

- English -



2008

The 2D lambda controller units - Operating manual -

Table of content

TABLE OF CONTENT	2
1. THE 2D LAMBDA CONTROLLER UNITS: BC-LSUX-4.Y-000	4
1.1 CONTROLLER TYPES	4
1.2 CAN BUS INTERFACE - OUTPUT.....	4
1.3 TWO CHANNEL LAMBDA CONTROLLER UNIT (BC-LSU2-XX-000).....	4
1.4 FOUR CHANNEL LAMBDA CONTROLLER UNIT (BC-LSU4_XX-000).....	5
1.5 VALUES AND ERROR CODES	5
2. ADJUSTMENTS IN THE COMMUNICATION TOOL WINIT:.....	6
2.1 LOGGING THE DATA IN A 2D LOGGER	6
2.1 CHANGING THE TYPE OF LAMBDA PROBE IN THE MODULE.....	6
2.2 AUTOMATIC PROBE TEMPERATURE CONTROL.....	7
3. LAMBDA PROBES	8
3.1 MOUNTING THE LAMBDA PROBE	8
3.2 CONNECTING THE LAMBDA PROBE	8

Preface:

On the following pages you will find the basic settings for your 2D-Software.

In order to work with the 2D-Software the best way possible, you should read the instructions carefully and follow them step by step.

Please note:

The settings described in *First Steps* are only the basic settings. For further information please consult the Handbook or the Help.

Symbols used in the text



In the paragraphs highlighted with this symbol, you will find tips and practical advice to work with the 2D-Software.



In the paragraphs highlighted with this symbol, you will find additional information and it is very important that you follow the instructions given.

2D Debus & Diebold
Meßsysteme GmbH
Alte Karlsruher Straße 8
76227 Karlsruhe
Tel.: +49(0)721 94485-0
Fax: +49(0)721 94485-29
EMAIL: mail@2D-datarecording.com
Homepage: <http://www.2D-Datarecording.com>
Homepage: <http://www.2D-Kit-System.com>

1. The 2D lambda controller units: BC-LSUx-4.y-000



The 2D lambda controller unit is very powerful device to control Bosch 4.2 und 4.9 lambda probes. It controls and measures dynamically heater temperature. Air/Fuel ratio is precisely measured to be used as input for engine managements and data logging. All values are given as CAN bus values with a user definable CAN ID.



Do not communicate with the lambda controller while it is in use as communication interrupts the processor and false sensor readings will be shown. In order to observe the sensor output while in use copy the channels from the lambda module to a CAN-logger and supervise these values.

1.1 Controller types

2D offers various control units depending on the amount and type of probes. In the following text all controllers will be abbreviated with BC-LSU.

Order code	description	probe
BC-LSU2-4.2-000	2 probe unit for Bosch 4.2 probes	SA-LSU4.2-000
BC-LSU4-4.2-000	4 probe unit for Bosch 4.2 probes	SA-LSU4.2-000
BC-LSU2-4.9-000	2 probe unit for Bosch 4.9 probes	SA-LSU4.9-000
BC-LSU4-4.9-000	4 probe unit for Bosch 4.9 probes	SA-LSU4.9-000

Table 1 : The different 2D lambda controller units - order codes

1.2 CAN BUS Interface - Output

The BC-LSU module sends the CAN-parameters depending on the maximum set sampling rate. You have the possibility to use another CAN-ID when you change it in the WinIt program <BC-LSU> <Interfaces> <CAN>

1.3 Two Channel lambda controller unit (BC-LSU2-xx-000)



The default CAN-ID for the A/F value is 0x7B0. Check in the appendix for specific information of individual modules.

The A/F value will be send as **16-bit unsigned Integer** (Big Endian Motorola Format) and the heating + temperature values as **8-bit unsigned Byte**:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x7B0	A/F1	A/F2	Temp1	Temp2	Heat1	Heat2		

Table 2: Standard CAN-ID, 2 Channel LSU

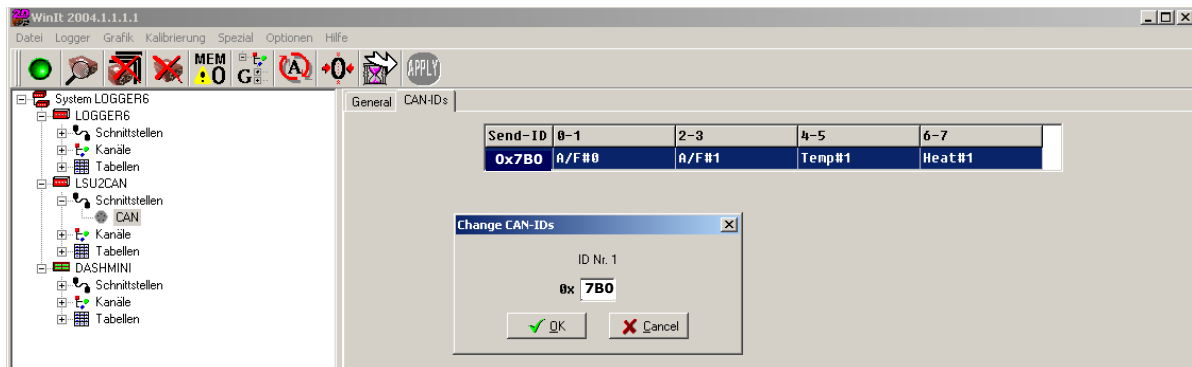


Figure 1: Changing the CAN-ID (2 Channel LSU)

1.4 Four Channel lambda controller unit (BC-LSU4_xx-000)



The default CAN-ID for the A/F value is x7B8. Temperature and Heating value are sending on x7B0. Check in the appendix for specific information of individual modules.

The A/F value will be send as **16-bit unsigned Integer** (Big Endian Motorola Format) and the heating + temperature values as **8-bit unsigned Byte**:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x7B0	Temp1	Temp2	Temp3	Temp4	Heat1	Heat2	Heat3	Heat4
0x7B8	A/F1		A/F2		A/F3		A/F4	

Table 3: Standard CAN-ID, 4 Channel LSU

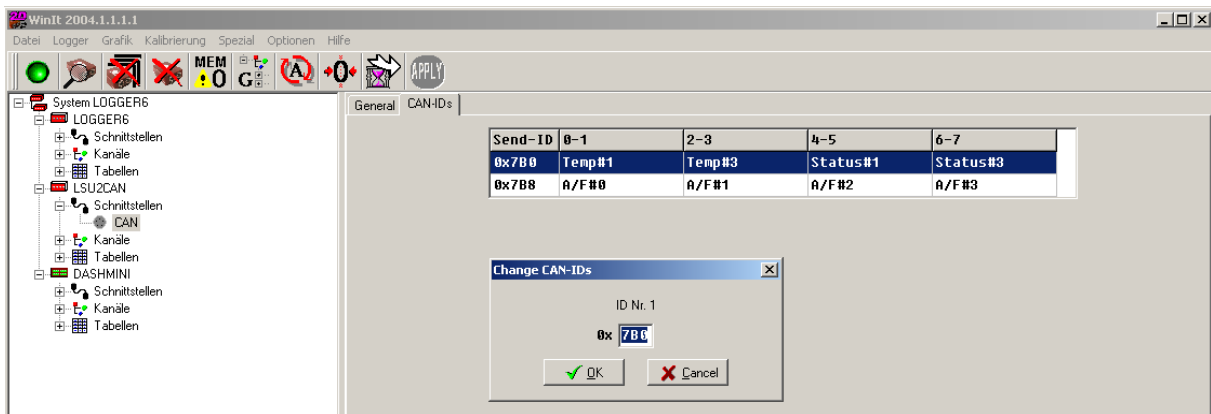


Figure 2 : Changing CAN-ID (4 Channel LSU)

1.5 Values and error codes

- **The displayed probe temperature is not equal to the exhaust gas temperature!**
- If the LED on the rear of BC-LSU box is blinking, the regulation of the probe temperature is active, otherwise the probe temperature is not regulated.
- The probe temperature is displayed in values between 540°C and 1050°C
- The Heat channel shows the heating value for the probe (denoted in %)
- If probe temperature is below 600°C the channel shows the status as shown in table 3.

A/F (λ- value)	Description
0.016	The probe temperature is below 600°C.
0.100	Probe is not connected <u>or</u> short circuit to GND
0.110	Open load (probe is not connected)
0.120	Short circuit to Vbatt
0.3	In the automatic mode – “no CAN data”
1.0	The probe temperature is below 600°C after the heating phase (approx.. 20sec.) → measurement is not possible
2.0	The probe is heating during the start
3.0	In the automatic mode the A/F-value measuring (λ-value measuring) is off according to the switching value
10.0 – 38.0	measurement range

Table 4: Values on Channel A/F and error codes

2. Adjustments in the communication tool WinIt:

2.1 Logging the data in a 2D logger

The module “BC-LSUx-4.y-000” sends data via CAN-Bus. To record these data in the logger following steps have to be done:

- Supply the Logger and the BC-LSU with power and connect to the PC
- Start WinARace and the communication tool WinIt via **<Logger>** or hotkey **<F2>**
 ⇒ in the left screen you will see the 2 red modules
- Copy the analog channels of the BC-LSU module in the CAN-path of your logger and confirm with **<Apply>**

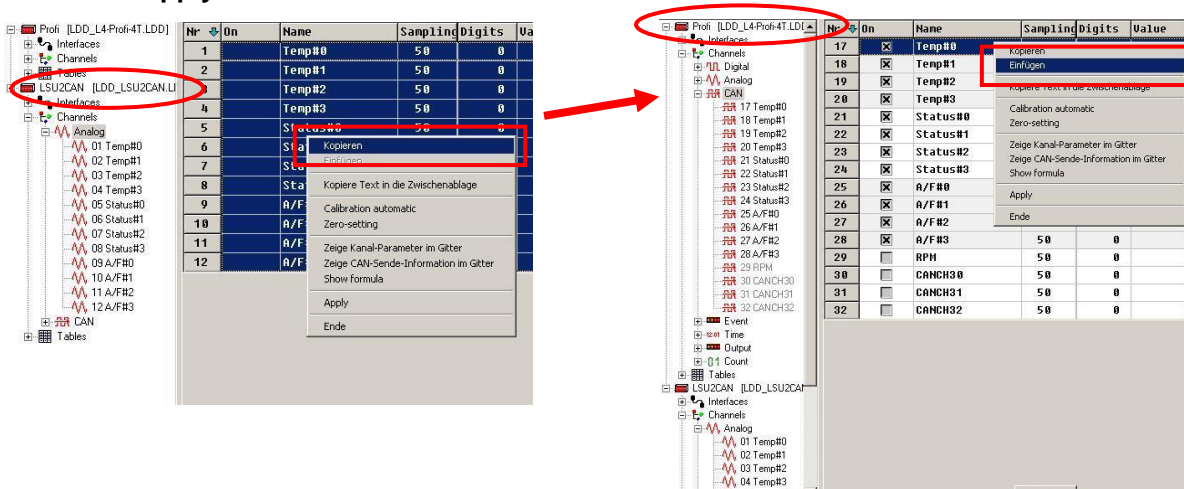


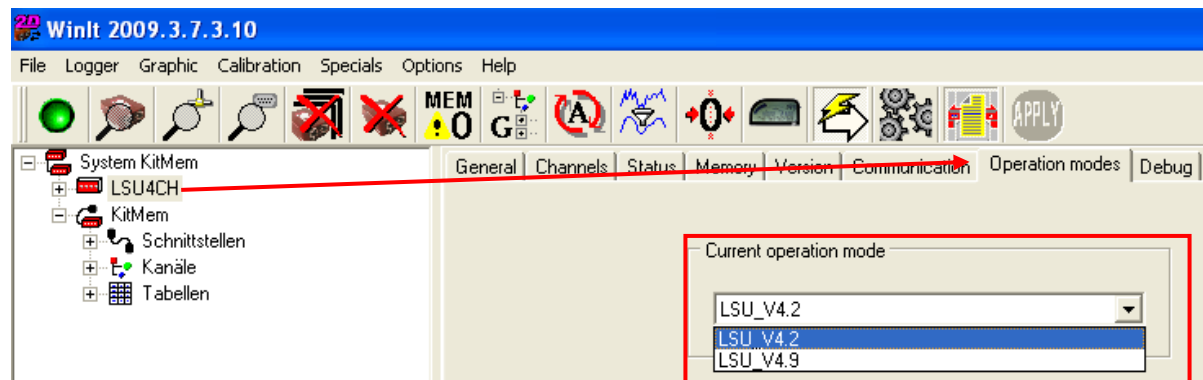
Figure 3: Parametrization of the 2D lambda controller unit in WinIt

2.1 Changing the type of lambda probe in the module



For Lambda 4.2 and 4.9 probes different settings have to be applied to the lambda unit. This is done automatically by choosing the used type of probe.

Click on the lambda module and on the tab **<Operation modes>**. Choose the used probe type and confirm your action with **<Apply>**.



2.2 Automatic probe temperature control

- In the CAN-In path of the “BC-LSUx-4.y-000” you’ll find a trigger input channel to start heating the probes. To set this start condition, copy the RPM-channel of your source module (e.g. logger) into the CAN-path of your BC-LSU.
 If the probe heating should only be triggered by temperature set CAN ID 000 (<CAN> <CAN-In > <Parameter> otherwise fill in the ID that RPM is send on the connected CAN bus with the used bytes in the correct order.

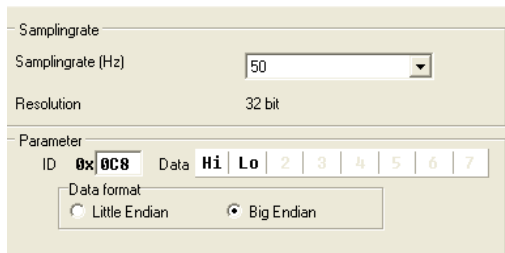


Figure 4: Setting the CAN Parameter

- It is useful to set this heating to start above 1500 RPM, so the battery is saved when the engine is not running. Select this RPM- channel and click on the <Analyse> tab. Type in the switching RPM (eg. -1500) in the <Offset> using the “-“ minus in front !

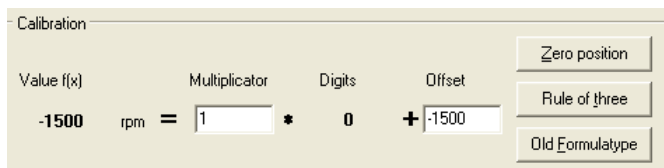


Figure 5: Specifying the Offset



When the physical value <value f(x)> is greater than 0 and the probe temperature is below 600°C, the heating starts working. Setting the offset to:-1500 means the heating starts at 1500 RPM because the value f(x) is equal to 0 at digits 1500.

- Send these adjustments to the BC-LSU by clicking <Apply>

3. Lambda Probes

The **2D** High-Quality Lambda probe has the following advantages:

- The linear voltage output makes it possible to measure the real λ - value (or A/F)
- A control of probe temperature holds the probe temperature on a constant level
⇒ reduces the fiducial error of the measurements at different probe temperatures
- It is possible to compare the data between other probes and other vehicles

3.1 Mounting the lambda probe

Mount the lambda probe in the exhaust pipe of your vehicle, paying attention to protect it as much as possible from crash damage. The end of the probe should be directly in the exhaust gas flow. Most racing pipes have a metal fitting to screw the probe into. If your pipe does not have a fitting, you must weld in a fitting with an inner thread of M18x1,5.



Figure 6: Bosch LSU 4.2

In most cases it is usual to fit the probe in or after the collector, so one probe measures gas from all cylinders. If you need more exact measurements you can fit 2 or 4 separate probes in the manifolds. In most cases (eg. for 4-cylinders) you can choose just one inner and one outer pipe for meaningful results.

Mount the box BC-LSU with velcro tape in a position to avoid crash damage. Pay attention that the housing does not vibrate on the chassis or other surfaces (severe vibration will damage the box).

3.2 Connecting the lambda probe

Connect the 5-pin connector with the CAN-Bus (e.g. on your CAN-Hub). The 6-pin connector will be connected with the lambda probes. For power supply connect the black wire to vehicle ground and the red wire to a switched positive (+12V) power.



Please note that the current consumption is a maximum of 2A per probe! When you connect the cables directly to the battery, use a slow 10A fuse.