



Operation and Service
Manual Cx-Series
940140-0005 Rev A



Programmable Logic Controller and
Touchscreen HMI (Carel)


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1 Overview

1.1 Using This Manual

Information about options and settings is included to commission and maintain a Colmac WaterHeat unit without difficulty. For more information on specific settings or for help with a unique application, please contact the factory.

 **NOTICE** The screenshots shown below do not necessarily depict the default or recommended setpoints or even the parameters available on every unit. Changing any parameter from its default setpoint may result in inefficient or incorrect operation.

1.2 Using the Touchscreen

This touchscreen, or human machine interface (HMI) is a graphic terminal designed to simplify user interface. This display uses high quality images and advanced functions to simplify navigation and control of the PLC.

In order to insure longevity of the HMI, it is recommended the equipment not be exposed to aggressive or polluting atmospheres (e.g. Sulphur and ammonia fumes, salt spray, smoke) to avoid corrosion and/or oxidation.

1.3 Levels of Access

There are two levels of access on your PLC:

Level 1: Basic maintenance and setpoints, I/O observation; no password required

Level 2: Settings menu, in depth adjustment of unit control; default password is “4505”.

2 Operation

2.1 Operating Conditions

Colmac Heat Pump Water Heaters are designed to operate in a range of conditions and robustly handle faults or exceptions that could impact performance. Colmac WaterHeat units are programmed at the factory to operate at the customer reported conditions. Please consult with your Colmac Factory representative before making modifications to machine settings.

2.2 Status Light and Display Sleep

After 15 minutes the touchscreen will enter sleep mode. To wake up the screen, lightly press anywhere on the screen. To provide user feedback while the HMI is asleep, the HMI is equipped with a low-power multi-color LED. Located on the right side of the touchscreen, this LED indicates a quick status of the equipment.

- Solid Red – Unit is currently disabled; the heat pump will not run.
- Blinking Red – Unit has an active alarm.
- Solid Yellow – Unit is in stand-by with no call for heat and no active alarms.
- Blinking Yellow – Unit has a countdown timer running.
- Solid Green – Unit is running.

2.3 Menus

During operation the main screen contains most of the necessary information.

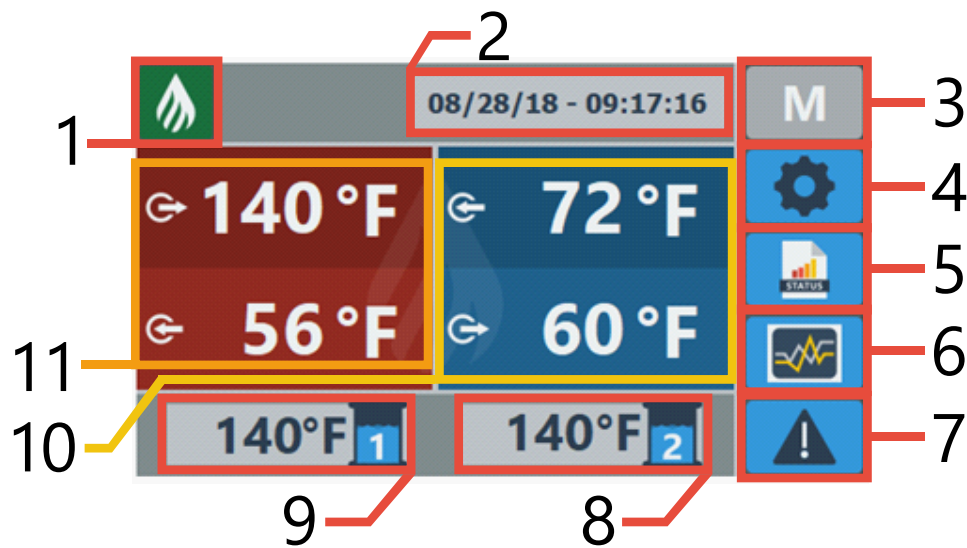


Figure 1: PLC User Terminal

1. **Unit status icon:** Touch and hold this for a text explanation of the status.
2. **Date and time:** Format can be changed in the clock settings.
3. **Unit ID:** Master unit (M), additional units are numbered 2+
4. **Settings:** Configure and change current operating parameters.
5. **Status:** Additional information about the heat pump.
6. **Historical trends:** Display historical data about the heat pump.
7. **Alarms:** Shows current alarms and the alarm log.
8. Tank 2 Aquastat temperature
9. Tank 1 Aquastat temperature
10. Source Temperatures (Entering/Leaving)
11. Potable Temperatures (Leaving/Entering)

2.3.1 Settings

For most installations the default values should not be modified.

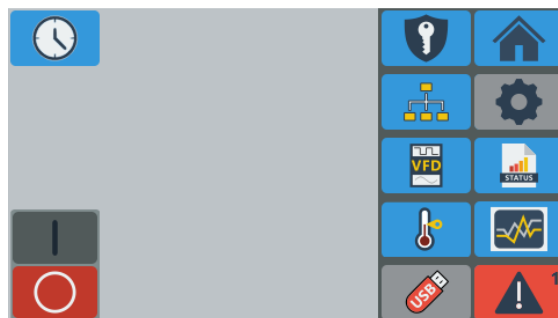



Figure 2: Settings page with Level 1 Access

- **Admin (🔑):** Sign-in to access advanced settings.

- **Network** (

2.3.2 Enable/Disable

This menu allows the user to enable or disable the machine locally; the PLC will still have power, but any call for heat is ignored while the unit is in the “Off” position. This button is in the lower-left corner of the settings menu. Press and hold the button for 2 seconds.

2.3.3 Temp Setpoint

“**Control Type**” selects which of three control methods is used for the unit:

- **Single-Pass control (Default):** The unit will alter the potable flow rate to maintain a consistent potable output temperature.
- **Multi-Pass control:** The unit does not directly control the output water temperature or pressure.

Aquastat Type: selects the method used to signal the unit to operate; application dependent.

- **PLC Single:** Uses the Tank Temp 1 thermocouple provided with the machine.
- **PLC Dual:** Uses the Tank Temp 1 and Tank Temp 2 thermocouples provided with the machine to separate the on and off setpoints for the machine.
- **BMS:** Triggered by the BMS system.
- **Digital In:** Uses a dry set of contacts on the terminal blocks to trigger a call for heat from an external aquastat or system.
- **Master Control:** Triggered by the master unit in the array.
- **Dual Demand:** Uses the Tank Temp 1 and Tank Temp 2 thermocouples provided with the machine. Only runs when there is demand for both cooling and heating.
- **Digital in & BMS:** Allows either source to run the unit.

Setpoint Screen contains the variables for the Temperature Control methodology. These values should not be changed without consulting the factory. Advanced options require Level 2 access.

| | | | | | | | |
|-----------------------------------|------|-------|----------|--------------------------|-------------|----------|-----|
| AQUASTAT SETPOINT: | 140 | °F | | ADVANCED OPTIONS | | | |
| AQUASTAT DIFFERENTIAL: | 20 | °F | | AQUASTAT TYPE: | PLC SINGLE | | |
| AQUASTAT DELAY: | 1800 | SEC | | CONTROL TYPE: | SINGLE-PASS | | |
| AQUASTAT OFF: | 140 | °F | | EVALUATION TIME: | 0 | | SEC |
| OUTPUT TEMPERATURE CONTROL | | | | ADVANCED OPTIONS | | | |
| OUTPUT TEMPERATURE: | 140 | °F | | CONTROL PRESSURE STEP: | 0 | PSI | |
| CURRENT TARGET PRESSURE: | 0.0 | RESET | | MAX PRESSURE ADJUSTMENT: | 0 | PSI | |
| | | | | OUTPUT DIFFERENTIAL: | 0 | °F | |

Figure 3: Aquastat settings and the advanced aquastat options.

2.3.4 Status

The Status page shows system values. There are no editable settings in this menu. System temperatures, pressures, component status, and individual safety statuses are all displayed here.

2.3.5 Alarm Logs

The Alarm Log menu is a record of all alarms recorded by the PLC. Each logged entry contains the date and time the alarm occurred as well as relevant data recorded by the PLC.

| | | | | | | |
|---|---|--|-------------|---|--|-------------|
| 1 | 2 | ACTIVE ALARMS | | 3 | ALARM HISTORY | |
| | | | | | Duration : 10 Mins | |
| | | Description | Time | | Description | Time |
| | | LOW REFRIGERANT PRESSURE DP:229 & -SP:43 | 02/01-09:35 | | LOW REFRIGERANT PRESSURE DP:229 & -SP:43 | 02/01-09:35 |

Figure 4: Active alarms and alarm history

To attempt to clear active alarms, press and hold the alarm reset icon (2) for 2 seconds; if alarms do not clear, they are still active.

To access the Alarm History from the Active Alarms page, press the alarm icon(1).

To Save the Alarm History Log to a USB, insert a USB drive into the screen and press the save icon(3). This action requires a USB drive to be inserted into the screen.

Alarm Key: This will appear in the alarm log description.

DP: Discharge Pressure

SP: Suction Pressure

LST: Leaving Source Temperature

EST: Entering Source Temperature

LPT: Leaving Potable Temperature

EPT: Entering Potable Temperature

ScT: Scroll Temperature (≥ 20 HP units only!)

2.3.6 C.PCO

This menu provides read-only information such as code version, basic software information, unit IP address, and BACnet License information.

2.4 System Info

This menu provides information about the physical/electrical status of the connection to the PLC.

2.5 Multiple Colmac Cx-Series Modules

The Colmac Cx-Series is Plug-and-Play expandable by connecting an Ethernet cable between two units or connecting multiple units via an Ethernet Switch. Each heat pump will operate individually but will act in concert with the other networked modules to provide staging, lead-lag optimization of compressors, scheduling, and other benefits. If applicable, the building only needs to supply a single BMS connection or Aquastat signal to the networked units.

3 Service and Maintenance

3.1 Servicing the Machine

NOTICE Before servicing the machine, follow proper “Lockout-Tagout” procedure and all local safety requirements.

Only qualified electricians should open control box doors. Power to the machine should be turned off before the electrician opens the control box door. Before turning off power, the PLC should be set to “OFF” in the **Enable/Disable** menu (2.3.2 Enable/Disable); this prevents unexpected startup of the unit when power is returned to the unit after servicing. Note that setting the unit to “OFF” is NOT sufficient to replace “Lockout-Tagout” and other safety procedures.



Figure 5: Locked and Tagged Interlock

If it is necessary to have the electricity on to the control box to troubleshoot electrical issues, the electrician should use extreme caution. Another person should guard against accidental operation of controls by others that could result in personal injury or damage to the equipment.

3.2 Safety Features

Colmac Heat Pumps have several safety features integrated into the controls. Many of these are automatic, such as High Discharge Pressure, Low Suction Temperature, Low Source Temperature, or Low Source Flow; the unit will automatically check these conditions and run as appropriate.

- **Hot Start Control:** Prevents nuisance high pressure faults when incoming heated water temperatures are higher than expected. This protection operates in the first 15 seconds after the compressor starts. After 15 seconds the unit resumes normal operation.
- **Maximum Potable Inlet Temperature:** The unit will NOT respond to a call for heat if the potable inlet water is higher than a specified temperature. By default, this temperature is set to 130 °F (54.4 °C).
- **Compression Ratio Control:** During periods of abnormally low source temperature, high refrigerant condensing temperatures may cause the compressor to exceed the manufacturer approved operating envelope. The unit will automatically adjust operation to stay within safe bounds while still providing hot water. Once the source temperature has increased to acceptable levels, the machine will return to normal operation. Temperature output may drop during this period.

3.3 Resetting Faults and Alarms

If the unit enters an alarm state due to a fault, the unit will ignore calls for heat until the fault condition has cleared. The alarm light will flash red while the fault persists. If the fault has cleared, hot water demand is present, and the unit is enabled (2.3.2 Enable/Disable), the unit will restart. The PLC is programmed to allow no more than six start attempts per hour.

3.4 Default Values

All Colmac Heat Pumps are set at the factory with default values designed to maximize the life and service of the unit. Changing these values may cause sub-optimal performance or even cause damage to the unit.



Colmac reserves the right to change product design and specifications without notice.

For more information on Colmac products call us at 1-800-926-5622 or visit us online at:

WWW.COLMACWATERHEAT.COM