

# Radar Interface Module RIM782



## User manual

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## DOCUMENT DESCRIPTION

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Radar Interface Module RIM782  
User Manual

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### Abstract

This document describes how you should connect the RIM782 and how it should be installed on your computer.

### Keywords

Radar Interface Module  
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UDR  
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UVR

ACP

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## ELECTRONIC REARUP

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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

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1.0	20/07/07	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
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## 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

The Radar Interface Module (RIM782) can be divided in two parallel running systems: **data recorder** and **video recorder**. The RIM782 contains all the necessary hardware to digitize the radar video and/or data, and provide this data to the PC over a standard USB interface.

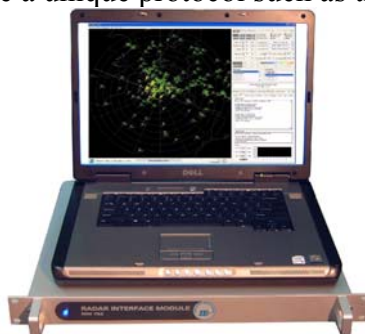
The video recorder functionality of the hardware interface is performed by 6 video channels, 2 trigger signals and 2 rotation interfaces (ARP-ACP signals both single ended and differential). The RIM782 can sample 2 analog video inputs simultaneously. The digitized video will be sent over an USB connection to a PC (USB Video) and can be used in both RASS-R as RASS-S applications.

For instance, the RASS-R software can extract ADS-B messages from the video signal or display video on the TMD3 and MRD3. For RASS-S on the other hand, the RIM782 can record all types of SSR or Mode S radar video signals using the sectorial recording software.

The radar recorder has two bidirectional digital RS232/RS422 synchronous serial data ports for inputting or outputting serial data. The RIM782 can both record and replay data. If more than two channels are required, multiple RIM782s can be "stacked" (or combined with a RDR803). The additional inputs azimuth and time (GPS) make it a real radar evaluation tool. This allows for example evaluating the extraction delay.

A vital part of the radar chain is the data processing unit, with at its output a data stream containing radar plots or tracks under a specific format. The most common format is ASTERIX, but some radars use other formats like RDIF, EC, SVE, Aircat, CD, etc... To analyze these data, they must first be recorded and converted into a uniform format that can be displayed and analyzed by dedicated RASS-S or RASS-R software tools.

Generally the data is produced on serial lines, because they need 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.



*Figure 1-1: RIM782 with TMD3 software on laptop*

The recordings made by the RIM782 can then be converted into a suitable data format for further evaluation: this can be the RASS-S data format (.S4) or RASS-R input format (.D6) or another third party data format like SASS-C. Continuous monitoring is possible in the RASS-R Trackan module. Furthermore, since the full communication protocol is recorded together with the radar data, an analysis of the line quality and communication protocol syntax is possible.



## 2. Product specifications

### 2.1 Video processing unit

The video processing unit has a USB-connection to the processing PC, and the following other specifications:

2 analog input channels I/Q	BNC connector
Analog input voltage	-2V...+2V
Sampling rate	8MHz
Resolution digitized output	12bit

### 2.2 Data processing unit

The RIM782 has 2 serial communication channels for active and passive recording. 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 RIM782. The unit is supplied with 2 RS232 Probe modules for connection of the DB15 to DB25 standard RS232 connection. A whole range of synchronous protocols is supported and others can be programmed upon request.

### 2.3 General specifications

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

### 2.4 Optional accessories

**APM 485:** ACP/ARP Probe Module: Differential Rotational Information input. Note that single ended azimuth input is by default supported by the RIM782.

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

## 2.5 Supported protocols

The RIM782 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):
  - AIRCAT 500
  - ALENIA
  - AUSTRO
  - BMIL
  - ERICSSON
  - EUROCONTROL
  - FPS 117
  - HUGHES
  - SVE
  - TOSHIBA
  - CUSTOMER SPECIFIC

## 2.6 Technical specifications

### Digital interface:

ARP/ACP for Azimuth: TTL, 10 k $\Omega$  (max 0.5 V input)

GPS interface for time stamping: Dedicated interface to GPS450

### Serial Inputs/outputs:

#### RS 232 C Receivers (Compatible with RS232C standard)

Input resistance	3 k $\Omega$ min, 5k $\Omega$ typ, 7 k $\Omega$ max
Low threshold	1.2V typ, 0.8 min.
High threshold	1.7V typ, 3.0 max.
Impedance	5k $\Omega$ 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	$\pm$ 100 mA
Power off Impedance	300 $\Omega$
Slew Rate RL=3K, CL=50pF	30V/ $\mu$ s

#### RS 485 Receivers (Compatible with RS485 standard)

Input resistance common mode	15k $\Omega$ typ (-7 to +12V)
Receiver sensitivity	$\pm$ 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=54 $\Omega$ )

### Power Supply

Input Voltage: 90-264V

Input Frequency: 47-63Hz

Power 22Watt

**Dimensions:** 19inch device, 1U

### Connections:

2 USB connectors to computer

### 3. Connections

Based on the functioning, we can split up the RIM782 in 3 main parts:

- The video recorder functionality or simply USB Video Recorder (UVR)
- The data recorder functionality or simply USB Data Recorder (UDR)
- 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 RIM782.



Figure 3-1: rear panel

#### 3.1 UVR

The UVR in the RIM782 has 6 analogue video signal inputs. These are suitable for PSR video signals, SSR video signals and weather radar video signals. From these 6, 4 channels can be quantized for simultaneous display or 1 channel can be sampled. The connections are described in the following table:

Table 3-1: UVR connections

Name <sup>1</sup>	Specification	Connector type	Value
CH1/2/3/4 Video	Video input	4x BNC	-2V,+2V, 10kΩ
I Video Q Video	I/Q input	2x BNC	-2V,+2V, 10kΩ
ACP1/2 ARP1/2	Single ended ACP/ARP input	2x BNC	TTL
Differential ACP1/2 ARP1/2	Differential ACP/ARP input	2x DB-9 female	TTL
Trigger 1/2	Trigger input	2x BNC	TTL
USB Video	USB Video	USB	USB2.0

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

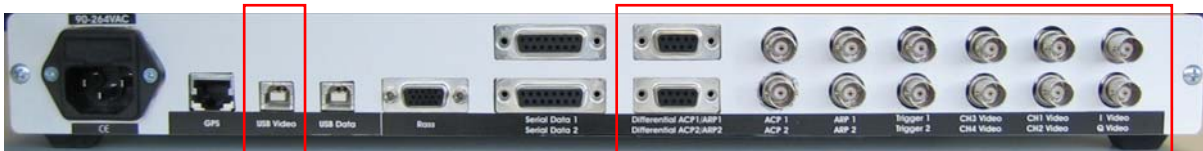


Figure 3-2: Rear panel - UVR



**There is a separate USB connector for dedicated video stream bandwidth.**

<sup>1</sup> The name corresponds to the label printed on the equipment. CH1/2/3/4 means CH1, CH2, CH3 and CH4.



**The DHM software can only take the analog signal from 1 channel, and not from 2 channels as the hardware can sample.**

### Differential ACP/ARP DB9 connector pin layout:

Table 3-2: Differential ACP/ARP Connector DB9 pin layout

Name	DB9 female on case
NC (not connected)	1
ACP +	2
NC	3
ACP -	4
NC	5
ARP +	6
NC	7
ARP -	8
NC	9

## 3.2 UDR

The UDR in the RIM782 has 2 serial synchronous ports. They can be used either as input or output.

The connections are described in the following table:

Table 3-3: UDR connections

Name	Specification	Connector type	Value
Serial data1/2	Serial data 1/ 2	2x DB15 female	Synchronous serial input RS232/RS422
RASS	Input: ModeS-Clock, Mod-S Data, trigger Output: ACP, ARP, event, trigger	DB15HD female	TTL
USB Data	USB Data	USB	USB2.0

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



Figure 3-3: Rear panel - UDR



**Radar data passed over LAN (TCP, UDP) will be fed directly into the PC via the Ethernet adapter. (Without the need of the RIM782)**



**The DHM software that controls the RIM782, can only use Serial data 1 and 2 as input or output, but not mixed (not possible is Serial data 1 input and Serial data 2 output or vice versa).**

### Serial data 1/2 DB15 connector pin layout:

Table 3-4: Serial data 1/2 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

### RASS Connector DB15HD connector pin layout:

Table 3-5: RASS Connector DB15HD pin layout

Name	DB15HD female on case
RASS ARP (output) <i>(red connector on Intersoft DB15HD male cable to 5xBNC)</i>	1
RASS ACP (output) <i>(green connector on Intersoft DB15HD male cable to 5xBNC)</i>	2
RASS PPS (output) <i>(blue connector on Intersoft DB15HD male cable to 5xBNC)</i>	3
<i>Reserved for future use</i>	4
<i>Reserved for future use</i>	5
GND	6
GND	7
GND	8
+12V	9
GND	10
<i>Reserved for future use</i>	11
RASS Mode-S data (input)	12
RASS Trigger (output) <i>(grey connector on Intersoft DB15HD male cable to 5xBNC)</i>	13
RASS Trigger (input) <i>(Black connector on Intersoft DB15HD male cable to 5xBNC)</i>	14
RASS Mode-S Clock (input)	15

### 3.3 GPS

Intersoft Electronics' GPS450 can be connected to the RIM782 so that the recordings made will be UTC time stamped. There is one connector foreseen:

Specification	Connector type	Value
GPS	RJ45	Intersoft proprietary



Figure 3-4: Rear panel - GPS

The data is distributed to the UVR and the UDR.



Figure 3-5: GPS 450

## 4. Installation

The RIM782 will only start up when the power is connected **and** when one of the two USB cables 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 RIM782 on and you will hear a beep sound in the RIM782 and a tone on your PC. This is the beginning of the RIM782 installation process on the PC.

The installation process of the RIM782 drivers is explained in the next paragraphs.

### 4.1 UVR installation

When the PC detects that a RIM782 is connected over the USB video port, the following window will appear:



Figure 4-1: RIM782 startup step 1

Select 'No, not this time' and click Next.





Figure 4-2: RIM782 startup step 2

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

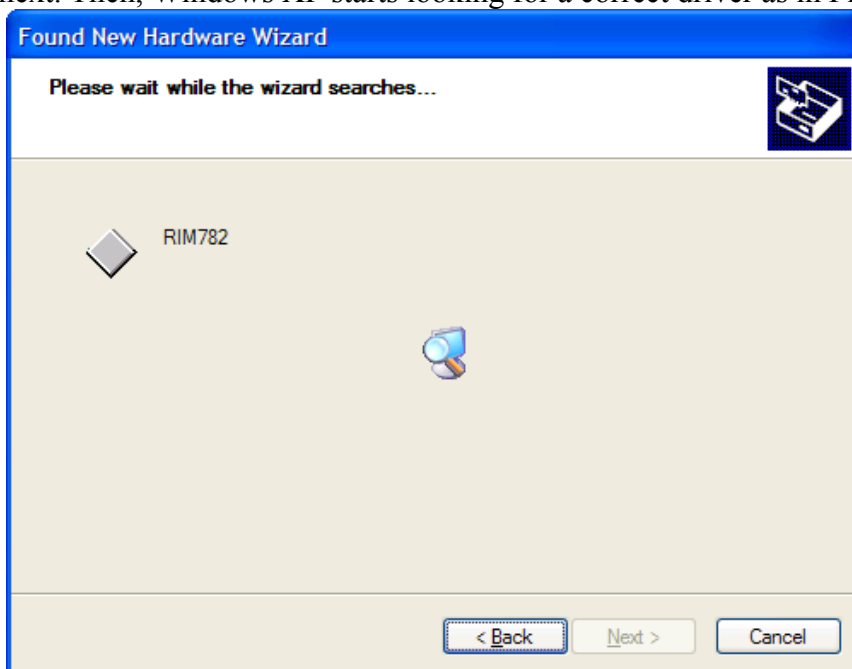


Figure 4-3: RIM782 startup step 3

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

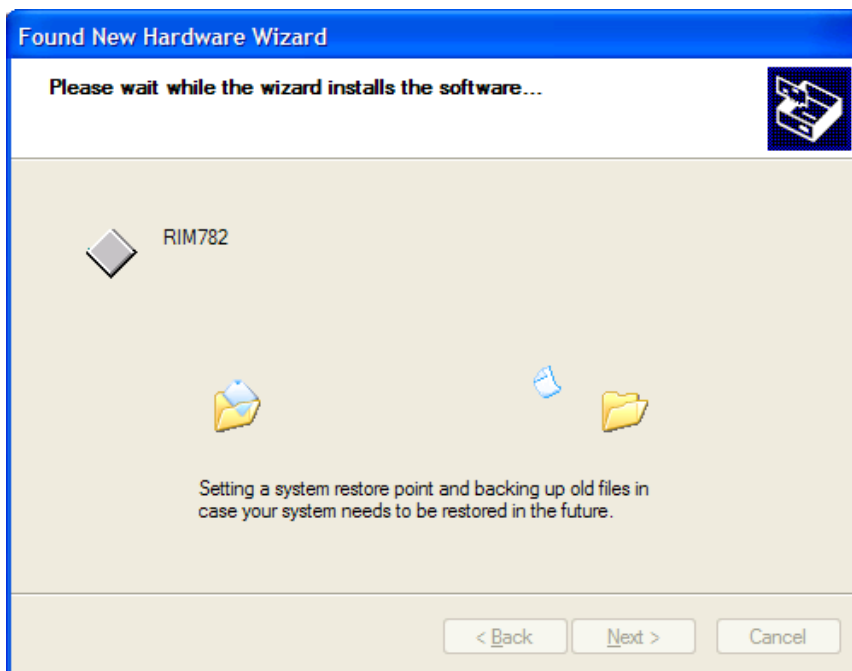


Figure 4-4: RIM782 startup step 4

Finally, the wizard is completed.

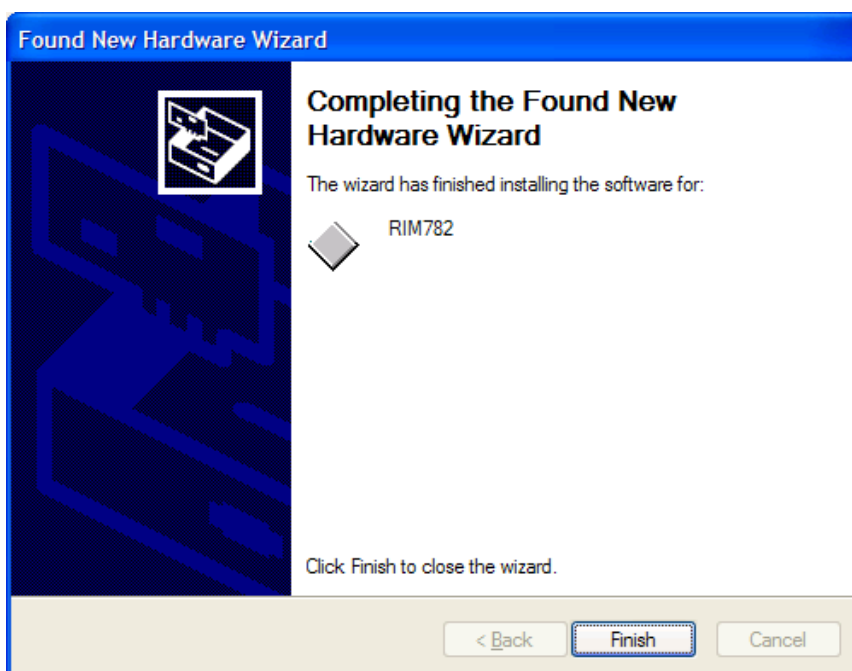


Figure 4-5: RIM782 startup step 5

After a correct installation, the RIM782 should appear in the device list as follows:

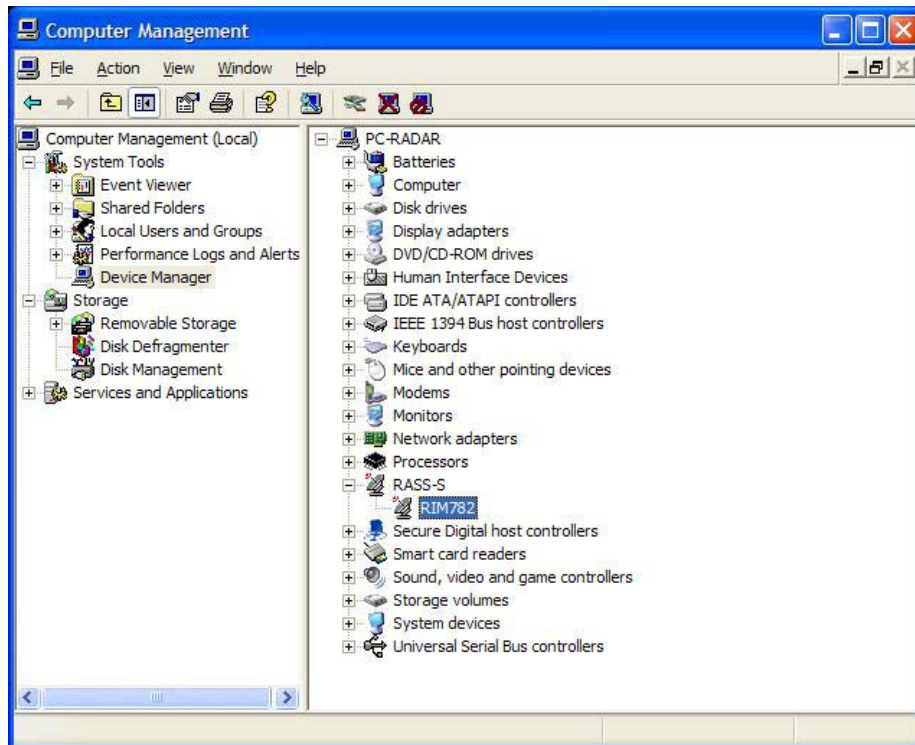


Figure 4-6: RIM782 in device list

## 4.2 UDR installation

For the UDR connection, the same procedure as in the previous paragraph can be followed. Upon completion, the UDR will appear in the hardware device list:

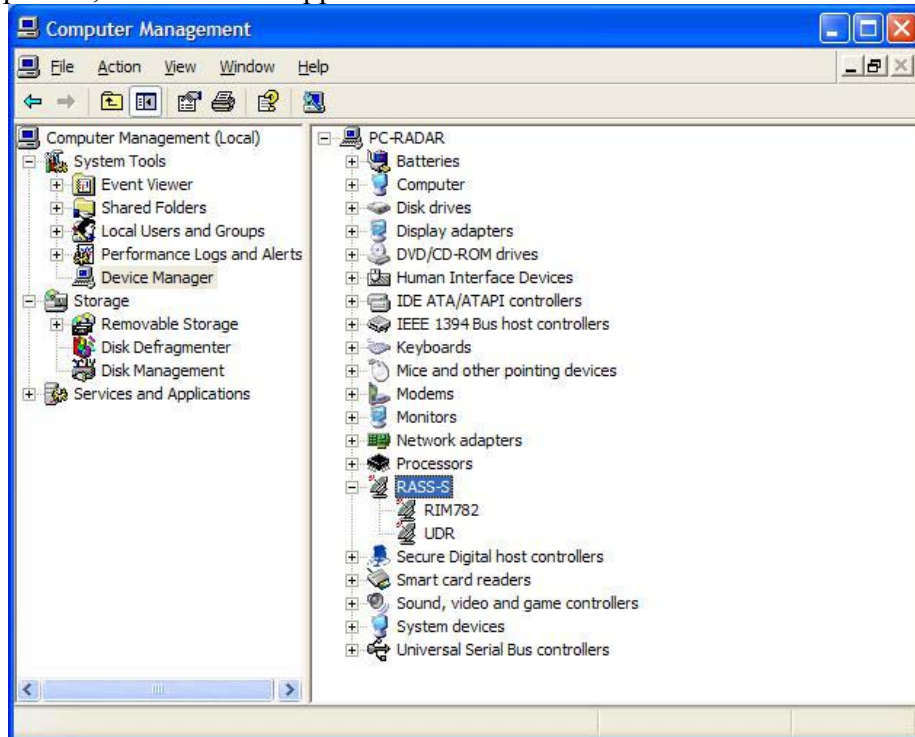


Figure 4-7: UDR in device list

### 4.3 Control via the Data Handler Module

Once the RIM782 is completely installed, it can be accessed via the Data Handler Module (DHM) of RASS-R.

In the '**Proprietary Input**' node, a name 'TMD [sn]<sup>2</sup>' will be available, containing the following subsections:

- UDR2 [sn]: UDR configured as input
- TMD [sn]= the UVR of the RIM782
- ADSBOnRim [sn]= the UVR of the RIM782 setup to receive ADS-B.

In the '**Proprietary Output**' node, a name 'TMD [sn]' will be available, containing the following subsection:

- UDR2 [sn]: UDR configured as output

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

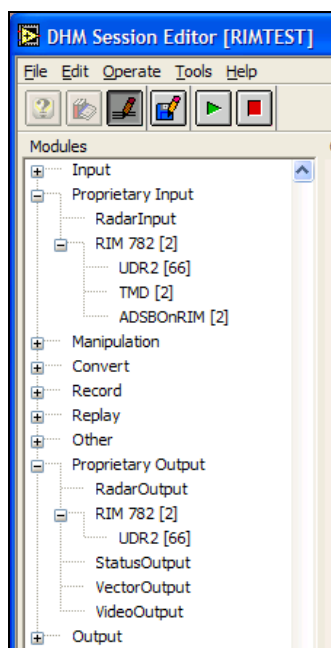


Figure 4-8: RIM782 in DHM

<sup>2</sup> [sn] = [serial number] of the hardware