

• OXYGEN MIL-STD 1553

TECHNICAL REFERENCE MANUAL

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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]



- 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.

Ø	System Settings	DAQ Hardware		
:=	Measurement Setup		HARDWARE SETTINGS	
	Header Data	ADMA	ALIA_DI	
0	Advanced Setup	ALTA_DT	Forceinit	A
	Hardware	CAMERA		
4	Sync Setup	DAQP		
	DAQ Hardware	EPAD EPAD		
-	Amplifier / RS232 / RS485	GIGECAMERA		
-	Sensors			
	Extensions and Plugins	ORIONDSA		
	Overview			

- a. Restart OXYGEN, if something was changed in the DAQ Hardware settings.
- 3. Open *Channel Lis*t and check the channels. You should see the group **Alta Dt** with sub-group **PMC-1553**.

				Alta Dt	calNode	Lo) , III &
							0
 «	3	7	Search]	ARINC	9	4
+	ored Scaled Value	Active 🛛 Sto	i Color Setup	Channel	< >	-	
B				Node	✓ Local		
dvan				Dt	∨ Alta		2
				MC-1553	∨ P		æ
	74 00 01 8e db 00 00 00 01 00 0		۵	MIL1553 1/1 MIL1553 1/1			
			۰	MIL1553 1/2 MIL1553 1/2			
				MC-A429	~ P		(i)
	3		۰ 📕	A429 1/1 A429 1/1			
	0		۵	A429 1/2 A429 1/2			
Advance	7 0 0 0 0 0 0 0 0 0 0 0		• • • •	Dt MC-1553 ML1553 1/1 ML1553 1/2 ML1553 1/2 ML1553 1/2 MC-A429 A429 1/1 A429 1/1 A429 1/2 A429 1/2 A429 1/2	V Altz		

- 4. Add a MIL-STD 1553 decoder to a channel.
 - a. Select the physical channel, you want to add a decoder for.

2		v Alta Dt
.t.	I	✓ PMC-1553
-		
	П	MLL553 1/2 Ø O
0		V PMC-4429

b. Press + (Add Channel) in the lower left corner.

+ - 袋	

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

۵ ۵	YGEN					- 🗆 X
	CVGEN	Atta Dt Add Channel - MIL-STD-1553 Decod Data Sources Ethernet Receiver Modbus Receiver Example Plugin: WAV file replay Example Plugin: Single matrix file replay Example Plugin: Single matrix file replay Example Plugin: Simple	er Decode MIL-STD-1553 messages Configuration file <u>_Select MIL-STD-1553 configuration file</u>		J Browse	
	+	Data Transfer Ethernet Sender		Cancel	Add	Æ

- d. Load a configuration file for the decoder by clicking on the *Browse* button.
- e. Press Add.
- 5. Channels are visible in OXYGEN

Alta Dt				
¥ PMC-1553				
MIL1553 1/1 MIL1553 1/1	۲		00 01 05 35 00 00	748 00 05 00 0s
MIL1553 1/2 MIL1553 1/2	۵	0		
DEWETRON_MILSTD1553 Channels				
V DEWETRON_MILSTD1553 0	٢	0		
✓ MyMessage	۲			
MyChannel	ø	0	1.0000000	AVG

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 <<u>Milstd1553</u>> 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 <<u>ChannelGroup</u>> enclosures one to many <<u>Channel</u>> elements if one wants to group the channels for the OXYGEN channel list.

name	String
description	String

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

name	String
description	String
unit	String, ""

The <sample> element initiates the sample description.

The <<u>NumericValue</u>> 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**

MyMessage

MyChannel

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

- 🗙 ARINC Search. DEWETRON_MILSTD1553 0 ~ « » X < > PROPERTIES Description ✓ Alta Dt Alignment LSB_First V PMC-1553 Input Channel | MIL1553 1/1 MIL1553 1/1 ٢ MIL1553 1/2 -V DEWETRON_MILSTD1553 Channels V DEWETRON_MILSTD1553 0
- Decoder Instance Channel holds the global configuration <<u>Milstd1553</u>>. •

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Message Group holds the message configuration and all child channels <<u>Message</u>>. •

:==

%	ARINC	Search		MyMessage 🛛 🗸 🔧	X
0.00	✓ LocalNode	1 00101 1 0	PROPERTIES		
	👻 Alta Dt		Description		
	V PMC-1553		Alignment	Default	
	MIL1553 1/1		Command Type	BC-RT	
	MIL1553 1/2 MIL1553 1/2		@ Word Count	32	
	V DEWETRON_MILSTD1553 Chann	els	Receiver Address	17	
	V DEWETRON_MILSTD1553 0		Receiver Subaddress	22	
	✓ MyMessage		0		
	MyChannel		ø		

• The channel itself holds the channel configuration <<u>Channel></u><<u>Sample></u><<u>Numer-</u> icValue><<u>LinearScaling</u>>.

ARINC Search	MyChannel	✓ « » X
V LocalNode	PROPERTIES	SENSOR SCALING
✓ Alta Dt	Description	Scaling 2-point Table
▼ PMC-1553	Sample Format Unsigned	
MIL1553 1/1	Alignment LSB_First	Scaling Sensitivity
MIL1553 1/2	Word Index 1	Unit
V DEWETRON_MILSTD1553 Channels	Bit Index 0	Scaling 1
V DEWETRON_MILSTD1553 0 🕘 👳	Bit Length16	Offset 0
V MyMessage 🕸	Scale 1	
MyChannel 🕘 🕸	Offset 0	

• 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.

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 (<u>https://ccc.dewetron.com/</u>).

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 (<u>https://ccc.dewetron.com/</u>).

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.