ATS-PH1000

pH Controller

User Instruction Manual

ATS-PH1000 Process Controller

Read this before using ATS-PH1000

Thank you for choosing the **ATS-PH1000** controller.

ATS-PH1000 is an ARM processor-based controller that can analyze and control pH parameter in various industrial water applications. **ATS-PH1000** provides set point values and relay for high and low signals.

This instruction manual contains information about the controller specifications, its optimal use and various anticipated applications in industry. Inform and educate your personnel in proper operation of the controller. Installation and maintenance of the controller should only be performed by the trained personnel. In case of parts replacement, only use parts that are specified by the manufacturer or call at the provided number for assistance. Unauthorized parts or procedures can effect the controller's performance and place safe operation of the process at risk.

Making cable connections to controller and servicing this instrument requires access to shock hazard level voltages which can cause death or serious injury. Therefore disconnect all hazardous voltages before making connections to the controller. For safety and proper performance, the controller should be connected to a properly grounded three-wire power source.

ATS-PH1000 controller comes with a 1-Year limited warranty. Kindly make sure to read the Warranty Terms & Conditions enclosed in the box.

The information presented in this manual is subject to change in future without prior notice. AT Systems does not accept any responsibility for damage or malfunctioning of the unit due to the improper usage or maintenance of the instrument.

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SECTION 1: PRODUCT OVERVIEW

1.1 INTRODUCTION

ATS-PH1000 is a single-channel pH controller used for industrial and commercial purposes. The isolated design provides superior noise control making it well suited for field application. Advance control with industry-acceptable control loop and relay logic makes it one of the most economical controllers in the market. This controller provides set point values and relay for High and Low digital control.`

Enhanced user interface and easy-to-use 6-Button keypad make the controller intuitive. Provided logging function can save parameters values in a dedicated microSD card with user-specified time. A password feature is an added functionally which keeps the process safe and secure.

1.2 FEATURES

ATS-PH1000 Controller is designed to be a fully isolated instrument for two-wire DC applications.

- Automatic and manual temperature compensation via RTD Pt1000
- Instrument supplied in a durable (IP65) enclosure (when installed in control panel)
- Built-in time, date and Logger function
- Programmable high-low relay function
- Wi-Fi feature (available on customer requirement)
- Calibrated out of the box. If required, any standard calibration solution can be used
- 4~20mA customizable analogue loop current outputs for plant operation
- Quick connection with sensors through connectors (requires tinned wires sensor)
- Built in password protection

1.3 SPECIFICATIONS

Measuring Range (pH)	0.00 - 14.00pH
Measuring Range (Temperature)*	-50.0°C - 200.0°C, 0.1°C resolution, Linear Coefficient, 0.1°C accuracy
Units	pH, mV (milliVolts)
Calibration Mode	3-points manual calibration All certified buffer calibration solutions are compatible. User may use any custom calibration solution for special purpose

Temperature Compensation	Linear Temperature Compensation through-out the sensor range 2-wire PT100/PT1000 RTD
Analog Output 1 (Isolated Output)	4~20mA corresponding to any selected parameter, ±0.001mA accuracy, 0.001mA resolution, maximum load 500Ω
Analog Output 2* (Isolated Output)	4~20mA corresponding to any selected parameter, ±0.001mA accuracy, 0.001mA resolution, maximum load 500Ω
Relays	1 (HI) – 24VDC, 1A – On/Off Programmable 2 (LO) – 24VDC, 1A – On/Off Programmable Relay function with customized dead band
Clock (Optional)	Internal Clock, 24 Hr format, ±1 min/month accuracy
SD Card (Optional)	Can save multiple values in SD Card, user can save values for up to 5 years with specific time interval
RS-485 Communication (Optional)	RS-485 Based communication with AT Systems software for microSD data retrieval MODBUS communication is available
Display	Large graphical LCD (128px × 64px) with adjustable contrast and brightness
Mounting Type	Panel Mount
Panel Cutoout Size	L x W (93mm x 93mm)
Dimensions	L x W x D (113.5mm 113.5mm x 83mm)
Power Requirements	24 VDC (Maximum up to 35 VDC), 2.5 Watts
IP Class Protection	IP65 (In panel mount installation)

**2nd analog output feature is available upon user request. Please select ATS-pH1000-N1N2 to avail this feature*

1.4 APPLICATIONS

ATS-PH1000 controller can be used for various industrial applications such as:

- Reverse Osmosis Plants
- Boilers
- Cooling Towers

- Closed Loop Systems
- Textile Chemicals
- Waste Water industry

SECTION 2: INSTALLATION

2.1 PANEL MOUNTING

ATS-PH1000 controller can be mounted on control panel plate for different industrial applications. Fig. 1 below shows the controller with panel cutout dimensions in mm. Panel cutout sticker is also provided in package for reference cutting.

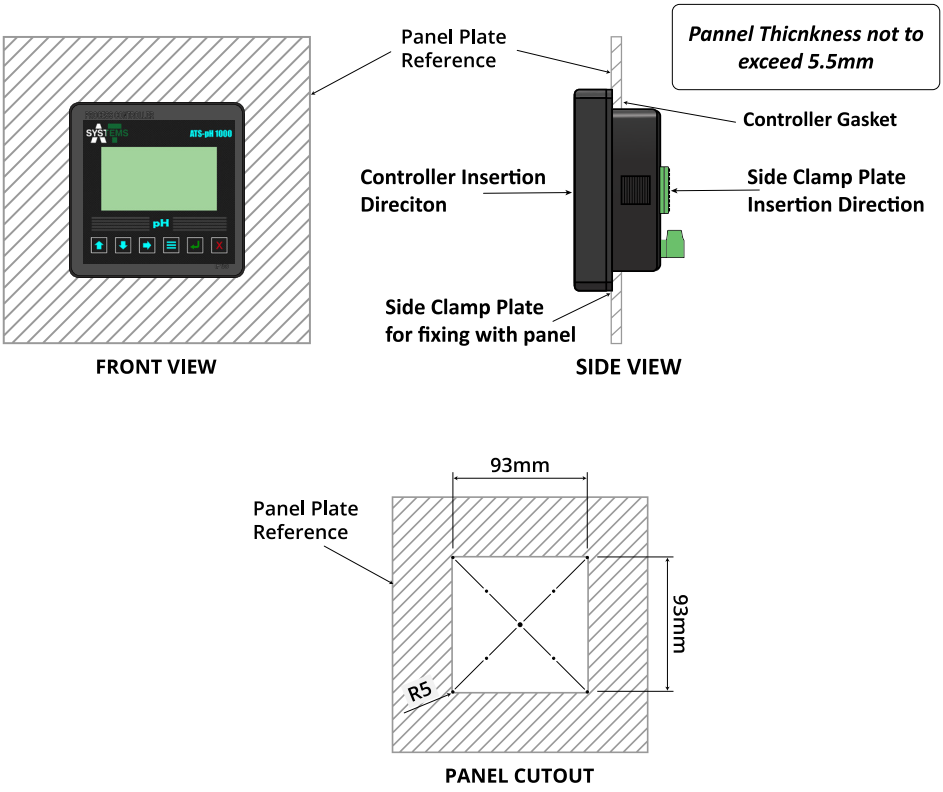


Fig. 1 - ATS-PH1000 Panel Mounting

2.2 SENSOR MOUNTING

Sensor can be installed within the maximum sensor cable length (05 meters cable length is included with the sensor). Sensor should be installed in a line which is always filled, even when not in operation, to keep sensor electrode from drying. If distance between electrode and controller is more than the cable length, an offline sensor housing (available on demand) is required. Install the sensor away from pumps, frequency drive systems or other high frequency sources.

Refer to the installation manual of pH controller for sensor installation and maintenance. AT Systems provide industrial grade sensor pHS-1001, pHS-1002, and pHS-1003 for ATS-PH1000 controller for various industrial standard applications.

2.3 CONNECTIONS

2.3.1 ELECTRICAL CONNECTIONS

ATS-PH1000 controller requires a regulated 16 - 24 VDC connection from an external supply (not included in the package) to work.

Warning!
Don't connect AC power cables to the ATS-PH1000 controller.

IMPORTANT NOTES:

- All electrical installations must be supervised by a qualified and responsible electrician.
- Use wiring practices that conform to all national, international and local electrical codes.
- Do not put sensor cables or instrument 4~20 mA output wires in a conduit that contains AC power wires to prevent intereference in controller signal.

ATS-PH1000 has power polarity protection which protects the controller from malfunctioning if +ve terminal of the power supply is connected to the -ve terminal of controller or vice versa, by keeping it from turning on. Make sure that input DC power is stable, noise free and non-fluctuating.

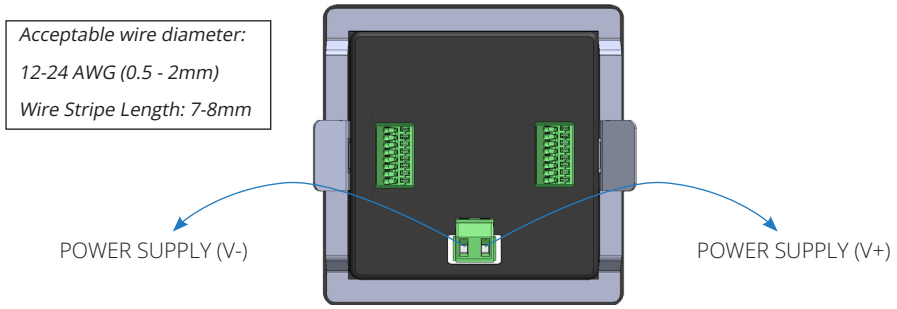
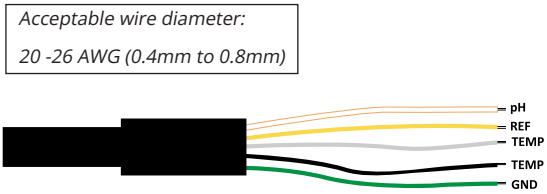


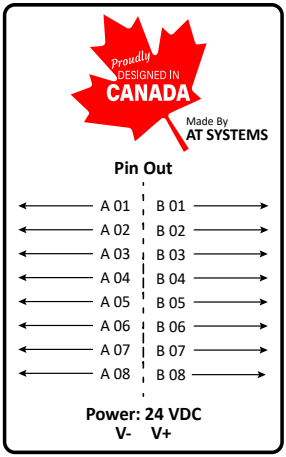
Fig. 2 - ATS-PH1000 VDC Connections

2.3.2 SENSOR CONNECTIONS

The sensor electrode cables can be connected to the **ATS-PH1000** controller terminal strip by matching the wire colors on the cable conductors. For convenience terminal blocks are labeled on back of the controller.



pHS1000 Series Sensor



ATS-PH1000 Controller Connection Layout

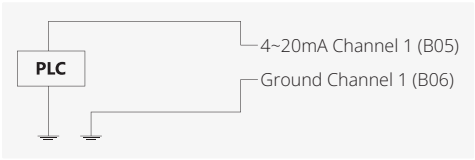
Fig. 3 - Connection with pHS-1000 Series Sensors

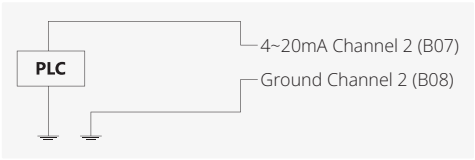
Fig. 3 shows the wiring connection names for **pHS-1000** series sensor with **ATS-PH1000** controller. Each sensor wire connection detail is provided below:

- Connect pH Wire (transparent) with A01 connection of Controller
- Connect REF Wire (Yellow) with A02 connection of Controller
- For 2 wire temperature sensor, connect TEMP Wire (white) with A03 and TEMP Wire (black) with A04
- GND Wire (Green) can be connected to A05

2.3.3 PLC/ANALOGUE OUTPUT AND COMMUNICATION CONNECTIONS

Communication connection descriptions is illustrated in figures below.





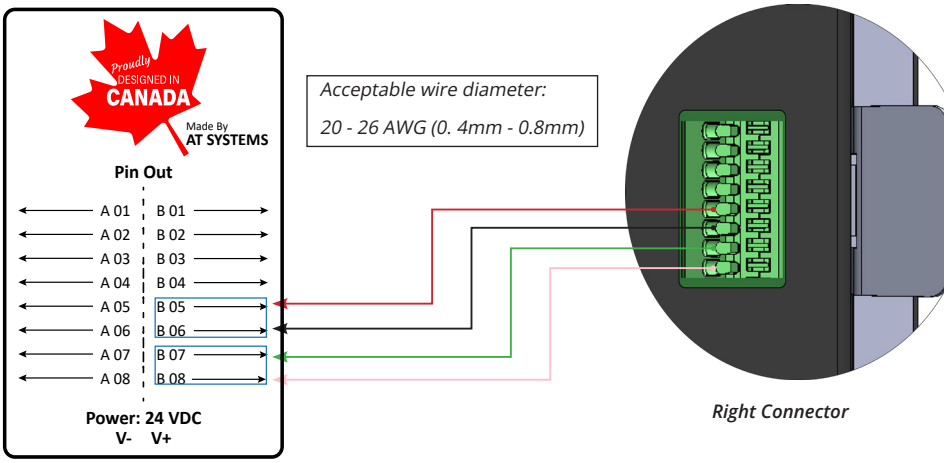


Fig. 4 - Analogue output and communication Connections

2.3.4 RELAY HI / LO CONNECTIONS

Two Channel relays (Relay lo, Relay hi) cables can be connected to the **ATS-PH1000** controller terminal strip by inserting the wires for RELAY 1 Channel 1 (B01, B02) , RELAY 2 Channel 2 (B03, B04) connections. (Marked in Blue and Yellow)

- Both connection can be used for High and Low relay function for channel 1. Connect top (blue and yellow marked connections) with Relay 1,2 Channel 1 terminals. Relay

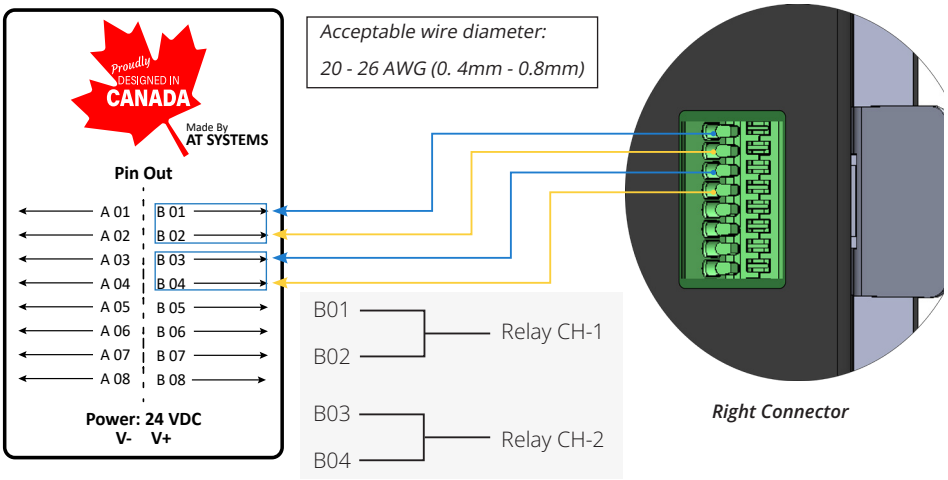


Fig. 5 - Relay HI / LO Connections

will turn on and off when pH value goes above / below the input value.

- Both connection can be used for High and Low relay function for channel 2. Connect top (blue and yellow marked connections) with Relay 1,2 Channel 2 terminals. Relay will turn on and off when pH value goes above / below the input value.

2.3.5 RELAY CONNECTION LEAFLET

Caution
Read this before connecting ATS-PH1000 controller to any external relays

ATS-PH1000 controller comes with built in relays which can be connected to external relays for control function.

Make sure to use Fly Back Diode across External Relay Coil while connecting to the **ATS-PH1000** controller as shown in the figure below.

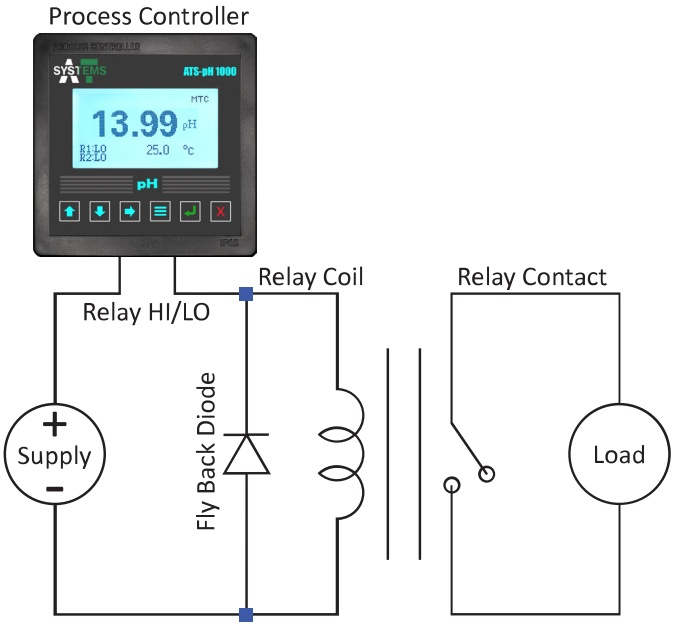


Fig.6 - Fly Black Diode Circuit Diagram

SECTION 3: GENERAL OPERATION

ATS-PH1000 controller has a 6 button layout with a 128px x 64px LCD to display information. Figure below shows front layout of the controller.

1	Up
2	Down
3	Right / Forward
4	Menu
5	Accept / Confirm / Enter
6	Escape / Previous / Back
7	LCD Display (128px x 64px)

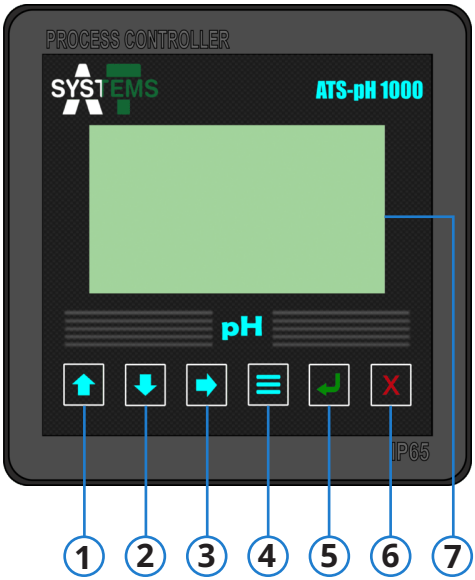


Fig. 7 - ATS-PH1000 Layout

3.1 START UP

Before Startup, ensure proper transmitter wire connections and the clamping of controller with panel plate. To start **ATS-PH1000** connect the power connector to the back of instrument. Fig. 8 shows the main LCD display and the information it displays.

1	Parameter value with unit
2	Relay 1 status (high or low)
3	Relay 2 status (high or low)
4	Temperature with unit
5	Temperature compensation (Auto, Manual or No compensation)

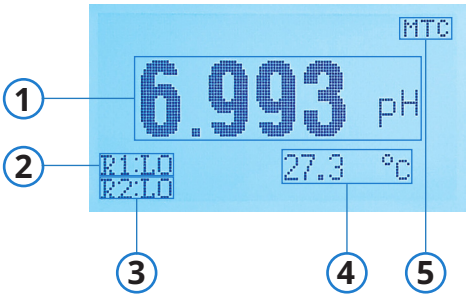


Fig. 8 - Main Screen

The controller comes factory calibrated but if required, can be performed with any certified calibration solution. For detailed procedure please see section 5.1.

3.2 OPERATING THE CONTROLLER

3.2.1 MENU NAVIGATION

ATS-PH1000 is user friendly and easy to use with its 6 button layout. To access the menu screen, press the menu button. Main menu screen is shown in fig. 9.

	**Caution** If password protection is on, pressing the menu button will take the user to password screen. Enter the password and press confirm button to enter the menu. For details please refer to section 9.

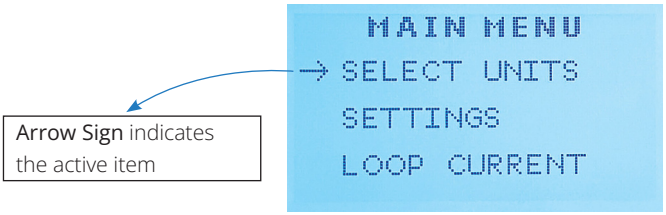


Fig. 9 - Main Menu

Through main menu user can setup the controller as per operation's needs. ***Up*** and ***down*** buttons can be used to navigate between the menu items. A right arrow sign before a menu item name indicates that it is the active item. To see items/options under a selected menu item, press ***enter*** button.

3.2.1.1 MENU TREE

Fig. 10 below shows the menu tree for the user to have an overview of all the options available. Menu options are discussed from section 4 to section 8.

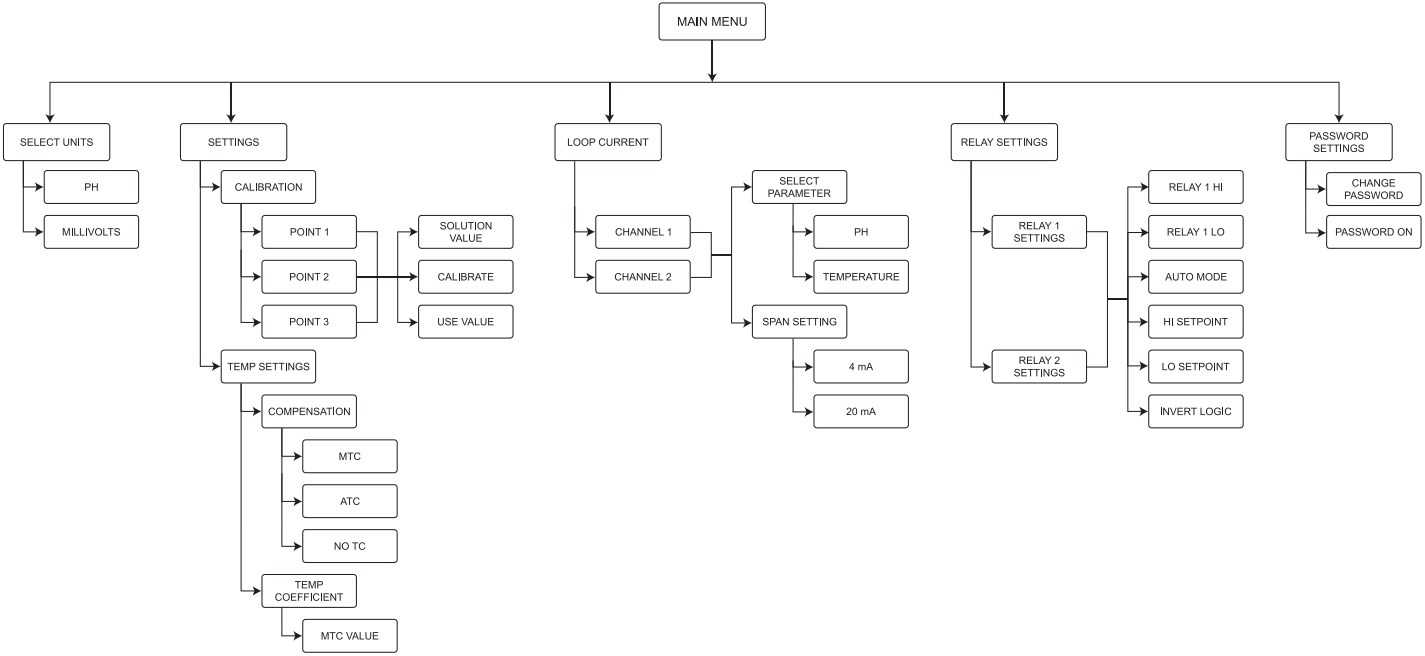


Fig. 10 - Menu Tree

3.2.2 SELECT OR TURN ON/OFF AN OPTION

If an option is to be selected or turned on from available options, navigagte to the option and press ***enter*** button. A tick sign next to it will indicate that the option is selected/turned on. ***Up*** and ***down*** buttons are used to navigate between the available options, and ***confirm*** button is used to selected/deselect or turn on/off the active option.

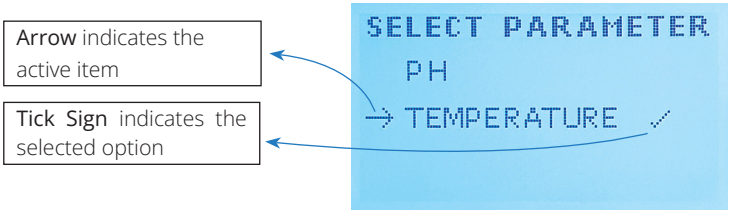


Fig. 11 - Select or Turn on/off an option

3.2.3 SET A VALUE

To set a value, ***right*** button can be used to navigate between the digits. An line under a digit indicates that it is the active digit. ***Up*** and ***down*** buttons are used to change the value. Once the desired value is set, press ***confirm*** button.

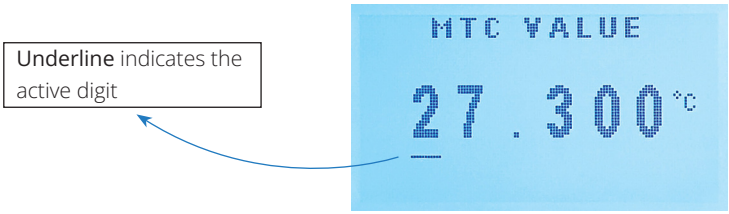


Fig. 12 - Setting a Value

Once the confirm button is pressed, a screen saying "VALUE SAVED" will appear for 3 seconds and then disappear indicating that the value is accepted and stored.

Fig. 13 - Value Saved Screen

SECTION 4: UNIT SELECTION

ATS-PH1000 offer two display units, pH and millivolts. To select desired unit navigate to MENU > SELECT UNITS. Unit selection screen is shown is fig. 14.

Fig. 14 - Unit Selection

Navigate to the desired display unit option and press ***enter*** button.

SECTION 5: CALIBRATION

ATS-PH1000 comes with 3 point manual calibration with a certified pH solution of any value. To perform pH calibration, navigate to MENU > SETTINGS > CALIBRATION. The calibration screen is shown in figure below.

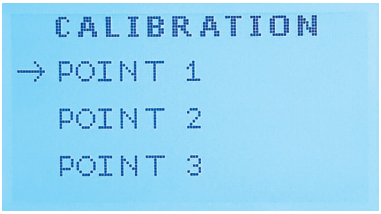


Fig. 15 - Calibration Menu

IMPORTANT:

- Make sure that the point 1 is calibrated with a solution a lowest pH value, point 2 is calibrated with a solution of pH value higher than point 1, and point 3 is calibrated with a solution of highest pH value.
- Before selecting the CALIBRATE option, make sure to rinse the pH electrode with distilled water and constantly stir it in the solution for at least a minute.

5.1 PROCEDURE

Navigate to MENU > SETTINGS > CALIBRATION > POINT 1 and press *enter* button. Fig. 16 shows calibration screen for point 1.

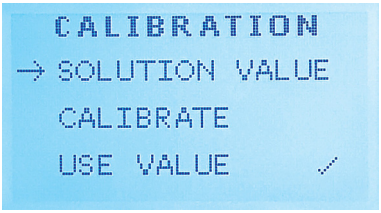


Fig. 16 - Point 1 Calibration Menu

Select Solution Value option and enter the pH value of the solution to be used. Make sure to use the solution of lowest pH value for point 1.

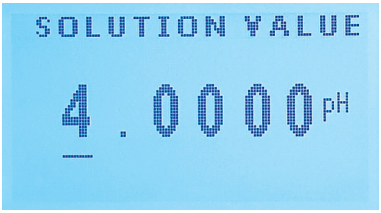


Fig. 17 - Entering Solution Value

Once the value is entered, press ***enter*** button to confirm the value. Rinse the pH electrode with distilled water and stir it constantly in the solution for about one minute. After the electrode is stirred in the solution for a minute, select the CALIBRATE option and press ***enter*** button.

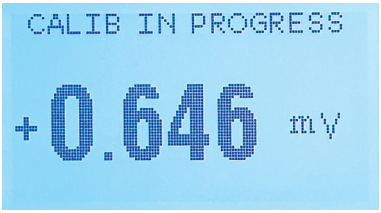


Fig. 18 - Calibration in Progress

"Calib in progress" screen will appear for about 30 seconds and then a message saying "calibration complete" will appear which shows that the calibration value for point 1 has been stored.

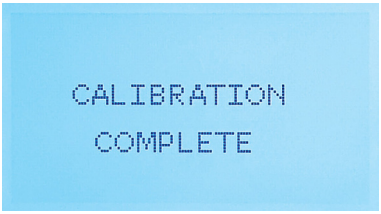


Fig. 19 - Calibration Complete

Now select the USE VALUE option and check it to make sure that the value is used in calibration process. If not checked the value will not be considered for calibration which will result in inaccurate readings.

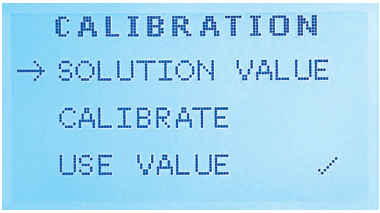


Fig. 20 - Use Value

Repeat the procedure for POINT 2 and POINT 3 to complete the calibration process. Make sure to use a solution of higher pH value for point 2 and highest pH value for point 3. Also make sure to rinse

SECTION 6: TEMPERATURE SETTINGS

To access temperature settings navigate to MENU > SETTINGS > TEMP SETTINGS. Fig. 21 shows temperature settings screen.

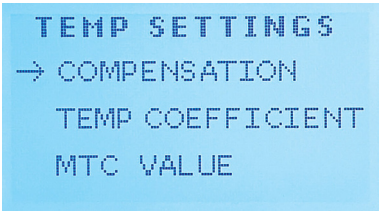


Fig. 21 - Temperature Settings

This menu has options to set temperature compensation to auto temperature compensation (ATC), manual temperature compensation (MTC), or to turn temperature compensation off (NO TC).

6.1 TEMPERATURE COMPENSATION

Navigate to MENU > SETTINGS > TEMP SETTINGS > COMPENSATION to access temperature compensation settings. Temperature compensation screen is shown in the figure below.

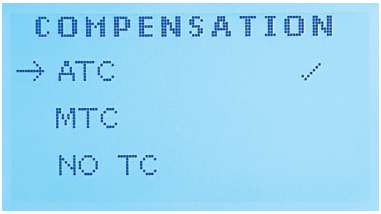


Fig. 22 - Temperature Compensation

Choose the desired option from available options and press enter button to set it as active option. Temperature compensation is also indicated on the main screen.

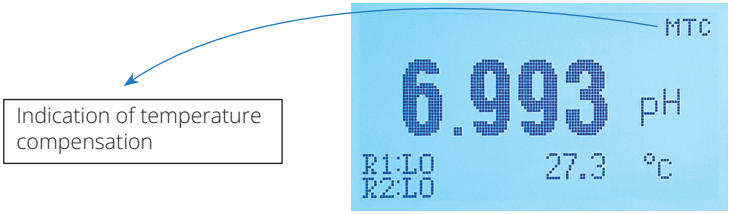


Fig. 23 - Temperature Compensation indication

6.1 TEMPERATURE COEFFICIENT VALUE

Navigate to MENU > SETTINGS > TEMP SETTINGS > COMPENSATION > MTC VALUE to set temperature coefficient for manual temperature compensation.

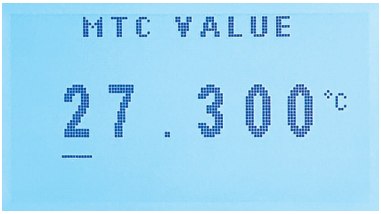


Fig. 24 - Setting Temperature Coefficient Value

Set the desired value and press enter button to save it.

SECTION 7: LOOP CURRENT

To access loop current settings navigate to MENU > LOOP CURRENT. Here loop current settings can be changed for both Channel 1 & Channel 2.

Fig. 25 - Loop Current Settings

7.1 CHANNEL 1

Navigate to MENU > LOOP CURRENT > CHANNEL 1 to access channel 1 loop current settings.

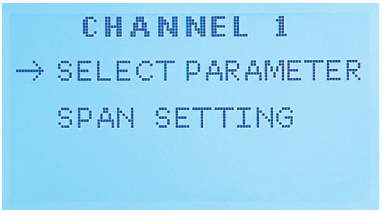


Fig. 26 - Channel 1 Loop Current Settings

7.1.1 SELECT PARAMETER

Navigate to MENU > LOOP CURRENT > CHANNEL 1 > SELECT PARAMETER to select pH or Temperature for channel 1.

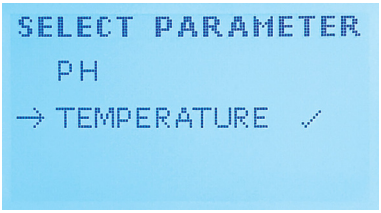


Fig. 27 - Select Parameter for Channel 1

7.1.2 SPAN SETTINGS

Navigate to MENU > LOOP CURRENT > CHANNEL 1 > SPAN SETTINGS to access span settings for channel 1.

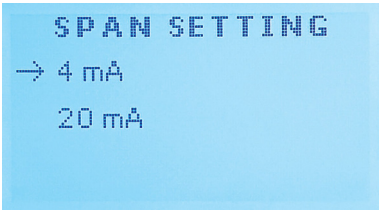


Fig. 28 - Span Settings for Channel 1

To change the low value, choose 4 mA option and press enter button, or choose 20 mA option to change the high value.

Fig. 29 - Low Value

Fig. 30 - Low Value

Once the desired value is set, press ***accept*** button to store the value.

7.2 CHANNEL 2

Navigate to MENU > LOOP CURRENT > CHANNEL 2 to access channel 2 loop current settings.

All options are in this menu are same as CHANNEL 1 options. See section 7.1

SECTION 8: RELAY SETTINGS

To access relay settings navigate to MENU > RELAY SETTINGS. Here relay settings can be changed as required for relay 1 and relay 2.

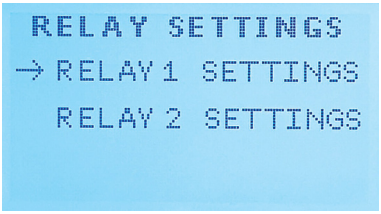


Fig. 31 - Relay Settings

8.1 RELAY 1 SETTINGS

Navigate to MENU > RELAY SETTINGS > RELAY 1 to access relay 1 settings.

Fig. 32 - Relay 1 Settings

In this menu, relay 1 can be set to high, low or auto mode. High and low set point values can also be set here as required.

8.1.1 RELAY 1 HIGH

Navigate to MENU > RELAY SETTINGS > RELAY 1 > RELAY 1 HI and press ***enter*** button to set relay 1 to high.

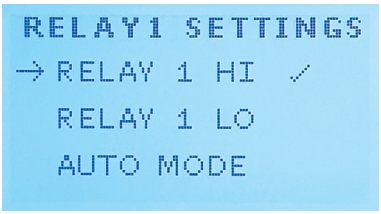


Fig. 33 - Relay 1 High

8.1.2 RELAY 1 LOW

Navigate to MENU > RELAY SETTINGS > RELAY 1 > RELAY 1 LO and press ***enter*** button to set relay 1 to low.

Fig. 34 - Relay 1Low

8.1.3 AUTO MODE

Navigate to MENU > RELAY SETTINGS > RELAY 1 > AUTO MODE and press ***enter*** button to set relay 1 to auto mode.

Fig. 35 - Relay 1 Low

In auto mode, relay will operate based on high set point and low set point values set by user by navigating to MENU > RELAY SETTINGS > RELAY 1 > HI SETPOINT and MENU > RELAY SETTINGS > RELAY 1 > LO SETPOINT consecutively. Both screens are shown below.

Fig. 36 - High Set Point

Fig. 37 - Low Set Point

Once the desired value is set, press ***accept*** button to store the value. The relay

will now turn on if value falls below low set point and turn off if the value rises above the high set point.

8.1.4 INVERT LOGIC

Navigate to MENU > RELAY SETTINGS > RELAY 1 > INVERT LOGIC and press ***enter*** button to invert the logic for auto mode of relay 1.

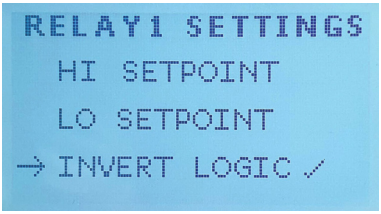


Fig. 38 - Invert Logic

This option inverts the logic for auto mode of relay 1. Now the relay will turn on when the value rises above high set point value and will turn off when the value falls below low set point value.

8.2 RELAY 2 SETTINGS

Navigate to MENU > RELAY SETTINGS > RELAY 2 to access relay 2 settings. ***All options are in this menu are same as RELAY 1 SETTINGS options. See section 8.1***

SECTION 9: PASSWORD SETTING

ATS-1000-A has a built-in password protection feature for enhanced operation security.

9.1 SETTING/CHANGING THE PASSWORD

To set the password, navigate to MENU > PASSWORD SETTINGS > CHANGE PASSWORD and press ***enter*** button.

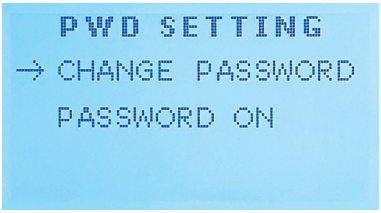


Fig. 39 - Password Settings

Password is 6 digits. Each digit can be a number or a ".".

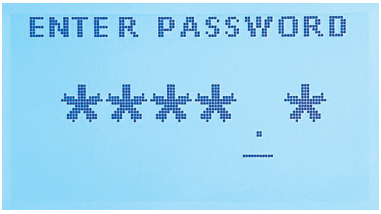


Fig. 40 - Enter Password Screen

Once the desired password is entered, press accept button to set the password. A screen showing "Saved" will appear for 3 seconds to show that the entered password is saved.

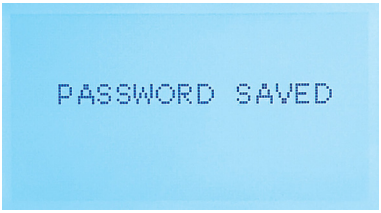


Fig. 41 - Password saved screen

9.2 TURN PASSWORD PROTECTION ON/OFF

To turn password protection on or off, navigate to MENU > PASSWORD SETTINGS > PASSWORD ON. Check or uncheck this option to turn the password protection on or off.

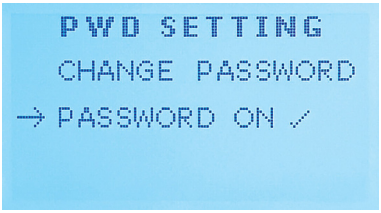


Fig. 42 - Password On/Of

SECTION 10: MAINTENANCE

10.1 GENERAL GUIDELINES

Controller requires little to no maintenance for its smooth operation. Routine maintenance will be recommended for its ideal operation. Calibration (see section 8.2) should be performed once every two weeks for accurate readings.

10.2 MAINTENANCE PARTS

Maintenance / replacement parts for controller are available as per requirement. For any requirement of parts kindly contact the Manufacturer representative. Damaged electronic PCB's , PCB components, buttons, connectors and LED can also be replaced if required. Manufacturer's corresponding personnel will remain in contact until the issue is resolved.

10.2 MAINTENANCE PARTS

Controller is provided with high quality stainless steel side clamp for fixing with panel plate. For panel mounting procedure kindly refer to section 2.1. Side clamp plate can be ordered separately if required.

10.3 FIELD MOUNTING PARTS

Controller is already assembled in IP65 panel mount enclosure for dust and water protection. For field mounting, manufacturer can also provide IP67 field enclosure with installed cable glands for cables connection. Field enclosure also contains the through hole of lock for protection from unknown users' interaction on the field.

Fig. 43 - Field Mounting

SECTION 11: TECHNICAL DRAWINGS

11.1 CONTROLLER DIMENSIONS

ATS-PH1000 controller technical detailed dimensions can be seen below:

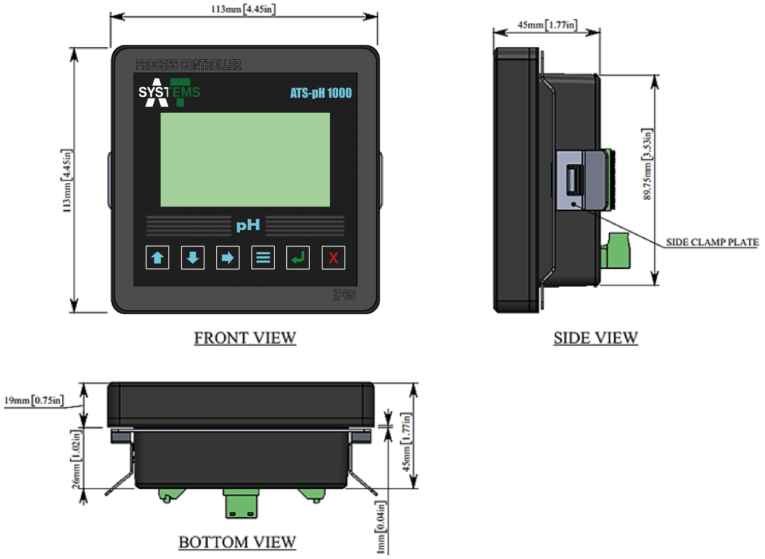


Fig. 44 - Controller Dimensions

11.2 EXPLODED VIEW

ATS-PH1000 controller exploded view can be seen below:

Fig. 45 - Controller Exploded View

Front Part includes LCD and controller buttons PCB.
Back Part includes power supply PCB, Main PCB and connectors.
Controller Gasket is provided for insulation of controller with electrical panel and IP65

protection.
Side Clamp Plate is provided for clamping of controller with electrical panel.
Screws are for front and back box encapsulation and IP65 protection.

NOTES:

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