MDR-4SRC/MDR-4SFRC/ MDR-4SHRC/MDR-4SHRC-E

Data recording system

HEIM DATaRec® 4 MDR

Hetm

Technical Specifications

The HEIM DATaRec® 4 MDR-4 data recording systems are digital data acquisition and recording systems that can be equipped with user changeable MDR interface modules to meet various applications. The MDR-4..RC are equipped with a slot for a SSD media (HEIM DATaRec® 4 RSM/DSM).

MDR-4SRC (SHS500-12242/-12342)
MDR-4SFRC (SHS500-22242/-22342)
MDR-4SFRC-E (SHS503-22242/-22342)
MDR-4SHRC (SHS500-32242/-32342)
MDR-4SHRC-E (SHS503-32242/-32342)

Data aquisition/recording system

Bit rate

MDR-4SRC	100 Mbit/s
MDR-4SFRC, MDR-4SFRC-E	
	240 Mbit/s
MDR-4SHRC, MDR-4SHRC-E	
	800 Mbit/s
Bus data rate	2.1 Gbit/s

Internal communication bus

MDR-4SRC	PCI
MDR-4SFRC	PCI
MDR-4SHRC	PCI
MDR-4SFRC-E, MDR-4SHRC-E	
	PCI, PCIe
Bus data rate	2.1 Gbit/s
Data format	IRIG 106 chapter 10-07 compliant

Storage device

Internal	RSM/DSM
External	via eSATA.
	via Ethernet
Module slots	4 slots for MDR interface modules

All modules can be used interchangeably and exchanged by the customer

Note: Some newer interface modules (SHS515-...) are based on PCIe only technology and can only be used in Mainframes with PCIe internal bus communication.

SAFRAN

Module signal types	PCM serial
	MIL 1553B buses
	ARINC 429 buses
	Serial data, asynchronous and synchronous
	Different bandwidth analog data
	Ethernet network communication
	Voice, compressed video
	Discrete
	Hybrid (different signal types)
	Others on request

Build-in interfaces

Voice

Channels	2 input single ended headset channels
	2 single ended head set monitor outputs
Sampling rate	max. 25 kS/s selectable in steps
Sampling to BW ratio	2.22
High pass filter	300 Hz selectable
Resolution	8 bit / 16 bit
Dynamic range	48 dB / 70 dB
Input Range	1 Vrms, 1 Vpeak
	0.1 Vrms, 0.1 Vpeak
	10 mVrms, 10 mVpeak
Input coupling	AC
Input impedance	10 kΩ
Output Range	max. 1 Vpeak
Output coupling	AC

Ethernet

Channels	1 port (2 ports for MDR-4SH...)
Input format	10 / 100 / 1000 Mbit/s Ethernet bus communication
Function	UDP broadcast, PTP (Precision Time Protocol; time code sync. IEEE 1588-2002 / IEEE 1588-2008), FTP server download function, remote control

Serial

Channels	1 channel remote
	1 channel GPS (NMEA)
Interface standards	RS232 / RS422

Setup/Control/Remote

Interfaces	USB 2.0 (set up only), Ethernet, RS232, RS422

Contact Remote (CR)	6 discrete inputs
CR Input level high	4.7 V- 36 V
CR Input level low	0 V - 3.5 V
CR Input impedance	min 25 kΩ
CR Status output	6 open collector
CR Output current	max. 60 mA, max. 36 V(short circuit protected)

Time coding

Input Standard codes	IRIG A, B, G, 1 pps / 10 pps and GPS time code, IEEE1588 slave
IRIG input codes accepted	IRIG DC/pulse width code: B00x, A00x, G00x; IRIG AC/AM/sine wave: B12x, A13x, G14x (where x=0-7, all combinations of coded expressions with proper setup accepted; CF and SBS are not taken into consideration, BCDyear is optional)
Input accuracy	
IRIG A	±5 μs
IRIG B	±20 μs
IRIG G	±2 μs
IRIG B/A/G DC	±1 μs
1 pps / 10 pps	±0.2 μs
Input signal level	
IRIG A, B, G	0.2 Vpp – 20 Vpp
GPS (NMEA)	RS232/ RS422 standard
1 pps / 10 pps / IRIG DC	TTL
Input impedance	IRIG A, B, G: 25 kΩ
Output standard codes	IRIG A, B, G, 1 pps / 10 pps; replay as RS232; IEEE1588 time master version
Output IRIG coded expressions	IRIG DC/pulse width code: B003, B007, A003, A007, G003, G007; IRIG AC/AM/sine wave: B123, B127, A133, A137, G143, G147 (SBS is mandatory, BCDyear is optional, CF is omitted)
Output accuracy	2×10^{-5} s (standard)
Output signal level	2 Vpp on 75 Ω (IRIG A, B, G), TTL (1 pps / 10 pps)
Output impedance	75 Ω (IRIG A, B, G)
Synchronization	1 pps / 10 pps output with accuracy
Build-in GPS receiver	
Receiver type	50 channels
	GPS L1 frequency C/A code
	Galileo open service L1 frequency
Max. speed	< 600 m/s
Max. navigation update rate	4 Hz
Velocity accuracy	0.1 m/s
Heading accuracy	0.5 degrees
Dynamics	< 4 g

Horizontal position	< 2.5 m autonomous
Accuracy	> 2.0 m SBAS
Power for active antenna	5.0 V, 3.3 V or selectable (depending on HW rev)

Real time clock (RTC) time accuracy

Power on state	±1 ppm (-25 ...+25°C)
	±4 ppm (-40 ...+71°C)
	10 ppb (with optional High Precision Oscillator; -40 ...+55°C)
Power off state	±2 ppm (0 ...+25°C)
	±4 ppm (-40 ...+71°C)

General

Supply voltage	According to MIL-STD-704F, including power interruption of 50 ms.
	Permissible supply voltage range: 11 ...36 V DC; During power-on sequence the needed minimum voltage can increase (up to 13.0 V; depends on type and number of modules).
Cooling	conducted, no fans

Power consumption

MDR-4SRC	15 W (without signal modules)
MDR-4SFRC, MDR-4SFRC-E	20 W (without signal modules)
MDR-4SHRC, MDR-4SHRC-E	24 W (+13 W RAID cartridge)

Note: The maximum nominal power consumption of the MDR, with inserted interface modules and inserted media is up to 120 W (of which 100 W is available internally to the MDR chassis and modules - this is based on 85% power supply efficiency).

Connectors

Power	5-pin Souriau
Time, voice, synch	HD-D-Sub 26 pin female
Remote, media	HD-D-Sub 44 pin female
GPS antenna	SMA

Communication interfaces

Recording information	20 character sunlight readable LED matrix (green)
Status indicators	3 x LED, for system, time and media status
Buttons	4 (record, stop, mode, event)

Dimensions

Screw down plate	124 x 136.9 x 262 mm (w x h x d)
ATR plate	½ ATR
Weight	3.65 kg (without modules/storage media)

Additional Infos

Mounting variants

ATR-plate	MDR-4SRC (SHS500-12242)
	MDR-4SFRC (SHS500-22242)
	MDR-4SFRC-E (SHS503-22242)
	MDR-4SHRC (SHS500-32242)
	MDR-4SHRC-E (SHS503-32242)
Screw down plate	MDR-4SRC (SHS500-12342)
	MDR-4SFRC (SHS500-22342)
	MDR-4SFRC-E (SHS503-22342)
	MDR-4SHRC (SHS500-32342)
	MDR-4SHRC-E (SHS503-32342)

Enviromental specifications

Temperature (operational), MIL-STD-810F

Method 501	Procedure II, +71°C
Method 502	Procedure II, -40°C

Temperature (storage), MIL-STD-810F

Method 501	Procedure I, +85°C
Method 502	Procedure I, -50°C

Humidity, MIL-STD-810F

Method 507	95% rel. h., non-condensing

Altitude, MIL-STD-810F

Method 500	Procedure II, 21.000m

RFI, MIL-STD-461F

Method CE101	Class: Army Aircraft, 28V or below
Method CE102	Class: 28V
Method CS101	Class: 28V or below
Method CS114	Class: Aircraft External
Method CS115	
Method CS116	
Method RE101	Class: Navy Applications
Method RE102	Class: Aircraft, Fixed Wing Internal <25m
Method RS101	Class: Army Applications
Method RS103	Class: Aircraft External

Vibration, MIL-STD-810F

Method 514	Category 24 general minimum integrity exposure, scaled to 10grms

Shock (operational), MIL-STD-810F

Method 516	Procedure I, 20g 11ms

Shock (crash safety), MIL-STD-810F

Method 516	Procedure V, 40g 11ms

Acceleration, MIL-STD-810F

Method 513	20g

EMC CE conformity, EU-Directive 2014/30/EU (EMC)

Emissions:	DIN EN 55011 Class A industrial environment, Group 1
Immunity:	DIN EN 61000-6-2 for industrial environment

Notes

Performance varies depending on installation environment. The values shown were measured using an appropriately designed test system with a default setup under nominal conditions of temperature, voltage, etc. Performance is significantly influenced by storage medium type, signal module configuration, power supplies and cabling.

Features and capabilities of the MDR product line as well as the range of its pertaining items are continuously evolving. Before being able to utilize new features, functions or modules, the firmware of the MDR system has to be updated to the latest firmware version.

Take ESD precautions when handling MDR modules. Always ensure to use only cables with the correct pin out for the interface module! The use of cables with wrong pin assignment may result in damage to connected hardware.

Definitions
Specifications with limiting symbols (<, >, $\leq$, $\geq$, $\pm$, min, max, etc.) or a domain (…) represent performance within a range of values. Specifications named as "typical" represent performance met by approximately more than 80% of the specification basis (channels, produced devices, …). Specifications without limits are nominal values or values within standard tolerances (e. g. dimensions).
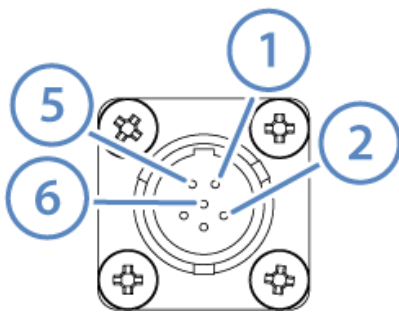
Connector Pin out

Power (Souriau 8T3C08F35PN)

Pin	Description
1	Input +11 to +36 V DC / max. 8 A
2	Input +11 to +36 V DC / max. 8 A
3	DC power input return
4	DC power input return
5	Reserved, not connected
6	DC power input connector shield

Corresponding mate connector (e. g.): MS27473T8F35S with
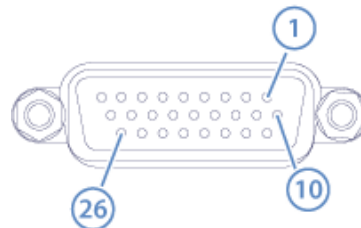8LST101F02

GPS (SMA female)

Pin	Description
1	Signal input (inner contact)
2	Signal ground (outer contact)

Corresponding mate connector (e. g.): 1-1478908-0 (TYCO)

Time/voice/synch (HD-Sub type, HD 26-pin female)

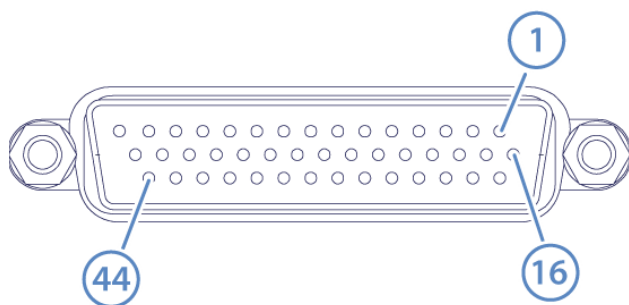| Pin	Description
	IRIG interface
8	IRIG analog time code input
7	IRIG analog time code output
9	IRIG analog signal ground
	PPS interface
17	1/10 PPS input
16	1/10 PPS output
18	1/10 PPS signal ground
	GPS interface
22	GPS RS422 serial data receiver input -, symmetrical signal
21	GPS RS422 serial data receiver input +, symmetrical signal
20	GPS RS422 transmitter output +
19	GPS RS422 transmitter output -
25	GPS RS232 receiver input
24	GPS RS232 transmitter output
23	GPS RS232/RS422 common signal ground
	Voice interface
2	Voice line input 1
3	Voice line input 2
1	Voice line input ground
11	Voice line output 1
12	Voice line output 2
10	Voice line output ground
	Synchronisation port
15	Synchronous 1 I/O+
6	Synchronous 1 I/O-
13	Synchronous 2 I/O+
4	Synchronous 2 I/O-
5	Synchronous configuration input
14	Synchronous common ground
26	Common cable shield (case)

Corresponding mate connector (e. g.): HD-Sub type, HD 26-pin
male (e. g.: Amphenol L717HDA26P with Framatome
8655MH1501LF)

Remote/media (D-Sub type, HD 44-pin female)

Pin	Description
	eSATA interface
35	eSATA receiver +
34	eSATA receiver -
36	eSATA receiver shield (signal ground)
32	eSATA transmit +
31	eSATA transmit -
33	eSATA transmit shield (signal ground)
17	eSATA common cable shield (case)
	Power supply interface
16	Power supply output (12 ...34 V DC / 1.2 A)
1	Power supply ground (isolated from signal ground)
2	Power supply shield (case)
	GigE interface
44	GigE Twisted pair 0+ side (BI_DA+)
43	GigE Twisted pair 0- side (BI_DA-)
42	GigE Twisted pair 1+ side (BI_DB+)
41	GigE Twisted pair 1- side (BI_DB-)
40	GigE Twisted pair 2+ side (BI_DC+)

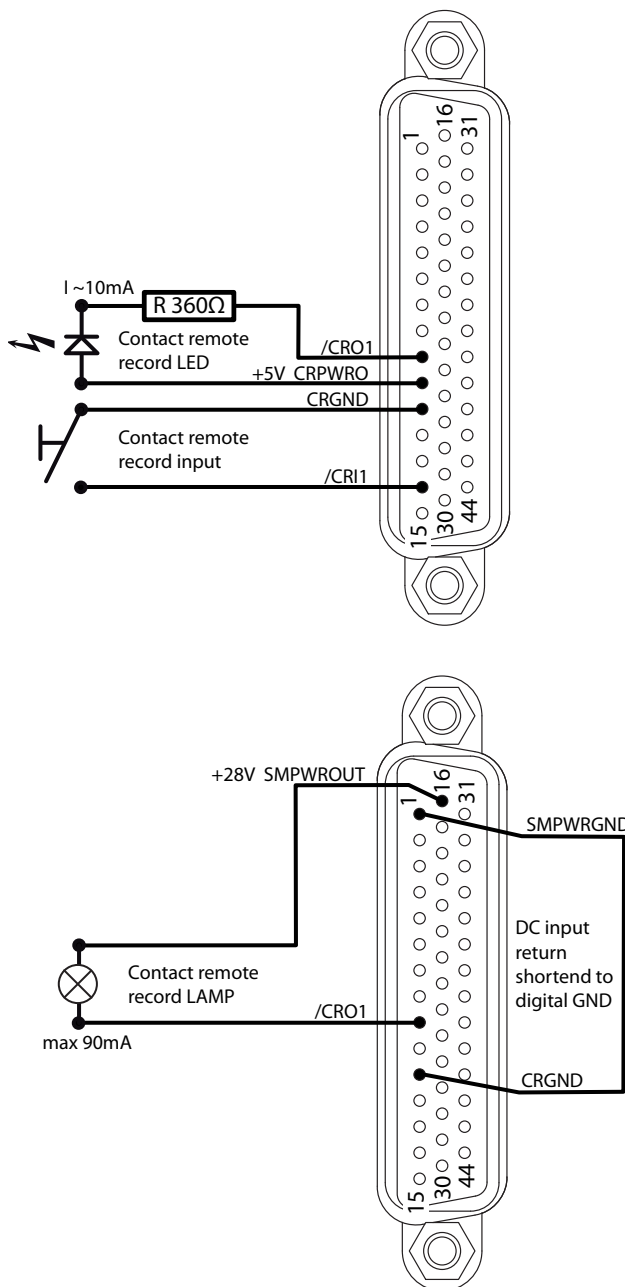| 39	GigE Twisted pair 2- side (BI_DC-)
38	GigE Twisted pair 3+ side (BI_DD+)
37	GigE Twisted pair 3- side (BI_DD-)
30	GigE Common cable shield (case)
	Serial remote interface
6	RS422 receive input pair +
5	RS422 receive input pair -
4	RS422 transmit output pair +
3	RS422 transmit output pair -
21	RS232 receive input
20	RS232 transmit output
19	RS232/RS422 common signal ground
15	RS232/RS422 common cable shield (case)
	Contact Remote interface
14	C-REM input 1
29	C-REM input 2
13	C-REM input 3
28	C-REM input 4
12	C-REM input 5
27	C-REM input 6
9	C-REM open collector output 1
24	C-REM open collector output 2
8	C-REM open collector output 3
23	C-REM open collector output 4
7	C-REM open collector output 5
22	C-REM open collector output 6
10	C-REM Power output +5 V DC / 1 A
11	C-REM I/O common signal ground
18	C-REM I/O cable shield (case)
	Reserved general purpose I/O
26	I/O Connection 1 (not used)
25	I/O Connection 2 (not used)

Corresponding mate connector (e. g.): HD-Sub type, HD 44-pin male (e. g.: Amphenol LL717HDB44P with Framatome 8655MH2511LF)

Specification of the contact remote interface

All outputs are open drain signals, active low. For example when record is running, the record output will be pulled to ground with a current limit of 90 mA. When record is not running the pin is floating. An external pullup resister should be provided with a maximum voltage of 50V.
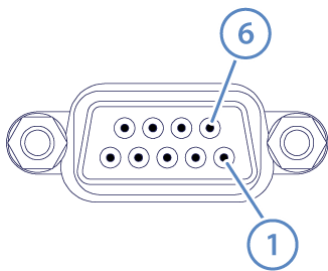
The input pins are also low active and should be pulled to GND to activate them. When left open, an internal current source (0.5 mA limit) will pull the pins to 5.0 V. The function will be activated if the corresponding pin is pulled below 3.0 V. This should be done using a switch, relay, open drain FET or similar. The inputs can also tolerate higher voltages of up to 35 V (direct connection to 28 V aircraft power is possible).

Example for contact remote wiring

IEEE 1394b connector (D-Sub type, 9-pin male; variant-dependend)

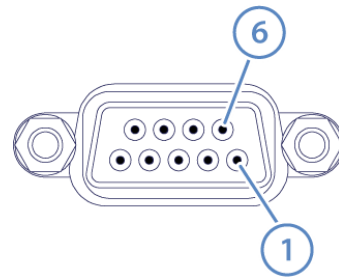| Pin		Description
	6	IEEE 1394b port B+ side symmetrical signal
	7	IEEE 1394b port B-
2		IEEE 1394b port B shield
	8	IEEE 1394b port A+ side symmetrical signal
	9	IEEE 1394b port A-
4		IEEE 1394b port A shield
3		IEEE 1394b power input (11...36 V DC)
1		Digital signal ground and power return
5		Digital signal ground and power return

Corresponding mate connector (e. g.): D-Sub type, 9-pin female

Note:
The IEEE 1394b connector can only be used in combination with IEEE 1394b-enabled RSM cartridges to download recorded data without removing the cartridge. Standard RSM cartridges are not equipped with an IEEE 1394b interface.

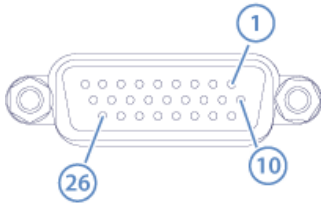LAN2 connector (D-Sub type, 9-pin male; variant-dependend)

Pin		Description
	6	GigE port 2, twisted pair 0+ side symmetrical signal
1		GigE port 2, twisted pair 0- side
	7	GigE port 2, twisted pair 1 + side symmetrical signal
2		GigE port 2, twisted pair 1- side
	8	GigE port 2, twisted pair 2+ side symmetrical signal
4		GigE port 2, twisted pair 2- side
	9	GigE port 2, twisted pair 3+ side symmetrical signal
5		GigE port 2, twisted pair 3- side
3		GigE port 2 common cable shield CASE connection

Corresponding mate connector (e. g.): D-Sub type, 9-pin female

USB/HDP (HD-Sub type, HD 26-pin female; variant-dependend)

Pin		Description
US B		
	17	USB bus power input
	14	USB data negative
	15	USB data positive
	18	USB ID configuration input: do not connect (Target mode)
	13	USB digital signal ground
PPC JTAG debug port		
3		Power PC JTAG TCK clock input
4		Power PC JTAG TMS mode input
1		Power PC JTAG TDI data input
2		Power PC JTAG TDO data output
5		Power PC JTAG TRST reset input
7		Power PC hard reset input
6		Power PC soft reset input
	12	PPC JTAG digital signal ground
Debug config		
	10	DEBUG enable input (connect to pin 17 for debug enable)
Debug port power supply		
	11	Debug port power output (+3.3 V)
PPC RS232 serial debug port		
8		PPC RS232 serial debug port transmit output
9		PPC RS232 serial debug port receive input
	16	PPC RS232 serial debug port digital signal ground
FPGA JTAG debug port		
	21	FPGA JTAG TCK clock input
	20	FPGA JTAG TMS mode input
	23	FPGA JTAG TDI data input
	22	FPGA JTAG TDO data output
19		FPGA JTAG digital signal ground
	24	Digital signal ground
	25	Not connected
	26	Not connected

Corresponding mate connector (e. g.): HD-Sub type, HD 26-pin male (e. g.: Amphenol L717HDA26P with Framatome 8655MH1501LF)