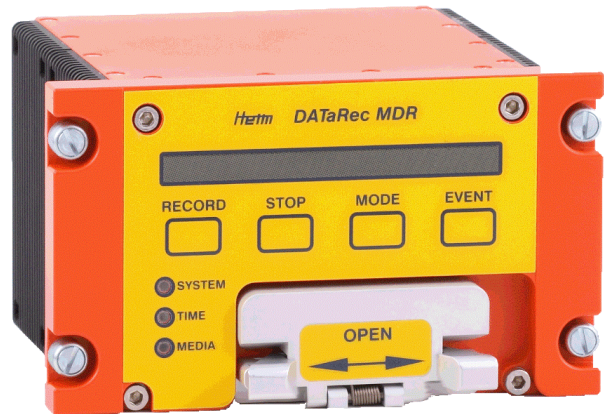# MDR-2

Data recording system

HEIM DATaRec® 4 MDR

Heim

Technical Specifications

The HEIM DATaRec® 4 MDR-2 data recording systems are digital data acquisition and data recording systems that can be equipped with user changeable MDR interface modules to meet various applications. The MDR-2 is a cockpit mountable unit with control interfaces and a CF card slot for the recording media on the front panel.

MDR-2s (SHS500-11121/SHS501-11121)
MDR-2sf (SHS500-21121/SHS501-21121)

Data recording system

Bit rate		
	MDR-2s...	100 Mbit/s
	MDR-2sf...	240 Mbit/s
	Bus data rate	800 Mbit/s
Data format		IRIG 106 chapter 10-07 compliant
Storage device		Internal: removable CF card (up to 256GB supported)
		External: via eSATA.
Module slots		2 slots for MDR interface modules; all modules can be used interchangeably and exchanged by the customer

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

SAFRAN

Input Range	1 Vrms, 1 Vpeak
	0.1 Vrms, 0.1 Vpeak
	10 mVrms, 10 mVpeak
Input coupling	AC
Input impedance	Typ. 10 kΩ
Output Range	max. 1 Vpeak
Output coupling	AC

Ethernet

Channels	1 port
Input format	10 / 100 / 1000 Mbit/s Ethernet bus communication
Function	UDP broadcast, 1588 time code sync., FTP server download function, remote control

Serial

Channels	1 channel remote
	1 channel GPS (NMEA)
Interface standards	1 x RS232 / 1 x 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)
External storage interface	eSATA

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 x 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 single power interruption of 50 ms within 40 s operation
	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-2s	15 W (without signal modules)
MDR-2sf	16 W (without signal modules)
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	
Cockpit mountable	146 x 85.5 x 147.6 mm (w x h x d)
Weight	2,0 kg (without modules/storage media)

Additional Infos

Color variants		
Orange/Yellow		MDR-2s (SHS500-11121)
		MDR-2sf (SHS500-21121)
Black		MDR-2s bl (SHS501-11121)
		MDR-2sf bl (SHS501-21121)
Dimension variants		
Without DZUS-fixing fastener		
		MDR-2sf nfp (SHS200-NS000030)
Dimensions MDR-2sf nfp		124 x 85.5 x 147.6 mm (w x h x d)

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).
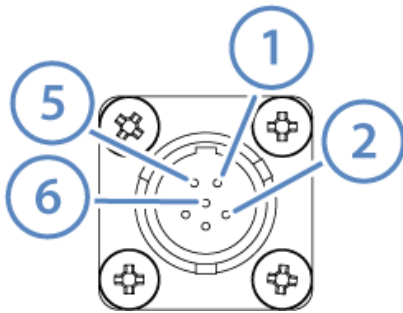
Connector Pin out

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 (HD-Sub type, HD 26-pin female)

| Pin		Description
8		IRIG analog time code input
7		IRIG analog time code output
9		IRIG analog signal ground
	17	1/10 PPS input
	16	1/10 PPS output
	18	1/10 PPS signal ground
	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 RS23output2 transmitter
	23	GPS RS232/RS422 common signal ground
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
	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)
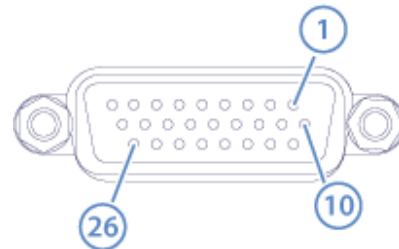
Corresponding mate connector (e. g.): HD-Sub type, HD 26-pin male (e. g.: Amphenol L717HDA26P with Framatome 8655MH1501LF)

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

Pin		Description
	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)
16		Power supply output (12 ...34 V DC / 1.2 A)
1		Power supply ground (isolated from signal ground)
2		Power supply shield (case)
	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)

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)
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)
	26	I/O Connection 1 (not used)
	25	I/O Connection 2 (not used)
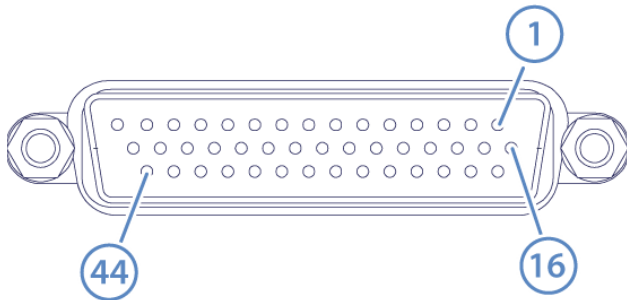
Corresponding mate connector (e. g.): HD-Sub type, HD 44-pin male (e. g.: Amphenol LL717HDB44P with Framatome 8655MH2511LF)

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