

CORRSYS

DATRON

Sensorsysteme GmbH



CeCalWin Pro & S-350 Racing

Sensor Configuration and
Data Acquisition Software

for

Setup and calibration of the CORRSYS-DATRON S-350 Racing Sensor

USER MANUAL

VOLUME III

S-350 Racing

Sensor-specific Software Description

Note:

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

For the hardware description of the Sensor please refer to the separate user manual Volume I.

VOLUME III - S-350 Racing Sensor-specific Software Description

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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.

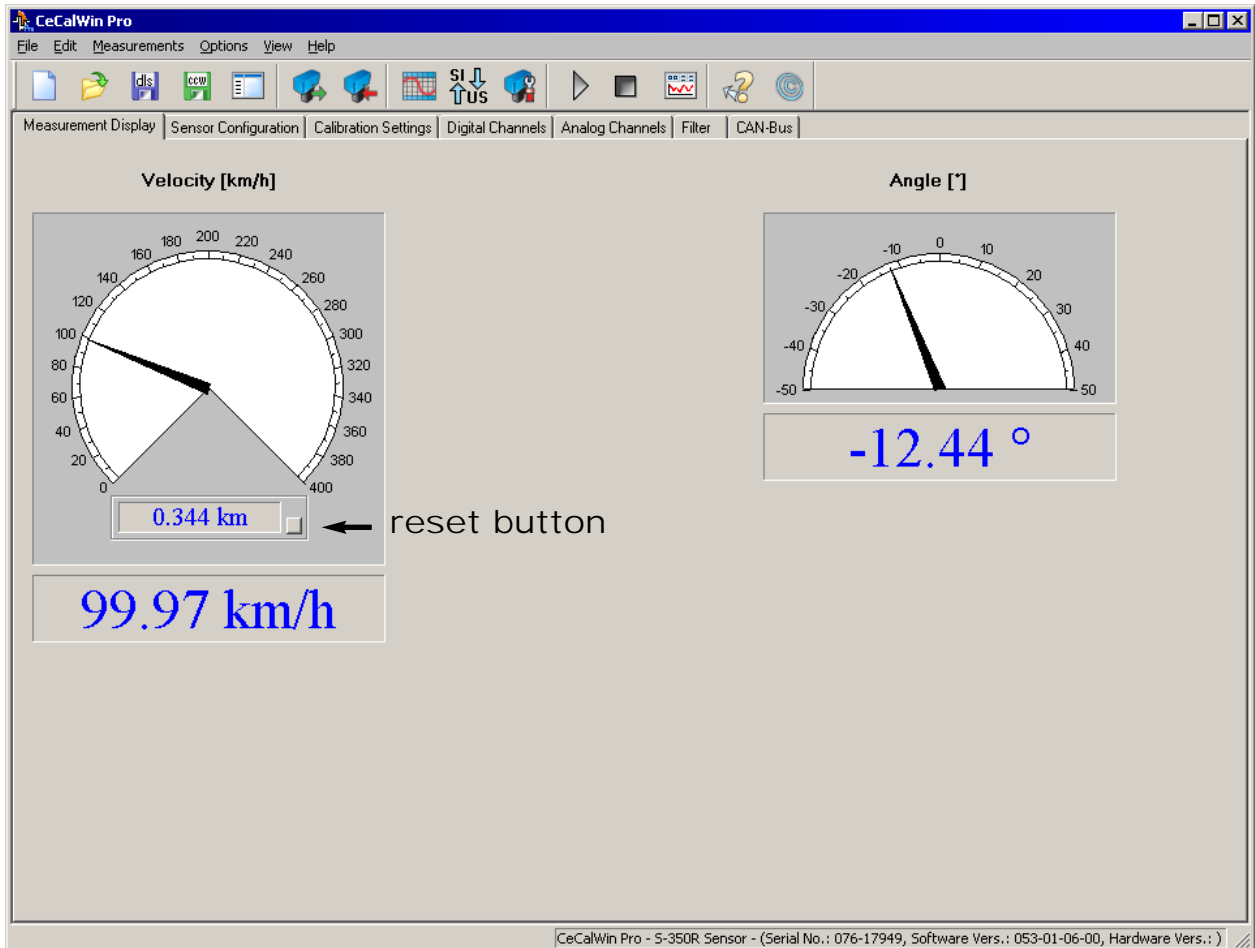
- Use hardware and/or software only for intended applications. Improper application is not advised.
- Do not modify or change equipment or its accessories in any way.
- Improper use or mounting of the equipment may affect the safety of the vehicle and/or occupants.
- The equipment must not be mounted 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.

1. Project Window Settings for the S-350 Racing Sensor

Within the Project Window, seven tabbed sections will be displayed: Measurement Display, Sensor Configuration, Calibrating Settings, Digital Channels, Analog Channels, Filter, and CAN-Bus. Options for system configuration, operation and data display are explained in the following pages.

1.1 Measurement Display

The Measurement Display tab shows measurement values from the S-350 Racing Sensor in real time.



Velocity [km/h]

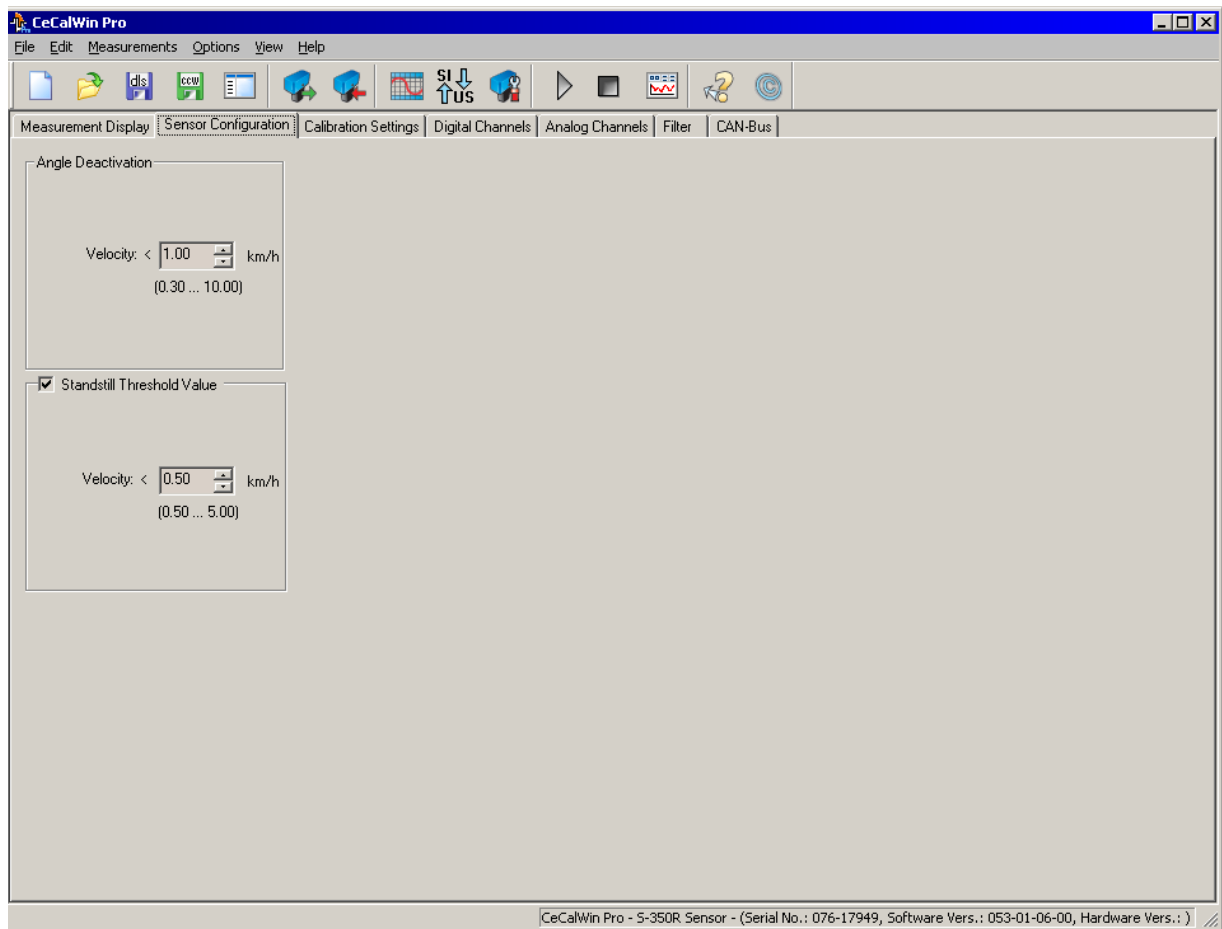
The display shows the actual velocity and the milage of the sensor. With the reset button, the user can reset the milage to 0.

Angle [°]

The Display shows the actual angle.

1.2 Sensor Configuration

The Sensor Configuration tab enables sensor parameterization.



Angle deactivation:

If the velocity of the sensor is lower as the entered threshold, the sensor sets the value of the angle to 0.

Velocity (Default value = 1.0 km/h)

Use the scroll-edit field to set the velocity threshold, or enter the new value manually.

Standstill Threshold Value:

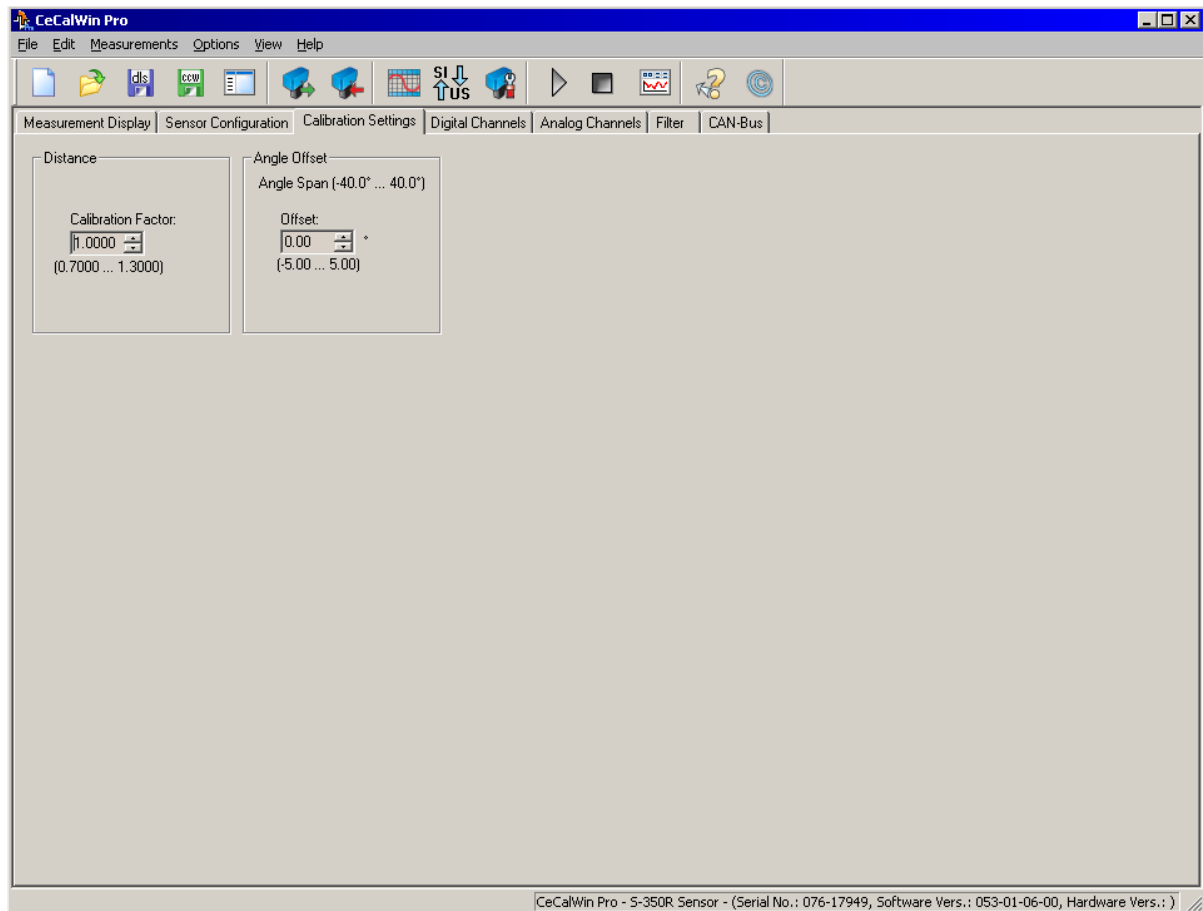
Select the checkbox to activate the standstill controll by velocity threshold.

Velocity (Default value = 0.5 kph)

Use the scroll-edit field to set the velocity threshold, or enter the new value manually.

1.3 Calibration Settings

The Calibration Settings tab enables editing the calibration factor.



Distance

Calibration factor (Default value = 1.0000)

Displays the value that is calculated during calibration to correct for mounting errors, surface changes, etc. The value can also be changed by using the scroll-edit function, or enter new value manually.

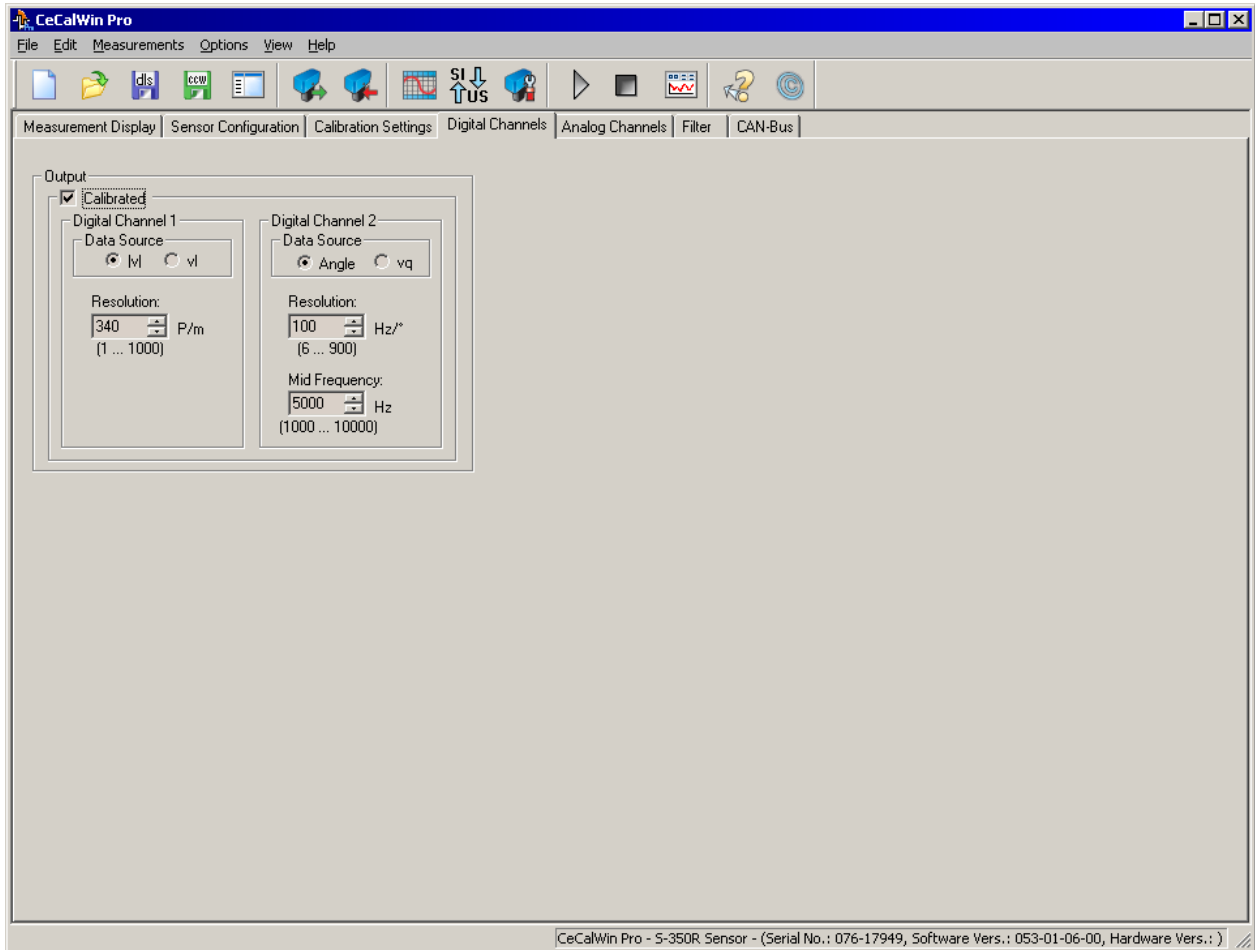
Angle

Offset (Default Value = 0.0°)

Displays the value that is calculated during calibration to correct for mounting errors, surface changes, etc. The value can also be changed by using the scroll-edit function, or enter new value manually.

1.4 Digital Channels

The digital output can be configured from within this section per the following descriptions.



Output

Calibrated (Default = selected)

Select the checkbox to set microcontroller calculated signals on Digital Channels .

Digital channel 1 (Default value = |v|)

Set the radio button to select between the data sources |v| and vl

Resolution (Default value, |v| = 340 P/m; Default value, vl = 340 P/m)

Selects the number of digital pulses/meter at the digital output.

Other values can be entered manually, or by using the scroll-edit field.

Digital channel 2 (Default value = Angle)

Set the radio button to select between the data sources Angle and vq

Resolution (Default value Angle = 50 Hz/°; Default value, vq = 100 Hz/km/h)

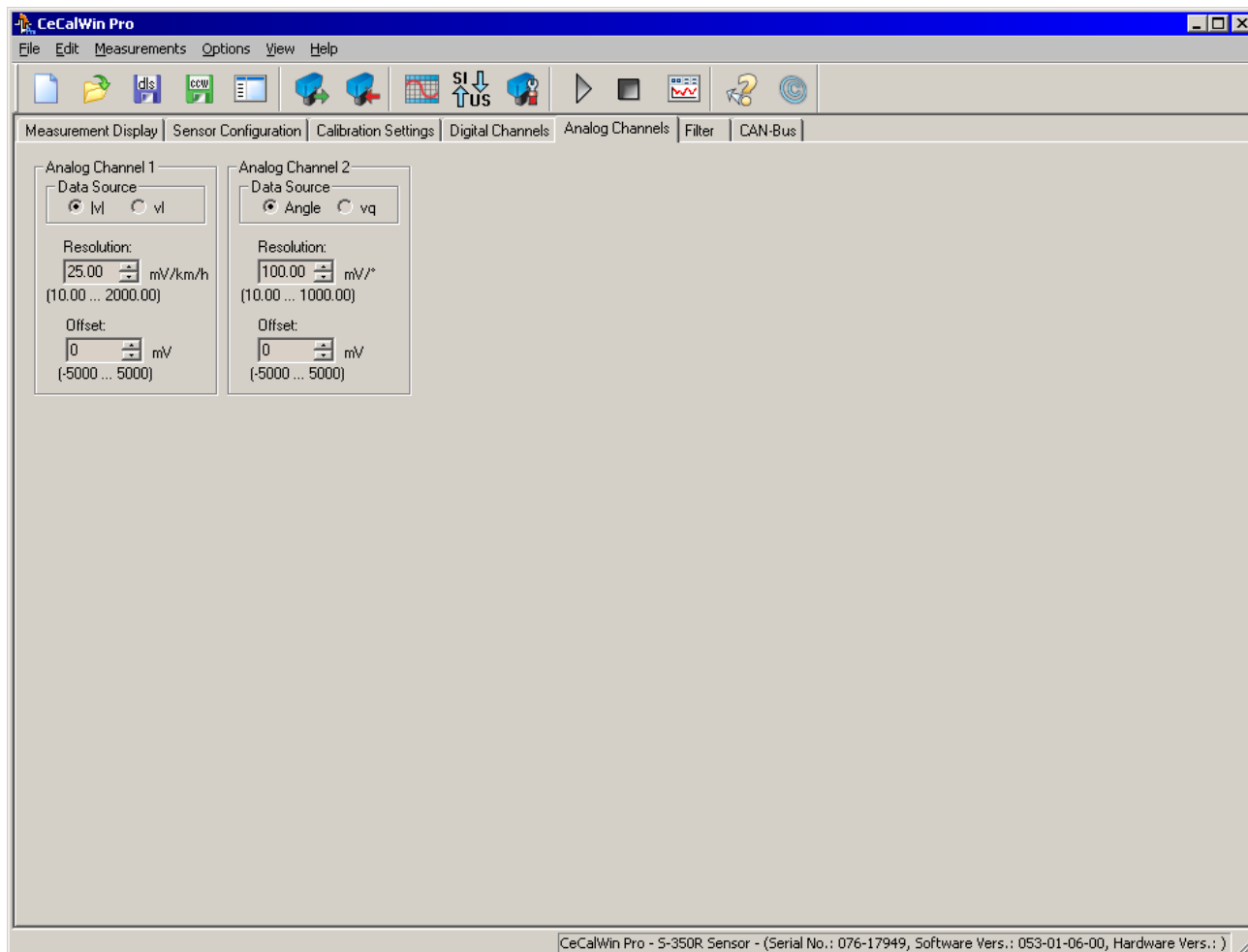
Selects the desired resolution for the selected digital output. Other values can be entered manually, or by using the scroll-edit field.

Mid Frequency (Default value Angle = 5000 Hz; Default value vq = 5000 Hz)

Selects the desired resolution for the selected digital output. Other values can be entered manually, or by using the scroll-edit field.

1.5 Analog Channels

The analog output can be configured from within this section per the following descriptions.



Analog Channel 1 (Default value = |v|)

Set the radio button to select between the data sources |v| and vI.

Resolution (Default value |v|= 25 mV/km/h, Default value vI = 25 mV/km/h)

Use the scroll-edit field to set the resolution of the analog output, or enter the new value manually.

Offset (Default value = 0 mV)

Use the scroll-edit field to define an additional offset value, or enter the new value manually.

Analog Channel 2 (Default value = Angle)

Set the radio button to select between the data sources Angle and vq

Resolution (Default value = 100 mV/ °; Default value, vq = 100 mV/kph)

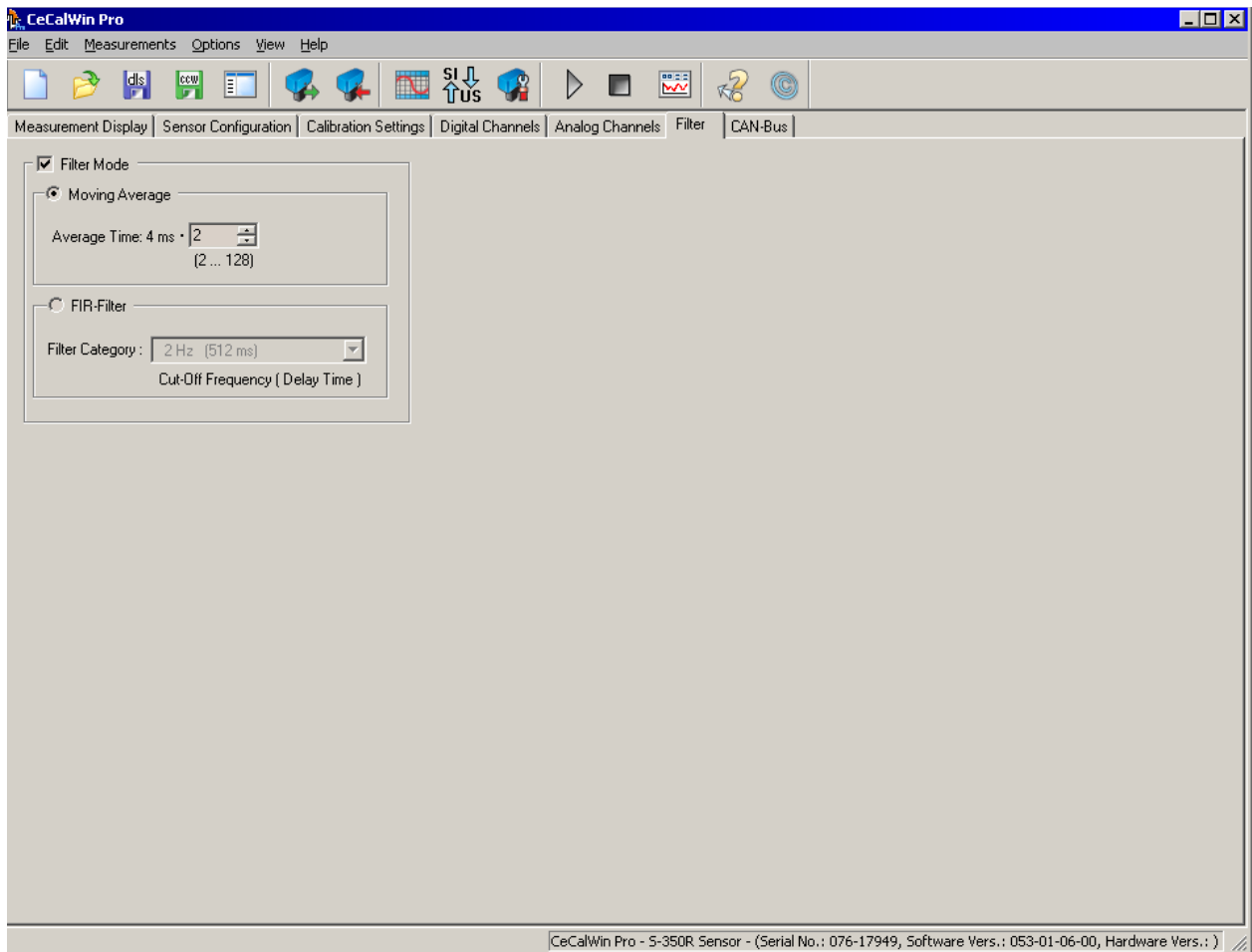
Use the scroll-edit field to set the resolution of the analog output, or enter the new value manually.

Offset (Default value = 0 mV)

Use the scroll-edit field to define an additional offset value, or enter the new value manually.

1.6 Filter

The Filter tab enables adjustment of the filter-time setting for a connected CORREVIT® S-350 Racing Sensor.



Filter Mode (Default = selected)

Select the checkbox to activate access to the filter-time setting for the connected CORREVIT® S-350 Racing Sensor.

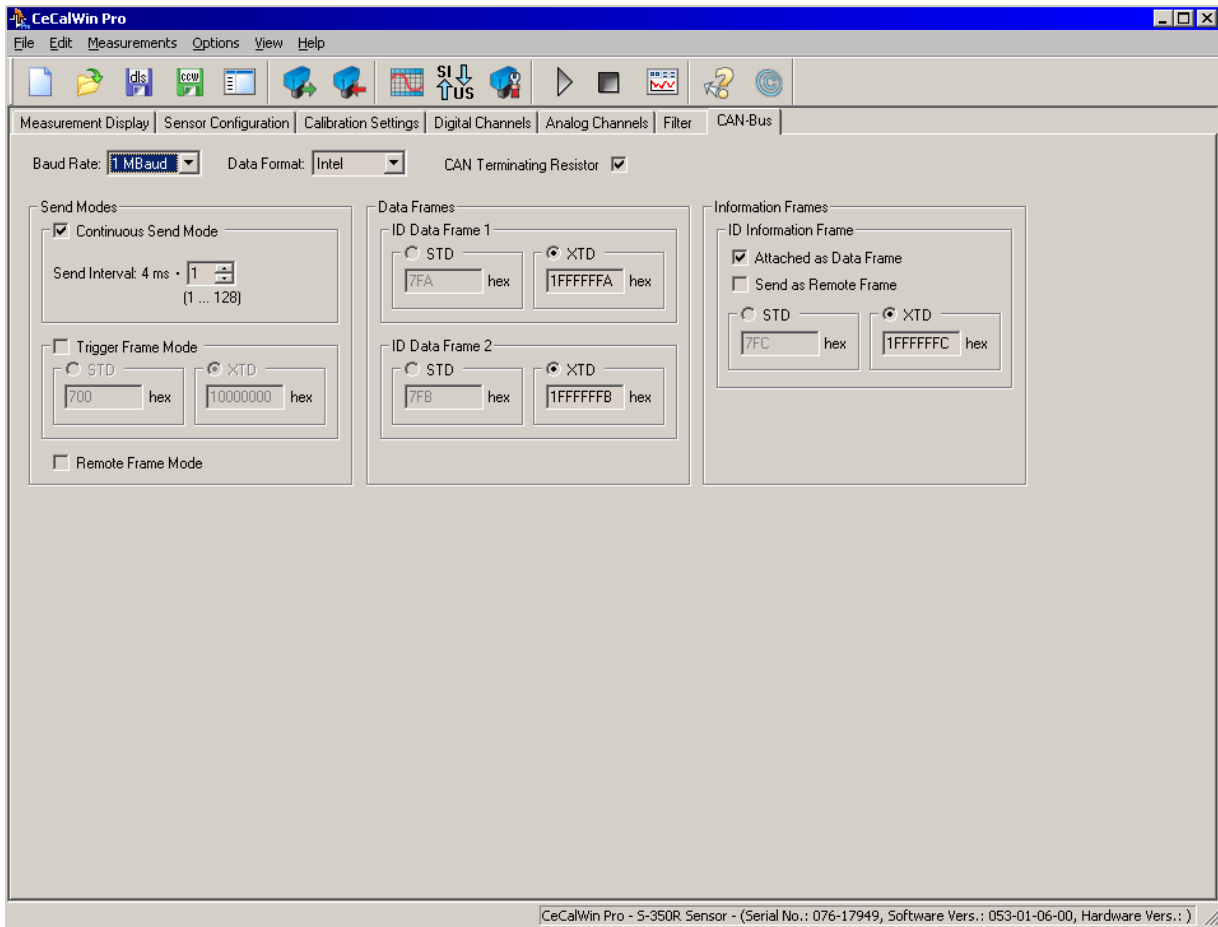
Moving Average: user-selectable (default value = $2 \times 4 = 8$ ms).
Other values can be entered manually, or by using the scroll-edit field.

FIR Filter: user-selectable (default value = 2 Hz (512 ms)).
Other values can be entered manually, or by using the scroll-edit field.

1.7 CAN Bus

In this menu you can configure the CAN Bus according to your requirements.

Also see Chapter 3 for further information (Data Protocol CAN-Bus, page 18 ff).



Baud rate (Default value = 1 Mbaud)

Sets the communication baud rate for the CAN Protocol.

Data Format (Default = Intel)

You can choose between Intel or Motorola data format.

CAN Terminating Resistor (Default = selected)

Select the checkbox to terminate the CAN Bus

Send Modes:

Continuous Send Mode (Default setting = selected) (Default value = 1)

Sets sensor to send CAN message frame at regular intervals, selectable in 4 ms increments.

Trigger Frame Mode (Default setting = not selected)

Sets sensor to respond to CAN Trigger Frames.

Select either Standard (STD) or Extended (XTD) Identifier Mode (Default setting = XTD)

Set Sensor Message Identifier (Default value, STD = 700)

(Default value, XTD = 10000000)

Remote Frame Mode (Default setting = not selected)

Sets sensor to respond to Remote Frame requests.

Data Frames

Sets Sensor Data Frames (see CAN Protocol, page 18ff)

ID Data Frame 1

Select either Standard (STD) or Extended (XTD) Identifier mode (Default setting = XTD)

Set Sensor Message Identifier (Default value, STD = 7FA)
(Default value, XTD = 1FFFFFFFA)

ID Data Frame 2

Select either Standard (STD) or Extended (XTD) Identifier mode (Default setting = XTD)

Set Sensor Message Identifier (Default value, STD = 7FB)
(Default value, XTD = 1FFFFFFFB)

Information Frames

Sets Sensor Information Frame (see CAN Protocol, page 19ff)

Select either Standard (STD) or Extended (XTD) Identifier mode (Default setting = XTD)

Set Sensor Message Identifier (Default value, STD = 7FC)
(Default value, XTD = 1FFFFFFFC)

Attached as Data Frame

Select the checkbox to attach the Information Frame as Data Frame

Send as Remote Frame

Select the checkbox to set Information Frame to respond to Remote Frame request.

2. Sensor Calibration

Calibration Values

Distance [m]

These values define the nominal value of the calibration distance.

Use the scroll-edit field to set the calibration distance, or enter the new value manually.

Note: Value “**Simulator Height [mm]**” is only for 3-axis sensors and not active for S-350 Racing Sensors.

Values to calibrate

Select the signal you want to calibrate.

Note: “**Height**” is only for 3-axis sensors and not active for S-350 Racing Sensors

Trigger

Pulses Count for End

This value defines the number of trigger pulses to stop the calibration.

For example: If Pulses Count for End is 4, the first trigger pulse will start the calibration and the fourth trigger pulse will stop it. Trigger pulses 2 and 3 will be ignored.

Use the scroll-edit field to set the pulses count for end, or enter the new value manually.

Delay after Trigger [ms]

To debounce the Trigger signal, you can set a delay time here.

Use the scroll-edit field to set the delay time, or enter the new value manually.

Number of Acquisitions

CeCalWin Pro is able to calculate an average for the calibration values. With "Number of Acquisitions" you can set the number of acquisitions for the average calculation.

Use the scroll-edit field to set the number of acquisitions, or enter the new value manually.

Button "OK"

Pushing the "OK" button initializes CeCalWin Pro for calibration and the calibration can start.

Button "Cancel"

To cancel the calibration, push the "Cancel" button.

End Distance: [m] 200.0	Distance: [m] 0.000	Time: [s] 4.3
Min Angle: [deg] 0.00	Angle: [deg] 0.0	Max Angle: [deg] 0.00
Min Height: [mm] 0.00	Height: [mm] 0.00	Max Height: [mm] 0.00

Trigger Remaining: 1

Stop Cancel

End Distance [m]

This value displays the nominal calibration distance.

Distance [m]

Here you can see the actual distance since start trigger.

Time [s]

This value shows the actual time since start trigger.

Min Angle [deg]

Here you can see the minimum angle during calibration.

Angle [deg]

This value shows the actual measured angle.

Max Angle [deg]

Here you can see the maximum angle during calibration.

Note: The Values "**Min Height**", "**Height**" and "**Max Height**" are only for 3-axis sensors not active for S-350 Racing Sensors.

Trigger Remaining

The value shows the actual remaining trigger pulses to end the actual calibration acquisition.

Button "Start / Stop"

To start the calibration manually, push the "Start" button. To stop the calibration manually, push the button "Stop".

Button "Cancel"

To cancel the calibration, push the "Cancel" button.

Results of Calibration...

Distance	Angle	Height
Entered: 200	Min: 0	Min: 0
Real: 0	Max: 0	Max: 0
Old factor: 1	Old offset: 0	Old offset: 0
New factor: 0	New offset: 0	New offset: 0
Average Factor: 1	Average Offset: 0	Average Offset: 0
Accept Distance	Accept Angle	Accept Height

Remaining acquisitions: 0

OK Accept all Cancel

Distance:

Entered

This value shows the nominal calibration distance.

Real

This value shows the actual measured distance.

Old factor

This value shows the old calibration factor, which is stored in the sensor.

New factor

This value shows the actual calibration factor, which was calculated at the end of the actual calibration acquisition.

Average Factor

Average over all valid calibration factors

Button "Accept Distance"

To accept the actual calibration factor, please push the button "Accept Distance".

The accepted factor will be used to calculate the average calibration factor.

Angle:

Min

This value shows the minimum value of angle during calibration.

Max

This value shows the maximum value of angle during calibration.

Old offset

This value shows the old angle offset, which is stored in the sensor.

New offset

This value shows the actual angle offset, which was calculated at the end of the actual calibration acquisition.

Average Offset

Average over all valid calibration offsets

Button "Accept Angle"

To accept the actual angle offset, please push the button "Accept Angle".

The accepted offset will be used to calculate the average angle offset.

Note: **"Height"** is only for 3-axis sensors not active for S-350 Racing Sensors.

Remaining acquisitions:

The value shows the actual number of remaining acquisitions.

Button "OK"

With pushing the "OK" button, you get either to the next calibration acquisition, or the calibration routine will be finished with writing the average factor in edit field "Calibration factor" on tab "Calibration Settings".

Note: If button "OK" will be pushed without accepting the actual calibration factor or the actual angle offset, the last acquisition will not be valid and has to be repeated.

Button "Accept all"

If you want to accept the actual values of calibration factor and angle offset at once, you can do this with pushing the button "Accept all".

Button "Cancel"

If you want to finish the calibration routine without storing the average factor, you are able to do this with this button.

3. Data Protocol CAN-Bus

S-350 Racing Sensor Version 1.0

(valid from Sensor Software Version 053-01-05-00)

12.12.2007

There are 3 modes of data transmission on the CAN-bus. The transmission mode can be selected using CeCalWinPro. 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** and one **combined ID-Status-Frame**. The frame format is the same for each send mode. It is possible to choose between **Intel** data format or **Motorola** data format.

To reduce the traffic on the can bus, it's possible to switch off the optional Data-Frame and the ID-Status-Frame. For the ID-Status-Frame, it is possible to send this frame as a remote frame independent from the data frames.

Continuous-send mode (CONT):

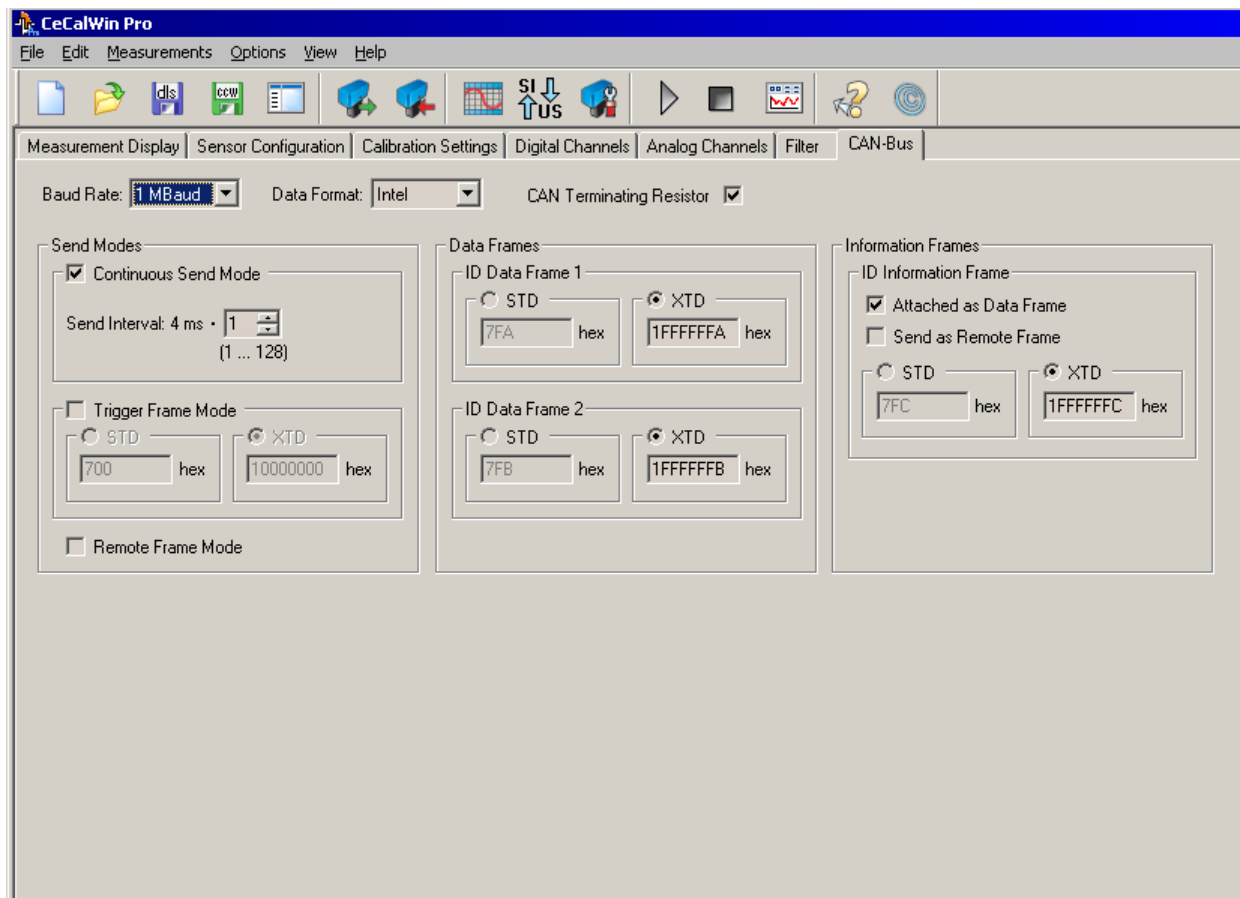
The messages are sent continuously and cyclically with a period set in CeCalWinPro (by default 4ms). Cycle times between 4ms and 512ms (in 4ms steps) can be selected.

Remote Frame mode (REM):

The sensor responds to a remote-frame request from a master controller. The sensor sends the **Data-Frames** (response to the remote frame request), followed by the **ID-Status-Frame**, if switched on.

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 CeCalWinPro.



The Identifier numbers of the **Data-Frames** and the **ID-Status-Frame** can be set separately in CeCalWin Pro. The settings of 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

3.1 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.

Definitions for Intel Format

Data_Frame 1

Format: 8 Data bytes

Default ID (Standard): 0x7FA

Default ID (Extended): 0x1FFFFFFFA

Data byte	Description	Unit	Data type
0	Timestamp (Bit 0...7)	4 ms	unsigned
1	Timestamp (Bit 8...15)		
2	l _v (Bit 0...7)	10 ⁻² m/s	unsigned
3	l _v (Bit 8...15)		
4	<i>Distance since sensor power on</i> (Bit 0...7)		
5	<i>Distance since sensor power on</i> (Bit 8...15)	mm	unsigned
6	<i>Distance since sensor power on</i> (Bit 16...23)		
7	<i>Distance since sensor power on</i> (Bit 24...31)		

Data_Frame 2

Format: 6 Data bytes

Default ID (Standard): 0x7FB

Default ID (Extended): 0x1FFFFFFFB

Data byte	Description	Unit	Data type
0	v _L (Bit 0...7)	10 ⁻² m/s	unsigned
1	v _L (Bit 8...15)		
2	v _T (Bit 0...7)	10 ⁻² m/s	signed
3	v _T (Bit 8...15)		
4	Angle (Bit 0...7)	10 ⁻² (°)	signed
5	Angle (Bit 8...15)		

ID-Status_Frame:

Format: 8 Data bytes

Default ID (Standard): 0x7FC

Default ID (Extended): 0x1FFFFFFC

Data byte	Description	Unit	Data type
0	Serial number (Bit 0...7)		
1	Serial number (Bit 8...15)		
2	Serial number (Bit 16...23)	none	unsigned
3	Serial number (Bit 24...31)		
4	Temperature	°C	signed
5	LED illumination current	10 ⁻² A	unsigned
6	Status byte 1	see Table 1, page 24	
7	Status byte 2	see Table 2, page 24	

Definitions for Motorola Format

Data_Frame 1

Format: 8 Data bytes

Default ID (Standard): 0x7FA

Default ID (Extended): 0x1FFFFFFA

Data byte	Description	Unit	Data type
0	Timestamp (Bit 8...15)	4 ms	unsigned
1	Timestamp (Bit 0...7)		
2	l _v (Bit 8...15)	10 ⁻² m/s	unsigned
3	l _v (Bit 0...7)		
4	<i>Distance since sensor power on (Bit 24...31)</i>	mm	unsigned
5	<i>Distance since sensor power on (Bit 16...23)</i>		
6	<i>Distance since sensor power on (Bit 8...15)</i>		
7	<i>Distance since sensor power on (Bit 0...7)</i>		

Data_Frame 2

Format: 6 Data bytes

Default ID (Standard): 0x7FB

Default ID (Extended): 0x1FFFFFFB

Data byte	Description	Unit	Data type
0	v _L (Bit 8...15)	10 ⁻² m/s	unsigned
1	v _L (Bit 0...7)		
2	v _T (Bit 8...15)	10 ⁻² m/s	signed
3	v _T (Bit 0...7)		
4	Angle (Bit 8...15)	10 ⁻² (°)	signed
5	Angle (Bit 0...7)		

ID-Status_Frame:

Format: 8 Data bytes

Default ID (Standard): 0x7FC

Default ID (Extended): 0x1FFFFFFC

Data byte	Description	Unit	Data type
0	Serial number (Bit 24...31)		
1	Serial number (Bit 16...23)	none	unsigned
2	Serial number (Bit 8...15)		
3	Serial number (Bit 0...7)		
4	Temperature	°C	signed
5	LED illumination current	10 ⁻² A	unsigned
6	Status byte 1	see Table 1, page 24	
7	Status byte 2	see Table 2, page 24	

Table 1, Status byte 1:

Bit	Description	Status
0	STST_bit	0: Sensor activ 1: Sensor is at standstill
1	Filter_ON-OFF	0: Filter OFF 1: Filter ON
2	Sensor_OK	0: Sensor error (see Bits 3-7 in Status byte 1) 1: Sensor OK
3	Temperature_OK	0: Temperature is to high 1: Temperature OK
4	Optics_OK	0: Error in optical path 1: Optical path OK
5	Current_Low_High	0: LED current too low 1: LED current too high
6	Current_OK	0: LED current not OK (see Bit 5) 1: LED current OK
7	Power_Supply_OK	0: Error in power supply 1: Power supply OK

Table 2, Status byte 2:

Bit	Description	Status
0	Filter type	0: Moving Average filter 1: FIR filter
1 - 7	Filter setting	If filter type = "Moving average" (Bit 0 = 0) -> filter time = Filter setting * 4 ms If Filter type = "FIR filter" (Bit 0 = 1) -> Filter number (see Table 3)

Table 3: Filter Settings

Filter Number	Limit Frequency [Hz]	Delay [ms]
0	2	512
1	3	512
2	4	512
3	5	256
4	6	256
5	7	256
6	8	256
7	9	256
8	10	128
9	15	128
10	20	64
11	25	64
12	30	64
13	35	64
14	40	64
15	45	64
16	50	64
17	55	32
18	60	32
19	65	32
20	70	32
21	75	32
22	80	32
23	85	32
24	90	32
25	95	32
26	100	32
27-127	not used	

Control Frame:

The control frame is generated by the host controller and has two functions. The first is for synchronization whereby the sensor responds to a trigger frame from a master controller. The other is to accept control messages from the host controller and react upon them.

Data byte zero of the control frame is read out and the function described below is performed. All other data bytes (Data byte 1 to data byte 7) of the trigger frame are ignored.

Format: 8 Data bytes

Default ID (Standard): 0x700

Default ID (Extended): 0x10000000

Data byte 0 value	Sensor reaction
0x00	Sensor sends the Data-Frames followed by the ID-Status-Frame , if switched on (Synchronization)
0xAA	Reset sensor
0xAB	Reset value "Distance since sensor power on"
0xF0	Switch Lamp off
0xF1	Switch lamp on
Other	No sensor reaction

3.2 Troubleshooting CAN with the CORREVIT® S-350 Racing

Problem: There are no messages on the CAN-bus

Check to be sure that:

- the electronic has power
- data acquisition is connected to the S-350 Racing sensor electronics
- the data acquisition system and all sensor electronics use the same settings for baud rate, CAN identifiers and identifier types (standard or extended)
- if you use CANalyser or a data acquisition system with an acceptance filter, be sure the message from the sensor is not disabled

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)

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, or may also be obtained by contacting the CORRSYS-DATRON application department directly.