Radar Data Recorder RDR803

User manual

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DOCUMENT DESCRIPTION

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Abstract
This document describes how you should connect the RDR803 and how it should be installed on your computer.

Keywords

Radar Data Recorder	GPS	UDR

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ELECTRONIC REARUP

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WINDOWS XP SP3	Type : Hard disk	Word XP
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DOCUMENT APPROVAL

The following table identifies all authorities who have successively approved the present issue of this document.

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DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
1.0	18/07/07	New document	All
1.1	09/01/08	Chapter 2: added, same information as in the brochure Chapter 3: DB15 pin layout added Chapter 4: DHM view added	All
1.2	23/06/08	Paragraph 3.1: Pin layout RASS connector added	3.1
3	13/10/09	Filename changed	None
4	28-JUN-11	RS485 drivers are compatible with RS422; In case RS232 is selected, only the negative pins become active (Table 3-2)	11, 13
5	27-JUN-12	Glossary added, UDR600 renamed to UDR module	P7, P13-15

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Glossary of Terms

ACP	Azimuth Change Pulse
ARP	Azimuth Reference Pulse
ATC	Air Traffic Control
DHM	Data Handling Module
EIA	Electronic Industries Association
GPS	Global Positioning System
ICD	Interface Control Document
IE	Intersoft Electronics
I/O	Input/Output
Radar	Radio Detection And Ranging
RASS-R	Radar Analysis Support Systems – Real-time measurements
RASS-S	Radar Analysis Support Systems – Site measurements
RDR803	Radar Data Recorder, an IE hardware device
RIM782	Radar Interface Module, an IE hardware device
Rx	Receive
Tx	Transmit
UDR	USB Data Recorder
UTC	Coordinated Universal Time

CONVENTIONS USED IN THIS MANUAL

The following conventions are used in this manual:

Note: This icon to the left of bold italicized text denotes a note, which alerts you to important information.

Caution: This icon to the left of bold italicized text denotes a caution, which alerts you to the possibility of data loss or a system crash.

Warning: This icon to the left of bold italicized text denotes a warning, which alerts you to the possibility of damage to you or your equipment

1. Introduction

A vital part of the radar chain is the data processing unit, with at its output a data stream containing radar plots or tracks in a specific format. The most common format is ASTERIX, but some radars use other formats like RDIF, EC, SVE, Aircat, CD, etc…

Generally the data is produced on serial lines, because it needs to be transmitted to one or more remote centers. This serial link can be run using a number of protocols like HDLC, Lap-B or X25. Other formats use a unique protocol such as the 13-bit formatted CD.

To record this data, Intersoft presents its Radar Data Recorder 'RDR 803' with 6 serial channels. The RDR803 is connected to a pc and completely controlled by the RASS-R Data Handler Module Software or 'DHM'. In this DHM, you can select different protocols (e.g. HDLC, Aircat) for the serial ports and define the ports as input or output.

The RDR803 is a convenient 19inch rack device that can be installed in ATC centers, where a high number of radar data channels might be input. Multiple RDR803's can be connected to each other using the built-in USB hub and so increasing the number of serial channels up to 6, 12, 18, 24 or even more. If there is a need for video inputs, the RDR803 can be combined with the RIM782

The RDR803's can be connected to a dedicated 19inch 'processing pc' running the RASS-R Data Handler Module (DHM). This DHM can perform the following tasks on the data: serial input of data, recording of the data, conversion to other protocols, output of the data on serial port and/or ethernet. A management console can be installed for remote DHM- and RDR803-configuration.As an asset, Intersoft's Multi Radar Display 3 can be installed on the management console for visualization of the data on the level of input, conversion and output.

The recordings made by the RDR803 are suitable for advanced replay and further evaluation in RASS-S, RASS-R (Radar Comparator) or other third party tools like SASS-C or for continuous monitoring in the RASS-R Trackan module.
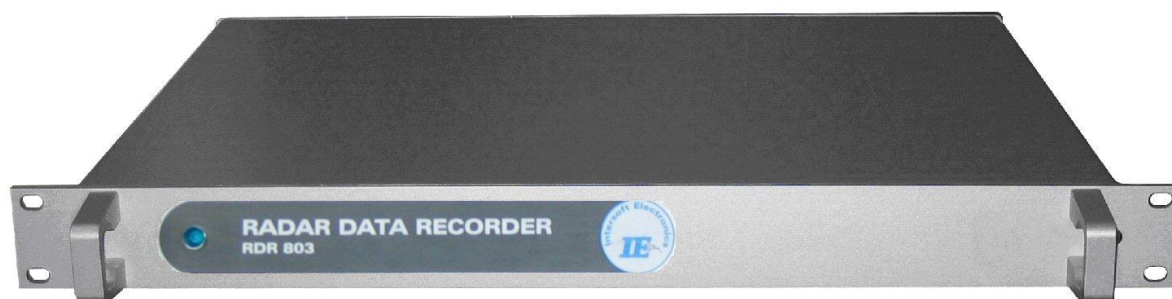

Figure 1-1: RDR803

2. Product specifications

2.1 Interfaces – external connectors

The RDR has 3 pairs of twin high-speed serial communications channels for active and passive recording. Each pair of channels can be configured individually. They can handle transmission speeds up to 128 Kb/s. Two electrical standards are supported: RS232 (single ended) and RS485 (differential). The serial data is fed to the recorder using a female DB15 connectors (alike X.21 connections) on the rear panel of the RDR803. The unit is supplied with six RS232 Probe modules for connection of the DB15 to a DB25 standard RS232 connection. A whole range of synchronous protocols is supported and others can be programmed upon request.

2.2 General specifications

Temperature Range – Operating	0...40 degC
Temperature Range - Non operating	-30...+50 degC
Relative Humidity	10%...80%
Max. Operating Altitude	3080 m

2.3 Optional accessories

APM 485: ACP/ARP Probe Module: Differential Rotational Information input. Note that single ended azimuth input is by default supported by the RDR803.

GPS 450: Weather-proof GPS receiver for UTC time stamping of messages.

2.4   Supported protocols

The RDR803 can handle the following passive protocols (up to 128k):

- HDLC: Passive recording of HDLC bases protocols, including Lap-B and X25.3 Passive monitoring. (E.g. ASTERIX, RDIF)
- LINK 1: Passive recording of Military LINK 1 protocol
- SYNC 13: Passive recording of most bit protocols as implemented on US radars (CD1, CD2, ASR9, etc...)
- Aircat 500: passive recording of Thales specific protocol
- TVT2 military protocol
- EV760 protocol
- Output U-HDLC and bit protocols
- Bit Recording Protocols (9600 BAUD):
    o AIRCAT 500
    o ALENIA
    o AUSTRO
    o BMIL
    o ERICSSON
    o EUROCONTROL
    o FPS 117
    o HUGHES
    o SVE
    o TOSHIBA
    o CUSTOMER SPECIFIC

2.5   Technical specifications

Digital interface:
ARP/ACP for Azimuth: TTL, 10 kΩ (max 0..5 V input)
GPS interface fo timestamping: Dedicated interface to GPS450

Serial Inputs/outputs:

RS 232 C Receivers (Compatible with RS232C standard)

Input resistance	3 kΩ min, 5kΩ typ, 7 kΩ max
Low threshold	1.2V typ, 0.8 min.
High threshold	1.7V typ, 3.0 max.
impedance	5kΩ typ (+15V to -15V)

RS 232 C Drivers (Compatible with RS232C standard)

High Level Output	+5V min, +15V
Low Level Output	-15V min, -5V max
Short Circuit Current	±100 mA
Power off Impedance	300Ω
Slew Rate RL=3K, CL=50pF	30V/μs

RS 485[1] Receivers (Compatible with RS485 standard)

Input resistance common mode	15kΩ typ (-7 to +12V)
Receiver sensitivity	±0,2Vtyp
Common Mode Range	-7.0V min, +7.0V max.

RS 485 Drivers (Compatible with RS485 standard)

Short Circuit Current	150 mA
Transition Time	40 ns max. (10-90%)
Output current	28 mA min (RL=54Ω)

Power Supply
Input Voltage: 90-264V
Input Frequency: 47-63Hz
Power 22Watt

Dimensions: 19inch device,1U

Connections:
USB2.0 connector to computer
USB hub fuction to other USB devices

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[1] The signal levels and driver capability of the RS-485 drivers allow the drivers to comply with RS-422 levels

3. Connections

Based on the functioning, we can split up the RDR803 in 2 main parts:

- The data recorder functionality (RDR)
- The GPS connection

The different connectors are described in the next paragraphs, according to their functionality as explained above. The picture below shows the rear panel of the RDR803.
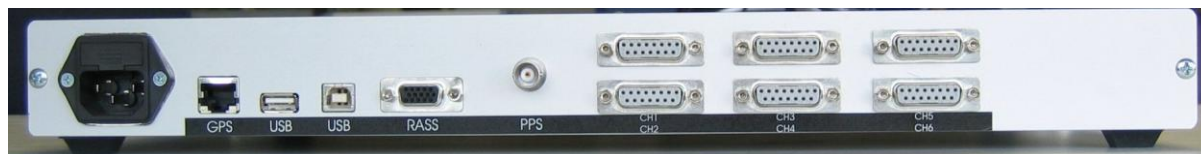

Figure 3-1: rear panel

3.1   RDR

The RDR in the RDR803 has 6 serial synchronous ports, paired per two as one so called UDR module (CH1&2=UDR1, CH3&4=UDR2, CH5&6=UDR3).
They can be used either as input or output.

The connections are described in the following table:

Table 3-1: RDR connections

Name	Specification	Connector type	Value
CH1/2/3/4/5/6	Serial data 1/2/3/4/5/6	6x DB15 female	Synchronous serial input/output RS232/RS422
RASS	Input: ACP, ARP, PPS, trigger	DB15HD female	TTL
PPS	Timing signal input	BNC	TTL
USB ⬜	USB Data connection to pc	USB	USB2.0
USB ▭	USB hub, to connect an other RDR803	USB	USB2.0

The PPS signal can be input by the GPS connection, by the RASS connector or by the PPS connector. The RASS connector can be used when a RIM782 outputs the timing signals to the RDR803, for example in case an extra UDR module is required.

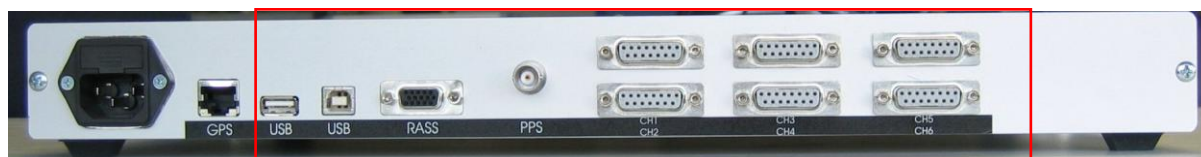On the rear panel, they correspond to the following part:

Figure 3-2: Rear panel - UDR

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Serial data 1/2 DB15 connector pin layout:

Table 3-2: DB15 pin layout

Name	DB15 female on case
Gnd	1, 8
TxD+	9
TxD-	2
RxD+	11
RxD-	4
RxC+	13
RxC-	6
TrxC+	14
TrxC-	7
TxC+	/
TxC-	/
-10Volt	12
+10Volt	5
+5Volt (USB4.2V)	15

With the DHM software one selects the physical and data link layer protocol. In case RS232 protocol (either as input or output) is selected, only the negative pins are enabled. In case RS422 is selected, both negative and positive pins are used.

For further details refer to EIA standard RS-232-C "Interface between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange" and EIA Standard RS-422-A "Electrical Characteristics of Balanced Voltage Digital Interface Circuits"; Washington: Electronic Industries Association.

RASS Connector DB15HD connector pin layout:

Table 3-3: RASS Connector DB15HD pin layout

Name	DB15HD female on case
RASS ARP (input) *(red connector on Intersoft DB15HD male cable to 5xBNC)*	1
RASS ACP (input) *(green connector on Intersoft DB15HD male cable to 5xBNC)*	2
RASS PPS (input) *(blue connector on Intersoft DB15HD male cable to 5xBNC)*	3
Reserved for future use	4
Reserved for future use	5
GND	6
GND	7
GND	8
+12V	9
GND	10
Reserved for future use	11
Not connected	12
RASS Trigger (input) *(grey connector on Intersoft DB15HD male cable to 5xBNC)*	13
Not connected	14
Not connected	15

☞ *Radar data sent over LAN (TCP, UDP) will be fed directly into the PC via the Ethernet adapter. (Without the need of the RDR803)*

☞ *The DHM software that controls the RDR803, controls each UDR module separately. Each UDR module can only be configured for one Serial protocol (listed in heading 2.4) and one direction at the same time. Serial data 1 and 2 are either input or output, never possible is simultaneously Serial data 1 as input and Serial data 2 as output or vice versa. The same is true for channel pairs 3&4 and 5&6.*

3.2   GPS

Intersoft Electronics' GPS450 can be connected to the RDR803 so that the recordings made will be UTC time stamped. There is one connector foreseen:

Specification	Connector type	Value
GPS	RJ45	Intersoft proprietary
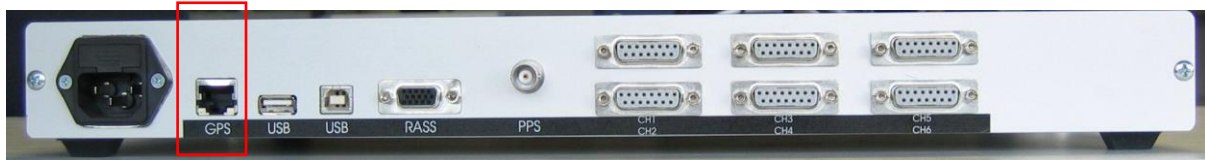
Figure 3-3: Rear panel – GPS

Figure 3-4: GPS450

4. Installation

The RDR803 will only start up when the power is connected AND when the USB cable is connected to the pc. (There is no power on/off switch) Upon insertion of the USB cable, you will see the power LED of the RDR803 on and you will hear a tune on your pc. This is the beginning of the RDR803 installation process on the pc.

The installation process of the RDR803 drivers is explained in the next paragraphs.

4.1   RDR installation

When the PC detects that a RDR803 is connected over the USB port, the following window will appear:

Figure 4-1: RDR803 startup step 1

Select 'No, not this time' and click Next.
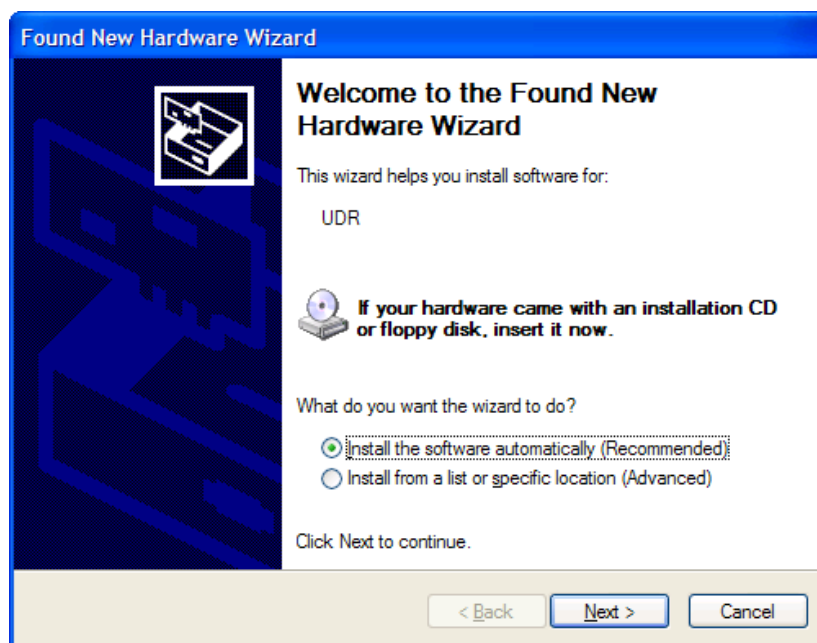
Figure 4-2: RDR803 startup step 2

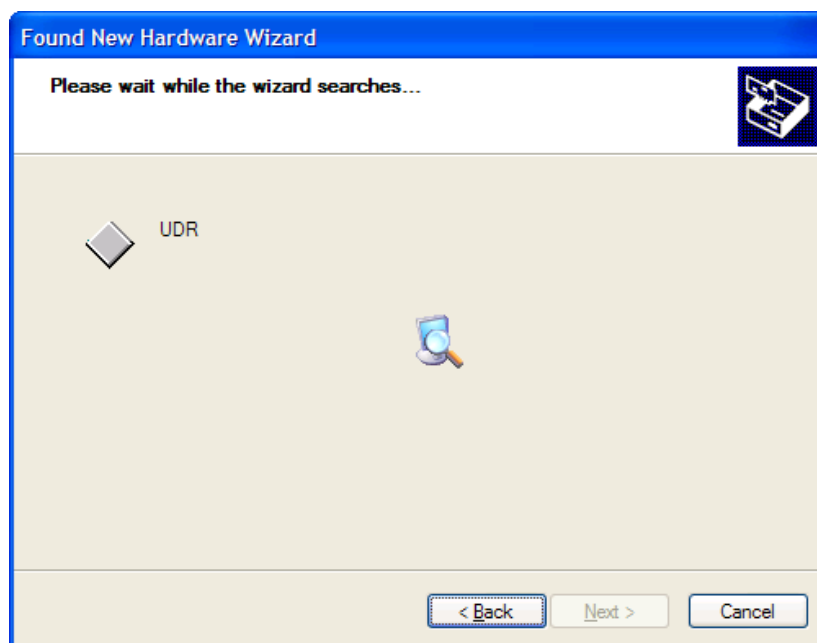Again, click next. Then, Windows XP starts looking for a correct driver as in figure Figure 4-3.

Figure 4-3: RDR803 startup step 3

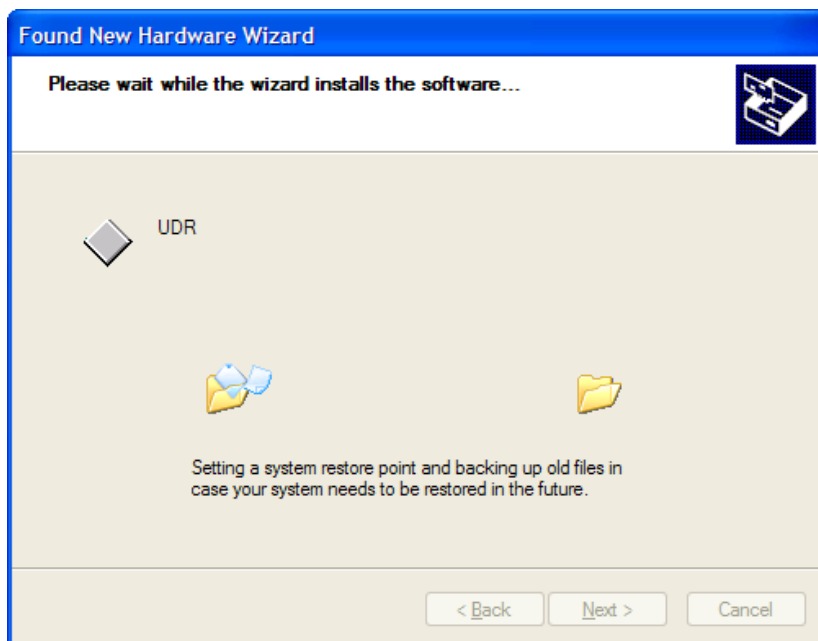Once the correct driver is found, the installation automatically goes on.

Figure 4-4: RDR803 startup step 4

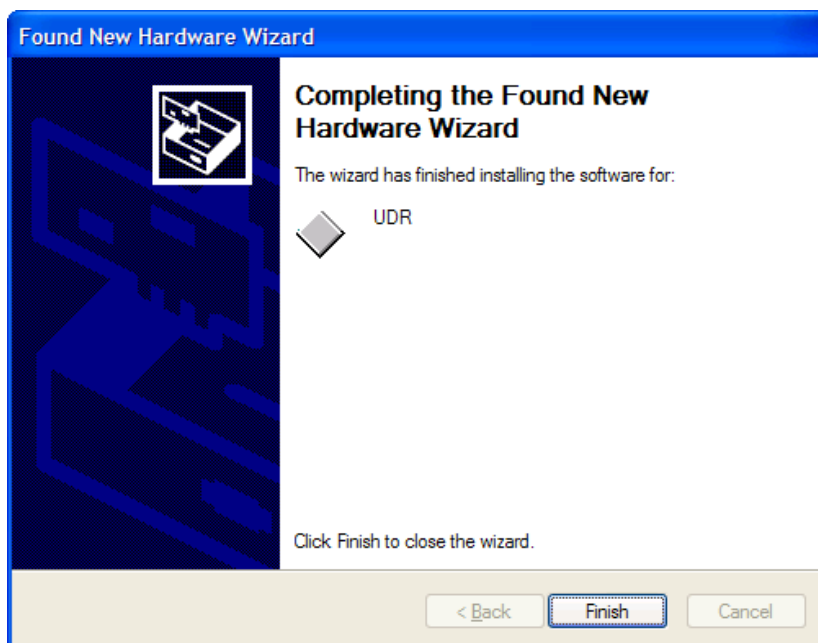Finally, the wizard is completed.

Figure 4-5: RDR803 startup step 5

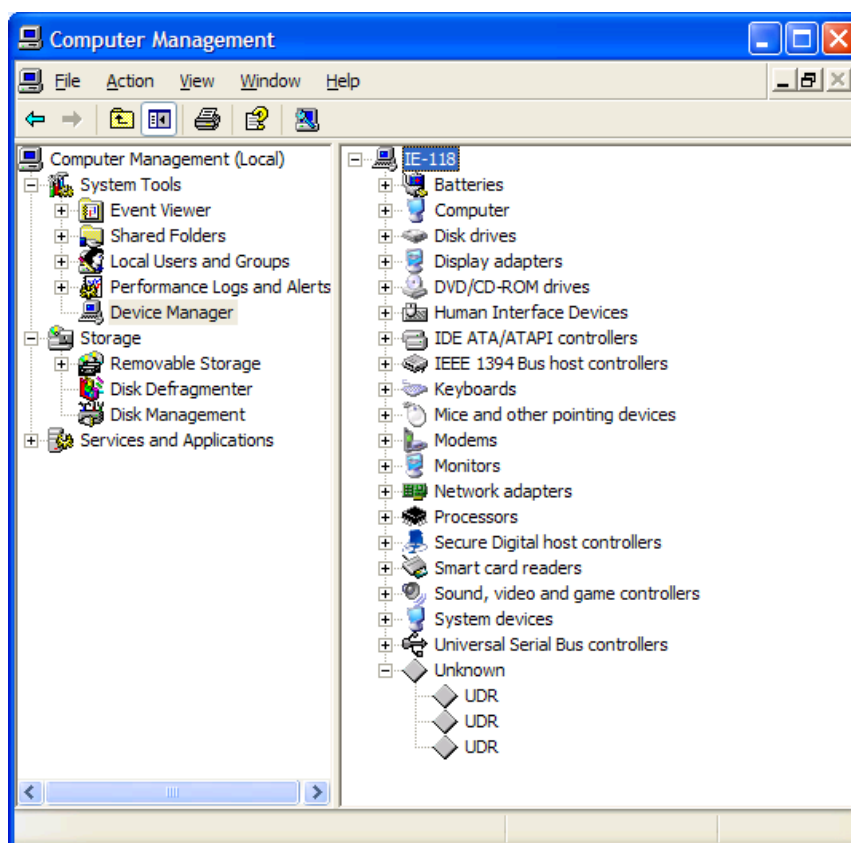After a correct installation, the RDR803 should appear in the device list as follows:

Figure 4-6: RDR803 in device list

☞ *Because the RDR803 contains 3 UDR module's, this driver installation process will be repeated 3 times, so that finally 3 UDR's will be displayed in the computer management window as in the figure above.*

4.2 Control via the Data Handler Module

Once the RDR803 is completely installed, it can be accessed via the Data Handler Module (DHM) of RASS-R.

In the '**Proprietary Input'** node, 3 times 'UDR2'[sn][2]' will be available:

- D 5-6 UDR2 [sn]: UDR configured as input (with serial channel 5 and 6)
- D 3-4 UDR2 [sn]: UDR configured as input (with serial channel 3 and 4)
- D 1-2 UDR2 [sn]: UDR configured as input (with serial channel 1 and 2)

In the '**Proprietary Output**' node, 3 times 'UDR2'[sn][3]' will be available:

- D 5-6 UDR2 [sn]: UDR configured as input (with serial channel 5 and 6)
- D 3-4 UDR2 [sn]: UDR configured as input (with serial channel 3 and 4)
- D 1-2 UDR2 [sn]: UDR configured as input (with serial channel 1 and 2)

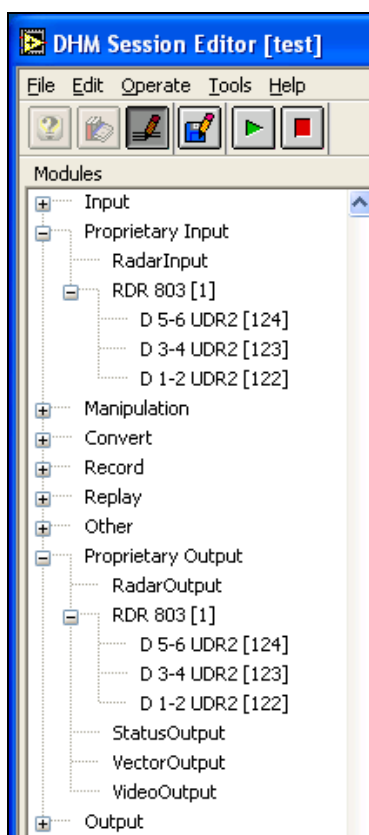Further details can be found in the DHM user manual and tutorial.

Figure 4-7: RDR803 in DHM

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[2] [sn] = [serial number] of the hardware
[3] [sn] = [serial number] of the hardware