23.04.2019

Promix
engineering and production center

SPLIT SYSTEMS RESERVATION CONTROL UNIT

Promix-CT.RES.01

OPERATIONS MANUAL

Technical description. Installation Guide. Passport

1. PURPOSE

The split-systems reservation control unit (hereinafter referred to as the device) is designed to control two split-systems in order to ensure uniform resource utilization, split-system performance monitoring, cooling capacity control by enabling and/or disabling the backup split-system. To analyze the performance and to control split-systems, the device monitors the availability of supply voltage, the current consumed by split-systems, the airflow temperature difference at the input and output of the internal units of both split-systems, and the indoor temperature.

The device performs the functions of:

- Alternate time-based split systems reservation: one split system is in operation, another one is in reserve, after a preset time the split systems switch to the opposite state;
- Emergency reservation: in case of the evaporator failure, compressor overload, loss of supply voltage on one of the split-systems, the backup system is enabled automatically;
- Reservation upon indoor temperature deviation: in case of violation of the indoor temperature mode, the backup split system is enabled, or all systems are disabled;
- Integration of the air-conditioning system with an alarm system: “alarm” signaling in case of an emergency;
- Integration with fire alarms: disabling of the VAC (air conditioning and ventilation) system when a fire alarm is triggered;
- Disabling/enabling air conditioning system by external command.

2. MONITORED PARAMETERS

- Monitoring power supply voltage availability in each split system;
- Monitoring current consumption in split-systems;
- Monitoring the indoor temperature using a separate sensor;
- Monitoring the airflow temperature at the input and output of the internal unit of each split system.

3. OPERATION CONDITIONS

The device has resistance to climatic factors according to GOST 15150-69: U3.

The device is intended for the indoor use or use under sheds with the following climatic conditions:

- ambient temperature: from -10 to +55°C
- relative air humidity of 95% at 35°C and lower temperatures without moisture condensation and frost formation.

4. DELIVERY SET

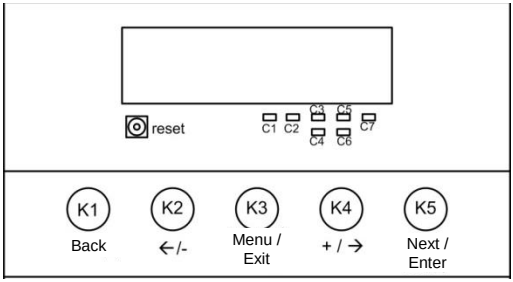
1 – Central controller of split-system reservation	1 pc
2 – Temperature controllers	3 pcs
3 – Temperature sensors	5 pcs
4 – Clamps for fastening sensors	5 pcs
5 – Operations manual	1 pc

Verify completeness of the device at purchase! Manufacturer does not accept further claims in respect of completeness.

5. SPECIFICATIONS

Power supply voltage (alternating current), V	220±15%
Current consumption, mA, not more than	100
Maximum load current per one channel, not more than, A	15
Split systems rotation cycle, hours	6-96
Operating temperature range, °C	-10 … +55

6. PURPOSE OF CONTROLS AND DISPLAYS



Purpose of controls and displays of the central controller of the unit

Element	Purpose
"MENU / EXIT" button	Enter/quit the menu without saving changes
"NEXT / ENTER" button	Go to the next parameter, enter the menu item
"BACK" button	Return to the previous parameter
"+/→" button	Increase the value of parameter, go to the next menu branch
"-/←" button	Reduce the value of parameter, go to the previous menu branch
"RESET" button	Central controller reset
«C1» LED	On - menu is entered
«C2» LED	Flashing - reservation function is activated Off - reservation disactivated
«C3» LED	On - split system 1 enabled Off - split system 1 disabled
«C4» LED	On - supply voltage is available in split system 1. Off - no voltage
«C5» LED	On - split system 2 enabled Off - split system 2 is disabled
«C6» LED	On - supply voltage is available in split system 2 Off - no voltage
«C7» LED	Red - alarm, errors detected Green - normal operation

7. CONNECTION AND INSTALLATION

ATTENTION! Installation and connection should be carried out on de-energized equipment!

ATTENTION! Device does not provide protection against short-circuit currents; therefore, the unit must be connected to the power supply circuit through automatic circuit breakers. Circuit breakers should be selected based on the current consumed by the split systems.

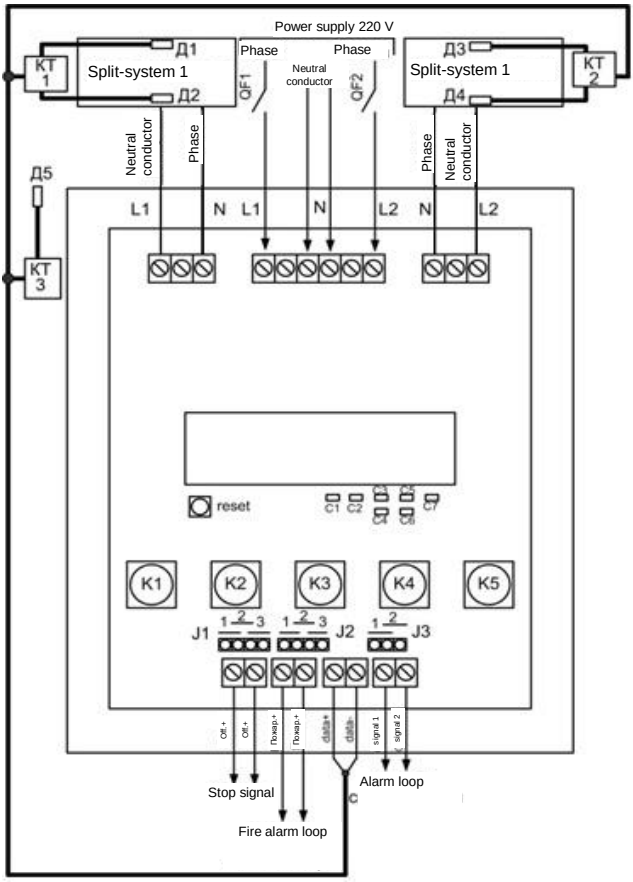
The central controller is installed on the wall and is connected to the power lines of the split-systems (it can be connected to different phases). Two split systems are powered from the central controller. The alarm loop, the fire alarm loop, the STOP signal loop and the temperature controllers are connected to the central controller.

Below is shown the wiring diagram of the device, contacts of the central controller are designated, the table below shows their description and the purpose of the central controller jumpers.

Also, further below the pictures with designations of the temperature controllers contacts are

shown followed by their description.

Temperature controllers are connected to the central controller through the data + and data - terminals. Temperature controllers do not require additional power supply as they are powered from the central controller via an information loop. The information loop is electrically isolated from the power circuit. Temperature controllers are installed in close proximity to split systems. Temperature sensors, which are installed at the airflow input and output of the split system internal unit, are connected to temperature controllers.

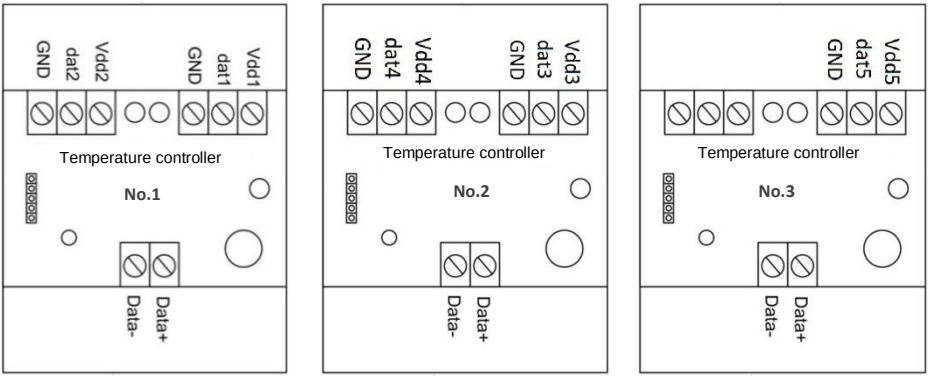


Wiring diagram of the unit controller

Element	Purpose
Д1, Д3	Airflow temperature sensors at the inputs of the split system internal units
Д2, Д4	Airflow temperature sensors at the outputs of the split system internal units
Д5	Indoor temperature sensor
КТ1, КТ2, КТ3	Peripheral temperature controllers
Jumpers field J1	Mode of operation of the STOP external signal inputs
Jumpers field J2	Mode of operation of the fire alarm inputs
Jumpers field J3	Type of alarm loop

Contact		Purpose
Connection to the power circuit	**N**	Neutral conductor of power circuit
	L1	Phase of the power circuit from which the split-system 1 should be powered
	L2	Phase of the power circuit from which the split system 2 should be powered
Split system 1 connection	**N**	Neutral conductor
	L1	Phase - split-system 1 power supply.
Split system 2 connection	**N**	Neutral conductor
	L2	Phase - split-system 2 power supply.
Data+		Connection of temperature controllers
Data-		
ПОЖАР+		Fire alarm loop connection
ПОЖАР-		
СТОП+		External command STOP (disabling split-systems)
СТОП-		
СИГНАЛ1		Alarm loop connection
СИГНАЛ2		

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Contact	Purpose
Data+	Connection of temperature controller to the central controller
Data-	
Vdd1	Temperature sensor 1 power supply
Dat1	Data exchange with temperature sensor 1
GND	Common wire
Vdd2	Temperature sensor 2 power supply
Dat2	Data exchange with temperature sensor 2
GND	Common wire
Vdd3	Temperature sensor 3 power supply
Dat3	Data exchange with temperature sensor 3
GND	Common wire
Vdd4	Temperature sensor 4 power supply
Dat4	Data exchange with temperature sensor 4
GND	Common wire
Vdd5	Temperature sensor 5 power supply
Dat5	Data exchange with temperature sensor 5
GND	Common wire

Wire color	Purpose
Brown	Vdd (Sensor power supply +5 V)
Yellow/green	Dat (Data exchange)
white	GND (Common wire)

The FIRE +, FIRE- inputs, and STOP + STOP- inputs, depending on jumpers J1 (FIRE + and FIRE- inputs) and J2 (STOP + and STOP- inputs) state, have different control signal versions.

If the jumper field J1 has two jumpers in position 1 and 3 (see the wiring diagram), to issue the command “fire” it is necessary to close the FIRE + and FIRE - inputs with a dry contact. If the jumper field J1 has a jumper in position 2, then in order to issue the “fire” command it is necessary to apply a direct voltage to the FIRE- - “0V” , FIRE + inputs – “+ 5 ... 12 V”.

If the jumper field J2 has two jumpers in position 1 and 3 (see the wiring diagram), then to issue the command “stop”, it is necessary to close the STOP + and STOP- inputs with a dry contact. If the jumper field J2 has a jumper in position 2, then in order to issue the “stop” command, a direct voltage must be applied to the STOP — “0V”, STOP + inputs – “+ 5 … 12 V”.

The jumper field J3 determines the type of alarm loop, position 1 - loop is normally open, position 2 - loop is normally closed.

Three temperature controllers are connected to the data + and data - contacts (see the previous figure): temperature controller No.1 - measurement of the airflow temperature at the input and output/input and output of the evaporator of split-system No.1; temperature controller No.2 - measurement of the airflow temperature at the input and output of the split-system No.2 evaporator; temperature controller No.3 - measurement of the indoor temperature. Temperature sensors are connected to temperature controllers with the like wires.

8. Operating modes

- Operating mode. In the operating mode, the device performs the reservation and analysis of the split-systems operation according to the algorithm described below (see section 12 and the appendix).
- Reservation parameters setting mode. This mode is used to program the reservation parameters. When entering this mode, the reservation stops, both split systems are disabled;
- The mode of setting the parameters of the split-system No.1. This mode is used to program the parameters of the split-system No.1. When entering this mode, the reservation stops, both split-systems are disabled;
- The mode of setting the parameters of the split-system No.2. This mode is used to program the parameters of the split-system No.2. When entering this mode, the reservation stops, both split systems are disabled;
- Service mode. In this mode, the reservation stops, the split-systems are enabled and disabled manually. In this mode, only one of the split-systems is enabled. This mode is used for adjusting and manual diagnostics of split-systems by operation personnel.

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9. RESERVATION PARAMETERS

1. Presence/absence of the “heating” mode. The parameter indicates whether the split-systems have a “heating” mode.
2. Rotation cycle. The parameter defines the time interval after which the backup split system is changed.
3. Emergency temperature. The parameter defines the range of permissible indoor temperatures. If the indoor temperature is out of the specified values, this is considered a violation of the indoor temperature mode.
   a. Minimum temperature. The lower limit of permissible indoor temperature.
   b. Maximum temperature. The upper limit of the permissible indoor temperature.
4. Reservation parameters for the “cooling” mode:
   a. Backup split system enabling temperature. The parameter determines the indoor temperature enabling backup split-system if the main one is operating in the “cooling” mode.
   b. Disabling temperature of all split systems. The parameter determines the indoor temperature disabling all split-systems operating in the “cooling” mode.
5. Reservation parameters for the “heating” mode:
   a. Backup split system enabling temperature. The parameter determines the indoor temperature enabling the backup split-system if the main one is operating in the “heating” mode.
   b. Disabling temperature of all split systems. The parameter determines the indoor temperature disabling all split-systems operating in the “cooling” mode.

10. PARAMETERS OF SPLIT-SYSTEM No.1 / No.2

1. System readiness. Time required for a split system to reach full operation. After enabling the compressor, the device does not monitor the temperature difference of the airflow at the input and output of the internal unit of the split system for the specified period of time and does not analyze the split system operation mode (“heating”/“cooling”)
2. Minimum current. The minimum current consumed by the split system when the compressor is on. It is recommended that the average current between the current consumed by the split system with the disabled compressor and that consumed when compressor is operating at the rated power be set as the value of this parameter. To measure the current, the service mode should be initiated (see section 8)
3. Maximum current. The maximum permissible current consumed by the split system in normal operation. To measure the current, the service mode should be entered (see section 8).
4. Parameters in the "cooling" mode:

   Temperature difference. The minimum allowable temperature difference between the airflow at the input and output of the internal unit of the split system in steady state. If, after the compressor is turned on after the time required for the split system to reach full operation, the temperature difference is not achieved, the evaporator is

considered out of service.

5. Parameters in the “heating” mode:

Temperature difference. The minimum allowable temperature difference between the airflow at the input and output of the internal unit of the split-system in steady state. If, after the compressor is turned on after the time the required for the split system to reach full operation, the temperature difference is not achieved, the evaporator is considered out of service.

11. RECOMMENDATIONS ON SPLIT SYSTEM SETUP

For the correct operation of the air conditioning system, split systems MUST have AUTOMATIC RESTART ON, the split system must be adjust to work in AUTOMATIC MODE, timers must be turned off, the same indoor temperature must be setup for both split systems. To adjust split systems and setup operating modes, follow the split systems operating instructions.

12. DESCRIPTION OF WORK ALGORITHM

The algorithm of the device operation includes alternate enabling split-systems using relay contacts to ensure uniform utilization of the resource of split-systems. The rotation period is setup in the respective section of menu.

When the air-conditioning system is turned on, both split-systems are enabled, after the split-systems reach full operation (time of system readiness can be adjusted, see section 10.) the device analyzes the performance of split systems and if both split systems are fully functional, split-system No.2 is disabled and performs the function of "backup" system, split-system No. 1 continues to work. If a malfunction is detected in one of the split-systems, this split-system is disabled, the backup system is enabled, and the alarm loop is closed.

At the expiration of the rotation period, the backup split system is activated. Both split-systems start working. After the split-system reaches full operation, its availability is analyzed. If the split-system is fully functional, the main split-system disables and starts to perform the backup function, and the backup system starts working as the main one. Split systems rotation takes place.

At the time of the split-systems rotation, the detected faults are reset, and the availability is again analyzed.

If one split-system is not able to support required indoor temperature, the backup system is activated. The backup system activation occurs in the following cases: the main split system operates in the “cooling” mode, and the indoor temperature has risen above the backup split system enabling temperature (see section 9.4); if the main split-system works in the “heating” mode, and the indoor temperature has dropped below the backup split-system enabling temperature (see section 9.5). If after the split-systems reach full operation, one split-system works in the “heating” mode, and the second one is in the “cooling” mode, the backup split-system is disabled, the alarm loop is closed, the information message “ERROR 10. Air conditioning system set incorrectly” is displayed.

Disabling all split-systems due to change in the indoor temperature takes place in the following cases: the main split-system works in the “cooling” mode and the indoor temperature has dropped below the disabling temperature of all split-systems (see section 9.4); the main split-system works in the “heating” mode, and the indoor temperature has exceeded the disabling temperature of all split-systems (see section 9.5).

The analysis of the split-systems operation mode (“heating”/“cooling”) occurs after the split-systems reach the full operation and the required temperature difference at the airflow input and output is achieved.

If the current consumed by the split-system is above its minimum value (see section 10.2), the timer of system readiness is activated, after the system readiness timer stops (see section 10.1), the split-system is considered to reach full operation. If the current consumed by the split-system gets below its minimum value, the split-system is considered to be disabled by its own temperature control system, and the system readiness timer is reset.

If the current consumed by the split-system exceeds the maximum value (see section 10.3) for 5-10 seconds, the compressor is considered to be overloaded, the unit disables the split system, enables the backup system, switches the alarm loop and displays an information message.

If, after reaching the full operation, the required temperature difference at the input and output of the internal unit is not achieved, that the evaporator is considered out of service. Faulty split system is disabled, the backup system is enabled. An alarm loop is closed, an informational message is displayed.

In case of failure of temperature sensors (or loss of communication with sensors) on any of the split systems, it becomes impossible to analyze its availability, the split system is considered faulty and is disabled, the backup system is enabled, and the alarm loop is closed. If a sensor failure (loss of communication) has occurred on both split-systems, then, to eliminate temperature violations, the reservation function is disabled. Both split-systems get enabled, the alarm loop is closed.

In case of indoor failure of a temperature sensor (loss of communication with the sensor), the sensors installed at the airflow inputs to the split-system are used to monitor the indoor temperature. In this case, the alarm loop is closed, an informational message is displayed.

At loss of power supply, the unit remembers the current state of rotation (which of split system is enabled, which one is in reserve, rotation time), after power is restored, both split systems are enabled, their availability is analyzed, then the device resumes operation from the breakpoint.

At arrival of a “FIRE” signal (see section 6), all split-systems are disabled, the device is disactivated, the message “FIRE” is displayed. Resumption of work is possible only after unit restart, or switching power supply off and on again.

At arrival of the “STOP” signal (see section 6), all split-systems are disabled and the rotation cycle timer is stopped. Message “STOP” appears on the display. After removing the signal "STOP" the device resumes operation.

13. TROUBLESHOOTING

Error displayed	Cause of error	Recovery method
ERROR 2.1. "Split system 1 power supply is off"	No voltage in the power supply circuit of the split-system No.1	Check power supply connection of the device , check the state of the input circuit breaker
ERROR 2.2. "Split system 2 power supply is off "	No voltage in the power supply circuit of the split-system No.2	Check power supply connection of the device, check the state of the input circuit breaker.
ERROR 3.1. "There is no connection with the temperature controller 1."	No communication with the temperature controller installed on the split-system No.1	Check the connection of the temperature controller to the central controller and the information loop.
ERROR 3.2. "There is no connection with the temperature controller 2."	No communication with the temperature controller installed on the split-system No.2	Check the connection of the temperature controller to the central controller and the information loop.
ERROR 3.3. "There is no connection with the temperature controller 3."	No communication with the indoor temperature controller	Check the connection of temperature controller to the central controller and the information loop.
ERROR 5.1. "No connection with temperature sensor 1"	The temperature sensor installed at the airflow output of the split-system No.1 is missing or faulty.	Check the temperature sensor connection
ERROR 5.2. "No connection with temperature sensor 2"	The temperature sensor installed at the airflow output of the split-system No.2 is missing or faulty.	Check the temperature sensor connection.
ERROR 5.3. "No connection with temperature sensor 3"	The temperature sensor installed at the airflow output of the split-system No.3 is missing or faulty.	Check the temperature sensor connection.
ERROR 5.4. "No connection with temperature sensor 4"	The temperature sensor, installed at the airflow output of the split-system No.4, is missing or faulty	Check the temperature sensor connection.
ERROR 5.5. "No connection with temperature sensor 5"	Indoor temperature sensor is missing or faulty	Check the temperature sensor connection.
ERROR 6.1. "Overload of split system 1 compressor"	Split-system compressor No.1 seized up or in severe operation conditions. Reservation parameters set incorrectly.	Check the state of the compressor and the level of freon. Check the correctness of reservation parameters settings.
ERROR 6.2. "Overload of split system 2 compressor"	Split-system compressor No.2 seized up or in severe operation conditions. Reservation parameters set incorrectly.	Check the state of the compressor and the level of freon. Check the correctness of reservation parameters settings.

Error displayed	Cause of error	Recovery method
ERROR 7.1. “Split system 1 evaporator faulty”	Lack of freon in a split-system No.1. Reservation parameters set incorrectly.	Check freon level and reservation parameters settings
ERROR 7.2. “Split system 2 evaporator faulty”	Lack of freon in a split-system No.2. Reservation parameters set incorrectly.	Check freon level and reservation parameters settings.
ERROR 8. “High indoor temperature”	Violation of the indoor temperature conditions. Windows, doors may be opened, additional heat sources installed, or the air conditioning and ventilation system designed incorrectly.	
ERROR 9. “Low indoor temperature”	Violation of the indoor temperature conditions. Windows, doors may be opened, additional heat sources installed, or the air conditioning and ventilation system designed incorrectly.	
ERROR 10. “Incorrect setting of the air conditioning system”	Split systems operate in different modes (cooling/ heating); At least one of the split-systems works in a heating mode, while the settings indicate the absence of the “heating” mode in split-systems.	Check and correct the settings of the device and split systems
ERROR 11. "Short circuit of the information loop"	Short circuit of an information loop with external units.	Check and replace the information loop.

14. MAINTENANCE

The controller does not need special maintenance.

15. SAFETY AND ENVIRONMENTAL PROTECTION

The installation and operation of the Promix-CT.RES.01 split systems reservation control unit must comply with the safety requirements of GOST 12.2.003-91.

The Promix-CT.RES.01 control unit complies with the fire safety requirements of GOST 12.1.004-91.

The Promix-CT.RES.01 split-systems reservation control unit i provides no risks to human life and health or the environment; after the end of its service life, its disposal is carried out without special environmental protection measures.

16. STORAGE AND TRANSPORTATION

Before commissioning, the device should be stored in the packaging of the manufacturer at room temperature from -30 to +50 °C and relative humidity not more than 98% at a temperature of 25 °C in accordance with the storage conditions according to GOST15150-69.

Terms of transportation of products, depending on the impact of mechanical factors comply

with group C according to GOST 23216-78, and depending on the impact of climatic factors comply with ZH2 of GOST 15150-69.

17. WARRANTY OBLIGATIONS

The manufacturing company "ITC "PROMIX" LLC guarantees the conformity of devices to the requirements of existing specifications, providing the compliance with rules of transportation, storage, installation and operation set forth in this manual.

The warranty period for the devices is 12 months from the date of sale, but not more than 18 months from the date of acceptance by the manufacturer's quality control department.

During the warranty period, "ITC "PROMIX" LLC undertakes to repair defective devices free of charge. Cost of shipping devices to the place of repair and back shall be borne by the Buyer.

Warranty obligations do not apply to defects or damages arising from:

- Improper maintenance by the Buyer;
- Use of devices in conditions that do not meet the requirements of operation;
- Mechanical damage or disassembly of products by the Buyer;
- Violations of the rules of transportation and storage.

Defective devices are accepted for repair only in a complete set, with the mandatory preservation of manufacturer's labels on the device packages.

Upon the expiration of the warranty period, the manufacturer provides post-warranty service of the product on a contractual basis.

In order to improve the quality of the device, the manufacturer reserves the right to make changes in design of devices without prior notice.

18. CERTIFICATE OF ACCEPTANCE AND PACKING

The Promix-CT.RES.01 split-systems reservation control unit is supplied in amount of ____pcs (1 pc by default) with the release date and the quality control mark indicated on the package, made and accepted in accordance with TU 4218-005-80210527-14, mandatory requirements of state standards and the current technical documentation, is recognized suitable for operation and packaged by "ITC" PROMIX" LLC.

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