

# **Telemetry Attribute Transfer Standard (TMATS)**

# Purpose of TMATS

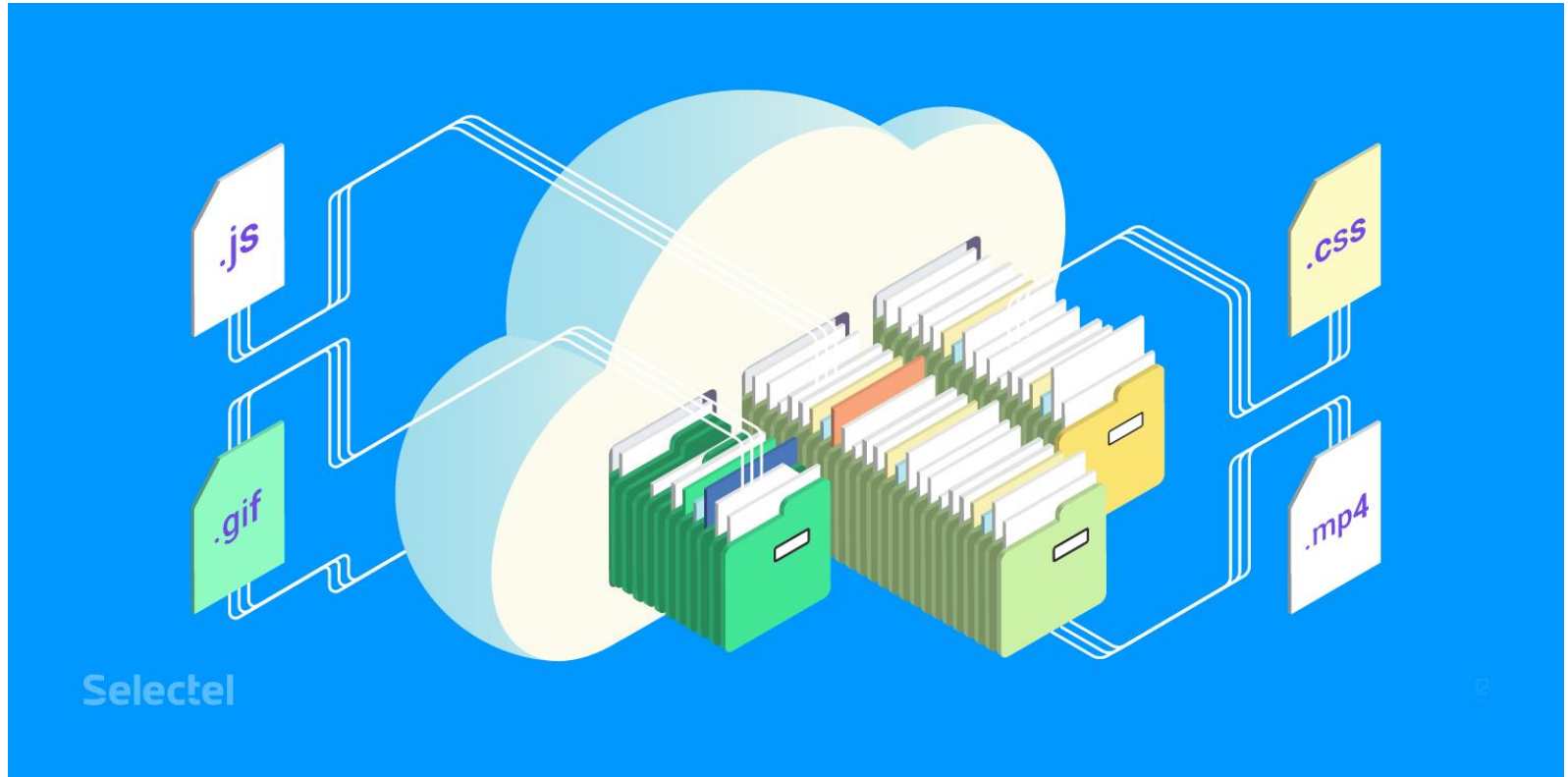
## The Original Problem



**Tape libraries full of data but no information about how to decode and interpret it**

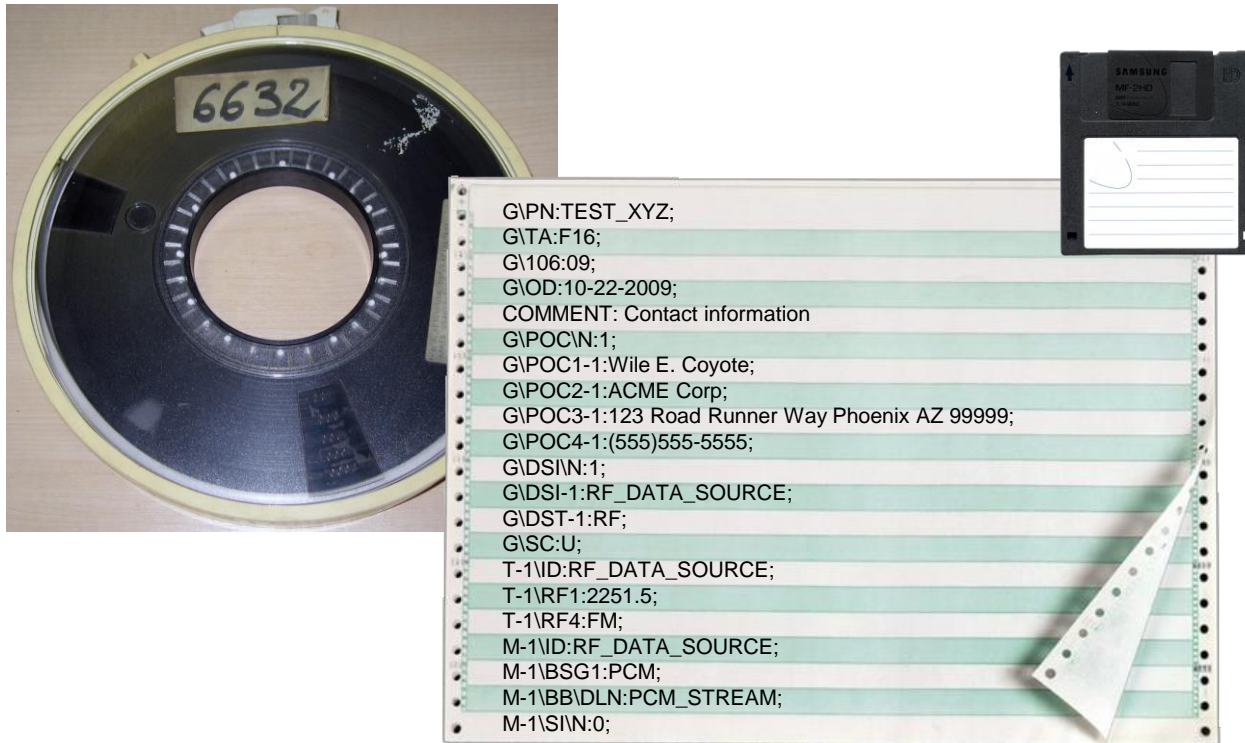
# Purpose of TMATS

The problem isn't getting any better



# Purpose of TMATS

## The Solution

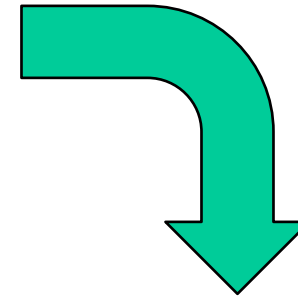


**Describe the test configuration and data layout in a  
Succinct and Standard way**

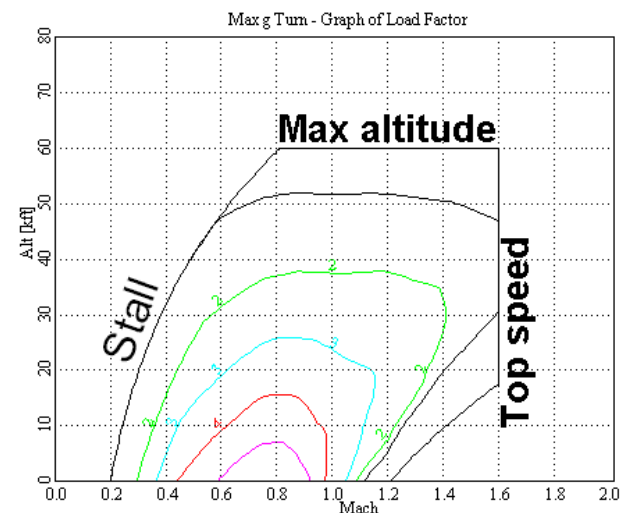
# Purpose of TMATS

```
10101010110101101010010101011010101101010101010110101
1010101010110101010101101110101010101011010101010101
10101011010101010101011010101010101011010101010110
11010101010100001010101101010001010101010101101010101
1010010100001010101010111001011001010010101011010100
0001101010100101001101000101010101101011010101010101
0011010101101010100100101010101010101010101011010101
1010101011010110101001010101101010110101010101101010
1010101010110101010101101110101010101011010101010101
10101011010101010101101010101010101101010101010110
110101010101000010101011010100101010101010101101010101
1010010100001010101010111001011001010010101011010100
0001101010100101001101000101010101101011010101010101
0011010101101010100100101010101010101010101011010101
1010101010110101010101101110101010101011010101010101
10101011010101010101011010101010101011010101010110
11010101010100001010101101010010101010101101010101
1010010100001010101010111001011001010010101011010100
0001101010100101001101000101010101011010110101010101
0011010101101010100100101010101010101010101011010101
1010101010110101010101101110101010101011010101010101
10101011010101010101011010101010101011010101010110
11010101010100001010101101010010101010101101010101
1010010100001010101010111001011001010010101011010100
0001101010100101001101000101010101011010110101010101
0011010101101010100100101010101010101010101011010101
```

Help  
turn  
this



Into this



# **TMATS History**

- **TMATS was developed by the Range Commanders Council (RCC) Telemetry Group (TG) Data Multiplex Committee and Data Reduction and Computer Group**
- **TMATS was first published in 1993**
- **Data Multiplex Committee maintains TMATS**
- **TMATS is published as IRIG 106 Chapter 9**

# Purpose of TMATS

## From IRIG 106 Chapter 9

- **Telemetry attributes** are those parameters required by the receiving/processing system to acquire, process, and display the telemetry data received from the test item/source.
- TMATS provides the **definition of the telemetry attributes** and specifies the media and data format necessary to permit the transfer of the information required to set up the telemetry receiving/processing functions at a test range.
- TMATS provides a **common format for the transfer of information** between the user and a test range or between ranges

# Telemetry Attributes

- **Program Name**
- **Item Under Test**
- **Recording Date and Time**
- **Data Sources**
- **Data Rate**
- **Data Bit Format**
- **Synchronization Pattern**
- **Number of Bits per Data Frame**
- **Data Word Length**
- **Data Word Format**
- **Data Measurement Conversion**



# How TMATS Is Used

- **Originally TMATS described**
  - **Data Format**
    - Bits Per Frame
    - Frame Synchronization Pattern
    - Word Length
    - Measurement Fields
  - **Instrumentation Setup**
    - Data Rate
    - Bit Format
    - Polarity
    - Filtering

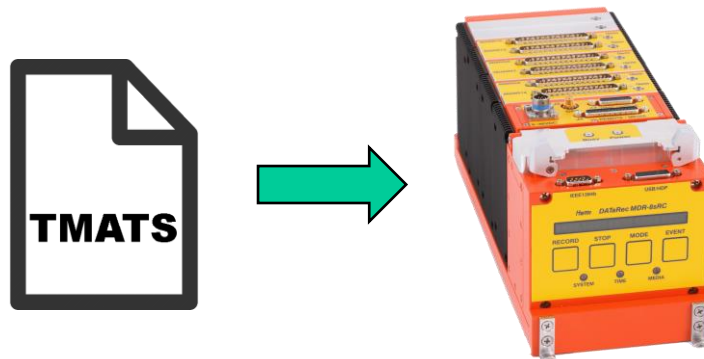
# How TMATS Is Used

- **Later used to configure IRIG 106 Ch 10 recorders**
  - **Configure Interfaces**
    - Video Input Signal Format
    - UART Baud Rate
    - Audio Signal Input Range
    - Analog Sample Rate
  - **Define Operation**
    - Document Manufacturer
    - Configure Discrete Control
    - Define Recording Medium
    - Start / Stop Record Based On Events

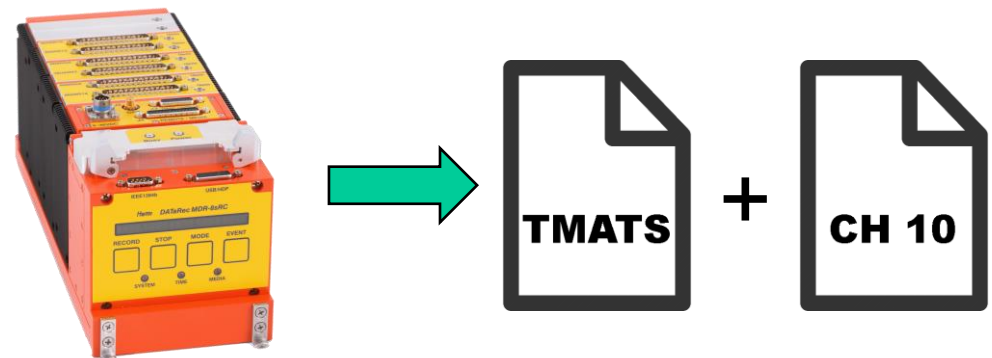
# How TMATS Is Used

## Two primary use cases for TMATS

### Configure Instrumentation



### Document Recorded Data



# **TMATS General Format and Structure**

- **TMATS is designed to be**
  - **Humanly Readable**
  - **Machine Parsable**
- **TMATS defines two formats**
  - **“Code Name” format**
  - **XML format**
  - **Both formats provide the same information**

# TMATS General Format and Structure

## “Code Name” TMATS

G\POC\N:1;  
G\POC1-1:Wile E. Coyote;  
G\POC2-1:ACME Corp;  
G\POC3-1:123 Roadrunner Way;  
G\POC4-1:(555)555-5555;

## XML TMATS

```
<Tmats:Tmats TmatsG:TmatsVersion="106-13" ">  
<TmatsG:PointOfContact>  
<TmatsCommon:Name>Wile E. Coyote</TmatsCommon:Name>  
<TmatsCommon:Agency>ACME Corp</TmatsCommon:Agency>  
<TmatsCommon:Address>Roadrunner Way</TmatsCommon:Address>  
<TmatsCommon:Telephone>(555) 555-5555</TmatsCommon:Telephone>  
</TmatsG:PointOfContact>  
</Tmats:Tmats>
```

# Code Name Syntax

- **Code Name Syntax has Two Parts**
  - **Unique Code Name**
    - Terminated by Colon “:”
  - **Data Item**
    - Terminated by Semicolon “;”

## Example

**A:B;**

**Where “A” is the Code Name  
and “B” is the Data Item**

# Code Name Syntax

- **Multiple successive Code Names may end with CR and/or LF for readability**

```
G\POC\N:1;  
G\POC1-1:Wile E. Coyote;  
G\POC2-1:ACME Corp;  
G\POC3-1:123 Roadrunner Way;  
G\POC4-1:(555)555-5555;
```

- **CR / LF is common but not required**

```
G\POC\N:1;G\POC1-1:Wile E. Coyote;G\POC2-1:ACME Corp;G\POC3-  
1:123 Roadrunner Way;G\POC4-1:(555)555-5555;
```

- **Code Names are defined in IRIG 106 Chapter 9**
- **Code Names continually evolve to meet new requirements**

# Code Name Syntax

- **Two types of code names**

- **Single Entry Type**

- G\PN:A10 SIM;

- G\106:07;

- G\POC\N:1;

- **Multiple Entry Type**

- G\POC1-1:Wile E. Coyote;

- G\POC2-1:ACME Corp;

- G\POC3-1:123 Roadrunner Way;

- G\POC4-1:(555) 555-5555;



# Code Name Syntax

## Chapter 9 has detailed information

Figure 9-6. PCM Format Attributes Group (P)		Code Name
<b>DATA LINK NAME - 9-93</b>		(P-d\DLN)
<b>9-93</b>	<b>*Input Data</b>	
	PCM CODE	(P-d\D1)
	BIT RATE	(P-d\D2)
	ENCRYPTED	(P-d\D3)
	POLARITY	(P-d\D4)
	AUTO-POLARITY CORRECTION	(P-d\D5)
	DATA DIRECTION	(P-d\D6)
	DATA RANDOMIZED	(P-d\D7)
	RANDOMIZER LENGTH	(P-d\D8)

PCM CODE	P-d\D1	R/R Ch 10 Status: RO	Define the data format code. A randomized PCM stream can be specified as: “P-d\D1=NRZ-L” and “P-d\D7=Y”; or “P-d\D1=RNRZ-L” and “P-d\D7” is ignored.
		Allowed when: P-d\DLN is specified	
		Range: Enumeration	
		Enumeration	
		Description	
		NRZ-L	
		NRZ-M	
		NRZ-S	
		RNRZ-L	
		BIO-M	
BIT RATE	P-d\D2	BIO-L	Data rate in bits per second.
		BIO-S	
		OTHER	
		Default: NRZ-L	
ENCRYPTED	P-d\D3	R/R Ch 10 Status: RO	If the data is encrypted, provide details in comments.
		Allowed when: P-d\DLN is specified	
		Required when: Allowed	
		Range: positive floating point	
		Allowed when: P-d\DLN is specified	

# TMATS Evolution

Attribute	Code	04	05	07	09	11	13	15	17	19
PROGRAM NAME	G\PN	X	X	X	X	X	X	X	X	X
TEST ITEM	G\TA	X	X	X	X	X	X	X	X	X
TMATS FILE NAME	G\FN				X	X	X	X	X	X
IRIG 106 REVISION LEVEL	G\106	X	X	X	X	X	R	R	R	R
ORIGINATION DATE	G\OD	X	X	X	X	X	X	X	X	X
REVISION NUMBER	G\RN	X	X	X	X	X	X	X	X	X
REVISION DATE	G\RD	X	X	X	X	X	X	X	X	X
UPDATE NUMBER	G\UN	X	X	X	X	X	X	X	X	X
UPDATE DATE	G\UD	X	X	X	X	X	X	X	X	X
TEST NUMBER	G\TN	X	X	X	X	X	X	X	X	X

A lot of TMATS attributes are in all versions of Ch 9

[https://www.irig106.org/wiki/tmats\\_attributes](https://www.irig106.org/wiki/tmats_attributes)

# TMATS Evolution

RMM IDENTIFIER .....	R-x\RMMID-n				X	X	X	X	X	X
RMM SERIAL NUMBER .....	R-x\RMMS-n				X	X	X	X	X	X
RMM FIRMWARE REVISION .....	R-x\RMMF-n				X	X	X	X	X	X
NUMBER OF ETHERNET INTERFACES	R-x\EI\N						O	O	O	O
ETHERNET INTERFACE NAME	R-x\EINM-n						O	O	O	O
PHYSICAL ETHERNET INTERFACE	R-x\PEIN-n								O	O
ETHERNET INTERFACE LINK SPEED	R-x\EILS-n								O	O
ETHERNET INTERFACE TYPE	R-x\EIT-n						O	O	O	O
ETHERNET INTERFACE IP ADDRESS	R-x\EIIP-n						O	O	O	O

New attributes are continually defined as needed

[https://www.irig106.org/wiki/tmats\\_attributes](https://www.irig106.org/wiki/tmats_attributes)


# TMATS Evolution

RECORDER PHYSICAL CHANNEL NUMBER	R-x\TK4-n			X	X	X	R	R	R	R
CHANNEL ENABLE	R-x\CHE-n	X	X	X	X	X	R	R	R	R
DATA SOURCE TYPE	R-x\DST-n	X								
CHANNEL DATA TYPE	R-x\CDT-n	X	X	X	X	X	R	R	R	R
DATA LINK NAME	R-x\BDLN-n	X	X							
PCM DATA LINK NAME *****	R-x\PDLN-n	X	X							
CHANNEL DATA LINK NAME	R-x\CDLN-n			X	X	X	R	R	R	R
SECONDARY HEADER TIME FORMAT	R-x\SHTF-n						O	O	O	O
PCM DATA TYPE FORMAT *****	R-x\PDTF-n			X	X	X	O	O	O	O
DATA PACKING OPTION	R-x\PDP-n	X	X	X	X	X	O	O	O	O
RECORDER POLARITY SETTING	R-x\RPS-n								O	O

Some attributes are discarded

[https://www.irig106.org/wiki/tmats\\_attributes](https://www.irig106.org/wiki/tmats_attributes)

# TMATS Evolution

INPUT OFFSET VOLTAGE	R-x\AOVI-n-m			X	X	X	O	O	O	O
LSB VALUE	R-x\ALSV-n-m			X						
EUC SLOPE	R-x\AECS-n-m			X						
EUC OFFSET	R-x\AECO-n-m			X						
EUC UNITS	R-x\AECU-n-m			X						
FORMAT  Note: Omitting R-x\AF-n-m in 2009 was an oversight.	R-x\AF-n-m			X		X	O	O	O	O
INPUT TYPE	R-x\AIT-n-m			X	X	X	O	O	O	O
AUDIO	R-x\AV-n-m			X	X	X	O	O	O	O
AUDIO FORMAT	R-x\AVF-n-m			X	X	X	O	O	O	O

This attribute was accidentally omitted from 106-09

[https://www.irig106.org/wiki/tmats\\_attributes](https://www.irig106.org/wiki/tmats_attributes)

# TMATS Evolution

WORD LENGTH	S-x\SWL-n-m-e		X	X						
BIT MASK	S-x\SBM-n-m-e		X	X						
TRANSFER ORDER	S-x\STO-n-m-e		X	X						
FRAGMENT POSITION	S-x\SFP-n-m-e		X	X						
NUMBER OF STREAMS	S-d\NS\N				X	X	X	X	X	X
STREAM NAME	S-d\SNA-i				X	X	X	X	X	X
MESSAGE DATA TYPE	S-d\MDT-i				X	X	X	X	X	X
MESSAGE DATA LAYOUT	S-d\MDL-i				X	X	X	X	X	X

There was a total rewrite of S Groups in 106-09

[https://www.irig106.org/wiki/tmats\\_attributes](https://www.irig106.org/wiki/tmats_attributes)

# TMATS Evolution

MINOR FRAME LOCATION	D-x\MF-y-n	X	X	X	X						
BIT MASK	D-x\MFM-y-n	X	X	X	X						
NUMBER OF MINOR FRAME LOCATIONS	D-x\MFS\N-y-n	X	X	X	X						
LOCATION DEFINITION	D-x\MFS1-y-n	X	X	X	X						
LOCATION IN MINOR FRAME	D-x\MFS2-y-n	X	X	X	X						
BIT MASK	D-x\MFS3-y-n	X	X	X	X						
INTERVAL	D-x\MFS4-y-n	X	X	X	X						
MINOR FRAME LOCATION	D-x\MFSW-y-n-e	X	X	X	X						
BIT MASK	D-x\MFSM-y-n-e	X	X	X	X						
NUMBER OF FRAGMENTS	D-x\FMF\N-y-n	X	X	X	X						

There were major changes to D Group in 106-11

[https://www.irig106.org/wiki/tmats\\_attributes](https://www.irig106.org/wiki/tmats_attributes)

# TMATS Evolution

COMMENTS	S-d\COM		X	X	X	X	X	X	X	X
DATA LINK NAME	A-x\DLN	X		X	X	X				
INPUT CODE	A-x\A1	X		X	X	X				
POLARITY	A-x\A2	X		X	X	X				
SYNC PATTERN TYPE	A-x\A3	X		X	X	X				
SYNC PATTERN (OTHER)	A-x\A4	X		X	X	X				
CHANNEL RATE	A-x\A5	X		X	X	X				
CHANNELS PER FRAME	A-x\A\N	X		X	X	X				
NUMBER OF MEASURANDS	A-x\A\MN\N	X		X	X	X				
0% SCALE CHANNEL NUMBER	A-x\RC1	X		X	X	X				
50% SCALE CHANNEL NUMBER	A-x\RC2	X		X	X	X				
FULL SCALE CHANNEL NUMBER	A-x\RC3	X		X	X	X				
NUMBER OF SUBFRAMES	A-x\SF\N	X		X	X	X				
SUBFRAME n LOCATION	A-x\SF1-n	X		X	X	X				
SUBFRAME n SYNCHRONIZATION	A-x\SF2-n	X		X	X	X				
SUBFRAME n SYNCHRONIZATION PATTERN	A-x\SF3-n	X		X	X	X				
MEASUREMENT NAME	A-x\MN1-n	X		X	X	X				
SUBCOM	A-x\MN2-n	X		X	X	X				
SUPERCOM	A Group deleted in 106-13		X		X	X	X			
CHANNEL NUMBER	A-x\LCW-n-s	X		X	X	X				
SUBFRAME CHANNEL NUMBER	A-x\LCN-n-s-r	X		X	X	X				
COMMENTS	A-x\COM	X		X	X	X				
NAME	C-d\DCN	X	X	X	X	X	X	X	X	X



# Telemetry Attribute Groups

Identifier	Title
G	General Information
T	Transmission Attributes
R	Recorder-Reproducer Attributes
M	Multiplex/Modulation Attributes
P	PCM Format Attributes
D	PCM Measurement Description
B	Bus Data Attributes
S	Message Data Attributes
C	Data Conversion Attributes
H	Airborne Hardware Attributes
V	Vendor-Specific Attributes
X	TMATS eXtension Attributes

# TMATS “G” Group

- **General Information group**
- **Provides overall program information**
  - **General Section**
  - **One or more (always 1) Data Source Section**

```
G\PN:D200 Sample;  
G\TA:TMATS generated by DATSetup 2.38;  
G\106:07;  
G\DSI\N:1;  
G\DSI-1:DATASOURCE;  
G\DST-1:OTH;  
G\OD:03/30/2009;  
G\UD:04/06/2009;  
G\POC\N:1;  
G\POC1-1:Heim DatSetup;
```

# TMATS “T” Group

- **Transmission Attributes**
- **Used to set up the RF receiver through the detection and recovery of the baseband composite waveform**
- **Contains the information needed to configure the antenna and receiver subsystems**

# TMATS “R” Group

- **Recorder-Reproducer Attributes**
- **Attributes required for**
  - **Magnetic Tape**
  - **Chapter 10 Recorder**

## **Overall Recorder Info**

```
R-1\ID:DATASOURCE;  
R-1\TC1:SSR;  
R-1\RI1:Heim;  
R-1\RI2:D200;  
R-1\RI3:Y;  
R-1\N:19;  
R-1\IDX\E:T;  
R-1\IDX\IT:T;  
R-1\IDX\ITV:1000000;  
R-1\RID:HeimSystems;
```

## **Per Data Source Info**

```
R-1\DSI-1:Time;  
R-1\TK1-1:1;  
R-1\CHE-1:T;  
R-1\CDT-1:TIMEIN;  
R-1\TK4-1:1;  
R-1\TTF-1:1;  
R-1\CDLN-1:TimeChannel;  
R-1\TFMT-1:B;  
R-1\TSRC-1:E;
```

# TMATS “P” Group

- **PCM Format Attributes**
- **Information required to decommutate PCM data stream**
- **Class I and Class II PCM supported**

# TMATS “M” Group

- **Multiplex/Modulation (Mux/Mod) Attributes**
- **Defines composite waveforms**
- **May consist of**
  - **Baseband signal**
  - **One or more subcarriers**

# **TMATS “D” Group**

- **PCM Measurement Description Group**
- **Used to define binary measurands or data items of interest within PCM frame**
- **Measurand name links to data conversion (C)**
- **Major changes between -09 and -11**

# TMATS “B” Group

- **Bus Data Attribute**
- **Used to define binary measurands or data items of interest within bus-oriented data**
- **Support for Ch 10 types**
  - **MIL-STD-1553**
  - **ARINC 429**
- **Measurand name links to data conversion (C)**



# TMATS “S” Group

- **Message Data Attributes**
- **Used to define binary measurands or data items of interest within Data Stream data**
- **Support for Ch 10 types**
  - **UART**
  - **Ethernet**
  - **IEEE-1394**
  - **Fibre Channel**
  - **Message**
- **Major Rewrite between -07 and -09**
- **Measurand name links to data conversion (C)**

# TMATS “C” Group

- **Data Conversion Attributes**
- **Definitions to convert Binary Messages into Engineering Units**
- **Conversion types**
  - **Pair Set (Linear Piece-wise Approximation)**
  - **Coefficients (Polynomial, Negative Powers of X)**
  - **Derived Parameter**
  - **Discrete Conversion**
  - **Time (PCM, 1553)**
  - **Digital Voice**
  - **Digital Video**
  - **Other**

# TMATS “V” Group

- **Vendor-Specific Attributes**
- **Provides information that is specific to a vendor**
- **Each vendor defines their own V attributes**
- **Attributes**
  - **V-x\ID**                      **Data Source ID, connect to G group**  
V-1\ID:DATASOURCE;  
G\DSI-1:DATASOURCE;
  - **V-x\VN**                      **Vendor Name, 3 letter acronym**  
V-1\VN:HDS;
  - **V-x\acr\attribute**  
V-1\HDS\SYS:sfh5o5r-t-;

# TMATS “H” Group

- **Airborne Hardware Attributes**
- **Defines the specific configuration of airborne instrumentation hardware**
- **Only two attributes defined**
  - **H\TA**                **Test Item**
  - **H\ST-n**            **Airborne System Type**
- **Any other attributes are defined outside Ch 9**

# TMATS “X” Group

- **eXtension Attributes**
- **Extends existing attributes**

`X-x\ORG\ORIGCODE\EXTENSION_CODE-i-j-m-n:Value;`

- **Everything to the right of “ORG” matches an existing TMATS code to be extended**
- **Example**

`D-1\MN-1-2:MEAS1;`

`X-1\MYORG\D\MN\SGAIN-1-2:10.75;`

- X-1 is connected to D-1

- D\**MN\SGAIN-1-2** is connected to MN-1-2

# TMATS Structure

- **TMATS attributes are organized in a tree structure**
  - **This tree structure is not obvious when looking at raw TMATS**
  - **Tree branches are linked by link names**
  - **Multiple branches are iterated by an index number**

# TMATS Structure

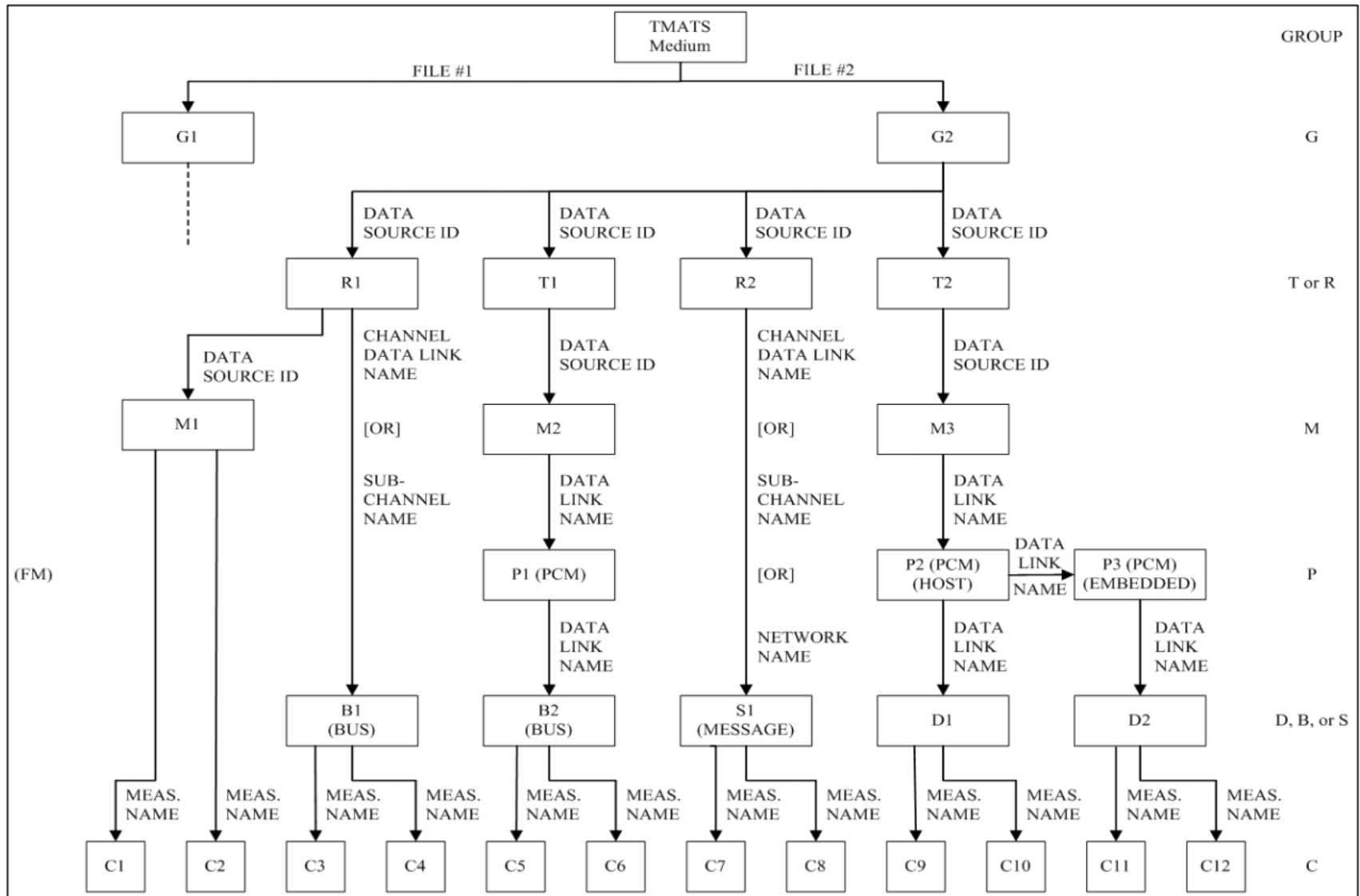


Figure 9-1. Group Relationships

# TMATs Structure

## NOTE



- a. Data Source ID is unique within a General Information group (G). It ties the Transmission group (T) or the Recorder-Reproducer group (R) or both to the G group and to the Multiplex/Modulation group (M).
- b. The tie from the M group to a PCM group (P) is the Data Link Name.
- c. The tie from the P group to an embedded P group is another Data Link Name.
- d. The tie from the M group to the Data Conversion group (C) for an analog measurement is the Measurement Name.
- e. The tie from the P group to the PCM Measurement Description group (D) or Bus group (B) is the Data Link Name.
- f. The tie from the R group to the P group is from the Channel Data Link Name (R) to the Data Link Name (P).
- g. The tie from the R group to the B group is from the Channel Data Link Name or Sub-Channel Name (R) to the Data Link Name (B).
- h. The tie from the R group to the Message Data group (S) is from the Channel Data Link Name, Sub-Channel Name, or Network Name (R) to the Data Link Name (S).
- i. The tie from either the R, D, B, or S group to the Data Conversion group is the Measurement Name.



# TMATS Structure

**Table 9-7. PCM Measurement Description Group (D)**

Parameter	Code Name	Usage Attributes	Definition
DATA LINK NAME	D-x\DLN	Allowed when: P-d\DLN is specified and decommutation is required	Provide the data link name.
		Required when: Allowed and defining CH10 non-throughput mode	
		Links from: P-d\DLN	
		Range: 32 characters	
NUMBER OF MEASUREMENT LISTS	D-x\ML\N	Allowed when: D-x\DLN is specified	Specify the number of measurement lists to be provided.
		Required when: Allowed	
		Range: 1-99	
MEASUREMENT LIST NAME	D-x\MLN-y	Allowed when: D-x\DLN is specified	Provide the measurement list name associated with the following attributes. The following information will have to be repeated for each measurement list identified in the PCM Format Attributes group.
		Required when: Allowed	
		Links from: P-d\MLC2-n	
		Range: 32 characters	
NUMBER OF MEASURANDS	D-x\MN\N-y	Allowed when: D-x\DLN is specified	Specify the number of measurands included within this measurement list.
		Required when: Allowed	
		Range: 1-9999999	
MEASUREMENT NAME	D-x\MN-y-n	Allowed when: D-x\DLN is specified	Measurand name.
		Required when: Allowed	
		Links to: C-d\DCN	
		Links from: D-x\REL1-y-n-m, R-x\SMF\SMN-n-m	
		Range: 32 characters	

# TMATS Structure

**G\DSI-n** -> R-x\ID, T-x\ID, M-x\ID, V-x\ID  
 T-x\ID -> M-x\ID  
 R-x\EPL\LSNM-n -> R-x\CGNM-n  
 R-x\EPL\LSSN-n -> R-x\CGSN-n  
 R-x\EPL\LDEIP-n -> R-x\EIIP-n  
 R-x\EPL\LDEPA-n -> R-x\EI\PA  
 R-x\EV\DLN-n -> P-d\DLN, B-x\DLN, S-d\DLN  
 R-x\EV\PM\MN-n-m -> B-x\MN-i-n-p, D-x\MN-y-n, S-d\MN-i-n-p  
**R-x\DSI-n** -> M-x\ID  
**R-x\CDLN-n** -> P-d\DLN, B-x\DLN, S-d\DLN  
 R-x\SMF\SMN-n-m -> D-x\MN-y-n  
 R-x\BME\SMN-n-m -> B-x\MN-i-n-p  
 R-x\AMN-n-m -> C-d\DCN  
 R-x\DMN-n-m -> C-d\DCN  
 R-x\OSNM-n -> R-x\CGNM-n  
**M-x\BB\DLN** -> P-d\DLN  
 M-x\BB\MN -> C-d\DCN  
 M-x\SI\DLN-n -> P-d\DLN  
 M-x\SI\MN-n -> C-d\DCN  
**P-d\DLN** -> D-x\DLN, B-d\DLN  
 P-d\AEF\DLN-n -> P-d\DLN  
 P-d\MLC2-n -> D-x\MLN-y  
 P-d\FSC2-n -> P-d\DLN  
 P-d\ADM\DMN-n -> P-d\DLN  
**D-x\MN-y-n** -> C-d\DCN  
 D-x\REL1-y-n-m -> D-x\MN-y-n  
 B-x\UMN1-i -> C-d\DCN  
 B-x\UMN2-i -> C-d\DCN  
 B-x\UMN3-i -> C-d\DCN  
**B-x\MN-i-n-p** -> C-d\DCN  
 S-d\MN-i-n-p -> C-d\DCN  
 C-d\DPMT -> C-d\DCN  
 C-d\DP-n -> C-d\DCN

# TMATS Structure

## Some Other TMATS Field Connections

R-x\DSI-n <----> M-x\ID

M-x\BB\DLN <--+-> P-x\DLN \

+--> B-x\DLN - With M-x Baseband

+--> S-x\DLN /

M-x\SI\DLN-n <--+-> P-x\DLN \

+--> B-x\DLN - With M-x Subchannels

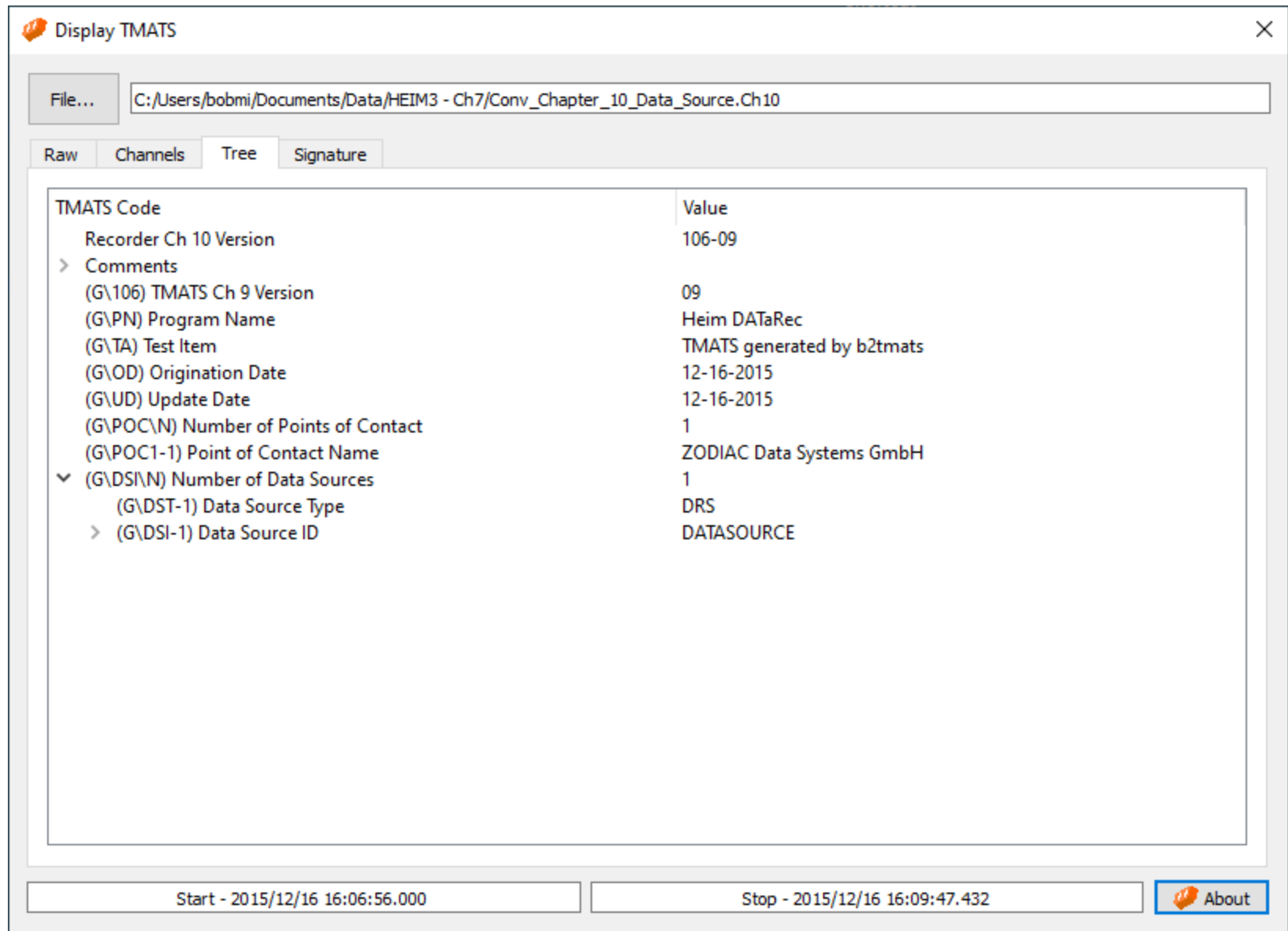
+--> S-x\DLN /

R-x\CDLN-n <-----+--> P-x\DLN \

+--> B-x\DLN - Without M-x


+--> S-x\DLN /

# TMATS Structure - Example #1

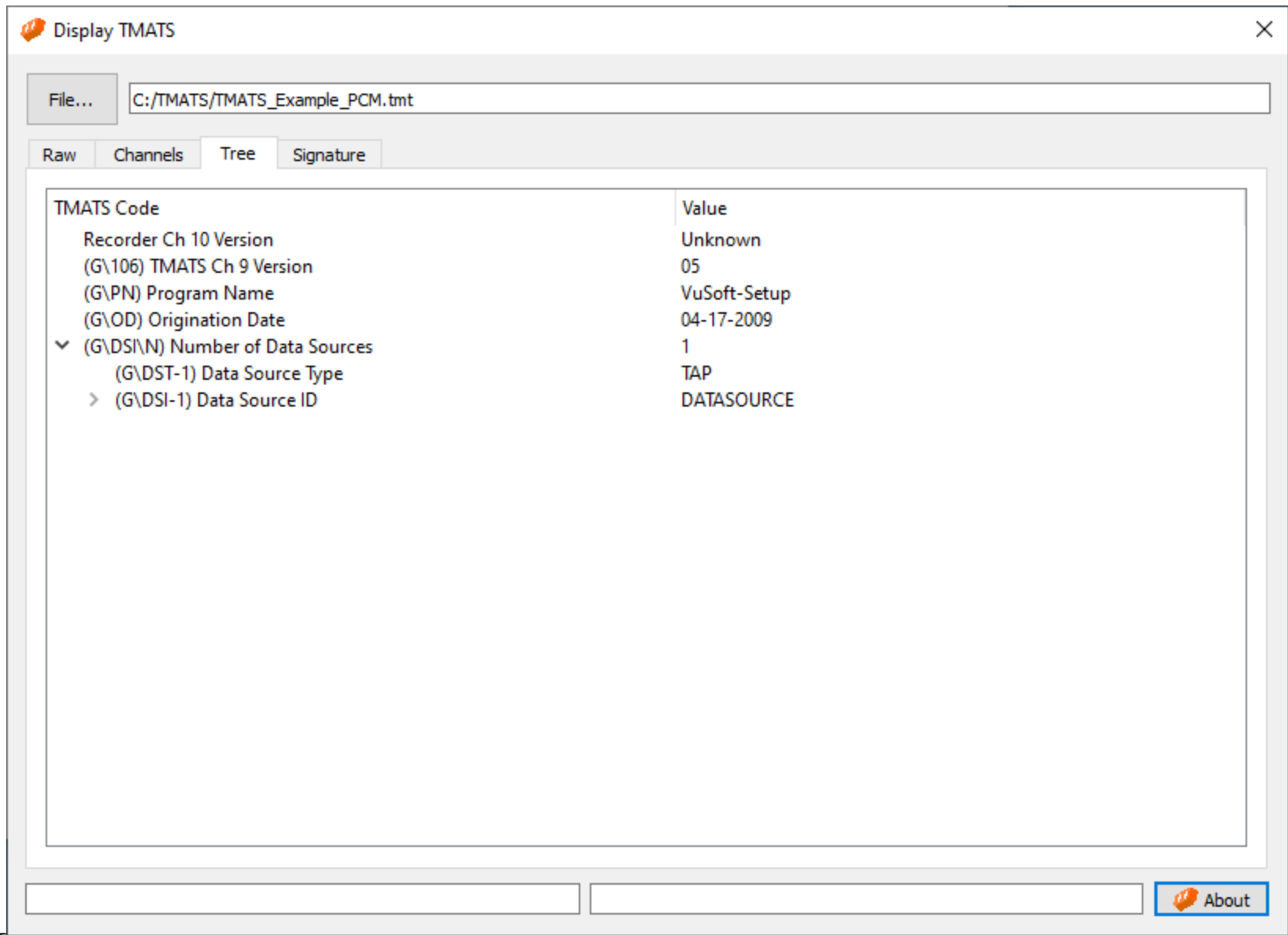


The screenshot shows a software window titled "Display TMATS" with a file path and a tree view of TMATS data. The file path is "C:/Users/bobmi/Documents/Data/HEIM3 - Ch7/Conv\_Chapter\_10\_Data\_Source.Ch10". The tree view has tabs for "Raw", "Channels", "Tree", and "Signature", with "Tree" selected. The tree view shows a hierarchy of TMATS data, including "Recorder Ch 10 Version", "Comments", "TMATS Ch 9 Version", "Program Name", "Test Item", "Origination Date", "Update Date", "Number of Points of Contact", "Point of Contact Name", "Number of Data Sources", "Data Source Type", and "Data Source ID". The values are listed to the right of the tree view.

TMATS Code	Value
Recorder Ch 10 Version	106-09
> Comments	
(G\106) TMATS Ch 9 Version	09
(G\PN) Program Name	Heim DATaRec
(G\TA) Test Item	TMATS generated by b2tmats
(G\OD) Origination Date	12-16-2015
(G\UD) Update Date	12-16-2015
(G\POC\N) Number of Points of Contact	1
(G\POC1-1) Point of Contact Name	ZODIAC Data Systems GmbH
▼ (G\DSI\N) Number of Data Sources	1
(G\DST-1) Data Source Type	DRS
> (G\DSI-1) Data Source ID	DATASOURCE

Start - 2015/12/16 16:06:56.000      Stop - 2015/12/16 16:09:47.432       About

# TMATS Structure - Example #2



The screenshot shows a window titled "Display TMATS" with a file path "C:/TMATS/TMATS\_Example\_PCM.tmt" and tabs for "Raw", "Channels", "Tree", and "Signature". The "Tree" tab is active, displaying a hierarchical view of TMATS data. The data is organized into a table with two columns: "TMATS Code" and "Value".

TMATS Code	Value
Recorder Ch 10 Version	Unknown
(G\106) TMATS Ch 9 Version	05
(G\PN) Program Name	VuSoft-Setup
(G\OD) Origination Date	04-17-2009
▼ (G\DSI\N) Number of Data Sources	1
(G\DST-1) Data Source Type	TAP
> (G\DSI-1) Data Source ID	DATASOURCE

At the bottom of the window, there are two empty text input fields and an "About" button.

# TMATS Structure - Example #2

Display TMATS

File... C:/TMATS/TMATS\_Example\_PCM.tmt

Raw Channels Tree Signature

TMATS Code	Value
Recorder Ch 10 Version	Unknown
(G\106) TMATS Ch 9 Version	05
(G\PN) Program Name	VuSoft-Setup
(G\OD) Origination Date	04-17-2009
▼ (G\DSI\N) Number of Data Sources	1
(G\DST-1) Data Source Type	TAP
▼ (G\DSI-1) Data Source ID	DATASOURCE
(R-1\ID) Data Source ID	DATASOURCE
(R-1\RID) Recorder ID	PERMASTORE
(R-1\TC1) Media Type	SSR
(R-1\NSB) Number of Source Bits	0
(R-1\RI1) Recorder Manufacturer	JDA
(R-1\RI2) Recorder Model	PSTORE
(R-1\RI3) Original Recording	Y
(R-1\RI4) Recording Date / Time	04-17-2009-15-46-43
(R-1\IDX\E) Recording Index Enabled	F
▼ (R-1\N) Number of Data Sources	5
> (R-1\DSI-1) Data Source ID	Time
> (R-1\DSI-2) Data Source ID	PCMIIn1
> (R-1\DSI-3) Data Source ID	PCMIIn2
> (R-1\DSI-4) Data Source ID	PCMIIn3
> (R-1\DSI-5) Data Source ID	PCMIIn4

About

# TMATS Structure - Example #2

Display TMATS

File... C:/TMATS/TMATS\_Example\_PCM.tmt

Raw Channels Tree Signature

TMATS Code	Value
(G\DST-1) Data Source Type	TAP
▼ (G\DSI-1) Data Source ID	DATASOURCE
(R-1\ID) Data Source ID	DATASOURCE
(R-1\RID) Recorder ID	PERMASTORE
(R-1\TC1) Media Type	SSR
(R-1\NSB) Number of Source Bits	0
(R-1\RI1) Recorder Manufacturer	JDA
(R-1\RI2) Recorder Model	PSTORE
(R-1\RI3) Original Recording	Y
(R-1\RI4) Recording Date / Time	04-17-2009-15-46-43
(R-1\IDX\E) Recording Index Enabled	F
▼ (R-1\N) Number of Data Sources	5
▼ (R-1\DSI-1) Data Source ID	Time
(R-1\TK1-1) Channel ID / Track Number	1
(R-1\TK2-1) Recording Technique	SSR
(R-1\CHE-1) Channel Enabled	T
(R-1\CDT-1) Channel Data Type	TIMEIN
(R-1\TFMT-1) Time Format	B
(R-1\TSRC-1) Time Source	E
> (R-1\DSI-2) Data Source ID	PCMIIn1
> (R-1\DSI-3) Data Source ID	PCMIIn2
> (R-1\DSI-4) Data Source ID	PCMIIn3
> (R-1\DSI-5) Data Source ID	PCMIIn4

About

# TMATS Structure - Example #2

Display TMATS

File... C:/TMATS/TMATS\_Example\_PCM.tmt

Raw Channels Tree Signature

TMATS Code	Value
(G\DST-1) Data Source Type	TAP
▼ (G\DSI-1) Data Source ID	DATASOURCE
(R-1\ID) Data Source ID	DATASOURCE
(R-1\RID) Recorder ID	PERMASTORE
(R-1\TC1) Media Type	SSR
(R-1\NSB) Number of Source Bits	0
(R-1\RI1) Recorder Manufacturer	JDA
(R-1\RI2) Recorder Model	PSTORE
(R-1\RI3) Original Recording	Y
(R-1\RI4) Recording Date / Time	04-17-2009-15-46-43
(R-1\IDX\E) Recording Index Enabled	F
▼ (R-1\N) Number of Data Sources	5
> (R-1\DSI-1) Data Source ID	Time
▼ (R-1\DSI-2) Data Source ID	PCMin1
(R-1\TK1-2) Channel ID / Track Number	2
(R-1\CHE-2) Channel Enabled	T
(R-1\CDT-2) Channel Data Type	PCMIN
(R-1\PDLN-2) PCM Data Link Name	PCMin1
(R-1\PDOP-2) Data Packing Option	THROUGHPUT MODE
> PCM Format Attributes (P)	
> (R-1\DSI-3) Data Source ID	PCMin2
> (R-1\DSI-4) Data Source ID	PCMin3
> (R-1\DSI-5) Data Source ID	PCMin4

About



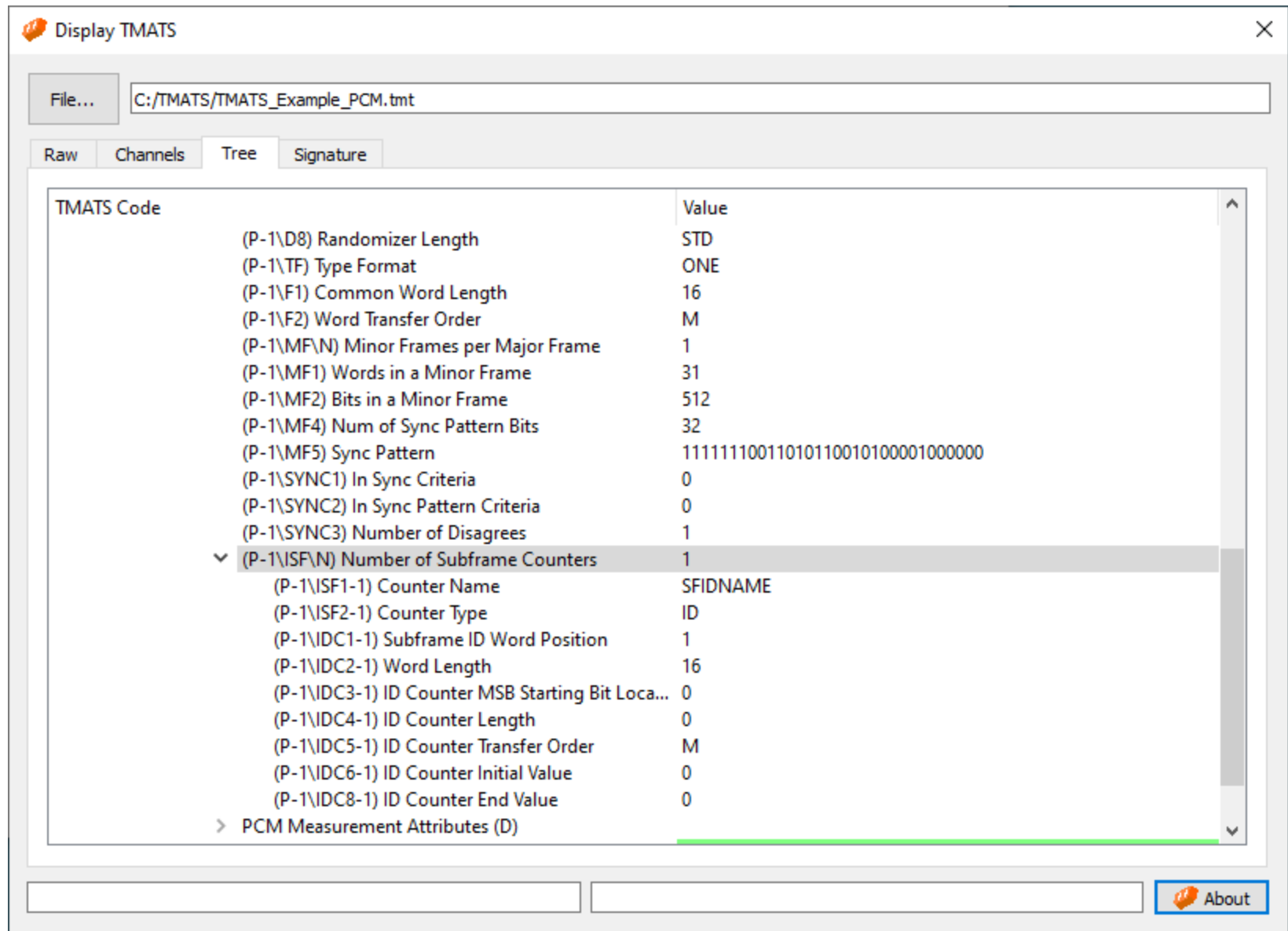
# TMATS Structure - Example #2

The screenshot shows the 'Display TMATS' application window. The title bar reads 'Display TMATS'. Below the title bar is a 'File...' button and a text field containing 'C:/TMATS/TMATS\_Example\_PCM.tmt'. Below this are four tabs: 'Raw', 'Channels', 'Tree', and 'Signature'. The 'Tree' tab is selected, displaying a hierarchical tree structure of TMATS codes and their values. The tree is expanded to show 'PCM Format Attributes (P)'. The values are displayed in a table-like format.

TMATS Code	Value
(R-1\PDP-2) Data Packing Option	THROUGHPUT MODE
▼ PCM Format Attributes (P)	
(P-1\DLN) Data Link Name	PCMin1
(P-1\D1) PCM Code	NRZ-L
(P-1\D2) Bit Rate	20000000
(P-1\D4) Polarity	N
(P-1\D5) Auto-polarity Correction	N
(P-1\D6) Data Direction	N
(P-1\D7) Data Randomized	N
(P-1\D8) Randomizer Length	STD
(P-1\TF) Type Format	ONE
(P-1\F1) Common Word Length	16
(P-1\F2) Word Transfer Order	M
(P-1\MF\N) Minor Frames per Major Frame	1
(P-1\MF1) Words in a Minor Frame	31
(P-1\MF2) Bits in a Minor Frame	512
(P-1\MF4) Num of Sync Pattern Bits	32
(P-1\MF5) Sync Pattern	11111110011010110010100001000000
(P-1\SYNC1) In Sync Criteria	0
(P-1\SYNC2) In Sync Pattern Criteria	0
(P-1\SYNC3) Number of Disagrees	1
> (P-1\ISF\N) Number of Subframe Counters	1
> PCM Measurement Attributes (D)	

At the bottom of the window, there are two empty text input fields and an 'About' button with a logo.

# TMATS Structure - Example #2



Display TMATS

File... C:/TMATS/TMATS\_Example\_PCM.tmt

Raw Channels Tree Signature

TMATS Code	Value
(P-1\D8) Randomizer Length	STD
(P-1\TF) Type Format	ONE
(P-1\F1) Common Word Length	16
(P-1\F2) Word Transfer Order	M
(P-1\MF\N) Minor Frames per Major Frame	1
(P-1\MF1) Words in a Minor Frame	31
(P-1\MF2) Bits in a Minor Frame	512
(P-1\MF4) Num of Sync Pattern Bits	32
(P-1\MF5) Sync Pattern	11111110011010110010100001000000
(P-1\SYNC1) In Sync Criteria	0
(P-1\SYNC2) In Sync Pattern Criteria	0
(P-1\SYNC3) Number of Disagrees	1
▼ (P-1\ISF\N) Number of Subframe Counters	1
(P-1\ISF1-1) Counter Name	SFIDNAME
(P-1\ISF2-1) Counter Type	ID
(P-1\IDC1-1) Subframe ID Word Position	1
(P-1\IDC2-1) Word Length	16
(P-1\IDC3-1) ID Counter MSB Starting Bit Loca...	0
(P-1\IDC4-1) ID Counter Length	0
(P-1\IDC5-1) ID Counter Transfer Order	M
(P-1\IDC6-1) ID Counter Initial Value	0
(P-1\IDC8-1) ID Counter End Value	0
> PCM Measurement Attributes (D)	

About

# TMATS Structure - Example #2

Display TMATS

File... C:/TMATS/TMATS\_Example\_PCM.tmt

Raw Channels Tree Signature

TMATS Code	Value
(P-1\D2) Bit Rate	20000000
(P-1\D4) Polarity	N
(P-1\D5) Auto-polarity Correction	N
(P-1\D6) Data Direction	N
(P-1\D7) Data Randomized	N
(P-1\D8) Randomizer Length	STD
(P-1\TF) Type Format	ONE
(P-1\F1) Common Word Length	16
(P-1\F2) Word Transfer Order	M
(P-1\MF\N) Minor Frames per Major Frame	1
(P-1\MF1) Words in a Minor Frame	31
(P-1\MF2) Bits in a Minor Frame	512
(P-1\MF4) Num of Sync Pattern Bits	32
(P-1\MF5) Sync Pattern	11111110011010110010100001000000
(P-1\SYNC1) In Sync Criteria	0
(P-1\SYNC2) In Sync Pattern Criteria	0
(P-1\SYNC3) Number of Disagrees	1
> (P-1\ISF\N) Number of Subframe Counters	1
▼ PCM Measurement Attributes (D)	
(D-1\DLN) Data Link Name	PCMin1
▼ (D-1\ML\N) Number of Measurement Lists	1
(D-1\MLN-1) Measurement List Name	PCMin1
> (D-1\MN\N-1) Number of Measurands	30

About

# TMATS Structure - Example #2

The screenshot shows a software window titled "Display TMATS" with a file path "C:/TMATS/TMATS\_Example\_PCM.tmt". Below the file path are tabs for "Raw", "Channels", "Tree", and "Signature". The "Tree" tab is selected, displaying a hierarchical tree view of TMATS data. The tree structure is as follows:

- PCM Measurement Attributes (D)
  - (D-1\DLN) Data Link Name: PCMIIn1
  - (D-1\ML\N) Number of Measurement Lists: 1
    - (D-1\MLN-1) Measurement List Name: PCMIIn1
      - (D-1\MN\N-1) Number of Measurands: 30
        - (D-1\MN-1-1) Measurand Name: TP1 W0002 F0
        - (D-1\MN-1-2) Measurand Name: TP1 W0003 F0
        - (D-1\MN-1-3) Measurand Name: TP1 W0004 F0
        - (D-1\MN-1-4) Measurand Name: TP1 W0005 F0
        - (D-1\MN-1-5) Measurand Name: TP1 W0006 F0
        - (D-1\MN-1-6) Measurand Name: TP1 W0007 F0
        - (D-1\MN-1-7) Measurand Name: TP1 W0008 F0
        - (D-1\MN-1-8) Measurand Name: TP1 W0009 F0
        - (D-1\MN-1-9) Measurand Name: TP1 W0010 F0
        - (D-1\MN-1-10) Measurand Name: TP1 W0011 F0
        - (D-1\MN-1-11) Measurand Name: TP1 W0012 F0
        - (D-1\MN-1-12) Measurand Name: TP1 W0013 F0
        - (D-1\MN-1-13) Measurand Name: TP1 W0014 F0
        - (D-1\MN-1-14) Measurand Name: TP1 W0015 F0
        - (D-1\MN-1-15) Measurand Name: TP1 W0016 F0
        - (D-1\MN-1-16) Measurand Name: TP1 W0017 F0
        - (D-1\MN-1-17) Measurand Name: TP1 W0018 F0
        - (D-1\MN-1-18) Measurand Name: TP1 W0019 F0

At the bottom of the window, there are two empty text input fields and an "About" button.

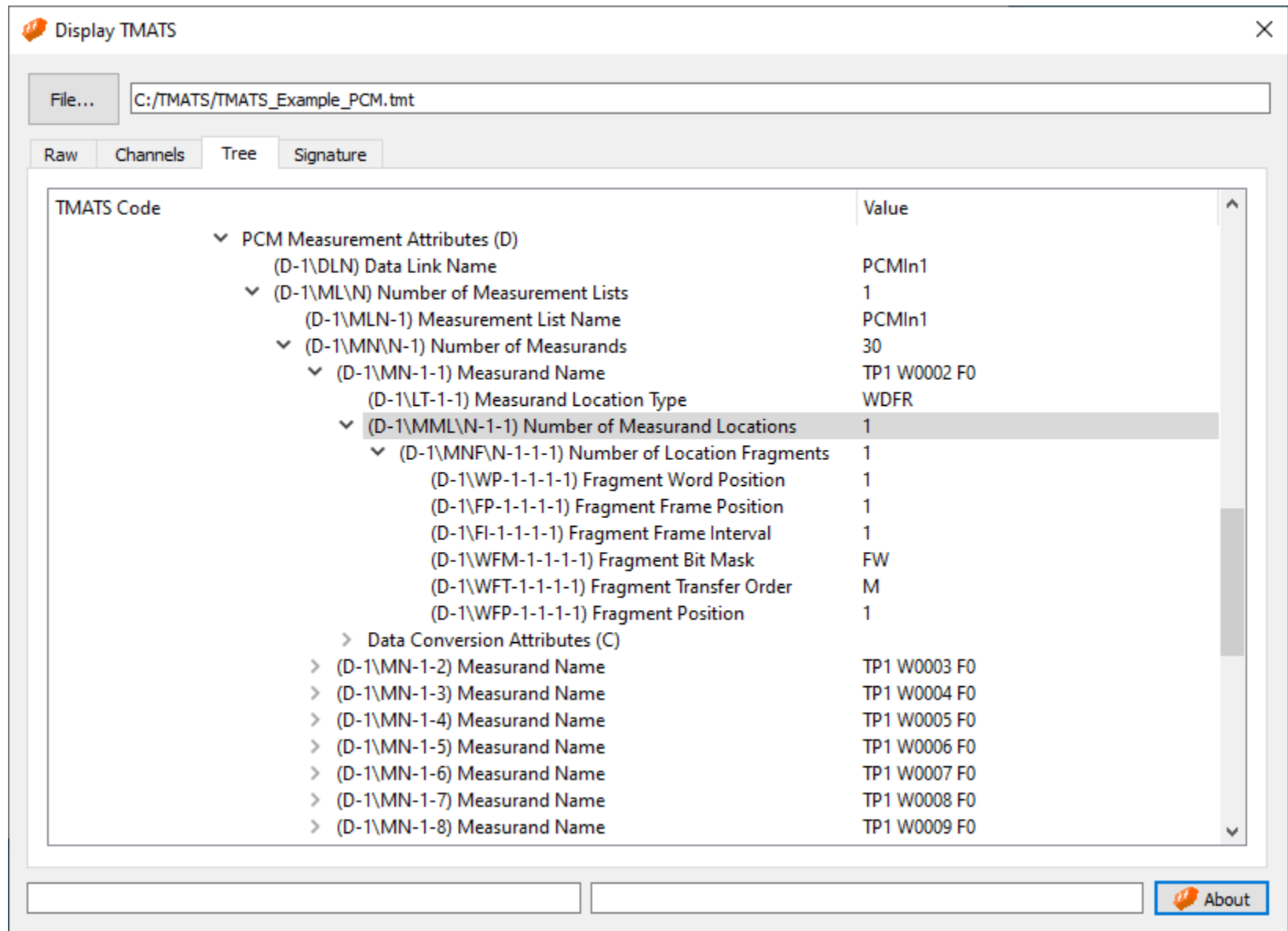
# TMATS Structure - Example #2

The screenshot shows the 'Display TMATS' application window. At the top, there is a 'File...' button and a text field containing 'C:/TMATS/TMATS\_Example\_PCM.tmt'. Below this are four tabs: 'Raw', 'Channels', 'Tree', and 'Signature'. The 'Tree' tab is selected, displaying a hierarchical tree view of measurement attributes. The tree is organized into columns: 'TMATS Code' and 'Value'. The tree structure is as follows:

- PCM Measurement Attributes (D)
  - (D-1\DLN) Data Link Name
    - PCMin1
  - (D-1\ML\N) Number of Measurement Lists
    - 1
  - (D-1\MLN-1) Measurement List Name
    - PCMin1
  - (D-1\MN\N-1) Number of Measurands
    - 30
  - (D-1\MN-1-1) Measurand Name
    - (D-1\LT-1-1) Measurand Location Type
      - WDFR
    - (D-1\MML\N-1-1) Number of Measurand Locations
      - 1
    - Data Conversion Attributes (C)
    - (D-1\MN-1-2) Measurand Name
      - TP1 W0003 F0
    - (D-1\MN-1-3) Measurand Name
      - TP1 W0004 F0
    - (D-1\MN-1-4) Measurand Name
      - TP1 W0005 F0
    - (D-1\MN-1-5) Measurand Name
      - TP1 W0006 F0
    - (D-1\MN-1-6) Measurand Name
      - TP1 W0007 F0
    - (D-1\MN-1-7) Measurand Name
      - TP1 W0008 F0
    - (D-1\MN-1-8) Measurand Name
      - TP1 W0009 F0
    - (D-1\MN-1-9) Measurand Name
      - TP1 W0010 F0
    - (D-1\MN-1-10) Measurand Name
      - TP1 W0011 F0
    - (D-1\MN-1-11) Measurand Name
      - TP1 W0012 F0
    - (D-1\MN-1-12) Measurand Name
      - TP1 W0013 F0
    - (D-1\MN-1-13) Measurand Name
      - TP1 W0014 F0
    - (D-1\MN-1-14) Measurand Name
      - TP1 W0015 F0
    - (D-1\MN-1-15) Measurand Name
      - TP1 W0016 F0

At the bottom of the window, there are two empty text input fields and an 'About' button.

# TMATS Structure - Example #2

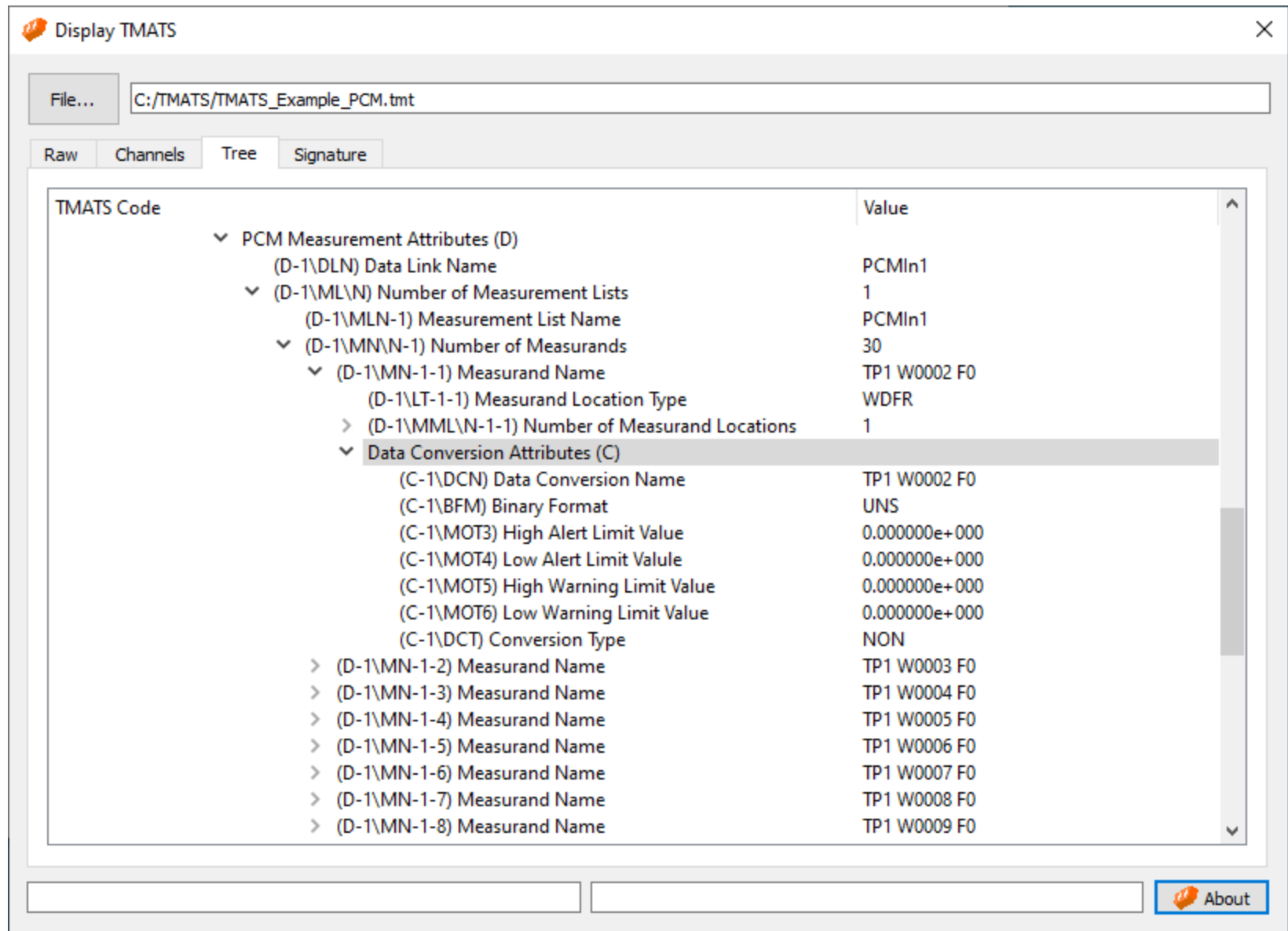


The screenshot shows the 'Display TMATS' application window. The title bar is 'Display TMATS'. Below the title bar is a 'File...' button and a text field containing 'C:/TMATS/TMATS\_Example\_PCM.tmt'. Below this is a tabbed interface with 'Raw', 'Channels', 'Tree', and 'Signature' tabs. The 'Tree' tab is selected, showing a hierarchical tree view of the TMATS structure. The tree is organized into two main columns: 'TMATS Code' and 'Value'. The tree is expanded to show the following structure:

- PCM Measurement Attributes (D)
  - (D-1\DLN) Data Link Name: PCMIIn1
  - (D-1\ML\N) Number of Measurement Lists: 1
    - (D-1\MLN-1) Measurement List Name: PCMIIn1
    - (D-1\MN\N-1) Number of Measurands: 30
      - (D-1\MN-1-1) Measurand Name: TP1 W0002 F0
        - (D-1\LT-1-1) Measurand Location Type: WDFR
        - (D-1\MML\N-1-1) Number of Measurand Locations: 1
          - (D-1\MNF\N-1-1-1) Number of Location Fragments: 1
            - (D-1\WP-1-1-1-1) Fragment Word Position: 1
            - (D-1\FP-1-1-1-1) Fragment Frame Position: 1
            - (D-1\FI-1-1-1-1) Fragment Frame Interval: 1
            - (D-1\WFM-1-1-1-1) Fragment Bit Mask: FW
            - (D-1\WFT-1-1-1-1) Fragment Transfer Order: M
            - (D-1\WFP-1-1-1-1) Fragment Position: 1
- Data Conversion Attributes (C)
  - (D-1\MN-1-2) Measurand Name: TP1 W0003 F0
  - (D-1\MN-1-3) Measurand Name: TP1 W0004 F0
  - (D-1\MN-1-4) Measurand Name: TP1 W0005 F0
  - (D-1\MN-1-5) Measurand Name: TP1 W0006 F0
  - (D-1\MN-1-6) Measurand Name: TP1 W0007 F0
  - (D-1\MN-1-7) Measurand Name: TP1 W0008 F0
  - (D-1\MN-1-8) Measurand Name: TP1 W0009 F0

At the bottom of the window, there are two empty text input fields and an 'About' button.

# TMATS Structure - Example #2

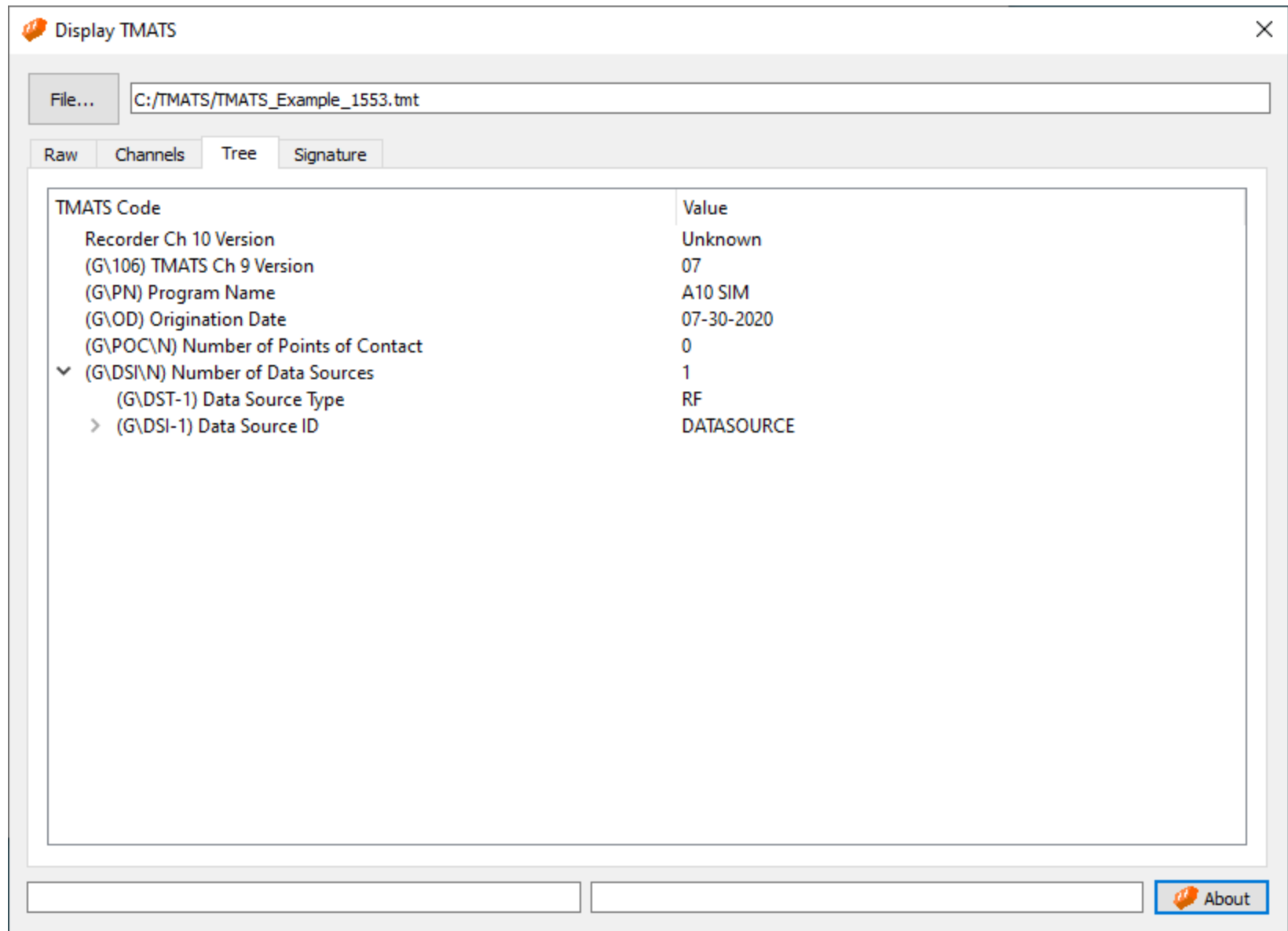


The screenshot shows the 'Display TMATS' application window. The title bar includes a logo and the text 'Display TMATS'. Below the title bar is a 'File...' button and a text field containing 'C:/TMATS/TMATS\_Example\_PCM.tmt'. Below this is a tabbed interface with 'Raw', 'Channels', 'Tree', and 'Signature' tabs. The 'Tree' tab is selected, displaying a hierarchical tree view of TMATS data. The tree is organized into columns: 'TMATS Code' and 'Value'. The tree structure is as follows:

- PCM Measurement Attributes (D)
  - (D-1\DLN) Data Link Name: PCMin1
  - (D-1\ML\N) Number of Measurement Lists: 1
    - (D-1\MLN-1) Measurement List Name: PCMin1
    - (D-1\MN\N-1) Number of Measurands: 30
      - (D-1\MN-1-1) Measurand Name: TP1 W0002 F0
        - (D-1\LT-1-1) Measurand Location Type: WDFR
        - (D-1\MML\N-1-1) Number of Measurand Locations: 1
        - Data Conversion Attributes (C)
          - (C-1\DCN) Data Conversion Name: TP1 W0002 F0
          - (C-1\BFM) Binary Format: UNS
          - (C-1\MOT3) High Alert Limit Value: 0.000000e+000
          - (C-1\MOT4) Low Alert Limit Value: 0.000000e+000
          - (C-1\MOT5) High Warning Limit Value: 0.000000e+000
          - (C-1\MOT6) Low Warning Limit Value: 0.000000e+000
          - (C-1\DCT) Conversion Type: NON
      - (D-1\MN-1-2) Measurand Name: TP1 W0003 F0
      - (D-1\MN-1-3) Measurand Name: TP1 W0004 F0
      - (D-1\MN-1-4) Measurand Name: TP1 W0005 F0
      - (D-1\MN-1-5) Measurand Name: TP1 W0006 F0
      - (D-1\MN-1-6) Measurand Name: TP1 W0007 F0
      - (D-1\MN-1-7) Measurand Name: TP1 W0008 F0
      - (D-1\MN-1-8) Measurand Name: TP1 W0009 F0

At the bottom of the window, there are two empty text input fields and an 'About' button with a logo.

# TMATS Structure - Example #3



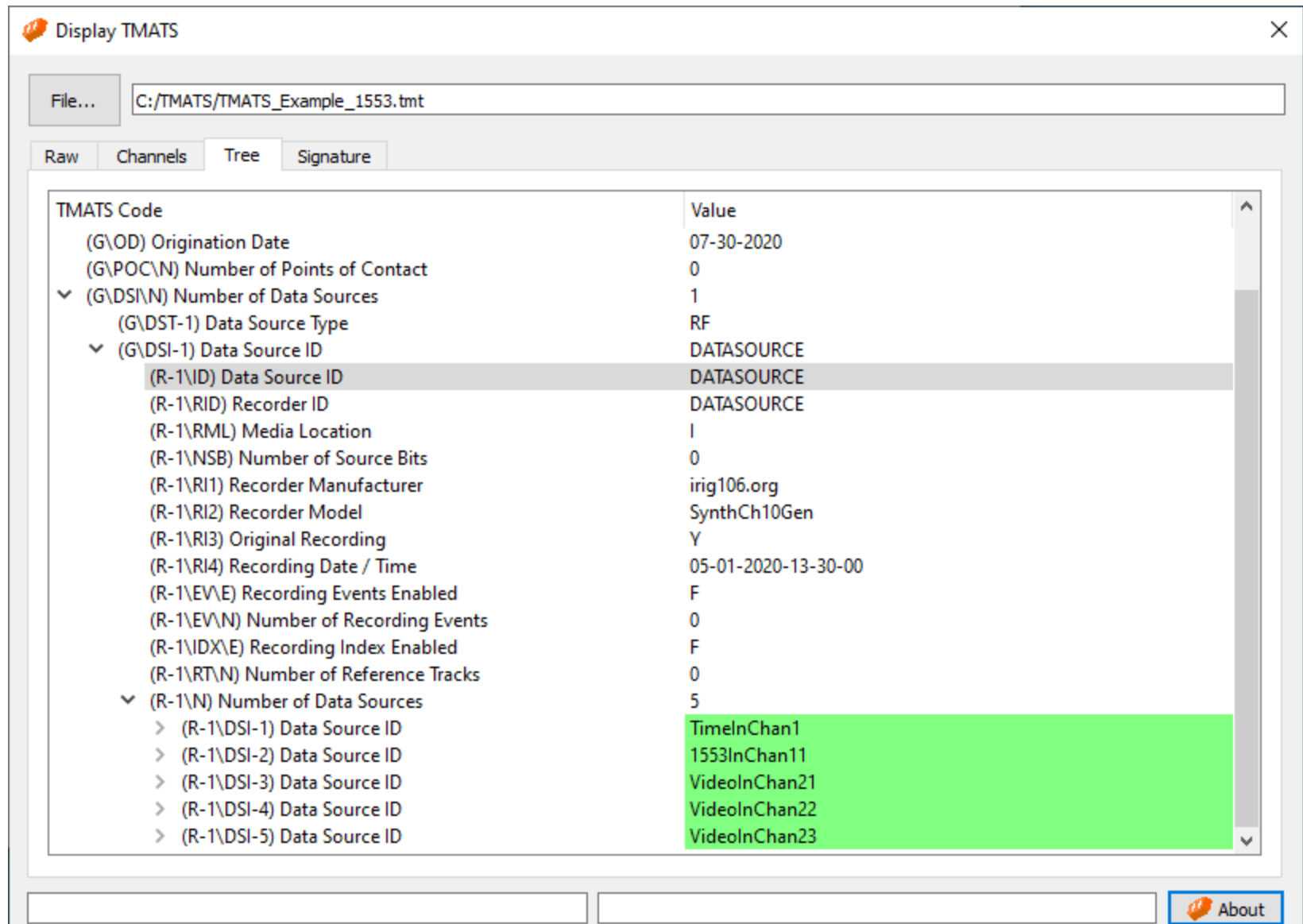
The screenshot shows a software window titled "Display TMATS" with a close button in the top right corner. Below the title bar is a "File..." button and a text field containing the path "C:/TMATS/TMATS\_Example\_1553.tmt". Below this is a tabbed interface with four tabs: "Raw", "Channels", "Tree", and "Signature". The "Tree" tab is currently selected. The main area of the window displays a tree view of TMATS data. The tree has a root node "TMATS Code" which is expanded, showing several sub-nodes. The sub-nodes are listed in a table-like structure with two columns: "TMATS Code" and "Value".

TMATS Code	Value
Recorder Ch 10 Version	Unknown
(G\106) TMATS Ch 9 Version	07
(G\PN) Program Name	A10 SIM
(G\OD) Origination Date	07-30-2020
(G\POC\N) Number of Points of Contact	0
▼ (G\DSI\N) Number of Data Sources	1
(G\DST-1) Data Source Type	RF
> (G\DSI-1) Data Source ID	DATASOURCE

At the bottom of the window, there are two empty text input fields and an "About" button with a small icon.



# TMATS Structure - Example #3



Display TMATS

File... C:/TMATS/TMATS\_Example\_1553.tmt

Raw Channels Tree Signature

TMATS Code	Value
(G\OD) Origination Date	07-30-2020
(G\POC\N) Number of Points of Contact	0
▼ (G\DSI\N) Number of Data Sources	1
(G\DST-1) Data Source Type	RF
▼ (G\DSI-1) Data Source ID	DATASOURCE
(R-1\ID) Data Source ID	DATASOURCE
(R-1\RID) Recorder ID	DATASOURCE
(R-1\RML) Media Location	I
(R-1\NSB) Number of Source Bits	0
(R-1\RI1) Recorder Manufacturer	irig106.org
(R-1\RI2) Recorder Model	SynthCh10Gen
(R-1\RI3) Original Recording	Y
(R-1\RI4) Recording Date / Time	05-01-2020-13-30-00
(R-1\EV\E) Recording Events Enabled	F
(R-1\EV\N) Number of Recording Events	0
(R-1\IDX\E) Recording Index Enabled	F
(R-1\RT\N) Number of Reference Tracks	0
▼ (R-1\N) Number of Data Sources	5
> (R-1\DSI-1) Data Source ID	TimeInChan1
> (R-1\DSI-2) Data Source ID	1553InChan11
> (R-1\DSI-3) Data Source ID	VideoInChan21
> (R-1\DSI-4) Data Source ID	VideoInChan22
> (R-1\DSI-5) Data Source ID	VideoInChan23

About

# TMATS Structure - Example #3

Display TMATS

File... C:/TMATS/TMATS\_Example\_1553.tmt

Raw Channels Tree Signature

TMATS Code	Value
(R-1\RI3) Original Recording	Y
(R-1\RI4) Recording Date / Time	05-01-2020-13-30-00
(R-1\EV\E) Recording Events Enabled	F
(R-1\EV\N) Number of Recording Events	0
(R-1\IDX\E) Recording Index Enabled	F
(R-1\RT\N) Number of Reference Tracks	0
▼ (R-1\N) Number of Data Sources	5
> (R-1\DSI-1) Data Source ID	TimelnChan1
> (R-1\DSI-2) Data Source ID	1553InChan11
▼ (R-1\DSI-3) Data Source ID	VideolnChan21
(R-1\TK1-3) Channel ID / Track Number	21
(R-1\TK4-3) Physical Channel Number	21
(R-1\CHE-3) Channel Enabled	T
(R-1\CDT-3) Channel Data Type	VIDIN
(R-1\CDLN-3) Channel Data Link Name	VideolnChan21
(R-1\VTF-3) Video Data Type Format	0 - FORMAT 0 (MPEG-2/H.264)
(R-1\VST-3) Video Signal Type	5 - RGB
(R-1\CBR-3) Video Constant Bit Rate	0
(R-1\VSF-3) Video Signal Format Type	0 - AUTO DETECT
(R-1\VBR-3) Video Variable Peak Bit Rate	0
(R-1\VED-3) Video Encoding Delay	1600
> (R-1\DSI-4) Data Source ID	VideolnChan22
> (R-1\DSI-5) Data Source ID	VideolnChan23

About

# TMATS Structure - Example #3

Display TMATS

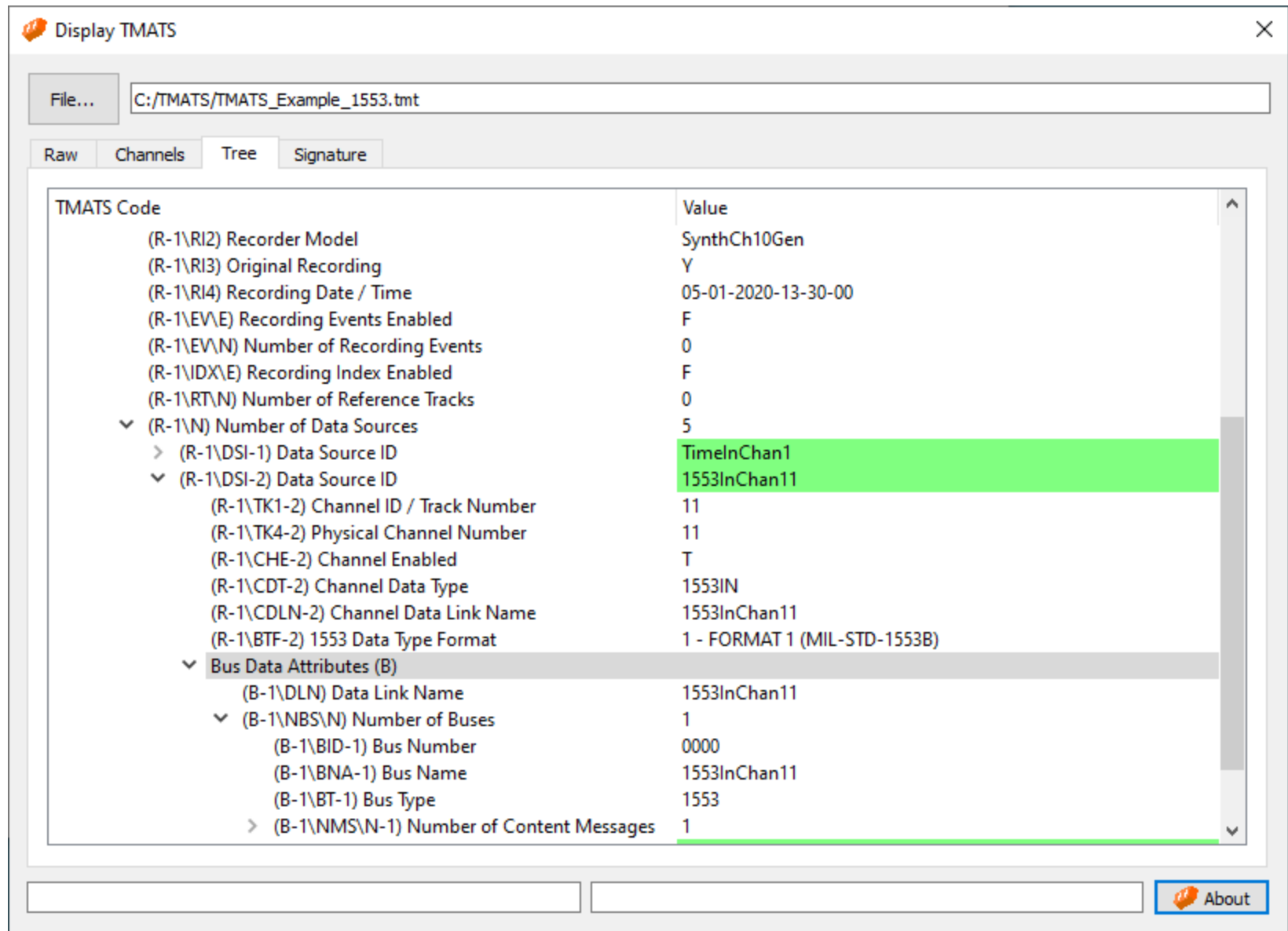
File... C:/TMATS/TMATS\_Example\_1553.tmt

Raw Channels Tree Signature

TMATS Code	Value
▼ (G\DSI-1) Data Source ID	DATASOURCE
(R-1\ID) Data Source ID	DATASOURCE
(R-1\RID) Recorder ID	DATASOURCE
(R-1\RML) Media Location	I
(R-1\NSB) Number of Source Bits	0
(R-1\RI1) Recorder Manufacturer	irig106.org
(R-1\RI2) Recorder Model	SynthCh10Gen
(R-1\RI3) Original Recording	Y
(R-1\RI4) Recording Date / Time	05-01-2020-13-30-00
(R-1\EV\E) Recording Events Enabled	F
(R-1\EV\N) Number of Recording Events	0
(R-1\IDX\E) Recording Index Enabled	F
(R-1\RT\N) Number of Reference Tracks	0
▼ (R-1\N) Number of Data Sources	5
> (R-1\DSI-1) Data Source ID	TimeInChan1
▼ (R-1\DSI-2) Data Source ID	1553InChan11
(R-1\TK1-2) Channel ID / Track Number	11
(R-1\TK4-2) Physical Channel Number	11
(R-1\CHE-2) Channel Enabled	T
(R-1\CDT-2) Channel Data Type	1553IN
(R-1\CDLN-2) Channel Data Link Name	1553InChan11
(R-1\BTF-2) 1553 Data Type Format	1 - FORMAT 1 (MIL-STD-1553B)
> Bus Data Attributes (B)	

About

# TMATS Structure - Example #3



Display TMATS

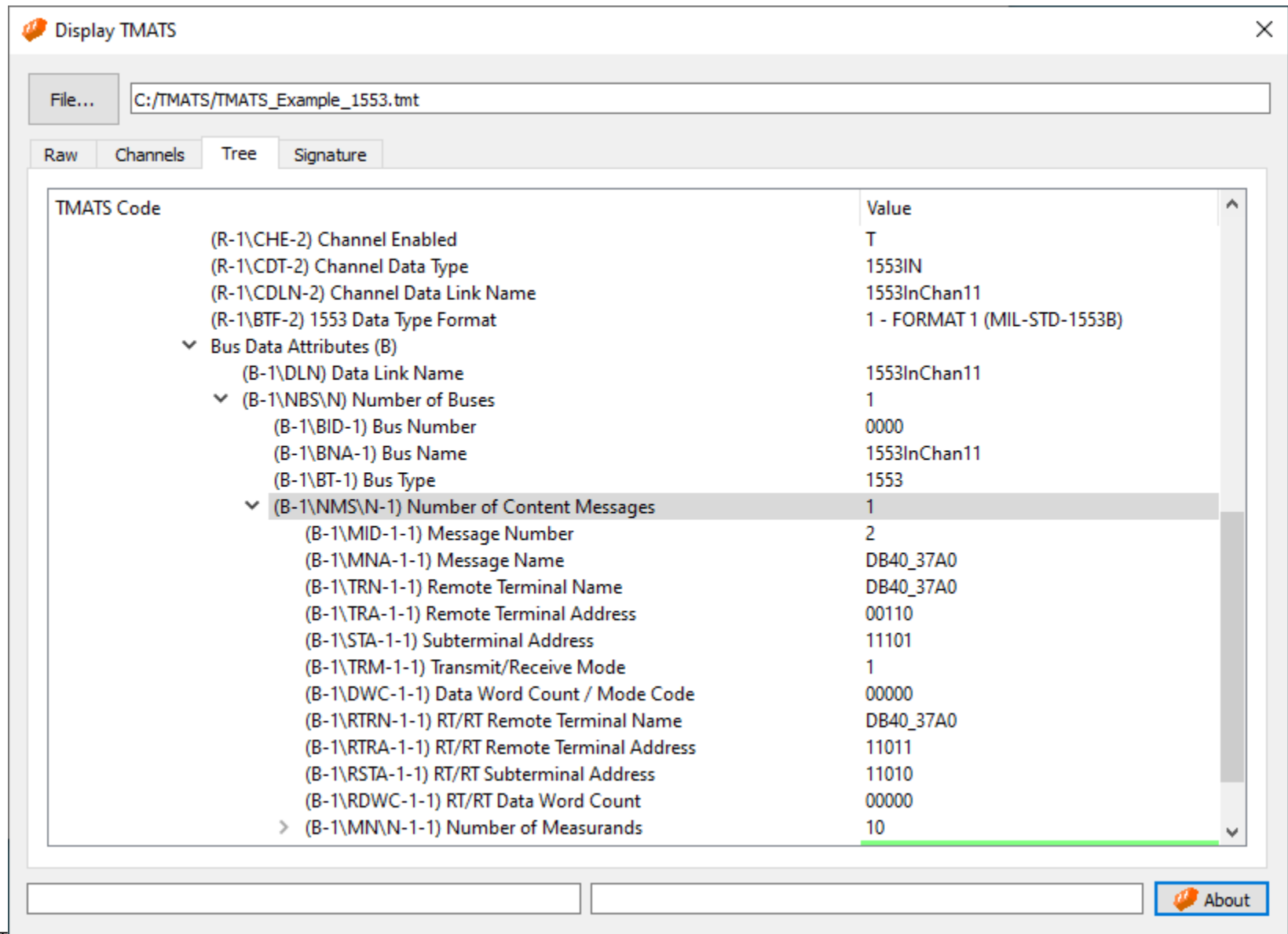
File... C:/TMATS/TMATS\_Example\_1553.tmt

Raw Channels Tree Signature

TMATS Code	Value
(R-1\RI2) Recorder Model	SynthCh10Gen
(R-1\RI3) Original Recording	Y
(R-1\RI4) Recording Date / Time	05-01-2020-13-30-00
(R-1\EV\E) Recording Events Enabled	F
(R-1\EV\N) Number of Recording Events	0
(R-1\IDX\E) Recording Index Enabled	F
(R-1\RT\N) Number of Reference Tracks	0
▼ (R-1\N) Number of Data Sources	5
> (R-1\DSI-1) Data Source ID	TimeInChan1
▼ (R-1\DSI-2) Data Source ID	1553InChan11
(R-1\TK1-2) Channel ID / Track Number	11
(R-1\TK4-2) Physical Channel Number	11
(R-1\CHE-2) Channel Enabled	T
(R-1\CDT-2) Channel Data Type	1553IN
(R-1\CDLN-2) Channel Data Link Name	1553InChan11
(R-1\BTF-2) 1553 Data Type Format	1 - FORMAT 1 (MIL-STD-1553B)
▼ Bus Data Attributes (B)	
(B-1\DLN) Data Link Name	1553InChan11
▼ (B-1\NBS\N) Number of Buses	1
(B-1\BID-1) Bus Number	0000
(B-1\BNA-1) Bus Name	1553InChan11
(B-1\BT-1) Bus Type	1553
> (B-1\NMS\N-1) Number of Content Messages	1

About

# TMATS Structure - Example #3

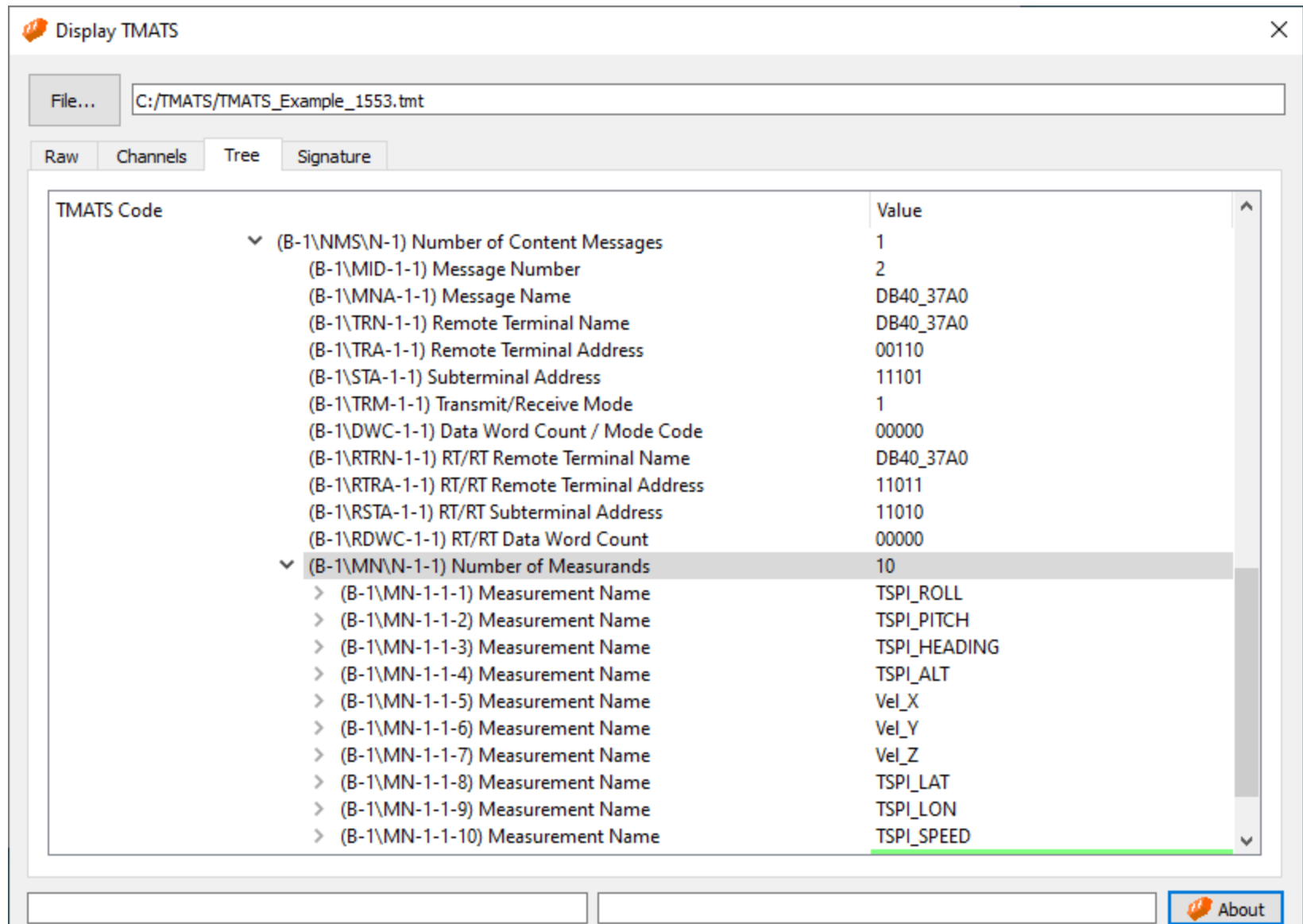


The screenshot shows the 'Display TMATS' application window. The file path is 'C:/TMATS/TMATS\_Example\_1553.tmt'. The 'Tree' tab is selected, displaying a hierarchical list of TMATS codes and their values. The code '(B-1\NMS\N-1) Number of Content Messages' is highlighted.

TMATS Code	Value
(R-1\CHE-2) Channel Enabled	T
(R-1\CDT-2) Channel Data Type	1553IN
(R-1\CDLN-2) Channel Data Link Name	1553InChan11
(R-1\BTF-2) 1553 Data Type Format	1 - FORMAT 1 (MIL-STD-1553B)
▼ Bus Data Attributes (B)	
(B-1\DLN) Data Link Name	1553InChan11
▼ (B-1\NBS\N) Number of Buses	1
(B-1\BID-1) Bus Number	0000
(B-1\BNA-1) Bus Name	1553InChan11
(B-1\BT-1) Bus Type	1553
▼ (B-1\NMS\N-1) Number of Content Messages	1
(B-1\MID-1-1) Message Number	2
(B-1\MNA-1-1) Message Name	DB40_37A0
(B-1\TRN-1-1) Remote Terminal Name	DB40_37A0
(B-1\TRA-1-1) Remote Terminal Address	00110
(B-1\STA-1-1) Subterminal Address	11101
(B-1\TRM-1-1) Transmit/Receive Mode	1
(B-1\DW-1-1) Data Word Count / Mode Code	00000
(B-1\RTRN-1-1) RT/RT Remote Terminal Name	DB40_37A0
(B-1\RTRA-1-1) RT/RT Remote Terminal Address	11011
(B-1\RSTA-1-1) RT/RT Subterminal Address	11010
(B-1\RDWC-1-1) RT/RT Data Word Count	00000
> (B-1\MN\N-1-1) Number of Measurands	10

At the bottom right, there is an 'About' button.

# TMATS Structure - Example #3



Display TMATS

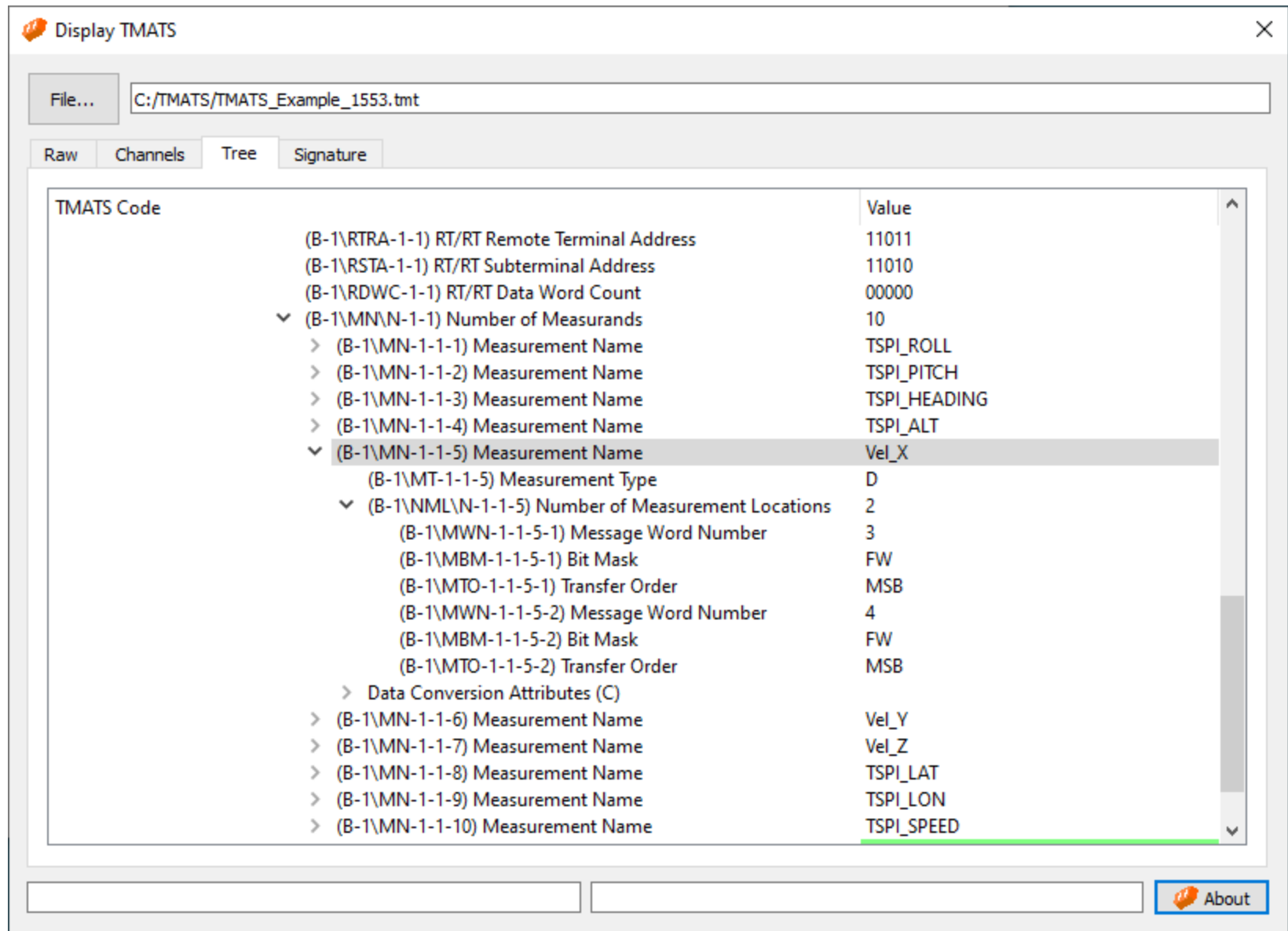
File... C:/TMATS/TMATS\_Example\_1553.tmt

Raw Channels Tree Signature

TMATS Code	Value
▼ (B-1\NMS\N-1) Number of Content Messages	1
(B-1\MID-1-1) Message Number	2
(B-1\MNA-1-1) Message Name	DB40_37A0
(B-1\TRN-1-1) Remote Terminal Name	DB40_37A0
(B-1\TRA-1-1) Remote Terminal Address	00110
(B-1\STA-1-1) Subterminal Address	11101
(B-1\TRM-1-1) Transmit/Receive Mode	1
(B-1\DW-1-1) Data Word Count / Mode Code	00000
(B-1\RTRN-1-1) RT/RT Remote Terminal Name	DB40_37A0
(B-1\RTRA-1-1) RT/RT Remote Terminal Address	11011
(B-1\RSTA-1-1) RT/RT Subterminal Address	11010
(B-1\RDWC-1-1) RT/RT Data Word Count	00000
▼ (B-1\MN\N-1-1) Number of Measurands	10
> (B-1\MN-1-1-1) Measurement Name	TSPI_ROLL
> (B-1\MN-1-1-2) Measurement Name	TSPI_PITCH
> (B-1\MN-1-1-3) Measurement Name	TSPI_HEADING
> (B-1\MN-1-1-4) Measurement Name	TSPI_ALT
> (B-1\MN-1-1-5) Measurement Name	Vel_X
> (B-1\MN-1-1-6) Measurement Name	Vel_Y
> (B-1\MN-1-1-7) Measurement Name	Vel_Z
> (B-1\MN-1-1-8) Measurement Name	TSPI_LAT
> (B-1\MN-1-1-9) Measurement Name	TSPI_LON
> (B-1\MN-1-1-10) Measurement Name	TSPI_SPEED

About

# TMATS Structure - Example #3

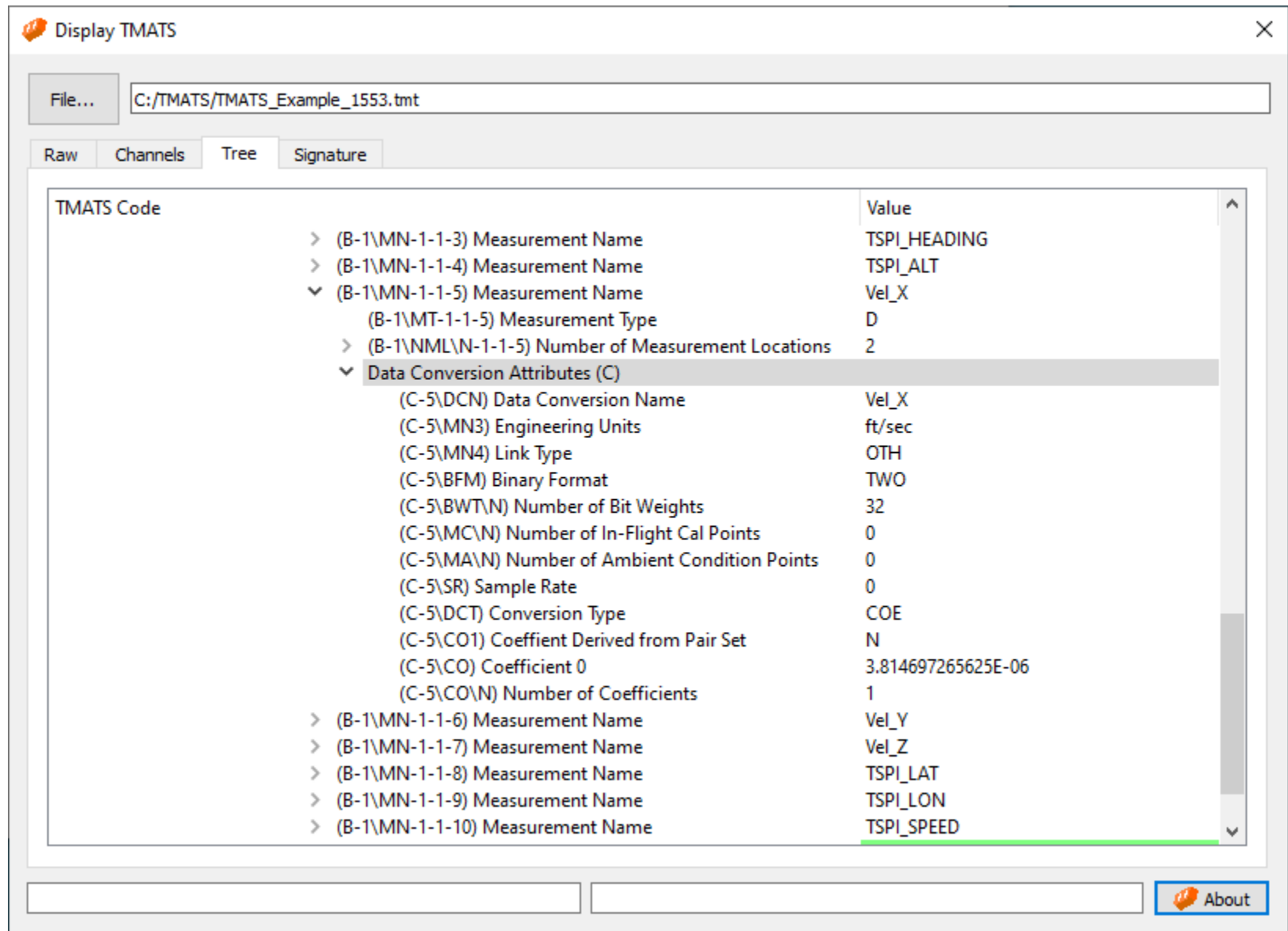


The screenshot shows a software window titled "Display TMATS" with a file path "C:/TMATS/TMATS\_Example\_1553.tmt". The window has tabs for "Raw", "Channels", "Tree", and "Signature". The "Tree" tab is active, displaying a hierarchical tree view of TMATS data. The tree is organized into a table with two columns: "TMATS Code" and "Value".

TMATS Code	Value
(B-1\RTRA-1-1) RT/RT Remote Terminal Address	11011
(B-1\RSTA-1-1) RT/RT Subterminal Address	11010
(B-1\RDWC-1-1) RT/RT Data Word Count	00000
▼ (B-1\MN\N-1-1) Number of Measurands	10
> (B-1\MN-1-1-1) Measurement Name	TSPI_ROLL
> (B-1\MN-1-1-2) Measurement Name	TSPI_PITCH
> (B-1\MN-1-1-3) Measurement Name	TSPI_HEADING
> (B-1\MN-1-1-4) Measurement Name	TSPI_ALT
▼ (B-1\MN-1-1-5) Measurement Name	Vel_X
(B-1\MT-1-1-5) Measurement Type	D
▼ (B-1\NML\N-1-1-5) Number of Measurement Locations	2
(B-1\MWN-1-1-5-1) Message Word Number	3
(B-1\MBM-1-1-5-1) Bit Mask	FW
(B-1\MT-1-1-5-1) Transfer Order	MSB
(B-1\MWN-1-1-5-2) Message Word Number	4
(B-1\MBM-1-1-5-2) Bit Mask	FW
(B-1\MT-1-1-5-2) Transfer Order	MSB
> Data Conversion Attributes (C)	
> (B-1\MN-1-1-6) Measurement Name	Vel_Y
> (B-1\MN-1-1-7) Measurement Name	Vel_Z
> (B-1\MN-1-1-8) Measurement Name	TSPI_LAT
> (B-1\MN-1-1-9) Measurement Name	TSPI_LON
> (B-1\MN-1-1-10) Measurement Name	TSPI_SPEED

At the bottom of the window, there are two empty input fields and an "About" button.

# TMATS Structure - Example #3



The screenshot shows the 'Display TMATS' application window. The title bar includes a logo and the text 'Display TMATS'. Below the title bar is a 'File...' button and a text field containing 'C:/TMATS/TMATS\_Example\_1553.tmt'. A tabbed interface at the top has four tabs: 'Raw', 'Channels', 'Tree', and 'Signature', with 'Tree' currently selected. The main area displays a tree view of the TMATS structure. The tree is organized into a table with two columns: 'TMATS Code' and 'Value'. The tree is expanded to show the 'Data Conversion Attributes (C)' section, which is highlighted. Below this section, several measurement names are listed, including 'Vel\_X', 'Vel\_Y', 'Vel\_Z', 'TSPI\_LAT', 'TSPI\_LON', and 'TSPI\_SPEED'. The 'TSPI\_SPEED' entry is highlighted with a green background. At the bottom of the window, there are two empty text input fields and an 'About' button with a logo.

TMATS Code	Value
> (B-1\MN-1-1-3) Measurement Name	TSPI_HEADING
> (B-1\MN-1-1-4) Measurement Name	TSPI_ALT
▼ (B-1\MN-1-1-5) Measurement Name	Vel_X
(B-1\MT-1-1-5) Measurement Type	D
> (B-1\NML\N-1-1-5) Number of Measurement Locations	2
▼ Data Conversion Attributes (C)	
(C-5\DCN) Data Conversion Name	Vel_X
(C-5\MN3) Engineering Units	ft/sec
(C-5\MN4) Link Type	OTH
(C-5\BFM) Binary Format	TWO
(C-5\BWT\N) Number of Bit Weights	32
(C-5\MC\N) Number of In-Flight Cal Points	0
(C-5\MA\N) Number of Ambient Condition Points	0
(C-5\SR) Sample Rate	0
(C-5\DCT) Conversion Type	COE
(C-5\CO1) Coefficient Derived from Pair Set	N
(C-5\CO) Coefficient 0	3.814697265625E-06
(C-5\CO\N) Number of Coefficients	1
> (B-1\MN-1-1-6) Measurement Name	Vel_Y
> (B-1\MN-1-1-7) Measurement Name	Vel_Z
> (B-1\MN-1-1-8) Measurement Name	TSPI_LAT
> (B-1\MN-1-1-9) Measurement Name	TSPI_LON
> (B-1\MN-1-1-10) Measurement Name	TSPI_SPEED



# TMATS Structure - Example #3

Display TMATS

File... C:/TMATS/TMATS\_Example\_1553.tmt

Raw Channels Tree Signature

TMATS Code	Value
> (B-1\MN-1-1-5) Measurement Name	Vel_X
> (B-1\MN-1-1-6) Measurement Name	Vel_Y
> (B-1\MN-1-1-7) Measurement Name	Vel_Z
> (B-1\MN-1-1-8) Measurement Name	TSPI_LAT
> (B-1\MN-1-1-9) Measurement Name	TSPI_LON
▼ (B-1\MN-1-1-10) Measurement Name	TSPI_SPEED
(B-1\NML\N-1-1-10) Number of Measurement Locations	1
▼ Data Conversion Attributes (C)	
(C-10\DCN) Data Conversion Name	TSPI_SPEED
(C-10\MN3) Engineering Units	m/sec
(C-10\MN4) Link Type	OTH
(C-10\BFM) Binary Format	INT
(C-10\MC\N) Number of In-Flight Cal Points	0
(C-10\MA\N) Number of Ambient Condition Points	0
(C-10\SR) Sample Rate	0
(C-10\DCT) Conversion Type	DER
(C-10\DPA) Derived Algorithm	$\text{Sqrt}(a*a+b*b+c*c)*0.3048$
(C-10\DPNO) Derived Num of Occurrences	1
▼ (C-10\DP\N) Number of Derived Input Measurands	3
(C-10\DP-1) N-th Measurand	Vel_X
(C-10\DP-2) N-th Measurand	Vel_Y
(C-10\DP-3) N-th Measurand	Vel_Z
(C-10\DPC\N) Number of Derived Input Constants	0

About

# Creating TMATS

- All IRIG 106 instrumentation is *required* to accept TMATS for configuration
- Vendor generally provides configuration software
- TMATS can be created by hand in any text editor
  - There are no comprehensive TMATS editors
    - Most or all recorders require Vendor (V) attributes
- Sometimes software generated TMATS can be easily hand edited to add additional fields.
  - Add B, D, S, and C records to Heim MDR

# Required TMATS Attributes

PROGRAM NAME	GPN	Allowed when: Always	Name of program.
		Range: 16 characters	
TEST ITEM	GTA	Allowed when: Always	Test item description in terms of name, model, platform, or identification code, as appropriate.
		Range: 64 characters	
Information			
TMATS FILE NAME	GVN	Allowed when: Always	Name of this TMATS file.
		Range: 256 characters	
RCC IRIG 106 REVISION LEVEL	G106	R/R Ch 10 Status: R	Version of RCC IRIG 106 standard used to generate this TMATS file. The last 2 digits of the year should be used. Use a leading 0 if necessary.
		Allowed when: Always	
		Required when: Always	
		Range: 0 to 99	

Always Optional

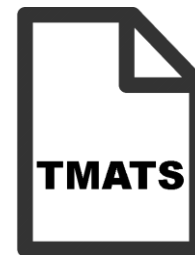
Always Required

If Allowed Then Always Required

RECORDER-REPRODUCER MEDIA LOCATION	R-x\RML	R/R Ch 10 Status: R	Indicate the location of the recorder-reproducer media.
		Allowed when: R\TC1 is not "N"	
		Required when: Allowed	
		Range: Enumeration	
		Enumeration	Description
		I	Internal
		E	External
		B	Both internal and external

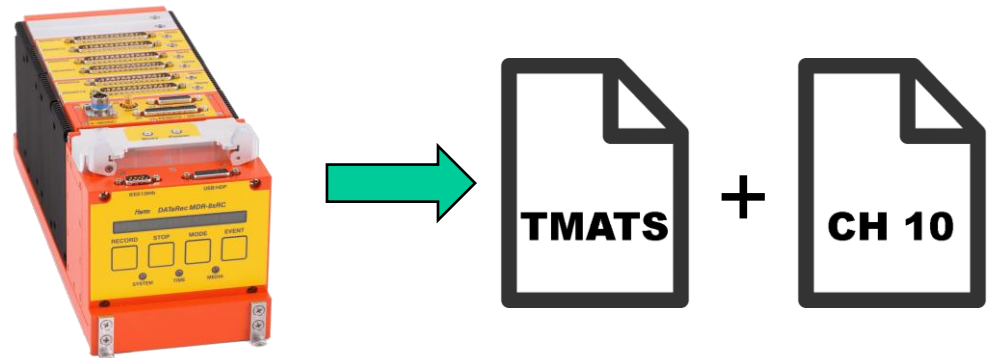
# TMATS For Recorder Configuration

- **Control Port is required by Ch 10**
  - Serial
  - Telnet
- **Chapter 6 command syntax**
- **.TMATS command to read and write TMATS**
  - .TMATS READ**
  - .TMATS WRITE**
  - .TMATS SAVE**
  - .TMATS GET**
  - .TMATS DELETE**
  - .TMATS VERSION**
  - .TMATS CHECKSUM**



# TMATS For Data Description

- **TMATS is the first Ch 10 packet**
- **Data description records (D, B, S, C) are not required but can be very helpful**
- **Software used to define data description records**
  - Illiad
  - TTCware
  - Telspan NetView
- **Analysis software**
  - Illiad
  - Telspan NetView
  - IADS



# TMATS Signature



- **Chapter 9 defines a standard signature**
  - Protection against changes
  - Checksum of all fields except “G\SHA”
  - G\SHA contains the calculated checksum
  - Checksum based on SHA2-256 secure hash function
  - ALL characters (whitespace, case, etc.) are significant
- **Some recorders will display TMATS signature**

# References

- **IRIG 106-19 Chapter 9**
- **IRIG 106-19 Chapter 6**
- **IRIG 124-19 TMATS handbook**
- **<https://www.irig106.org/wiki/>**
- **[https://www.irig106.org/wiki/tmats\\_attributes](https://www.irig106.org/wiki/tmats_attributes)**