Schedule 2

TRANSMISSION INTERCONNECT

1.   Introduction

This Schedule defines the physical and electrical characteristics of Interconnect Links, between the ECAS and the Operator System. This document does not address the logistics such as location or traffic planning of interconnects which will be agreed bi-laterally and in confidence with each Operator and documented. All references to ITU Recommendations refer to the White Book unless otherwise indicated.

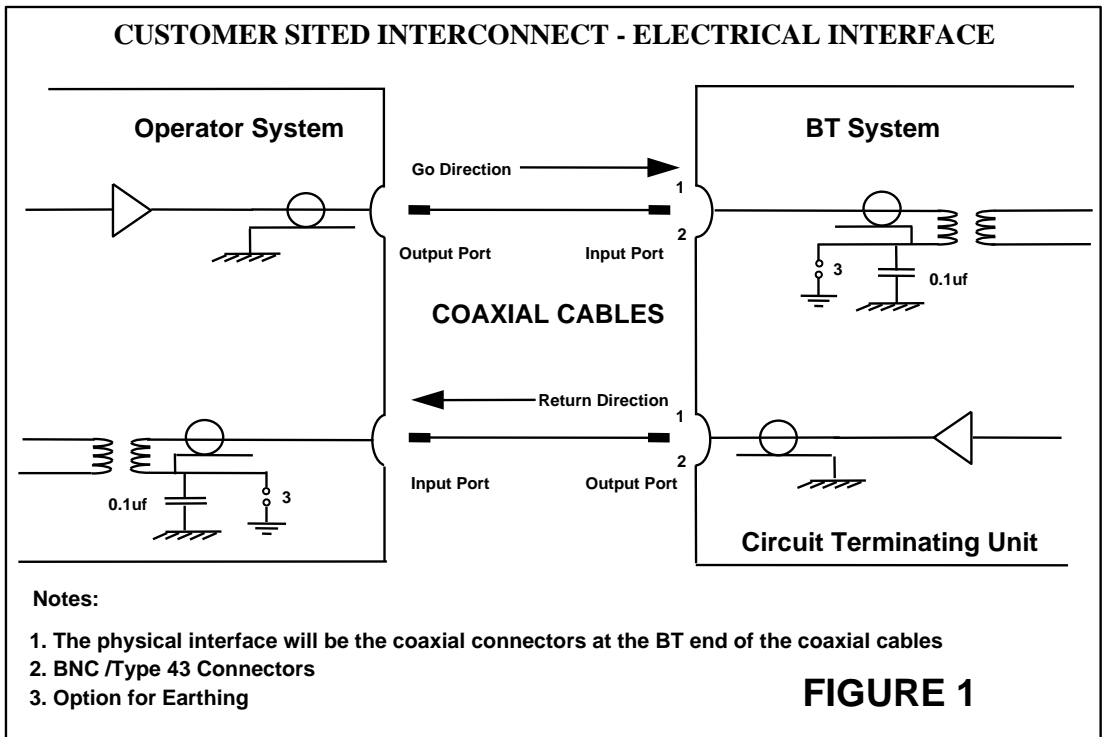## 2.   Generic Electrical & Physical Interface Specification

2.1   General

The Electrical and Physical interfaces documented here are intended to align with the current interfaces deployed in Ireland for interconnecting networks.

2.2   Physical interfaces for interconnect where both ECAS and the Operator are located within the same ECAS Equipment Centre.

The interconnection between the ECAS equipment in the ECAS Equipment Centre and the Operator System shall be provided by a BT digital path that terminates on the BT equipment located within the ECAS Equipment Centre and or Digital Distribution Frame (DDF) or Operator Optical Interface.

2.2.1   2M/bit/s Presented Interconnect with a Data Centre

BT will present a G703 Interface via two 75 ohm coaxial cables using Type 43 connectors direct to the Operator System. The Point of Connection shall be the 75 ohm G703 interface presented at the Type 43 coaxial connector at the BT end of the cables connecting the Operator System. The coaxial cables connecting ECAS to the Operator Switch shall have a loss not exceeding 6dB at 1024 kHz (see Fig 1). The cables connecting ECAS to the Operator System shall be owned and maintained by BT.

CUSTOMER SITED INTERCONNECT - ELECTRICAL INTERFACE

Notes:

1. The physical interface will be the coaxial connectors at the BT end of the coaxial cables
2. BNC /Type 43 Connectors
3. Option for Earthing

FIGURE 1

Note. BT System = ECAS

2.2.2   Aggregate Interconnect configuration within an ECAS Equipment Centre.

BT shall present either an electrical or optical STM-1 or STM-4 interface which shall conform to the technical recommendation specified in the Generic Synchronous Digital Hierarchy Interface Specification 0120.

BT electrical interface shall be presented via two 75 ohm coaxial cables using Type 43 connectors direct to the Operator System. The Point of Connection shall be the 75 ohm G703 interface presented at type 43 coaxial connector at the BT end of the cables connecting the ECAS to the Operator System (See Fig 1).

The BT Optical Interface shall be presented via two optical fibres direct to the Operator System. The Point of Connection shall be the FC type optical connector at the BT end of the fibres connecting the ECAS to the Operator System (See Fig 2).

The cables and optical fibres connecting BT to the Operator System shall be owned and maintained by BT.

CUSTOMER SITED INTERCONNECT - OPTICAL INTERFACE

FIGURE 2
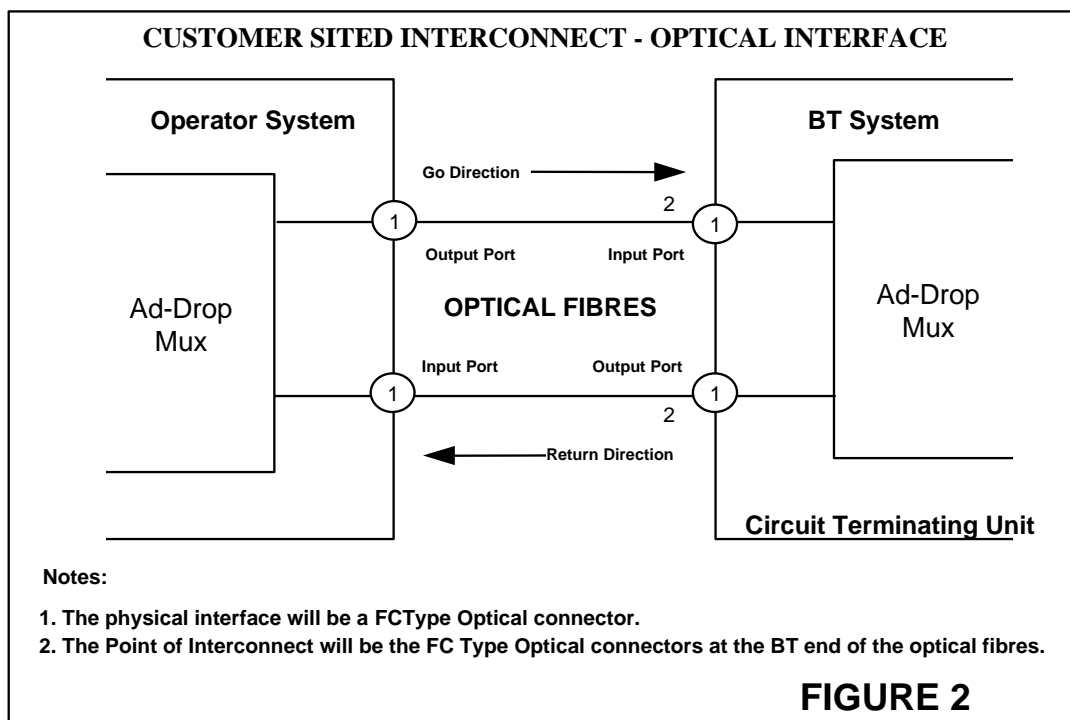
Note. BT System = ECAS

2.3   Electrical Interface

The electrical interface for an Aggregate Interconnect within an ECAS Equipment Centre shall conform to the technical recommendation specified in the Generic Synchronous Digital Hierarchy Interface Specification 0120.

The following section shall apply to a 2Mbit/s electrical interface using the coaxial pair option of ITU-T Recommendation G.703 (Physical/Electrical Characteristics of Hierarchical Digital Exchanges).

2.3.1   General Characteristics

These shall conform with section 6.1 of ITU-T Rec. G703. Type 43 connectors will be used for the physical connection.

2.3.2   Specifications at the output ports

These shall conform with section 6.2 of ITU-T Rec. G.703 (Table 6).

2.3.3   Specifications at the input ports

These shall conform with section 6.3 of ITU-T Recommendation G.703.

2.3.4   Earthing of screen

2.3.4.1   Output Ports

At output ports the cable screen shall be bonded to the equipment metalwork at the equipment boundary or as near as possible to it.

2.3.4.2   Input Ports

The input port cable screen shall be earthed via a capacitor (typically 0.1 μF) to the equipment. Provision shall be also made at this point for providing a DC connection to earth. The equipment shall be set-up with the DC earth not connected, this is illustrated in figure 1.

A suitable ferrite tube ferrule should be threaded onto the cable so as to be located at a point between the bonding point and the equipment circuitry.

2.3.5 Interference

The input ports shall tolerate, without error, interference from a non synchronous standard test signal (ITU-T Recommendation 0.151- Error Performance Measuring Equipment for Digital Systems At The Primary Bit Rate and Above) at a level 18dB lower than the wanted signal.

2.3.6 Jitter

2.3.6.1   Maximum jitter at output ports

Under worst case operating conditions (i.e. fault free) the output jitter shall not exceed 0.05 UI when measured in the frequency range 20 Hz to 100 kHz.

Note: This assumes that the Operator Switch meets:

1.   the input jitter tolerances given in section 3.6.2.
2.   the jitter transfer function given in Figure 5 of ITU-T Recommendation Q.551 (Transmission Characteristics of Digital Exchanges).

2.3.6.2   Tolerance of input ports to jitter and wander

The tolerance of both BT and the Operator input ports to jitter shall be as defined in section 3.1.1 of ITU-T Recommendation G.823 (Jitter And Wander Tolerance of Digital Input Ports).

2.3.6.3   Measurement of Jitter

A jitter measuring set conforming to the requirements of ITU-T Recommendation O.171 (Timing Jitter Measuring Equipment for Digital Systems) shall be used. BT and the Operator shall co-operate in the application of testing methods as described in ITU-T Recommendation G.823 (The Control of Jitter and Wander Within Digital Networks Which Are Based on the 2048 kbit/s Hierarchy).

2.3.7   Wander at BT and Operator input ports

The tolerance of BT and the Operator input ports to wander shall be as defined in section 3.1.1 of ITU-T Recommendation G.823.

2.4   ECAS and the Operator System Synchronisation

2.4.1   Operator System Synchronisation

To ensure synchronisation with the ECAS, the Operator System shall employ a synchronisation system which is time traceable to a source complying with the requirements of ITU-T recommendations G.811.

The performance of digital clocks, shall comply with the objective slip rate characteristics given in ITU-T recommendations G.811 and G.822 for the purpose of minimising timing perturbations in general and slip rates in particular.

2.5   Functional Characteristics of the Interface

Functional characteristics of the 2Mbit/s interface shall be in accordance with ITU-T Recommendations G.704 (Synchronous Frame Structures used at Primary and Secondary Hierarchical Levels) and G.706 (Frame Alignment and Cyclic Redundancy Check (CRC) Procedures Relating To Basic Frame Structures Defined In Rec. G704) with the following additions and clarifications:

2.5.1   Signalling

Please see Schedule 3

2.5.2.   Timeslot '0'

Chapter 2.3 of Rec. G.704 (Basic Frame Structure at 2048 kbit/s) applies. Bits 4-7 in time slot zero not containing the frame alignment signal should be set to "1". The use of bit 8 for the return direction shall be determined by BT at each location. On some systems bit 8 will be set to "1" in the go and return direction. On other systems when BT detects one or more errors in the frame alignment word, this bit 8, in the return TSO "not" word, will be set at a "1" state on two successive occasions; when no errors are detected bit 8 will be set to the "0" state. If possible, the Operator Switch should make the same use of this bit 8, if not it should be tolerant to the sending of bit 8 in the return direction and set it to "0" in the go direction.

2.5.3   Alarm Indication Signal (AIS)

Under certain fault conditions AIS is used in the ECAS. AIS is indicated by a continuous stream of binary 1's. When transmitted AIS is controlled by a free running 2048 kbit/s crystal oscillator (accuracy within $\pm$ 50 ppm).

The strategy for detecting the presence of AIS should be such that AIS is detectable, even in the presence of an error ratio of 1 in 1000. However, a signal with all bits except the frame alignment word in the '1' state, should not be mistaken as an AIS.

2.5.4   Channel Time Slot Encoding

The 64 kbit/s channel time slots comprising the 2048 kbit/s stream shall carry 'A' law encoded information as defined in ITU-T Recommendation G.711 (Pulse Code Modulation (PCM) Of Voice Frequencies).

The idle channel bit pattern transmitted over the Interconnect Link shall be compliant with ITU-T Recommendation Q.522 section 2.12 (Bit Patterns Generated By The Exchange In Idle Channel Time slots).

2.6   Safety And Protection

    2.6.1   Dangerous Voltages

        In order to protect personnel and equipment on both sides of a Point of Connection, it is necessary to provide protection against the transmission of excessive voltage across the interface.

        Excessive voltages shall be as defined in BS 6301: 1989. For equipment which uses or generates excessive voltages the interface shall be electrically isolated from those voltages. Suitable devices are described in BS 6301: 1989.

    2.6.2   Radiation Hazards

        Where radio equipment is used, arrangements shall be made to protect all personnel from levels of radiation exceeding 1 milliwatt per square centimetre.

3.   Generic Synchronous Digital Hierarchy (SDH) Interface Specification

Where interconnect is to be established using SDH technology this specification will apply.

3.1   Interconnect Requirements

The Synchronous Digital Hierarchy interface between the ECAS and the Operator System shall be agreed between the Parties in writing.

3.2   Functional Characteristics Of The 2 Mbit/S Interface

The functional characteristics of the 2 Mbit/s interface shall be as specified in Part 1 of this Schedule.

4.   Generic Transmission Interface Specification

4.1   General

Calls received at the interconnect with ECAS should have been originated and conveyed according to international standards and recommendations, and in accordance with the standard working practices in Ireland for communications networks. The calls should be delivered to ECAS capable of being received and with a transmission quality capable of enabling the ECAS to carry out its function.

5   References

ITU	ITU-T – International Telecommunications Union for the Telecommunications Sector.
G.703	Physical/Electrical Characteristics of Hierarchical Digital Exchanges
G.704	Synchronous Frame Structures used at Primary and Secondary Hierarchical Levels.
G.706	Frame Alignment and Cyclic Redundancy Check (CRC) Procedures Relating To Basic Frame Structures Defined In Rec. G704
G.711	Pulse Code Modulation (PCM) Of Voice Frequencies.
G.811	International Connections Terminating on Synchronous Network Nodes
G.812	section 2.2.3 (Holdover Operation).
G.823	The Control of Jitter and Wander Within Digital Networks Which Are Based on the 2048 KBIT/S Hierarchy
G.823	section 3.1.1 Jitter And Wander Tolerance of Digital Input Ports
G.957	Optical Interfaces For Equipments And Systems Relating To The Synchronous Digital Hierarchy

0.151 Error Performance Measuring Equipment for Digital Systems At The Primary Bit Rate and Above

O.171 Timing Jitter Measuring Equipment for Digital Systems

Q.522 Section 2.12 Bit Patterns Generated By The Exchange In Idle Channel Time slots

Q.551 Transmission Characteristics of Digital Exchanges

BS6301 1989. Safety Requirements for Apparatus for Connection to British Telecommunication Networks

6 Glossary

µF   Micro Farad
µs   Microsecond
2Mbit/s 2048kbit/s
AIS   Alarm Indications Signal
BS   British Standard
CTU   Circuit Terminating Unit.
dB   Decibel
DC   Direct Current
DDF   Digital Distribution Frame
kbit/s   KiloBits per second
kHz   Kilo Hertz
Mbit/s   Megabits per second
SDH   Synchronous Digital Hierarchy
ppm   Parts per million
UI   Unit Interval