



Automotive
Energy & Power Analysis
Field Service
Environmental
Research & Development

EPAD-BASE2

Technical reference manual

Features:

- Dewe-modules interface (DAQ and PAD) via native USB or RS232 interface;
- transforms PAD data to CAN;
- works always independent on where it is connected on the PC;
- recognizes USB communication losses and reports it back in Dewesoft;



... the precision signal conditioning company



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2 Safety Instructions

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Safety symbols in the manual:



Indicates hazardous voltages.

WARNING Calls attention to a procedure, practice, or condition that could cause body injury or death.

CAUTION Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. DEWETRON Elektronische Messgeraete Ges.m.b.H. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as option and will not be shipped as standard parts.

Environmental Considerations

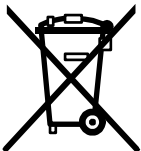
Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a DEWETRON system:

System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid an unnecessary pollution of the environment and to keep natural resources.



This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the DEWETRON web site www.dewetron.com

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead.

Safety instructions for all DEWETRON systems

- The DEWETRON data acquisition systems may only be installed by experts.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.
- DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid

dangerous

electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

- No modifications are allowed at the instrument. The fuse in the power module has to be replaced by the same type. For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holder labels and print on the power module may not be removed.
- DO NOT service or adjust alone. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- Before opening the instrument (experts only) or exchanging the fuse in the power module disconnect

power!

- Don't touch internal wiring!
- Don't use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- For voltages above 60 V you are not allowed to use the metal housing of DSUB connectors!
- You may not connect higher voltages than 250 V to the DSUB connectors of the DEWETRON modules.
- Install filler-panels in unused slots.
- The power-cable and -connector serve as Power-Breaker. The cable must not exceed 10 feet, disconnect function must be possible without tools.
- Safety of the operator and the unit depend on following these rules.

3 Specifications

EPAD-BASE2 is the device which reads the data from EPAD modules or interfaces the modules in any Dewetron BOOK solution.

Features:

- Dewe-modules interface (DAQ and PAD) via native USB or RS232 interface;
- transforms PAD data to CAN;
- works always independant on where it is connected on the PC;
- recognizes USB communication losses and reports it back in Dewesoft.



Inputs	
RS485/RS232 speeds	9600,19200,38400,57600,115200 Baud
Outputs	
CAN	1000, 500, 250, 125, 62.5, 31,25 kBaud
Supported PAD modules on CAN	PAD-V8-P, PAD-TH8-P, PAD-V8, PAD-TH8, PAD-CNT2
USB	USB 2.0 compatible
General	
Power supply	9-18 V DC
Maximum EPAD power consumption	3 A
Physical dimensions	100x70x25 mm
Weight	140 g
Operating temperature	-20 to 60 deg. C
Storage temperature	-40 to 85 deg. C
Humidity	95% RH non condensing @ 60 deg. C
Revision control	
Hardware	1.1
Firmware	2.1

4 Device operation

EPAD-BASE 2 can be used as a standalone device with EPAD connected to it. In this case the power is supplied through Power supply connector (9-18 V) and EPAD modules are powered from the BASE (maximum power 3 A should not be exceeded).

The second option is that it can be connected to DEWE-RACK providing CAN output of the PAD modules. In this case the power can be already received through the RS485 interface and no additional power supply is needed. The device can be also used as a simple RS485 to RS232 converter.

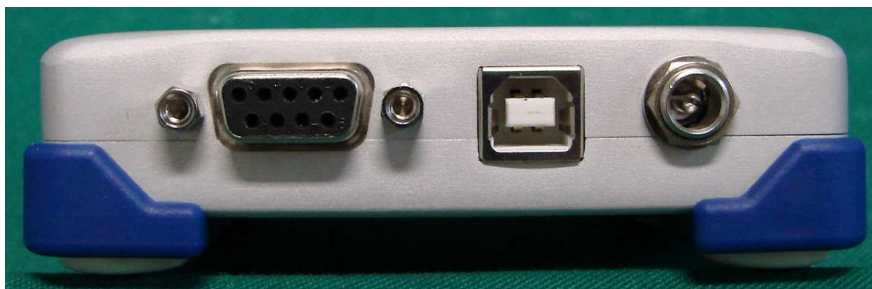
Third option of EPAD-BASE2 is to test the functionality of the CAN interface of any data acquisition system. Test CAN messages are sent synchronized with TTL pulses. So it is also useful tool to check the synchronization quality of the measurement system between the CAN data and analog data. An acceleration sensor is also included for comparing the time delay between analog and CAN data.

To switch between all three modes there is a small button available on the front side. RS232 mode is indicated as green bottom LED on the left, the CAN out mode is indicated as left red LED on the top and CAN tester mode is indicated as right red LED on the top. If the device is connected to Dewesoft, it goes to USB mode and right green LED is illuminated.

Front side connectors

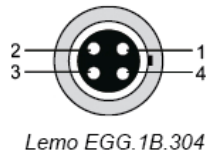


Rear side connectors



4.1 Connectors

The 4 pole LEMO connector is used for connecting to module (RS485) bus.



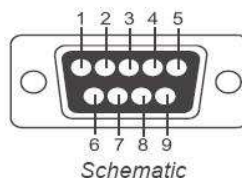
- Pin assignment
- 1: RS-485 A
 - 2: RS-485 B
 - 3: +12 V
 - 4: GND
- Shield is connected on housing

USB connector is used for connecting to the PC and should be used to connect to Dewesoft.



- Pin assignment
- 1: +5 V
 - 2: D-
 - 3: D+
 - 4: GND

For backwards compatibility also standard RS232 interface is provided.

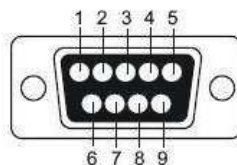


- Pin assignment
- 1: Reserved
 - 2: RD (Received Data)
 - 3: TD (Transmitted Data)
 - 4: Reserved
 - 5: GND (Ground)
 - 6: Reserved
 - 7: Reserved
 - 8: Reserved
 - 9: Reserved

The standard CAN connector is used for reading the CAN data. Please note that if a single device will read the data from the EPAD-BASE2 (point-point), then the cable should be terminated at both ends with 120 Ohm resistors.



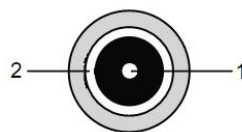
9-pin SUB-D connector (male)



Schematic

- 1 .. reserved
- 2 .. CAN-L
- 3 .. GND
- 4 .. EXTENDED MESSAGE digital out
- 5 .. ACCELERATION SENSOR analog out (0-5V)
- 6 .. GND
- 7 .. CAN-H
- 8 .. STANDARD MESSAGE digital out
- 9 .. reserved

Lumberg 1614 14 connector is used to connect the system to an external DC power supply.

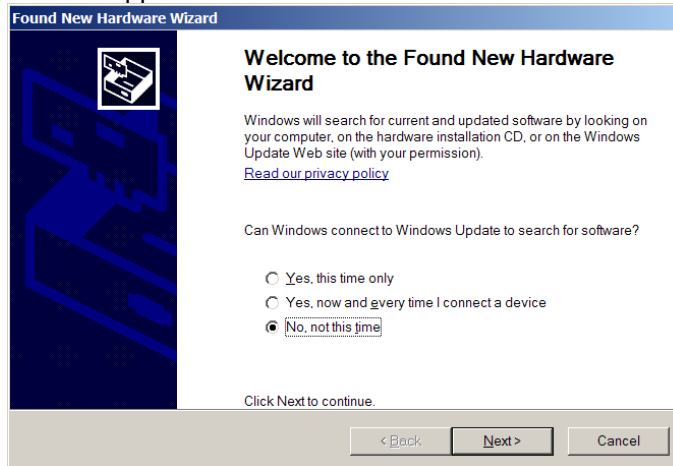


Schematic

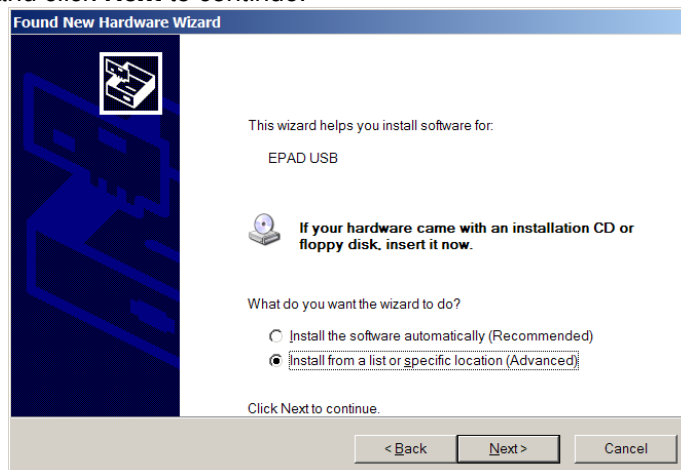
- Pin assignment
- 1: +9 to 16 V_{DC} power supply
 - 2: GND power supply

5 Driver installation

To install the driver of EPAD-BASE2, please connect the device to the power supply and next to the PC with USB cable. The following message should appear:

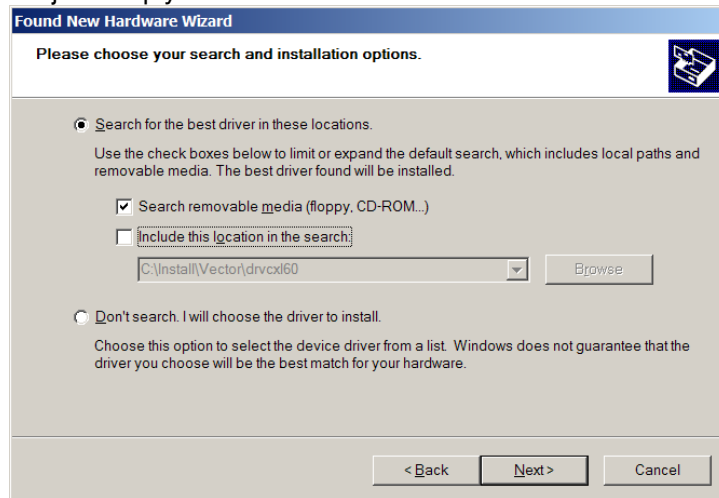


Press »**No, not this time**« and click **Next** to continue.

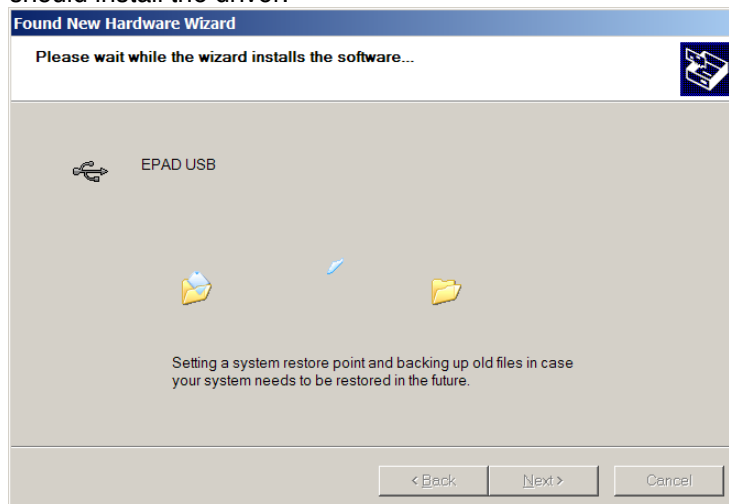


Select »**Install from a list or specific location (Advanced)**« option and click **Next**.

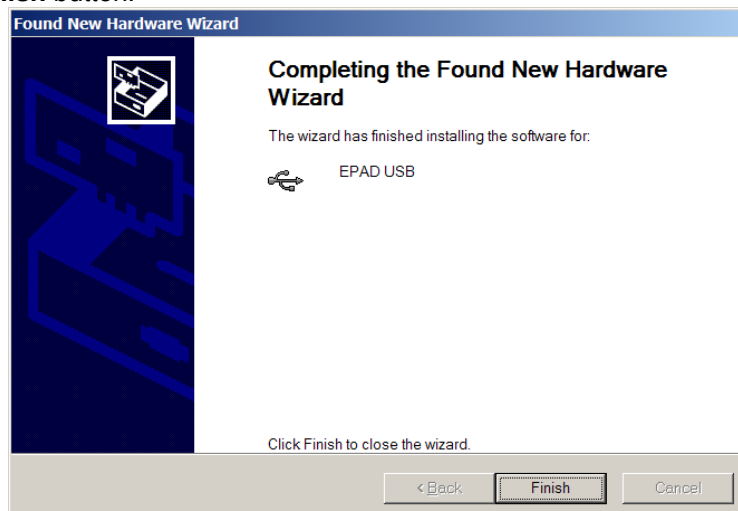
The driver should be located in `cd_drive:\install\driver\EPAD_BASE2\driver` folder on the system CD. You can either point out this location or just simply select »**Search removable media**«.



The installation procedure should install the driver.



Finish the Wizard with **Finish** button.

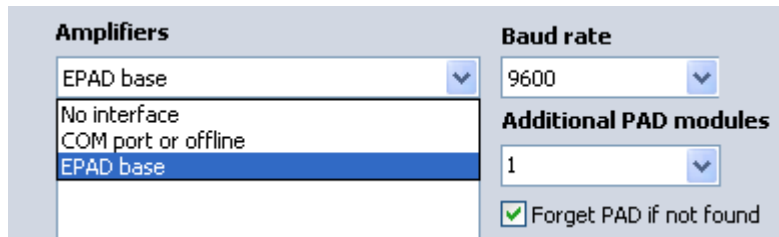


6 Using EPAD_BASE2 in Dewesoft

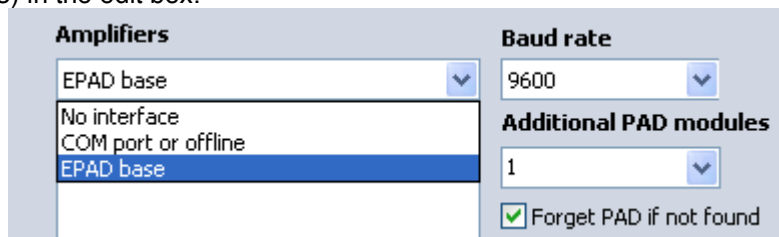
6.1 Module configuration

The EPAD-BASE2 should be automatically recognized in Dewesoft to be used instead of COM port for module configuration. Please note that at least 6.4.2 or 7.0.2b21 is necessary to run this hardware in USB mode. No matter to which USB port the device is connected, it will be recognized and used in Dewesoft for configuring the modules.

You can see this in Dewesoft hardware manual (Settings – Hardware setup). Please select first EPAD base from Amplifiers drop down.

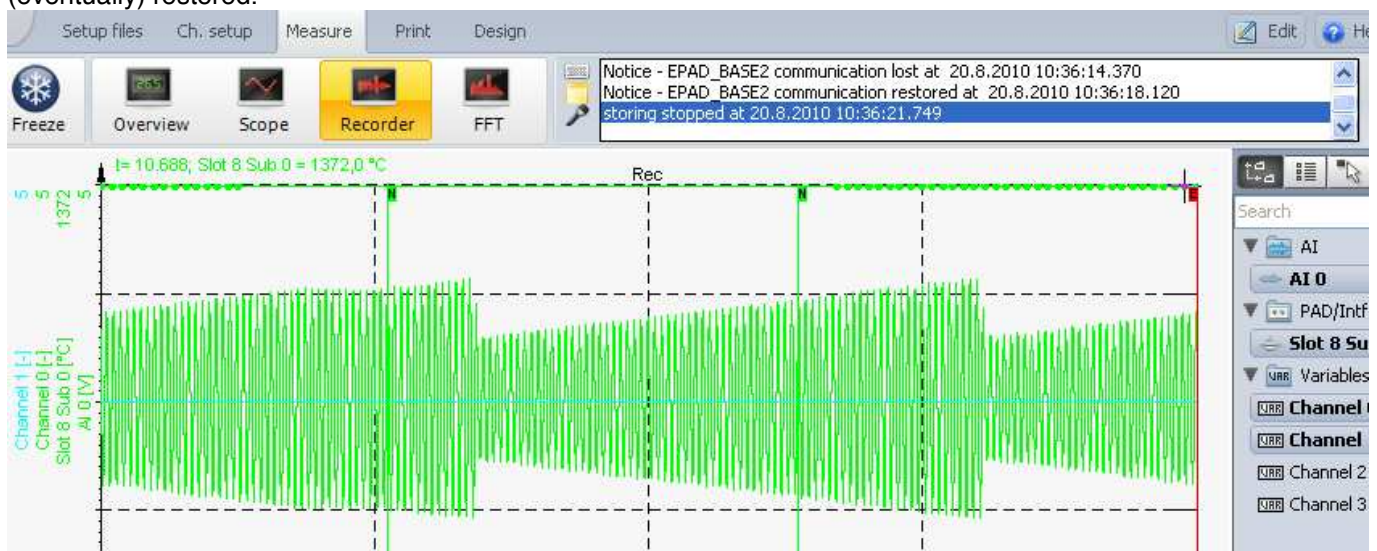


Then select PAD modules. The baud rate can be defined. In case of EPAD base the additional PAD modules can be defined which will extend the analog channel list. Select number of modules from drop down or manually enter any value (for example 5) in the edit box.



Forget PAD module option is made

There is no difference if modules are programmed via RS232 or USB. The only nice advantage in case of loss of power or USB is that Dewesoft (in store mode) will create event when communication with the modules is lost and (eventually) restored.



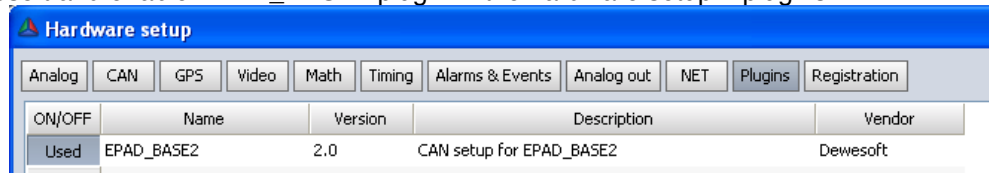
To use EPAD-BASE2 in other software packages, please use the RS232 port since the USB is only intended to be used inside Dewesoft. However you can use Dewesoft DCOM access to program the modules and read the data from the devices.

Please note that EPAD-BASE2 device can't be used together with DEWE-IRIG-CLOCK.

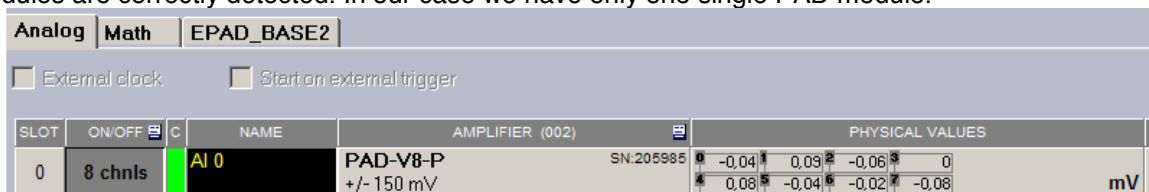
6.2 CAN output setup in Dewesoft

To set up and program the CAN output you need to copy the plugin EPAD_BASE2.dll found in `cd_drive:\install\driver\EPAD_BASE2\plugin` folder to the `c:\dewetron\program\dewesoft64\addons` folder.

Then run Dewesoft and enable EPAD_BASE2 plugin in the hardware setup – plugins.



Note that at least V2.0 of the plugin is needed for use in version 7. Please make sure that the device is connected through the USB and that the PAD modules are enabled. Then go to the channel setup and make sure that the PAD modules are correctly detected. In our case we have only one single PAD module.



Next go to the EPAD_BASE2 CAN configurator tab.

There are settings to select output CAN speed which can range from 31 kbaud to 1000 kbaud.

Next to it is RS232 (RS485) speed (needed for module scan and should be the same as detected from Dewesoft – noted below). The startup mode determines either the module will be in CAN or RS232 mode when switched on or when disconnected from Dewesoft. Number of scanned modules determines the maximum amount of PAD modules to read. More modules means more channels, but the start scan (where the device scans for connected modules) will be slower. Data format for each channel can be Intel or Motorola 2 or 4 bytes wide.

All these settings are valid only after “Write to device” button is pressed.

When the channels are correctly configured, we could export the standard DBC file by pressing “Save file” button. We can also choose to store the DBC for all found PAD channels or only for those one selected. However the device will transmit all found modules.

Please note that if the setup panel is not available, the module interface is not switched on or is set to work through RS232 or Orion interface.



When all the settings are done, the device can be disconnected from Dewesoft.

6.2.1 CAN data overview

To show how the CAN data looks like, we used Dewesoft CAN interface. First let's load the DBC library previously created by the import. We see four messages on the bus. Each channel is transmitted as a 32 bit integer value, so we need four messages to transmit eight channels from a PAD module. The module with address zero will have Arb ID 1000, 1001, 1002 and 1003 (decimal). Modules with address 1 will have 1010, 1011, 1012 and 1013 and so on.

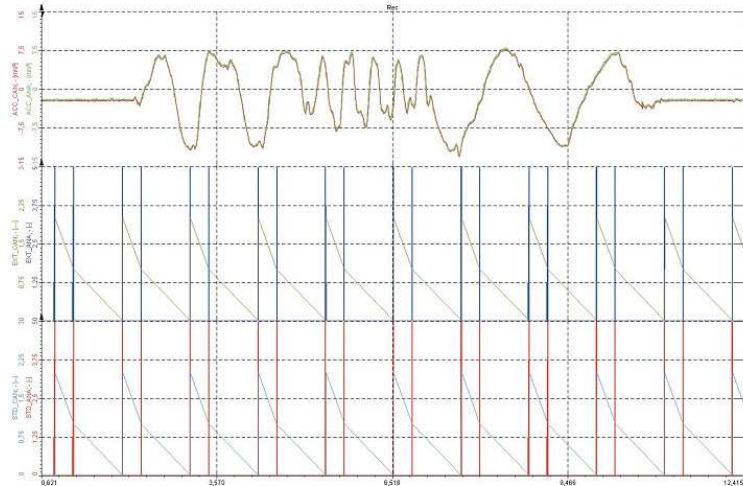
EXP	ARB	ON/OFF	NAME	VALUE	SETUP
+	1000 26 Hz	Unused	PAD00_Ch0_Ch1	00 00	Setup
+	1001 26 Hz	Unused	PAD00_Ch2_Ch3	00 00	Setup
+	1002 26 Hz	Unused	PAD00_Ch4_Ch5	00 00	Setup
+	1003 26 Hz	Unused	PAD00_Ch6_Ch7	00 00	Setup

Because the EPAD-BASE2 is already connected, we can see live data on those messages already. If we switch to channel view, we can see live data from the current measurements. The scaling factors depends on the setup of PAD module in Dewesoft, therefore it is recommended to use the DBC library.

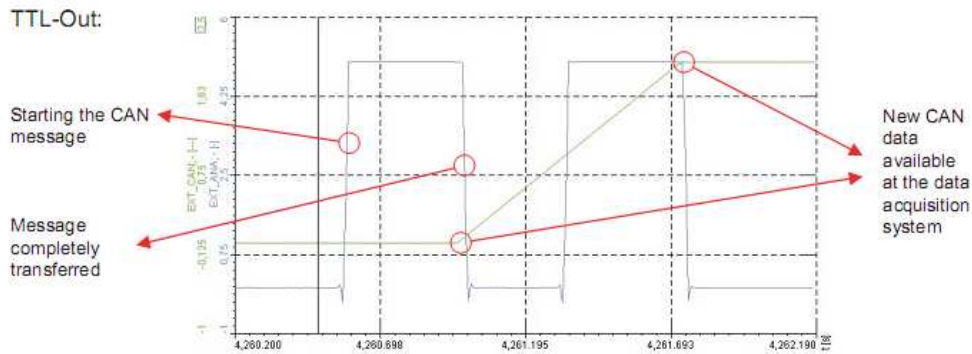
ARB	ON/OFF	NAME	VALUE	SETUP
3E8h (0 .. 31)	Used	Ch_0_Sub_0	0	[mV] Setup
3E8h (32 .. 63)	Used	Ch_0_Sub_1	0.005	[mV] Setup
3E9h (0 .. 31)	Used	Ch_0_Sub_2	-0.015	[mV] Setup
3E9h (32 .. 63)	Used	Ch_0_Sub_3	0	[mV] Setup
3EAh (0 .. 31)	Used	Ch_0_Sub_4	-0.025	[mV] Setup
3EAh (32 .. 63)	Used	Ch_0_Sub_5	-0.04	[mV] Setup
3EBh (0 .. 31)	Used	Ch_0_Sub_6	0.02	[mV] Setup
3EBh (32 .. 63)	Used	Ch_0_Sub_7	-0.015	[mV] Setup

6.3 CAN tester output

The picture beyond shows some data recorded with DEWESoft. The first recorder shows the analog and CAN output of the acceleration sensor. At both diagrams below the TTL output and CAN messages are compared together. One recorder shows an extended and the other a standard identifier message.



Zooming into the recorder gives an idea of the exact timing relation.



CAN data output format (*always unsigned Intel*)

Identifier (Name, No.)	Channel name	Startbit	Length	Datatype	Scaling (kx+d)	Range
Acceleration, 14h	ACC_CAN	6	10	unsigned, Intel	0.0479, -24.525	±20 m/s ²
Extended, 28h	EXT_CAN	56	2	unsigned, Intel	1	0...2
Standard, 29h	STD_CAN	56	2	unsigned, Intel	1	0...2

Analog output

Output level: 0...5 V

Range: ± 20 m/s²

Sensitivity: 0.1019 V/m/s² (±5%)

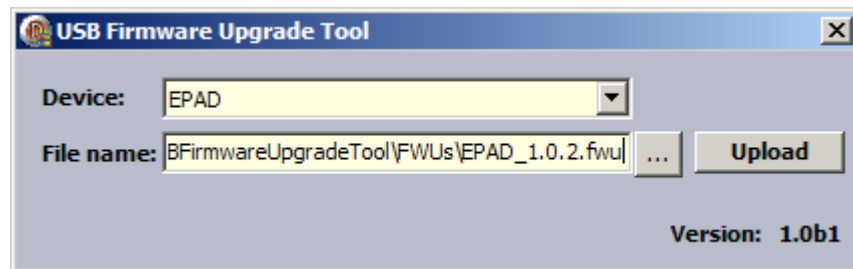
Offset: 2.5 V (±0.2 V)

Please note that during the installation of DEWESoft 6.2 a sample setup (DEWECanTest.dss) for the EPAD-BASE2 and also the CAN library (EPAD-BASE2_v2.dbc) is automatically installed.

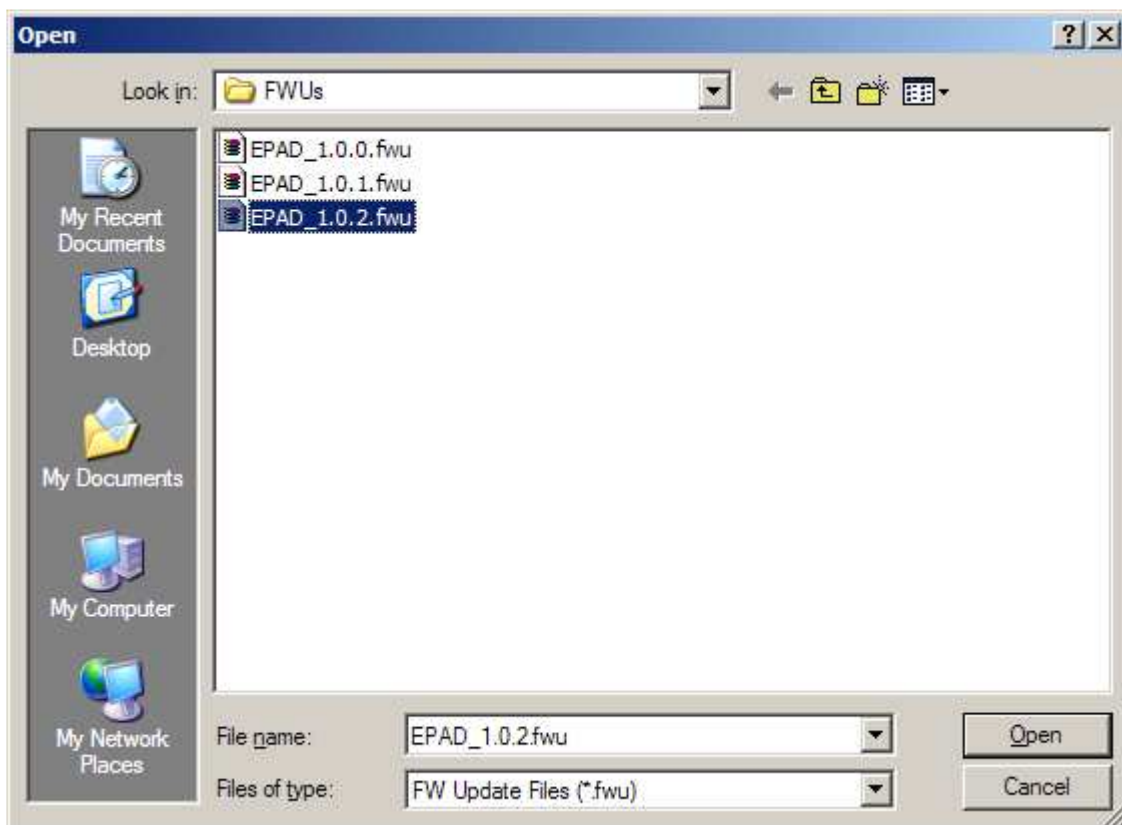
7 Firmware upgrade

To make firmware upgrade of the device, please connect EPAD_BASE2 to power and then with the USB cable to the computer. It is assumed that the drivers are already installed.

Please download the latest firmware from Dewetron web site. Then run “USB Firmware Upgrade Tool” program from `cd_drive:\install\driver\EPAD_BASE2\firmware`
Next select EPAD in the “Device” combo box.

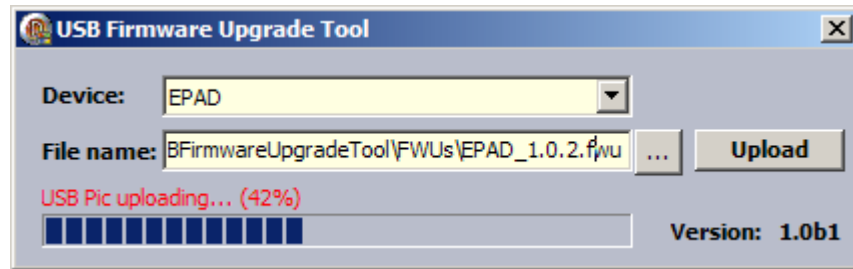


Press “...” button, select EPAD_xxx.fwu file and click open.



EPAD-BASE2

Press Upload button and wait until progress bar reaches 100%. Please don't interrupt this operation.



When upload is finished, press OK and new firmware is uploaded on the device. If this fails for any reason, repeat the upload process again.