

**CORRSYS**

**DATRON**

Sensorsysteme GmbH



# CeCaIWin Pro & RV-4 Sensor Configuration and Data Acquisition Software

for

*Set-up and calibration of the CORRSYS-DATRON RV-4 Sensor*

## USER MANUAL

## VOLUME III

RV-4 Wheel Vector Sensor  
Sensor-specific Software Description

## Note:

For a general description of the CeCalWin Pro Software refer to the separate user manual Volume II.

For the hardware description of the RV-4 Sensor refer to the separate user manual Volume I.

# VOLUME III - RV-4 Sensor specific Software Description

## Table of Contents

General Information .....	4
Safety Instructions .....	5
1. Project Window Settings for the RV-4 Sensor .....	6
1.1 Measurement Display .....	6
1.2 Input/Output Display .....	7
1.3 Sensor Configuration .....	8
1.4 Digital Channels .....	9
1.5 Analog Channels .....	10
1.6 Filter .....	12
1.7 CAN Bus .....	13
2. CAN-Bus Protocol .....	15
2.1 Definition of the Frames .....	16
3.1.1 Definition of the Intel Format .....	16
3.1.2 Definition of the Motorola Format .....	17
2.2 Troubleshooting CAN-Bus .....	19
3. Creation of CAN Database Files (CanDB) .....	20
4. Firmware Update .....	21
4.1 Performing the Firmware Update .....	21
4.2 Problems during the Firmware Update .....	23

# General Information

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# Safety Instructions

Please read the following instructions carefully before installing or using CeCalWin Pro Software

CORRSYS-DATRON is not responsible for damage that may occur if hardware and/or software is used in any way other than that for which it is intended.

To assure safe and proper operation, all supplied equipment, components and/or accessories must be carefully transported and stored, as well as professionally installed and operated. Careful maintenance and usage in full accordance with operating instructions is imperative.

CORRSYS-DATRON hardware and/or software should be installed and operated only by qualified persons who are familiar with devices of this type.

Local regulations may not permit the operation of motor vehicles on public highways while the equipment is mounted on the exterior of the vehicle.

- Use hardware and/or software only for intended applications. Improper application is not advised.
- Do not modify or change equipment or its accessories in any way.
- Improper use or mounting of the equipment may affect the safety of the vehicle and/or occupants.
- The equipment must not be mounted and/or operated in any way that may compromise vehicle or and/or occupant safety.
- Equipment must be mounted firmly and securely.
- Use only original equipment, components and/or accessories included in the scope of delivery.
- Do not mount equipment, components and/or accessories near heat sources (e.g. exhaust).
- Do not use defective or damaged equipment, components and/or accessories.
- Always note correct pin assignments and operating voltages when connecting equipment to power supplies, data acquisition/evaluation systems, and/or any other applicable system or component. Equipment may be damaged if not properly connected and/or operated.
- CORRSYS-DATRON recommends using cables supplied within the scope of delivery. If it is necessary to make cables, always note correct pin assignments (see the pin assignments in the supplied sensor user manual).  
Damage to the device caused by cables other than those supplied by CORRSYS-DATRON is not covered under the product warranty.
- For additional information, please call the CORRSYS-DATRON Hotline: ++49 (6441) 9282-82 or email: [hotline@corrsys-datron.com](mailto:hotline@corrsys-datron.com).

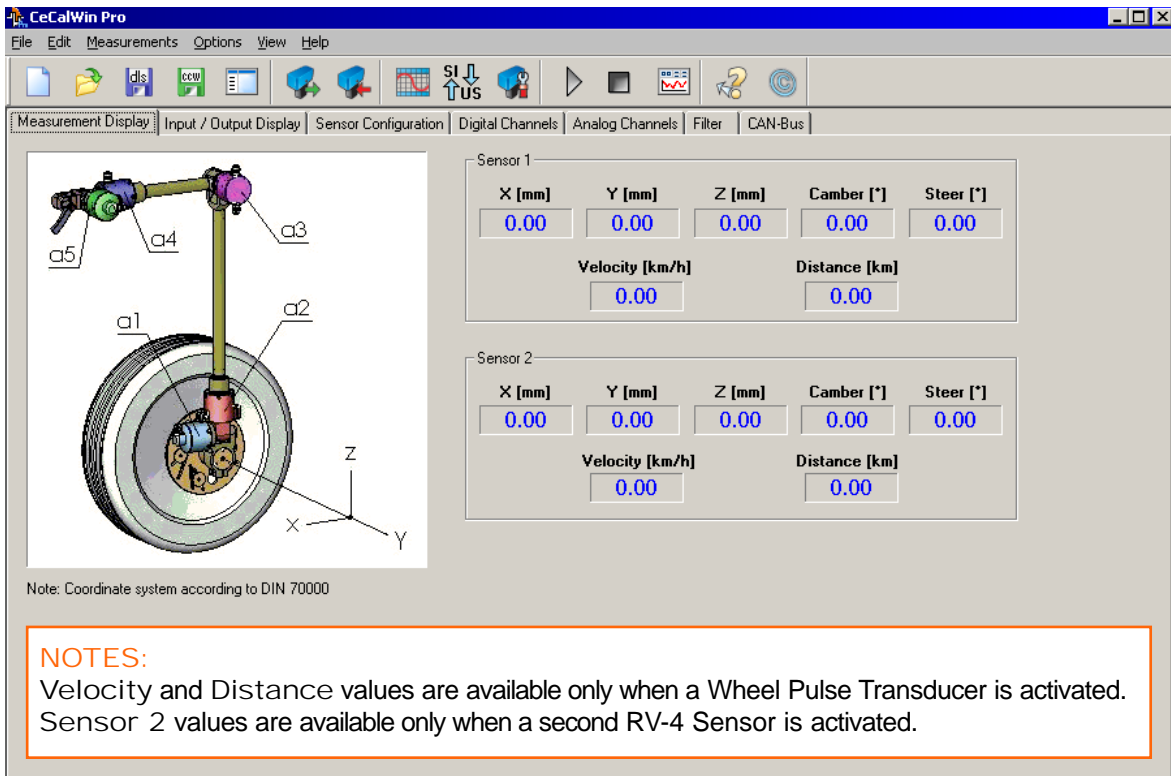
# 1. Project Window Settings for the RV-4 Sensor

Within the Project Window, either six or seven tabbed sections will be displayed: Measurement Display, Input/Output Display, Sensor Configuration, Digital Channels\*, Analog Channels, Filter and CAN-Bus. Options for system configuration, operation and data display are explained in the following pages.

**\* NOTE:** Digital Channels tab available only when an optional Wheel Pulse Transducer is activated

## 1.1 Measurement Display

The Measurement Display tab shows measurement values from the RV-4 Sensor(s), and activated Wheel Pulse Transducer(s), in real time.



### Sensor 1

Values acquired from the RV-4 Sensor:

- X (mm): X-axis value, in millimeters
- Y (mm): Y-axis value, in millimeters
- Z (mm): Z-axis value, in millimeters
- Camber (°): camber angle value, in degrees
- Steer (°): steering angle value, in degrees

Values acquired from the Wheel Pulse Transducer: (available only if activated)

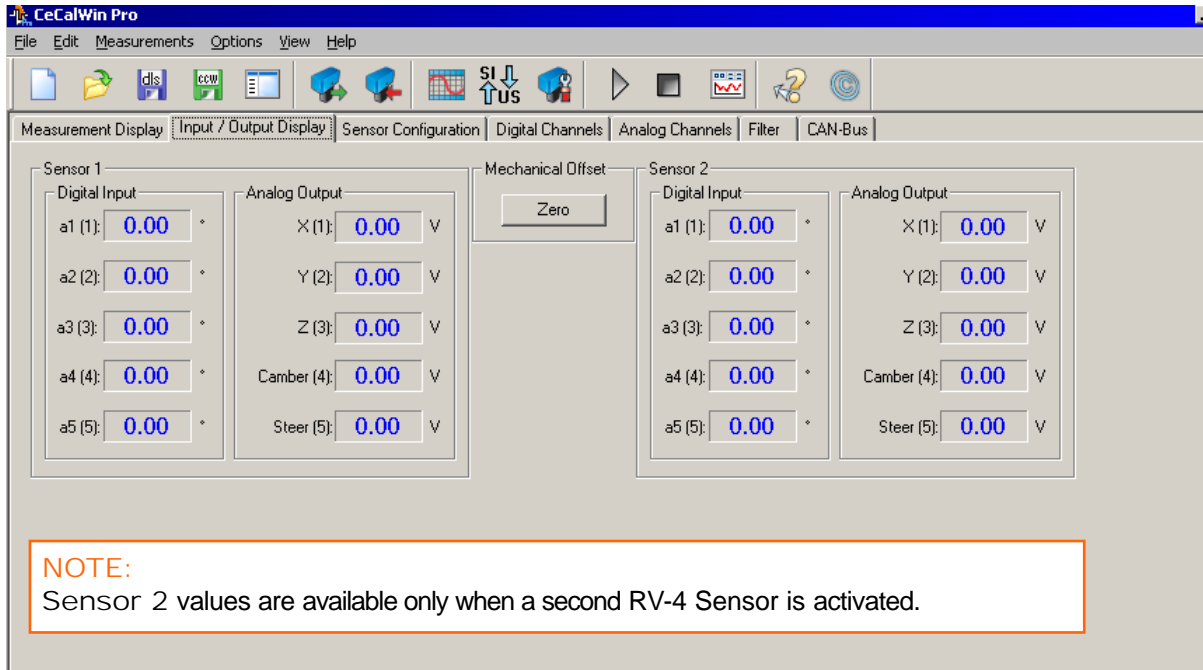
- Velocity: velocity value, in kph or mph (user-selectable)
- Distance: distance value, in kilometers or miles (user-selectable)

### Sensor 2 (available only if activated)

All value displays are the same as Sensor 1.

### Input/Output Display

After mounting the RV-4, it is typical that the angular transducers in the sensor will not be positioned at their respective mechanical zero points. The Input/Output Display tab shows mechanical offset values for each of the angular transducers in the connected RV-4 Sensor(s), and enables the values for each transducer to be set as the zero-point from which dynamic measurement values will be determined.



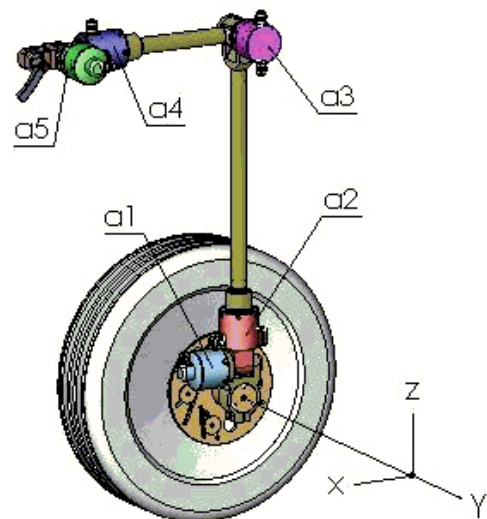
### Sensor 1

#### Digital Input

- a1 (1): angle 1 input value, in degrees
- a2 (2): angle 2 input value, in degrees
- a3 (3): angle 3 input value, in degrees
- a4 (4): angle 4 input value, in degrees
- a5 (5): angle 5 input value, in degrees

#### Analog Output

- X (1): X-axis value, output as voltage
- Y (2): Y-axis value, output as voltage
- Z (3): Z-axis value, output as voltage
- Camber (4): camber angle value, output as voltage
- Steer (5): steering angle value, output as voltage



#### Mechanical Offset

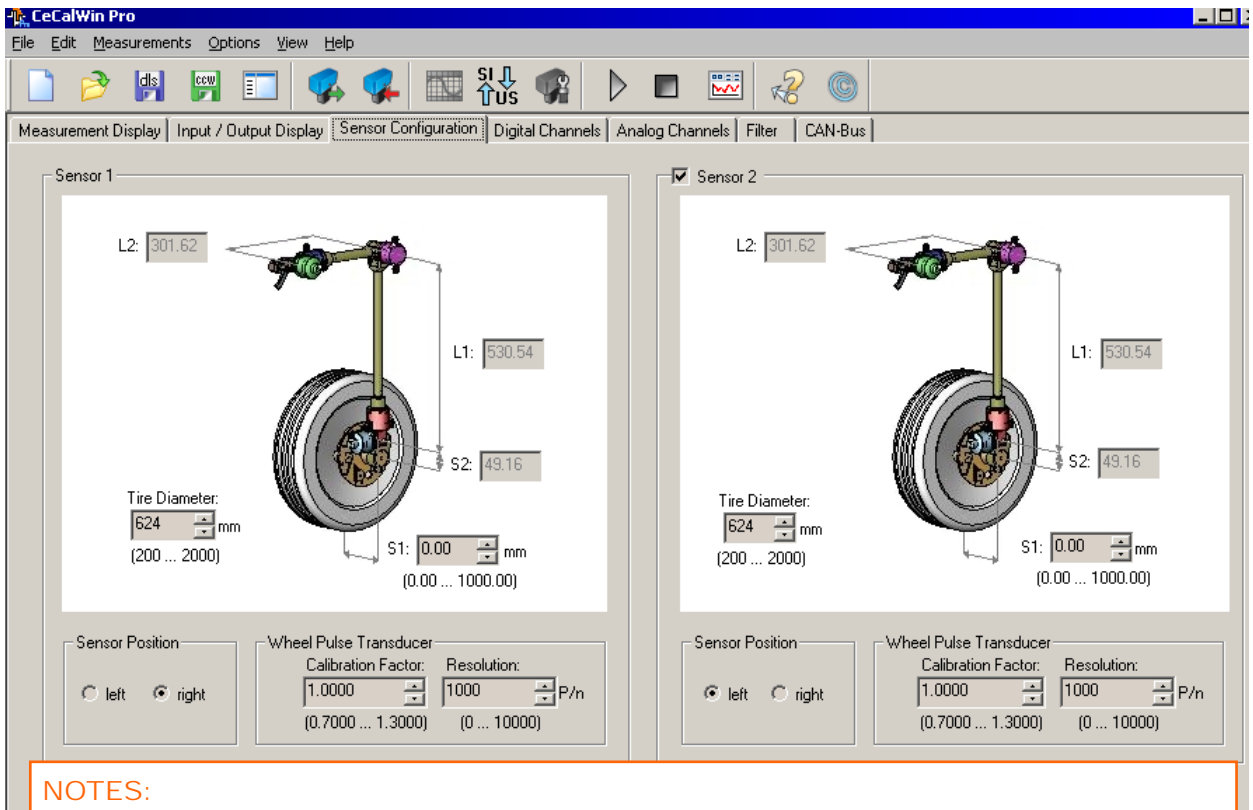
Click on the Zero button to set all RV-4 Sensor mechanical offset values as a zero points.

### Sensor 2 (available only if activated\*)

All value displays are the same as Sensor 1.

### Sensor Configuration

The Sensor Configuration tab enables sensor parameterization.



**NOTES:**

Wheel Pulse Transducer values are available only when a Wheel Pulse Transducer is activated.  
 Sensor 2 values are available only when a second RV-4 Sensor is activated.

#### Sensor 1

L2: not user-selectable

L1: not user-selectable

S2: not user-selectable

S1: enter the distance from the center of the tire's width to the center of the retainer clamp bolt on the RV-4. The value (mm) can be entered manually, or selected with the up/down arrows.  
 NOTE: This value must be entered to ensure proper calculation of steering angle.

Tire Diameter:  
 (required only if Wheel Pulse Transducer is activated)  
 enter the diameter of the tire. The value (in millimeters) can be entered manually, or selected with the up/down arrows.

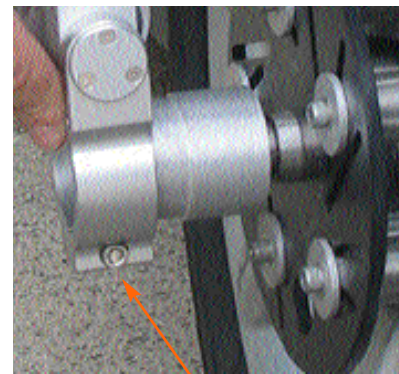
Sensor Position: select left or right, corresponding to the side of the vehicle on which the sensor is mounted.

Wheel Pulse Transducer (available only if Wheel Pulse Transducer is activated\*)

Calibration factor: user-selectable, values can be entered manually, or selected with the up/down arrows (default = 1.0000) or by calibration drive.

Resolution: user-selectable (default = 1,000 pulses/rotation).

Other values can be entered manually, or selected with the up/down arrows.



Retainer clamp bolt

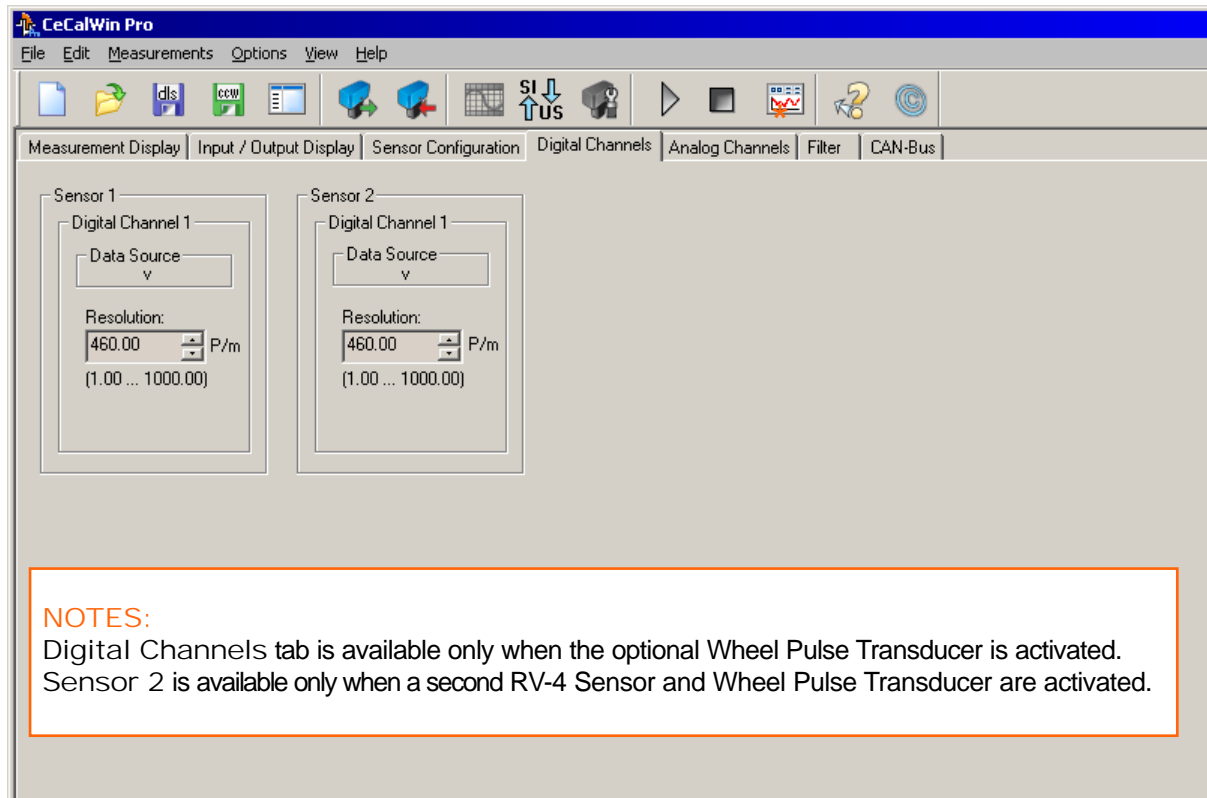
#### Sensor 2 (available only if second RV-4 Sensor is activated)

Select the Sensor 2 checkbox to activate the Sensor 2 interface.

See Sensor 1, above, for setting instructions.

## Digital Channels

The Digital Channels tab enables adjustment of digital signal output resolution for activated Wheel Pulse Transducer(s).



### Sensor 1

#### Digital Channel 1

Resolution: user-selectable (default = 460 P/m).

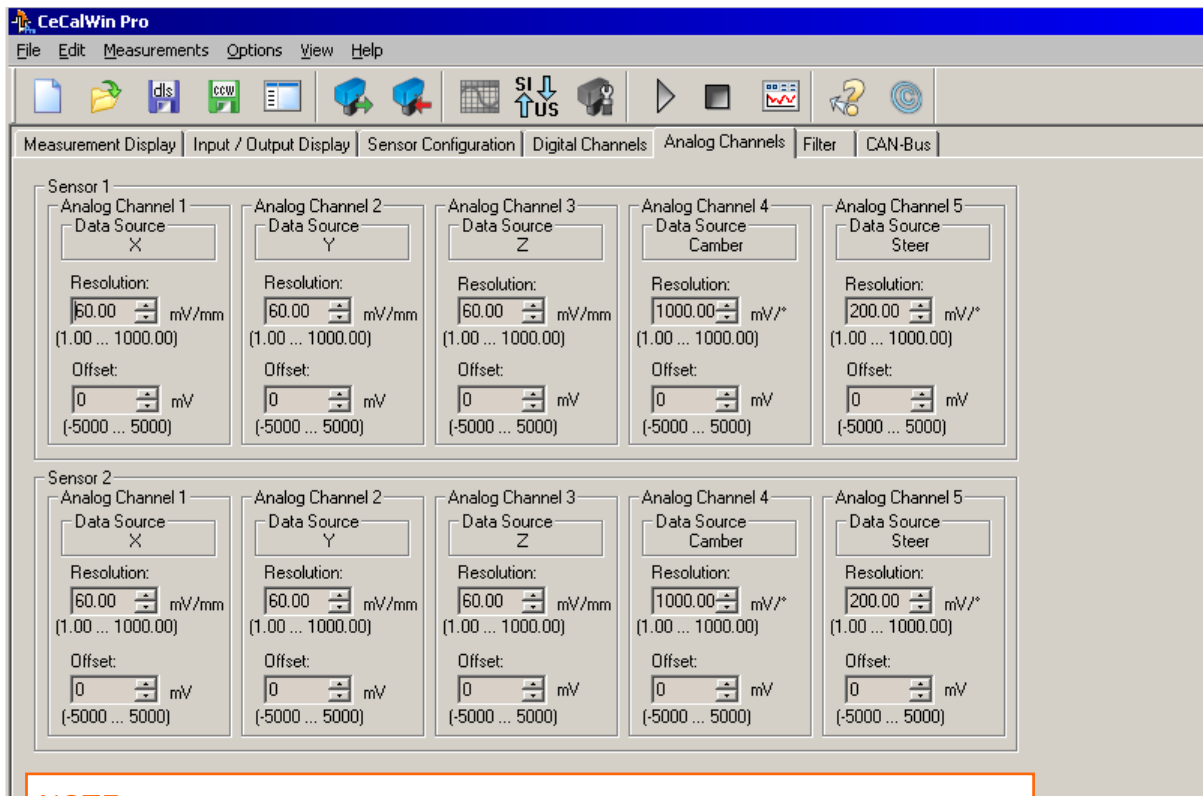
Other values can be entered manually, or selected with the up/down arrows.

### Sensor 2 (available only if second RV-4 Sensor and Wheel Pulse Transducer are activated)

See Sensor 1, above, for setting instructions.

## Analog Channels

The Analog Channels tab enables adjustment of analog signal output settings for activated RV-4 Sensors.



**NOTE:**

Sensor 2 values are available only when a second RV-4 Sensor is activated.

### Sensor 1

Analog Channel 1 data source is the X-axis value

Resolution: user-selectable (default = 60 mV/mm).

Other values can be entered manually, or selected with the up/down arrows.

Offset: user-selectable (default = 0 mV).

Other values can be entered manually, or selected with the up/down arrows.

Analog Channel 2 data source is the Y-axis value

Resolution: user-selectable (default = 60 mV/mm).

Other values can be entered manually, or selected with the up/down arrows.

Offset: user-selectable (default = 0 mV).

Other values can be entered manually, or selected with the up/down arrows.

Analog Channel 3 data source is the Z-axis value

Resolution: user-selectable (default = 60 mV/mm).

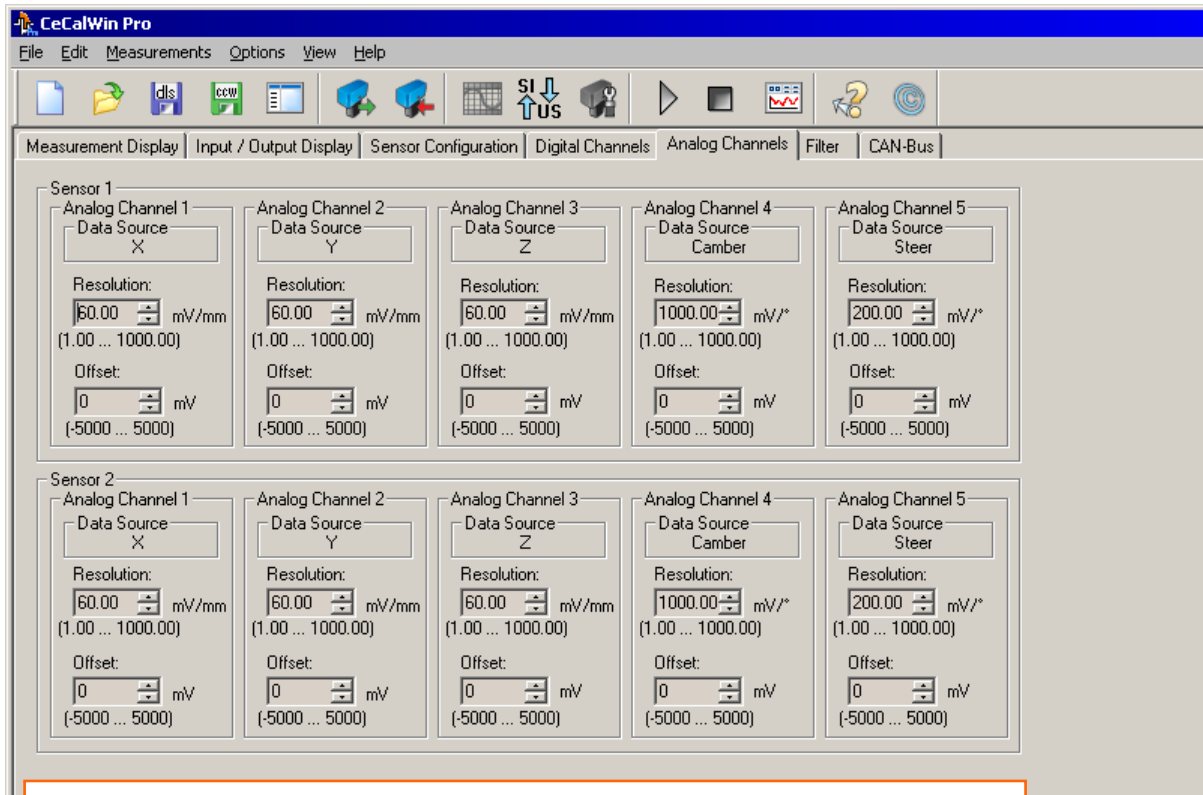
Other values can be entered manually, or selected with the up/down arrows.

Offset: user-selectable (default = 0 mV).

Other values can be entered manually, or selected with the up/down arrows.

*Analog Channels information continues on next page...*

Analog Channels, continued



**NOTE**  
Sensor 2 values are available only when a second RV-4 Sensor is activated.

Sensor 1

Analog Channel 4 data source is the Camber Angle value

- Resolution: user-selectable (default = 1,000 mV/degree).  
Other values can be entered manually, or selected with the up/down arrows.
- Offset: user-selectable (default = 0 mV).  
Other values can be entered manually, or selected with the up/down arrows.

Analog Channel 5 data source is the Steering Angle value

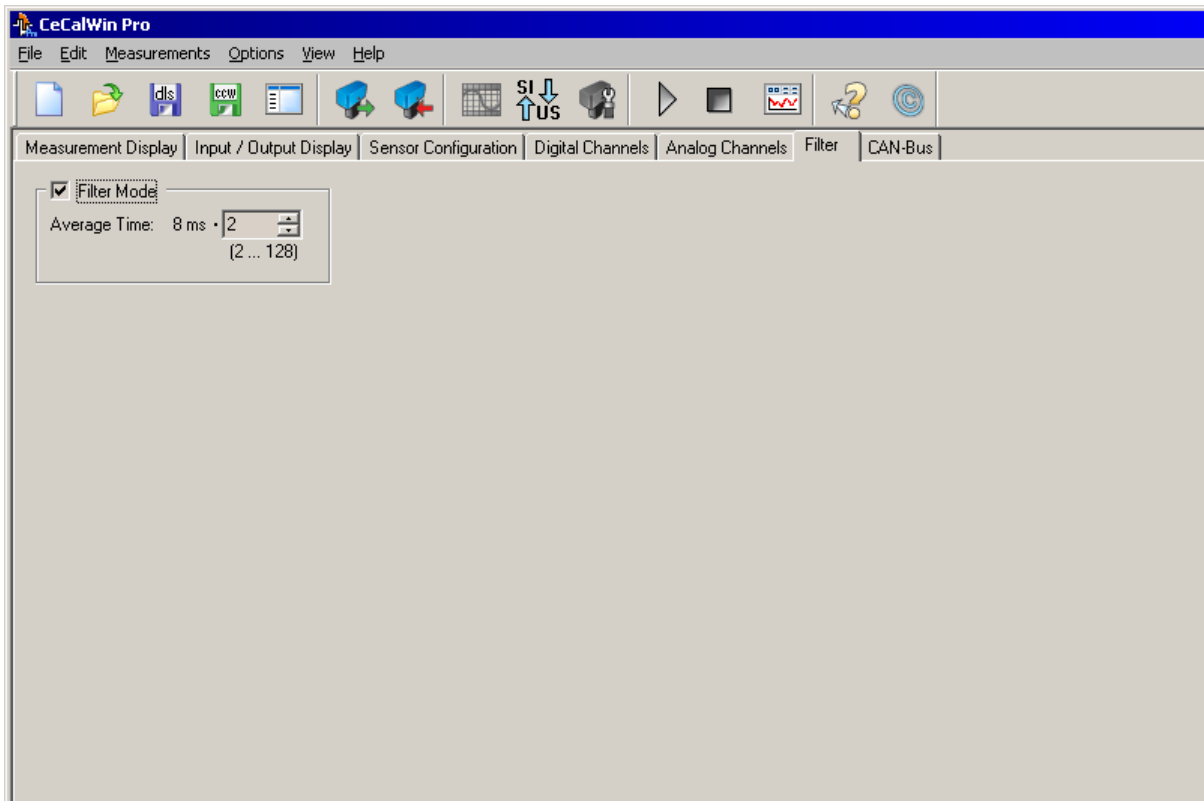
- Resolution: user-selectable (default = 200 mV/degree).  
Other values can be entered manually, or selected with the up/down arrows.
- Offset: user-selectable (default = 0 mV).  
Other values can be entered manually, or selected with the up/down arrows.

Sensor 2 (available only if second RV-4 Sensor is activated\*)

See Sensor 1, above and on previous page, for setting instructions.

## Filter

The Filter tab enables adjustment of the filter-time setting for the RV-4 Sensor.



## Filter Mode

Select the checkbox to activate access to the filter-time setting for the RV-4 Sensor.

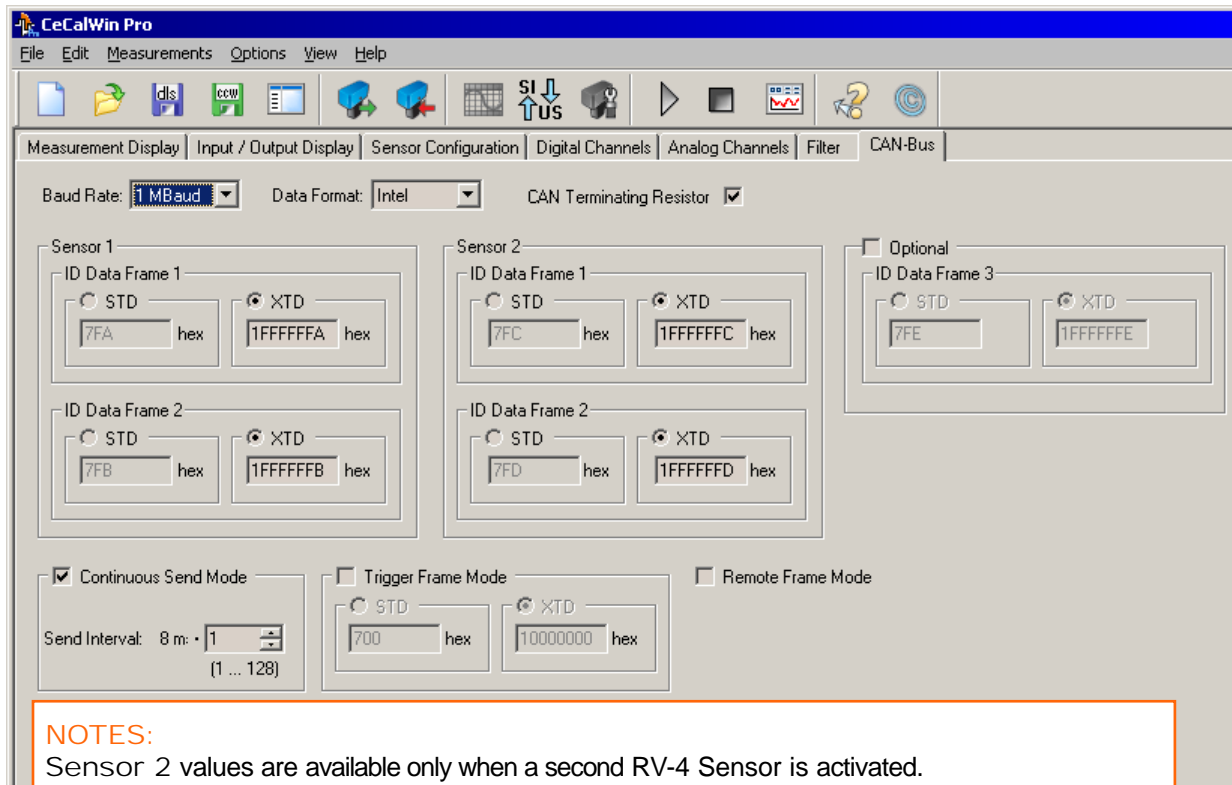
Average Time: user-selectable (default value =  $2 \times 8 \text{ ms} = 16 \text{ ms}$ ).

Other values can be entered manually, or selected with the up/down arrows.

## CAN-Bus

The CAN-Bus tab enables adjustment of the CAN-Bus settings.

For additional CAN information, see Chapter 3, CAN Protocol, page 15ff.



### NOTES:

Sensor 2 values are available only when a second RV-4 Sensor is activated.  
Optional values are available only when a Wheel Pulse Transducer is activated.

Baud Rate (default = 1 MBaud)

Use the pull-down menu to select either 1 MBaud, 500 kBaud, 250 kBaud or 125 kBaud.

Data Format (default = Intel)

Use the pull-down menu to select either Intel or Motorola.

Can Terminating Resistor (default = selected)

Click on the checkbox to select or de-select the CAN Terminating Resistor option.

### Sensor 1

ID Data Frame 1 (default setting = XTD)

Select the desired Sensor Message Identifier mode: STD (standard, 11-bit) or XTD (extended, 29-bit).

(Default value, STD = 7FA)

(Default value, XTD = 1FFFFFFFA)

ID Data Frame 2 (default setting = XTD)

Select the desired Sensor Message Identifier mode: STD (standard, 11-bit) or XTD (extended, 29-bit).

(Default value, STD = 7FB)

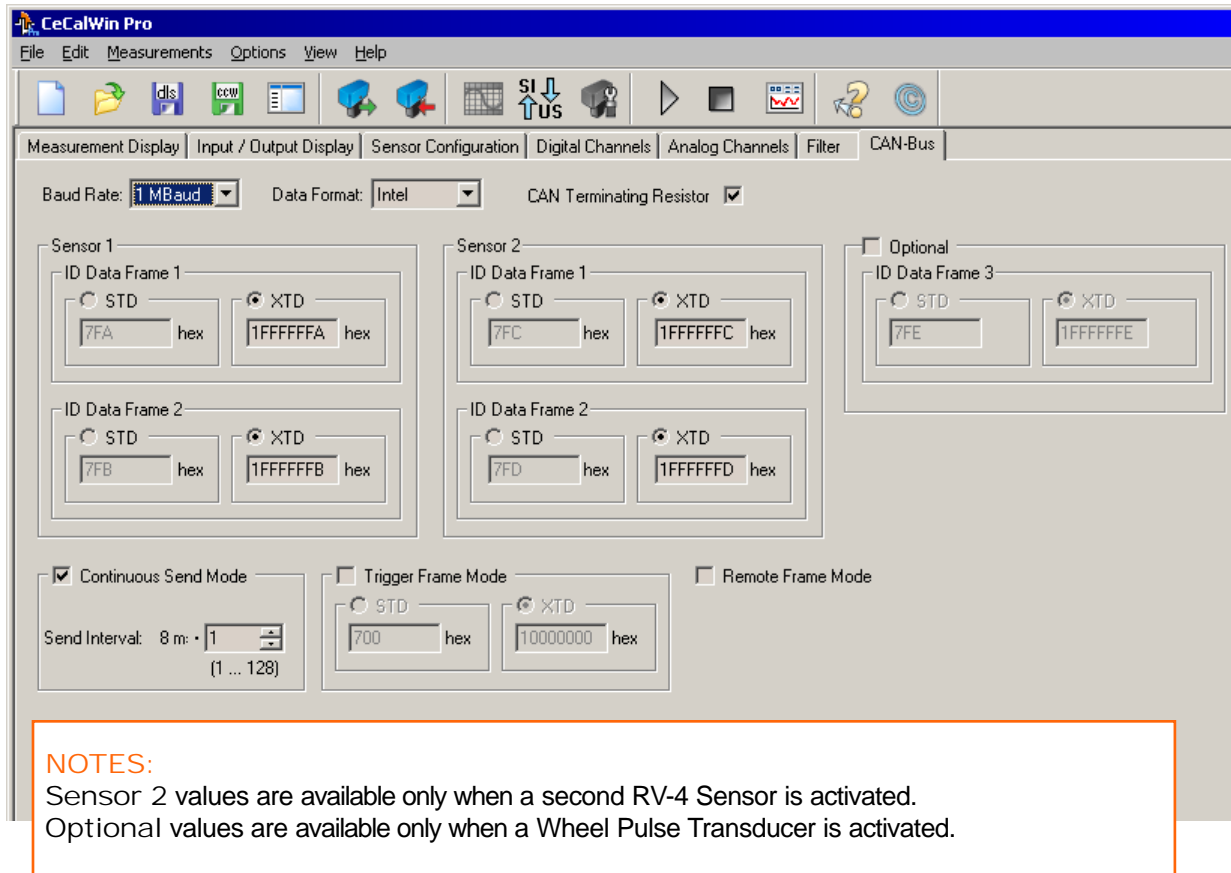
(Default value, XTD = 1FFFFFFFB)

Sensor 2 (available only if second RV-4 Sensor is activated)

See Sensor 1, above, for setting instructions.

CAN-Bus information continues on next page...

CAN-Bus, continued



Optional (available only if Wheel Pulse Transducer is activated)

Select the checkbox to activate ID Data Frame 3 settings.

ID Data Frame 3 (default setting = XTD)

Select the desired Sensor Message Identifier mode: STD (standard, 11-bit) or XTD (extended, 29-bit).  
 (default value, STD = 7FE) (default value, XTD = 1FFFFFFE)

Continuous Send Mode (default setting = selected)

Sets sensor to send CAN messages continuously and cyclically. (default = 8ms)  
 Cycle times between 8ms and 1024ms (in 8ms steps) can be selected.

Send Interval: (default setting = 1)

Other values can be entered manually, or selected with the up/down arrows.

Trigger Frame Mode (default setting = not selected)

When selected, sets sensor to respond to CAN trigger frames from a master controller for synchronization.

(default setting = XTD) (Default value, STD = 700 hex) (Default value, XTD = 10000000 hex)

Remote Frame Mode (default setting = not selected)

Sets the sensor to responds to a remote-frame request from a master controller. The sensor sends one Data Frame (response to the remote frame request) followed by the rest of Data Frames and, if selected, the optional Data Frame 3.

## 2. Data Protocol CAN-Bus

RV-x Sensors Version 1.1

(Valid from Sensor Software Version 030-01-01-00)

25.04.2006

There are 3 modes of data transmission on the CAN bus. The transmission mode can be selected using CeCalWin Pro; combinations of modes are not possible. The CAN messages sent by the sensors for all three modes consist of one or more Frames (a Frame is defined in the CAN-bus specifications).

The Sensor sends two **Data\_Frames**. The frame format is the same for each send mode. It is possible to choose between **Intel** data format or **Motorola** data format.

**If a second sensor is connected to the electronics, its data frames will be sent additionally. It is possible to append one optional Data\_Frame for RV-4 Sensors.**

### Continuous-send mode (**CONT**):

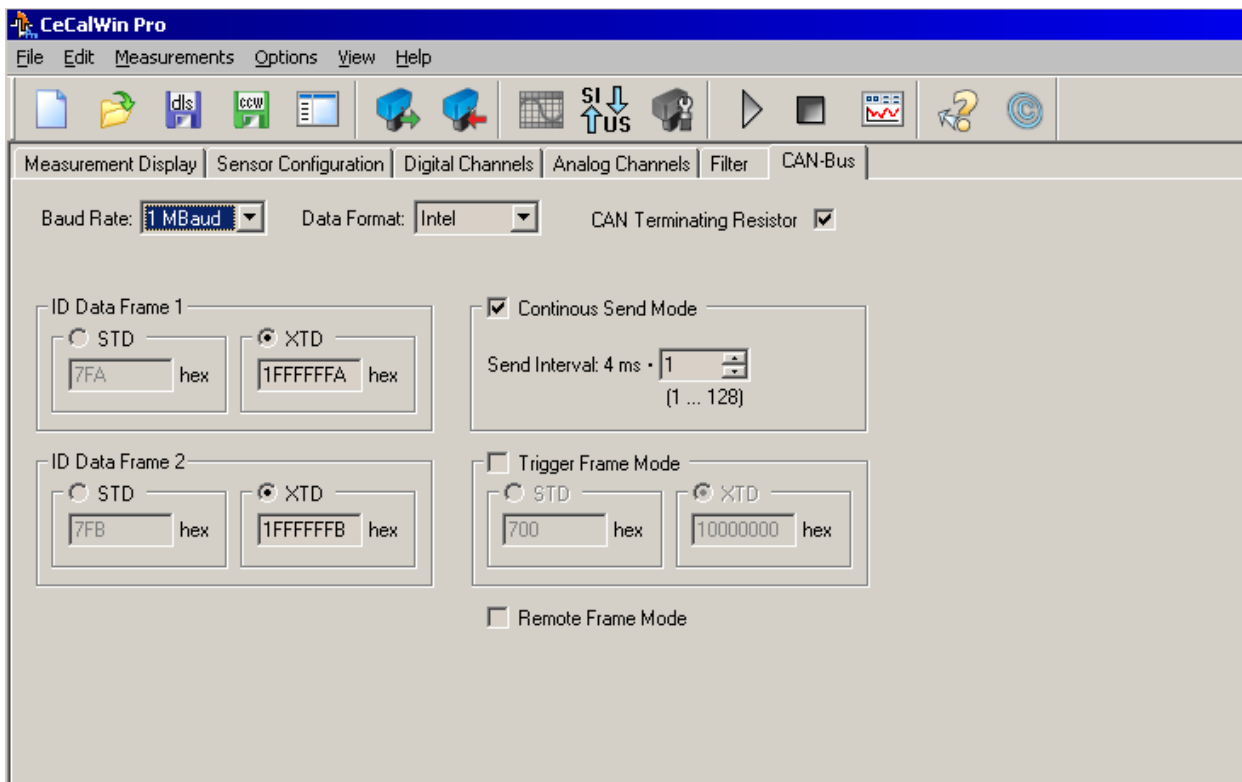
The messages are sent continuously and cyclically with a period set in CeCalWin Pro (by default 8ms). Cycle times between 8ms and 1024ms (in 8ms steps) can be selected.

### Remote Frame mode (**REM**):

The sensor responds to a remote-frame request from a master controller. The sensor sends one Data\_Frame (response to the remote frame request) followed by the second Data\_Frame.

### Trigger Frame mode (**TRG**):

The sensor responds to a trigger frame from a master controller (for synchronization). The trigger frame ID must be entered in the sensor using CeCalWin Pro.



The Identifier numbers of all **Data\_Frames** can be set separately in CeCalWin Pro. Baud rate and data format are selectable with CeCalWin Pro as well.

CAN-bus type : CAN V2.0B  
 Baud rate : 1MBaud (default), 500kBaund, 250kBaund, 125kBaund  
 Data format : Intel (default), Motorola backward

## 2.1 Definitions of the Frames

The following definitions indicate how the data bytes within a CAN message frame are allocated in order to decipher the transmitted data.

### 2.1.1 Definitions for Intel format:

Data\_Frame 1 (Sensor 1):  
 Format: 8 Data bytes  
 Default ID (Standard): 0x7FA  
 Default ID (Extended): 0x1FFFFFFFA

Data\_Frame 1 (Sensor 2):  
 Format: 8 Data bytes  
 Default ID (Standard): 0x7FC  
 Default ID (Extended): 0x1FFFFFFFC

Data byte	Description	Unit	Data type
0	Timestamp (Bit 0...7)	4 ms	unsigned
1	Timestamp (Bit 8...15)		
2	Coordinate X (Bit 0...7)	10 <sup>-2</sup> mm	signed
3	Coordinate X (Bit 8...15)		
4	Coordinate Y (Bit 0...7)	10 <sup>-2</sup> mm	signed
5	Coordinate Y (Bit 8...15)		
6	Coordinate Z (Bit 0...7)	10 <sup>-2</sup> mm	signed
7	Coordinate Z (Bit 8...15)		

Data\_Frame 2 (Sensor 1):  
 Format: 8 Data bytes  
 Default ID (Standard): 0x7FB  
 Default ID (Extended): 0x1FFFFFFFB

Data\_Frame 2 (Sensor 2):  
 Format: 8 Data bytes  
 Default ID (Standard): 0x7FD  
 Default ID (Extended): 0x1FFFFFFFD

Data byte	Description	Unit	Data type
0	Camber angle (Bit 0...7)	10 <sup>-2</sup> °	signed
1	Camber angle (Bit 8...15)		
2	Steer angle (Bit 0...7)	10 <sup>-2</sup> °	signed
3	Steer angle (Bit 8...15)		
4	<i>Distance since sensor power on</i> (Bit 0...7)	mm	unsigned
5	<i>Distance since sensor power on</i> (Bit 8...15)		
6	<i>Distance since sensor power on</i> (Bit 16...23)		
7	<i>Distance since sensor power on</i> (Bit 24...31)		

Optional Data\_Frame:

Format: 2 Data bytes if one sensor is connected / 4 Data bytes if two sensors are connected

Default ID (Standard): 0x7FE

Default ID (Extended): 0x1FFFFFFE

Data byte	Description	Unit	Data type
0	v (Bit 0...7) Sensor 1	10 <sup>-2</sup> m/s	unsigned
1	v (Bit 8...15) Sensor 1		
2	v (Bit 0...7) Sensor 2	10 <sup>-2</sup> m/s*	unsigned
3	v (Bit 8...15) Sensor 2		

\* **Note:** Data byte 2 and 3 will be sent only when two sensors are connected to the RV-4 electronics.

### 2.1.1 Definitions for Motorola format:

Data\_Frame 1 (Sensor 1):

Format: 8 Data bytes

Default ID (Standard): 0x7FA

Default ID (Extended): 0x1FFFFFFA

Data\_Frame 1 (Sensor 2):

Format: 8 Data bytes

Default ID (Standard): 0x7FC

Default ID (Extended): 0x1FFFFFFC

Data byte	Description	Unit	Data type
0	Timestamp (Bit 8...15)	4 ms	unsigned
1	Timestamp (Bit 0...7)		
2	Coordinate X (Bit 8...15)	10 <sup>-2</sup> mm	signed
3	Coordinate X (Bit 0...7)		
4	Coordinate Y (Bit 8...15)	10 <sup>-2</sup> mm	signed
5	Coordinate Y (Bit 0...7)		
6	Coordinate Z (Bit 8...15)	10 <sup>-2</sup> mm	signed
7	Coordinate Z (Bit 0...7)		

Data\_Frame 2 (Sensor 1):

Format: 8 Data bytes

Default ID (Standard): 0x7FB

Default ID (Extended): 0x1FFFFFFB

Data\_Frame 2 (Sensor 2):

Format: 8 Data bytes

Default ID (Standard): 0x7FD

Default ID (Extended): 0x1FFFFFFD

Data byte	Description	Unit	Data type
0	Camber angle (Bit 8...15)	$10^{-2} \text{ }^\circ$	signed
1	Camber angle (Bit 0...7)		
2	Steer angle (Bit 8...15)	$10^{-2} \text{ }^\circ$	signed
3	Steer angle (Bit 0...7)		
4	<i>Distance since sensor power on</i> (Bit 24...31)	mm	unsigned
5	<i>Distance since sensor power on</i> (Bit 16...23)		
6	<i>Distance since sensor power on</i> (Bit 8...15)		
7	<i>Distance since sensor power on</i> (Bit 0...7)		

Optional Data\_Frame:

Format: 2 Data bytes if one sensor is connected / 4 Data bytes if two sensors are connected

Default ID (Standard): 0x7FE

Default ID (Extended): 0x1FFFFFFE

Data byte	Description	Unit	Data type
0	v (Bit 8...15) Sensor 1	$10^{-2} \text{ m/s}$	unsigned
1	v (Bit 0...7) Sensor 1		
2 *	v (Bit 8...15) Sensor 2	$10^{-2} \text{ m/s}$	unsigned
3 *	v (Bit 0...7) Sensor 2		

\* **Note:** Data byte 2 and 3 will be sent only when two sensors are connected to the RV-4 electronics.

## 2.2 Troubleshooting CAN with the RV-4 Sensor

Error: No messages are available on the CAN Bus

Please be sure that:

- The electronics unit is supplied with power.
- The data acquisition system is connected to the electronics of the RV-4 Sensor.
- Data acquisition system and sensor electronics have the same settings for baud rate, CAN Identifier and Identifier Types.
- If you use a CANalyser or a data acquisition system with acceptance filter, be sure that the messages from the sensor are not blocked.

Problem: Data received via the CAN bus appear to be incorrect

Please be sure that:

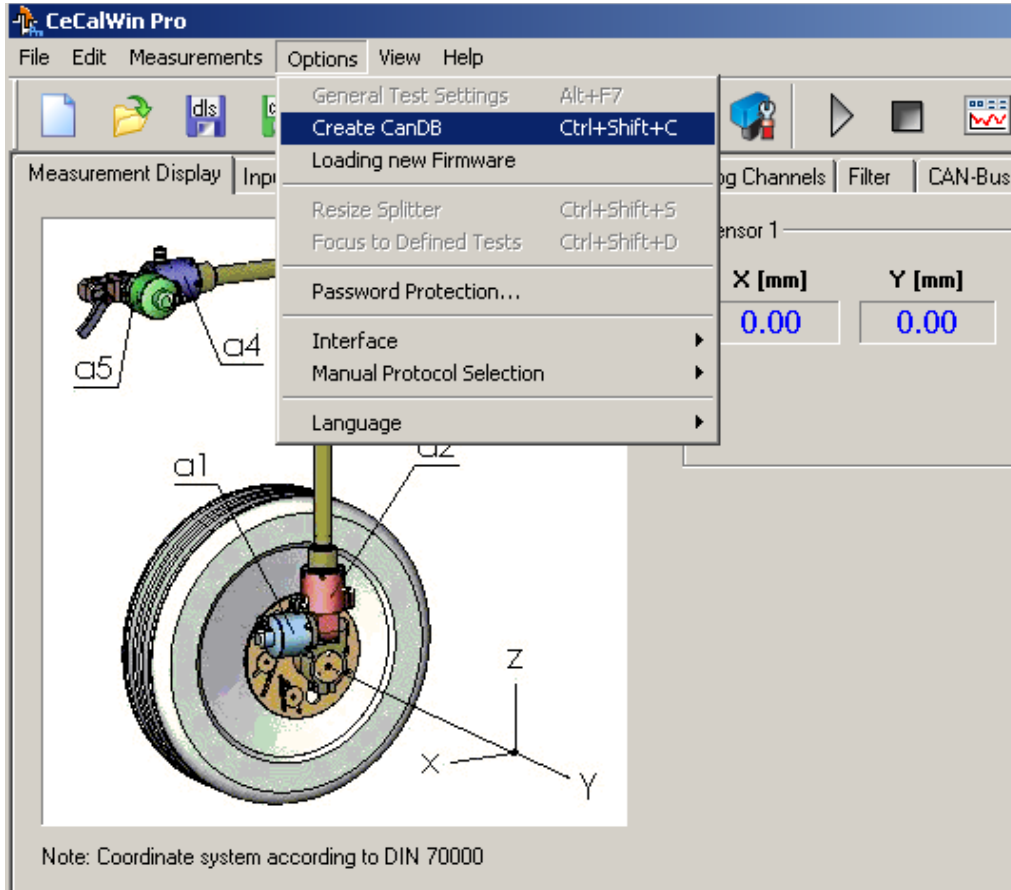
- the data acquisition system uses Intel data format for communication via CAN-bus
- the data acquisition system and all sensor electronics use the same settings for the type of measured value (signed or unsigned, number of bits)
- Incorrect data format is selected (Intel/Motorola)

CORRSYS-DATRON recommends that the .dbc file option be used to avoid problems with false data types or bit lengths. Sensor-specific .dbc files are available for download at [www.corrsys-datron.com](http://www.corrsys-datron.com), or may also be obtained by contacting the CORRSYS-DATRON application department directly.

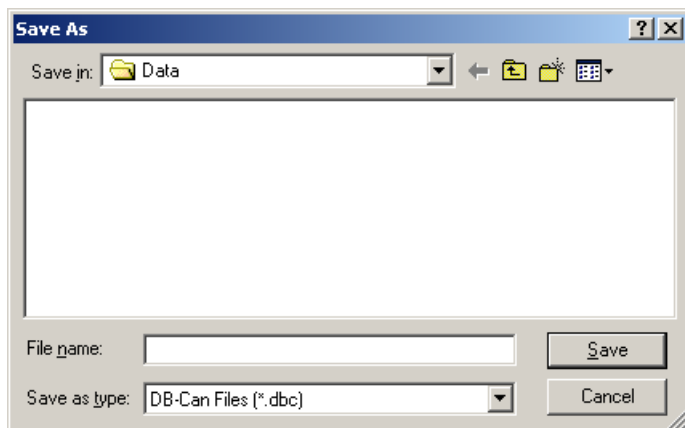
### 3. Creation of CAN Database Files (CanDB)

From CeCalWinPro Version 1.9 on, it is possible to create CAN database files. These files provide an easy way to extract measured data from the CAN signals of CORRSYS-DATRON Sensors

To start the generation of CAN database files, please select options>create CanDB



After selecting this menu item, you will be prompted to choose a location for storing the CAN database file.



Please select a suitable location and file name, and store the file by clicking the “Save” button.

## 4. Firmware Update

Due to the continuous development of our sensors, an update of the sensor firmware could be necessary. This chapter describes, how to perform this using CeCalWin Pro.

This function is available from CeCalWin Pro Version 1.9 onwards.

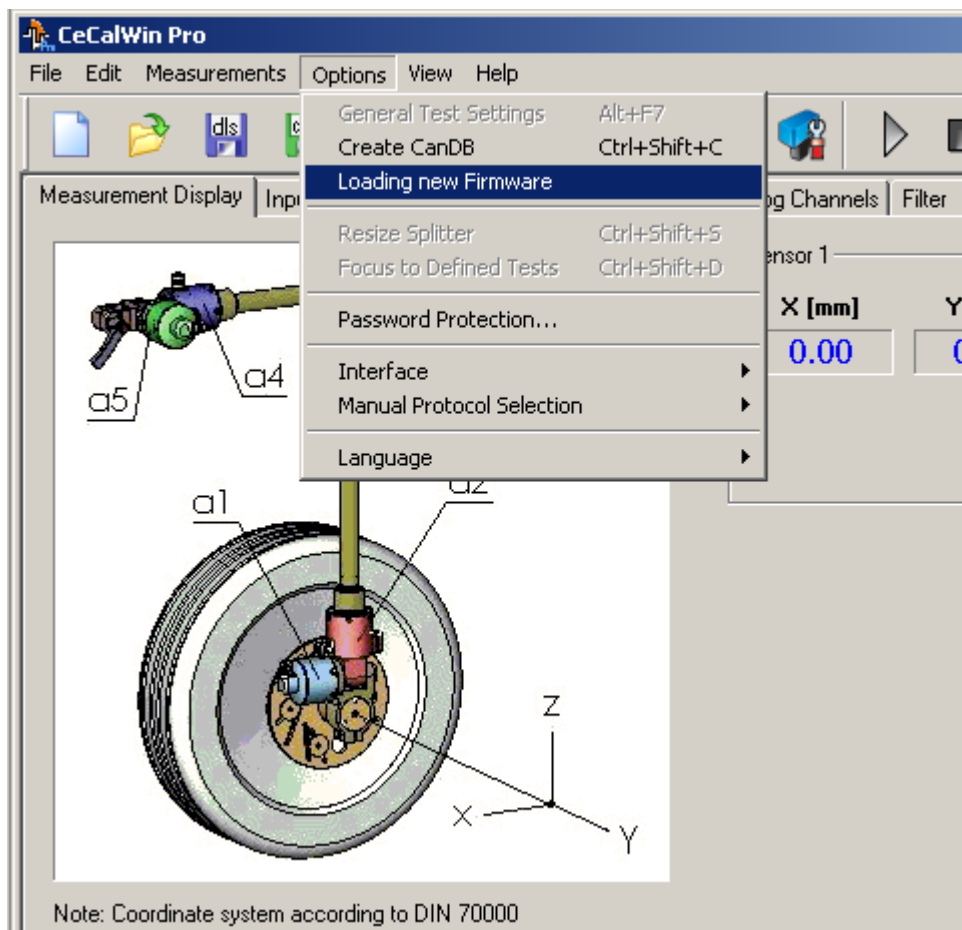
**Note: Before you start the firmware update, please be sure that the data connection (USB or RS232) between the Computer and the Sensor as well as the power supply of the Computer and Sensor are correct.**

**An interruption of sensor communication / power supply or a computer crash during the firmware update can result in an irreparable destruction of the sensor programming.**

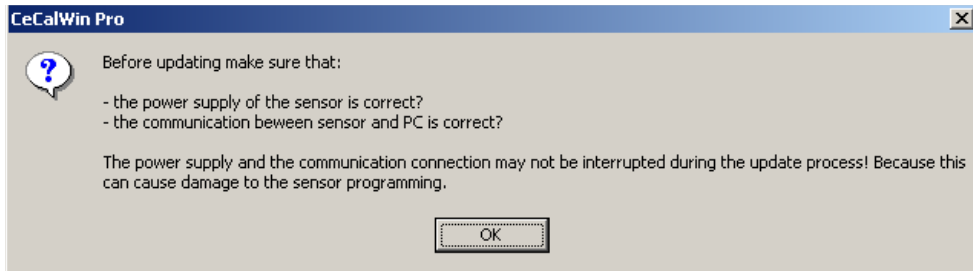
### 4.1. Performing the Firmware Update:

#### Step 1: Start the firmware update function

To start the firmware update, please select Options>Loading new Firmware from the menu.



Now, a message appears, prompting you to check data connection PC/Sensor and power supply.

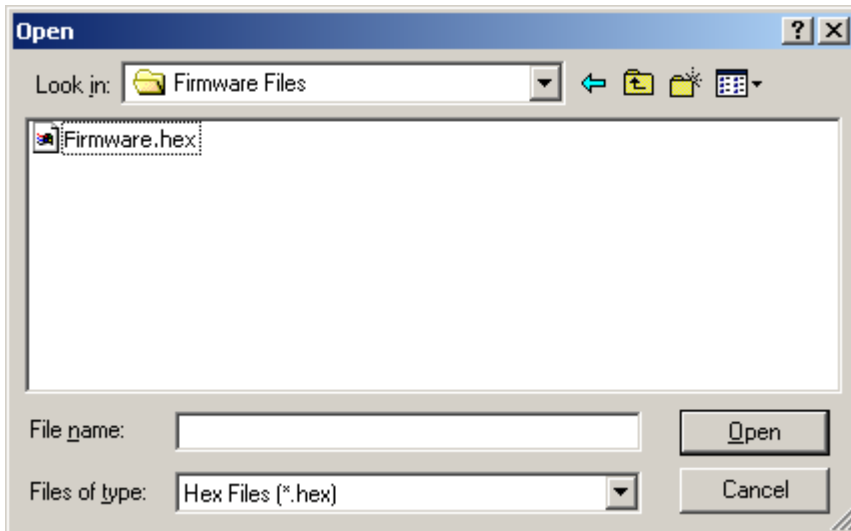


Please make sure that both, data connections and power supply, are correct and then confirm this message by clicking "OK".

**Step 2: Selection of firmware file**

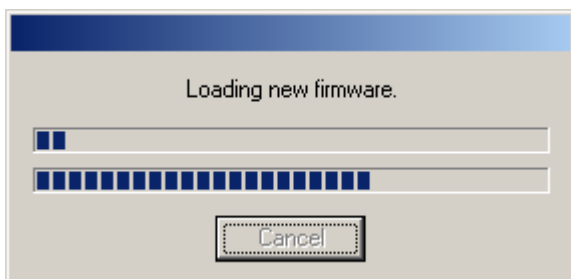
Next, you will be prompted to select the firmware file, which you want to write into the sensor. For this purpose, please browse to the location on your hard disk, where the desired file is stored. Clicking on "Open" will confirm the firmware file and starts loading the new firmware.

**Note: From this moment on, the firmware update must not be interrupted!**



**Step3: Loading the new firmware**

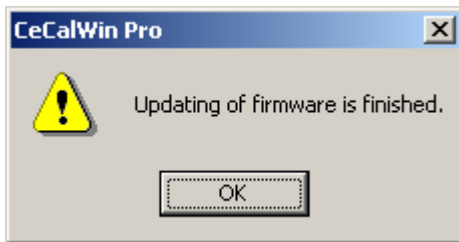
During the sensor programming, a status window appears that shows the actual progress of the firmware update.



Temporarily, the progress bar may stop for a little moment. This is normal, caused by erasing of required memory space in the background.

#### Step 4: Finishing the firmware update

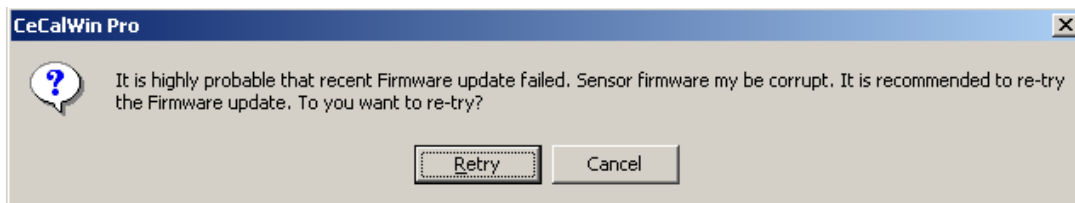
If the firmware update is finished successfully, the following message appears.



After confirming this message by clicking the OK button, CeCalWinPro reads out the Sensor automatically and the firmware update is finished.

#### 4.2. Problems during the firmware update

If an interruption of the communication connection between Computer and Sensor or a failure of the sensor power supply occurs during the firmware update, CeCalWinPro displays the following error message.

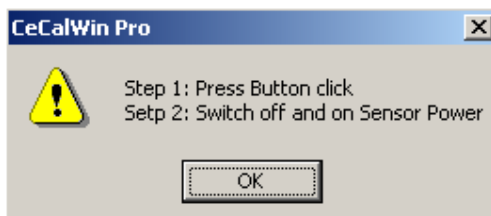


It is strongly recommended, to confirm this message with clicking the Retry button. The firmware update will be repeated automatically, depending on the BIOS, which is running in the Sensor (see procedure 1 and procedure 2 below).

Confirming this message by clicking the Cancel button, may result in irreparable damages of the sensor programming.

**Procedure 1 (newer BIOS Versions):** In this case, the Retry of the firmware update begins with Step 3 (please see chapter 4.1).

**Procedure 2 (older BIOS Versions):** In this case, a hardware reset is necessary after confirming the message with "Retry". This will be displayed with a message..



After having confirmed this message with OK (Step 1), the power supply must be switched off and on (Step 2) within 5 seconds. Following, the firmware update will be continued with Step 3 (see chapter 4.1).