

PEAK System: PCAN-View

ATI F/T CAN Bus for NETCANOEM Guide



December 13, 2019
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OVERVIEW

This guide covers how to use PCAN View (PEAK-System CAN Viewer) to communicate with the ATI CAN BUS interface of a 9105-NETCANOEM board.

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SYSTEM COMPONENTS

ATI Components

9105-NETCANOEM

PEAK System Components

The hardware used to generate the screenshots in this guide was the PCAN-USB from PEAK System. The link to the device used is below:

<https://www.peak-system.com/PCAN-USB.199.0.html?&L=1>




Note: There may be other compatible devices that also work.

The driver for this adaptor can be found at the same link under *Downloads*.

Downloads

Device driver setup for Windows

 Download

PEAK-System installation package for device drivers and tools for Windows® 10, 8.1, 7 (32/64-bit) for our PC interfaces.

Included tools: PEAK-CPL, PCAN-View, PLIN-View Pro, and Virtual PCAN-Gateway

Software

The software tested was PCAN VIEW:

<https://www.peak-system.com/PCAN-View.242.0.html>

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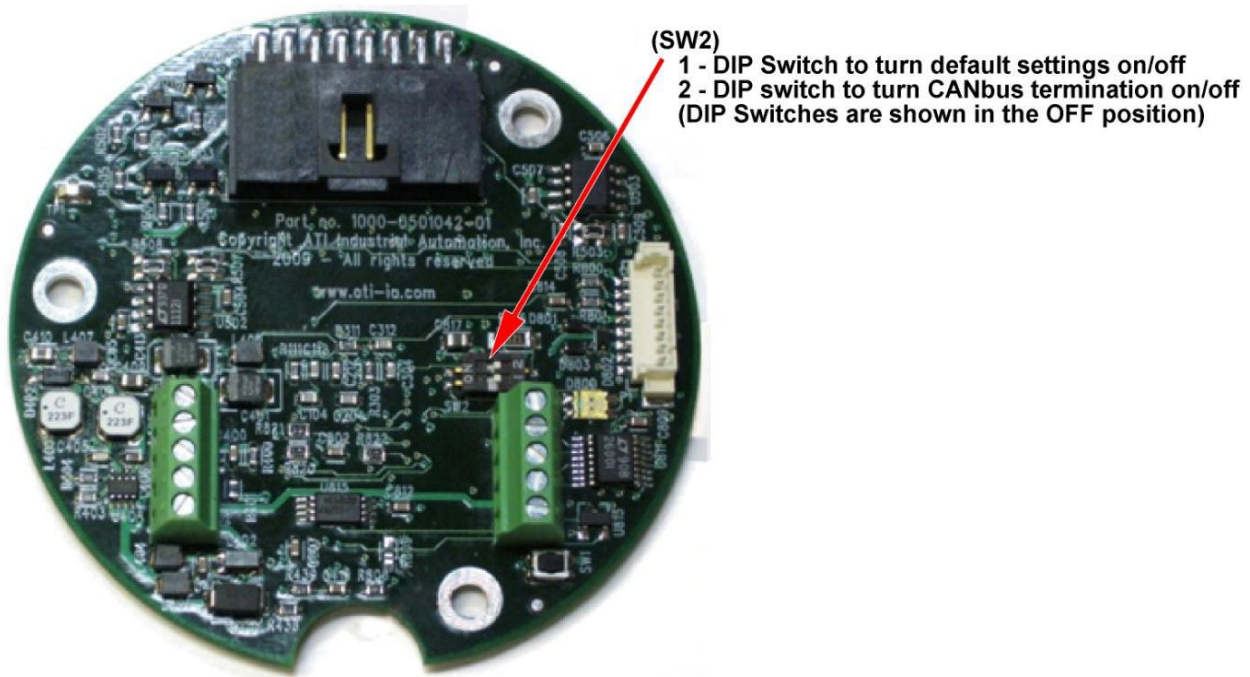
SYSTEM CONFIGURATION

Please review the 9105-NETCANOEM manual for the information required to wire and power the OEM board. The 9105-NETCANOEM manual can be found at the following link:
https://www.ati-ia.com/app_content/documents/9610-05-1030.pdf

The NETCANOEM board can be powered with a DC voltage between 12V and 24V.

Configure ATI Hardware

On the NETCANOEM board, there are 2 DIP switches for SW2:
Set DIP switch One to On -> Default settings
Set DIP switch Two to On -> Termination Resistor ON



For reference, the Default settings are below:

Bit rate = 250 kBit/s
Address (hex) = 20

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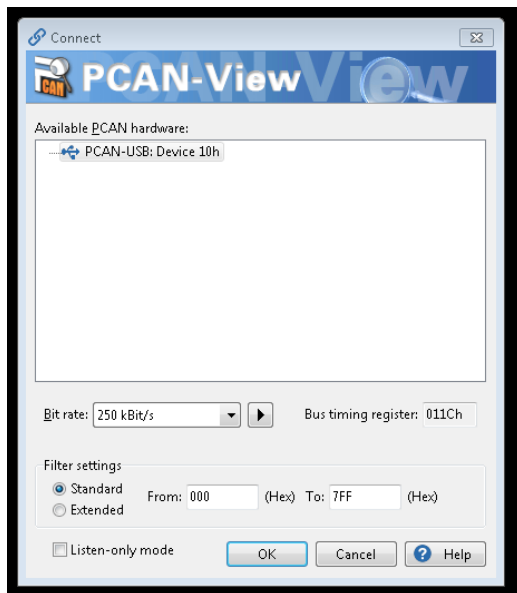
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Configure PCAN VIEW

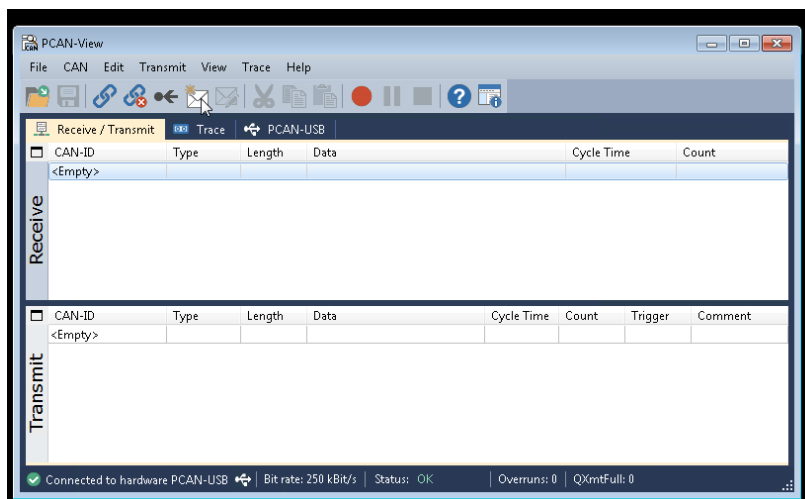
In the *Connect* window, set the Bit rate to 250 kBit/s and click *OK*.



USING PCAN TO COMMUNICATE WITH THE SENSOR

Send a Message

Click on the envelope icon to create a new message.



After a new message is created, it will show up under *Transmit*. To send the message, double-click on the *CAN-ID* of the message to send it.

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UNDERSTANDING THE SENSOR DATA

Request Sensor Data

Use the following message to request one sample of data from the sensor.

The screenshot shows the 'New Transmit Message' dialog box. The 'ID: (hex)' field contains '200'. The 'Length' dropdown is set to '0'. The 'Cycle Time' is '0 ms'. The 'Paused' checkbox is unchecked. In the 'Message Type' section, the 'Remote Request' checkbox is checked, while 'Extended Frame' is unchecked. The 'Comment' field is empty. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

In order to stream the data continuously from the sensor, set the *Cycle Time*. This will put the command in a loop every xxx ms. In the following picture, the *Cycle Time* was set to 100 ms which will request sensor data every tenth of a second.

This screenshot is identical to the previous one, except the 'Cycle Time' field is now set to '100 ms'. All other settings (ID: 200, Length: 0, Remote Request checked) remain the same.

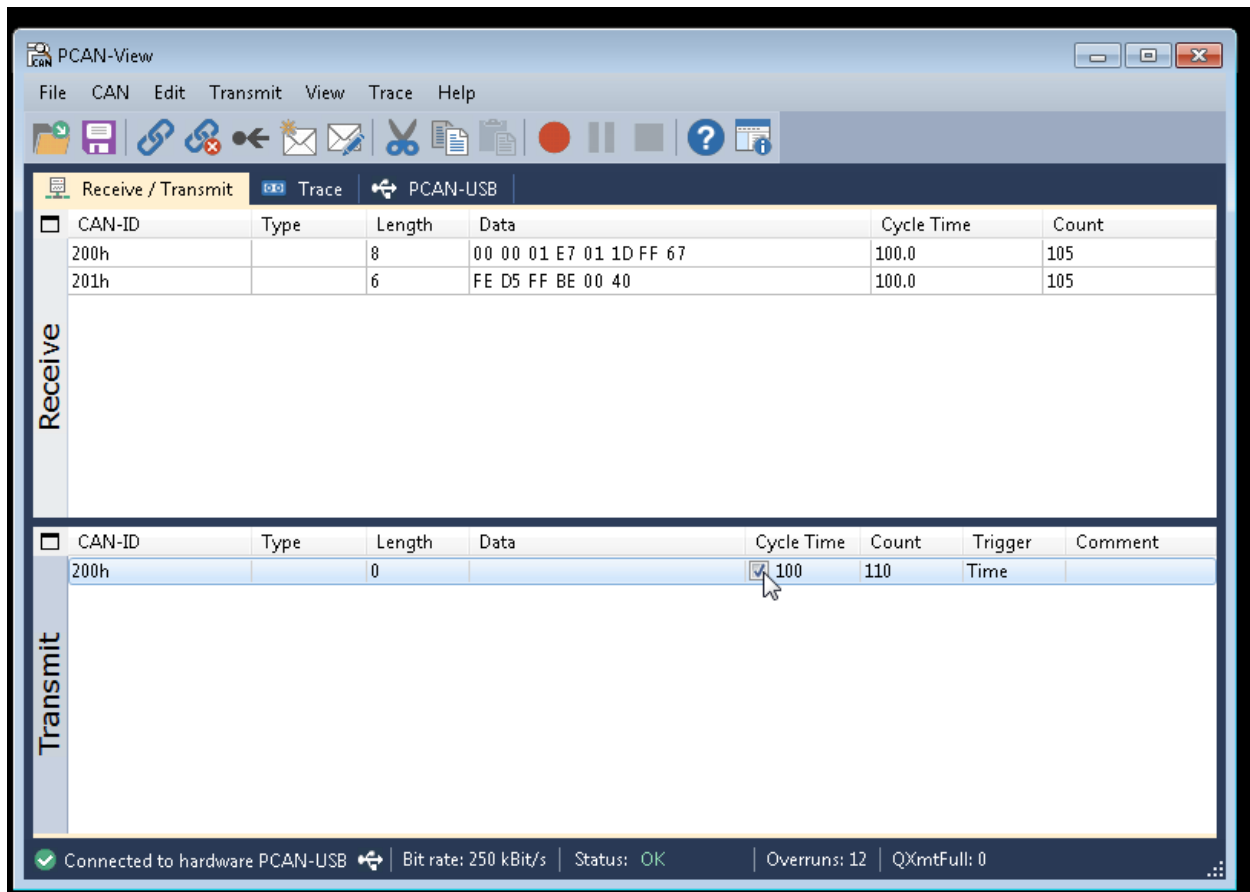
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The sensor will return two data packets, one with CAN-ID 0x200 and one with 0x201.



To stream the data, click the check box under *Cycle Time* as shown in previous picture.

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Status Word

The first 2 bytes of CAN-ID 0x200 shown below are the Status Word.

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

This 00 00 indicates a healthy sensor with no status bits shown. If this is not 00 00, we recommend reviewing the *NETCANOEM Status Register* table in the NETCANOEM manual to confirm the meaning of the status bit.

Below is a link to the NETCANOEM Manual:

https://www.ati-ia.com/app_content/documents/9610-05-1030.pdf

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Strain Gage Measurement

Similarly, the strain gage readings are returned when sensor data is requested. The values for SG0, SG2, and SG4 are returned in the packet for CAN-ID 0x200. The values for SG1, SG3, and SG5 are returned in the packet for CAN-ID 0x201.

SG0

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

SG2

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

SG4

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

SG1

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

SG3

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

SG5

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

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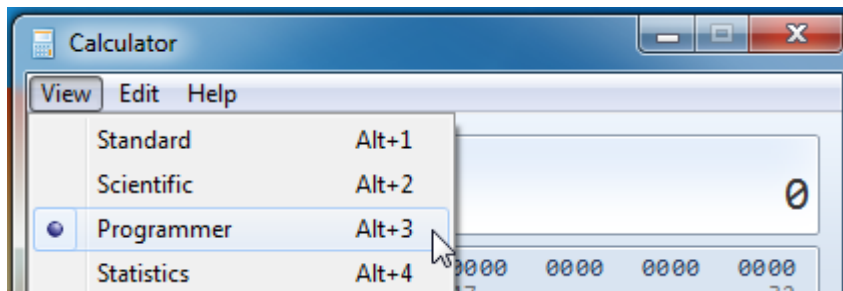


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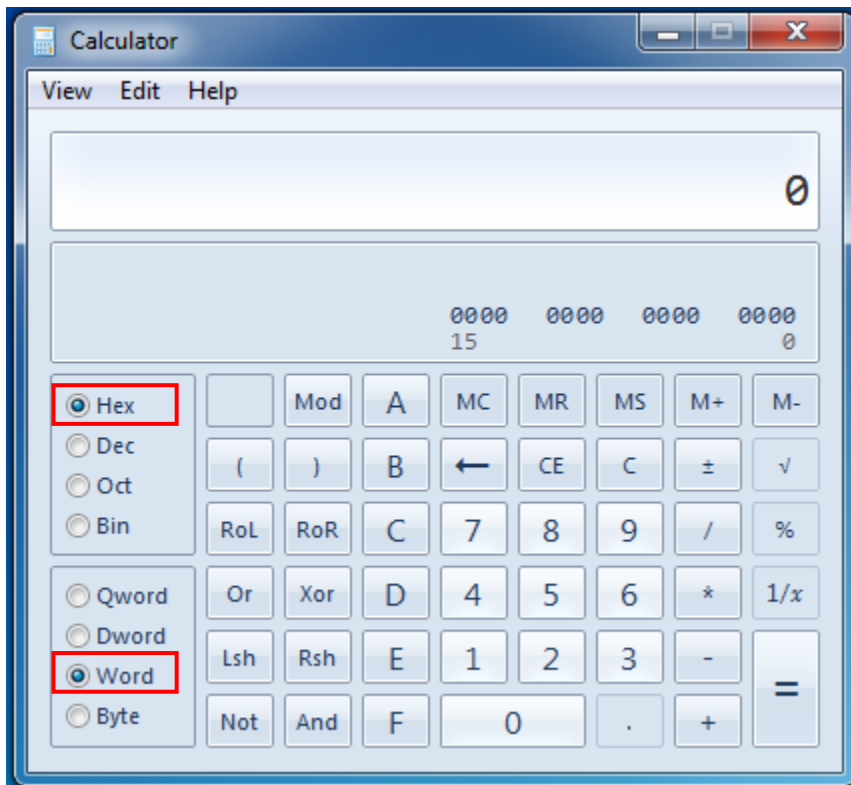
Decoding the Status Word

The Status Word is provided in Hex format. For Microsoft Calculator to convert these correctly, *Word* must be selected. The example below shows how to see which bits the word 0x01E7 corresponds to. If you are using Windows 10, please review the section *Comments About the Windows 10 Calculator* before proceeding.

In the calculator under *View*, select *Programmer*.



Select *Hex* and *Word* as shown below.



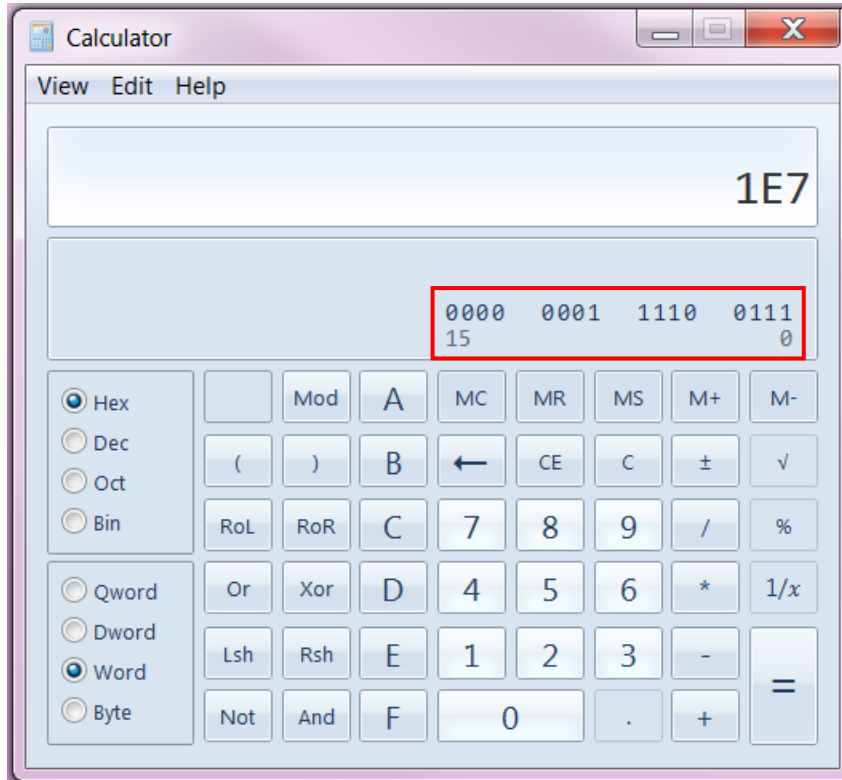
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Type in the Hex value that you wish to decode. For the example, we are decoding 0x01E7 from Hex to Binary. The Binary bits are shown below.



This shows that 0x01E7 = 0000 0001 1110 0111

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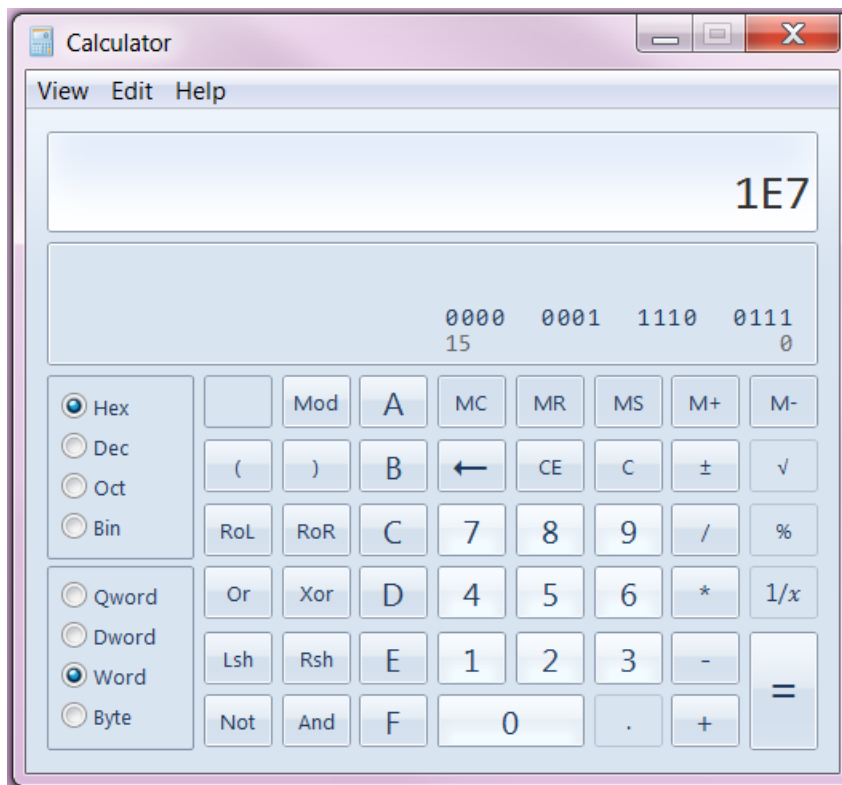
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Decoding Gage Values from Hex to Counts

The gage counts are provided in signed bytes (two's complement). For Microsoft Calculator to convert these correctly, *Word* must be selected. The example below shows how to convert the word 0x01E7 from Hex to counts. If you are using Windows 10, please review the section *Comments About the Windows 10 Calculator* before proceeding.

In the calculator select *Programmer*, then select *Hex* and *Word*. Type in the HEX that you wish to convert to counts.



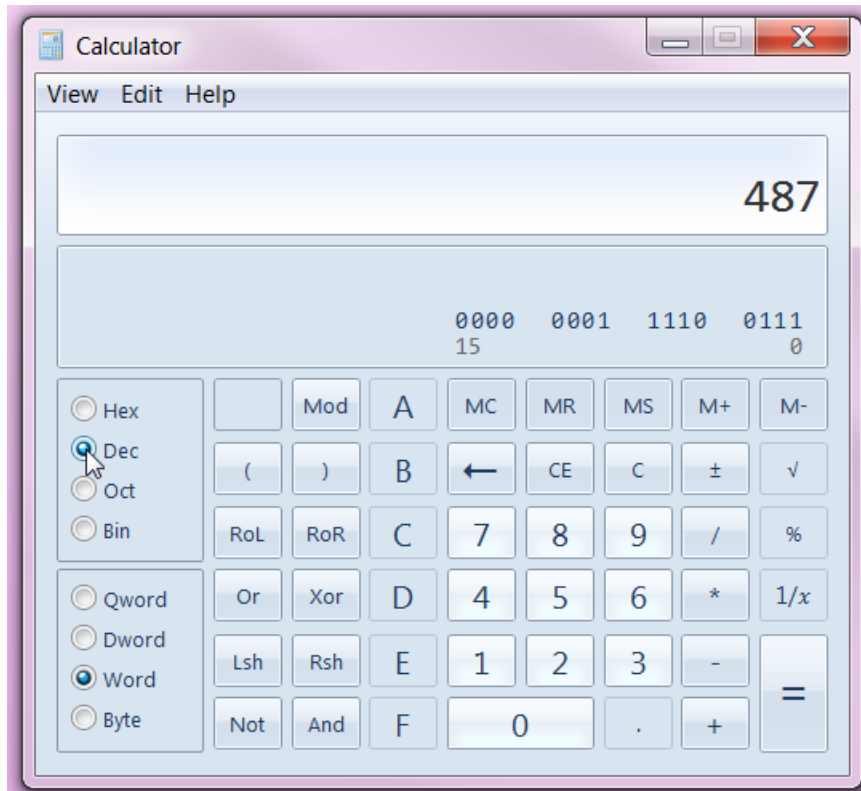
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Now click on *Dec* to convert to decimal format.



This shows that $0x01E7 = 0000\ 0001\ 1110\ 0111 = 487$ counts (or a signed integer value of +487).

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HOW TO READ MATRIX COEFFICIENTS

To read the coefficients for Fx of the currently selected calibration, send a message to CAN-ID of 0x202 with a *Length* of 1(one data byte) containing the *Data* value of 00.

Dialog box: Edit Transmit Message

ID: (hex) 202 Length: 1 Data: (hex) 00

Cycle Time: 0 ms

☐ Paused

Message Type:
☐ Extended Frame
☐ Remote Request

Comment: Read Matrix Fx

Buttons: OK, Cancel, Help

This will return 3 packets of data from 0x203, 0x204, and 0x205 as shown below.

PCAN-View

File CAN Edit Transmit View Trace Window Help

Receive / Transmit Trace PCAN-USB

CAN-ID	Type	Length	Data	Cycle Time	Count
200h		8	00 00 FF 62 00 03 FD 15	951.9	3
201h		6	01 40 F9 36 FD 39	952.0	3
202h		8	BE A0 75 C1 C0 84 A3 D0	94801.5	4
203h		8	C2 22 7A C9 45 68 04 40	94801.5	4
204h		8	42 A3 00 A2 C5 6C 15 26	94801.5	4

CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
200h		0		500	3	Manual	Request Data
202h		1	00	Wait	2	Manual	Read Matrix Fx

Connected to hardware PCAN-USB Bit rate: 250 kBit/s Status: OK Overruns: 0 QXmtFull: 0

Note: To send the message, under *Transmit* double click on the *CAN-ID* of the message you wish to send.

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To read the coefficients for Fy, send a message to CAN-ID of 0x202 with a *Length* of 1(one data byte) containing the *Data* value of 01.

Edit Transmit Message

ID: (hex) Length: Data: (hex)

Cycle Time: ms

☐ Paused

Message Type

☐ Extended Frame

☐ Remote Request

Comment:

Notice that the values returned under 0x202, 0x203, and 0x204 are now updated. These correspond to Fy.

PCAN-View

File CAN Edit Transmit View Trace Window Help

Receive / Transmit Trace PCAN-USB

	CAN-ID	Type	Length	Data	Cycle Time	Count
Receive	200h		8	00 00 FF 62 00 03 FD 15	951.9	3
	201h		6	01 40 F9 36 FD 39	952.0	3
	202h		8	42 E7 94 F2 C5 89 65 CB	1175.9	7
	203h		8	C1 AA E7 D8 45 06 2A 82	1175.9	7
	204h		8	C2 BF AE 17 45 08 A4 37	1175.9	7
Transmit	200h		0		500	3
	202h		1	00	Wait	2
	202h		1	01	Wait	3

Comment: Request Data, Read Matrix Fx, Read Matrix Fy

Connected to hardware PCAN-USB Bit rate: 250 kBit/s Status: OK Overruns: 0 QXmtFull: 0

The *Data* pattern continues for Fz, Tx, Ty, and Tz coefficients as shown below:

Fx=00 Tx=03
Fy=01 Ty=04
Fz=02 Tz=05

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Using the Matrix Coefficients

The Six coefficients for the Six strain gages of the Fy example are shown below. Please note that the values for your sensor will be different.

SG0 Coefficient

Receive	202h	8	42 E7 94 F2	C5 89 65 CB	1175.9	7
	203h	8	C1 AA E7 D8	45 06 2A 82	1175.9	7
	204h	8	C2 BF AE 17	45 08 A4 37	1175.9	7

SG1 Coefficient

Receive	202h	8	42 E7 94 F2	C5 89 65 CB	1175.9	7
	203h	8	C1 AA E7 D8	45 06 2A 82	1175.9	7
	204h	8	C2 BF AE 17	45 08 A4 37	1175.9	7

SG2 Coefficient

Receive	202h	8	42 E7 94 F2	C5 89 65 CB	1175.9	7
	203h	8	C1 AA E7 D8	45 06 2A 82	1175.9	7
	204h	8	C2 BF AE 17	45 08 A4 37	1175.9	7

SG3 Coefficient

Receive	202h	8	42 E7 94 F2	C5 89 65 CB	1175.9	7
	203h	8	C1 AA E7 D8	45 06 2A 82	1175.9	7
	204h	8	C2 BF AE 17	45 08 A4 37	1175.9	7

SG4 Coefficient

Receive	202h	8	42 E7 94 F2	C5 89 65 CB	1175.9	7
	203h	8	C1 AA E7 D8	45 06 2A 82	1175.9	7
	204h	8	C2 BF AE 17	45 08 A4 37	1175.9	7

SG5 Coefficient

Receive	202h	8	42 E7 94 F2	C5 89 65 CB	1175.9	7
	203h	8	C1 AA E7 D8	45 06 2A 82	1175.9	7
	204h	8	C2 BF AE 17	45 08 A4 37	1175.9	7

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For this example, the sensor output value for Fy can be constructed using the following expression, where FP(" ") indicates the floating point conversion of the data:

$SG0 * FP(42\ E7\ 94\ F2) + SG1 * FP(C5\ 89\ 65\ CB) + SG2 * FP(C1\ AA\ E7\ D8) + \dots + SG5 * FP(45\ 08\ A4\ 37)$

Your programming language should have a way to do this conversion.

Matrix Coefficients Diagnostics

It is a good idea to see if you are converting these numbers correctly.

There is an online converter at the following link:
<https://www.h-schmidt.net/FloatConverter/IEEE754.html>

This converter lets you enter a decimal number to see the corresponding hexadecimal and binary representation. Alternatively, you can enter a sequence of hexadecimal bytes to see what the decimal value is. Try entering the byte values you are reading into the converter to see if it matches your program's output.

Below, is an example using the converter to convert a 4 byte floating point Hex (42 E7 94 F2) into decimal format.

The screenshot shows the IEEE 754 Converter interface. The input field for 'Encoded as:' contains the hexadecimal value '0'. The 'Binary' field shows a sequence of 32 bits, with the first 31 bits checked. The 'Decimal representation' field shows '115.79091'. The 'Value actually stored in float:' field shows '115.7909088134765625'. The 'Error due to conversion:' field is empty. The 'Binary Representation' field shows '01000010111001111001010011110010'. The 'Hexadecimal Representation' field shows '0x42e794f2'. The interface also displays the IEEE 754 components: Sign (+1), Exponent (2^6, 133), and Mantissa (1.8092329502105713, 6788338).

FP(42 E7 94 F2) = 115.79

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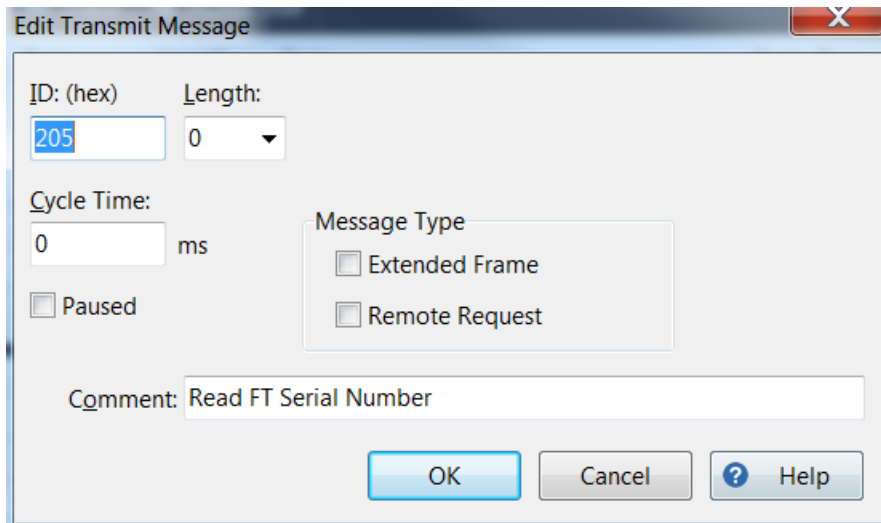
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READ FT SERIAL NUMBER

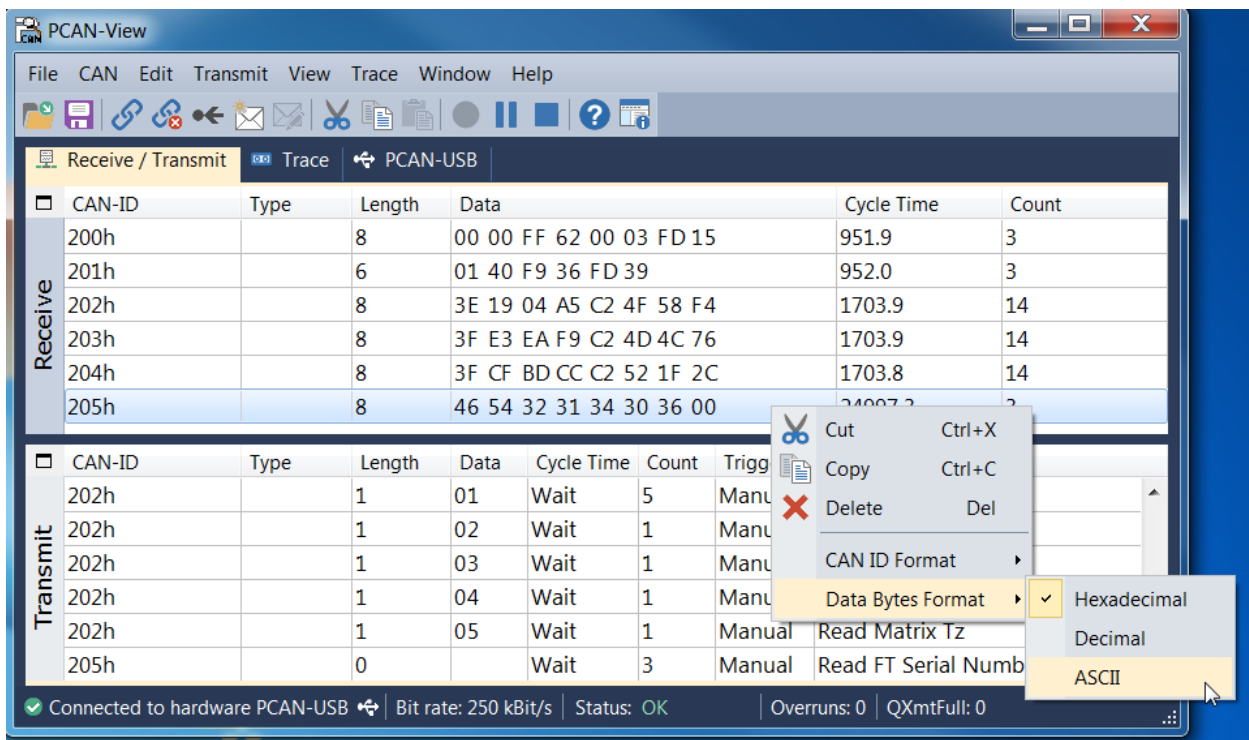
Use the following message to read the FT Serial Number.



The 'Edit Transmit Message' dialog box contains the following fields and options:

- ID: (hex):** 205
- Length:** 0
- Cycle Time:** 0 ms
- Message Type:**
 - ☐ Extended Frame
 - ☐ Remote Request
- Comment:** Read FT Serial Number
- Buttons:** OK, Cancel, Help

This will return a message with a CAN-ID of 0x205. Right click on the message and select *Data Bytes Format* of *ASCII* to change the output to an easy to read format.



The PCAN-View main window displays a table of CAN bus data. The 'Receive' section shows several messages, with the last one (ID 205h) selected. The 'Transmit' section shows a sequence of messages. A right-click context menu is open over the selected message, showing options like Cut, Copy, Delete, and CAN ID Format. The 'Data Bytes Format' option is expanded, showing 'Hexadecimal', 'Decimal', and 'ASCII' (which is highlighted).

	CAN-ID	Type	Length	Data	Cycle Time	Count
Receive	200h		8	00 00 FF 62 00 03 FD 15	951.9	3
	201h		6	01 40 F9 36 FD 39	952.0	3
	202h		8	3E 19 04 A5 C2 4F 58 F4	1703.9	14
	203h		8	3F E3 EA F9 C2 4D 4C 76	1703.9	14
	204h		8	3F CF BD CC C2 52 1F 2C	1703.8	14
	205h		8	46 54 32 31 34 30 36 00	24007.2	2
Transmit	202h		1	01	Wait	5
	202h		1	02	Wait	1
	202h		1	03	Wait	1
	202h		1	04	Wait	1
	202h		1	05	Wait	1
	205h		0		Wait	3

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Notice that the FT serial number (in this case FT21406) is now displayed.

The screenshot shows the PCAN-View software interface. The 'Receive / Transmit' tab is active, displaying two tables of CAN bus data. The 'Receive' table shows incoming messages with CAN-ID, Type, Length, Data, Cycle Time, and Count. The 'Transmit' table shows outgoing messages with CAN-ID, Type, Length, Data, Cycle Time, Count, Trigger, and Comment. The status bar at the bottom indicates the device is connected to hardware PCAN-USB, with a bit rate of 250 kBit/s and status OK.

	CAN-ID	Type	Length	Data	Cycle Time	Count
Receive	200h		8	00 00 FF 62 00 03 FD 15	951.9	3
	201h		6	01 40 F9 36 FD 39	952.0	3
	202h		8	3E 19 04 A5 C2 4F 58 F4	1703.9	14
	203h		8	3F E3 EA F9 C2 4D 4C 76	1703.9	14
	204h		8	3F CF BD CC C2 52 1F 2C	1703.8	14
	205h		8	FT21406?	24997.3	3

	CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
Transmit	202h		1	01	Wait	5	Manual	Read Matrix Fy
	202h		1	02	Wait	1	Manual	Read Matrix Fz
	202h		1	03	Wait	1	Manual	Read Matrix Tx
	202h		1	04	Wait	1	Manual	Read Matrix Ty
	202h		1	05	Wait	1	Manual	Read Matrix Tz
	205h		0		Wait	3	Manual	Read FT Serial Number

Connected to hardware PCAN-USB | Bit rate: 250 kBit/s | Status: OK | Overruns: 0 | QXmtFull: 0

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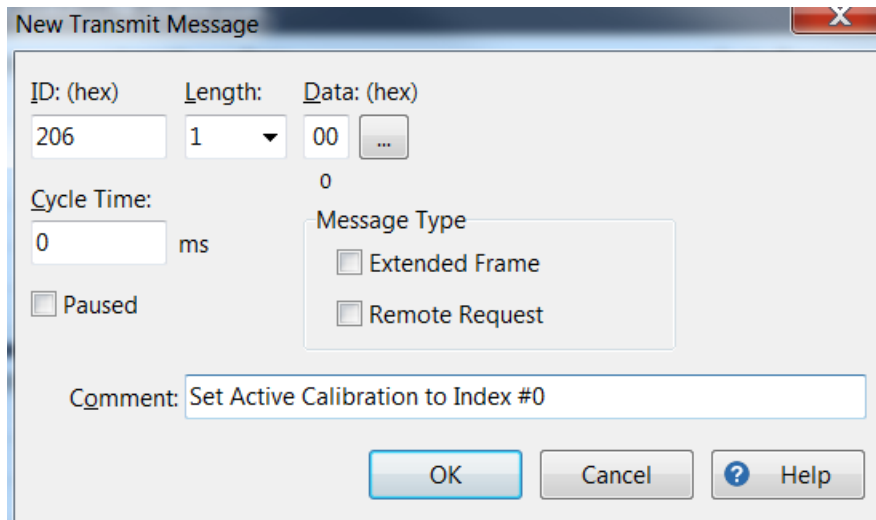
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SET ACTIVE CALIBRATION

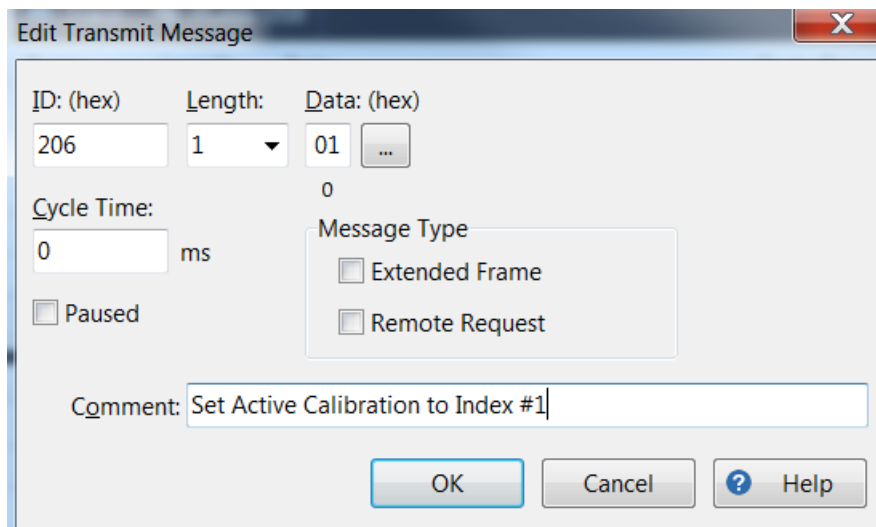
The active calibration is set to the first slot using the following message.



The 'New Transmit Message' dialog box is shown. It contains the following fields and options:

- ID: (hex): 206
- Length: 1
- Data: (hex): 00
- Cycle Time: 0 ms
- ☐ Paused
- Message Type:
 - ☐ Extended Frame
 - ☐ Remote Request
- Comment: Set Active Calibration to Index #0
- Buttons: OK, Cancel, Help

The active calibration is set to the second slot using the following message.



The 'Edit Transmit Message' dialog box is shown. It contains the following fields and options:

- ID: (hex): 206
- Length: 1
- Data: (hex): 01
- Cycle Time: 0 ms
- ☐ Paused
- Message Type:
 - ☐ Extended Frame
 - ☐ Remote Request
- Comment: Set Active Calibration to Index #1
- Buttons: OK, Cancel, Help

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After sending a message with a new calibration slot, double click on the *CAN-ID* 205h message to resend, this will refresh the serial number data.

CAN-ID	Type	Length	Data	Cycle Time	Count
200h		8	00 00 FF 62 00 03 FD 15	951.9	3
201h		6	01 40 F9 36 FD 39	952.0	3
202h		8	3E 19 04 A5 C2 4F 58 F4	1703.9	14
203h		8	3F E3 EA F9 C2 4D 4C 76	1703.9	14
204h		8	3F CF BD CC C2 52 1F 2C	1703.8	14
205h		8	FT21406?	164891.7	4

CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
202h		1	03	Wait	1	Manual	Read Matrix Tx
202h		1	04	Wait	1	Manual	Read Matrix Ty
202h		1	05	Wait	1	Manual	Read Matrix Tz
205h		0	Wait	4	Manual	Read FT Serial Number	
206h		1	00	Wait	1	Manual	Set Active Calibration to Index #
206h		1	01	Wait	1	Manual	Set Active Calibration to Index #

Notice a new serial number is now loaded.

CAN-ID	Type	Length	Data	Cycle Time	Count
200h		8	00 00 FF 62 00 03 FD 15	951.9	3
201h		6	01 40 F9 36 FD 39	952.0	3
202h		8	3E 19 04 A5 C2 4F 58 F4	1703.9	14
203h		8	3F E3 EA F9 C2 4D 4C 76	1703.9	14
204h		8	3F CF BD CC C2 52 1F 2C	1703.8	14
205h		8	FT29081?	79499.4	5

CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
202h		1	03	Wait	1	Manual	Read Matrix Tx
202h		1	04	Wait	1	Manual	Read Matrix Ty
202h		1	05	Wait	1	Manual	Read Matrix Tz
205h		0	Wait	5	Manual	Read FT Serial Number	
206h		1	00	Wait	1	Manual	Set Active Calibration to Index #
206h		1	01	Wait	1	Manual	Set Active Calibration to Index #

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Re-send the messages requesting the matrix coefficients. With a new active calibration loaded, the coefficients for the matrix are now different. The active calibration must be selected before the coefficients for that serial number can be retrieved.

PCAN-View

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Receive / Transmit Trace PCAN-USB

	CAN-ID	Type	Length	Data	Cycle Time	Count
Receive	200h		8	00 00 FF 62 00 03 FD 15	951.9	3
	201h		6	01 40 F9 36 FD 39	952.0	3
	202h		8	42 39 89 10 3F B9 7F 48	369054.8	15
	203h		8	C2 93 D8 CD 44 E9 E0 A5	369054.7	15
	204h		8	C1 80 F8 2B C4 EC B2 49	369054.8	15
	205h		8	FT29081?	79499.4	5

	CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
Transmit	200h		0		500	3	Manual	Request Data
	202h		1	00	Wait	4	Manual	Read Matrix Fx
	202h		1	01	Wait	5	Manual	Read Matrix Fy
	202h		1	02	Wait	1	Manual	Read Matrix Fz
	202h		1	03	Wait	1	Manual	Read Matrix Tx
	202h		1	04	Wait	1	Manual	Read Matrix Ty

Connected to hardware PCAN-USB Bit rate: 250 kBit/s Status: OK Overruns: 0 QXmtFull: 0

PEAK System: PCAN-View

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READ UNIT CODES

The following message is used to read the unit codes from the sensor for the current calibration.

Dialog box: Edit Transmit Message

ID: (hex) 208 Length: 0

Cycle Time: 0 ms

☐ Paused

Message Type:
☐ Extended Frame
☐ Remote Request

Comment: Read Unit Codes

Buttons: OK, Cancel, Help

For this sensor, note that 02 and 03 in table 5.1 of the NETCANOEM manual correspond to N and Nm.

PCAN-View

File CAN Edit Transmit View Trace Window Help

Receive / Transmit Trace PCAN-USB

	CAN-ID	Type	Length	Data	Cycle Time	Count
Receive	202h		8	BE A0 75 C1 C0 84 A3 D0	10025.6	20
	203h		8	C2 22 7A C9 45 68 04 40	10025.5	20
	204h		8	42 A3 00 A2 C5 6C 15 26	10025.5	20
	205h		8	FT21406?	83761.2	6
	206h		1	00	129558.9	3
	208h		2	02 03		1

	CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
Transmit	202h		1	04	Wait	1	Manual	Read Matrix Ty
	202h		1	05	Wait	1	Manual	Read Matrix Tz
	205h		0		Wait	6	Manual	Read FT Serial Number
	206h		1	00	Wait	2	Manual	Set Active Calibration to Index #
	206h		1	01	Wait	1	Manual	Set Active Calibration to Index #
	208h		0		Wait	1	Manual	Read Unit Codes

Connected to hardware PCAN-USB Bit rate: 250 kBit/s Status: OK Overruns: 0 QXmtFull: 0

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Below is a link to the NETCANOEM Manual:
https://www.ati-ia.com/app_content/documents/9610-05-1030.pdf

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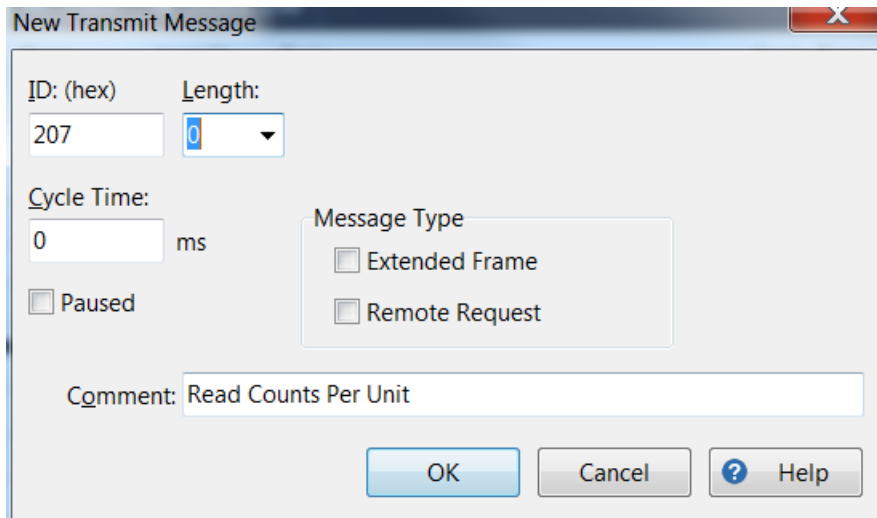
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READ COUNTS PER UNIT

The following message is used to read the *Counts Per Unit* for the current calibration.



The dialog box 'New Transmit Message' contains the following fields and options:

- ID: (hex): 207
- Length: 0
- Cycle Time: 0 ms
- Paused: ☐
- Message Type: ☐ Extended Frame, ☐ Remote Request
- Comment: Read Counts Per Unit
- Buttons: OK, Cancel, Help

This returns a message with a CAN-ID of 0x207. The first 4 bytes are the *Counts Per Unit* of force. The second 4 bytes are for the *Counts Per Unit* of torque.

PCAN-View

File CAN Edit Transmit View Trace Window Help

Receive / Transmit

Trace

PCAN-USB

	CAN-ID	Type	Length	Data	Cycle Time	Count
Receive	203h		8	C2 22 7A C9 45 68 04 40	10025.5	20
	204h		8	42 A3 00 A2 C5 6C 15 26	10025.5	20
	205h		8	FT29081?	13471.0	8
	206h		1	01	252070.6	4
	208h		2	02 03	11864.8	3
	207h		8	00 0F 42 40 00 0F 42 40		1

	CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
Transmit	202h		1	05	Wait	1	Manual	Read Matrix Tz
	205h		0		Wait	8	Manual	Read FT Serial Number
	206h		1	00	Wait	2	Manual	Set Active Calibration to Index #
	206h		1	01	Wait	2	Manual	Set Active Calibration to Index #
	208h		0		Wait	3	Manual	Read Unit Codes
	207h		0		Wait	1	Manual	Read Counts Per Unit

Connected to hardware PCAN-USB | Bit rate: 250 kBit/s | Status: OK | Overruns: 0 | QXmtFull: 0

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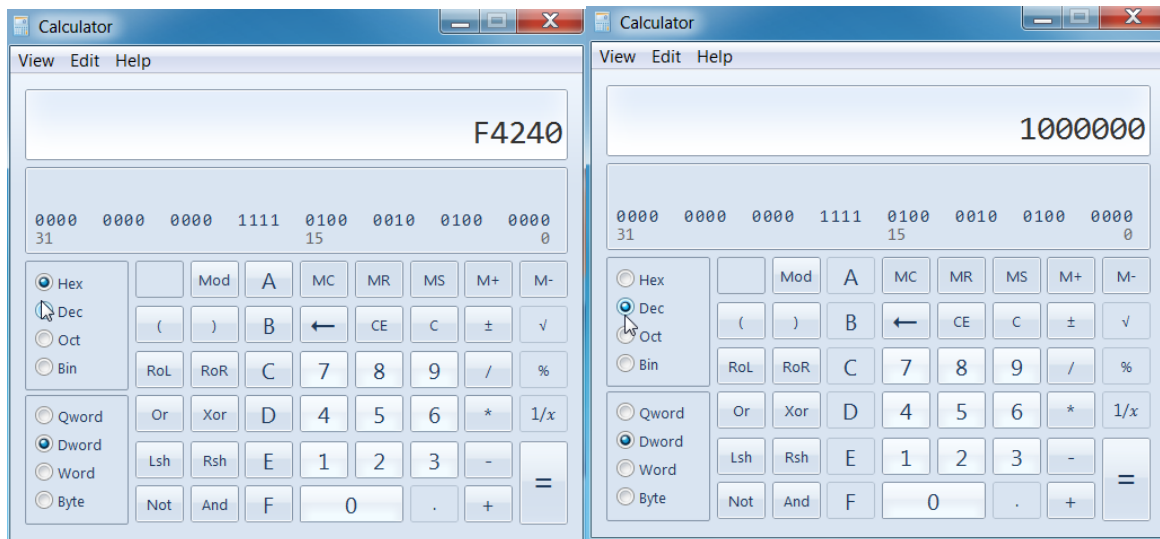
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The *Counts Per Unit* are provided in a 4 bytes integer format. Below is an example using Microsoft Calculator to convert these.

In the calculator, first select *Programmer*, then select *Hex* and *DWord*. Type in the Hex that you wish to convert to counts.



Notice that this shows 1,000,000 *Counts Per Unit*, since the force unit is N, this is 1,000,000 counts/N.

PEAK System: PCAN-View

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To find the *Counts Per Unit* of torque, use the second 4 bytes. Notice that for this sensor and calibration, this is the same value which indicates 1,000,000 counts/(Nm)

Receive / Transmit | **Trace** | **PCAN-USB**

	CAN-ID	Type	Length	Data	Cycle Time	Count
Receive	203h		8	C2 22 7A C9 45 68 04 40	10025.5	20
	204h		8	42 A3 00 A2 C5 6C 15 26	10025.5	20
	205h		8	FT29081?	13471.0	8
	206h		1	01	252070.6	4
	208h		2	02 03	11864.8	3
	207h		8	00 0F 42 40 00 0F 42 40		1

	CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
Transmit	202h		1	05	Wait	1	Manual	Read Matrix Tz
	205h		0		Wait	8	Manual	Read FT Serial Number
	206h		1	00	Wait	2	Manual	Set Active Calibration to Index #
	206h		1	01	Wait	2	Manual	Set Active Calibration to Index #
	208h		0		Wait	3	Manual	Read Unit Codes
	207h		0		Wait	1	Manual	Read Counts Per Unit

✓ Connected to hardware PCAN-USB | Bit rate: 250 kBit/s | Status: OK | Overruns: 0 | QXmtFull: 0

PEAK System: PCAN-View

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EXAMPLE CALCULATION

Below we show how to calculate Fy from the following strain gage data and matrix coefficients that were retrieved for Fy. In order to calculate a different sensor output (Fx, Fy, Fz, Tx, Ty, Tz), request the corresponding coefficients as shown in the *How to read matrix coefficients* Section of this guide.

Fy matrix coefficients: (Please review *How to Read Matrix Coefficients* for more information)

Receive	202h	8	42 E7 94 F2 C5 89 65 CB	1175.9	7
	203h	8	C1 AA E7 D8 45 06 2A 82	1175.9	7
	204h	8	C2 BF AE 17 45 08 A4 37	1175.9	7

Strain gage data: (Please review *Understanding the Sensor Data* for more information)

<input type="checkbox"/>	CAN-ID	Type	Length	Data	Cycle Time	Count
	200h		8	00 00 FF 57 00 0E FD 2C		1
	201h		6	01 42 F9 43 FD 2E		1

Fy is calculated using the following equation:

$$Fy = SG0 * SG0_Coefficient + SG1 * SG1_Coefficient + SG2 * SG2_Coefficient + SG3 * SG3_Coefficient + SG4 * SG4_Coefficient + SG5 * SG5_Coefficient$$

Here is the raw data:

SG0 = FF 57	SG0 Coefficient = FP(42 E7 94 F2)
SG1 = 01 42	SG1 Coefficient = FP(C5 89 65 CB)
SG2 = 00 0E	SG2 Coefficient = FP(C1 AA E7 D8)
SG3 = F9 43	SG3 Coefficient = FP(45 06 2A 82)
SG4 = FD 2C	SG4 Coefficient = FP(C2 BF AE 17)
SG5 = FD 2E	SG5 Coefficient = FP(45 08 A4 37)

Converting the data into Signed Integer and Floating point results in the following:

SG0 = -169	SG0 Coefficient = 115.79091
SG1 = 322	SG1 Coefficient = -4396.724
SG2 = 14	SG2 Coefficient = -21.363205
SG3 = -1725	SG3 Coefficient = 2146.6567
SG4 = -724	SG4 Coefficient = -95.84002
SG5 = -722	SG5 Coefficient = 2186.2634

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Fy is calculated to be the following:

$$F_y = -169 * 115.79091 + 322 * (-4396.724) + 14 * (-21.363205) + (-1725) * 2146.6567 + (-724) * (-95.84002) + (-722) * 2186.2634$$

$$F_y = -6647689.7 \text{ counts}$$

Earlier, for this example sensor, we determined that the unit for Fy was N, and the *Counts Per Unit* of force was 1,000,000 counts/N.

$$F_y = -6,647,689.7 \text{ counts} / 1,000,000 \text{ (counts/N)} = -6.64 \text{ N}$$

PEAK System: PCAN-View

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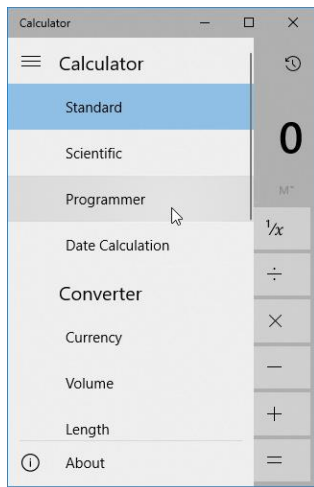


COMMENTS ABOUT THE WINDOWS 10 CALCULATOR

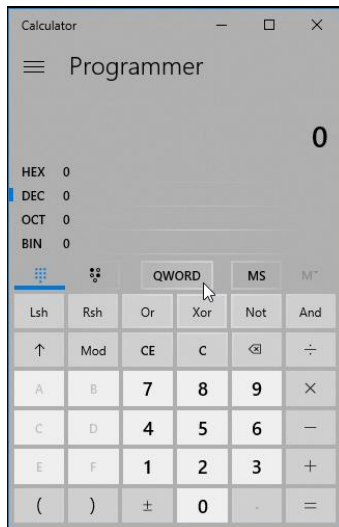
Please note there are some differences between the calculator program in Windows 7 and Windows 10. The functionality is the same, but there are differences in appearance.

Below we will go over how to perform operations shown earlier, but using the Windows 10 calculator instead.

In Windows 10 under settings select *Programmer*.



Word and *Dword* are accessed by clicking on the following to toggle between data types.



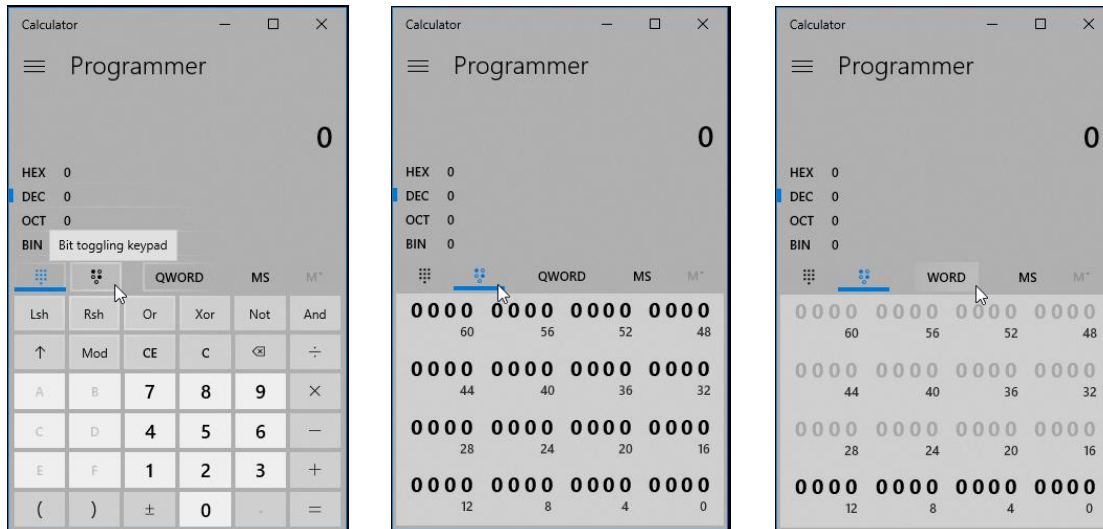
PEAK System: PCAN-View

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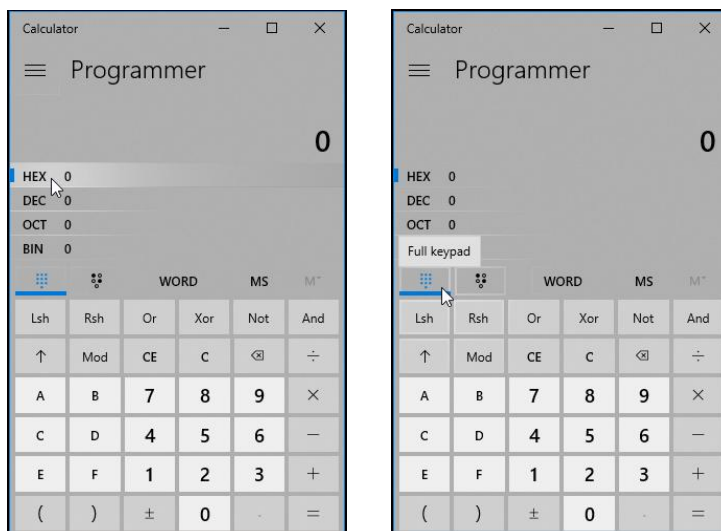
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The Windows 10 calculator has the *Bit toggling keypad* which can be useful in troubleshooting.



Notice that when *WORD* is selected the top 3 rows of bits are greyed out.

To convert Hex to either Binary or Decimal, first select Hex input mode and use the *Full keypad*.



PEAK System: PCAN-View

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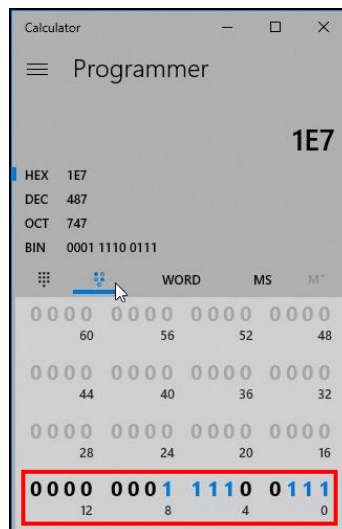
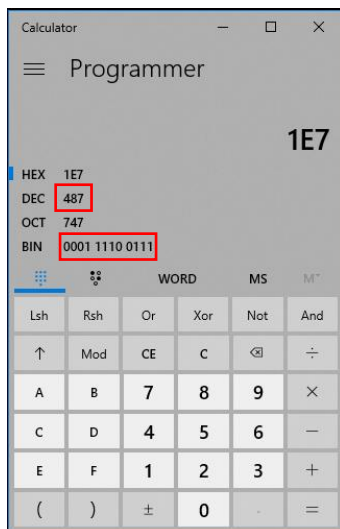


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In the following example, we will convert 0x01E7 from Hex to Binary and to Dec(two's compliment signed integer).
On the Keypad with Hex selected, input 01E7.



Notice that the calculator did not allow us to input the leading 0 of the 01E7, but the conversion is still the same.
The calculator conveniently shows all conversions to other formats at a glance. If reviewing a status word, clicking on the *Bit toggling keypad* allows to quickly confirm which individual status bits are ON.



0x01E7 = 487 = 0000 0001 1110 0111

PEAK System: PCAN-View

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Word vs DWORD/QWORD

The gage counts are provided in signed bytes (two's complement). For Microsoft Calculator to convert these correctly, *Word* must be selected. In the screenshots below notice that the *Dec* conversion for 0x81E7 changes when *Word* is selected.

