Vertical Display and Storage

SK1500-2

SKOPE Top Mounted Three Door Chiller

Operating and Service Manual

MAN0592 Rev. 1.1 Nov. 2003 edition

SKOPE® Refrigeration

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1 SPECIFICATIONS

1.1 Cabinet and Refrigeration Unit

Cabinet Construction

Exterior/Interior:	White powdercoat on galvanised steel
Insulation:	50mm thick, polyurethane foam Cyclo-iso Pentane blowing agent: C_5H_{10}/C_5H_{12}

Dimensions

Height:	2195mm
Width:	1706mm
Depth:	700mm
Floor area:	1.19m^2
Internal volume:	1526 litres

Refrigeration Unit

Two separate top mounted SKOPE Cyclone® refrigeration units:

Nominal capacity:	625 Watts x 2
Compressor:	Danfoss SC12G
Refrigerant:	R134a
Charge:	450 grams

Electrical

230-240 Volts a.c. 50 Hz, single phase power supply

Run Amps:	6.7 Amps at 240 Volts

Lighting

2 side lights: 35 Watt T5 fluorescent tube, Ø16mm x 1450mm
2 centre pillar lights: 35 Watt T5 fluorescent tube, Ø16mm x 1450mm

Illuminated Sign

370mm sign with 1 x 35 Watt T5 fluorescent tube, Ø16mm x 1450mm

Doors

Self-closing, aluminium framed, double glazed, toughened safety glass

Shelves

Adjustable height, white plastic coated, steel wire shelves

Table 1: Specifications

2.1 Positioning of Machine

Mains Flex

The mains flex exits below the rear panel behind the refrigeration units. For convenience, the flex should be retrieved before the machine is positioned, when walls and partitions may make access difficult.

Ventilation

When positioning the refrigerator, a gap must be left between the top of the sign panels and ceiling, of at least 200mm. For efficient operation of the refrigerator, it is essential that adequate ventilation be provided above the refrigeration units. Maximum recommended operating ambient temperature is 40°C.

Siting machine

When siting the cabinet, avoid direct sunlight, and warm draughts etc. Adequate allowance should be made for door opening. The swing doors have internal torsion bars which are pretensioned at the factory.

The cabinet must be positioned on a level surface for the door to shut and seal correctly, and to prevent the condensate tray from overflowing.

Remove all packaging material from the shelves. Clip shelf support brackets into the shelf support strips at the desired heights, and relocate shelves.

Important:

For efficient operation of the chiller, it is essential that adequate ventilation be provided above the refrigeration unit.

3 OPERATION

3.1 Safety Information

When using any electrical appliance, safety precautions should always be observed. Read these instructions carefully, and retain for future reference.

Warning:

Do NOT overload power supply.
Machine rated at 6.7 Amps at 240 Volts

- Do not use this appliance for other than its intended use.
- Only use this appliance with voltage specified on the rating label.
- Ensure adequate ventilation of SKOPE refrigeration units.
- Condenser coil MUST be kept clean. To ensure trouble free performance, it is recommended that on a regular basis the unit be isolated from the power supply and a vacuum cleaner used to remove dust and fluff from the condenser coils.
- Be careful not to touch moving parts.
- Do NOT cover the grilles or block the entry or exhaust of airflow by placing objects up against or on top of refrigeration unit.
- Do NOT probe any opening.
- Regulations require that all electrical work be carried out by authorised persons. For your own safety and that of others, ensure this is done.
- If the refrigeration units are required to be installed or removed from the cabinet, ensure all necessary safety precautions are observed.

Caution:

Disconnect the cabinet from mains supply before attempting any electrical servicing, cleaning or maintenance.

3.2 Operation of Machine

Plug in machine and check operation of both refrigeration units, illuminated sign, and cabinet lights. The compressors, as well as evaporator and condenser fans should all operate initially. This may be verified by listening for compressor switch-on, and by checking air movement around the refirgeration unit and out of the rear duct inside the cabinet.

Isolation Switch and IEC Sockets

An isolation box fitted with an isolation switch and two IEC sockets is located on top of cabinet between the refrigeration units. To isolate the cabinet and unit electrics, when the supply socket is not readily available; turn off the isolating switch and unplug BOTH the refrigeration unit IEC plugs from the isolating box.

Checking Operation

- Compressor and condenser fan should switch off when cabinet internal temperature reaches approximately 2°C, and on again at approximately 4°C. The internal cabinet air will continue to circulate at all times.
- The lights which illuminate the top sign and cabinet interior are permanently on. Lights will require a period of time to stabilise following initial start up.
- For efficient operation, ensure door gaskets form a good seal with the cabinet.

3.3 Loading

For even cooling and efficient operation, allow air space around packages etc. Do not allow products to overhang the front of the shelf as this could prevent the door from shutting or cause glass breakage. Important: Leave airspace of at least 75mm above product on top shelf.

3.4 Cleaning

Before cleaning; disconnect the cabinet from mains power supply.

When necessary, wash both interior and exterior of cabinet with soapy water. Exterior of cabinet may be waxed with automobile polish for extra protection.

Condenser Coil

Before cleaning the condenser coils; isolate the cabinet from mains supply, or when the supply socket is not readily available - turn off the isolating switch and unplug both the refrigeration unit IEC plugs from the isolating box.

The condenser coils MUST be kept clean for efficient and reliable operation. Clean condenser coils with a brush and / or vacuum cleaner regularly. To access the condenser coils:

1. Remove the sign unit, from top of cabinet (see ‘To remove Sign Unit, page 31).
2. Clean both condenser coils with a soft brush and / or vacuum cleaner.
3. Replace the sign unit, and reconnect cabinet to power supply.

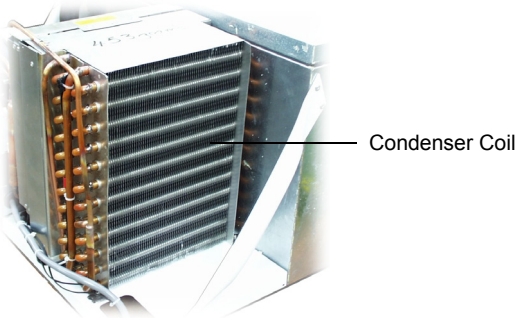


Figure 1: Condenser Coil

4 ELECTRONIC CONTROLLER

4.1 Controller Display

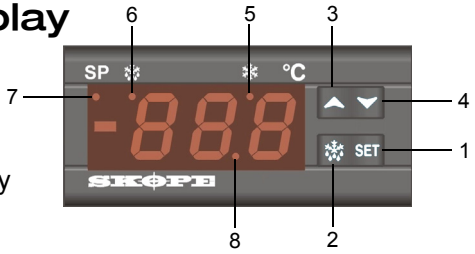


Figure 2: Controller Display

Item	Key	Function
1	SET	**SET:** Press to display target set point. In programming mode it selects a parameter or confirms an operation
2	❄	**DEFROST:** Press to start a manual defrost
3	▲	**UP:** Press to see the maximum stored temperature. In programming mode it browses the parameter codes, or increases the displayed value
4	▼	**DOWN:** Press to see the minimum stored temp. In programming mode it browses the parameter codes, or decreases displayed value
5	Compressor ON indicator	
6	Defrost cycle ON indicator	
7	Set Point displayed indicator	
8	Decimal point indicator	

Key Combinations:

▲ + ▼	Press to lock and unlock the keypad
SET + ▼	Press to enter the programming mode
SET + ▲	Press to return to the room temperature display

In normal operating conditions the controller can permanently display one of the following:

1. Internal cabinet temperature (standard parameter ‘Lod’ = P1)
2. Setpoint (parameter ‘Lod’ = SP)
3. Condensing temperature (parameter ‘Lod’ = P2)

Meaning of LEDs

Each LED function is described in the following table:

LED	Mode	Function
❄	ON	Compressor enabled
❄	Flashing	Programming phase (flashing with ❄) Anti-short cycle delay enabled
❄	ON	Defrost enabled
❄	Flashing	Programming phase (flashing with ❄) Drip time in progress
SP	ON	The Set Point is displayed

Table 2: LED Functions

4.2 Controller Operation

The SKOPE electronic controller controls and displays the cabinet temperature. The preset temperature setting controls internal air temperature between 2°C and 4°C. For compressor protection the control has built in minimum off cycle time of 3 minutes, and features regular timed defrost cycles (compressor off, evaporator fans on).

The controller, consisting of one self contained control / display unit, is mounted in the cabinet control panel, and is fitted with two probes.

Probe One is fitted to a bracket in the return evaporator airflow. This probe is used for both temperature control and display.

Probe Two is fitted to the condenser half position. It is cable tied in place with an insulated cover. This probe is used for condenser over-temperature alarms.

4.3 Programming Controller

The controller keypad must always be locked, to prevent unauthorised modification.

To unlock the keypad (to modify parameters)

Press both the **UP** and **DOWN** keys until ‘Pon’ is displayed.

How to lock the keypad

1. Press and hold both the **UP** and **DOWN** keys for more than 3 seconds.
2. The ‘PoF’ message will be displayed and the keypad will be locked. At this point it will be possible only to see the Set Point or the maximum or minimum temperature stored.
3. If a key is pressed for more than 3 seconds, the ‘PoF’ message will be displayed.

To display the Set Point

Press, and immediately release the **SET** key. The display will show the Set Point value, and the Set Point LED will be highlighted.

4 ELECTRONIC CONTROLLER

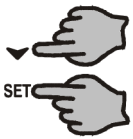
To change the Set Point

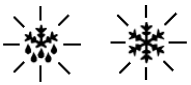
1. Push and hold the **SET** key for more than 2 seconds.
2. The value of the Set Point will be displayed, and the ❄ LED will start blinking.
3. To change the Set value, push the **UP** or **DOWN** keys.
4. To memorise the new Set Point value, push the **SET** key again or wait 15 seconds.

To start a manual defrost

Push and hold the **DEFROST** key for more than 2 seconds.

To change a parameter value





1. Enter the programming mode by pressing and holding both the **SET** and **DOWN** keys for 3 sec. (❄ and ❄ start flashing).
2. Select the required parameter.
3. Press the **SET** key to display the Set value (now only the ❄ LED is flashing).
4. Press the **UP** or **DOWN** keys to change the Set value.
5. Press the **SET** key to store the new value and move to the following parameter.
6. To exit: Press both the **SET** and **UP** keys, or wait 15 seconds without pressing any keys.
7. To lock in new parameter value; after one minute operation, disconnect and reconnect cabinet from mains power supply.

NOTE: The Set value is stored even when the procedure is exited by waiting the time-out to expire.

To see the minimum temperature

1. Press and release the **DOWN** key.
2. The ‘Lt’ message will be displayed, followed by the minimum temperature.
3. Press the **DOWN** key again, or wait 5 seconds, to restore the normal display.

To see the maximum temperature

1. Press and release the **UP** key.
2. The ‘Ht’ message will be displayed, followed by the maximum temperature recorded.
3. Press the **UP** key again, or wait 5 seconds, to restore the normal display.

To reset the maximum and minimum temperature

1. Press and hold the **SET** key for more than 3 seconds, while the maximum or minimum temperature is displayed. The ‘rSt’ message will be displayed.
2. To confirm the operation, the ‘rSt’ message starts flashing and the normal temperature will be displayed.

NOTE: Dependent on customer requirements, the SKOPE electronic controller has different parameter configurations.
Parameter configuration 160 = Beverage, and 170 = Food.
To establish correct controller parameter configuration, see label on controller housing.

4.4 Parameters

Display	Parameters Beverage 160	Food 170	Range	Description of Parameter
SET POINT PARAMETERS				
Set	2	1	LS to US	Set Point
Hy	2	2	0.1°C to 25.5°C	Differential
LS	1	-1	-50°C to Set	Minimum Set Point
US	15	5	Set to 150°C	Maximum Set Point
PROBE PARAMETERS				
Ot	-0.7	0	-12°C to 12°C	Thermostat probe calibration
OE	0	0	-12°C to 12°C	Condenser probe calibration
CONTROL PARAMETERS				
OdS	0	0	0 to 255 minutes	Outputs delay at start up
AC	3	3	0 to 50 minutes	Anti-short cycle delay
DISPLAY PARAMETERS				
CF	°C	°C	°C / °F	Temperature measurement unit
rES	dE	in	in / dE	Resolution
LoD	P1	P1	P1 / P2 or SP	Local display
DEFROST PARAMETERS				
IdF	6	6	1 to 120 hours	Interval between defrost cycles
MdF	12	12	0 to 255 minutes	Maximum length for defrost
dFd	dEF	dEF	rt / it / Set / DEF	Displaying during defrost
dAd	20	20	0 to 255 minutes	Maximum display delay after defrost
ALARM PARAMETERS				
ALc	Ab	Ab	rE / Ab	Temperature alarms configuration
ALU	12	7	up to 150°C	Maximum temperature alarm
ALL	-2	-2	-50°C to ALU	Minimum temperature alarm
AtH	1	1	0.1°C to 25.5°C	Differential for temperature alarm in cabinet
ALd	240	120	0 to 255 minutes	Temperature alarm delay
dAO	24	24	0 to 23.5 hours	Delay of temperature alarm at start up
tbA	n	n	n = no / y = yes	Alarm relay silencing
PA2	58	58	-40°C to AU2	Condenser over temperature
AU2	65	65	-40°C to 110°C	AUE Condenser alarm temperature
ACH	5	5	0.1°C to 25.5°C	Differential for condenser alarm temp recovery
dL2	2	2	0 to 255 minutes	Condenser alarm delay
dA2	0	0	0 to 23.5 hours	Condenser alarm temperature delay at start up
AOP	CL	CL	OP / CL	Alarm relay polarity
OTHER PARAMETERS				
dP1	-		- -	Thermostat probe read out
dP2	-		- -	Condenser probe read out
rEL	-		- -	Software release
Ptb	-		- -	Map code

Table 3: Controller Parameters

4.5 Display Alarms

A flashing LED indicates an alarm. Possible alarm displays are:

Alarm	Description
	Stage ONE - Maintenance required: Immediately attend condenser (for auto alarm reset).
	Stage TWO - Refrigeration Shut-Down: Condenser over-temperature has shut-down system and cabinet lighting. Attend condenser. To reset alarm, cabinet must be replugged into power supply. For repeat alarms, contact an authorised service agent.
	Faulty Ambient probe (internal cabinet - return air)
	Faulty High Temperature probe (condenser)
	Internal cabinet - LOW temperature alarm
	Internal cabinet - HIGH temperature alarm

Table 4: Controller Display Alarms

Note: Refrigeration system and cabinet lighting shut down with ‘P1’, ‘P2’ and ‘CSd’ alarms.

Alarm Recovery

- Condenser over temperature alarm ‘COH’ recovers when the condenser is either cleaned or cools down.
- Condenser alarm ‘CSd’ temperature recovers by replugging the cabinet power supply (or isolation switch). In this case, all the alarms are reset.
- Cabinet temperature alarms ‘LO’ and ‘HI’ automatically stop at temperature recovery.

4.6 Replacement

If the SKOPE electronic controller has a suspected fault, care must be taken to ensure accurate diagnosis. The controller has various programmable parameters that effect operation such as time delay and defost modes. Any suspected failure must be double checked. Confirm all wiring and terminations are correct. Check probe resistance is correct (see table 5, below). Replace any faulty components. For spare parts, see page 55.

Controller NTC Probe Resistance

Temperature	Resistance*
-10°C	42.5 Ω
-5°C	34.0 Ω
0°C	27.3 Ω
5°C	22.1 Ω
10°C	18.0 Ω
20°C	12.1 Ω
30°C	8.3 Ω
40°C	5.8 Ω
50°C	4.2 Ω

* Tolerance ± 2.4%

Table 5: NTC Probe Resistance

Controller Removal

1. Disconnect cabinet from mains power supply.
2. Remove sign unit (see ‘To remove Sign Unit’, Page 31).
3. Undo the two screws underneath the control panel, directly under the controller display, and lift the controller housing up and forward to clear the control panel.
4. Remove the two top fixing screws from the housing, and bend the housing lid back to gain access to controller connections.
5. Disconnect the two green wiring plugs from the back of the controller, and then remove controller from the housing.
6. When re-fitting the controller, ensure the plugs engage firmly into the back of the controller, and the housing lid is screwed down to hold the controller firmly in place.

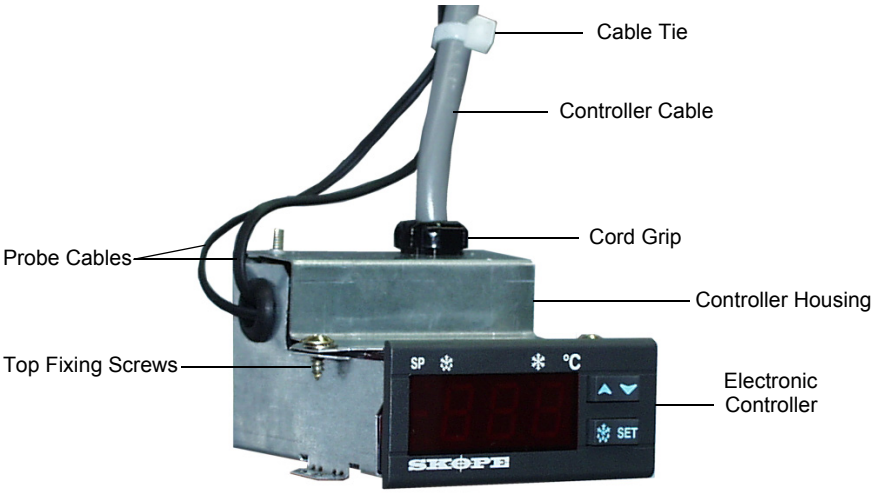


Figure 3: Controller Housing (closed)

4 ELECTRONIC CONTROLLER

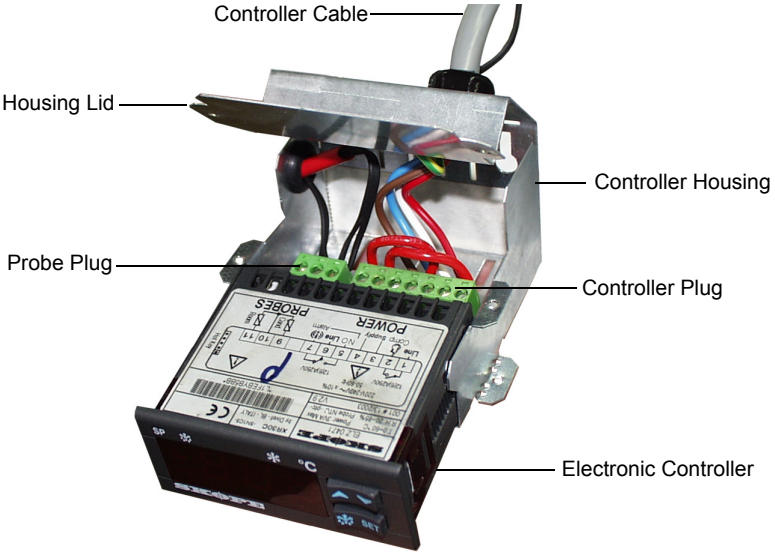


Figure 4: Controller Housing (open)

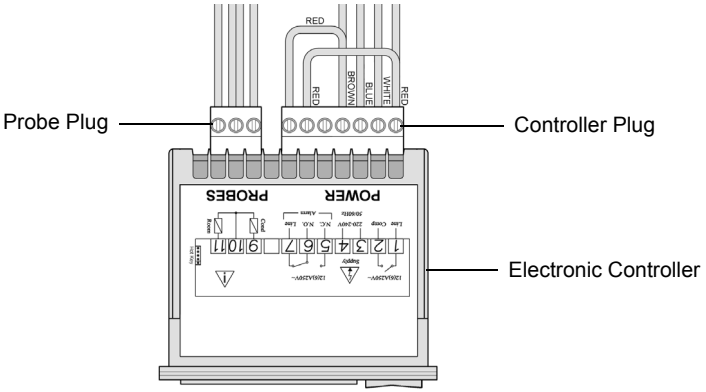


Figure 5: Controller Connections

5.1 Interior Side light

The cabinet has two interior side lights, each housing a 35 Watt fluorescent tube. To replace the fluorescent tube:

1. Disconnect cabinet from power supply.
2. Compress the back section of the diffuser, so that it disengages from the aluminium housing and push the diffuser back, to gain access to the fluorescent tube.
3. The fluorescent tube can be removed, by revolving the tube until the pin position allows withdrawal.
4. When refitting the new fluorescent tube ensure the printing on the tube is at the bottom, as the orientation of the tube is important. The replacement tube must be of the same wattage and colour rendering as the original.
5. When refitting the diffuser, engage back section into side light housing, and compress and clip front section of diffuser back into place working progressively down the full length of light.

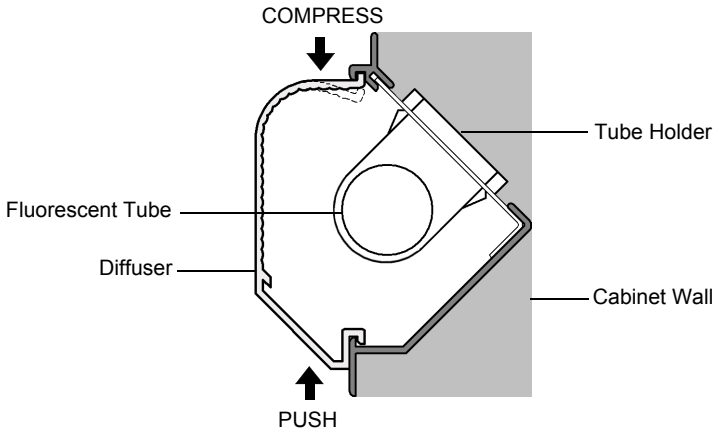


Figure 6: Side Light

5.2 Centre Pillar Light

The cabinet has two centre pillar lights, each housing a 35 Watt fluorescent tube. To replace the fluorescent tube:

1. Disconnect cabinet from power supply.
2. Remove the centre pillar diffuser by compressing both sides of the diffuser so that it disengages from the pillar housing.
3. The fluorescent tube can be removed, by revolving the tube until the pin position allows withdrawal.
4. When refitting the new fluorescent tube ensure the printing on the tube is at the bottom, as the orientation of the tube is important. The replacement tube must be of the same wattage and colour rendering as the original.
5. To refit the diffuser; engage one side of the diffuser into the pillar housing, and compress and clip the diffuser back into place working progressively down the full length of the light.

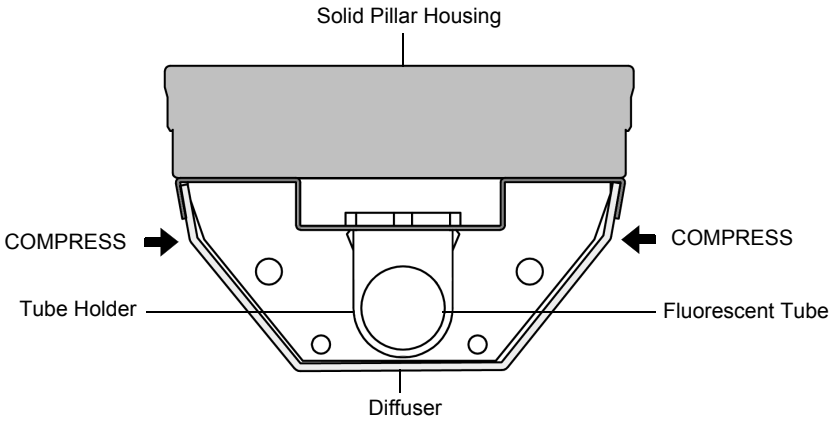


Figure 7: Centre Pillar Light

5.3 Door

Alignment

This can be achieved by releasing the bottom hinge bracket, which is provided with slots allowing alignment adjustment, enabling the bottom of the door to be moved sideways.

Gasket Replacement

The door gaskets clip into the door gasket retainer extrusion and may be removed for repair or replacement simply by peeling from frame, starting at a corner.

New gaskets, when fitted, may be lightly lubricated with a clear silicone grease or similar compound. This will lessen the possibility of the gasket rolling. Should the gasket be out of shape when in place, use hot air (i.e. from hair drier) to realign.

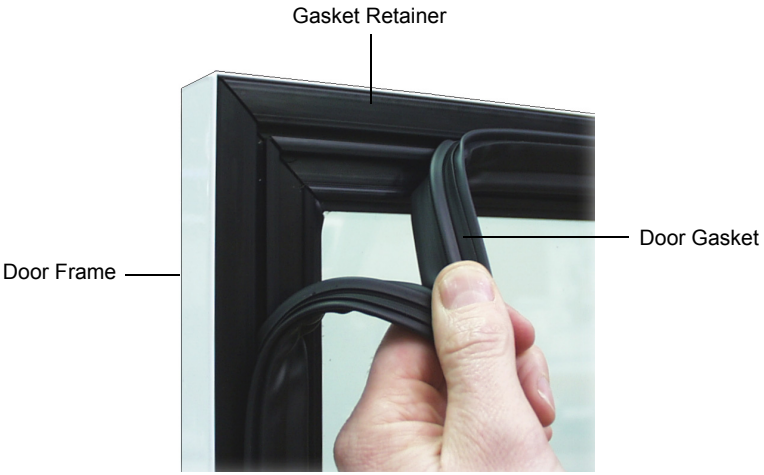


Figure 8: Door Gasket Removal

Door Tension

The glass door has an internal torsion bar, pretensioned at the factory, which enables the door to self-close. If necessary, door tension can be further adjusted by rotating the capstan mounted in the bottom hinge bracket. To adjust door tension:

1. Slowly release tension on the capstan, by turning the capstan with a Ø2.5mm steel rod, and removing the split pin.
2. With the aid of another Ø2.5mm steel rod, increase the tension by turning the capstan in the direction the door closes.
3. Once adequate tension has been achieved, re-insert the split pin through the hole in the hinge bracket, to lock in position.
4. To check door tension; hold the door open approximately 100mm and let go of the door. The door should gently close, with the door gasket forming an air tight seal with the cabinet.

In the event the door tension can no longer be adjusted, the torsion bar may need replacing (see ‘Torsion bar replacement’, page 26).

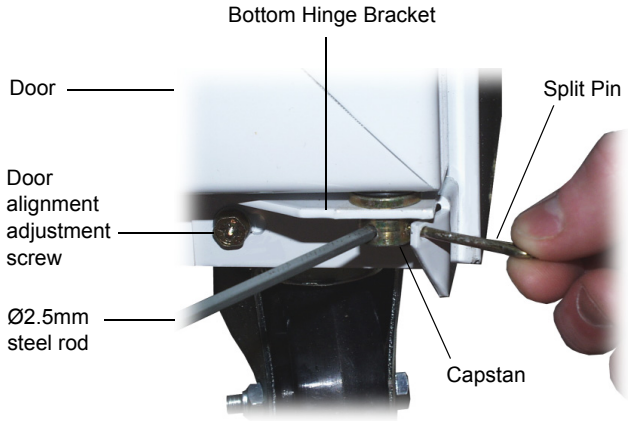


Figure 9: Door Tension

Torsion Bar Replacement

The torsion bar assembly is located inside the door frame, and can be replaced if necessary. To replace the door torsion bar assembly:

1. Remove the door from cabinet (see ‘Door removal’, page 27).
2. Carefully lever out the bottom bush from the door frame, and pull old torsion bar out from the door frame. The end of the torsion bar will need manoeuvring, to allow the ‘flat hook’ end to clear the hinge hole.
3. Remove existing capstan and bush from old torsion bar.
4. Thread the capstan, complete with the bush, over the ‘round hook’ end of the new torsion bar (see figure 10 below). Ensure the aluminium tube moves freely up and down the torsion bar.
5. Fit the new torsion bar assembly into the door frame. When the torsion bar is correctly installed, the capstan should not turn.
6. Lightly tap bottom of capstan into hinge hole, until the bush is flush with door frame.
7. Refit the door to cabinet, and adjust tension (see ‘Door tension’, page 25).

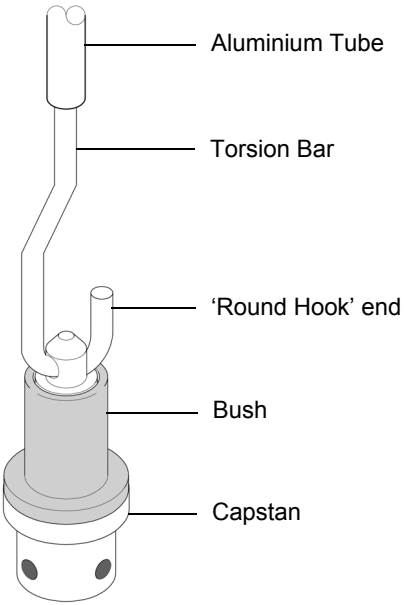


Figure 10: Torsion Bar Assembly

Door Removal

For ease of servicing, and reversing hinging, the door can be removed from the cabinet. To remove the door:

1. Disconnect refrigerator from mains power supply.
2. Slowly release tension on the door capstan, by turning the capstan with a Ø2.5mm steel rod, and removing the split pin from the bottom hinge bracket.
3. Unscrew the bottom hinge. Important: ensure the weight of the door is fully supported, before removing the bottom hinge.
4. The door and hinge can now be removed from the cabinet.

To refit the door:

1. Lift the door onto the top hinge pin. The weight of the door will need supported, until the bottom hinge is fitted.
2. Locate bottom hinge onto door capstan, and screw hinge to cabinet.
3. Check alignment with other doors, and adjust as necessary.
4. Re-tension the door (see ‘Door tension’, page 25).

Hinge Reversal

The glass door can be hinged on either the left or right hand side. To reverse the door hinging the following procedure should be followed:

1. Disconnect refrigerator from mains power supply.
2. Remove the door (see ‘Door removal’, above).
3. Remove torsion bar assembly from the door (see ‘Torsion bar replacement’, page 26).
4. Refit torsion bar assembly into the opposite end of the door.
5. Refit top door bush.
6. Refit the door to the cabinet (see ‘Door removal’, above).
7. Re-tension the door (see ‘Door tension’, page 25).

5.4 Sign Unit

The illuminated sign unit, located on top of the cabinet, houses a fluorescent tube and electronic ballast. Internal access to the sign unit may be gained with the sign unit still attached to the cabinet.

To Replace the Fluorescent Tube

To access the fluorescent tube, the curved sign panel must first be removed from the sign unit. No tools are required for this procedure.

To remove the sign panel:

1. Disconnect cabinet from the power supply.
2. Start at one of the top corners of the sign unit and pull the sign panel out from under the sign top cover (see figure 11 below).
3. Work along the length of the sign unit, pulling the sign panel out as you go.
4. Carefully remove the sign panel away from the sign unit.
5. The fluorescent tube can now be accessed for replacement (see figure 13, page 29).

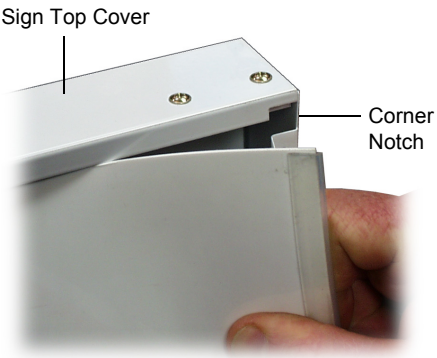


Figure 11: Removing Sign Panel

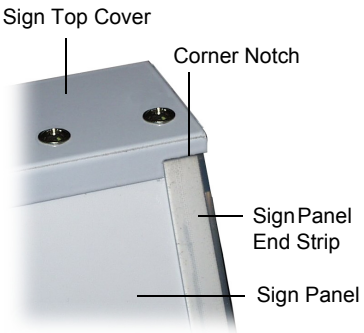


Figure 12: Sign Corner Detail

To refit the curved sign panel:

1. Ensure both sign end strips are fitted to the sign panel.
2. Carefully fit the sign panel into the bottom sign cover, ensuring the sign end strips are correctly positioned in both of the bottom corner notches.
3. Locate one top corner of the sign panel into the corner notch of the top cover. Ensure the end strip fits neatly into the corner notch (see figure 12, page 28).
4. Use your thumbs to push the sign panel under the top cover, working progressively along the full length of the panel. Ensure the sign panel engages into the sign top along the full length of the sign unit.
5. Ensure both the sign end strips fit neatly into the top and bottom corner notches.

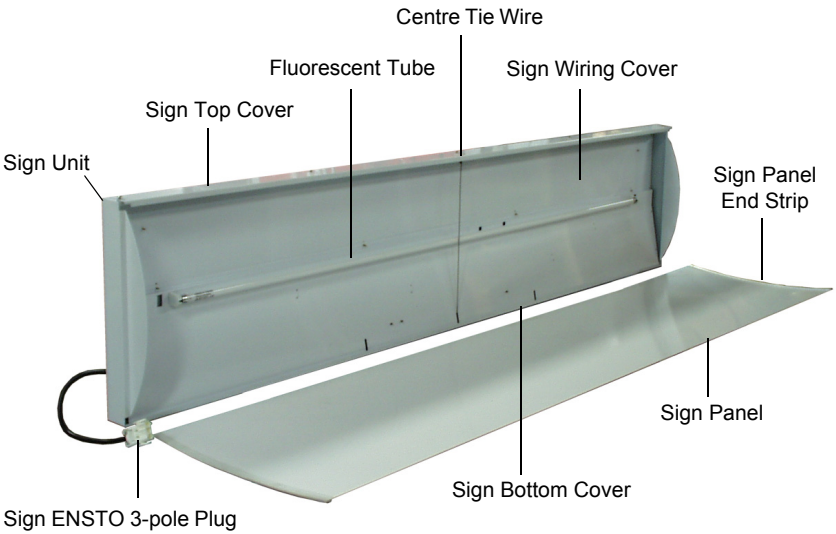


Figure 13: Sign Unit (with sign panel removed)

To Replace the Electronic Ballast

The electronic ballast is located inside the sign unit, mounted on the back of the sign wiring cover. To access the electronic ballast:

1. Disconnect cabinet from the power supply.
2. Remove the sign unit from the top of cabinet (see ‘To remove Sign Unit’, page 31).
3. Remove the curved sign panel (see ‘To replace Fluorescent Tube’, page 28).
4. Remove the centre tie wire (see figure 13, page 29).
5. Remove the fluorescent tube, to avoid it being damaged.
6. Remove the sign wiring cover, by undoing the four screws from the rear of the sign unit.
7. The electronic ballast, mounted on the back of the sign wiring cover, can now be accessed for replacement (see figure 14, below).

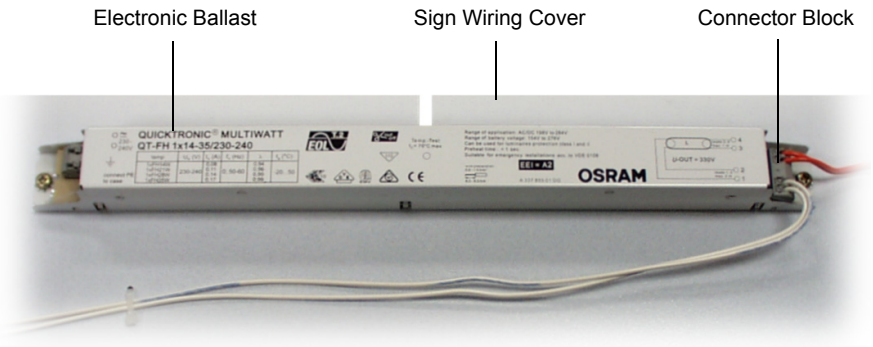


Figure 14: Electronic Ballast

To Remove the Sign Unit

For ease of servicing, the sign unit can be removed from the cabinet. To remove the sign unit:

1. Unplug the sign ENSTO 3-pole plug from the left hand end of the unit junction box (see figure 17, page 33).
2. Loosen, and turn the sign retaining clip on the top of each side panel (see figure 15, below).
3. Lift the sign unit up, to separate the sign from the sign sides.
4. The sign unit can now be removed from the cabinet.

To Remove the Sign Side Panels

For ease of servicing, the sign side panels can be removed from the cabinet. To remove the side panels:

1. Remove the sign back panel, by lifting up to disengage from the side and unit separation panels (see figure 16, below).
2. Loosen the keyhole screws, holding side panels to cabinet top.
3. Slide the side panels forward to disengage the keyholes.

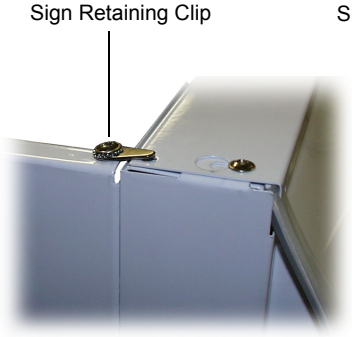


Figure 15: Sign Retaining Clip

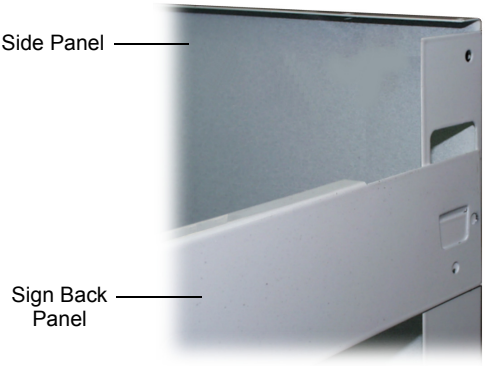


Figure 16: Sign Back Panel

5.5 Refrigeration Unit

The SK1500-2 chiller utilises two separate SKOPE Cyclone® refrigeration units, which align with port holes in the roof of the cabinet. Air is drawn through the evaporators and blown down the back duct. Air returns to the evaporator through the roof port holes.

To Remove the Refrigeration Unit

1. Unplug and remove the sign unit (see 'To remove Sign Unit', page 31). Remove sign back and side panels.
2. Turn off the isolating box switch, on top of cabinet, and unplug both the refrigeration unit IEC plugs.
3. Undo the two screws underneath the control panel, directly under the controller display, and lift the controller housing up and forward to clear the control panel.
4. To prevent damage to the controller, locate controller housing over the transit position screws located on front of the evaporator box, just to the right of the condenser coil.
5. Unscrew unit retaining brackets, each side of evaporator box.
6. By using the diagonal white handles on either side of unit, lift the unit up and off the cabinet. Avoid damage to the underside sealing strip by not dragging the refrigeration unit. If damage to the seal occurs, it must be repaired prior to re-installation.

To re-install refrigeration unit

1. Ensure all cables, capillaries etc. are secured away from moving or hot parts before re-installing the refrigeration unit.
2. Lift unit up onto the top of cabinet, using the diagonal white handles on either side of the unit, aligning the evaporator box over the port hole in the cabinet top. Avoid damaging the underside sealing strip, by not dragging the unit.
3. Refit screw to the unit retaining bracket, on each side of unit.

4. Fit controller housing into the control panel, and refit the two screws from underneath the control panel.
5. Plug both refrigeration unit IEC plugs into the isolation box and turn on the isolation switch.
6. Refit sign unit, and reconnect sign plug to the unit junction box.

Caution:

Each refrigeration unit weighs approximately 40kg. Ensure care is taken when removing units. Steps or platform about 1 metre high are suggested, to allow the unit to be safely lifted, carried and put down at waist height.

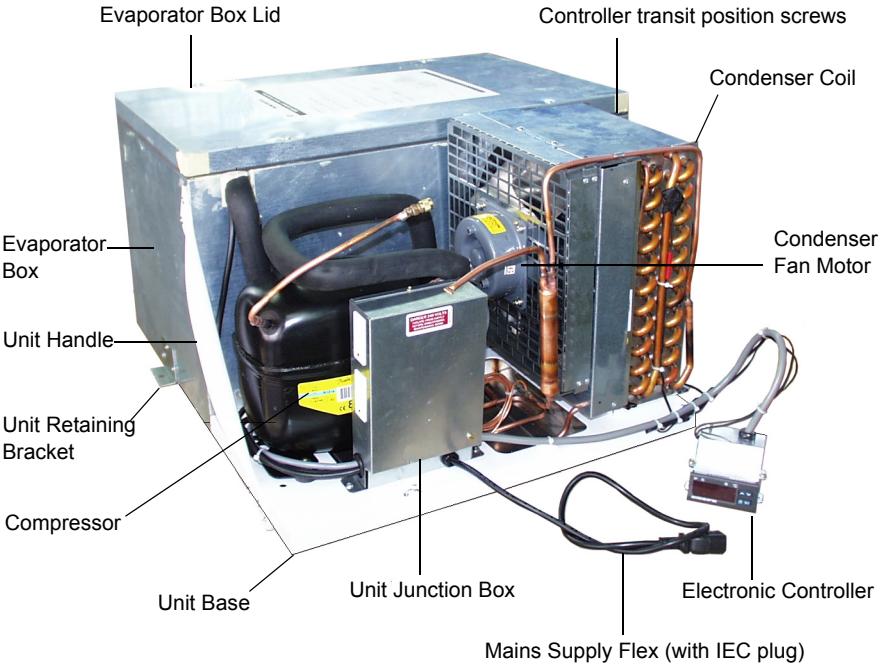


Figure 17: Refrigeration Unit

Unit Junction Box

All electrical connections for the refrigeration unit are contained inside the unit junction box, mounted on the front of the refrigeration unit. To access fan motor connections or to replace the fuse, remove the unit junction box cover. To access the unit junction box:

1. Isolate cabinet from mains power supply (see page 10).
2. Undo the top and bottom screws from unit junction box and remove the cover, leaving the cover Earth wire attached.
3. All electrical connections can now be accessed.
4. Ensure the unit junction box cover is replaced after servicing.

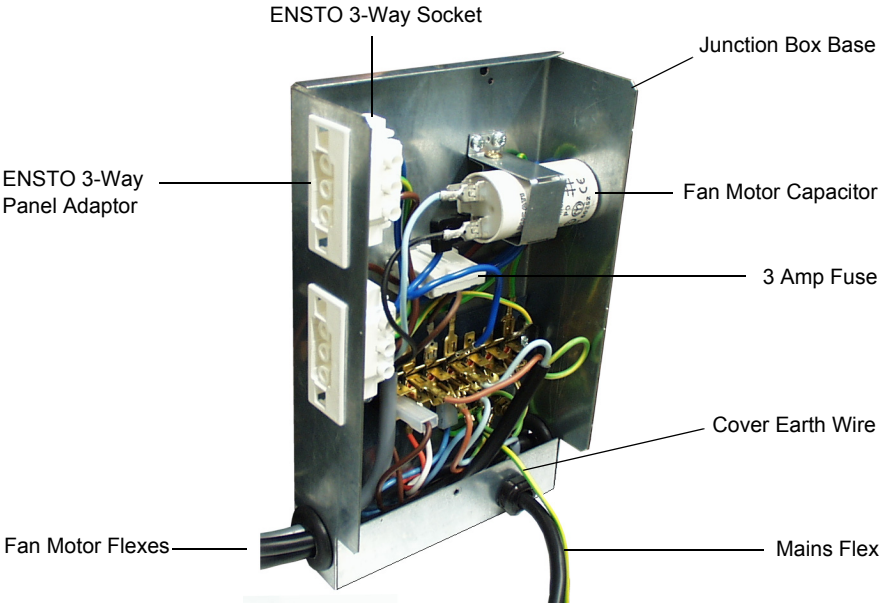


Figure 18: Unit Junction Box (with cover removed)

Condenser Fan Motor Assembly

The condenser fan motor, fan blade, and mounting bracket can be removed from the refrigeration unit as a complete assembly. To replace the condenser fan motor assembly:

1. Isolate cabinet from mains power supply (see page 10).
2. Remove the cover from the refrigeration unit junction box.
3. Trace the condenser fan motor flex to the push-on connections inside the unit junction box, and disconnect the terminals.
4. Withdraw condenser fan motor flex out of the unit junction box.
5. Undo the two top fixing screws from the mounting bracket.
6. Remove the clamp holding the liquid/drier line to top of the fan shroud, and carefully pull the line forward enough to allow the removal of the condenser fan motor assembly.
7. Remove complete condenser fan motor assembly.
8. Remove fan blade, and undo four screws holding fan motor.
9. Replace the fan motor capacitor inside the unit junction box.
10. Fit new fan motor, and re-assemble.

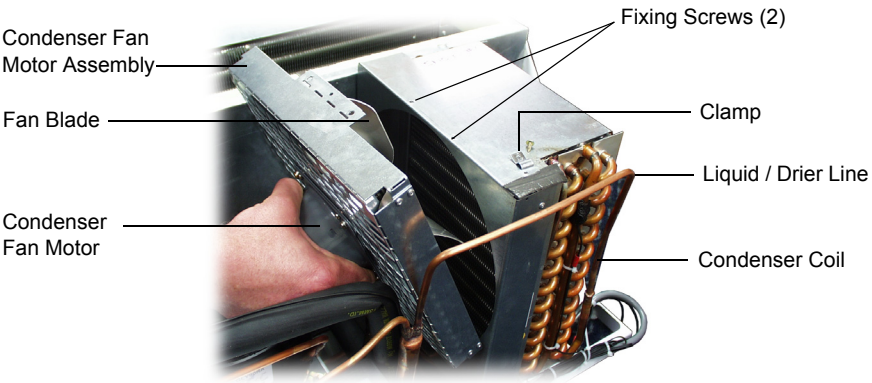


Figure 19: Condenser Fan Motor Assembly

Evaporator Fan Motor Assembly

The evaporator fan motors can be removed from the evaporator box as a complete assembly. To replace an evaporator fan motor:

1. Isolate cabinet from mains power supply (see page 10).
2. Remove the cover from refrigeration unit junction box.
3. Trace the evaporator fan motor flex to the push-on connections inside the unit junction box, and disconnect the terminals.
4. Remove evaporator box lid.
5. Undo two top screws from the mounting bracket, and remove complete evaporator fan motor assembly.
6. Undo two screws from motor junction box, and disconnect flex.
7. Remove fan blade, and undo four screws holding fan motor.
8. Replace the fan motor capacitor inside the unit junction box.
9. Fit new fan motor, and re-assemble.
10. When refitting the evaporator fan motor assembly reseal the flex hole in evaporator box, before refitting the evaporator lid.

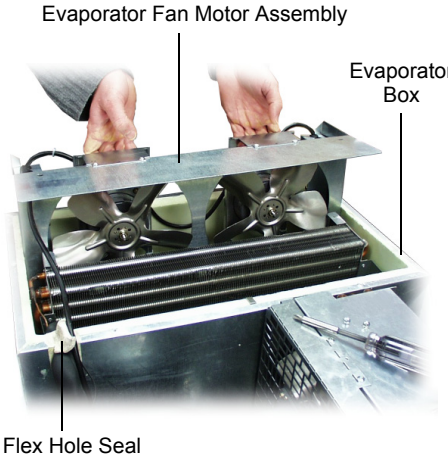


Figure 20: Evaporator Fan Motor Assembly

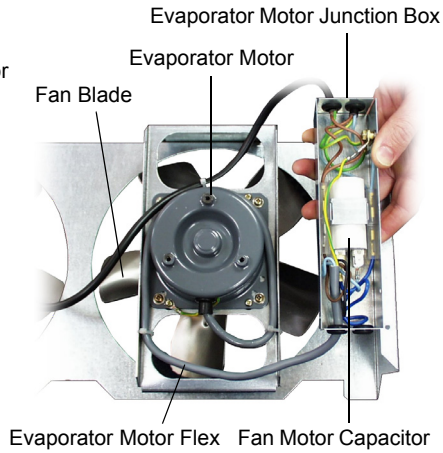


Figure 21: Evaporator Motor Junction Box

Cleaning Condenser Coil

The condenser coils MUST be kept clean for efficient and reliable operation. Clean both condenser coils regularly with a brush and / or vacuum cleaner. To access the condenser coils:

1. Isolate cabinet from mains power supply (see page 10).
2. Remove the sign unit, from the top of cabinet (see ‘To remove Sign Unit, page 31).
3. Clean each condenser coil with a soft brush and / or vacuum cleaner.
4. Refit sign unit.

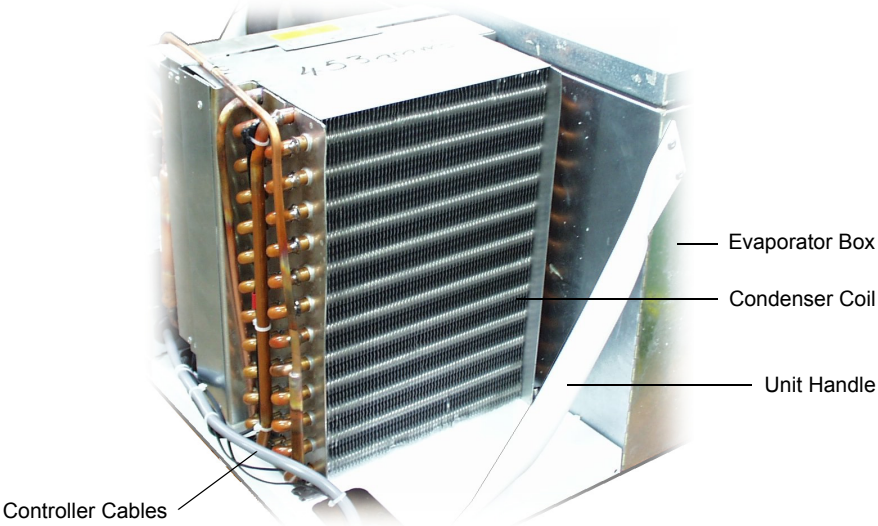


Figure 22: Condenser Coil

Recommended Service Procedures

SKOPE recommend the SKOPE Cyclone® demountability and exchangeability philosophy, which in essence means:

The customer must not be inconvenienced during system maintenance.

In the unlikely event of Refrigeration failure, an exchange unit is simply swapped in a matter of minutes. There is no cabinet down time or unloading product. In one 5 minute visit, the customer's inconvenience ends. The faulty Cyclone® is then removed to the workshop for repair as time allows.

For a Suspected Refrigerant Problem

Disconnect the evaporator fan motor and with the system running, a 'frost line' will become obvious (after approximately 8 minutes): Entire evaporator and accumulator must be frosting. Compressor at suction inlet will be cold and sweating.

If these conditions are not met, the system is faulty, either short of refrigerant, compressor not pumping efficiently, or capillary restriction. The system must then be opened (see Refrigerant R134a Handling Precautions section) and gauges temporarily fitted (i.e. either temporarily fit line piercing valves, or braze in service lines).

Short of Refrigerant

Where the frosting effect is shorter than required (unless all refrigerant is lost, where there is no frosting effect). Only a small amount of refrigerant will exit the system. A leak test (refrigerant / dry nitrogen mix, up to 250 psig) should be performed to locate the leak. If no leak is found, a pressure test should be performed (dry nitrogen only, up to 250 psig) if there is no pressure drop over 24 hours, the fault should be treated as a capillary restriction.

Compressor Not Pumping Efficiently

Where the frosting effect is not as cold as it should be. Symptoms include: compressor body hotter than normal, condenser cooler than normal, and the compressor may make an unusual hissing sound. All of these symptoms depend on the severity of the problem.

The only way to prove a pumping problem is to perform a compressor pump-down test: braze closed compressor suction line, Open discharge line; then run the compressor to pull a vacuum on a vacuum gauge. The compressor should pull down to approximately 30" (inches) vacuum then turn the compressor off and this vacuum must be held without any loss for 5 minutes. If the Compressor does not pass these tests; it is not pumping efficiently and must be replaced.

There are different methods to proving pumping efficiency. If the test is performed with a system charged with refrigerant, a deep vacuum will not be achieved.

Capillary Restriction

With a totally blocked capillary, there will be no refrigeration effect. A partially blocked capillary may have similar symptoms to a system being short of refrigerant. Flush a restricted capillary with dry nitrogen. If the capillary will not clear, it must be replaced.

After the repair, the drier must be replaced (every time the refrigeration system is opened, the drier must be replaced). The Cyclone® must be fully evacuated and charged to the volume of refrigerant indicated on the Cyclone® serial/rating label. All service lines must be purged.

Finally, pinch-off the gauge process lines (or remove line piercing valves) and braze the system closed. SKOPE recommend against leaving service valves in the system as these are prone to leak (and are open to abuse). Perform a final system leak test.

Refrigerant R134a Handling Precautions

It is important to maintain dedicated HFC service equipment and parts:

- Refrigeration gauges
- Service lines / Fittings
- Vacuum Pump
- Charging equipment
- Driers
- Compressors
- Temperature / Pressure chart

HFC (R134a) refrigeration systems require special service procedures because of the highly hygroscopic (moisture sensitive) polyolester (POE) compressor oil:

- The system (especially compressor) must only be open for the very minimum time (to prevent moisture ingression). All parts required for servicing must be at hand - before the system is opened, and there should be no interruption until the system is on the vacuum pump (or hermetically sealed).
- The system must not be open for longer than 20 minutes max.
- The drier must be replaced every time the system is opened.
- Clean work practices are essential.
- SKOPE recommend brazing the system closed after service - as valves are prone to leak due to the nature of R134a.

Important:

Every time the refrigeration system is opened, the drier MUST be replaced.

5.6 Pressure Temperature Chart

TEMPERATURE		R134a		R404A	
°F	°C	KPa	psig	KPa	psig
-29.2	-34	-32	9.4	71	10
-27.4	-33	-28	8.4	79	11
-25.6	-32	-25	7.3	86	13
-23.8	-31	-21	6.2	94	14
-22.0	-30	-17	5.0	103	15
-20.0	-29	-13	3.8	111	16
-18.4	-28	-9	2.6	120	17
-16.6	-27	-4	1.3	129	19
-14.8	-26	0	0.0	138	20
-13.0	-25	5	0.7	148	21
-11.2	-24	10	1.4	158	23
-9.4	-23	15	2.2	168	24
-7.6	-22	20	2.9	179	26
-5.8	-21	26	3.7	189	27
-4.0	-20	31	4.5	200	29
-2.2	-19	37	5.4	212	31
-0.4	-18	43	6.3	224	32
1.4	-17	49	7.2	236	34
3.2	-16	56	8.1	248	36
5.0	-15	63	9.1	261	38
6.8	-14	69	10.0	274	40
8.6	-13	77	11.0	288	42
10.4	-12	84	12.0	302	44
12.2	-11	91	13.0	316	46
14.0	-10	99	14.0	331	48
15.8	-9	107	16.0	346	50
17.6	-8	116	17.0	361	52
19.4	-7	124	18.0	377	55
21.2	-6	133	19.0	393	57
23.0	-5	142	21.0	410	59
24.8	-4	151	22.0	427	62
26.6	-3	161	23.0	445	65
28.4	-2	171	25.0	463	67
30.2	-1	181	26.0	481	70
32.0	0	192	28.0	500	73
33.8	1	202	29.0	519	75
35.6	2	213	31.0	539	78
37.4	3	225	33.0	559	81
39.2	4	237	34.0	580	84
41.0	5	249	36.0	601	87
42.8	6	261	38.0	623	90
44.6	7	274	40.0	645	94
46.8	8	287	42.0	668	97
48.2	9	300	44.0	691	100
50.0	10	314	46.0	715	104

Table 6: Pressure Temperature Chart

5.7 Troubleshooting

Complaint	Possible Cause	Repair
1. Cabinet not operating - lights etc. not going.	Loss of power supply.	Check power supply.
	Refrigeration shut-down. Condenser over-temperature has shut-down system and cabinet lighting.	Attend condenser. To reset alarm, cabinet must be rep-lugged into power supply.
	Cabinet supply fuse blown.	Check fuse in junction box. Determine reason for failure.
	Fluorescent tube failed.	Replace with tube of same wattage and colour rendering.
	Loose connections at light supply fittings.	Check all connections (ballast and lamp holders).
	IMPORTANT: Each twin lighting ballast supplies two tubes. If either tube or associated connections fail, BOTH tubes will not go. No voltage will be detectable at lighting supply side of the ballast.	
2. Compressor will not start - no hum.	Overload protector tripped.	Refer to electrical section.
	Faulty electronic controller,	Repair or replace control.
	Thermostat off, due to cold location.	Relocate control.
	Wiring improper, or loose.	Check wiring against diagram.
3. Compressor will not start - hums but trips on overload protector.	Improperly wired.	Check wiring against diagram.
	Low voltage to unit.	Determine reason and correct.
	Start capacitor defective on CSIR or CSR motor.	Determine reason and replace.
	Run capacitor defective on PSC motor.	Determine reason and replace.
	Relay failing to close.	Determine reason and correct. Replace if necessary.
	Compressor motor has a winding open or shorted.	Check resistance values. Replace compressor if necessary.
	Internal mechanical trouble in compressor.	Replace compressor.

Table 3: Troubleshooting - continued on next page

5.7 Troubleshooting

Complaint	Possible Cause	Repair
4. Compressor starts, but does not switch off - start winding.	Improperly wired.	Check wiring against diagram.
	Low voltage to unit.	Determine reason and correct.
	Relay failing to open, due to welded contacts or relay incorrectly mounted.	Determine reason and correct. Replace if necessary.
	Run capacitor defective on CSR motor.	Determine reason and replace.
	Excessively high discharge pressure.	Clean condenser. Check power input. Possible overcharge, insufficient condenser cooling, or non-condensible gasses.
	Compressor motor has winding open or shorted. Check continuity and resistance.	Replace compressor if faulty.
	Internal mechanical trouble in compressor (tight). May be lubrication.	Replace compressor.
5. Compressor starts and runs, but short cycles on overload protector (relay may chatter on RSIR, CSIR and CSR motors).	Additional current passing through overload protector.	Check wiring diagram. Check for added fan motors etc., connected to wrong side of protector.
	Low voltage to unit.	Determine reason and correct.
	Overload protector defective.	Check current, replace protector.
	Run capacitor defective on CSR motor.	Determine reason and replace.
	Excessive discharge pressure.	Check condenser, check ventilation, check for restrictions in refrigeration system.
	Suction pressure too high.	Check for possibility of misapplication.
	Compressor too hot - insufficient suction gas cooling.	Check refrigerant charge (fix leak), add if necessary. Check return vapour temperature and suction superheat.
	Comp'r motor has a winding shorted.	Replace compressor.

Table 7: Troubleshooting - continued on next page

5.7 Troubleshooting

Complaint	Possible Cause	Repair
6. Unit runs OK, but short cycles.	Overload protector.	See section 5 on p.42.
	Thermostat: requires adjustment or incorrectly positioned.	Adjust or relocate thermostat. See p.16.
7. Unit operates long or continuously. Unsatisfactory cabinet temperature.	Short of refrigerant.	Fix leak, and add charge.
	Overcharge of refrigerant.	Remove refrigerant to correct charge.
	Thermostat not reading temperature correctly.	Check air temperature with thermometer. Adjust offset if required.
	Evaporator has excessive load.	Establish load within limits.
	Evaporator coil iced.	Defrost evaporator, check refrigeration. Check thermostat. Check door closing, seals etc. Check defrost.
	Restriction in refrigeration system.	Determine location and clear restriction. Flush with dry nitrogen. Replace component if blockage will not clear.
	Dirty condenser.	Clean condenser. Advise client how to regularly clean condenser.
	Inadequate air circulation.	Internal: Improve air movement, allow airflow around stock. External: Remove any restrictions to condensing ventilation.
	Compressor not pumping efficiently.	Replace compressor.
	Filter dirty (if applicable).	Clean or replace.
	Faulty fan motor.	Check rotation. Replace if necessary.

Table 7: Troubleshooting - continued on next page

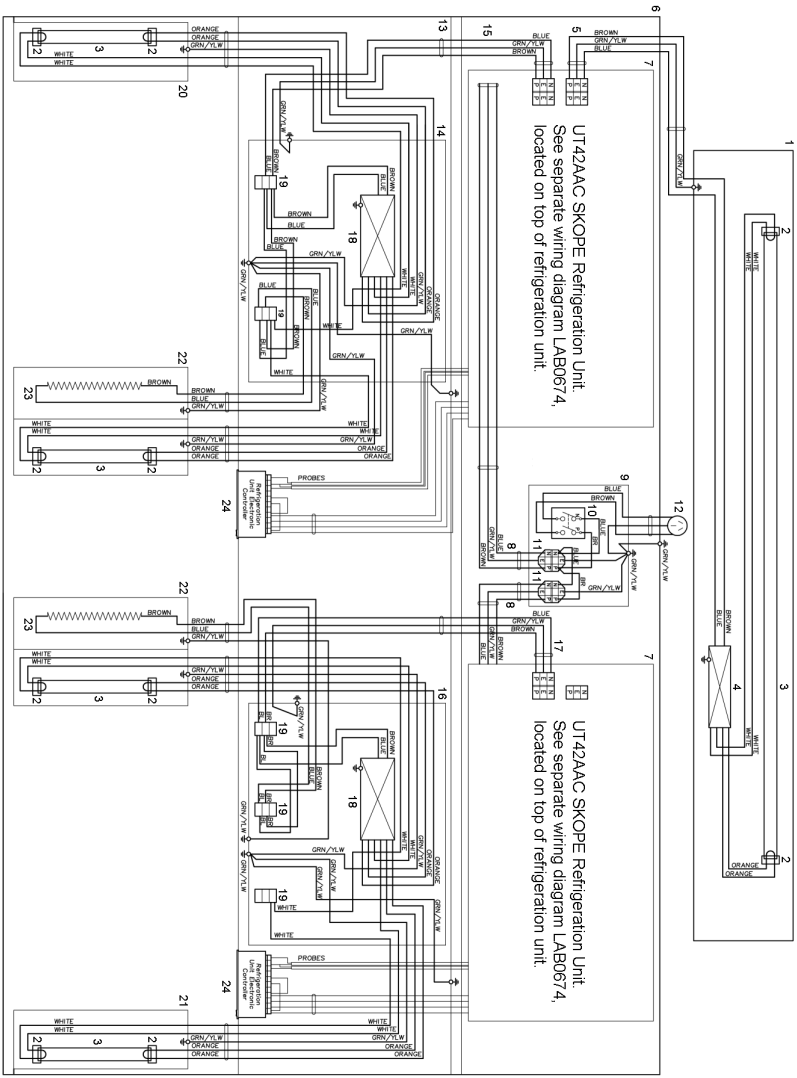
5.7 Troubleshooting

Complaint	Possible Cause	Repair
8. Start capacitor open, shorted or blown.	Relay contact not opening properly.	Clean contacts, or replace relay if necessary.
	Prolonged operation on start cycle due to: (a) Low voltage to unit. (b) Improper relay.	(a) Determine reason and correct. (b) Replace relay.
	Excessive short cycling.	Determine reason for short cycling, and correct.
	Improper capacitor.	Determine correct size and replace.
9. Relay defective or burned out.	Incorrect relay.	Check and replace.
	Line voltage too high or too low.	Determine reason and correct.
	Excessive short cycling.	Determine reason, and correct.
	Relay being influenced by loose vibrating mount.	Remount rigidly.
10. Suction line frosted.	Evaporator fan not running.	Determine reason and correct.
	Overcharge of refrigerant capillary systems.	Correct charge.
11. Unit noisy.	Loose parts or mountings.	Find and tighten.
	Tubing rattle.	Reform to be free of contact.
	Bent fan blade causing vibration.	Replace blade.
	Fan motor bearing worn.	Replace motor.

Table 7: Troubleshooting

6 WIRING DIAGRAMS

6.1 SK1500-2: Cabinet Wiring

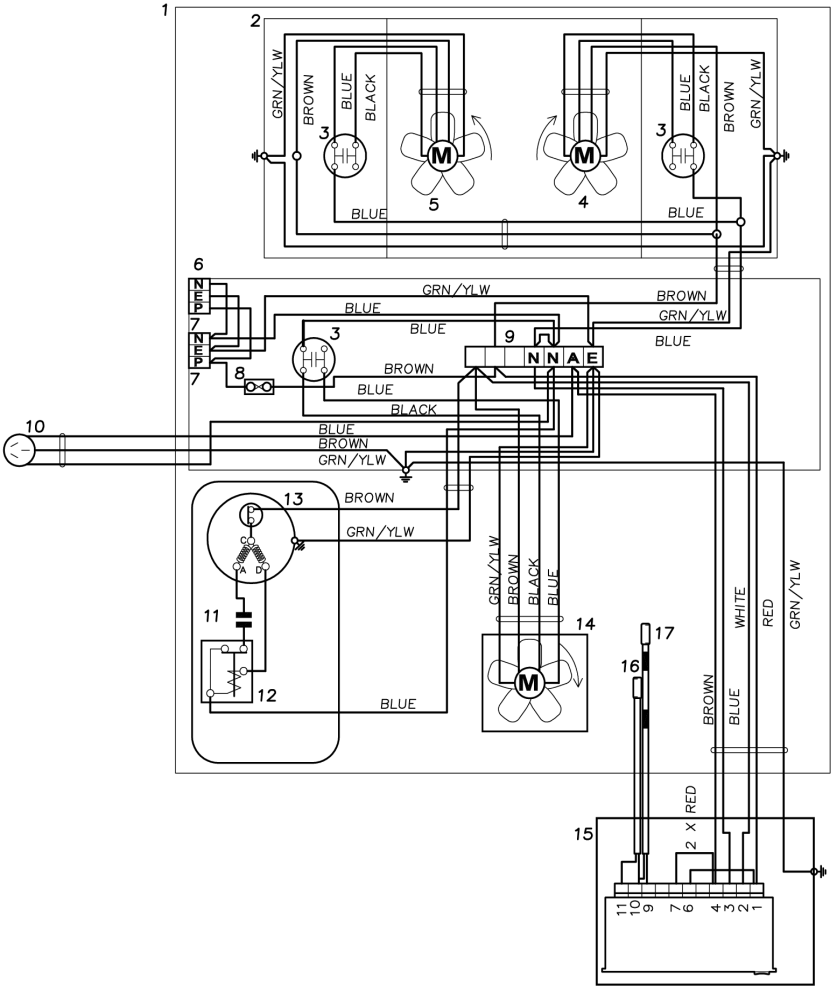


6 WIRING DIAGRAMS

6.1 SK1500-2: Cabinet Wiring

Item	Part Description
1	Lighted Sign Unit
2	T5 Lampholder
3	T5 35 Watt Fluorescent Tube
4	Electronic Ballast (single 14-35W)
5	Sign Unit Supply Flex
6	Foamed Cabinet
7	Refrigeration Unit (see separate wiring diagram)
8	Refrigeration Unit Supply Flex and IEC Plug
9	Mains Isolation Box
10	2-Pole Mains Isolation Switch
11	IEC Appliance Socket
12	Refrigeration Mains Supply Flex and Plug
13	Cabinet Front Top Step Wiring
14	Cabinet Wiring Junction Box - L/H
15	Cabinet Wiring Junction Box Supply Flex - L/H
16	Cabinet Wiring Junction Box - R/H
17	Cabinet Wiring Junction Box Supply Flex - R/H
18	Electronic Ballast (Twin 14-35W)
19	3-Pole Connector Block
20	Side Light Assembly - L/H
21	Side Light Assembly - R/H
22	Lit Centre Pillar Assembly
23	Pillar Fascia Heater Wire (15W)
24	Electronic Controller Box Assembly

6.2 UT42AAC: Refrigeration Unit Wiring



6.2 UT42AAC: Refrigeration Unit Wiring

Item	Part Description
1	Refrigeration Unit
2	Evaporator Motor Bracket Assembly
3	Capacitor
4	Evaporator Fan Motor (clockwise - LE)
5	Evaporator Fan Motor (anti-clockwise - LE)
6	Control Box
7	3-Way ENSTO Socket
8	3 Amp Fuse
9	7-Way Termianal Block
10	Mains Flex and Plug
11	Start Capacitor
12	Start Relay
13	Compressor - Danfoss SC12G
14	Condenser Fan Motor (clockwise - LE)
15	Electronic Controller Box Assembly
16	Cabinet Temperature Probe
17	Condenser Temperature Probe

7.1 Cabinet Assembly

Part Description	SKOPE P/No.	Customer P/N.
Control Panel	V80BA/N70	
Unit Separation Panel	V80BA/N45	
SKOPE Badge	V5000/770BF-99	
Shelf Support Channel	V50BC/353-32	
Shelf Support Bracket	V50BC/354-32	
Middle Shelf	WRKC15AJ/J70	
Side Shelf	WRKC15AJ/J70S	
Shelf Bracket	V0973-99	
Shelf Support Strip	ALXV5000/150	
Swivel Castor	SXX4339	

7.2 Cabinet Wiring Junction Box

Part Description	SKOPE P/No.	Customer P/N.
Cabinet Wiring J/Box - L/H	V50BA/G29	
Cabinet Wiring J/Box - R/H	V80BC/G29	
Junction Box Base - L/H	V50BA/G30-GT	
Junction Box Base - R/H	V55BA/G30-GT	
Junction Box Cover	V60BA/G31-GT	
Cabinet Supply Flex	V60BA/X03	
ENSTO 3-Pole Plug	ELZ0500-3	
Twin Electronic Ballast	ELZ0606	
Connector Block	ELZ8108	
Connector Block Pin	PLM9549	

7.3 Isolation Box

Part Description	SKOPE P/No.	Customer P/N.
Isolation Box Assembly	V80BA/E80	
Isolation Box Base	V80BA/E81-GT	
Mains Flex and Plug	V4800/E53	
IEC Socket Outlet	ELK8880	
16 Amp Rocker Switch	ELS0495	

7.4 Interior Side Light

Part Description	SKOPE P/No.	Customer P/No.
T5 Side Light Assembly - L/H	V50BB/L85-32	
T5 Side Light Assembly - R/H	V50BA/L85-32	
Side Light Channel	V50BA/L86-32	
Side Light Diffuser	V50BA/E71	
35 Watt T5 Fluorescent Tube	ELL0604	
T5 Lampholder	ELZ0600	

7.5 Centre Pillar Light

Part Description	SKOPE P/No.	Customer P/No.
Centre Pillar Light Ass'y - L/H	V50BC/L55L-32	
Centre Pillar Light Ass'y - R/H	V50BC/L55R-32	
Solid Pillar Assembly	V50BC/L43	
Channel Support	V50BC/L77	
Centre Pillar Diffuser	V50BC/L57	
35 Watt T5 Fluorescent Tube	ELL0604	
T5 Lampholder	ELZ0600	

7.6 Door

Part Description	SKOPE P/No.	Customer P/No.
Glass Door Assembly	V50BA *	
Door Frame Assembly	V50BA/D01/1	
Door Gasket	GKT0572N	
Door Heater Element	ELE9932	
Torsion Bar Assembly	REF5014	
Bush	PLM5075	
Capstan	TUR5100	
Split Pin	FAS5076	
Gasket Retainer - Vertical	V50BA/765	
Gasket Retainer - Horizontal	V5000/766	
Top Hinge Assembly - L/H	V50BA/389	
Top Hinge Assembly - R/H	V50BA/388	
Top Hinge Blank - L/H	V50BA/390B	
Top Hinge Blank - R/H	V80BA/390A	
Bottom Hinge - L/H	V50BA/394	
Bottom Hinge - R/H	V50BA/393	

* If ordering a glass door assembly; please quote this part number, if the door is left or right hand, and the cabinet serial number.

7.7 Sign Unit

Part Description	SKOPE P/No.	Customer P/No.
Sign Unit Assembly (packed)	V80BA/S21	
Sign End - R/H	V50BA/S23	
Sign End - L/H	V50BA/S24	
Sign Reflector	V80BA/C23	
Curved Sign Panel	PLY9135	
Sign Wiring Cover	V80BA/C26-32	
Sign Side - R/H	V50BA/182R	
Sign Side - L/H	V50BA/182L	
Sign Retaining Clip	V5000/C31	
Sign Top / Bottom Panel	V80BA/S26	
Sign Back Strip	V80BA/C53	
Sign Centre Tie Wire	WRK8240	
Sign Panel Edge Strip	RUE3704	
35 Watt T5 Fluorescent Tube	ELL0604	
T5 Lamp Holder	ELZ0600	
Single Electronic Ballast	ELZ0605	
ENSTO 3-Pole Plug	ELZ0500-3	
Sign Supply Flex	V80BA/934	

7.8 Refrigeration Unit

Part Description	SKOPE P/No.	Customer P/No.
Refrigeration Unit Assembly	UT42AAC	
Unit Base	UT40AA/210-32	
Unit Base Foot	PLM6108	
Unit Retaining Bracket	V60BA/226	
Evaporator Box Assembly	UT40AA/376	
Evaporator Lid Assembly	UT40AA/225	
Evaporator Brace - straight	V5500/227-32	
Evaporator Brace - angled	V55BA/227-32	
Evaporator Assembly	UT40AA/R39	
Evaporator Coil	CLS9930	
Evaporator Motor	ELM9917	
Motor Capacitor	ELC9142NC	
R/H Fan Blade (CW)	FAN4100	
L/H Fan Blade (ACW)	FAN4101	
Suction Line	UT40AA/379A	
Compressor - Danfoss	CPR6108	
Compressor Relay	ELR2729NC	
Compressor Start Capacitor	ELC2369NC	
Compressor Mounting Kit	SXX3654NC	
Drier	DRY8783	
DIXELL Electronic Controller	ELZ0471SP	
DIXELL NTC Probe	ELZ0472	
Controller Flex Assembly	UT40AA/E19	
Condenser Assembly	UT40AA/R38	
Condenser Coil	CLS9929	
Condenser Motor	ELM9917	
R/H Fan Blade (CW)	FAN7355	

7.9 Refrigeration Unit Junction Box

Part Description	SKOPE P/No.	Customer P/No.
Unit Junction Box Assembly	UT42AA/R86	
Junction Box Base	UT40AA/R87-GT	
Junction Box Cover	UT40AA/R88-GT	
Motor Capacitor	ELC9142NC	
3 Amp Ceramic Fuse	ELZ9654	
Fused Terminal Block	ELZ9655	
ENSTO 3-Pole Socket	ELZ0499-3	
ENSTO 3-Pole Panel Adaptor	PLM0497-3	
Controller Flex Assembly	UT40AA/E19	
Mains Flex and IEC Plug	FLX0539	

Notes