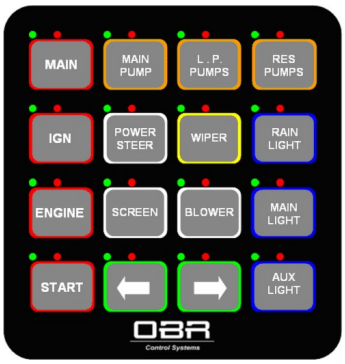
Membrane Switch Panel

MSP

The Next Generation Intelligent Switch Panel Module

Installation and User Guide for MSP
Firmware and Tool Version 2.9



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Version 2.9 – August 2026

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1 Membrane Switch Panel

OBR's membrane switch panels can be supplied with from 8 and up to 20 individually programmable switches.
OBR membrane panels are all backlit using an EL layer.
The panel can be configured with up to 10 individually programmable CAN exports and can control a wide variety of external modules.
Each MSP is highly configurable:

- Each switch can be configured as being either momentary or latching
- Initial switch status selectable as being either ON or OFF
- Each switch can have up to 8 individually programmable stages
- Switches can be arranged in groups
- 3 spare 0..5V analogue inputs
- Green LEDs display switch status, linked to switch or feedback from PCM output channel
- Red LEDs displays output channel error status or any user defined warnings
- ON and OFF activation timers for each switch
- Each key can be assigned to several CAN addresses
- Up to 10 independent definition of CAN identifiers
- Adjustable EL backlight and LED intensity

1.1 Software installation

There is no software to be installed. The program can ne run directly from the files supplied.
Make sure the program file "MSP_200.EXE" is located in a folder which must also contain these files:

- CANSWITCON.INI
- PCANBASIC.DLL

When the software is installed, right-click the MSP icon and select Properties. Now select Compatibility and tick the box "Run the program as an administrator".

1.2 Connection to system

Communication with the MSP is established using either a Peak System PCAN interface or EFI Technology's EFP02 and EFT20 CAN communication interfaces.
OBR or your wiring loom manufacturer can provide you with the cable suitable for your installation and selected connectors.
The mating communication connector required is a Deutsch ASL6-06-05 SN connector:

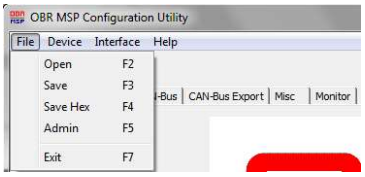
- Pin 1 = CAN L
- Pin 2 = CANH
- Pin 3 = Ground
- Pin 4 = Battery power
- Pin 5 = Optional wake-up signal to OBR Master Switch

Connect the CAN interface to your PC and as soon as the CAN interface is plugged into the CAN connector, it will automatically establish communication with the MSP.

1.3 Main Menu

The Main Menu contains three sections, FILE, DEVICE, INTERFACE and HELP.

1.3.1 File

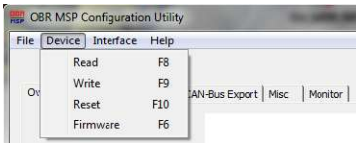


Click on Open (or press **F2**) to load a configuration from disc.

Click on Save (or press **F3**) to save a configuration to disc.

Save Hex is an OBR feature only.

Admin is an OBR feature only.



Click on Exit (or press **F7**) to c lose the MSP tool.

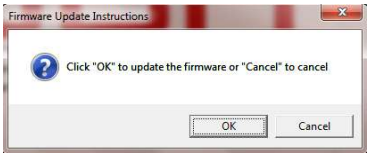
1.3.2 Device

Click on Read (or press **F8**) to read a configuration from the MSP.
Reading the configuration from the panel, the following information is displayed:
- Controller serial number.
- Panel version (keypad configuration).
- Hardware version, 1 (version 2009 to 2014) or 2 (the revised controller from 2015).
- Panel user name.

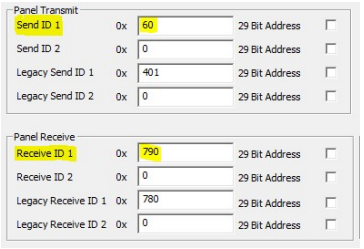
Click on Write (or press **F9**) to send a configuration file to the MSP.
The panel will reset and use the new configuration.

Click on Reset (or press **F10**) to reset the controller manually.

1.3.2.1 Firmware Update

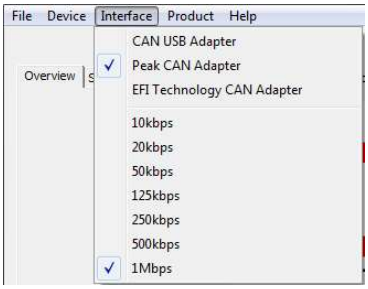


It is possible to update the current version of firmware with new releases.
Click on Firmware (or press **F6**) to locate the firmware BIN file and click OK to load the firmware into the programmer.
The Firmware Update Instructions window opens, click OK to update the firmware in the controller.
Please note that firmware can **only** be updated if the tool and controller are set to communicate on addresses **0x60** (Panel Transmit, Send ID1) and **0x790** (Panel Receive, Receive ID1).



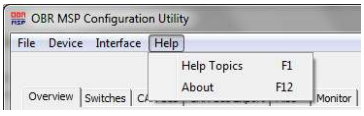
IMPORTANT: You must send the MSP configuration file to the panel after having updated firmware.

1.3.3 Interface



In this section you can select:
- Type of interface used, Peak or EFI Technology
- Baud rate used, select between 10 kbps up to 1 Mbps.

1.3.4 Help



- Click on Help Topics to open the help file.
- Click on About to check MSP software version.

1.4 Switches

1.4.1 Position and Numbering

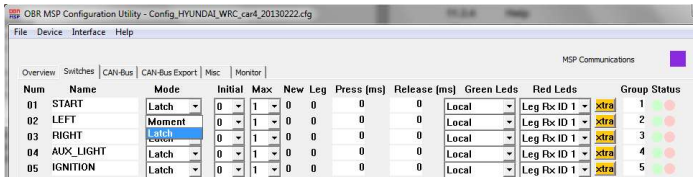
Panels are available with different layouts, but the switches are numbered according to this 20-key example matrix. Bytes are numbered 0..7:

Switch 17	**Switch 18**	**Switch 19**	**Switch 20**
Switch 13	**Switch 14**	**Switch 15**	**Switch 16**
Switch 9	**Switch 10**	**Switch 11**	**Switch 12**
Switch 5	**Switch 6**	**Switch 7**	**Switch 8**
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**

Please note that switches #4, #8 and #12 do not exist in with the panels having 9 and 12 switches.
- 9-key panel uses switches #1-2-3-5-6-7-9-10-11
- 12-key panel uses switches #1-2-3-5-6-7-9-10-11-13-14-15

1.4.2 Switch name

Key in the name of each switch.
A maximum of 15 characters including spaces can be used.



1.4.3 Mode

Select the key mode as latching or momentary.
In latching mode the key is ON when pressed. Press again to switch OFF.
In momentary mode the key is ON only when pressed and hold pressed.

1.4.4 Initial

Each switch can have up to 8 selectable switch levels.
In standard switch mode, a switch can be OFF (status = 0) or ON (status = 1).
In advanced switch mode, a switch can be OFF (status = 0) or on with up to 7 switch levels (status = 1..7).
Set the level applied automatically when the membrane panel is powered on.
Please refer to section 11.5 for information about the different CAN modes.

1.4.5 Max

Select the maximum available switch levels.

1.4.6 New / Leg

Displays the switch status for both standard and advanced switch mode.

1.4.7 Press / Release

Set the time delay for switching ON or OFF.
Select 0 if no time delay for the switch action is required.

1.4.8 Green LED's

Select the activation condition for the green LED for each switch.
Available modes are:

- **Local** = Turn LED on when switch is pressed.
- **Leg RX ID1** = Receive trigger signal from for example a PCM2.
  The LED will turn on when PCM2 confirms output is switched ON.
  Typically selected when the car has a single PCM2.
- **Leg RX ID2** = Receive trigger signal from for example a PCM2.
  The LED will turn on when PCM2 confirms output is switched ON.
  Typically selected when the car has dual PCM2's.

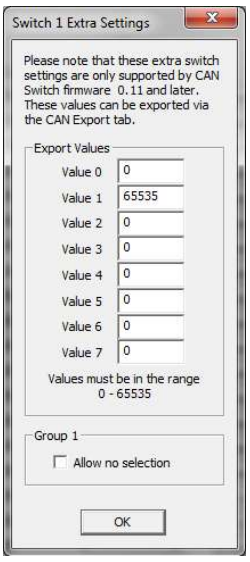
1.4.9 Red LED's

All red LED's will be ON if the membrane panel detects errors on the CAN bus.

Select the activation condition for the green LED for each switch.
Available modes are:
- **Local** = Disabled.
- **Leg RX ID1** = Receive trigger signal from for example a PCM2.
  The LED will turn on when PCM2 confirms the output is in fault mode.
  Typically selected when the car has a single PCM2.
- **Leg RX ID2** = Receive trigger signal from for example a PCM2.
  The LED will turn on when PCM2 confirms the output is in fault mode.
  Typically selected when the car has dual PCM2's.

1.4.10 Extra / Group

In addition to the regular CAN export, the panel may perform a secondary CAN export.
It is possible to define up to 8 additional CAN export packages, each can be defined as single byte or word. Individual identifiers can be assigned for each of these 8 packages.
Please see section 11.5 for further information on the CAN definition.

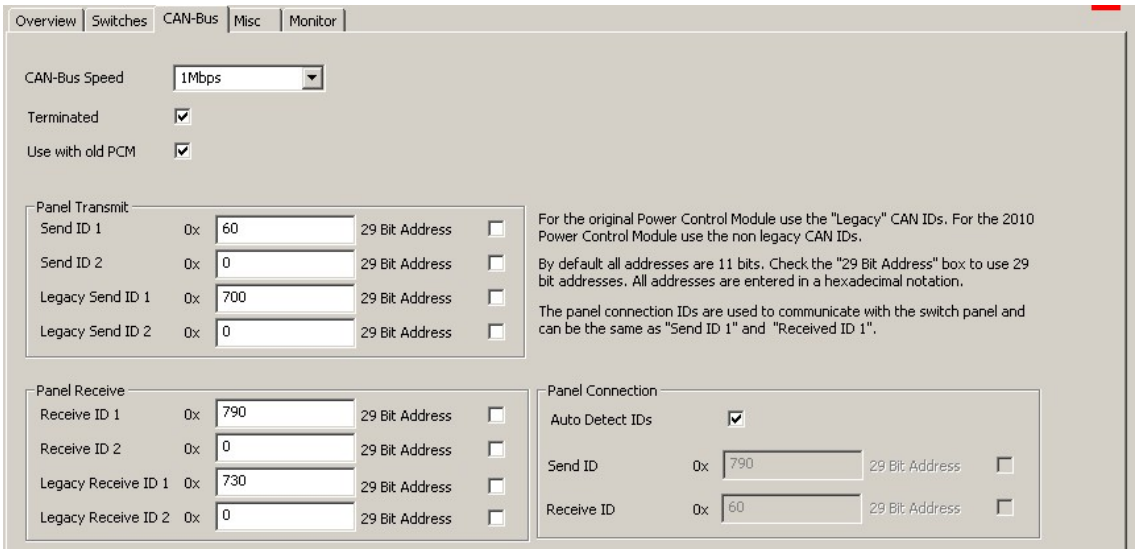


Click the **XTRA** button to access the switch condition for this feature.
Select the individual values to be assigned with each of the up to 8 switch levels.
If values up to 255 are used, data can be exported as a single byte.
If values between 256 and 65,535 are used, data is exported as a word (2 bytes).
Use the value 0 to define a level not used.
Furthermore, switches can be arranged in **groups**. By default, each switch represents its own group, but by joining for example two switches in a single group, it is possible to switch between two functions by pressing one or the other button. Pressing the second button will cancel the status of the first button and vice versa.
Pressing one of the buttons in a group will activate the switch, pressing it again will deactivate it. By un-ticking the group option "Allow no selection", it is no longer possible to turn the switch off unless any other switch in the group is pressed.
A switch can only belong to a single group.

1.4.11 Status

This column displays the status of the green and red LED's.

1.5 CAN Bus



Standard CAN Protocol – Transmit from MSP

Tick the box “Use with old PCM”. In this condition switch commands are transmitted on the CAN bus in the following manner. Please note that bits and bytes are numbered from 0..7.

- Switch 1 transmits on byte 7, bit 0 (absolute bit number 56).
- Switch 2 transmits on byte 7, bit 1 (absolute bit number 57).
- Switch 3 transmits on byte 7, bit 2 (absolute bit number 58).
- Switch 4 transmits on byte 7, bit 3 (absolute bit number 59).
- Switch 5 transmits on byte 7, bit 4 (absolute bit number 60).
- Switch 6 transmits on byte 7, bit 5 (absolute bit number 61).
- Switch 7 transmits on byte 7, bit 6 (absolute bit number 62).
- Switch 8 transmits on byte 7, bit 7 (absolute bit number 63).

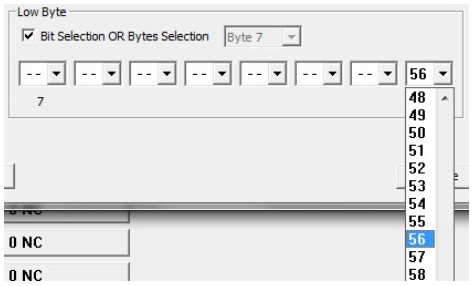
- Switch 9 transmits on byte 6, bit 0 (absolute bit number 48).
- Switch 10 transmits on byte 6, bit 1 (absolute bit number 49).
- Switch 11 transmits on byte 6, bit 2 (absolute bit number 50).
- Switch 12 transmits on byte 6, bit 3 (absolute bit number 51).
- Switch 13 transmits on byte 6, bit 4 (absolute bit number 52).
- Switch 14 transmits on byte 6, bit 5 (absolute bit number 53).
- Switch 15 transmits on byte 6, bit 6 (absolute bit number 54).
- Switch 16 transmits on byte 6, bit 7 (absolute bit number 55).

- Switch 17 transmits on byte 5, bit 0 (absolute bit number 40).
- Switch 18 transmits on byte 5, bit 1 (absolute bit number 41).
- Switch 19 transmits on byte 5, bit 2 (absolute bit number 42).
- Switch 20 transmits on byte 5, bit 3 (absolute bit number 43).

In PCM2 a CAN input for a dedicated switch can be configured to display 0 or 1 when toggling between ON and OFF. When reading data from the CAN bus, any switch position can be allocated to any bit position in the CAN input byte. Having the CAN input to toggle between 0 and 1, allocate the switch status from the CAN bus to bit position 0, leaving all other bits unallocated in the byte.

Again, with PCM2 for example, to define a CAN input for switch 1, you can proceed this way:

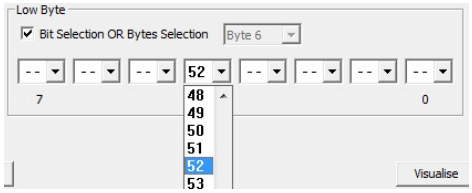
- Define the identifier for the byte in which to look for MSP key status.
  NOTE: Maximum value is 7FF when using an 11 bit identifier.
- Do not assign any other data channels to this byte.
- In section *Low Byte* un-tick “Bit Selection OR Byte Selection”.
- Click on the arrow down and select the byte containing the data information, byte 7.
- Now tick the box “Bit Selection OR Byte Selection”.
- Click on the first bit window, “0”, and select “56”.
- Deselect reading of data from bits 1, 2, 3, 4, 5, 6 and 7 by selecting the option “- -“ from the scroll down menu for each of these bits.
  An easy way to proceed is to click once on one of the bit windows, then press END (now the selection “- -“ is displayed). Using the TAB key jump to the next bit, press END and then the TAB key again etc.
- The channel will display “0” when switch 1 is not activated and it will display “1” when the switch is activated.



Repeat the configuration for the other MSP keys, replacing the absolute bit value in bit position 0 with the absolute bit number from the channel you are configuring.

If you want the CAN input to display the decimal number related to its position within the byte you can alternatively configure the low byte this way, for example for switch 13:

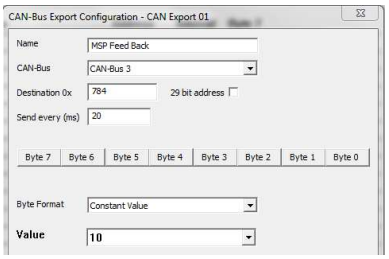
- Define the identifier for the byte in which to look for switch 13 status.
- Do not assign any other data channels to this byte.
- In section *Low Byte* un-tick “Bit Selection OR Byte Selection”.
- Click on the arrow down and select the byte containing the data information, byte 6.
- Now tick the box “Bit Selection OR Byte Selection”.
- Click on the fifth bit window, “4”, and select “52”.
- Deselect reading of data from bits 0, 1, 2, 3, 5, 6 and 7 by selecting the option “- -“ from the scroll down menu for each of these bits.
  An easy way to proceed is to click once on one of the bit windows, then press END (now the selection “- -“ is displayed). Using the TAB key jump to the next bit, press END and then the TAB key again etc.
- The channel will display “0” when switch 13 is not activated and it will display “16” when the switch is activated.

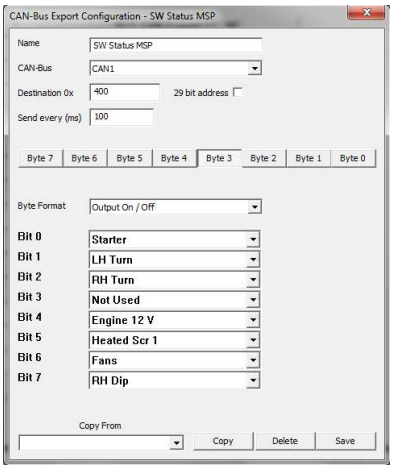


1.5.1 Standard CAN Protocol – Receive switch status from PCM2

The green LED's can be controlled either by the MSP by pressing a switch having selected "Local" in the MSP switch configuration or by a confirmation received from the powerbox that the related output is switched on. This is done by selecting "Leg RX".

NOTE:
To activate this feature in the membrane controller, you have to add the constant decimal value of "10" (or "0A" in hex) in byte 0 in the identifier transmitting the switch status from the powerbox.
The green LEDs are controlled by bit values in bytes 3, 2 and 1.
MSP will turn ON a LED if the received value is "1" and OFF if the received value is "0".





In PCM2 use the CAN Export to configure transmission of the output switch status to the membrane panel:

- Name the package.
- Select CAN bus on which the MSP is communicating.
- Set destination address (this must correspond with the receive address specified in MSP software).
  NOTE: Maximum value is 7FF for an 11 bit identifier.
- Select 11 or 29 bit identifier used.
- Select update interval in milliseconds.
- Click in byte 0 and select Constant Value, select "10".
- Click on byte 3 and select "Output On/Off" as byte format.
- For each bit select the output to monitor on MSP.
- Continue this configuration on byte 2 and 1.

To control the green LED's, the output switch status, transmitted from an external system, must be configured this way:

- Green LED on switch #1 receives on byte 3, bit 0.
- Green LED on switch #2 receives on byte 3, bit 1.
- Green LED on switch #3 receives on byte 3, bit 2.
- Green LED on switch #4 receives on byte 3, bit 3.
- Green LED on switch #5 receives on byte 3, bit 4.
- Green LED on switch #6 receives on byte 3, bit 5.
- Green LED on switch #7 receives on byte 3, bit 6.
- Green LED on switch #8 receives on byte 3, bit 7.

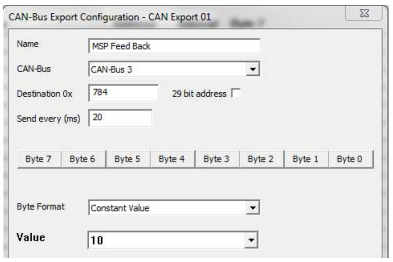
- Green LED on switch #9 receives on byte 2, bit 0.
- Green LED on switch #10 receives on byte 2, bit 1.
- Green LED on switch #11 receives on byte 2, bit 2.
- Green LED on switch #12 receives on byte 2, bit 3.
- Green LED on switch #13 receives on byte 2, bit 4.
- Green LED on switch #14 receives on byte 2, bit 5.
- Green LED on switch #15 receives on byte 2, bit 6.
- Green LED on switch #16 receives on byte 2, bit 7.

- Green LED on switch #17 receives on byte 1, bit 0.
- Green LED on switch #18 receives on byte 1, bit 1.
- Green LED on switch #19 receives on byte 1, bit 2.
- Green LED on switch #20 receives on byte 1, bit 3.

1.5.2 Standard CAN Protocol – Receive fault status from PCM2

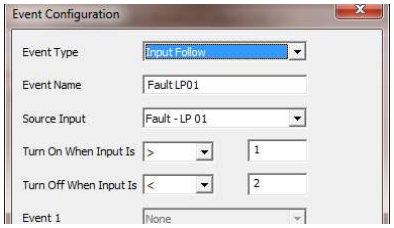
The red LED's are intended to be controlled by an error status received from the powerbox. This is done by selecting "Leg RX".

NOTE:
To activate this feature in the membrane controller, you have to add the constant decimal value of "10" (or "0A" in hex) in byte 0 in the identifier transmitting the switch status from the powerbox. The red LEDs are controlled by bit values in bytes 7, 6 and 5. MSP will turn ON a LED if the received value is "1" and OFF if the received value is "0".



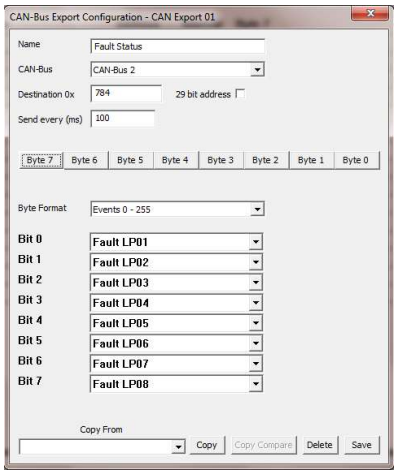
To detect a failed PCM2 output an event for each output must be configured.
In PCM2 define an event this way:

- Select Event Type as Input Follow.
- Name the event, for example Fault LP01.
- Select the input as the Fault for the actual output, for example called Fault LP01.
- Set the threshold for detecting an error to "**>1**".
- Set the threshold for detecting no fault to "**<2**".
- Click Save.



In PCM2 use the CAN Export to configure transmission of the output switch status to the membrane panel:

- Name the package.
- Select CAN bus on which the MSP is communicating.
- Set destination address (this must correspond with the receive address specified in MSP software).
  NOTE: Maximum value is 7FF for an 11 bit identifier.
- Select 11 or 29 bit identifier used.
- Select update interval in milliseconds.
- Click in byte 0 and select Constant Value, select "10".
- Click on byte 7 and select "Events 0 - 255" as byte format.
- For each bit select the fault event to monitor on MSP.
- Continue this configuration on byte 6 and 5



To control the red LED's, the output error status, transmitted from an external system, must be configured this way:

- Red LED on switch #1 receives on byte 7, bit 0.
- Red LED on switch #2 receives on byte 7, bit 1.
- Red LED on switch #3 receives on byte 7, bit 2.
- Red LED on switch #4 receives on byte 7, bit 3.
- Red LED on switch #5 receives on byte 7, bit 4.
- Red LED on switch #6 receives on byte 7, bit 5.
- Red LED on switch #7 receives on byte 7, bit 6.
- Red LED on switch #8 receives on byte 7, bit 7.

- Red LED on switch #9 receives on byte 6, bit 0.
- Red LED on switch #10 receives on byte 6, bit 1.
- Red LED on switch #11 receives on byte 6, bit 2.

- Red LED on switch #12 receives on byte 6, bit 3.
- Red LED on switch #13 receives on byte 6, bit 4.
- Red LED on switch #14 receives on byte 6, bit 5.
- Red LED on switch #15 receives on byte 6, bit 6.
- Red LED on switch #16 receives on byte 6, bit 7.

- Red LED on switch #17 receives on byte 5, bit 0.
- Red LED on switch #18 receives on byte 5, bit 1.
- Red LED on switch #19 receives on byte 5, bit 2.
- Red LED on switch #20 receives on byte 5, bit 3.

1.5.3 Speed / Termination / PCM Select

Set the CAN bus baud rate to suit the installation. The speed can be set to values between 10 kbps and 1 Mbps.

Tick the box “Terminated” to terminate the MSP CAN bus. This will enable a 120 Ohm resistor between CAN High and CAN Low.
Remember, the CAN bus must be terminated at its two extremities by a 120 Ohm resistor each.

It is extremely important to terminate the CAN bus with the correct number of resistors!

Tick the box “Use with old PCM” to switch to enable the standard CAN mode in parallel with the advanced mode.
Please see section 11.5 for a description of the two strategies.

1.5.4 Panel Transmit

Use this section to define the addresses in which the panel sends commands to external systems.
MSP can control two PCM’s independently.
MSP uses the advanced protocol #1 for communication with the PC tool, but this can be shared with a PCM2.
A second option is to use “ID2” to transmit data from MSP.

ID1 is used for communication with the tool and a primary PCM2 in advanced CAN mode.
ID2 is used for communication with a secondary PCM2 in advanced CAN mode.

If the box “Use with old PCM” is ticked, MSP will transmit data using the standard protocol, too.

Leg ID1 is used for communication with a primary PCM2 in standard CAN mode.
Leg ID2 is used for communication with a secondary PCM2 in standard CAN mode.

Data addresses have to be entered in HEX. Please note that the lower address number, the higher the transmission priority. Maximum value is 7FF when using an 11 bit identifier.
Addresses can be selected having either 11 or 29 bit identifiers.

1.5.5 Panel Receive

Use this section to define the addresses in which the panel receives commands from external systems to control the green and red LED’s.
MSP uses the advanced protocol #1 for communication with the PC tool, but this can be shared with a PCM2.

A second option is to use “ID2” to receive data from external systems.
ID1 is used for communication with the tool and a primary PCM2 in advanced CAN mode.
ID2 is used for communication with a secondary PCM2 in advanced CAN mode.

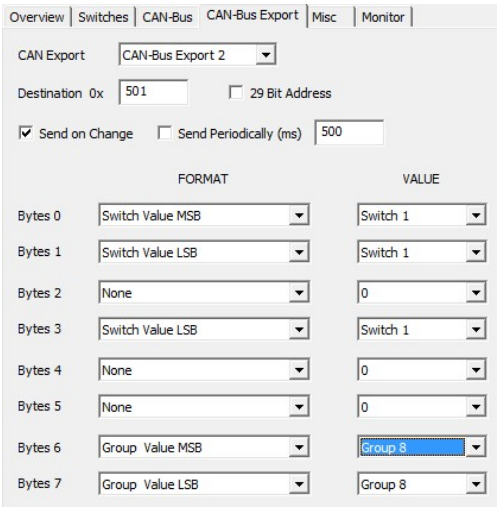
If the box “Use with old PCM” is ticked, MSP will transmit data using the standard protocol, too.

Leg ID1 is used for communication with a primary PCM2 in standard CAN mode.
Leg ID2 is used for communication with a secondary PCM2 in standard CAN mode.

Data addresses have to be entered in HEX. Please note that the lower address number, the higher the transmission priority. Maximum value is 7FF when using an 11 bit identifier.
Addresses can be selected having either 11 or 29 bit identifiers.

1.6 CAN Bus Export

This section is used for configuring the extended CAN bus export, selected in section XTRA on the "Switches" tab.
It is also used to export data from the 3 analogue inputs and the panel battery voltage.



It is possible to assign up to 8 individually selectable CAN identifiers for this export.
Maximum value is 7FF when using an 11 bit identifier.
Enter the identifier in hex, for example 0x500.

Tick the box "29 bit" ONLY if a 29 bit identifier is required.
Leave the box empty if the system uses a conventional 11 bit identifier.

Select whether to change CAN data only when pressing a switch or to send periodic updates.
A combination of both can also be selected.

It is recommended to use only "Send Periodically" when any of the analogue channels are assigned for export.

In Format it is possible to define the type of CAN export, using one or two bytes:
- Switch value LSB
  Select to send switch data having values between 0 and 255.
- Switch value MSB
  Select to send switch data having values between 256 and 65535
- In Value select which switch to assign to this export.

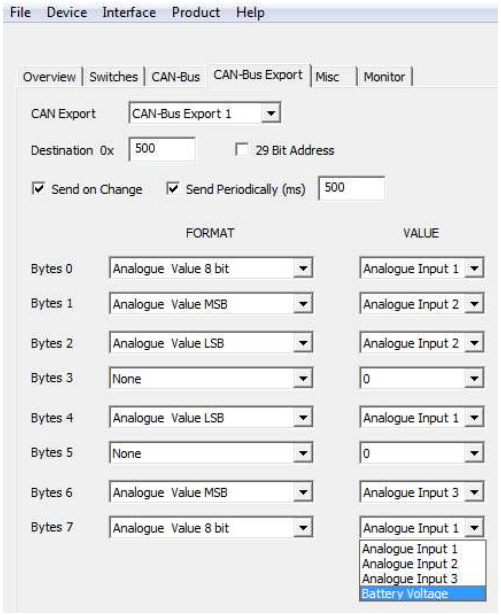
Note:
If it is required to send switch values at any value between 0 and 65,535 bits arrange the export so that the lower byte is the MSB and the higher number is LSB (for example as bytes (0,1) = (Switch MSB,Switch LSB) – this is the Motorola format.
If the data is required in the Intel format then arrange the export as for example bytes (0,1) – (Switch LSB,Switch MSB).

- Group value LSB
  Select to send group data having values between 0 and 255.
- Group value MSB
  Select to send group data having values between 256 and 65535
- In Value select which group to assign to this export.

Note:
If it is required to send group values at any value between 0 and 65,535 bits arrange the export so that the lower byte is the MSB and the higher number is LSB (for example as bytes (0,1) = (Group MSB,Group LSB) – this is the Motorola format.
If the data is required in the Intel format then arrange the export as for example bytes (0,1) – (Group LSB,Group MSB).

- Constant value
  Select any value 0..255 from the drop down menu in Value.

- Analogue Inputs
The 3 available analogue channels all have a 10 bit resolution. This means that the data resolution splits the 0...5,000 mV sensor range into 1024 steps and requires 2 bytes (a word) to send this data.
If data space has to be as compact as possible, then select to export the data with an 8 bit resolution. This means that the data resolution splits the 0...5,000 mV sensor range into 256 steps and requires 1 byte to send this data.



- Analogue value 8 bits
  Select to send 0..5.0 V sensor data having values between 0 and 255 bits.
- Analogue value LSB
  Select to send 0..255 bits of the 1024 bits representing 5,000 mV sensor data
- Analogue value MSB
  Select to send 256..1023 bits of the 1024 bits representing 5,000 mV sensor data
- In Value select which analogue sensor input to assign to this export, being sensor 1,2, 3 or battery voltage.

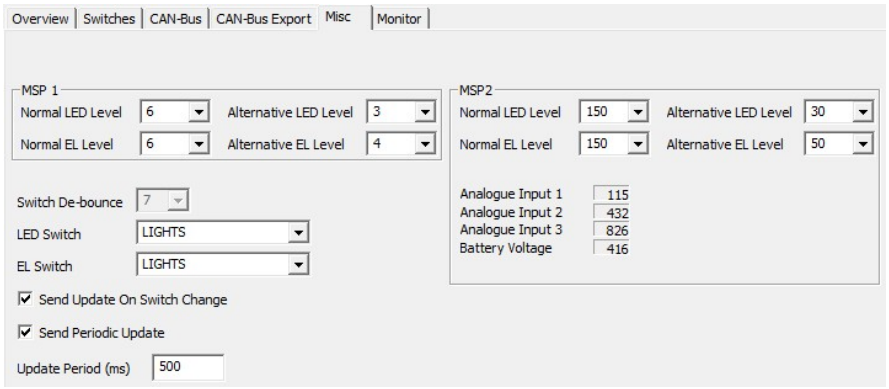
Note:
If it is required to send analogue values at any value between 0 and 1,023 bits arrange the export so that the lower byte is the MSB and the higher number is LSB (for example as bytes (0,1) = (Analogue MSB,Analogue LSB) – this is the Motorola format.
If the data is required in the Intel format then arrange the export as for example bytes (0,1) – (Analogue LSB,Analogue MSB).

Exporting the MSP battery voltage on CAN, please use this scaling:

- Exporting battery voltage as single byte value please scale using 29.4 as a multiplier and then divide by 256.

- Exporting battery voltage as a word (2 bytes) value please scale using 29.4 as a multiplier and then divide by 1024.

1.7 Miscellaneous Functions



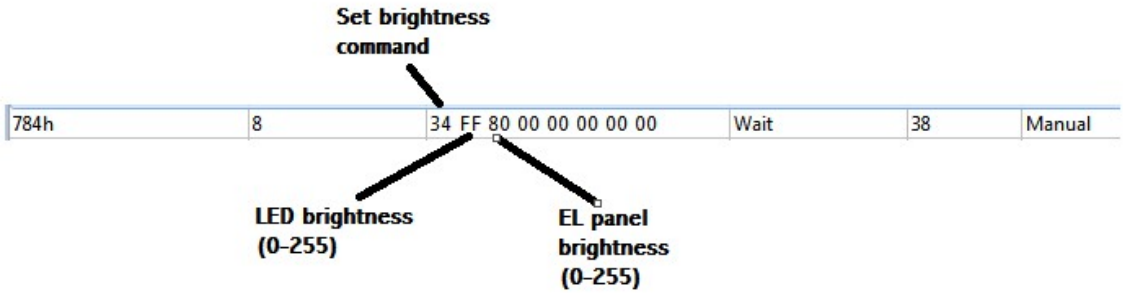
This tool support software for both hardware version of the CAN controller.
MSP1 covers hardware version 1.
MSP2 covers hardware version 2.
The MSP panel is backlit by an electro luminescent layer.
It is possible to adjust the brightness of the EL layer and of the LED's individually in 8 steps for MSP1, but in 255 steps for MSP2.

MSP1
Selecting number 7 sets the brightest levels while selecting 0 turns the backlight off and dims the LED's to their minimum intensity.

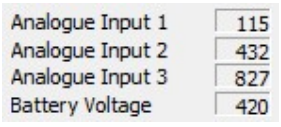
MSP2
With the current CAN controller the brightness of EL and the LEDs are adjustable in up to 255 steps.

For both MPS1 and MPS2 it is possible to assign an alternative intensity level to be selected automatically when pressing one of the membrane switches – typically the light switch. This way the brightness will be dimmed when lights are turned on for night driving.

In addition, with MSP2 it is also possible to adjust the brightness via CAN.
The command sent to MSP2 must be using the ID specified under CAN Bus for Legacy Receive.
Byte 0 must be the constant value of 52 (or 34 in hex) to enable the adjustment in MSP2.
The value in byte 1 can vary between 0..255 to adjust the brightness of the LEDs.
The value in byte 2 can vary between 0..255 to adjust the brightness of the EL panel.

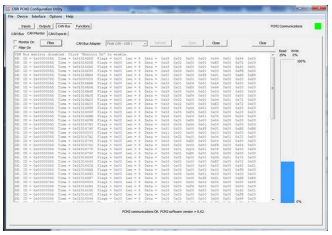


The four windows in this section shows the sensor value for each of the 3 analogue inputs and battery voltage. All inputs are 0..5 Volts with a 10 bit resolution, the values are displayed as 0..1023 bits.
The battery voltage scaling uses a multiplier of 29.4 and a divisor of 1024.



Tick the box "Send Update on Switch Change" to send a CAN message as soon as a switch is activated.
Tick the box "Send Periodic Update" to send CAN packages at a selected time interval.
Enter the time interval in milliseconds.

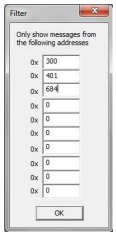
1.8 CAN Bus Monitor



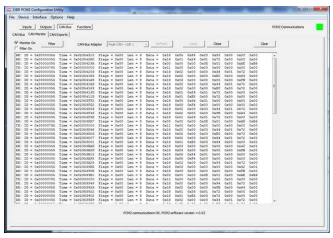
A CAN bus analysing tool is included in the PC tool.

By default the monitor displays the load on the actual CAN bus.
The monitor is only active once the “Monitor On” box is ticked.

Tick the box “Monitor On” to display the data detected on the bus.
The analyser displays all traffic on the bus it is connected to.



It is possible to filter the messages so that only selected CAN messages are shown. To activate this feature tick the “Filter On” box.
Next click the button “Filter” and type the required CAN identifiers in hex. The CAN monitor will now only display messages having the selected identifiers.



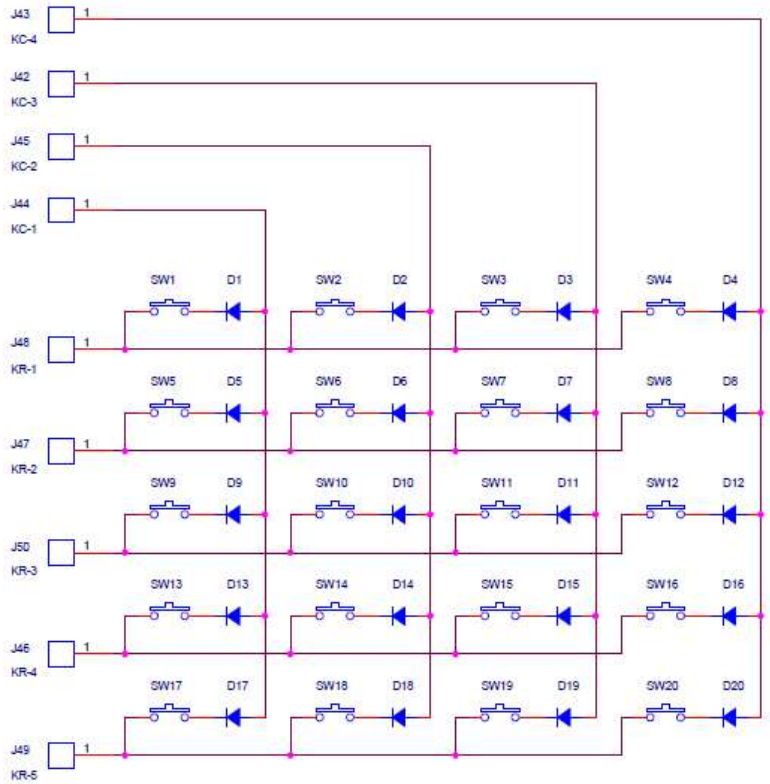
2 Steering Wheel Controller

The steering wheel controller is a very compact controller, converting digital and analogue inputs to CAN. It is small enough to fit inside a steering wheel, measuring just 55 mm in diameter and only requires a 4-wire connection to include it in the car wiring, considerably simplifying wiring of the steering wheel.
The SWC has inputs for up to 20 switches and 3 analogue inputs (5 in the extended version) and 24 LED drivers. Communication, programming and terminating is done via the CAN link and it can be programmed to communicate on any address.
It is fitted to the steering wheel by 2 x M3 screws and has a total thickness of 13 mm.

The steering wheel controller shares software with the membrane switch controller.
Please refer to section 13 for general software description.

Specifications:
- 4 x 5 input matrix for up to 20 switches.
- 3 analogue inputs, 0..5 Volts and 10 bit resolution.
- 1 CAN port with software selectable termination resistor.
- 24 LED outputs, max 30 mA each and software controlled brightness.
  This is for 24 mono colour LED's, use of RGB diodes are planned for the future
- VREF supply for LED's and analogue sensors; 5.0 Volts, max 350 mA.
- Power supply 7..30 Volts.
- Board diameter 55 mm.
- 1 mm diameter holes for soldering connections, 3 mm pitch.
- Board thickness 13 mm.

Layout:
Digital inputs are arranged in a 4 x 5 matrix:



All switch inputs can be configured as latching or momentary in the software.
This means that using momentary acting switches it is possible to control the switching in two different ways:

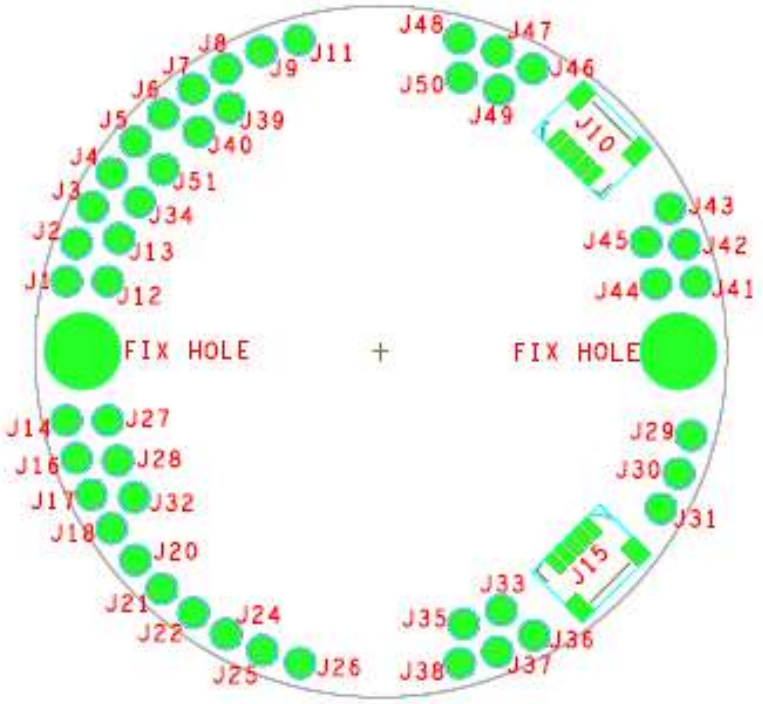
- Set as momentary, the SWC registers the signal ON as long as the switch is pressed.
- Set as latching, press the switch once to turn ON, press the switch again to turn OFF.

Using this setup the diodes shown in the diagram are not required.

Some installations are done by using conventional toggle switches. These switches will provide a constant trigger signal. To avoid any unintended switching the diodes shown in the diagram must be used.
Using these toggle switches all iSWC inputs must be set to be momentary inputs.

The SWC shares the software with our MSP.

Connections:



Pin	Name	Description
J1	LED -2	SWITCH 2 LED
J2	LED - 3	SWITCH 3 LED
J3	LED - 5	SWITCH 5 LED
J4	LED - 7	SWITCH 7 LED
J5	LED - 9	SWITCH 9 LED
J6	LED - 10	SWITCH 10 LED
J7	LED - 12	SWITCH 12 LED
J8	LED - 14	SWITCH 14 LED
J9	LED – 15	SWITCH 15 LED

Pin	Name	Description
J10		
J11	LED - 16	SWITCH 16 LED
J12	LED -1	SWITCH 1 LED
J13	LED – 4	SWITCH 4 LED
J14	LED - 17	SWITCH 17 LED
J15	PRG	MCU Programming Header
J16	LED - 19	SWITCH 19 LED
J17		
J18		
J19		
J20		
J21	GND	Ground connection for SWC Power/All connections
J22	Vbatt	Positive connection for SWC Power
J23		
J24	Vbatt	Positive connection for SWC Power
J25	+5V	5V Reference and LED indicators
J26	+5V	5V Reference and LED indicators
J27	LED - 18	SWITCH 18 LED
J28	LED - 20	SWITCH 20 LED
J29	CAN-H	CAN Bus High signal
J30	CAN-L	CAN Bus Low signal
J31	GND	Ground connection for SWC Power/All connections
J32		
J33	AN-2	Analogue Input 2
J34	LED - 6	SWITCH 6 LED
J35	AN-1	Analogue Input 1
J36	AN-3	Analogue Input 3
J37		
J38		
J39	LED - 13	SWITCH 13 LED
J40	LED - 11	SWITCH 11 LED
J41	GND	Ground connection for SWC Power/All connections
J42	KC-3	Keyboard Matrix Column 3
J43	KC-4	Keyboard Matrix Column 4
J44	KC-1	Keyboard Matrix Column 1
J45	KC-2	Keyboard Matrix Column 2
J46	KR-4	Keyboard Matrix Row 4
J47	KR-2	Keyboard Matrix Row 2
J48	KR-1	Keyboard Matrix Row 1
J49	KR-5	Keyboard Matrix Row 5
J50	KR-3	Keyboard Matrix Row 3
J51	LED - 8	SWITCH 8 LED