



## **KLA-5-TS AUTOMATIC FREEZING POINT ANALYZER WITH INTEGRATED PANEL PC**

### ***OPERATION AND INSTRUCTION MANUAL***

REV A

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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing



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## 1. Introduction

The KLA-5-TS Automatic Freezing Point Analyzer with integrated panel PC is designed for use in the laboratory. What sets the KLA range apart from all competitive low temperature instrumentation is the cooling mode of the jacket.

In all other instruments existing on the market, the cooling is done through an external circulating bath. In an external circulating bath, a volume of medium (very often methanol) is cooled down with a coil. The gas running through this coil is compressed by either one or two stage compressors. The temperature of the gas decreases as it expands and the coils cool the medium. This medium is pumped to the analytical cell of the analyzer.

In the case of the KLA, the gas does not cool a medium, but directly cools the jacket (cooling cell). This unique system has several advantages:

- Requires less energy, Saving costs in electrical supply
- Less space taken by the assembly cooling unit / analyzer
- Fast cooling response. It takes approximately 15 minutes to reach about -60°C from the ambient temperature of +20°C. This allows the instrument to be powered OFF during the night.
- The start-up is very easy and requires only a 115/230V plug. There is no other fitting. This avoids the danger of pumping an inflammable fluid.

The KLA-5-TS conforms to the ASTM D2386 test method and related test specifications. This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Automatic Pour Point Analyzer. This manual should also be used in conjunction with applicable published laboratory procedures. Information on these procedures is given in section 1.2.

### 1.1 Koehler's Commitment to Our Customers

Providing quality testing instrumentation and technical support services for research and testing laboratories has been our specialty for more than 50 years. At Koehler, the primary focus of our business is to provide you with the full support of your laboratory testing needs. Our products are backed by our staff of technically knowledgeable, trained specialists who are experienced in both petroleum products testing and instrument service to better understand your requirements and provide you with the best solutions. You can depend on Koehler for a full range of accurate and reliable instrumentation as well as support for your laboratory testing programs. Please do not hesitate to contact us at any time with your inquiries about equipment, tests, or technical support.

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### 1.2 Recommended Resources and Publications

#### 1. American Society for Testing and Materials (ASTM)

100 Barr Harbor Drive West Conshohocken,  
Pennsylvania 19428- 2959, USA

Tel: +1 610 832 9500

Fax: +1 610 832 9555

<http://www.astm.org>

email: [service@astm.org](mailto:service@astm.org)

#### ASTM Publication:

- ASTM D2386: Standard Test Method for Freezing Point of Aviation Fuels
- ASTM D1177: Standard Test Method for Freezing Point of Aqueous Engine Coolants

### 1.3 Instrument Specifications

**Models:** KLA-5-TS  
KLA-5-TS(220)  
KLA-5-TS/2  
KLA-5-TS/2(220)

**Electrical Requirements:** 115V  $\pm 10\%$  60Hz  
230V  $\pm 10\%$  50/60Hz

**Temperature Range (Single Stage):** +80°C to -40°C

**Temperature Range (Double Stage):** +80°C to -85°C

**Dimensions:** 26x23x31 (66x60x80)  
**l x w x h, in. (cm)**

**Net Weight:** 176.5 lbs (80 kg)

**Consumption:** 2000 VA

**Ambient Temperature:** 5°C to 35°C

**Admitted Moisture:** 20% to 80 r.h.

### 1.4 Delivery Condition and Procedure of Instruments

Koehler Instrument Company, Inc. instrumentation is monitored according to our internal quality control procedures. Each component is tested for its specific function before assembling the instrument.

Once the instrument is assembled, it goes through a general functionality control test, to verify every device works properly in accordance with its expected functions.

Then the measurement devices are electronically calibrated according to the physical parameters that they must quantify and to the measurement scales defined for each application.

Finally, the instrument is tested with a certified reference sample on the desired parameter. These tests are done according to our internal procedure. The test results are included in the manual delivered with the instrument.

The instrument is designed for the normalized methods where the nature of the product to be tested as well as the procedure to follow is clearly defined. The certified reference samples used for the final tests are in accordance with these methods.

We recommend performing the start-up only with one certified reference sample. Any discrepancy on the results found on other products must be done only on the basis of certified reference sample. We kindly ask the customer to send us this sample with its certificate. Koehler Instrument Company, Inc. will immediately undertake an act procedure for the control and, if necessary, the correction.

***Instrumentation is tested in a laboratory where the ambient temperature can vary from +15°C to +25°C. The power supply is 115 Volts  $\pm 10\%$ , Hot, Neutral, Ground, uninterrupted, without electrical noise and perturbation, equipped with ground fault intensity devices (30 ma).***

### 1.5 Assistance

Koehler Instruments are warranted for 12 months for mechanical parts and 6 months for electronic parts, at the condition that the use and the handling for each instrument are respected.

During this period, assistance is provided free of charge upon our head office in New York or upon our agent, if one is available in your area.

In a case of assistance to a customer site, the customer will be responsible for the call cost and the traveling expenses.

The intervention costs, during the warranty period also, are subordinated to our availability and to the eventual spare parts.

**WARNING: Any changes or modifications made on the instrument without our express authorization will CANCEL the warranty.**

### 1.6 Packing and Shipment

The complete instrument is carefully and properly packaged by the staff of Koehler Instrument Company, Inc. The packing procedure conforms to the specific standards of the company. We adhere to the following procedure:

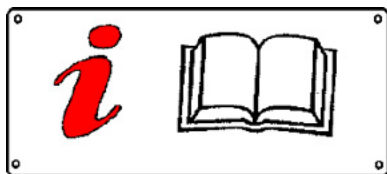
- The glass cell is disassembled and the instrument is packed in a wooden box filled with anti-shock polyethylene-foam.
- The instrument documentation can change from contract to contract; it is inside the box or in an envelope fixed on the box. The documentation includes: packing identification, usual documents, packing numbers, and the whole customer's address.
- The following information is written on the box:
  - Handle with care (FRAGILE).
  - The indication of the UP side of the box for a right handling of the box.
  - Total weight.

**NOTE:** The forwarder must take all the necessary actions to assure the stability of the shipment whatever is his speed, his accelerations, his direction changes and the journey characteristics. The forwarder must respect every note written on the packing.

It is important to ensure proper warehousing of the instrument in order to check if there is any deterioration before start up.

## 2. Safety Information and Warnings

### General Safety Standards



It is essential to thoroughly read this manual in order to correctly and safely use the KLA-5-TS. Observe all safety standards and take note of the devices on the instrument to assure safe and successful use. Be sure only qualified staff use and handle the instrument. Before performing minimal handling or maintenance, then 115V/230V plug MUST be removed. The safety devices on the instrument must never be manipulated.

**NOTE:** In case of incorrect start up or inadequate use and handling, the person's safety will NOT be warranted. Koehler Instrument Company, Inc. declines all responsibilities for any incident or trouble

resulting from operation inconsistent with intended use or in disregard to these instructions.

**Safety Considerations.** The use of this equipment may involve *hazardous* materials and operations. This manual does not purport to address all of the safety problems associated with the use of this equipment. It is the responsibility of any user of this equipment to investigate, research, and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

### Safety Symbols Present on the Instrument



Symbol indicating danger due to electrical power ON.

**Equipment Modifications and Replacement Parts.** Any modification or alteration of this equipment from that of factory specifications is not recommended voids the manufacturer warranty, product safety, performance specifications, and/or certifications whether specified or implied, and may result in personal injury and/or property loss. Replacement parts must be O.E.M. exact replacement equipment.

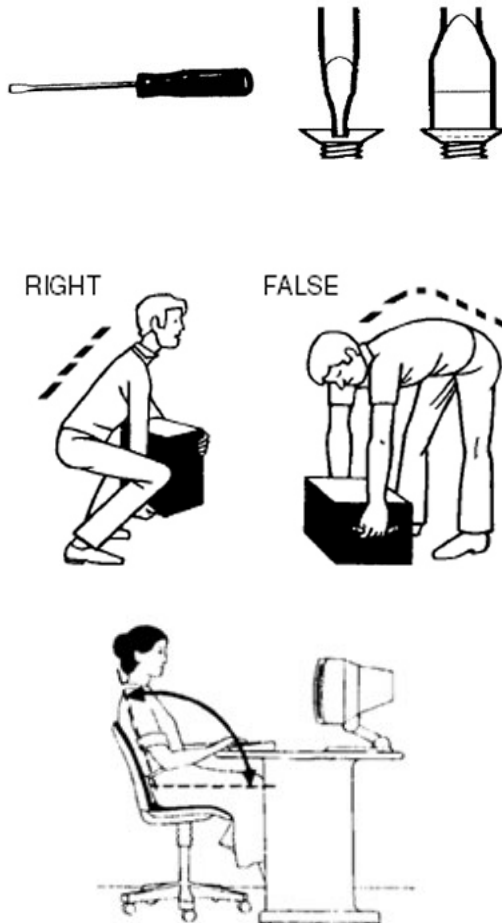
**Unit Design.** This equipment is specifically designed for use in accordance with the applicable standard test methods. The use of this equipment in accordance with any other test procedures, or for any other purpose, is not recommended and may be extremely hazardous.

**Chemical Reagents Information.** Chemicals and reagents used in performing the test may exhibit potential hazards. Any user must be familiarized with the possible dangers before use. We also recommend consulting the Material Data and Safety Sheet (MSDS) on each chemical reagent for additional information. MSDS information can be easily located on the internet at <http://siri.uvm.edu> or <http://www.sigma-aldrich.com>.

**Conclusion of the Instrument Cycle.** The instruments that Koehler manufactures do not include dangerous components. During Start-Up ensure that any operation of this instrument is performed by specialized and authorized companies. Claim copies of the prescribed authorization and keep them in appropriate records.

**Assembly.** Safety is very important during assembly and operation of this instrument.

Use only tools in good condition with insulating handles. Be sure there is a clear path when moving the instrument. The instrument must be placed on a strong support. The work position must respect ergonomics.



### 3. Getting Started

#### 3.1 Packing List

The instructions for preparing the equipment assume that the user is aware of the contents of this document, which lists the warranty conditions and important precautions.

- KLA-5-TS Auto Freezing Point Analyzer 115V/230V 50/60 Hz
- Freezing Point head
- Cord cable without plug
- Freezing Point Glass Cell
- KLA-5-TS Freezing Point Analyzer with Integrated Panel PC Operation and Instruction Manual

#### 3.2 Unpacking

Carefully unpack and place the instrument and accessories in a secure location that will maintain an ambient temperature between 5°C and 35°C and relative humidity under 80% with a sufficient power supply.

Ensure that all parts listed on the packing list are present. Inspect the unit and all accessories for damage. If any damage is found, keep all packing materials and immediately report the damage to the carrier. We will assist you with your claim, if requested. When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment. Do not return goods to Koehler without written authorization.

### 4. Descriptions

#### 4.1 Software Features

- User friendly touch screen interface
- Windows® based system
- Analytical progress and results recorded and stored
- Results Journal is accessible during analysis
- Analytical progress can be displayed in both graphical and numeric form.
- Diagnostic panel with access to all inputs/outputs
- Analysis results automatically saved in Excel® compatible format.
- Guided probe calibration in 3 easy steps

#### 4.2 Component Descriptions

##### Measuring temperature sample probe

- Platinum resistance, PT 100, precision A Class



**Measuring devices**

- Coaxial Fiber Optic Equipped with Mirror
- Light Pulsed Emission, on green spectrum through a coaxial fiber optic

**Test jar**

- Same dimensions and volume as ASTM D2386
- Level mark
- Small edge on the top part to fix the jar to the analytical head

**Stirrer**

- According to ASTM D2386
- Single Motor Drives the entire mechanical system

**Cooling unit**

- Internal refrigeration, double stage up to - 85°C lower temperature specification given at ambient temperature +22°C
- Equipped with over temperature cut-out

**Push button**

- One to start and stop the analysis
- One to test the stirrer functionality

### 4.3 Measuring Principle

#### 4.3.1 ASTM D2386

**Scope.** This test method covers the determination of the temperature below which solid hydrocarbon crystals may form in aviation turbine fuels.

**Significance and Use.** The freezing point of an aviation fuel is the lowest temperature at which the fuel remains free of solid hydrocarbon crystals that can restrict the flow of fuel through filters if present in the fuel system of the aircraft. The temperature of the fuel in the aircraft tank normally falls during flight depending on aircraft speed, altitude, and flight duration. The freezing point of the fuel must always be lower than the minimum operational tank temperature

**Test Procedure.**

1. Pour 25ml of kerosene in the test jar. The KLA-5-TS cell automatically stirs the fuel vigorously and continuously, moving the stirrer up and down. The stirrer loops remain below the fuel surface at all times. Disregard any cloud that appears at approximately - 10°C and does not increase in intensity as

the temperature is lowered, because this is due to water.

2. The KLA records the temperature at which crystals of hydrocarbon appear.
3. The sample warms up slowly and stirs continuously.
4. The KLA records the temperature at which the hydrocarbon crystals completely disappear.

#### 4.3.2 ASTM D1177

**Scope.** This test method covers the determination of the freezing point of an aqueous engine coolant solution in the laboratory.

**Significance and use.** The freezing point of an engine coolant indicates the coolant freeze protection, it may be used to determinate the approximate glycol content, provided the glycol type is known.

**Test Procedure.**

1. Pour 25ml of sample in the test jar. The KLA-5-TS cell stirs automatically the sample vigorously and continuously, moving the stirrer up and down. The stirrer loops remain below the sample surface at all times. The appearance of water crystals in the sample is assumed as the point where glycol anti-freeze effect is fading out.
2. The observation of the sample's temperature begin: when a flat or horizontal plateau is detected in the freezing curve, the KLA records the temperature.

## 4.4 Instrument Controls and Connections

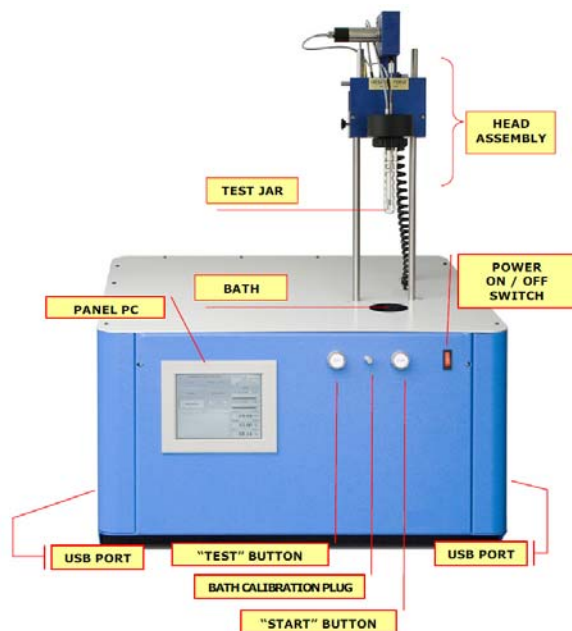


Figure 1: KLA-5-TS Control Descriptions

## 5. Installation

### 5.1 Installing the Analyzer

1. Connect the cord cable 115/230V from the analyzer to a network in conformity with the specifications.
2. Switch ON the analyzer

### 5.2 Main Software Interface

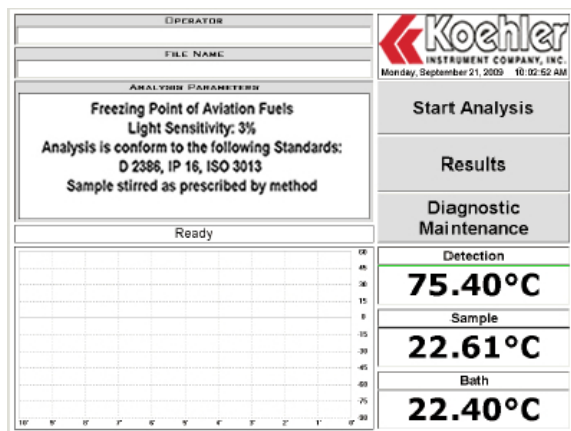


Figure 2: Main Software Screen

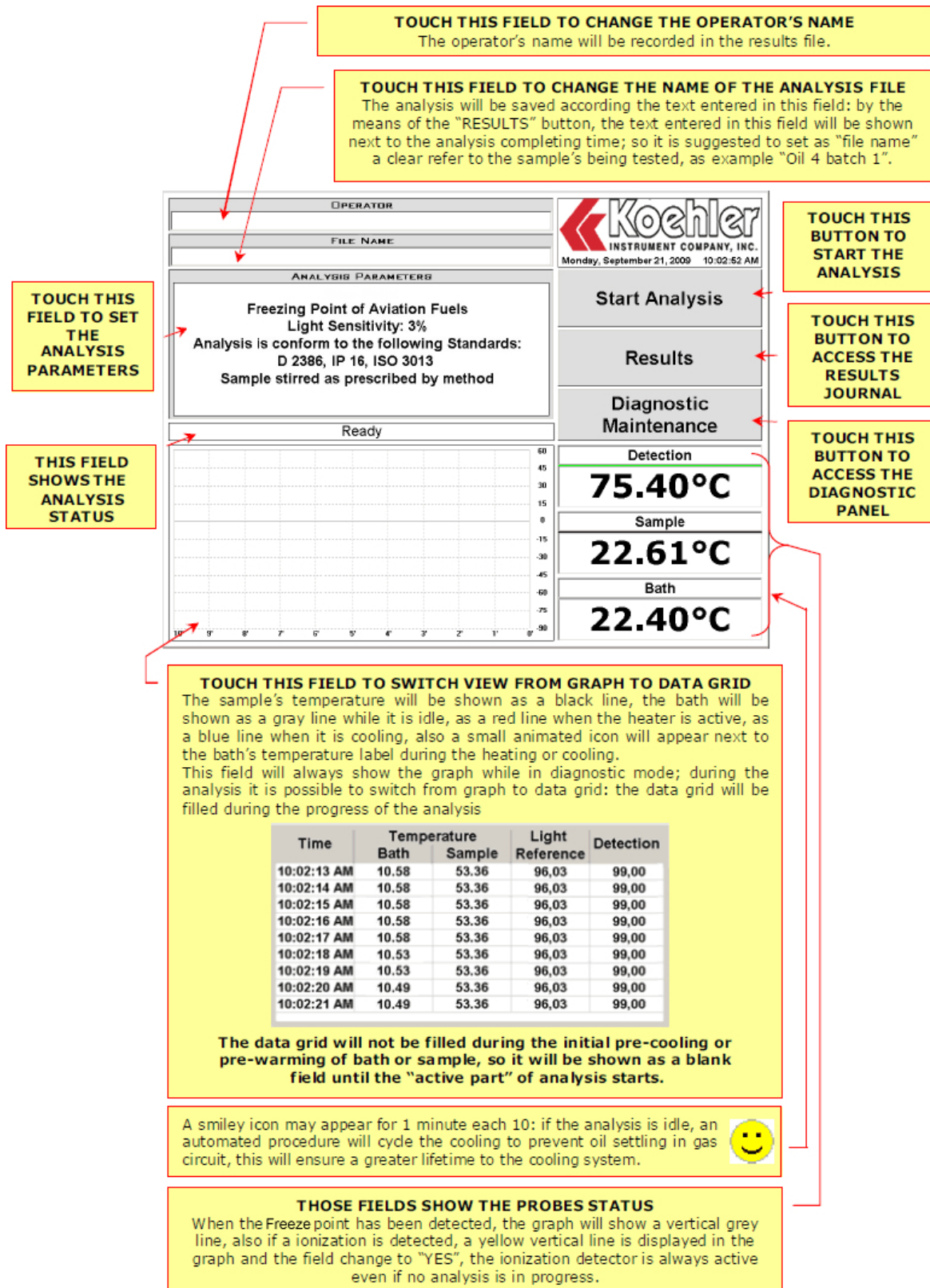


Figure 3: Main Software Screen Descriptions

## Diagnostic Panel

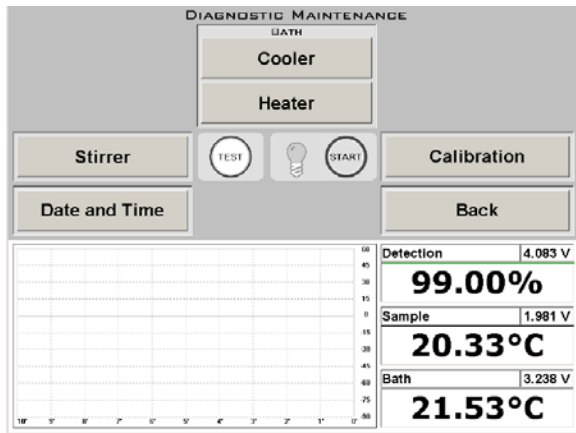


Figure 4: Diagnostic Panel

The Bath field allows to turn on/off the cooling or heating, note that they cannot be activated together, so by turning on the Cooler while the heater is active, then the heater will be automatically disengaged and vice-versa; since the instrument is equipped with a safety cut-off: despite the Heater status, the heating will be disabled if the bath reaches a temperature of 72°C or above.

The Stirrer button will engage the stirrer.

The Date and Time button let you change the actual date and time according your local time/date.

The round shaped TEST and START icons will show the analyzer's front panel buttons status, also by touching the light bulb icon next to the START icon the START button's light will cycle on and off.

The Calibration button let you access the calibration panel.

The Back button will close the diagnostic panel.

For troubleshooting purposes, while the diagnostic panel is open, the detection, sample, and bath fields will also show the probe's VOLT signal.

## Calibration Panel

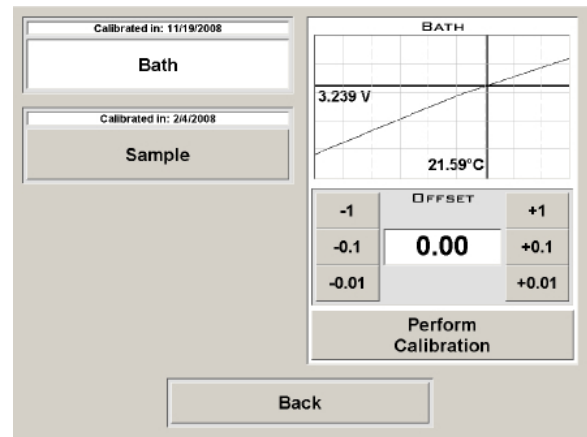


Figure 5: Calibration Panel

On the left side of the panel, the two buttons allow the user to select which probe will be displayed on the right side. Above each button, the last calibration date is shown.

Once a probe has been selected, the right side of the panel will display probe's calibration curve, the temperature and VOLTS signal read is displayed in real time. By the means of the **Perform Calibration** it is possible to perform the calibration of the selected probe, each calibration step will be shown in the screen as a guided procedure.

The **Back** button will close the calibration panel.

## Date and Time Panel

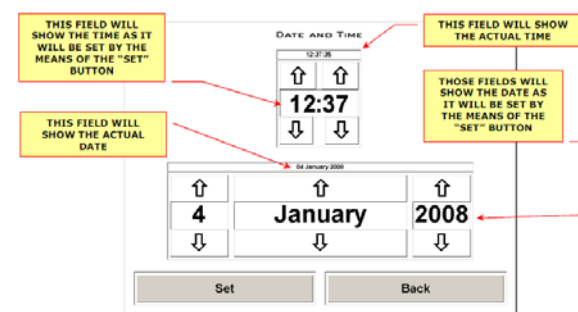


Figure 6: Date and Time Panel

By the means of the arrow buttons, the user may change the hour, minute, day, month and year;

note that any change will be applied only by the means of the SET button.

The **Back** button will close the Date and Time Panel

## 6. Operation

### 6.1 Analysis Parameters

By touching the main screen's **OPERATOR** field or the **FILE NAME** field a standard keyboard will appear on the screen, you can insert the desired text and then push the **OK** button to confirm.



Figure 7: Keyboard Screen

By touching the main screen's **ANALYSIS PARAMETERS** field, the **Analysis Setup** panel pops up.

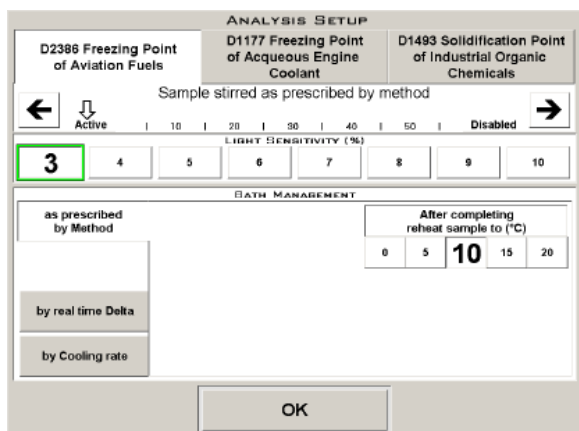


Figure 8: Analysis Parameter Set Up Screen

The analysis will be saved according the text entered in FILE NAME field: by the means of the results browser, the text entered in this field will

be shown next to the analysis completing time; so it is suggested to set as "file name" a clear refer to the sample's being tested, as example "Avio 4 batch 1".

The three buttons atop of the Analysis Setup panel you can select the desired test method, note: the obsolete D1493 is basically the same procedure as the D1177, except the stirrer will be stopped at the beginning of the forming of the plateau and provides an higher temperature range for the sample reheating at the end of the analysis.

The standard analysis is preset by a 3% of Light Sensitivity, by selecting a different value a notice panel will pop up as reminder: normally 3% is the best option, but for research purposes it is possible to decrease the light sensitivity up to 10%. The Light Sensitivity will set the amount of light signal drop to determine the result; it is expressed as percent because it is a relative value: prior to start the analysis the analyzer will check the sample's transparency, then from the obtained value the chosen Light Sensitivity percentage is applied; as example, the result of a sample having a 90% of transparency, choosing 3% as Light Sensitivity, will be obtained once the light signal drops under 87.3%. As mentioned, prior to start the analysis the analyzer will check the sample's transparency: if the sample's transparency is lower than 60%, the analyzer will warn you about a possible need for cleaning of the fiber optic's tip.

If the Bath Management is defined as prescribed by method, the bath management will follow the schedule shown in the above picture according the official methods.

If the Bath Management is defined as user defined bath set point the bath will be controlled at the entered temperature until the sample reaches the bath's temperature plus 10°C, then the bath will be driven to the lowest temperature reachable.

If the Bath Management is defined by Real Time Delta, the bath's temperature will be related to the sample's temperature, supposing a delta of 20°C with a sample's temperature of 25°C, the bath will be controlled at 5°C, once the sample reach 24°C, the bath will be controlled at 4°C and so on, this analysis method can be useful to



determine the behavior of the inner part of the sample when stored in large tanks.

If the Bath Management is defined by Cooling Rate, the bath's temperature will be decreased time by time: supposing a cooling rate set to 10°C, the bath's temperature will be decreased by 1°C each 6 minutes so that the bath will be lowered by 10°C each hour; this analysis method can be useful to determine the behavior of the sample when stored in critical ambient conditions such for regions near to the polar circle where ambient temperature may lose 30°C in an hour. Once an analysis has been completed, if the After Completing Reheat Sample is enabled, the heater will be activated to reheat the sample to the selected temperature. The Back button will close the panel.

## 6.2 Freezing Point Analysis Step by Step

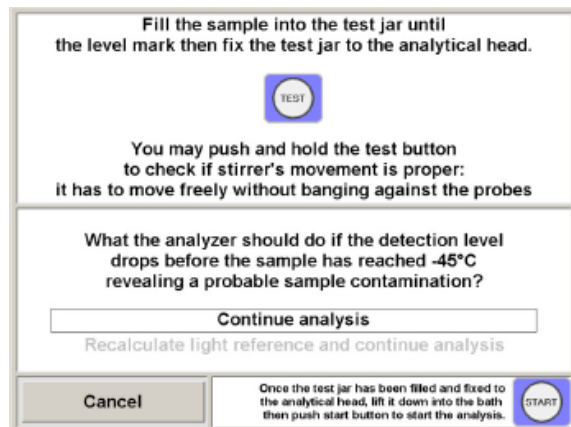


Figure 9: Start Analysis Panel

Once the analysis has been setup as described in previous chapter, touch the main screen's Start Analysis button, the panel shown on the right will pop up, fill the test jar as required then fix the test jar to the analytical head.

If the stirrer is enabled, as described in the panel, you may press (and hold as needed) the TEST button; while the TEST button is pressed, the stirrer is engaged: you may verify that it moves correctly without banging against the probes.

The "What the analyzer should do..." panel is available for the D2386 method, it allows the operator to choose which kind of behavior the analyzer should satisfy if a detection is revealed

before the sample has reached -45°C, revealing a probable sample contamination.

While the "What the analyzer should do..." is set as "Continue analysis", at the start of the analysis the analyzer will record the light signal value (decreased by the light sensitivity percentage) as the Light Reference, then it will consider any light signal drop as the appearance of crystal, so once a light signal drop has detected, it will start to reheat the sample until the light signal level regain its reference value: the sample's temperature is considered as:

The appear as the first time the light signal value drops under its reference.

The disappear once the light signal value regain its reference.

The above describe means that (as example) a water contaminated sample could give a result around -10°C, a gasoil contaminated sample could give a result around -30, depending from the kind and amount of contamination.

**NOTE:** If the last analysis has been performed as D1177 or D1493, improper cleaning of the test jar and sensors could lead to a contaminated detection while performing D2386: it is imperative a deep and proper cleaning and dry out of all parts before each test.

While the "What the analyzer should do..." is set as "Recalculate light reference...", the reference is recorded as described above, then if the signal drops before the sample reaches -45°C, the analyzer will record its temperature as the "First contamination": a black vertical line appear in the graph highlighting the contamination, then the analyzer will observe the light signal until it get non-floating stable value, then it recalculate the reference by subtracting the sensitivity percentage from the actual value, if a new signal drop is detected, another black line appear on the graph to highlight a further contamination and the reference is re-calculated, this procedure continues until the sample reaches -45°C. Once the sample has reached -45°C, the drop of the light signal is the samples temperature recorded as appearance, then the sample is reheated and when the signal recalls the last calculated reference the samples temperature recorded as disappearance. At the end of the analysis all 3 values are reported:

First Contamination, Appear and Disappear. By the means of the results browser, it is possible to have a deeper overview of all the contaminations detected by reloading the whole analysis: any contamination is recorded in the data grid and is revealed by the word "contamination" placed in the "Light Reference" column. If a contamination is detected but the new calculated reference drops under 30%, the analyzer will abort the analysis.

While the "What the analyzer should do..." is set as "Recalculate light reference..." but the sample does not show any signal drop before it reaches -45°C, the result given does not report any mention of contamination leading to the same result as for the "Continue analysis": the "Recalculate light reference..." procedure should be considered while testing a sample which is known to be contaminated and is needed to reveal it's characteristics for research purposes and/or investigate it's contamination level and origin.

As told, the D2386 analysis, reports both crystal's Appear and Disappear, the official methods requires to report the temperature at which the hydrocarbon crystals completely disappear, so disappear has to be considered as analysis result.

In D1177 and D1493 however, once the signal drops a plateau is observed: the analyzer will consider a 60" of data to determinate the plateau's significant value as analysis result, in D1177 is reported as Freezing Point, in D1493 as Solidification Point.

In D2386 and D1177 the stirrer will stop moving once the analysis result is obtained, but in D1493 the stirrer will stop moving once the light signal drops.

Once the analysis is completed, the analyzer will show at full screen the obtained results. If the "After Completing Reheat Sample to" is enabled, the bath is warmed to the selected sample's temperature plus 12°C in order to reheat the sample, if the screen has been touched removing the screen results report, it will pops up again when the sample has reached the "After Completing Reheat Sample to" temperature.

Although it's not suggested, the reheating procedure could be interrupted by the means of the "Start" button without affecting the result, by the way the main benefit of a sample reheating at analysis end allows an easier and safer cleaning of probes and test jar. The analysis is completed: the main screen's the status field reports the obtained results.

### 6.3 Results Browser

The result browser may be accessed even while the analysis is in progress.

The Results browser allows the user to easily browse and display the performed analysis, in the top area you will see the selected month. By means of the arrow buttons you may select the desired month. If an analysis was performed on a certain day in a month, then the correspondent day will turn from grey to black as shown in Figure 10 below for December 1<sup>st</sup>, 3<sup>rd</sup> and 4<sup>th</sup>.

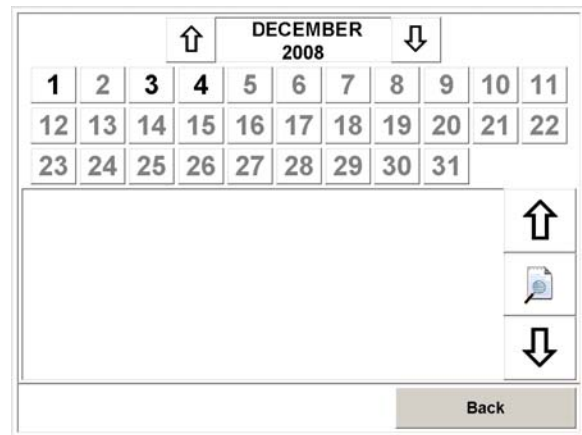


Figure 10: Results Browser Screen

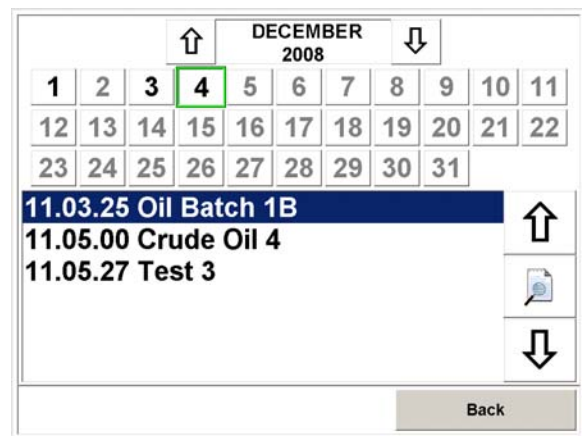


Figure 11: Results Screen 1-Day Result

By selecting a day, the analysis performed during the selected day will appear in the central area. The arrow buttons on the right allow the user to choose the analysis to be displayed. The central button picturing a magnifying glass on a sheet of paper will load the selected analysis.



Figure 12: Results Screen - Selecting a File to See Result

A loaded analysis is shown in Figure 12. The arrow buttons allow the user to cycle through the analyses lists from the previous screen. The **Show Details** button will load the entire analysis allowing the user to browse through the entire analysis progress.

If a printer is installed, the **Add to Print Queue** and **Print Queue** buttons will turn from grey to black and be available for use (see Figure 15 below). By inserting an external mass storage device, such as a disk drive or flash drive the **Export to USB** button will be available to use (see Figure 16 below). The analysis data will be exported in a spreadsheet compatible format.



Figure 13 and 14: Export Data Functions

Figure 15 shows the Detailed Analysis screen. The arrow buttons on the right hand side allow the user to scroll through the analysis data. The single arrows will scroll one row at a time. The double arrows will scroll through the data 11 rows at a time and the arrows pointing to the

horizontal line will allow the user to jump to either the first or last row of the data.

Time	Temperature Bath	Sample	Light Reference	Detection
11.03.32	0.11	21.15	96.03	99
11.03.33	0.12	21.1	96.03	99
11.03.34	0.1	20.64	96.03	99
11.03.35	-0.2	20.55	96.03	99
11.03.36	-0.6	20.32	96.03	99
11.03.37	-0.19	20.25	96.03	99
11.03.38	-0.12	20.21	96.03	99
11.03.39	-0.24	20.16	96.03	99
11.03.40	-0.12	20	96.03	99
11.03.41	0.8	20.1	96.03	99
11.03.42	0.21	20	96.03	99

Figure 15: Results Screen - Detailed Data Analysis

## 7. Measuring Cell Diagram

General Scheme:

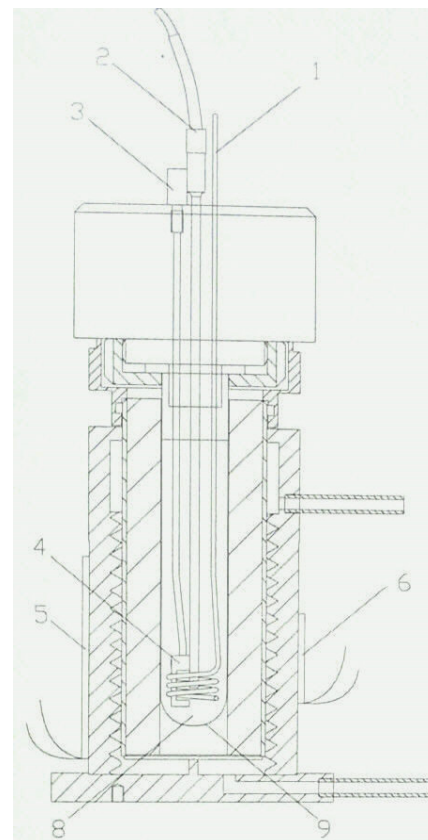


Figure 16: Freezing Point Measuring Cell

1. **Stirrer.** Assures sample homogeneity during cooling.
2. **PT100 Product.** Measures sample temperature
3. **Double Fiber Optic.** For Detection of Freezing Point
4. **Mirror.** Works with Fiber Optic for Detection of Freezing Point
5. **Heater.** To Ensure Temperature Stability of Test Area



6. **PT100 Bath.** For measuring of the bath temperature.
8. **Sample.** Sample size must be in accordance to ASTM D2386 (25 ± ml)
9. **Test Jar.**

No. on Scheme	Art. Description	Article Number
1	Stirrer	KLA-5S-008-05
2	PT100 Product	KLA-5S-008-04
3	Fiber Optic	KLA-5S-008-07
4	Mirror	KLA-5S-008-08
5	Heater	KLA-5S-005-03
6	PT100 Bath	KLA-5S-005-06
9	Test Cell	KLA-5S-008-12A

## 8. Troubleshooting

Use our set of specific keys and screw drivers for the following procedures:

### 8.1 Replacement of the Mirror

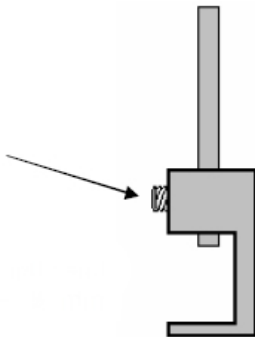


Figure 17: Mirror replacement (Side View)

1. Raise the head assembly
2. Pull up the Stirrer
3. Unscrew the small screw M2 on the mirror
4. Remove the mirror
5. Place the new mirror

**NOTE:** The distance between the fiber optic and mirror surface must be approx. 7 - 8 mm.

6. Remove the insulation.

### 8.2 Replacement of the sample measuring probe (PT 100)

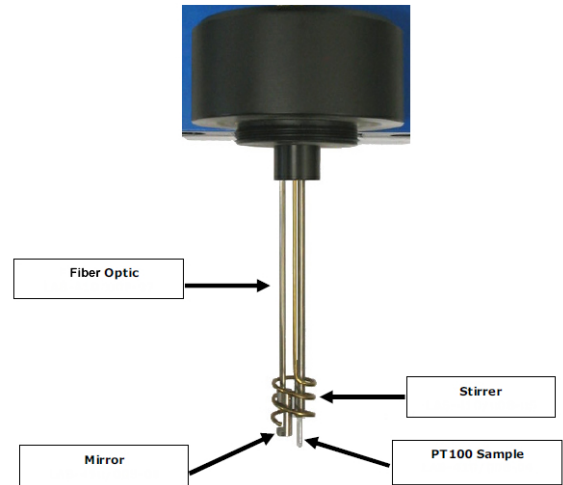


Figure 18: Sample Measuring Probe (PT100)

1. Remove the white probe connector from the back box of the head.
2. Unscrew the imbus screw which is under the main bloc.
3. Unscrew the magnet drive of the stirrer.
4. Remove the temperature probe.
5. Check that no piece of glass remain in the head assembly
6. Place the new probe
7. The probe extremity must be at the same level as the base of the mirror.
8. Slightly tighten the imbus screw on the probe.
9. Screw the magnet drive of the stirrer and check the alignment.
10. Check, on screen, that the probe is working

### 8.3 Replacement of the Stirrer

1. Raise the Head Assembly
2. Release the Stirrer by unscrewing the two M3 screws

3. Carefully remove the stirrer
4. Carefully place the new stirrer and tighten the two M3 screws
5. The stirrer must move freely and must not touch the PT100 probe.
6. Replace the test jar. By hand, carefully move the stirrer actuator and check the stirrer's movement. It should move freely without touching the mirror and/or the PT100 probe.
7. Open the analysis panel and hold down the test button, the Stirrer's motor will start, check if it is working correctly.

#### 8.4 Replacement of the Bath Heater / Thermoswitch / PT100

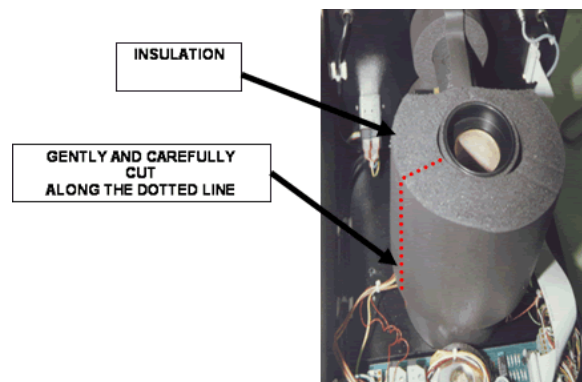


Figure 19: Insulation

1. Disconnect the Power Supply of the analyzer.
2. Disconnect the signal cable connector (if present on the connection box) from the head. Remove the head.
3. Remove the screws from the main cover of the analyzer and remove it
4. Remove the black support from the top of the cooling bath.
5. Carefully, cut the insulation on the back of the bath along the red dotted line in Figure 19 above.

**WARNING:** Cut it slowly and do not touch the bath with the knife to avoid cutting the heater or wires

6. Remove the insulation
7. Disconnect and remove the defective item. (Heater / Thermoswitch / PT100)
8. Dry the cooling bath surface with acetone.
9. Heater: Pull out the heater and properly replace with new one.
10. Put the insulation glue on both sides of the insulation.

**NOTE:** Avoid Air Bubbles Below the Heater.

11. In order to protect the heater, fix two insulation ribbons side by side on the heater.
12. PT100: Pull out the PT100 and properly replace with new one.
13. Thermoswitch: Unscrew the thermoswitch and replace it.
14. Connect the heater or PT100 or thermoswitch
15. Use the opposite procedure to close the analyzer.

#### 8.5 Connection Box

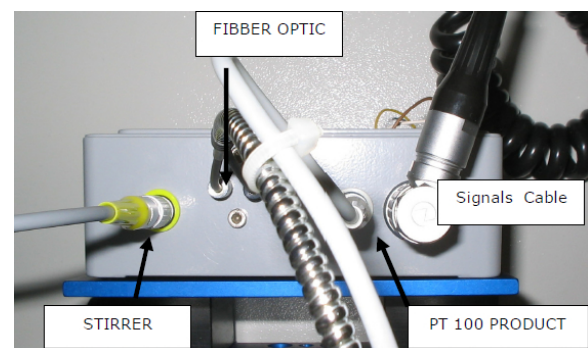


Figure 20: Connection Box

## 9. Maintenance and Precautions

### Regular Maintenance

- Regularly clean the fixation system of the test jar.
- Regularly clean the cooling tank.
- Do NOT analyze other products than those described in the method.
- Do NOT use solvent like acetone to clean any element of the analyzer.
- Do NOT leave the same sample in the test jar for several days.
- Avoid shock from the PT100.

### Maintenance Tools

Article Number	Designation
KLA-PT100-CAL	Calibration box for PT-100
KLA-DB-KIT	Calibration kit (Set of connectors and cables for calibration)

## 10. Service

Under normal operating conditions and with routine maintenance, the KLA-5-TS Analyzer does not require service. Any service problem can be quickly resolved by contacting Koehler's technical service department either by letter, phone, fax, or email. In order to assure the fastest possible service, please provide us with the following information.

Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Date of Shipment: \_\_\_\_\_

## 11. Storage

This laboratory test instrument is equipped with electrical components. Storage facilities should be consistent with an indoor laboratory environment. This testing equipment should not be subjected to extremes of temperature and/or moisture. This equipment was shipped from the factory in a corrugated cardboard container. If

long term storage is anticipated, re-packing the instrument in a water-resistant container is recommended to ensure equipment safety and longevity.

## 12. Warranty

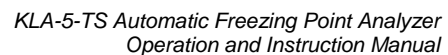
We, at Koehler, would like to thank you for your equipment purchase, which is protected by the following warranty. If within one (1) year from the date of receipt, but no longer than fifteen (15) months from the date of shipment, Koehler equipment fails to perform properly because of defects in materials or workmanship, Koehler Instrument Company, Inc. will repair or, at its sole discretion, replace the equipment without charge F.O.B. its plant, provided the equipment has been properly installed, operated, and maintained. Koehler Instrument Company must be advised in writing of the malfunction and authorize the return of the product to the factory. The sole responsibility of Koehler Instrument Company and the purchaser's exclusive remedy for any claim arising out of the purchase of any product is the repair or replacement of the product. In no event shall the cost of the purchaser's remedy exceed the purchase price, nor shall Koehler Instrument Company be liable for any special, indirect, incidental, consequential, or exemplary damages. KOEHLER INSTRUMENT COMPANY, INC. DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. Please save the shipping carton in the event the equipment needs to be returned to the factory for warranty repair. If the carton is discarded, it will be the purchaser's responsibility to provide an appropriate shipping carton.

### **13. Returned Goods Policy**

To return products for credit or replacement, please contact Koehler Customer Service with your purchase order number, our packing list/invoice number, the item(s) to be returned and the reason for the return. You will be issued a Returned Authorization (RA) number, which must be prominently displayed on the shipping container when you return the material to our plant. Shipping containers without an RA number prominently displayed with will be returned to the sender. Goods must be returned freight prepaid. Returns will be subject to a restocking charge, the application of which will depend upon the circumstances necessitating the return. Some returns cannot be authorized, including certain products purchased from outside vendors for the convenience of the customer, products manufactured on special order, products shipped from the factory past

ninety (90) days, and products which have been used or modified in such a way that they cannot be returned to stock for future sale.



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