

# LiDAR Plus 01 Common CAN Protocol

## 1.0. CAN Message **0x568** Details – Obstacle Status

This message contains the number of obstacles, the timestamp and the application version. Obstacles can be vehicles, pedestrians, cyclists, traffic cones.

Bit	7(MSB)	6	5	4	3s	2	1	0(LSB)
Byte 0	Num_Obstacles							
Byte 1	Timestamp							
Byte 2	Relative timestamp							
Byte 3	Application_Version							
Byte 4	Protocol_Version							
Byte 5	Reserved							Close_Car
Byte 6	Reserved							
Byte 7	Reserved							

### 1.0.1. Num\_Obstacles

- Type: unsigned integer
- Range: 0 : 255

### 1.0.2. Timestamp

- Type: unsigned integer
- Unit: milliseconds
- Range: 0 : 255
- Note: Only the lowest 8 bits of the timestamp is given. The timestamp source is from the LP-01 lidar scanning.

### 1.0.3. Relative timestamp

- Type: unsigned integer
- Unit: milliseconds
- Range: 0 : 255
- Note: Timestamp of this object relative to the scan start time in ms. The time is based on the object reference point.

### 1.0.4. Application\_Version

- Type: unsigned integer
- Range 0 : 255
- Note: software version number

### 1.0.5. Protocol\_Version

- Type: unsigned char
- Range: 0x00 .. 0xff
- Note: The index of current protocol version.

### 1.0.6. Close\_Car

Indication whether we detect a close car in front of the host vehicle or not.

- Type: boolean
- 0 No close car
- 1 Close car exists

## 1.1. CAN Message **0x569 + i\*3** Details – Obstacle Data A

Where  $i = 0 : \text{num\_obstacles} - 1$

This message contains obstacle detection information and measurements.

Bit	7(MSB)	6	5	4	3	2	1	0(LSB)
Byte 0	Obstacle_ID							
Byte 1	Obstacle_Pos_X (LSB)							
Byte 2	Obstacle_Pos_Y (LSB)				Obstacle_Pos_X(MSB)			
Byte 3	Obstacle_Pos_Y (MSB)							
Byte 4	Obstacle_Pos_Z							
Byte 5	Obstacle_Rel_Vel_X (LSB)							
Byte 6	Obstacle_Type			Reserved	Obstacle_Rel_Vel_X (MSB)			
Byte 7	Obstacle_Status			Reserved			Obstacle_Valid	

### 1.1.1. Obstacle\_ID

- Type: unsigned integer
- Range: 0 : 255
- Note: New obstacles are given the last used free ID.

### 1.1.2. Obstacle\_Pos\_X

- Type: signed integer
- Unit: meter
- Range: -127.93 : 127.93 [m]
- Conversion: (HEX)\*0.0625
- Meaning: The longitude position of the obstacle relative to the reference point.

### 1.1.3. Obstacle\_Pos\_Y

- Type: signed integer

- Unit: meter
- Range: -127.93 : 127.93 [m]
- Conversion: (HEX)\*0.0625
- Meaning: The lateral position of the obstacle.

#### 1.1.4. Obstacle\_Pos\_Z

- Type: signed integer
- Unit: meter
- Range: -7.93 : 7.93[m]
- Conversion: (HEX)\*0.0625

#### 1.1.5. Obstacle\_Rel\_Vel\_X

- Type: signed integer
- Unit: meter/sec
- Range: -127.93 : 127.93 [m/s]
- Conversion: (HEX)\*0.0625
- Meaning: The relative longitude velocity of the obstacle. The value is a single frame value.

#### 1.1.6. Obstacle\_Type

- Type: 3 bits, unsigned integer
- Range 0 : 7
- Invalid value: none
- Enumerator signal, which indicates the object's classification  
Enumerator values:  
000 – unused  
001 – Vehicle  
010 – Pedestrian  
011 – Cyclist  
100 – Traffic cone  
101 – unused  
110 – unused  
111 – unused

#### 1.1.7. Obstacle\_Valid

- Type: unsigned integer
- Unit: Enum

1	New valid (detected this frame)
2	Older valid

#### 1.1.8. Obstacle\_Status

- Type: unsigned integer
- Unit: Enum

0	Undefined
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1	Standing (never moved, back lights are on)
2	Stopped (movable)
3	Moving
4	Oncoming
5	Parked (never moved, back lights are off)
6	Unused

## 1.2. CAN Message **0x56A + i\*3** Details - Obstacle Data B

Where  $i = 0 : \text{num\_obstacles} - 1$

This message contains obstacle detection information and measurements.

Bit	7(MSB)	6	5	4	3	2	1	0(LSB)
Byte 0	Obstacle_Legnth							
Byte 1	Obstacle_Width							
Byte 2	Obstacle_Height							
Byte 3	Obstacle_Age							
Byte 4	Obstacle_Confidence							
Byte 5	Reserved							
Byte 6	Reserved							
Byte 7	Reserved							

### 1.2.1. Obstacle\_Length

- Type: unsigned integer
- Units: meter
- Range: 0 : 30.6 [m]
- Conversion: (HEX)\*0.12
- Meaning: The length of the obstacle (longitude axis).

### 1.2.2. Obstacle\_Width

- Type: unsigned integer
- Unit: meter
- Range: 0 : 12.75 [m]
- Conversion: (HEX)\*0.05
- Meaning: The width of the obstacle (lateral axis).

### 1.2.3. Obstacle\_Height

- Type: unsigned integer
- Unit: meter

- Range: 0 : 12.75 [m]
- Conversion: (HEX)\*0.05
- Meaning: The height of the obstacle.

#### 1.2.4. Obstacle\_Age

- Type: unsigned integer
- Range: 0 : 255
- Meaning: The age of the obstacle (in frames). This value starts at 1 when the obstacle is first detected, and increments in 1 each frame. The value reported is min(realAge, 254), which means that it remains 254 if the age is larger than that number.

#### 1.2.5. Obstacle\_Confidence

- Type: unsigned integer
- Range 0 : 100
- Meaning: confidence of the Obstacle

### 1.3.CAN Message **0x56B + i\*3** Details - Obstacle Data C

Where i = 0 : num\_obstacles - 1

This message contains obstacle detection information and measurements.

Bit	7(MSB)	6	5	4	3	2	1	0(LSB)
Byte 0	Obstacle_Angle_Rate (LSB)							
Byte 1	Obstacle_Angle_Rate (MSB)							
Byte 2	Reserved							
Byte 3	Reserved							
Byte 4	Object_Accel_X (LSB)							
Byte 5	Obstacle Replaced	Reserved					Object_Accel_X(MSB)	
Byte 6	Obstacle_Angle (LSB)							
Byte 7	Obstacle_Angle (MSB)							

#### 1.3.1. Obstacle\_Angle\_Rate

- Type: signed integer
- Unit: degree
- Range: -327.68 : 327.67 [degree/sec]
- Conversion: (HEX)\*0.01
- Meaning: Angle rate of Center of Obstacle in degrees/sec. A negative angle rate indicates that the obstacle has moved to the left (clockwise axis system).

#### 1.3.2. Object\_Accel\_X

- The longitude acceleration of the object.
- Type: 10 bit, signed integer
- Range: -14.97 : 14.97 [m/s<sup>2</sup>]
- Conversion: (HEX)\* 0.03

### 1.3.3. Obstacle\_Replaced

- Type: boolean

0	Not replaced in this frame
1	Replace in this frame

### 1.3.4. Obstacle\_Angle

- Type: signed integer
- Unit: degree
- Range: -327.68 : 327.67
- Conversion: (HEX)\*0.01
- Meaning: Angle to Center of Obstacle in degrees. 0 indicates that the obstacle is in exactly in front of us (along the longitudinal axis); a positive angle indicates that the obstacle is to the right (clockwise axis system).