



Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRDA Ltd. to ISO 9001/14001



Instruction Manual

Pocket TrapMan® PT1

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Introduction

Thank you for purchasing the TLV Pocket TrapMan PT1.

When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

To ensure safe and correct use of this product, be sure to observe the safety precautions listed in this manual as they relate to installation, operation, maintenance and repair of the product. Please keep it in a safe place for future reference.

TLV accepts no responsibility for incorrect use of the product by the customer or any third-party, malfunction occurring during use, other defects and any damage caused by this product, excluding cases in which it is under obligation to pay reparations by law.

This product has undergone strict quality management and product inspection before being shipped from the factory. However, in the event of malfunction or defects, please contact your local TLV representative or the TLV customer service center.

This instruction manual and product are subject to modification without notice, for the purpose of improvement.

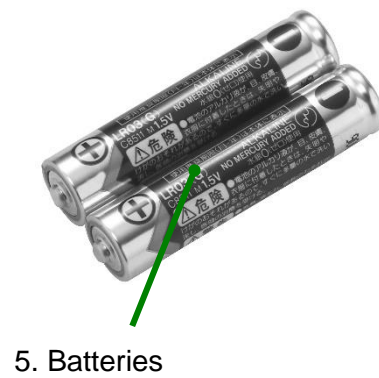
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Contents

Introduction	1
1. PT1 Standard Set	2
2. Safety Considerations	3
3. Principles of Operation.....	6
4. Features and Functions	7
5. Components, Features and Functions	8
6. PT1 Preparation.....	9
7. Proper Measurement Procedure.....	10
8. Steam Trap Diagnosis	11
9. Valve Diagnosis	16
10. Bearing Inspection	18
11. Deleting Existing Data.....	22
12. Settings.....	23
13. Accessories.....	26
14. Troubleshooting	27
15. Specifications.....	28
16. Product Warranty	29

1. PT1 Standard Set







1. Instruction Manual (this manual)
2. Pocket TrapMan PT1
3. Soft Case
4. Earphones
5. Batteries (2 alkali AAA (LR03))
6. Cap
7. Carrying Strap






2. Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- Inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to use, maintenance and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.











Symbols

	Indicates a DANGER, WARNING or CAUTION item.	
	DANGER	Indicates an urgent situation which poses a threat of death or serious injury
	WARNING	Indicates that there is a potential threat of death or serious injury
	CAUTION	Indicates that there is a possibility of injury or equipment / product damage
	PROHIBITED	This precautionary symbol indicates an item or action that must not be used or performed
	MANDATORY	This precautionary symbol indicates an action or precaution that MUST be performed or observed













2.1 PT1 Precautions

 DANGER	
 PROHIBITED	Do not use the carrying strap or earphones if there is any possibility of entanglement with rotating machinery. Operating the unit with the strap or earphone cord hanging loosely could lead to accidents resulting in serious injury caused by their becoming caught in rotating machinery.
 PROHIBITED	Do not use in areas requiring explosion-proof equipment. The unit does not have an intrinsically safe rating. Use in such dangerous environments may result in ignition or accidental explosions.

Continued on next page

 WARNING	
 PROHIBITED	Do not disassemble or modify. Failure to observe this precaution could result in injury, electrical shock, ignition or fire.
 PROHIBITED	Do not operate the buttons or stare at the screen while walking. Failure to observe these precautions could lead to accidents such as tripping or collisions.
 MANDATORY	Be attentive to the background noises in the surrounding area. When wearing the earphones, it becomes difficult to hear noises from the surrounding area. Operate the unit together with a person who is not wearing any earphones or take measures during operation to ensure advance awareness of potential dangers in the surrounding area.
 PROHIBITED	Do not turn the power ON while wearing the earphones. A sudden loud sound may be emitted, leading to hearing impairment or injury. After turning the power ON, check to see whether a loud sound is being output before putting on the earphones.
 PROHIBITED	Do not subject the unit to strong impact and do not throw it. Such handling could result in leakage of the battery fluid, excessive heat generation or injury.
 PROHIBITED	Do not place components in microwave ovens or high- pressure vessels, and do not place components in the vicinity of electromagnetic devices. Such handling could result in excessive heat generation, smoke, damage to circuitry, battery leakage, rupture or ignition.
 CAUTION	
 PROHIBITED	Make sure no foreign matter gets inside the unit. Before use in areas with large amounts of metal powder or other fine foreign matter, take measure to prevent this foreign matter from getting inside the unit. The presence of such foreign matter could result in fire or unit failure.
 PROHIBITED	Do not let the unit become wet. If liquid gets inside the unit, it may result in excessive heat generation, electrical shock or unit failure. Be mindful of the location of use and the method of handling.

2.2 Battery Precautions

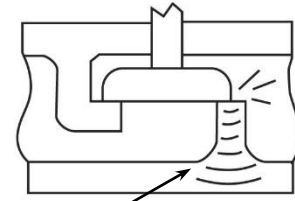
 DANGER	
 PROHIBITED	<p>Do not apply heat to the batteries or throw them into a fire. Failure to observe this precaution could result in leakage of the battery fluid, excessive heat generation, rupture or ignition.</p>
 PROHIBITED	<p>Do not cause the unit to become wet by immersing in water, salt water or liquid chemicals. Failure to observe this precaution could result in leakage of the battery fluid, excessive heat generation, rupture or ignition.</p>
 MANDATORY	<p>If fluid leaks from the battery and gets in the eyes, flush it out. Do not rub the eyes, and after immediately flushing out thoroughly with clean water, see a doctor.</p>
 PROHIBITED	<p>Do not disassemble, modify, solder, etc. Failure to observe this precaution could result in leakage of the battery fluid, excessive heat generation, rupture or ignition.</p>
 PROHIBITED	<p>Do not leave unit where it will be exposed to direct sunlight or in areas that will become very hot, such as interiors of cars, near heating equipment, etc. Failure to observe this precaution could result in leakage of the battery fluid, excessive heat generation, rupture or ignition.</p>
 WARNING	
 MANDATORY	<p>Cease use of the batteries immediately if the unit exhibits abnormal operation. If irregularities such as fluid leakage, an unusual smell, unusual heat generation, discoloration or deformation are noticed, cease use of the unit immediately. If use is continued under such conditions, excessive heat generation, ignition or rupture may result.</p>
 MANDATORY	<p>If battery fluid leaks and comes into contact with the body, rinse immediately. There is danger of resultant damage to the skin. Immediately rinse any battery fluid off with clean water.</p>
 CAUTION	
 MANDATORY	<p>When not intending to use for extended periods of time, remove the battery pack from the unit and store in a dry, cool, dark location. Failure to observe this precaution could result in fluid leakage, rust, deterioration in performance or a reduction in service life.</p>
 PROHIBITED	<p>Do not dispose batteries with normal garbage. If at any time the batteries become unusable, observe your company regulations for proper disposal in accordance with local laws. If proper disposal is impossible, insulate the contact terminals by covering them with tape and return them to a TLV office.</p>

3. Principles of Operation

3.1 Generation of Ultrasonic Sound (Trap & Valve)

When fluid rapidly passes through a small hole, it generates ultrasonic sound.

When fluid leaks through the seat in a steam trap or valve, it emits ultrasonic sound. (Ultrasonic refers to the very high-frequency range of sound that is above the threshold of human hearing.)



Ultrasonic Sound Wave

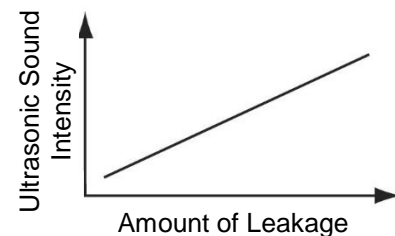
Since this ultrasonic sound is generated by an amount of leakage that would otherwise be too small to be noticed by human perception, checking for ultrasonic sound enables the detection of deteriorated steam traps or valves at a very early stage.

As liquids generate much lower intensity ultrasonic sound levels than gases, PT1 should only be used on steam traps, or valves installed on steam, air and other gas systems.

3.2 Ultrasonic Intensity & Steam Leakage Correlation (Trap & Valve)

There is a correlation between the intensity of the ultrasonic sound generated by a leak and the amount of steam leakage.

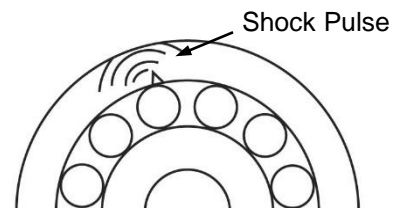
Pocket TrapMan PT1 judges the trap or valve operational condition by measuring the intensity of the ultrasonic sound and comparing it with a standard set of precisely measured values obtained from experimentation.



3.3 Ultrasonic Shock Pulse Generation (Bearing)

Shock pulses are generated whenever two metals collide. For bearings, they are generated from contact between the races due to insufficient lubrication or damage from wear.

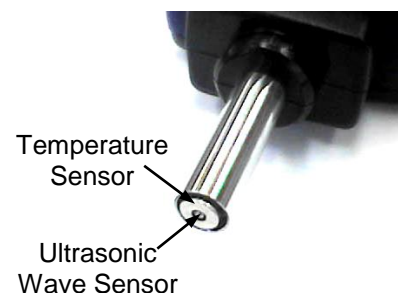
As there is a correlation between the intensity of the shock pulse generated, the degree of damage and the velocity of the contact (rotation frequency / shaft size), the operational condition of a bearing can be determined by measuring the intensity of the shock pulse.



3.4 Surface Temperature Measurement (Trap & Valve, Bearing)

Pocket TrapMan PT1 can measure surface temperature and ultrasonic sound simultaneously.

Temperature data can be used to detect blockage in steam traps and can be utilized to help determine the condition of bearings.



4. Features and Functions

4.1 Steam Trap Operation Inspection

- 1) PT1 automatically inspects the steam trap and makes a judgement estimate regarding the basic operational condition (Good / Caution / Leaking /Blocked / Low Temp).

Note: [Good] judgments for Temperature Control (Adjustable) Steam Traps must be confirmed manually. Compare the internal temperature and the allowed temperature range to confirm proper operating conditions. There is no [LowTemp] judgement for Temperature Control (Adjustable) Steam Traps.

- 2) Ideal for systems where detailed steam trap management is not implemented, or for daily inspections of critical systems between annual steam trap surveys. Using PT1 for a daily inspection is an effective way to determine whether maintenance is required or not.

4.2 Valve Seal Inspection

- 1) PT1 automatically inspects the valve and makes a judgement estimate regarding the condition of the valve's seal (Good/Caution/Leaking).
- 2) PT1 is effective for determining whether or not a valve is properly closed.

4.3 Bearing Deterioration Inspection

- 1) PT1 is effective for collecting the data regarding a bearing's operational characteristic.
- 2) Bearing deterioration (lack of lubricant, ball wear, etc.) can be determined based on the collected data.

Note: PT1 cannot detect structural or configuration problems (such as misalignment, being unbalanced, etc.) in rotating equipment.

4.4 Simultaneous Surface Temperature Measurement

- 1) As surface temperature is measured simultaneously with ultrasonic sound (vibration), a separate temperature measurement is unnecessary.
- 2) PT1 can be used for any application requiring surface temperature measurement.

4.5 Measurements Start and Stop Automatically

- 1) Measurements begin automatically when the probe is set on the measurement point.
- 2) Measurements stop after a certain amount of time has elapsed ("Trap&Valve" mode and "Bearing" mode), or after the probe is removed from the measurement point ("Bearing" mode only).

4.6 Data Stored in Memory

- 1) Inspection data is automatically stored in memory after each measurement.
- 2) PT1 has two inspection modes, "Trap&Valve" mode and "Bearing" mode. Each mode has 100 available memory locations (records).

Note: Steam trap inspection data and valve inspection data share the same memory locations. Be careful not to overwrite one when measuring the other.

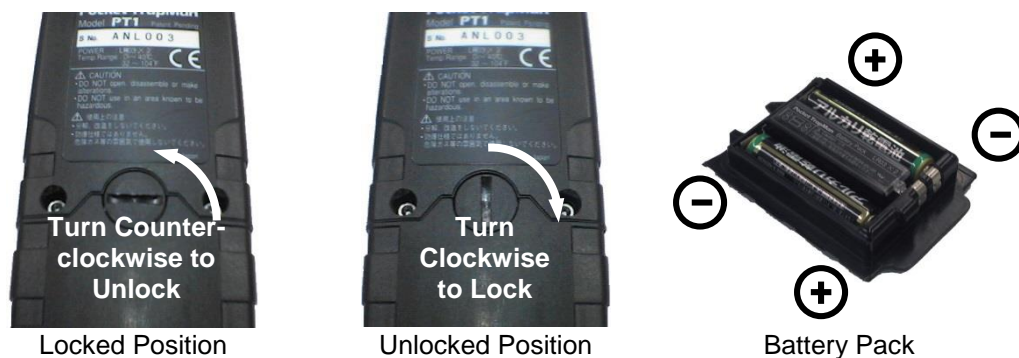
5. Components, Features and Functions



6. PT1 Preparation

6.1 Inserting Batteries

- 1) Turn the battery compartment lock counter-clockwise to unlock.
- 2) Open the battery compartment and remove the battery pack (battery compartment cover).
- 3) Insert 2 AAA (LR03) batteries into the battery pack. Make sure the batteries have the correct orientation (polarity). (Rechargeable batteries, Ni-MH or Ni-Cd can be used.)
- 4) Reattach the battery pack and close the battery compartment.
- 5) Turn the battery compartment lock clockwise to lock.



CAUTION When not intending to use for extended periods of time, remove the battery pack from the unit and store in a dry, cool, dark location.

6.2 Turning the Power ON/OFF

- 1) Press [ENT] to turn PT1 on. The initial screen will appear on the display after 2 seconds.
- 2) Press and hold the [ENT] key for more than 2 seconds to turn PT1 off.
- 3) The power will shut off automatically if 1 minute passes without a measurement being taken and no keys being pressed.

Note: PT1 will not shut off if in the process of taking a measurement or when settings are being changed.

6.3 Removing and Attaching the Cap

- 1) To remove the cap, twist it 45° counter-clockwise and take it off.
- 2) To attach the cap, place it over the probe and twist 45° clockwise to secure.



7. Proper Measurement Procedure

7.1 Prepare Surface for Measurement

Ultrasonic sound and surface temperature cannot be measured accurately if the surface where the measurement is to be taken is curved or a rough finished surface, or if it is coated with paint, dirt, rust or scale.

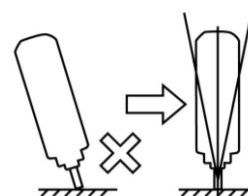
File the measurement point to produce a smooth and flat region of at least $\varnothing 8$ mm ($\varnothing 3/8$ in).



7.2 Probe Application

Hold the PT1 so that the probe is perpendicular to the measurement surface.

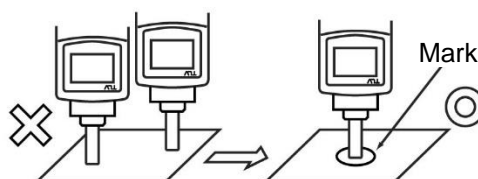
If the probe is tilted or applied to the surface at an angle, inconsistent contact with the surface will make it difficult to obtain an accurate measurement. Try to keep the probe as perpendicular and steady as possible during the measurement.



7.3 Consistent Measurement Point

Always take measurements from the same spot. If measurement points are different, the measured data may also differ. Especially, when trying to observe trends in measured values taken over time, it is likely to be more difficult to accurately identify such trends, leading to misjudgment, if the point differs with every measurement.

Determine an appropriate measurement point first, and measure from the same point for subsequent measurements. For convenience, mark the measurement point, but avoid scoring the surface or making a small indentation on the surface as this may cause inaccurate measurement.



7.4 Surface Temperature Restriction

The maximum allowable surface temperature of the object to be measured is 350 °C (662 °F). If the surface temperature exceeds 350 °C (662 °F), "Over" appears on the display and LED indicator will flash rapidly at four times per second. If you observe the indicator flashing in such a rapid manner, quickly remove the PT1 probe from the object, canceling the measurement.



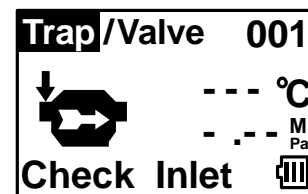
Continuing measurement under conditions that exceed maximum allowable surface temperature (350 °C, 662 °F) could result in temperature sensor damage.

8. Steam Trap Diagnosis

The PT1 is equipped with a simple automatic diagnosis function for steam traps. This section explains how to properly operate PT1 for steam trap inspections.

8.1 Mode Selection

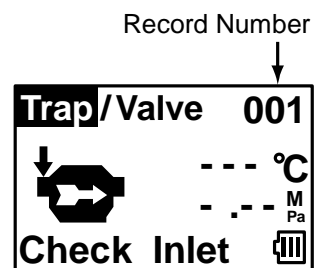
- 1) Set the mode to "Trap&Valve". If already set to "Trap&Valve", the following operation is unnecessary.
 - a) With the power on, simultaneously press [▲] + [ENT].
 - b) Press [▲] or [▼] to highlight "Trap&Valve".
 - c) Press and hold [ENT] for more than 1 second.
- 2) Set the mode to "Trap". If already set to "Trap", the following operation is unnecessary.
 - a) If "Valve" is highlighted, simultaneously press [▲] + [▼].



8.2 Set Record Number

- 1) Set the record number to use by pressing [▲] or [▼].
 - a) Pressing [▲] / [▼] once increments/decrements the record number by 1.
 - b) Holding [▲] / [▼] for more than 1 second increments/decrements record numbers more quickly.

Note: The record number cannot be changed after the measurement is taken.



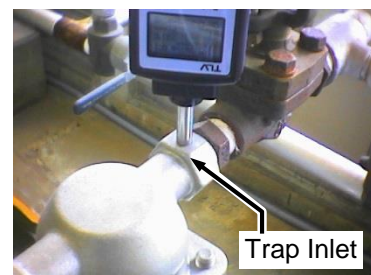
- 2) If any data is recorded at the selected record number, its contents are shown.

Note: If data is already recorded at the selected record number, taking a measurement will overwrite the data.
- 3) Record numbers from 001 to 100 are available, records do not need to be saved sequentially, and not all record numbers need to be used (numbers in the middle can be skipped).

8.3 Take Measurement

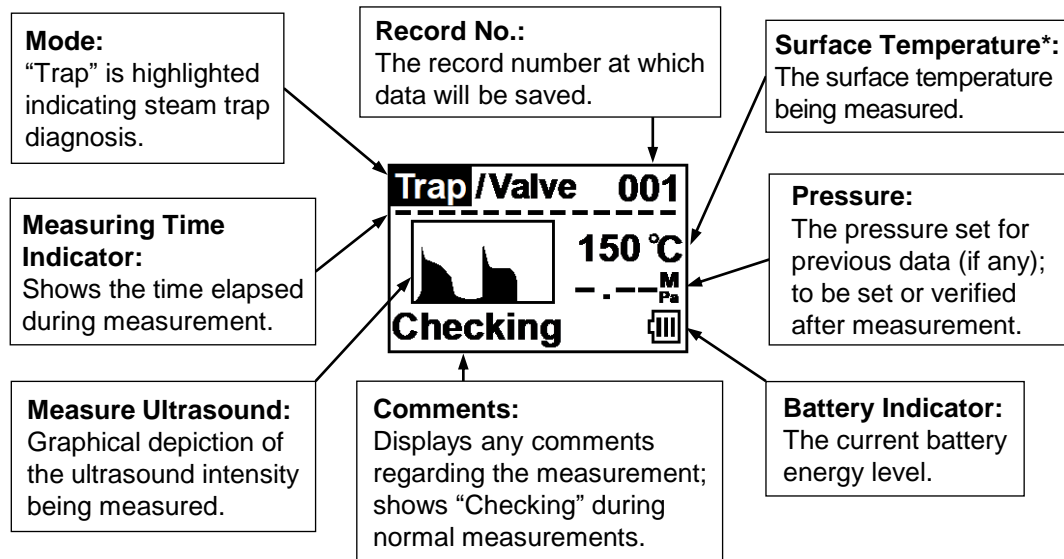
Before proceeding with taking a measurement, be sure to read section "7. Proper Measurement Procedure".

- 1) Measurements should be taken from the inlet side of the trap. If the measurement point is at the outlet, measurement accuracy cannot be assured.
- 2) Press the probe against the measurement point. Measurements begin automatically once the probe is applied to the measurement point.
- 3) It takes 15 seconds after placing the probe against the measurement surface for the measurement to be complete. Be sure to hold the probe perpendicular and steady for this entire period.



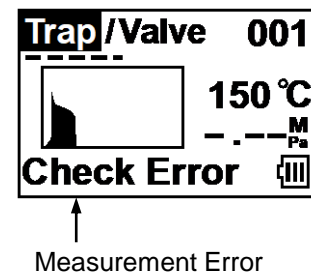
8.4 Display During Measurement

- 1) The following information is displayed while PT1 takes a measurement:



*When the measured surface temperature is higher than the measurable range, "OVER" will be displayed. If it is lower than the measurable range, "UNDER" will be displayed.

- 2) The LED at the base of the PT1 signals when a measurement is complete. It also flashes rapidly if the surface temperature exceeds 350 °C (662 °F).
- 3) If the probe is moved during the measurement, or is held at too high of an angle to the measurement surface, the measurement will stop and an error comment will be given.



8.5a Set Pressure

Set the operating pressure of the trap.


Note: All displayed pressures are gauge pressures, not absolute pressures.

Note: Due to space limitations, pressure unit kg/cm²G is shown on the display as “KG”.

If no data was previously saved under this record number, “-,-” will be displayed.

If data was previously saved, the previous pressure will be highlighted.

- 1) Enter the pressure at which the steam trap is operating.
 - a) Press [▲] or [▼] to enter the desired pressure.
Increase or decrease pressure setting to the following scale:

Trap/Valve 001
Inlet Press. 150 °C
1.00^M Pa
▲▼: Up&Down 

Displayed Unit	MPa	KG, bar	psi
Pressure Setting Range	0.00 - 0.09 MPaG	00.0 - 00.9 kg/cm ² G, barg	000 - 009 psig
[▲] or [▼]	by 0.01	by 00.1	by 001
Pressure Setting Range	0.10 - 0.95 MPaG	01.0 - 09.5 kg/cm ² G, barg	010 - 095 psig
[▲] or [▼]	by 0.05	by 00.5	by 005
Pressure Setting Range	1.00 - 9.90 MPaG	10.0 - 99.0 kg/cm ² G, barg	100 - 990 psig
[▲] or [▼]	by 0.10	by 01.0	by 010


- b) Holding [▲] / [▼] for more than 1 second increases/decreases numbers more quickly.
- 2) Press [ENT] to save the selected pressure.

8.5b Set Condensate load factor

Set the condensate load factor (MIN, ?, MAX).

If no data was previously saved under this record number, “?” will be displayed as default.

If data was previously saved, the previous factor will be displayed.

Trap/Valve 001
Cond. Load 150 °C
?
▲▼: Select 

- 1) Select the condensate load factor under which the steam trap is operating.
 - a) The standards for selection of the condensate load factor are as follows:

Think of the condensate load factor as:

$$\frac{(\text{Amt. of condensate currently being discharged})}{(\text{Trap capacity under operating conditions})} \times 100 (\%)$$

Use the following standards to select the factor.

Condensate load status	Less than 10%	More than 90%	10-90% or unknown
Factor	MIN	MAX	?

- b) Press [▲] or [▼] to select the condensate load factor.
- 2) Press [ENT] to save the selected factor.

8.5c Set Type of Steam Trap

Set the type of steam trap to be measured.

If no data was previously saved under this record number, [0:Disc] will be highlighted.

If data was previously saved, the previous trap type will be highlighted.

1) Select appropriate trap type from

[0:Disc]: Disc (Thermodynamic)

[1:Float]: Float

[2:Bucket]: Bucket

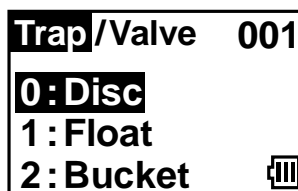
[3:Thermo]: Thermostatic

[4:Temp.ADJ]: Temperature Control (Adjustable)

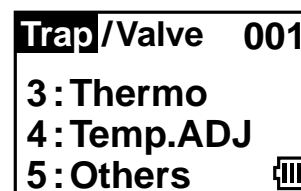
[5:Others]: Orifice type / Trap type Unknown

a) Press [▲] or [▼] to select the type of trap.

b) Press [ENT] to save the selected trap type.



the following:



8.6 Automatic Judgement

Based on the measured data, PT1 will automatically judge the operational status of the steam trap. For steam trap diagnosis, there are 5 possible judgements:

Good: The surface temperature is as expected, and there is no detected ultrasonic sound. The steam trap is likely to be in proper operational condition.

Caution: The surface temperature is as expected, but there is some ultrasonic sound detected. The sound level is very low, so it is difficult to determine if the trap is operating properly or if there is a very small leak. Continue to observe the steam trap closely.

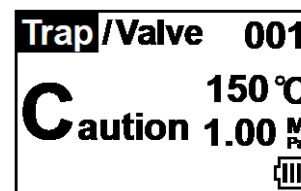
Leaking: A large amount of high-intensity ultrasonic sound is detected. There is a high possibility that the trap is leaking steam, and immediate repair or replacement is recommended.

Blocked: The surface temperature is less than 40 °C (104 °F). The trap is most likely blocked making condensate discharge impossible. Immediate cleaning, repair or replacement is recommended.

LowTemp (other than temperature control traps): Measured surface temperature is less than the saturation temperature at the input pressure $\times 0.6$. There is a high possibility that the surface temperature has dropped due to condensate accumulation, inlet pressure drop, closed inlet valve, or blocked inlet piping.

Note: The PT1 does not take the set temperature of Temperature Control (Adjustable) Steam Traps into account, and therefore [Good] judgments must be confirmed manually by comparing the internal temperature to the allowed temperature range of the trap. The internal temperature is slightly higher than the measured surface temperature.

When the judgement is displayed, the result is automatically saved at the designated record number simultaneously.



8.7 Retake Measurement and Proceed to Next Measurement

- 1) If the measurement or judgement is in doubt and you wish to verify by measuring again, simply apply the probe to the measurement point again (see 8.3). The measurement will restart automatically.

Note: The second measurement will overwrite the data from the first measurement; the original data will be lost.

- 2) If the measurement and judgement are acceptable, proceed to next device.
 - a) Press [ENT] to save data. ("Check Inlet" will be displayed.)
- 3) If the next device to inspect is a steam trap, repeat operation from "8.2 Set Record Number".
- 4) If the next device to inspect is a valve, switch PT1 diagnostic modes.
 - a) Press [▲] + [▼] simultaneously, changing mode to "Valve".
 - b) Follow the instructions under section "9. Valve Diagnosis".
- 5) If finished performing inspections, turn PT1 off.
 - a) Press and hold [ENT] for more than 2 seconds.

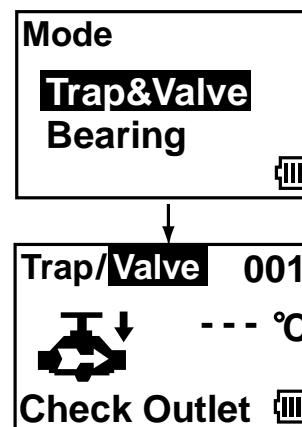
9. Valve Diagnosis

The PT1 is equipped with a simple automatic diagnosis function for valves. This section explains how to properly operate PT1 for valve inspections.

PT1 is suitable for valve diagnosis on steam, air and other gas systems.

9.1 Mode Selection

- 1) Set the mode to "Trap&Valve". If already set to "Trap&Valve", the following operation is unnecessary.
 - a) With the power on, simultaneously press [▲] + [ENT].
 - b) Press [▲] or [▼] to highlight "Trap&Valve".
 - c) Press and hold [ENT] for more than 1 second.
- 2) Set the mode to "Valve". If already set to "Valve", the following operation is unnecessary.
 - a) If "Trap" is highlighted, simultaneously press [▲] + [▼].



9.2 Set Record Number

This procedure is the same as for steam trap diagnosis described earlier. Refer to section 8.2 for details.

9.3 Take Measurement

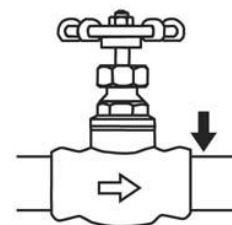
Before proceeding with taking a measurement, be sure to read section "7. Proper Measurement Procedure".

PT1 checks for valve leaks on closed valves. Make sure that the valve is fully closed before taking a measurement.

Note: Some valves on critical systems should not be closed. Verify whether or not it is acceptable to temporarily close the valve before proceeding to do so.

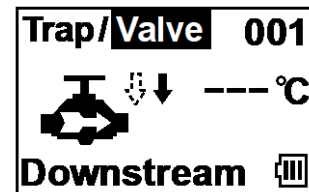
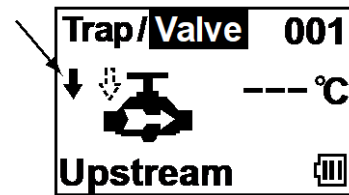
For valves, measurements may be required at up to 3 different locations; at the outlet, upstream and downstream.

- 1) The first measurement must be taken at the piping immediately after the valve outlet.
- 2) Press the probe against the measurement point. Measurements begin automatically once the probe is applied to the measurement point.
- 3) For valves, it takes 10 seconds after placing the probe against the measurement surface for the measurement to be complete. Be sure to hold the probe perpendicular and steady for this entire period.



Note: The display during measurement is the same as for steam trap diagnosis except the mode displayed will be "Valve". See section 8.4 for display details.

- 4) There are two possible outcomes from the measurement at the valve's outlet:
 - a) No ultrasonic sound was detected and the valve seals properly. Proceed to section "9.4 Automatic Judgement".
 - b) Ultrasonic sound was detected and further inspection is required. Continue to step 5.
- 5) If after taking a measurement at the outlet the screen shown right appears, further measurements are required. The second measurement is taken about 50 cm (2 ft) upstream of the valve.
- 6) After the upstream measurement, a third measurement is required about 50 cm (2 ft) downstream of the valve.



9.4 Automatic Judgement

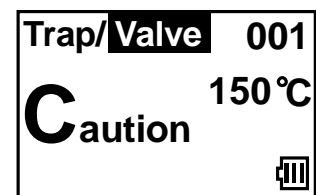
Based on the measured data, PT1 will automatically judge the operational status of the valve. For valve diagnosis, there are 3 possible judgements:

Good: No ultrasonic sound originating from the valve was detected. The valve seems to seal properly without leakage.

Caution: There is some ultrasonic sound detected. The sound level is very low, so it is difficult to determine if the valve seals properly or if there is a very small leak. Continue to observe the valve closely.

Leaking: A large amount of high-intensity ultrasonic sound is detected. The valve is likely leaking fluid, and immediate repair or replacement is recommended.

When the judgement is displayed, the result is automatically saved at the designated record number simultaneously.



9.5 Proceed to Next Measurement

- 1) If the measurement or judgement is in doubt and you wish to verify by measuring again, simply apply the probe to the measurement point at the valve outlet again (see 9.3). The measurement will restart automatically.

Note: The second measurement will overwrite the data from the first measurement; the original data will be lost.
- 2) If the measurement and judgement are acceptable, proceed to the next device.
 - a) Press [ENT] to save data. ("Check Outlet" will be displayed.)
- 3) Reopen the valve if it was open before performing the inspection.
- 4) If the next device to inspect is a valve, repeat operation from step 9.2.
- 5) If the next device to inspect is a steam trap, switch PT1 diagnostic modes.
 - a) Press [▲] + [▼] simultaneously, changing mode to "Trap".
 - b) Follow the instructions under "8. Steam Trap Diagnosis".
- 6) If finished performing inspections, turn PT1 off.
 - a) Press and hold [ENT] for more than 2 seconds.

10. Bearing Inspection

The PT1 can measure and display vibration acceleration levels (dB). This information is useful for checking and determining the operational condition of bearings. This section explains the features and proper measurement procedure for using PT1 for bearing inspections.

10.1 Special PT1 Features for Bearing Inspections

PT1 has several special functions particular to its bearing inspection mode.

- 1) Bearing measurement data can be displayed in three different modes. Refer to “10.5 Display During and After Measurement” for details on displayed information, and section “12.3 View Mode Selection” for instructions on how to modify this display setting.
- 2) The average value from 9 individual measurements can be saved for one record. This is used when measurements are subject to high fluctuations and a longer term average is desired. See 10.6 for procedure details.
- 3) The CF (Crest Factor) value is automatically calculated and displayed. If the CF value is large, the bearing may be scratched or damaged; if the CF value is small, new lubrication packing may be required.
- 4) The LED indicator on the PT1 will flash once preset conditions for the measurement completions have been reached. See section “12.7 LED Indicator Flash Setting” for setting detail. The possible set conditions are as follows:
 - 10 seconds have passed since the measurement began
 - The measured vibration acceleration level stabilizes
 - The surface temperature stabilizes
- 5) One of two different calculation methods can be selected. See section “12.6 Calculation Type” for selection details.

Converge: The average measured value from all intervals is displayed. The value converges with time as instantaneous measurements vary.

Interval: The value from the current measurement interval is displayed. This is useful to visualize instantaneous variations.

10.2 Mode Selection

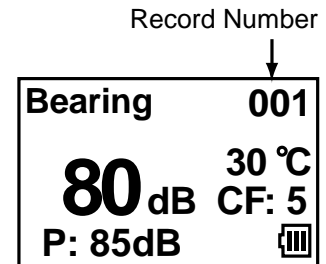
- 1) Set the mode to “Bearing”. If already set to “Bearing”, the following operation is unnecessary.
 - a) With the power on, simultaneously press [▲] + [ENT].
 - b) Press [▲] or [▼] to highlight “Bearing”.
 - c) Press and hold [ENT] for more than 1 second.



10.3 Set Record Number

- 1) Set the record number to use by pressing [▲] or [▼].
 - a) Pressing [▲] / [▼] once increments/decrements the record number by 1.
 - b) Holding [▲] / [▼] for more than 1 second increments/decrements record numbers more quickly.

Note: The record number cannot be changed after the measurement is taken.



- 2) If any data is recorded at the selected record number, its contents are shown.

Note: If data is already recorded at the selected record number, taking a measurement will overwrite the data.
- 3) Record numbers from 001 to 100 are available, records do not need to be saved sequentially, and not all record numbers need to be used (numbers in the middle can be skipped).

10.4 Take Measurement

Before proceeding with taking a measurement, be sure to read section “7. Proper Measurement Procedure”.

- 1) As it is impossible to take a measurement directly from the bearing itself, select a point on the housing as close to the bearing as possible.

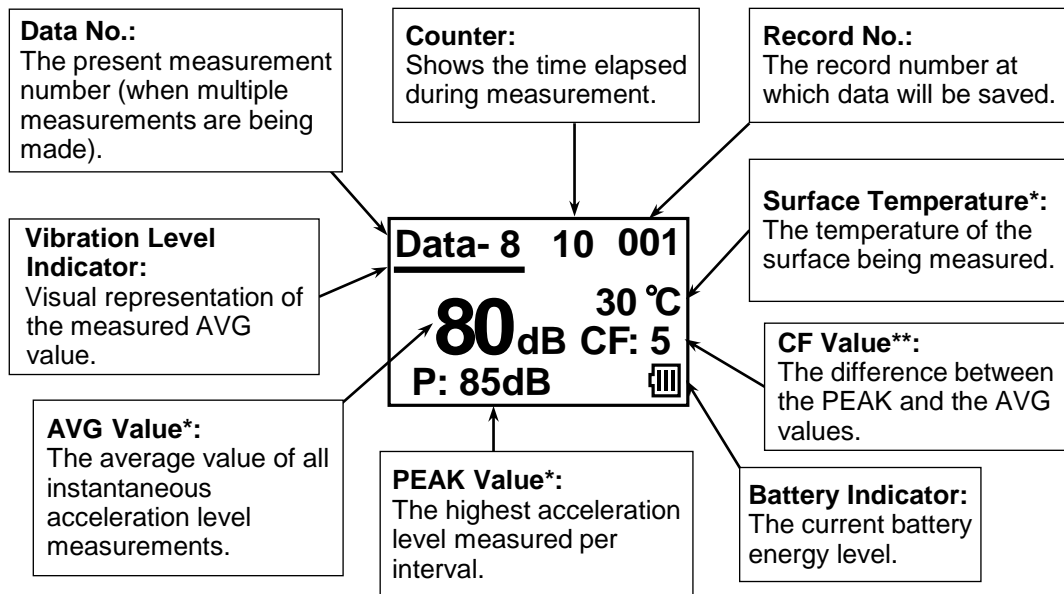


CAUTION Avoid taking measurements at dangerous locations or from places that require dangerous body positioning.

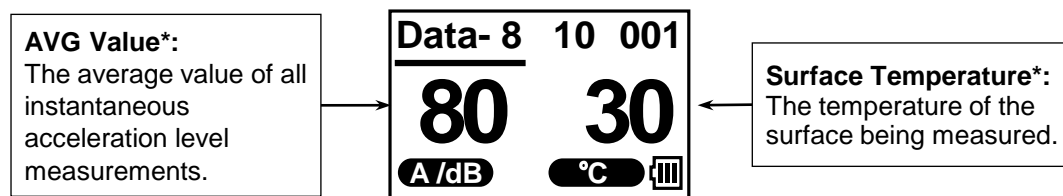
- 2) Determine one measuring point, and always measure from the same angle and orientation.
- 3) Press the probe against the measurement point. Measurements begin automatically once the probe is applied to the measurement point.
- 4) A single measurement can be taken for as long as 1 minute. After 1 minute, the measurement ends automatically. Measurements can be stopped sooner if desired (i.e. the LED is flashing to indicate preset conditions have been reached). In such a case, simply lift the probe off of the measurement point to end measurement.

10.5 Display During and After Measurement

- 1) The following information is displayed while PT1 takes a measurement in “Full Mode”:

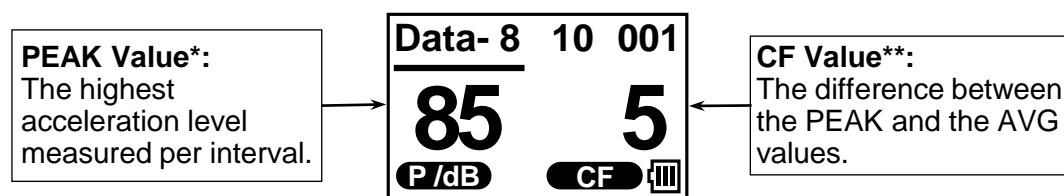


- 2) The following information is displayed while PT1 takes a measurement in “AVG & Temp. Mode”:



- a) Peak and CF values are not displayed.
b) All other information is the same as shown in “Full Mode”.

- 3) The following information is displayed while PT1 takes a measurement in “Peak & CF Mode”:



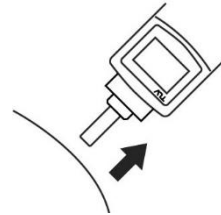
- a) AVG value and Surface Temperature are not displayed.
b) All other information is the same as shown in “Full Mode”.

* When the measured surface temperature and the measured acceleration level are higher than their respective measurable ranges, “OVER” will be displayed. If they are lower than their respective measurable ranges, “UNDER” will be displayed.

** If the CF (Crest Factor) value is large, the bearing may be scratched or damaged; if the CF value is small, new lubrication packing may be required.

10.6 Proceed to Next Measurement

- 1) If the measurement or judgement is in doubt, or if you wish take the average of multiple measurements (for a longer operation time analysis), proceed as follows:
 - a) Press [▲] / [▼] to set the data number. The data number is a single digit number from 1 to 9.
 - b) If any data is recorded at the selected data number, its contents are shown.
Note: If data is already recorded at the selected data number, taking a measurement will overwrite the data.
 - c) Once the data number is selected, press the probe against the measurement point to begin. Proceed to “10.4 Take Measurement”.
- 2) If the measurement data is acceptable, save the data.
 - a) Press [ENT] to save the data in the present record and return to the original screen.
 - b) When only one measurement was taken, its results will be saved and shown. If multiple measurements were taken, the average of all measurements will be saved and shown (data from individual measurements (Data No.) will be discarded).
- 3) If another bearing requires inspection, repeat operation from “10.3. Set Record Number”.
- 4) If finished performing inspections, turn PT1 off.
 - a) Press and hold [ENT] for more than 2 seconds.



11. Deleting Existing Data

Existing data can be deleted from PT1 Memory.

PT1 has two inspection modes, "Trap&Valve" mode and "Bearing" mode. Each mode has 100 available memory locations (records).

Note: Steam trap inspection data and valve inspection data share the same memory locations.

- 1) Set the mode to the type of data to delete. If already set to correct mode, the following operation is unnecessary.
 - a) With the power on, simultaneously press [▲] + [ENT].
 - b) Press [▲] or [▼] to highlight the desired mode.
 - c) Press and hold [ENT] for more than 1 second.



- 2) Select a record you wish to delete by pressing [▲] or [▼]. If intending to delete all data, select any record.
 - a) Pressing [▲] / [▼] once increments/decrements the record number by 1.
 - b) Holding [▲] / [▼] increments/decrements record numbers more quickly.
- 3) Press and hold [▼] + [ENT].

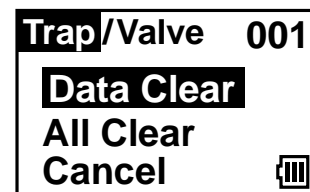
- 4) A menu will appear with three options.

Data Clear: Delete data at the present record number.

All Clear: Delete all data from all records in this mode.

Cancel: Cancel delete action and return to the normal screen.

- a) Press [▲] or [▼] to highlight the desired action.
- b) Press [ENT]. The selected action will be implemented, then PT1 will return to normal screen.



12. Settings

This section explains how to adjust PT1 settings. Default settings are already set in advance when shipped from the factory, but can be adjusted anytime to meet the needs of the user. Settings are saved in memory, and are maintained after the power is turned off.

12.1 Access Setting Selection

- 1) With the power on, simultaneously press [▲] + [ENT].
- 2) Perform the following actions for each setting:
 - a) Press [▲] or [▼] to highlight the desired mode or setting. (Slightly different operation when setting “12.5 Earphone Volume” and “12.8 LCD Contrast”.)
 - b) Press [ENT] to select highlighted mode and proceed to next setting option.
 - c) Press and hold [ENT] for more than 1 second to exit settings and return to normal operation.



12.2 Mode Selection

Set the mode to the type of inspection to be performed.

Trap&Valve: To perform steam trap or valve diagnosis.

Bearing: To perform a bearing inspection.



12.3 View Mode Selection

Select what data is to be shown when performing a bearing inspection.

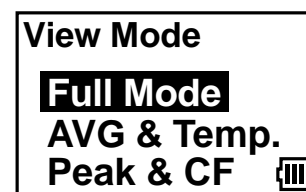
Note: View mode only affects the display in “Bearing” mode.

Full Mode: Display all measurement data.

AVG & Temp.: The average acceleration level (AVG) and the surface temperature are displayed in large font (PEAK and CF values are not shown).

Peak & CF: The PEAK (highest measured acceleration) and CF (Crest Factor) values are shown (AVG value and temperature are not shown).

See Section 10.5 for display samples and explanations.



12.4 Backlight

Turn the backlight on or off.

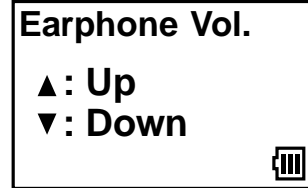
Note: The operating the PT1 with the backlight on consumes more power, shortening the lifespan of the batteries.



12.5 Earphone Volume

Increase or decrease the earphone volume.

- Pressing [▲] / [▼] once increases/decreases the volume by 1 step.
- Holding [▲] / [▼] for more than 1 second increases/decreases the volume more quickly.
- Once volume is as desired, press [ENT] once to proceed to the next setting.



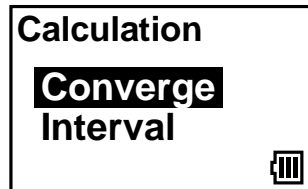
12.6 Calculation Type

Select how to perform the calculation for AVG and Peak values when performing a bearing inspection.

Note: Calculation type only affects data in "Bearing" mode.

Converge: The average measured value from all intervals is displayed. The value converges with time as instantaneous measurements vary.

Interval: The value from the current measurement interval is displayed. This is useful to visualize instantaneous variations.



12.7 LED Indicator Flash Setting

The LED indicator can be a useful tool for signaling when a measurement is complete (measured data matches preset criteria).

Note: For steam trap diagnosis, it flashes after 15 seconds. For valve diagnosis, it flashes after 10 seconds. These two settings cannot be changed.

The criteria under which the LED flashes (indicating the measurement is complete) for bearing inspections (in "Bearing" mode) can be selected from the following:

10 sec: 10 seconds after beginning the measurement.

Sound: When the measured acceleration level stabilizes.

Temp.: When the surface temperature becomes stable.

Note: For bearing inspections, measurement does not stop when the LED flashes. It only stops after 1 minute passes or the probe is removed from the measuring point.

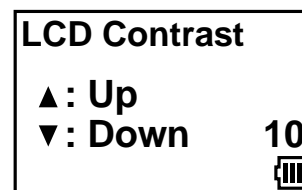


Note: LED indicator flash setting only affects the LED flashing condition when in "Bearing" mode.

12.8 LCD Contrast

Increase or decrease the LCD display contrast level (between 0 and 10).

- Pressing [▲] / [▼] once increases/decreases the contrast level by 1.
- Holding [▲] / [▼] for more than 1 second increases/decreases the contrast level more quickly.
- Once contrast is as desired, press [ENT] once to proceed to the next setting.



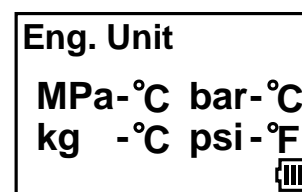
12.9 Engineering Unit Selection

Select the units desired for displaying temperature and pressure measurements.

Note: All pressures are gauge pressures, not absolute pressures.

Note: "kg" refers to the unit "kg/cm²".

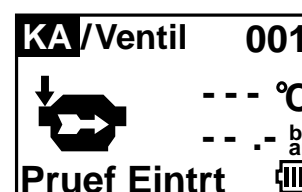
- After selecting the engineering units, press [ENT] once to return to the first setting, "12.2 Mode Selection".



12.10 Language Selection

Select the language to be used on the LCD display. The available languages are English, German and French.

- With the power on and in normal operation, simultaneously press and hold [▼] + [ENT] to display the data clear screen.
- Press [▲] + [▼] in the data clear screen to display the language selection screen.
- Press [▲] / [▼] to scroll through the languages and press [ENT] to select the required language.
- The language is changed and the display returns to normal operation.



13. Accessories

Attach the various accessories supplied with PT1 as explained below. Use only accessories supplied by TLV specifically for PT1.

13.1 Soft Case

- 1) Insert the unit into the soft case with the probe sticking through the top of the case. Make sure the PT1 display and key pad are facing up and are visible through the transparent windows in the soft case.
- 2) Pull the cover over the unit and fasten the Velcro pads.

13.2 Earphones

- 1) Open the rubber cover on the earphone jack at the side of the PT1. The rubber cover is attached to the PT1 above the jack; be careful not to use excessive force when opening and accidentally tear the cover.
- 2) Plug the earphone cable into the jack.



WARNING Do not use the earphones if there is any possibility of the cable being caught or entangled in rotating machinery.

13.3 Carrying Strap

- 1) Attach the carrying strap to the strap anchor on the cap or bottom of the PT1.
- 2) To prevent the PT1 from falling from a breast pocket, attach the strap to the cap. Attach the other end of the strap to a pocket button, or attach a clip to the strap to clip somewhere onto a work uniform.
- 3) To prevent PT1 falling if dropped during use, attach the strap to the anchor at the bottom of PT1. Be sure to hold PT1 through the strap when taking measurements.



WARNING Do not use the carrying strap if there is any possibility of it being caught or entangled in rotating machinery.



14. Troubleshooting

When the product fails to operate properly, use the following table and apply the appropriate corrective measures.

Problem	Corrective Measure
Nothing appears in the display, even if the [ENT] (ON) key is pressed.	<ul style="list-style-type: none"> • Check if the battery pack (battery compartment cover) is attached; reattach securely if not. • Check the batteries and verify they have the proper polarity (orientation). • Check if the battery has sufficient charge; recharge or replace if necessary.
After pressing the [ENT] (ON) key, there is a delay before the unit goes on.	<ul style="list-style-type: none"> • This is proper operation; the initial display will appear 2 seconds after the [ENT] key is pressed.
The temperature displayed is abnormal. <ul style="list-style-type: none"> • Temperature is high even when cold surfaces are measured. • Ambient temperature is displayed even when hot surfaces are measured. 	<ul style="list-style-type: none"> • Check to see if the probe tip is deformed or damaged. If deformed or otherwise damaged, it will need to be repaired or replaced. Contact TLV for details.
Temperature measurements are lower than indicated with other thermometers.	<ul style="list-style-type: none"> • Verify that the measuring surface is smooth and flat. • Hold the PT1 perpendicular to the surface when taking a measurement. • Clean any foreign matter off of the tip of the probe. Be careful not to damage or deform the sensor. • Check to see if the probe tip is deformed or damaged. If deformed or otherwise damaged, it will need to be repaired or replaced. Contact TLV for details.
Measurements do not begin automatically when the probe is placed against the measurement point.	<ul style="list-style-type: none"> • Clean any foreign matter off of the tip of the probe. Be careful not to damage or deform the sensor.
Nothing can be heard from the earphone.	<ul style="list-style-type: none"> • Verify that the earphone cord is plugged in securely. • Increase the earphone volume (see section 12.5). • Replace with a new earphone.
The power does not go off automatically after 1 minute passes without any operation.	<ul style="list-style-type: none"> • PT1 will not turn off if in the process of taking a measurement (waiting for pressure data) or when settings are being changed. Complete measurement data entry or exit setting adjustment.
Display is blinking or only part of the screen is displayed.	<ul style="list-style-type: none"> • Possibly due to electromagnetic influences such as static electricity. Turn the power off, or remove and reinsert the battery pack, and turn the power on again.
The display unexpectedly returns to the start-up screen.	<ul style="list-style-type: none"> • This is not due to a malfunction. PT1 may have been reset due to electromagnetic influences such as static electricity. Be sure to use the unit away from electro-magnetic influences or sources of static electricity.

After checking the above items and performing the suggested corrective measure, if the PT1 is still not performing as expected, contact your local TLV technical sales representative with details regarding the malfunction.

15. Specifications

Product Name:	Pocket TrapMan
Model Name:	PT1
Measurement Specifications:	
Items Measured:	<ul style="list-style-type: none"> • Ultrasonic sound / vibration acceleration level (shock pulse: 32 kHz) • Surface temperature
Temperature Measurements:	
Measurement Temp. Range:	0 to 350 °C (32 to 662 °F)
Response:	97% within 15 seconds (ideal conditions)
Accuracy:	± 2 °C (± 4 °F) after 1 minute (ideal conditions)
Diagnostic Judgements:	
Steam Trap:	Good, Caution, Leaking, Blocked, LowTemp
Valve:	Good, Caution, Leaking
Power	
Power Source:	2 AAA (LR03) batteries
Suitable Battery Types:	Manganese batteries, Alkali Batteries, Ni-Cd rechargeable, Ni-MH rechargeable
Operating Life (continuous use):	~ 8 hours (backlight OFF, alkali batteries) ~ 6 hours (backlight ON, alkali batteries)
Earphone Output:	
Output Connection:	ø3.5 stereo output
Output Sound	Tone beat
Operating Temp. Conditions (ambient):	
In Use:	0 to 40 °C (32 to 104 °F)
In Storage:	-5 to 50 °C (23 to 122 °F)
Unit Dimensions	
Length:	188 mm (7 ³ / ₈ in)
Width:	49 mm (2 in)
Thickness:	31 mm (1 ¹ / ₄ in) (max. thickness)
Weight:	165 g (5.8 oz) (including batteries)

16. Product Warranty

16.1 Warranty Period

One year following product delivery.

16.2 Warranty Coverage

TLV CO., LTD. warrants this product to the original purchaser to be free from defective materials and workmanship. Under this warranty, the product will be repaired or replaced at our option, without charge for parts or labor.

This product warranty will not apply to cosmetic defects, nor to any product whose exterior has been damaged or defaced; nor does it apply in the following cases:

- 1) Malfunctions due to improper use, handling, etc.
- 2) Malfunctions due to dirt, scale, rust, etc.
- 3) Malfunctions due to improper disassembly and reassembly, or inadequate inspection and maintenance by other than TLV CO., LTD. authorized service representatives.
- 4) Malfunctions due to disasters or forces of nature.
- 5) Accidents or malfunctions due to any other cause beyond the control of TLV CO., LTD.

Under no circumstances will TLV CO., LTD be liable for consequential economic loss or damage, or consequential damage to property.

16.3 Calibration

The tip of the probe, which is used to detect temperature and ultrasonic waves, is a crucial component of PT1. The detection sensitivity may change, not only if the unit is dropped or knocked about, but also as a result of regular wear and use. Therefore, periodic calibration is recommended.

Frequency: Every 2 years, or when the sensor is warped or damaged

Calibration can only be performed with special equipment at TLV's factory.

Contact your local TLV representative or your regional TLV office for details.

17. Service

For Service or Technical Assistance: Contact your TLV representative or your TLV office.

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