IA3 - MIL-STD 1553B

This course covers the 1553 military bus

Objectives

- The bus topology is explained.
- The various bus standards are described, mainly focusing on 1553B and 1553C.
- Bus frames are studied field per field.
- The architecture of a 1553 coupler is described.
- The course describes testing, covering the MIL-HDBK-1553A.
- The course details the software interface necessary to control the coupler.
- This course has been delivered several times to companies developing defense/avionics equipments.

A more detailed course description is available on request at formation@ac6-formation.com

Prerequisites

- Basic knowledge of a processor or DSP.

Course Environment

- Theoretical course
  - PDF course material (in English) supplemented by a printed version for face-to-face courses.
  - Online courses are dispensed using the Teams video-conferencing system.
  - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Evaluation modalities

- The prerequisites indicated above are assessed before the training by the technical supervision of the traineein his company, or by the trainee himself in the exceptional case of an individual trainee.
- Trainee progress is assessed by quizzes offered at the end of various sections to verify that the trainees have assimilated the points presented
- At the end of the training, each trainee receives a certificate attesting that they have successfully completed the course.
  - In the event of a problem, discovered during the course, due to a lack of prerequisites by the trainee a different or additional training is offered to them, generally to reinforce their prerequisites,in agreement with their company manager if applicable.

Plan

INTRODUCTION

- History
- Utilization domain
- Objectives of this bus
- Protocol overview
- The 3 node types: BC, RT and BM
- Differences between 1553, 1553A, 1553B, and 1553C
- Multiplex selection criteria

PHYSICAL LAYER

- Introduction to differential transmission
- 1553B transmission medium
- Stubbing
- Connecting a terminal to a backbone, long stub
- Connection a terminal to a backbone, short stub
- Multi-stub couplers
- Terminal electrical characteristics

LINK LAYER

- Terminal operation
- Manchester bi-phase coding scheme
- Word formats, SYNC pattern
- Word validation
- Command word detail
- Data word detail
- Status word detail, studying various sequences in order to explain Status flags
- Terminal architecture, word controller, message controller, frame controller

MESSAGE FORMATS

- Remote Terminal operation, assigning an address
- The 10 message types
- Point-to-point messages
- Broadcast messages
- Studying various sequences explaining the way of transferring data from terminal to terminal
- Message timings, taking into account the round-trip delay
- Illegal commands vs invalid commands

MODE CODES

- Management messages
- Command format, subaddress specific usage
- Mode codes supporting data
- Dynamic bus control
- Synchronize commands, usage to implement a heardbeat
- Transmit Status word and Transmit Last command use cases
- Interface with self tests in both RT and subsystems
- Transmitter shutdown commands used in redundant systems

SYSTEM ISSUES

- Using subaddress
- Double buffering

- **Framing in the BC to support both periodic transfers and asynchronous transfers**

REDUNDANT DATA BUS REQUIREMENTS

- **Electrical isolation**
- **Dual standby redundant data bus operation**
- **Superseding commands**
- **High reliability requirements**

TESTING

- **Test plans described in 1553A handbook**
- **Using an analyzer to capture traffic**
- **Generating traffic to check how the system react in case of errors**
- **Data wrap around mechanism, remote loopback test**

Renseignements pratiques

Duration : 2 days
Cost : 1880 € HT
Prochaines sessions : from 14th to 15th of January, 2025 - Ac6 - Courbevoie / Paris (France)