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Model 88-P
pH Process Controller

1. INTRODUCTION.....	1
2. CONTROLS.....	1
2.1 Calibrate Controls.....	1
2.2 Limit Controls.....	1
2.3 Output Controls.....	1
2.4 Display Function Switch.....	2
3. CABLES AND WIRING.....	2
3.1 Sensor connections.....	2
3.2 Power and Relay Output Connections.....	3
3.3 Recorder and 4-20mA Output Connections.....	3
3.4 Connection Diagram.....	3
4. CALIBRATION.....	4
5. SETTING THE LIMITS.....	5
5.1 Lower Limit.....	5
5.2 Upper Limit.....	5
6. 4-20 MA CURRENT OUTPUT OPTION.....	5
7. RECORDER OUTPUT OPTION.....	5
8. TROUBLESHOOTING.....	6
9. PH ELECTRODE APPENDIX.....	7
10. SPARES AND ACCESSORIES.....	8
11. WARRANTY.....	9

Congratulations ! You have purchased the latest in Instrumentation for Industrial pH Process Measurement and control. We hope that your new Model 88-P Controller will provide you with many years of reliable service.

To help with correct installation and operation, please read this manual carefully.

If at any stage we can be of assistance, please contact either your local T.P.S. representative or the TPS factory in Brisbane.

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1. Introduction

The T.P.S. pH Process Controller instantaneously measures and controls the pH value of industrial aqueous solutions. The system consists of two parts:

- (a) Electrode assembly (open or submersible type), with pH sensor and ATC sensor.
- (b) Controller/readout section.

From this latter section signals are available for voltage or current accessories. In addition there are relay contact closures for control purposes.

2. Controls

2.1 Calibrate Controls

ISO This is the PRIMARY calibration control and sets the isoelectric value using a buffer near pH=7.

SPAN (Slope%) This is the SECONDARY calibration control and sets the electrode sensitivity using a buffer remote from pH=7 (usually with pH Buffer 4.00).

2.2 Limit Controls

LOWER This sets the trip point of the Lower relay contacts. It represents a TOO ACIDIC limit to reach.
The LOW LIMIT lamp lights when the signal goes BELOW this value.

UPPER This sets the trip point of the Upper relay contacts. It represents a TOO ALKALINE limit to reach.
The HIGH LIMIT lamp lights when the signal goes ABOVE this value.

2.3 Output Controls

RECDR. ZERO This sets the zero of the optional recorder output.

RECDR. SPAN This sets the span of the optional recorder output. (Adjusts full scale voltage).

LOOP 4mA This sets the output value of the optional current loop at low end of the data.

LOOP 20mA This sets the output value of the optional current loop at the high end of the data.

2.4 Display Function Switch

The four position switch is labeled:

LOWER	The display INDICATES DIRECTLY, the setting of the LOWER limit. See section 2.2 <i>Limit Controls</i> , above.
UPPER	The display INDICATES DIRECTLY, the setting of the UPPER limit See 2.2 <i>Limit Controls</i> , above.
STANDBY	The display indicates the pH data from the sensor, BUT relays are inhibited (off state). The voltage/current outputs are maintained.
AUTO	The display indicates the pH data from the sensor, AND the LOWER/UPPER relays outputs are enabled under the controller's action.

NOTES: The function switch should not be left in the (a) or (b) position as it is NOT indicating the pH data from the sensor at all!

In (a),(b) and (c) positions the COLON ":" is displayed to show that the controller is NOT controlling the relays.

3. Cables and Wiring

pH Electrode (plastic body with glass bulb)

There are two types of cables generally supplied, either

1. Co-axial cable, with clear-insulated centre core and black-insulated braid.
2. 2 Core plus shield, with one white-insulated core, one black-insulated core and green-insulated braid.

ATC Sensor (stainless steel body)

1. 2 Core plus shield, with one white-insulated core, one black-insulated core and green-insulated braid

Identify your sensors and which types of cables they have before attempting to connect them.

3.1 Sensor connections

Terminal Block	Terminal No	Connection
J-2	1	BLACK core of ATC Sensor
J-2	2	WHITE core of ATC Sensor
J-2	3	GREEN-insulated braid of ATC Sensor
J-2	4	BLACK-insulated braid of pH Sensor type 1, OR BLACK core of pH Sensor type 2.
J-2	5	No connection for pH Sensor type 1, OR GREEN-insulated braid of pH Sensor type 2.
J-2	6	CLEAR-insulated core of pH Sensor type 1, OR WHITE core of pH Sensor type 2.

3.2 Power and Relay Output Connections

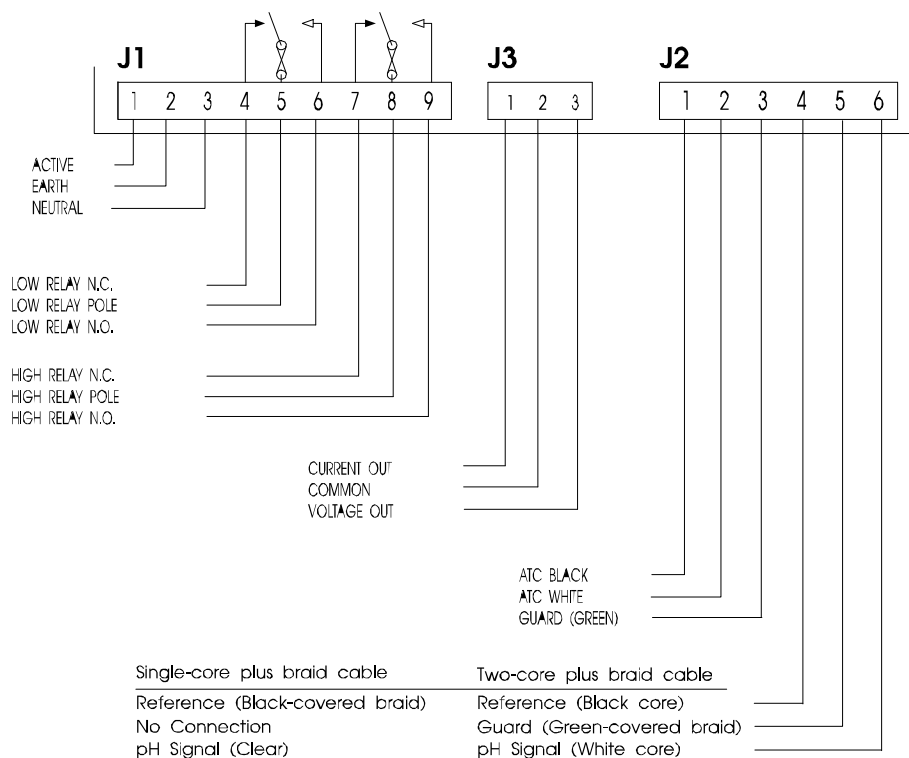
Terminal Block	Terminal No	Connection
J-1	1	Active 240 Vac IN
J-1	2	Earth (mains)
J-1	3	Neutral 240 Vac IN
J-1	4	Lower Relay NC (normally closed)
J-1	5	Lower Relay COM (common)
J-1	6	Lower Relay NO (normally open)
J-1	7	Upper Relay NC (normally closed)
J-1	8	Upper Relay COM (common)
J-1	9	Upper Relay NO (normally open)

NOTES: Relay contacts are undedicated change-over type capable of 1-2A (MAX) at 240V AC
 The use of external contactors for higher currents and reduced interference is recommended.

3.3 Recorder and 4-20mA Output Connections

Terminal Block	Terminal No	Connection
J-3	1	+ve Current Output 4-20mA (Not Isolated) - (Optional) NOTE: Voltage compliance is 12 volts.
J-3	2	Common
J-3	3	Recorder Output. NOTE: Impedance is 100 ohms and so 0-10mA is delivered into a low impedance device if required.

3.4 Connection Diagram



4. Calibration

1. Set to **STANDBY** to disable the Relay functions.
2. New pH sensors are fitted with a soft plastic “wetting cap” to keep the glass electrode bulb wet during transport. Remove this cap, and keep for future use when storing the sensor.
Condition a new pH sensor by soaking for some hours in water. A shorter time may be achieved
3. Place the pH sensor, **AND** (essential!) the A.T.C. sensor (or a wire connection to J-2 term. 3) into a sample of pH6.88 buffer. **DO NOT** place the sensor directly into the buffer bottle.
4. Set the **ISO** control until the display reads 6.88.
5. Rinse the pH and ATC sensors and now place into a sample of pH4.00 buffer (for acid work) **OR** pH9.23 buffer (for alkali work). **NOTE:** Use the pH4.00 buffer for both **ACID** and **ALKALINE** pH work is highly recommended. Difficulties may be experienced when adjusting slope if the pH9.32 buffer is not freshly-made. High pH buffers are notoriously unstable, due to CO₂ absorption
6. Set the **SPAN** control until the display reads the value of the pH4.00 or pH9.23 buffer.
Inability to set the **SPAN** control to the correct pH indicates electrode failure.
7. Confirm steps 3 to 6.
An **ISO** calibration should be performed approximately weekly.
A **SPAN** calibration should be performed approximately monthly.
8. The following simple method may be performed **ON-LINE** without removing the electrodes:
"With a portable pH meter measure the sample pH, then set the **ISO** control on the controller to this value".
9. Never return used buffers to stock; distilled water is **NOT** a standard for pH=7. Use a pH7 (or pH6.88) **BUFFER!**

5. Setting the Limits

5.1 Lower Limit

1. Switch the Function Switch to **LOWER** (see section 2.4, Display Function Switch)
Note that the output control relays are disabled in this mode. Voltage and current outputs are maintained, as a function of the digits on the display.
2. Adjust the **LOWER** Limit control (see section 2.2, Limit Controls) until the display shows the value at which you wish to ADD ALKALI to raise the pH value. Alkali addition can be by solenoid valve, dosing pump etc., depending on the application.
3. Switch the Function Switch back to **STANDBY** or **AUTO**, as required (see section 2.4, Display Function Switch).

5.2 Upper Limit

1. Switch the Function Switch to **UPPER** (see section 2.4, Display Function Switch)
Note that the output control relays are disabled in this mode. Voltage and current outputs are maintained, as a function of the digits on the display.
2. Adjust the **UPPER** Limit control (see section 2.2, Limit Controls) until the display shows the value at which you wish to ADD ACID to lower the pH value. Acid addition can be by solenoid valve, dosing pump etc., depending on the application.
3. Switch the Function Switch back to **STANDBY** or **AUTO**, as required (see section 2.4, Display Function Switch).

6. 4-20 mA Current Output Option

This is a current output, proportional to the DISPLAY, positive with respect to common and is NOT isolated.

This option is normally set up as 4-20mA for 0 to 14.00 pH

The **88-P** has two adjustments to fine-tune the current output:

1. **LOOP ZERO** (4mA adjustment) Range at 4mA = +/- 20%
2. **LOOP SPAN** (20mA adjustment) Range at 16mA (ie: 20mA minus 4mA) = +/- 10%

This unit configured as 4-20mA for _____ to _____

7. Recorder Output Option

This is a voltage output proportional to the DISPLAY and is NOT isolated.

This option is normally set up as 0-1 Volt for 0 to 14.00 pH

The **88-P** has two adjustments to fine-tune the voltage output:

1. **RECDR. ZERO** (Zero adjustment) Range +/- 10%
2. **RECDR. SPAN** (Span adjustment) Range +/- 10%

This unit configured as 0-1 Volt for _____ to _____

8. Troubleshooting

1: pH reading unstable:

- a: Electronics fault ?
Check controller by disconnecting leads from the pH electrode (J-2 term. 4,5,6.)
Replace with a wire linking the 3 terminals 4,5,6. If the pH reading is now stable, and can be adjusted between approx. 6 to 8 pH with the ISO control, the electronics is probably correct. The sensor (or wiring) is probably faulty.
- b: ATC sensor earth not connected
Check wiring continuity from metal of ATC sensor to J-2 terminal 3 of controller or Head Amp.
Is the ATC sensor in the solution ?
- c: Clogged pH electrode Reference Junction.
Check reading stability in pH Buffer solutions. Remember to have an earth connection to the Buffer solution from the ATC sensor, or put the ATC sensor also in the buffer solution.
Clean, Refill, or Replace electrode.
- d: pH glass bulb dirty.
Clean electrode bulb with Acetone, or other suitable solvent, considering the solutions being measured.

2: Low or Excessive response to pH change:

- a: Check pH sensor in buffers,
Clean, Refill, or Replace electrode.
- b: Check ATC sensor.
Measure sensor resistance from black to white wires, (disconnected from the controller or Head Amp.) This should be approx 12000 Ohms at 25°C.
Also check the shield wire is connected to the Stainless Steel barrel of the ATC sensor.

9. pH Electrode Appendix

If the electrode has been left dry in air for several days, its immediate use will sometimes give a slow response.

If the pH electrode has been received without its plastic "wetting cap" over the pH bulb, the electrode should be immersed in a standard solution or in distilled water for about 24 hours before its use.

Immersing the electrode in about 1/10N hydrochloric acid for a few minutes serves as an expedient.

The electrode may be of two types:

- (a) Sealed GEL reference system which needs no filling for its lifetime.
- (b) Refillable Reference Type:
With this electrode it is necessary to replenish the filling solution, and to ensure it remains saturated with a small excess of crystals.
(Too much excess will block the junction and must be removed).

For the refillable probe, the procedure for supplying the KCl solution is as follows:

1. Unscrew the refilling cap from the side of the electrode, and flush out the filling solution and crystals with a syringe filled with warm water.
Refill with saturated KCl solution. (listed in ACCESSORIES)
2. Use a syringe or eye dropper and add the solution at the filling hole. Wipe the electrode around the hole and re-plug.
3. No air bubbles must remain trapped in the glass electrode bulb.
These can be removed by "flicking" the sensor as you would with a mercury thermometer.
The sensor internal solution is sealed and not replaceable.
Electrodes should be stored wet and disconnected from the meter.

Cracks in Glass Bulb

If the meter indicates almost the same value with the electrode in various standard solutions, the trouble may be caused by a crack in the glass membrane. Replace the electrode.

Insulation and Internal Resistance

The glass electrode has a membrane resistance of several hundred million ohms and every part of the meter has been carefully insulated. If this insulation value is lowered, the needle will go off scale or become unstable. Great care must be taken not to wet the plug or cap of the electrode nor the meter and connector themselves. Clean with pure alcohol and cotton wool. Blow dry with a heat gun set at a moderate temperature.

10. Spares and Accessories

	Part No
Dip type pH Electrode with 5m cable	111228
Dip type ATC sensor, 5m	111275
Screw-in pH Electrode 5m.....	111244
Screw-in ATC sensor, 5m.....	111265
Junction Box for pH and ATC sensors.....	111341
Extension cable for pH or ATC sensor	130040 (order by the metre)
pH Buffer 4.00, 200mL	121381
pH Buffer 6.88, 200mL	121306
Sensor Clamp for pH and ATC.....	121342
Submersible. Assembly for pH & ATC Sensor	111303
4-20 mA current Option.....	130070
Recorder Option	130028

11. Warranty

TPS Pty. Ltd. guarantees all instruments and electrodes to be free from defects in material and workmanship when subjected to normal use and service. This guarantee is expressly limited to the servicing and/or adjustment of an instrument returned to the Factory, or Authorised Service Station, freight prepaid, within twelve (12) months from the date of delivery, and to the repairing, replacing, or adjusting of parts which upon inspection are found to be defective. Warranty period on electrodes is three (3) months.

There are no express or implied warranties which extend beyond the face hereof, and TPS Pty. Ltd. is not liable for any incidental or consequential damages arising from the use or misuse of this equipment, or from interpretation of information derived from the equipment.

Shipping damage is not covered by this warranty.

PLEASE NOTE:

A guarantee card is packed with the instrument or electrode. This card must be completed at the time of purchase and the registration section returned to TPS Pty. Ltd. within 7 days. No claims will be recognised without the original guarantee card or other proof of purchase. This warranty becomes invalid if modifications or repairs are attempted by unauthorised persons, or the serial number is missing.

PROCEDURE FOR SERVICE

If you feel that this equipment is in need of repair, please re-read the manual. Sometimes, instruments are received for "repair" in perfect working order. This can occur where batteries simply require replacement or re-charging, or where the electrode simply requires cleaning or replacement. TPS Pty. Ltd. has a fine reputation for prompt and efficient service. In just a few days, our factory service engineers and technicians will examine and repair your equipment to your full satisfaction.

To obtain this service, please follow this procedure:

Return the instrument AND ALL SENSORS to TPS freight pre-paid and insured in its original packing or suitable equivalent. INSIST on a proof of delivery receipt from the carrier for your protection in the case of shipping claims for transit loss or damage. It is your responsibility as the sender to ensure that TPS receives the unit.

Please check that the following is enclosed with your equipment:

- **Your Name and daytime phone number.**
- **Your company name, ORDER number, and return street address.**
- **A description of the fault. (Please be SPECIFIC.)**
(note: "Please Repair" does NOT describe a fault.)
- **either \$12 for return freight for units under warranty,**
- **or \$20 to cover inspection costs and return freight.**

(These amounts are not applicable to full-account customers.)

For out-of-warranty units, a repair cost will be calculated from parts and labor costs. If payment is not received for the additional charges within 30 days, or if you decline to have the equipment repaired, the complete unit will be returned to you freight paid, not repaired. For full-account customers, the repair charges will be debited to your account.

- **Always describe the fault in writing.**
- **Always return the sensors with the meter.**

If you did not receive a Warranty Card, please photocopy or tear off the bottom half of this page, fill in the details and send to:

T.P.S. PTY. LTD.
4 JAMBEROO STREET,
SPRINGWOOD, BRISBANE,
AUSTRALIA, 4127.

Fill in purchase details for your reference. (Retain this section).

Model No: _____ Serial No: _____

Purchase Date: _____ Dealer: _____

Send this section to TPS

Customer: _____ Position: _____

Company/Division: _____

Address: _____

City: _____

Post Code: _____ Country _____

Phone No: _____ Fax No: _____

Model No: _____ Serial No: _____

Purchase Date: _____ Dealer: _____

Comments: _____

