



Guide to Operations

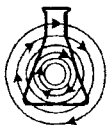
REFRIGERATED/ILLUMINATED INCUBATOR SHAKER MODELS G25-KC/G25-KLC MODELS R25-KC/R25-KLC

MANUAL NO.: M1164-0051
Rev. G



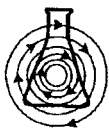
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WARRANTY

Every instrument manufactured by the New Brunswick Scientific Co., Inc. is warranted to be free from defects in material and workmanship. This apparatus, with the exception of glassware, lamps and electrodes (where supplied), is warranted for one year against faulty components and assembly and our obligation under this warranty is limited to repairing or replacing the instrument or part thereof, which shall within one year after date of shipment, prove to be defective after our examination. This warranty does not extend to any NBS products which have been subjected to misuse, neglect, accident or improper installation or application; nor shall it extend to products which have been repaired or altered outside the NBS factory without prior authorization from New Brunswick Scientific Co., Inc.. In addition to the above, all biological shakers shipped to the U.S.A. and Canada carry an additional one-year warranty.



CAUTION

CARE MUST BE EXERCISED IN THE SELECTION OF SPEED AND STROKE COMBINATIONS. UNDER CERTAIN LOADING CONDITIONS, PARTICULARLY WITH HEAVY AND UNEVENLY DISTRIBUTED LOADS, VIBRATION MAY OCCUR AND CAUSE DAMAGE TO THE MACHINE. ALL G25-2" STROKE MACHINES ARE LIMITED TO MAX 300 RPM OPERATING SPEED.

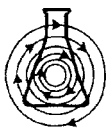


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INTRODUCTION

SCOPE OF MANUAL

This manual contains the installation, operating and maintenance instructions, plus a description of the Refrigerated/Illuminated Incubator Shaker Model G25-KC and G25-KLC, manufactured by the New Brunswick Scientific Co., Inc., 44 Talmadge Road, P.O. Box 4005, Edison, New Jersey 08818-4005, U.S.A..

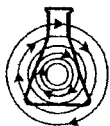
DESCRIPTION OF EQUIPMENT

The Incubator Shaker combines the advantages of a controlled temperature incubator with the efficiency of a continuous duty shaking apparatus. In addition, the G25-KLC provides a means to evenly illuminate the chamber. The Gyrotory Shaker, Model G25, is built for continuous service and reproducible agitation. Acting through a triple-eccentric drive, a powerful ball bearing motor rotates the shaking platform horizontally in a circular orbit.

To minimize friction and stress, the platform rotates on nine life-time ball bearings of high thrust and load bearing capacity. In addition, the bearing housing is designed with grease fittings to permit periodic lubrication.

The environment growth chamber is thoroughly insulated and has an extremely low heat transfer coefficient for close temperature uniformity. Work is observed through a hermetically sealed, double pane viewing window in the incubator lid of the G25-KC. An adjustable air intake vent in the chamber permits room air to circulate through the incubator when required, without affecting temperature regulation.

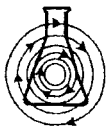
An automatic switch in the drive circuit de-energizes the shaker when the incubator lid is opened. To insure operating temperature, a safety thermostat is incorporated in the heater circuit. Thermostats are fitted with tension lock-knobs to prevent inadvertent change of temperature.



INTRODUCTION

PRODUCT SPECIFICATIONS

Temperature Range:	4°C to 60°C (17°C below ambient min 4°C).
Recovery Time:	Approx. 45 sec. (at 37°C) for chamber to recover to 37°C after lid is opened for 10 sec. with ambient air at 25°C.
Stroke:	Rotary motion - 1" circle Reciprocating motion - variable from 0 to 3 1/2".
Speed Range:	Rotary - 40 to 400 RPM Reciprocating - 30 to 285 RPM
Refrigeration:	1/6 Hp hermetically sealed.
Illumination:	Seven 30 watt fluorescent lamps (Gro-Lux).
Timer:	24 hour adjustable in 10 minute increments.
Dimension (external with lid closed):	Length: 22" Width: 45 1/2" Height: 30 1/2"
Dimensions Chamber:	Length: 22" Width: 34 1/2" Height: 12 1/2" (optional king size 19 1/2")
Drive Motor:	1/6 Hp D.C. drive
Net Weight:	325 lbs. (optional king size 350 lbs)
Electrical:	See Unit Specification Plate

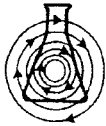


REFERENCE MATERIAL

SUPPLEMENTARY DRAWINGS

Supplementary drawings are supplied with this manual and are listed as follows:

Control Schematic
Refrigeration Schematic



INSTALLATION

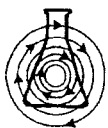
INSPECTION

When uncrated, the Incubator Shaker should be inspected for any possible damage which may have occurred during transit. Carefully unpack the Shaker and any of the optional equipment ordered with the unit. Report any obvious damage to the Carrier and to the New Brunswick Scientific Co., Inc..

INSTALLATION

For efficient temperature control, the Incubator Shaker should be placed in a shaded area away from sources of excessive heat. For maximum cooling capacity, the unit should be located in an air conditioned room.

Check the electrical specifications plate on the Shaker to make certain that the power supply matches the electrical requirements before making connections.



OPERATION

FUNCTIONAL DESCRIPTION OF CONTROLS

<u>Operating Controls</u>	<u>Function</u>
Main Power - Switch	Applies power to the Incubator Shaker Circuitry.
Shaker - Switch	Applies power to the drive motor circuitry through a cover safety switch.
Heater - Switch	Applies power to the fan motor and the heater through the operation of both thermostats.
Cooling - Switch	Turns compressor ON.
Control Thermostat	Controls chamber temperature.
Safety Thermostat (Heat)	Secondary thermostat, provides de-energizing of heater in case of Control Thermostat failure.
Safety Thermostat (Cool)	Secondary thermostat, limits cold temperature.



NOTE:

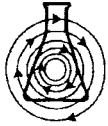
Lid must be closed for driver operation.

Tachometer	Indicates speed of the shaker table in RPM.
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OPERATING PROCEDURE FOR SHAKER

Set all switches on the shaker OFF.

Rotate the Speed control fully counter-clockwise (minimum speed).



OPERATION

When a Model G25 is supplied, proceed to step 4.2.4. When a Model R25 is supplied, the stroke of the machine must be adjusted first before loading the platform. To adjust the stroke, proceed as follows:

- Remove the four screws located near the platform center with the Allen wrench provided.
- Attached to the "T"-wrench provided, by a chain, is a locking pin. Insert the locking pin in the hole in the eccentric wheel, and loosen the locking nut on top of the eccentric wheel with the "T"-wrench. Position the pointer to the desired stroke engraved on the eccentric wheel. Each mark equals 1/2" of stroke. (Stroke length is the total platform movement.)
- After adjusting the desired stroke, tighten the locking nut with the "T"-wrench and locking pin from the shaker.
- Attach the platform to the shaker drive mechanism with the four screws previously removed, and close the lid.

CAUTION:
WEAR PROTECTIVE GLOVES AT ALL
TIMES WHEN HANDLING GLASSWARE

Open the lid of the shaker and load the platform evenly. When the platform is loaded, close lid.



NOTE:

A safety switch is activated by the lid which removes power from the shaker table motor when the lid is opened.

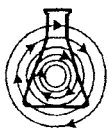
Set the Main Power switch ON.

Set the Shaker switch On and adjust the speed control until the desired RPM is indicated on the tachometer.



NOTE:

To achieve maximum speed with low line voltage, variac output may be changed from Tap #3 to #4 when operating at maximum speed.



OPERATION

CAUTION:
THIS CHANGE MUST BE MADE BY A
LICENSED ELECTRICIAN WITH THE POWER
TURNED OFF

Set the Heater switch ON and adjust the thermostat as follows:

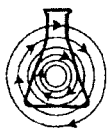


NOTE:

Both thermostats are provided with a locking tab. When it is desired to change the temperature setting of either thermostat, the locking tab must be held pressed in. The locking tab should be released when the desired setting is reached.

Temperature is controlled by a control thermostat. A safety thermostat is also provided to prevent overheating, should the control thermostat ever fail. The control thermostat can be set a point that will bring the incubator chamber to the desired temperature, while the safety thermostat is set for an operating temperature approximately 2°C higher. If for some reason the chamber temperature should begin to rise above the desired level, temperature will automatically be taken over by the safety thermostat, which will prevent the operating temperature from rising more than 2°C above the desired setpoint. This condition will be indicated by the safety thermostat indicator light. Operation of the apparatus need not be interrupted in the event of control thermostat failure. If necessary, the auxiliary (safety) thermostat may be employed temporarily as a main thermostat, and may be set to regulate the incubator at the desired temperature, until the source of the failure is located and corrected.

CAUTION:
THE SAFETY THERMOSTAT MUST NOT BE USED
CONTINUOUSLY AS THE PRIMARY CONTROLLER
AS THIS WOULD DEFEAT THE SAFETY FEATURE OF
HAVING BACK-UP CONTROL.



OPERATION

The thermostat dials are divided into 100 graduations which have no temperature significance. However, the thermostat knobs have been oriented at the number "37" to correspond with a control temperature of 37°C.

To attain operating temperature of 37°C, set the control thermostat at "37" and set the heater switch ON. The indicator lamp will light, indicating that the heater has been energized.

Set the safety thermostat two graduations higher than the control thermostat. Wait until the incubator temperature reaches a state of equilibrium before proceeding. A 30 to 60 minute warm-up period is required (depending on operating temperature), to stabilize temperature in the incubation chamber.

For operating temperatures above 37°C, first bring the incubator temperature to 37°C, and then adjust the dial setting as required, moving the knob approximately one graduation for each degree of temperature adjustment required. Some fine tuning may be necessary. With each adjustment of the main thermostat, advance the safety thermostat correspondingly so that it is always approximately two graduations higher than the main thermostat setting.



NOTE:

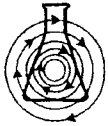
A fresh air vent is provided on the left-hand side of the lid. This may be opened by turning counter-clockwise.

When it is desired to remove a flask or test-tube from the incubator chamber, open the lid. A safety switch activated by the lid removed power from the drive motor.

When the optional gassing fitting are supplied, they are located on the right-hand side of the unit facing the front. One fitting is used to admit gases to the chamber, the other is for removal.

The gassing fittings may also be used in conjunction with the vent control on the right-hand side of the lid.

To shut-down the unit, rotate the speed control to the minimum setting and set all switches OFF.



OPERATION

OPERATION FROM 5°C ABOVE AMBIENT TO 4°C

Switch on heater and cooler, the cooling compressor will be heard running. Depending on the temperature setting on the control thermostat the light above it may be on.

Rotate the control thermostat to the required temperature. The graduations on the dial are approximately one degree but fine tuning to obtain the required operating temperature will be required.

After 15 to 60 minutes depending on the temperatures selected the indicator light above the control thermostat will start to slowly switch on and off showing a state of equilibrium has been reached. The cooler is continually trying to lower the temperature but the heater is switching on and off to compensate and retain the incubator at the selected temperature.

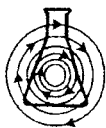
Observe the thermometer and adjust the control thermostat until the desired temperature is obtained.

The minimum thermostat is set during manufacture so that when turned fully counter-clockwise it switches the cooling compressor off when a temperature of 2°C is reached. This temperature was selected to ensure that it is not possible for the temperature to drop below freezing in the shaker. When the minimum thermostat operates the cooling compressor switches off and the indicator light above it lights. When setting the minimum temperature of 4°C on the control thermostat make sure that the indicator light above the control thermostat is switching on and off when the temperature stabilizes and not the indication light above the minimum thermostat.

**MINIMUM THERMOSTAT MUST BE
SET FULLY COUNTER-CLOCKWISE
AT ALL TIMES**

Damage can result to the cooler if a temperature is selected between 4°C and 2°C where the minimum thermostat begins to switch the cooling compressor on and off.

On returning the temperature setting to a temperature of 5°C above ambient or above switch off the cooler.



OPERATION



NOTE:

When a lighted lid is fitted particularly if the selected level of illumination is high, it may be necessary to run the cooler to obtain temperatures between ambient and approximately 10 °C above ambient.

The G25KC/KLC are factory set, so that the lowest temperature is $6^{\circ}\text{C} \pm 2^{\circ}\text{C}$. This temperature range was selected to accommodate variations in ambient temperature which significantly affect the low temperature range. This setting was also selected in order to keep the evaporator coil temperature just above 0°C .

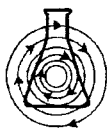
If it is desired to attain lower temperatures, an automatic expansion valve is provided to raise or lower the gas pressure in the evaporator coil. Raising the pressure increases temperature and lowering the pressure decreases the coil temperature which will decrease the temperature within the G25KC/KLC.

This automatic expansion valve is accessed by removing the right side cover of the control box, locate the cutout in the black insulation, and remove the small black plug to expose the knob of the automatic expansion valve.

Turning the knob counter-clockwise lowers the coil temperature, and turning the knob clockwise raises the coil temperature.

Operation of the Lighted Lid (G25 KLC Only)

Check that the lead at the back of the lid is plugged into the socket at the rear of the shaker. Lift the plastic cover of the timer and switch it on. Using the 4 switches on the lid, select the level of illumination required. From 1 tube at 30 watts to all 7 tubes giving 210 watts can be selected in 30 watt increments.



OPERATION

FLUORESCENT LIGHT TIMER

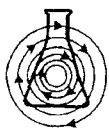
The timer that cycles that fluorescent lights on and off is located on the front face of the G25KLC lid.

It is adjusted by first removing the clear plastic window which is simply pulled straight forward to remove.

The operating time is set on the switch dial, by pushing out the blue segments.
1 segment = 10 min.

To set the time, turn the large clock hand clockwise until the correct time of day is set against the switch operating lever point ensure that the correct half day is chosen (24 hour clock). Ensure that the dial clicks into the fixed position.

The light switches must be in the ON position for the timer to be able to control them.



MAINTENANCE

PREVENTIVE MAINTENANCE

Preventive maintenance is performed to keep equipment in proper working order. When periodically performed, preventive maintenance will result in longer life for the equipment and will reduce time lost due to equipment failure.

Techniques

Cleaning

Use a clean, dry, lint-free cloth, or a dry brush for cleaning the interior of the shaker chamber. If necessary, wipe any parts of the interior with a cloth saturated with water or a commercial scouring cleanser. Do not use steel wool or other abrasives which will mar the finish.

WARNING:
DO NOT USE A CLEANING COMPOUND THAT
IS FLAMMABLE OR TOXIC

Periodic Inspection

At three month intervals, perform the following checks and inspections with all switches OFF.

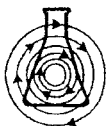
1. Check the fuses on the equipment for good contacts.



NOTE:

On 208 and 220 volt units, two fuses are located behind the rear panel.

2. Remove dirt from the panels, cabinet, wiring cables and motor.
3. Check all controls and accessible items (switches, knobs, connectors, pilot lights, fuse holders, screws, nuts and bolts) to make sure that they are properly tightened. Tighten any item that is loose.
4. Check that all controls operate easily.



MAINTENANCE

CORRECTIVE MAINTENANCE

Replacement of Drive Belt

To replace the drive belt, proceed as follows:

1. Set all switches on the shaker to OFF.
2. Disconnect the power and cord from the electrical outlet.
3. Remove the screws holding the left lower panel when facing the front of the shaker.
4. Remove the screws holding the control panel and lay the panel forward. This provides access to the motor plate clamping bolt assembly.
5. Loosen the bolt on the motor mounting plate. Switch the motor and plate towards the center of the shaker. The belt can now be removed and replaced.
6. Slip the new belt over the flywheel and motor pulley and reverse the procedure for installation of the belt.

Drive Motor Lubrication

Drive motor does not require lubrication.

Main Housing Bearing Lubrication

1. Set the main power switch OFF and remove the line cord plug from electrical receptacle.
2. Remove the six front panel screws and carefully lower the front panel.
3. Using a grease gun with 90° head, grease the fittings which are now accessible from the front of the unit. Use a high-grade, high-temperature, ball bearing grease and lubricate every three months.

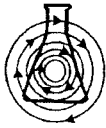
DO NOT OVER LUBRICATE



NOTE:

Model G25 contains 4 grease fittings on the lower eccentric shaft housing. The upper housing contains sealed bearings.

4. After lubrication, replace front panel and screws.
5. Insert power cord from unit to suitable electrical outlet.



MAINTENANCE

Circulation Blower Motor Lubrication

Permanently sealed - no lubrication required.

Platform Removal

To removal platform, simply unscrew the 4 retaining screws and lift out. Make sure retaining screws are thoroughly tightened when platform is replaced.

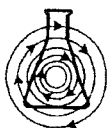
Lid Adjustment

In the event the lid fails to remain fully raised when opened, it can be easily corrected by a simple tension adjustment. Hold lid fully open and tighten nut in lower section of both rear hinges.

Thermostat Calibration

The control thermostat knob may be oriented at a specific dial setting to correspond with operating temperature of the equipment by repositioning knob in relation to the dial plate. In addition, the high and low temperature "stop" may be reset at a new position if it is not possible to attain required temperature. First determine whether the safety thermostat is interfering with the operation of the control thermostat. If so, the safety thermostat should be taken out of the circuit by rotating the knob to its highest setting. If this fails, the adjustable stop of the safety thermostat must be reset to a new position. (*Refer to steps 10-14.*) To calibrate control thermostat knob at 37°C (for example) proceed as follows:

1. Remove control thermostat knob by loosening its two set screws (*see figure 5-1*).
2. Loosen adjustable stop by loosening its set screw.
3. Put machine in operation and set control thermostat knob shaft so as to achieve a temperature of 37°C. (It may be helpful to first "Key" the position of the knob shaft as an aid in orienting it.)
4. Allow temperature to stabilize before proceeding. This condition will be apparent when the heater cycles on and off at frequent intervals, (as indicated by the heater pilot light).
5. Without changing the position of the knob shaft, move adjustable stop until it is in contact with the shaft pin. Temporarily lock the "Stop" in position to secure position of knob shaft.



MAINTENANCE

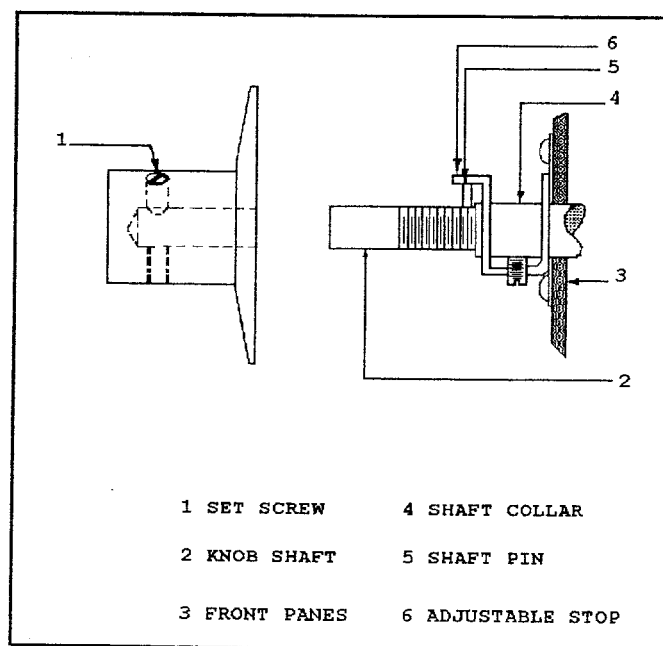


FIGURE 5-1 THERMOSTAT CALIBRATION

6. Without disturbing position of the knob shaft, replace knob on the outermost portion of the shaft, and point it to a setting of "37" on the dial. Tighten knob in new position. (Make sure knob is firmly in contact with the "Adjustable Stop" before it is secured.)
7. Loosen adjustable stop and set it at a position so that thermostat knob can be moved over the entire scale and does not exceed high and low temperature limits.

CAUTION:
DO NOT RESET THERMOSTAT FOR A HIGHER
TEMPERATURE THAN THAT WHICH THE
APPARATUS IS DESIGNED AND RATED FOR.

8. Lock adjustable stop in its new position by tightening its set screw. (The new temperature attainable at this position will be maximum [or minimum] that can be reached.)
9. Rotate the knob fully counter-clockwise. Loosen the set screws on the knob and push the knob as far as possible towards the panel, then back out from the panel 1/32". Tighten the set screws on the knob. This permits the proper tension to be applied to knob by the locking tab. After the control thermostat has been calibrated at 37°C, proceed to calibrate the safety thermostat.



MAINTENANCE

10. Repeat steps 1 and 2 outlined previously.
11. During heat cycle, when heater pilot light is on, move safety thermostat knob shaft slowly until safety thermostat pilot lights and the control thermostat pilot light goes out.
12. Then rotate knob back slightly to the precise point where the safety pilot light goes out. This setting will correspond to operating temperature.
13. Repeat steps 5 through 9 outlined previously.
14. Ascertain whether safety thermostat takes over temperature control when set several degrees lower than the control thermostat. Return safety thermostat setting to original value.

Overload Protection

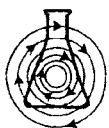
On 230 volt models, four additional fuses are located behind the front panel. These fuses are used for incoming power. For fuse values, refer to the wiring and schematic diagrams supplied.

Replacement Parts

The replacement parts are listed as follows:

TABLE 5-1 REPLACEMENT PARTS

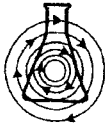
<u>Part No.</u>	<u>Description - Models G25 & R25</u>	<u>Qty/Unit</u>
M1024-3003	Motor (D.C.)	1
P0460-0153	DC Motor Drive	1
R-352	Drive Belt (G25)	1
R-466	Drive Belt (R25)	1
ER-102	Fuse Receptacle	1
EW-126	Electrical Cord (220 volt unit)	1
ET-151	Thermostats (control and safety)	3
H-1506	Knob & Lock Spring for Thermostats	2
ER-121	Relay	1
P0400-0470	Switches	3
EI-107	Indicator Lamps (Amber) (115V)	1
EI-114	Indicator Lamps (Amber) (230V)	2
P0620-1340	Heater Assembly	1
H-401	Thermometer	1
R-100	Rubber Feet	12



MAINTENANCE

<u>Part No.</u>	<u>Description - Models G25 & R25</u>	<u>Qty/Unit</u>
P0620-2560	Blower Motor	1
ES-209	Door Switch	1
G25-484	Hinge	2
EF-111	Fuse (10 amp)	1
P0380-3080	Fuse (2 amp)	1
EF-123	Fuse (5 amp)	3
P0380-3460	Fuse (3.15 amp) Lighted Lid	2
EF-128	Fuse (10 amp)	1
P0420-5150	Ballast	1
P0620-2580	Fan (illuminated lid)	1
P0300-0040	Fluorescent Lamp	7
P0380-0280	Lamp Socket	14
P0400-0930	Light Switch	4
P0440-0260	Thermometer (dial)	1
P0620-0811	Compressor	1
P0460-7150	Temp. Controller	1
P0720-6290	Temp. Probe	1
P0620-2536	Fan	1

<u>Part No.</u>	<u>Description - Models G25 & R25</u>	<u>Qty/Unit</u>
P0620-2560	Compressor Fan	1
P0220-1950	Timer	1
P0400-1410	Starter (fluorescent lamp)	7
P0380-1181	Motor Brush	2



MAINTENANCE

<u>Part No.</u>	<u>Description - Model G25</u>	<u>Qty/Unit</u>
G25-155	Main Bearing Housing Assy. (for units having 1" stroke)	1



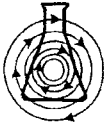
NOTE:

The following are the individual components of the G25-115 Main Bearing Housing Assembly.

G10-147	Bearing Retainer Washer	3
1/4-20 x 1/2"	Socket Head Cap Screw	3
G10-103	Upper Bearing Housing (casting)	1

<u>Part No.</u>	<u>Description</u>	<u>Qty/Unit</u>
6-32 x 1/4"lg	Round Head Machine Screw w/ Flat Washer	9
B-162	Bearings	3
H-890	Shims	as required
H-156	Roll Pins	3
G25-197*	Idler Shaft - 1" Stroke Assembly	2
G25-196*	Main Shaft - 1" Stroke Assembly	1
B-109	Bearing	4
B-100	Bearing	2
H-142	Retaining Ring	2
H-146	Retaining Ring	2
H-642	Oil Seal	3
H-158	Retaining Ring	1
H-193	Grease Fitting	4

*Please refer to the supplement in order to obtain proper parts number for units with stroke other than 1".



MAINTENANCE



NOTE:

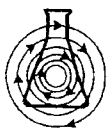
For electrical components, refer to the electrical drawings supplied.

IMPORTANT:

When placing orders for replacement parts or requesting information on service, furnish the serial number of the equipment appearing on the Serial Number Identification Plate, located on the inside of the chamber door.

SPECIAL NOTE:

The G25 has a unique counter-balancing system which is designed to meet the specific needs of the customer. When using lighter or heavier loads than shaker is designed to accommodate, excessive creeping may be encountered. To prevent creeping with light load, remove counter-balance weights located beneath platform on a drive pulley. With heavier loads additional counter-balance weights should be added beneath platform. Additional weights may be purchased from NBS.










CLAMP MOUNTING HARDWARE KIT

HARDWARE FOR 10mL TO 500mL CLAMPS

NBS flask clamps are used on a variety of shaker platforms. Flat head screws of different lengths and thread pitch are used to secure the clamp. The table below identifies the proper screw for your shaker application by reference to the head style.








Clamp Hardware Application Chart

<i>Description</i>	<i>Part Number</i>	<i>Qty.</i>	<i>Application</i>
 10-24 x 5/8 (15.87 mm) flat Phillips (+) head screw	S2116-3101	1	3/4" (19.05 mm) thick wood platform 
 10-24 x 5/16 (7.9 mm) flat Phillips (+) head screw	S2116-3051	1	5/16" (7.9 mm) thick aluminum, phenolic and stainless steel platforms.  
 10-32 x 5/16 (7.9 mm) flat slotted (-) head screw	S2117-3050	1	all stainless steel platforms 

HARDWARE FOR 1 LITER TO 6 LITER CLAMPS

NBS flask clamps are used on a variety of shaker platforms. Flat head screws of different lengths and thread pitch are used to secure the clamp. The table below identifies the proper screw for your shaker application by reference to the head style.

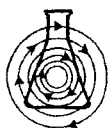
Clamp Hardware Application Chart

<i>Description</i>	<i>Part Number</i>	<i>Qty.</i>	<i>Application</i>
 10-24 x 5/8 (15.87 mm) flat Phillips (+) head screw	S2116-3101	5	3/4" (19.05 mm) thick wood platform 
 10-24 x 5/16 (7.9 mm) flat Phillips (+) head screw	S2116-3051	5	5/16" (7.9 mm) thick aluminum, phenolic and stainless steel platforms.  
 10-32 x 5/16 (7.9 mm) flat slotted (-) head screw	S2117-3050	5	all stainless steel platforms 



NOTE:

2800 mL Fernbach Flask Clamp applicable to above chart.



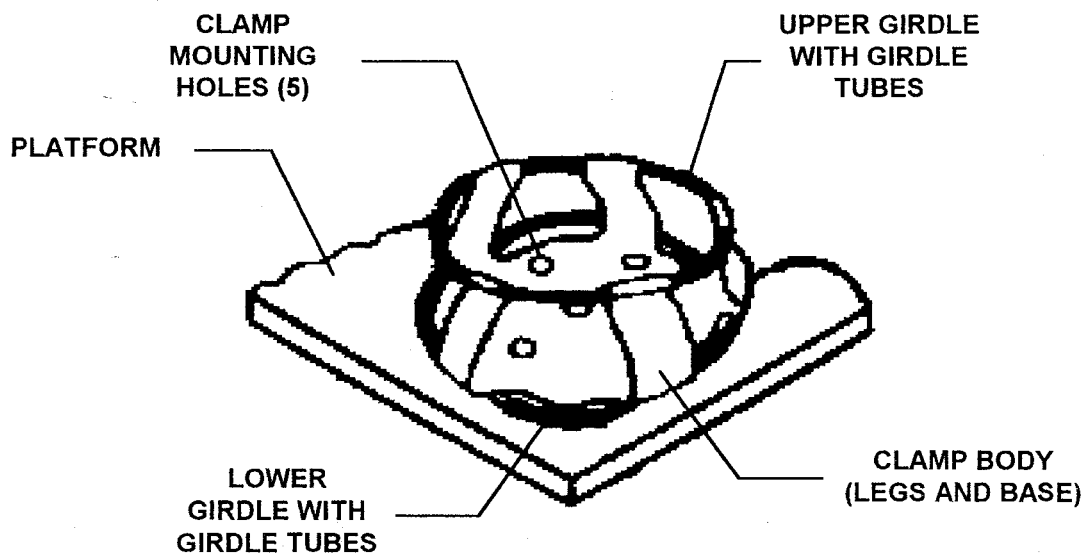
CLAMP MOUNTING HARDWARE KIT

INSTALLATION OF CLAMPS

Flask clamps purchased for use with universal platforms require installation. Clamps are installed by securing the base of the clamp to the platform with the correct type and number of screws (refer to clamp hardware application charts). All clamps are shipped complete with hardware. Clamps for 2 to 6 liter flasks are shipped with an additional girdle to keep the flasks in place. To install 2 to 6 liter clamps, perform the following:

1. Place clamp on platform, secure in place with correct type of screws (refer to clamp hardware application charts).
2. Slide the girdle around the upper portion of the clamp body (legs) down until it reaches the platform.
3. Place the loose girdle around the upper portion of clamp body so that it is held in place by the legs of the clamp.
4. Insert the flask into the clamp.

2 to 6 Liter Clamp Installation



NOTE:

2800 mL Fernbach Flask Clamp applicable to above.

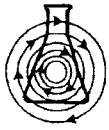
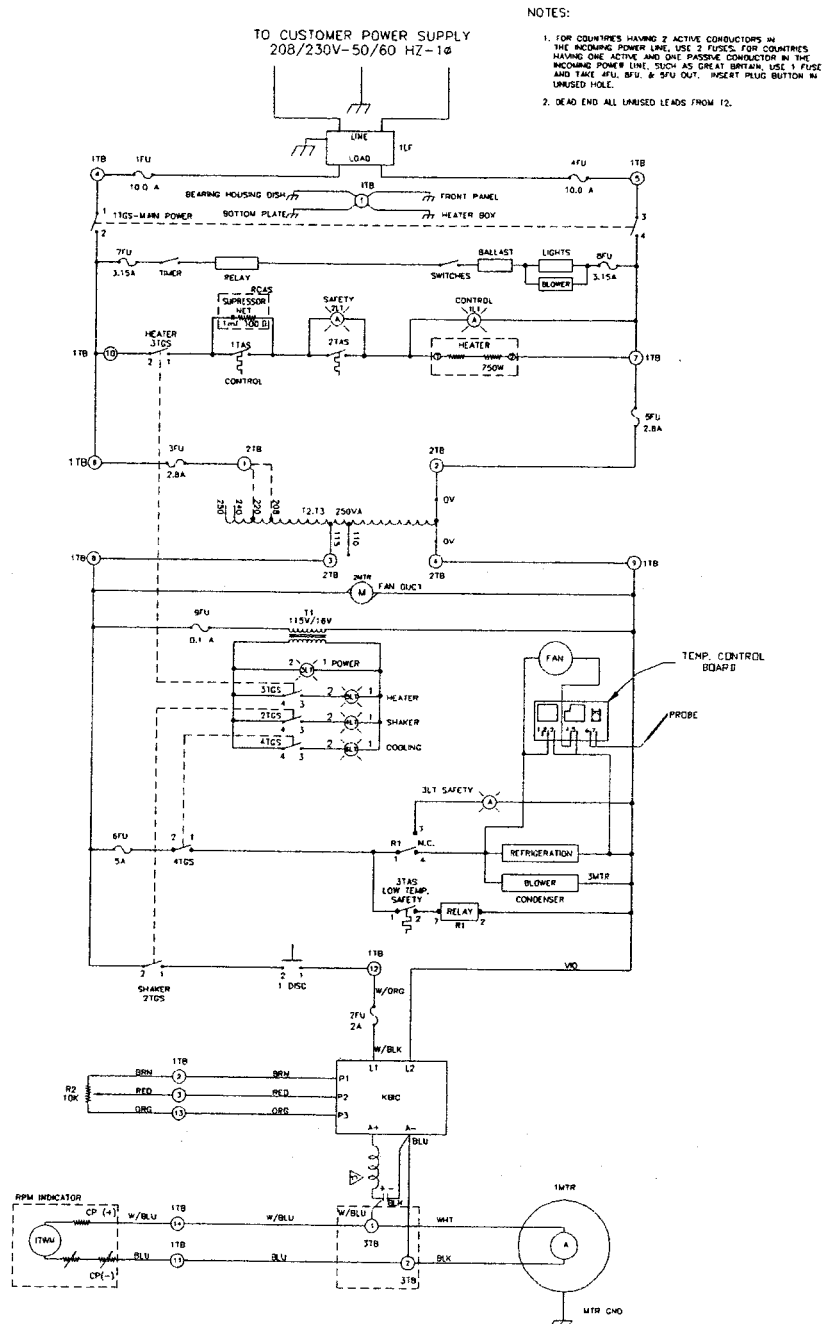


FIGURE 1

Control Schematic G25 KC/G25 KLC 208/230 VAC, 50/60 Hz, Single Phase



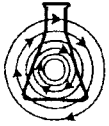


FIGURE 2

Control Schematic G25 KC 208/220 VAC, 50/60 Hz, Single Phase

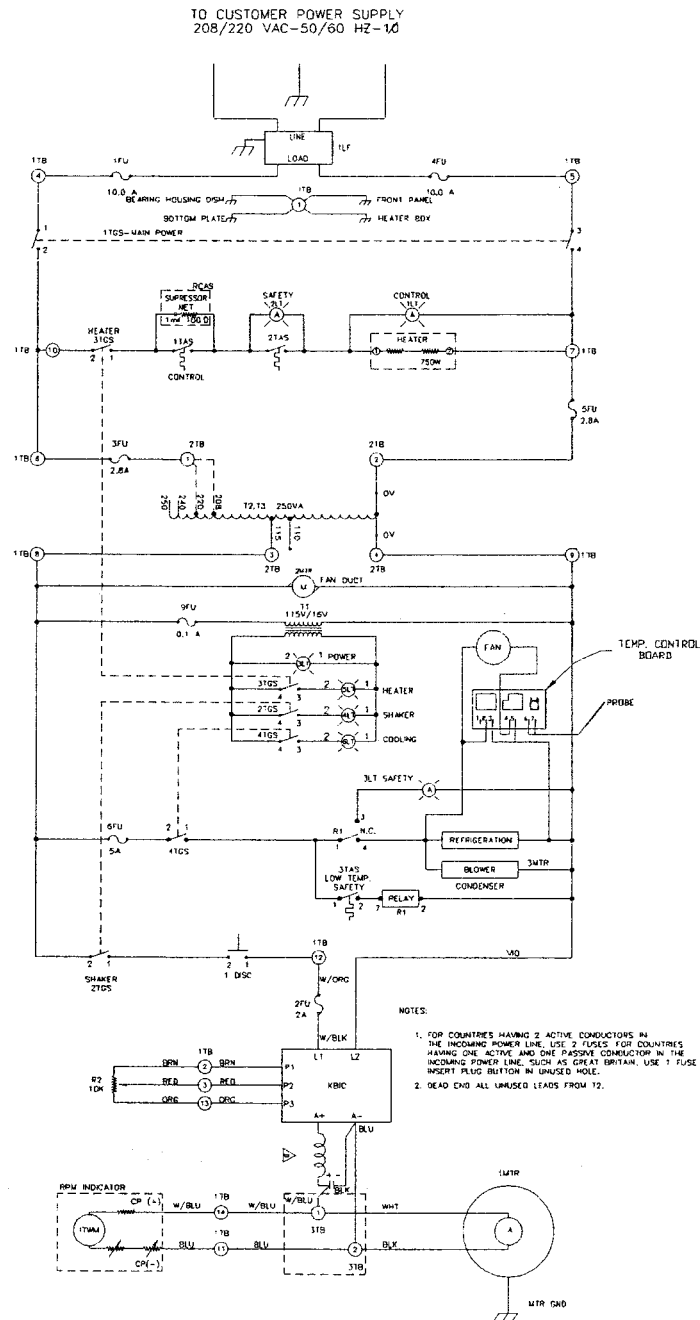
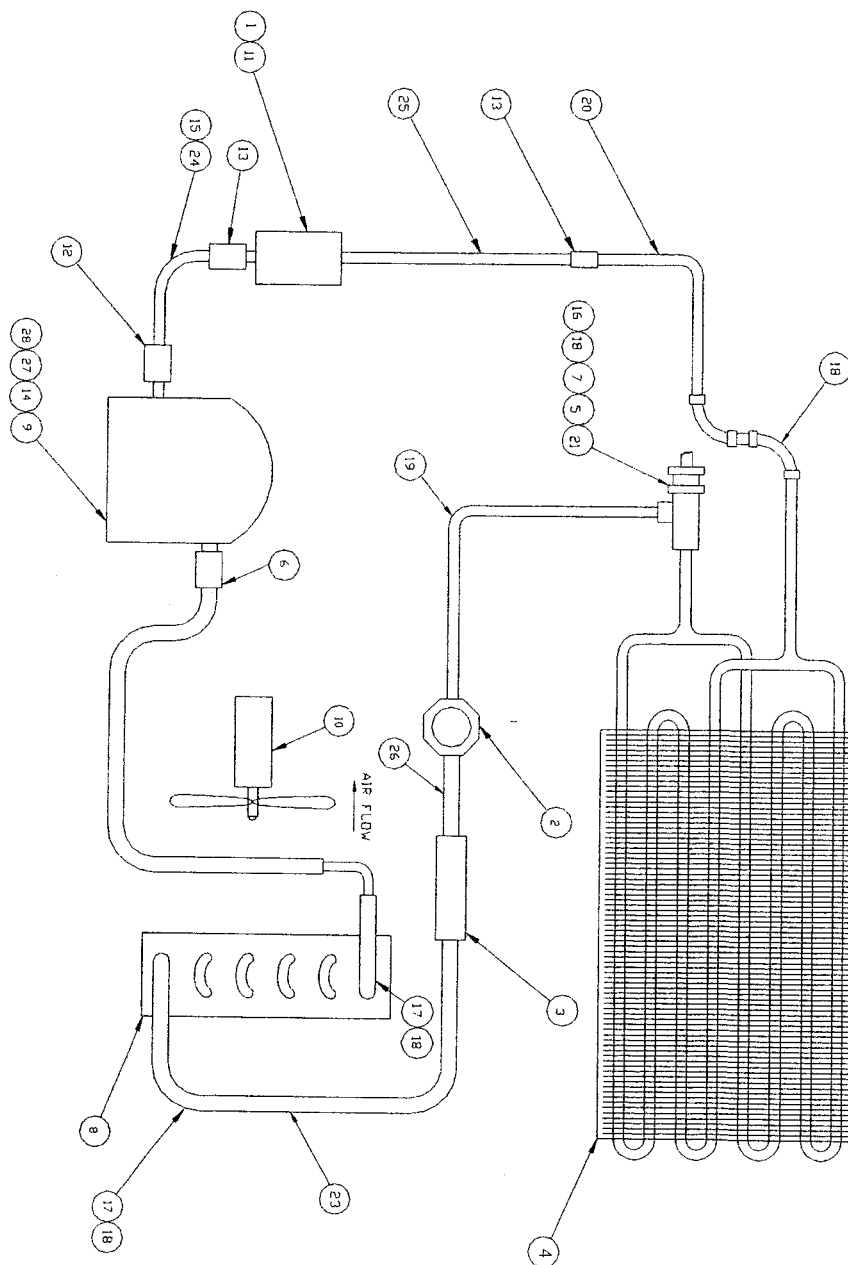




FIGURE 5

Refrigeration Schematic



INSTALLATION OF FREON:

1. CHECK THAT A VACUUM WAS PULLED ON THE REFRIGERATION LINE BEFORE CHARGING UNIT.
2. STATIC CHARGE UNIT WITH R134A FREON. AFTER STATIC CHARGE, CHARGE UNIT WITH 100Z. OF R134A USING CHARGING CYLINDER. SET PRESSURE ON LOW PRESSURE SIDE TO 27PSI (+0,-1 PSIG).



FIGURE 6

**1" Stroke
Supplement for 1" Stroke
Under 2L and 2L and above**

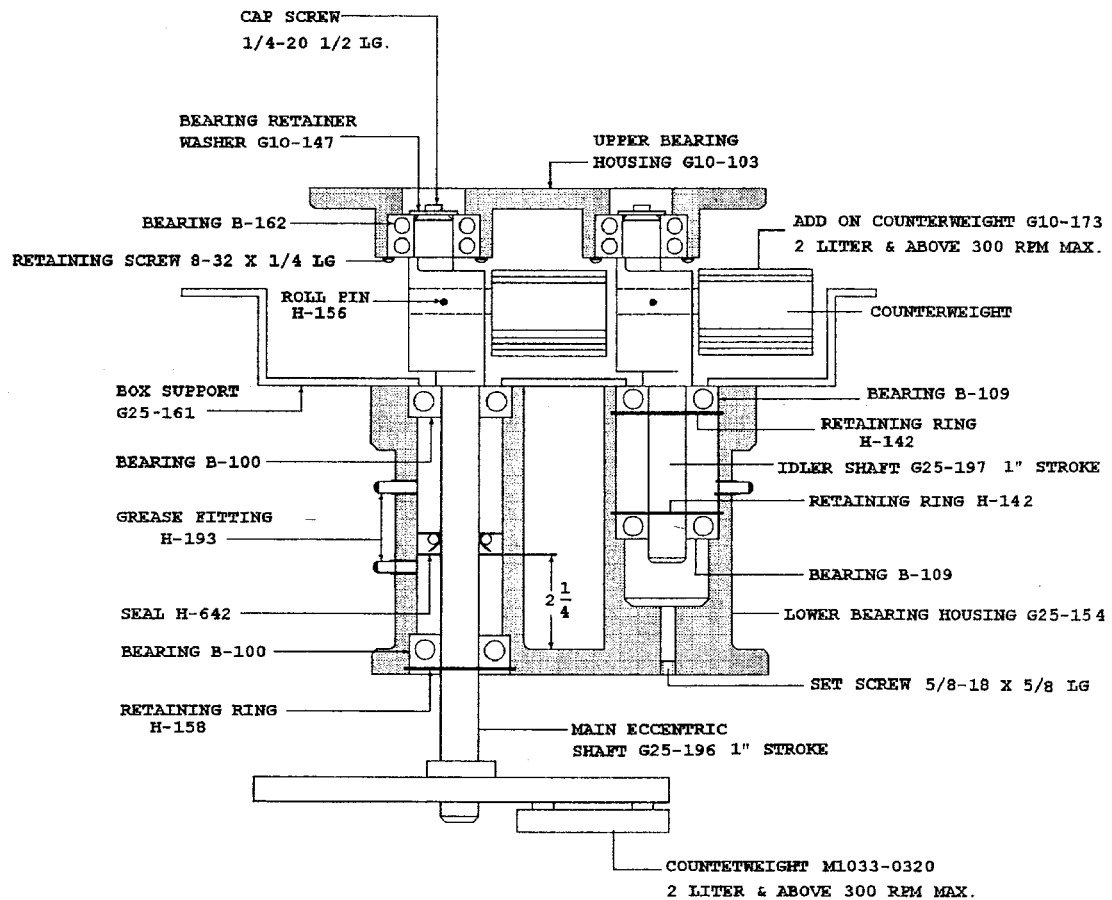
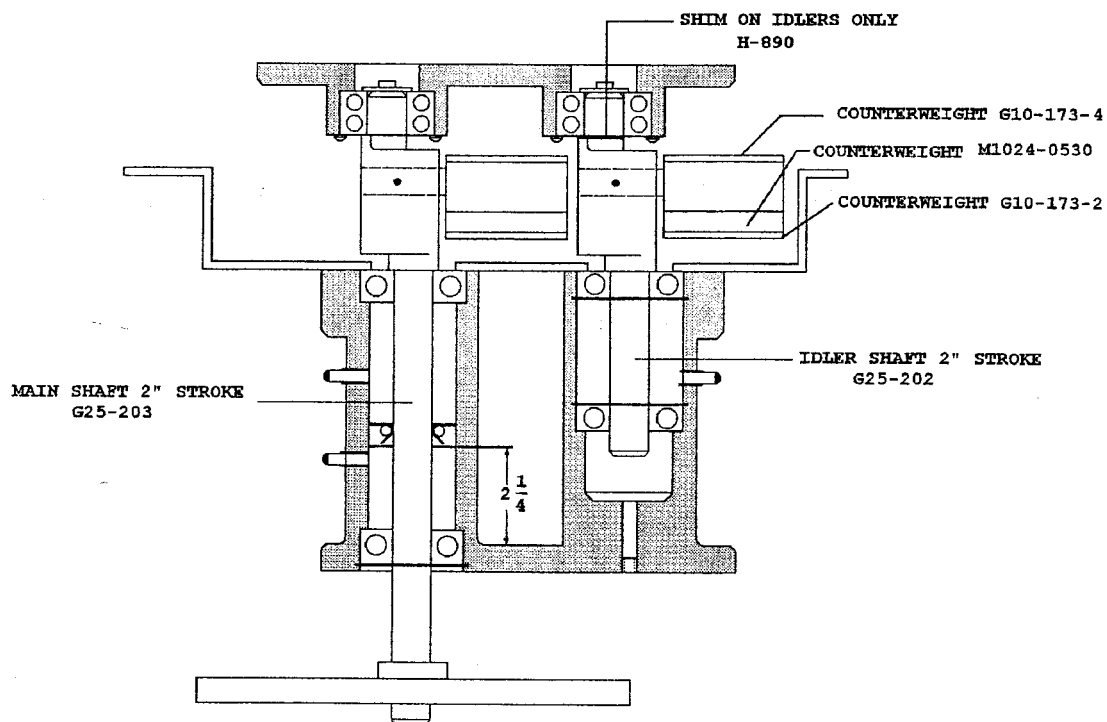




FIGURE 7

**2" Stroke
Supplement for 2" Stroke
Less than 2 Liter**

**This machine is equipped with 2" eccentrics.
It is recommended that the maximum
operational speed be limited to 300 RPM.**



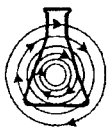


FIGURE 8

**2" Stroke
Supplement for 2" Stroke
2 Liter and Above**

**This machine is equipped with 2" eccentrics.
It is recommended that the maximum
operational speed be limited to 300 RPM.**

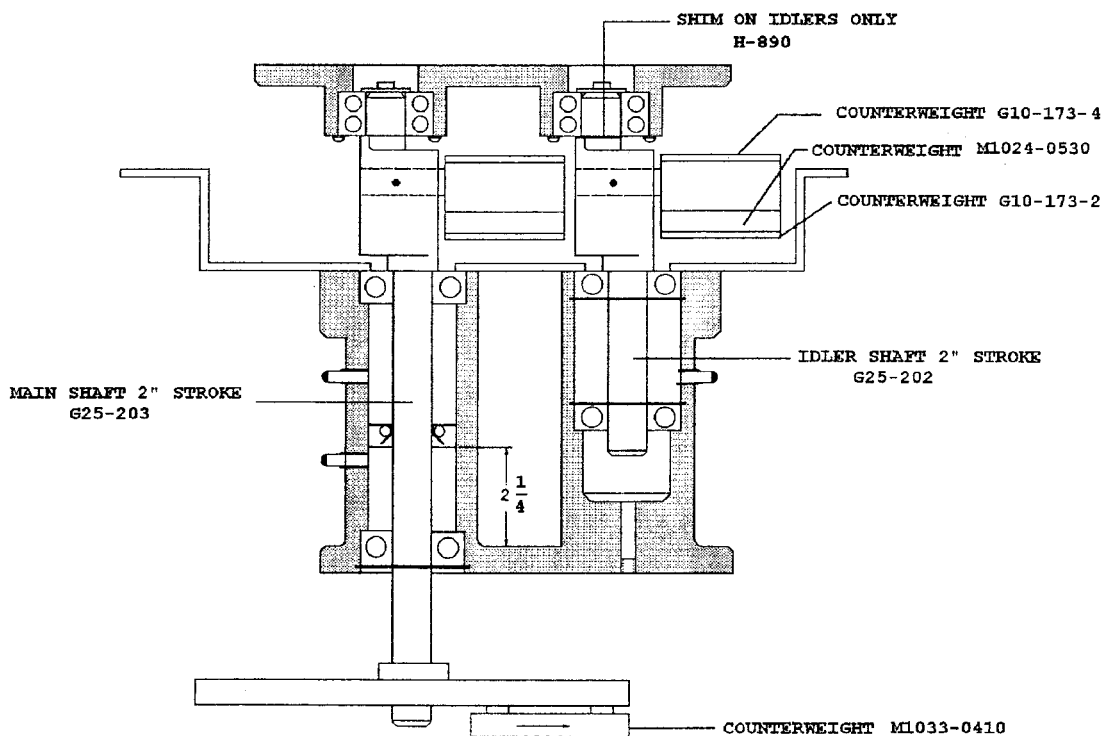
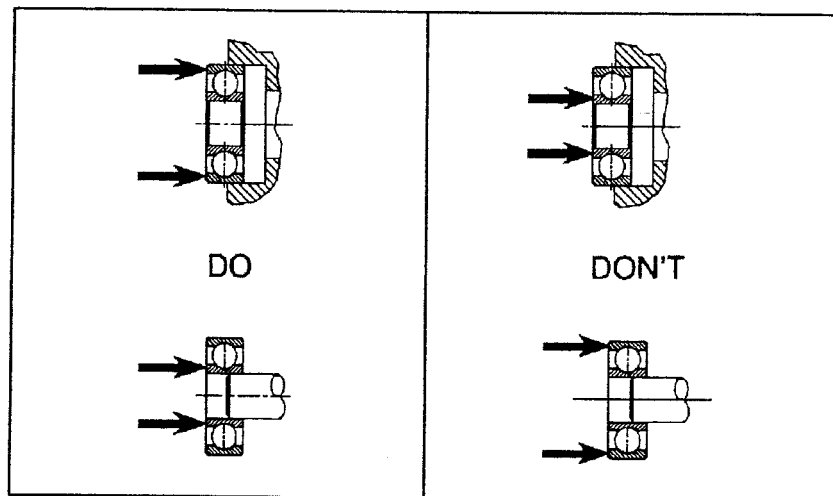




FIGURE 9

- Associated hardware such as shafts and housings must be designed with proper consideration for bearing mounting surface geometry and fits.
- Associated hardware and assembly tooling must be clean, free of burrs, and demagnetized before contacting bearings.
- Tooling should be designed to mount the bearings squarely onto the shaft and into the housing. Misalignment during installation can severely distort a bearing.
- Apply force only to the ring being press-fitted. Shock or impact techniques should never be used to seat a bearing.
- Tooling must be designed and used in a manner which will observe the basic assembly Do's and Don't's illustrated below.



Correct and Incorrect Bearing Mounting Practices

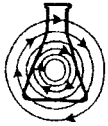


FIGURE 10

