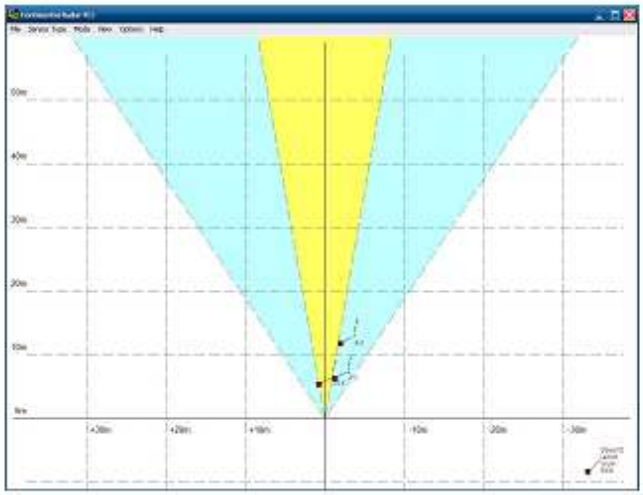
Continental Radar PLC



Manual

Version 2.1 en

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CHANGE HISTORY

Version	*Date*	*Change Description*	*Author*
0.01	05.02.15	Initial Version	H.C. Enders
0.02	26.02.15	Update Filter	Thomas Kruppi
1.00	23.03.15	Release for fist system delivery	H.C. Enders
1.01	29.05.15	Some small updates	H.C. Enders
2.00	24.07.15	Update to SW Version 2.0	H.C. Enders
2.01	03.08.15	Updates after internal Review	H.C. Enders

Please read this manual carefully before installing the system and carry out the installation procedures correctly.
This manual provides guidelines for installation, but it does not guarantee the quality of the installation work. Please complete all work in a responsible and professional manner. Electrical work should be performed by a qualified electrician.

1. Introduction

1.1 Scope of this documentation

This documentation is written for trained electricians. Knowledge of national standards is required. The following document should be read before installing and operating the Radar PLC. If the following issues are disregarded, the equipment may get damaged and the safe function is not ensured.

1.2 Liability Conditions

The responsible staff must ensure that all laws, standards, regulations and guidelines are fulfilled.
All information is given in good faith; it does not represent a guarantee with respect to characteristics and does not exempt the user from testing the suitability of products and from ascertaining that the industrial property rights of third parties are not violated. No liability whatsoever will be accepted for damage – regardless of its nature and its legal basis – arising from advice given in this publication. This does not apply in the event that we or our legal representatives or management are found guilty of having acted with intent or gross negligence. No liability is borne for damage due to ordinary negligence. This exclusion of liability applies also to the personal liability of our legal representatives and employees and other persons employed in performing our obligations. All components are shipped in a condition to be able to fulfill the requirements in operation according to their scope.
The Radar PLC must not be used in order to reduce safety systems, especially personal safety. The System should only be operated by personnel who are familiar with all states that can occur! Software knowledge is mandatory. The products are improved continuously. This may lead to differences in the description.
We reserve the right to make technical modifications or to amend the delivery specifications.

Please contact your supplier if it should become necessary to check the technical functions or to repair the device.

1.3 Operating Personnel

Every user of the CONTINENTAL® Radar PLC has to read this handbook and must be acquainted with all the functions of the system.
Also every user has to read the documentation of the used continental Radar sensor.

1.4 Technical data

Parameter	Value
Processor	Intel® Atom™ E3845, 1.91 GHz, 4 cores (TC3: 50)
Flash memory	8 GB CFast card
Internal main memory	4 GB DDR3 RAM
Persistent memory	integrated 1-second UPS (1 MB on Compact Flash card)
Interfaces	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x CANopen,2x4..20mA Analoge,8x Relay
Diagnostics LED	1 x power, 1 x TC status, 1 x flash access, 2 x bus status
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows Embedded Standard 7 P
Control software	Continental Radar PLC Software
Power supply	24 V DC (-15 %/+20 %)
Dielectric strength	500 V (supply/internal electronics)
Max. power	24 W
USP	Integrated 1s UPS (Up to 20s power with standard configuration)
Dimensions (W x H x D)	185 mm x 100 mm x 92 mm
Weight	approx. 1,5 Kg
Operating/storage temperature	-25…+60 °C/-40…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Approvals	CE
Mount	Cap rail

Table 1: Technical data Continental Radar PLC

1.5 Product identification

Figure 1 Radar PLC Hardware

The Radar PLC is designed to display the output of either one Continental SRR208 or ARS308 Radar Sensor on a monitor. If collision detection is supported by the sensor, it is possible to use this device to trigger up to 8 different Solid state relays.
The Radar PLC can be mounted on a cub rail.

2. Electrical Connection

2.1 Connection to Power

To bring the system into operation 24V DC has to be connected to the power input terminals.

Figure 2 Power input terminals

2.2 Connection to CAN

The CAN interface allows the communication between a Notebook or PC and the device via a separate converter CAN to USB. The CAN bus must have a terminal resistance of respectively 120 Ω between CAN H and CAN L at the first and last subscriber to avoid reflections. The standard cable harness from Continental includes this resistor.
The CAN BUS of the Radar Sensor has to be connected to the CANopen connector plug.

Figure 3 CANopen connector plug

2.3 Connection to relative Speed and yaw rate signal

When the radar is integrated in a vehicle, the radar sensor needs the vehicle speed. This can be done by an input current (4...20mA) from outside.

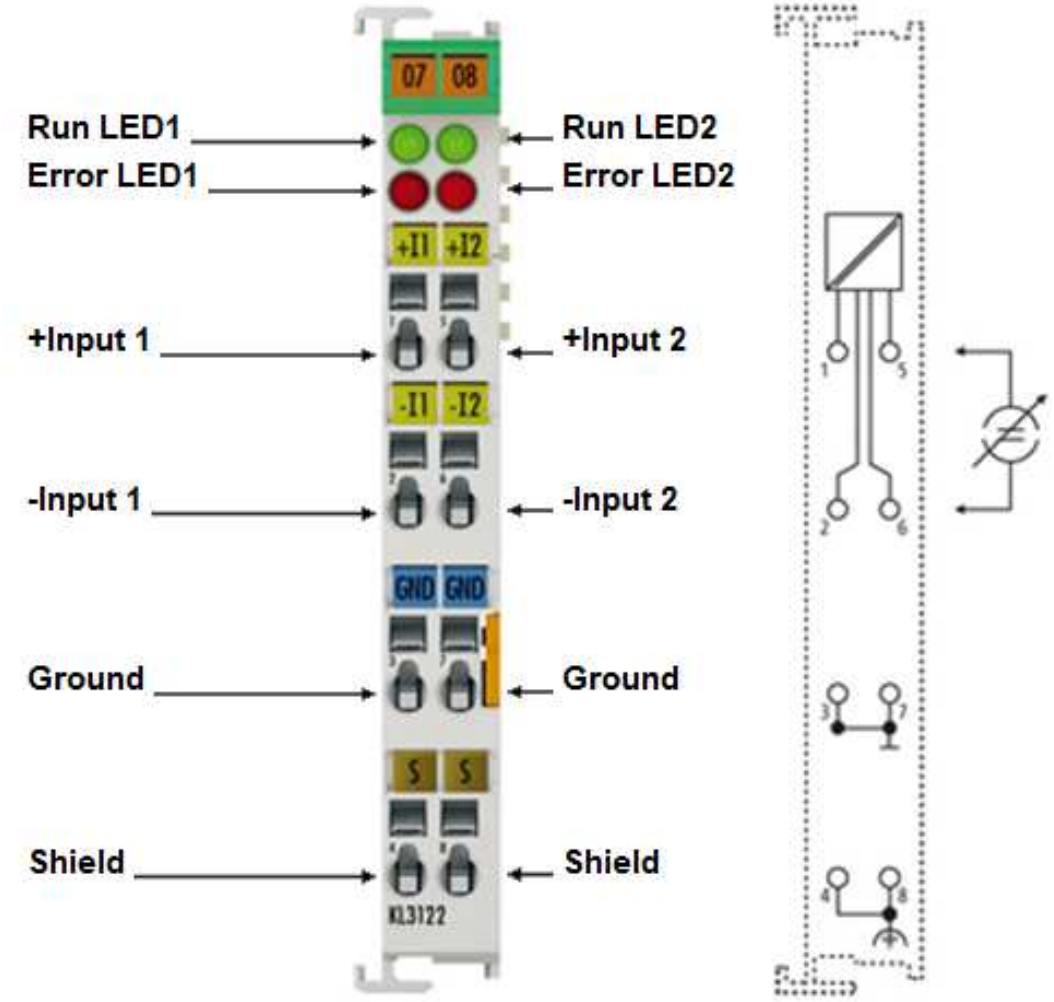

Figure 4 Analog input terminal

The speed signal has to be connected to terminal 1 and 2.
The run LEDs give an indication of the data exchange with the Bus Coupler. The error LEDs indicate an overload condition, also it shows a cable break (0mA).
Also it is possible to connect a yaw-rate to terminal 5 and 6

Parameter	Value
Technology	differential input
Signal current	4…20 mA
Internal resistance	50 Ω typ. shunt, load: 60 Ω + diode voltage
Common-mode voltage UCM	35 V max.

Table 2: Technical data analog input terminal

2.4 Connection to Output Relays

The Radar PLCs is able to support up to 8 solid state relays, when a collision is detected[1]. With these Relays costumer specific functions can be triggered.

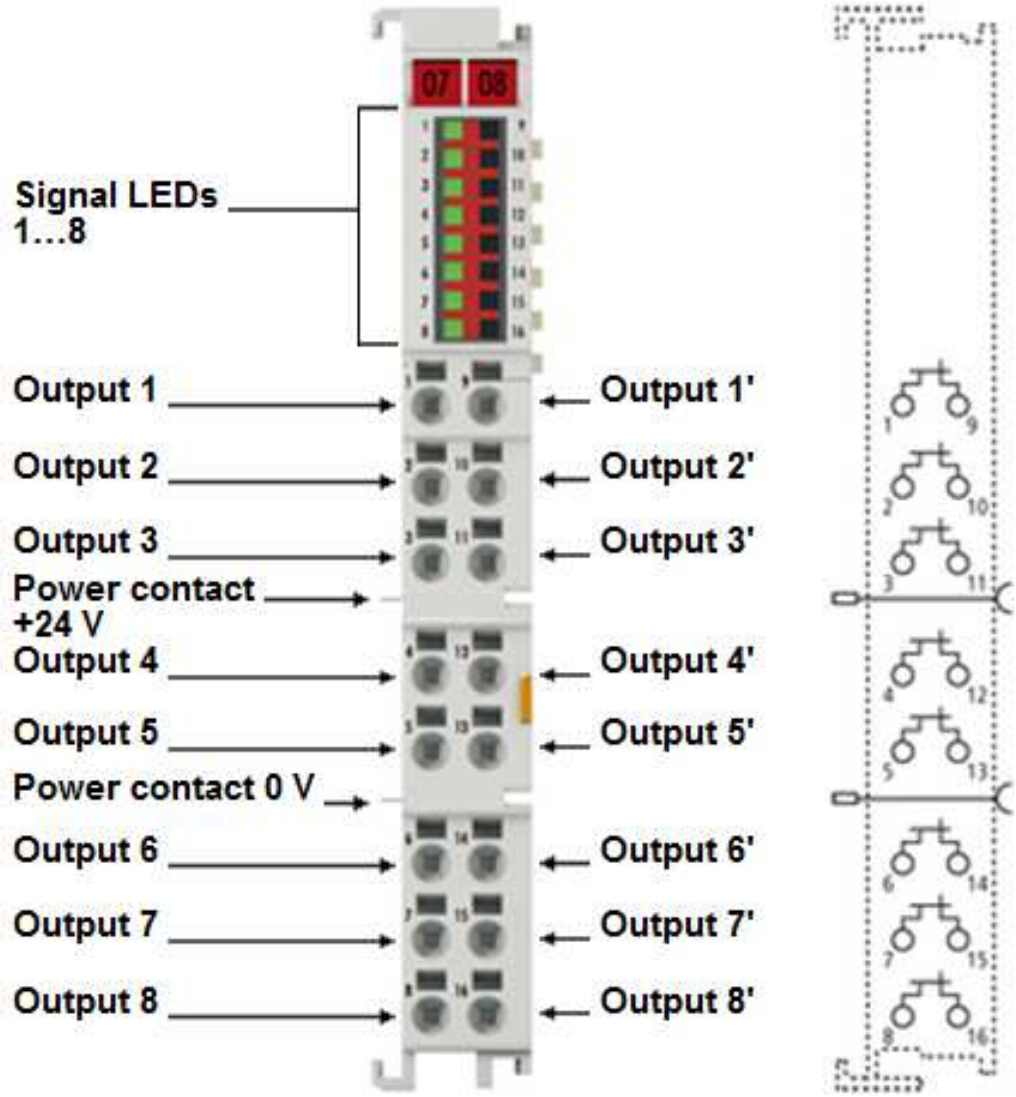

Figure 5 Relays output terminal

The digital Terminal provides eight switches that can be used like a relay contact for AC/DC voltages. The electronic switch is realized through high-performance MOSFET transistors with a low switch-on resistance. The switch itself is not short-circuit-proofed, but due to its high pulse current capability it can cope with currents until an external fuse triggers a switch-off. Wear resistance increases the availability of the application. Resistive and light inductive loads can be switched up to a rated voltage of 30 V AC/DC, completely resistive loads also up to a rated voltage of 48 V DC. High peak voltages and electromagnetic interference pulses are prevented.

[1] Only possible, if the radar sensor supports collision detection. (SRR 208-21 / -2C or ARS 308-21 / -2C)

Parameter	Value
Rated load voltage	0…30 V AC/DC (only ohmic load: 0…48 V DC)
Short circuit current	not short-circuit-proof, see peak current
Output current	2 A (∑ 10 A @ 55° C)
Breakdown voltage	80 V
Peak current	5 A (100 ms), < 50 A (10 ms)
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08…1.5 mm²; stranded wire: 0.25…1.5 mm²; ferrule: 0.14…0.75 mm²

Table 3: Technical data output relays

3. Software

The Radar PLC software starts automatic when powering up the embedded PC. It takes about 2 minutes.

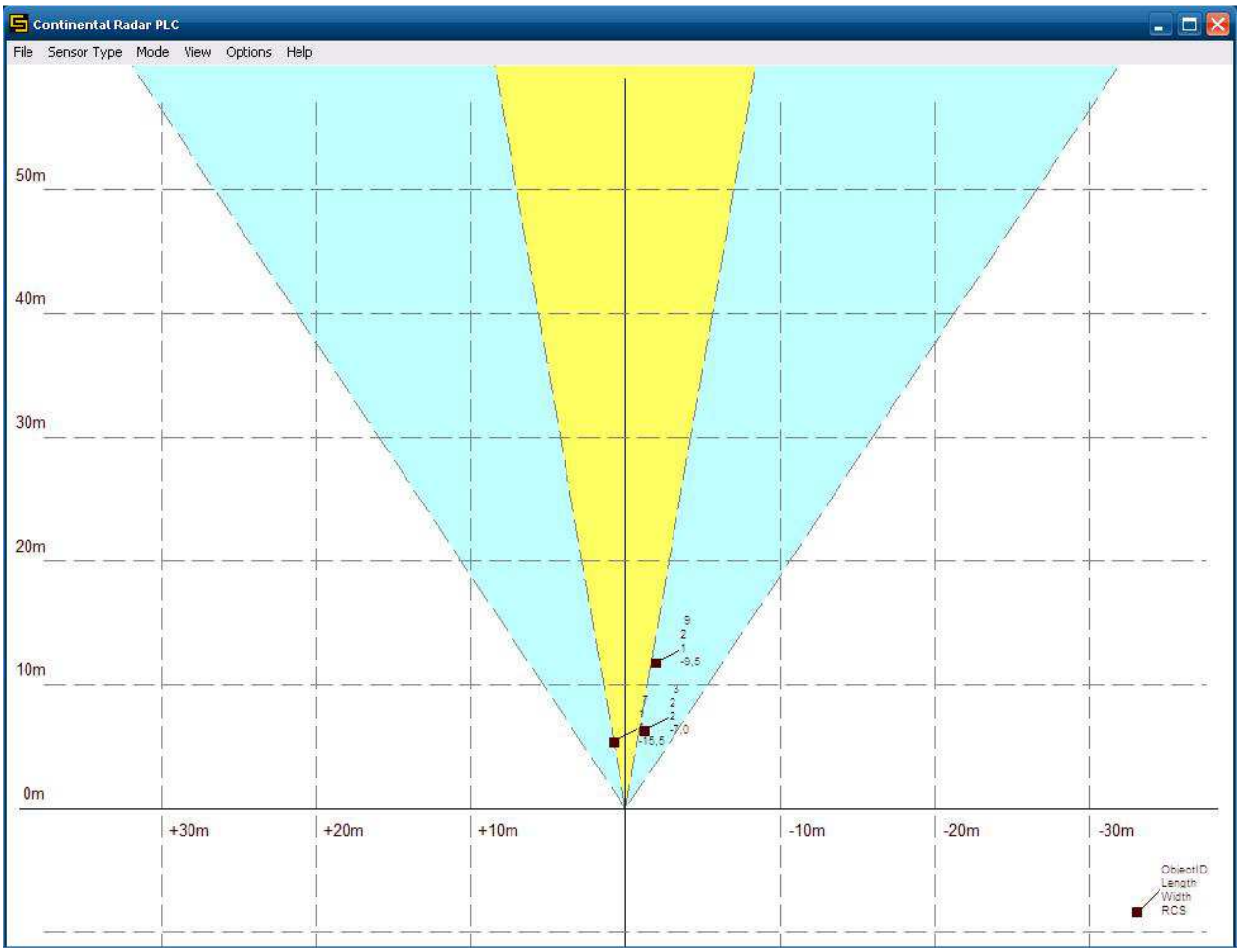

Figure 6 Radar PLC Software

3.1 Overview

The software consists of two parts:

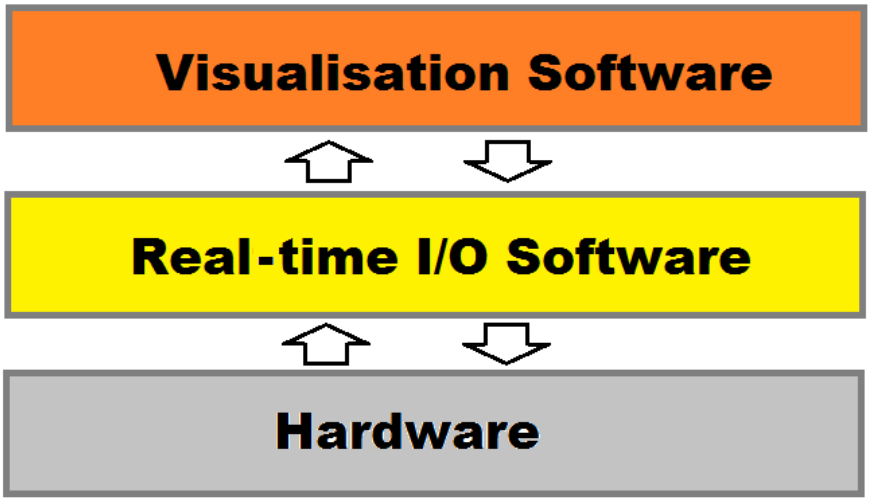

Figure 7 Two parts of the Radar PLC Software

3.1.1 Real-time I/O software

This software part is responsible for the communication between the In- and Output-Cannels and the Visualization software. It is operating between the hardware and the Windows operating system. This allows the software to work around the Windows system instantly providing exceedingly fast access times for hardware communication.

3.1.2 Visualization Software

This software represents the Graphical User Interface (GUI) for the Radar Sensor signals. This GUI operates on the Windows System and communicates with the real-time I/O software. It shows objects the Radar detected and enables the user to configure the Radar Sensor.

4. GUI

The handling of the SRR- and ARS-Sensor is different. So the user has to configure the software according to the connected sensor.

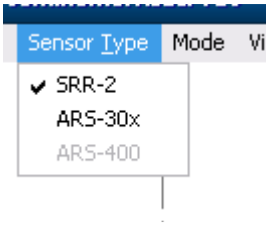

Figure 8 Configuration of Sensor type

The Continental Radar PLC menus and appearance is adjusted on startup according to the Sensor (SRR20X, ARS30x) referenced in the *"program.ini"* file in the Continental Radar PLC folder. By editing the *"program.ini"* the default startup sensor can be configured. To do so, edit the *"defaultSensor"* parameter in *"C:\Continental Radar-PLC\program.ini"*. Valid values for that parameter are *"ARS30x"* and *"SRR20X"*.

4.1 SRR Sensor

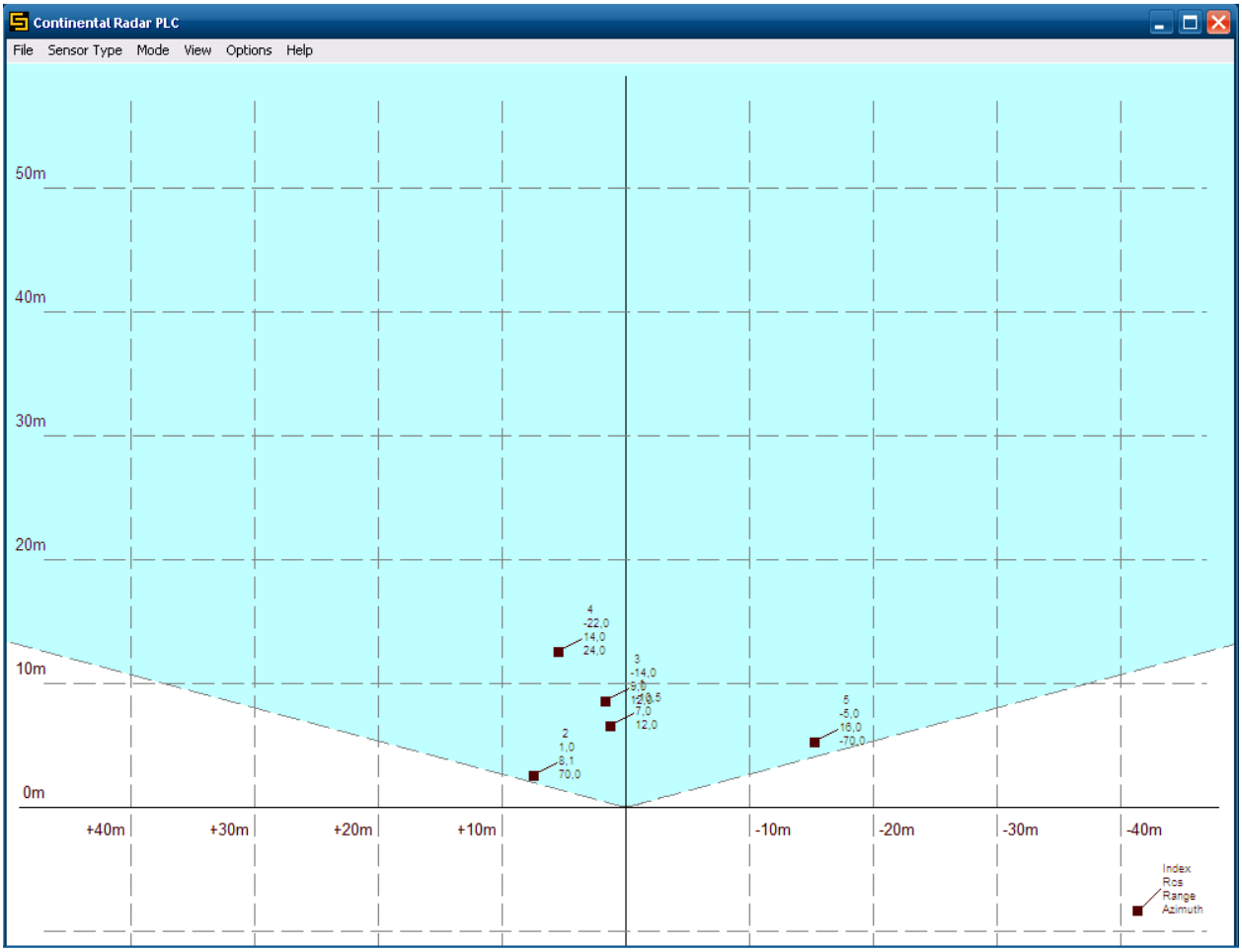

Figure 9 SRR Main Screen

The main screen shows the SRRs field of view, marked by the turquoise area. The white triangles mark everything outside the sensors detection scope. By the sensor detected entities are displayed as small red boxes within the field of view of the sensor. The markers also provide additional information about detected entities. Besides the entities location further information about its speed and the Radar Cross Section (RCS) is displayed. An exemplary marker is shown as information in the lower right corner of the Main Screen.
The sensors supports two modes. It can display the Sensors signals either as Tracks or Cluster[2].

4.1.1 Cluster

The Cluster display can be activated by selecting Cluster from the Mode Menu.

Figure 10 Mode selection for Cluster

Clusters represent reflected signals with similar position and movement. The software is able to display up to 128 Cluster at once. Each Cluster provides a set of information.

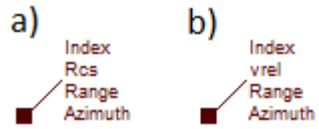

Figure 11 SRR Cluster Markings

Parameter	Description
Index	Current index of the cluster in the cluster list
RCS	Radar Cross Section[dB*m^2]
Range	Radial distance of the cluster[m]
Azimuth	Cluster angle[°]
Vrel	Relative velocity of the cluster[m/s]

Table 4 Cluster parameter overview

The displayed set of information can be altered between displaying the RCS value (Figure 11a) or the relative velocity (Figure 11b) by configuring the view available in the View-Menu.

[2] See the SRR208 manual for description

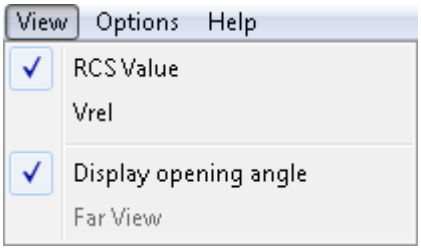

Figure 12 View Settings for Cluster

4.1.2 Tracks

The Track mode can be activated by selecting Tracks from the Mode Menu.

Figure 13 Mode selection for Tracks

Tracks in contrast to Cluster have a history. They represent Cluster tracked over time. The software is able to display up to 25 Tracks at once. Each Track provides a set of information.

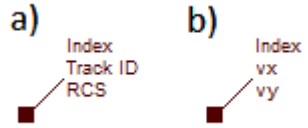

Figure 14 SRR Track Markings

Parameter	Description
Index	Current index of the track in the track list
Track ID	Unique ID identifying the track
RCS	Radar Cross Section[dB*m^2]
vx	Relative longitudinal velocity[m/s]
vy	Relative lateral velocity[m/s]

Table 5 Track parameter overview

The displayed set of information can be altered between displaying the TrackID and RCS value (Figure 14a) or the relative longitudinal and lateral velocities (Figure 14b) by configuring the view available in the View-Menu.

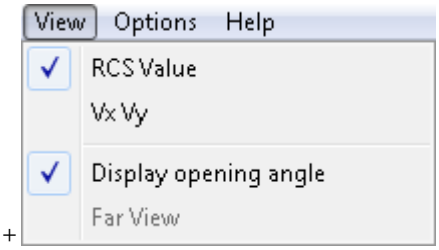

Figure 15 View Settings for Tracks

4.1.3 Sensor Configuration Window

Basic Sensor properties can be adjusted in the "**Sensor Configuration**" window. To open it, select Options/ Sensor Configuration.

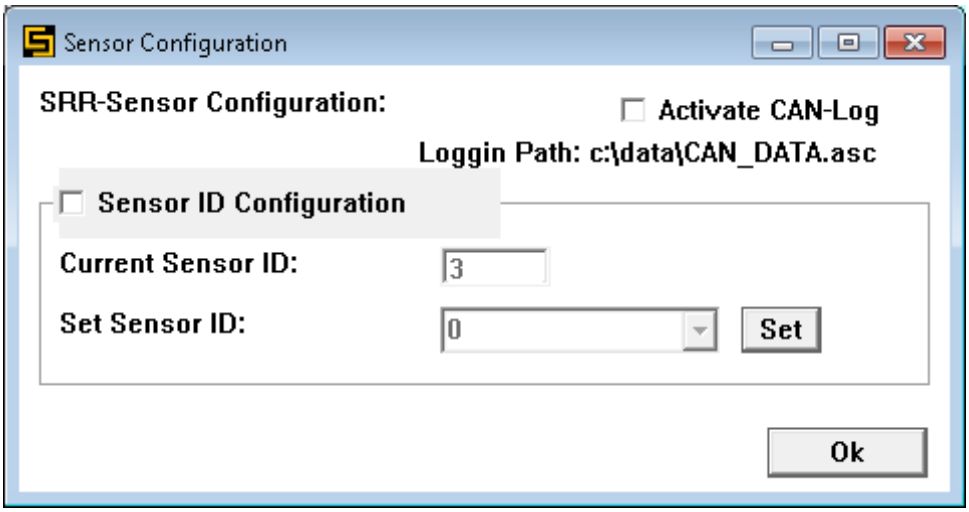

Figure 16: The Sensor Configuration Window

4.1.3.1. CAN-Bus Log

In the "**Sensor Configuration**" window you can activate a CAN-Log which will record every CAN-Message sent by the sensor.
The logging file *"CAN_DATA.asc"* is stored at the location shown at *"Logging Path"*. This is the **default Logfile location**. If you want to adjust the Logging Path, you can do so by changing the *"logPath"* parameter in the *"program.ini"* file in the program folder *"C:\Continental Radar-PLC\program.ini"*.

Note: When changing the default Logfile location, it is **mandatory** to enter a **valid path-string** e.g. *c:\data\CAN_DATA.asc* without any apostrophes or quotation marks. In general it might be helpful to create backup copies of all **.ini* files before changing parameter values.

4.1.3.2. Sensor ID Configuration

The **Sensor ID Configuration** allows selecting a sensor ID for the connected sensor. The Sensor ID also determines the address space of CAN communication messages according to (base message ID | (0x10 * sensor ID)).

The **Current Sensor ID** option shows the currently used Sensor ID. The **Set Sensor ID** option allows changing the Sensor ID. Therefore a value between 0 and 7 can be selected from the drop-down menu. Confirming the new value by pressing the **Set-Button** will write the new configuration to the Radar-Sensor.

4.1.4 Filter

To see only application relevant Cluster or Tracks it is possible to set filter values. This allows the software to reject entities that violate the set of rules established by the filter values thus displaying only relevant Cluster or Tracks.

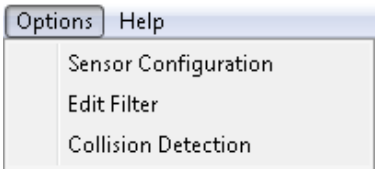

Figure 17 Enable Filter

The filter can be adjusted and activated in the Filter Settings, available through the Options/Edit Filter Menu. Since Tracks and Cluster data come with different sets of parameters the Filter Menu automatically adjusts to the respective display mode. Figure 18 and Figure 19 display the Filter Settings for Cluster and Tracks.

Customized filter values can be written to an **Ini-File** for later use by pressing the "**Save to Ini"** Button. Depending on whether Cluster or Tracks are selected, the filter values will be written to the *"C:\Continental Radar-PLC\SRR20X.ini"* File at the Key *"filter_tracks"* for Track-Mode or *"filter_cluster"* when the display mode is set to Cluster. Formerly saved customized filter values can be loaded from the Ini by pressing the "**Load from Ini"** Button.

Note: The Ini-Filter values will be loaded automatically after program startup and when switching the Sensor-Type or Send Mode. This includes the filter activation.

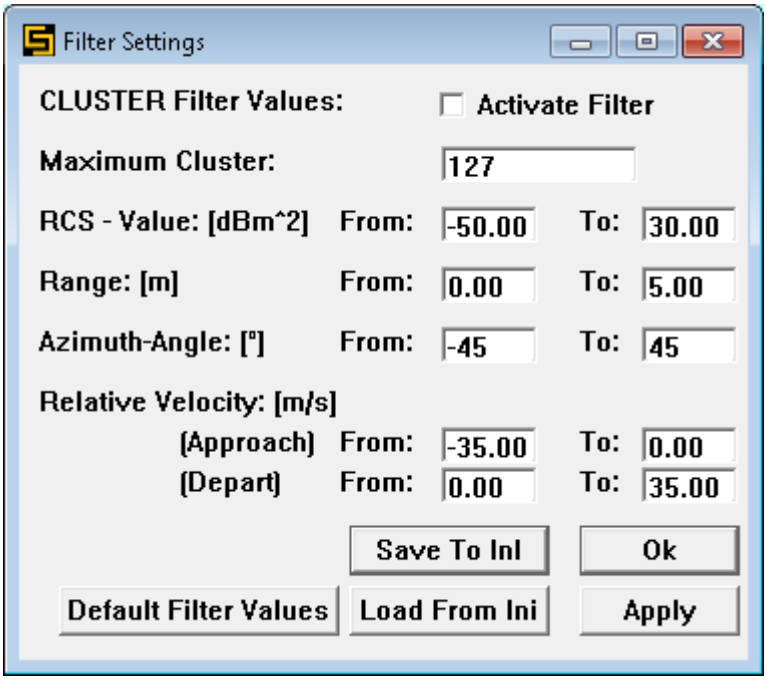

Figure 18 Cluster Filter Settings

Parameter	Description
Activate Filter	Flag the filter to be activated on confirmation
Maximum Cluster Index	Maximum Cluster Index to be displayed
RCS-Value	Radar Cross Section range to be displayed
Range	Distance range in which Cluster should be displayed
Azimuth-Angle	Angle range in which Cluster should be displayed
Relative Velocity	Relative Velocity range for Cluster that should be displayed

Table 6 Cluster Filter value description

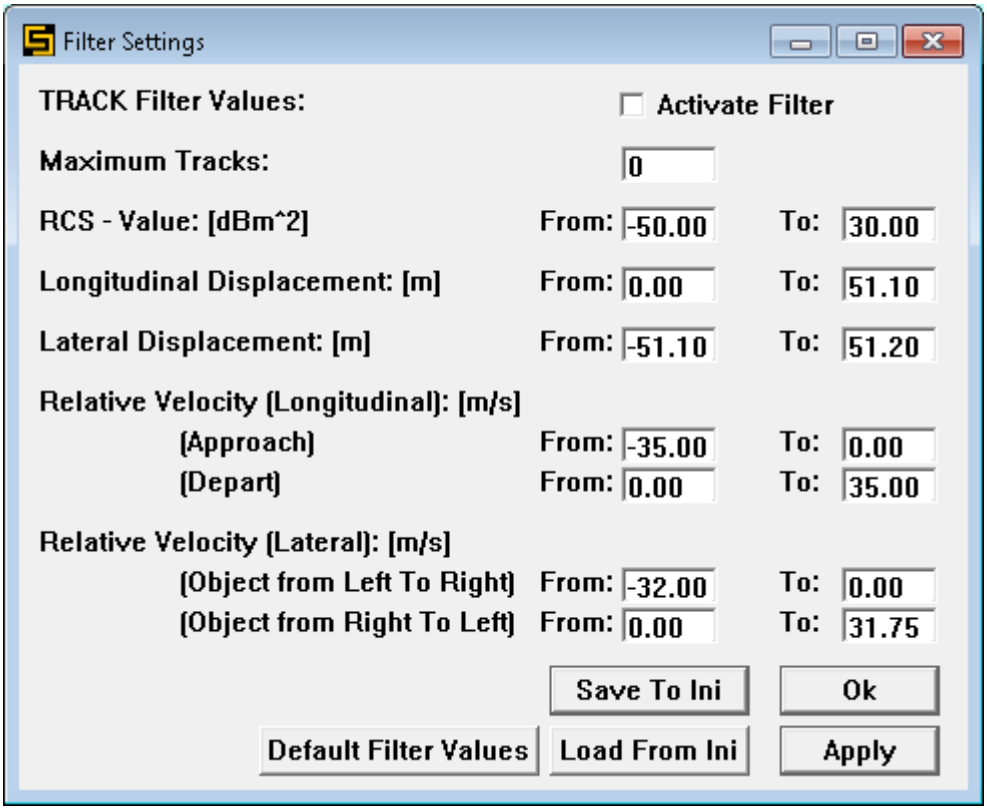

Figure 19 Track Filter Settings

Parameter	Description
Activate Filter	Flag the filter to be activated on confirmation
Maximum Track Index	Maximum Track Index to be displayed
RCS-Value	Radar Cross Section range to be displayed
Longitudinal Displacement	Displacement range in longitudinal direction in which Tracks should be displayed
Lateral Displacement	Displacement range in lateral direction in which Tracks should be displayed
Relative Velocity (Longitudinal)	Relative velocity range in longitudinal direction for Tracks that should be displayed
Relative Velocity (Lateral)	Relative velocity range in lateral direction for Tracks that should be displayed

Table 7 Track Filter value description

In the Filter Settings the signals can be filtered by all relevant information. Only Cluster/Tracks within the activated filter range will be displayed on screen. For the filter to take effect it needs to be activated and applied. Upon start and when no customized filter values have been saved to the Ini file, the filter value range for each parameter reflects the sensors default value range. Edited filter values can easily be restored to the original sensor default value range by pressing the “**Default Filter Values”** Button.

4.1.5 Collision Detection

Collision Detections is only supported with a SRR 208 with sensor internal collision detection software (optional).
The Collision Detection recognition is done directly on the sensor itself and the visualization software only reflects the current collision states monitored by the Radar. So the filter function is not supported. At present the Collision Detection for the sensor versions mentioned above is only available for Tracks.

The collision detection Configuration is accessible through the Options/Collision Detection Menu.

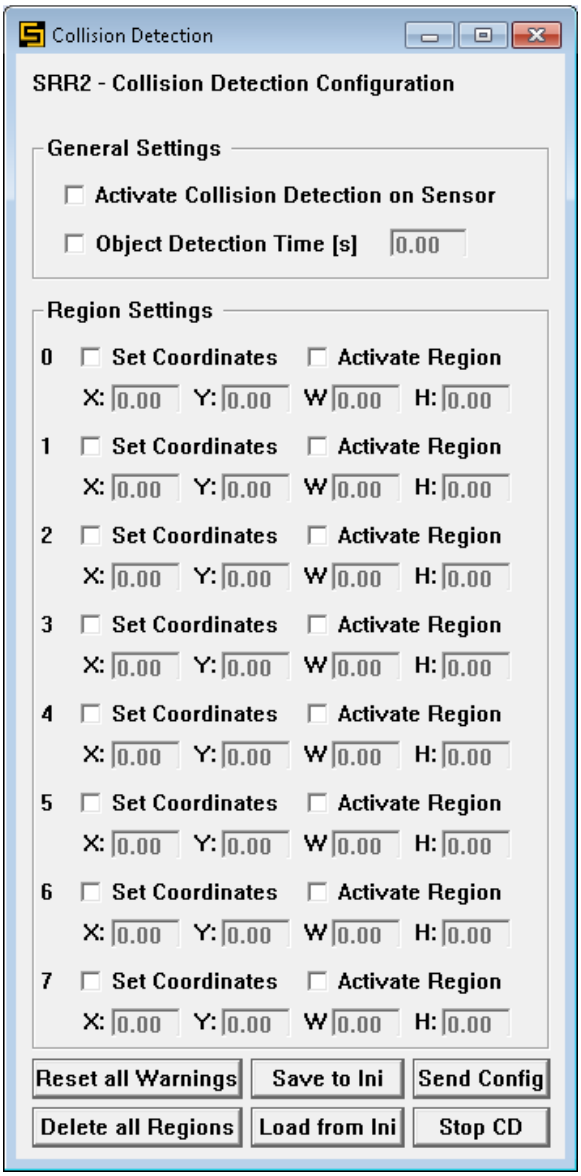

Figure 20 SRR Collision Detection Configuration

Parameter	Description
General Settings	
Activate Collision Detection	Region independent. De-/activate collision detection function
Set Object Detection Time	Minimum time an objects needs to be detected before warning is triggered
Region Settings	
0…7	Number of the region
Set Coordinates	Activates selected region for drawing
Activate Region	Activates selected region for collision detection
X	X value of the upper left corner of the warning region
Y	Y value of the upper left corner of the warning region
W	Width of the warning region
H	Height of the warning region

Table 8 SRR Collision Detection Settings

In Collision Detection Mode the user is able to define and activate up to 8 Warning Regions for which he will receive collision detection information.

The Collision Detection Configuration is separated into General Settings which affect the Collision Detection function as a whole and Region dependent settings which only affect the selected Warning Region. To bring the Collision Detection to work the user first needs to activate the Collision Detection Functionality on the sensor. Furthermore at least one Warning Region needs to be **defined** and **activated**. Only then the Sensor will monitor the defined region for collision detection violations.

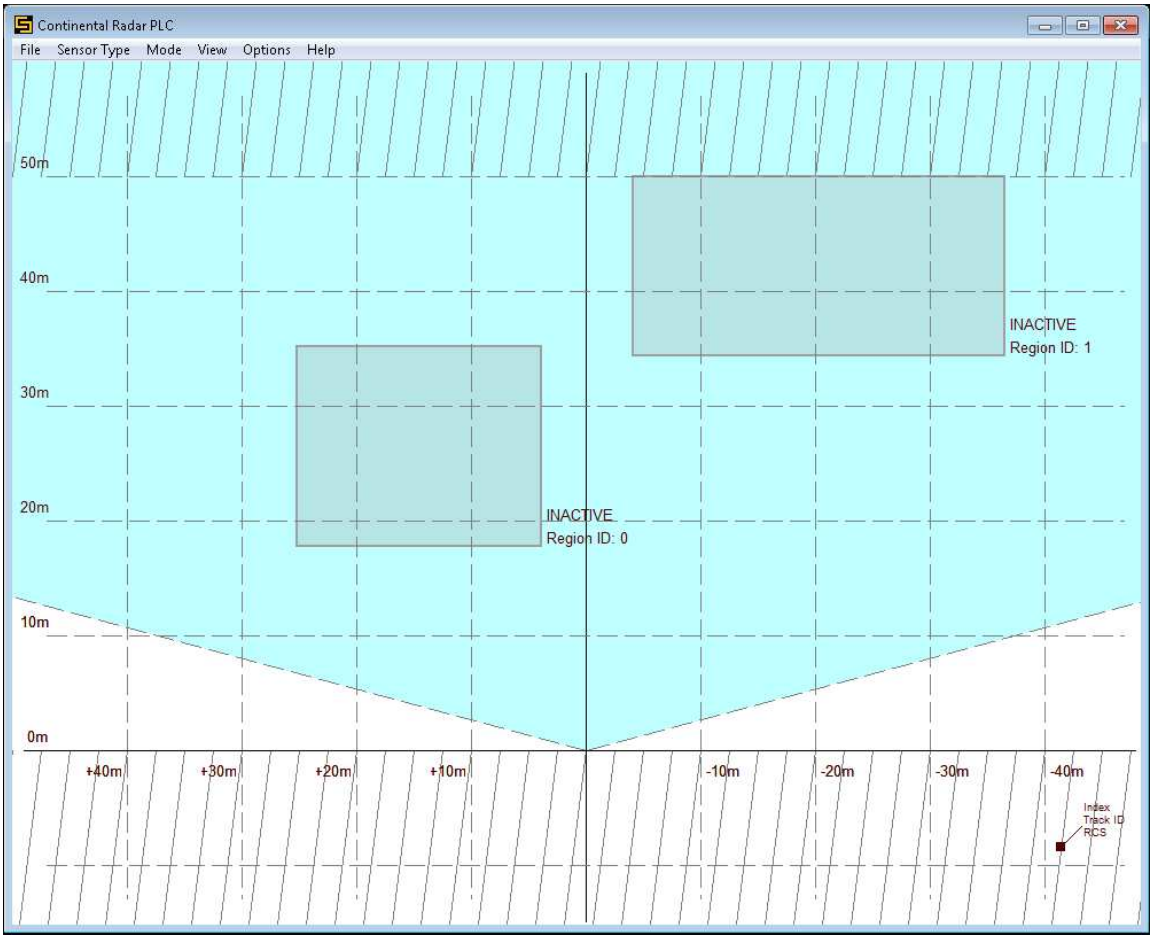

Figure 21: SRR defining warn regions

To define a Warning Region the *Set Coordinates Flag* of the respective region needs to be set. This activates the selected region for drawing. By left-clicking into the Main Screen and dragging the mouse a rectangular, Warn Regions can be created. While moving the mouse the regions *X*, *Y*, *W* and *H* Parameters in the Collision Configuration Window will be updated.
When selecting a Region for drawing, some crossed out areas can be seen. Those limit the Sensors detection scope and make sure only valid regions are defined. When trying to set invalid values to warning regions by starting or ending outside the detection scope the region will automatically use the maximum valid value for the respective invalid coordinate (Figure 21).

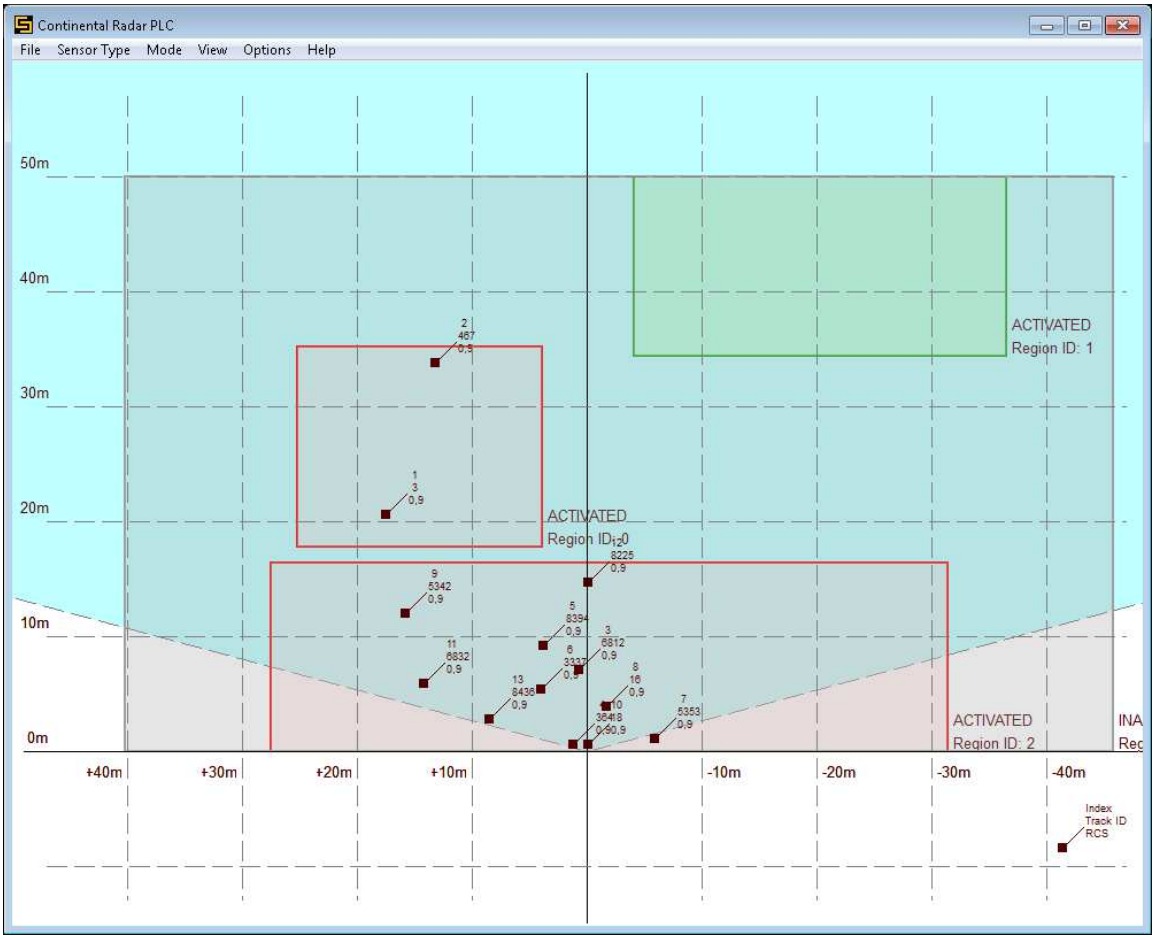

Figure 22 SRR Collision Detection Mode

To activate the region the "*Activate Region"* flag needs to be set. The *Send Config* Button will write the General Settings and the Region Settings of active Regions to the Radar Sensor.

The Regions current color also reflects the regions current state (grey = inactive, green = activated, red = warning).

A defined Region-Setup can be stored by pressing the "**Save to Ini"** Button. Hereby all region coordinates and their active state as well as the general Collision Detection settings are written to the *"C:\Continental Radar-PLC\SRR20X.ini"* at the key *"coll_det_regions"*. Respectively a saved Region-Setup can be loaded by pressing the "**Load from Ini"** Button.

By selecting the "**Reset all Warnings"** Button, all active Warning Regions on the Sensor will be reset to the *"No Warning* State*"* (green) until another violation of the region is detected. This can be immediately if no restrictions are set or after the Minimal Detection Time if it is selected and written to the sensor.

The "**Delete all Regions"** Button deletes all Regions that are currently observed by the Radar Sensor. No Collision Detection Warnings will be sent after this, unless a new region is created.

By selecting the “**Stop C***(ollision)***D***(etection)”* Button the Collision Detection Functionality is shut down. No more Collision Detection Warning Messages are sent until the Functionality gets reinitialized.

In Collision Detection Mode the Radar Sensor is unable to send regular Track Signals displayed in None Collision Detection Mode, however creating a warning region that covers the whole Main Screen will allow the sensor to detect all Tracks within his detection scope. But note that the displayed tracks are Warning Tracks, meaning Tracks that triggered a Collision Detection Warning, thus the region activation is mandatory.

4.2 ARS 308 Sensor

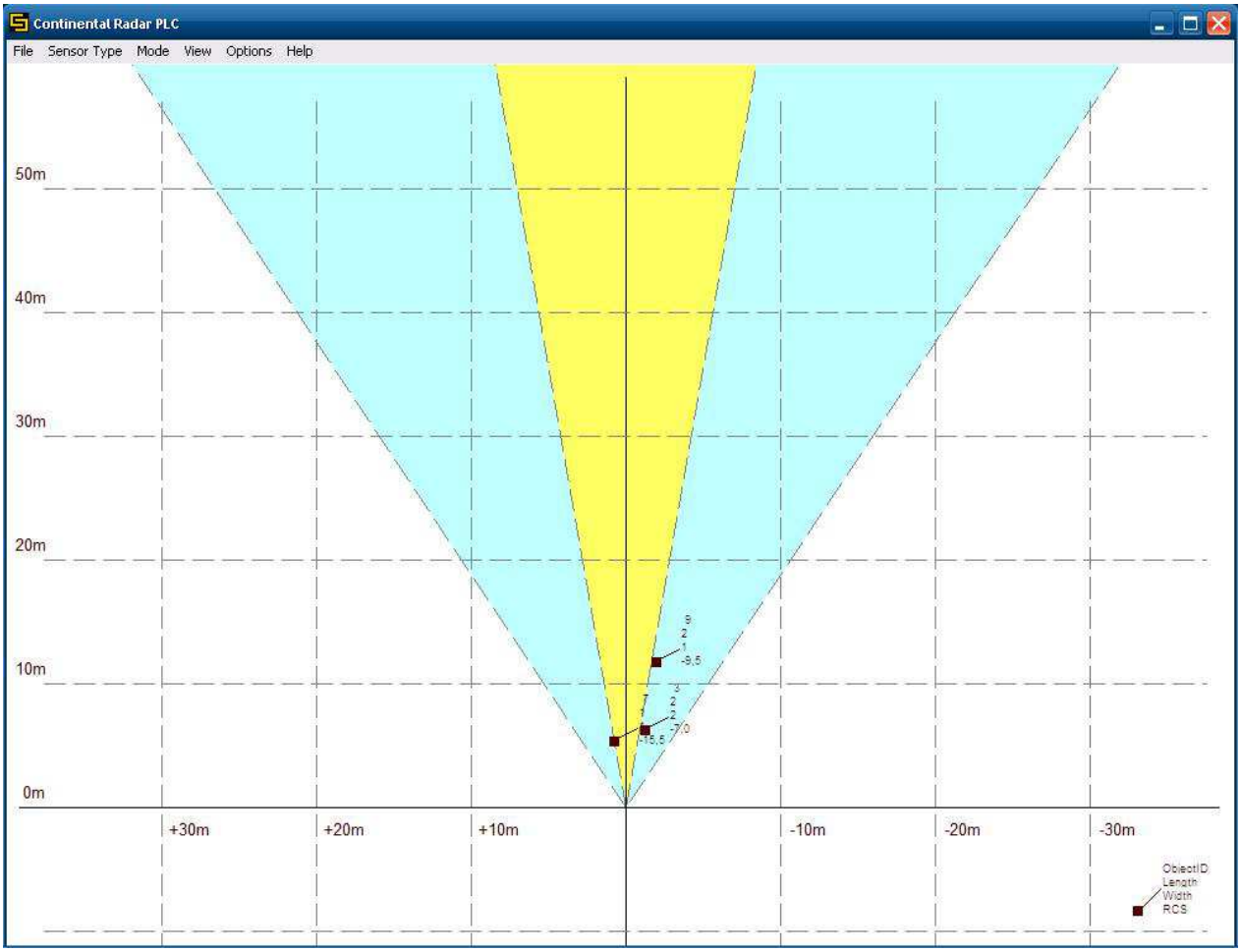

Figure 23 ARS308 Main Screen in Near-View

The *Main Screen* shows the ARS308s field of view. The Yellow and turquoise areas indicate the sensors Near- and Long-Range detection areas. Since the Long-Range area covers a distance up to 200m it is possible to switch the view area from *Near-View* (standard, Figure 23) to *Far-View* (Figure 25). This option can be activated by selecting *Far-View* from the *View Menu*.

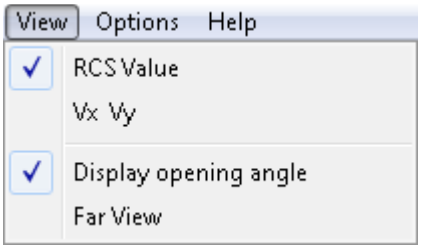

Figure 24: Far-View selection for the ARS308 Sensor.

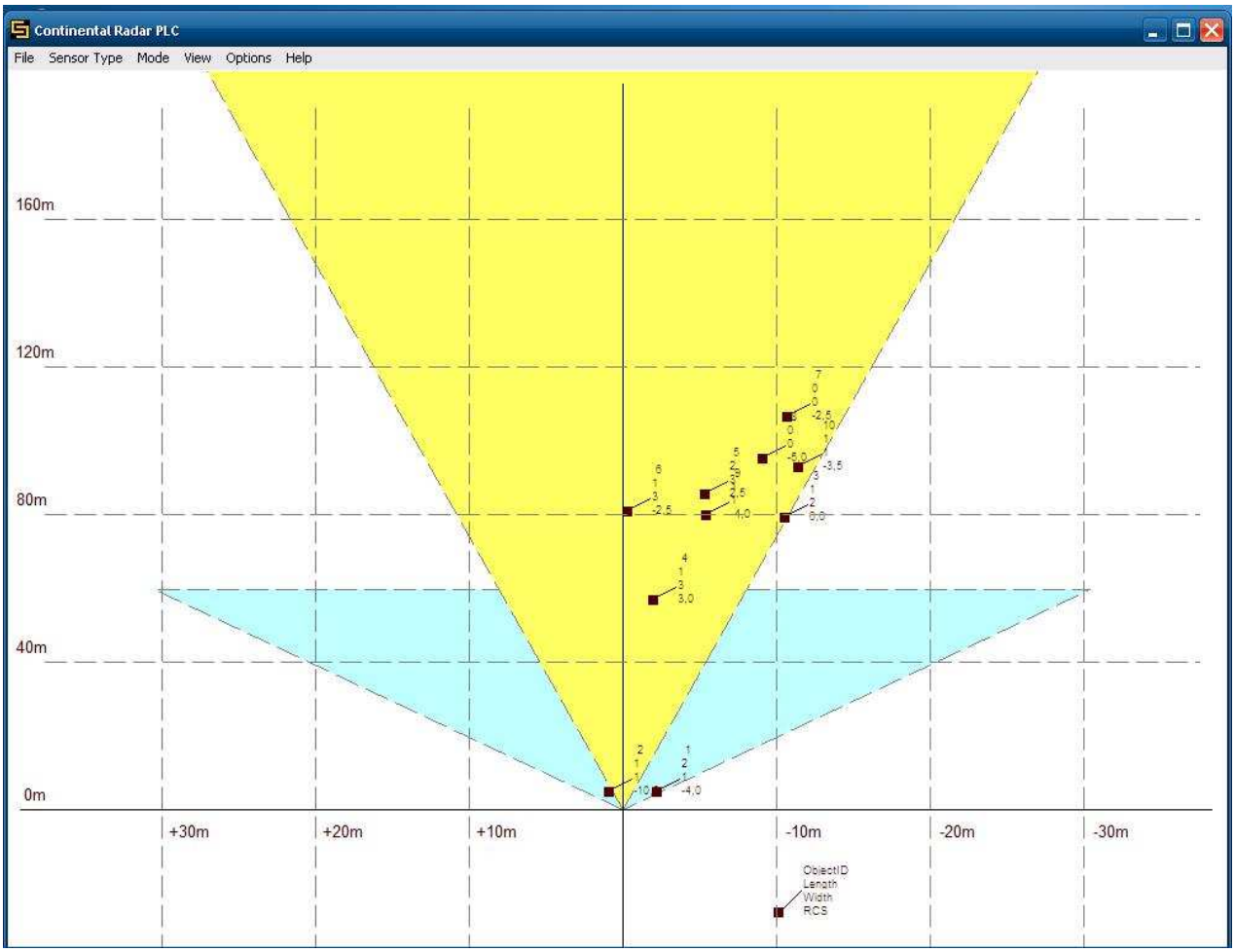

Figure 25: ARS308 Main Screen in Far-View

The white areas are outside the sensors detection scope. By the sensor detected entities are displayed as small red boxes within the field of view of the sensor. The markers also provide additional information about detected entities. Besides the entities location further information about its speed, dimensions and the Radar Cross Section (RCS) are displayed. An exemplary marker is shown as information in the lower right corner of the *Main Screen*. The sensor supports two modes. It can display the Sensors signals either as Objects or Targets[3].

[3] See the ARS308 manual for description

4.2.1 Targets

The Targets display can be activated by selecting Targets from the *Mode Menu*.

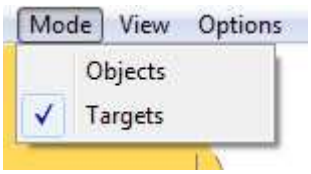

Figure 26 Mode Selection for Targets

Targets represent reflected signals with similar position and movement. The software is able to display up to 96 Targets at once. Each Target provides a set of information.

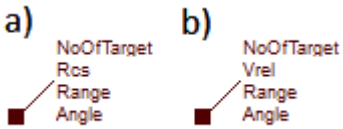

Figure 27 ARS308 Target Markings

Parameter	Description
NoOfTarget	Target number in the Target List
RCS	Radar Cross Section[dB*m^2]
Range	Target Range
Angle	Target Angle[°]
Vrel	Target relative velocity[m/s]

Table 9 Target parameter Overview

The displayed set of information can be altered between displaying the RCS value (Figure 27a) or the relative velocity (Figure 27b) by configuring the view available in the *View Menu*.

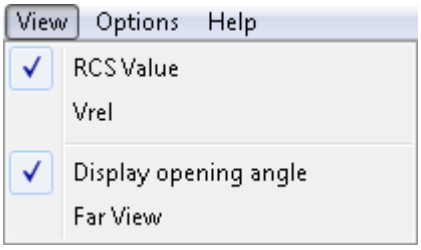

Figure 28 View settings for Targets

4.2.2 Objects

The Objects display can be activated by selecting Objects from the *Mode Menu*.

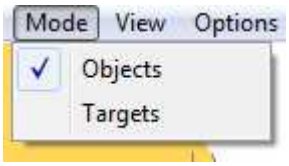

Figure 29 Configuration - Targets / Objects

Objects in contrast to Targets have a history. They represent Targets tracked over time. The software is able to display up to 40 Objects at once. Each Object provides a set of information.

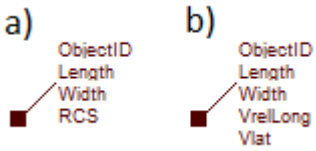

Figure 30 ARS308 Object Markings

Parameter	Description
ObjectID	Unique Object ID
Length	Object Length[m]
Width	Object width[m]
RCS	Radar Cross Section[dB*m^2]
VrelLong	Relative longitudinal speed[m/s]
Vlat	Object lateral velocity[m/s]

Table 10 Object parameter overview

The displayed set of information can be altered between displaying the RCS value (Figure 30) and the relative longitudinal and lateral velocities (Figure 31) by configuring the view available in the *View Menu*.

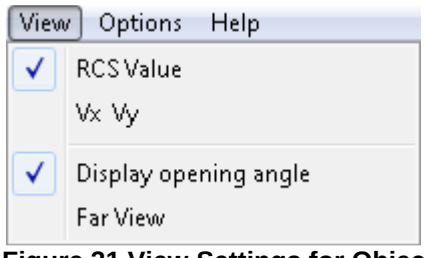

Figure 31 View Settings for Objects

4.2.3 Sensor Configuration Window

Basic Sensor properties can be adjusted in the "**Sensor Configuration"** Window. To open it, select Options/ Sensor Configuration

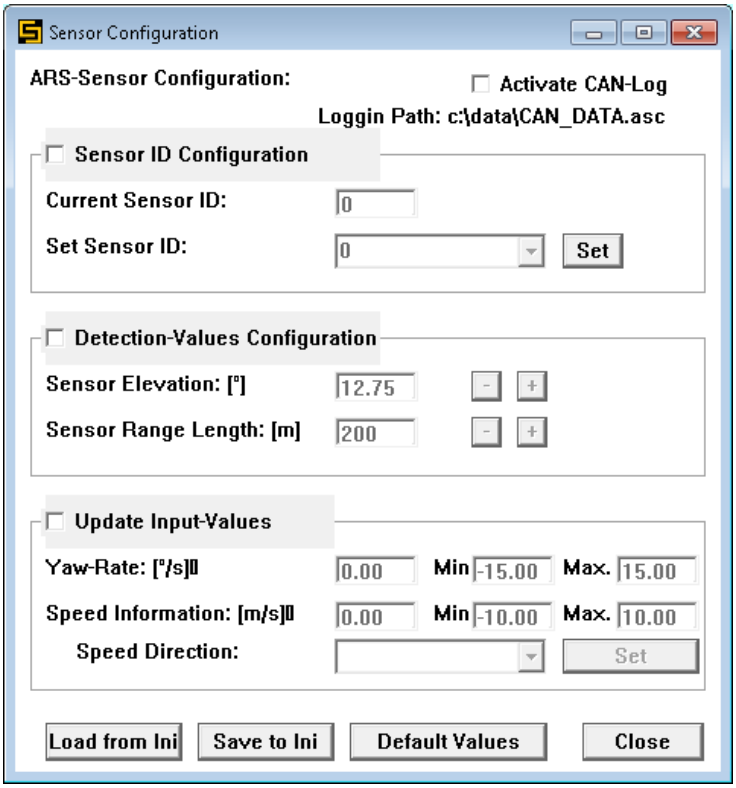

Figure 32: ARS 308 Sensor Configuration Window

4.2.3.1. CAN-Bus Log

In the "**Sensor Configuration**" window you can activate a CAN-Log which will record every CAN-Message sent by the sensor.
The logging file *"CAN_DATA.asc"* is stored at the location shown at *"Logging Path"*. This is the **default Logfile location**. If you want to adjust the Logging Path, you can do so by changing the *"logPath"* parameter in the *"program.ini"* file in the program folder *"C:\Continental Radar-PLC\program.ini"*.

Note: When changing the default Logfile location, it is **mandatory** to enter a **valid path-string** e.g. *c:\data\CAN_DATA.asc* without any apostrophes or quotation marks. In general it might be helpful to create backup copies of all **.ini* files before changing parameter values.

4.2.3.2. Sensor ID Configuration

The **Sensor ID Configuration** allows changing the ID between 0 and 7 for the connected sensor. The Sensor ID also determines the address space of CAN communication messages according to (base message ID | (0x10 * sensor ID)).

The **Current Sensor ID** option shows the currently used Sensor ID. The **Set Sensor ID** option allows changing the Sensor ID. Therefore a value between 0 and 7 can be selected from the drop-down menu. Confirming the new value by pressing the **Set-Button** will write the new configuration to the Radar-Sensor.

4.2.3.3. Detection Value Configuration

The **Detection Value Configuration** allows adjusting the Radar sensors detection scope by changing the **plate elevation** and the **Range Length**. By adjusting the sensor's plate, the elevation angle of the radar beam is altered between **0°** *(inclined towards the sky)* and **32°** *(inclined towards the ground)*. By setting the range length parameter, the maximum distance at which objects will be detected can be adjusted between **50m** and **200m**. By adjusting both parameters the radar sensor can be optimized to receive optimal reflections from an area of interest. With a shorter range, the measurement accuracy of the measured distances are getting better.

4.2.3.4. Update Input Values

These values are used, when the sensor is mounted on vehicle. It helps to separate moving objects from the environment.
By selecting **Update Input Values** the currently **vehicle speed** and **yaw rate** are displayed and continuously updated. Those signals are calculated from the externally set input current (4…20mA) on the EL3122 module (2.3, p.7). The default minimum and maximum values for speed and yaw rate are set to the sensors limits. Both values can be adjusted by entering new values in the *"Min."* and *"Max."* fields and activated by pressing the Set Button.

It is also possible to save **Detection Value Configuration** and the **set minimum and maximum values of the Input Values Configuration** to the *"ARS30x.ini"* file. Respectively a saved Detection Value Configuration and Input Value Configuration can be loaded by pressing the "**Load from Ini"** Button.

The "**Default Values"** Button resets the **Set Sensor ID** within the **Sensor ID Configuration** the whole **Detection Values Configuration** and the **minimum** and **maximum** values for speed and yaw rate within the **Input Values Configuration** to their individual default value given by the radar sensor.

4.2.4 Filter

To see only application relevant Targets or Objects it is possible to set filter values.

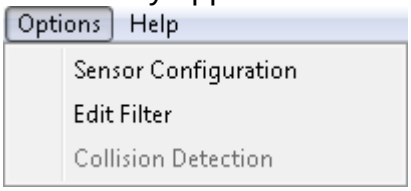

Figure 33 Enable Filter

The filter can be adjusted and activated in the *Filter Settings*, available through the *Options/Edit Filter Menu*. Since Objects and Targets data come with different sets of parameters the Filter Menu automatically adjusts to the respective display mode. Figure 34 and Figure 35 display the Filter Settings for Objects and Targets.

Customized filter values can be written to an **Ini-File** for later use by pressing the "**Save to Ini"** Button. Depending on whether Objects or Targets are selected, the filter values will be written to the *"C:\Continental Radar-PLC\ARS30x.ini"* File at the Key *"filter_objects"* for Object-Mode or *"filter_Targets"* when the display mode is set to Targets. Formerly saved customized filter values can be loaded from the Ini by pressing the "**Load from Ini"** Button.

Note: The Ini-Filter values will be loaded automatically after program startup and when switching the Sensor-Type or Mode.

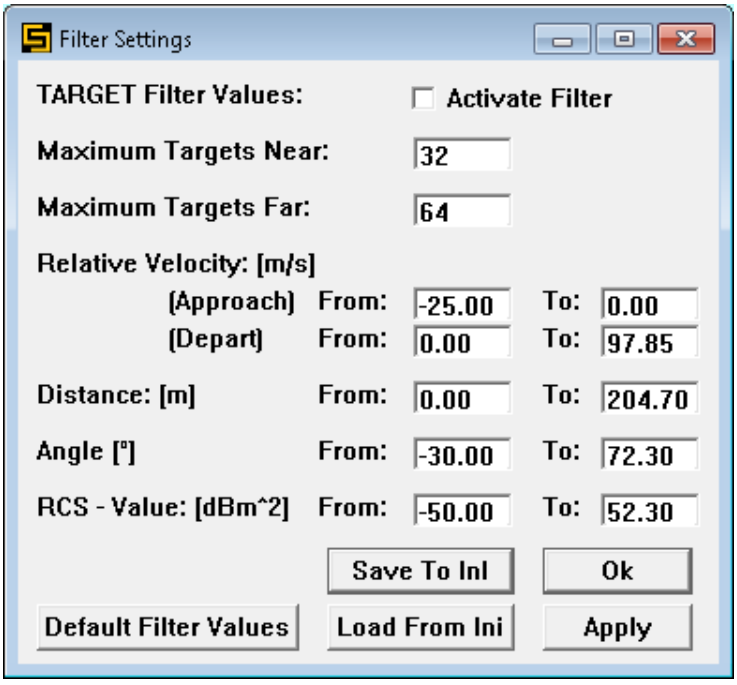

Figure 34 Target Filter Settings

Parameter	Description
Activate Filter	Flag the filter to be activated on confirmation
Maximum Target Index Near	Maximum Index of Targets in Near distance to be displayed
Maximum Target Index Far	Maximum Index of Targets in Far distance to be displayed
Relative Velocity	Relative velocity range for Targets that should be displayed
Distance	Distance range in which Targets should be displayed
Angle	Angle range in which Cluster should be displayed
RCS-Value	Radar Cross Section range to be displayed

Table 11 Target Filter value description

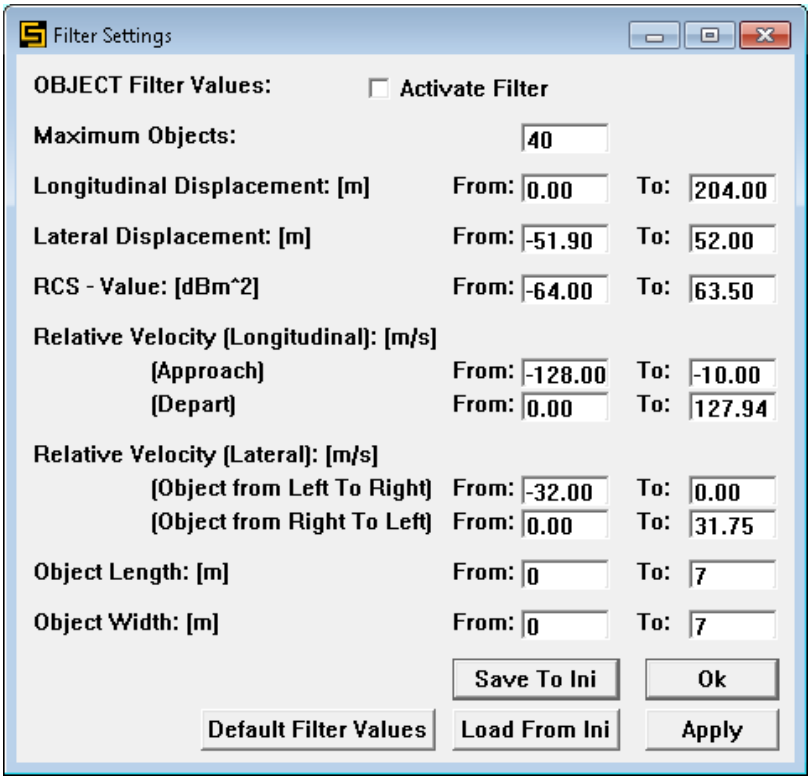

Figure 35 Object Filter Settings

Parameter	Description
Activate Filter	Flag the filter to be activated on confirmation
Maximum Object Index	Maximum Object Index to be displayed
Longitudinal Displacement	Displacement range in longitudinal direction in which Objects should be displayed
Lateral Displacement	Displacement range in lateral direction in which Objects should be displayed
RCS-Value	Radar Cross Section range to be displayed
Relative Velocity (Longitudinal)	Relative velocity range in longitudinal direction for Objects that should be displayed
Relative Velocity	Relative velocity range in lateral direction for Objects that should be

(Lateral)	displayed
Object Length	Length range for Objects that should be displayed
Object Width	Width range for Objects that should be displayed

Table 12 Object Filter Value description

In the Filter Settings the signals can be filtered by all relevant information. Only Targets/Objects within the activated filter range will be displayed on screen. For the filter to take effect it needs to be activated and applied. Upon start and when no customized filter values have been saved to the Ini file, the filter value range for each parameter reflects the sensors default value range. Edited filter values can easily be restored to the original sensor default value range by resetting the filter values. Edited filter values can easily be restored to the original sensor default value range by pressing the "**Default Filter Values"** Button.

4.2.5 Collision Detection

If the ARS308 Radar Sensor supports collision detection, this function can be activated. This is done directly by the sensor itself and the visualization software only reflects the current collision states monitored by the Radar Sensor. So the filter function is not supported. Collision Detection is only available for Objects.

The collision detection Configuration is accessible through the Options/Collision Detection Menu.

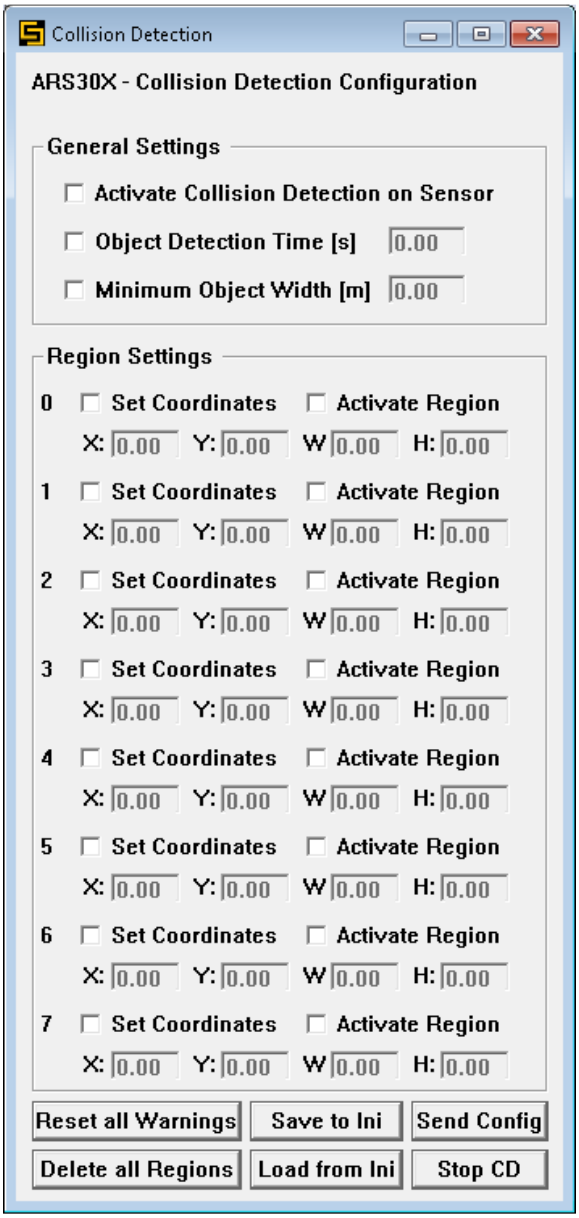

Figure 36 ARS308 Collision Detection Configuration

Parameter	Description
General Settings	
Activate Collision Detection	Region independent. De-/activate collision detection function
Set Object Detection Time	Minimum time an objects needs to be detected before warning is triggered
Minimum Object Width	Minimum Width an object needs to have in order to trigger a warning.
Region Settings	
0…7	Number of the region
Set Coordinates	Activates selected region for drawing
Activate Region	Activates selected region for collision detection

X	X value of the upper left corner of the warning region
Y	Y value of the upper left corner of the warning region
W	Width of the warning region
H	Height of the warning region

Table 13 ARS Collision Detection Settings

In Collision Detection mode the user is able to define and activate up to 8 warning regions for which he will receive collision detection information. Each warning region is connected to an output relay (See 2.4)

The Collision Detection Configuration is separated into General Settings which affect the Collision Detection function as a whole and Region dependent settings which only affect the selected Warning region. For starting the Collision Detection, the user first needs to activate the Collision Detection Functionality on the sensor. Furthermore at least one Warning Region needs to be **defined** and **activated**. Only then the Sensor will monitor the defined region for collision detection violations.

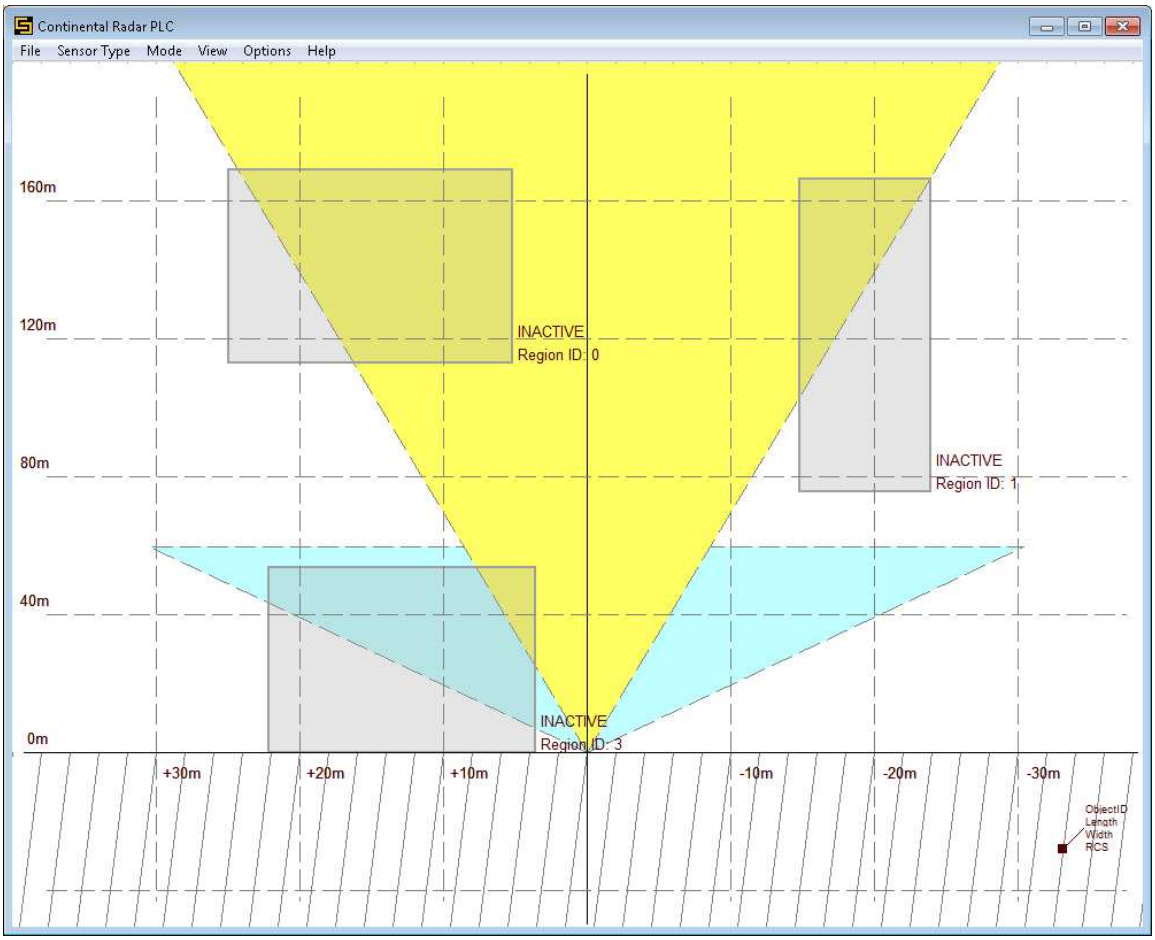

Figure 37: ARS 308 defining warn regions

To define a Warning Region the *Set Coordinates* Flag of the respective region needs to be set. This activates the selected region for drawing. By left-clicking into the *Main Screen* and dragging the mouse a rectangular Warn Region can be created. While moving the mouse the regions *X*, *Y*, *W* and *H* Parameters in the Collision Configuration Window will be updated.
When selecting a Region for drawing, a crossed out area can be seen. It limits the Sensors detection scope and makes sure only valid regions are defined. When trying to set invalid values to warning regions by starting or ending outside the detection scope the region will automatically use the maximum valid value for the respective invalid coordinate (Figure 37).

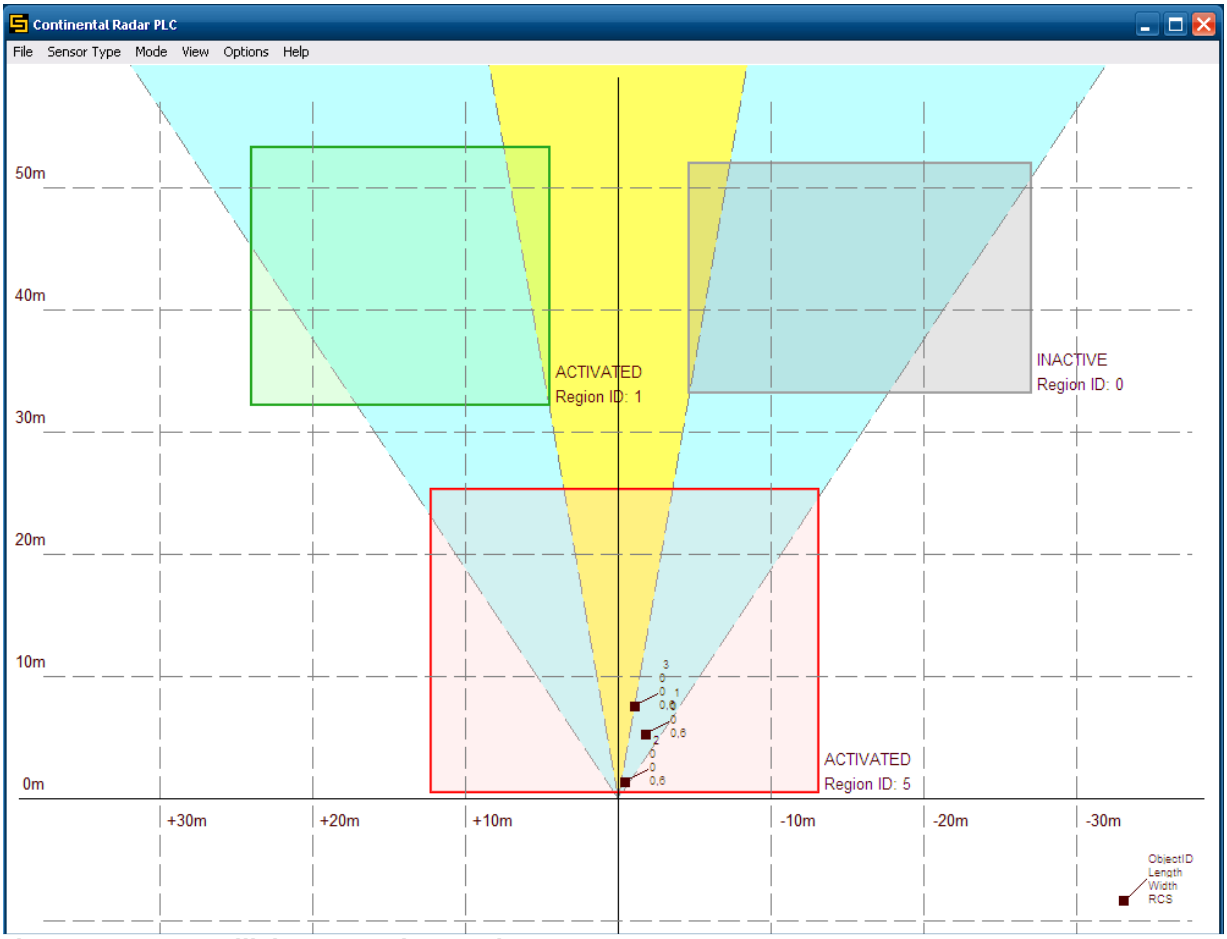

Figure 38: ARS-Collision Detection Mode

To activate the region the *Activate Region* flag needs to be set. The "**Send Config**" Button will write the General Settings and the Region Settings of the currently selected Region to the Radar Sensor.

The Regions current color also reflects the regions current state (grey = inactive, green = activated, red = warning).

A defined Region-Setup can be stored by pressing the "**Save to Ini"** Button. Hereby all region coordinates and their active state as well as the general collision settings are

written to the *“C:\Continental Radar-PLC\ARS30x.ini”* at the key *“coll_det_regions”*. Respectively a saved Region-Setup can be loaded by pressing the “**Load from Ini”** Button.

By pressing the “**Reset all Warnings”** Button, all active warning regions on the Sensor will be reset to the *“No Warning State”* (green).

The “**Delete all Regions”** Button deletes all Regions that are currently observed by the Radar Sensor. **No Collision Detection Warnings** will be sent after this.

By selecting the **Stop C***(ollision)* **D***(etection)* **Button** the Collision Detection Functionality is shut down. **No more Collision Detection Warning Messages** are sent until the Functionality gets reinitialized.

In Collision Detection Mode the Radar Sensor is unable to send the regular Object Signals displayed in None Collision Detection Mode, however creating a Warning Region that covers the whole Main Screen will allow the sensor to detect all Objects within his detection scope. But note that the displayed Objects are Warning Objects, meaning Objects that triggered a Collision Detection Warning, thus the region activation is mandatory.

5. Tools

5.1 Remote Desktop

When the Radar PLC is connected over an Ethernet cable to another computer it is possible to access the Radar PLC over Remote Desktop.

IP. Address:

169.254.167.240

Password:
Arcus

6. Appendix

6.1 Power Supply AC/DC

For the Power supply with 100-240 VC AC it is possible to use the PULS ML 30.106 power supply. It delivers 24V DC for the Radar PLC and 12V for the Radar Sensor

Figure 39 PULS ML 30.106 power supply

6.2 Power Supply DC/DC

RS 50W Single Output 12V DC/DC voltage converter – Output 24V DC

Figure 40 12/24V DC/DC voltage converter (part of delivery)