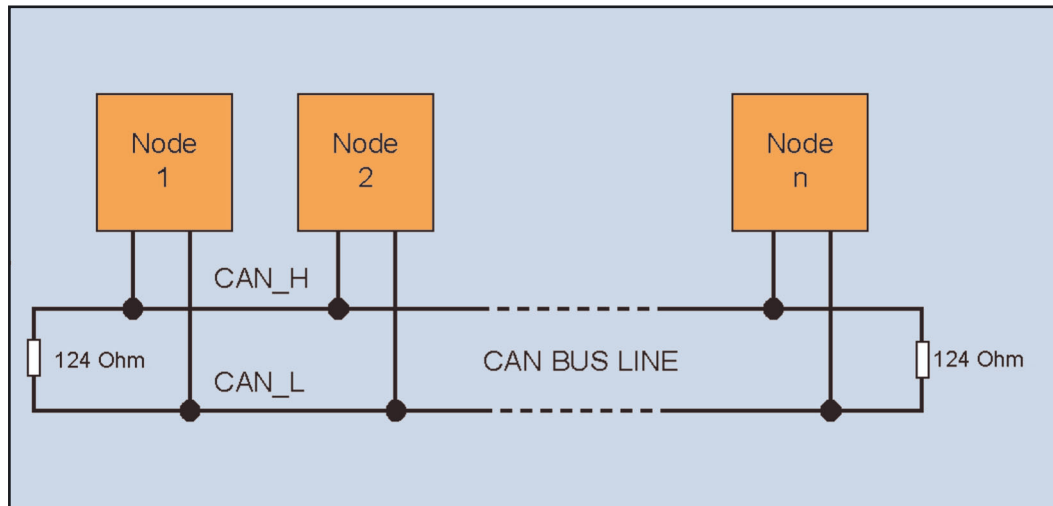
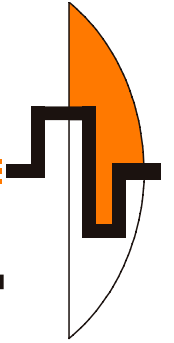


CORRSYS

DATRON

Sensorsysteme GmbH



CAN Bus

for use with
CORRSYS-DATRON Sensors

USER MANUAL

Notes:

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General Information

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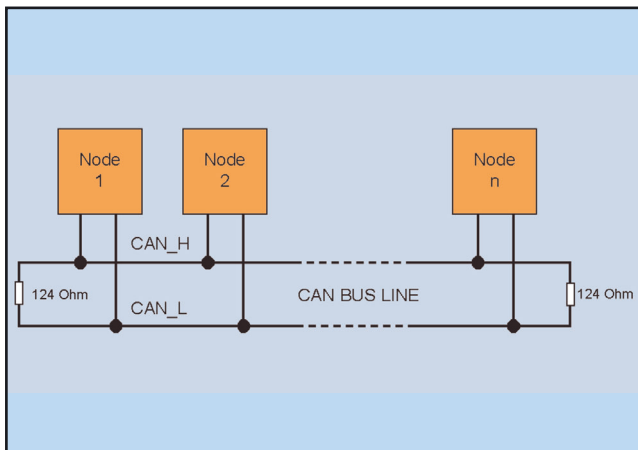
URL www.corrsys-datron.com

CORRSYS**DATRON**

Sensorsysteme GmbH



1. Overview



CAN Bus

The latest generation of CORRSYS-DATRON Sensors are optionally equipped with the CAN Bus Technology that has got growing importance for the automobile industry during the last years and has already become widespread throughout the whole world.

CAN stands for **C**ontroller **A**rea **N**etwork and was developed for data transmission under real time conditions. CAN works on the basis of two-wire connection quickly and without any troubles and thus is suited best for application with the latest measurement technology.

We have adapted our Sensor technique to this standard enabling the user not only to transmit the data supplied by the Sensor to a connected data acquisition system but also to include the sensor to the network of the customer, e.g. engine network.

CAN Data Bases for all of our Sensors are available on our website.

Features

- High-Speed CAN up to 1 Mbaud
- Two-Wire Connection, thus easy connection
- High Immunity to Interference
- Worldwide Standard
- High Fault Tolerance
- Real Time Operation
- CAN Parameters easily adjustable
- Baudrate adjustable
- Support of standard/extended format

Applications

Transmission of sensor specific measurement values* such as:

- Velocity (Longitudinal, Transverse, Absolute)
- Distance
- Height
- Tire Slip Angle
- Temperature
- Position
- Degree of Longitude and Latitude, Height

to the data acquisition systems connected or networks of the customers.

* Measurement values depend on the Sensor type, i.e. according to the applied sensor, many other values than the above mentioned may be transmitted.

2. Technical Data

Specifications

| | |
|----------------------------|--|
| CAN Bus | CAN V2.0B |
| Baudrate (adjustable) | 1 MBaud (default) 500 kBaud 250 kBaud 125 kBaud |
| Identifier | Standard (11 Bit - free selectable) Extended (29 Bit - free selectable) |
| Data Transmission Interval | selectable from 4 ... 512 ms (in 4 ms steps) |
| Transmission Modes | Continuous Send Mode Remote Frame Mode Trigger Frame Mode |

3. Data protocol using CAN-bus

Version 2.3

(Valid from Sensor software version S003-01-00-18)

20.08.2003

The new generation of CORRSYS-DATRON sensors now come equipped with a CAN-bus interface. For each sensor, the specific measured data (traveled distance, speed, angle, height, etc.) is made available to the CAN-interface.

There are 3 modes of data transmission on the CAN-bus. The transmission mode can be selected using CeCalWin; combinations of modes is 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).

One **ID_Frame** is followed by one or more **Data_Frames**. The number of **Data_Frames** depends on the sensor type. All unused data bytes within a frame are set to 0. The frame format is the same for each mode for a given sensor.

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

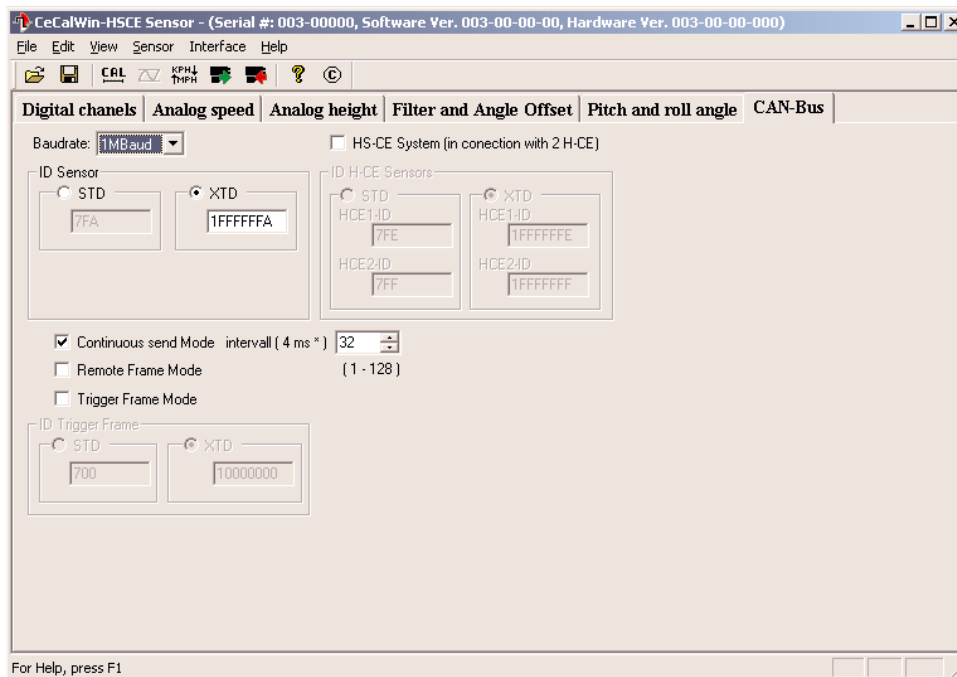
The messages are sent continuously and cyclically with a period set in CeCalWin (by default 128ms). Cycle times between 4ms and 512ms (in 4ms steps) can be selected.

Remote Frame mode (**REM**):

The sensor responds to a remote-frame request from a master controller. The sensor sends one **ID_Frame** (response to the remote frame request) followed by one or more **Data_Frames**. The H_CE sensor operates only in this mode (see special note below).

Trigger Frame mode (**TRG**):

The sensor responds to a trigger frame from a master controller (for synchronization). One **ID_Frame** is sent and one or more **Data_Frames** (except H-CE sensors - see special note below) is sent. The trigger frame ID must be entered in the sensor using CeCalWin.



The Identifier number set in CeCalWin sets the identifier number for the **ID_Frame**. The **Data_Frame(s)** have identifier numbers automatically assigned to them based on the **ID_Frame** identifier number (as explained shortly).

CAN-bus type : CAN V2.0B

Baud rate : 1MBaud (default), 500kBaude, 250kBaude, 125kBaude

3.1 Definitions of the Frames

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

ID_Frame:

The **ID_Frame** protocol is for all sensor types identical.

Format: 5 Data bytes

Default ID (Standard) : 0x7FA

Default ID (Extended) : 0x1FFFFFFA

| Data byte | Description | Data type |
|------------------|------------------------------------|------------------|
| 0 | Sensor Serial Number (Bit 0 ... 7) | unsigned |
| 1 | Sensor Serial Number (Bit 8 ...15) | unsigned |
| 2 | Sensor Serial Number (Bit16...23) | unsigned |
| 3 | Sensor type (see chapter 3.2) | unsigned |
| 4 | Sensor status (see chapter 3.3) | unsigned |

Data_Frames:

The number and contents of the **Data_Frames** is variable depending on the sensor type. The format of the **Data_Frames** for the various sensor types is listed on the next few pages.

Special note:

H-CE sensors transmit their data on the CAN-bus as answer to a Remote Frame (see CAN-bus specifications for the definition of a Remote Frame). The messages transmitted by a H-CE sensor do NOT include an **ID_Frame**, they are a combined **ID_DATA_Frame**.

3.1.1 HS-CE Sensor

Data_Frame 1:

Format: 8 Data bytes

Default ID (Standard): ID_Frame + 1

Default ID (Extended): ID_Frame + 1

| Data byte | Description | Units | Data type |
|-----------|-------------------------------------|----------------------|-----------|
| 0 | Timestamp (Bit 0 ... 7) | 4 ms | unsigned |
| 1 | Timestamp (Bit 8 ...15) | | |
| 2 | v or v _x (Bit 0 ... 7) | 10 ⁻² m/s | unsigned |
| 3 | v or v _x (Bit 8 ... 15) | | |
| 4 | v _y (Bit 0 ... 7) | 10 ⁻² m/s | signed |
| 5 | v _y (Bit 8 ... 15) | | |
| 6 | Angle (Bit 0 ... 7) | 10 ⁻² (°) | signed |
| 7 | Angle (Bit 8 ... 15) | | |

Data_Frame 2:

Format: 8 Data bytes

Default ID (Standard): ID_Frame + 2

Default ID (Extended): ID_Frame + 2

| Data byte | Description | Units | Data type |
|-----------|---|----------------------|-----------|
| 0 | Height (Bit 0 ... 7) | 10 ⁻¹ mm | unsigned |
| 1 | Height (Bit 8 ...15) | | |
| 2 | Pitch angle (Bit 0 ... 7) (see note) | 10 ⁻³ (°) | signed |
| 3 | Pitch angle (Bit 8 ... 15) (see note) | | |
| 4 | Roll Angle (Bit 0 ... 7) (see note) | 10 ⁻³ (°) | signed |
| 5 | Roll Angle (Bit 8 ... 15)(see note) | | |
| 6 | Distance since sensor power on (Bit 0 ... 7) | mm | unsigned |
| 7 | Distance since sensor power on (Bit 8 ... 15) | | |

Notes:

Pitch and Roll angles are only present when the HS-CE sensor is connected with two H-CE sensors in a HS-CE Sensor System specifically used to measure Pitch and roll angles. In a stand-alone system, the values of Pitch angle and Roll angle transmitted are set to 0.



Because the distance is a 16 bit value, there will be an overflow every 65,535 mm (or 65.535m).

3.1.2 S-Sensors

Data_Frame 1:

Format: 8 Data bytes

Default ID (Standard): ID_Frame + 1

Default ID (Extended): ID_Frame + 1

| Data byte | Description | Units | Data type |
|-----------|--------------------------------------|----------------------|-----------|
| 0 | Timestamp (Bit 0 ... 7) | 4 ms | unsigned |
| 1 | Timestamp (Bit 8 ...15) | | |
| 2 | v or v _x (Bit 0 ... 7) | 10 ⁻² m/s | unsigned |
| 3 | v or v _x (Bit 8 ... 15)) | | |
| 4 | v _y (Bit 0 ... 7) | 10 ⁻² m/s | signed |
| 5 | v _y (Bit 8 ... 15) | | |
| 6 | Angle (Bit 0 ... 7) | 10 ⁻² (°) | signed |
| 7 | Angle (Bit 8 ... 15) | | |

Data_Frame 2:

Format: 2 Data bytes

Default ID (Standard): ID_Frame + 2

Default ID (Extended): ID_Frame + 2

| Data byte | Description | Units | Data type |
|-----------|--|-------|-----------|
| 0 | Distance since sensor power on (Bit 0 ... 7) | mm | unsigned |
| 1 | Distance since sensor power on (Bit 8 ...15) | | |



Because the distance is a 16 bit value, there will be an overflow every 65,535 mm (or 65.535m).

3.1.3 L-Sensors

Data_Frame 1:

Format: 6 Data bytes

Default ID (Standard): ID_Frame + 1

Default ID (Extended): ID_Frame + 1

| Data byte | Description | Units | Data type |
|-----------|---|---------------|-----------|
| 0 | Timestamp (Bit 0 ... 7) | 4 ms | unsigned |
| 1 | Timestamp (Bit 8 ... 15) | | |
| 2 | v_L (Bit 0 ... 7) | 10^{-2} m/s | unsigned |
| 3 | v_L (Bit 8 ... 15) | | |
| 4 | Distance since sensor power on (Bit 0 ... 7) | mm | unsigned |
| 5 | Distance since sensor power on (Bit 8 ... 15) | | |



Because the distance is a 16 bit value, there will be an overflow every 65,535 mm (or 65.535m).

3.1.4 H-CE Sensor

Data_Frame 1:

Format: 7 Data bytes

Default ID (Standard): 0x7FF

Default ID (Extended): 0x1FFFFFFF

| Data byte | Description | Units | Data type |
|-----------|--------------------------------------|--------------|-----------|
| 0 | Sensor serial number (Bit 0 ... 7) | | |
| 1 | Sensor serial number (Bit 8 ... 15) | n/a | unsigned |
| 2 | Sensor serial number (Bit 16 ... 23) | | |
| 3 | Sensor type (see 3.2) | n/a | unsigned |
| 4 | Height (Bit 0 ... 7) | 10^{-1} mm | unsigned |
| 5 | Height (Bit 8 ... 15) | | |
| 6 | Sensor status (see 3.3) | n/a | unsigned |

3.2 Sensor Types

| Nr. (Decimal) | Sensor Type |
|----------------------|--------------------|
| 1 | L-CE |
| 2 | S-CE |
| 3 | HS-CE |
| 8 | H-CE |
| 21 | L-200 |
| 22 | SL |
| 23 | LL |
| 25 | L-400 |
| 26 | S-400 |
| 27 | ST |
| 28 | S-200 |
| 35 | SL-R |

3.3 Sensor Status

For all sensor types except the HS-CE Sensor

| Status (Decimal) | Meaning |
|------------------|------------|
| 00 | Standstill |
| 01 | Standstill |
| 02 | Active |
| 03 | Active |

For HS-CE Sensor

| | Status (Hex) | Meaning |
|--------------------------|--------------|--------------------------------|
| HS-CE (single) | 90 | HS-CE in Standstill |
| | 91 | HS-CE in Standstill |
| | 92 | HS-CE is active |
| | 93 | HS-CE is active |
| HS-CE System | 00 | HS-CE in Standstill |
| | 13 | System is OK |
| | 23 | HCE 1 in Standstill |
| | 33 | HCE 2 in Standstill |
| | 43 | HCE 1 and HCE 2 in Standstill |
| | 53 | HCE 1 not on CAN Bus |
| | 63 | HCE 2 not on CAN Bus |
| | 73 | HCE 1 and HCE 2 not on CAN Bus |

4. Data protocol using CAN-bus

Version 2.2

(Valid up to Sensor software version S003-01-00-17)

08.05.2003

The new generation of CORRSYS-DATRON sensors now come equipped with a CAN-bus interface. For each sensor, the specific measured data (traveled distance, speed, angle, height, etc.) is made available to the CAN-interface.

There are 3 modes of data transmission on the CAN-bus. The transmission mode can be selected using CeCalWin; combinations of modes is 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).

One **ID_Frame** is followed by one or more **Data_Frames**. The number of **Data_Frames** depends on the sensor type. All unused data bytes within a frame are set to 0. The frame format is the same for each mode for a given sensor.

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

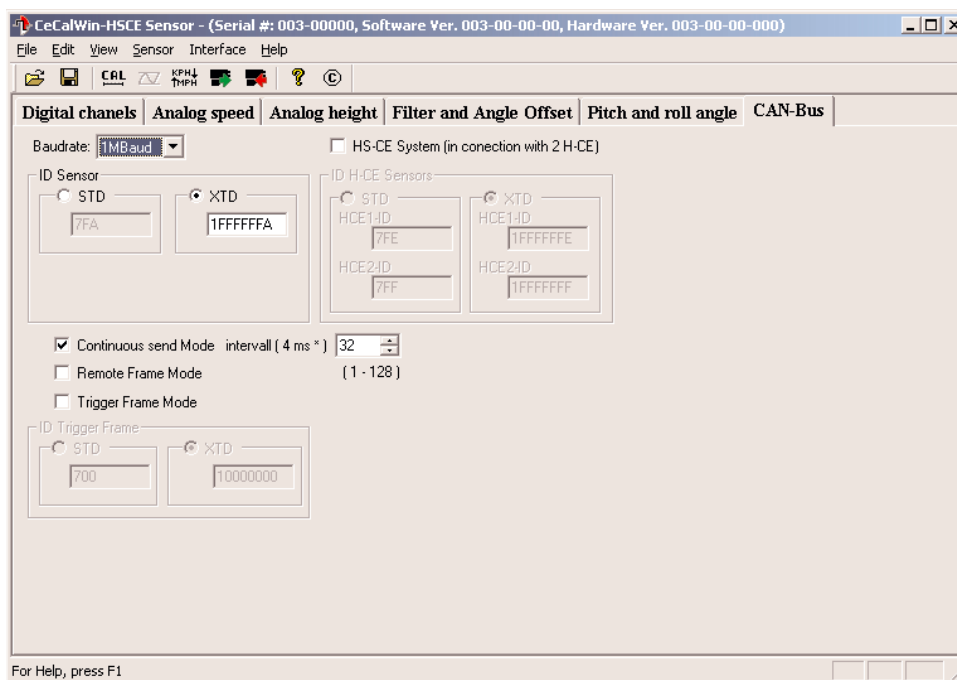
The messages are sent continuously and cyclically with a period set in CeCalWin (by default 128ms). Cycle times between 4ms and 512ms (in 4ms steps) can be selected.

Remote Frame mode (**REM**):

The sensor responds to a remote-frame request from a master controller. The sensor sends one **ID_Frame** (response to the remote frame request) followed by one or more **Data_Frames**. The H_CE sensor operates only in this mode (see special note below).

Trigger Frame mode (**TRG**):

The sensor responds to a trigger frame from a master controller (for synchronization). One **ID_Frame** is sent and one or more **Data_Frames** (except H-CE sensors - see special note below) is sent. The trigger frame ID must be entered in the sensor using CeCalWin.



The Identifier number set in CeCalWin sets the identifier number for the **ID_Frame**. The **Data_Frame(s)** have identifier numbers automatically assigned to them based on the **ID_Frame** identifier number (as explained shortly).

CAN-bus type : CAN V2.0B

Baud rate : 1MBaud (default), 500kBaund, 250kBaund, 125kBaund

4.1 Definitions of the Frames

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

ID_Frame:

The **ID_Frame** protocol is for all sensor types identical.

Format: 5 Data bytes

Default ID (Standard) : 0x7FA

Default ID (Extended) : 0x1FFFFFFA

| Data byte | Description | Data type |
|-----------|------------------------------------|-----------|
| 0 | Sensor Serial Number (Bit 0 ... 7) | unsigned |
| 1 | Sensor Serial Number (Bit 8 ...15) | unsigned |
| 2 | Sensor Serial Number (Bit16...23) | unsigned |
| 3 | Sensor type (see chapter 4.2) | unsigned |
| 4 | Sensor status (see chapter 4.3) | unsigned |

Data_Frames:

The number and contents of the **Data_Frames** is variable depending on the sensor type. The format of the **Data_Frames** for the various sensor types is listed on the next few pages.

Special note:

H-CE sensors transmit their data on the CAN-bus as answer to a Remote Frame (see CAN-bus specifications for the definition of a Remote Frame). The messages transmitted by a H-CE sensor do NOT include an **ID_Frame**, they are a combined **ID_DATA_Frame**.

4.1.1 HS-CE Sensor

Data_Frame 1:

Format: 8 Data bytes

Default ID (Standard): ID_Frame + 1

Default ID (Extended): ID_Frame + 1

| Data byte | Description | Units | Data type |
|-----------|-------------------------------------|----------------------|-----------|
| 0 | Timestamp (Bit 0 ... 7) | 4 ms | unsigned |
| 1 | Timestamp (Bit 8 ...15) | | |
| 2 | v or v _x (Bit 0 ... 7) | 10 ⁻² m/s | unsigned |
| 3 | v or v _x (Bit 8 ... 15) | | |
| 4 | v _y (Bit 0 ... 7) | 10 ⁻² m/s | signed |
| 5 | v _y (Bit 8 ... 15) | | |
| 6 | Angle (Bit 0 ... 7) | 10 ⁻² (°) | signed |
| 7 | Angle (Bit 8 ... 15) | | |

Data_Frame 2:

Format: 8 Data bytes

Default ID (Standard): ID_Frame + 2

Default ID (Extended): ID_Frame + 2

| Data byte | Description | Units | Data type |
|-----------|---|-------|-----------|
| 0 | Height (Bit 0 ... 7) | | |
| 1 | Height (Bit 8 ...15) | | |
| 2 | Pitch angle (Bit 0 ... 7) (see note) | | |
| 3 | Pitch angle (Bit 8 ... 15) (see note) | | |
| 4 | Roll Angle (Bit 0 ... 7) (see note) | | |
| 5 | Roll Angle (Bit 8 ... 15)(see note) | | |
| 6 | Distance since sensor power on (Bit 0 ... 7) | | |
| 7 | Distance since sensor power on (Bit 8 ... 15) | | |

4.1.2 S-Sensors

Data_Frame 1:

Format: 8 Data bytes

Default ID (Standard): ID_Frame + 1

Default ID (Extended): ID_Frame + 1

| Data byte | Description | Units | Data type |
|-----------|--------------------------------------|----------------------|-----------|
| 0 | Timestamp (Bit 0 ... 7) | 4 ms | unsigned |
| 1 | Timestamp (Bit 8 ...15) | | |
| 2 | v or v _x (Bit 0 ... 7) | 10 ⁻² m/s | unsigned |
| 3 | v or v _x (Bit 8 ... 15)) | | |
| 4 | v _y (Bit 0 ... 7) | 10 ⁻² m/s | signed |
| 5 | v _y (Bit 8 ... 15) | | |
| 6 | Angle (Bit 0 ... 7) | 10 ⁻² (°) | signed |
| 7 | Angle (Bit 8 ... 15) | | |

Data_Frame 2:

Format: 2 Data bytes

Default ID (Standard): ID_Frame + 2

Default ID (Extended): ID_Frame + 2

| Data byte | Description | Units | Data type |
|-----------|--|-------|-----------|
| 0 | Distance since sensor power on (Bit 0 ... 7) | | |
| 1 | Distance since sensor power on (Bit 8 ...15) | | |

4.1.3 L-Sensors

Data_Frame 1:

Format: 6 Data bytes

Default ID (Standard): ID_Frame + 1

Default ID (Extended): ID_Frame + 1

| Data byte | Description | Units | Data type |
|-----------|---|---------------|-----------|
| 0 | Timestamp (Bit 0 ... 7) | 4 ms | unsigned |
| 1 | Timestamp (Bit 8 ...15) | | |
| 2 | v_L (Bit 0 ... 7) | 10^{-2} m/s | unsigned |
| 3 | v_L (Bit 8 ... 15) | | |
| 4 | Distance since sensor power on (Bit 0 ... 7) | mm | unsigned |
| 5 | Distance since sensor power on (Bit 8 ... 15) | | |

4.1.4 H-CE Sensor

Data_Frame 1:

Format: 7 Data bytes

Default ID (Standard): 0x7FF

Default ID (Extended): 0x1FFFFFFF

| Data byte | Description | Units | Data type |
|-----------|--------------------------------------|--------------|-----------|
| 0 | Sensor serial number (Bit 0 ... 7) | | |
| 1 | Sensor serial number (Bit 8 ... 15) | n/a | unsigned |
| 2 | Sensor serial number (Bit 16 ... 23) | | |
| 3 | Sensor type (see 4.2) | n/a | unsigned |
| 4 | Sensor type(see 4.3) | | |
| 5 | Height (Bit 0 ... 7) | 10^{-1} mm | unsigned |
| 6 | Height (Bit 8 ... 15) | | |

4.2 Sensor Types

| Nr. (Decimal) | Sensor Type |
|----------------------|--------------------|
| 1 | L-CE |
| 2 | S-CE |
| 3 | HS-CE |
| 8 | H-CE |
| 21 | L-200 |
| 22 | SL |
| 23 | LL |
| 25 | L-400 |
| 26 | S-400 |
| 27 | ST |
| 28 | S-200 |
| 35 | SL-R |

4.3 Sensor Status

For all sensor types except the HS-CE Sensor

| Status (Decimal) | Meaning |
|------------------|------------|
| 00 | Standstill |
| 01 | Standstill |
| 02 | Active |
| 03 | Active |

For HS-CE Sensor

| | Status (Hex) | Meaning |
|--------------------------|--------------------------------|-------------------------------|
| HS-CE (single) | 90 | HS-CE in Standstill |
| | 91 | HS-CE in Standstill |
| | 92 | HS-CE is active |
| | 93 | HS-CE is active |
| HS-CE System | 00 | HS-CE in Standstill |
| | 13 | System is OK |
| | 23 | HCE 1 in Standstill |
| | 33 | HCE 2 in Standstill |
| | 43 | HCE 1 and HCE 2 in Standstill |
| | 53 | HCE 1 not on CAN Bus |
| | 63 | HCE 2 not on CAN Bus |
| 73 | HCE 1 and HCE 2 not on CAN Bus | |

5. Data protocol CAN-Bus

LF Sensor Version 1

(Valid from Sensor-Software Version S042-01-00-03)

06/2004

The new generation of CORRSYS-DATRON sensors now come equipped with a CAN-bus interface. For each sensor, the specific measured data (traveled distance, speed, angle, etc.) is made available to the CAN-interface.

There are 2 modes of data transmission on the CAN-bus. The transmission mode can be selected using CeCalWin; combinations of modes is not possible. The CAN messages sent by the sensors for all two modes consist of one or more Frames (a Frame is defined in the CAN-bus specifications).

The sensor sends two **Data_Frames**. All unused data bytes within a frame are set to 0. The frame format is the same for each mode for a given sensor.

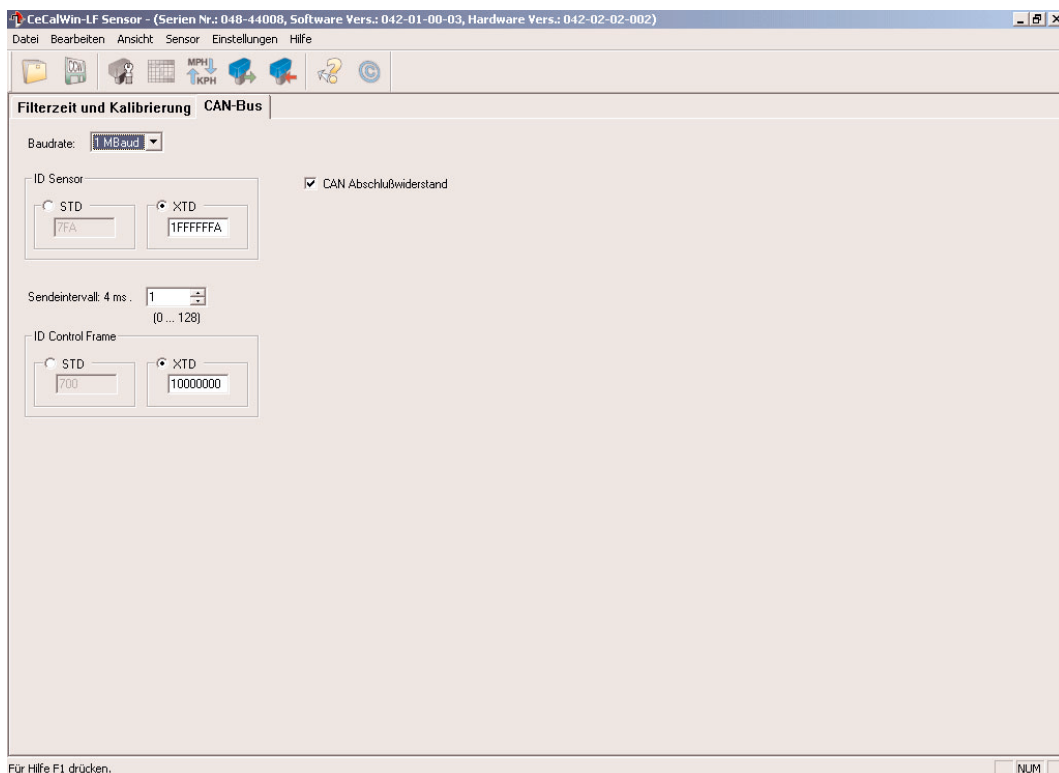
Continuous-send mode (CONT):

The messages are sent continuously and cyclically with a period set in CeCalWin (by default 128ms). Cycle times between 4ms and 512ms (in 4ms steps) can be selected.

Control Frame mode (TRG):

The sensor responds to a control frame from a master controller. This is for synchronization purposes or for control purposes.

The Identifier number set in CeCalWin sets the identifier number for the **first Data_Frame**. The **second Data_Frame** has identifier number automatically assigned to them based on the **first Data_Frame** identifier number (as explained shortly).



CAN-bus type : CAN V2.0B

Baud rate : 1MBaud (default), 500kBaud, 250kBaud, 125kBaud

Definitions of the Frames

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

Data_Frame 1 (Motorola Format):

Format: 8 Data bytes

Default ID (Standard): 0x7FA

Default ID (Extended): 0x1FFFFFFFA

| Data byte | Description | Units | Data type |
|-----------|--------------------------|---------------|------------|
| 0 | Timestamp (Bit 8 ... 15) | 4 ms | unsigned |
| 1 | Timestamp (Bit 0 ... 7) | | |
| 2 | v_L (Bit 8 ... 15) | 10^{-2} m/s | unsigned |
| 3 | v_L (Bit 0 ... 7) | | |
| 4 | 0 | | Future use |
| 5 | 0 | | Future use |
| 6 | 0 | | Future use |
| 7 | 0 | | Future use |

Data_Frame 2 (Motorola Format):

Format: 8 Datenbytes

Default ID (Standard): **Data_Frame 1** +4

Default ID (Extended): **Data_Frame 1** +4

| Data byte | Description | Units | Data type |
|-----------|--|-------------|------------|
| 0 | <i>Distance since sensor power on (Bit 8 ... 15)</i> | mm | unsigned |
| 1 | <i>Distance since sensor power on (Bit 0 ... 7)</i> | | |
| 2 | Status Byte 1 | | see below |
| 3 | Status Byte 2 | | see below |
| 4 | LED Illumination Current | 10^{-2} A | unsigned |
| 5 | 0xFF | | Future use |
| 6 | 0xFF | | Future use |
| 7 | 0xFF | | Future use |



Because the distance is a 16 bit value, there will be an overflow every 65,535 mm (or 65.535m).

StatusByte 1: (Motorola Format)

| Bit | Description | Status |
|------------|--------------------|---|
| 1 | STST_bit | 0: Sensor active 1: Sensor is at standstill |
| 2 | Sensor_OK | 0: Sensor error (see Bits 3 - 8) 1: Sensor OK |
| 3 | Selftest_FLAG | 0: Sensor operating mode 1: Sensor in self test mode |
| 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 NOK (see Bit 4) 1: LED-current OK |
| 7 | VEE_ok | 0: -8 V failed 1: -8 V OK |
| 8 | VDD_ok | 0: +8 V failed 1: +8 V OK |

StatusByte 2: (Motorola Format)

| Bit | Description | Status |
|------------|-----------------------|---|
| 1 | Temperature OK | 0: Temperature NOK 1: Temperature OK |
| 2 | LED_Cal | 0: LED calibration mode off 1: LED calibration mode on |
| 3 | LED-Status (Low-Bit) | 0: LED off 1: LED on |
| 4 | LED-Status (High-Bit) | 2: LED flashing |

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 first Data_Frame followed by the second Data_Frame . (Synchronization) |
| 0x01 | Sensor goes in self-test modus - LEDs are modulated at approximately 2kHz - a speed of approximately 14 kph should be output by sensor. Vehicle must be at standstill for this to occur. |
| 0x02 | Sensor goes out of test modus - normal functionality of LEDs and sensor. |
| 0xAA | Reset sensor |
| Others | No sensor reaction |

6. Data protocol CAN-Bus

SF Sensor Version 1

(Valid from Sensor-Software Version S042-01-00-05)

01/2005

The new generation of CORRSYS-DATRON sensors now come equipped with a CAN-bus interface. For each sensor, the specific measured data (traveled distance, speed, angle, etc.) is made available to the CAN-interface.

There are 2 modes of data transmission on the CAN-bus. The transmission mode can be selected using CeCalWin; combinations of modes is not possible. The CAN messages sent by the sensors for all two modes consist of one or more Frames (a Frame is defined in the CAN-bus specifications).

The sensor sends two **Data_Frames**. All unused data bytes within a frame are set to 0. The frame format is the same for each mode for a given sensor.

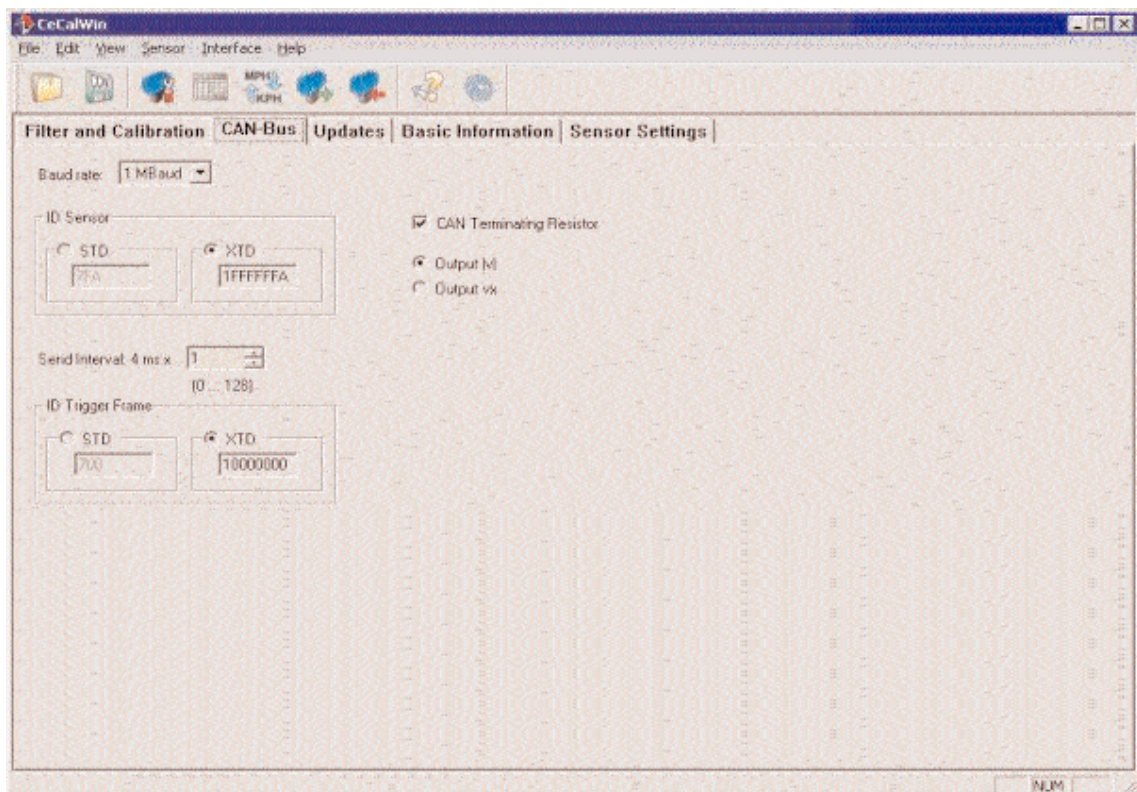
Continuous-send mode (**CONT**):

The messages are sent continuously and cyclically with a period set in CeCalWin (by default 128ms). Cycle times between 4ms and 512ms (in 4ms steps) can be selected.

Control Frame mode (**TRG**):

The sensor responds to a control frame from a master controller. This is for synchronization purposes or for control purposes.

The Identifier number set in CeCalWin sets the identifier number for the **first Data_Frame**. The **second Data_Frame** has identifier number automatically assigned to them based on the **first Data_Frame** identifier number (as explained shortly).



CAN-bus type : CAN V2.0B

Baud rate : 1MBaud (default), 500kBaud, 250kBaud, 125kBaud

Definitions of the Frames

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

Data_Frame 1 (Motorola Format):

Format: 8 Data bytes

Default ID (Standard): 0x7FA

Default ID (Extended): 0x1FFFFFFFA

| Data byte | Description | Units | Data type |
|-----------|---|----------------------|-----------|
| 0 | Timestamp (Bit 8 ... 15) | 4 ms | unsigned |
| 1 | Timestamp (Bit 0 ... 7) | | |
| 2 | l _v or v _x (Bit 8 ... 15) | 10 ⁻² m/s | unsigned |
| 3 | l _v or v _x (Bit 0 ... 7) | | |
| 4 | v _y (Bit 8 ... 15) | 10 ⁻² m/s | signed |
| 5 | v _y (Bit 0 ... 7) | | |
| 6 | Angle (Bit 8 ... 15) | 10 ⁻² (°) | signed |
| 7 | Angle (Bit 0 ... 7) | | |

Data_Frame 2:

Format: 8 Datenbytes

Default ID (Standard): **Data_Frame 1 + 1**

Default ID (Extended): **Data_Frame 1 + 1**

| Data byte | Description | Units | Data type |
|-----------|--|--------------------|-----------------|
| 0 | <i>Distance since sensor power on (Bit 8 ... 15)</i> | mm | unsigned |
| 1 | <i>Distance since sensor power on (Bit 0 ... 7)</i> | | |
| 2 | Status Byte 1 | | see below |
| 3 | Status Byte 2 | | not yet defined |
| 4 | LED Illumination Current | 10 ⁻² A | unsigned |
| 5 | Temperature | ° | signed |
| 6 | FF | | Future use |
| 7 | FF | | Future use |



Because the distance is a 16 bit value, there will be an overflow every 65,535 mm (or 65.535m).

StatusByte 1:

| Bit | Description | Status |
|-----|------------------|---|
| 0 | STST_bit | 0: Sensor active 1: Sensor is at standstill |
| 1 | Sensor_OK | 0: Sensor error (see Bits 3-7 and bit 0 in status byte 2) 1: Sensor OK |
| 2 | Selftest_FLAG | 0: Sensor operating mode 1: Sensor in self test mode |
| 3 | Optics_OK | 0: Error in optical path 1: Optical path OK |
| 4 | Current_Low_High | 0: LED-current too low 1: LED-current too high |
| 5 | Current_OK | 0: LED-current NOK (see Bit 4) 1: LED-current OK |
| 6 | VEE_ok | 0: -8 V failed 1: -8 V OK |
| 7 | VDD_ok | 0: +8 V failed 1: +8 V OK |

StatusByte 2:

| Bit | Description | Status |
|-----|---------------------|---|
| 1 | Temperature OK | 0: Temperature NOK 1: Temperature OK |
| 2 | LED_Cal | 0: LED Calibration mode off 1: LED Calibration mode on |
| 3 | LED-Status (Bit 0) | 0: LED off 1: LED on |
| 4 | LED-Status (Bit 1) | 2: LED flashing (1 kHz) |

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 first Data_Frame followed by the second Data_Frame . (Synchronization) |
| 0x01 | Sensor goes in self-test modus - LEDs are modulated at approximately 2kHz - a speed of approximately 14 kph should be output by sensor. Vehicle must be at standstill for this to occur. |
| 0x02 | Sensor goes out of test modus - normal functionality of LEDs and sensor. |
| 0xAA | Reset sensor |
| Others | No sensor reaction |

7. Troubleshooting

Problem: There are no messages on the CAN-bus

Check to be sure that:

- the electronic has power
- data acquisition is connected to the sensor electronic
- the correct send mode is selected
- the data acquisition system and all sensor electronics use the same settings for baud rate, CAN identifiers and identifier types
- 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.