Autoplugin RCP-V1R

Version 7.3

Technical Description
User Manual

Rev. A

Table of Contents

Description

The **Autoplugin RCP-V1R** provide a function of remote control for the fuel-fired heater (parking heater, fuel operated heater, pre-heater), factory installed on **Volvo S60** (2005-2010), **V70** (2005-2007), **XC70** (2005-2007) or **XC90** (2005-2014). The device controls the heater via CAN-bus.

Possibilities

- Heater start and stop by various impulses
- Heater status signals
- Embedded remote control of the heater from Volvo car's key
- Remote cancellation of heater start, programmed in the driver information system
- Main battery protection from discharging inspecting voltage level and time of autonomous work of the heater

Package Content

1. RCP-V1R module
2. Wiring
3. Technical Description brochure
4. Installation Manual brochure

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 first pin on each connector 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, by 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. If the heater is idle, positive impulse on this input cancels the timer start of the heater, programmed by 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 is marked in the table in Italics

Table 2

X2 pin number	Signal Name	Polarity	Wire colour	Maximum Electric Load*, mA
1	RC_out	+	Blue-white	500
2	Heater_Status	-	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, is not permitted. The connection of outputs 1 and 6 directly to the Ground, without a load, is not permitted

The signals to be necessarily connected is 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 pushbutton connection. The pushbutton may be used for 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 RC_out

The input 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. For Defa Smart Start remote control the input is connected to the blue wire of Defa Vehicle Unit

X2.2 Status

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 heater operation. Time of signal appearing is defined by the setting 5.1. When the heater operates for 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 stand alone or pushbutton’s indicator, which informs about heater run-time errors.
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 green wire of LOSPEED CAN bus[1].
X2.10 CAN-H
High-level CAN bus line has to be connected to the white wire of LOSPEED CAN bus[1].

[1]- See installation manual for connection details

Connection

RCP can be easily connected 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 module needs that 2 timers and direct start / stop function for the heater control are present in CIP. Therefore it may be necessary to load software to CIP by using Volvo dealer's equipment before make a connection.

Basic Functions

1. To start the heater using car's key, press the yellow button on the key (turns the perimeter lighting on). Then within 30 seconds press "Lock" button twice, while the lighting is on. The module will turn the lighting off confirming heater startup.
2. To stop the heater using car's key, turn on and then turn off perimeter lighting twice by pressing yellow button. Intervals between button presses should not exceed 20 seconds.
3. You can remotely cancel timer start of the heater, programmed in CIP: send the stop command by remote control for the idle heater. After stop command sending, CIP timers will be temporary disabled. Start the heater by any way or turn the ignition on enables CIP timers again.
4. Additional button may be connected to the module. The button is used for immediate start or stop of the heater. Button pressing changes heater condition to another one: switches off operated heater or switches on idle heater.
5. If additional remote control connected in conjunction with RCP, the functions of the remote control will depend on connection schemes, module settings and the possibilities of remote. See documentation of the remote control for details.

Additional Functions

By default RCP adjusted to perform only basic functions, such as start and stop of the heater by using the remote control key. To turn on additional functions such as battery monitoring, flashing with direction indicators in 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 change the settings. 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 "READ" button (module's LED starts to flash once a second and then goes on). Both direction indicators in the CIP confirm entering to the setup mode with 2 flashes. Release the brakes pedal and "READ" 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 "READ" 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 direction indicators flashing. Both direction indicators flash twice simultaneously in case of valid code and flash twice alternately in case of invalid code.

If entered digit is not correct, press and release "READ" 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 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.

Settings Table (3)

Settings Group	**Setting**	**Possible Values**
1. Heater Timing	**1.1.** Limitation of heater 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 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. Heater Control by Volvo Key	**2.1.** "Lock" and "Yellow" button functions for heater control	**2.1.1** *"Lock" button for heater start, yellow button for heater stop **2.1.2** Yellow button heater start, "Lock" button for heater stop

	2.2. Number of sequential "Yellow" button presses for the heater control	**2.2.1** Heater control by "Yellow" button disabled **2.2.2** Two times **2.2.3** Three times **2.2.4** **Four times*
	2.3. Number of sequential "Lock" button presses for heater control (with perimeter lighting turned on)	**2.3.1** Heater control by "Lock" button disabled **2.3.2** Two presses **2.3.3** Three presses **2.3.4** **Four presses*
3. Battery Monitoring	**3.1.** Minimal voltage to let the heater start 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 voltage to 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 Control	**4.1.** Activate the Timer_Out line by time of heater 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 directly by start command resend via the "Heater_On" line	**4.3.1** *Off **4.3.2** On
6. Heater	**6.1.** Indication of heater startup	**6.1.1** *Off (only switching off the lighting) **6.1.2** Switch the lighting on for 1 sec

startup and stop indication by the perimeter lighting		**6.1.3** Switch the lighting on for 2 sec **6.1.4** Switch the lighting on for 3 sec **6.1.5** Switch the lighting on for 5 sec **6.1.6** Switch the lighting on for 7 sec **6.1.7** Switch the lighting on for 10 sec
	6.2. Indication of heater stop	**6.2.1** *Off (only switching off the lighting) **6.2.2** Switch the lighting on for 1 sec **6.2.3** Switch the lighting on for 2 sec **6.2.4** Switch the lighting on for 3 sec **6.2.5** Switch the lighting on for 5 sec **6.2.6** Switch the lighting on for 7 sec **6.2.7** Switch the lighting on for 10 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. Signals on the output "Status"	**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 frequency adjusted at 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
8. Settings reset		**8.1.1** Apply factory settings

* Factory setting
Recommended settings is marked in italics

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

Troubleshooting

If a run-time error occurs at start of the heater, RCP indicates error code with built-in and additional LEDs flashing. The number of flashes corresponds to the error code. See table 4 for the codes 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	The heater is not activated in CIP	Configure the heater by Volvo dealer's equipment
		Fuel level in the tank is close to empty ("Fuel Low" warning indicator is lighting in CIP)	Refuel the car
		The heater is blocked after 3 unsuccessful starts	Try to start the heater from CIP menu. If it not started to burn, make diagnostics of the heater.
3	Battery low	The module has determined that the battery voltage at heater startup or during heater operation is below the specified settings 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 setting
5	Unsuccessful start	The heater was switched off spontaneously at startup	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 connection of the module to the CAN-bus	Check for the module connection
9	Settings error	Settings have been stored incorrectly in RCP's memory	Reset the settings (8.1.1), readjust RCP
11	Heater no connection	The heater is unplugged from CAN-bus or is out of order	Make diagnostics of the heater

Glossary

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