Application Note 010e

AED / FIT®

in legal for trade applications

I1702-1.1 en

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1 Introduction

The individual AED family electronics and the digital load cells are prepared for use in legal for trade application and have certification in accordance with OIML standards (R60, R76).

This application document describes parameter backup in legal for trade application, detecting parameter manipulation and activities when the weighing system is started up.

In the text below, the electronics are abbreviated to AED. Of course, these explanations also apply to HBM's digital load cells, such as FIT® and C16i.

2 Checking bus usage and communication settings when starting the system

System startup can be split into three phases:

- Connecting the supply voltage
- Setting up communication
- Checking and setting parameters

Only then should the productive phase (= measurement query) be activated.

After connecting the supply voltage, it is necessary to set up communication with the AED. In bus mode, each AED must have a separate bus address (**ADR**).

The baud rate (**BDR**) should also be stored safe from power failure (with **TDD**1;).

Communication is set up in two stages:

- Establishing bus usage (are all nodes available ??)
- Setting and checking the output format for the measured values (**COF**)

This is the command sequence for determining **bus usage**:

S00; // Select address 0

ADR?; // the expected response from the bus node is the string ‘00crlf’

S01; // Select address 1

ADR?; // the expected response from the bus node is the string ‘01crlf’

S02; // Select address 2

ADR?; // the expected response from the bus node is the string ‘02crlf’

...

This sequence is run for all the assigned addresses.

If a bus node is not available, once a time_out time has elapsed (approx. 50..100 ms, depending on baud rate) an error message should be generated to the effect that the bus node has not been found.

If there is an incorrect response (parity error, framing error, ..) the problem is usually multiple assignment of an address or an electrical fault on the bus (perhaps check the bus termination). Please note that the AED is always delivered from the factory with the address 31.

Commands **S**98; **COF**8; (example) can be used to **set the output format**.

There may be no need to set the output format, if, during commissioning, the parameter for the **COF** command was also stored safe from power failure.

If the installed electronics have an automatic calibration function (AD101B) and this is activated (**ACL**1), then the calibration command (**S**98; **CAL**;) should be sent so that the determination of bus usage is not disrupted by autocalibration. When you send the calibration command, you have to wait 1.6 s (= **CAL** run time).

If, after this command sequence (**S**98; **CAL**;) you send a Select command (Sxx;), the response is output to the last broadcast command (in the example **CAL**;) (0crlf or ?crlf).

3 Parameter check and settings

Before the productive phase (= measurement query) is activated, the parameter settings should be checked. This check covers the following groups of parameters:

- Characteristic curve settings (**SZA**, **SFA**, **LDW**, **LWT**, **NOV**, **CWT**, **RSN**, **DPT**, **MRA**, **LIC, TRF, ENU**)
- Zeroing parameters (**ZTR**, **ZSE**)
- Filter settings (**HSM**, **FMD**, **ASF**, **ICR**)
- Measured value processing gross / net output (**TAS**, **TAV**, **MTD**)
- Other parameters, such as the trigger settings (**TRC**, **TRF**, **DZT**) , the limit values (**LIV**), the function settings (**IMD**, **POR**), dosing parameters, if used
- Calibration parameters (**LFT**, **TCR**, **CRC**), if relevant (see Legal for trade application)

The easiest method is to query the individual parameters (e.g. **ASF**?;) and to compare them with the settings stored in the Master.

A further method is described in the Using the **CRC** command section.

If a measured value with a status has been selected (e.g. **COF**8), an overflow state may have been detected (see **MSV**? command).

4 Legal for trade application

In accordance with the OIML/INTEP standards, legal for trade application require special parameter protection and simple recognition of when changes are made to parameters relevant to calibration.

Parameters relevant to calibration are parameters that change the measurement properties of a weighing system (for example, characteristic curves, measurement resolution, ...):

SZA, **SFA**, **LDW**, **LWT**, **NOV**, **ZTR**, **ZSE**, **IDN**, **CRC**, **MRA**, **RSN**, **DPT**, **LIC**, **TRF, ENU**

The command **IDN** contains the type information and production number, as well as the software version of the AED. The **CRC** can be used as an additional safeguard (see Using the **CRC** command). All these parameters are additionally protected by password commands (SPW, DPW).

Implemented in the AED is the **LFT** command, which in conjunction with the legal-for-trade counter (**TCR**), makes it obvious when parameters have been changed. The legal-for-trade counter **TCR** is a non-resettable counter, that is incremented by changing **LFT**.

The following steps must be taken to set up applications subject to mandatory calculation (**LFT** = 0):

- Define password (**DPW**)
- Activate password (**SPW**)
- Set parameters relevant to calibration
- Back up parameters with **TDD**1;
- Establish **CRC** (see Using the **CRC** command), if required
- Activate obligation of verification **LFT**1;
- Read out the new legal-for-trade counter setting with **TCR**?; and note it on the name-plate of the scale

Should parameters relevant to calibration have subsequently changed (**LFT** = 1), perform the following steps:

- Activate password (**SPW**)
- Deactivate obligation of verification with **LFT**0;
- Set parameters relevant to legal for trade
- Back up parameters with **TDD**1;
- Establish **CRC** (see Using the **CRC** command), if required
- Activate obligation of verification **LFT**1;
- Read out the legal-for-trade counter with **TCR**?; and note it on the nameplate of the scale

It is necessary to keep a record of the legal-for-trade counter, so that when checking the weigher, for example, you can ascertain whether a subsequent change has been mad to the parameters relevant to calibration.

Any change to **LFT** changes the legal-for-trade counter (**TCR**). With **LFT** > 0 no legal for trade parameter can be changed. The amplifier AD103C has implemented a hardware switch. If this switch is activated also **LFT** can not be changed.

This information is important for the main display of a scale.

Measurement status (valid for **MSV**?):

In 4-byte binary output and in ASCII output, the measurement status can be transferred with the measured value (see also **COF** command). The content of the status depends on **CSM** and the operation mode (**IMD)**.

It is possible to read in addition the status with the command **RIO** in the case of legal for trade applications.

ASF10 is not allowed in the filter mode **FMD**0/3 in legal for trade applications (**LFT** > 0) because of the long settling time.

The input of **TAV** (pre tare value) is not allowed in case of legal for trade applications (**LFT** > 0).

5 Using the CRC command

The **CRC** command allows a checksum to be stored in the AED. If the obligation of verification is activated (**LFT**1), writing to this memory is detected by the legal-for-trade counter (**TCR**).

The checksum must be calculated over at least all the parameters relevant to calibration. Of course, parameters that are not relevant to calibration that change during operation must not be included in the checksum (e.g. **TAS**, **TAV**, **LIV**, **TRC**,....).

The Master Controller software has sole responsibility for calculating this checksum and should not reveal how this is done.

The easiest checksum method is EXOR formation, using the responses of the parameters that are read in.

Example:

Master	AED response	Comment
ADR?;	07crlf	Address
SZA?;	123crlf	Factory characteristic curve
SFA?;	987000crlf	
LDW?;	21000crlf	User characteristic curve
LWT?;	253000crlf	
NOV?;	3000crlf	Resolution
ZTR?;	1crlf	Zero tracking
ZSE?;	1crlf	Zero on startup
MTD?;	1crlf	Standstill condition
IDN?;	AED"AD101B","12345",P14crlf	Identification
	xx	EXOR over all bytes received
CRCxx;	0crlf	Storing CRC in the AED

cr = 0dh, lf = 0ah (end label)

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APPN005en	Measurement query via the serial link (RS232/RS485)
APPN006en	Dosing and filling with AD103 / FIT®
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