

Specification for Avionic data transmission interface systems — Utilities bus

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Foreword

This Standard defines a bit-serial dual redundant utilities data bus operating at a signalling rate of 250 kbit/s for high integrity applications. It uses screened twisted pair data bus cable as the transmission medium, and employs transformer isolation at all terminals.

For lower integrity applications an alternative (lower cost to connect) coupling method is specified in Annex A.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 21 and a back cover.

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Introduction

Data bus technology provides an efficient means for the transfer of data between a number of processors, controls, displays, sensors, etc. within modern modular electronic systems.

The first data bus standards to find general acceptance in the aerospace industry were UK Def Stan 00-18 (Part 2) [1] /US MIL-STD-1553B [2] for military aircraft and ARINC 429 [3] for civil aircraft. The data bus defined in this standard may be used in other military and commercial applications where high integrity operation is also required.

With recent developments in modular electronic systems there is a need for data bus technology to be applied to communications with low-level utility-functions (sensors, detectors, switches, indicators, relays and electrical-load controls, etc.) to achieve reliable operation in harsh environments such as aircraft.

The bus system specified in this standard is designed to provide a high integrity, low cost, solution based on the proven technology of Def Stan 00-18 (Part 2)/MILSTD-1553B [1][2]. It retains the same centralized control, command/response philosophy using transformer isolated terminals coupled to a shielded, twisted pair, bus medium but operates at a lower 250 kbit/s with an increased addressing limit of 126 terminals. In practice the actual number of terminals and maximum data bus length used will be constrained by the electrical parameters of the implementation.

1 Scope

This Standard specifies a high integrity, low cost to connect bit-serial dual redundant utilities bus operating at 250 kbit/s.

The purpose of this document is to establish uniform requirements for data bus system techniques which will be used to control and monitor utilities based components and equipment. This utilities data bus will enable the integration of, and promote standard system interfaces for, associated utilities sub-systems.

This document also defines the concept of operation and information flow on the bus along with the electrical signalling and message formats to be employed.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Def Stan 00-18 (Part 2), *Serial, Time Division, Command/Response Multiplex Data Bus*.

RTCA DO-160/EUROCAE ED-14, *Environmental Conditions and Test Procedures for Airborne Equipment*.

3 Definitions

For the purpose of this standard, the following definitions apply.

3.1

asynchronous operation

use of an independent clock source in each terminal for message transmission. Decoding is achieved in receiving terminals using clock information derived from the message

3.2

Bi-phase space (Biø-S)

an encoding scheme which has a level change at the beginning of every bit period which represents a zero by a mid-bit level change and which represents a one by no mid-bit level change

3.3

bit

contraction of a binary digit (may be either zero or one). In information theory a binary digit is equal to one binary decision or the designation of one of two possible values, or states, used to store or convey information

3.4

bit rate

the number of bits transmitted per second

3.5

broadcast

operation of a data bus system such that information is transmitted by the bus controller or a remote terminal for reception by all terminals using the broadcast address

3.6

bus

all the hardware including screened twisted pair cables, isolation resistors, transformers, etc., required to provide a single data path between the bus controller and all the associated remote terminals

3.7

Bus Controller (BC)

the sole terminal that initiates all information transfers on the bus

3.8

Bus Monitor (BM)

the terminal assigned the task of listening to bus traffic and extracting selected information to be used at a later time

3.9

command/response

operation of a bus system such that remote terminals transmit only when commanded to do so by the bus controller

3.10

half duplex

operation of a data transfer system in either direction over a single line; but not in both directions on that line simultaneously

3.11

message

the transmission of a sequence of: start, source identifier, address, data, parity, and stop bits

3.12

Non-Return to Zero (NRZ)

a binary method of representation for Pulse Code Modulation (PCM) signals where one is represented by one level, and zero is defined as the other level in a bi-level system

3.13

Pulse Code Modulation (PCM)

form of modulation in which the modulation signal is sampled, quantized, and coded so that each bit of information consists of different types or numbers of pulses and spaces

3.14

redundant bus

use of more than one bus to provide more than one data path between the subsystems, e.g. dual redundant bus, tri redundant bus, etc.

3.15

Remote Terminal (RT)

any terminal not operating as the bus controller or bus monitor

3.16

Terminal

hardware/software function which provides the interface between the bus and the host/user Subsystem

3.17

Time Division Multiplexing (TDM)

the transmission of information from several signal sources through one communication system with different signal samples staggered in time to form a composite pulse train.

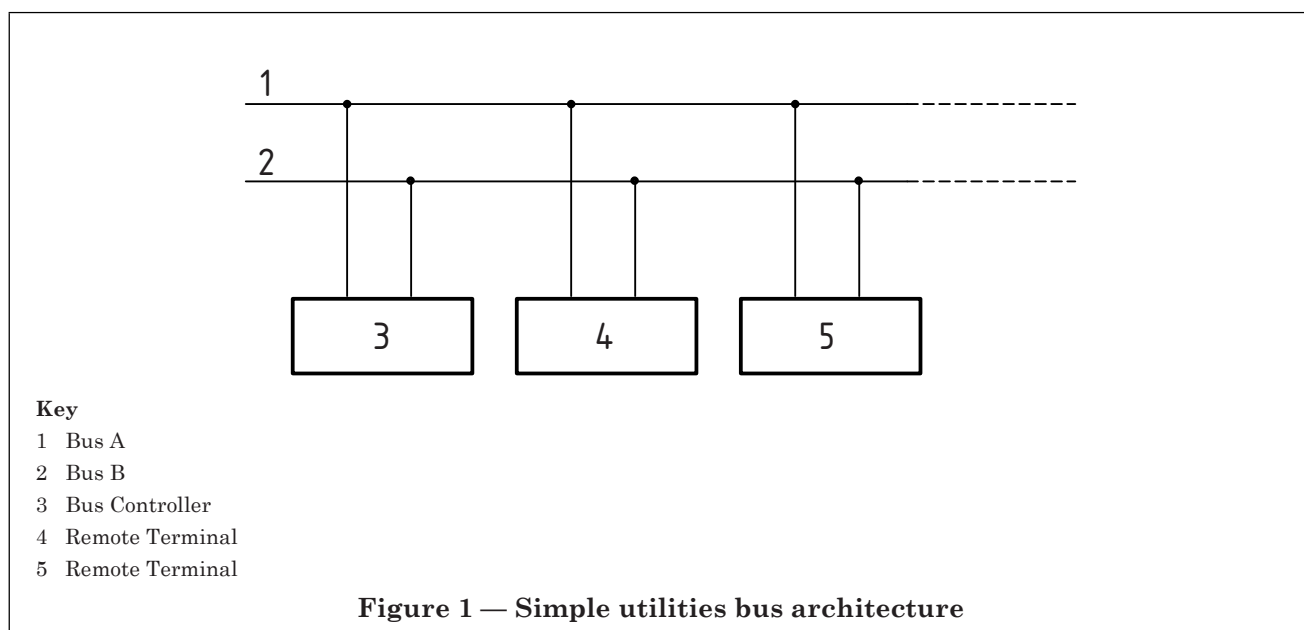
4 General requirements

4.1 Test and operating requirements

NOTE All requirements specified herein should be met over the range of environmental conditions in which the utilities bus system is required to operate.

4.2 Bus operation

The utilities bus system in its most elemental configuration is shown in Figure 1. The utilities bus system shall function asynchronously in a command/response mode, and transmission shall occur in a half-duplex manner. Sole control of information transmission shall reside with the bus controller, which shall initiate all transmissions.



4.3 Data form

Digital data may be transmitted in any format compatible with the data fields specified in Clause 6. Any unused bit positions shall be transmitted as logic zeros.

4.4 Bit priority

The most significant bit shall be transmitted first, with the less significant bits following in descending order of value in the data word.

5 Transmission method

5.1 Modulation

The signal shall be transferred over the bus in serial digital pulse code modulation form.

5.2 Data code

The data shall be bi-phase space (BiØ-S) encoded. A feature of this form of encoding is that the signal may be inverted without affecting data recovery. A transition shall be transmitted at the start of each data bit, and a logic zero bit shall have a transition at its midpoint (see Figure 2).

5.3 Transmission bit rate

The transmission bit rate on the bus shall be 250 kbit/s with a combined accuracy and long term stability of ±0.1%.

