Autoplugin RCP-FM

Version 7.4

Technical Description
User Manual

Rev. A

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Description

The **Autoplugin RCP-FM** is electronic module designed for remote control of fuel-fired heater (parking heater, fuel operated heater, pre-heater), factory installed on **Ford Transit Custom** (2013-), **Ford Tourneo Custom** (2013-) or **Ford Transit Van** (2014-). The device controls the heater via CAN-bus.

Module's Possibilities

- Embedded heater's remote control using the car's remote control key
- Set of inputs for outer heater's remote control using various impulses
- Set of outputs with programmable heater's status signals
- Remote cancellation of heater startup, programmed in the driver information system of the CIP
- Indication of heater's autonomous operation with the direction indicators flashing in the rearview mirrors
- Extended boost heat mode control
- Additional protection of the main battery from discharging by inspecting voltage level and time of autonomous operation of the heater

Package Content

1. Autoplugin RCP-FM module (0108-1110)
2. Plug-n-play cable
3. Wiring for permanent connection
4. Installation set
5. Technical Description brochure
6. Installation Manual brochure

Basic Functions

1. To start/stop the heater by using additional remote control, see documentation for the remote control. The functions of the remote control depend on its possibilities, connection schemes and module's settings.
2. To start the heater by using car's remote control key press "Unlock" button 2 times and then press "Lock" button. Time intervals between presses must not exceed 20 seconds. The excess of time interval restarts the counter of "Unlock" button presses. *If the car is equipped with factory alarm system, intervals between button pressings should be at least 6 seconds long, and final "Lock" pressing should be performed twice*. Car confirms reception of commands from the key with hazard signals flashing. As a result of entering of the sequence the car should flash 2 times with long flashes, then 2 times with short flashes.
3. By default RCP adjusted only to switch on the heater by using remote control key. To switch off the heater from the key, change the setup item 3.1. As both the commands use the same combination of "Unlock" presses, you should know the heater's status before you send a command. Therefore it is recommended to activate setup items 6.4 – 6.6 to see the heater's status by the means of direction indicators' flashing in rearview mirrors. The possibility to stop the heater remotely may be useful in case of trip cancelation, including one programmed in the CIP.
4. It is possible remotely disable startups of the heater, programmed in the CIP. Use additional remote control to send stop command when the heater is idle (not possible with car's remote control key). Starting the heater any way or turning the ignition to "on" position enables CIP programs again.
5. Additionally installed button has several functions. Current function is defined by the heater status, the ignition status and the engine status (see table. 1)

When the ignition is turned off, the button is used for immediate start or stop of the heater. Button pressing changes the heater status to another one: switches off the operated heater or switches on the idle heater.

When the ignition is turned on, button press keeps current condition of the heater after the engine start. So, if the heater has operated before the engine start, it may continue to operate after the engine start (in the boost heat mode). If the heater has been idle before engine start, button pressing keeps heater status (heater doesn't start in boost heat mode) after engine start. These functions are called quick enabling and disabling of boost heat mode respectively. Being activated these functions act for the current ignition cycle. Turning the ignition off cancels function activity.

When the engine runs, the button is used to quick enable of the boost heat mode (if the boost heat mode was disabled).

Warning! The parking heater must not be operated at filling stations, near sources of combustible vapours or dust or in enclosed spaces

Table 1

Button function	Ignition status	Engine status	Heater status	Description (how to use)
Heater immediate start	Off	Not running	Off	One-touch heater start
Heater immediate stop	Off	Not running	On	One-touch heater stop
One-time boost disable	On	Not running	Off	Quick disabling of boost heat mode for short trips
One-time boost enable	On	Not running	On	Quick enabling of boost heat mode in case of boost heat mode disabling by RCP settings or in case of one-time disabling previously
	On	Running	Off	

The fuel fired heater needs about 3 minutes to go to the normal operation after the startup. If your trip is planned to be shorter, it is highly recommended to use the button's function called "one-time boost disable". This preserves the heater from premature clogging. Turn on the ignition, press the button, then start the engine. Now the heater will not operate with the engine while don't you enable boost heat mode again.

Connection

RCP may be connected in two ways. Plug-n-play connection is easy type of connection which not requires special skills. Permanent connection is recommended for professional installation. It needs at least some experience in car electronics installation. Read installation manual for detailed connection schemes.

Additional Functions

By default RCP adjusted to execute basic functions, such as start of the heater by using Ford key or additional button, stop of the heater by using the button, control of boost heat mode, etc. To turn on additional functions (a possibility to stop the heater by using Ford key, battery monitoring, indication by turn signals in rear-view mirrors, extended control of boost heat mode, etc.) you need enter the module into programming mode and activate corresponding setting.

Programming button and the brakes pedal are used to enter programming mode and to the settings change. Plug-n-play cable is equipped with preinstalled

programming button. Use additionally installed button as programming button in case of permanent connection of the module.

It is necessary to stop the engine and the heater at first. Turn the ignition on, press and hold the brakes pedal. Then 3 times press the programming button (each time hold the button until LED goes off, about 1.5 seconds). Both direction indicators in the CIP confirm entering to the setup mode with 2 flashes. Release the brakes pedal finally.

Each setup item in the settings table is a 3-digit code. To enter a digit of a code, shortly press the 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 brakes pedal. 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 brakes 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.

To clear all the errors in the heater's memory and thus unblock the heater, enter the code 9.1.1. Both direction indicators flash five times confirming errors clearing. If unblocking of the heater is impossible, the indicators flash five times alternatively. **Pay attention**: when you apply unblocking function for the first time, RCP remembers VIN code of the car. In the future unblock function will work only for this car.

Settings Table (2)

2. Heater Timing	**2.1.** Limitation of heater's total operation time in pre-heat mode	**2.1.1** *Not applied **2.1.2** 40 minutes **2.1.3** 50 minutes **2.1.4** 60 minutes **2.1.5** *70 minutes* **2.1.6** 80 minutes **2.1.7** 90 minutes **2.1.8** 100 minutes

		2.1.9 120 minutes
	2.2. Limitation of heater's cycle operation time in pre-heat mode	**2.2.1** 10 minutes **2.2.2** 15 minutes **2.2.3** 20 minutes **2.2.4** 25 minutes **2.2.5** **30 minutes*
3. Heater remote control by using remote control key	**3.1.** Entering the sequence on the remote control key	**3.1.1** *Start the heater **3.1.2** Start of idle heater, stop of operated heater
	3.2. Number of "Unlock" button presses in sequence for heater control	**3.2.1** Heater control by Ford key is disabled **3.2.2** Two presses **3.2.3** *Three presses* **3.2.4** *Four presses **3.2.5** Five presses **3.2.6** Six presses
4. Battery Monitoring	**4.1.** Minimal battery voltage that lets the module start the heater in pre-heat mode	**4.1.1** * Not adjusted **4.1.2** 11.4V **4.1.3** 11.6V **4.1.4** 11.8V **4.1.5** *12.0V* **4.1.6** 12.1V **4.1.7** 12.2V **4.1.8** 12.3V **4.1.9** 12.4V
	4.2. Minimal battery voltage that lets the module keep operating the heater in pre-heat mode [2]	**4.2.1** * Not adjusted **4.2.2** 10.6V **4.2.3** 10.8V **4.2.4** 11.0V **4.2.5** 11.2V **4.2.6** *11.4V* **4.2.7** 11.5V **4.2.8** 11.6V **4.2.9** 11.7 V
6. Indication of the heater status using the car's lighting and the direction indicators in the rearview mirrors [6]	**6.1.** Indication of command reception from remote control[7]	**6.1.1** Off **6.1.2** *Three flashes
	6.2. Indication of successful startup of the heater from a remote control	**6.2.1** Off **6.2.2** *Seven flashes
	6.3. Indication of the heater's operation, when	**6.3.1** *Off **6.3.2** On

	starting source is the remote control	
	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
	6.5. Indication of the heater's operation, when starting source is additional button	**6.5.1** *Off **6.5.2** On
	6.7. Flashing frequency for 6.3-6.5 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 signal feed to the output "Alert_1"	**7.3.1** *"Heater started"[4] **7.3.2** "Heater stopped"[4] **7.3.5** "Heater started to burn"[4] **7.3.6** "Heating finished **7.3.7** "Error occurred" **7.3.8** Disable the output
	7.4. Notification signal feed to the output "Alert_2"	**7.4.1** "Heater started"[4] **7.4.2** *"Heater stopped"[4] **7.4.5** "Heater started to burn"[4] **7.4.6** "Heating finished **7.4.7** "Error occurred" **7.4.8** Disable the output
	7.5. Signal feed to the output "Status"	**7.5.1** Heater operates (potential) **7.5.2** *Heater operates autonomously (from battery, engine is off) (potential) **7.5.3** Hazard flashers control (double impulses with the frequency adjusted by 6.7, applying settings 6.1-6.5)[5] **7.5.4** Engine runs (potential) **7.5.5** Engine runs (RPM impulses) **7.5.6.** Ventilation is on during the heater operation (potential) **7.5.7.** Ventilation is off during the heater operation (potential) **7.5.8** *Heater operates autonomously, coolant temperature is below 30 Celsius degrees (potential)

		7.5.9 *Heater operates autonomously, coolant temperature is 30 Celsius degrees or higher (potential) **7.5.10.** Disable the output
8. Settings reset		**8.1.1** Apply factory settings
9. Heater errors reset		**9.1.1** Clear all errors in heater's memory, resulting heater unblocking

* Factory setting
Recommended settings is marked in italics

[2] –RCP turns off the heater if the battery voltage becomes lower than preset
[3] – Setting is not tested yet
[4] – Signals appear only at the heater's autonomous operation
[5] – 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).
[6] – Additional connections required (see installation manual), not available by using plug-n-play cable
[7] – For the car's remote control key only

Signals

The module has two connectors: 9-pin connector X1 (table 3) for input signals and power connection, 10-pin connector X2 (table 4) for output signals, special signals and CAN-bus connection. The first pin on each connector is marked by the key.

Table 3

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	Timer _in	+	Orange
7	RC_in	+	Yellow
8	*Ground*		*Black*
9	*Battery Power*		*Red*

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

X1.1 Heater_off+
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 program start of the heater, programmed by CIP.

Table 4

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	Engine_RS	-	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 marked in the table in Italics

X1.2 Heater_off-
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 program 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+
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-
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 outer multi-functional button connection. The current function of the button depends on the heater status, the ignition status and the engine status (see Table 4 for more details)

X1.6 Timer_in

Not used in current version

X1.7 RC_in

The input can be used to switch the heater on/off by the 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. GSM-modules with a potential signal on the control channel also may be connected to the input.

X1.8 Ground

X1.9 Power +12V

X2.1 RC_out

Signal is used for DSS Kit version only

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.

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 send a notification to the remote control device (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 send a notification to the remote control device (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 Engine_RS
Not used

X2.6 Indication
The output can be used for connection of stand alone or built-in to a button indicator, which informs user about heater run-time errors and heater's status

X2.7 Sensor_In
Not used

X2.8 Sensor_Out
Not used

X2.9 CAN-L
Low-level line of Medium Speed CAN bus.

X2.10 CAN-H
High-level line of Medium Speed CAN bus.

Troubleshooting

If a run-time error occurs at the heater's startup, RCP informs user by the built-in and additional LEDs blinking about the error code. The number of flashes corresponds to the error code. See table 5 for the codes description and possible solutions.

Table 5

Error Code	Error Description	Possible Reasons of Error Appearance	Solutions
2	No answer from the heater followed the start command	Outer temperature is upper than +15 Celsius degrees	The heater works only at temperatures outside are below +15°C. It is the heater manufacturer's restriction
		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 5 unsuccessful starts	Try to start the heater from CIP menu. If it not started to burn, check for fuel and coolant quality (especially at extreme cold temperatures) and possible heater's exhaust system

			clogging by snow. Then unblock the heater in the Setup mode.
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 4.1 и 4.2	Charge vehicle's battery with special charger (or start engine to charge) or cancel 4.1/4.2 module's settings
4	Time limits exceeded	Time limit for autonomous operation of the heater has achieved (with active setting 2.1.2 - 2.1.9)	Run the engine. It is recommended to make trips between heater operation cycles longer than heater operation cycles
5	Unsuccess-ful start	The heater 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 with operating time of less than 20 minutes	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 cables 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
BHM or Boost Heat Mode – operational mode of the heater, when it operates together with the engine to help the engine and the interior warm up more quickly.