RCP Can-V2
Version 7.5

Technical Description
User Manual

Rev. B

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Description

The **RCP Can-V2** is electronic module designed for remote control connection to the fuel-fired heater (parking heater, fuel operated heater, pre-heater), factory installed in **Volvo S60** (2010-), **V60** (2010-), **V70** (2007-), **XC70** (2007-) or **XC60** (2010-). The device controls the heater via CAN-bus.

Module Possibilities

- Set of inputs for outer heater's remote control using various impulses
- Set of outputs with programmable heater's status signals
- Embedded heater's remote control using the car's remote control key
- Indication of heater's autonomous operation with the direction indicators flashing in the rearview mirrors.
- Additional protection of the main battery from discharging inspecting voltage level and time of autonomous operation of the heater

Package Content

1. RCP Can-V2 module (0106-1110)
2. Wiring for permanent connection
3. Plug-n-play cable
4. Technical Description brochure
5. Installation Manual brochure

Basic Functions

1. A special combination of buttons' presses is used to start the heater with the remote control key. Firstly press "Lamp" button on the key to switch on the car's perimeter lighting. Then press "Lock" button twice within 30 seconds, while lighting is on. Every "Lock" button's pressing is confirmed with direction indicators flashing.
2. To stop the heater with the remote control key, switch on and then switch off car's perimeter lighting twice. Intervals between "Lamp" button presses should not exceed 20 seconds.
3. It is possible remotely disable startups of the heater, programmed in the CIP. Use remote control key to send stop command when the heater is idle. Starting the heater any way or turning the ignition to "on" position enables CIP timers again.
4. Additionally installed button can be connected to the module. The button is used for immediate start and stop of the heater. Button pressing changes heater's condition to another one: switches off operated heater or switches on idle heater.
5. If additional remote control is connected to the RCP, the remote control's functions depend on connection schemes, module's settings and the remote control's possibilities of. See remote control's documentation for details.

Additional Functions

By default RCP is adjusted to perform only the basic functions, such as start and stop of the heater using the remote control key. To turn on the additional functions such as battery monitoring, flashing with direction indicators in the rearview mirrors, etc. enter the module into Setup mode and activate the corresponding setup item (see settings table 3).

The buttons of the left-hand stalk switch and the brakes pedal are used to enter Setup mode and to the settings change. It is necessary to stop the engine and the heater before. Turn the ignition on, press and hold the brakes pedal. Rotate the thumbwheel some steps to turn off the display in the CIP. Then press and hold for at least 5 seconds "OK" button, while module's LED flashes once a second. Both direction indicators in the CIP confirm entering to the setup mode with 2 flashes*. Release the brakes pedal and "OK" button finally.

Each setup item in the settings table is a 3-digit code. To enter a digit of a code, shortly press "RESET" button so much times, as corresponds to a digit. The LED and the direction indicators symbols in the CIP confirm each button press: the LED briefly goes off, the left direction indicator flashes one time when the first or the third digit of code is entered, the right direction indicator - when the second digit of code is entered. To complete a digit entering, press and release "OK"

button. The CIP confirms it with one flash of both direction indicators simultaneously. When all three digits entered, the module checks the code for validity and confirms it with the direction indicators flashing. The both direction indicators flash twice simultaneously in the case of valid code and flash twice alternately in the case of invalid code.
If entered digit is not correct, press and release "OK" button until the module indicates an error. Enter the code once more in that case. Several codes can be entered without exit of setup mode.
Turn the ignition off to exit setup mode. New settings are saved in the nonvolatile memory of the module and stored there regardless of whether the module is connected or not. **Attention:** If you start the engine without exit Setup mode, new settings will not be saved in memory.
To reset the module to the factory settings, enter the code 8.1.1. Both direction indicators in the CIP should flash three times, confirming command execution. Then the module exits Setup mode and restarts.

* Direction indicators can flash in the Setup mode only for cars with analogue instrument panel. For cars with digital instrument panel (some cars since MY 2013) use LED's indication of the RCP for settings change.

Settings Table (3)

Settings Group	**Settings Item**	**Possible Values**
1. Heater's operation time	**1.1.** Limitation of heater's total operational time in pre-heat mode	**1.1.1** *Not adjusted **1.1.2** 40 minutes **1.1.3** 50 minutes **1.1.4** 60 minutes **1.1.5** 70 minutes **1.1.6** 80 minutes **1.1.7** *90 minutes* **1.1.8** 100 minutes **1.1.9** 120 minutes
	1.2. Limitation of heater's 1-cycle operational time in pre-heat mode	**1.2.1** 10 minutes **1.2.2** 15 minutes **1.2.3** 20 minutes **1.2.4** 25 minutes **1.2.5** 30 minutes **1.2.6** 40 minutes **1.2.7** 50 minutes **1.2.8** 60 minutes **1.2.9** **70 minutes*
	2.1. "Lock" and "Lamp" buttons' functions for the heater control	**2.1.1** *"Lock" button for the heater start, "Lamp" button for the heater stop **2.1.2** "Lamp" button for the heater start, "Lock" button for the heater stop

	2.2. Number of sequential "Lamp" button presses for the heater control	**2.2.1** Combination is disabled **2.2.2** **Four presses* **2.2.3** Six presses **2.2.4** Eight presses
	2.3. Number of sequential "Lock" button presses for the heater control (with the car's lighting turned on)	**2.3.1** Combination is disabled **2.3.2** **Two presses* **2.3.3** Three presses **2.3.4** Four presses
3. Battery Monitoring	**3.1.** Minimal battery voltage that lets the module start the heater in pre-heat mode	**3.1.1** * Not adjusted **3.1.2** 11.8V **3.1.3** 11.8V **3.1.4** 11.9V **3.1.5** *12.0V* **3.1.6** 12.1V **3.1.7** 12.2V **3.1.8** 12.3V **3.1.9** 12.4V
	3.2. Minimal battery voltage that lets the module keep operating the heater in pre-heat mode [2]	**3.2.1** * Not adjusted **3.2.2** 11.4V **3.2.3** 11.5V **3.2.4** 11.6V **3.2.5** *11.7V* **3.2.6** 11.8V **3.2.7** 11.9V **3.2.8** 12.0V
4. Timer_Out line control	**4.1.** Activate the Timer_Out line by time of the heater's autonomous operation	**4.1.1** *Don't activate **4.1.2** In 10 minutes after the heater startup **4.1.3** In 15 minutes after the heater startup **4.1.4** In 20 minutes after the heater startup **4.1.5** In 25 minutes after the heater startup **4.1.6** In 30 minutes after the heater startup **4.1.7** In 40 minutes after the heater startup **4.1.8** In 50 minutes after the heater startup **4.1.9** In 60 minutes after the heater startup
	4.3. Activate the Timer_Out line by the second start command	**4.3.1** *Off **4.3.2** On
6. Indication with direction indicators in	**6.1.** Indication of the heater's startup	**6.1.1** *Off **6.1.2** Five flashes
	6.2. Indication of command reception from a remote control	**6.2.1** *Off **6.2.2** Three flashes

the rearview mirrors	**6.3.** Indication of the heater's operation, when starting source is the remote control	**6.3.1** *Off **6.3.2** On
	6.4. Indication of the heater's operation, when starting source is the CIP (direct or timer start)	**6.4.1** *Off **6.4.2** On
	6.7. Flashing frequency for 6.3-6.4 Setup items	**6.7.1** One flash within 3 sec **6.7.2** One flash within 5 sec **6.7.3** ** One flash within 10 sec* **6.7.4** One flash within 15 sec
7. Output signals adjustment	**7.3.** Notification signals on the output "Alert_1" [2]	**7.3.1** *"Heater started" **7.3.2** "Heater stopped" **7.3.5** "Heater started to burn" **7.3.7** "Error occurred" **7.3.8** Disable the output
	7.4. Notification signals on the output "Alert_2"	**7.4.1** "Heater started" **7.4.2** *"Heater stopped" **7.4.5** "Heater started to burn" **7.4.7** "Error occurred" **7.4.8** Disable the output
	7.5. Signal feed to the output "Status Minus"	**7.5.1** Heater operates (potential) **7.5.2** *Heater operates autonomously (from battery, engine is off) (potential) **7.5.3** Heater operates autonomously (double impulses with the frequency adjusted by 6.7, applying settings 6.3-6.5)[3] **7.5.4** Engine runs (potential) **7.5.5** Engine runs (RPM impulses) **7.5.6.** Disable the output
	7.6. Signal feed to the output "Status_Plus"	**7.6.1** Heater operates (potential) **7.6.2** Heater operates autonomously (from battery, engine is off) (potential) **7.6.3** Engine runs (potential) **7.6.4** Ignition is on (potential) **7.6.5.** Disable the output **7.6.6** *Feedback for Defa Vehicle Unit
8. Service menu	**8.1.** Default Settings	**8.1.1** Apply factory settings

* Factory setting
Recommended settings marked in italics

[1] –RCP will turn off the heater if the battery voltage becomes lower than preset
[2] – Signals appears only at the heater autonomous operation
[3] – Signal is used for indication by all the hazard flashers. It uses 1-wire connection to the hazard alarm button (see installation manual for details). Indication by the turn signals via CAN-bus is switched off

Signals

The module has two connectors: 9-pin connector X1 (table 1) for input signals and power connection, 10-pin connector X2 (table 2) for output signals, special signals and CAN-bus connection. The connector's first pin is marked by the key.

X1.1 Heater_off+[1]
The input can be used to switch off the heater, operated in pre-heat mode, with the impulse of positive polarity (the input **Heater_off-** in that case has to be connected to the Ground). The heater is stopped by the leading edge of the impulse. When the heater is idle, positive impulse given to the input cancels the timer start of the heater, programmed in the CIP.

Table 1

X1 pin number	Signal Name	Polarity	Wire colour
1	Heater_off+	+	White
2	Heater_off-	-	Grey
3	Heater_on+	+	Green
4	Heater_on-	-	Blue
5	Button	-	Brown
6	Ventilation	+	Orange
7	RC_in	+	Yellow
8	*Ground*		*Black*
9	*Battery Power*		*Red*

The signals to be necessarily connected are marked in the table in Italics

Table 2

X2 pin number	Signal Name	Polarity	Wire colour	Maximum Electric Load*, mA
1	Status_Plus	+	Blue-white	500
2	Status_Minus	-	Yellow	500
3	Alert_1	-	Grey	500
4	Alert_2	-	Orange	500
5	Timer_out	-	Blue	500
6	Indication	+	Red-white	1000
7	Sensor_In	-	Green-yellow	
8	Sensor_Out	-	Green	500
9	*CAN-L*		*Brown-white*	
10	*CAN-H*		*Brown*	

*The connection of outputs 2-5 directly to the Power (without a load) prohibited. The connection of outputs 1 and 6 directly to the Ground (without a load) prohibited

The signals to be necessarily connected are marked in the table in Italics

X1.2 Heater_off-[1]

The input can be used to switch off the heater, operated in pre-heat mode, by the impulse of negative polarity (the input **Heater_off+** in that case has to be connected to the Power). The heater is stopped by the leading edge of the impulse. If the heater is idle, negative impulse on this input cancels the timer start of the heater, programmed by CIP. This input is suitable for the most alarm systems and GSM-modules connections in order to control the heater remotely.

X1.3 Heater_on+[1]

The input can be used to switch the heater on by the impulse of positive polarity (the input **Heater_on-** in that case has to be connected to the Ground). The heater is started by the leading edge of the impulse.

X1.4 Heater_on-[1]

The input can be used to switch the heater on by the impulse of negative polarity (the input **Heater_on+** in that case has to be connected to the Power). The heater is started by the leading edge of the impulse. This input is suitable for the most alarm systems and GSM-modules connections in order to control the heater remotely.

X1.5 Button

The input for connection of outer button. The button may be used for the direct start and stop of the heater

X1.6 Ventilation
The input is not used in current version

X1.7 RC_in
The input can be used to switch the heater on/off by an impulse of positive polarity. The heater is turned on by the leading edge of an impulse and is turned off by the trailing edge of the impulse. The specialized remotes such as Smart Start, Easy Start and Telestart can be connected to this input[1]. GSM-modules with a potential signal on the control channel also may be connected to the input.

X1.8 Ground [1]

X1.9 Power +12V [1]

X2.1 Status_Plus
The assignment of this output is defined by the setting 7.6. By default special signal for Defa Smart Start (settings 7.6.3) is used to inform the remote control unit that the heater has been switched off. When the heater is switched off, the impulse of positive polarity with 0.5 second duration appears on the output. When the engine is running, the output is permanently pulled up to the Power.

X2.2 Status_Minus
The assignment of this output is defined by the setting 7.5. By default the signal "Heater operates autonomously" is given on the output.

X2.3 Alert_1
The signal is used to receive a notification to remote control (if remote is compatible to alerts receiving). The assignment of this output is defined by the setting 7.3. When programmed event is occurred, the impulse of negative polarity with 1 second duration appears on the output. By default the signal "Heater started" is given on the output.

X2.4 Alert_2
The signal is used to receive a notification to remote control (if remote is compatible to alerts receiving). The assignment of this output is defined by the setting 7.4. When programmed event is occurred, the impulse of negative polarity with 1 second duration appears on the output. By default the signal "Heater stopped" is given on the output.

X2.5 Timer_out
The output can be used to control an external device by time of the heater operation. Time of signal appearing is defined by the setting 5.1. When the heater operates programmed time, the impulse of negative polarity with 1 second duration appears on the output.

X2.6 Indication
The output can be used for connection of outer stand alone or button built-in indicator.

X2.7 Sensor_In
Not used

X2.8 Sensor_Out
Not used

X2.9 CAN-L
Low-level CAN bus line has to be connected to the violet-orange wire of LOSPEED CAN bus[1].

X2.10 CAN-H
High-level CAN bus line has to be connected to the grey-orange wire of LOSPEED CAN bus[1].

[1]- See installation manual for connection details

Connection

RCP Can has a possibility of quick (plug-n-play) connection to the OBD-II service connector using supplied PnP-cable. The connection of additional remote control is recommended for professional installation. It needs at least some experience in car electronics installation. See installation manual for detailed connection schemes for various remotes.

RCP needs that 2 timers and direct start / stop function for the heater control are present in CIP. Therefore it may be necessary to load the special software to the CIP at first, by the means of Volvo dealer's equipment.

Troubleshooting

If a run-time error occurs during the heater's operation, RCP informs about the error code with LED flashing. The number of flashes corresponds to the error code. See table 2 for the error's description and possible solutions.

Table 4

Error Code	Error Description	Possible Reasons of Error Appearance	Solutions
2	No answer from the heater followed the start command	Outer temperature is higher than +15 Celsius degrees	The heater operates only at temperatures below +15°C. It is the heater manufacturer's restriction
		Fuel level in the fuel tank is close to empty ("Fuel Low" warning indicator is illuminated in the CIP)	Refuel the vehicle
		The heater is blocked after 3 unsuccessful starts	Try to start the heater in the CIP menu. If it doesn't start up, make diagnostics of the heater.
3	Battery low	The module has determined that the battery's voltage is below the specified by settings items 3.1 or 3.2	Charge vehicle's battery with special charger (or start engine to charge) or cancel 3.1/3.2 module's settings
4	Time limits exceeded	Time limit for autonomous operation of the heater is achieved (with active setting 1.1)	Run the engine or cancel 1.1 module's settings
5	Unsuccessful start	The heater was switched off spontaneously at starting	Make diagnostics of the heater if the error appears again
6	Operation cycle too short	The heater was switched off spontaneously	Make diagnostics of the heater if the error appears again
8	CAN-bus error	There is a problem with module's connection to the CAN-bus	Check for the module's connection
9	Settings error	Settings have been stored in the RCP's memory incorrectly	Reset the settings (8.1.1), readjust the module
11	Heater no connection	The heater is unplugged or out of order	Make diagnostics of the heater

Glossary

CAN - Control Area Network (digital network for data transfer in vehicles)
RCP - Remote Control Plug-in (electronic module for the heater remote control)
CIP - Combined Instrument Panel