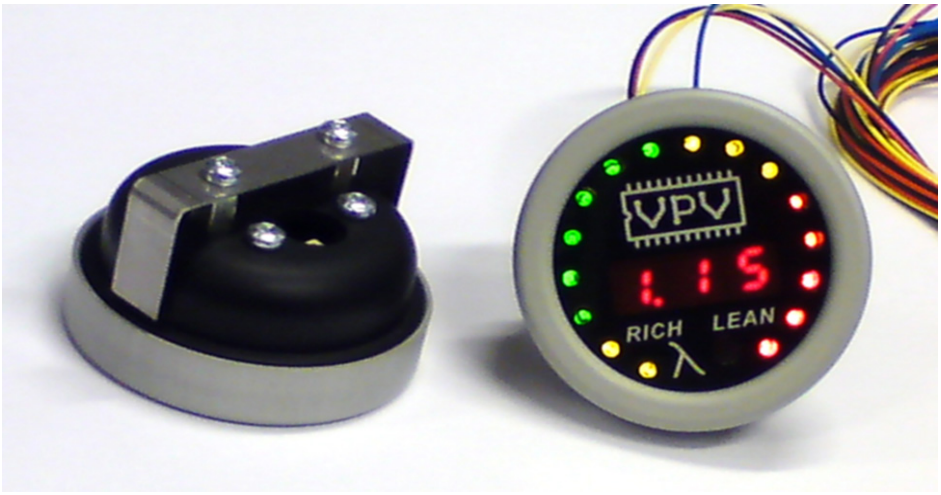

WB-DISPLAY USER MANUAL

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1. GENERAL

WB-Display has been designed for usage together with Innovate LC-1 module. WB-Display has 12V operating voltage and its differential measurement input is designed for 0-5V signal. Due to differential input it has very good accuracy even when ground potential errors normal to automotive environment are present. Both measurement and operating voltage inputs has been designed to handle voltage transients typical to automotive systems.

1.1. SPECIFICATION

- **Input voltage/lambda relationship / measuring range: 0,5V = λ 0,75, 4,5V = λ 1,15**
- **Differential input offset voltage: Max ±5V**
- **Operating voltage: 6-16Vdc**
- **Current consumption: 60mA max**
- **Polarity protection: -16Vdc continuous, -45V t<20ms**
- **Operating voltage transient: +40V t<20ms**
- **Operating voltage transient, power: 600W max, 10/1000us**
- **Internal fuse protection: 2 x F2A**
- **Operating temperature range: -40 - +85°C (-40 - +185°F)**
- **Measurement accuracy: ±0,01 λ-units**
- **Outer LED circle colours: Yellow, green, orange and red**
- **Outer LED circle lambda values: 0.75, 0.80, 0.82, 0.84, 0.86, 0.88, 0.90, 0.92, 0.94, 0.96, 0.98, 1.00, 1.02, 1.05, 1.10, 1.15**
- **Colour options for 7-segment display: red, yellow and orange**
- **Display update rate: 5 x/s**
- **Display brightness control: Automatic**
- **Dimensions (∅ x Depth): 44 x 28mm**
- **Installation hole diameter: ∅ 38mm**
- **Ingress protection class: IP20**
- **Weight: 35g**
- **Mating connector, frame: MOLEX Picoblade, 51021-0400**
- **Mating connector, socket: MOLEX Picoblade, 50079-8100**

2. INSTALLATION

2.1. MECHANICAL INSTALLATION

Because of high quality components used in the WB-Display it can be used in both cold and hot environment. Display unit is not weatherproof so it can only be used in dry non-condensing environment.

Mechanical installation is easiest done using supplied fixing kit. Assembly hole should be round hole, diameter 38mm (1.5 inch).

Individual LEDs in the outer circle has narrow cone type light output. Because of this the display should be installed so the front of the display is directly pointed towards the driver eyes.

Wire harness has some delicate wires and connectors; great care should be used when assembling wires.

2.2. ELECTRICAL INSTALLATION

WB-Display needs +12V feed and ground for basic operation. +12V feed to wire harness *ORANGE* cable should be taken from some low transient location. Near starter, alternator or ignition coil is not suitable. Voltage transients and disturbances in these locations may cause permanent failure to the unit and in milder cases it can cause measurement errors and some other malfunctioning. Grounding (wire harness *GREY* cable) is best when done using shortest possible cabling and good quality connector.

Measurement input of the WB-Display is differential and it can adopt some grounding errors between LC-1 and WB-Display. This potential error can be measured between grey and green cable of the display and it can have a maximum value of ±5V. Please remember to connect both input wires; otherwise there will be a massive measurement error.

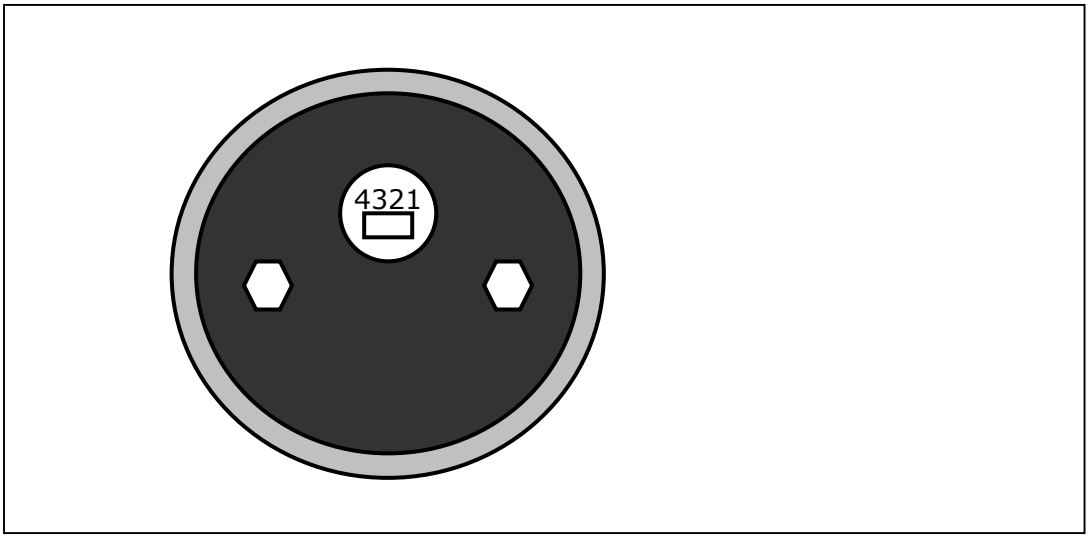
Best accuracy will be achieved when WB-Display input ground wire (green wire) is connected very close to LC-1 grounding wire according to Picture 1.

Positive input (white wire) should be connected directly to LC-1 analog output wire.

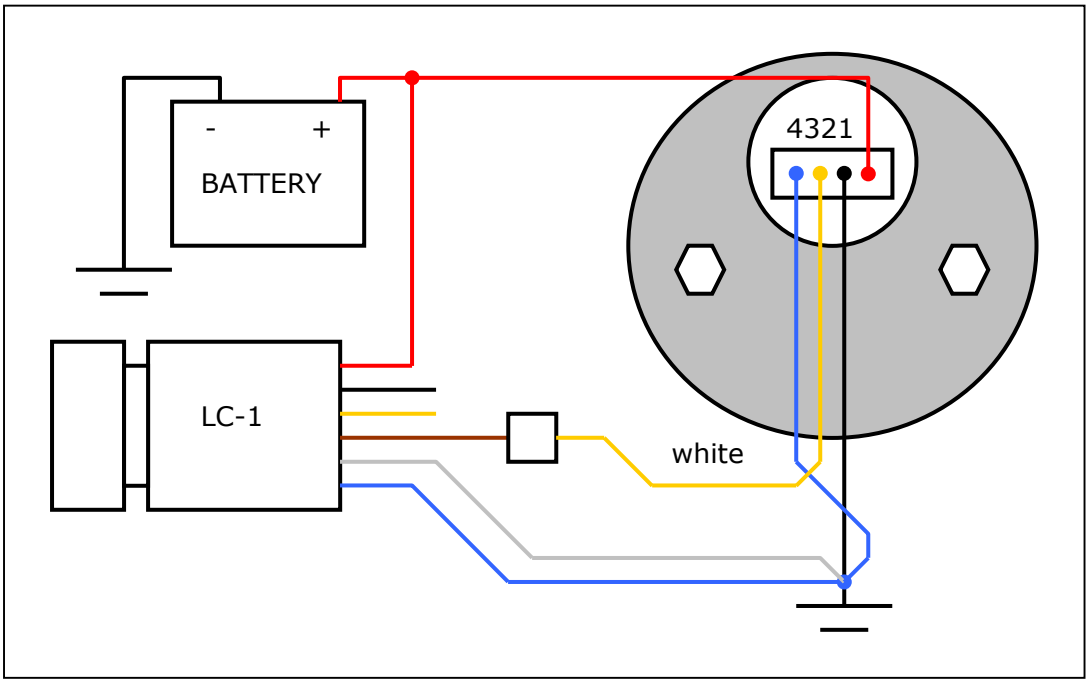
Input impedance of the WB-Display is 450 kΩ, so it causes no harmful loading of the LC-1 0-5V analog output.

Pin number	Signal	Cable colour
1	+12V	RED
2	Ground / -	BLACK
3	INPUT +	YELLOW
4	INPUT -	BLUE

Table 1 Pinning



Picture 1 WB-Display, connector pinning. Seen from the backside



Picture 2 WB-Display and Innovate LC-1 electrical connection

2.3. INNOVATE LC-1 OUTPUT PROGRAMMING

To get correct displayed lambda value, Innovate LC-1 module must be programmed to give suitable voltage from its output (Analog Out 2). Programming should be done using LM Programmer software supplied by Innovate Motorsports.

Please note that this programming is different from standard values supplied by Innovate Motorsports!

Innovate LC-1 output programming: 0,5V = λ 0,75, 4,5V = λ1,15

With this same software you can adjust some other values in LC-1 module. It is good practice to program the analog output so it gives constant 5V when sensor is heating or there are some errors in the operation of the LC-1. This gives 'lean' indication when something is wrong and driver will be warned before any engine failures etc.

It is also possible to change the update rate of the LC-1 output. 'INSTANT' gives fastest response but sometimes slower value may be needed for better display readout clarity.

3. OPERATION

3.1. NORMAL USAGE

WB-Display is ready to use after installation. Display is permanently programmed to display lambda-value; AFR display value is not possible.

WB-Display has automatic brightness control. Sensor is located in the front panel, on right side below 'LEAN'-text.

4. WARRANTY

WB-Display has a full one (1) year warranty from the date of the purchase. Warranty includes component failures and workmanship. Not included are natural wear, usage against specification and Force Majeure -type failures. Warranty does not include failures in other systems connected to WB-Display, it is assumed that the end-user of the WB-Display has skills necessary to assemble and analyze the product so it causes no risk to any other systems even in cases of malfunction and failure. Warranty is valid also in competition use.