DA
SERIES

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READ AND SAVE THESE INSTRUCTIONS

ADVANCED-PLC MANUAL

For Condair DA 500-4000 desiccant dryer
equipped with Advanced-PLC

With modulating capacity and
post-cooling temperature

Valid for version: 21.05.17

Dehumidification and Drying

≋condair

Thank you for choosing Condair

Installation date (MM/DD/YYYY):

Commissioning date (MM/DD/YYYY):

Site:

Model:

Serial number:

Contents

1 Introduction

1.1 To the very beginning

We thank you for having purchased a **Condair DA 500-4000 (Condair DA for short) desiccant dryer with Advanced PLC controller**.

The Condair DA desiccant dryers incorporate the latest technical advances and meets all recognized safety standards. Nevertheless, improper configuration and use of the Condair DA desiccant dryer with Advanced PLC controller may result in danger to the user or third parties and/or damage to property.

To ensure a safe, proper, and economical operation of the Condair DA desiccant dryer, please observe and comply with all information and safety instructions contained in the present manual as well as in the separate documentations of the components installed in the drying system.

If you have questions after reading this documentation, please contact your Condair representative. They will be glad to assist you.

1.2 Notes on this manual

Limitation

The subject of this manual is the Advanced PLC controller which is used together with the Condair DA desiccant dryers and is meant for **well-trained personnel being sufficiently qualified for their respective work.**

Safekeeping

Please safeguard this manual in a safe place, where it can be immediately accessed. If the desiccant dryer changes hands, the manual must be passed on to the new operator.

If the manual gets misplaced, please contact your Condair representative.

Language versions

This manual is available in other languages. Please contact your Condair representative for information.

2 For your safety

General

Every person working with the Advanced PLC control of the Condair DA desiccant dryer must have read and understood this PLC controller manual as well as the installation and operation manual of the corresponding Condair DA desiccant dryer before carrying out any work.

Knowing and understanding the contents of this PLC controller manual and Condair DA desiccant dryer installation and operation manual is a basic requirement for protecting the personnel against any kind of danger, to prevent faulty operation, and to operate the unit safely and correctly.

Qualification of personnel

All operations described in this PLC controller manual **may only be carried out by specialist who are well trained and adequately qualified and are authorized by the customer**.

For safety and warranty reasons any action beyond the scope of this manual must be carried out only by qualified personnel authorised by the manufacturer.

It is assumed that all persons working with the Condair DA desiccant dryer are familiar and comply with the appropriate regulations on work safety and the prevention of accidents.

The Condair DA desiccant dryer may not be used by persons (including children) with reduced physical, sensory or mental abilities or persons with lacking experience and/or knowledge, unless they are supervised by a person responsible for their safety or they received instructions on how to operate the system. Children must be supervised to make sure that they do not play with the Condair DA desiccant dryer.

Intended use

The Advanced PLC controller is intended exclusively to control the Condair DA 500-4000 desiccant dryers. Any other type of application, without the written consent of Condair, is considered as not conforming with the intended purpose and may lead to the Condair DA desiccant dryer becoming dangerous. Operation of the equipment in the intended manner requires **that all the information contained in this installation and operation manual are observed (in particular the safety instructions)**.

Prohibited modifications to the unit

No modifications must be undertaken on the Advanced PLC controller without the express written consent of Condair.

3   Advanced PLC controller

The Condair DA 500-4000 desiccant dryers can be equipped with an Advanced PLC controller.

It contains functions to control the desiccant dryer and monitors runtime meters and alarm functions. In order to cool the heating elements after the dehumidification has been switched off, a 5-minute cool-down timer is programmed for the reactivation air fan.

Compared to the Basic PLC variant, the Advanced PLC variant has 2 analog inputs and outputs. This allows the connection of e.g. a humidity and temperature sensor to control the dehumidification capacity with post-cooling temperature.

There is also the option of network integration via Modbus RS-232 (standard), Modbus RTU RS-485 or TCP / IP (optional Modbus card). Alternatively, the PLC can also be controlled remotely via a PC or mobile phone/tablet app.

The Advanced PLC controller also includes a rotation guard for the rotor.

4 Displays

The Advanced PLC has different displays, which are described in detail in this manual.

The LCD display switches off automatically after 15 minutes and switches on again when touched. In case of an alarm, the display remains turned on.

4.1 Main page

Fig. 1: Main display

The main page contains three buttons and three indication lights.

– Buttons
    – **<Unit On/Off>** button.
      Turns the unit on and off.
    – **<Manual/Auto>** button.
      In manual mode (MAN) the unit runs continuously with full reactivation power. In automatic mode (AUTO) the desiccant dryer is controlled by an external On/Off control signal, 0-10 V signal or by the integrated controller.
    – **<Cont. P. A. Fan>** button (**Cont**inuous **P**rocess **A**ir **Fan**).
      In automatic mode, the process air fan can be switched to constant operation by pressing **<Cont. P. A. Fan>**. The air circulation is maintained, even if no dehumidification is required.
– Indication lights
    – **Operation** indicator light.
      The operation indication light turns green when the unit is turned on and dehumidification is active.
    – **Stand by** indicator light.
      The stand by indication light is yellow as long as dehumidification is inactive.
      With Operation + Stand by only the process air fan is running.
    – **Alarm** indicator light.
      If an alarm is active, the alarm indicator turns red and it will be turned on until the alarm has been acknowledged and reset.

4.2 Operation

The operation page shows the current operation status of the Condair DA desiccant dryer.

Fig. 2: Operation display

The unit can be controlled with one of the following methods:

- Humidity sensor for relative humidity control (% rH).
- Humidity and temperature sensor for absolute humidity control x (g/kg).
- External 0-10V control signal.
- On/off with full reactivation power.
- Cooling coil control with a temperature sensor.

The standard setting is the relative humidity control using a humidity sensor and a % rH set point. The sensor value and set point are shown in two columns. The set point can be adjusted on Service Level 2.

If a humidity and temperature sensor is connected, it is possible to use absolute humidity control x (g/kg). If no temperature sensor is connected, these values will not be shown on the screen.

It is also possible to control the dehumidification capacity with an external 0-10 V signal. The unit will start above +3V, step 2 start above +5V. When this option is selected, the humidity sensor values are hidden.

Outputs show the control signal in % for "Reactivation fan speed" and "Pre/post cooling valve".
The fan speed only changes if an EC type fan is installed, otherwise the reactivation air volume flow remains constant.

The unit can be stopped with two external normally closed (NC) digital inputs.

• External interlock signal (External interlock ON)
• External emergency stop (Ext. emergency stop)

When opening the external interlock contact or removing the jumper the unit stops dehumidification. To prevent heat build-up around the device, the regeneration air fan continues to run for 5 minutes to cool the unit down. The unit restarts normal operation when the contact closes again.

If one of the two contacts is active it is indicated in red on the operation page.

> **⚠ CAUTION!**
>
> The external emergency stop turns off the unit completely, including both fans. This function is only to be used in an emergency (fire alarm) due to the risk of overheating the unit.
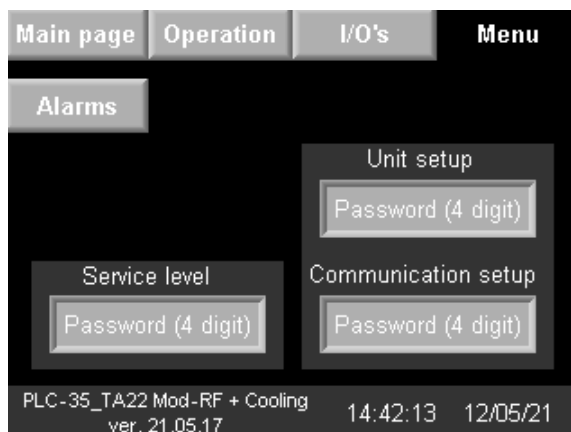
4.3   Menu

Fig. 3: Menu display

The menu display contains links to the "**Alarms**" submenu as well as to the password protected sub-menus "Service level", "Unit setup" and "Communication setup".

– "Service level" passwor: "**1111**"
– "Unit setup" and "Communication setup" password: "**4498**"

The software version number, time and date are displayed here as well.

4.4   I/O's menu (Digital inputs and outputs)

Main page	Operation	I/O's	Menu

Digital inputs	**Digital outputs**
0 Rotation guard	0 React. heater step 1
0 R. heater/fan, DM fault	0 React. heater step 2
0 Process air fan fault	0 Process air fan
0 P.a. fan thermal	0 React. air fan
0 Filter guard	0 Rotor drive motor
0 Ext. interlock signal	0 Ext. alarm indication
0 Ext. emergency stop	
0 React. air fan thermal	

0 Ext. interlock signal
1 Ext. emergency stop
0 React. air fan thermal

Fig. 4: IO's menu

The IO's menu page shows the current status of the digital inputs and outputs of the PLC controller. Some I/O's are different depending on unit size and version.

If the emergency stop is active it is highlighted in red for better visibility.
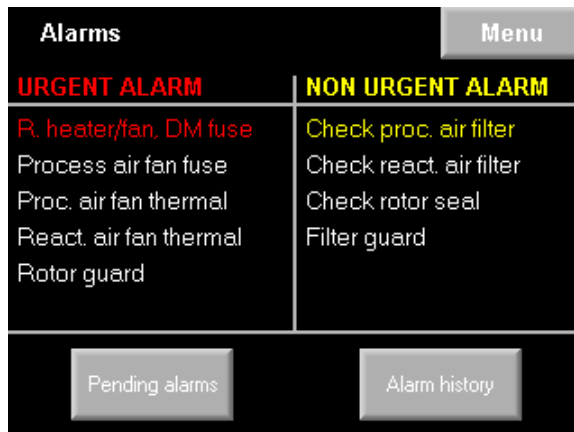
4.5   Alarms menu

Fig. 5: Alarms submenu

The "Alarms" menu page shows alarm status in two groups:

–   **Urgent** alarms
    –   R.heater/fan, DM fuse (Fault reactivation air heater fuse, Rotor motor, heating)
    –   Process air fan fuse (Fault process air fan circuit breaker)
    –   Proc. air fan thermal (Fault process air fan)
    –   React. air fan thermal (Fault reactivation air fan)
    –   Rotor guard (Fault rotor guard)

–   **Non urgent** alarms
    –   Check proc. air filter (Check process air filter, when active)
    –   Check ract. air filter (Check reactivation air filter, when active)
    –   Check rotor seal
    –   Filter guard (filter monitoring)

Note: The rotor guard is active only when the drive motor is running. The magnet on the rotor must pass the sensor within 45 minutes or there will be an alarm. The alarm will reset when there is an impulse from the sensor.

When an alarm is active, it is indicated by the red and/or the yellow light. If an alarm is not active it is shown in gray.

The button **<Pending alarms>** opens a page showing all alarms that are pending (see *section 4.5.1*). The button **<Alarm history>** opens a page showing the alarm history (see *section 4.5.2*).

If an urgent alarm occurs, the unit will stop running. The unit can be restarted, but without the functions connected to the cause for the alarm. The alarm will remain active until the cause of the alarm has been eliminated. If there is a non-urgent alarm, the PLC will continue to operate normally.

4.5.1   Pending alarms

After pressing the **<Pending alarms>** button in the "Alarms" submenu (see *Fig. 5*), the display of pending alarms grouped by category appears (see *Fig. 6*).

Fig. 6: Example display: pending alarms display

With the **<Reset>** button you can reset alarms, if the cause of the problem has been solved.

With the **<Refresh>** button you can update the alarm list.

By pressing the magnifying glass button beside a pending alarm group, the alarms of the respective group are listed (see *Fig. 7*).

Fig. 7: Example display: List of alarms of the selected group

The column "**Ack**" (acknowledge) indicates whether the respective alarm was acknowledged ("Y") or not ("N").

By pressing the magnifying glass button in this display, further details of the respective alarm are displayed (see *Fig. 8*).

Fig. 8: Example display: Alarm details

By pressing the **<Ack>** button in this display, you acknowledge an alarm, which allows to reset the alarm if the cause is resolved.

4.5.2   Alarm History

By pressing the **<Alarm history>** button in the "Alarms" submenu (see *Fig. 5*), the history of all existing alarms is displayed. Use the <Double arrow> buttons to scroll through the alarm history list.

Fig. 9: Example Display: Alarm history

In the alarm history list for each alarm in the list the time is shown, when it occurred, when it was fixed, the elapsed time until it was acknowledged and the time when it was reset.

4.6   Service Level

The "Service Level" Menu is password protected (see *section 4.3*).

The first page of the service level (Service Level 1) shows runtime meters for different components. The operating hours counters for the air filter and rotor seal can be reset with the **<Reset>** buttons after they have been replaced.

The service interval for filter and rotor seals runtime alarm can be adjusted. When the runtime exceed the set service interval, a non urgent alarm will show.

Fig. 10: Screen Service Level 1

On the second page of the service level (Service Level 2) the setpoints for temperature control and for humidity control if using a humidity sensor are displayed. The deactivated setpoint (depending on the settings in "Unit Setup") has a gray background.

In addition, the current control parameters ("PID P-band", "PID I-time" and "PID output ") of the integrated PI temperature controller and PI humidity controller are displayed.

With the <Clear alarm history> button the alarm history can be reset and with the **<Rotation guard ON/ OFF>** button the rotor guard can be activated or deactivated.

Fig. 11: Screen Service Level 2

On the DA 500-4000 devices, the humidity setpoint is used for the dehumidification control. The dehumidification starts when the "PID output" reaches 30%. The regeneration air fan is controlled at 30%. When the demand increases, the fan speed changes in the range of 30% - 100%. At 50% control, the second available heating level is switched on.
Note: The fan speed only changes if an EC type regeneration air fan is installed, otherwise the regeneration air volume flow remains constant.

The temperature setpoint is used to control the temperature of the dry air. If the temperature of the dry air exceeds the setpoint, the integrated PI temperature controller opens the post-cooling valve between 0% and 100% depending on the cooling demand.

4.7 Communication setup

In the "Communication setup" submenu (password protected, see *section 4.3*) you can adjust the communication settings if a Modbus R485 or TCP/IP connection is to be established using a corresponding optional interface card.

– For RS485 there are six different combinations available to choose from.

– For TCP/IP it is possible to change IP address, gateway and subnet.

After adjusting a communication settings, press the corresponding button **<Save RS485>** or **<Save TCP/ IP>**, in order to the save the adjusted settings. The Modbus network ID can also be set (default is "35").

Fig. 12: Communication settings

4.8   Unit Setup

In the "Unit setup" menu you can define how the unit is controlled.

Fig. 13: Unit setup menu

Analog input selection gives the option to choose between a humidity sensor signal or an external 0-10 V control signal for dehumidification control. Both options share the same input so it is not possible to use a sensor signal and an external 0-10V control signal at the same time.

If a humidity and a temperature sensor is used (0-10 V; 0-100 % rH; 0–50 °C), it is possible to choose between relative humidity (% rH) and absolute humidity (g/kg) control. Depending on the selected value, the inactive set points will be disabled.

If a 0-10V external control is active, all options associated with the humidity sensor will be hidden.
If a temperature sensor (0-10 V; 0–50 °C) is installed and enabled, temperature control for a post cooler will be available.

Depending on the type of reactivation air fan modulating heating control can be activated (Type EC) or deactivated (Type AC).

5 Modbus Communication

The PLC has built in support for Modbus RTU with RS-232 interface (P1, RJ11).

For Modbus RTU RS485 and TCP/IP an optional interface board is required.

5.1 Modbus data register table

Modbus datapoint table				ID: 35 Baudrate: 9600, Parity: None, Stop bits: 1				
Holding Register	Coil Status	Read/ Write	INFO	Text / Info	Var.	Start	End	Format
				Analog inputs				
70	91	R		Humidity sensor (coil 1 = rH control)	% rH	0	100.0	###.#
71	92	R		0-10V dehumidification control (coil 1 = 0-10V)	VDC	0	10.0	##.#
76		R		Temperature sensor	°C	0.0	50.0	##.#
99	93	R		Absolute humidity (coil 1 = g/kg control)	g/kg	0.0	-	##.#
22		R		Post cooling valve	%	0.0	100.0	###.#
23		R		Reactivation air fan speed	%	0.0	100.0	###.#
				Analog set point				
9		R/W		Setpoint % RH process air	% rH	50.0	-	##.#
10		R/W		Setpoint °C process air	°C	20,0	-	##.#
11		R/W		Setpoint g/kg process air	g/kg	7.3	-	##.#
				Misc				
	2	R/W	1=On	Unit on/off	1/0	-	-	-
	3	R	1=On	Urgent alarm	1/0	-	-	-
	4	R	1=On	Non urgent alarm	1/0	-	-	-
	13	R	1=On	Cooling time reactivation air fan	1/0	-	-	-
	15	R/W	1=Auto	Unit automatic/manual mode	1/0	-	-	-
	27	R/W	1=On	Continuous process air fan	1/0	-	-	-
				Digital inputs (Read)				
	24576	R	1=On	Rotation guard sensor	1/0	-	-	-
	24577	R	1=On	Circuit breaker reactivation heater/fan, drive motor	1/0	-	-	-
	24578	R	1=On	Circuit breaker, process/dry air fan	1/0	-	-	-
	24579	R	1=Off	Thermal protection process air fan	1/0	-	-	-
	24580	R	1=On	Filter guard	1/0	-	-	-
	24583	R	1=Off	External interlock signal	1/0	-	-	-
	24584	R	1=Off	External emergency stop	1/0	-	-	-
	24585	R	1=Off	Thermal protection, react. air fan	1/0	-	-	-
				Digital outputs (Read)				
	16384	R	1=On	Reactivation heater step 1	1/0	-	-	-
	16385	R	1=On	Process air fan	1/0	-	-	-
	16386	R	1=On	Reactivation air fan	1/0	-	-	-
	16387	R	1=On	Drive motor	1/0	-	-	-
	16388	R	1=On	Alarm indication	1/0	-	-	-
	16389	R	1=On	Reactivation heater step 2	1/0	-	-	-

Pin #	RS232 (Port 1)
1	Not connected
2	0V reference
3	TXD Signal
4	RXD Signal
5	0V reference
6	Not connected

Signals are related to the controller's 0V; the same 0V is used by the power supply.

The serial port is not isolated. If the controller is used with a non-isolated external device, avoid potential voltage that exceeds ± 10V.
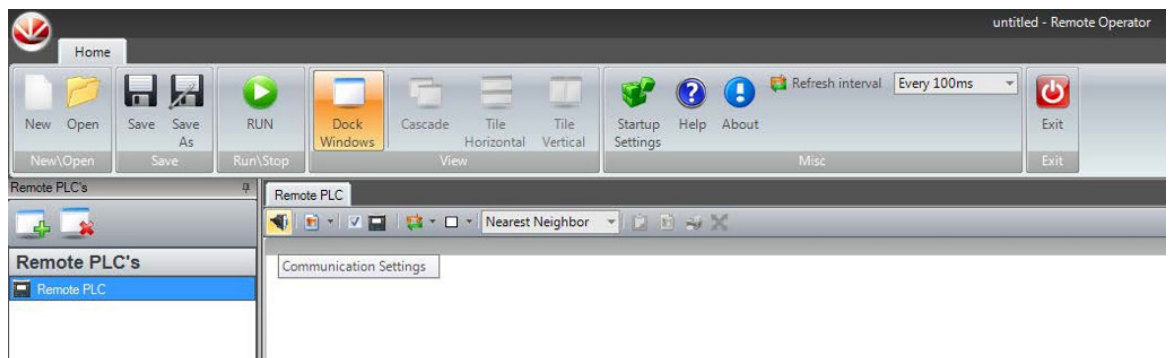
6   Remote operation

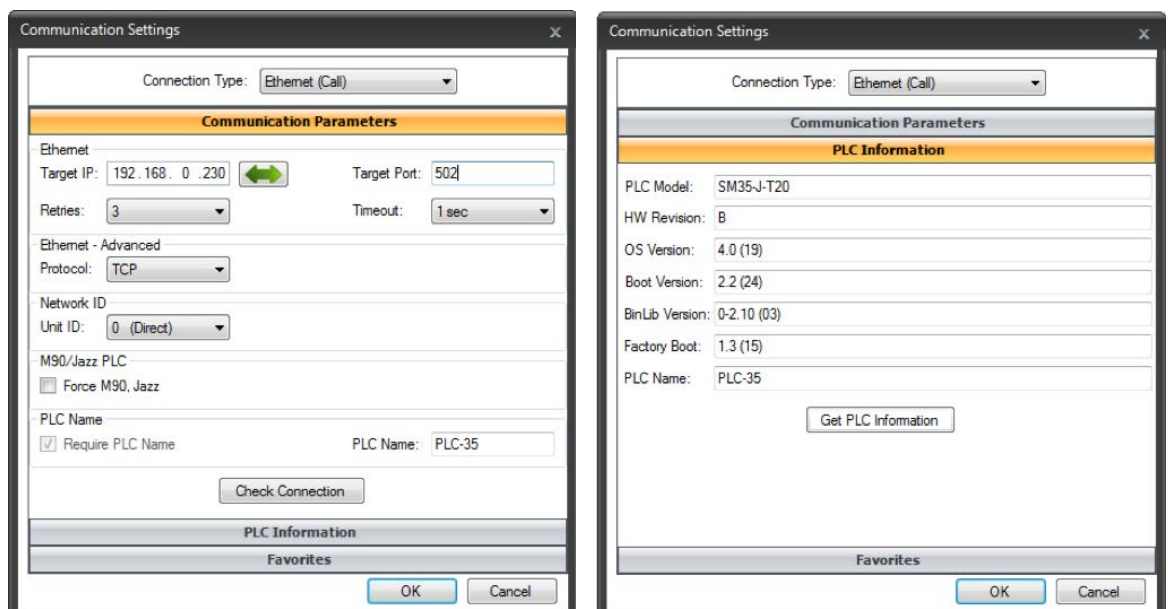The "Remote Operation" software enables you to use a PC to view and work with a remote controller's HMI panel.

The Remote Operation software can be downloaded from the PLC's-manufacturer website (http://uni-tronicsplc.com/software-visilogic/).

6.1   Software configuration

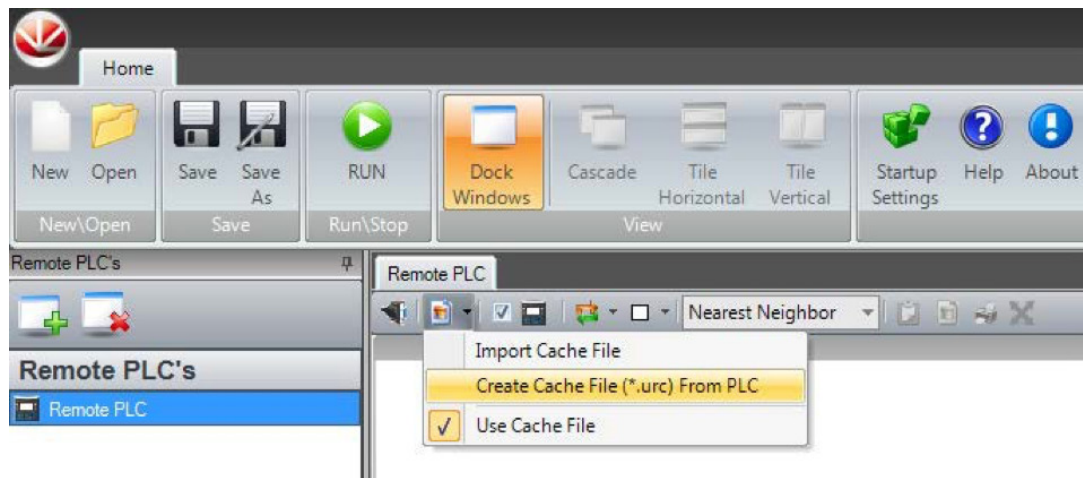• Press "Communication Settings" to set up communication with the PLC.

• Enter the communication parameters.
  The PLC name is **PLC-35** for unit sizes DA 500 up to DA 4000 and **PLC-45** for unit sizes from DA 4400.
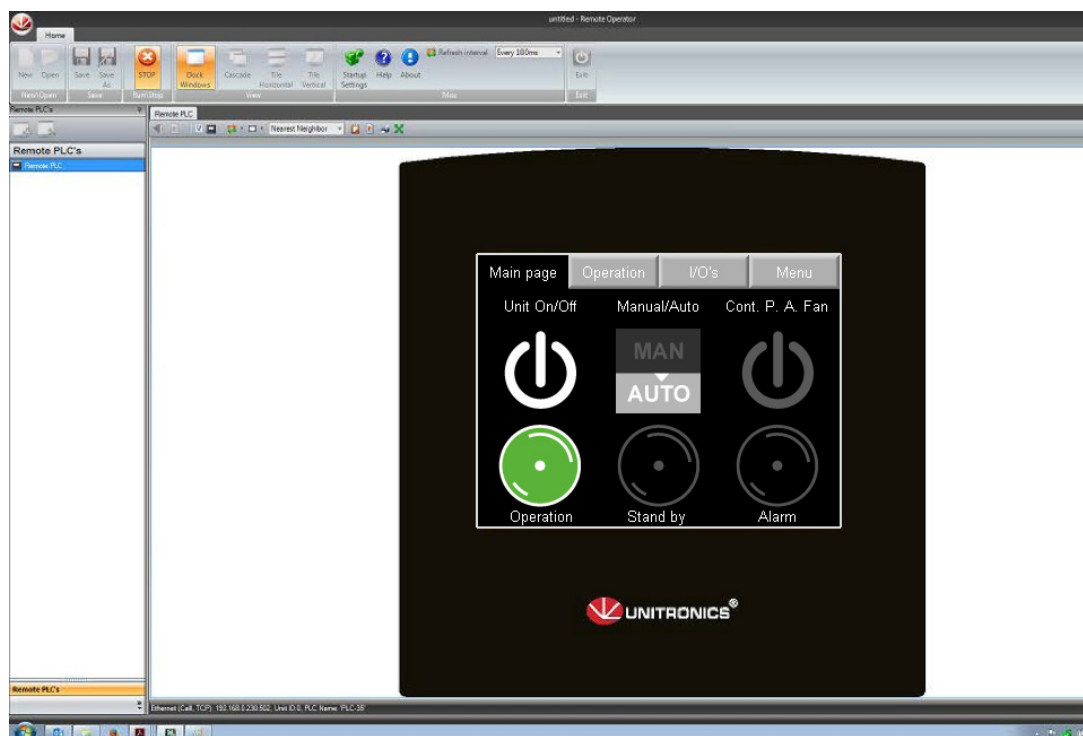

Press **<Check Connection>** and if the parameters are correct, the PLC information will be shown. Press **<OK>** to confirm.

- When the PC has a connection to the PLC, a cache file must be created for the HMI.

  Press **<Create Cache File (*.urc) From PLC>**. Choose a file name and press Next a few times. A cache file is created.

- Now, a live connection can be established.

  To start the remote operation, press **<RUN>**. The PLC can now be operated remotely.

Notes

Notes

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