



K600X2 HEATED OIL TEST CENTRIFUGE

OPERATION AND INSTRUCTION MANUAL

REV C

Koehler Instrument Company, Inc.

1595 Sycamore Avenue • Bohemia, New York 11716-1796 • USA

Toll Free: 1-800-878-9070 (US only) • Tel: +1 631 589 3800 • Fax: +1 631 589 3815

<http://www.koehlerinstrument.com> • e-mail: info@koehlerinstrument.com

Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing

CERTIFICATE OF CONFORMANCE

Automatic Heated Oil Test Centrifuge K600X2

This certificate verifies that part number K600X2, Automatic Heated Oil Test Centrifuge, was manufactured in conformance with the applicable standards set forth in this certification.

Specifications:

ASTM D91
ASTM D96
ASTM D893
ASTM D1796
ASTM D1966
ASTM D2273
ASTM D2709
ASTM D2711
ASTM D4007
ASTM D5546
IP 75
IP 145
IP 359
API MPMS Chapter 10.4
API 2542
API 2548
ISO 3734
DIN 5793
NF M 07-020

This unit is tested before it leaves the factory, to ensure total functionality and compliance to the above specifications and ASTM standards. Test and inspection records are on file for verification.



Jesse Kelly
Application Engineer
Koehler Instrument Company



EC Declaration of conformity

Koehler Instrument Company, Inc.
of 1595 Sycamore Av., Bohemia, New York USA

We declare that the product listed below meets all basic requirements in accordance with the following Directive(s) by design, type, and version placed upon the market by us.

2004/108/EC The Electromagnetic Compatibility Directive
2006/42/EC The Machinery Directive by way of the Low-Voltage directive 2006/95/EC

And hereby declare that:

Equipment : **Oil Test Centrifuge for Petroleum**

Model Numbers: K6009X with respective Part Numbers: K60092, K60092-PT, K60092-ST

Qualifications:

This product may only to be used in a professional laboratory setting by authorized personnel following the instruction handbook.

and

This product declaration is valid for unmodified equipment when installed and operated by authorized personnel following the instruction handbook.

Conforms to the following standards:

Safety	Low-Voltage directive 2006/95/EC
EN 61010-1:2010	Safety Requirements for electrical equipment for measurement, control and laboratory use; by engineering design and risk review and by meeting the requirements of Hi-Pot Test (1900 VAC, 60 sec.) as detailed in the product's technical documentation.
EMC	Meets the essential requirements of EMC Directive 2004/108/EC by engineering design review and by meeting the requirements of Conducted Emissions Test for Group 1 Class A as detailed in the product's technical documentation.
EN 55011:2007	

James R. Ball
Dir. Research & Development

1595 Sycamore Av.
Bohemia, NY 11716
United States of America
April 24, 2012

WEEE Directive Compliance Statement

Background

The goal of the WEEE Directive is to encourage design of environment-friendly products that increase reuse, recycling and other forms of recovery to reduce waste streams and applies to listed Electronic and Electrical Equipment (EEE) and Koehler's equipment falls broadly into Appendix 1A; Section 9 Monitoring and Control Equipment: Measuring, weighing or adjusting appliances for household or as laboratory equipment.

Any associated non-embedded equipment such as Lighting (Saybolt Color) and PCs/Printers also fall under WEEE. If provided with an order these ancillary items must be WEEE compliant. For these and other reasons (printer cartridges are regionalized) the equipment must be supplied through a third party supplier in Europe.

The WEEE Directive applies to electrical and electronic equipment falling under the categories set out in Annex IA provided that the equipment concerned is not part of another type of equipment that does not fall within the scope of this Directive. Annex IB contains a list of products which fall under the categories set out in Annex IA.

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0024:0038:en:PDF>

We do not qualify for any of the 10 exemption categories.

<http://www.dpa-system.dk/en/WEEE/Products/Exemptions>

Professional use

For equipment defined for 'professional use' local authorities have no role to play. Producers and importers are basically responsible for collection of WEEE recyclables from the professional user and for subsequent management. A separate statement is given cataloging the items that require separation from the equipment along with basic information on subsequent processing or recycling prior to disposal of the equipment.

<http://www.dpa-system.dk/en/WEEE/Products/Private-or-professional-use>

Responsibility for Registration and Annual Reporting:

Koehler will not sell directly to end users in the EU and so has no responsibility to register within each EU state and to make annual reports. Koehler declares that this responsibility is born by the importer who is the first level of the distribution chain and is subject to producer responsibility. We will communicate this in writing to our distributor/importers in the EU stating they are responsible to satisfy WEEE registration and reporting requirements in the EU states where they conduct sales activities.

It is illegal to market electrical and electronic equipment covered by producer responsibility without being registered.

<http://www.dpa-system.dk/en/WEEE/Producers/Whoissubjecttoproducerresponsibility>

Product Design

Koehler's designs allow for complete disassembly to a modular level which usually allows for standard recycling. A qualified refrigeration system technician must be consulted when disassembling and de-commissioning any equipment with refrigeration systems.

Koehler's scientific testing equipment is robustly designed to function over a long service life and are typically repaired many times over the course of years rather than being replaced. We believe that re-use and refurbishment is the very best form of re-cycling.

All batteries must be readily removable not soldered in place.

Recycling instructions

In the event that replacement becomes necessary, we will include instructions, particularized to each instrument that informs the customer of their recycling responsibilities and giving them guidance in doing this. All Koehler equipment has been placed on the market since 13th August 2005 and so Koehler is defined as a "new WEEE producer". As such we must provide information on refurbishment, treatment, and re-use.

Our instrument manual will include this compliance statement and indicate that any collection of materials will be handled by their authorized distributor. In the event that the distributor is unreachable or is no longer a distributor for Koehler Instrument, Co., other arrangements may be made including accepting the materials directly.

Recycling is free of charge. Shipping is the responsibility of the end users. Whether shipping to a distributor or to Koehler directly, safe, properly declared, and labeled packaging and shipping expenses are the sole responsibility of the end user.

WEEE Marking



Since Koehler products are subject to the WEEE Directive we must display the WEEE symbol shown above in accordance with European Standard EN 50419 on the equipment. It must be indelible, at least 5mm in height, and clearly legible. If the equipment is too small the mark must be in the product literature, guarantee certificate, or on the packaging. Rules on marking are established in section 49 of the WEEE Order.

Koehler Instrument Company, Inc.
c/o RECYCLING
1595 Sycamore, Ave.
Bohemia, NY 11716

As a minimum the following substances, preparations and components have to be removed from any separately collected WEEE:

- Mercury containing components, such as switches or backlighting lamps (compact fluorescent lamps, CFL),
- Batteries
- Printed circuit boards if the surface of the printed circuit board is greater than 10 square centimeters (about 4 sq in.),
- Toner cartridges, liquid and pasty, as well as color toner,
- Chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC)
- Liquid crystal displays (together with their casing where appropriate) of a surface greater than 100 square centimeters and all those back-lighted with gas discharge lamps,
- External electric cables
- Components containing refractory ceramic fibers as described in Commission Directive 97/69/EC of 5 December 1997 adapting to technical progress Council Directive 67/548/EEC relating to the classification, packaging and labeling of dangerous substances (2),
- Electrolyte capacitors containing substances of concern (height > 25 mm, diameter > 25 mm or proportionately similar volume)

2. The following components of WEEE that is separately collected have to be treated as indicated:

- Equipment containing gases that are ozone depleting or have a global warming potential (GWP) above 15, such as those contained in foams and refrigeration circuits: the gases must be properly extracted and properly treated. Ozone-depleting gases must be treated in accordance with Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer (4).

Table of Contents

1	Introduction	2
1.1	<i>Koehler's Commitment to Our Customers</i>	2
1.2	<i>Recommended Resources and Publications</i>	2
1.3	<i>Instrument Specifications</i>	3
2	Safety Information and Warnings	3
3	Getting Started.....	4
3.1	<i>Unpacking</i>	4
3.2	<i>Installation</i>	4
3.3	<i>Accessories for Running Tests</i>	5
4	Descriptions.....	6
4.1	<i>Instrument Descriptions.....</i>	6
4.2	<i>Temperature Controller</i>	6
5	Operation	7
5.1	<i>Running Tests</i>	9
6	Maintenance.....	9
6.1	<i>Routine Maintenance</i>	9
6.2	<i>Replacement Parts.....</i>	10
7	Wiring Diagrams.....	11
7.1	<i>Cabinet Wiring.....</i>	11
7.2	<i>PCB Wiring.....</i>	12
8	Troubleshooting	13
8.1	<i>The test will not start</i>	13
8.2	<i>The motor stalls or will not come up to speed properly.....</i>	13
8.3	<i>The unit does not heat up</i>	13
9	Service.....	13
10	Storage	13
11	Warranty.....	13
12	Returned Goods Policy.....	13
	Notes.....	14

1 Introduction

The K600X2 Oil Test Centrifuge is a fully automatic bench top centrifuge designed expressly for petroleum testing applications. This unit accommodates four centrifuge tubes of either ASTM conical type (6 or 8"), pear shaped (100mL), or finger tube (12.5mL) with the use of appropriate rotor and accessories. The molded PTFE supports provide for maximum protection and easy positioning of the tubes. Voltage compensating circuitry ensures constant operating speed in the event of voltage fluctuations at the main power supply. Includes automatic electronic braking system and safety interlocks.

- Choice of long, short, or pear rotor assembly to accommodate corresponding centrifuge tubes.
- Accommodates four (4) centrifuge tubes of either 6" and 8" conical ASTM types, pear-shaped tubes, or finger tubes
- Automatic control of acceleration ramp, centrifugation speed, and timing function
- Digital speed and temperature displays
- Doubly-insulated to reduce heat loss
- Dynamically balanced for quiet operation
- See-thru explosion resistant locking door

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Oil Test Centrifuge. 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 providing 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.

Toll Free: 1-800-878-9070 (US only)
Tel: +1 631 589 3800 • Fax: +1 631 589 3815
Email: info@koehlerinstrument.com
<http://www.koehlerinstrument.com>

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

ASTM Publication:

- ASTM D91: Precipitation Number of Lubricating Oils
- ASTM D96: Standard Test Method for Water and Sediment in Crude Oil by Centrifuge Method (Field Procedure)
- ASTM D893: Insoluble in used Lubricating Oils
- ASTM D1796: Water and Sediment in Fuel Oils by the Centrifuge Method
- ASTM D1966: Fouts in Raw Linseed Oil (Gravimetric Method)
- ASTM D2273: Trace Sediment in Lubricating Oils
- ASTM D2709: Water and Sediment in Middle Distillate Fuels by Centrifuge
- ASTM D2711: Demulsibility Characteristics of Lubricating Oils.
- ASTM D4007: Water and Sediment in Crude Oils by the Centrifuge Method
- ASTM D5546: Solubility of Asphalt Binders in Toluene by Centrifuge

2. International Organization for Standardization (ISO)
1, rue de Varembe
Case postale 56
CH-1211 Geneva 20, Switzerland
Tel: 41 22 749 01 11 • Fax: 41 22 733 34 30
<http://www.iso.org>

ISO Publication:

- ISO 3734: Determination of Water and Sediment in Residual Fuel Oils- Centrifuge Method

3. Energy Institute (IP)
61 New Cavendish Street
London, W1M 8AR, United Kingdom
Tel: 44 (0)20 7467 7100
Fax: 44 (0)20 7255 1472

<http://www.energyinstpubs.org.uk/>

IP Publication:

- IP 75:
- IP 145:
- IP 359:

4. Deutsche International Norm (DIN)
<http://www.din.de>

DIN Publication:

- DIN 51793: Testing of Liquid Fuels; Determination of Water Content and Sediments in Fuel Oils and Crude Oils; Centrifuge Method

5. Association Française de Normalisation (AFNOR)
<http://www.afnor.fr>

AFNOR Publication:

- NF M 07-020

6. **API Publication:**

- API 2542

1.3 Instrument Specifications

Models: K60002: Long tube
K60092: Long tube
K60002-ST: Short tube
K60092-ST: Short tube
K60002-PT: Pear tube
K60092-PT: Pear tube
K60002-FT: Finger tube
K60092-FT: Finger tube

Electrical Requirements: 115V, 60 Hz, 7A
220-240V, 50/60Hz, 3.5A

Temperature Range: Ambient to 200°F (93°C)

Temperature Readout: Digital

Maximum Speed: 2200 rpm

Set Speed: 500-2200 rpm

Speed Readout: 0-2200 rpm

Brake: Automatic Dynamic Braking

Dimensions: 31 x 25.8 x 14.3 in
(l x w x h) (78.74 x 65.53 x 36.32 cm)

Net Weight: 98 lbs (44.5 kg)

Capacity: Four (4) oil test centrifuge tubes: long, short, pear (100 mL) or finger (12.5mL) tubes

Maximum RCF: Short: 1170
Long: 1327
Finger: 1050
Pear Shaped: 1209

Carousel Diameters: Short: 16.95 in (38.68 cm)
(Tip to tip of Glass Tubes) Long: 19.25 in (48.90 cm)
Finger: 15.23 in (38.68)
Pear Shaped: 17.53 in (44.43 in)

Explosion Resistance: In accordance to the specifications of Group D, Class 1, Division 2 Areas

2 Safety Information and Warnings

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.

- Be sure there are no foreign objects in the centrifuge bowl.
- Keep bowl lid closed while samples are spinning.
- Turn all switches off when the unit is not in use.
- **NEVER** try to slow the carousel arm down with your hands or place your hands or any object inside the bowl while the carousel arm is spinning. Allow the carousel arm to come to a complete stop before removing your sample. Allow the automatic brake to stop the carousel arm.
- **NEVER** leave the centrifuge unattended while the samples are spinning.
- **NEVER** leave the centrifuge unattended while unit is on.
- Disconnect power supply before removing or replacing electrical or mechanical parts.

- **DO NOT** leave oily rags or any type of combustible material in or around your centrifuge.
- **DO NOT** allow unauthorized persons to access the centrifuge.
- **STAY ALERT!** Do not operate this unit while under the influence of medication, alcohol, or drugs.

Equipment Modifications and Replacement Parts: Any modification or alteration of this equipment from that of factory specifications is not recommended and 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 listed in section 1.2 of this manual. 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.

Over Temperature Protection: This unit is equipped with Over Temperature Protection (OTP) circuitry to prevent overheating. The unit will automatically interrupt power to the heater if equipment malfunction or operator error causes the temperature to exceed **220°F**. The power can only then be restored by identifying and correcting the problem and allowing the unit to return to normal operating temperatures.

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>.

Safety Lockout Mechanism: The Centrifuge comes equipped with a Safety Lockout Mechanism. Upon emergency shutdown the door is locked and cannot be unlocked until the unit comes to a complete stop, is turned back on, and the **STOP** key is pressed on the touch screen display. The centrifuge cannot start while the door of the chamber is open and the latch is not engaged.

Nitrogen Purge: The Nitrogen Purge feature allows for a slow release of Nitrogen into the bowl of the

centrifuge. This feature requires an external Nitrogen gas source and can easily connect to an Inlet port located at the back of the unit.

3 Getting Started

3.1 Unpacking

Carefully unpack and place the instrument and accessories in a secure location. Inspect the unit 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.

3.2 Installation

Equipment Placement: Place the instrument on a firm, level table in a secure area.

It is recommended to secure the centrifuge to a bench top prior to operation. Z-brackets are included with the instrument for this purpose. To install please refer to the steps below and Figures 1 and 2:

1. Turn the Centrifuge "ON" and open the door.
2. Remove all of the glass tubes and the tube holders from the carousel.
3. Close the door and press the start button (the door lock mechanism should click).
4. Press the "RED" mushroom stop button and remove the plug from the wall outlet.
5. Turn the machine on its left side as shown in Fig. 1 (below).

NOTE: Place a soft cloth on the table to avoid scratching the cabinet

6. Remove five (5) Phillips Head 8-32 screws and the two (2) Isolator feet.

NOTE: It is not necessary to remove the second (2nd) screw from the front.

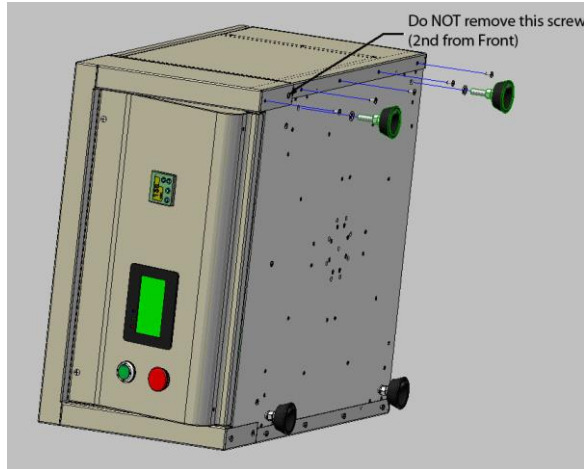


Figure 1. Z-Bracket Installation

7. Place the Z-Bracket onto the base of the machine as shown in Figure 1 making sure that it is oriented so that the screw that was left in the bottom is inside the large hole in the Z-Bracket.
8. Re-install the five (5) screws and two (2) isolator feet that were removed in step 6 above.
9. Turn the machine on its opposite side and repeat steps 6 thru 8 to mount the remaining Z-Bracket
10. The unit can now be bolted to the table using 1/4 inch bolts or lag screws. The screws should go through the rubber isolators in the Z-Brackets. It is suggested that the screws not be fully tightened so that the Z-Bracket is "floating" but is still restrained from moving by the screws as shown in Fig 1.
11. After the unit is mounted to the table, plug in the line cord and turn the unit "ON". Press the "STOP" button on the touch screen to unlock the door.

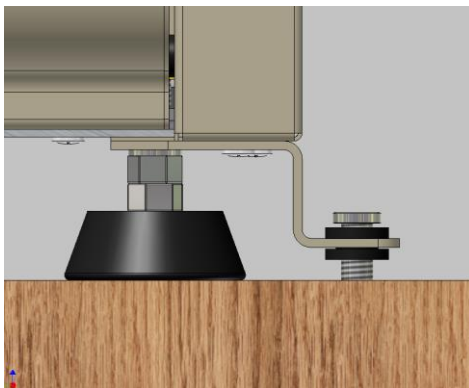


Figure 2. Z-Bracket Assembled

3.3 Accessories for Running Tests

Long Tube Accessories

8" long, 100mL sample capacity

K61101	Long Tube marked in mL (ASTM D91,D96, D893, D1796, D4007)
K61106	Long Tube marked in 200 parts (ASTM D96)
K61110	Long Tube marked in mL every 1 mL above 10 mL (ASTM D96, D4007)
K61112	Long Tube marked in 200 parts every 2 parts above 20 parts (ASTM D96)
K61109	Cone Shaped Tube with capillary tip capable of measuring 0.01 mL and readable by estimation to 0.005% (ASTM D2273, D2709) (K61153 cushion required for each tube)
K60002-23008	PTFE cushion for Long Tubes
K61153	PTFE cushion for Long Tubes with capillary tip (Required for K61109 tubes)
K61111	Cork Stopper for Long, Short, and Pear Tube

Short Tube Accessories

6" long, 100mL sample capacity

K61102	Short Tube, marked in 200 parts every 4 parts above 20mL (ASTM D96)
K61105	Short Tube, marked in mL (ASTM D96)
K61107	Short Tube, marked in mL every 2mL above 10mL (ASTM D96)
K61108	Short Tube, 6", marked in 200 parts (ASTM D96)
K60002-03058	PTFE cushion for Short Tubes
K61111	Cork Stopper for Long, Short, and Pear Tube

Pear Shaped Tube Accesories

100mL sample capacity

K61104	Pear Shaped Tube, marked in mL
K61152	Trace Sediment Tube (ASTM D2709), pack of 3
K61111	Cork Stopper for Long, Short, and Pear Tube

Finger Tube Accessories

12.5 mL sample capacity

K61141	Finger Tube (API 2542)
K61136	Felt Support for Finger Tube
K61132	Cork Stopper for Finger Tube

4 Descriptions

4.1 Instrument Descriptions



- 1. Power ON.** Pushing this button turns on the power to the entire unit.
- 2. Power OFF.** Pushing this button turns off the power to the entire unit. This button can also be used as the Emergency Shut Down Point.
- 3. Operation Touch Screen.** Integrated Touch Screen for turning heat on and off, setting the duration of the test, setting the RCF/RPM values, and choosing the type of rotor assembly and corresponding glassware to be used during the test.
- 4. Temperature Controller.** The temperature controller regulates the bath temperature for the test procedure. Refer to Section 4.3 for full operational details.

4.1 Temperature Controller Operation

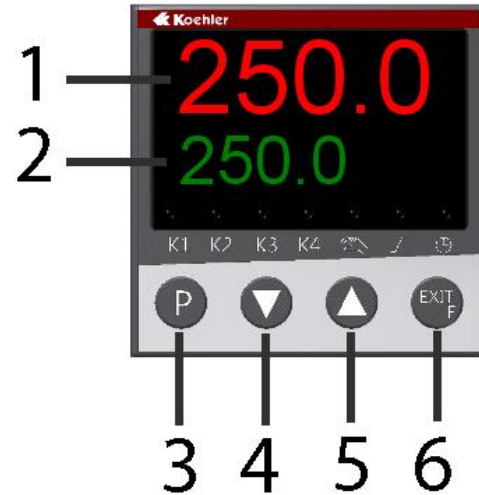


Figure 4. Temperature Controller

- 1. Process Temperature Display.** The upper red LED display shows the process temperature as read from the RTD probe.
- 2. Set Point Temperature Display.** The lower green LED display shows the set point temperature of the controller.
- 3. Programming Key.** Permits scrolling through controller menu parameters. One Level Forward
- 4. Down Key.** Used to decrease the set point temperature and to decrease or change parameter values when programming the temperature controller.
- 5. Up Key.** Used to increase the set point temperature and to increase or change parameter values when programming the temperature controller.
- 6. Exit / Function Key.** This key is used to exit or leave a level. One level backward

IMPORTANT NOTE: The digital temperature controller for the unit comes pre-programmed from the Koehler factory. Please do NOT attempt to re-program the digital temperature controller as this will void the product warranty. If assistance is required, please do not hesitate to contact the Koehler technical service department.

Setting the Temperature. Set the desired operating temperature by adjusting the set point with the up and down keys. The set point will be displayed in the lower green Set Point LED display and the actual temperature will be displayed in the upper red Process LED display. Please allow the instrument to fully equilibrate before proceeding with any testing.

Temperature Calibration. This routine allows the digital temperature controller to be calibrated to a certified thermometer.

- Use a certified calibrated measuring device to acquire the temperature. Calculate the difference between the measuring device and the Process value displayed on the controller.
- Press the program key two times until **PCt** is displayed in the lower green LED display. Press the DOWN key. CAL will display on the lower green display. If there is a value observed in the upper red LED display, add it to the calculated difference obtained in the previous step. This is the offset value.
- Press the Program Key. The lower green display will flash. Use the up or down keys to adjust to the new calibration offset value on the upper red display calculated in the previous step. When the value has been entered, the controller will automatically store the value. The lower green display will stop flashing. If further adjustments are necessary, press the Program Key again. Resume regular operations by pressing the Exit / Function key two times. Verify if the new calibration is correct by observing the upper red display and comparing the value with the calibrated reference device.

Auto Tune. This routine allows the digital temperature control to learn the heating parameters needed for any particular set point temperature. This operation should be done when installing a new unit, after replacing or changing the bath medium type, or utilizing a different temperature set point 20% different from the previously used set point temperature.

- Set the operating temperature to the desired setting.
- Press the up and down arrow buttons simultaneously for about 5 seconds. When Auto Tune is active, the lower green LED

display will blink **TUNE**. Auto Tune will automatically toggle off when the set point temperature is reached. Auto tune can be terminated by pressing the up & down buttons simultaneously again.

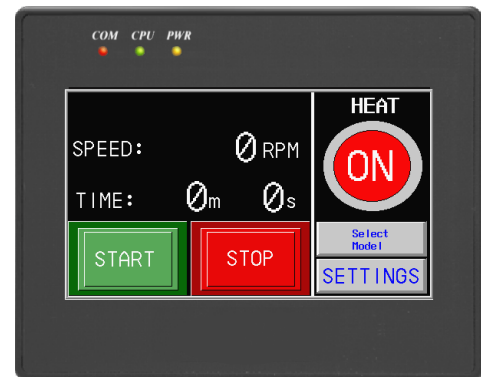
5 Operation

- Push the green button to power ON the centrifuge. The splash screen will display on the touch screen



The yellow PWR LED will illuminate to indicate power is on. The red COM LED will illuminate to indicate successful communication between the screen and the centrifuge's internal PLC.

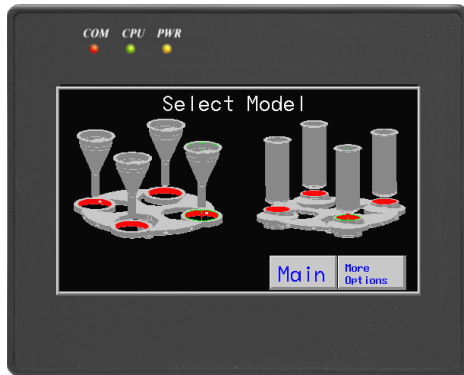
The main screen will then display:



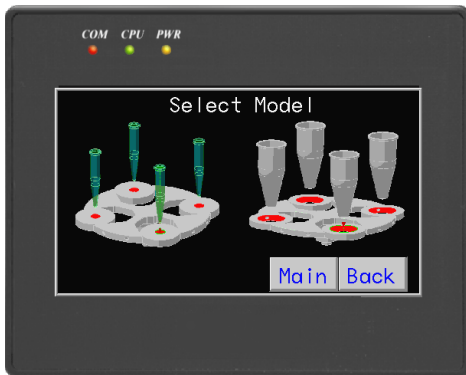
2. Select Model:

Press the **Select Model** button to open the **Select Model** screen:

The first screen displays the Pear Shaped Tube on the left and the Long Tube on the right.



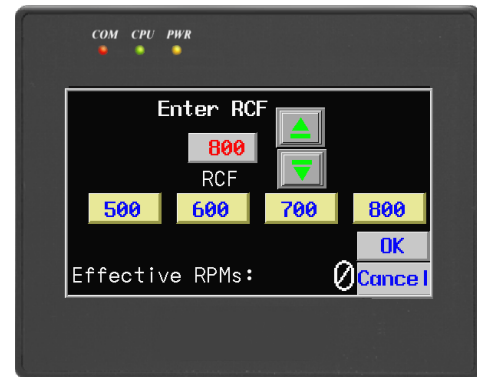
The second screen displays the Finger Tube on the left and the Short Tube on the right.



Select the image of the tube types to be used for testing.

3. Enter RCF:

Once a tube type is selected, the **Enter RCFs** screen will automatically display:



Enter RCF two ways:

1. Select one of the preset RCFs (500, 600, 700, 800) and use the green arrows to fine adjust the value.
2. Press on the **RCF** button (red display) to activate the keypad and manually enter the RCF. Press **Enter** to save the value and return to the **Enter RCF** screen.



Effective RPMs vary with tube type and are automatically calculated by the centrifuge according to the following equation:

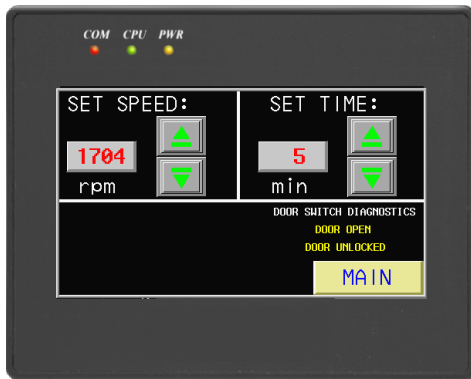
$$\text{RPM's} = 265 \sqrt{\frac{\text{RCF}}{\text{DIAMETER}^*}}$$

*Tip to tip of glass tubes

Effective RPMS will display on the bottom of the RCF screen. Click OK to save any changes made in settings and return to the Main screen.

5. Settings:

From the Main screen, select **SETTINGS** to open the **Settings** screen.



Set the time of duration of the test here by using the green arrows or by selecting the **Set Time** button to activate the keypad.

If the operator wishes to set the speed without using the **Select Model** function, set the speed here.

The **Door Switch Diagnostics** are displayed in the **Settings** screen. It will display whether the door is OPEN or CLOSED and whether the door is LOCKED or UNLOCKED.

NOTE: The door will automatically lock once a test has begun and remain locked until the carousel completely stops spinning.

Press the **MAIN** button to return to the Main screen.

6. Heated Operation:

To run a test under controlled temperature, power on the temperature controller by pressing the **Heat ON/OFF** button on the **Main** screen. Set the desired operating temperature (See section 4.2).

For faster tests, preheat samples before spinning.

5.1 Running Tests

Once all test parameters have been set the centrifuge is ready for testing.

1. Open the lid and load filled tubes into the tube holders. Make sure there are cushions at the bottom of the tube holders and there is no oil residue or build-up. Always check for and remove any foreign objects within

the bowl. **Always** balance a sample with a filled tube in the opposite holder.

2. Ensure all tubes are properly placed within their holders and close the lid. Begin the test by pressing the green **START** button on the touch screen. During spinning, the current RPM and time elapsed will display on the screen along with test status (READY, RUNNING, BREAKING, DOOR LOCKED, DOOR OPEN).

At the end of the set time, the centrifuge will break. When the carousel completely stops spinning, the unit will beep for approximately 20 seconds to signal the end of test. (To cease the beeping signal, press the red stop button on the **Main** screen) The lid will unlock and samples can be removed.

IMPORTANT: Exercise caution when handling heated samples.

3. To end a test before the set time has elapsed, the operator can press the red **STOP** button on the touch screen.

In case of an emergency, press the red mushroom button underneath the power button to turn off the entire unit.

NOTE: The lid will stay locked if emergency shut down is performed during a test. The lid will remain locked until it is powered on using the green button and the red **STOP** button on the touch screen is pressed to unlock the lid.

4. Between tests you must wait 10 seconds before starting next run.

6 Maintenance

WARNING. Disconnect power to the unit before servicing to avoid exposure to high voltages and/or temperatures which may result in personal injury or death. If you have any questions about maintaining your equipment, then please do not hesitate to contact the Koehler technical service department.

6.1 Routine Maintenance

- Clean the unit after each test. Build-up of oil residues can cause problems with the operation and efficiency of the centrifuge.

- Periodically, check the sample tube cushion inside the carousel shields. Replace if worn excessively.
- ALWAYS** check moving parts, both mechanical and electrical, for wear and stress. Replace if necessary.

6.2 Replacement Parts

Some instrument parts may need to be replaced. When ordering replacement part(s), please provide the model number, serial number, and product shipment date of your equipment so that we can ensure you will receive the proper replacement part(s).

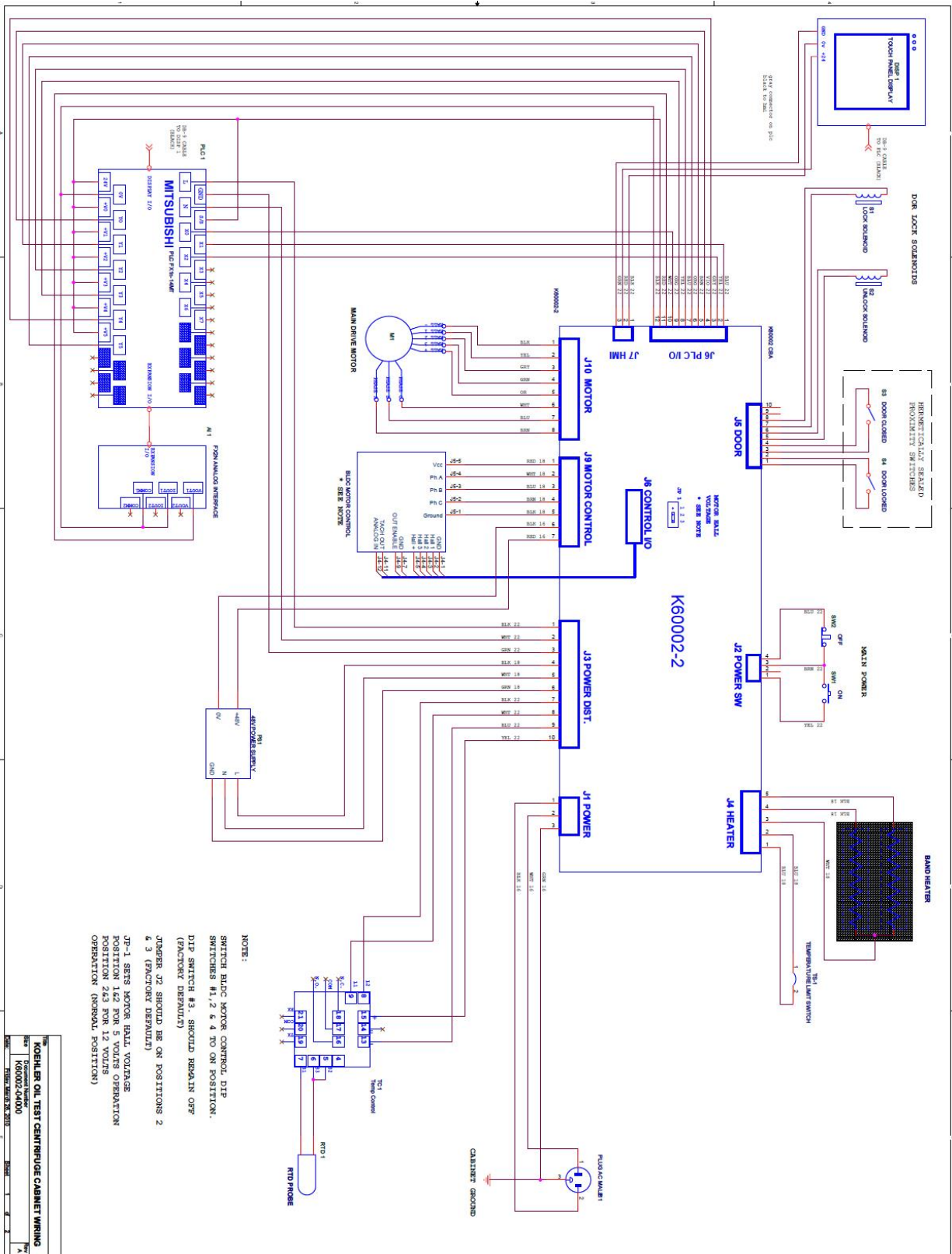
Part Number	Description
351-000-007	Proximity Magnet
050-001-047	Proximity Magnet Switch
090-120-030	Hold Down Relay Clip
275-020-001	20A Motor Controller
425-230-002	Power Supply, 48V, 5A
428-048-005	48V Solenoid
K60002-23007	Centrifuge Window
K6002-23004	Centrifuge Motor
K60002-23006	Vibration Rubber Foot
230-110-001	Band Heater 450W, 110/220V
K60002-23010	RTD Assembly
K60002-2	PC Board Assembly
090-120-029	Hermetic Relay 24VDC
090-280-000	Solid State Relay 10A
278-001-006	1A Fuse
278-005-001	5A Fuse
278-008-001	8A Fuse
278-205-001	2.5A Fuse
K60002-03044B	PCB Shield

Carousel Assemblies

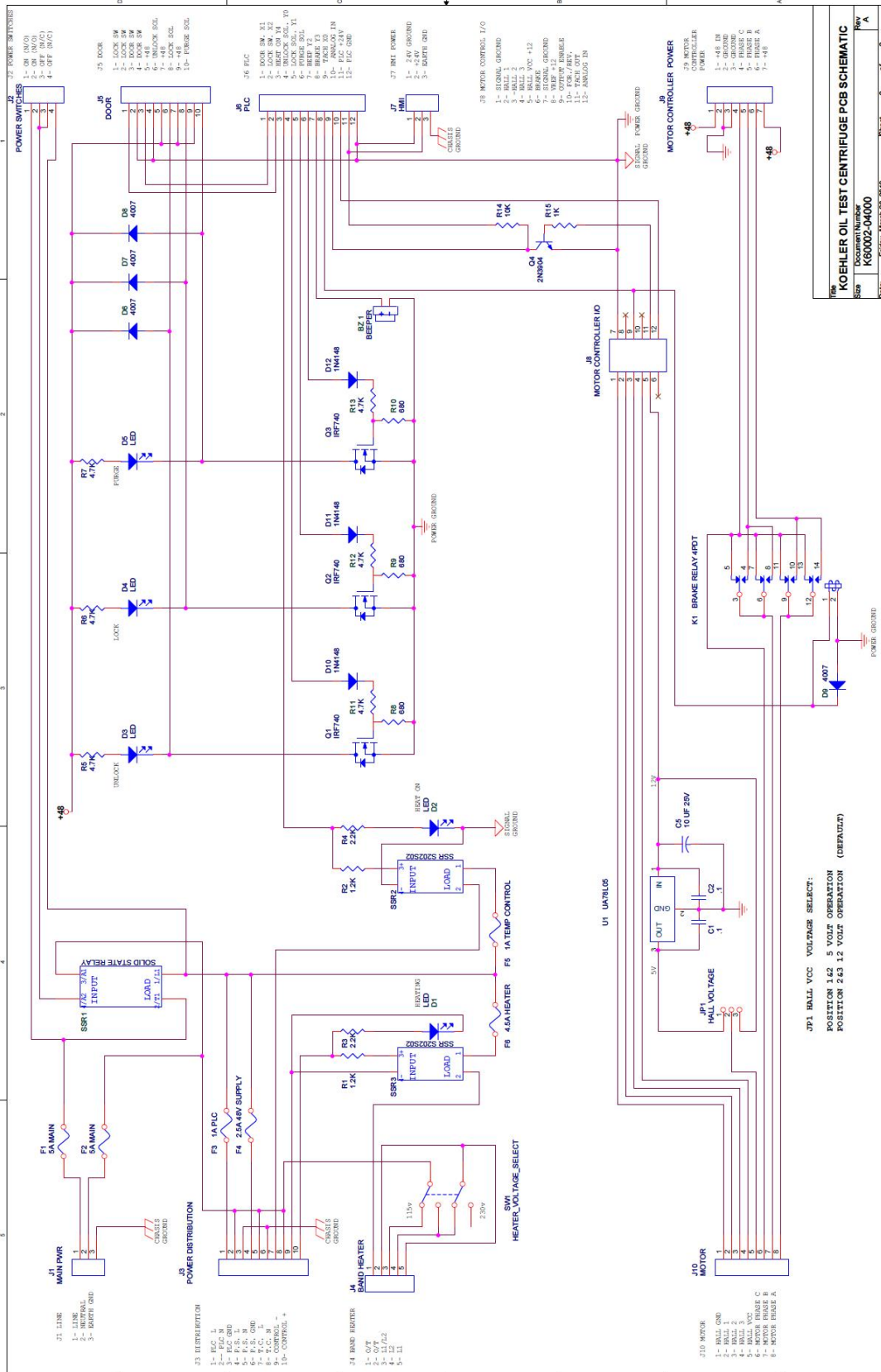
Part Number	Description
K60002-LT-1	LONG TUBE Carousel Assembly (Includes Carousel, Tube Holders, & Cushions)
K60002-LT-2	LONG TUBE Carousel (NOT including tube holders and cushions)
K60002-LT-3	LONG TUBE Tube Holders & Cushions
K60002-ST-1	SHORT TUBE Carousel Assembly (Includes Carousel, Tube Holders, & Cushions)
K60002-ST-2	SHORT TUBE Carousel (NOT including tube holders and cushions)
K60002-ST-3	SHORT TUBE Tube Holders & Cushions
K60002-PT-1	PEAR SHAPED TUBE Carousel Assembly (Includes Carousel, & Tube Holders)
K60002-PT-2	PEAR SHAPED TUBE Carousel (NOT Including Tube Holders)
K60002-PT-3	PEAR SHAPED TUBE Tube Holders
K60002-FT-1	FINGER TUBE Carousel Assembly (Includes Carousel and Tube Holder Rings)

7 Wiring Diagrams

7.1 Cabinet Wiring



7.2 PCB Wiring



8 Troubleshooting

8.1 The test will not start

- Make sure the lid is closed.
- If door is closed, make sure the latch is engaged. If the latch is not engaged the lid is not closing properly. Make sure there is nothing obstructing the lid.
- If there is nothing obstructing the lid, there is an internal failure. Contact Koehler's Customer Service Department.

8.2 The motor stalls or will not come up to speed properly

- Check Fuses

8.3 The unit does not heat up

- Ensure the heater is powered on. On the **Main** screen, the **Heat ON/OFF** button should read **ON**.
- Check fuses

9 Service

Under normal operating conditions and with routine maintenance, the K600X2 Heated Oil Test Centrifuge should 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: _____

10 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.

11 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.

12 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 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.

Notes

[illegible]