



# OPERATOR MANUAL

RE357Tx/Kit

pH Meter  
with RS232C

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## RE357/RE357Tx

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# SECTION 1

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## Introduction

### Description

The RE357(Tx) Microprocessor pH Meter, is a precision, microprocessor controlled pH meter that includes automatic calibration with standard buffers and is suitable for many applications that require high accuracy.

### Unpacking

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call your EDT direct ION Agent

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the agent.

#### *Note*

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material in the event that re-shipment is necessary.

The following items are packed in the box:

- RE357Tx pH Meter
- Temperature Probe
- Electrode Stand
- pH Buffers 4,7,10
- Power Adaptor
- 9V Battery
- Operator's Manual

## Setting Up

The instrument can be used on battery or AC power. It is not necessary to remove the battery before transferring to AC power.

### AC Operation

- Use only the approved power adaptor supplied.
- Check that the adaptor is the correct voltage for your power supply.
- Plug the adaptor into the power socket on the back of the meter then connect to the AC supply.

### Battery Operation

- A battery should always be used to protect calibration data in the event of a power failure. Install the battery as shown in figure 1.
- The battery will afford the user 24 hours of continuous use. When the battery needs changing, the word BAT will appear on the display.

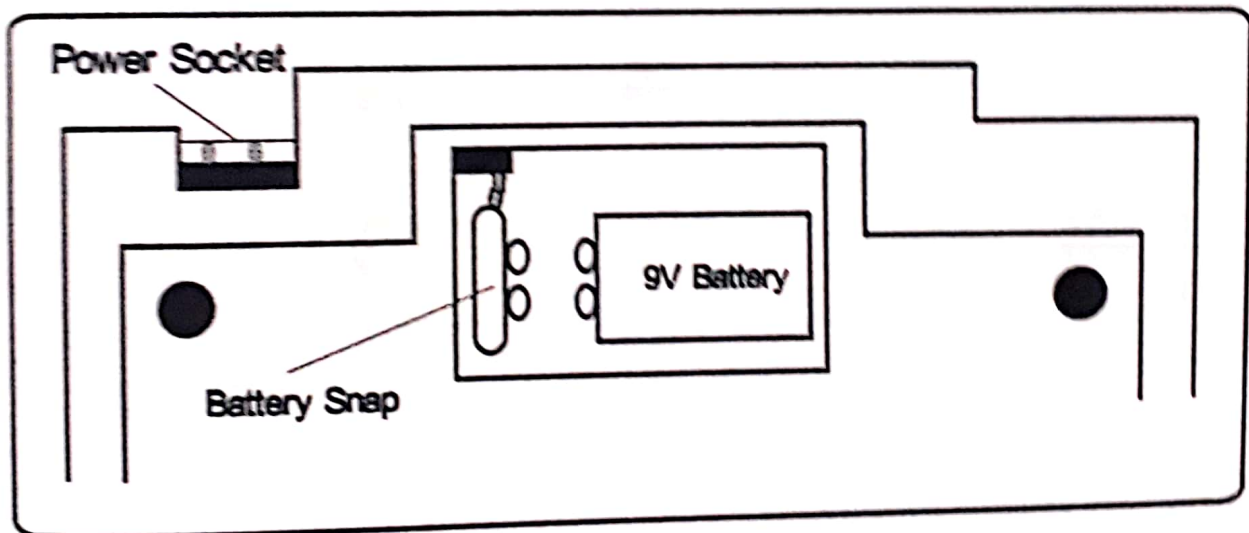


Figure 1. Bottom view of instrument showing power connections.

# Instrument Test Procedure

- Ensure that the shorting plug is connected to the BNC pH input at the back of the meter and that the temperature probe is removed. (see Figure 2)
- Switch on and ensure that the meter is in pH mode and un-calibrated. (Press Mode Key to select pH mode and press Clear Key for 5 seconds to clear calibration data).
- This display should now read  $7.00 \pm 0.02\text{pH}$ .
- Switch to mV mode (press the Mode Key), clear any calibration data (press Clear Key for 5 seconds), and ensure the display reads  $0.0 \pm 0.2\text{mV}$ .
- Switch to  $^{\circ}\text{C}$  mode (press the Mode Key) and ensure the display has a value in the range  $0.0$  to  $19.9^{\circ}\text{C}$  and is adjustable. ie responds to the use of the  $\uparrow\downarrow$  Keys. Adjust the display until it reads  $20.0^{\circ}\text{C}$ .
- The meter is now ready for calibration.

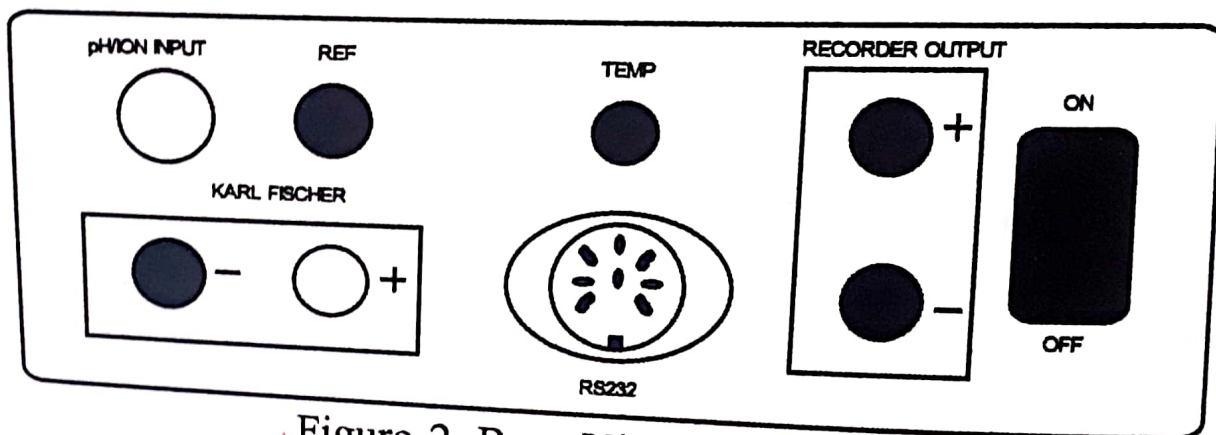


Figure 2. Rear View of RE357Tx









## A NOTE ON ELECTRODES

pH, ion selective, and redox electrodes may all be used with the RE357Tx. These may be combination electrodes (reference and sensing electrode in one body) or two half-cells (reference and sensing electrodes separate). Combination or separate sensing electrodes should have a BNC connector and be attached to the input marked pH/ion at the back of the meter. Separate reference electrodes should have a 4mm bunched connector and be attached to the input marked REF at the back of the meter. Always refer to electrode instruction manuals before use. See also, Appendix 1.

**pH Buffers:** Refer to Appendix 1



Figure 3: Front Panel

- 
 - Calibration Keys, alter displayed value
-  - Enters displayed value as calibration data
-  - Clears calibration data when pressed for 5 seconds
-  - Selects pH Mode
-  - Selects mV mode.
-  - Transmits data to printer/computer. If not connected, freezes displayed value
-  - Selects °C Mode

# SECTION 2

## pH Calibration and Measurement

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For accurate results, stir all buffers and samples. Always rinse electrode(s) with de-ionized water and blot dry before transferring from one solution to another to prevent contamination.

Ensure that the electrode fill hole (if present) is left uncovered during use.

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REFER TO FIGURE 3

### ○ With Automatic Calibration and Temperature Compensation.

- ① Switch on using the power ON/OFF switch on the back panel.
- ② Connect pH electrode(s) and temperature probe.
- ③ Select pH mode. Clear any existing calibration data by pressing Clear for 5 seconds.
- ④ Place pH electrode(s) and temperature probe in pH 7 buffer and wait for the reading to stabilize. Press Enter key. The first calibration point will now be entered automatically at the correct value for the temperature of measurement. The CAL flag will be displayed.
- ⑤ Rinse, blot and place electrode(s) and temperature probe in pH buffer 4 or 10. Wait for a stable reading. Press Enter key. The second calibration point has now been entered automatically at the correct value for the temperature of measurement.
- ⑥ Rinse, blot and place pH electrode(s) and temperature probe in the sample, wait for a stable reading and record pH value.
- ⑦ Temperature or mV measurements may be made at any time by pressing the appropriate key.

**DISPLAY HOLD:** The display may be frozen at any time by pressing Send (provided no printer or computer is connected.). To release the display again, press Send.

## ○ With Manual Calibration

If buffers other than 4, 7 and 10pH are to be used then the calibration must be performed manually. That is, the correct buffer value should be entered by using the ↓ ↑ keys

Follow the procedure for Automatic calibration above but before pressing the Enter key (points ① and ②), carry out the following procedure.

- ① Check the temperature of the buffer
- ② Look up the value of the buffer at the temperature of measurement.
- ③ Use the ↓ ↑ Keys to adjust the displayed reading to the value obtained in ② (The CAL flag will flash). Press Enter. The CAL flag will stop flashing.

## ○ With Manual Temperature Compensation.

If use of a temperature probe is inappropriate (eg small sample size), then it is possible to use manual temperature compensation.

Follow the procedure for Automatic Temperature Compensation above, points ① to ③.

- ④ Press °C key to select temperature function. Note that the °C flag flashes when no probe is connected. Use the ↓ ↑ keys to adjust the displayed reading to the temperature of the pH 7 buffer.
- ⑤ Press the pH key to return to pH function.
- ⑥ The meter may now be calibrated automatically or manually, following either of the procedures above.



# SECTION 3

## mV Calibration and Measurement

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The mV mode has two ranges . The meter automatically selects the most appropriate as follows:

0 to  $\pm 400\text{mV}$  with resolution  $0.1\text{mV}$

$\pm 400\text{mV}$  to  $\pm 2\text{V}$  with resolution  $1\text{mV}$

---

### ○ Absolute mV

- ① Connect electrode(s) and select mV mode..
- ② Clear any existing calibration data. (Press Clear for 5 seconds).
- ③ Absolute mV measurements may now be taken by immersing electrode(s) in the sample and recording the displayed reading.

### ○ Relative mV

Follow the procedure for Absolute mV above points ①-②

- ③ Immerse electrode(s) in the standard or blank solution. Wait for a stable reading and press Enter. The display will automatically zero and the cal flag will be displayed.
- ④ mV values relative to the standard solution may now be taken by immersing the electrode(s) in the sample and recording the reading

# SECTION 4

## Use of the Recorder Output

### REFER TO THE RECORDER INSTRUCTIONS

- Connect the recorder, via the red and black 4mm recorder sockets on the back panel. (Red positive and Black negative)
- Ensure that the recorder is set for the appropriate range, i.e.

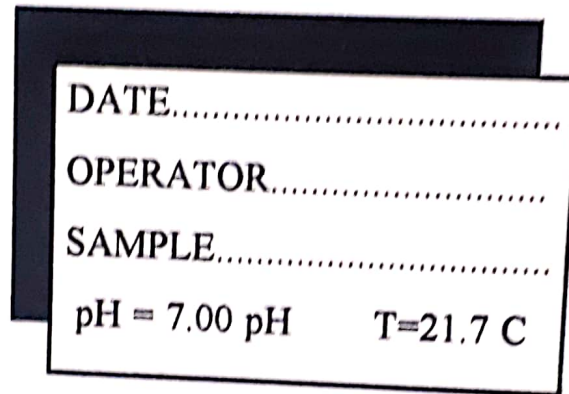
MODE	RANGE(mV)	DISPLAY	RECORDER
pH	0 - 200	7.00pH	70.0mV
mV	$\pm 200$	500mV	50.0mV
$^{\circ}\text{C}$	$\pm 200$	25.0 $^{\circ}\text{C}$	25.0mV

# SECTION 5

## Operation with a Printer or Computer

### Operation with a Printer

- Connect a printer (set at 1200 Baud) to the RE357Tx via the RS232C port on the back of the meter
- Follow the calibration procedure given in SECTION 2 or 3
- To print out a sample reading, press the Send key. The first time the key is pressed the following printout is obtained.



DATE.....  
OPERATOR.....  
SAMPLE.....  
pH = 7.00 pH      T=21.7 C

- Pressing and releasing the Send key subsequently, will result in a printout of the displayed reading and temperature only.
- To obtain a printout of other parameters for the same sample, press the appropriate key and then the Send key.
- To print a new identifier, press and hold down the Send key.

## Operation with a computer

Connect a computer using 1200 Baud via the RS232C port on the back of the meter. A computer programme is required to receive and send characters from the computer. The current readings can be sent to the computer manually by pressing the Send Key. Each line is terminated with a CR LF (Carriage return line feed). All characters are ASCII printable alpha-numeric.

Three commands CA, PR and RD can be sent from the computer.

### OCA - send calibration data

COMMAND CA

1 CR LF

pH = 7.06 CR LF

T = 15.8 C CR LF

mV = -0.2mV CR LF

2 CR LF

(second calibration point data)

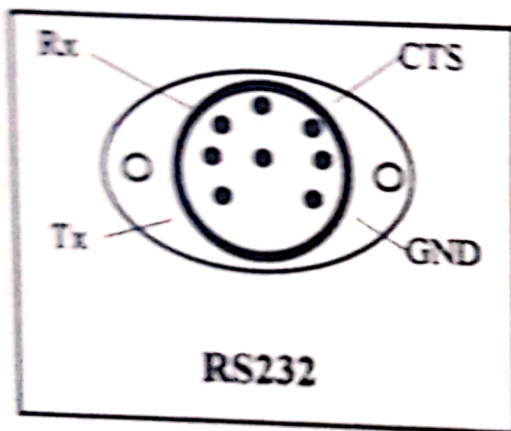
OPR - send probe status data

```
COMMAND PR
SI = 95.5% NERNST CR LF
Ez = 5.2 mV CR LF
```

ORD - send current readings

```
COMMAND RD
pH = 7.00pH CR LF
T = 21.5 C CR LF
mV = 0.2mV CR LF
```

### Connection Details



**Port Specification**

Baud Rate: 1200

Data Format: 1 start bit, 8 Data bits  
2 stop bits, No parity bits

Voltage levels:  $\pm 5V$

# SECTION 6

## TROUBLESHOOTING

### Symptom

No Display

"BAT" flag displayed

Wildly erratic readings or display reads  
-- on left hand side

Drifting Readings

Erratic/drifting readings or display-  
reads -- on left hand side when  
shorting plug is attached

### Probable Cause(s)

- Power supply disconnected
- Battery is flat or not installed
- Battery is low
  
- Electrode(s) disconnected
  
- Electrode(s) not immersed in solution
  
- Reference electrode not filled
- Reference junction dry
- **Inconsistent (or lack of) stirring**
- Electrode(s) needs cleaning or reconditioning
- Reference filling solution contaminated
- Buffers contaminated

**Return meter for servicing**

# TROUBLESHOOTING

## Error Codes

<b>PRO</b>	- Temperature probe malfunctioning
<b>buf</b>	- Wrong buffer used (pH mode only)
<b>SL</b>	- Poor electrode slope. Service or replace electrode(s)
<b>Eo</b>	- Poor electrode(s). Service or replace electrode(s)

In the event of a malfunction, it is important to pinpoint the problem to either the meter or the electrode(s). If spare electrodes are available, substitute them for those in use.

**There are no user serviceable parts in this instrument. Please ensure that the instrument, together with all accessories, is returned to the EDT direct ION agent with a full description of the symptoms of the fault. No attempt should be made to repair the meter.**

# SECTION 7

## Accessories

Replacement pH electrode:	E8081
Temperature probe:	E8051
Flexible Arm Stand:	E8060
Solutions	pH Buffers 4,7,9,10 pH storage solution



# SECTION 8

## Specifications

<b>pH</b>	<b>Range:</b>	<b>0 -14pH</b>
	<b>Resolution:</b>	<b>0.01pH</b>
	<b>Accuracy:</b>	<b>±0.02pH</b>
	<b>Slope units:</b>	<b>% Nernst</b>
	<b>Temperature Compensation:</b>	<b>0 - 100°C</b>
	<b>Automatic Calibration:</b>	<b>2 points at 4, 7 or 10</b>
	<b>Manual Calibration:</b>	<b>2 points at any value</b>
<b>mV</b>	<b>Range:</b>	<b>±400mV &amp; ±2000mV</b>
	<b>Resolution:</b>	<b>0.1mV or 1mV</b>
	<b>Accuracy:</b>	<b>±2% ± 1 digit</b>
	<b>Relative mV calibration:</b>	<b>±2000mV</b>
	<b>Automatic Range change at:</b>	<b>400mV</b>
<b>°C</b>	<b>Range:</b>	<b>-30 to +130°C</b>
	<b>Resolution:</b>	<b>0.1°C</b>
	<b>Accuracy:</b>	<b>±0.3°C</b>
<b>Recorder Output:</b>		<b>±200mV, 2x 4mm sockets</b>
<b>Karl Fisher Output:</b>		<b>10µA, 2 x 4mm sockets</b>
<b>RS232:</b>		<b>See Section 6</b>
<b>Power:</b>		<b>9V battery or power adaptor via 2.1mm female socket</b>
<b>Instrument size:</b>		<b>210 x 150 x 88mm</b>
<b>Instrument weight:</b>		<b>550g</b>

# Appendix 1

## pH Electrodes

### Care, Maintenance and Storage

Before use, remove the protective cap covering the glass sensing bulb and replace with the protective guard if applicable. Inspect the filling solution for air bubbles and remove by shaking the electrode in a downwards direction. If the electrode is a refillable type, uncover the filling hole. Soak the electrode in pH electrode storage solution\* for 3 minutes.

### Cleaning

Soak the electrode in 0.1M HCl for 15 minutes followed by soaking in pH electrode storage solution\* for 30 minutes.

### Storage

Soak the electrode in pH electrode storage solution\*. Recover the filling hole.

**Never store the electrode in distilled or de-ionized water. Never allow the electrode to dry out.**

## pH Buffers

pH buffers 4, 7 and 10 are usually used to calibrate the meter and electrode

### Buffer Capsules

Buffer capsules are made up as follows: For each buffer, empty the powder into a suitable container. Using de-ionized water, make up to 100mL and ensure powder is fully dissolved before use. The coloured outer skin may also be added to colour code the resulting buffer solution. (This may take up to 4 hours to dissolve but will not affect the pH of the buffer).

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*\*pH electrode storage solution is made up by dissolving 1g KCl in 100mL pH 7 buffer*

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## Buffer Solutions

Ready made buffer solutions may be used. Please note that if the automatic calibration function on the meter is to be used, the buffers must have the temperature coefficients given in the table below.

Temperature/°C	pH 4	pH 7	pH 10
10	3.99	7.07	10.18
15	4.00	7.04	10.14
20	4.00	7.02	10.06
25	4.00	7.00	10.00
30	4.00	6.99	9.95
35	4.01	6.98	9.91
40	4.02	6.97	9.85
50	4.05	6.96	9.78
60	4.07	6.96	9.75

Table Showing Temperature Coefficients of Buffers



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