

WinFrog Device Group:	Output
Device Name/Model:	Simrad702 WP
Device Manufacturer:	<p>KONGSBERG SIMRAD AS DYRMYRGATA 35, P.O. BOX 483 3601 KONGSBERG NORWAY Phone: 47 32 28 50 00; Fax: 47 32 73 59 87 E-mail: WebOffice@kongsberg.simrad.com http://www.kongsberg-simrad.com/</p> <p>KONGSBERG SIMRAD INC. 7250 LANGTRY STREET HOUSTON TX 77040-6625, U.S.A. Phone: 1 713 934 8885; Fax: 1 713 934 8886</p>
Device Data String(s) Output to WinFrog:	NMEA string: \$--RBM (Minimum Navigation Information)
WinFrog Data String(s) Output to Device:	NMEA strings: \$GPRTE (Route), \$GPWPL (Way point Location)
WinFrog .raw Data Record Type(s):	Type: 450

DEVICE DESCRIPTION:

Kongsberg Simrad Dynamic Positioning (SDP) control systems integrate control of the vessels propulsion systems via inputs from positioning systems, gyrocompasses, wind speed and direction monitoring equipment, and any other sensors that can assist with the automatic positioning of the vessel.

Commands to the thrusters can be based on two main types of systems. The first version has conventional cabling of signals to and from thrusters; while the second version has dual net communication. These commands control the dynamic positioning system, thruster control, power management and other vessel control systems.

Many of Kongsberg’s Dynamic Positioning (DP) systems are based on common hardware and software. Following is a list of current WinFrog drivers having outputs to Simrad DP systems:

- SIMRAD 301 DP
- SIMRAD 701 DP
- **SIMRAD 702 WP**
- SIMRAD SDP21 WP
- SIMRAD SDP24
- SIMRAD SDP600

The Simrad 702 system is configured (for inputs and outputs) by Simrad. These systems can accept completely differing input/output data strings. Prior to interfacing to

these devices, the WinFrog operator should verify the system configuration of the Simrad 702 system installed on the vessel.

DEVICE CONFIGURATION INSTRUCTIONS (WinFrog Suggested):

Baud Rate: 4800

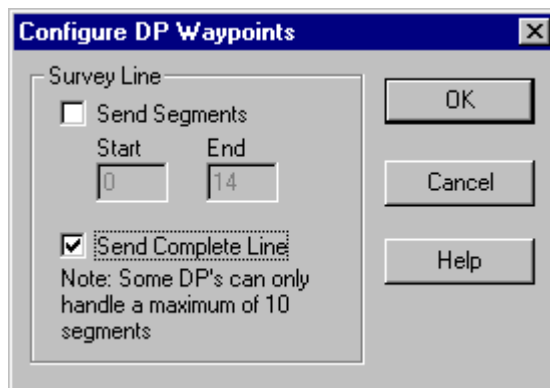
Data Bits: 8

Stop Bits: 1

Parity: None

WINFROG I/O DEVICES > CONFIG OPTIONS:

The SIMRAD702 WP device is added to WinFrog from the OUTPUT device types. The DP OUTPUT and LINETRACK data types are added along with the SIMRAD702 WP device. The following dialog box appears for configuring output data via the Configure > I/O Devices > Configuration command. This dialog box will also appear if you highlight the SIMRAD702 WP device in the I/O Devices Window, then right-click and choose Configure Device. Only configuration of the DP OUTPUT data type is available at the I/O Device level.



Survey Line:

Enter the survey line segments, of the active survey line, in the Start and End boxes; then select the Send Segments checkbox. When the OK button is clicked to exit the dialog box, the survey line segments are sent to the DP system. The device must be added to a vehicle before any data transfer occurs.

Note: Some DP systems can only accept a maximum of 10 points.

Another option with the SIMRAD702 WP device configuration is the ability for this driver to Send (the) Complete Line to the DP system. This option is shown in the above dialog box, and is the option that should be used in most cases.

When the device is configured a second time, after sending the complete line, the Configure DP Waypoints dialog box will display the start and end line segment sent, in the Start and End boxes.

Refer to Configuration Details for more information on the raw data logging and data output/input strings associated with the Simrad702 WP driver.

The above procedure must be repeated every time the operator wishes to send Line Segments (and vehicle position data) to the DP system.

Data Checks:

Prior to attempting to send the specified line nodes, several checks are performed, including the validity of the segments selected. The tests are as follows:

- Is there a valid line selected for the respective vehicle?
- Is the start segment ≥ 0 , the first node in any line?
- Is the end segment $>$ the start segment?
- Is the start segment $>$ the last line node?
- Is the end segment $>$ the last line node?

The waypoint download is aborted if the answer to any of these is considered a failure.

Download Status:

The download status is displayed in the device window, as are the actual messages transmitted to the DP. The display of the status is maintained between redrawing of the device window; however, the displays of the output messages are not. The possible status messages are as follows:

- Wpt Download Status: N/A
- Wpt Download Status: Good
- Wpt Download Status: Bad: End Seg \leq Start Seg
- Wpt Download Status: Bad: Start Seg $>$ Last Line Node
- Wpt Download Status: Bad: End Seg $>$ Last Line Node
- Wpt Download Status: Bad: Seg Span $>$ Total Available Nodes
- Wpt Download Status: Bad: No Active Line Tracking

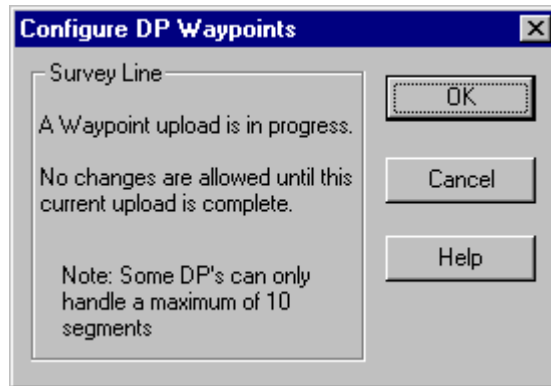
The N/A indicates that no action has been attempted yet and therefore is no available status.

WINFROG VEHICLE - DEVICES > EDIT OPTIONS:

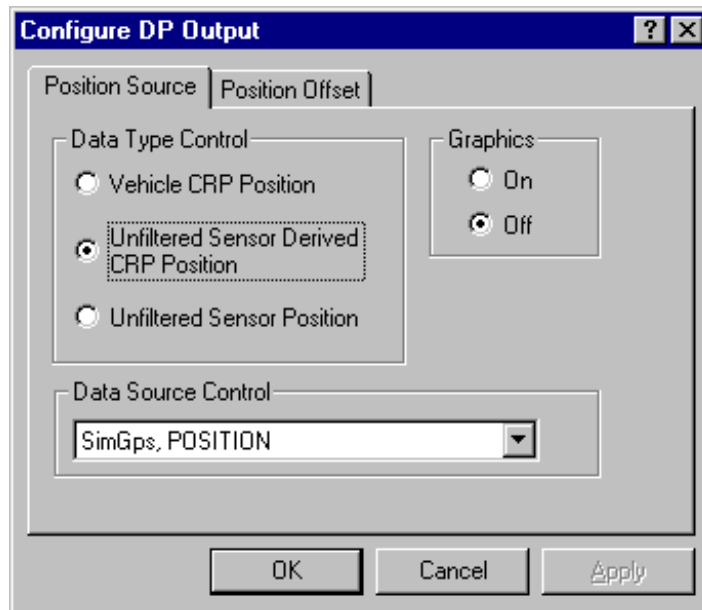
As mentioned above, the DP OUTPUT AND LINETRACK data items are available for adding to a vehicle's device list, once the SIMRAD702 WP device is added as an I/O Device. The DP OUTPUT data item outputs Route Information (\$GPRTE) and Waypoint Locations of the line segment nodes (\$GPWPL), to the DP console. The LINETRACK data item accepts the Recommended Minimum Navigation Information string (\$--RMB) from the Simrad 702 console. These data strings are described in the Configuration Details section of this document.

DP OUTPUT Data Type:

The SIMRAD702 WP, DP OUTPUT is added to the vehicle with the DP system in use. This vehicle should also be tracking the Survey Line for which the operator intends to send the relevant line data, to the DP system. If a Survey Line is not enabled, or the device is not added to the vehicle, no line segment data will be transferred. The dialog box below will appear when the operator attempts to configure the device, and send data to the vehicle. This will not change until a tracking line is enabled and the device is added to the vehicle.



When the SIMRAD702 WP, DP OUTPUT item is edited from the Configure Vehicle Calculations dialog box, the Configure DP Output dialog box appears. The **Position Source** and the **Position Offset** tabs must be configured from here. These items configure the vehicle position output as described in the type 450 record under Configuration Details.



Position Source:

Three items need to be configured: Data Type Control, Graphics, and Data Source Control.

Data Type Control:

In Data Type Control, there are three options to choose from: Vehicle CRP Position, Unfiltered Sensor Derived CRP Position, and Unfiltered Sensor Position.

Choose the **Vehicle CRP Position** for filtered position updates referenced to the vehicles' Central Reference Point (CRP). The offset input under the Position Offset Folder is added to the CRP position.

The **Unfiltered Sensor Derived CRP Position** is the same as the above only unfiltered (or raw) data is output. With this option, filtering can be performed within the DP unit.

The **Unfiltered Sensor Position** outputs unfiltered positions from the positioning sensors location. The offset input under the Position Offset Folder is added to the sensors raw position.

Data Source Control:

The data source depends on the Data Type Control that was selected. If the *Vehicle CRP Position* is chosen, the Data Source Control will automatically be set to VEHICLE, CRP POSITION, and the primary positioning sensor data will be used. If either the *Unfiltered Sensor Derived CRP Position* or the *Unfiltered Sensor Position* is chosen in the Data Type Control, then the positioning sensor can be chosen from the dropdown list under Data Source Control. Here a secondary positioning sensor can be chosen. It is important to note that the *Unfiltered Sensor Derived CRP Position* is based on the chosen sensor, however the data is related to the CRP. Note that the SimGps, POSITION is used in this window as an example only.

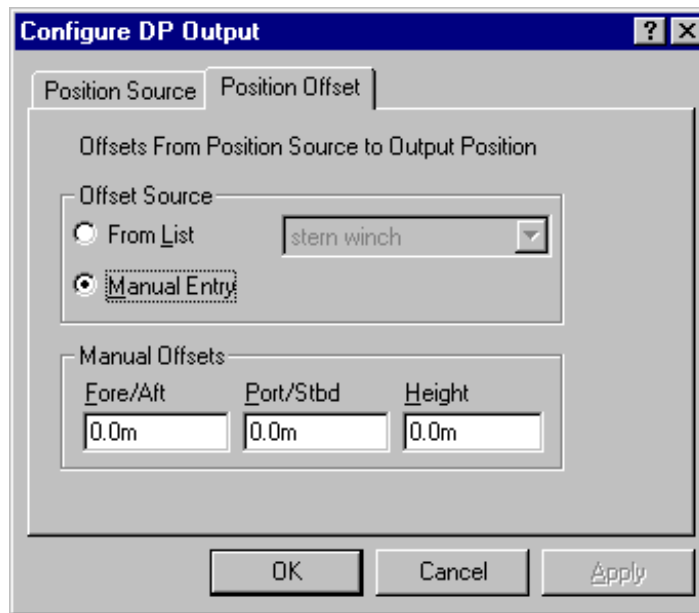
Graphics:

Turning on the Graphics will display the device name and a square at the location of the SIMRAD702 WP position output. This position (grid) can be found in the type 450 record in the fields shown under the Configuration Details section of this document.

It is advisable to have this option turned on so the position output location can be visually referenced from the Graphics Window.

Position Offset:

As shown below, the 'Offsets From Position Source to Output Position' can be configured on this tab. This means that any offset input here will be applied to the position output from the Position Source tab options listed above.



Offset Source:

The Offset Source can be chosen from the list of offsets for the vehicle, or the Manual Entry can be used.

Manual Offsets:

If Manual Entry is chosen under the Offset Source, the offsets must be input here. Offsets are input similar to all offsets in WinFrog.

LINETRACK Data Type:

The LINETRACK data item should also be added to the vehicle with the DP system in use. This data type allows for data inputs providing line track information for which the operator can use to synchronize WinFrog line tracking calculations, with those of another device.

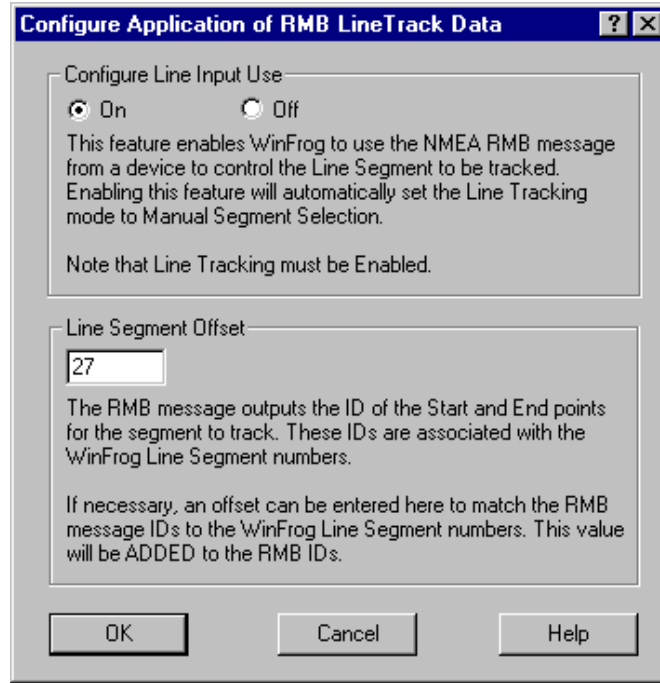
The original implementation of the LINETRACK data type was for the input of the NMEA Recommended Minimum Navigation Information (\$--RMB message version 2.30).

Attaching this data type to a vehicle enables the use of the associated line tracking information (Origin Waypoint ID and Destination Waypoint ID), to be used to override WinFrog's automatic line segment selection. This assures WinFrog is basing its line tracking calculations on the same segment as other devices.

A line must be selected for tracking by the respective vehicle in order for the LINETRACK data type to be used. The correct application of this data type requires that the Waypoint List in the Simrad 702 match the respective WinFrog vehicle's active Line Nodes.

Configure Line Input Use:

After adding the LINETRACK data type to the vehicle's device list, the data type must be edited for the dialog box shown below to appear.



To apply the LINETRACK data, the operator must select the 'On' radio button and exit the dialog box by clicking the 'OK' button. This will cause WinFrog to reset the Line Tracking mode for the selected line to *Manual Segment Selection*. The line segment in WinFrog is then set to the value of the *Origin Waypoint ID* in the \$--RMB string.

Selecting 'Off' returns the control of the Line Tracking mode to the WinFrog operator, but does not automatically reset the tracking mode, instead leaving it in Manual Segment Selection.

Line Segment Offset:

The operator is also presented with a *Line Segment Offset* that is applied to the IDs of the Origin Waypoint ID sent via the \$--RMB message. This is important since the use of this data type assumes that the other device and WinFrog are tracking the same numbered line, or in the case of most DP systems, the list of waypoints that make up the survey line.

The IDs associated with the line nodes when downloaded from the Simrad 702 to WinFrog are incremented by 1, thus when this DP system sends a \$--RMB message, the IDs will actually be 1 higher than the respective line node IDs in WinFrog. This can be adjusted by entering a -1 in the LINETRACK data type

configuration option Line Segment Offset. Note that WinFrog lines begin at Segment '0' and the Simrad 702 DP system numbers waypoints from '1'.

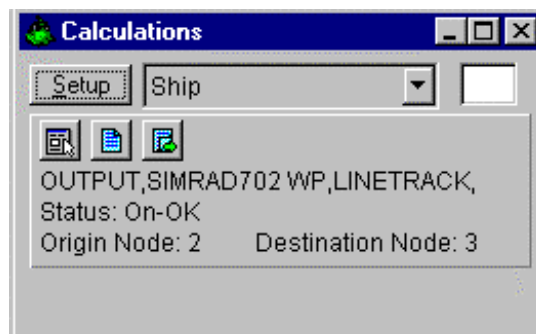
Another example of utilizing this box would be due to possible restrictions in the upper limit of Waypoint ID numbers for the DP system. For example, during a trans oceanic cable lay where WinFrog is tracking segment 56, and the DP system can only handle ID's between 1 and 30, the WinFrog operator can input a Line Segment Offset of 27 to match the line identifiers. This offset would enable correlation of the respective ID's in the two systems.

Calculations Window Data Display:

The application status of the LINETRACK data type, and the corrected IDs, can be displayed in the Calculation Window. This is possible by enabling the *Data Item Text* under the Setup button, and setting the LINETRACK data type to 'ON'. The data displayed after the above procedure is performed is shown in the Calculations Window below.

The 'Status' item in the Calculations Window displays the validity of the data before it is applied. Following are possible status messages:

- On-OK: The data type has been set to 'On'. The data received is valid and has been applied.
- On: The data type has been set to On, but no data has been received since setting it to On.
- Off: The data type has been set to Off.
- On-No Line Enabled, Not Used: The data type is set to On, but there is no Line Tracking enabled for this vehicle, so the data is not being used.
- On-ID > Max Segment, Not Used: The data type is set to On, but the corrected ID is larger than the ID of the last Line node, so the data is not being used.
- On-ID Less < 0, Not Used: The data type is set to On, but the corrected ID is a negative number, which is not a valid Line node ID, so the data is not being used.



CONFIGURATION DETAILS:

Interfacing to the DP system should only be performed under the supervision of the vessels' electrician or other qualified person as designated by the Captain. After

interfacing, all systems should be thoroughly checked prior to operation. First check that the correct data is being output from WinFrog, and then check for the input at the DP system.

Raw Data Output to WinFrog:

The Recommended Minimum Navigation Information data string **can be** output from the Simrad DP system. The string is as follows:

RBM – recommended Minimum Navigation Information

```
$--RBM,A,x.x,a,c—c,cc—c,lll.ll,a,yyyyy.yya,x.x,x.x,x.x,A*hh<CR><LF>
```

Where:	A	Data Status
	x.x	Cross track error – nautical miles
	a	Direction to steer – L/R
	c—c	Origin waypoint ID
	c—c	Destination waypoint ID
	lll.ll,N	Destination waypoint lat. – N/S
	yyyyy.yy,W	Destination waypoint long. – E/W
	x.x	Range to destination, nautical miles
	x.x	Bearing to destination, degrees True
	x.x	Destination closing velocity, knots
	A	Arrival Status

Raw Data Output to the Simrad 702:

The Routes (\$GPRTE) and Waypoint Location (\$GPWPL) NMEA data strings are output to the Simrad 702 system. These strings are as follows:

RTE – Routes RTE

This string lists the waypoint identifiers for the route.

```
$GPRTE,A,B,c,LN,d—d,....,e—e*hh<CR><LF>
```

Where:	A	Total number of messages being transmitted (Larger routes may require multiple messages).
	B	Message number (of the total messages).
	c	Message mode: c=complete route, w=working route.
	LN	Line Name or Route Identifier.
	d—d	Waypoint ID.
	Additional Waypoint ID's.
	e—e	n th waypoint ID.

WPL– Waypoint Location

This string lists the waypoint identifiers for the route.

\$GPWPL,IIII.II,A,yyyyy.yy,B,c--c*hh<CR><LF>

Where: IIII.II Waypoint Latitude.
 A N/S.
 yyyyy.yy Waypoint Longitude.
 B E/W.
 c--c Waypoint ID.

The \$GPWPL string from WinFrog adds the following on the string after the waypoint ID:

0.0,N,0.0,N

Raw Data Record-type 450:

In WinFrog:

```
sprintf(rawStr, "450,%s,% .2f,% .8f,% .8f,% .8f,% .8f,% .3f,% .3f,% .3f,% .8f,% .8f\n",name,
fixTime,centreLat,centreLon,
waypointX,waypointY,desiredBrg,desiredSpeed,desiredRange,
currentX,currentY);
```

The 450 Raw Record:

```
450,SIMRAD702 WP,980437502.29,46.22148557,-63.19405810,
484583.43330372,5121844.24644184,0.000,0.000,0.000,0.00000000,0.00000000
```

Where:

980437502.29, is the time of the last position,
46.22148557,-63.19405810, is the latitude and longitude of the vessel position,
484583.43330372,5121844.24644184, is the position (Grid) of the line segment waypoints,

and,

no other data fields are recorded for the Simrad 702 WP device.

I/O Devices Window:

The following I/O Devices Window displays the data output from the Simrad702 WP when:

1. A line with 15 Line Segment Waypoints (0 to 14) is enabled for the Vehicle with the Simrad702 WP driver attached.
2. \$--RMB data is input to WinFrog from the Simrad702 with the Origin Waypoint set to '5', and the Destination Waypoint set to '6'.
3. SimGps and SimGyro devices have been added to WinFrog for sample data output. Actual operation will have other position and heading inputs.
4. The \$GPRTE string has two message lines to accommodate 15 waypoints.
5. The 'c' identifies that a complete line is being sent.
6. The line name is 'Hello'.
7. Although the line in WinFrog has line segment nodes '0' to '14', the \$GPRTE message shows waypoints '1' to '15'.

