Fridge-Freezer Combinations
Side by Side and Top Mount

KE 650-2-2T

KE 470-2-2T

Küppersbusch

THE HEART OF A GOOD KITCHEN

GB

Service Manual: H7-420-64-01

Responsible:	D. Rutz	KÜPPERSBUSCH HAUSGERÄTE AG
Tel.:	(0209) 401-733	Kundendienst
Fax:	(0209) 401-743	Postfach 100 132
Date:	21.08.2000	45801 Gelsenkirchen

Contents

Safety Precautions

This manual is to be used only by Küppersbusch authorised service technicians familiar with and knowledgeable of proper safety and servicing procedures and possessing high quality testing equipment associated with microwave, gas, and electrical appliance repair.

All individuals who attempt repairs by improper mean or adjustments subject themselves and others to the risk of serious or fatal injury.

Use only genuine Küppersbusch approved factory replacement components.

1. Introduction

This refrigeration service manual provides the information necessary to service Top Mount and Side-by-Side Fridge-Freezer combinations.

Note: All models covered in this Service Manual use R134a refrigerant.

Each part of this manual is divided into sections relating to a general group of components and each section is subdivided into various parts describing a particular component or service procedure.

This service manual is a valuable service tool and care should be taken to keep it up to date by prompt and proper filing of subsequent pages as they are issued.

The following models are covered in this service manual:

	KE 650-2-2T **Side-by-Side Model**	**KE 470-2-2T** **Top Mount Model**
W x H x D	915 x 1.815 x 713 mm incl. handle	710 x 1.739 x 786 mm incl. handle
Total capacity	603 l	474 l
Fridge area	402 l	339 l
Freezer area	201 l	135 l
Noise level	47 dB	48 dB
Energy consumption	1.9 kWh / 24 h	2.1 kWh / 24 h
Energy efficiency class	B	B
No-Frost-System	Yes	Yes
No-Clean-Condenser	Yes	Yes
Water inlet with Aquastop	Yes	retrofittable
Free-standing unit on rollers	Yes	Yes
Climazone technology	Yes	Yes

2. General Information

2.1 Instructions and Electrical Requirements

2.1.1 General Instructions

- A 230 volts 50 Hz, 13 ampere fused electrical supply is required. A separate socket (or individual spur) is recommended.
- Use only kitemarked extension cables.
- Before plugging in power cable for permanent installation or testing, follow earthing instructions in the “Earthing” Section.
- Electrical earth: 230 volts, 50 Hz.

2.1.2 Important Safety Precautions:

Personal Injury Hazard
To prevent unnecessary risk of fire, electrical shock or personal injury, all wiring and earthing must be done in accordance with IEE regulations and those of the local electricity supply company.
It is the personal responsibility and obligation of the appliance owner to provide adequate electrical service for this appliance.

Personal Injury Hazard
This appliance must be earthed.

2.1.3 Earthing Instructions

- This appliance is equipped with a mains cable with a 3-pin earthing plug. For your safety, this cable must be plugged into a wall socket which is properly wired, earthed and polarised.
- If a wall socket is not available, contact a qualified electrician to have one fitted. If in any doubt, speak to your electric company.

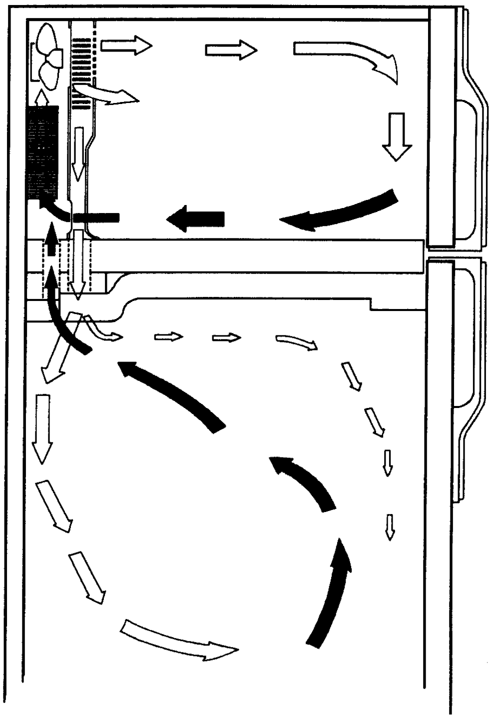
Personal Injury Hazard
Do not under any circumstances remove the grounding pin from the mains plug.

2.2 Forced Air Systems

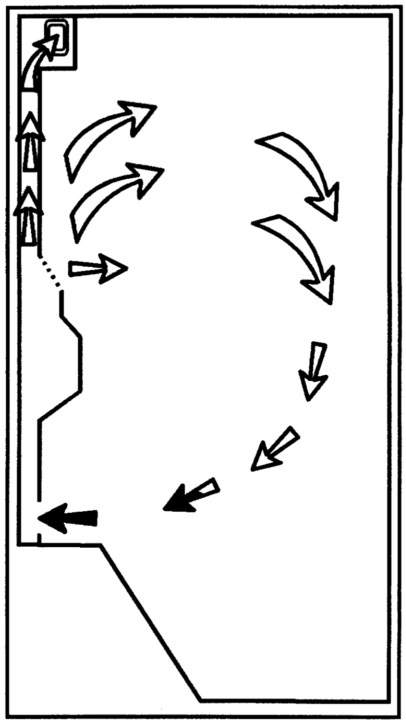
On all forced air models, an air circulating fan draws air from the evaporator and directs it to the fresh food and freezer compartments. A carefully measured amount of chilled air is directed into the fresh food compartment through a baffle to maintain the desired fresh food compartment temperature.

The greater part of chilled air is directed into the freezer compartment to maintain freezer temperature. Forced air models use a fan-cooled condenser.

The evaporator is automatically defrosted every eight or then hours of compressor run time depending on the model. Defrosting is accomplished by a defrost heater activated by a timer. The accumulated moisture is drained into a defrost pan located in the compressor area of the cabinet.



KE 470-2-2T
Air from around the evaporator



KE-650-2-2T
Air from across the evaporator

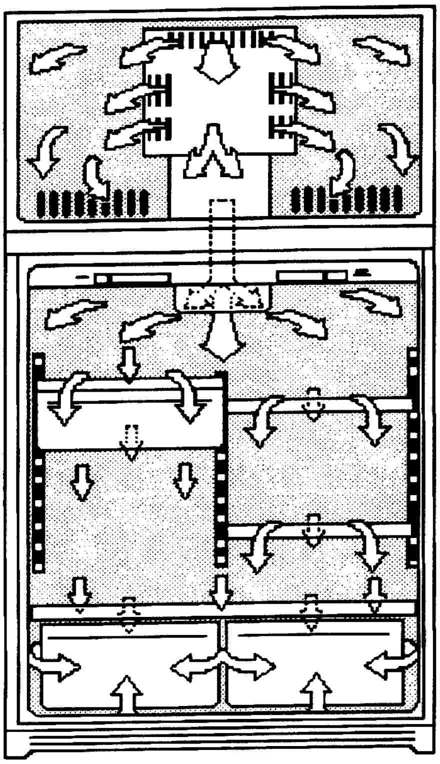
2.3 Air Flow-Forced Air Systems

The balance between air flow into the fresh food and freezer compartments is an important factor in maintaining proper compartment temperatures in a forced air refrigeration system.

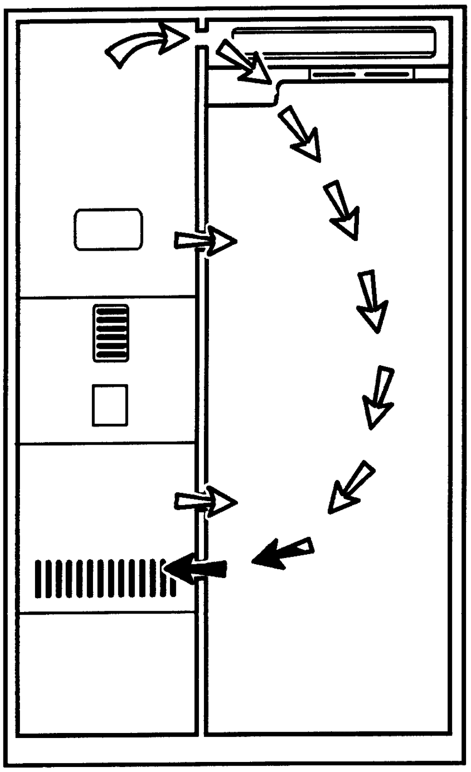
A baffle is used to regulate the amount of chilled air directed into the fresh food compartment. If a colder freezer compartment temperature is desired, the baffle is adjusted so that less air is directed into the fresh food compartment. This causes the compressor to run longer since the thermostat sensing element is located in the fresh food compartment.

Cold air is drawn through the fin and tube evaporator and into the fan. A portion of the air is deflected into the fresh food compartment where it absorbs heat and returns to the fin and tube evaporator through the return opening in the back centre of the fresh food, freezer divider.

Most of the air moving through the fin and tube evaporator, however, is blown through the freezer air tunnel and circulated throughout the freezer compartment and back across the fin and tube evaporator where it starts another cycle.



KE 470-2-2T
Cold air is drawn through the fin and tube evaporator and into the fan



KE-650-2-2T
Cold air is drawn across the evaporator and into the fan

2.4 Checking Operation

The following general information explains several methods for checking the operation of the refrigeration system. This information applies to all systems covered in this manual. The correct operation of a refrigeration systems is dependent upon the proper functioning of each of the parts comprising the system.
If the system does not operate properly (long run periods, warmer than normal temperatures), the trouble may be caused by one of the following conditions.

2.4.1 Restricted Capillary Tube

The opening of a capillary tube is about the same diameter as the period at the end of this sentence. This should indicate that it doesn't take much to restrict this tube. It should also tell you to use care when any service procedures involve moving or touching the capillary tube. A very slight kink can cause a complete restriction of the tube.

Restrictions of the capillary tube may be caused by:

1. moisture freeze-up,
2. foreign particles lodged in the tube, or
3. a bend or kink.

If the capillary tube is restricted, there will be a noticeable lack of frost on all of the cooling surface; the compressor may operate for a short period of time and cycle on the overload. Because some models can hold the entire charge in the condenser, the compressor may run continuously and definite vacuum will be noticed in the low side. When moisture freeze-up causes a restriction, it usually occurs at the outlet end of the capillary tube. Normally, frost build-up can be detected in this area. At the discharge end of the capillary apply heat.

Note: When using a heat gun or hair dryer, use low heat. Never use a naked flame.

If there is enough head pressure, and if the restriction is caused by moisture freeze-up, you will be able to hear a gurgling noise as the heat releases the refrigerant through the tubing.

It is possible that this moisture will be absorbed by the drier and remedy the trouble. However, if the freeze-up reoccurs, you must replace the drier.

A kink in the capillary tube will reveal about the same symptom as a moisture freeze-up except for the accumulation of frost.

Check the capillary tube in areas that are possible, and straighten the kink to relieve the restrictions.

Check the unit operation to see if you have helped the situation. If the trouble persists, replace the defective part. If the freeze-up condition does not exit and there is not a kink, you can assume that a foreign particle is causing the restrictions. The only remedy in this case is to replace the restricted part.

2.4.2 Partial Restriction In Low Side Tubing

Bent tubing, foreign matter, or moisture in the system may cause a partial restriction in the low side tubing. This is usually indicated by frost-free tubing between the restriction and the capillary tube and by frost-covered tubing between the restriction and the suction line.

The restriction acts like a second capillary tube, increasing the pressure ahead of it (warming) and decreasing the pressure beyond it (cooling). To confirm the existence of a restriction in the low side tubing, perform operational pressure checks.

2.4.3 Slow Leak In System

On forced air models, long run time will be noticed during the early stages of a leak. As the refrigerant continues to escape, both compartments will gradually warm up and the compressor will run continuously. The freezer will probably warm up first.

2.4.4 Incorrect Refrigerant Change

The sealed unit may have too much refrigerant (overcharged system) or too little refrigerant (undercharged system). The paragraphs below will inform you how to recognise a system with these defects.

An overcharged system may have a frost back condition appearing outside the insulation sleeve on the suction line at the cabinet rear. When the compressor stops, the frost melts and drips on the floor. A heat exchanger separation will also cause this symptom.

An undercharged system, depending on the degree of undercharge, will operate with temperatures above normal and the compressor run time will be increased. The greater the undercharge, the higher the temperature will be and the longer the run time.

An undercharged system must be purged, evacuated, and recharged with the proper amount of refrigerant. Before recharging, however, test for refrigerator leaks.

2.5 Tools Needed For R134a Sealed System Repair

The following list may help identify basic refrigeration tools needed for repair and maintenance of the Fridge-Freezer Combinations:

- **Use standard tool kit for refrigerators**
- **Leak detector**

  Leak detectors compatible with R134a should be used. Due to the possibility of contaminating the sealed system with moisture, using soap bubbles can cause problems, especially if drawn into a low side leak. To minimise the possibility of moisture entering the system, the use of wet rags or towels to cool a brazed joint should be avoided.
- **Dryers / Filters**

  Any time a sealed system repair is made, the drier must be replaced.

  The drier on R134a systems is different, using a new desiccant, which provides system compatibility and proper moisture absorption. Use of the old type drier on new R134a systems would result in repeated failure of the sealed system. Spare-part number 178456 is the drier which must be used on R134a systems.

2.6 Other Important Information

Always wear eye protection and protective clothing when handling any refrigerants.

2.6.1 Limit time of exposure to the atmosphere

Whenever a sealed system is repaired, do not expose an open line to the atmosphere for more than 15 minutes. Replacement components will come sealed by either brazing (drier) or plugs (compressor).

Do not open the new drier to the atmosphere until you are ready to braze it into place. Before installing a new compressor, pull a plug to be sure the unit is still pressurised. If no pressure, do not use the compressor. If pressure exists, reinstall the plug to ensure non-contamination during the service procedure.

2.6.2 Low side leaks

In the event of a low side leak, moisture has probably been drawn into the system. The compressor must be replaced in addition to the normal repair. Also, a system flush must be made before proceeding with the sweep charge and final charge.

2.6.3 Plugged capillary tube

Moisture or other contaminants in the R134a system can cause the formation of gel-like or salt-type deposits within the system. This causes capillary tube restrictions, which may not be removed by the flush procedure detailed later. If the restriction cannot be removed from the capillary tube, the heat exchanger, evaporator and compressor must be replaced.

2.6.4 System flush

Flushing of the system is required whenever there has been a low side leak, plugged capillary tube or compressor replacement. This is a procedure in which R134a refrigerant is flushed through the system and into the recovery system to remove moisture and non-condensables which may have entered the open system.

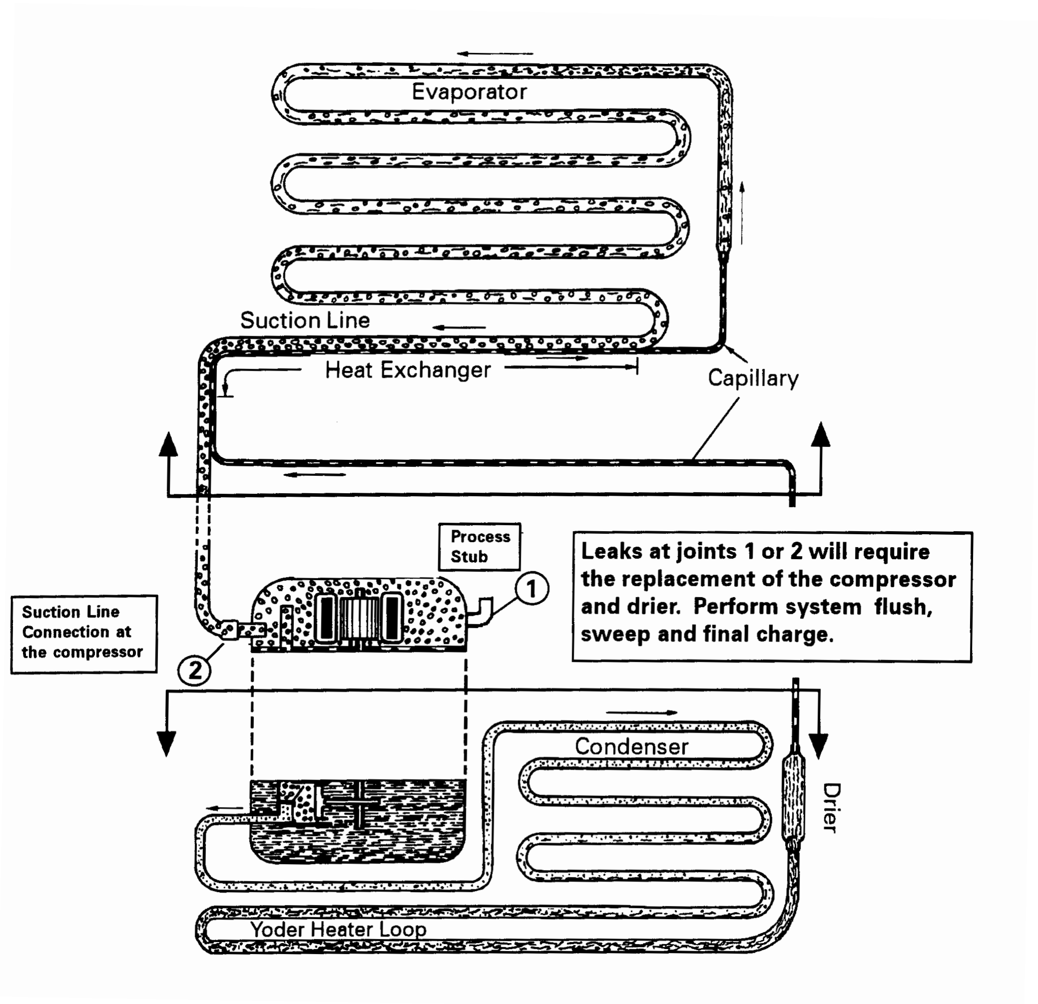
The compressor must be isolated during the flush procedure, in order to prevent contaminants from being absorbed into the ester oil, resulting in a contaminated system.

The system flush procedure will be done in two parts. First, the condenser, including the yoder loop, will be isolated by means of process tube adapters and flushed with 115g of R134a. After the drier has been replaced, the entire sealed system minus the compressor will be flushed, also with 4115g of the refrigerant.

This second step can take about 15 minutes in order to circulate the refrigerant through the condenser, the drier, the capillary tube, the evaporator and out the suction line into the recovery equipment. During this 15 minutes, the old compressor can be removed and the new one placed into position, mounted and prepared electrically. The compressor is totally installed except for the final brazing of the suction and discharge lines.

2.7 R134a Sealed System Service Procedure

Any sealed system failure in the upper area indicated requires the replacement of the evaporator, heat exchanger, drier and compressor. Perform system flush, sweep and add final charge according to procedure shown.



Leaks or repairs to joints or components in the lower area require repair or replacement of the component and drier. Perform system sweep and add final charge according to normal procedure.

3. Refrigeration System

3.1 Test

All refrigerators cool by removing heat from the cabinet rather than pumping in cool air. In a conventional refrigerator, liquid refrigerant enters the evaporator and vaporises (boils) due to the low pressure, creating a very cold surface which removes heat from inside the cabinet.
This causes the refrigerant to boil (evaporate) into a vapour state and be drawn into the compressor.
The compressor pressurises the vapour and pumps it into the condenser. The hot vapour in the condenser gives off heat into the room. As the vapour cools, it condenses back into a liquid and returns to the evaporator to start the process over again. The system continually soaks up the heat inside the refrigerator and deposits the heat back into the room.

3.2 The Compressor

of the refrigeration system serves two purposes: it ensures movement of the refrigerant throughout the system and it increases the pressure and temperature of the vapour received from the suction line and pumps the refrigerant into the discharge line. The condenser receives this high temperature, high-pressure refrigerant and allows the heat to be released into the cooler surroundings. This heat removal “condenses” the refrigerant vapour into a liquid.

3.3 The Yoder Loop

is the last pass of the condenser routed around the cabinet of the freezer to help prevent moisture formation.

3.4 The Drier

is installed at the end of the condenser or yoder loop to capture moisture that may be present in the system.

3.5 The Capillary Tube

meters the flow of refrigerant and creates a pressure drop. Size and length of the capillary is critical to the efficiency of the system.

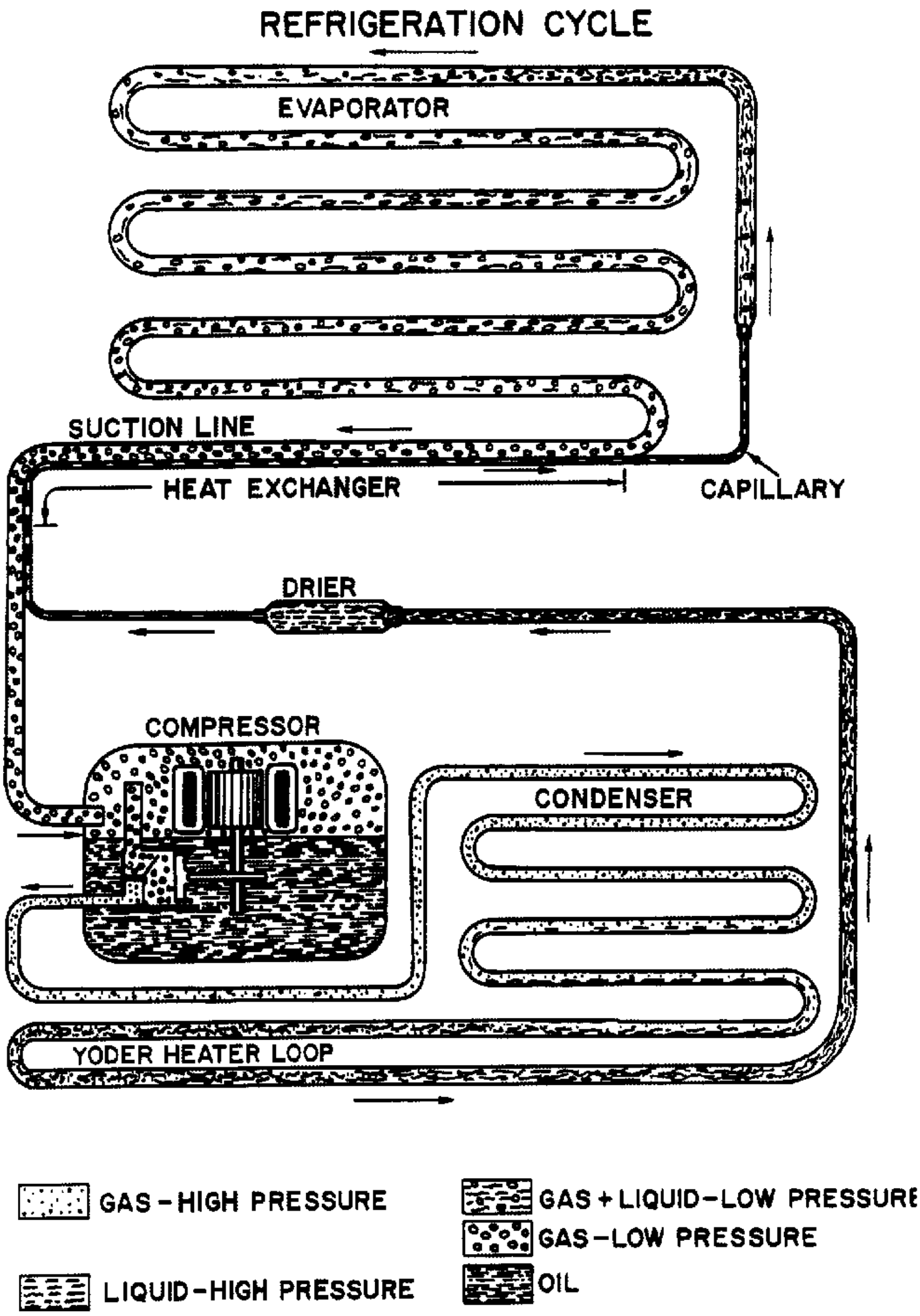
As the refrigerant leaves the capillary tube and enters the larger tubing of the evaporator, the sudden increase in tubing diameter and the pumping action of the compressor from a low pressure area and the temperature of the refrigerant drops rapidly as it changes to a mixture of liquid and vapour. In the process of passing through the evaporator, the refrigerant absorbs heat from the storage area and is gradually changed from a liquid and vapour mixture (saturated refrigerant) into a vapour.

3.6 The Suction Line

returns this low pressure vapour from the evaporator back to the compressor, and the cycle starts again.

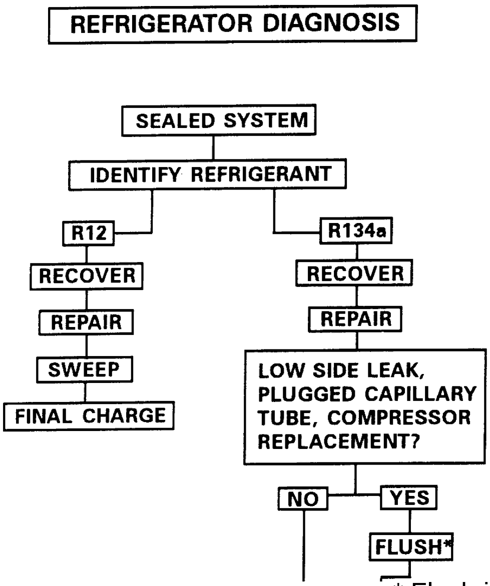
3.7 The Heat Exchanger

Part of the capillary tube is soldered to the suction line which forms the heat exchanger. Heat from the capillary tube is thus transferred to the suction line to superheat the refrigerant there and at the same time this further cools the liquid in the capillary tube. This cools the refrigerant before it enters the evaporator and also heats the refrigerant before it enters the compressor to ensure a vapour state.



4. Diagnosis

Sealed system diagnosis of R134a refrigerant systems is to be performed identically to that of R12 systems. In fact, as shown in the following flow chart, the service procedures are virtually the same, except for low side leaks, plugged capillary tube or compressor failure which results in a system flush.



* Flush includes compressor replacement

Remember, before entering the sealed system, all other systems must be tested and properly repaired. These include the electrical system, defrost system, control operation, and air flow systems: evaporator and condenser motors.

Before “turning a screwdriver”, many checks can be made simply by using your senses:

LISTEN:

- What is the customer complaint?
- Are the fans operating?
- Is the compressor operating?

LOOK:

- Are ice cubes present?
- Is the light on/off when the switch is operated?
- Are the controls set properly?
- Do door gaskets seal properly?
- Is there an ice build-up on the evaporator cover?
- Are the return air ducts free of ice?

TOUCH:

- Is the evaporator cover warm?
- Is air felt exhausting from the kick plate?
- Is air circulating in the freezer and fresh food compartments?
- Is the quarter inch discharge line from the compressor hot?
- Is the condenser warm?

4.1 Sealed System Diagnosis

Once it has been determined that the other refrigerator systems are working properly, a probable sealed system problem can be confirmed through the use of a wattmeter and checks of low and high side pressures.

Access valves are not to be left on a sealed system after service.

To measure low side pressure, a temporary access valve can be installed on the compressor process tube. To remove the valve after repair, a pinch off tool may be used to seal the tube while the valve is removed and the hole brazed shut.

To check high side pressure, a temporary access valve should be installed on the discharge line. When the high side valve is installed, the technician is committed to replacement of the drier and a sealed system repair. Once again, this valve must be removed upon completion of repair.

Make sure that the gauges which are used to check the operating pressures are accurately calibrated. When not connected to a system, the gauge pointer should indicate zero pressure. If necessary, turn the calibrating screw until the pointer is at “0”.

Note: The following situations are typical. However, other factors such as gauge placement, line voltage and ambient temperature must also be considered.

The following symptoms use high and low side pressures plus wattage measurements to diagnose sealed system problems. Normal low side pressure will range from below 0 – 0,4 Bar ≅ -25°C – -38°C, depending on several factors such as refrigerator model, ambient temperature, load and customer usage. Normal high side pressure is also dependent on external factors but will be in the 7,0 – 8,0 Bar ≅ -30°C – -40°C range. Wattage and pressure figures will vary based on the model and age of the refrigerator.

Refer to the performance data table(s) at the end of this manual.

Symptoms:

High Side	-	Near normal pressure
Low Side	-	Slightly lower pressure
Wattage	-	Lower than normal

Diagnosis: Low side restriction.

The evaporator, suction line or other low side tubing is probably restricted (kinked or blocked with a foreign article such as moisture or contaminant). This condition is usually accompanied by a frost build up on the low side of the restriction. High side pressure will take longer to balance with the low side pressure when the compressor is stopped.

Symptoms:

High Side - Lower than normal

Low Side - Slightly lower than normal

Wattage - Lower than normal

Diagnosis: high side leak

Both high and low side pressures will drop as more refrigerant escapes.

Symptoms:

High Side - Higher than normal

Low Side - Slightly lower than normal

Wattage - Higher than normal

Diagnosis: low side leak

High side pressure will continually increase since air is being drawn into the system through the leak and becomes trapped in the high side tubing. The low side may show a slight increase in pressure because of the air being drawn in through the leak.

Symptoms:

High Side - Lower than normal

Low Side - In a vacuum

Wattage - Lower than normal

Diagnosis: capillary tube restriction

High side pressure will take much longer (or not at all) to equalise with the low side pressure when the compressor is stopped.

Symptoms:

High Side - Higher than normal

Low Side - Higher than normal

Wattage - Higher than normal

Diagnosis: overcharged system

The extent of the pressure increase depends on the amount of overcharge and ambient temperature. An overcharge may also cause the suction line to be frosted during the run cycle, resulting in water on the floor after cycling off.

Symptoms:

High Side - Lower than normal

Low Side - Higher than normal

Wattage - Lower than normal

Diagnosis: inefficient compressor

Cooling surfaces may be covered with a thin film of frost, but the temperature will not descend to cut-off temperature of the control, even with continuous running. Also, the condenser will be noticeably cooler to the touch than normal. Once there is confirmation that a compressor is inefficient, the compressor should be replaced.

Symptoms:

High Side - Normal

Low Side - Normal to slightly higher than normal-suction line possibly sweats

Wattage - Normal

Diagnosis: separated capillary tube

The capillary tube must be connected to the suction line to provide proper heat transfer. Without this transfer, liquid refrigerant in the capillary tube enters the evaporator at a slightly higher temperature, thereby lessening the ability to remove heat from inside the refrigerator.

The customer complaint would be long run time, slow ice production, warmer fresh food temperature, in general, poor overall performance.

Another symptom of a separated capillary tube could be moisture on the floor behind the refrigerator. The heat from the capillary tube is utilised by the suction line to ensure that vapour rather than liquid refrigerant is returned to the compressor. If liquid is present in the suction line, frost or moisture forms on the outside of the line and eventually drips to the floor.

4.2 Leak Testing

Once it has been determined through proper diagnosis that a leak is present in the sealed system, attempt to find the leak before opening the system if possible. To check the high side for leaks, be sure that the compressor is running.

During run time the high side pressure is greater. To increase the pressure slightly, stop the condenser fan blade or block the air flow through the condenser. To check the low side for leaks, stop the compressor.

During off times, the low side pressure will increase to equalise with the high side. By warming the evaporator, this pressure will increase. If too much refrigerant has leaked out to create enough pressure to locate the leak, add 112 g of the proper refrigerant to the system and proceed with the test procedure.

The presence of oil around a tubing joint usually indicates a leak. Care must still be taken to pinpoint the exact location. Remember that a leak detector compatible with R134a refrigerant must be used.

A sealed system component, such as the evaporator or yoder loop, should not be condemned unless a non-repairable leak is confirmed. This should be determined by either locating the actual leak or by isolating the component from the rest of the system and determining if it holds pressurisation or a vacuum - whichever method is chosen.

5. Components

5.1 Drier

Whenever the sealed system is entered, the drier must be replaced. The drier is stamped with an arrow which indicates the direction of refrigerant flow.

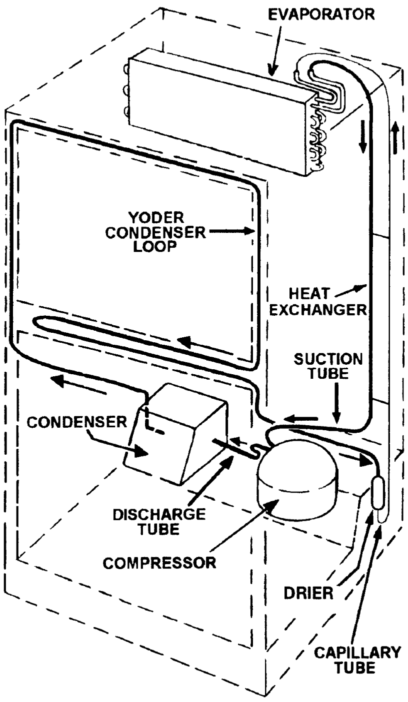
The drier inlet has two lines - one connects to the yoder loop and the other will be used as a process tube through which the system sweep and final charge will be made.

The drier outlet will be connected to the capillary tube. Care should be taken to ensure that that the capillary is not inserted too far into the drier to make contact with its internal screen, yet in far enough to prevent restricting the small diameter capillary tube opening with the solder alloy.

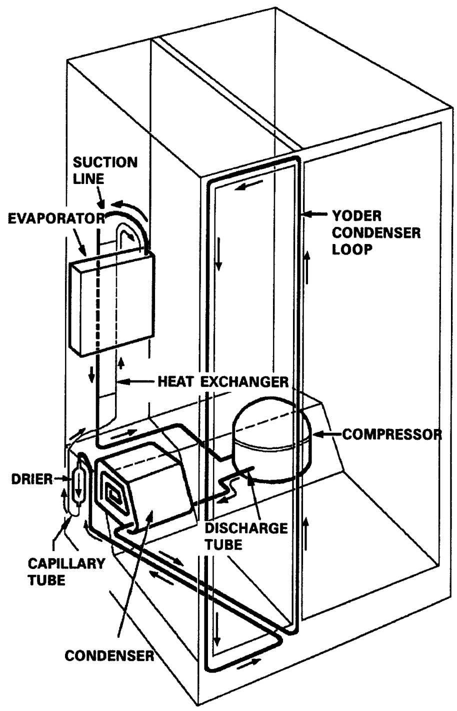
5.2 Condenser

The condenser is a long folded tube which receives the hot, high pressure vapour from the compressor. While the most common problem is keeping the condenser clean from lint and dirt build-up, which prevents proper airflow and the required transfer of the heat to the surroundings, it is possible that, due to an unrepairable leak or a non-removable restriction, the condenser could require replacement.

As with any R134a sealed system repair, the key to success is the limiting of the time of atmospheric exposure. Do not remove the plugs on the condenser inlet and outlet tubes until the new condenser is mounted in place and made ready for brazing. The inlet side will connect to the compressor discharge line and the outlet to the yoder loop.



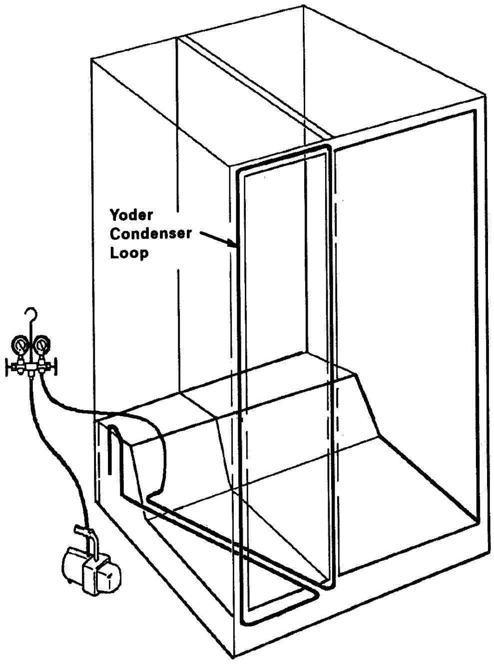
KE 470-2-2T



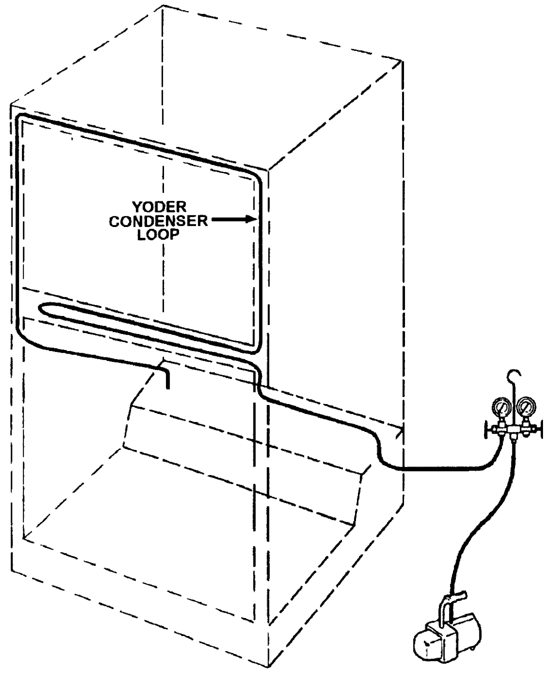
KE-650-2-2T

5.3 Yoder Loop

The yoder loop is a non-replaceable component of the sealed system routed within the walls of the cabinet. To diagnose the yoder loop, the tubing must be isolated from the sealed system. This procedure is shown below. If the loop fails to hold the vacuum, a heater repair assembly is to be installed and the loop bypassed by connecting the condenser outlet tube directly to the inlet of the drier.



KE 470-2-2T



KE-650-2-2T

5.3.1 Yoder Loop Diagnostic Test

1. Isolate yoder loop from remainder of sealed system.
2. Cap or seal one end of the loop (braze or use process adapter and cap).
3. Attach process adapter to open end of loop.
4. Attach compound gauge and vacuum pump to the loop.
5. Pull a vacuum and close valve to test for leak in the loop.
6. If unit holds a vacuum, no leak is indicated. Reconnect the yoder loop to the system, replace the system to specifications.

A vacuum will be maintained if the system is good.

5.4 Evaporator

The evaporator is a long aluminium tube folded or coiled within the freezer compartment. If a leak is present in the evaporator, it is not repairable and must be replaced. On R134 A system, whenever the evaporator is replaced, the heat exchanger must also be replaced as well as the compressor.

The replacement evaporator will come with the heat exchanger attached. Leave the caps in place on the opposite end of the heat exchanger. Again, whenever the evaporator and heat exchanger are replaced on R134A units, the compressor must also be replaced and the sealed system flushed.

Do not connect the suction line to the replacement compressor unit until the system has been flushed (see System Flush Procedure).

After mounting the evaporator in place, connect the capillary tube of the heat exchanger to the replacement drier.

5.5 Heat Exchanger

The heat exchanger is composed of the capillary tube and suction line soldered together. The heat exchanger should be replaced if there is a non-repairable leak, plugged capillary, more than 75 mm have been removed from the capillary or the capillary tube separates from the suction line. If the heat exchanger is replaced, the evaporator must also be replaced as well as the compressor.

5.6 Compressor

The compressor is the “heart” of the refrigerator, consisting of an electrical motor and a “pump” sealed inside a steel case. The compressor used on R134A refrigerant systems is virtually the same in external appearance as the compressor used with R12 refrigerants. However, due to changes in lubricants and other internal differences, the compressors are **not** to be interchanged, otherwise system failure will result. Diagnostic procedures will be the same as with the R12 refrigerant systems, except that the high side pressure will be slightly lower.

If a new compressor is to be installed, pull one of the plugs to ensure that is properly pressurised. If no pressure is observed, do not use the compressor. If unit is pressurised, reinstall the plug and keep the compressor sealed until it is installed and ready for solder connections. Whenever the compressor is replaced on a R134A refrigerator, the sealed system must be flushed (see System Flush Procedure).

5.7 System Flush Procedure

Before accessing the sealed system, it is necessary to determine that the problem is actually a sealed system problem by utilising a wattmeter, thermometer, visual and touch indicators. Once it has been determined that the problem is in the sealed system, and diagnosis indicates a low side leak, plugged capillary tube, or a defective compressor, in addition to the normal repair, the system must be flushed and the compressor **must** be replaced.

5.7.1 Isolate and flush the Condenser

a Score and break the discharge line at a convenient location to which the replacement compressor tubing can be connected later.

b Attach a process tube adapter to the condenser side of this break.

c Connect a quick coupler hand valve to the process adapter.

d Connect the hose from the charging cylinder to this valve (refer to figure 1). This connection will remain in place throughout the flush procedure in Step 3.

NOTE: Due to the extra flushing and sweep charge procedures, about 340 g of R134A refrigerant should be added to the original charge specified on the model/serial plate and loaded into the charging cylinder initially.

e Next, score and break the tube at the yoder loop to the input side of the drier.

f Attach a process tube adapter to the condenser side of this break.

g Connect a quick coupler hand valve to this process adapter.

h Connect the hose from the recovery equipment to this valve (figure A). Use the heater on the charging cylinder to ensure that the cylinder pressure is approximately 2 Bar above ambient room temperature. For example, if room temperature is 21 °C, cylinder pressure should be 7 Bar.

i Start the recovery system and open the valve at the process adapter attached to the yoder loop.

j Open the valve from the charging cylinder and allow 113 g. of R134A to flow through the condenser and into the recovery system. This process should take about two minutes.

k Keep the process adapters and hoses attached at this time.

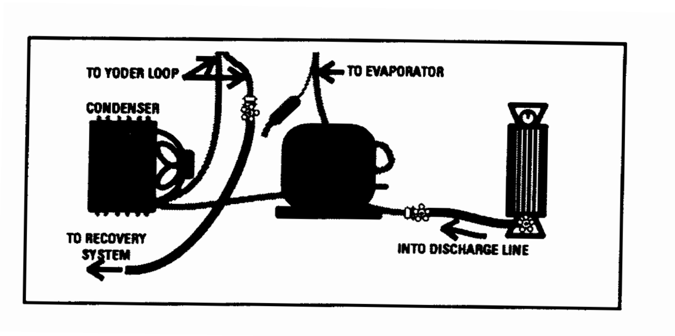


Figure A

Flush into discharge line, through hi-side and out the yoder loop at drier inlet.

5.7.2 Replace the drier

a Score and break either one of the two inlet lines on the new drier (the other line will remain sealed until the sweep charge, at which time it will be process tube).

b Prepare the drier outlet side for connection to the capillary tube. The capillary tube should be inserted about 2 cm into the drier to prevent solder alloy from plugging the capillary tube extending too far into the drier and contacting the screen. To facilitate the installation, place a slight bend in the capillary tube about 3/4 inch from the end and insert into the drier.

c Remove the process tube adapter from the yoder outlet and prepare the tube for connection to the drier inlet. The drier inlet joint will be the only copper-to-steel connection requiring the silver solder and flux. To help prevent flux from entering the system, first insert the line from the yoder loop into the drier inlet, then apply the flux.

d Braze both the inlet and the outlet joints of the replacement drier.

5.7.3 Isolate and flush the remainder of the system

a Score and break the suction line close enough to the old compressor to be able to reconnect it to the replacement compressor later.

b Attach a process tube adapter to the evaporator side of the suction line.

c Connect the hand valve and hose from the recovery equipment to this adapter (figure B). Be certain that the pressure in the charging cylinder is about 2 Bar above ambient temperature.

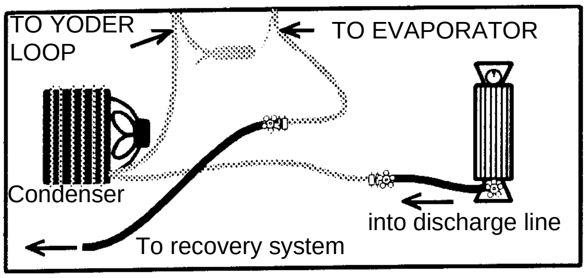


Figure B
Flush the entire system (less compressor) out the suction line

d Start the recovery unit and open the hand valve to the suction line.

e Release 113 g. of R134a from the charging cylinder into the system. It will take about 15 minutes for the refrigerant to pass through the condenser, yoder loop, drier, capillary tube, evaporator, suction line and into the recovery system. This 15 minutes can be utilised to remove the old compressor (figure C) and prepare the new compressor by mounting into place and wiring electrically. Remember to leave the plugs in place until brazing (refer to figure D).

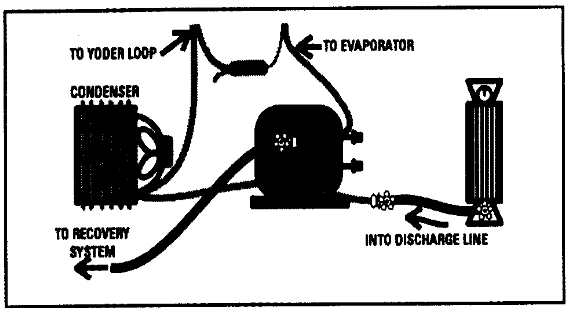


Figure C

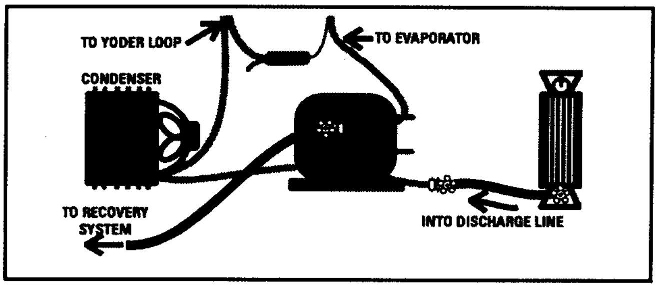


Figure D

During final flush, remove old compressor, and install replacement compressor; leave plugs in place until brazing.

5.7.4 Complete Compressor Replacement

a Close the valves to the recovery system.

b Remove process tube adapters from both the suction and discharge lines.

c Connect and braze suction and discharge lines to the replacement compressor (fig. E). You are now ready to add the temporary piercing valve to the drier process line and proceed with the sweep and final charging system.

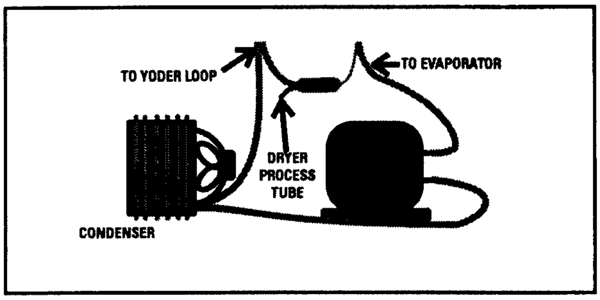


Figure E
Flush complete - ready for sweep charge.

In order to prevent sealed system contamination, the time of atmospheric exposure must be limited to 15 minutes.

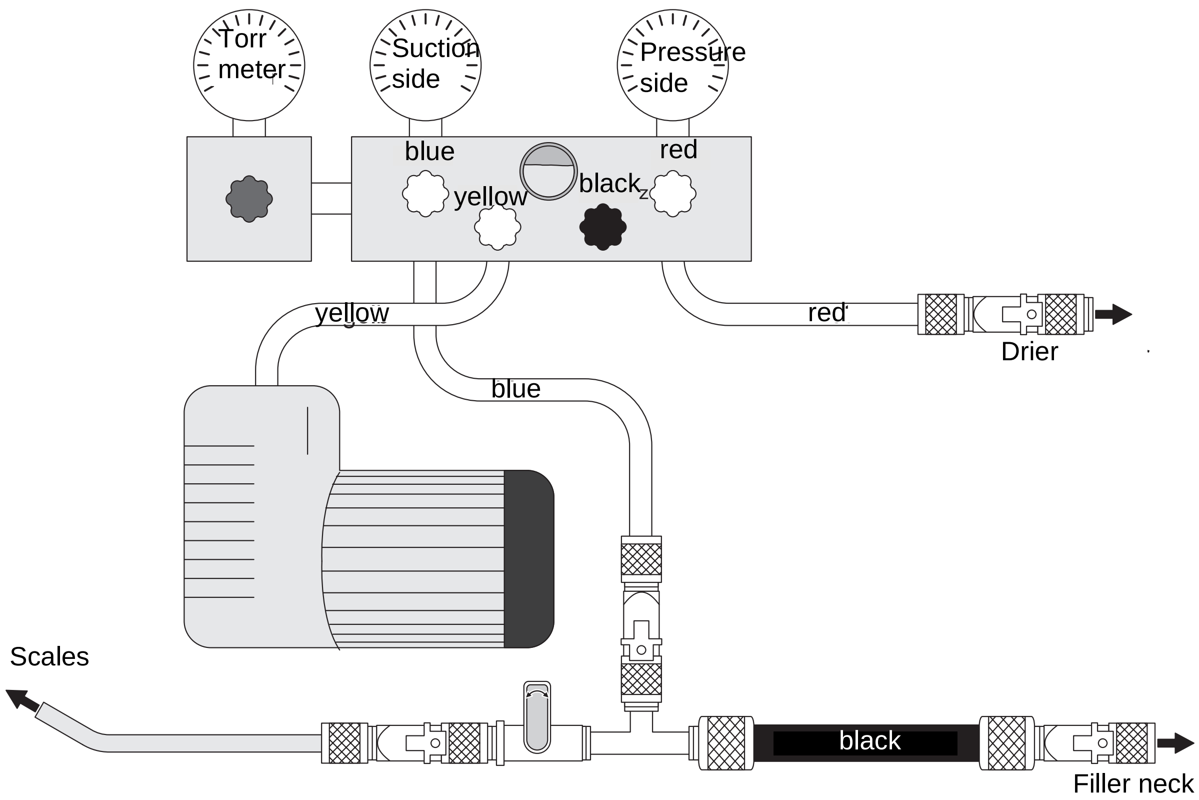
Do not pull the plugs from the new compressor until you are ready to make the connections.

5.8 Sweep and Final Charge

Sweeping removes air and moisture from the system. It also enables serious leaks to be detected.

Make the following connections. (Example: Revco unit (see illustration) – the same principle apply to other units):

- Pressure connector (red) with quick coupler onto the Schrader valve of the drier.
- Suction connector (blue) with quick coupler onto the T-piece of the Lokring filling system.
- Connect a short piece of tubing from the straight outlet of the T-piece with the quick coupler to the filler neck on the compressor.
- Connect the filler tube to the side of the T-piece with the ball valve.
- Close all valves!
- Switch on the vacuum pump and open each valve in turn. Carefully open the Torrmeter valve last.
- Sweep for approx.10 to 20 minutes.
- Close all valves. Do not forget to close the ball valve!
- Remove the quick coupler from drier and T-piece.
- Charge the unit with the recommended amount of refrigerant.
- Check the suction side for leaks.
- Switch on the compressor and check the pressure side for leaks.



5.9 Summary – Repairing the sealed system

1. Collect any refrigerant which may still be in the system.
2. Repair the low side leak or replace the evaporator/ heat exchanger. If the entire low side section is to be replaced, only braze the suction line on the replacement compressor after completing the flushing procedure (step 3).
3. Proceed with the flushing procedure and exchange the compressor.
4. When flushing is finished, sweep and charge in the usual way.

6. Special Components

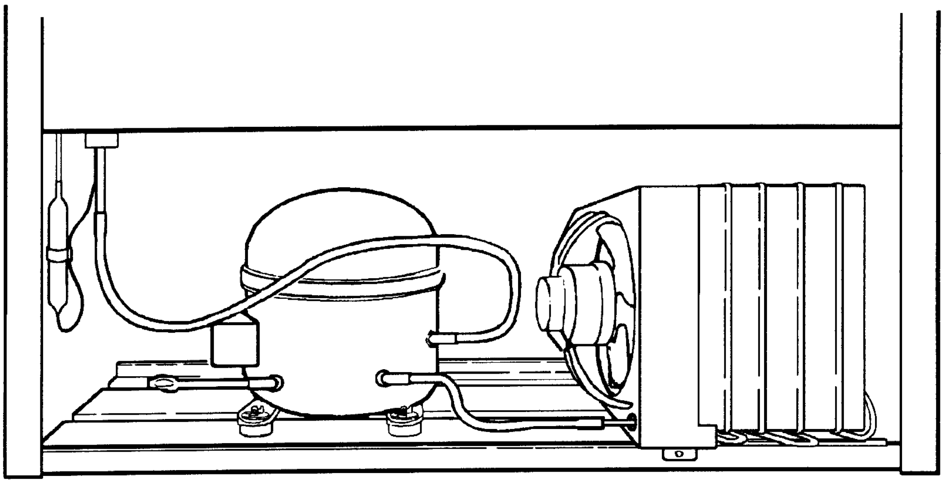
6.1 Replacing the Compressor

The following general information explains how to successfully replace compressors for any model covered in this manual.

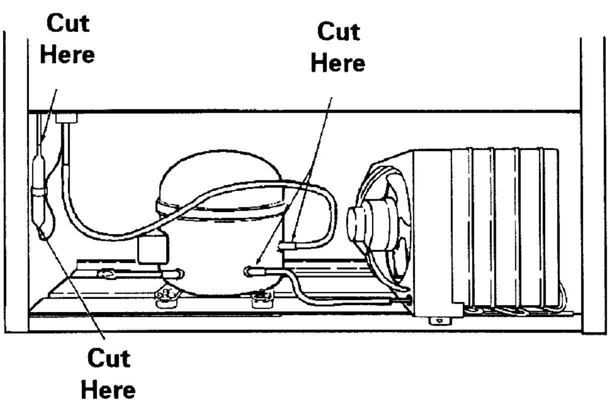
All replacement compressors are charged with the correct amount of oil and a holding charge of dry nitrogen.

The holding charge is your assurance that the compressor is dry and ready to install. If you receive a replacement compressor that shows no evidence of holding charge when you centre the lines or remove the plugs, return it.

Note: A new drier must be installed each time any component of the system is opened or replaced.



1. **Disconnect the unit from the power source.**
2. Locate defective compressor and evacuate the sealed system (see Sweep Charging and Refrigerant Recovery).
3. Clean and cut the refrigerant lines as close as possible to the compressor stubs, leaving enough length to install the replacement compressor.



Küppersbusch
THE HEART OF A GOOD KITCHEN

4. Disconnect lead wires from compressor terminals.
5. Remove the retaining clips from the compressor mounts. Remove defective compressor from cabinet and install rubber grommets on replacement compressor.
6. Clean the compressor stubs with an abrasive cloth such as grid No. 23. Do not open the compressor stubs.
7. Install the replacement compressor using the mounting clips previously removed.
8. Connect the compressor leads.
9. Solder a short piece of tubing the process tube (approximately 6 inches long). Connect the refrigerant tubing to the compressor stubs using silfos on copper to copper joints and silver solder and flux on steel to copper joints.

Locate and remove old drier. Install new drier. The new drier is installed in the following manner:

a Carefully bend the old drier and tubing away from electrical parts.

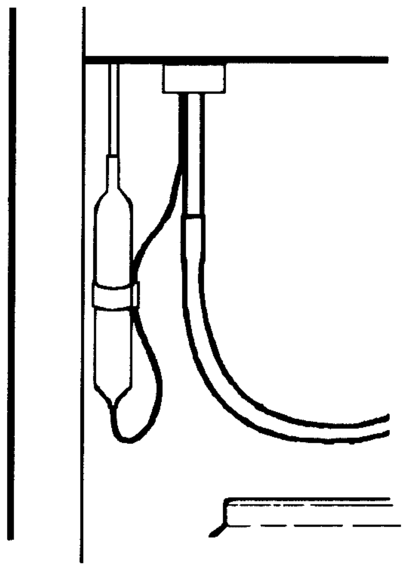
b Use steel wool or fine emery paper to clean the capillary tube 7.5 cm from the original joint. Also, clean the input tubing to the drier of 7.5 cm from the original joint.

c Use steel wool or fine emery paper to clean both ends of the new drier. Use a knife or file to score the capillary tube 1 inch from the original joint. Use your finger to break the connection.

d Make an offset 2.5 cm from the end of the cap tube to prevent it from penetrating too far into the drier.

e Cut the inlet tube of the replacement drier and use pliers to snap off the scored end.

f Install the new drier using silver solder with the proper flux at the Yoder tube to drier joint. Use silfos at the drier to capillary tube joint.

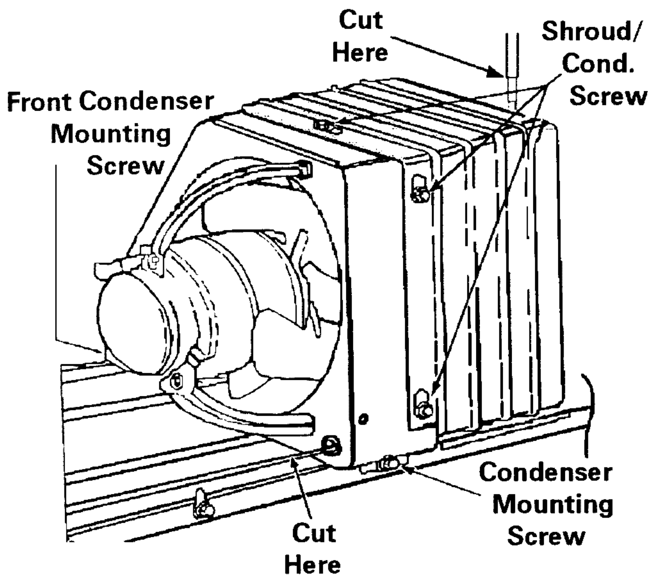


10. Evacuate, recharge and leak test the system.
11. Test run the unit to check operation.
12. Replace the machine compartment cover.

6.2 Replacing the Condenser

The following general information explains how to successfully replace the condenser for any model covered in this manual.

1. Disconnect the unit from the power source.
2. Remove all loose items from the refrigerator interior.
3. Working at the back of the cabinet, remove the cover from the machine compartment. It is necessary to reinstall this cover after the job is completed.
4. Using a sponge, remove any drain water from the defrost pan.
5. With assistance, tilt the cabinet back and remove the front condenser mounting screw.



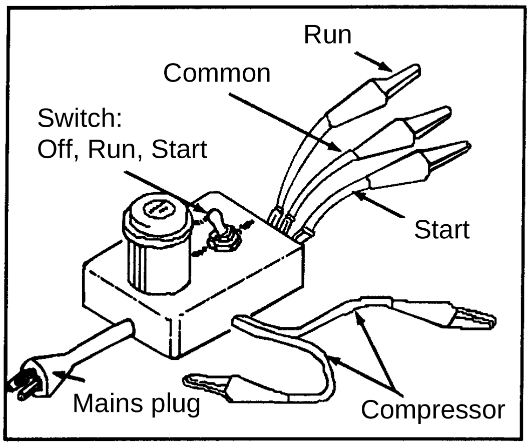
6. With assistance, return cabinet to upright position. Remove the back condenser mounting screw.
7. Disconnect the fan motor wire lead connector.
8. Use steel wool or fine emery paper to clean both the inlet and outlet end of the new condenser.
9. Evacuate the sealed system. (see Sweep Charging and Refrigerant Recovery).
10. Clean and then cut the inlet and the outlet tube of the old condenser.
11. Remove the condenser assembly from the compressor mounting pan and place it on a workable surface.
12. Remove the shroud/condenser screws which secure the fan motor shroud to the condenser.
13. Transfer all clips to the replacement condenser. Make sure the condenser tubing goes through the rubber sleeve on the fan motor shroud. Install the mounting screws.
14. Place the replacement condenser on the compressor mounting pan and install both front and rear condenser mounting screws.
15. Clean then connect the discharge line to the inner tubing. Clean again and connect the Yoder loop to the outer tubing of the condenser.

16. Solder all joints. Silver solder and proper flux and proper flux should be used on copper to steel or steel to steel joints. Excess flux should be wiped off all tubing.
17. Remove and replace the old drier. Do not allow more than ½" of the cap tube to penetrate the drier.
18. Install the new drier using silver solder with the proper flux.
19. Visually check the joints for leaks.
20. Connect the fan motor wire connector.
21. Evacuate and recharge the system.
22. Test for leaks.
23. Install the machine compartment cover.
24. Test run the refrigerator to make sure it is operating properly.

6.3 Electrical System

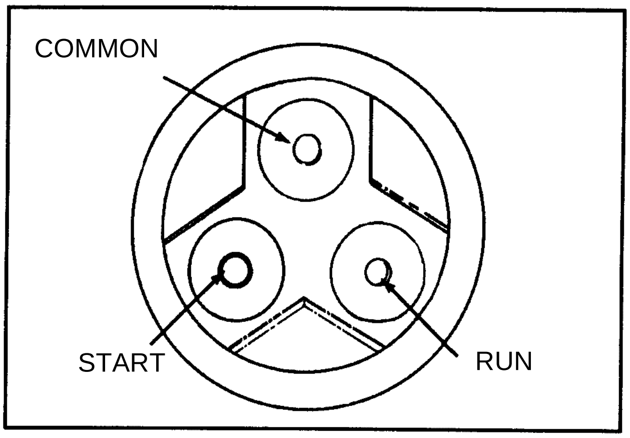
- The wiring diagram is located in the control housing area.
- All electrical components are grounded to the cabinet.
- The green/yellow centre conductor in the power cord is attached to the cabinet to provide a ground circuit when the cord is plugged into a properly grounded outlet.
- After replacing an electrical component, always reconnect the ground wire.
- The electrical outlet should be checked to make sure it is properly wired. Check the outlet with a circuit tester.

Compressor tester



6.3.1 Testing the Compressor Direct

Testing the compressor with no other wiring in the circuit is called the direct test method. Remove all electrical components from the compressor in order to perform this test. It is recommended that a compressor tester as illustrated be used for this test.



The tester leads are marked RUN, START and COMMON. Connect the common lead to the common terminal of the compressor, the start lead to the start terminal and the run lead to the run terminal.
The compressor terminal arrangements are illustrated above. The other two leads are for a start capacitor (if used).

When not in use, attach the two leads together and place the toggle switch in the OFF position. There should not be any bare leads touching the cabinet. Plug in the tester and flip the switch to the start position. When the compressor starts, release the switch to the run position. If the compressor is operative, it will continue operating on the run windings. If the compressor fails to run, the compressor is defective and must be replaced.

6.3.2 Overload Protector

The overload protector prevents the compressor from burning out its electrical windings in the event that it becomes overheated or draws too much current. The overload trips, opening the circuit to the compressor. If it does this repeatedly, the compressor is said to be cycling on the overload.

Cycling on the overload may be caused by:

1. Insufficient air circulation around the compressor and condenser.
2. Pull-down on the compressor, caused by a large quantity of warm food placed in the refrigerator.
3. Compressor stalling due to lack of pressure unloading.
4. Low line voltage.
5. Defective start relay.
6. Defective winding in the compressor or shorted windings.

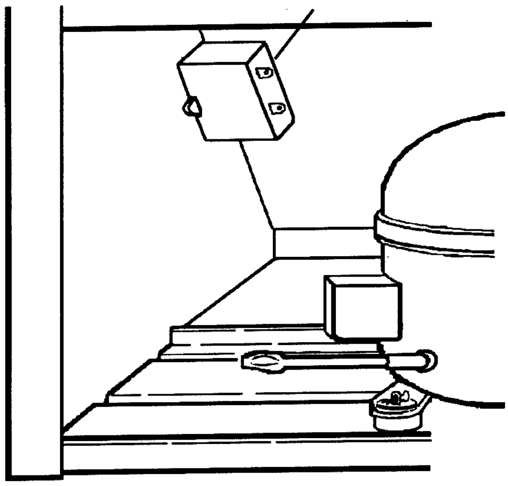
6.3.3 Testing the Overload Protector

Disconnect the unit from the power source.

To test the overload protector, remove the compressor terminal cover. Examine the bottom of the overload for signs of arcing. If signs of arcing are present, either check for continuity or connect a jumper wire across the terminals. If using a jumper wire, plug in the line cord and set the temperature control to a cold setting. If the compressor starts, the overload is defective and must be replaced. If the compressor fails to start, check for a defective start relay or compressor.

1. Remove the PTC and overload from the compressor.
2. Connect one ohmmeter probe to the compressor shell. Make sure the probe makes good contact with bare metal. One at a time, connect the other ohmmeter probe to each of the three compressor terminals.
3. If the meter shows no continuity to ground, install PTC and overload protector to the compressor’s terminals. If the meter indicates the compressor terminals are earthed, replace the compressor.
4. Attach a jumper wire across the overload terminals.
5. Make sure the jumper wire does not short to earth.
6. Reconnect the unit to power source. If the compressor starts, the overload protector is defective and must be replaced.

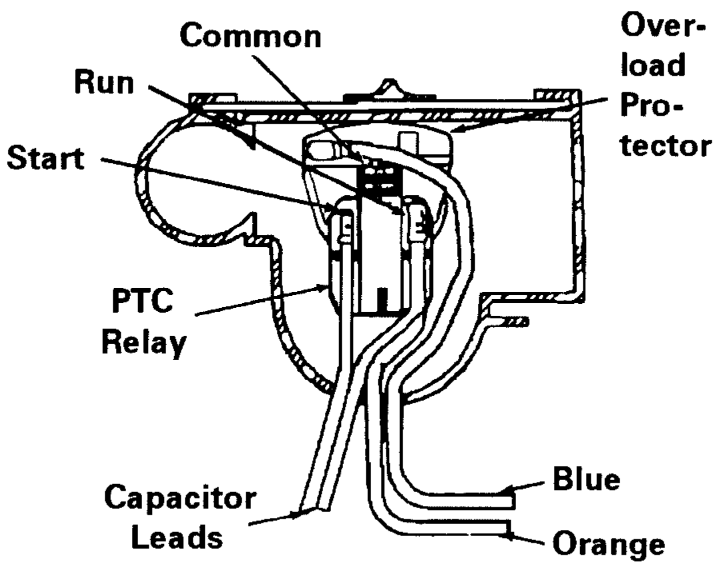
6.3.4 PTC Starting Device And Run Capacitor



The PTC solid state starting device is a push-on component mounted to the start and run terminals of the compressor. This device is connected in parallel with the run capacitor and is in series with the compressor start windings. This will produce a short circuit across the run capacitor during the compressor starting sequence and full current is applied to the start windings as well as the main winding.

Since the PTC device is temperature sensitive, a variance in its temperature causes a change in its resistance. When current is first applied to the compressor, the PTC device’s low resistance shorts out the run capacitor; thus producing adequate motor starting torque.

As the compressor motor approaches running speed, the current through the PTC device causes the temperature and resistance of the PTC device to increase to where it appears to be an open circuit. The compressor continues to operate on the run winding in parallel with the series combination of the run capacitor and start winding.



6.3.5 Checking the PTC Device

1. Disconnect the unit from the power source.

2. Discharge the capacitor. (See ”Testing The Capacitor”)
3. Remove the wires from the PTC device terminals.
4. Allow the PTC to cool to room temperature.
5. Remove the PTC device.
6. Using an ohmmeter, check the resistance between the PTC device terminals. The ohmmeter should register between 3 and 20 ohms.

An extreme variance between 3 and 20 ohms indicates a defective PTC device which must be replaced.

6.3.6 PTC Device Replacement

1. Disconnect the unit from the power source.

2. Disconnect the PTC from the compressor terminals.
3. Remove the lead wires from the PTC terminals.
4. Replace the PTC and reconnect the wires to the proper terminals.

6.3.7 Run Capacitor

The run capacitor is mounted adjacent to the compressor. It is electrically connected to the compressor circuit to provide the required phase difference between the start and run windings for running the compressor.

Capacitor failures may be caused by:

1. **A Short Circuit** - Will cause the start windings to be energised continuously in the start mode. The compressor could start, but the overload protector will trip, and eventually trip continuously.
2. **An Open Circuit** – Should, under normal conditions, allow the compressor to start. Under a heavy running load, however, the compressor will trip on the overload.
3. **A Capacitor Low In Capacitance** – A capacitor may lose capacitance by a loss of its electrolytic properties. The compressor would run under a light load, but would trip on the overload in high ambient conditions.

Testing the capacitor

Personal Injury Hazard
Discharge a capacitor before handling. Short across its terminals, using a resistor with a minimum resistance of 1.000 Ohms.

We recommend using a capacitor analyser when testing. A solid state unit that measures capacitance and power of any capacitor, and has an automatic means of discharging the capacitor through resistance is preferred.

Alternative Method Using Ohmmeter

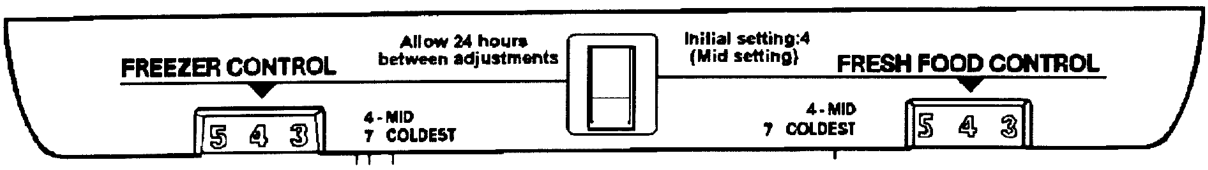
1. **Disconnect the unit from the power source.**
2. Disconnect the capacitor lead wires.
3. Short across the terminals using a resistor with a minimum resistance of 1.000 ohms. This ensures that no charge remains to damage the ohmmeter.
4. Set the ohmmeter selector switch to the 10.000 ohm scale (Rx10K).
5. Connect the ohmmeter leads to the capacitor terminals and observe the meter point lower end.

a If the pointer deflects to the lower end and remains there, the capacitor is shorted and must be replaced.

b If there is no deflection of the pointer, the capacitor is open and must be replaced.

c If the pointer deflects toward the high end of the scale and then slowly returns to the low end, the capacitor is good.

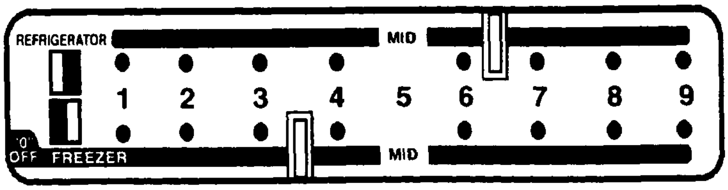
6.3.8 Temperature Control KE 470-2-2T



The refrigerator has two temperature controls:

1. **Fresh Food Compartment** – The fresh food temperature control senses the temperature of its compartment and governs the compressor operation accordingly.
2. **Freezer Compartment** – The freezer compartment control adjusts baffle which regulates the amount of air allowed to enter the fresh food compartment.

6.3.9 Temperature Control KE 650-2-2T



The refrigerator has two temperature controls:

1. **Fresh Food Compartment** – The fresh food temperature control senses the temperature of its compartment and governs the compressor operation accordingly.
2. **Freezer Compartment** – The freezer compartment control adjusts the damper door which regulates the amount of air allowed to enter the fresh food compartment.

Turning the freezer temperature control to the coldest settings reduces the flow of chilled air to the fresh food compartment. The fresh food temperature control uses a sensing element that must be cooled sufficiently before stopping the compressor. The reduced air flow causes longer compressor run time and colder freezer temperatures, while maintaining the required fresh food compartment temperatures.

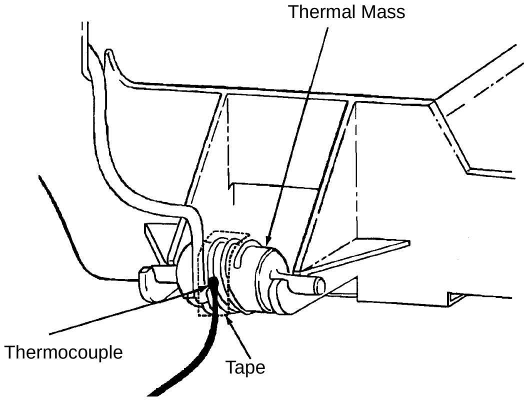
Conversely, by turning the freezer temperature control to the warmest setting, you increase the flow of air into the fresh food compartment and decrease the flow to the freezer. This cools the fresh food temperature control sensing element faster, resulting in shorter compressor run times and warmer freezer compartment temperatures. The fresh food compartment will stay near the recommended fresh food temperature, unless the freezer temperature is turned to an extreme temperature. The differential between cut-in/cut-out temperature will vary approximately 5°C.

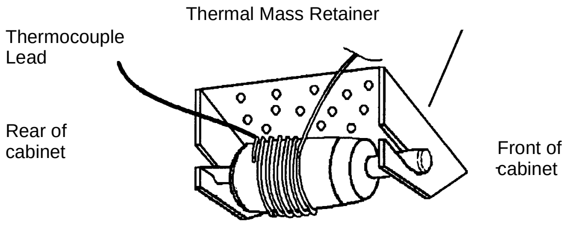
6.3.10 Checking Operating Temperatures

The temperature control feeler tube is located in the fresh food compartment. The feeler tube is wrapped around a thermal mass located in the *back right corner* (KE 470-2-2T) or in the *back left corner* (KE 650-2-2T) of the control housing. A small amount of air passes over the thermal mass, which gives a consistent run time during ambient changes.

To check the cut-in/cut-out temperatures, attach the bulb of thermistor temperature tester to the control feeler tube and set controls at mid position.

Allow the compressor to complete two or three complete cycles. If the temperature readings are not within 1°C of the requirements, the control is defective and must be replaced. Do not attempt to recalibrate.





KE 470-2-2T

Ke 650-2-2T

A defective control may cause the compressor to run continuously or not at all. If either of these conditions exist, check as follows:

♦ **Compressor Won't Run**

1. Remove the control enough to expose its terminals.
2. Short across the control terminals. If the compressor starts, install a new control. If the compressor fails to start, check the defrost timer, compressor receptacle and unit wiring for defects.

♦ **Compressor Runs Continuously**

1. Turn the control knob to OFF. IF the compressor continues to run, proceed to step 2. If the compressor stops, check that the feeler tube is positioned properly and that the air flow through the control housing is not restricted. If the feeler tube is positioned properly and there is no air restriction, check the control operating temperatures.
2. Remove the control far enough to remove one of the wires from its terminal. If the compressor continues to run, there is a short in the unit wiring.