

# **Autoplugin RCP-V1**

**Version 7.1**

**Technical Description  
User Manual**

**Rev. B**

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## Description

The **Autoplugin RCP-V1** module is intended for remote control connection to the fuel-fired heater (parking heater, fuel operated heater, pre-heater), factory installed in **Volvo S60** (2001-2004), **V70** (2001-2004), **XC70** (2002-2004), **Volvo S80** (2000-2004) or **XC90** (2002-2004). 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 using Volvo remote control key
- Remote cancellation of the heater start, programmed in the CIP
- Main battery protection from discharging inspecting voltage level and time of autonomous work of the heater

## Package Content

1. RCP-V1 module (0105-1100)
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+<sup>1</sup>

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 the input cancels the timer start of the heater, programmed by CIP.

**Table 1**

<b>X1 pin number</b>	<b>Signal Name</b>	<b>Polarity</b>	<b>Wire colour</b>
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	<i>Ground</i>		<i>Black</i>
9	<i>Battery Power</i>		<i>Red</i>

*The signals to be necessarily connected is marked in the table in Italics*

**Table 2**

<b>X2 pin number</b>	<b>Signal Name</b>	<b>Polarity</b>	<b>Wire colour</b>	<b>Maximum Electric Load*, mA</b>
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	<i>CAN-L</i>		<i>Brown-white</i>	
10	<i>CAN-H</i>		<i>Brown</i>	

\*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<sup>-1</sup>**

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<sup>+1</sup>**

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<sup>-1</sup>**

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 Telearstart can be connected to this input<sup>1</sup>. GSM-modules with a potential signal on the control channel also may be connected to the input.

### **X1.8 Ground<sup>1</sup>**

### **X1.9 Power +12V<sup>1</sup>**

### **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 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 stand alone or button built-in indicator, which will inform you 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<sup>1</sup>.

**X2.10 CAN-H**

High-level CAN bus line has to be connected to the white wire of LOSPEED CAN bus<sup>1</sup>.

<sup>1</sup>- See installation manual for connection details

**Connection**

Autoplugin RCP needs permanent connection to the car’s wiring. See installation manual for detailed connection schemes for various remotes.

*The timers and direct start / stop function for the heater control have to be presented in the CIP. It may be necessary to load the software to the CIP using Volvo dealer equipment before make a connection of RCP.*

## Basic Functions

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

**Settings Table (3)**

<b>Settings Group</b>	<b>Setting</b>	<b>Possible Values</b>
<b>1.</b> Heater Timing	<b>1.1.</b> Limitation of heater’s total operational time in pre-heat mode	<b>1.1.1</b> Not adjusted
		<b>1.1.2</b> 40 minutes
		<b>1.1.3</b> 50 minutes
		<b>1.1.4</b> 60 minutes
		<b>1.1.5</b> *70 minutes
		<b>1.1.6</b> 80 minutes
		<b>1.1.7</b> 90 minutes
		<b>1.1.8</b> 100 minutes
		<b>1.1.9</b> 120 minutes
	<b>1.2.</b> Limitation of heater’s 1-cycle operational time in pre-heat mode	<b>1.2.1</b> 10 minutes
		<b>1.2.2</b> 15 minutes
		<b>1.2.3</b> 20 minutes
		<b>1.2.4</b> 25 minutes
		<b>1.2.5</b> 30 minutes
		<b>1.2.6</b> 40 minutes
		<b>1.2.7</b> 50 minutes
		<b>1.2.8</b> 60 minutes
		<b>1.2.9</b> *70 minutes
<b>2.</b> Heater Control by Volvo Key	<b>2.1.</b> “Lock” and “Yellow” button functions for the heater control	<b>2.1.1</b> *”Lock” button to the heater startup, yellow button to the heater stop
		<b>2.1.2</b> Yellow button to the heater startup, “Lock” button to the heater stop
	<b>2.2.</b> Number of sequential turning on and then turning off	<b>2.2.1</b> Heater control by “Yellow” button disabled
		<b>2.2.2</b> Two times

	the perimeter lighting by “Yellow” button for the heater control	<b>2.2.3</b> Three times <b>2.2.4</b> * <i>Four times</i>
	<b>2.3.</b> Number of sequential “Lock” button presses for the heater control (with the perimeter lighting turned on)	<b>2.3.1</b> Heater control by “Lock” button disabled <b>2.3.2</b> Two presses <b>2.3.3</b> Three presses <b>2.3.4</b> * <i>Four presses</i>
<b>3.</b> Battery Monitoring	<b>3.1.</b> Minimal voltage to let the heater start in pre-heat mode	<b>3.1.1</b> * Not adjusted <b>3.1.2</b> 11.8V <b>3.1.3</b> 11.8V <b>3.1.4</b> 11.9V <b>3.1.5</b> <i>12.0V</i> <b>3.1.6</b> 12.1V <b>3.1.7</b> 12.2V <b>3.1.8</b> 12.3V <b>3.1.9</b> 12.4V
	<b>3.2.</b> Minimal voltage to keep operating the heater for pre-heat mode <sup>2</sup>	<b>3.2.1</b> * Not adjusted <b>3.2.2</b> 11.4V <b>3.2.3</b> 11.5V <b>3.2.4</b> 11.6V <b>3.2.5</b> <i>11.7V</i> <b>3.2.6</b> 11.8V <b>3.2.7</b> 11.9V <b>3.2.8</b> 12.0V
<b>4.</b> Timer Out Control	<b>4.1.</b> Activate the Timer_Out line by time of the heater autonomous operation	<b>4.1.1</b> *Don’t activate <b>4.1.2</b> In 10 minutes after the heater startup <b>4.1.3</b> In 15 minutes after the heater startup <b>4.1.4</b> In 20 minutes after the heater startup <b>4.1.5</b> In 25 minutes after the heater startup <b>4.1.6</b> In 30 minutes after the heater startup <b>4.1.7</b> In 40 minutes after the heater startup <b>4.1.8</b> In 50 minutes after the heater startup <b>4.1.9</b> In 60 minutes after the heater startup
	<b>4.3.</b> Activate the Timer_Out line directly by the start command resend via the “Heater_On” line	<b>4.3.1</b> *Off <b>4.3.2</b> On
<b>6.</b> Heater startup and stop	<b>6.1.</b> Indication of the heater startup	<b>6.1.1</b> *Off (only switching off the lighting) <b>6.1.2</b> Switch the lighting on for 1 sec <b>6.1.3</b> Switch the lighting on for 2 sec <b>6.1.4</b> Switch the lighting on for 3 sec

indication by the perimeter lighting		<b>6.1.5</b> Switch the lighting on for 5 sec <b>6.1.6</b> Switch the lighting on for 7 sec <b>6.1.7</b> Switch the lighting on for 10 sec
	<b>6.2.</b> Indication of the heater stop	<b>6.2.1</b> *Off (only switching off the lighting) <b>6.2.2</b> Switch the lighting on for 1 sec <b>6.2.3</b> Switch the lighting on for 2 sec <b>6.2.4</b> Switch the lighting on for 3 sec <b>6.2.5</b> Switch the lighting on for 5 sec <b>6.2.6</b> Switch the lighting on for 7 sec <b>6.2.7</b> Switch the lighting on for 10 sec
7. Output signals adjustment	<b>7.3.</b> Notification signals on the output "Alert_1" <sup>2</sup>	<b>7.3.1</b> *"Heater started" <b>7.3.2</b> "Heater stopped" <b>7.3.5</b> "Heater started to burn" <b>7.3.7</b> "Error occurred" <b>7.3.8</b> Disable the output
	<b>7.4.</b> Notification signals on the output "Alert_2"	<b>7.4.1</b> "Heater started" <b>7.4.2</b> *"Heater stopped" <b>7.4.5</b> "Heater started to burn" <b>7.4.7</b> "Error occurred" <b>7.4.8</b> Disable the output
	<b>7.5.</b> Signals on the output "Status"	<b>7.5.1</b> Heater operates (potential) <b>7.5.2</b> *Heater operates autonomously (from battery, engine is off) (potential) <b>7.5.3</b> Heater operates autonomously (double impulses with the frequency adjusted by 6.7, applying settings 6.3-6.5) <sup>3</sup> <b>7.5.4</b> Engine runs (potential) <b>7.5.5</b> Engine runs (RPM impulses) <b>7.5.6.</b> Disable the output
<b>8.</b> Settings reset		<b>8.1.1</b> Apply factory settings

\* Factory setting

*Recommended settings is marked in italics*

<sup>1</sup> –RCP turns off the heater if the battery voltage becomes lower than preset

<sup>2</sup> – Signals appears only during the heater's autonomous operation

<sup>3</sup> – 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 the start of the heater, RCP indicates error code with built-in and additional LEDs blinking. The number of flashes corresponds to the error code. See table 4 for the codes description and possible solutions.

**Table 4**

<b>Error Code</b>	<b>Error Description</b>	<b>Possible Reasons of Error Appearance</b>	<b>Solutions</b>
2	No answer from the heater followed the start command	The heater is not activated in CIP	Configure the heater by Volvo car dealer 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 a diagnostics of the heater.
3	Battery Low	The module has determined that the battery voltage at the heater startup or during the heater operation is below the specified settings 3.1 и 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 setting
5	Unsuccessful start	The heater was switched off spontaneously at a 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’s connection
9	Settings error	Settings have been incorrectly stored in RCP 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)

RCP - Remote Control Plug-in (electronic module for the heater remote control)

CIP - Combined Instrument Panel

