📖 User's guide

Adash 4700
Vibration Recorder

Applications:

- 📁 Vibration diagnostics of machines
- 📁 Measurement in inaccessible places
- 📁 Measurement on moving parts
- 📁 Diagnostics of bearings

Characteristics:

- 📁 Fully automated measurement
- 📁 Measurement and saving of RMS or PEAK value in specified interval
- 📁 Measurement of Time signal
- 📁 FFT analysis
- 📁 Recording vibrations to WAV format (PC acoustic format)
- 📁 Envelope analysis for bearing conditions
- 📁 Data storage to MMC memory card up to 2 GB
- 📁 Internal battery for continuous measurement up to 8 hour
- 📁 Mounting tools to attach to machinery
- 📁 Standard high quality piezo-electric sensor for measurement (100mV/g)
- 📁 Indication of overload and defects of sensor or cable
- 📁 Indication of instrument condition

Obsah

Unit description

ADASH 4700-Vibration Recorder is designed for measurement in inaccessible places. It has been developed as individual unit with its own built-in power supply. The instrument can be mounted directly to a machine by screws or other fixtures. This feature enables A4700 to take measurements from points with difficult or no access (e.g. moving parts of machines, dangerous areas, etc.). This instrument can be use on standard places for continual, long-time measuring too.

A4700 can be switch on after install sensor and memory card. Now measuring is started automatically (configuration is stored on the memory card) and free of human operation until either battery is discharged, the memory is full or it is switched off by the user.

Front view

Power supply connector	Signal connector

LED:
MEAS - measuring
MMC- data storage
ERR - error
PWR:
- slower blink: A4700 is active, accumulator is OK
- faster blink: A4700 is active, discharged
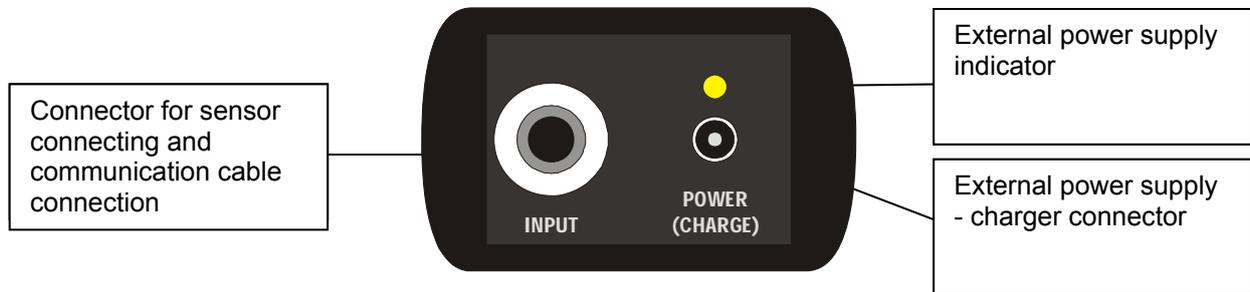   accumulator

door for protecting memory card, and control switch

Top view

On the front side of instrument are two connectors:
- 7-pin, screw connector for connect sensor
- connector for connect power supply / charger with LED

Connector for sensor connecting and communication cable connection

INPUT

POWER (CHARGE)

External power supply indicator

External power supply - charger connector

Rear view

Behind small protecting door are:
- slot for memory card (MMC)
- control switch

slot for memory card (MMC)

1 0

MMC

control switch:
To slot - 1 = switch on
Out slot - 0 = switch off
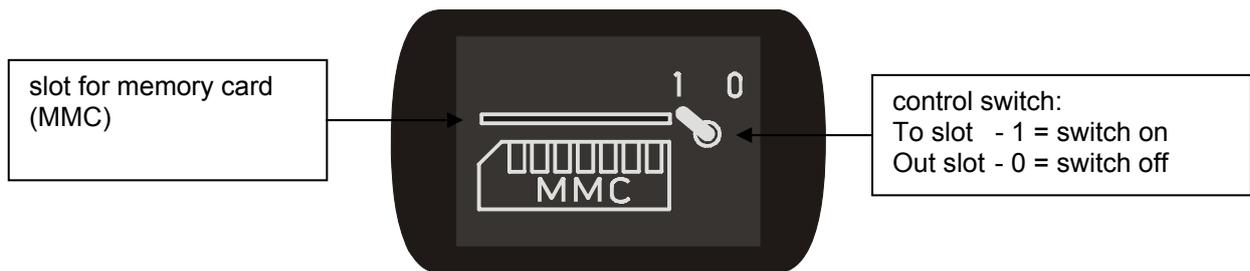
Note: The door push-up and open.

Power supply

To feed the instrument, use internal LiPOL accumulator, it is possible to measure up to 8 hours. A4700 contain a connector for an external power supply - accumulator charger. If the external power supply is used and instrument is ON, then measuring time is longer and the external power supply indicator is ON. This indicator is above the external power supply connector.

If the instrument is OFF and external power supply indicator is ON, then accumulator is charging.

If the instrument and indicator are OFF, then charging of accumulator is done.

If the instrument is ON and external power supply is disconnected, then this indicator indicated current drain. As external power supply-charger can by used power supply 5.5-7V/0.5A DC with positive pole within connector. The power supply-charger is a part of distribution.

Data storege

A4700 uses for data storage standard **MMC**, **MMC+** or **RS-MMC** memory card.

Memory cards

MMC+   RS-MMC

Slot for memory card is on the under site of instrument (behind protection door). A memory capacity of the memory card is 128MB - 2GB. A time capacity of memory card depend on measuring configuration and can be from tens minutes (for recording to standard acoustic format WAV) to tens hours (for measuring of time and spectra). The time capacity of the card is almost unlimited for measuring of static data. The time capacity of the memory card for maximum sampling rate and for minimum measuring cycle delay (values are approximate):
- recording of wav   - 300MB/hour
- time measurement   - 78MB/hour
- FFT measurement   - 3,5MB/hour
- rms or peak measurement   - 1MB/13 hours
A measuring data can be storage and process in PC. For data transmission from the memory card to the PC is used standard MMC-card reader. Measuring data can be process in the PC by special program (e.g. DDS2000).
When MMC-card is inserting into instrument, then chamfer must be on the left-site (gold contacts must be at the top).

Clamping of instrument

A4700 is matched to clamping on a machine by four clamps, which can be fix to instrument by screw in three basic direction or to them combination. The clamps can be rotate around the clamping screw. It is possible to clamping of instrument on the uneven surface of machine too.
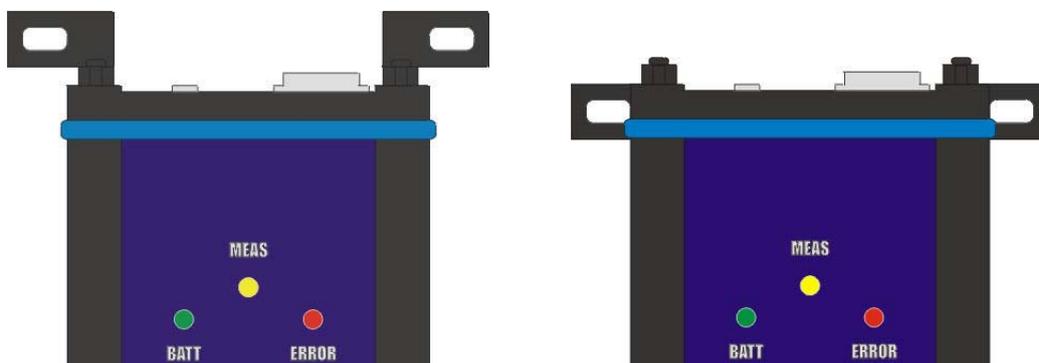
A4700 setting

Before measuring:
- the instrument must be set by PC (configuration is storage on the memory card),
- the instrument can be mount on a machine by four clamps,
- a sensor must be installed on the measuring places and to the instrument.

Measuring mode

Measuring type

- TRUE RMS   - measuring of TRUE RMS
- TRUE PEAK - measuring of TRUE PEAK
- Time   - measuring of TIME
- FFT   - spectral analysis
- WAV   - recording of time signal to standard PC acoustic format

Measuring method

- wideband measuring of acceleration (parameter LIN, acceleration in band 1Hz – 16kHz)
- measuring of low-speed and heavy bearings (parameter LB, acceleration in band 500Hz – 16kHz)
- measuring of standard bearings (parameter HB, acceleration in band 5 – 16kHz)
- envelope analysis in band 5-16kHz (parameter ENV)
- envelope analysis in band 500Hz – 16kHz (parameter ENVL)
- measuring of velocity in band 1 – 1000Hz (parameter LF)
- measuring of acceleration in band 1 – 1000Hz (parameter XLF, integration is not used)

Configuration of measuring

For configuration of measuring is required basic knowledge of computer. The instrument is configured by configuration files, which are stored in the root directory of the memory card.

    - 4700CFG.INI   - compulsory   - configuration of measuring
    - 4700TIME.INI   - optional   - date and time settings

Note: Configuration files can be created by PC such as standard text files (**.txt**), which must be renamed to ini-files (**.in**i).
The configuration file 4700CFG.INI is compulsory, without this file measuring cannot start. The configuration file 4700TIME.INI is optional. If 4700TIME.INI is not, then default setting of time and date is used.

Attention!!! Memory card must be formatted in FAT16 (FAT) files system.
Attention!!! On the memory card must be least 1% of free spaces.

Creation of configuration files

The measuring parameters are set in the configuration file 4700CFG.INI, this configuration file is compulsory for measurement and must be created. If you need settings of actual time and data, then create the configuration file 4700TIME.INI too.

Note: This description is designated for system Windows Me, 2000 and latter version. For older Windows versions must be installed special driver for a card reader.
Note: Configuration files can be created by other way too.

Create configuration files by program **Notepad**, which is standard program of Windows, then close the **Notepad** and rename extension of configuration files to **.ini**:

1. Remove the memory card from the instrument and insert it to the card reader (card reader must be connected to the PC).
2. Close all information windows, which are appears. Locate the name of the memory card.
3. Start the program **Notepad** (*Start - Programs - Accessories*).
4. Save this empty file (*File - save as...*) as 4700CFG.txt to the root directory of the memory card (e.g. Removable disk F:).
5. Create a new file (*File - new*) and save this as 4700TIME.txt.
6. Close *Notepad*.

Rename extension of configuration files:

1. Find configuration files *(This computer - Removable disk)*.
2. Click on the icon of configuration file by right button of mouse and from menu chooses **Rename**.
3. Rename configuration files to:
- 4700CFG.INI
- 4700TIME.INI

Now configuration files are created, but they are empty. Edit of the file 4700TIME.INI (setting of time and date) is very simply and contain only two rows for date and time.

1. Open the file A4700TIME.INI - Click on the icon of configuration file by right button of mouse and from menu choose **Open**.
2. Write these two rows to file (you can copy these rows from WORD by keys **Ctrl+C** (copy) and **Ctrl+V** (paste)):

```
time = hh:mm:ss        - actual time, e.g.13:00:00
date = dd.mm.rrrr      - actual date, e.g. 21.03.2006
```
3. Save file *(File - Save)* and close **Notepad**.

Edit of the file 4700CFG.INI (configuration of measuring) is similar to edit of the 4700TIME.INI:

1. Open the file A4700CFG.INI.
2. Write these rows to file (you can copy these rows from WORD by keys **Ctrl+C** (copy) and **Ctrl+V** (paste)) and create your configuration by parameter modification:

```
[CONFIG]              - global configuration of A4700
sensor = 100          - sensibility of sensor - 100mV/g
icp    = on           - ICP power supply - on/off
range  = auto         - range of measuring (auto or fix-value in acceleration-g)
intflt = 1            - setting of lower cutoff frequency of filter (1/10Hz)


[MEAS 1]              - configuration of first measuring
start = 5             - first measuring is started five second after instrument activation
repeat= 10            - first measuring is repeated every ten second
type  = rms           - measuring type is TRUE RMS
path  = LIN           - measuring method is LIN (0,5Hz - 16kHz)
samples = 4000        - value of TRUE RMS is computed from 4000 samples of signal
```

3. Save this file *(File - Save)* and close **Notepad**.
4. Remove the memory card from the card reader and insert it to the A4700.

Now, we must installed sensor on the measuring place and to the instrument and activated the instrument. The instrument will be measure values of TRUE RMS every 10 seconds until discharge of

the accumulator, filling of the memory or switch off the instrument. It is only one example of measuring and all parameters are describes in the capitol **Detailed description of parameters of configuration files***.*

Note: The memory card can also contain other data, it is possibility to create several different configuration files with different names.
Note: In the configuration files is possible remove the unused measuring by **semicolon** at the start of rows.

Parameters description

4700CFG.INI

Standard INI-file, which contain two sections:

`[CONFIG]` – optional   - global configuration of instrument (sensor, range, etc.).
`[MEAS x]` – compulsory   - configuration of measuring (max. 32 independent measurements)

Note: If configuration file doesn't contain the section **`[CONFIG]`**, then will use default configuration.
Attention!!! Section **`[MEAS x]`** is compulsory. If configuration file doesn't contain section **`[MEAS x]`**, then the instrument will not measure.

[CONFIG]

`sensor = 100`   - sensor sensitivity - mV/g
                            If not set, then the instrument will use sensitivity from calibration.

`icp   = on`   - ICP power supply setting - ON/OFF
                            If not set, then the instrument set: **`icp = on`**.

`range  = auto`   - input range (auto/fix)
                            Input range is possible set to auto range, or fix range (e.g. 10g, 1g, 0.1g, etc.).
                            If any fix range is used, then the instrument finds and set nearby fitting value.
                            If not set, then the instrument set: **`range = auto`**.

`intflt = 10`   - lower cutoff frequency of filter (1Hz/10Hz)
                            If not set, then the instrument set: **`intflt = 10`**.

[MEAS 1]   **1** - measuring number (max. 32 independent measurements)
`start = 5`   - optional - measuring is started 5 second after instrument activation
`start = 10:05`   - optional - measuring is started at 10 hours and 5 minutes of instrument time
                            - format of this parameter is: **`hh:mm`**, **`hh:mm:ss`**, or **`ss`**
                            If not set, then the instrument set `start = 0`
`repeat= 10`   - optional - first measuring is repeating every ten seconds
                            - format of this parameter is: **`hh:mm`**, **`hh:mm:ss`**, or **`ss`**
                            If is set **`repeat = -1`**, then the first measuring run once.
                            If not set, then the instrument set **`repeat = 0`**

`type  = time`   - compulsory - type of measuring:
                            - rms   TRUE RMS of signal
                            - peak TRUE PEAK of signal
                            - time measuring of time
                            - fft   spectral analysis
                            - spec spectral analysis
                            - wav   recording of a time signal to the WAV format (standard PC acoustic format)

`path  = LF`   - compulsory - method of the measuring (input signal processing), see **table 1**

table 1: value of path parameter and characteristic of filters:

Path	Frequency band of filter	minimum value of the parameter FREQ (min. sampling rate)	note
LF	1/10Hz - 1000Hz	2560Hz	with integration to mm/s
LB	500Hz - 16kHz	40960Hz	
HB	5kHz - 16kHz	40960Hz	
LIN	0,5Hz - 16kHz	40960Hz	
ENV	5kHz - 16kHz	256Hz	with envelope detector
ENVL	500Hz - 16kHz	256Hz	with envelope detector
XLF	0,5Hz - 1000Hz	2560Hz	without integration

`freq  = 4096`   - for measuring of spectra - optional - maximum value of frequency (19530Hz)
                          - for other measuring type - sampling rate of the signal in Hz (min. 20Hz, max. 50000Hz).

Note: If the measuring type is **wav**, or **time**, then value of this parameter gets sampling rate of the signal. If the measuring type is **fft**, then value of this parameter gets maximum value of frequency.
Note: If not set, then the instrument set values from **table 1**.
Note: The parameter **freq** depend on the parameter **path** (see **table 1**) and it mustn't be smaller than values of **table 1 (min. sampling rate)**. If you set smaller value, then the instrument set value from **table 1**. If you set greater value, then the instrument set value from **table 2**.

`samples = 2048`   - compulsory (except **FFT**) - number of samples of the measuring signal (min. 200, max. 16384)
`length = 1:35`   - compulsory (except **FFT**) - measuring time
                          - format of this parameter is: **mm:ss**, or **ss** (**ss** format can be a real number). Set one of these parameters, only if measuring type isn't **fft** (for **fft** use parameter **lines**).

Note: If these parameters are used together, then the instrument uses parameter **samples**.
Note: Parameter **length** is recommended to use only for recording to **WAV** format.
Note: If these parameters are greater, or smaller than allowable values, then the instrument use values from **table 2**.

`lines = 800`   - compulsory for **FTT** - number of lines in spectra (min. 100, max. 3200).

Using of parameters

Using of parameters depend on the measuring type:

- optional   - repeat (if not set, then the instrument set **repeat = 0**)
                               - start (if not set, then the instrument set **start = 0**)
                               - freq (if not set, then the instrument set value from **table 1**)

- all measuring type   - type
                               - path

- measuring of RMS/PEAK   - length, or samples

- measuring of FFT (SPEC)   - lines

- measuring of TIME, or WAV   - length, or samples

table 2: maximal and minimal value of parameters:

parameter	minimal value	maximal value
freq for measuring of spectra	1	19530
freq for other measuring	20	50000
samples	200	16384
length - depend on **freq**	length(sec)*freq=200	length(sec)*freq=16384
lines	100	3200

Note: Wrong, or unusable settings are ignored.
Note: If two, or more measurements start at same time, then the instrument shift these measurements.
Note: The real time (from 4700TIME.INI) is saved to the instrument.
Note: A sequence of the parameters in sections **[MEAS x]** is free.

Maximum number of measurements (**[MEAS x]**) is 32. Measurements are reading depend on measuring sequence and depend on its measuring time.

Examples of configuration file 4700CFG.ini

```
[CONFIG]                    - global configuration of instrument
sensor = 100                - sensor sensitivity is 100mV/g
icp    = on                 - ICP is ON
range  = auto               - auto-range is ON
intflt = 1                  - lower cutoff frequency of filter is 1

[MEAS 1]                    - setting of the first measuring
start = 7                   - measuring is started 7 second after instrument activation
repeat= 5                   - the [MEAS 1] is repeating every 5 seconds
type  = rms                 - measuring type is TRUE RMS
path  = LF                  - measuring method is LF (1Hz – 1000Hz)
length = 1                  - measuring time is 1 second (using of the samples is better)

[MEAS 2]                    - setting of the second measuring
repeat= 25                  - the [MEAS 2] is repeating every 25 seconds
type  = peak                - measuring type is TRUE PEAK
path  = XLF                 - measuring method is XLF (0.5Hz – 1000Hz, without integration)
samples = 2000              - the number of samples is 2000

[MEAS 3]                    - setting of the third measuring
start = 13:00               - measuring is started at 13:00 of real instrument time
repeat= 2:00                - the [MEAS 3] is repeating every 2 minutes
type  = fft                 - measuring type is FFT (spectrum)
path  = LB                  - measuring method is LB (500Hz – 16kHz)
freq  = 16000               - maximum frequency is 16000Hz
lines = 1600                - the number of lines in spectra is 1600

;[MEAS 4]                   - setting of the third measuring is unused, this measuring is
                              remove by semicolon at the start of rows
;start = 13:05              - measuring is started at 13:05 of real instrument time
;repeat= 2:00               - the [MEAS 4] is repeating every 2 minutes
;type  = time               - measuring type is time
;path  = HB                 - measuring method is HB (5 – 16kHz)
;samples  = 4096            - the number of samples is 4096
```

```
[MEAS 5]                          - envelope analysis of time ( 5-16kHz)
type  = time
path  = ENV
samples  = 8000



[MEAS 6]                          - envelope analysis of spectra (500Hz-16kHz)
type  = fft
path  = ENVL
lines = 1600

[MEAS 7]                          - wide-band spectrum of signal (LIN: 1Hz – 16kHz)
start = 13:30
repeat= 10:00
type  = fft
path  = LIN
lines = 800

[MEAS 8]                          - measuring of the time (LIN: 1Hz – 16kHz) with length
type  = WAV                         2 minutes, is saved to standard PC acoustic format (WAV)
repeat= -1                        - measuring will not be repeated
path  = LIN
length = 2:00

[MEAS 9]                          - measuring of the time (HB: 5kHz – 16kHz) with length
type  = WAV                         5 seconds, is saved to standard PC acoustic format (WAV)
repeat= 30:00                     - measuring is repeated every 30 minutes.
path  = HB
length = 5
```

4700TIME.INI

This configuration file contains settings of the instrument time and date.
The file 4700TIME.INI contains these parameters:

```
time = 10:30:00
date = 12.3.2005
```

The **time** parameter defines instrument time in format: `hh:mm:ss`, or `hh:mm`
The **date** parameter defines actual-date in format `dd:mm:yy`, or `dd:mm:yyyy`.
After file processing, is this file renamed to 4700TIME.IN~. At a next start of the instrument the file
4700TIME.IN~ will not procesing (settings of real time and date are saved in the instrument memory).

Examples of configuration file 4700TIME.ini

time = 13:00:00
date = 03.03.2006

Sensor connection

To measure, a vibration sensor with the ICP feeding must be connected to the instrument. As regards
the type of sensor, use a standard ***accelerometer with a sensitivity of 100 mV/g***. The instrument is
equipped with its own ICP supply of the connected sensor.
Connect the sensor to this input (right connector) using the supplied connection cable.

Measuring and data processing

After instrument initialization is:
1. performed verification of memory card, its file system and inherency of configurations file,
2. reading of 4700TIME.INI (if exists) and setting of instrument clock,
3. reading of 4700CFG.INI, at first is instrument set by `[CONFIG]` section (if exists).

Now instrument automatically performs continual measurements, which are defined in configuration file 4700CFG.INI. Measured data are saved to files:
4700_xxx.MEM - data file for measuring of TRUE RMS, TRUE PEAK, FFT, TIME,
4700_xxx.WAV - standard acoustic PC file for measuring WAV,
where xxx are ordinal number of file, e.g. 000, ..., 999.
After end of measuring, remove the memory card from instrument and and insert it to card reader (card reader must be   connected to PC). WAV files can be played as standard acoustic files by any acoustic-player (e.g. Windows media player, etc.), or can be edited by any acoustic editor (e.g. GoldWave, etc.). For MEM files processing is possible use the program DDS2000.

Note Before instrument initialization you must connect a sensor to instrument, insert a memory card and clamp the instrument.
Note If MMC LED is OFF, then is possible to remove the memory card from instrument during measuring (measuring will automatically stopped). If MMC LED is ON and you remove the memory card from instrument, then measuring data corruption is possible!
Note If any **MEAS [x]** measuring contain parameters mismatch, then this measuring will be skipped.

LED signalization

Normal state

MEAS   - measuring is in progress
MMC   - communication with memory card
PWR   - slower blink: A4700 is active, accumulator is OK
         - faster blink: A4700 is active, discharged accumulator

Errors

If any error occurs, which prevent data storage, it will be indicated by LED.
All errors are indicated by blinking of ERR LED. ERR led blinking in cycle: one long and few short blinks. Number of short blinks specified a type of error. If occurs any memory error, then is lightning MMC LED and is blinking ERR LED. If occurs any measure error, then is lightning MEAS LED and is blinking ERR LED.

MMC Error

ERR LED blinking	definition
-	instrument can't find the memory card, or storage access error
- . . .	wrong file system on the memory card (must be FAT16)
- . .	instrument can't find file 4700CFG.INI (measure setup don't exist)
- .	memory card is full

MEAS Error

ERR LED blinking	definition
-	sensor power supply error
- . . .	over-excitation of input amplifier (auto-range error, or low fix-range)

Technical specification: