IONEX IEX-100

User Manual

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IONEX IEX-100 User Manual

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- **Main Items: The main hardware components of the IONEX IEX-100 system are:**
  - **LCD**
  - **LEDs**
  - **Switches**
  - **Power connector**
  - **Inputs connector**
  - **Outputs connector**

Electrical Wiring

- **Inputs**

The controller monitors four main sensor inputs via the MCP23009 I2C expander (active-low logic):

1. **Input 1: Raw Water Low Level**
   - **Pauses operation until water is sufficient.**
2. **Input 2: Low Pressure**
   - **Monitors system pressure.**
   - **Pauses operation if pressure drops below safe threshold.**
3. **Input 3: Product High Level**
   - **Indicates when the product tank reaches a high level.**
   - **Prevents overflow and manages output flow.**
4. **Input 4: High Conductivity**
   - **Senses high conductivity in the product water.**
   - **Triggers pre-rinse or post-rinse cycles for water quality.**

All inputs are active-Hi: a Hi signal (12-24VDC) means the condition is active.

- **Outputs**

The controller provides the following outputs:

- **Outputs Terminals Block 1:**
    1. **Terminal 1: [Common]**
    2. **Terminal 2: [Common]**
    3. **Terminal 3: [Relay 1]**
    4. **Terminal 4: [Relay 2]**
    5. **Terminal 5: [Relay 3]**
    6. **Terminal 6: [Relay 4]**
    7. **Terminal 7: [Relay 5]**
    8. **Terminal 8: [Relay 6]**
    9. **Terminal 9: [Relay 7]**
    10. **Terminal 10: [Relay 8]**
- **Outputs Terminals Block 2:**
    1. **Terminal 11: [Common]**
    2. **Terminal 12: [Common]**
    3. **Terminal 13: [Relay 9]**
    4. **Terminal 14: [Relay 10]**
    5. **Terminal 15: [Relay 11]**
    6. **Terminal 16: [Relay 12]**
    7. **Terminal 17: [Relay 13]**
    8. **Terminal 18: [Relay 14]**
    9. **Terminal 19: [Relay 15]**
    10. **Terminal 20: [Relay 16]**

- **Power Supply Details**
  - **Input Voltage: [24V DC]**
  - **Power Consumption: [e.g., 20W max]**
  - **Current Draw: [e.g., 0.8A max]**
  - **Polarity: [Left Positive, Center Negative, Right Ground]**
  - **Connector Type: [3-pin terminal block]**

System Overview:

The IONEX IEX-100 is an automated ion exchange water treatment controller that produces deionized (DI) water through a dual-bed purification process.

Display & Controls

- **Switch Functions**
  - **[ESC] - Cancel / Exit**
  - **[Down] - Decrease**
  - **[Up] - Increase**
  - **[ENT] - Confirm / Enter**
  - **[RGN] - Start Regeneration**
  - **[SRV] - Manual Service ***
  - **[RNS] - Manual Rinse ***
  - **[SET] - Settings Menu / Skip Stage**

    (*) Option available on specific models

- **LCD Display (20x4)**
  - **Line 1 - Total remaining time during regeneration**
  - **Line 2 - Total countdown (MM: SS format)**
  - **Line 3 - Current stage name**
  - **Line 4 - Stage countdown / Status indicators**
- **LEDs**
  - **PWR LED Green - main power on /Normal**
  - **PWR LED Red**
  - **L1 Green - Blink in Cation regeneration**
  - **L1 Red**
  - **L2 Green - Blink in Aion regeneration**
  - **L2 Red**

Basic Operation

- **Service Mode (Normal Operation)**

  Service mode is the normal idle/ready state of the controller.

  1. **Power on the controller**
  2. **The LCD shows IONEX IEX-100 and SERVICE**
  3. **In this state the controller holds its default service outputs and continuously monitors the input alarms**

  - **Level Inputs / Alarms in Service Mode**

Based on the firmware logic the controller monitors the inputs at line 4 when an alarm input becomes active during SERVICE, the controller:

1. **Stops outputs (enters a pause state)**
2. **Displays the alarm message on LCD line 4**
3. **Holds in this state until the input clears, then returns to SERVICE**

Alarms handled in SERVICE include:

- **RAW WATER LOW LEVEL: System pauses until the raw-water low-level input clears in all cycles (SERVICE, PRE-RINSE, POST-RINSE REGENERATION).**
- **LOW PRESSURE: System pauses until the low-pressure input clears in all cycles (SERVICE, PRE-RINSE, POST-RINSE REGENERATION).**
- **PRODUCT HIGH LEVEL: System pauses until the product-tank high-level input clears in cycles (SERVICE, PRE-RINSE, POST-RINSE).**
- **HIGH CONDUCTIVITY:**

  1. **If HI CONDUCTIVITY input is active in SERVICE controller displays the warning in Line 4 and start a PRE-RINSE sequence**
  2. **If HI CONDUCTIVITY input is active After complete REENERATION cycle, the controller displays the warning in Line 4 and start a POST-RINSE Cycle.**

- **PRE-RINSE will operate for a preset time, if the time reaches zero and conductivity high still active then the controller will start the regeneration sequence, if conductivity high signal is cleared it will return to SERVICE.**
- **POST-RINSE for a previous a preset time, if time reaches zero and conductivity high signal did not clear (did not go to accepted conductivity level) then the controller will stop the rinse and goes to stand-by position showing bad regeneration message.**

- **Running Regeneration Cycle (MANUAL START)**

  1. **Press [RGN] (hold for 1 sec)**
  2. **Display shows: REGENERATION ...**
  3. **Cycle runs through 8 automatic stages as time in setting the LCD will display the total regeneration remain time and the current cycle name and the current cycle remaining time, cycles are sequences of the following order:**
     - **Cation Backwash**
     - **Cation CHEM**
     - **Cation S-RINSE (Slow Rinse)**
     - **Cation F-RINSE (Fast Rinse)**
     - **Anion Backwash**
     - **Anion CHEM**
     - **Anion S-RINSE**
       - **Anion F-RINSE**

- **During Regeneration**
  - **Current stage displays with countdown timer**
  - **Total time remaining shown on line 1**
  - **[SET] - Skip the current stage (hold 1 sec)**
  - **[ESC] - Cancel entire REGENERATION (hold 1 sec)**

*** Warning: Do not off or restart the power source, this will case cancel the REGENERATION and could cause bad quality output and require a manual regeneration immediately after power is ON.**

○ Settings Mode

- **Entering Settings**
  1. **Press [SET] (hold for 1 sec)**
  2. **Display shows: SETTING MODE**
  3. **Current timer value appears**
- **Moving Through Settings (Select a Timer)**
  1. **After entering SETTING MODE, one timer parameter is shown on the display.**
  2. **Use [Up] / [Down] to move through (scroll) the available timers.**
  3. **When the timer you want to change is shown, press [ENT] to edit it.**

○ **Editing / Changing the Timers Value**

1. **Press [ENT] to enter edit mode for the currently displayed timer.**
2. **Change the value:**
   - **[Up] - Increase (+1 minute)**
   - **[Down] - Decrease (-1 minute)**
   - **[Up] + [ENT] - Fast increase (+10 minutes)**
   - **[Down] + [ENT] - Fast decrease (-10 minutes)**
3. **Repeat until the required value is reached.**

○ **Save or Discard Changes**

1. **Press [ESC] to show the save confirmation (save dialog).**
2. **Choose an action:**
   - **[ENT] - Save (store the new value)**
   - **[ESC] - Cancel (discard changes and return without saving)**
3. **After saving or canceling, you will return to SETTING MODE and can select another timer with [Up] / [Down].**

- **Timer Range**
  - **Minimum: 0 minutes**
  - **Maximum: 120 minutes (2 hours)**
- **Exiting Settings Mode**
  1. **Ensure you are not in the save dialog.**
  2. **Press [ESC] (hold for 1 sec) to exit.**
  3. **Confirm exit LCD will show SERVCE mode.**

FACTORY DEFULT SETTING

The controller is shipped with the following factory default settings:

Parameter	Default Value
Cation Backwash	10 min
Cation CHEM	30 min
Cation S-RINSE	40 min
Cation F-RINSE	10 min
Anion Backwash	10 min
Anion CHEM	30 min
Anion S-RINSE	500 min
Anion F-RINSE	10 min
PRE-RINSE	15 min
POST-RINSE	15 min
All other timers	0 min

EEPROM Parameters

Parameter	Value
Write/Erase Endurance	1,000,000 cycles (typical)
Data Retention	40 years (typical)

○ FACTORY DEFAULT RESTORATION

To restore factory defaults:

1. **Enter Settings Mode**
2. **Press SERVICE] + [RINSE] (hold for 1 sec)**
3. **the FACTORY DEFAULT option will Display.**
4. **Choose an action:**
    - **[ENT] - Save (store the FACTORY DEFULT values, old settings will be replaced)**
    - **[ESC] - Cancel (discard changes and return with the old stored values)**

Note: Default values may vary by model, size or water quality. Always verify with your supplier if unsure.

LED Indicators

- **Blinking LED - Shows active regeneration stage**
    - **Bit 5 blinks: Cation stages (0-3)**
    - **Bit 7 blinks: Anion stages (4-7)**

Regeneration Stages Detail

Stage	Name	Function
0	Cation Backwash	Removes debris from cation bed
1	Cation CHEM	Acid regeneration of cation resin
2	Cation S-RINSE	Slow rinse, displaces chemical
3	Cation F-RINSE	Fast rinse, final cation flush
4	Anion Backwash	Removes debris from anion bed
5	Anion CHEM	Base regeneration of anion resin
6	Anion S-RINSE	Slow rinse, displaces chemical
7	Anion F-RINSE	Fast rinse, final anion flush

Troubleshooting

Display Issues

- **No display - Check power connection**
- **Garbled text - Power cycle the system**
- **Dim display - Check Power Source**

Operation Issues

- **Buttons not responding - Wait for current operation to complete**
- **Timer not counting - Verify timer value is not set to 0**
- **Stage skips immediately - Check if timer value is configured**

Memory Issues

- **Settings not saving - Confirm save prompt with [ENT]**
- **Values reset to 0 - EEPROM may need initialization**
- **Cannot enter settings - Exit any active operation first**

Maintenance

Regular Checks monthly

- **Verify all timer values**
- **Test each switch for proper operation**
- **Test each input for proper operation**
- **Check display for clarity**
- **Inspect all valve connections**
- **Inspect Feed Water quality vs design parameters**
- **Inspect produced Water quality vs conductivity reading**

Technical Specifications

- **Microcontroller: Microchip (USA) @ 16MHz**
- **Display: 20x4 Character LCD (HD44780)**
- **Inputs: 8 tactile switches (active low)**
- **Outputs: latch-controllers**
- **Expansion: I2C GPIO (8-bit) ***
- **Memory: 256-byte EEPROM for settings**
- **Power: 24VDC 1A**

Safety Notes

⚠ **IMPORTANT**

- **Always complete regeneration cycles when started**
- **Do not interrupt power during EEPROM saves**
- **Ensure chemical supply lines are secure before regeneration**
- **Monitor first regeneration cycle after timer changes**
- **Keep display and controls dry at all times**

Quick Reference Card

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│ IONEX IEX-100 Quick Reference

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│ [RGN] Start Regeneration

│ [SET] Settings / Skip Stage

│ [ESC] Cancel / Exit

│ [Down]/[Up] Navigate / Adjust

│ [ENT] Confirm / Enter

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│ Hold time: 2.0 sec for mode entry

│ Hold time: 1.0 sec for cancel/skip

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