HBM Digital Transducer Interfaces

Information Sheet for Crimson v2.0

Compatible Devices

- HBM Digital Transducer Interfaces, AED, PW18i, FIT/HLR

Verified Device

- AD101B, AD103C
- PW18iLR2
- FIT/HLR5

Driver Options
None

Device Options
The programmer enters the desired address.

Important Information
Some commands exist only in certain units. The programmer ensures proper operation by selecting only those items that are supported by the device.

Except where otherwise specified, no attempt is made to verify any data value being written. It is the responsibility of the programmer to ensure valid data are written.

Write Commands DPW, DZT, LIV,NTF,PVS,SPW,TRC: These commands require multiple data items be written at one time. The driver has additional items, indented in the table below the command, for storing each data item in the driver. This data is not initialized when the driver is loaded. The programmer may want to copy the data read from the device into these write locations upon calling the page in order to present the current value to the operator.

Accessible Data

NAME	DESCRIPTION	R/W	DATA TYPE	NOTES
ACL	Automatic Calibration On/Off		BIT	
ADR	Address		LONG	
AOV	ADC Overflow Counter	R	LONG	
ASF	Amplifier Signal Filter		LONG	
ASS	Amplifier Signal Source		LONG	
BRK	Break	W	BIT	1
CAL	Calibration	W	BIT	1
CBK	Coarse Break Limit		LONG	
CBT	Coarse Break Time		LONG	
CDL	Zero Setting (+/- 2%)	W	BIT	
CFD	Coarse Flow Disconnect		LONG	
CFT	Coarse Flow Time (x 10ms)	R	LONG	
COF	Configure MSV/MAV Output Format	R	LONG	4
CPV	Clear Peak Values	W	BIT	
CRC	Cyclic Redundancy Check		LONG	
CSN	Clear Cumulative Count Weight/Batch Ctr.	W	BIT	1
CTR	Clear Trigger Results	W	BIT	
CWTN	Next Calibration Weight		LONG	
CWTL	Read Previous Calibration Weight	R	LONG	
DGA	Diagnostic Activation		LONG	
DGL	Diagnostic Trigger Level		LONG	
DGN	Diagnostic Number		LONG	
DGRV	Diagnostic Read Value	R	LONG	18
DGRS	Diagnostic Read Status	R	LONG	18
DGS	Diagnostic Start and Status		LONG	
DMD	Dosing Mode		LONG	
DPT	Decimal Point for MSV		LONG	
DPW	Send DPW1+DPW2	W	BIT	1
DPW1	Define Password. Characters 1 - 4		LONG	5,6
DPW2	Define Password. Characters 5 - 7		LONG	6
DST	Dosing Time (x 100ms)	R	LONG	
DZR1	Read Dynamic Zero Tracking – Timing	R	LONG	17
DZR2	Read Dynamic Zero Tracking – Band	R	LONG	17
DZT	Send DZT1 + DZT2	W	BIT	17
DZT1	Dynamic Zero Tracking – Timing		LONG	17
DZT2	Dynamic Zero Tracking – Band		LONG	17
EMD	Emptying Mode		LONG	
ENU	Engineering Unit		LONG	5,7
EPT	Emptying Time		LONG	
ESR	Event Status Register	R	LONG	
EWT	Empty Weight		LONG	
FBK	Fine Break Difference		LONG	
FBT	Fine Break Time		LONG	
FFD	Fine Flow Disconnect		LONG	
FFL	First Fine Flow		LONG	
FFM	Fine Feed Minimum		LONG	

FFT	Fine Flow Time (x 10ms)	R	LONG	
FMD	Filter Mode		BIT	
FNB	Actual Parameter Set	R	LONG	
FRS	Filling Result		LONG	
FWT	Filling Weight		LONG	
GRU	Group Address		LONG	
HSM	High Speed Mode		LONG	
ICR	Internal Conversion Rate		LONG	
IDN0	IDN Characters 1 - 4	R	LONG	5,8
IDN1	IDN Characters 5 - 8	R	LONG	5,8
IDN2	IDN Characters 9 – 12	R	LONG	5,8
IDN3	IDN Characters 13 – 16	R	LONG	5,8
IDN4	IDN Characters 17 – 20	R	LONG	5,8
IDN5	IDN Characters 21 – 24	R	LONG	5,8
IDN6	IDN Characters 25 – 28	R	LONG	5,8
IDN7	IDN Characters 29 – 32	R	LONG	5,8
IMD	Input Mode		BIT	
LDWC	Load Cell Dead Weight - Command		BIT	9
LDWV	Load Cell Dead Weight - Value		LONG	9
LDST	LDWC/LDWV Write Status		BIT	9
LFT	Legal For Trade	R	LONG	
LIC0	Linearization Coefficient 0		LONG	
LIC1	Linearization Coefficient 1		LONG	
LIC2	Linearization Coefficient 2		LONG	
LIC3	Linearization Coefficient 3		LONG	
L1RM	(LIV) Read Limit 1 Monitoring on/off	R	LONG	10
L1RI	(LIV) Read Limit 1 Input Value	R	LONG	10
L1RO	(LIV) Read Limit 1 Switch On Value	R	LONG	10
L1RF	(LIV) Read Limit 1 Switch Off Value	R	LONG	10
L2RM	(LIV) Read Limit 2 Monitoring on/off	R	LONG	10
L2RI	(LIV) Read Limit 2 Input Value	R	LONG	10
L2RO	(LIV) Read Limit 2 Switch On Value	R	LONG	10
L2RF	(LIV) Read Limit 2 Switch Off Value	R	LONG	10
L3RM	(LIV) Read Limit 3 Monitoring on/off	R	LONG	10
L3RI	(LIV) Read Limit 3 Input Value	R	LONG	10
L3RO	(LIV) Read Limit 3 Switch On Value	R	LONG	10
L3RF	(LIV) Read Limit 3 Switch Off Value	R	LONG	10
L4RM	(LIV) Read Limit 4 Monitoring on/off	R	LONG	10
L4RI	(LIV) Read Limit 4 Input Value	R	LONG	10
L4RO	(LIV) Read Limit 4 Switch On Value	R	LONG	10
L4RF	(LIV) Read Limit 4 Switch Off Value	R	LONG	10
LIV	Send Limits LxWM-LxWF (x = <1,2>)	W	BYTE	3, 11
L1WM	(LIV) Store Limit 1 Monitoring on/off		LONG	11
L1WI	(LIV) Store Limit 1 Input Value		LONG	11
L1WO	(LIV) Store Limit 1 Switch On Value		LONG	11
L1WF	(LIV) Store Limit 1 Switch Off Value		LONG	11
L2WM	(LIV) Store Limit 2 Monitoring on/off		LONG	11
L2WI	(LIV) Store Limit 2 Input Value		LONG	11
L2WO	(LIV) Store Limit 2 Switch On Value		LONG	11
L2WF	(LIV) Store Limit 2 Switch Off Value		LONG	11
L3WM	(LIV) Store Limit 3 Monitoring on/off		LONG	11

L3WI	(LIV) Store Limit 3 Input Value		LONG	11
L3WO	(LIV) Store Limit 3 Switch On Value		LONG	11
L3WF	(LIV) Store Limit 3 Switch Off Value		LONG	11
L4WM	(LIV) Store Limit 4 Monitoring on/off		LONG	11
L4WI	(LIV) Store Limit 4 Input Value		LONG	11
L4WO	(LIV) Store Limit 4 Switch On Value		LONG	11
L4WF	(LIV) Store Limit 4 Switch Off Value		LONG	11
LTC	Lockout Time Coarse		LONG	
LTF	Lockout Time Fine		LONG	
LTL	Lower Tolerance Limit		LONG	
LWTC	Load Cell Weight - Command		BIT	9
LWTV	Load Cell Weight – Value		LONG	9
LWST	LWTC/LWTV Write Status		BIT	9
MAVR	Measured Alternative Value	R	REAL	19
MDT	Max. Dosing Time (x 100ms)		LONG	
MRA	Multi Range Switchpoint		LONG	
MSVR	Measured Signal Value - Real	R	REAL	19
MTD	Motion Detection - Standstill Value		LONG	
NDS	Number of Dosings		LONG	
NOV	Nominal Output Value		LONG	
NTR1	Read Notchfilter 1 Cutoff Frequency	R	LONG	17
NTR2	Read Notchfilter 2 Cutoff Frequency	R	LONG	17
NTF	Send NTW1 + NTW2	W	BIT	17
NTW1	Notchfilter 1 Cutoff Frequency		LONG	17
NTW2	Notchfilter 2 Cutoff Frequency		LONG	17
OMD	Output Mode		BYTE	
OSN	Optimisation		BYTE	
POR1	Set Output 1 On, Output 2 Unchanged	W	BIT	14
POR2	Set Output 2 On, Output 1 Unchanged	W	BIT	14
POR	Read I/O Bits, Write Outputs		BYTE	14,21
PVAL	Read Minimum Peak Value	R	LONG	
PVAH	Read Maximum Peak Value	R	LONG	
PVS	Send PVSL + PVSH		BIT	
PVSL	Set Minimum Peak Value		LONG	
PVSH	Set Maximum Peak Value		LONG	
RDP	Dosing Parameter Set		LONG	
RDS	Redosing		LONG	
RES	Restart	W	BIT	1
RFT	Residual Flow Time		LONG	
RIO	Read Status–Digital I/O and Measurement	R	LONG	
RSN	Resolution		LONG	
RUN	Run	W	BIT	1
SDF	Special Dosing Functions		LONG	
SDM	Mean Value Dosing Results	R	LONG	
SDO	State of Dosing		BYTE	
SDS	Standard Deviation, Dosing Results	R	LONG	
SEL	Select Device	W	BYTE	2
SFAC	Sensor Full Scale Adjust - Command		BIT	9,**13**
SFAV	Sensor Full Scale Adjust - Value		LONG	9,**13**
SOV	Sensor Overflow Counter	R	LONG	
SPW	Send SPW1+SPW2	W	BIT	1

SPW1	Set Password. Characters 1 - 4		LONG	5,6
SPW2	Set Password. Characters 5 - 7		LONG	5,6
STR	Bus Termination - On/Off		LONG	
STT	Stabilization Time		LONG	
SUM	Cumulative Weight		LONG	
SYD	Systematic Difference		LONG	
SZAC	Sensor Zero Adjust - Command		BIT	9,**13**
SZAV	Sensor Zero Adjust - Value		LONG	9,**13**
TAD	Tare Delay		LONG	
TAR	Taring	W	BIT	1
TAS	Tare Set - Gross/Net		BIT	
TAV	Tare Value		LONG	
TCR	Trade Counter	R	LONG	
TDD	Transmit Device Data		BYTE	2
TMD	Tare Mode		BIT	
TRC	Send TRW1+TRW2+TRW3+TRW4+TRW5	W	BIT	1,16
TRW1	Store Trigger Setting On/Off		BIT	16
TRW2	Store Trigger Setting External/Level		BIT	16
TRW3	Store Trigger Setting Level		LONG	16
TRW4	Store Trigger Setting Delay		LONG	16
TRW5	Store Trigger Setting Period		LONG	16
TRR1	Read Trigger Setting On/Off	R	BIT	15
TRR2	Read Trigger Setting External/Level	R	BIT	15
TRR3	Read Trigger Setting Level	R	LONG	15
TRR4	Read Trigger Setting Delay	R	LONG	15
TRR5	Read Trigger Setting Period	R	LONG	15
TRF	Trigger Correction Factor		LONG	
TRM	Trigger Mean Value	R	LONG	
TRN	Number of Trigger Results	R	LONG	
TRS	Standard Deviation, Trigger	R	LONG	
USR	Send USRC		BIT	20
USRC	User Command String		LONG	20
USRR	USRC Response String		LONG	20
UTL	Upper Tolerance Limit		LONG	
VCT	Valve Control		LONG	
WDP	Store Parameter Set	W	LONG	
ZSE	Initial Zero Setting		LONG	
ZTR	Zero Tracking On/Off		BIT	
MAV	Measured Alternative Value (Legacy)	R	LONG	12,19
MSV	Measured Signal Value (Legacy)	R	LONG	12,19

GENERAL INFORMATION ABOUT THE TABLE:

R/W – W indicates a selection is Write-only to the AED. R indicates a selection is read-only. Write attempts to read-only selections are ignored. All selections not otherwise specified are read and write, with write operations occurring immediately upon the user's change of a value, unless otherwise indicated in the appropriate note.

DATA TYPE – Reading a BIT will return either 0 or 1. Writing a BIT will write a 0 if the data value entered is 0, otherwise, a 1 will be written. If the current value of the display item is the same as the value entered, no command is sent.

IMPORTANT: It is the responsibility of the programmer to ensure that invalid values cannot be entered. With only a few exceptions that are specified in this document, the driver does not validate the data written.

NOTES:

1. These values return 0 when read. Write any non-zero value to execute the function.

2. These values return –1 when read. Write any value that is acceptable according to the device specification.

3. The LIV instruction returns 0 when read. Write 1 to send all **L1Wx**, 2 to send all **L2Wx**, 3 to send all **L3Wx**, and 4 to send all **L4Wx**. Any other value will be ignored.

4. **COF** is read upon first calling a device. Set COF to 3. The driver will attempt to set COF to 3 if the transducer responds to the request.

5. **ASCII Character Values.** These selections comprise ASCII characters. The driver compacts each character into a 32 bit word, one byte for each character. See the note for each selection for acceptable entries. Use a string tag, with Encoding set to 'Packed High-to-Low' be used for displaying the results.

6. **DPW1, DPW2, SPW1, and SPW2.** These selections permit the handling of password operations. Each byte must be a character in the range:
'0' – '9' (hex 30 - hex 39)
'A' – 'Z' (hex 41 - hex 5A)
'a' – 'z' (hex 61 - hex 7A)

All valid characters are shifted to the left, overwriting invalid characters. If no valid characters are found, the entry is set to 0.

DPW2 (**SPW2**) must be 0 unless there are four characters in **DPW1** (**SPW1**). Executing **DPW** (**SPW**) examines all seven characters of the password entry. A character following a null will cause the entire entry to be rejected and set to 0.

Example 1: 4142 (hex) is entered into **SPW1**, the letters AB. The redisplay will show 41420000. If SPW2 is 0, executing **SPW** will write only the string "AB" to the AED.

Example 2: 414243 is entered into **SPW1** and 444546 is entered into **SPW2**. The display will show 41424300 in **SPW1**, and 444546 in **SPW2**. Executing **SPW** will not send anything, and will clear the entry, as the 00 at the end of **SPW1** is followed by something other than a 0.

7. **ENU** is one 32 bit word. Each byte can be any valid ASCII character in the range hex 20 to hex 7E. Nothing will be written if any byte is outside that range, except for 0, which will be converted to a space. Use a String Tag with Encoding set to 'Packed High-to-Low', **Size = 4**, for display and entry as an entire string.

8: **IDN0 – IDN7.** The unit identification need only be read at startup. Each character in the string is one byte in the data returned to the display. The **IDN** is factory set. Write attempts are ignored. Use a String Tag, and set Encoding to 'Packed High-to-Low' for display as a string.

9: **LDWC, LDWV, LDST, LWTC, LWTV, LWST, SFAC, SFAV, SZAC, SZAV.** These selections have both Command and Value options for writing.
The Command selection instructs the AED to set its value based on an external input. The Value selection instructs the AED to set its value based on the entered data.
LDST(LWST) has the write status of **LDWC(LWTC)** and **LDWV(LWTV)**. Command selections take several seconds to complete. No other communication occurs until the Command has completed, or times out.

10: **L1Rx, L2Rx, L3Rx, L4Rx.**
These selections read the current settings of Limit Values 1 – 4.

11: **L1Wx, L2Wx, L3Wx, L4Wx.**
These selections store the user input. The data stored will be transmitted upon the setting of **LIV** to 1 – 4 for Limit Values 1,2,3,4 respectively. See Note 3.

12: **MAV, MSV.**
The data display for these selections depend upon the value of **COF.** Be aware of the **COF** setting before interpreting the data.

Both items have only 6 hex digits. If the most significant bit is set (the value is negative), the driver automatically adds hex FF000000 for correct display in decimal.

13: SFAC, SFAV, SFZC, SFZV
These selections require calibration equipment and a defined procedure in order to ensure successful operation. Please refer to the AED specification for the SFA and SFZ command before executing, or writing to, any of these items.

14: **POR1, POR2, POR.**
These items access the Digital I/O.
See note 21 if outputs 3-6 are accessible via the command **MUX**.
A read of **POR** will return four bits representing the state of the outputs and inputs. Output 1 is bit 3, Output 2 is bit 2, Input 1 is bit 1, and Input 2 is bit 0.

> Example: VariablePOR = 11 (binary 1011) : Output 2 is off, The others are on.

Reading **POR1** or **POR2** will display the status of that output only.

A change of **POR1** or **POR2** will turn that output on without writing to the other. The protocol does not support turning off one output without writing to the other.

A write of **POR** will write to both outputs. Bit 0 of the data writes to Output 1, bit 1 writes to Output 2.

> Example 1: VariablePOR is equal to 15 (all I/O on).
>   VariablePOR1 = 0 or VariablePOR2 = 0: no effect.
>   VariablePOR = 1: Output 1 is on, Output 2 is off.
>   VariablePOR = 2: Output 1 is off, Output 2 is on.

> Example 2: VariablePOR is equal to 3 (Inputs on, Outputs off).
>   VariablePOR1 = 1: Output 1 is on, Output 2 is unchanged.
>   VariablePOR2 = 1: Output 1 is unchanged, Output 2 is on.
>   VariablePOR   = 3: Both outputs on.
>   VariablePOR   = 2: Output 1 is off, Output 2 is on.

Some settings of Limit Values disallow writing to the outputs. This will cause a rejection of the write command, therefore a communications error. The programmer is responsible for ensuring the correct conditions exist before attempting to write to the outputs.

15: **TRR1, TRR2, TRR3, TRR4, TRR5**
These selections read the current Trigger Settings.

16: **TRW1, TRW2, TRW3, TRW4, TRW5**
These selections store the user input. The data will be transmitted upon changing **TRC** to any non-zero value. See Note 1.

17: **DZR1, DZR2, DZT, DZW1, DZW2** and **NTR1, NTR2, NTF, NTW1, NTW2**
The "R" selections read the values from the drive. The "W" selections hold new values to be written to the drive. **DZT**, and **NTF** transmit the respective values.

18: **DGRV, DGRS**
Select the Relative Address of the measured values when configuring these items. These Read-only items will be read with separate commands.

19: **MAVR, MSVR**
Use these for Measured Alternative Value, and Measured Signal Value for new, or updated applications on devices that support **COF13**. While they will work properly on older devices that do not support **COF13**, throughput is reduced by the additional transmissions required to determine that on each read. Using the Legacy MAV/MSV on older devices is recommended.

The correct value will be returned regardless of the number of decimal places in the response.
Also see Note 12.

20: **USR, USRC, USRR**
These selections are for implementing new commands not otherwise supported by the driver. **USRC** and **USRR** are defined as Strings, Packed High-To-Low, of a size less than 40 characters. **USRC** is set to a command string. When **USR** is set to 1, the driver adds the final ';', transmits the full string, and stores the response in **USRR**, less the carriage return, line feed that terminate the response string. The programmer must arrange to parse **USRR** to get the data desired.

21: **POR** with Outputs 3 – 6, and the **MUX** command is available in the device. The driver will automatically try to access Outputs 3-6 via the **MUX** command, and if the command is available, use it in conjunction with **POR**.

READ POR response byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
O6	O5	O4	O3	O1	O2	I1	I2

Bits 0-3 are the same noted in note 14.
Bits 4-7 have been added.
If MUX command is not in the device, bits 4-7 do not mean anything.

WRITE POR command byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
O6	O5	O4	O3	CB3	CB2	O2	O1

O1 and O2 are the same in note 14.

CB3	CB2	Action
0	0	Set O1 = Bit0, Set O2 = Bit1, O3 – O6 do not change
0	1	Set O1 = Bit0, Set O2 = Bit1, O3 = Bit 4, … O6 = Bit 7
1	0	Set O3 = Bit4, … O6 = Bit 7, O1 – O2 do not change
1	1	Toggle the state of O1, O2…O6 by setting bits 0,1,4,5,6,7

Examples of using Control Bits for Write:

DATA	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					CB3	CB2		
0x02	O6	O5	O4	O3	**0**	**0**	1	0
0x03	O6	O5	O4	O3	**0**	**0**	1	1
0x04	0	0	0	0	**0**	**1**	0	0
0x05	0	0	0	0	**0**	**1**	0	1
0x06	0	0	0	0	**0**	**1**	1	0
0xA5	1	0	1	0	**0**	**1**	0	1
0xF8	1	1	1	1	**1**	**0**	O2	O1
0x59	0	1	0	1	**1**	**0**	O2	O1
0x0C	O6	O5	O4	O3	**1**	**1**	O2	O1
0x0D	O6	O5	O4	O3	**1**	**1**	O2	!O1
0x0F	O6	O5	O4	O3	**1**	**1**	!O2	!O1
0xFC	!O6	!O5	!O4	!O3	**1**	**1**	O2	O1
0xFF	!O6	!O5	!O4	!O3	**1**	**1**	!O2	!O1

HBM Digital Transducer Interfaces – May 2010

Cable Information

AED/PW/FIT RS-232

RLC UNIT	AED KL23 (PW/FIT)
2 (RxD)	TxD (blue)
5 (TxD)	RxD (gray)
3/4 (0V)	GND (white)

AED RS-485 – 2 Wire

RLC UNIT	AED KL23
1+4 (RXB + TXB)	TB+RB
2+3 (RXA + TXA)	TA+RA

RS485 – 4 Wire

RLC UNIT	FIT
1 (TXB)	Gray (RB)
2 (TXA)	Green (RA)
3 (RXA)	Blue (TA)
4 (RXB)	Black (TB)

PW RS485 – 4 Wire

RLC UNIT	PW
1 (TXB)	Black
2 (TXA)	Green
3 (RXA)	Blue
4 (RXB)	Gray

Configuration Version 1.20 November 2008
Added DPT, MAVR, MSVR, USR, USRC, USRR, as enhancements.

Configuration Version 1.20, Driver updated May 2010
Added support for accessing Outputs 3-6 to the POR command via the new command MUX.