

# Padding of diagnostic frames

SN-IND-1-015\_CANoe\_CANalyzer\_Padding\_DiagnosticFrames.pdf

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# 1 About this Support Note

In the table below you will find the icon conventions used throughout the Support Note.

Symbol	Utilization
	This icon indicates notes and tips that facilitate your work.
$\mathbf{\Lambda}$	This icon warns of dangers that could lead to damage.
	This icon indicates examples.

## 2 Overview

In most cases, diagnostic frames using the ISO Transport Protocol (ISO-TP) shall be padded in order to have a constant 8 bytes long data field, independently of the actual data amount that is transported.

This Support Note explains how to process if your project CANoe /CANalyzer Setup doesn't provide the required padding. It also explains how to automatically control the proper frame padding using the Trace Window.

# 3 Set frame padding

There are two possibilities to set up the padding of the diagnostic frames:

 Set the padding of the frames sent by the Diagnostics Console (tester) of the corresponding ECU • Set the padding of the frames sent by a CAPL routine (tester or ECU). This possibility does only exist for CANoe.

We can send you on demand an example making usage of both possibilities.

### 3.1 Set padding using a CDD

#### 3.1.1 For CAN

To obtain the padding of all CAN diagnostic frames that are sent by CANoe/CANalyzer Diagnostics Console modify the CDD file of the concerned ECU using CANdelaStudio. In the ECU Information / Supported Interface / Diagnostic CAN section of the communication parameters (see figure below), the two following parameters shall be present.



Note: The name "Diagnostic CAN" is project specific and can be different in your case.

D:\CSP\BeispielConfPascale\Pac	dding\Cdd\UDS-ExampleEcu-4	I.0.1_FillerByteAA.cdd - Vect	or CANdelaStudio - [Door]		
🖌 File Edit View Insert Tools	Window Help				
🎦 New   📴 Open 閕 Save	# X & & &   X	🚠 🍾 🚠 💁 🔂 🟠	👫   🕜 Help   🗩 🍕   🍥	🖺 < 🖏 🚋 🚰 📥 🤝 🌾 🔿   npath:/	
🕈 Start Page 🖓 Door 🔇			·		
ECU Information	Diagnostic CAN				
Supported Interfaces	Diagnostic Grav				
Diagnostic CAN	Name	Category	Overwritten Value	Description	
Eault Memory	Bus Speed	Communication	500000	CAN bus data rate (bps)	
	Addressing Scheme	Communication	Normal	Addressing Scheme	
Common Diagnostics	Can Id Type	Communication	11-Bit	Can Id Type	
Variants	RequestCANIdentifier	Communication	0x0700	Request CAN identifier	
States	ResponseCANIdentifier	Communication	0x0600	Response CAN identifier	
Vehicle System Groups	StMin	Communication	20	Separation Time (minimum). The minimum time the sender shall wait between the transmissions of	
Data Types	Blocksize	Communication	0	The maximum number of frames the receiver allows the sender to send, before waiting for an auth	
Protocol Services	TimeoutAs	Communication	1000	Time for transmission of the CAN frame on the sender side.	
Negative Responses	TimeoutAr	Communication	1000	Time for transmission of the CAN frame on the receiver side.	
🗄 📎 Import Pool	TimeoutBs	Communication	1000	Time until reception of the next FlowControl frame.	
Requirements	TimeBr	Communication	1000	Time until transmission of the next FlowControl frame.	
	TimeCs	Communication	1000	Time until transmission of the next Consecutive frame.	
	TimeoutCr	Communication	1000	Time until reception of the next Consecutive frame.	
	P2Timeout	Communication	150	Timeout for the client to wait after the successful transmission of a request message.	
	P2ExTimeout	Communication	2000	Enhanced timeout for the client to wait after the reception of a negative response message with re	
	P3Time	Communication	4000	Tester Present interval.	
	*CANFrameFillerByte	Communication	0xAA	Fill byte used for filling CAN frames to eight byte length.	
	FillerByteHandling	Communication	true	Enables use of fill bytes; if "true", fill bytes are used, otherwise DLC may be smaller than 8.	

If they are not present, please add them.



Note: you require for this operation the CANdelaStudio Admin Edition.

If the parameters are present, the CANdelaStudio Standard Edition is sufficient to set the parameters to the necessary values.

- FillerByteHandling from type ENUM:
  - "True" the frames will be padded to a DLC of 8.
  - "False" no padding.
- CANFrameFillerByte from type unsigned: provides the byte value which is used to pad the frames.

#### 3.1.2 For LIN

According to LIN 2.1 Specification, all unused bytes shall be padded to 0xFF. Therefore CANoe/CANalyzer from CANoe 8.5 SP5 on automatically pad the requests that are sent by the Diagnostics Console.

### 3.2 Set padding using CAPL (CANoe only)

If you are using CAPL nodes to implement a tester or simulate a diagnostic ECU, you can make use of some available CANoe TP (Transport Protocol) functions to force the padding of your Diagnostic frames.

These functions must be integrated as a CCI (CAPL Callback Interface) which gives the CAPL user the possibility to adapt the PDUs that are exchanged between Diagnostics Layer and Transport Layers before they are sent on CAN.



Note: You can find more information on CCI in the corresponding Application Note that you can find for instance in the Windows Start Menu like shown in the picture below.





Note: Each concerned CAPL nodes shall be configured using the TP dll as component. For that use in Measurement Setup the mouse positioned on the node and press on the right mouse button. Add CANoe TP dll (see 3.2.1 or 3.2.1) as Component like indicated below.



### 3.2.1 For CAN

The following two CAPL functions pad the desired CAN frames with a constant value.

CanTpGetPadding CanTpSetPadding



Note: Both functions are part of the OSEK\_TP.DLL which implements ISO-TP and are available for CANoe versions 7.0 or higher.

Please first copy the corresponding CCI Header File to the same directory as your CAPL module: - for CANoe up to version 8.2: CCI\_Implementation.cin, stored in the Demo\_CAN\_CN\Diagnostics\UDSSim\Nodes in the "Location of user data". The directory "Location of user data" is installation dependent and can be found like shown in the picture below.

- from CANoe version 8.5 on: CCI\_CanTP.cin that can be found in the Reusable\CAPL\_Includes\Diagnostics subdirectory of the CANoe user data directory.

CANoe Options			x
Measurement	*	File locations	
Bus Systems / Protocols	×	According to the selection made during program setup, data files (user and application data) are	
Windows / Blocks	×	with the Windows Explorer.	
Programming	*	Location of user data: Open	
General	*	Location of application data: Onen	
Save / Open			-
Start Settings			
License			
Messages			
File Locations			
Appearance	*		
External Programs	×		
Extensions	×		
		OK Cancel Help	,

Then include the following code in your CAPL module for CANoe: - Up to CANoe version 8.2:

includes
{
#include "DownloadSim. <u>cin</u> "
<pre>#include "CCI_Implementation.cit" }</pre>
variables {
<pre>const cIsTester = 0; // set to 0 in ECU simulation//</pre>
char gECU[10] = "UDSsim";

- For CANoe version 8.5 on:

```
includes
{
  finclude "CCI_CanTP.cin"
}

variables
{
  const cIsTester = 1;
  char gECU[30] = "XXXXX_DW10FU_X250_Euro6";
```

Then set the required padding value, for instance:

```
canTpSetPadding(gHandle,0x11);// used to force padding value to 0x11
write("Return Value: %d", DiagSendRequest( request));
```



Note: The padding settings will then be used in all diagnostic parts of CANoe: trace window, diagnostics console window and fault memory window.

### 3.2.2 For LIN

Please first copy the following corresponding CCI Header File to the same directory as your CAPL module:

- for CANoe up to version 8.2: Please contact support@vector.com for more details.

```
- from CANoe version 8.5 on: CCI_LINTP.cin that can be found in the Reusable\CAPL_Includes\Diagnostics subdirectory of the CANoe user data directory.
```

Then include the following code in your CAPL module for CANoe: - For CANoe version 8.5 on:

```
2 □ includes
3 {
4 
4 
5 
5 
6
7 □ variables
8 {
9 char gECU[ 10] = "ECU"; // Provide a name to identify this node
10 const cIsTester = 1; // Set to 1 in master as tester,
11 
12 
13 
}
```

and set the Index of LIN schedule table to the correct value, for instance:

```
CCILIN_GetTableIndices( long& masterRequestTableIndex, long& slaveResponseTableIndex)
{
    // In a tester (=LIN master), change these values to the actual table indices!
    // In an ECU simulation (=LIN slave), these values will be ignored.
    masterRequestTableIndex = 0;
    slaveResponseTableIndex = 1;
}
Note: the padding value of all Diagnostics Frames sent using CAPL is then
    automatically set to 0xFF.
```

Make sure that the following LIN setting has been made in Diagnostics/ISO TP Configuration:

lay blocks aba	s Diagnostics/ISO TP Configuration	CART / NET _ send the V-
	ongrostes, so in comgaratori	
Env	Diagnostic Access	LIN Networks/LIN/Door/LIN Settings
LIN	<ul> <li>· 뀨 LIN Networks</li> <li>□ 뀨 LIN</li> <li>□ 모 Door</li> <li>- 문 Door</li> <li>- 문 Diagnostic Layer</li> <li>- 문 Security DLL</li> </ul>	This dialog allows changing the parameters from the LDF file. WARNING: Overriding the defaults with inappropriate values can lead to communication errors! Parameters from LDF file for LIN settings and diagnostics layer Override manually Reset to defaults
	Lin Settings     Lin Settings     Lin Settings     Security DLL     Additional Descripti     Diagnostic over IP/HSFZ	TP settings           NAD         0x7         N_As_timeout [ms]         1001           STMin [ms]         2         N_Cr_timeout [ms]         1002
	So Try Observer      So TP Advanced      WW TP 2.0 Observer      WW TP 2.0 Observer	Scheduling settings Scheduling Use schedule table activated from CAPL or by the LIN Interactive Master. Diagnostics only mode Reactivate communication table (activated from CAPL or by the LIN Interactive Master) after every completion of a diagnostics request. Interleaved mode Between every diagnostics segment the communication table is executed once. Direct sending The diagnostics request is sent spontaneously without scheduling table.
	< >	OK Cancel Help

# 4 Check frame padding

To observe the content of a padding field, the following CANoe settings are necessary:

- ZeroPadding = 1
- ZeroPaddingValue = set value

ommo	nDiagnostics1Door	etworks	
	Diagnostics/ISO TP Configuration	· · · · · · ·	×
	Diagnostic Access  CAN Networks  Basic Diag ECU  CAN Basic Diag ECU  Can anyon tayer  Dagnostic Layer  Can anyon tayer  Can a	Additional Diagnostic Settings USO TP Advanced Here it is possible to select the messages displayed in the trace window. Diaplayed protocol errors Very compliance of STmin (minimal separation time) Expect offset STMin before the first CF (consecutive frame) Supervise sequence number series Report frames unexpected according to protocol Report frames unexpected according to protocol Report frames sent by a wrong sender Warr on nested transmissions Show ISO TP protocol timer events Shows the starting, stopping and expiration of ISO TP protocol timers in the trace window. Setup Cancel Expire	
*	Ľ	Additional settings from the ISO TP configuration file:	
		OK Cancel Help	

This can be done like shown in the picture below in the CANoe  $osek_obm.ini$  file that is to be found in the "Location of application data".



Note: see also  $\Box$  to find the actual location.

```
osek_obm.ini - Editor
   Datei Bearbeiten Format Ansicht ?
dd
   [OSEK TP OBSERVER]
     / Addressmode Normal=0/Extended=1
   ADRMODE = 1
// Global Default Values
   TpBaseAddress=0x600
TpRxMask=0xff
  // ZeroPadding on=1/off=0
  ZeroPadd1ngValue=0xAA
     / If FCs are not evaluated and FCs are used, this value is used.
altu
   Blocksize=5
   // If EvalFC==0, then this value will be used TpsTmin=20
      Report if more than this number of wait frames are generated.
-1: ignore wait frames,
_0: report all wait frames.
   WFTMax=5
    // First sequence number to expect.
   FirstSN=1
  // Level of verbosity, 0 = quiet, 10 = print all.
```

Padding failure will then be indicated after next measurement start like indicated in the following trace window:



## **5** Contacts

Please find the contacts of Vector Informatik GmbH and all subsidiaries worldwide via: http://www.vector.com/vi\_addresses\_en.html