 dB to -10 dB (-14 dB with volume control), **Objective: -6.5 dB**

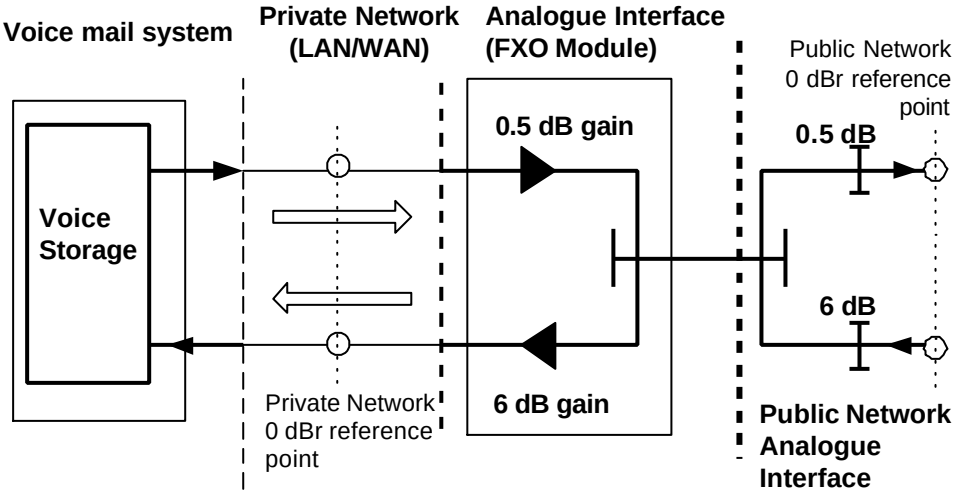
4.4
IP Phone to digital (ISDN) trunk



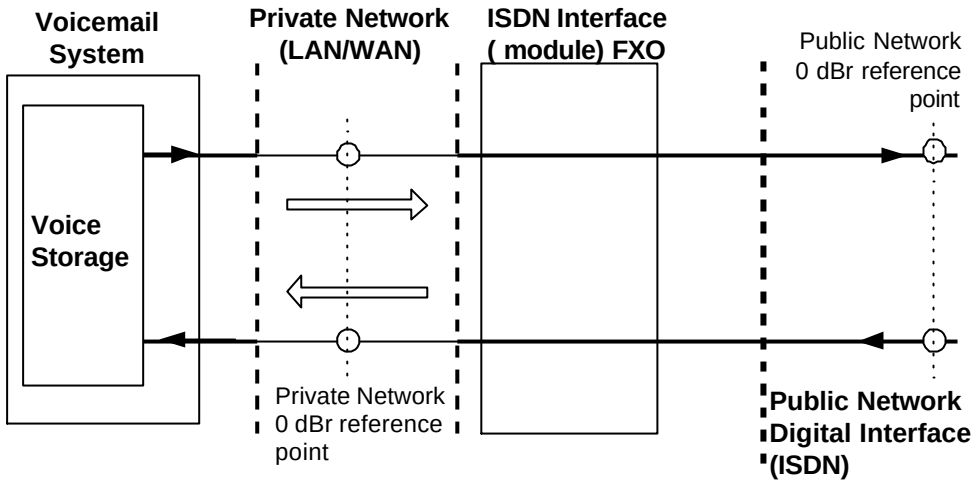
Send Loudness Rating (SLR): +10 dB to +6 dB, **Objective: +8 dB**

Receive Loudness Rating (RLR): +4 dB to 0 dB (-8 dB with volume control), **Objective: +2 dB**

4.5 Voicemail system with Analogue FXO



4.6 Voicemail system with Digital FXO



Voice mail systems connected to private networks should retransmit stored messages at the same level they were received at. Any gain adjustments take place in the FXO interface.

4.7
Additional gain
To overcome losses in access cable between PSTN and Analogue FXO module, the additional gain of up to 3 dB may be added symmetrically in each direction in the FXO module. This is subject to the stability criteria of PTC 200 clause 4.12.

Where an analogue FXS port is used (ref clause 3.1 of this specification), a PTC200 compliant phone with SLR of <+5 dB and RLR of <–6.5 dB shall be connected to the port, and tested as per PTC 200 clause 4.12.

4.8
Signal Distortion and Noise
The Signal distortion and noise shall meet the requirements of PTC 109 section 7.

5.0
Definitions
Loudness Rating (LR): is a measure, expressed in decibels, for characterising the loudness performance of complete telephone connections, or parts thereof, such as the sending system (Send Loudness Rating (SLR)), line (Circuit Loudness Rating (CLR), receiving system (Receive Loudness Rating (RLR)) and end to end (Overall Loudness Rating (OLR)).

- *Reference ITU-T Recommendations P. 64:1993 and P. 65:1993, and also CCITT Blue Book, Recommendation P. 76.*

- *Loudness rating is an internationally accepted method of objectively measuring the performance of telephones from the mouthpiece to a given point on the line, and vice versa to the earpiece. The approach enables computer-controlled measuring equipment to be used for making quick, accurate and, above all, repeatable tests.*

- *A loudness value is the result of a calculation based on fourteen separate measurements made at pre-determined frequencies within the normal telephony frequency range, each measurement being "weighted" according to its effect as perceived by the human ear when listening to normal spoken words.*

- *The loudness measurement value is actually the loss involved in the circuit under test, relative to an internationally accepted reference standard. Thus the higher the loudness value the quieter the perceived signal volume. A negative value occurs when the loss is actually less than that of the reference standard.*