Telemetry Attribute Transfer Standard (TMATS)

Purpose of TMATS

The Original Problem

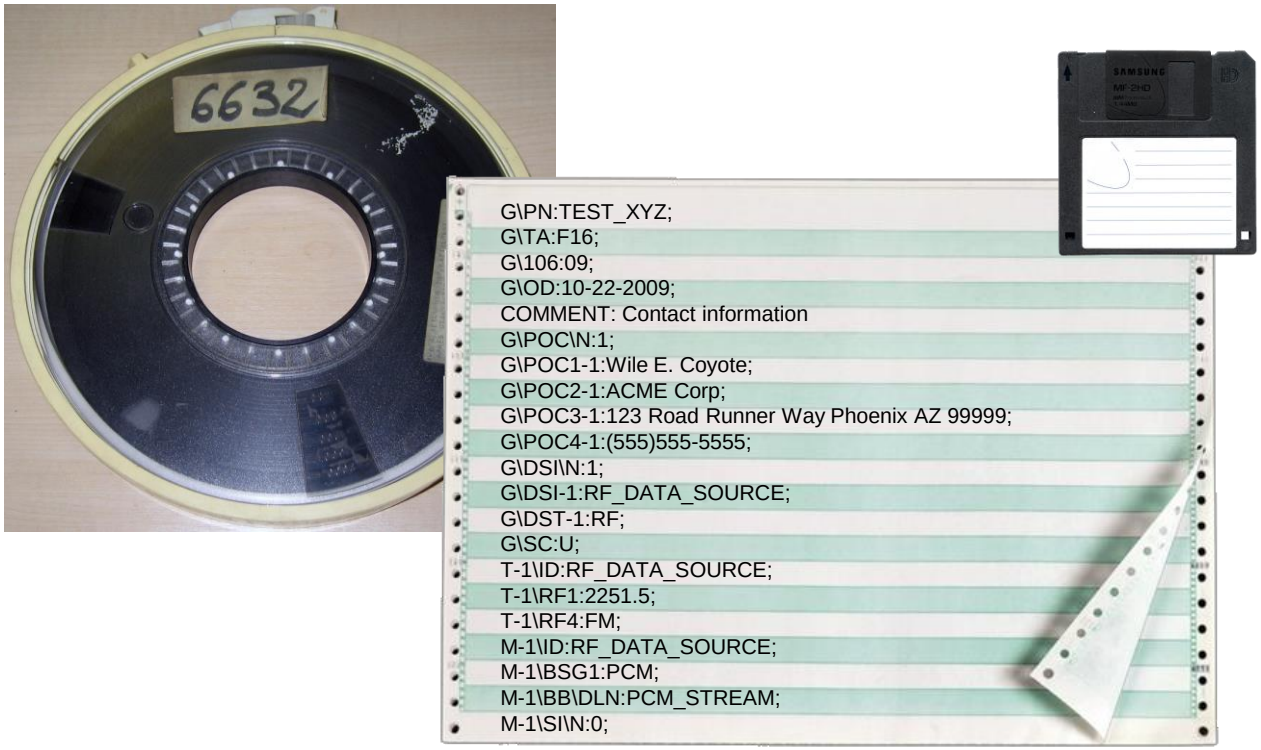
Tape libraries full of data but no information about how to decode and interpret it

Purpose of TMATS

The problem isn't getting any better

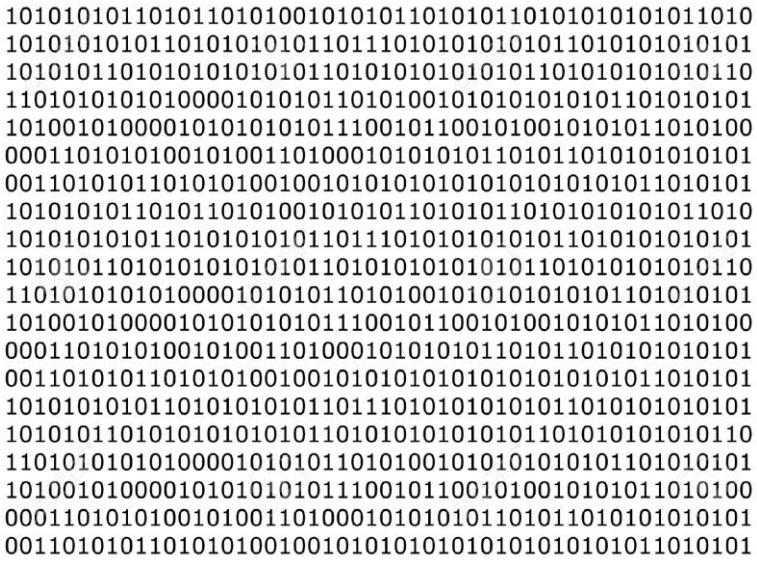
Purpose of TMATS

The Solution

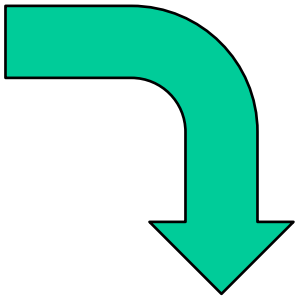


Describe the test configuration and data layout in a <u>Succinct</u> and <u>Standard</u> way

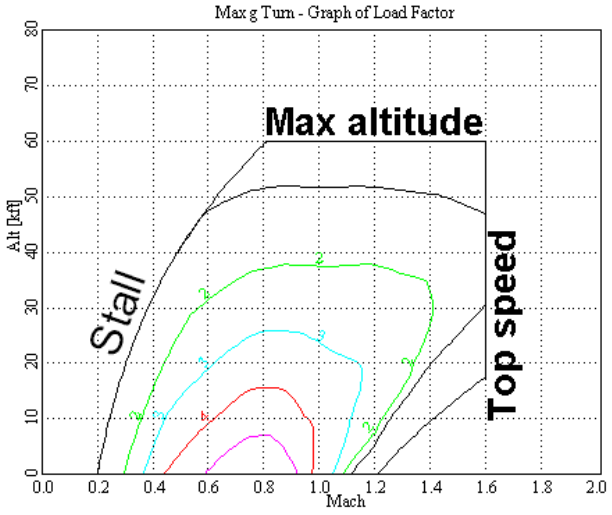
Purpose of TMATS



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

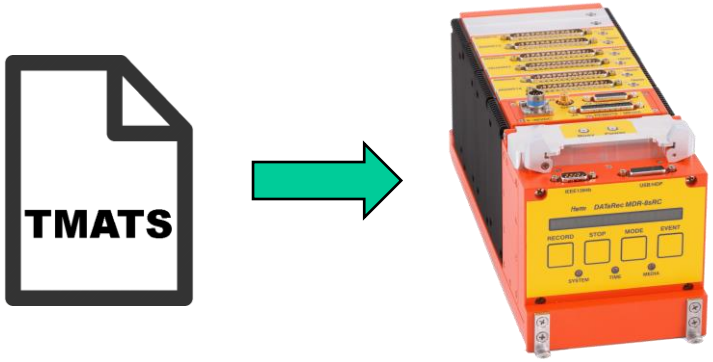
How TMATS Is Used

- **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

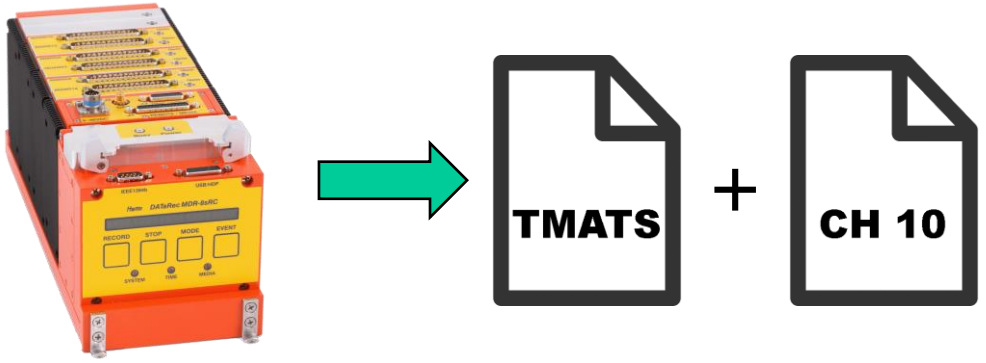
How TMATS Is Used

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
DATA LINK NAME - 9-93		(P-d\DLN)
9-93	***Input Data**	
	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: NRZ-L — Non-return-to-zero-level	
		NRZ-M — Non-return-to-zero-mark	
		NRZ-S — Non-return-to-zero-space	
		RNRZ-L — Randomized, non-return-to-zero-level	
		BIO-M — Bi-phase-mark	
		BIO-L — Bi-phase-level	
		BIO-S — Bi-phase-space	
		OTHER — Other encoding, define in comments	
		Default: NRZ-L	
BIT RATE	P-d\D2	R/R Ch 10 Status: RO	Data rate in bits per second.
		Allowed when: P-d\DLN is specified	
		Required when: Allowed	
		Range: positive floating point	
ENCRYPTED	P-d\D3	Allowed when: P-d\DLN is specified	If the data is encrypted, provide details in comments.

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

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

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

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

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

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

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		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

A Group deleted in 106-13

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

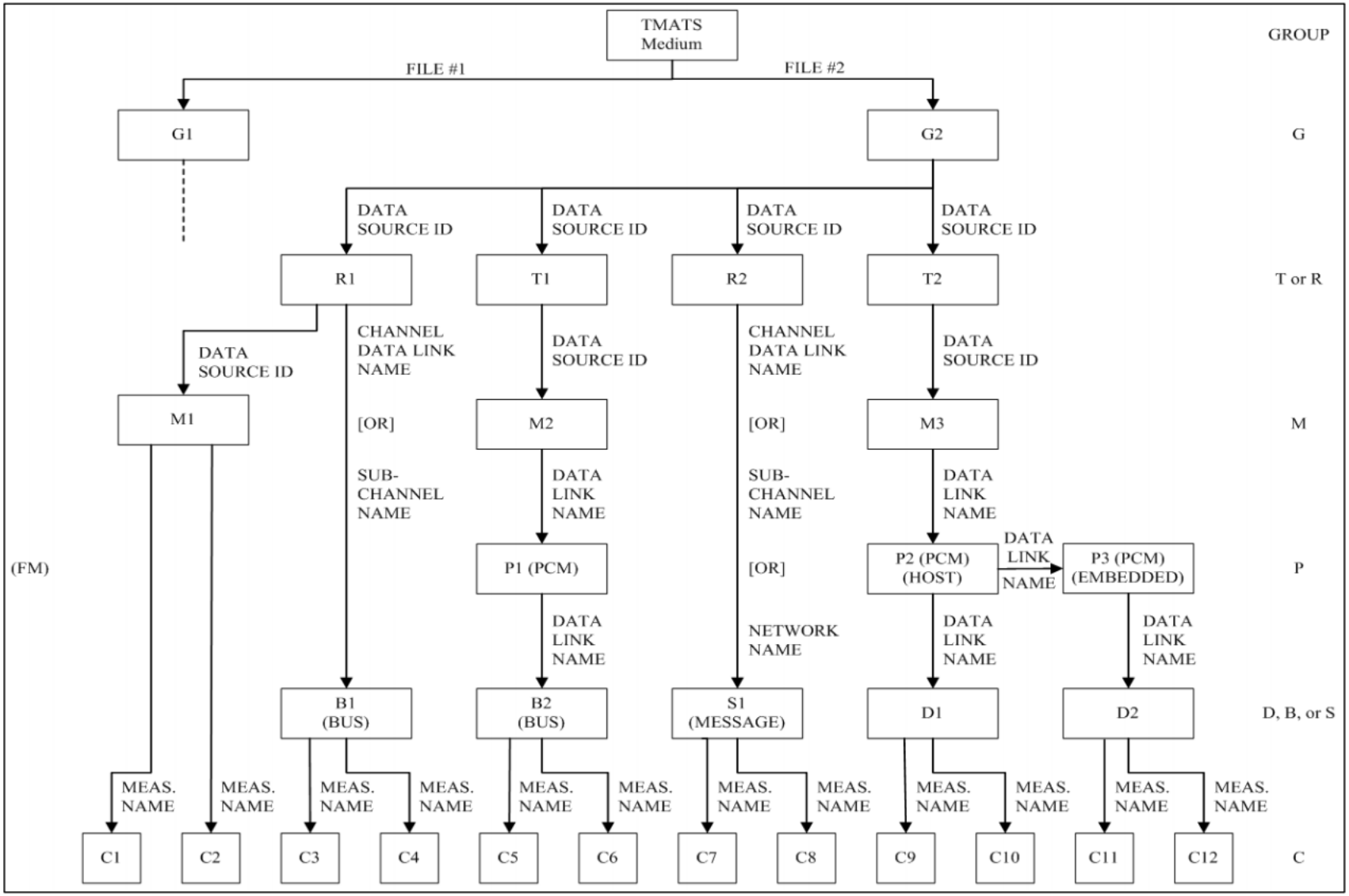


Figure 9-1. Group Relationships

TMATS Structure

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

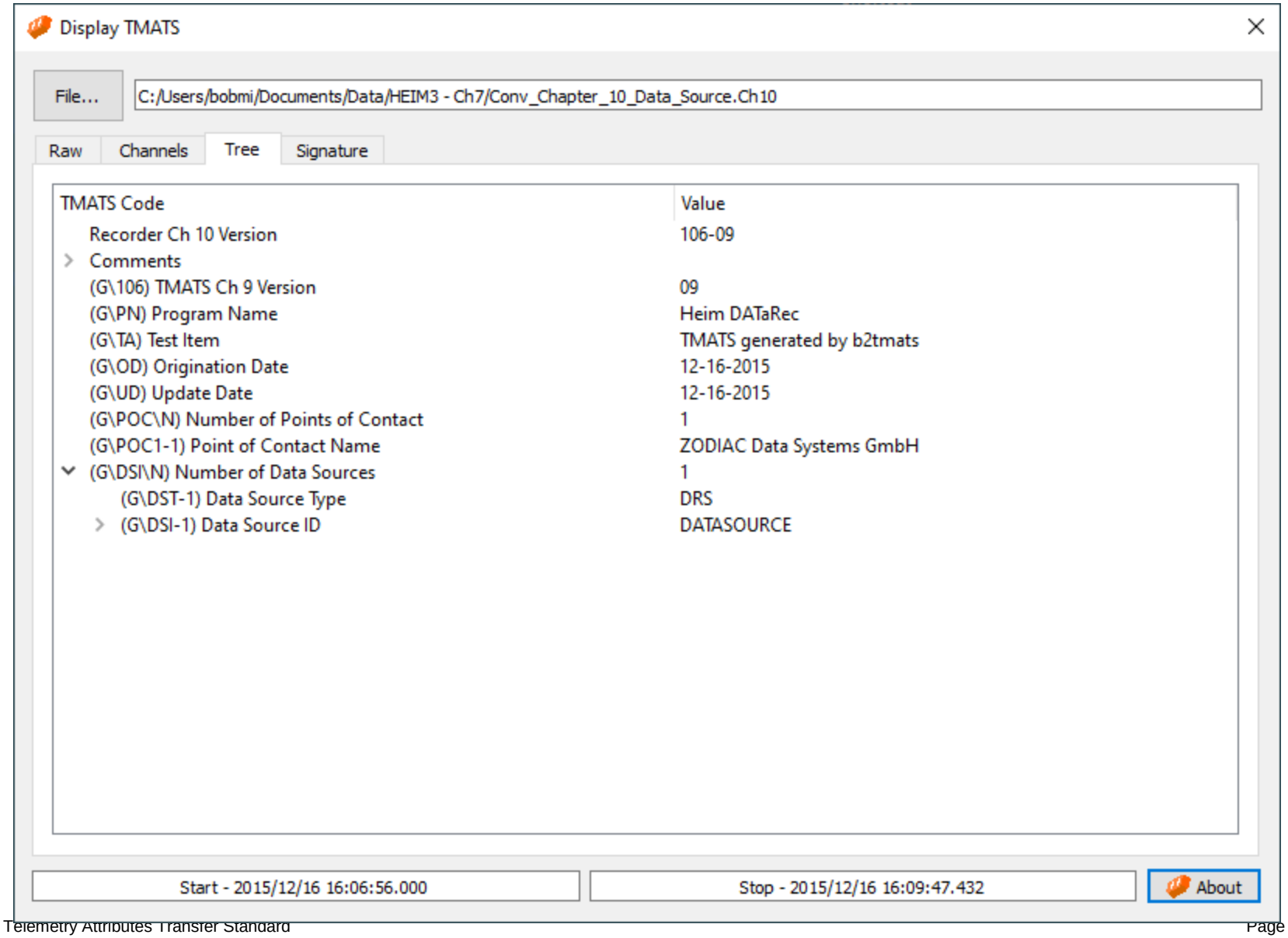
```
G\DSI-n             -> R-x\ID, T-x\ID, M-x\ID, V-x\ID
T-x\ID              -> M-x\ID
R-x\EPL\LSNM-n      -> R-x\CGNM-n
R-x\EPL\LSSN-n      -> R-x\CGSN-n
R-x\EPL\LDEIP-n     -> R-x\EIIP-n
R-x\EPL\LDEPA-n     -> R-x\EI\PA
R-x\EV\DLN-n        -> P-d\DLN, B-x\DLN, S-d\DLN
R-x\EV\PM\MN-n-m    -> B-x\MN-i-n-p, 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\DPTM            -> C-d\DCN
C-d\DP-n            -> C-d\DCN
```

TMATS Structure

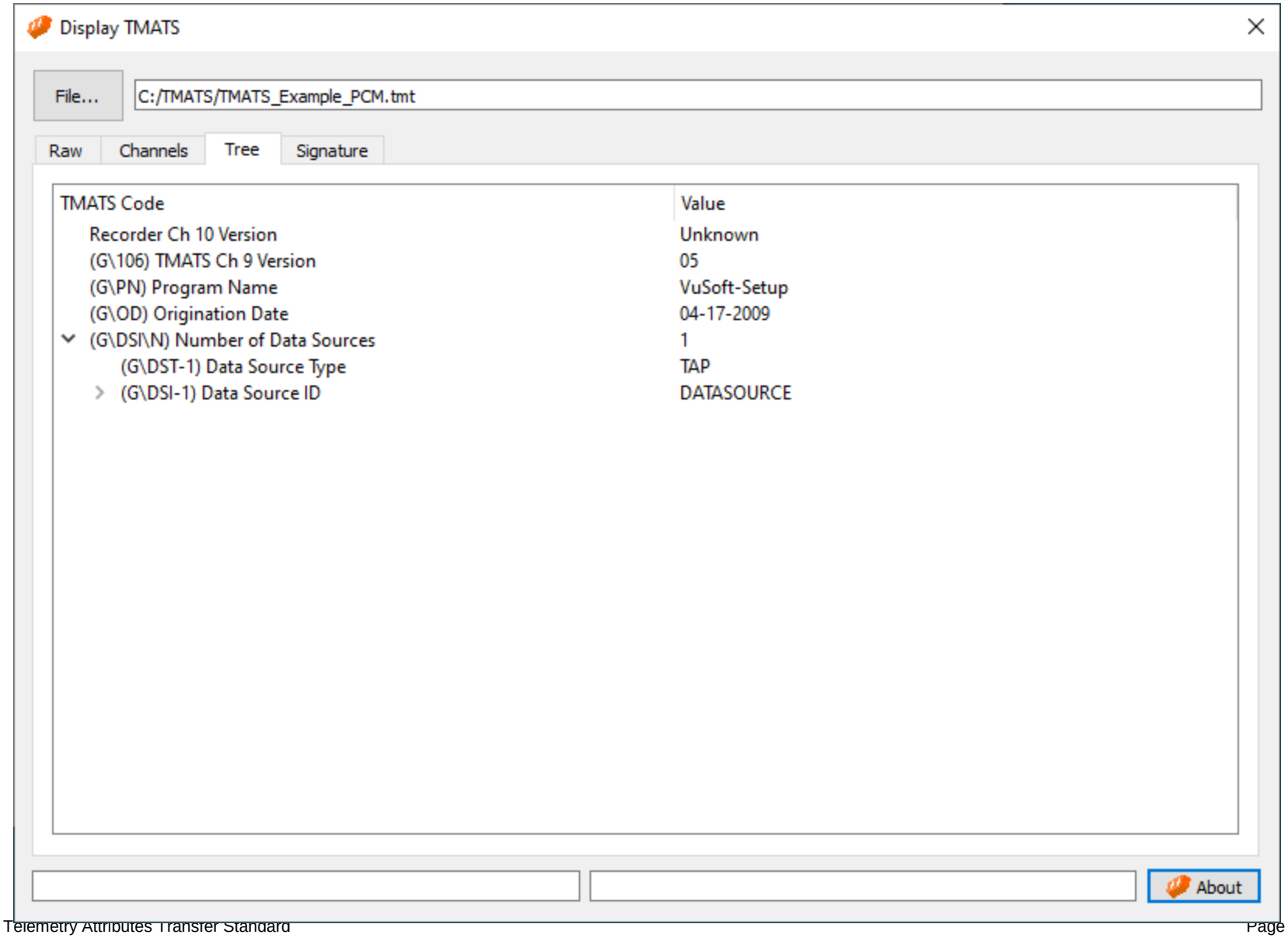
Some Other TMATS Field Connections

```
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  /
```

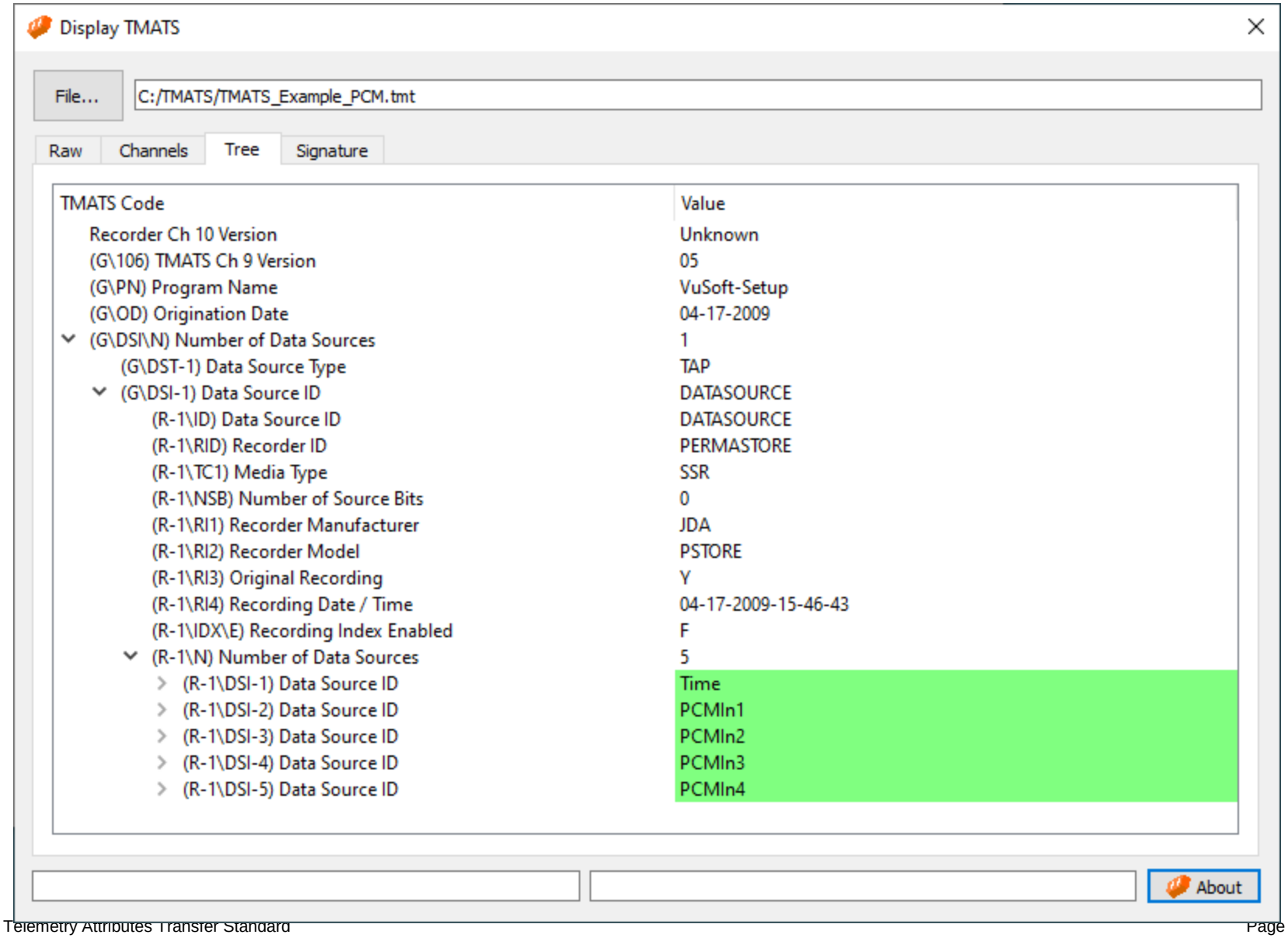
TMATS Structure - Example #1



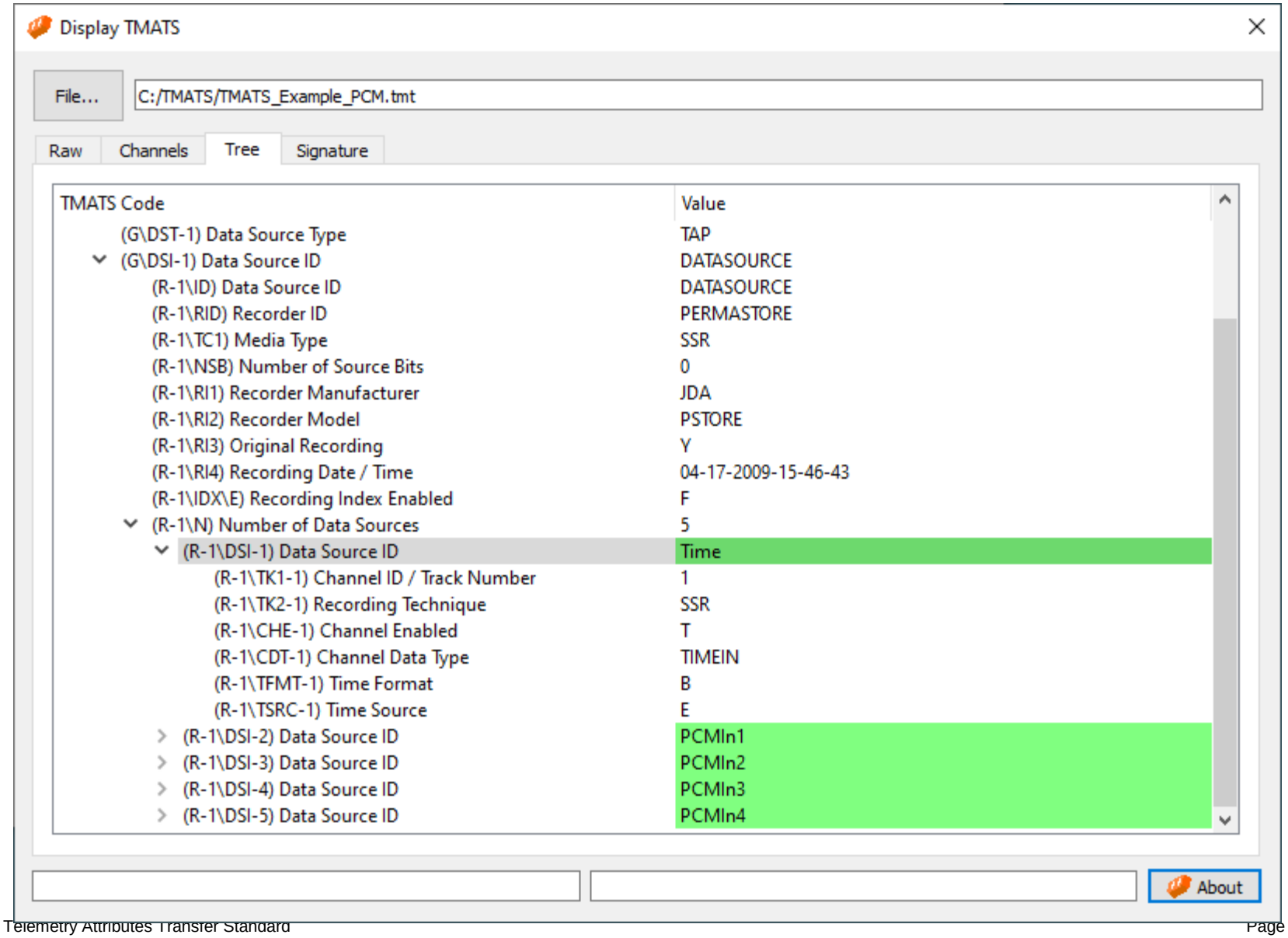
TMATS Structure - Example #2



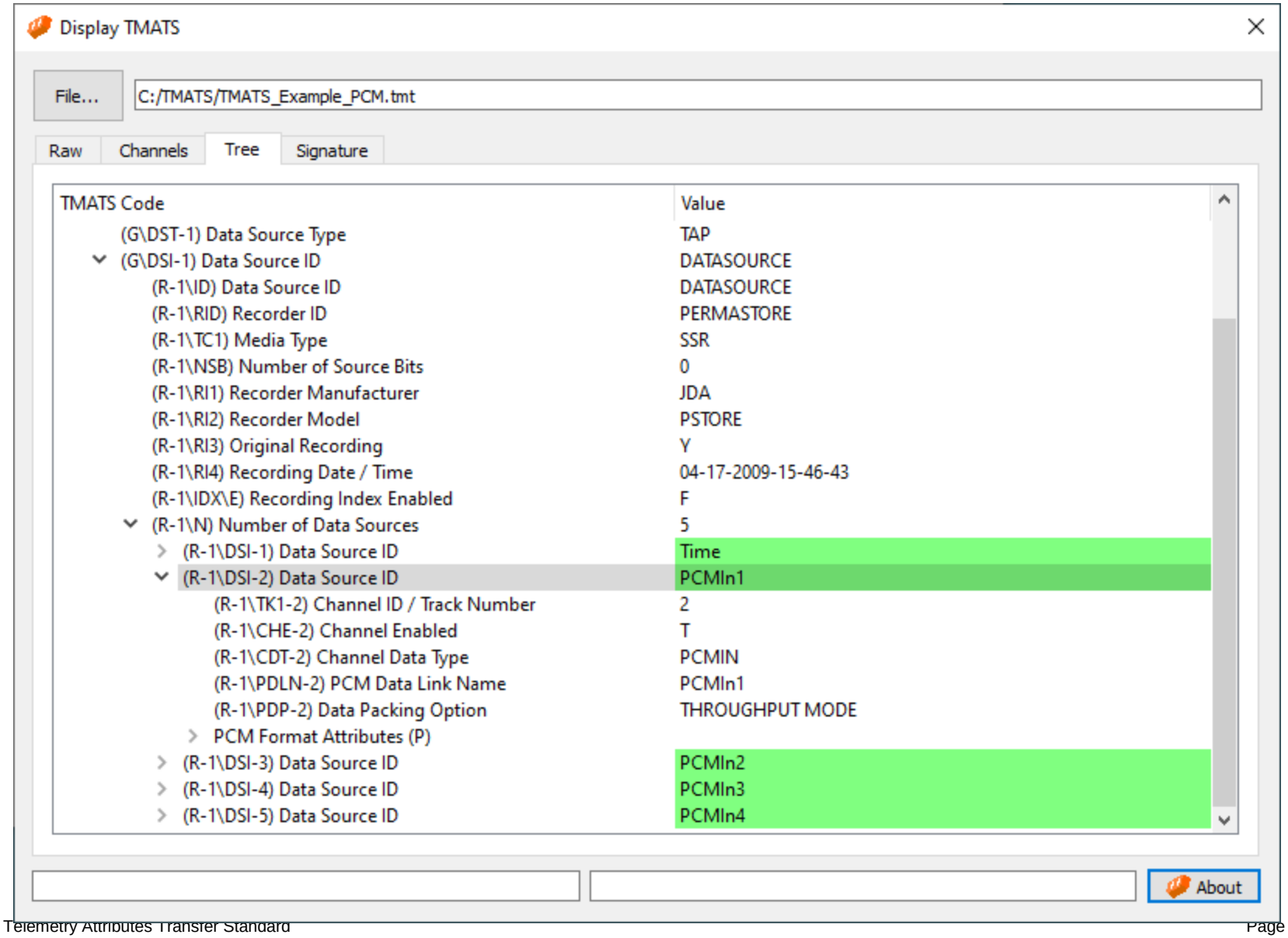
TMATS Structure - Example #2



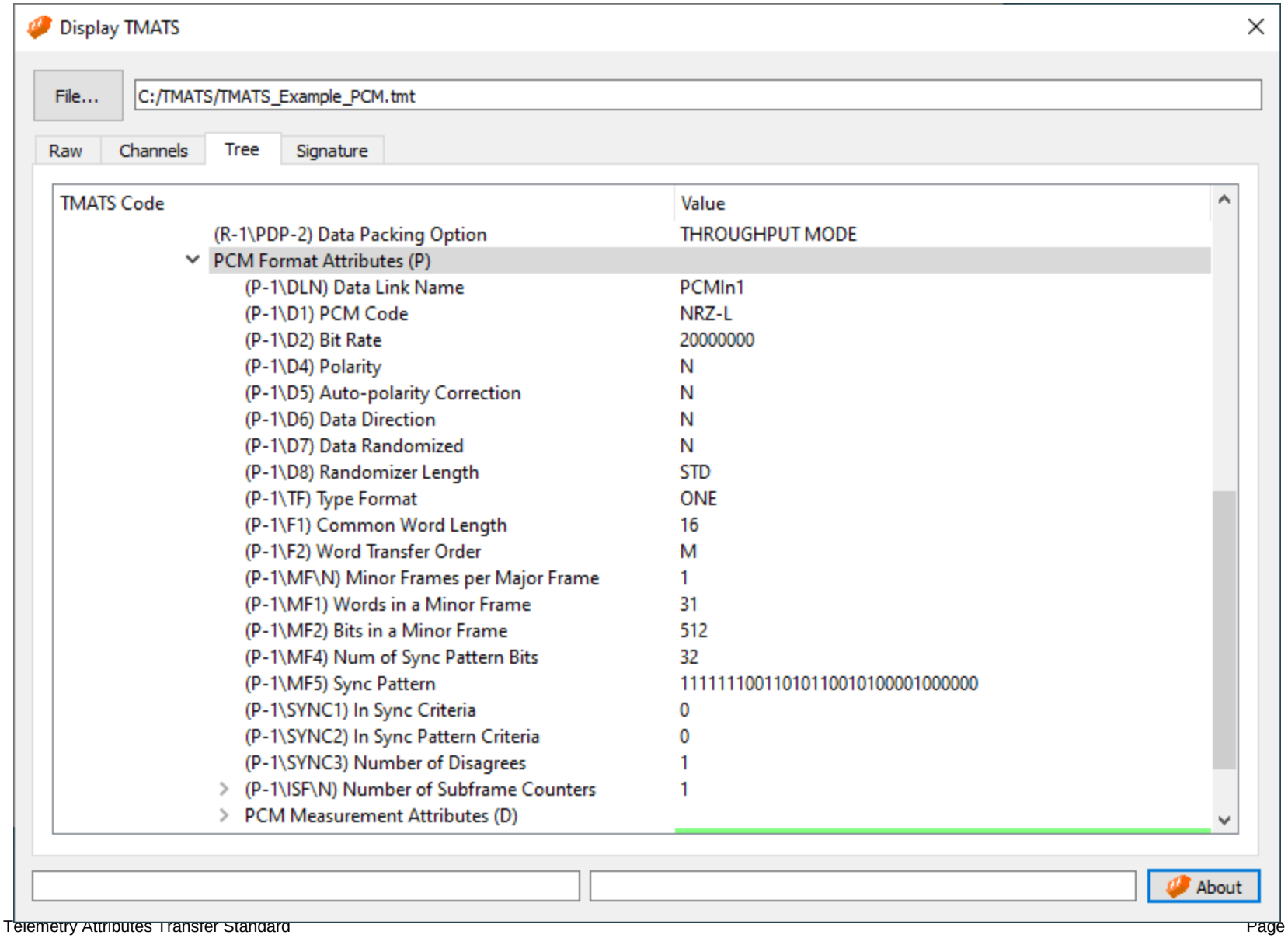
TMATS Structure - Example #2



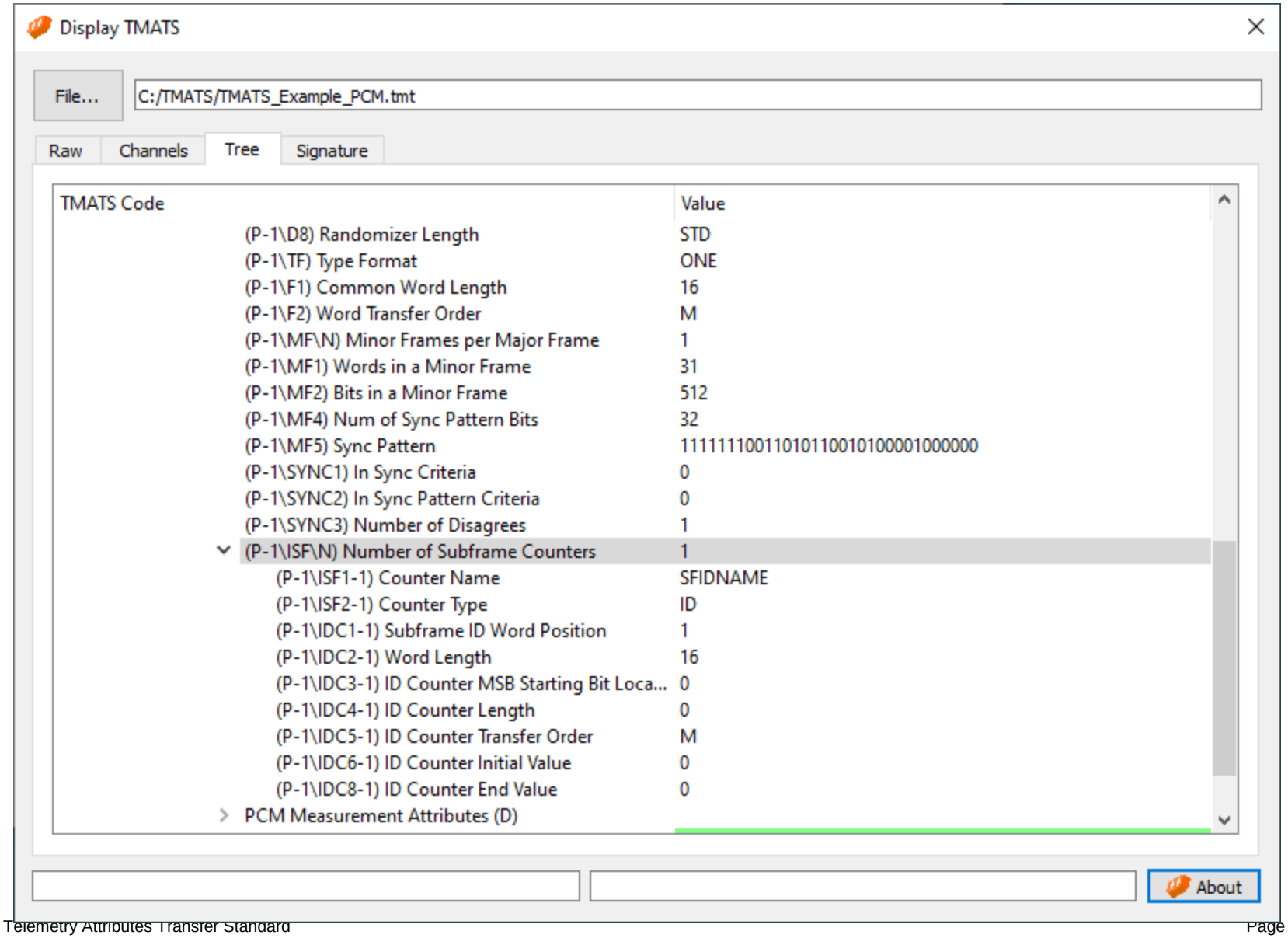
TMATS Structure - Example #2



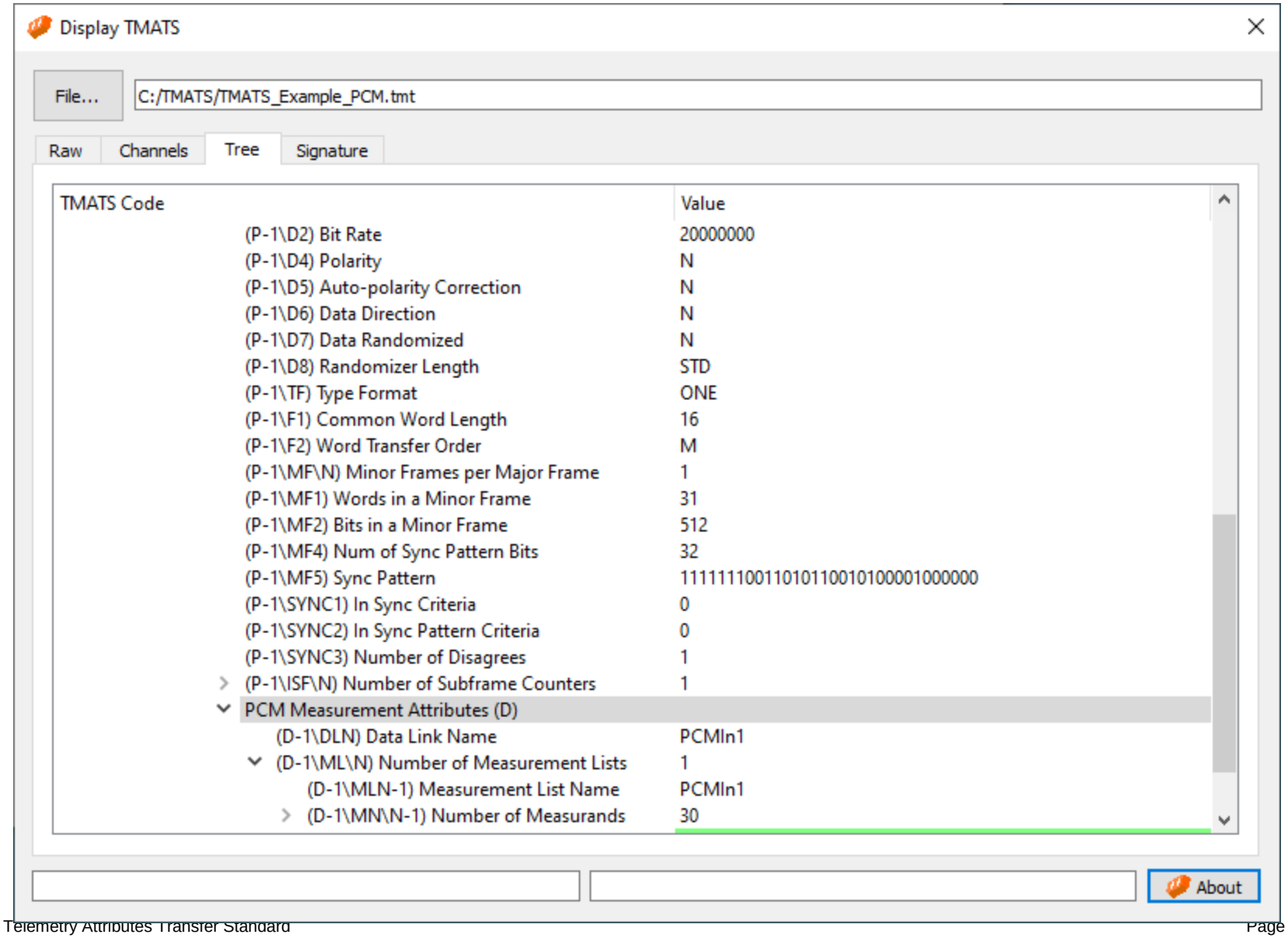
TMATS Structure - Example #2



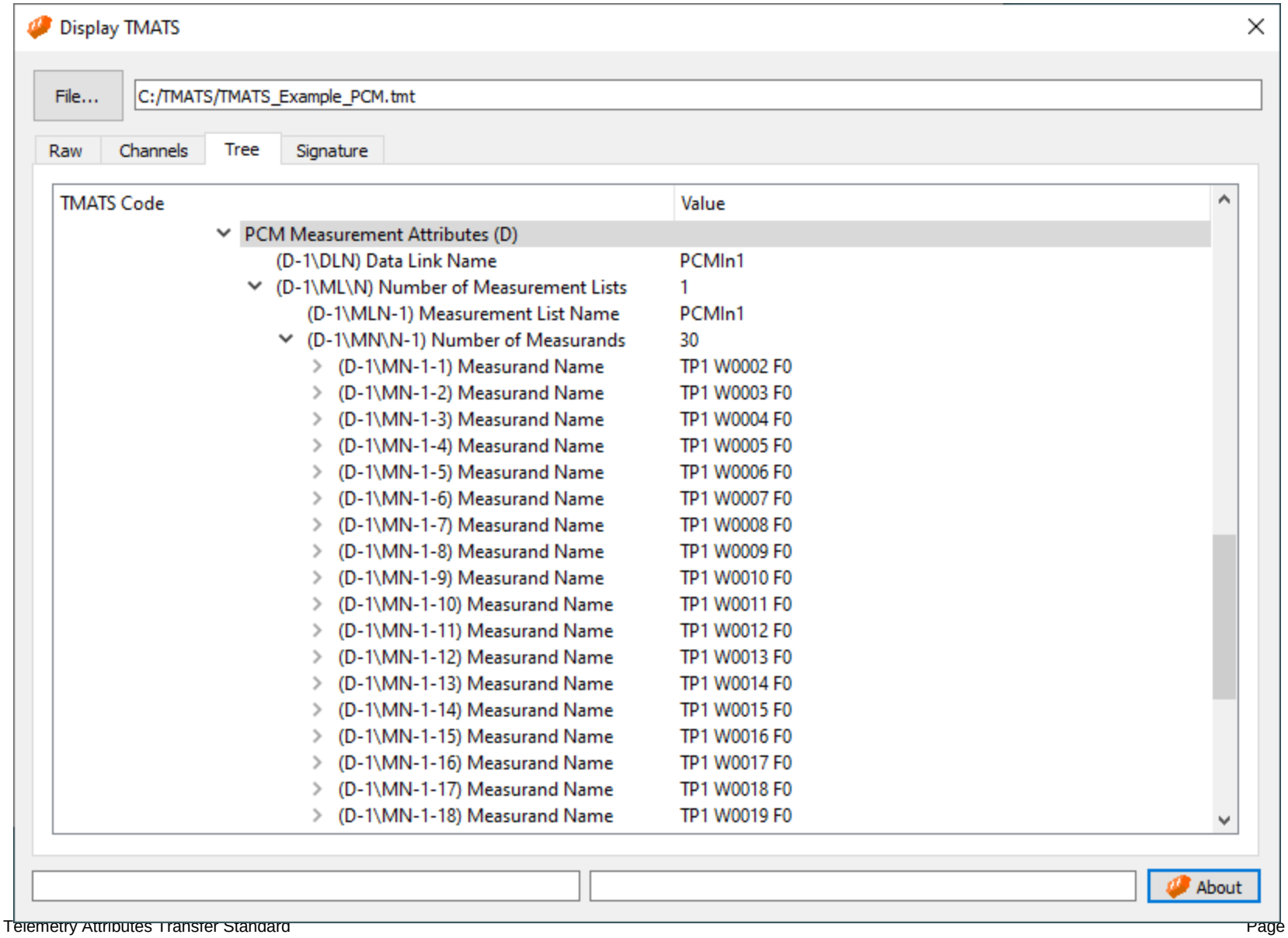
TMATS Structure - Example #2



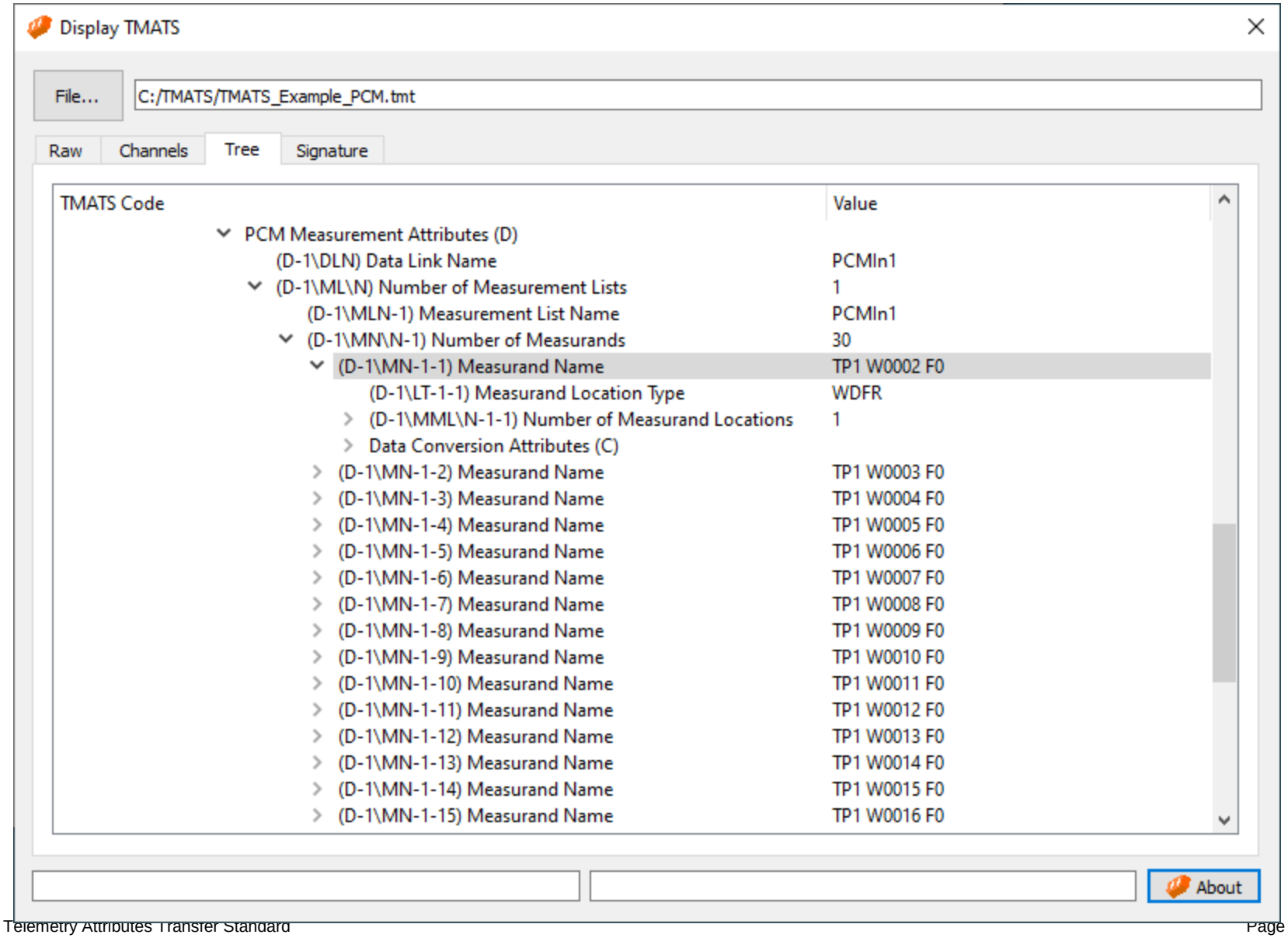
TMATS Structure - Example #2



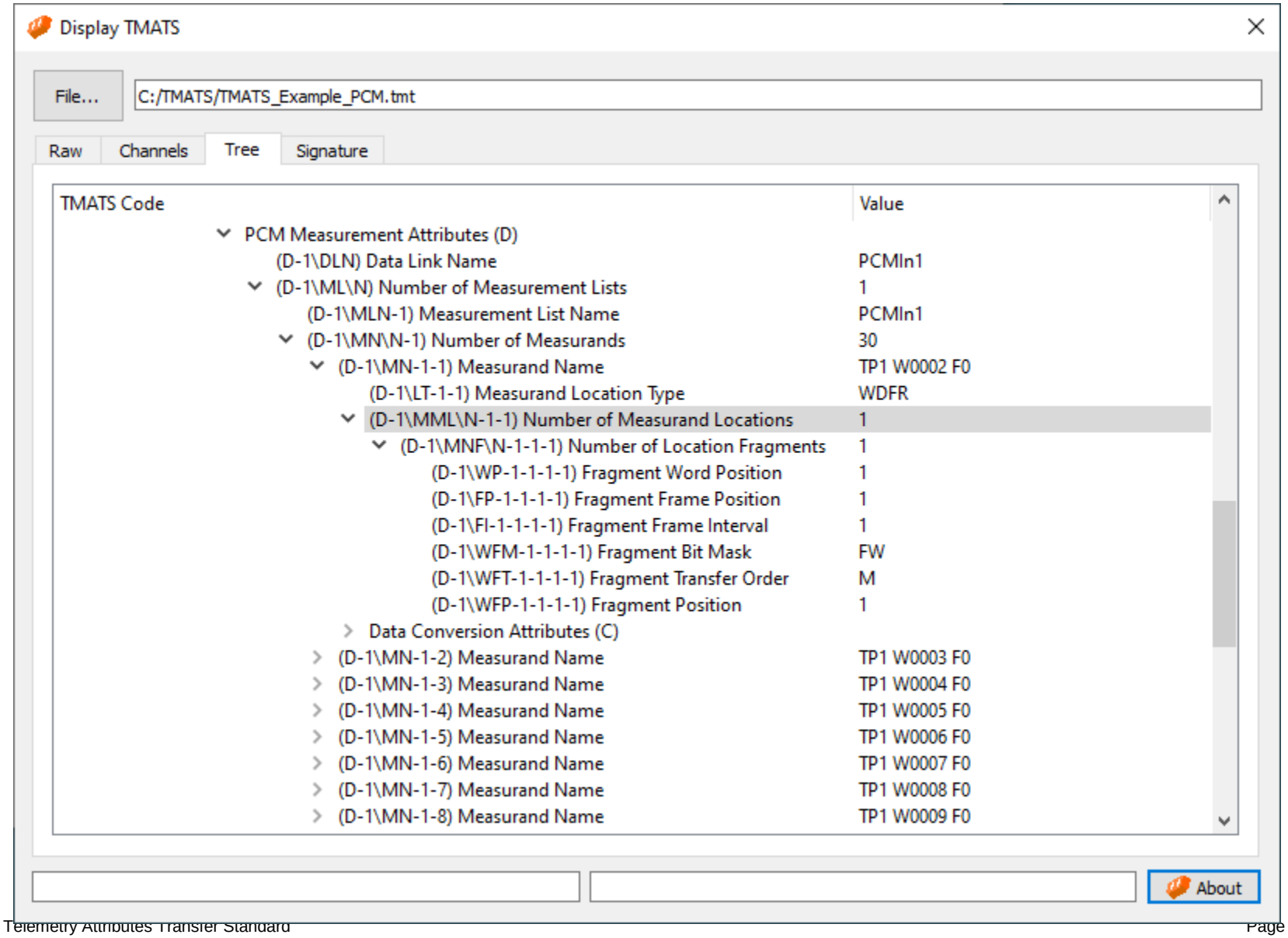
TMATS Structure - Example #2



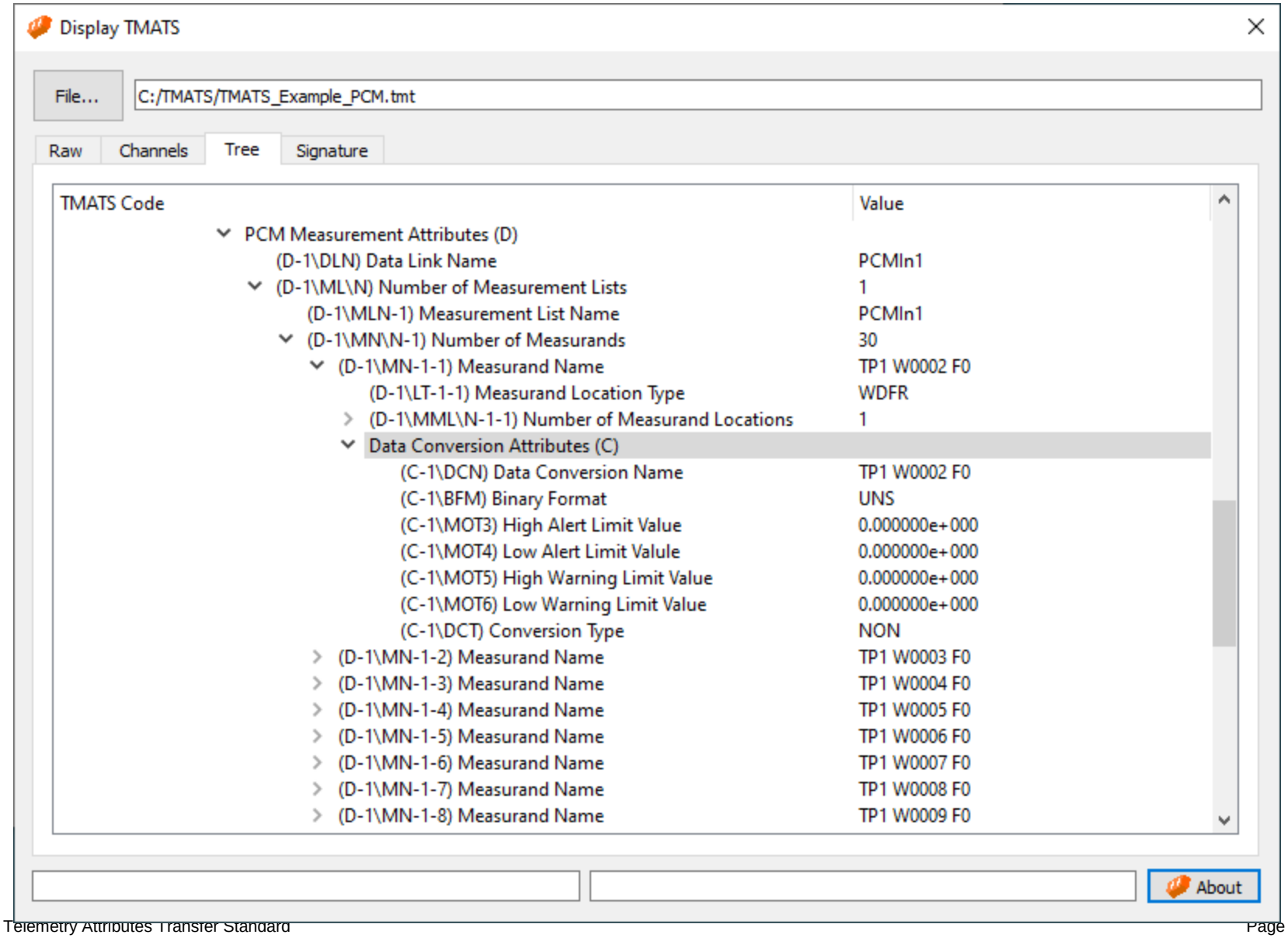
TMATS Structure - Example #2



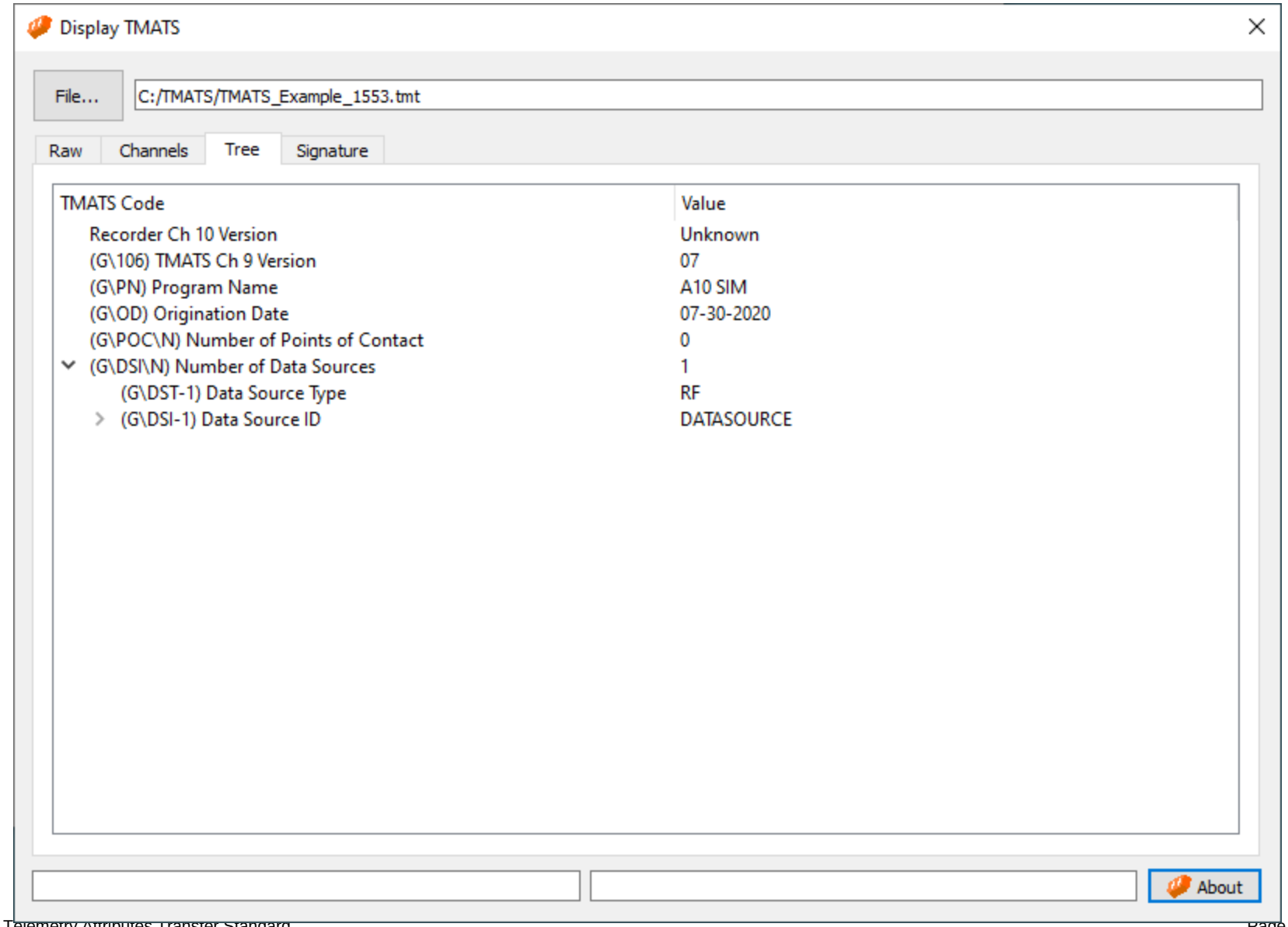
TMATS Structure - Example #2



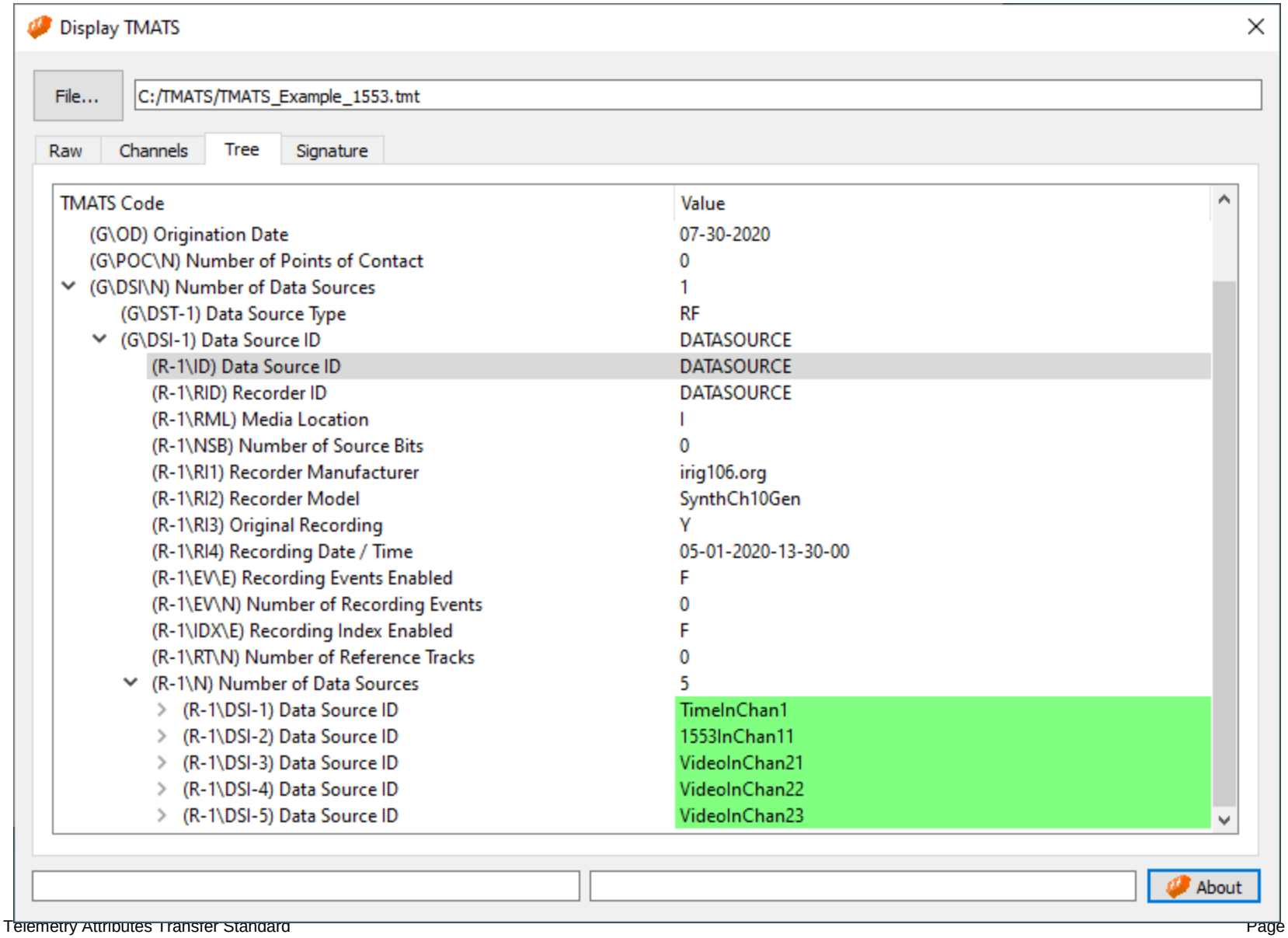
TMATS Structure - Example #2



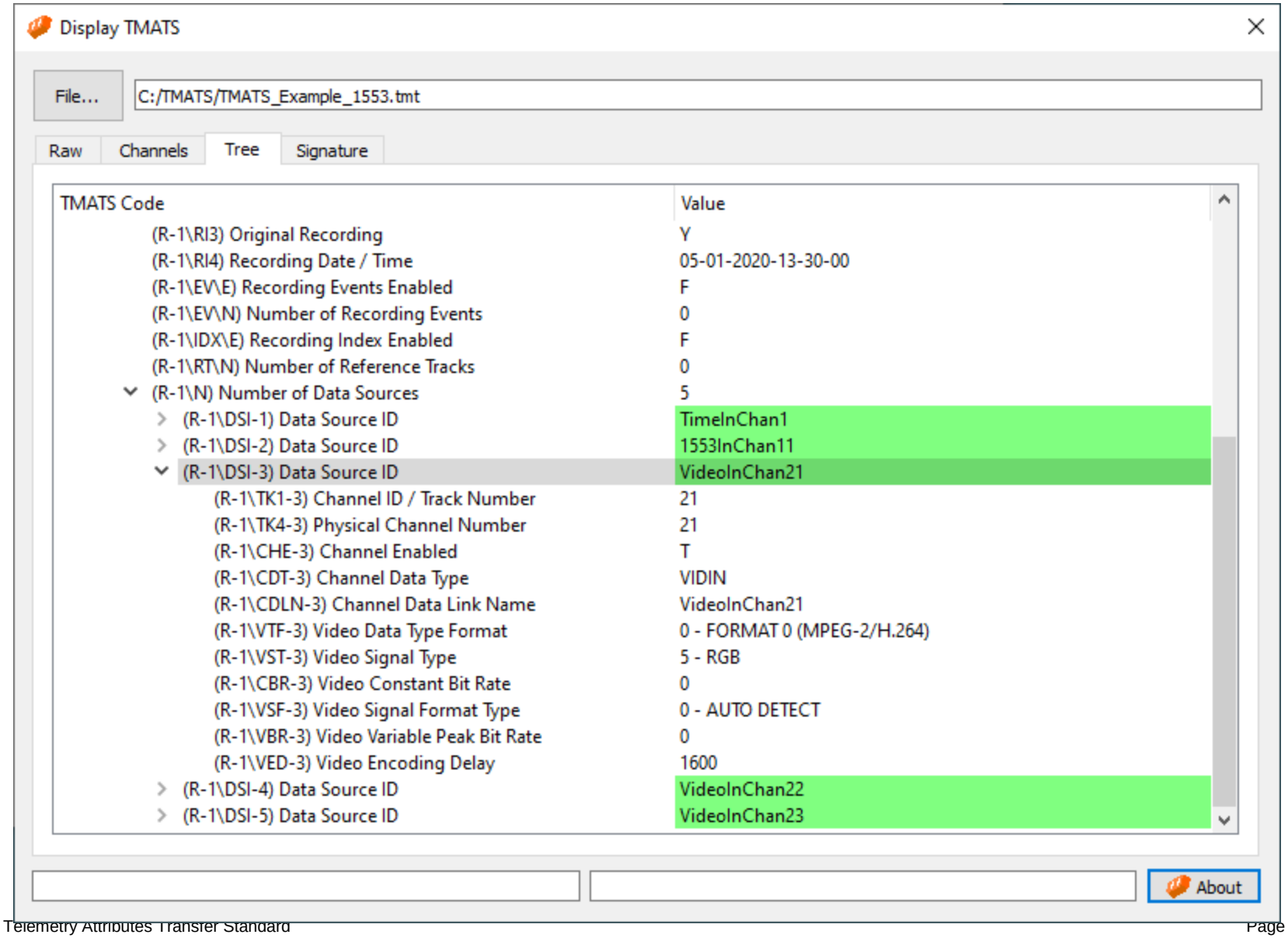
TMATS Structure - Example #3



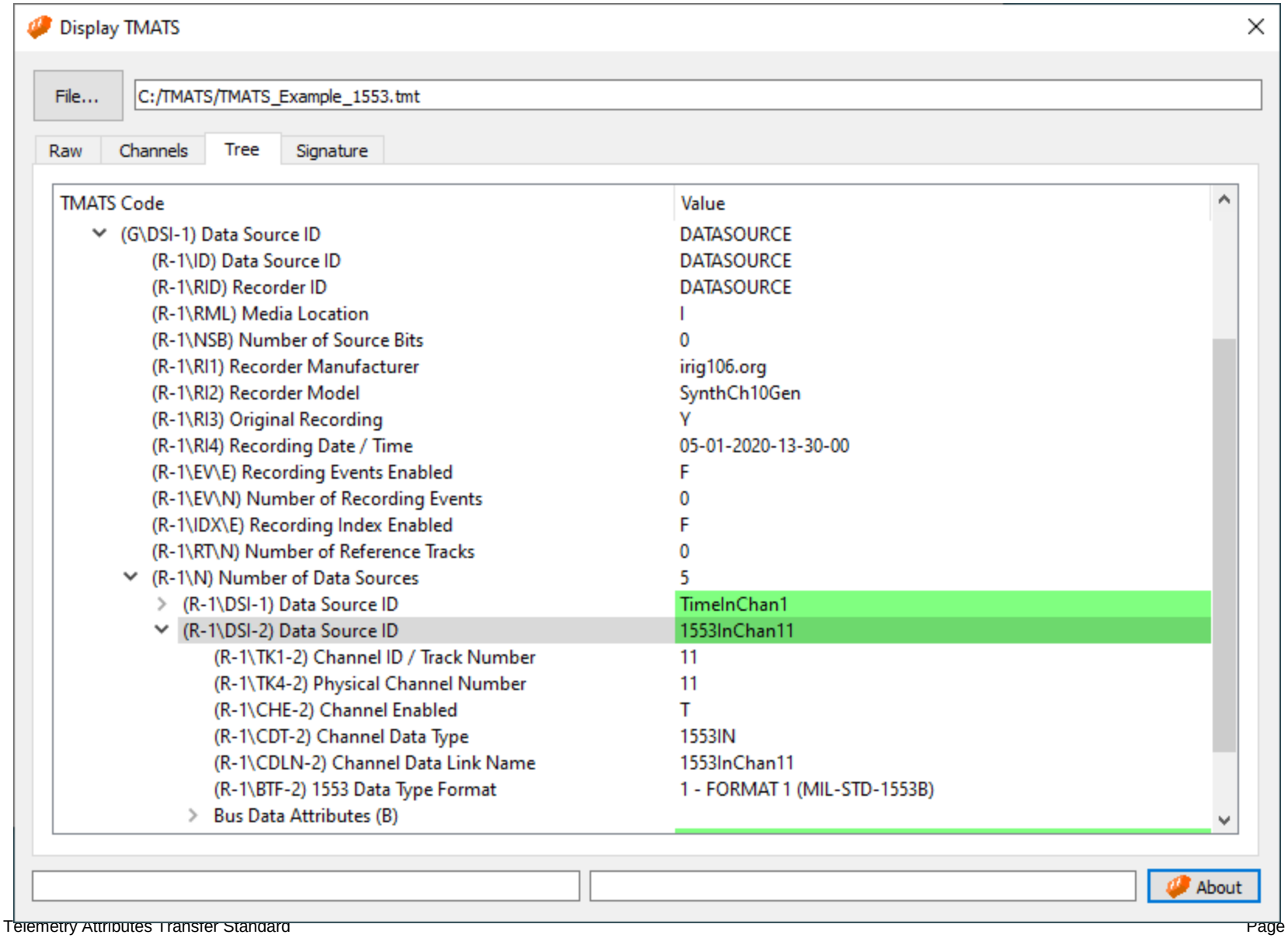
TMATS Structure - Example #3



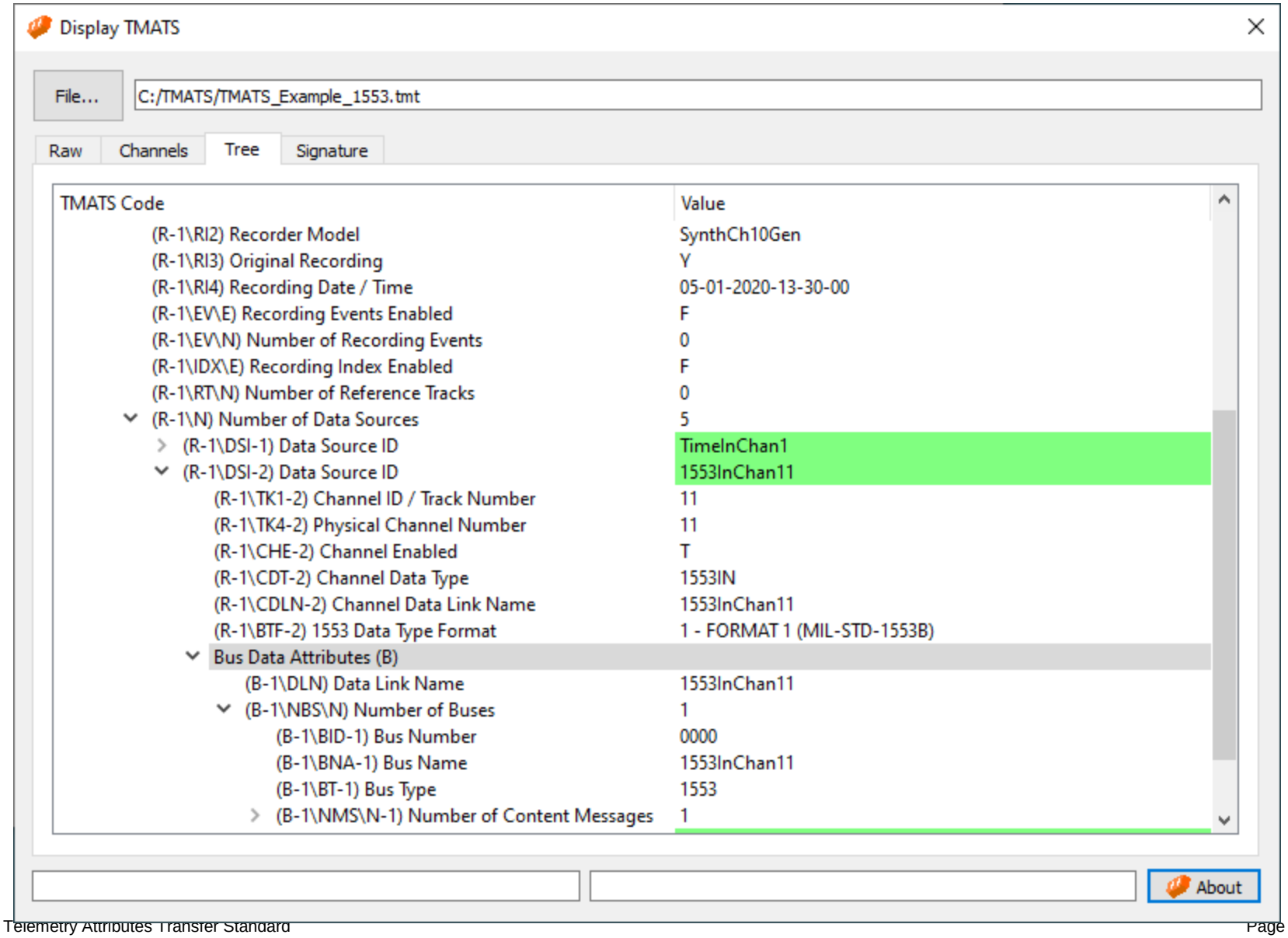
TMATS Structure - Example #3



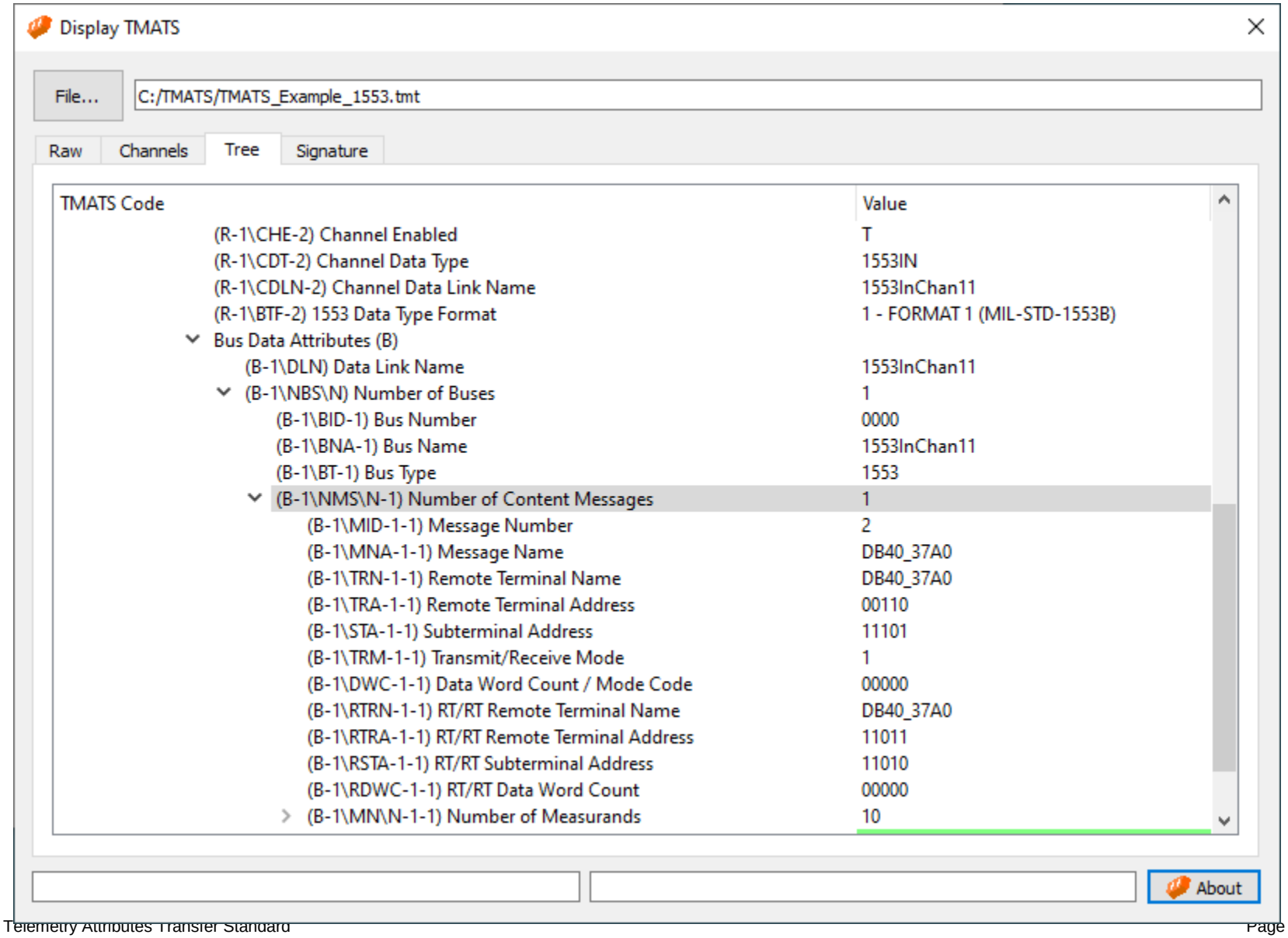
TMATS Structure - Example #3



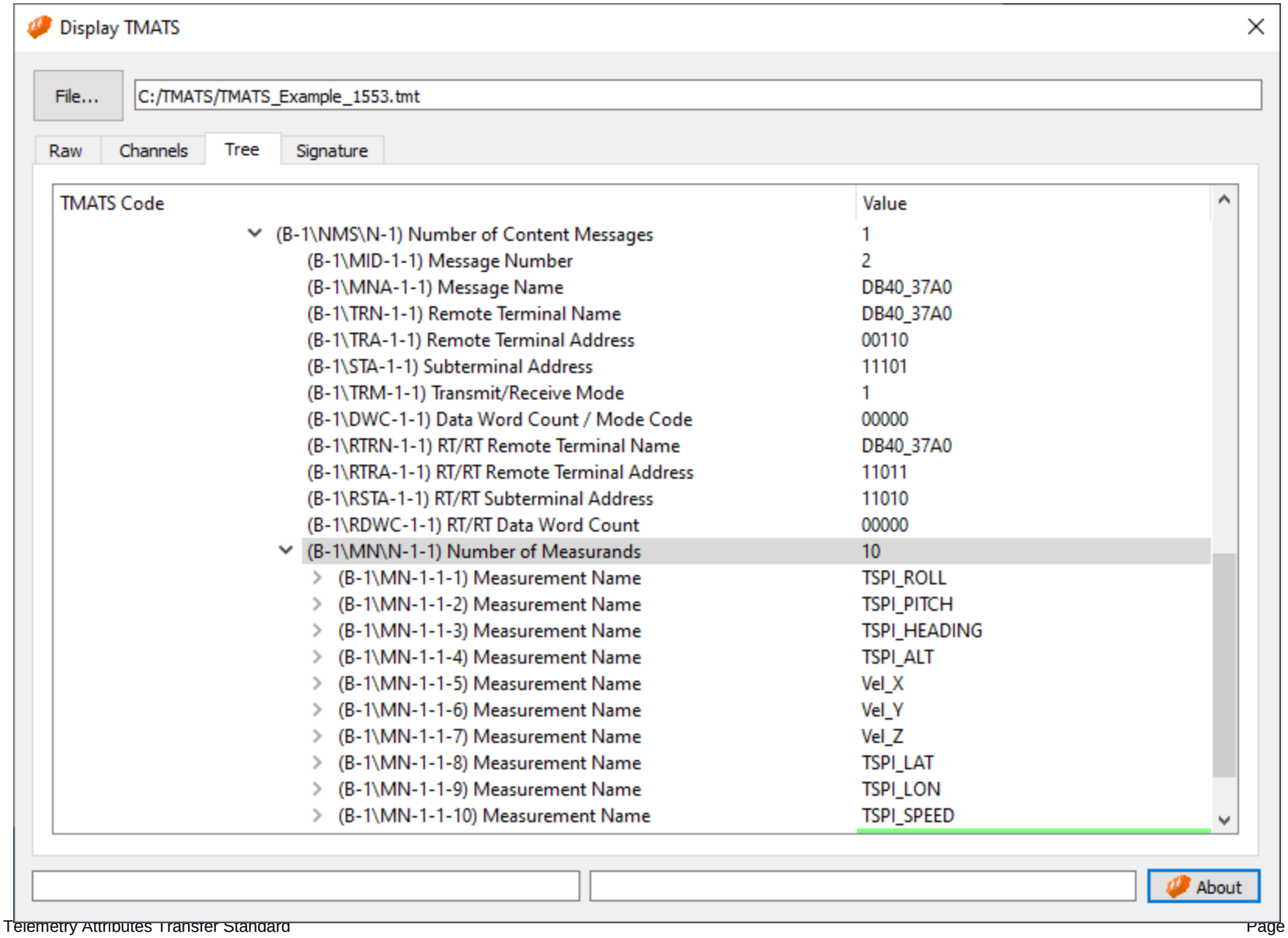
TMATS Structure - Example #3



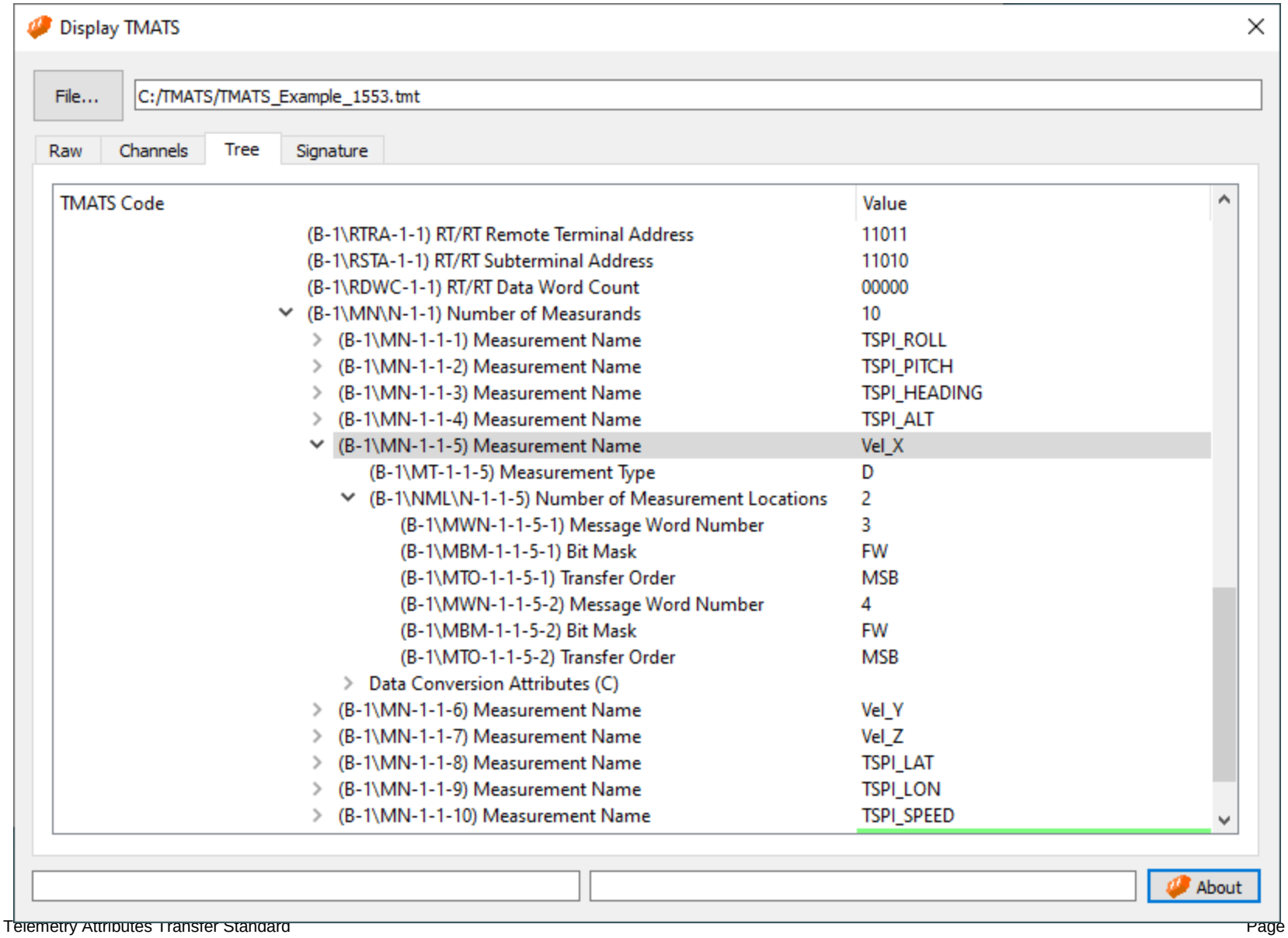
TMATS Structure - Example #3



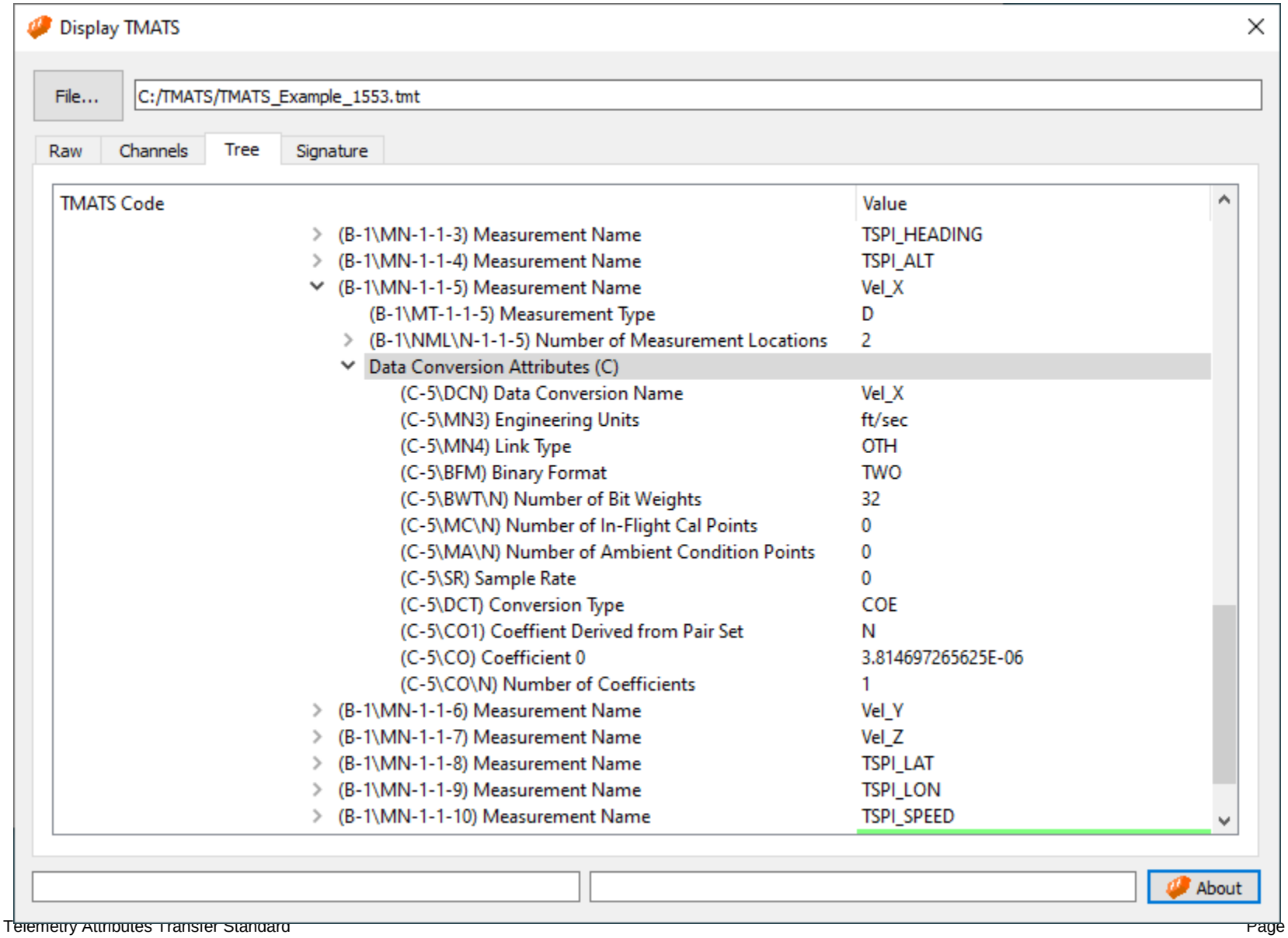
TMATS Structure - Example #3



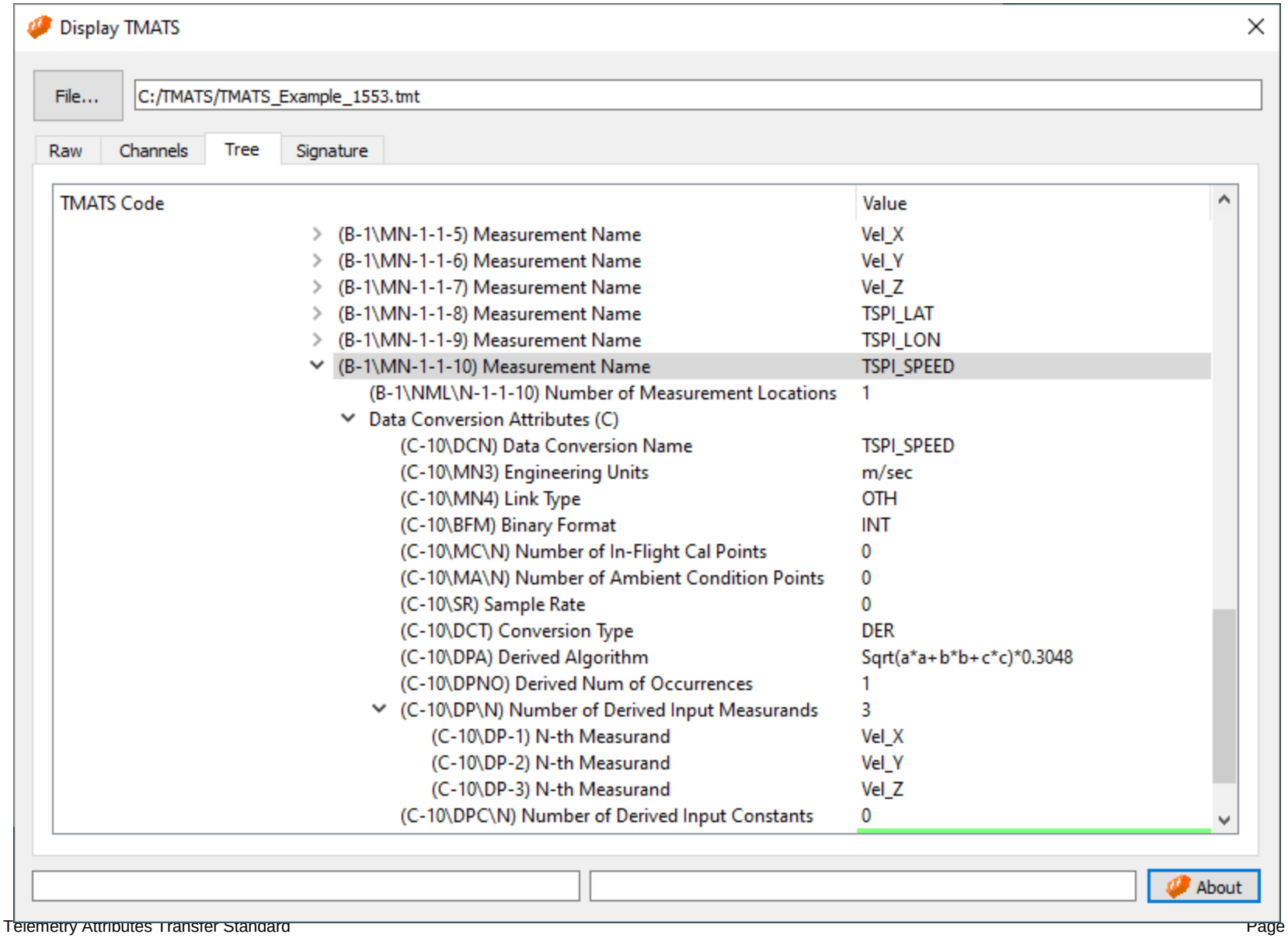
TMATS Structure - Example #3



TMATS Structure - Example #3



TMATS Structure - Example #3



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

Always Optional

PROGRAM NAME	G\PN	Allowed when: Always ~~Range: 16 characters~~	Name of program.
TEST ITEM	G\TA	Allowed when: Always Range: 64 characters	Test item description in terms of name, model, platform, or identification code, as appropriate.
Information			
TMATS FILE NAME	G\FN	Allowed when: Always Range: 256 characters	Name of this TMATS file.
RCC IRIG 106 REVISION LEVEL	G\106	~~R/R Ch 10 Status: R~~ Allowed when: Always Required when: Always Range: 0 to 99	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.

Always Required

If Allowed Then Always Required

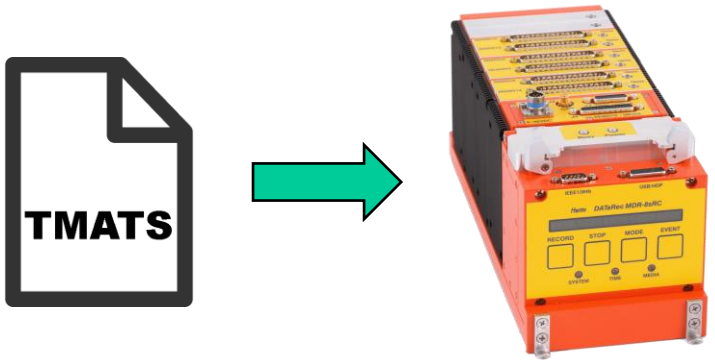
RECORDER-REPRODUCER MEDIA LOCATION	R-x\RML	~~R/R Ch 10 Status: R~~ Allowed when: R\TC1 is not "N" Required when: Allowed Range: Enumeration	Indicate the location of the recorder-reproducer media.

Enumeration	Description
I	Internal
E	External
B	Both internal and external

TMATS For Recorder Configuration

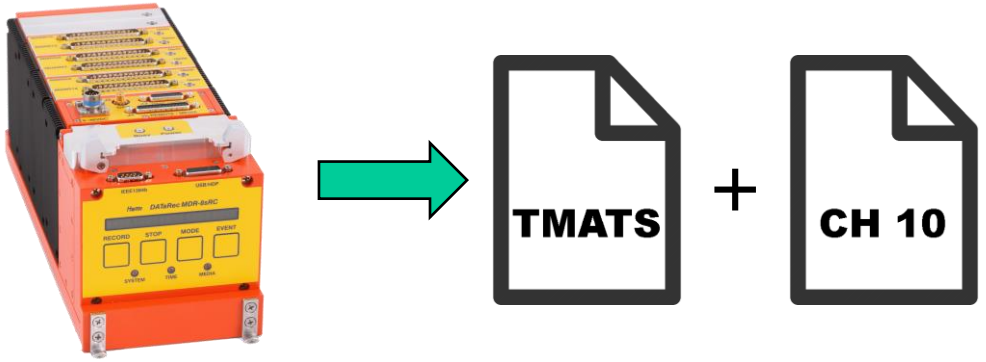
- **Control Port is required by Ch 10**
  - **Serial**
  - **Telnet**
- **Chapter 6 command syntax**
- **.TMATS command to read and write TMATS**

```
.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**