Manufactured by Kirby HVAC&R Pty Ltd ABN 42 624 910 041

Compact, Low Profile Cabinet Coolers HANDBOOK

For Units up to 2350 W

THANK YOU for purchasing refrigeration products from Kirby. Please read and apply the following procedures carefully in order to fully utilize the equipment you purchased.
This instruction booklet is only applicable to Compact, Low Profile Cabinet Coolers marketed as the Kirby KC / KF / KCT range.

IMPORTANT INFORMATION

REFER TO THE SECTIONS ON
"WARNINGS AND SAFEGUARDS", AND "INSTALLATION INSTRUCTIONS"
BEFORE ATTEMPTING TO COMMISSION THIS EVAPORATOR.

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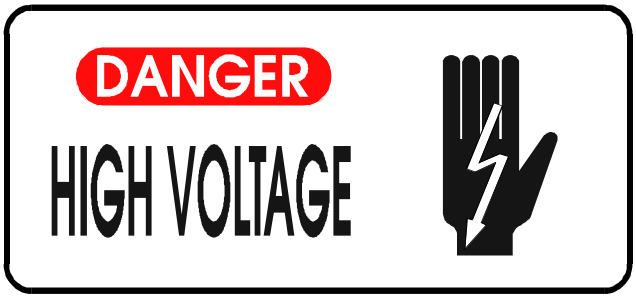
Warnings and Safeguards



Under no circumstances should anyone other than a qualified person attempt to gain access to the interior of the unit without first ensuring electric power is disconnected.

- Personal Protective Equipment such as gloves, eyewear and footwear should be used during any work carried out on this product.
- Installation, commissioning, testing, decommissioning and service maintenance should be performed only by qualified personnel (refrigeration mechanics and/or electricians) who have sufficient knowledge in this type of equipment. It is the purchaser's responsibility to co-ordinate with qualified personnel as required.
- Avoid contact with sheet-metal edges and the coil fins. They can be sharp and are a potential personal injury hazard.
- Refrigerant can be harmful if it is inhaled and/or makes contact with exposed skin. Refrigerant used in this equipment are controlled substances, and must be used and recovered responsibly. It is against the law to deliberately discharge controlled substances into the environment. Extreme care must be taken when handling refrigerant, as personal injury or death may occur.
- All field wiring must conform to the requirements of the equipment and all applicable National and Local Codes. All power sources must be disconnected before the commencement of any service, maintenance or electrical work.
- Avoid contact refrigerant pipes and heat transfer surfaces when the equipment is operating. Their extreme hot or cold surfaces may result in skin burns.
- **WARNING:** Do not insert any object into operating fans. Ignoring this warning may result in personal injury and/or severe equipment damage and consequences.
- Fans operate continuously even when the refrigeration system has 'cycled off'. The exception is on freezer models where the fans will cycle off during defrost.

Purpose

These Compact, Low Profile Cabinet Cooler ranges are standard OEM products of Kirby; they comprise both 'medium' and 'low' temperature ranges. They are intended for typical commercial under-bench, upright and reach-in display cabinet fridge and freezer applications for the storage of pre-chilled or frozen vegetables, meat, fish, general foodstuffs and beverages, etc. They are not intended for environments that may have harmful, corrosive or flammable atmospheres or for the storage of corrosive or flammable chemicals. 'Marine' environments are considered corrosive; please consult Kirby before installing in this environment.

Standard Design Conditions

MAXIMUM ALLOWABLE PRESSURE (PS/PSS)

UNIT DATA	
PS (kPag)	PSS (kPag)
3000	n/a

Medium temperature range coolers (Kirby KC / KCT series) are designed at –4°C saturation suction temperature (SST) and 6 KTD to suit cabinet temperature from -6°C to +16°C (refer to sales data sheet for maximum and minimum allowed KTD for specific SST), for use in 'medium duty' commercial display cabinet fridge applications. For cabinet below 2°C, additional defrosting means may be required. R507A/R404A is recommended refrigerants. Kirby KC/KCT series range coolers are suitable for R448A, R449A & R513A refrigerants. For different refrigerants, please refer to sales data sheet for capacity variations.

Low temperature range coolers (Kirby KF series) are designed at -24°C SST and 6 KTD to suit cabinet temperatures from –32°C to –2°C (refer to sales data sheet for maximum and minimum allowed KTD for specific SST), for use in 'medium duty' commercial display cabinet freezer applications. R507A or R404A are the recommended refrigerants. Kirby KF series range coolers are suitable for R448A, R449A refrigerants. For different refrigerants, please refer to sales data sheet for capacity variations. For lower temperatures design variations may be required.

These standard coolers cannot use Ammonia (NH_3) as refrigerant.

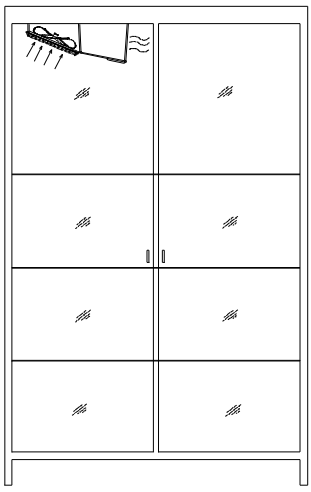
For special design requirements (non standard conditions and/or refrigerants such as Glycol, Hydrocarbons, etc), please inquire with your local representatives and/or Kirby local branches, or call our national telephone number 12 23 50 for your nearest available information resources.

Recommended Placement and Clearance

Some general rules for cabinet cooler placement shall be followed:

- The air pattern shall cover the entire cabinet or effective area.
- Do **NOT** locate coolers to blow over doors.
- Do **NOT** hinder the discharge and return airflow of the coolers.
- Do **NOT** overload the cabinet, and take note of the load line, so the cabinet can be held at a desired temperature.

Reasonable clearance between the coil discharge face and the sidewall or back wall of the cabinet shall be considered for efficient airflow. The general practice in the industry is to have the minimum clearance set as the height of the coil. Alternatively, leave 75mm distance for the small units, such as 1 fan and 2 fan units, and reserve 150mm space for the larger units, like 3 fan units.



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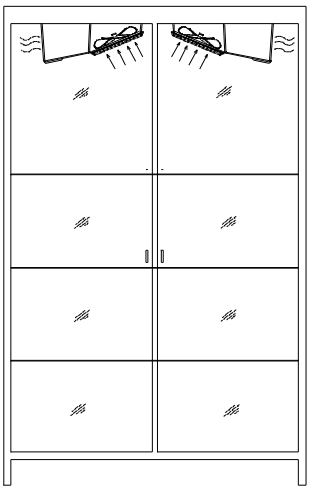

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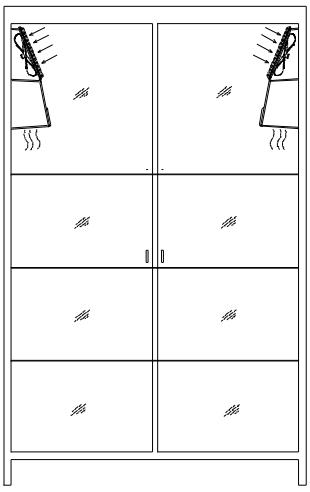

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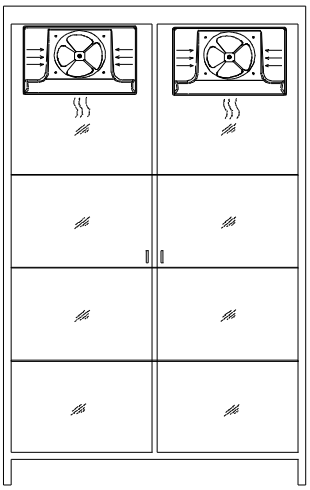

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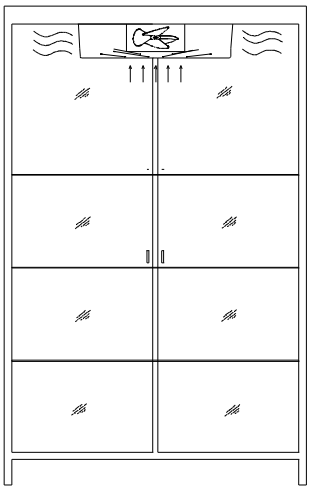


E)

A) – B):
Mounted on ceiling, blow to sidewall or back wall.
C) – D):
Mounted on sidewall or back wall, blow downward. (a special drain tray kit is needed)
E):
Twin blow model mounted on ceiling, blow to both sidewalls.

Installation Instructions

a) Lifting of Unit

The weight of the unit ranges from 3.9 to 18 kg. If necessary, use the appropriate mechanical handling equipment to lift the unit into place.

b) Unpacking of Unit

When unpacking, check for any damage to packing material or the unit itself, which may affect the unit's performance. **If any such damage is evident, please contact your Kirby branch.**

c) Mounting the Unit

These cabinet coolers can be mounted (1) on the ceiling or, (2) on the wall (a special kit is needed to modify the drain tray) of the cabinets, with screws or bolts, nuts and washers. The mounting-hole sizes are Ø7x12, Ø8x16 or Ø9.5x16 slots though the whole range depending on the specific unit. It is the installer's responsibility to ensure the units mounted securely and professionally.

All units shall be mounted professionally and levelled properly so that condensate water drains from the unit efficiently. Adequate support must be provided to hold the weight of the unit plus the weight of the refrigerant and any frost that may accumulate on the coil surface.

d) Condensate Drain Line

Ensure that the installation complies with HACCP and/or relevant regulations for food safety, and the end user's preferences when choosing copper, stainless steel or PVC material for condensate drain lines. For low temperature applications, proper insulation and heating cable shall be provided to prevent the drainpipe from freezing. Provide a minimum 300mm per meter pitch to condensate drain lines for proper drainage. Drain lines should be at least as large as the unit drain connection. All condensate drain lines must be trapped to prevent outdoor air and odours entering the cabinet, and must never be connected directly to the sewer system. All traps must be located in a warm ambient to prevent water from freezing. It is recommended that the drain line be kept to a minimum length within the cabinet.

e) TX Valve, Sensor Bulb and External Equalisation Line

Refer to the sales data sheet regarding preferred TX valves for each unit. For best performance, the TX valve should be installed as close to the distributor as possible.

Locate the TX valve sensor bulb on the horizontal section of suction line and close to the suction header. For a satisfactory TX valve operation, good thermal contact between the sensor bulb and the suction line is essential. Follow TX valve manufacturers recommendations when positioning TX valve and sensor bulb. Incorrect installation may result in poor coil performance.

The external equalisation line should be used to link the TX valve external equalisation port and the suction line, near the suction header. A 3/16" tube brazed to the suction line is supplied for that purpose.

Note: With modern high quality TX valves, refrigerant leakage through the equalisation line is at a minimum and the TX valve operation is not affected. Thus the external equalisation connection could be made either upstream or downstream of the sensor bulb.

f) Refrigeration Piping

Refrigeration piping work shall be carried out professionally by qualified refrigeration mechanics in accordance with applicable national and local regulations and in conformance with good engineering practices required for the proper operation of the refrigeration system.

All cabinet coolers supplied by Kirby are supplied with clean internal tubes, dry air purged and capped with Neoprene covers to prevent oxidation and ingress of moisture or foreign matter. Care shall be taken during installation of the piping to prevent entrance of foreign matter or moisture by minimising the time that the piping is uncapped.

The interconnecting refrigeration pipe size is not necessarily the same size as the outlet on the unit. The pipe sizes shall be selected/calculated based on the best compromise of minimizing refrigerant pressure drop and refrigerant velocity to ensure efficient oil return. Kirby can provide a software program to assist in the calculation of pipe sizes.

Horizontal suction lines shall slope away from the evaporators to allow the oil return freely to the compressor by gravity. A 1:100 slope is considered sufficient. It is a good engineering practice to fit an oil trap when the suction line rises above the evaporator.

If in doubt during the installation, please consult with your local sales representatives and/or application engineers from Kirby for technical support.

Electrical Connection

All electrical connections must be carried out by a licensed electrical technician and in accordance with the relevant regulations. Without prior permission from Kirby Australia, all the provided electrical wiring shall NOT be modified. Failure to follow this procedure may cause death and void warranty.

The Kirby KC / KCT, the medium temperature coolers, are supplied pre-wired to a terminal strip located inside the unit. The Kirby KF series, the low temperature coolers, are supplied pre-wired to a "WAGO" terminal block located inside the unit. The wiring diagram for each low temperature unit is located on the inside of the top-housing panel. Refer to the sales data sheets for all the information regarding voltage and current for fan motors and element heaters.

After electrical installation, units should be tested for correct current draw and rotation of fan motors.

General Commissioning Guide

Refrigeration system commissioning shall be carried out professionally by qualified refrigeration technicians in conformance with good engineering practices required for the proper operation of the refrigeration system.

After all installation and electrical work is completed, the entire refrigeration system must be leak tested. After satisfactory testing of the refrigeration system, the necessary refrigeration lines shall be insulated. The insulation located in outdoor environments shall be protected from UV exposure.

Before charging the refrigerant, the entire refrigeration system shall be evacuated by connecting a good, high vacuum pump to both the high-pressure side and low-pressure side service valves or ports.

Vacuum must be maintained sufficiently so as to minimise the occurrence of leaks when the system is charged. Refrigerant must not be charged into a system with known leaks. Should vacuum not be maintained, check for leaks with Nitrogen gas at a suitable pressure prior to charging.

Installing a liquid line drier and a sight glass in a refrigeration system is sound engineering practice. The liquid line drier will ensure all refrigerant supplied to the refrigeration system is clean and dry. The sight glass is a useful device to ensure sufficient refrigerant is supplied to the refrigeration system.

Refrigerant charging shall be in liquid form at the high-pressure side of the system such as condenser or liquid receiver. If the refrigerant charging must be carried out through the suction side of the compressor, charge in vapour form only.

Double-check all field wiring connections and factory terminals. Factory connections can vibrate loose during shipment. Ensure correct fan motor rotation, airflow is induced from fan motor side and forced out of coil side.

Check the cabinet thermostat for normal operation and adjust if necessary.

Advisory Defrost Guidelines

In order to maximise efficiency and airflow, the following advisory defrost data has been compiled. Defrost data is minimum number of defrosts required per 24 hrs for average cabinet loads.

SST	-36	-30	-24	-18	-12
DEFROSTS AT MAX. KTD	7	7	7	6	6
DEFROSTS AT 6KTD	5	5	4	4	4
DEFROSTS AT MIN. KTD	5	4	3	3	4

Advisory defrost timing for –18°C room

KTD	LIGHT LOAD		HEAVY LOAD			LIGHT LOAD		
	1	2	3	4	5	6	7	8
10	**X**	**X**	**X**	**X**	**X**	**X**		**X**
8		**X**	**X**	**X**	**X**	**X**		**X**
6		**X**		**X**		**X**		**X**
4			**X**		**X**			**X**

Each column represents a 3-hour period during the day. An X indicates the hour that a defrost should commence. “Heavy Load” represents the nominal ‘working period’ of each day.

a) Defrost Termination Requirements

Defrost time for average loads should be approx. 15 - 20 minutes including drainage. Time will vary with varying degrees of ice build up.

Time Termination – should be set to ensure complete defrost at the heaviest load condition. Typically allow 15 - 20 minutes with safety reset at 30 minutes.

Temperature Termination – setting depends on frequency and severity of defrosts, and location of the sensing device. If using the standard defrost termination thermostat (Kirby #MCC143-1, as fitted), the defrosting guidelines above should be used. If using an electronic defrost controller, the temperature termination setting must be determined for each installation. The setting should not be less than 12°C cutout. Location of the sensor must be determined to suit each application. Fitting the sensor in the finned coil block requires higher settings, possibly 20°C or greater.

Pressure Termination – can be incorporated into the defrost in a number of ways. Whatever method is preferred, it must be noted that the temperature of the fins will be somewhat lower than the saturation temperature corresponding to the refrigerant pressure. Therefore a somewhat higher refrigerant temperature must often be allowed for when setting the pressure control. See table below. It is also not recommended to control the fan delay by pressure as very low pressure will be reached quite quickly after defrost on TX valve systems, when the fans are not running. It is preferable to combine the pressure termination with a time clock for fan delay.

Heater Safety Thermostat – units equipped with electric defrost heaters are fitted with a Heater Safety Thermostat (Kirby #MCC126-1) as standard. This control cuts the supply to the heaters in the advent of a controller or sensor failure to prevent excessive temperatures / pressures developing. The operating point is +20°C. It is recommended that this control **NOT** be over-ridden, re-wired or removed. This control will **NOT** restart the refrigeration system.

Fan Delay Requirements – may vary with application, conditions and control method, but should not be more than 5 minutes. Fan delays with Kirby #MCC143-1 will be of the order of 2 – 4 minutes.

b) Control Setting Guidelines

Each application should be treated on its merits, however the following is given as a guide. During the commissioning, this data should be used as a reference initially. It is then necessary to fine-tune the control settings to achieve the satisfactory defrost results.

Termination Type	Sensor Location	Setting	Fan Delay
Time	n/a	15 – 20 mins	4 mins (max)
Temperature	Suction Line Plate	11 – 14°C	-2 - +1°C
Pressure (Gauge)	Header	750-770kPa R404A	n/a
		780-800kPa R507	n/a
		610-630kPa R407C	n/a

The above guidelines allow for relatively heavy defrost loads. Shorter times or lower settings must be verified on the installation. Pressure termination given for R407C and R404A corresponds to the mid point at the required temperature. Refer to the applicable Kirby Pressure / Temperature Chart.

All data given is for defrost without refrigerant pump down.
Pump-down is not recommended for electric defrost using pressure and/or temperature control. There is clear evidence in testing that positive defrosting of the distributor, leads, header and suction line, can not be achieved without refrigerant being present in the coil. Additional means, such as heater tape around these components, may be needed if using pump-down. Longer defrosting time and / or more frequent defrosting may also be necessary to ensure long-term ice built up does not occur.
Pump-down may be used with time termination. The defrost time will be longer and requirements must be determined on individual systems.

Routine Maintenance of Unit

All Kirby Cabinet Coolers are designed to have low service maintenance requirements. Based on normal operation conditions and working environment, a service maintenance schedule shall be established after the successful completion of commissioning, to ensure the units operate efficiently and running costs are kept at a minimum. The following items shall be checked and recorded during service maintenance,

- Visually inspect the units looking for corrosion, unusual vibrations, oil stains and drain tray blockage. The drain tray should be cleaned regularly with warm soapy water.
- Clean the unit fins by using a soft brush, low pressurised water and/or commercially available evaporator coil cleaner. Never use an acid based cleaner. Follow label directions for appropriate use. Flush and rinse coil until no residue remains.
- Coils supplied with 'Koil Kote' need special care so as not to damage the coating. The coils should not be cleaned with strong alkaline cleaners and/or with stiff brushes. Mild soapy solutions that are well rinsed after cleaning should be satisfactory.
- Check that each fan rotates freely and quietly, fan guards are free of airflow obstructions and fan screws are tight.
- Inspect electrical wiring, connections and components looking for damaged wiring, loose connections and worn components.
- Check that all heaters are in their original positions and properly secured.
- Ensure even coil frost formation pattern on the air off side of the coil during operation. An uneven frost pattern may indicate a distributor blockage or incorrect refrigerant charge. The air on side tubes may contain superheated vapour and may not frost completely.
- Look for abnormal accumulation of ice patterns and adjust the defrost cycles accordingly.
- Check the superheat and adjust TX valve accordingly.

All power must be disconnected before cleaning and/or service maintenance. The condensate drain tray also serves as a cover of hazardous (hot, cold, electrical and moving) parts. Operation of units without condensate drain tray constitutes a safety hazard.

The service maintenance record as well as this "Compact, Low Profile Cabinet Coolers Handbook" shall be kept together in a safe place as a future reference.

General Decommissioning Guide

In order to remove the unit from its mounting place, the following procedures need to be carried out professionally by qualified personnel. Failure to do so may result in personal injury or death, property damage by fire or explosion. Discharge of refrigerant to atmosphere is illegal and may result in heavy fines by relevant regulatory authorities.

- Pump down the entire refrigerant charge into the liquid receiver or appropriate container such as reclaim cylinder, and shut related valves. All reclaimed refrigerant that is not re-used must be taken to an approved refrigerant recycling or destruction facility. Kirby Branches will accept the used refrigerant and return back to the manufacturer for you.
- Disconnect the power supply. Remove all necessary field electrical wiring and related components, leaving the earth wire to the last.
- Disconnect the drainpipe.
- Care must be taken when de-pressing the Schrader valve core (if fitted) in order to balance the pressure between the unit and ambient. There may be a small amount of refrigerant trapped in the oil, the pressure rise in the unit will boil and vaporise the refrigerant resulting in a potential personal injury hazard.
- Cut and solder seal the refrigeration liquid line and suction line pipe connections.
- Remove the unit from its mounting place. Adequate support must be provided to hold the weight of the unit. If necessary, the use of weight lifting equipment is highly recommended whenever possible.

Material Safety Data Sheets – M.S.D.S.

These are available from your nearest Kirby Branch for all refrigerants that this range of products are approved for.

Important Note

- To ensure Kirby cabinet coolers operate efficiently and for a long working life, always obtain genuine replacement parts from your local Kirby Wholesale Branch. Genuine replacement parts are covered by the warranty. Refer to the Standard Terms & Conditions of Sale in the Price Guide for warranty statements.
- Continuous product improvement is our company policy. Kirby reserves the right to make changes in product specifications and/or this instruction manual without notice.

Kirby is dedicated to providing safe products and protecting the environment by complying with all applicable national laws and regulations governing environmental protection. New and used refrigerants cannot be vented into atmosphere. Reclaim all used refrigerants. EPA regulations are constantly updated. Ensure your refrigerant handling procedure follows correct regulations.

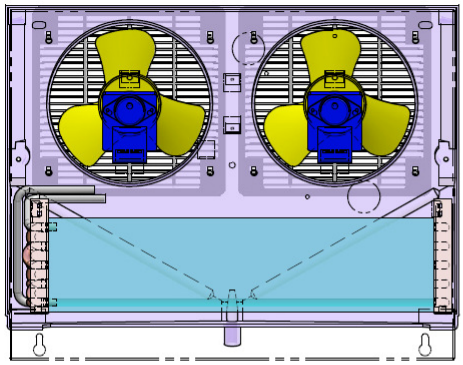
This product must be installed and maintained in accordance with the following:

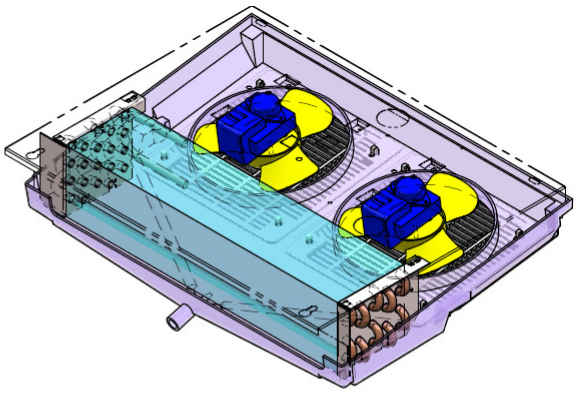
- AS/NZS5149:2016 – Parts 3 & 4 (as applicable)
- AS4041:1998 – Pressure Piping
- Refrigerant Handling Code of Practice, Part 2
  Useful information-
- Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 (and amendments) and Regulations 1995
- AIRAH, DA19 – HVAC&R Maintenance
- CIBSE Code M - Commissioning Management

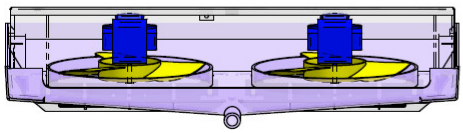
NOTE- There may be other applicable Codes and Standards that must be considered. It is the responsibility of the Installer and Owner to ensure all requirements are considered and complied with.

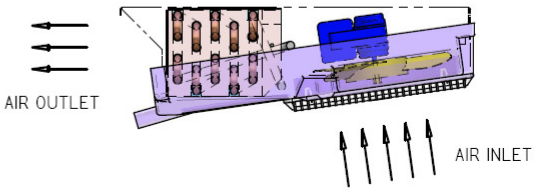
General Unit Drawings

1. Kirby “KC / KF” Range Small (1 & 2 Fan) Cabinet Coolers

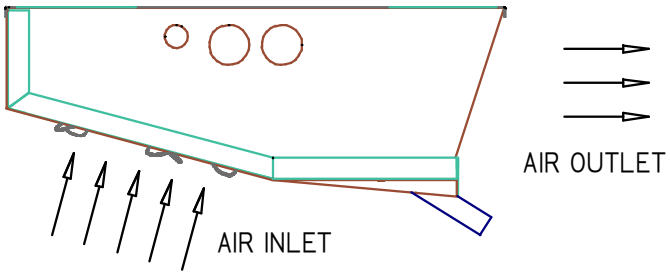


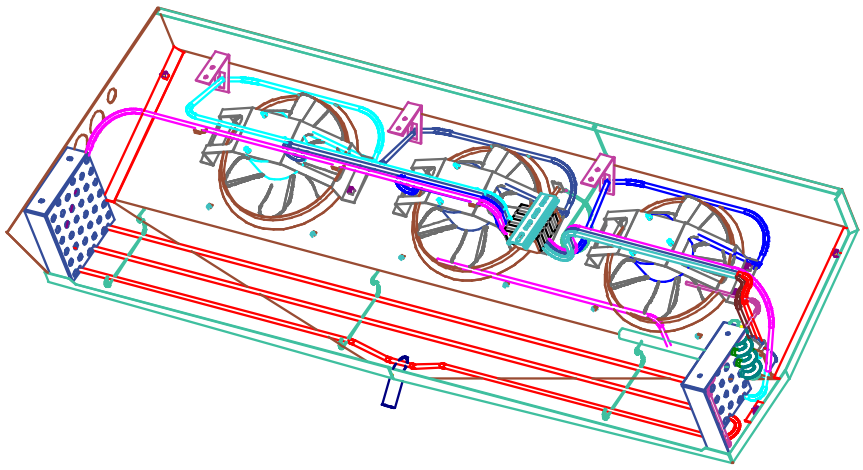




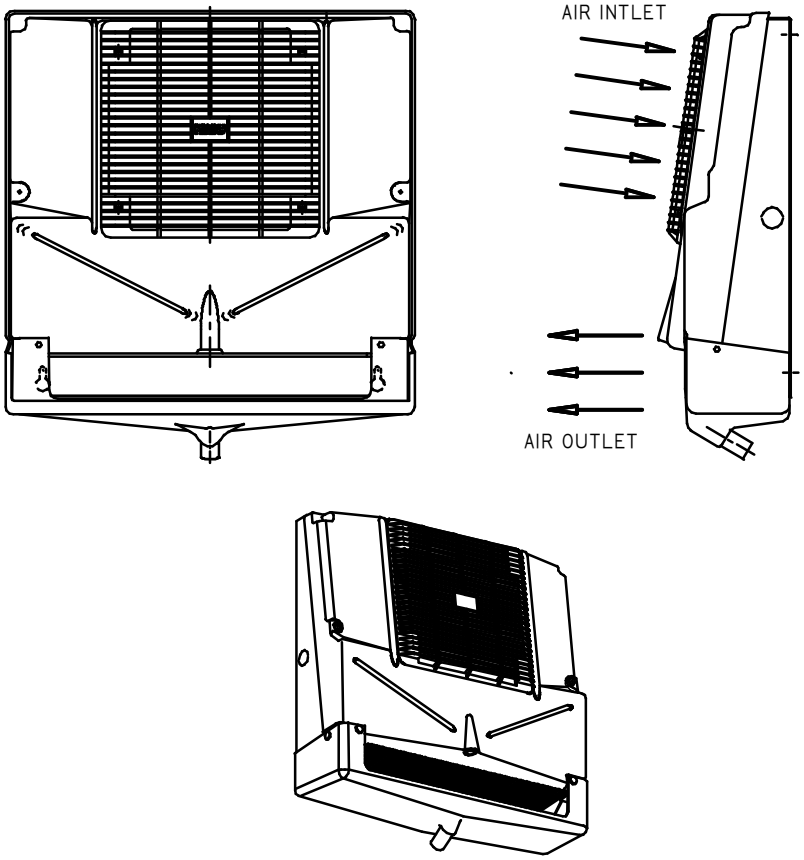


2. Kirby “KC / KF” Range Large (3 Fan) Cabinet Coolers

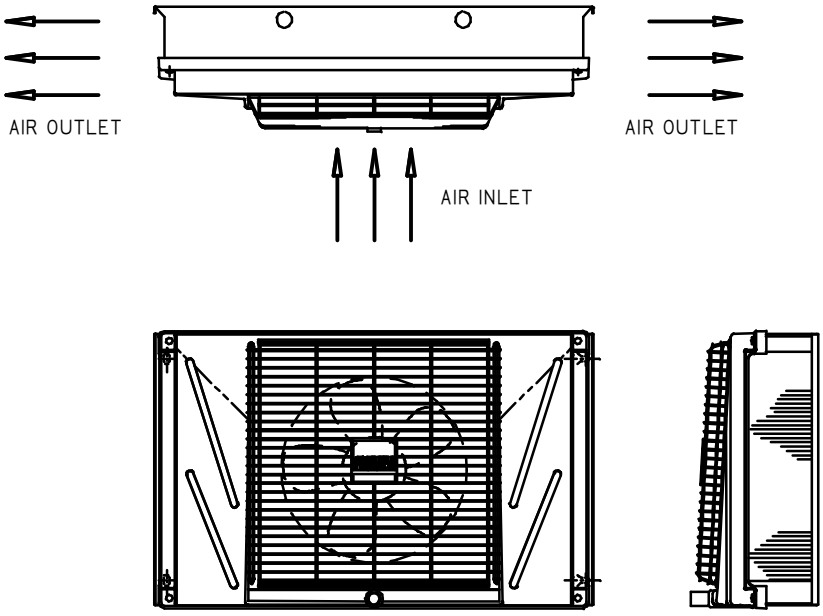




3. Special Drain Tray for Vertical Mounting Cabinet Coolers (1-Fan Units Only)

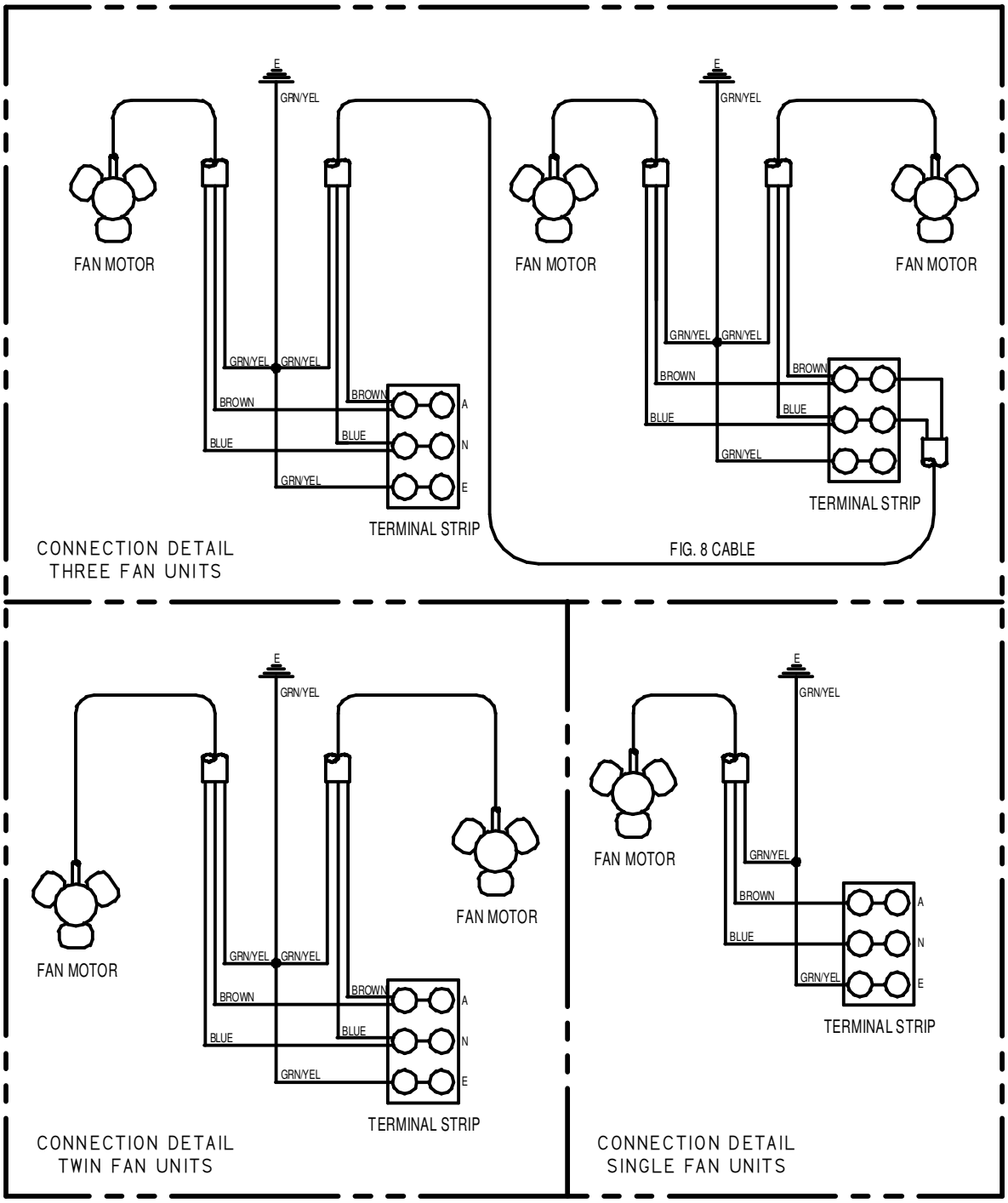


4. Kirby “KCT” ,“BCN-T” Range Twin Blow Cabinet Coolers



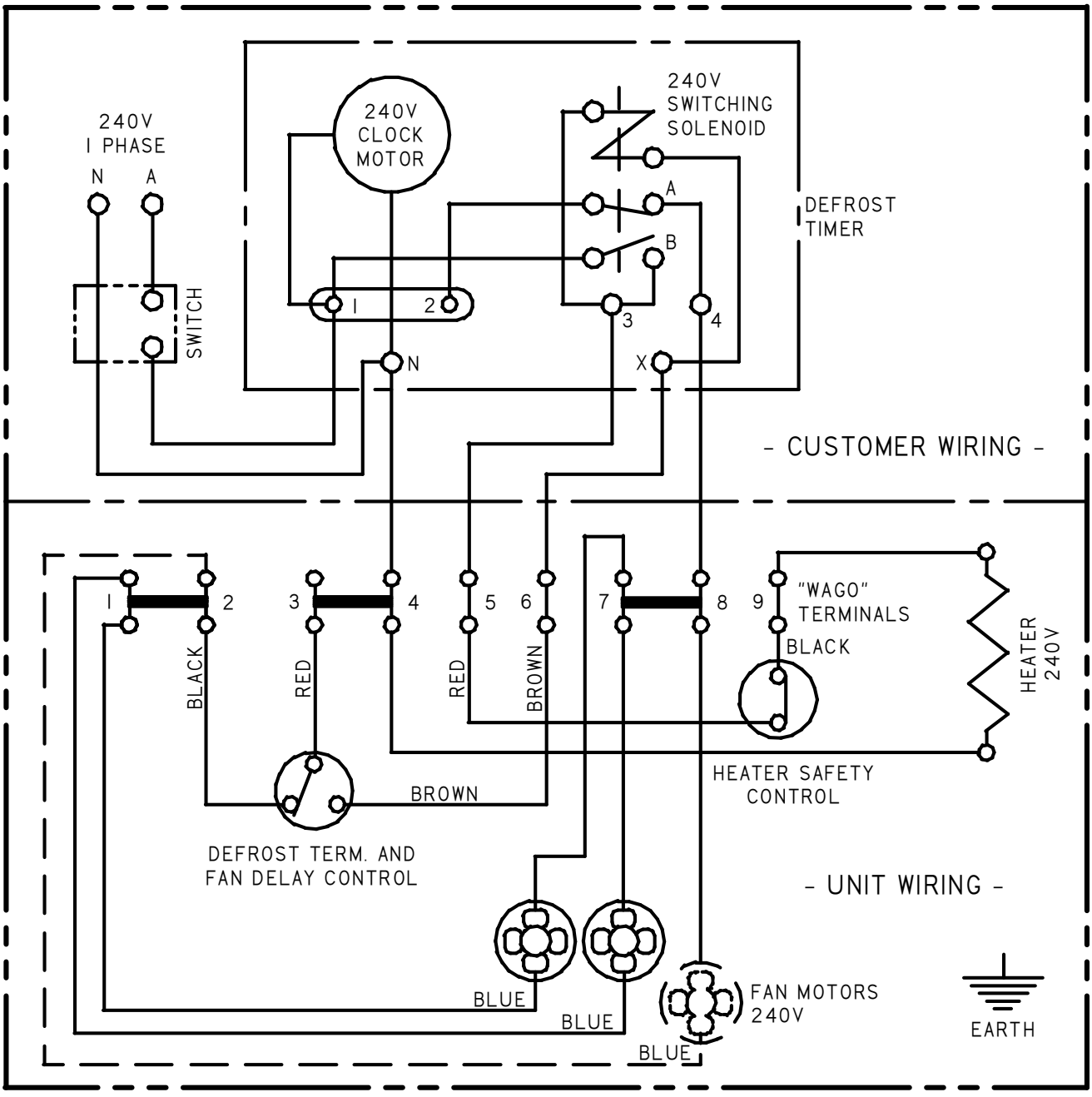
General Electrical Schematic Drawings

1. FACTORY FITTED COMPONENTS & ASSOCIATED WIRINGS FOR MEDIUM TEMPERATURE UNITS



2. FACTORY FITTED COMPONENTS AND ASSOCIATED WIRINGS FOR LOW TEMPERATURE UNITS

NOTE: Kirby supplies factory fitted components and associated wirings only to the scope limited within the "UNIT WIRING" section. All wiring & associated components within the scope of "CUSTOMER WIRING" are to be supplied and fitted on final installation by customer.



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