



Technical Note

TELEDYNE RESON Remote IO (RRIO) protocol

Version 2.3

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Amendment Record Sheet

Rev.	Date	Reason for Modifications
2.3	16/04/2020	Export control disclosure added.
2.2	22/11/2018	Introduction: Text modified. Synchronization PDS computer clock: Text modified.
2.1	28/06/2016	Minor textual changes.
2.0	20/06/2015	Update of entire document.
1.6	25/02/2015	Text modified section 'Port number and data packet description'.
1.5	08/10/2014	Added section Timing. RESON Remote IO general description: Text modified.
1.4	09/09/2014	Modified text section PDS2000 and T20-P RRIO setup. Added screen dumps for the RRIO setup in PDS.
1.3	28/12/2013	Added section PDS and T20-P.
1.2	04/11/2013	Added endianness to 'Raw data byte count' field type.
1.1	17/07/2013	Updated data packet specification.
1.0	05/07/2013	First version of this Technical Bulletin.

1 Introduction

RRIO is a protocol used for distribution of raw data messages. The RRIO is used by the RESON SeaBat 7K, the RESON T-series and the Odom MB2 sonar system. With the RRIO it is possible to receive the device data as interfaced to the RESON SeaBat or Odom MB2 RTA by the survey acquisition software such as Teledyne PDS. This means the external devices only need to be interfaced to the RESON or the Odom processor box. The RRIO setup for the Odom and RESON Sonar User Interface is described. Additionally the RRIO setup for Teledyne PDS is described in this document.

2 RESON Remote IO (RRIO) general description

A distinction must be made between these two systems. RESON systems use the 7k IO module for the RRIO while the ODOM MB2 uses the MB2 Center. This means RRIO is setup differently for:

- RESON 7K and T-series Seabat sonar systems (see chapter 2.1).
- Odom MB2 systems (see chapter 2.2).

2.1 RESON SeaBat RRIO

For RESON systems RRIO is added from 7k IO module version 3.9.x.x and onwards.

Raw data messages received by the 7k IO Module will always be send to the Sonar UI by UDP, but can be send to additional network addresses.

From the Sonar User Interface the IP address and port number is specified of the Acquisition computer in the network (refer to chapter 4.2.1).

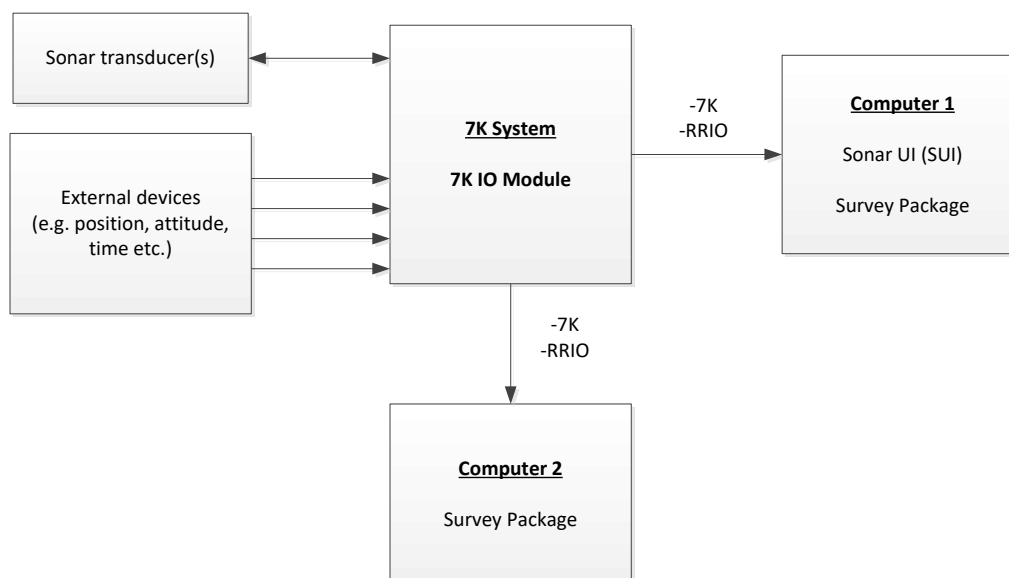


Figure 1: Raw data message distribution by 7k IO Module

2.2 Odom MB2 RRIO

For the Odom MB2 the RRIO is generated by the MB2 Center. The MB2 has no IO module. From the Odom Sonar User Interface (SUI) the IP address and port number is defined of the Acquisition computer in the network (refer to chapter 4.2.2).

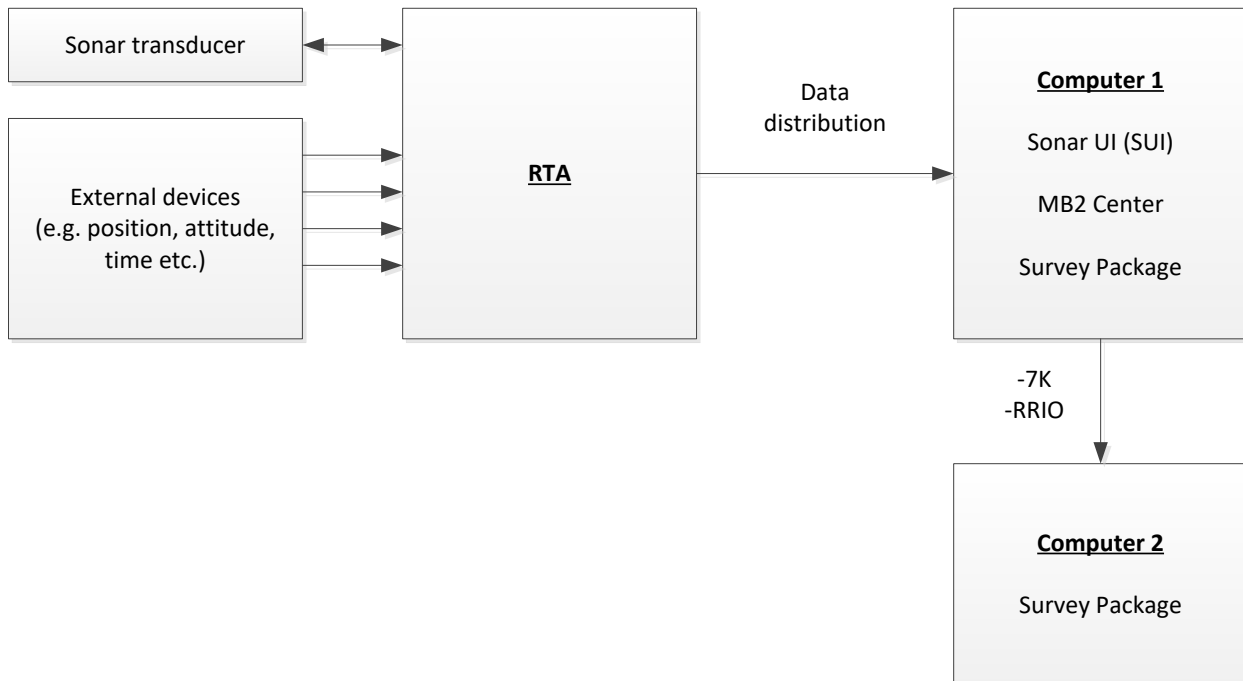


Figure 2: Raw Data message distribution by MB2 Center

3 Port Numbers and Data packet description

The raw data messages are sent to a specific port number. This port number is the base port with a fixed offset depending of the device type (see Table 1). The base port is set in the Sonar User Interface (SUI). The other port numbers are set automatically.

Table 1: Device port assignment

Device ID	Port number	Example
VRU	Base port number	2020
Positioning System	Base port number + 2	2022
Compass	Base port number + 4	2024
Sound Velocity	Base port number + 6	2026
External Clock	Base port number + 8	2028
Pan and Tilt	Base port number + 10	2030

⚠ A base port number between 6990 and 7000 and port number 7010 cannot be used as otherwise port conflicts may occur with the 7kCenter or MB2Center.

The raw data messages are sent in data packets, containing time stamp, device type and raw data string. Table 2 shows the format of the packets.

Table 2: Data packet description

Field name	Type	Byte number	Validity	Size (bytes)
Header	ASCII	0-3	“RRIO”	4
Version	ASCII	4-5	nn	2
Device ID	ASCII	6-7	PDS2000 device ID: 1 = Positioning system 3 = Compass 5 = VRU 16 = External clock 40 = Sound Velocity 67 = Pan and Tilt	2
UTC Day	ASCII	8-9	DD	2
UTC Month	ASCII	10-11	MM	2
UTC Year	ASCII	12-15	YYYY	4
UTC Hour	ASCII	16-17	HH	2
UTC Minutes	ASCII	18-19	MM	2
UTC Seconds	ASCII	20-21	SS	2
UTC Milliseconds	ASCII	22-24	mmm	3
Raw data byte count	u16 (little-endian)	25-26		2
Raw data string	ASCII	27 – (27 + byte count)		Raw data string byte count

4 Using RRIO

To use RRIO:

1. Establish a connection between the acquisition computer and the Sonar processor (see chapter 4.1).
2. Configure the Sonar User Interface (SUI) for the RRIO (see chapter 4.2).
3. Configure PDS to receive RRIO (see chapter 4.3).

4.1 Establish a network connection between the computer and the Sonar Processor

Establish a network connection between the RESON 7K processor, the RESON T-series PSP or the Odom RTA box and the Acquisition computer.

Refer to the corresponding sonar manual to establish a network connection.

Refer to the technical note 'Connecting to the RESON T-series PSP' for an example how to connect to the RESON PSP.

4.2 Configuring SUI for RRIO

To configure the RRIO from the SUI for a RESON sonar or Odom MB2 sonar is different.

See chapter 4.2.1 Configure RRIO from the RESON SUI.

See chapter 4.2.2 Configure RRIO from the Odom MB2 SUI.

4.2.1 Configure RRIO from the RESON SUI

1. Open the RESON Sonar User Interface.
2. Open the I/O Module pane.
3. Configure the port sensors of interfaced external sensors (Clock, Position, Sound Velocity, etc).

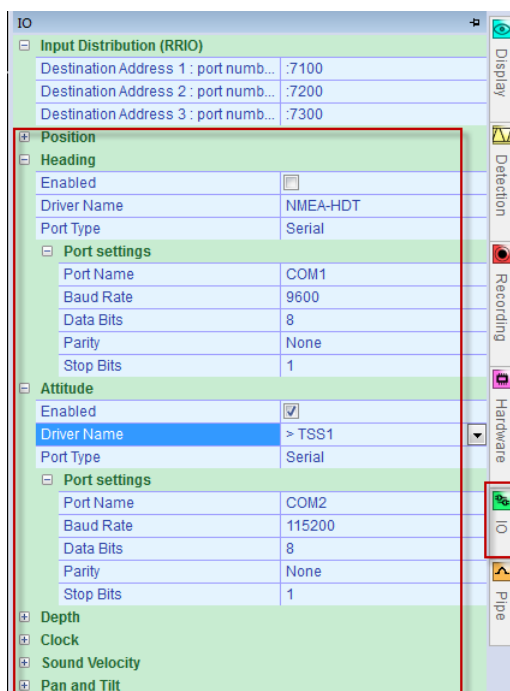


Figure 3: I/O pane

- Open the **Service** view.

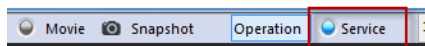


Figure 4: Service

- Open the **IO Module QC** tab and verify that all sensor data is received correctly.

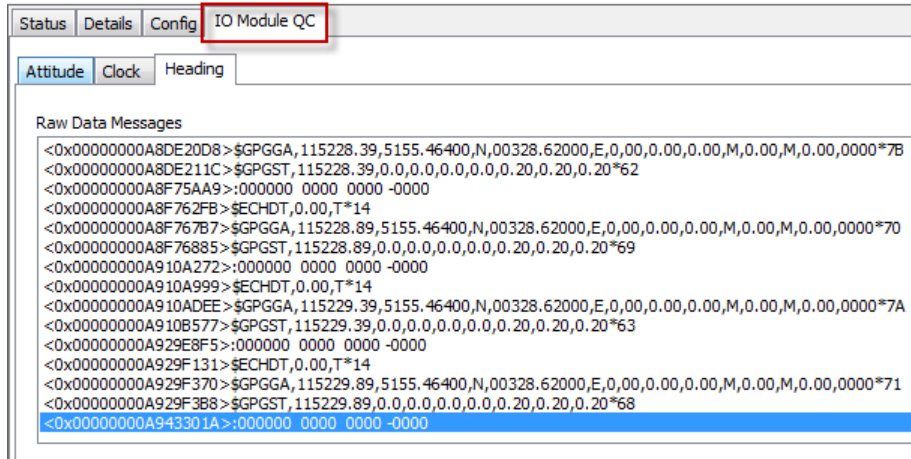


Figure 5: IO Module QC tab

- Open the Operation view again.

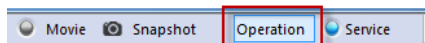


Figure 6: Operation

- Expand the Input Distribution (RRIO) node.

Enter the Destination Address xxx:yyy

With xxx the IP address of the connected survey laptop or PC,

and yyy the Base Port Number. See chapter 3 for the base port number.

Up to three destination addresses can be specified.

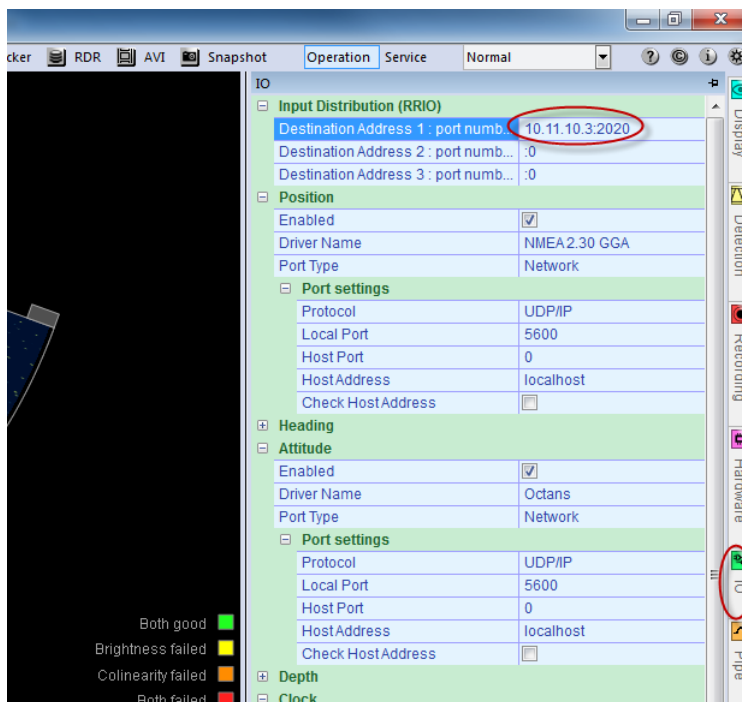


Figure 7: RRIO RESON SUI

4.2.2 Configure RRIO from the Odom MB2 SUI

1. Open the Odom MB2 Sonar User Interface.
2. Open the Hardware pane.
3. Configure the port sensors of interfaced external sensors (Clock, Position, Sound Velocity, etc.).

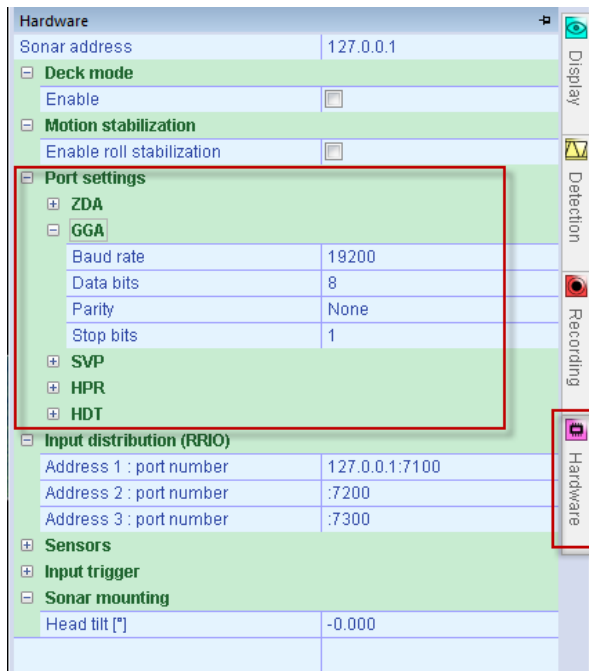


Figure 8: Hardware pane – Port Settings

4. Open the **Service** view and select the **IO Module QC** tab to verify that all sensor data is received correctly.

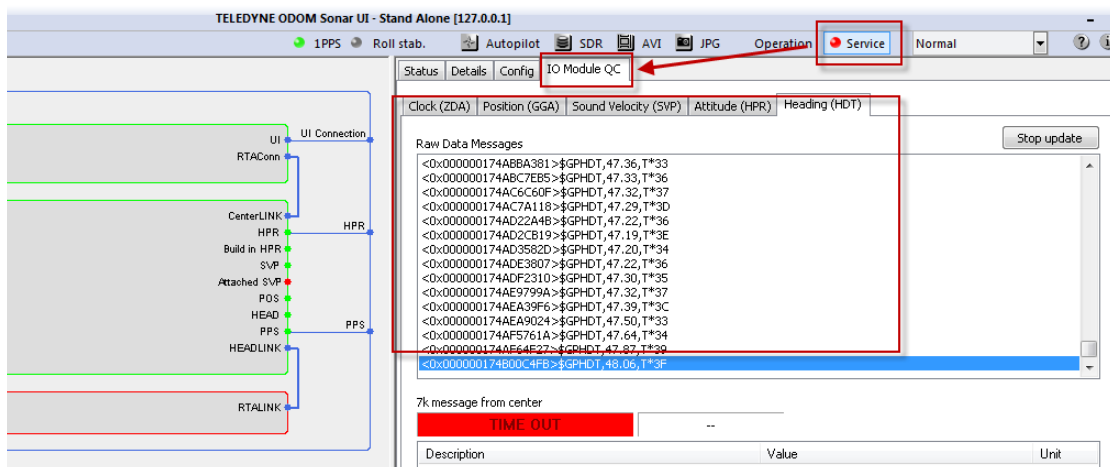


Figure 9: IO Module QC

5. Open the Operation view again.

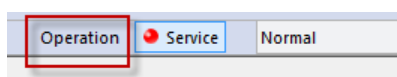


Figure 10: Operation

6. Open the Hardware pane.
7. Open the Input Distribution (RRIO) node.
Enter the Destination Address xxx:yyy

With:

xxx the IP address of the connected survey laptop or PC,

yyy the Base Port Number. See chapter 3 for the base port number.

Up to three destination addresses can be specified.

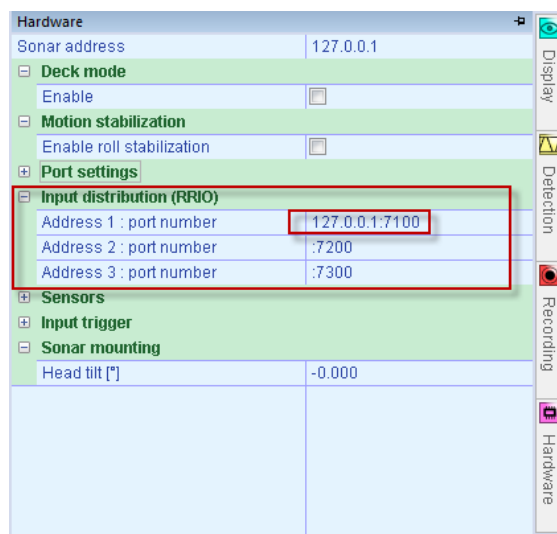


Figure 11: RRIO Odom SUI

4.3 Configuring PDS to receive RRIO messages

A RRIO port must be set for every added sensor using RRIO.

1. Add from the vessel configuration's Equipment page a device driver. The device driver must match with the format as connected to the SUI. When for example a device is connected to the SUI which output NMEA GGA the in PDS the NMEA GGA device driver is selected.

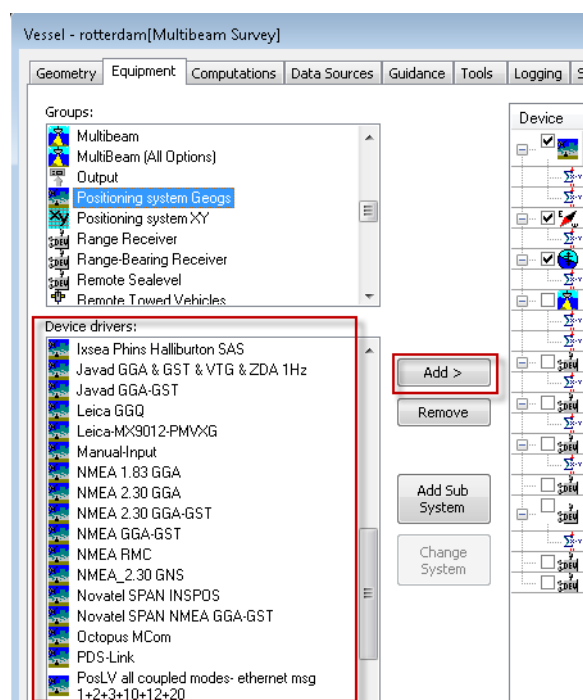


Figure 12: Device

2. Press on the 'I/O Port' button.



Figure 13: I/O Port

3. Press 'Add' to add a New interface Port and select from the opened dialog **RESON Remote IO**.

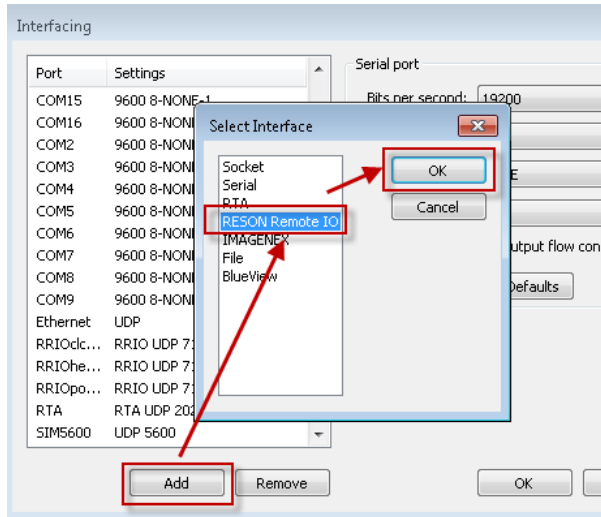


Figure 14: RESON Remote IO

4. Enter a name (e.g. Position).

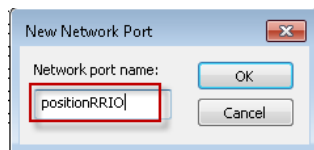


Figure 15: Name

5. Select from the RRIO dialog the sensor type.
Because in this example we add a position device using RRIO: **Position** is selected as the Sensor Type.
Enter the base port. The Base Port Number must match with the Base Port Number defined in the Sonar UI Input Distribution setting (refer to chapter 4.2). In this example Base Port number 2020.

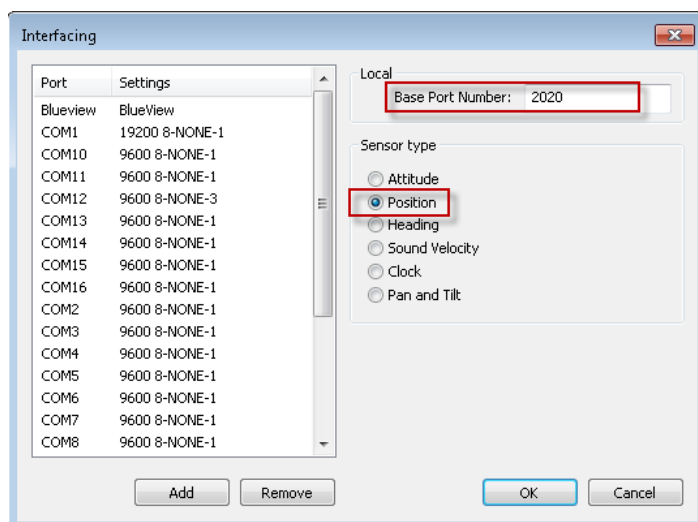


Figure 16: Interfacing

Press OK.

6. Press *Device Test* to verify the device data is received.



Figure 17: Device test

7. Repeat Step 1 to 6 for every device to use received by RRIO.

Be aware, a unique RRIO port is created for every added device.

Device	Port
<input checked="" type="checkbox"/> Positioning system Geogs(2) - NMEA 2.30 GGA [pos]	positionRRIO
<input checked="" type="checkbox"/> Antenna Position from Geogs	
<input checked="" type="checkbox"/> Reference Point Computation	
<input checked="" type="checkbox"/> Compass(1) - NMEA-HDT[hdg]	headingRRIO
<input checked="" type="checkbox"/> Heading computation	
<input checked="" type="checkbox"/> VRU(1) - TSS1[vru]	attitudeRRIO
<input checked="" type="checkbox"/> Attitude computation	
<input type="checkbox"/> Multibeam(1) - RESON SeaBat 7k[mbs]	RESON
<input checked="" type="checkbox"/> Multibeam xyz computation	
<input checked="" type="checkbox"/> Multibeam area computation	

Figure 18: RRIO ports

4.3.1 Synchronization PDS computer clock by using RRIO

It is possible to use RRIO as interface to clock synchronize the computer clock.

However, only a time message (e.g. NMEA ZDA) can use RRIO and **not** PPS. This means for accurate clock synchronizing the PPS should be interfaced to the computer. Refer to the Technical Note – Clock synchronization.

To use RRIO for the time message of the clock synchronization:

1. Set in the Sonar User Interface the correct port setting and RRIO (see chapter 4.2).
2. Open the PDS clock synchronization dialog.
3. Enable the PDS clock synchronization.
4. Select from the PDS clock synchronization dialog the correct driver. The driver should correspond with the received message as connected to the multibeam processor. When for example a NMEA ZDA message is interfaced then the NMEA ZDA device driver is selected. See the next figure.
 - a. Select from the list the device driver.
 - b. Press the *Select* button.

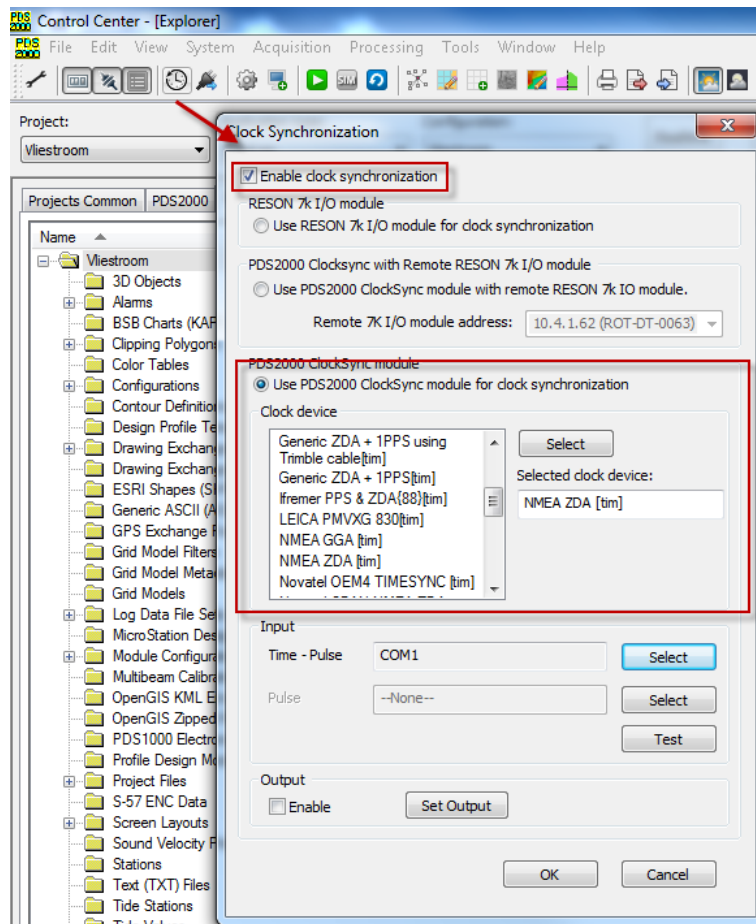


Figure 19: Clock synchronization PDS

5. Select the RRIO interface.
Press the **Select** button.

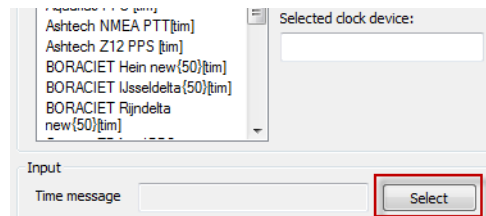


Figure 20: RRIO interface

6. Select from the list the RRIO port.
Continue to step a – e to create and define a new RRIO port.

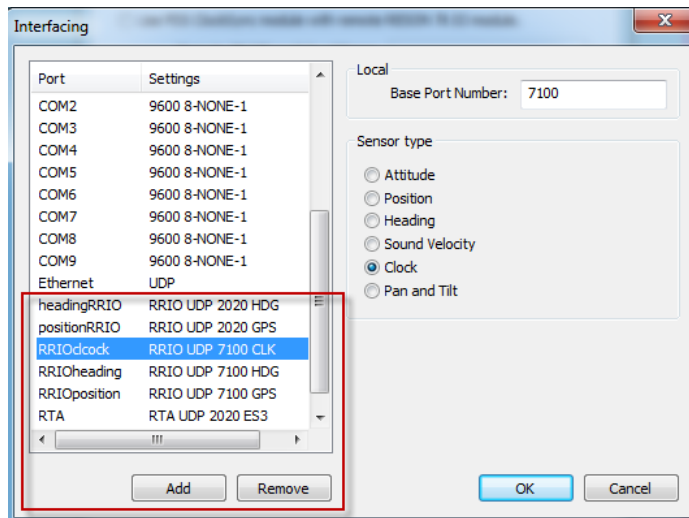
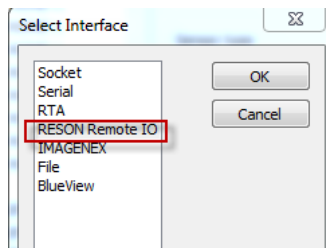
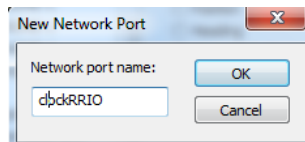


Figure 21: Select RRIO or create new RRIO port

- a. Click the Add button to create a new RRIO port.
- b. Select RESON Remote IO.

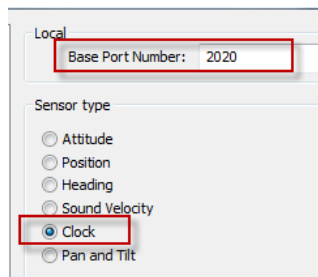


- c. Enter a name.



- d. Select *Clock* as sensor type.

The Base Port Number must match with the Base Port Number defined in the Sonar UI Input Distribution setting (see chapter 4.3).



- e. Press *OK*.

7. The RRIO clock message is set.

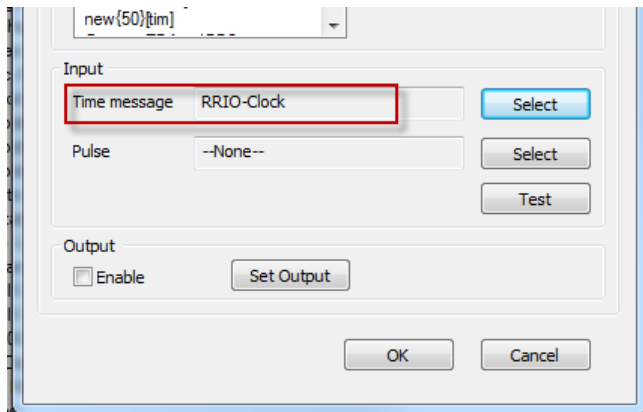


Figure 22: Input message

For accurate clock synchronization must for this method additionally the PPS pulse be connected to the PDS computer:

1. Select the 'Use separate port for pulse' checkbox.
2. Press the *Select* button and select the port the PPS pulse is connected to.

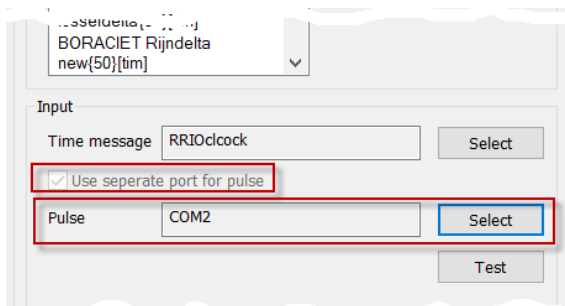


Figure 23 PPS pulse port

From 7k IO modules version 4.1.0.6 and onwards, PDS can clock synchronize the computer accurately using the 7k IO module.

In this case it is not needed to connect a PPS pulse additionally to the PDS computer when the 7k IO module runs on a different computer as PDS.

There are two options:

- a. The 7k IO module runs on the same computer as PDS.
- b. The 7k IO module runs on a different computer as PDS. Select in this case from the drop down box the computer the 7k IO module runs.

Select in the PDS Clock Synchronization, the applicable mode.

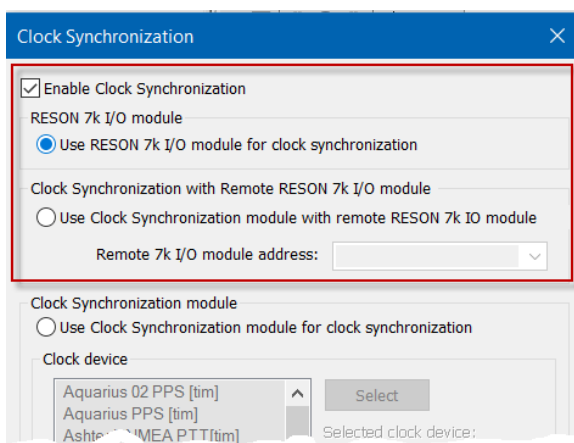


Figure 24 Clock synchronization using the 7k IO module

4.3.2 Time stamp mode

When position data is received by RRIO then the timestamp mode in PDS must set to 'Time in message'. It is not possible to set the timestamp mode for attitude and heading devices.