4RF

4RF Application Note

DTI interconnect to the Aprisa XE with E1 CAS providing FXS circuits

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Application overview

This application note describes the interconnect at E1 between an exchange or PBX Digital Trunk Interface (DTI) and the Aprisa XE E1 QJET / DFXS providing FXS foreign exchange circuits.

The Aprisa XE can interconnect at E1 to an exchange / PBX DTI if the DTI is capable of providing standard 1 bit channel associated signalling (CAS).

Network performance

The analogue performance of a Telecom network is very dependent on the number of '2 wire interconnect points' in the overall end to end circuit (telephone to telephone).

The end to end network performance is degraded for each additional 2 wire interconnect point which results in lower circuit levels and an increased possibility of circuit echo.
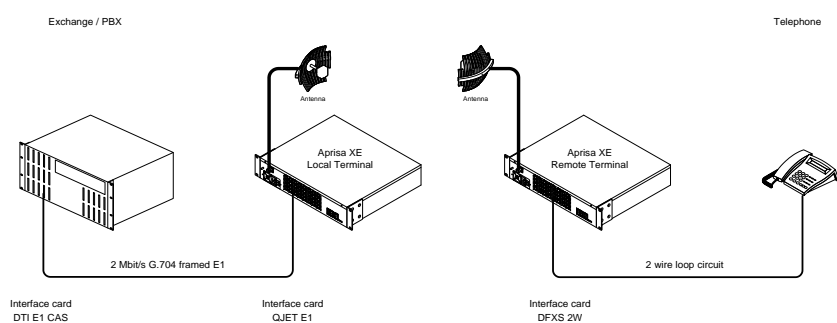
A digital interface is the best method of interconnect between network systems as it does not degrade the end to end circuit performance.

E1 CAS interconnect

The E1 CAS interconnect setup is as follows:

- The Aprisa XE local terminal is fitted with a QJET interface card which connects to the telephone exchange / PBX system. The E1 interface is a 2 Mbit/s G.704 framed with PCM30 (includes TS16 multi-frame for CAS)

- The Aprisa XE remote terminal is fitted with a DFXS interface card which connects via a 2 wire line to the telephone. The DFXS signalling is configured for '4 wire compatible' mode (1 bit)

- The telephone exchange / PBX is fitted with a E1 DTI interface card capable of providing standard 1 bit channel associated signalling (R1)

Interconnect with E1 CAS

Exchange / PBX

Telephone

Antenna

Antenna

Aprisa XE
Local Terminal

Aprisa XE
Remote Terminal

2 Mbit/s G.704 framed E1

2 wire loop circuit

Interface card
DTI E1 CAS

Interface card
QJET E1

Interface card
DFXS 2W

E1 CAS to FXS applications

Most modern digital exchanges / PBX systems deploy a customer side DTI capable of providing the 1 bit CAS protocol. Examples of applications are:

- Distant extension circuits from a PBX extension side DTI

- Foreign exchange circuits from a digital telephone exchange customer side DTI

An example of this E1 CAS interconnect is between the Aprisa XE and an Ericsson MD110 PBX extension side DTI providing distant extension circuits. The MD110 PBX E1 interface card used was a TLU76/3 R9A configured for 1 bit signalling.

E1 CAS to FXS Aprisa XE functionality

The signalling functions provided with a 1 bit CAS protocol are:

- Ring cadence transmission

- Ring trip

- Off hook

- Switch hook flash

- Decadic dialling

The speech path functions as normal and provides:

- Transmission of tones (e.g. dial tone, ring tone)

- Caller ID

- DTMF dialling

- Speech

The signalling functions not available with a 1 bit CAS protocol are:

- Polarity reversals

- Metering billing tones

- Fault state

Point-to-point microwave links distance engineered for demanding applications

CAS R2

ITU-T Q.421 R2 inter exchange line signalling was developed to standardize on the G.704 framed E1 channel associated signalling providing interconnecting trunk / junction circuits between digital telephone exchanges DTIs, PBX systems and derived PCM multiplex systems. As the name suggests, it used a 2 bit protocol using the CAS A and B bits (C and D were fixed at 0 and 1 respectively).

This R2 channel associated signalling protocol was later adopted and modified by Telcos to provide interconnecting foreign exchange circuits between digital telephone exchange (customer side), PBX systems (extension side) and derived PCM multiplex systems with FXS interfaces. Although loosely based on R2, these 2 bit CAS protocols were developed to meet the Telco specific requirements so are proprietary to each Telco.

As these 2 bit CAS protocols are Telco proprietary, interconnection with 2 bit CAS between telephone exchanges, PBX systems and multiplex systems often requires considerable product development.

CAS R1

A 1 bit CAS protocol was later developed to provide simplified channel associated signalling to facilitate interconnection of a wide range of products without any product development. The basic functions provided by this 1 bit CAS protocol are:

E1 to FXS	Af	FXS to E1	Ab
Idle	1	Idle	1
Ringing	0	Loop (offhook)	0

Spare CAS bits

As only 1 CAS bit is used for signalling in this application (the CAS A bit), the three remaining CAS bits BCD are spare but the state of these bits can be critical. Some exchange DTIs care about the state of these spare bits and may not allow calls to initiate if they are not set correctly.

The Aprisa XE provides the ability to set the state of these spare CAS BCD bits. The Aprisa XE default setting for these spare bits is B = 1, C = 0, D = 1 which is the standard R1 default.

About 4RF

Operating in more than 130 countries, 4RF solutions are deployed by oil and gas companies, international aid organisations, public safety, military and security organisations, transport companies and utilities, broadcasters, enterprises and telecommunications operators. All 4RF products are optimised for performance in harsh climates and difficult terrain, and support legacy analogue, serial data, PDH and IP applications.

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