DEWETRON

OXYGEN MIL-STD 1553

TECHNICAL REFERENCE MANUAL

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Printing History:

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1 PREFACE

MIL-STD-1553 is a military standard published by the United States Department of Defense that defines the mechanical, electrical, and functional characteristics of a serial data bus. It was originally designed as an avionic data bus for use with military avionics but has also become commonly used in spacecraft on-board data handling (OBDH) subsystems, both military and civil. It features multiple (commonly dual) redundant balanced line physical layers, a (differential) network interface, time division multiplexing, half-duplex command/response protocol, and can handle up to 30 Remote Terminals (devices). [1]
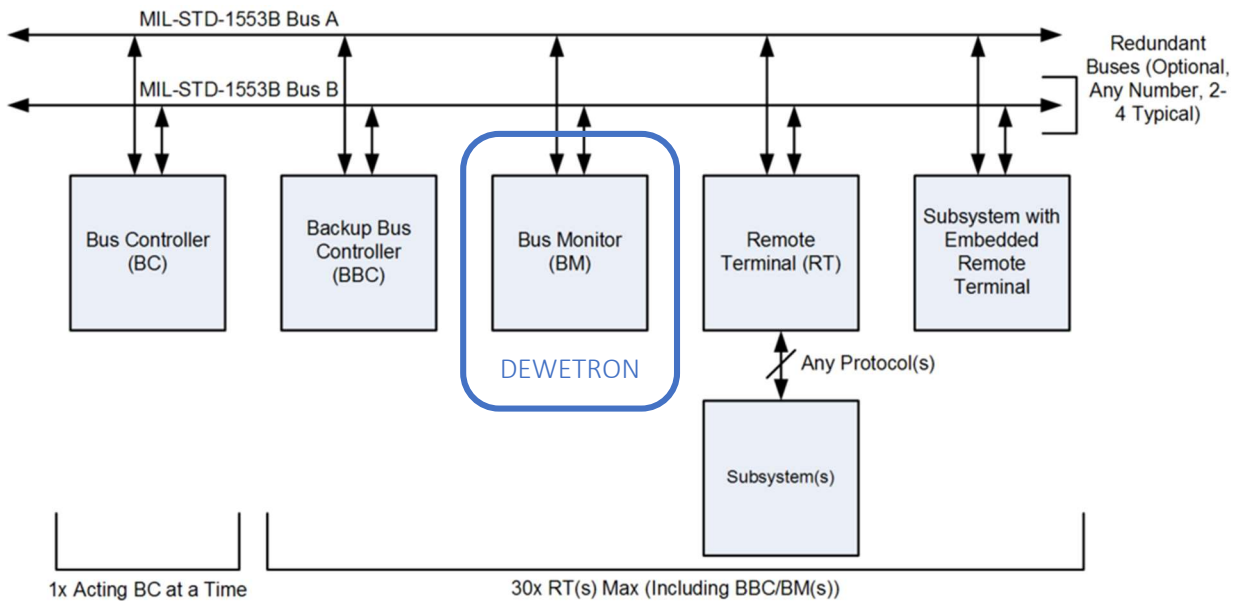
Figure 1-1: Data Bus Architecture and DEWETRON's point of application [2]

- BC… Bus Controller: Communication Master
- RT… Remote Terminal: Communication Client or Bridge to other Interfaces
- BM… Bus Monitor: Read only Bus Monitoring and Recording device (DEWETRON with TRION-MIL Board and OXYGEN MIL-STD-1553 Option)

[1] https://en.wikipedia.org/wiki/MIL-STD-1553
[2] https://commons.wikimedia.org/wiki/File:MS1553B-Large-v2.png

2 MIL-STD-1553 IN OXYGEN

The MIL-STD-1553 Option in OXYGEN consists of two different parts:
- Device driver which provides the physical bus channels in OXYGEN.
- The MIL-STD-1553 decoder which decodes the data of a given bus channel.
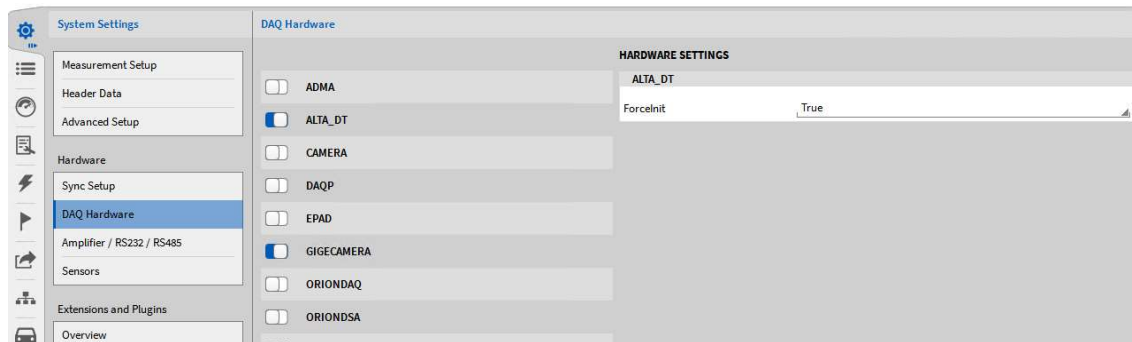
Requirements:
- TRION-MIL-1553 board (Altadt inside)
- Altadt driver installed (Install AltaView Bus Analyzer)

2.1 INSTALLATION AND GETTING STARTED

To create a MIL-STD decoder channel and to decode the corresponding signals, follow these steps.

1. Start OXYGEN
2. Enable ALTA_DT hardware support in *System Settings > DAQ Hardware*, if necessary.

    a. Restart OXYGEN, if something was changed in the DAQ Hardware settings.

3. Open *Channel List* and check the channels. You should see the group **Alta Dt** with sub-group **PMC-1553**.
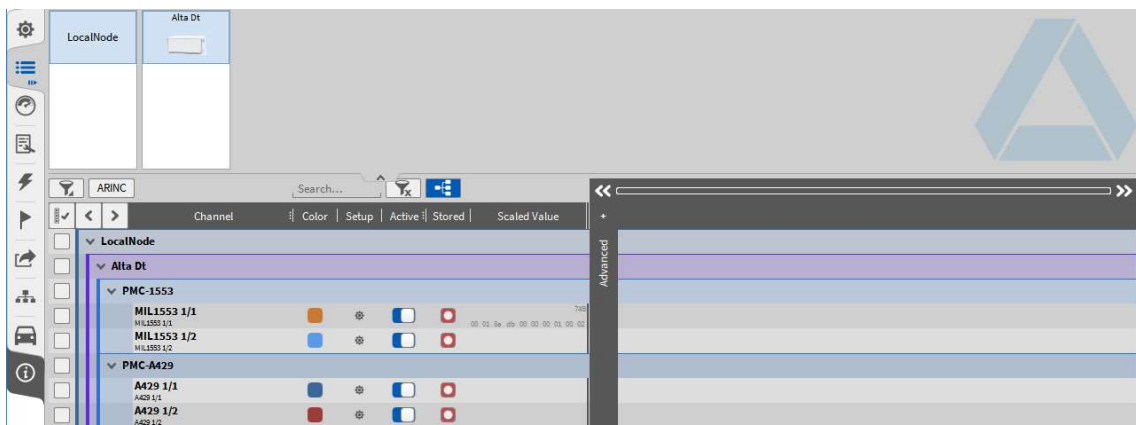
4. Add a MIL-STD 1553 decoder to a channel.
    a. Select the physical channel, you want to add a decoder for.
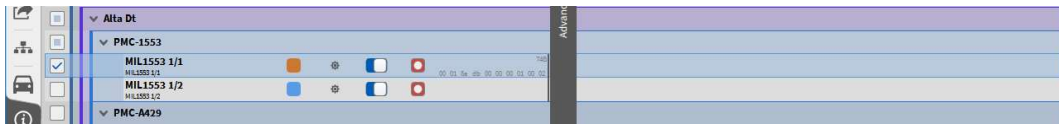
b. Press **+** (Add Channel) in the lower left corner.

c. Select the *MIL-STD-1553 Decoder*.

d. Load a configuration file for the decoder by clicking on the *Browse* button.
e. Press *Add*.

5. Channels are visible in OXYGEN

3 CONFIGURATION FILE SPECIFICATION

The configuration file is written in XML to provide a human-readable as well as machine-processable information. The file is structured in 3 different sections:
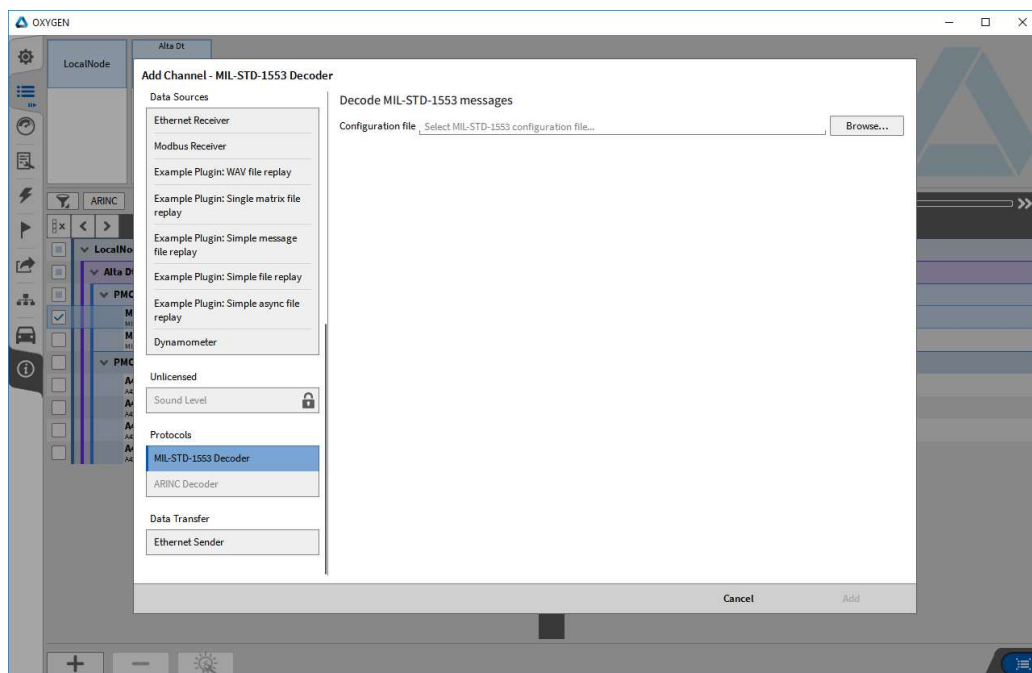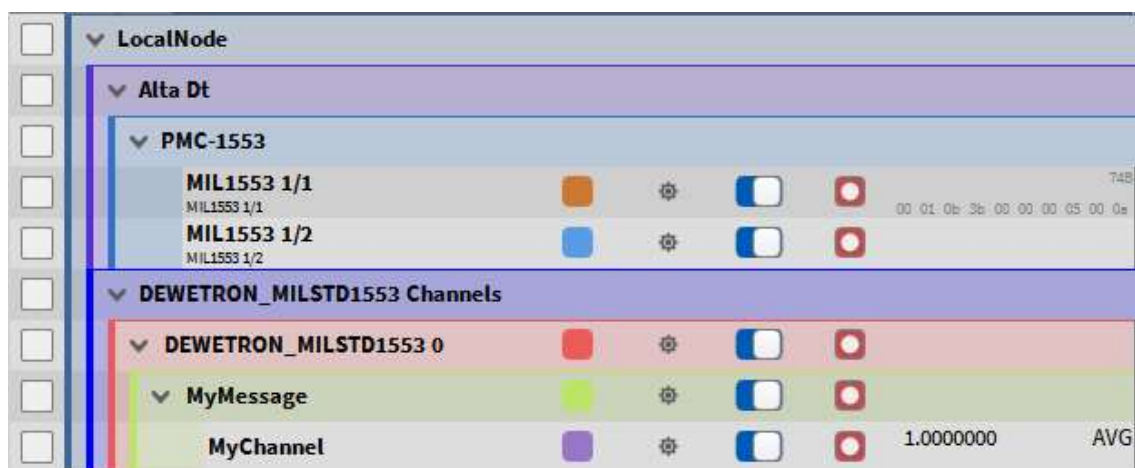
- Body (`MilStd1553`)
- Message (`Message`)
- Channel (`Channel`)
- And optionally channel group (`ChannelGroup`)

The different elements of these sections are described subsequently.

The `<MilStd1553>` Element initiates the specific XML description.

version	1.0
alignment	**default**, lsb_first, msb_first

The `<Message>` element describes covers the message description and enclosures the `<Channel>` or `<ChannelGroup>` elements.

name	String
type	bc_rt, rt_bc, rt_rt, bc_rt_broadcast, rt_rt_broadcast
transmitter_address	0-31; **empty**
transmitter_subaddress	0-31; **empty**
receiver_address	0-31; **empty**
receiver_subaddress	0-31; **empty**
word_count	0-32; **0**
description	String, **""**

The `<ChannelGroup>` enclosures one to many `<Channel>` elements if one wants to group the channels for the OXYGEN channel list.

name	String
description	String

The `<Channel>` element holds the information for one channel in OXYGEN.

name	**String**
description	String
unit	String, **""**

The `<Sample>` element initiates the sample description.

The `<NumericValue>` element describes the sample decoding information.

word_index	Unsigned integer (0-31)
bit_index	Unsigned integer (0-15)
bit_length	Unsigned integer (1-512)
type	unsigned, bcd, milstd1750-fp, ieee-fp, integer (=2's compl), sign-magnitude
alignment	**default**, lsb_first, msb_first

The `<LinearScaling>` element describes the scaling information.

scale	Floating point value; **1.0**
offset	Floating point value; **0.0**

The `<ValidIf>` element can be used to provide conditional decoding e.g. depending of a specific value.

name	String (Channel name)
equals	Floating point value

3.1 MINIMUM EXAMPLE

```
<MilStd1553 version = "1.0" alignment = "lsb_first">
  <Message name = "MyMessage"
           type = "bc_rt"
           receiver_address = "17"
           receiver_subaddress = "22"
           word_count = "32">
    <Channel name = "MyChannel">
      <Sample>
        <NumericValue word_index = "1" bit_index = "0" bit_length = "16" type =
"unsigned"/>
      </Sample>
    </Channel>
  </Message>
</MilStd1553>
```
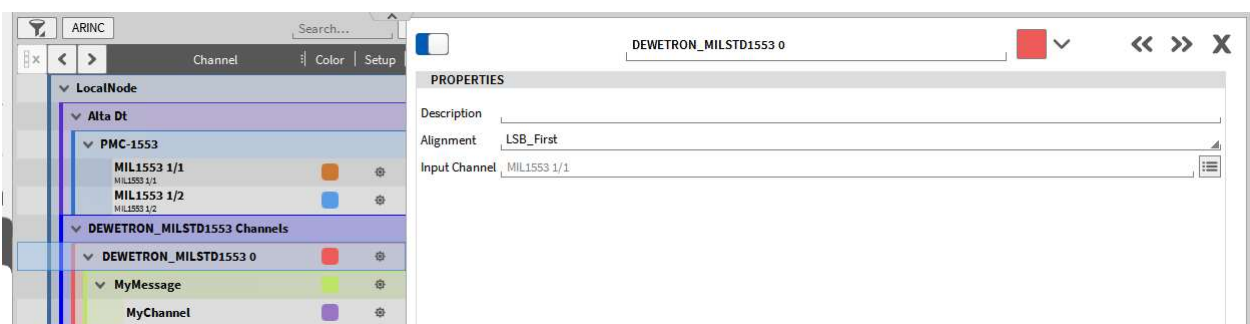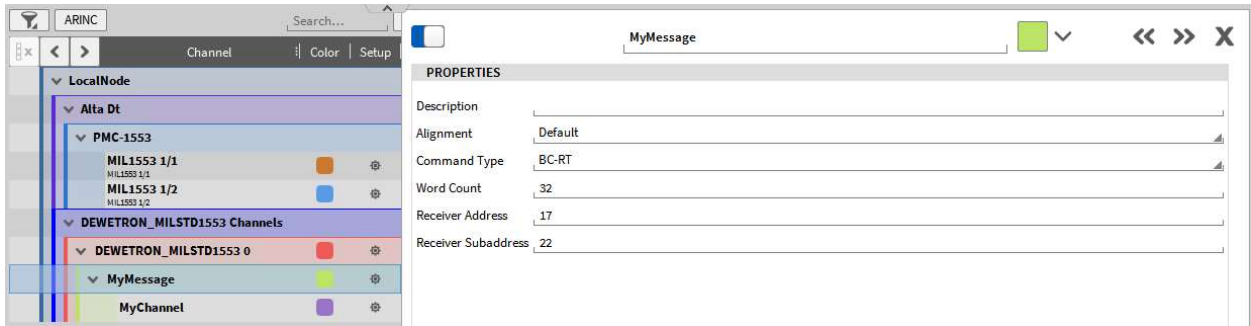
3.1.1 RESULT IN OXYGEN

This section shows the result in OXYGEN according to the Minimum Example in section 3.1.

- Decoder Instance Channel holds the global configuration `<MilStd1553>`.

- Message Group holds the message configuration and all child channels `<Message>`.

- The channel itself holds the channel configuration `<Channel><Sample><Numer-icValue><LinearScaling>`.
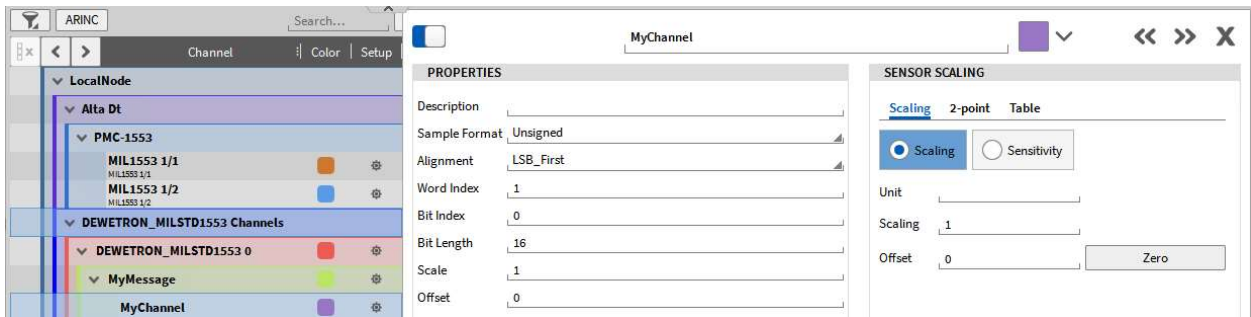
- The parameters can be edited in OXYGEN and are stored in the setup file! As for now, it is not possible, to export the configuration to an XML file.

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4 DATA RECORDING AND ANALYSIS

For general software operation instructions, please refer to the latest version of the OXYGEN technical reference manual available on the CCC-portal (https://ccc.dewetron.com/).

The decoded MIL-STD signals can be used in instruments like a recorder, digital meter or table. Just drag and drop the desired channel into the instrument to display the decoded values.
Additionally, the raw data stream in hexadecimal can be visualized in OXYGEN in the table instrument, by using the actual bus channels of the module, and not the decoded signal channels.

Offline decoding is currently not supported in OXYGEN. Thus, MIL-STD-1553 channels can only be created online.

4.1 OFFLINE DECODING

Offline decoding is also supported in OXYGEN. Thus, MIL-STD-1553 channels can also be created offline, after the raw MIL-STD-1553 data has been recorded.
For the offline decoding, follow the same steps as described in section 2.1.

4.2 EXPORT DATA

MIL-STD-1553 signals can also be exported in different formats. Only decoded MIL-STD-1553 signals can be exported, it is not possible to export the raw data stream.
Hereby, go to the *Export Settings*, select the MIL-STD-1553 channels, which should be exported and choose a corresponding export format and any additional settings if needed.
The export folder can also be set here.

For more detailed explanations about the export settings and formats, please refer to the OXYGEN technical reference manual available on the CCC-portal (https://ccc.dewetron.com/).

5 TROUBLESHOOTING

Board is not displayed in OXYGEN

- Check, if the necessary libraries are properly installed within OXYGEN program folder. Copy the files:
  C:\Program Files\Alta Data Technologies\Alta Software\ADT_L0_API\Win64\bin\ADT_L0.dll
  C:\Program Files\Alta Data Technologies\Alta Software\ADT_L1_API\Win64\bin\ADT_L1.dll

  to the following location:
  C:\Program Files\DEWETRON\OXYGEN\bin

- When the drivers are installed correctly, and the libraries are correctly updated in "C:\Program Files\DEWETRON\OXYGEN\bin", but the MIL board is not recognized in OXYGEN, turn off the measurement device and remove the MIL board from the device. Now restart the device and open the tool "AltaView Bus Analyzer", a shortcut to the tool should be available on the desktop. It could be, that the driver installation has not been finished correctly, when opening the "AltaView Bus Analyzer" this will be done automatically.

  When the tool is opened the installation is finished and it can be closed again. Now shut down the device, attach the MIL board again and restart the system. The MIL board should be available now in OXYGEN.