Commercial Vehicle TPMS User Guide

1 Modifications

Date	Modifications	Author	Version	Modified		Approved	
				Sheets	Ву	Date	Signed
16/01/06	Document Creation	GMS	1_00	ALL			
19/06/06	Explanation of simulated sensors mode changing Simadd example	GMS	1_00	4, 12			
	provided						
02/07/07	Generic document Created from customer specific version & template updated	GMS / GU	1_00	ALL			
28/11/07	Updated with bf1s template. Digityre Operation and screen shots added	GMS	1_01	All			
04/12/07	Changes after 1st read through	GMS	1_02	All			
07/12/07	Changes after 2nd read through	GMS	1_03	All			
14/02/2008	Text updates Template update	JRS	1_04	All	GMS	14/02/2008	GMS



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2 Brief System Overview:

The Commercial Vehicle TPMS (Tyre Pressure Monitoring System) is used to monitor the status of tyres fitted to a multi-wheeled vehicle. The system receives RF datagrams transmitted from sensors that are fitted inside the vehicle's wheels. The wheel sensors transmit information such as pressure, temperature and remaining sensor life. The information is processed inside the TPMS ECU and then transmitted on the vehicle's J1939 CAN bus. The signals can then be processed by the vehicle's other systems.

Data is received by antennae mounted on the vehicle and sent to the ECU. Received data is collected by the ECU into a 100 deep internal buffer of active sensors. The serial number, pressure, temperature and remaining sensor life (RSL) of every active sensor is then broadcast on the J-1939 bus at intervals of 10 seconds.

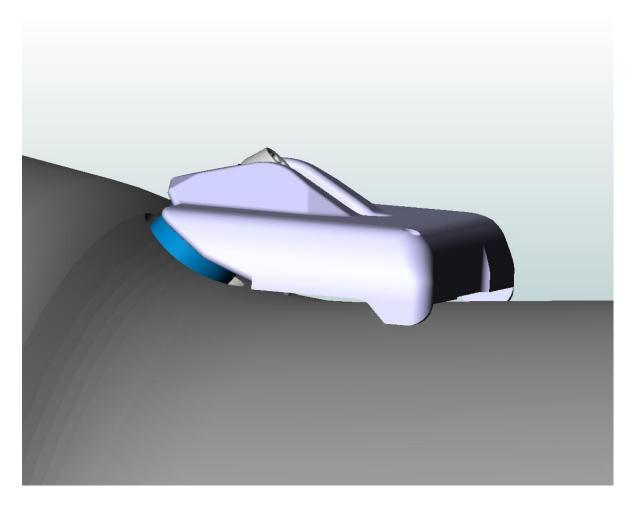
The serial number of recently received sensor data is compared against all of the stored sensor data in the list and if there is no match with any of the existing positions then the new sensor is added to the active sensor list and the time to send is set to the current time.

If the serial number is the same as an existing serial number then the pressure, temperature and RSL values are compared to the current values in the list. If all of the values are the same only the time of receiving the data is updated (time to send is not changed) If any of the data is different then all of the data is updated and the time to send is set to the current time (an updated sensor is broadcast on the J1939 immediately).

If the time exceeds (cparam - Sensor_timeout) for any sensor, then the ECU continues to send J1939 messages for this sensor at 10 seconds interval for the next 30 seconds (three updates) with the data readings marked as unavailable. After this time the sensor is then erased from the active sensor list.



3 Commercial Vehicle Sensors

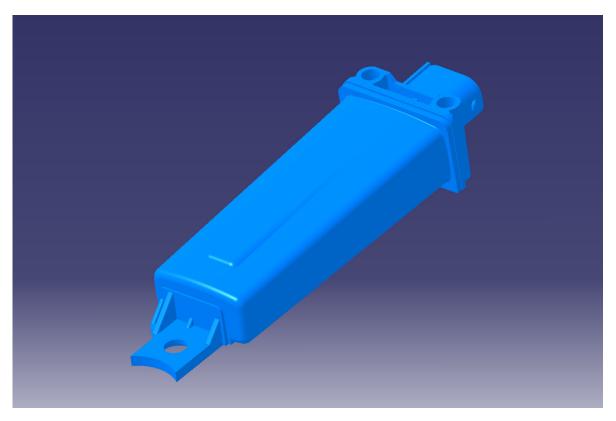


Each commercial vehicle wheel sensor is mounted to the wheel rim using a particular valve, suited to that rim. The feet of the sensors make contact with the rim creating a three point fixing.

The commercial vehicle wheel sensors are configured to transmit at a rate of one transmission every 60 seconds, unless the sensor detects a pressure deviation (+ve or -ve) of 0.4bar (5.8psi), when it will transmit at a rate of 1 Hz for 255 seconds.



4 DGA+ Antenna



The DGA+ Antenna is used to receive the RF datagrams from the TPMS sensors and transmit the information to the TPMS ECU using a LIN bus connection.

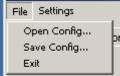


5 Truck Tyre Configuration Utility

The BERU f1systems Truck Tyre Configuration Utility is a PC program that is used to configure the Commercial Vehicle TPMS ECU.



5.1 File Menu



The file menu has 3 options.

- Open config open a previously saved configuration
- Save config save the current configuration
- Exit close the program



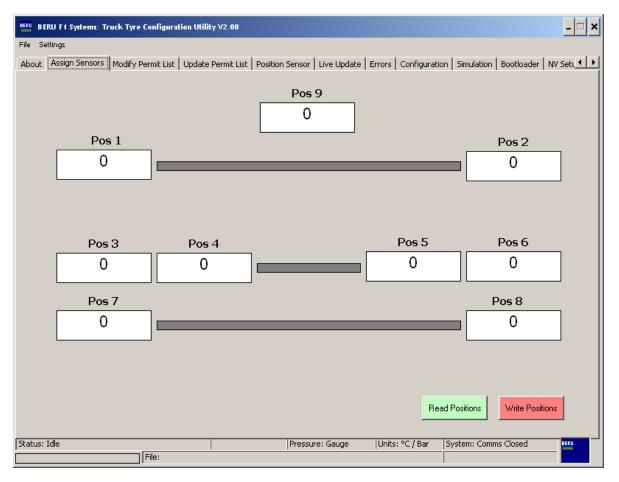
5.2 Settings Menu

	Settings	
5	Comm Port	ľ
•	Connect	
	✓ Gauge Pressure	I
	Temperature Units	ŀ
	Pressure Units	l
	Recall Last Page	F
	Auto Upload Parameters from ECU	

The settings menu is used to configure the port used to communicate with the ECU and how TPMS data is displayed on the PC screen.

- Comm Port The selected port must be that connected to the ECU
- Connect Attempt to connect to the ECU.
- Gauge Pressure Display all pressures as Gauge values (+1bar will be added to all absolute values)
- Temperature Units Display temperatures as °C or °F
- Pressure Units Display pressure values as Bar or psi.
- Recall Last Page When the software is started the last active page when previously closed will be displayed
- Auto Upload Parameters from ECU If selected the PC software will automatically look for any connected ECU and read the configuration parameters in to the Configuration Utility.

5.3 Assign Sensors



The assign sensors page is used to assign sensors to positions on the vehicle. Every sensor used on a vehicle must have its serial number programmed into the assign sensors page. This is the mechanism used to determine which sensor on the vehicle has an issue. The received sensor serial number is compared with the information entered into this page and the data allocated to a particular position.

A value of zero entered into any of the positions above will disable that position.

Once the serial numbers of all of the sensors have been entered the information must be written to the ECU by clicking the 'Write Positions' button. Similarly position information can be read from the ECU by clicking on the 'Read Positions' button.

- 5.4 Modify Permit List
- 5.5 Update Permit List
- 5.6 Position Sensor
- 5.7 NV Setup
- 5.8 Create Permit List

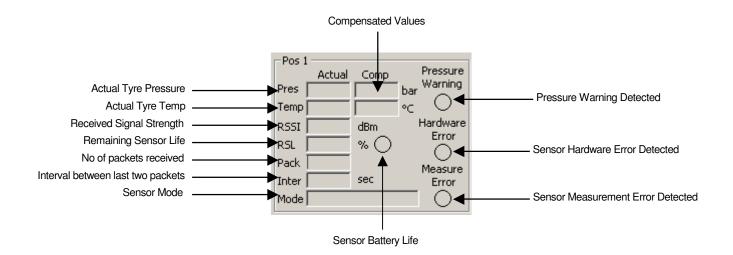
The above pages are used to enable multiple sets of sensors to be used on a single vehicle, please contact BERU f1systems for further information.



5.9 Live Update

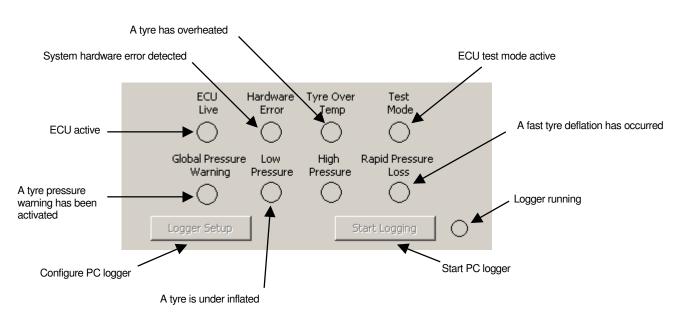
File Settings About, Assign Sensors, Modify Permit List, Update Permit List, Position Sensor, Live Update, Errors, Configuration, Simulation, Bootloader, NW Set, I Pres Pressure, Warning, Temp Pres Pressure, Pressure, Bar, Warning, Temp Pack Pressure, Pressure, Pack, Sec, Error Mode Pressure, Pressure, Pack, Sec, Error Pres Pressure, Pressure, Pack, Sec, Error Pres Pressure, Pressure, Pressure, Pressure, Pressure, Pack, Sec, Error Pres Pressure, Pressure	ERU F1 Systems: Truck Tyre Configuration Utility ∀2.08	×
Pos 1 Actual Comp Pressure Pres bar Warning Temp % C Actual Comp Pressure RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware Error RSSI dbm Hardware RSSI dbm Hardware Error RSSI dbm Hardware Pack Pressure Pressure Pressure Pressure Pressure Press bar Warning Temp % C O Pressure Press bar Mardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware RSSI dbm Hardware Error	ile Settings	
Actual Comp Pressure bar Warning Pressure bar Warning Pressure bar Warning Pressure pres Pres Pres Pres	About Assign Sensors Modify Permit List Update Permit List Position Sensor Live Update Errors Configuration Simulation Bootloader NV Setu	• •
Pres bar Warning Pres bar Warning Temp c Pres bar Warning RSSI dBm Hardware RSSI dBm Hardware RSL % () Pres Pack Pres Pack Pres Pack Pack Measure Inter sec Error Pack Measure Pres Pack Measure Inter sec Error Mode Pres Actual Comp Pressure Pres Pres Pres Pack Measure Pres bar Warning Pres Actual Comp Pressure Pres Pres<		sure
RSSI dBm Hardware RSSI dBm Hardware RSSI dBm Hardware RSL % Error Pack Measure Pack Measure RSSI dBm Hardware RSSI % Grow Pack Measure Press Pack Measure RSSI dBm Hardware RSSI dBm Hardware RSSI Measure RS		ning
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RSL %	Cost j dolini Frror Rost j dolini Frror Rost j dolini Frror	
Inter sec Measure Error Inter sec Error Mode Pos 3 Actual Comp Pressure Pos 4 Actual Comp Pressure	SL % 0 0 RSL % 0 0 RSL % 0 0	5 1
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Pos 3 Actual Comp Pressure Pos 4 Actual Comp Pressure Pos 5 Pres bar Warning Dar Warning Dar Warning Temp c O RSSI dBm Hardware RSSI dBm Hardware RSL % O RSL % O Pres Pack Measure Inter sec Error Made Measure Inter Sec Error Pres Actual Comp Pressure Measure Measure RSL % O Pack Measure Inter sec Error Measure Inter Sec Error Mode O Mode O O Measure Inter Sec Error Pres Actual Comp Pressure Mode O O Pack Inter Sec Error RSL Ya O O O O Pack Inter Sec Error Result Comp Pressure Node		or
Actual Comp Pressure Actual Comp Pressure Pressure <td></td> <td></td>		
Pres Comp Warning Pres Comp Warning Temp •c Temp Pres RSSI dBm Hardware RSSI Measure Terror RSSI Measure Terror Mode Mode O Mode O Mode O Mode O Mode O Pressure Pressure Pressure Pressure RSSI Measure R	Durana Duran	sure
RSSI dBm Hardware RSSI dBm Hardware RSSI dBm Hardware RSL % O Pack Status: Idle RSSI dBm Hardware RSSI dBm Hardware RSSI Measure Error RSL % O Pack	Actual comp Warping Actual comp Warping Actual comp Warping	
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RSL % RSL % Pack RSL % Pack Inter Sec Error Measure Inter Sec Error Mode O Pack Pack Inter Sec Error Mode O Pack Inter Sec Error Mode O Pack Pack Inter Sec Error Mode O Pack Pac		
Inter sec Inter		5
Mode Pressure RSSI dBm Hardware Bardware RSSI dBm Hardware RSSI Meadure RSSI dBm Hardware RSSI Meadure RSSI Measure<	Measure Measure Measure Measure Measure Measure	
Pos 7 Pressure ECU Hardware Tyre Over Test Pres bar Warning Error Temp Mode Pres bar O O Pressure Actual Comp Pressure RSSI dBm Hardware Error Temp Mode Pressure Pressure RSSI dBm Hardware Error Global Pressure Low High Rapid Pressure RSSI dBm Hardware RSSI % O O O O Pressure RSSI dBm Hardware Error Pack Measure Inter Sec Error Error O Pack Measure Inter sec Error Etror Start Logging Mode Mode Mode Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed Error		or
Actual comp Pressure Warning Live Error Temp Actual comp Pressure Pressure Pres bar - - - - - Temp •c - - - - - RSSI dBm Hardware Global Pressure Low High Rapid Pressure RSSI dBm Hardware RSL % - - - - - - - Pack Measure - - - - - - Inter sec Error - - - - - Mode - - - - - - - Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed Estatus:		
Pres Warning Warning Temp oc oc RSSI dBm Hardware RSL % oc Pres Global Pressure Low Warning Press Press Press Error Pack Measure Inter Sec Error Logger Setup Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed	Pressure Deco Hadinato Processor Deco	sure
RSSI dBm Hardware RSSI dBm Hardware RSL % Global Pressure Loss Pack Measure Pressure Pressure Inter sec Error Logger Setup Start Logging Mode Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed	Warping Warping	ning 📗
NJL Warning Pressure Naparity Naparity <td></td> <td></td>		
RSL % Pack Measure Inter sec Error Logger Setup Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed		
Inter sec Image: Fror Mode Inter Start Logging Status: Idle Pressure: Gauge Units: °C / Bar		5
Mode Logger Setup Start Logging Mode Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed	Measure (C C C C C Measure Measure	
Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed		or
	tatus: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed	

The 'Live Update' page displays the current status of the TPMS system. Any datagram transmissions from 'Assigned' sensors that have been received by the system will be displayed on this page. Each sensor has its own dedicated section of the screen





There are also a number of global status indicators, these are:



By clicking on the 'Logger Setup' the logging configuration page can be accessed.

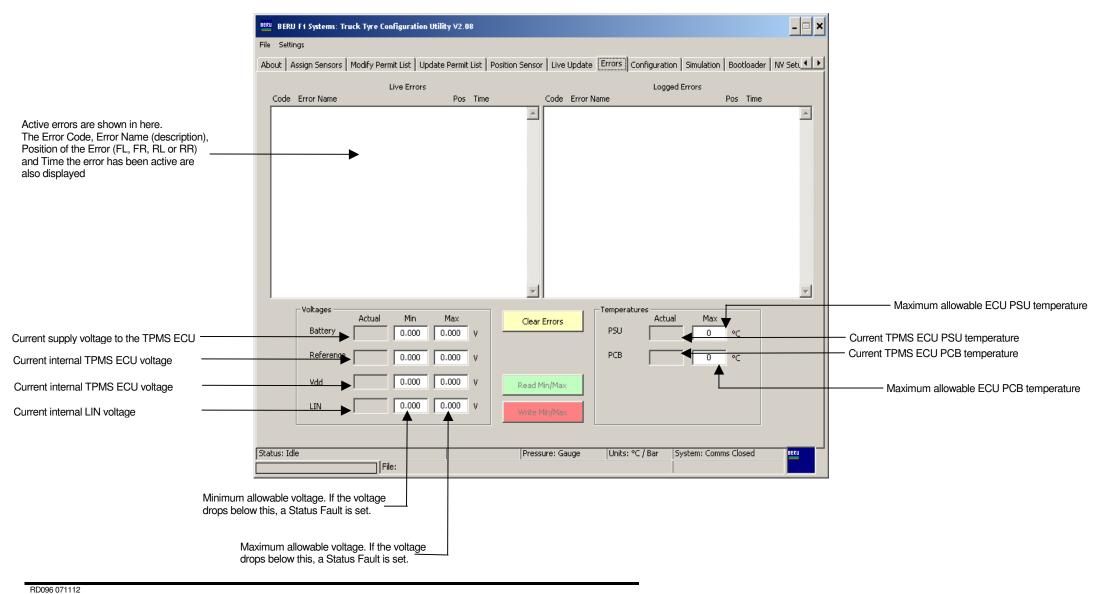


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	BERU F1 Systems Logg	er Setup									x	1
Wheel position	Front_Left	Logging	Trig Value	Trig Direction		Front_Right	Loggir	ig T	Frig Value	Trig Direction		If this channel is to be used as the trigger to activate
	IDNum_FL	True 💌	0	Rising		IDNum_FR	True		0	Rising <		the logging, select the trigger direction for the
	Pres_FL	True	0	Rising		Pres_FR	True		0	Rising		channel
	Pres_FL_Comp_Act	True	0	Rising		Pres_FR_Comp_Act	True		0	Rising		
	Temp_FL	True	0	Rising		Temp_FR	True		0	Rising	1	Enter the rate for DigiTyre to write data to
	RSSI_FL	True	0	Rising		RSSI_FR	True		0	Rising		the log file (1Hz recommended)
	RBL_FL	True	0	Rising		RBL_FR	True		0	Rising	1	
	RxCounter_FL	True	0	Rising	⊡	RxCounter_FR	True		0	Rising		
	Rear_Left	Logging	Trig Value	Trig Direction		Rear_Right 🔽	Loggin	ng T	Frig Value	Trig Direction		Enter the separator to be used in the log
Select whether this channel is logged —	IDNum_RL	True	0	Rising		IDNum_RR	True		q	Rising]	file (Comma recommended)
	Pres_RL	True	0	Rising		Pres_RR	True		a	Rising		
	Pres_RL_Comp_Act	True	0	Rising		Pres_RR_Comp_Act	True		q	Rising		
	Temp_RL	True	0	Rising		Temp_RR	True		q	Rising		
	RSSI_RL	True	0	Rising		RSSI_RR	True		0	Rising		
	RBL_RL	True	0	Rising		RBL_RR	True		q	Rising		
	RxCounter_RL	True	0	Rising	◄	RxCounter_RR	True			Rising	-	
	Globals	 Logging 	Trig Value	Trig Direction		Rate 1		sec	Separator	C	Ipen 🕂	Used to load an existing logger configuration
	Pres_Set_Hard_Front	True	0	Rising		Post Trigger Capture)	sec 🛛	Comma 📘	• –	iave 🕂	Used to save the current logger configuration
	Pres_Set_Soft_Front	True	0	Rising		Logging	Always			J		Accept the current logger configuration and
	Pres_Set_Hard_Rear	True	0	Rising		Trigger Channel	CU_Live			-	ок 🕂	return to the Live Update page
	Pres_Set_Soft_Rear	True	0	Rising		File PI Export		nent file	e with new se	ession C	ancel	Discard changed to the logger configuration
	Speed_Car	True	0	Rising		▎▁▁▓▁▁▎ቚ゛ ゛		nork nie	,			and return to the Live Update page
	Temp_Comp_Act	True	0	Rising		File Description						
	Atmos_Pres	True	0	Rising	◄							
be s Use	d to set the file name for the tored using d to set the store in the dat nat which can be imported	a in the log fi										Enter any comments you want recorded in the header of - the log file here. e.g. car setup, wheel fitted, weather conditions etc.
lo	necking this means that ea gging, a new log file will be creasing file names	ch time you created, with	start and st sequentia	op the								



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5.10 Configuration Page

This page is used to configure the majority of the ECU's set-up. Each section of the page is used to configure a different part of the ECU.

BERU F1 Systems: Truck Tyre Configuration Utility V2.08							
File Settings							
About Assign Sensors Modify Permit List Update	e Permit List Position Sensor Live Update Errors 🛛	Configuration Simulation Bootloader NV Setu					
11000.0							
J-1939 Config J-1939 PGN Low Word	Setup Test Mode Off	Pressure Warning Limits Soft Warning Limit 0.000 ∆ bar					
J-1939 PGN High Byte	Pressure Detect Mode Comp	Hard Warning Limit 0.000 △ bar					
J-1939 Address 0	Pressure Checking Relative						
J-1939 Priority 0	Beceive Timeout 0 Min	Pressure Loss Rate 0.000 bar/min Pressure Loss Latch Off					
Sensor Timeout 0 sec	Receive Timeout Pressure 0.000 bar	Pressure Minimum 0.000 bar					
J-1939 Pressure Offset 0.000 bar	Antenna Mode 4 Ch (1,2,3,4 👻	Pressure Maximum 0.000 bar					
J-1939 Pressure Scaling 0.000 kPa/bit	Allowed Sensor Source Real	Warning Limits					
Sensor Location	Glitch Filter Config	Temperature Max On 0 ℃					
Locate Mode Lookup -	Min Raw Pressure 0 Counts	Temperature Max Off 0 <⊂					
Multipath Receive Off 🔍	Max Change Raw Pressure 0 Counts	Battery Life Minimum 0 Counts					
Multipath Filter	Timeout 0 sec	Reference Temp 0 •C					
Sensor Primary Channel		Allowed Sensor Serial Numbers					
Po:		Min value Max value					
Pos 1	el 1 🔽 Pos 2	Range 1 0 0					
Channel 1 🔽	Channel 1 💌	Range 2 0 0					
		Range 3 0 0					
Pos 3 Pos 4	Pos 5 Pos 6	Range 4 0 0					
Channel 1 💌 Channel 1 💌	Channel 1 💌 Channel 1 💌	Range 5 0 0					
Pos 7	Pos 8						
Channel 1 💌	Channel 1 💌	Read Config Write Config					
	,						
Status: Idle	Pressure: Gauge Units: 9	°C / Bar System: Comms Closed					
File:							



5.10.1 J-1939 Configuration

0		
0		
0		
0		
0	sec	
0.000	bar	
0.000	kPa/bit	
	0 0 0 0 0.000	0 0 0 0 0 0.000 sec 0.000 bar

J-1939 PGN Low Word & J-1939 PGN High Byte – These two values are combined to create the 24-bit Parameter Group Number

J-1939 Address – Parameter Group Number Address (application specific)

J-1939 Priority –This value is used to define the priority during arbitration. '000' is the highest priority and is usually associated with high-speed control messages. Low priority is used for non-critical configuration and information messages.

Sensor Timeout – The amount of time that a sensor datagram will be transmitted on the bus after datagram reception has stopped.

J-1939 Pressure Offset -Offset applied to all pressure values sent on the bus

J-1939 Pressure Scaling – Scaling applied to all pressure values sent on the bus



5.10.2 Reception Configuration

Setup		
Test Mode	Off 🗨	
Pressure Detect Mode	Comp 💌	
Pressure Checking	Relative 💌	
Receive Timeout	<u> </u>	1in
Receive Timeout Pressure	0.000 Ь	ar
Antenna Mode	4 Ch (1,2,3,4 💌	
Allowed Sensor Source	Real 💌	

Test Mode – Enable one of the Internal Test modes. BERU f1ystems engineers may require selection of one of these modes during system installation testing

Pressure Detect Mode – Select if the system is to use compensated or actual pressure values for deflation detection

Pressure Checking - Select if an actual or relative pressure value will be used for the deflation limits

Receive Timeout – The amount of time that is allowed before the system will flag a sensor as 'not responding' (Recommend 195 seconds)

Receive Timeout Pressure – The pressure value that will be transmitted for a sensor when it has timed out (we recommend that a high value is used as a low value will trip deflation alarms)

Antenna Mode - The number of antennae that are connected to the system are configured here

Allowed Sensor Source - Select if 'Real' or 'Simulated' sensors are in use



5.10.3 Sensor Detection

- Sensor Location	
Locate Mode	Lookup 💌
Multipath Receive	Off 🗨
Multipath Filter	Off 🗨

Locate Mode – Select if sensors are entered into the Assign page or into a position file (Not covered in this manual)

Multipath Receive – If Multipath receive is turned on then any antenna can receive the signals from any wheel sensor. If it is turned off then only the antenna configured as that wheel sensors primary channel will receive that sensors data

Multipath Filter – When the Multipath filter is turned on (recommended) then the amount of reception packets for a sensor will only increase by one count (even if all antennas received a sensors transmission) If it is turned off then any antenna that received a sensors data will cause the packet counter to increase (which means the packet counter will increase very quickly and can lead to misinterpretation of the data)

5.10.4 Sensor Primary Channel

Sensor Primary Channel	Pos 9 Channel 1	•	Pos 2 Channel 1	•
Pos 3 Channel 1 V Ch Pos 7 Channel 1 V	Pos 4 nannel 1 💌	Pos 5 Channel 1 💌	Pos 6 Channel 1 Pos 8 Channel 1	•

In this section a sensor's primary antenna channel is selected. We recommend that the antenna closest to a wheel sensor be configured as its primary channel.



5.10.5 Warning Limits

Pressure Warning Limits						
Soft Warning Limit	0.000	∆ bar				
Hard Warning Limit	0.000	∆ bar				
Pressure Loss Rate	0.000	bar/min				
Pressure Loss Latch	Off 🗨]				
Pressure Minimum	0.000	bar				
Pressure Maximum	0.000	bar				
Warning Limits						
Temperature Max On	0	∘⊂				
Temperature Max Off	0	°C				
Battery Life Minimum	0	Counts				
Reference Temp	0	℃				

Soft Warning Limit – This is an early warning limit for a deflation of a tyre. In 'Relative' mode the deviation from the compensated pressure should be entered. In 'Absolute' mode the actual pressure value should be entered when the warning should be activated.

Hard Warning Limit - This is a final warning limit for a deflation of a tyre. In 'Relative' mode the deviation from the compensated pressure should be entered. In 'Absolute' mode the actual pressure value should be entered when the warning should be activated.

Pressure Loss Rate – If a tyre is deflating at a rate greater than the specified value then the system will immediately issue a 'Hard Warning'.

Pressure Loss Latch – If the rapid pressure loss rate warning has been activated then the alarm can be latched and will be activated even if the ECU is power cycled.

Pressure Minimum – The absolute minimum pressure warning. The 'hard warning' alarm will be activated if the pressure in the tyre is below this value.

Pressure Maximum - The absolute maximum pressure warning. The 'hard warning' alarm will be activated if the pressure in the tyre is above this value.

Temperature Max On – The 'hard warning' will be activated if the temperature in any tyre exceeds the defined limit.

Temperature Max Off– The temperature warning will be turned off when the temperature in the tyre at fault drops below the entered limit.

Battery Life Minimum – If the remaining sensor life value drops below this limit, then the sensor low battery warning will be activated.

Reference Temp – The temperature entered into this field is the value to which the compensated pressure values will be calculated.



5.10.6 Serial Number Limitation

Allowed Sensor Serial Numbers											
	Min value	Max value									
Range 1	0	0									
Range 2	0	0									
Range 3	0	0									
Range 4	0	0									
Range 5	0	0									

If values are entered into these fields, then sensors between the maximum and minimum values in each range will be allowed by the system. Numbers outside of these ranges will be ignored. If all of the fields are zero then all sensors will be accepted by the system.

5.10.7 Glitch Filter

-Glitch Filter Config		
Min Raw Pressure	o	Counts
Max Change Raw Pressure	0	Counts
Timeout	0	sec

Do not modify these values.

Once all of the configuration parameters haves been selected the configuration must be written to the ECU by clicking the 'Write Config' button. Alternatively a configuration can be read from an ECU by clicking the 'Read Config' button.



6 Sensor Simulation

The sensor simulation mode can be used to simulate the system's operation on the bench without the need for wheel sensors to be present.

The Appendix contains further information on the operation of the simulation mode.

If you need to activate the sensor simulation features then please contact BERU f1systems.

e Set	ttings													
out	Assign Sensors	Modify P	ermit	List Up	date	Permit List P	osition Sensor	Live Update	Errors Cor	nfiguration	Simulation] Bootload	er NV Se	n
Simula	ated sensors													
Index	Serial number	Active		Mode		TimeTx [sec]	TimeSim [sec]	Press [mBar]	Temp [°⊂]	RSL [%]	Channel	TxMode	Sensor G	en
0	0	OFF	-	Static	-	0	0	0	0	0	1 💌	0 🖵	gen12	•
1	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 🗸	gen12	-
2	0	OFF	-	Static	•	0	0	0	0	0	1 💌	0 🔻	gen12	-
3	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 🔻	gen12	•
4	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 💌	gen12	•
5	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 💌	gen12	•
6	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 💌	gen12	•
7	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 💌	gen12	•
8	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 💌	gen12	•
9	0	OFF	•	Static	•	0	0	0	0	0	1 💌	0 💌	gen12	-
Contr	rol		ctiva	tion							51			
	Start simulation		Acti	vate all s	ensoi	's						Read ser	nsors	
							BERU				_			
9	Stop simulation		Dis	able all se	ensor	5			·1 5Y5'			Write Sei	nsors	
itus: I	(dle				1		Pressur	e: Gauge	Units: °C	/Bar S	ystem: Com	ms Closed	866	Ú I



7 Bootloader

The bootloader page is used to update the ECU firmware. This is a very rare occurrence and will normally only need to be used during the development phase of a project when a customer requires specific changes to the systems operation. All of the ECU reprogramming is performed over the RS232 link, which must remain connected whilst bootloading is in progress.

BERU F1 Systems: Truck Tyre Configuration Utility V2.08
Settings
out Assign Sensors Modify Permit List Update Permit List Position Sensor Live Update Errors Configuration Simulation Bootloader NV Set. 💶
BERU F1 SYSTEMS
BERU F1 Systems Bootloader
Version 1.0
Release Date: 28/10/2003
Copyright (C) 2006 BERU F1 Systems
Update Firmware
Programming Status
tus: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed

With an ECU connected click the 'Update Firmware' button to start the bootloading process. You will be prompted to select the file to be programmed into the ECU. From this point on the process is automatic.



8 Terminal Page

The 'Terminal Page' is used to communicate directly with the ECU. Occasionally you may be asked by BERU f1systems engineers to enter commands into this page.

All key presses are echoed on the terminal screen as they are typed.

It is essential that all commands be entered using the specified mixture of upper and lower case.

Typing 'Help' or '?' Followed by pressing enter will display a list of all of the available commands.

Further information on the commands is available in the Appendix

BERU F1 Systems: Truck Tyre Configuration Utility V2.08	- 🗆 ×
File Settings	
Update Permit List Position Sensor Live Update Errors Configuration Simulation Bootloader NV Setup Create Permit List Terminal	• •
Clear Terminal Login	
Status: Idle Pressure: Gauge Units: °C / Bar System: Comms Closed	BERU
File:	



8.1.1 Simulation Mode

Features to simulate the RF data have been included in the firmware. This is when real sensor data is bypassed and the receiver collects data directly from the simulated sensor buffer. The Commercial Vehicle TPMS ECU allows the simulation of up to 10 different sensors and stores data in the same format as a real sensor.

In the Truck Tyre software three different simulation modes are implemented:

- 1. mode 0 values of data are not changed
- 2. mode 1 raw data are incremented every time when the sensor simulation time elapses
- 3. mode 2 raw data are decremented every time when the sensor simulation time elapses

Note: The active simulation mode of the sensors in the simulation is changed using the 'simadd' command, see page 12.

Data scaling

All of the data transmitted on the J-1939 bus are scaled as below:

Tyre pressure

Resolution: 40 mBar/bit gain, 0 mBar offset Data range: 0 - 10.2 Bar

Tyre temperature

Resolution: 0.03125 °C/bit gain, -273 °C offset Data range: -40 °C to 127 °C

Remaining Sensor Life in %

(0.4% per bit, 0 to 100%)



9 Message format Extended CAN identifier format

9.1.1.1.1		rior	ity		PC	PGN (Parameter Group Number)									r)	Source address												
9.1.1.1.1	28	27	26	25	24 2	23 2	221	20	19	18	17	16 ⁻	15 1	14 1	13	12 1	11 1	10	9	8	7	6	5	4	3	2	1	0

10 Data format

Byte position	No of bytes	Description
1-4	4	Sensor ID (LSB is send first)
5	1	Tire pressure
6-7	2	Tire temperature (LSB is send first)
8	1	Remaining sensor life in %





11 System Start-up:

When power is supplied to the ECU a sign-on message and the 'User>' prompt will be displayed.

When the 'User>' prompt is displayed, the amount of features which can be accessed from the terminal are restricted, this is to prevent the accidental modification of critical system parameters.

I'm alive...

Starting application...

EEPROM NV data is valid...

Copying EEPROM NV data to RAM: Ok

Error description table is valid...

CParam Table is valid and version is correct...

MC9S12DP256 TPMS ECU Application Copyright 2002-2006 BERU F1 Systems : TruckTPMS.h12 Program Part No. : F1-37-4767 Version : 01.00 PC Compat : 002 Permit Size : 450 : 12-Jan-2006 Date : 12-Jan-2006 : Sonic/Damian Author Serial No. : 000 : @ : 020801 Revision Date code Cust code : 000 : 480 Age Power-ups : 77 Initialising Variables... Initialising Ports... Initialising ADC subsystem... Initialising SPI subsystem... DAC Initialised Initialiaing CAN... Computed mask: 0101000000 Initialiaing J1939... Initialiaing LIN... Initialising OS... Initialising Tasks... Initialising Daughter Board... None Watchdog enabled...

USER>



12 User Mode Commands:

In the 'User>' mode the following commands are available:

The following commands are available:

?		This help screen
?e		List error descriptions
help		Do you really need to ask
setnom	:	Set nominal pressures
clrnom	:	Clear nominal pressures
check	:	Check sensor positions, learn if required
learn	:	Learn sensor positions
unlearn	:	Clear learnt sensor positions
can rx [0-1]	:	Display received CAN messages
can tx [0-1]	:	Display transmit CAN messages
lin rx [0-3]	:	Display received LIN messages
ping [fl-rr][all]	:	Send a lf-0 command
autoping [fl-rr][all]	:	Repeat send a lf-0 command
autoping [off]	:	Stops Autopinging
sdata	:	Display sensor data values
cdata	:	Display CAN data values
last [1-10]	:	Display last sensor rx buffer values
live	:	Display live sensor rx buffer values
adcs0	:	Display ADCO values
adcs1	:	Display ADC1 values
diags		Display internal volts and temps
minmax	:	Display volts and temps min/max
errors	:	Display error log
alarms	:	Display alarm status
ver	:	Software version info
testmode [0-8]	:	Request test mode to be set
list all	:	List all permitted sensors
list learnt	:	List learnt sensors
allow [serno]	:	Allow a sensor
block [serno]	:	Block a sensor
allow all	:	Allow all sensors
block all	:	Block all sensors
pos [serno][pos][set]	:	Position a sensor via permit list
assign[serno][pos]		Position a sensor via learnt list

Useful Command Descriptions

last [1-10]

Enter a value at the end of this command e.g. 5 to show the last 5 received sensor datagrams.

live

Enables a cyclic update of the current received sensor, press escape to exit.

testmode

Testmode followed by enter will display a list of all of the possible testmodes.

testmode [0-10]

Entering 'testmode followed by a number will activate a specific test mode, this will remain active until the power is cycled or the command 'testmode 0' is entered.



testmode 7

Testmode 7 will initiate the ECU to display on the terminal the current information being received by the antennas, this will indicate the serial number of the sensor received and also the antenna on which is has been received.

testmode 10

.

Testmode 10 will initiate the ECU to display on the terminal screen the current information being collected / updated / deleted to and from the active sensors list, this will display the serial number of a sensor which is added / updated / received in the active sensors list



BERU Prompt

To access all of the systems parameters the operator needs to login, this is achieved in this version of software by typing 'login' followed by enter. The prompt should then change to 'BERU>'.

In the final releases of the software access to the 'BERU>' login will be restricted with a password system that is disabled during the development phases of the project.

BERU> ?

The following commands are available:

<pre>lin rx [0-3] ping [fl-rr][all] autoping [fl-rr][all] autoping [off] sdata cdata last [1-10] live adcs0 adcs1 diags minmax errors alarms</pre>	<pre>: This help screen : List error descriptions : Do you really need to ask : Set nominal pressures : Clear nominal pressures : Check sensor positions, learn if required : Learn sensor positions : Clear learnt sensor positions : Display received CAN messages : Display transmit CAN messages : Display transmit CAN messages : Display received LIN messages : Send a lf-0 command : Repeat send a lf-0 command : Stops Autopinging : Display sensor data values : Display sensor data values : Display last sensor rx buffer values : Display live sensor rx buffer values : Display ADCO values : Display ADCO values : Display internal volts and temps : Display volts and temps min/max : Display error log : Display alarm status : Software version info</pre>
ver	: Soltware version into
testmode [0-10]	: Request test mode to be set
<pre>block [serno] allow all block all pos [serno][pos][set] assign [serno][pos] list details add [serno] del [serno] del all</pre>	<pre>: List all permitted sensors : List learnt sensors : Allow a sensor : Block a sensor : Allow all sensors : Block all sensors : Position a sensor via permit list : Position a sensor via learnt list : List details of permit list : Add a sensor to the permit list : Delete a sensor from the permit list : Delete all sensors from the permit list</pre>
debug [on off]	: Debug mode control
loads	: Processor loading
dacall [0-5000] hsdset [0-255] poff [mbar] toff [°C]	<pre>: Set DAC test output (tm = 2) : Set all DAC test output (tm = 2) : Set HSD (PortA) output (tm = 3) : Offset pressure (tm = 5) : Offset temperature (tm = 5) : Offset car speed (tm = 5) : Offset ambient temperature (tm = 5)</pre>
cpdisp	: Display CPARAMs
cpedit	: Single line edit of CPARAM
cpdefault	: Force use of default CPARAMs
adcOgain [gain]	: Set ADC0 gain (10000 = 1) in NV
adc1gain [gain]	: Set ADC1 gain (10000 = 1) in NV
dacOgain [gain]	: Set DAC0 gain (10000 = 1) in NV
getgains	: Display DAC and ADC gains in NV
baudrate [1-6]	: 1:4800 2:9600 3:19200 4:38400 5:57600 6:115200
RD096 071112	

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BERU

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serialno hwrev datemade custno clrons clrhrs clrerr mmdefault eedefault	: Set Serial Number in NV : Set Hardware Revision in NV : Set Date of Manufacture in NV : Set Customer ID Number in NV : Clear Power-up counter in NV : Clear Life time in NV : Clear error list in NV : Reset min max diag values : Force use of default NV Data	
simactive [serno] simactive [[index]] siminactive [serno]	<pre>: Display active sensor list : Delete sensor from the active list by serial number : Delete sensor from the active list by index : Start active sensors simulation : Stop active sensors simulation : Display simulated sensor list : Force use of default simulated data : Delete sensor from the simulated list by serial numb : Delete sensor from the simulated list by index : Allow simulated sensor by serial number : Allow simulated sensor by index : Block simulated sensor by serial number : Block simulated sensors by index : Allow all simulated sensors : Block all simulated sensors : Add sensor to the simulated list (11 parameters)</pre>	er

assign [serno] [pos]

Using this command a wheel sensor can be assigned to a particular position on the vehicle (FL, FR, RL, RR). When data is received for an assigned sensor it can be viewed with the 'sdata' command or viewed on the 'Live page' of the digityre software.

E.g: 'Assign 12345 fl' will assign sensor serial no 12345 to the fl channel.

sdata – sensor data

The 'sdata' command will display the current assigned sensor data.

asdisp

Display the list of active sensors

asdel [serno]

Manually delete an active sensor from the active sensor list – requires a serial number to be entered.

asdel [idx]

Manually delete an active sensor from the active sensor list - requires the index to be entered

simstart

Start the active sensor simulation, this will automatically output the simulated sensor information on the J1939 bus and automatically modify the sensor values.

simstop

Halt a currently running sensor simulation.

simdefault

Force the ECU to enter the default simulation values into the simulation table.

simdel [serno]

Delete a sensor from the simulation table – requires a serial number to be entered.

simdel [index]

Delete a sensor from the simulation table – requires the sensor index to be entered.

simactive [serno]

RD096 071112



Enable a sensor in the simulation table, allowing its data to be used and output on the J1939 bus.

siminactive [serno]

Stop a simulated sensors information from being used and output on the J1939 bus. **simactive all** Enable all of the sensors in the simulation table.

Enable all of the sensors in the simulation tab

siminactive all

Disable all of the sensors in the simulation table.

simadd [][][][][][][]: Add sensor to the simulated list, order of params as below [serno][active][simmode][tTx][tSim][P][T][RSL][ch][txmode][sensortype]

This command allows the user to enter specific sensor parameters into the simulation table. A sensor can only be added to the table if there is a space available in the list. If the list already contains the maximum of 10 sensors then a sensor must be removed with the 'simdel' command before a new sensor can be added.

All of the information in the command needs to be entered. The new sensor will then be included in the sensor in the simulation table. Alternatively the parameters of a sensor already in the list can be modified by using the serial number of a sensor already in the list, in the command.

[ser no] – serial number [0 – 4294967295]
[active] – sensor is active or inactive [on / off]
[simmode] – simulation mode [0-2]
[tTx] period of data transmission in sec [0-255]
[tsim] – period of data simulation in sec [0-255]
[p] - pressure in mBar [0-14000]
[t] – temperature in °C [-40 to 127]
[RSL] – percentage of remaining sensor life [0-100]
[ch] – antenna channel that receives the data [0-3]
[Txmode] – sensor transmission mode [0-3] this parameter is for future expansion but is still required to be entered.
[sensortype] – for Commercial Vehicle enter [GEN2T]

e.a.

simadd 123 on 2 255 255 5000 25 100 0 0 gen2t

800 800

flsystems

BERU

13 C-Parameters (cpdisp – C-parameter display)

All of the major functions of the ECU are controlled by a set of 'C-parameters'. These parameters contain the values of all of the major system functions including CAN id's, bus speeds, alarm limits and scalings. These values are stored in a non-volatile area of memory in the ECU and all changes will be remembered when the ECU is power cycled. . Care must be taken when modifying any of the C-parameter values, as it is possible to completely disable the ECU if the wrong values are entered.

If you need to return the ECU to the factory default C-parameter settings then the command: `cpdefault' will return all values to their factory settings.

Not all of the C-parameter values are relevant to the Commercial Vehicle TPMS and we have only detailed those that may need to be modified during the development phase.

Typing 'cpdisp' followed by enter will display a list of all of the internal system parameters.

BERU> cpdisp

RD096 071112

Watchdog	L	1								
Password	L	0								
Serial_tx_mode	R	0								
Permit_any_sensor	L	1								
Locate_mode	L	6								
Lock_when_moving	L	0								
Moving_speed	L	30								
Moving_by_sensor	L	1								
Moving_sensors	L	1								
Auto_set_nominal	L	0								
Auto_check_moving	L	0								
Stationary_time	L	30								
Moving_time	L	50								
No_of_wheels	R	4								
Reference_temp	L	25								
Reference_pres	L	1000								
LED_mode	L	3								
LED_single_warn	L	0								
Lamp_test_dur	L	10								
Fault_flash_dur	L	255								
Response_wait_dur	L	50								
Mode2_wait_dur	L	50								
Antenna_mode	L	15								
Ping_retries_max	L	5								
Ser_match_retries	L	2								
Ser_learn_counts	L	2								
Ser_learn_retries	L	5								
Multipath_rx	L	1								
Multipath_filter	L	1								
Multipath_timeout	L	800								
Allow_21	L	1								
Ping_code	L	64								
Ping_pwr_del	L	4								
Ping_pwr_dur	L	8								
Stat_ping_rate	L	0								
Allow_mode2_check	L	1								
DeltaP_latch	L	0								
OverPres_latch	L	0								
Pres_detect_mode	L	1								
Pres_output_mode	L	0								
Rx_timeout	L	120								
	L	6375								
Speed_hysteresis	L	10								
Lamp_hold_time	L	0								
Lamp_hold_spd_max	L	350								
LH_spd_max_hyster		1								
Abs_pres_max	L	6000								
Abs_pres_min	L	800								
DeltaP_lim	L	200								
Soft_warn_map	L	800	800	800	800	800	800	800	800	800
SOLL_WALII IIIAP										

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Speed_map	L	0 125	50	100	150	200	250	300	350	400	450	
Temp_max_on Temp_max_off	L L	125										
RBL_min	L	2										
Test_mode	L	0										
CAN_temp_scale	L	1										
CAN_pres_scale	L	1										
Ext_CAN_port	R	0										
Ext_CAN_rate	R	0	3									
CAN_rx_timeout	R	1100										
Ext_CAN_ID_tx_1	R	513	514	515	516	517	518					
Ext_CAN_ID_tx_2	R	519	520	521	522	523	524	525	526	527		
Ext_CAN_rx_Speed	R	640	0	0	2	255	65535					
Ext_CAN_rx_TAmb	R	640	1	0	1	255	65535					
Ext_CAN_rx_APres	R	640	2	133	30	255	65535					
Ext_CAN_rx_NomSet	R	640	3	0	1	255	65535					
Ext_CAN_rx_WrnAck		640	4	0	1	255	65535					
Ext_CAN_rx_DashID		641										
VBat_max		18000										
VBat_min	L	9000										
VRef_max	L	5200										
VRef_min	L	4500										
Vdd_max	L	5200										
Vdd_min	L	4500										
VLin_max		17000										
VLin_min		11500										
Temp_PSU_max	L	100										
Temp_PCB_max	L	100 65310										
J1939_PGN_LW	R R	00000										
J1939_PGN_HB J1939_Address	R	51										
J1939_Address J1939_Priority	R	6										
Sensor_timeout	R	140										
GEN12_RBL_max	R	90										
GEN12_RBL_max	R	90										
GEN2T_RBL_max	R	60										
Recognise sensor	R	0										
SE_mode	L	0										
-												

BERU>



13.1 C-Parameter Editing

There are two types of C-parameter: single value and multiple values, these are modified as follows:

NOTE: The 'BERU>' prompt must be displayed indicating that the user is logged into the parameter editing features of the ECU.

Single Value parameters:

Type 'cpedit' followed by enter. (or press CTRL and 'E' together)

XXXXXX will now be displayed on the screen as the prompt.

Type in the name of the single value cparameter (including underscores) followed by a space and the new parameter value:

e.g. 'SE_mode 1' followed by enter will change the value of SE_mode to 1.

Type 'cpdisp' followed by enter to confirm that the parameter value has changed.

Multiple Value parameters:

A multiple value C-parameter is:

Ext_CAN_ID_tx_1 R 513 514 515 516 517 518

It contains 6 elements (513, 514, 515, 516, 517, 518)

Element 513 is in position 0, 514 is in position 1, 515 is in position 2 etc.

To modify these values Type 'cpedit' followed by enter. (or press CTRL and 'E' together)

XXXXXX will now be displayed on the screen as the prompt.

Type in the full name of the C-parameter (including underscores) followed by a space and then an open square bracket '[' then add the position of the parameter (the first position is read as 0) followed by another square bracket, a space and then the new value.

e.g. 'Ext_CAN_ID_tx_1 [2] 555 will change the element 515 to a value of 555

Type 'cpdisp' followed by enter to confirm that the parameter value has changed.

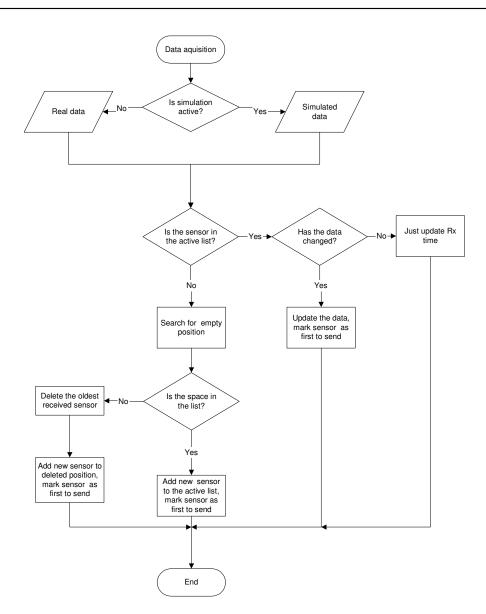


14 Software Engineer Mode Setting the C-parameter SE_mode to 1 activates software engineer mode.

This mode is useful for software developers as it displays additional diagnostic information for all commands. E.g. sensor serial numbers are displayed in hex format and raw sensor data is displayed.

Truck TPMS release 1.0 Embedded Code Data aquisition flow diagram

Damian Lemke - 11 January 2006

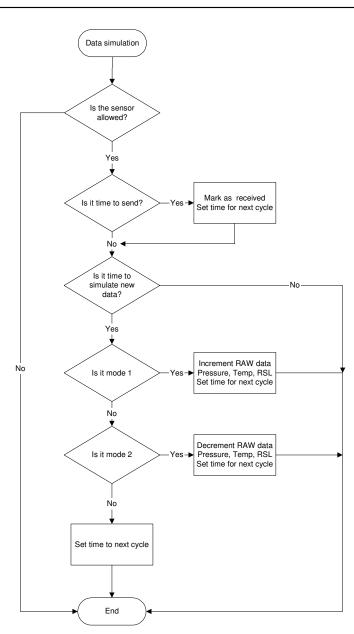


Note Active test mode 10 shows a lot of diagnostic information. Active SE_mode (cparam SE_mode = 1) shows additional information (eg. raw data, hex value of the serial number, time, etc.).

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Truck TPMS release 1.0 Sensor simulation flow diagram (for single sensor) Damian Lemke - 11 January 2006



Note Active test mode 10 and SE_mode (cparam SE_mode = 1) shows a lot of diagnostic information.

Page 1

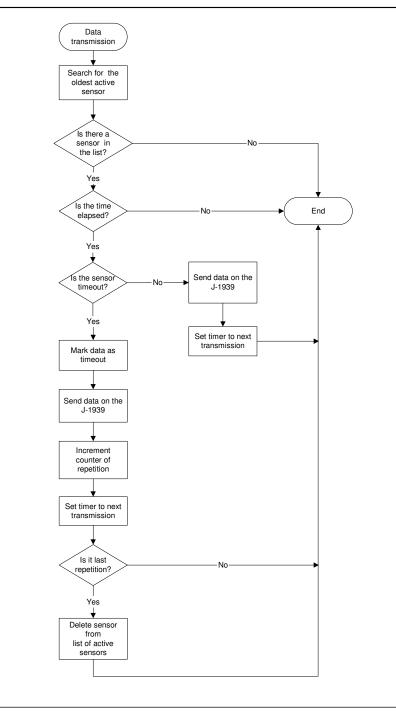


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Truck TPMS release 1.0 Data transmission flow diagram

Damian Lemke - 11 January 2006



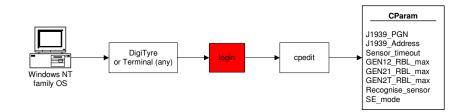


Truck TPMS release 1.0 System configuration Damian Lemke - 02 July 2007

New CParam

Parameter	Description				
J1939_PGN_LW	Parameter Group Number low word (16-bit value) PDU Format + Group Extension				
J1939_PGN_HB	Parameter Group Number high byte (8-bit value) Data Page Bit				
J1939_Priority	This 3-bit value is used to define the priority during arbitration (0 is the highest priority)				
J1939_Address	Address which is send on the J-1939 bus				
Sensor_timeout	Timeout for the sensor for received data				
GEN12_RBL_max	The greatest value of Percentage Sensor Life (this value correspond to 100% RBL) for GEN 1.2 sensor				
GEN21_RBL_max	The greatest value of Percentage Sensor Life (this value correspond to 100% RBL) for GEN 2.1 sensor				
GEN2T_RBL_max	The greatest value of Percentage Sensor Life (this value correspond to 100% RBL) for GEN 2T sensor This is value for truck sensor.				
Recognise_sensor	If value equals 1 ECU recognise sensor generation (serial number is used for generation recognition) If value equals 0 all data are handle as GEN2T truck sensors (this value should be used)				
SE_mode	Mode for software engineers only, shows additional data if test mode exists (eg. RAW data, serial numbers as HEX values, etc.) SE_mode = $0 - SE$ mode is inactive (this is recommended value) SE_mode = $1 - SE$ mode is active (it should be used by software developers only)				

Flow diagram for Truck TPMS configuration

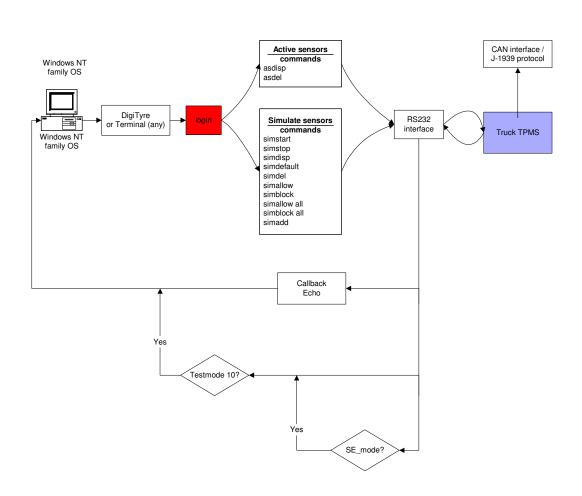


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Truck TPMS release 1.0 Debugging System architecture - flow diagram

Damian Lemke - 02 July 2007



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		Simulated sen	sor list		
simstart	Start simulation of active sensors				
simstop	Stop simulation of active sensors				
simdisp	Display the list of simulated sensors				
simdefault	Force use of default simulated data				
simdel	Delete the sensor from the list of	Serial number	0	4292967295	Serial nubmber of the simulated sensor to delete
	simulated sensors	[Index]	0	9	Index of the sensor to delete in the simulated sensors
simactive	Allow simulation of the sensor	Serial number / index	0	4292967295	Serial number of the simulated sensor to allow
	Allow simulation of the sensor	[Index]	0	9	Index of the sensor to delete in the simulated sensors
siminactive	Block simulation of the sensor	Serial number / index	0	4292967295	Serial number of the simulated sensor to block
siminactive		[Index]	0	9	Index of the sensor to delete in the simulated sensors
simactive all	Allow simulation of all sensors				
siminactive all	Block simulation of all sensors				
simadd		Serial No / index			Serial number
		Active	-	OFF ON	Enable/disable simulation of the sensor
		SimMode	0	2	mode 0 - data are not changed mode 1 - raw data are incremented at every simulatio mode 2 - raw data are decremented at ever simulatio
		tTx	0	255	How often data should be send expressed as sec
	parameters are correct)	tSim	0	255	How often new data should be simulated expressed a
		Pressure	0	depend on the sensor type	Value of the pressure expressed as mBar Max value for: GEN12 - 6375 GEN21 - 4630 GEN2T - 14000
		Temperature	-40	127	Temperature expresses as deg C
		RSL	0	100	Percentages Remain Sensor Life expressed
		Channel	0	3	Number of simulated channel (which antenna receive data)
		Tx mode	0	3	
		Sensor	GEN12 GEN21 GEN2T		Type of simulated sensor. It is important because, re data are scaled to raw values of selected sensor.

Testmode 10 enable diagnostic informations send by RS232 (data are scaled to real values, decimal format) SE_mode enable additional diagnostic informations (eg. RAW data, timers, serial number as hexadecimal value etc.)

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System debugging commands Damian Lemke - 02 July 2007

Truck TPMS release 1.0

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