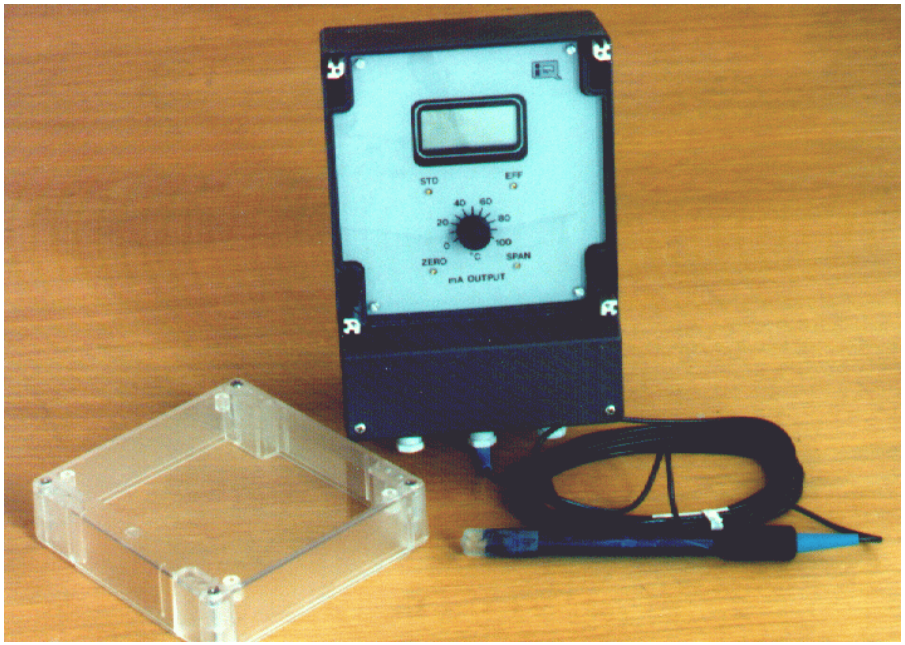
USER MANUAL - 2520 pH TRANSMITTER

Models manufactured after May 1994



The 2520 pH transmitter converts the signal from a combination pH electrode into a 4-20mA signal for transmission over a twisted pair of conductors.

The instrument is loop powered, the entire electronics being powered from the residual 4mA of the loop.

A 3.5 digit LCD indicator showing 0 - 14.00 pH is fitted as standard.

As the instrument is in an IP65 housing it may be mounted close to the pH electrode minimising noise pickup on the cable.

Temperature compensation can be either manual or automatic using a Pt100 sensor. Automatic temperature compensation is not normally required if the process being monitored is maintained at a steady temperature or the pH is close to 7pH.

USER ADJUSTMENTS

To the left of the terminal block are three sets of jumpers. These are user adjustments as follows.

1. The jumper to the extreme left sets the offset required when only a part of the instrument range is to be transmitted over the 4-20mA loop. There are 6 positions in increments of 2pH. Suppose we wish to transmit the range 5 to 9pH. The offset here is 5pH and we would select the position 4-6pH and use the zero adjustment (described later) to trim.

2. The next jumper sets the span to be transmitted. There are three positions. In the case of 5 to 9pH the span is 9-5=4pH. The jumper should be set to either the 2-4 or 4-8 position and is trimmed with the span adjustment. If a span of 4 is not achievable in one of these positions it will definitely be available in the other position as there is an overlap between each jumper position and the next.

3. The jumper next to the terminal block selects manual or automatic temperature compensation. For automatic compensation a Pt100 probe must be connected to the terminals indicated and should be mounted as close as practical to the pH electrode. If the jumper is set for automatic and no probe is fitted the readings will not be accurate.

On the front plate there are four screwdriver adjustments and one knob. Their functions are as follows:-

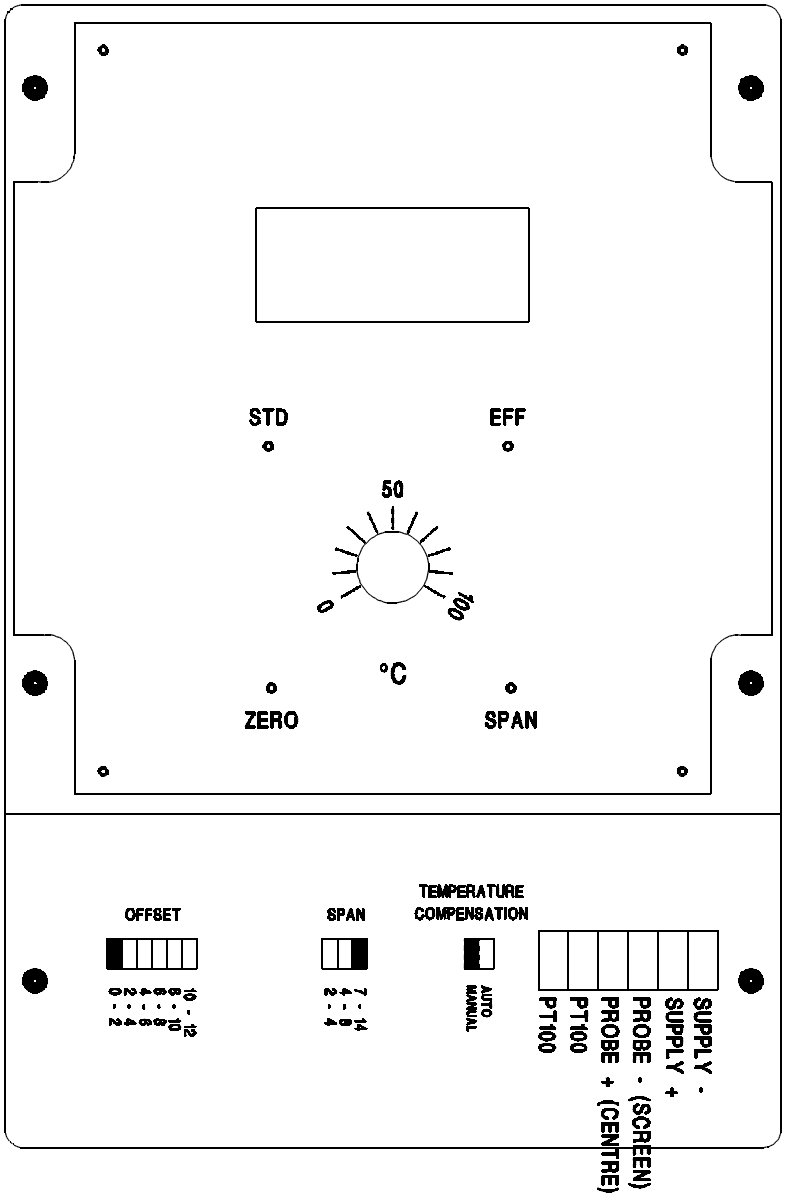
STD. (Standardise or Zero). This is used to set the display to a reading of 7.00 when the probe is in 7pH buffer solution.

EFF. (Efficiency or Slope). This is used to set the display to a reading of 4.00 or 10.00 when the probe is in 4pH or 10pH buffer solution respectively.

ZERO. This is used in conjunction with the offset jumpers to set the pH value required to give a 4mA output.

SPAN. This is used in conjunction with the span jumpers to set the pH value required to give a 20mA output.

EC. This should be set to the temperature of the solution being measured when manual temperature compensation is selected by jumper.



INSTALLATION

The enclosure is designed to mount on a wall using keyhole mounting holes for ease of attachment. The keyholes are on the back of the box and have plastic knockouts which should be removed prior to mounting.

Wiring connections should be made through the PG7 glands provided to maintain a water tight seal. Most pH electrodes are fitted with some type of connector and this should be cut off and the wire stripped back.

The terminals for the pH electrode are marked “centre” and “screen” and should be connected to the centre wire and screen of the coaxial cable from the pH electrode. When stripping back the coaxial cable make sure that you remove the thin black coating from the insulation around the centre wire. This is electrically conductive and could short against the centre wire giving an incorrect reading.

The 4~20mA signal is usually a twisted pair and connects to the +ve & -ve supply terminals. Sometimes this cable is screened. If this is the case, make sure that the screen is not connected at the transmitter.

Two extra terminals are provided for automatic temperature compensation. These connect to a Pt100 sensor which may be integral with the pH sensor or supplied as a separate probe. These terminals are not polarised.

CALIBRATING THE METER TO A pH ELECTRODE

When leaving the factory, the meter will be calibrated to the theoretical values for a perfect pH electrode. Real electrodes have small errors from the theoretical values and these should be calibrated out for best results. This is sometimes called “buffering” the instrument.

The standard method of calibrating a pH meter is with standard buffer solutions, usually 4, 7, and 10pH.

If the meter is to be used for low pH measurements (acid) the calibration points are 4 and 7pH. For high pH measurements 7 and 10pH are normally used. For even better results use 7pH buffer plus a buffer solution with a value close to your working value.

Procedure

This procedure will be described for 7pH and 4pH buffers. For use with other value buffers, substitute the required values as necessary.

Set up three containers containing 4pH buffer, 7pH buffer and distilled water. These should all be at the same temperature for best accuracy.

If using manual temperature compensation measure the temperature of the buffer solutions and adjust the dial of the temperature compensator to read the same.

If using automatic temperature compensation the Pt100 probe must be inserted into the buffer solution along with the pH electrode.

Clean the electrode by dipping in the distilled water and then insert in the 7pH buffer. Wait for the reading to stabilise (about 15 seconds) and adjust the STD trimmer until a reading of 7.00pH is obtained.

Remove the electrode from the 7pH buffer and clean in the distilled water before inserting in the 4pH buffer. After the reading has stabilised adjust the EFF trimmer until a reading of 4.00pH is obtained.

No further adjustment should be necessary for readings accurate to 0.05pH however the 7pH and 4pH adjustments may be repeated until no further improvement can be obtained. Don't forget to clean the electrode in the distilled water between readings to minimise contamination of the buffer solutions.

The same procedure may be carried out using buffers of 7 and 10pH. Always start with the 7pH buffer solution.

After calibrating at 7 and 4pH as described above, you may wish to check the instrument at 10pH. You will probably find that the reading is not exactly 10.00pH and may be out by as much as 0.2pH.

This is an error in the electrode or buffer solution, not the instrument. Most pH electrodes are not perfectly symmetrical and give slightly differing outputs depending on whether they are in acid or alkaline solutions.

Always calibrate your meter using buffers fairly close to the values you expect to be measuring, to ensure optimum accuracy.

If you expect to be measuring both acid and alkaline solutions it is possible to calibrate at 4 and 10pH. This will result in the worst error being around 7pH.

CALIBRATING THE 4-20mA OUTPUT

This should not be necessary under normal circumstances. We recommend that this operation only be performed by an instrument engineer.

To set the 4-20mA output to the correct transmission range requires either a millivolt source to replace the pH electrode, or a pH electrode with buffer solutions having the pH required to give the 4mA and 20mA outputs.

Before starting this procedure the meter must be calibrated as above.

Let us assume that we are to set up for 4pH=4mA and 10pH=20mA.

First we must set the jumpers for an offset of 4pH and a span of 6pH.

The auto/manual temperature jumper should be set to manual.

Place the pH electrode in the 4pH buffer and use the manual temperature setting knob to obtain a reading on the display of 4.00. (Alternatively adjust the millivolt source to obtain the same reading.)

Using a small screwdriver adjust the ZERO trimmer until the output is exactly 4.0mA.

Now wash the electrode in distilled water and insert in 10pH buffer. Obtain a reading of 10.00 on the display and adjust the SPAN trimmer until the output is exactly 20.0mA. (Alternatively obtain this reading using the millivolt source.)

Repeat this procedure alternately for 4 and 20mA until no further adjustment is required. This may take four or five operations to complete.

Once completed the auto/manual temperature jumper should be returned to the operating position required and the manual adjuster set to the correct temperature if required.

IMPORTANT NOTES

When replacing a pH electrode it is not necessary to readjust the 4~20mA output. Follow the procedure for calibrating the electrode to the built in meter and the 4~20mA output will be correct.

Re-calibration of the model 2520 against the electrode currently in use should be performed on a regular basis. The period between calibrations may be as short as 24 hours for high accuracy applications and should not be longer than about 1 month in normal circumstances.

When stored, the bulb of the pH electrode should be kept wet, preferably with 4pH buffer. All pH electrodes are supplied with a plastic cap for this purpose. An electrode which has been stored dry may sometimes be recovered by soaking in a strong acid solution for a few hours.

pH electrodes have a finite working life. This varies depending on application and is normally of the order of 3-12 months.

pH electrodes deteriorate with age even when stored correctly. Use electrodes on a first in first out basis for best results.

GROUND LOOPS

There is a possibility of ground loop problems if either side of the power supply to the model 2520 is grounded to the liquid being measured. This is often a problem with metal tanks in an outdoor environment and especially with distributed systems such as PLC's and PC's.

A ground loop is caused by leakage currents through the solution from the pH electrode and usually manifests itself by causing the instrument to drive hard upscale or downscale. For applications where ground loops are possible it is recommended that a 4~20mA signal isolator such as the model 1120 be used to break the loop.

If you suspect a ground loop problem try the following.

After checking the instrument calibration, place a sample of the process liquid in an insulated container such as a glass beaker or a plastic bucket and place the pH electrode in this container. Make a note of the reading. Next place the pH electrode in the process liquid tank and take another reading. If the two readings are dramatically different, the chances are you have a ground loop.

ELECTRODE CONTAMINATION

Various chemicals can affect the readings taken by a pH electrode by contaminating one of the junctions. Sometimes the contamination is temporary and can be reversed by washing the electrode, other times it can be permanent. Special electrodes, such as double junction types, are available for these applications. Below is a list of some of the more problematic chemicals, however it is advisable to consult your electrode supplier before ordering.

Sodium ions (Na+)	Proteins	Heavy Metals	Organic Compounds
Bromides	Iodides	Sulphides	Cyanides
Other compounds which interact with silver			Vegetable Oils

SPECIFICATIONS

SUPPLY VOLTAGE	10-40V DC UNSTABILIZED
OUTPUT	4~20mA (2-WIRE)
INPUT	COMBINATION pH ELECTRODE
pH RANGE INDICATED	0-14pH.
SPAN (4~20mA SIGNAL)	ADJUSTABLE 2-14pH.
OFFSET (4~20mA SIGNAL)	ADJUSTABLE 2-12pH.
INPUT IMPEDANCE	$30GS
BASIC ACCURACY	±0.02pH.
MANUAL TEMPERATURE ADJUSTMENT	0-100EC
AUTOMATIC TEMPERATURE ADJUSTMENT	PT100
OPERATING TEMPERATURE	0-60EC
OPERATING HUMIDITY	0-90% RH. NON CONDENSING
ENCLOSURE RATING	IP65

For more information on pH measurement please visit our website.

Phoenix Electrode Sales CC (011) 792 1210 http://www.ph.co.za