# Autoplugin RCP-V2

# Version 7.6

## Technical Description
## User Manual

**Rev. B**

**Table of Contents**

## Description

The **Autoplugin RCP-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-), **S80** (2007-) or **XC60** (2008-). The device controls the heater via CAN-bus.

## Module Possibilities

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

## Package Content

1. Autoplugin RCP-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 car's perimeter lighting. Then press "Lock" button twice within 30 seconds, while lighting is on. Every "Lock" button 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 condition to another one: switches off operated heater or switches on idle heater.
5. If additional remote control connected to the RCP, its functionality depends on connection schemes, module settings and the remote control possibilities. See remote control documentation for details.

## Additional Functions

By default RCP adjusted to perform only 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 rearview mirrors, etc. enter the module into Setup mode and activate 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 by holding engine start button for at least 2 seconds, then press and hold the brakes pedal. Rotate the thumbwheel some steps to select idle display in the CIP. Then press and hold for at least 5 seconds "Read" button ("OK" button in some cars), 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 "Read/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 "Read/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 case of valid code and flash twice alternately in case of invalid code.

If entered digit is not correct, press and release "Read/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 nonvolatile memory of the module and stored there regardless of whether the module is connected or not to the car. **Note:** If you start the engine during 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 Setup mode only for cars with analogue instrument panel. For cars with digital instrument panel (some cars since MY 2013) use LED indicator on RCP instead of direction indicators in Setup mode.

**Settings Table (3)**

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

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

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

\* Factory setting
*Recommended settings marked in italics*

[1] –RCP turns off the heater if the battery voltage becomes lower than preset
[2] – Signals appear only during 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 gives a possibility of quick connection to the OBD-II service connector by using supplied Plug-n-Play cable. This type of connection allows control the heater by using car's radio key. In case when additional remote control is connected to the heater, permanent connection to the car's wiring is required. 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 the 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 heater operation, RCP informs about error code with LED flashing. The number of flashes in series corresponds to the error code. See table 4 for errors 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 car |
| | | 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 voltage is below the specified by settings items 3.1 or 3.2 | Charge car'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 applied setting 1.1) | Run the engine or cancel applied 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 module connection to the CAN-bus | Check for 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

www.autoplugin.ru