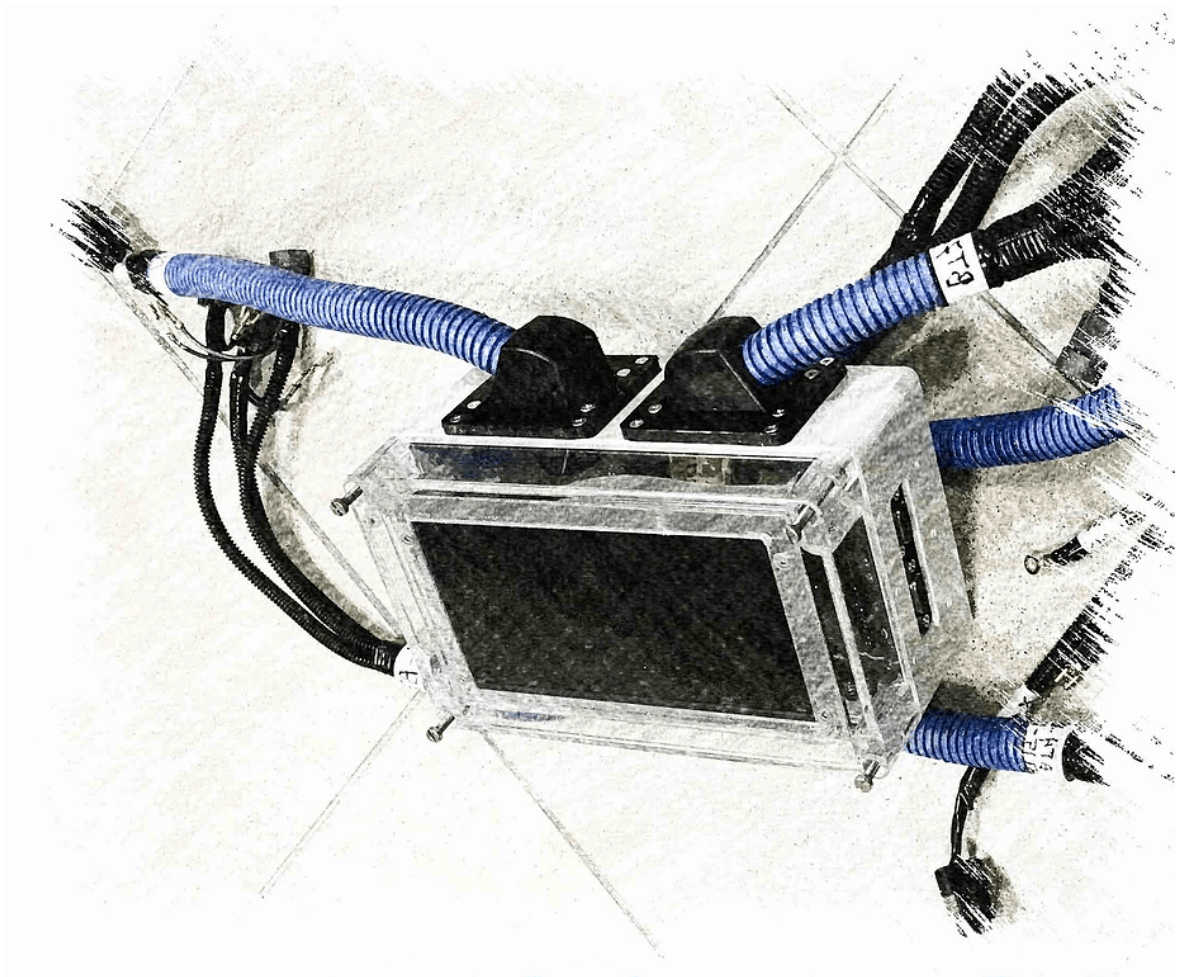
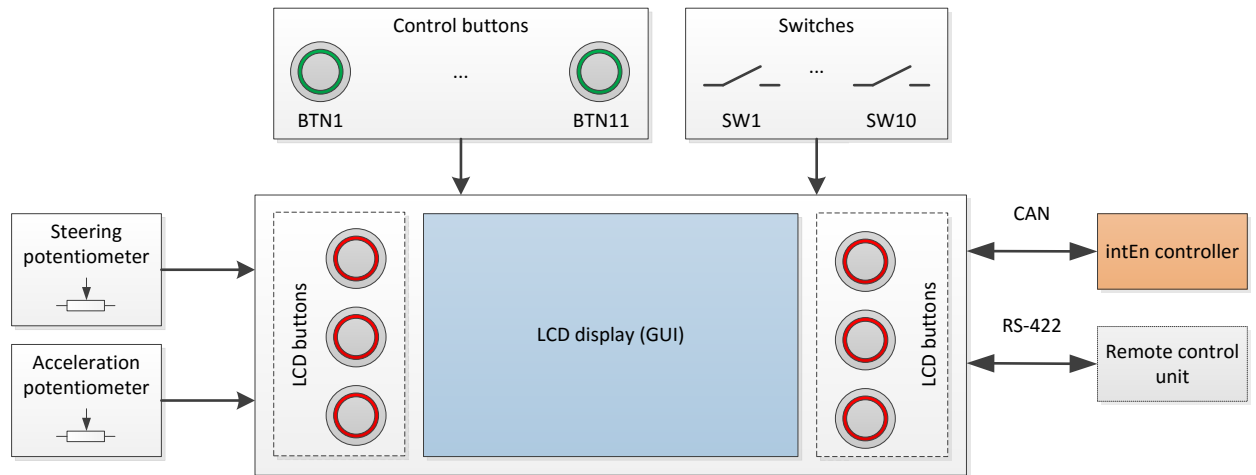


IntC front panel module



1 Description

Front panel module is an electronic module used as an on-board computer for vehicle control systems based on Advanced System Design intEn two-channel hybrid/electric vehicle integrated controller devices. The module provides driver's user interface and intEn controllers operation through CAN interface. Picture 1 shows the equipment and control elements that could be connected to the front panel module.



Pic. 1

The following devices can be connected to the front panel module:

- intEn controllers (CAN interface);
- Remote control unit (interface RS-422);
- Steering and accelerator potentiometers (or equivalent sensors);
- 11 control buttons (backlighting);
- 9 discrete switches with open collector type outputs (turning signal, horn, lights, etc.);
- 1 discrete switch with an active output (ignition).

In addition to the connected equipment the front panel module has a 640x320 4-bit grayscale display and 6 LCD control buttons (backlighting).

Front panel module fulfills the following functions:

- Controls a vehicle through data processing from steering and acceleration potentiometers or from remote control unit and through generation of control signals sent to intEn controllers;
- Controls the board equipment connected to intEn controllers based on buttons and switches state analysis;
- Indicates vehicle parameters via LCD display;
- Informs a user of the system errors or of the parameters over range (overheating, overloading, etc);
- Performs logging of control system parameters;

Front panel module. Specification (version 0.1)

- Stores the parameters and system settings in the nonvolatile memory;
- Controls the display and buttons backlighting.

2 Technical parameters

The module technical parameters are given in tables 1-8.

Table 1 Module technical parameters

Parameter	Value	Units
Power supply voltage range	6...18	V
Maximum supply current	0,5	A
Operating temperature	-20...+55	°C
Environmental protection	IP67	
Length	216	mm
Width	182	mm
Height	121	mm

Table 2 Display parameters

Parameter	Value	Units
Number of pixels in horizontal direction	640	pcs.
Number of pixels in vertical direction	320	pcs.
Picture width	140	mm
Picture height	70	mm
Color depth	4	bit
	16	tones

Table 3 Parameters of steering and accelerator sensors

Parameter	Value	Units
Power supply voltage range	11,3...12,3	V
Max supply current	100	mA

Table 4 Control buttons parameters

Parameter	Value	Units
Backlighting voltage range	$U_s^* - 0,8...$ $U_s^* - 0,5$	V
Max backlighting supply current (for all buttons)	2	A
Max contact resistance	3	kΩ
Min switching current	1	mA

* U_s – напряжение питания ходового контроллера

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Table 5 Open collector output switches parameters

Parameter	Value	Unit of measure
Max contact resistance	3	k Ω
Min switching current	1	mA

Table 6 Active output switch parameteres

Parameter	Value	Units
Min high-level voltage	5	V
Min switching current	1	mA

Table 7 CAN interface parameters

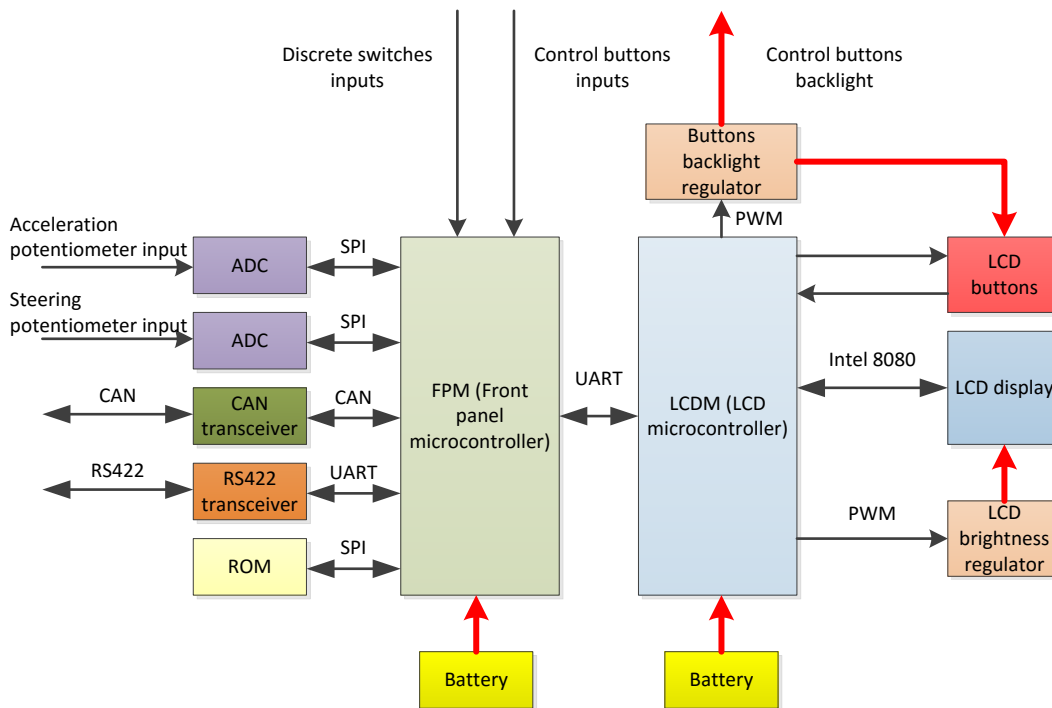
Parameter	Value	Units
Baud rate	1	mbps
CAN differential output voltage (dominant)	1,5...3,0	V
Short circuit steady-state output current, Dominant	-160...160	mA
Differential input resistance	30...80	k Ω
Differential input capacitance	15	pF

Table 8 RS-422 interface parameteres

Parameter	Value	Units
Baud rate	1	Mbps
Differential output voltage magnitude (no load)	3,0...5,0	V
Differential output voltage magnitude (54 Ω)	1,5...2,3	V
Short-circuit output current	-200...200	mA
Differential input resistance, not less than	48	k Ω
Differential input capacitance	7	pF

3 Architecture

Picture 2 shows the front panel module architecture.



Pic. 2

The front panel module includes two microcontrollers: front panel microcontroller (FPM) and LCD microcontroller (LCDM) connected to each other through UART interface.

The LCD microcontroller outputs image onto the display, processes LCD buttons and controls the buttons and display backlight brightness.

The front panel microcontroller processes discrete switches, buttons, steering and acceleration potentiometers; provides the module's external interfaces operation (CAN, RS-422). Moreover it acts as a system computer that processes the data coming from all system sensors (including those connected to intEn controllers) and generates control signals for intEn controllers (electric motors speed and power, the board equipment turning on/off). All parameters are logged into ROM.

Both microcontrollers have a backup power supply (battery) to provide discontinuous RTC operation.

4 Connections

4.1 Pins destination

The front panel module has 18 connectors on its body for connecting signals and power supply. The connectors and their counterparts are given in table 9. Pin descriptions are given in tables 10-17. Control buttons descriptions are given in table 18.

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Functionality of discrete inputs and control buttons may be changed upon Customer's request.

Table 9 Front panel module pins

Ref.des.	Partnumber	Number of positions	Counterpart (replacement)
X1	33472-0401	4	33482-0401(33482-4001)
X2	33482-1201	12	33472-1201
X3, X6	12162182	3	-
X4	33482-0601	6	33472-0601
X5	33482-0602	6	33472-0602
X7..X17	PAP-04V-S	4	B04B-PASK(LF)(SN)
KL1.13	TRI-1.25-4	1	-

Table 10 Pin definition of X1 pin connectors

Pin	Net	Type	Description
1	GND	Common	CAN (common)
2	CAN-	Input-output	CAN (-)
3	CAN+	Input-output	CAN (+)
4	-	-	Not used

Table 11 Pin definition of X2 pin connectors

Pin	Net	Type	Description
1	CAN+	Input-output	CAN bus (+)
2	CAN-	Input-output	CAN bus (-)
3	GND	Common	CAN bus (common)
4	Rx+	Input	RS422 (receive +)
5	Rx-	Input	RS422 (receive -)
6	Tx-	Output	RS422 (transmit -)
7	Tx+	Output	RS422 (transmit +)
8	GND	Common	RS422 (common)
9	GND	Common	Unit power supply (common)
10	+12V	Input	Unit power supply (+12V)

Таблица 12 Pin definition of X3

Pin	Net	Type	Description
1	GND	Common	Acceleration sensor (common)
2	Throttle	Input	Acceleration sensor (signal)
3	A +12V	Output	Acceleration sensor (power supply)

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Table 13 Pin definition of X4

Pin	Net	Type	Description
1	IN0	Input	Driving direction - forward
2	IN1	Input	Driving direction – backward
3	IN2	Input	Windscreen wiper
4	-	-	
5	IN3	Input	Not used
6	GND	Common	Common for discrete inputs

Table 14 Pin definition of X5

Pin	Net	Type	Description
1	IN4	Input	Left turning signal
2	IN5	Input	Right turning signal
3	IN6	Output	Low beam
4	IN7	Input	High beam
5	IN8	Input	Horn
6	GND	Common	Common for discrete inputs

Table 15 Pin definition of X6

Pin	Net	Type	Description
1	A +12V	Output	Steering sensor (power supply)
2	Helm	Input	Steering sensor (signal)
3	GND	Common	Steering sensor (common)

Table 16 Pin definition of X7...X17

Pin	Net	Type	Description
1	INxx	Input	Button input
2	OUTyy	Output	Button backlight (+12V)
3	GND	Common	Button (common)
4	GND	Common	Button backlight (common)

Table 17 Pin definition of KL1.13

Pin	Net	Type	Description
1	IN20	Input	Starter logging

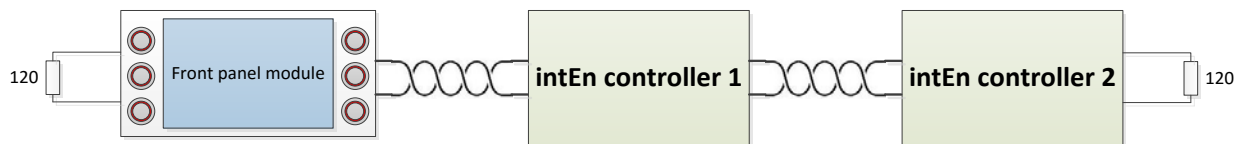
Table 18 Control buttons definition

Ref.des.	Nets	Description
X7	IN9/OUT0	Manual control
X8	IN10/OUT1	Remote control
X9	IN11/OUT2	Follow Me control
X10	IN12/OUT3	Front winch unwinding
X11	IN13/OUT4	Front winch winding
X12	IN14/OUT5	Back winch unwinding
X13	IN15/OUT6	Back winch winding
X14	IN16/OUT7	Additional low beams
X15	IN17/OUT8	Additional high beams
X16	IN18/OUT9	Back light
X17	IN19/OUT10	Hazard warning lights

4.2 CAN interface

Control and monitoring of intEn controllers parameters is performed via CAN interface. Front panel module is connected with intEn controllers via differential line with the linear bus topology. Data transfer is performed in the form of frames fully compatible with CAN2.0A standard.

The front panel module has two CAN line inputs in for connecting it in a ‘daisy chain’ arrangement without stubs (see pic. 3).

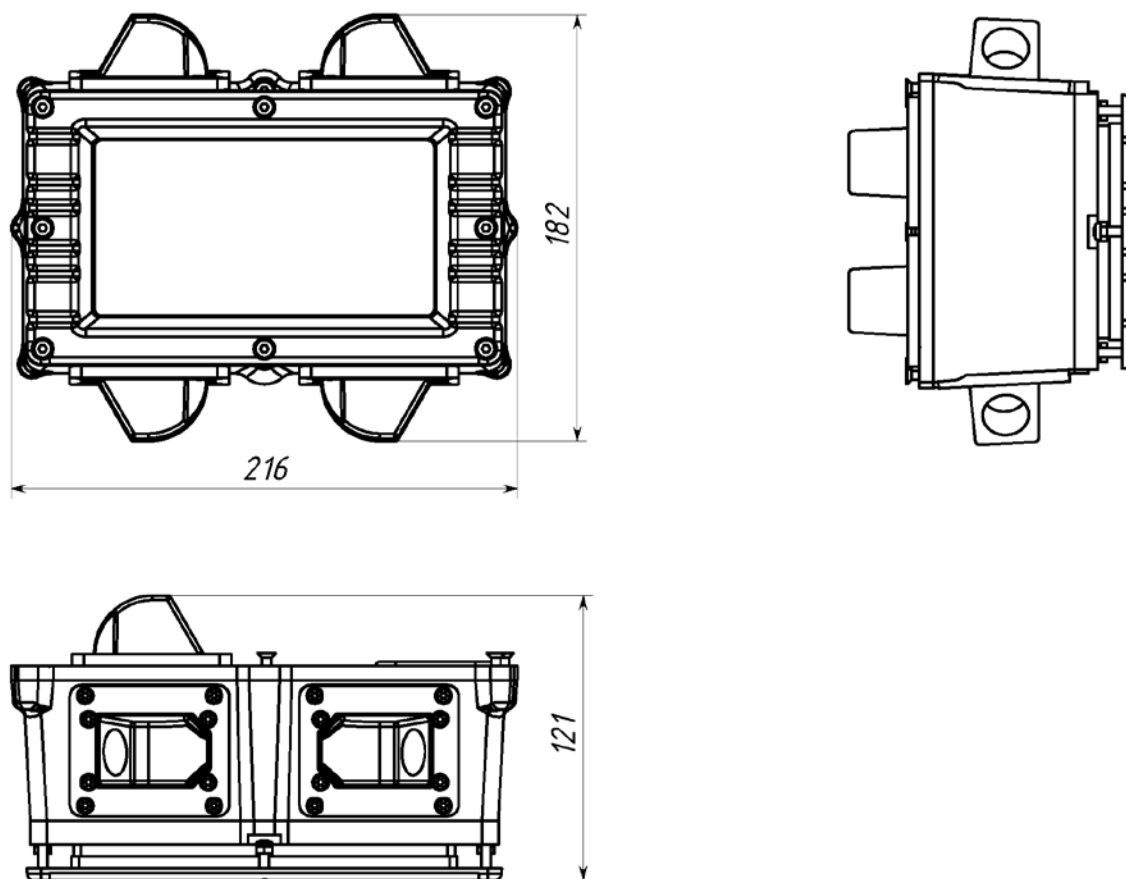


Pic. 3

5 Dimensions

Picture 4 shows the front panel module’s dimensions.

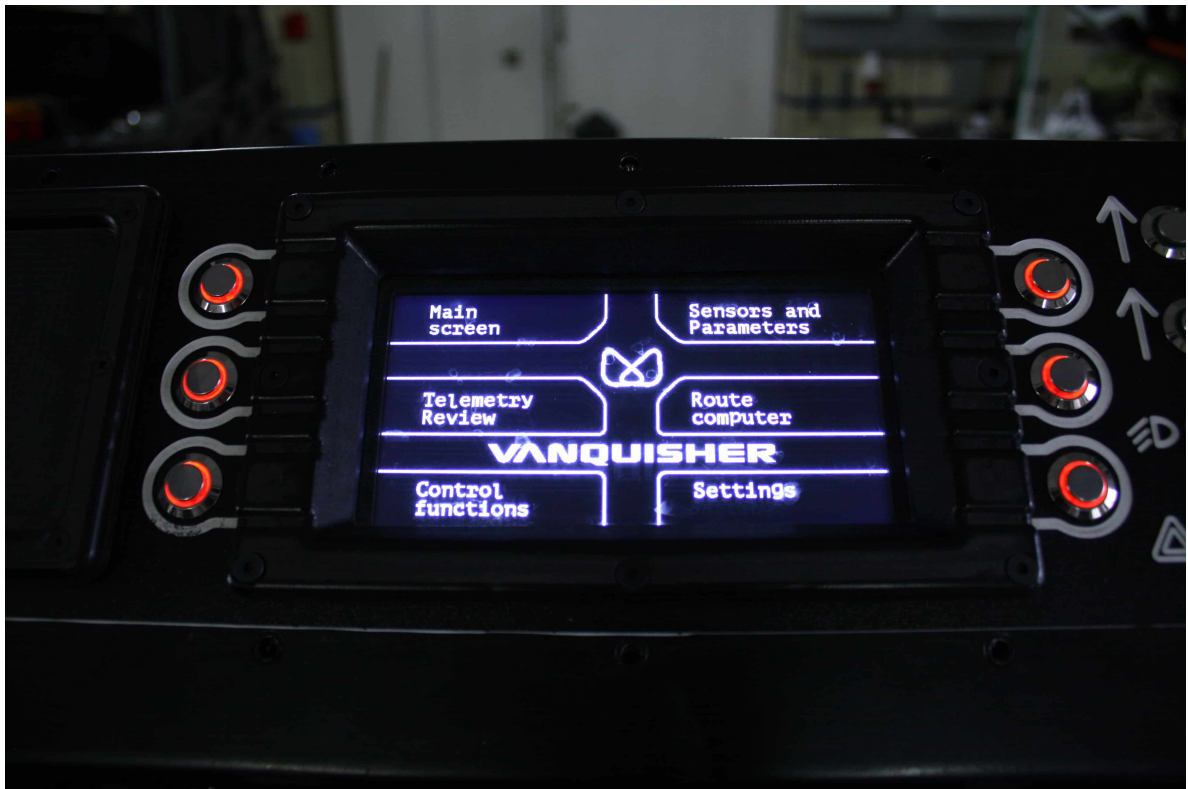
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Pic. 4

Front panel module. Specification (version 0.1)

APPEARANCE



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