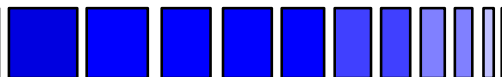


THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 1 of	21



PRODUCT SPECIFICATION



REFRIGERATION MACHINERY UNITS

CRR40

FOR
REFRIGERATION CONTAINERS



THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 2 of	21

TABLE OF CONTENTS

GENERAL UNIT INFORMATION.....	3
DESIGN STANDARD INFORMATION	4
UNIT CAPACITY REFRIGERANT R134A.....	4
TEMPERATURE CONTROL.....	5
CHILLED MODE.....	5
FROZEN MODE	5
DEFROST.....	5
DETAIL INFORMATION ON UNIT	6
COMPRESSOR	6
EVAPORATOR COIL	6
CONDENSER COIL (AIR COOLED)	7
EVAPORATOR FAN.....	7
CONDENSER FAN.....	7
EVAPORATOR FAN MOTORS	8
CONDENSER FAN MOTOR	8
DEFROST / HEATERS.....	9
ELECTRICAL SAFETY CONTROLS	9
REFRIGERATION VALVES	9
REFRIGERATION SAFETY CONTROLS.....	9
ELECTRICAL PANEL COMPONENTS	9
POWER PLUG	9
POWER CABLE	10
DATALOGGER DOWNLOAD PLUG	10
USDA RECEPTACLE	10
MISCELLANEOUS.....	10
MICROPROCESSOR CONTROLLER MP-3000.....	11
LCD DISPLAY	11
LED DISPLAY	11
LED DEFINITION	12
DATALOGGER	12
RETRIEVABLE DATA	13
FUNCTION AND PTI TEST	13
CONTROL ALARMS.....	14
TEMPERATURE SENSORS.....	14
GRAPHS, DRAWINGS AND DIAGRAMS	15
AIR FLOW CRR-40	15
PIPING DIAGRAM.....	17
INSTALLATION DIAGRAMS	18

THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 3 of	21

GENERAL UNIT INFORMATION

Manufacturer	Thermo King Corp.
Type of System	Picture frame, electric cooling and heating single piece condenser / evaporator unit.
Construction	The refrigeration machinery is of the picture frame type. The frame is constructed of aluminum, treated to resist corrosion induced by salt spray atmosphere. The evaporator door is of the hinged removable type for easy access. The rear bulkhead panels are constructed of aluminum with a high inherent corrosion resistance. Between the evaporator and condenser section the unit is insulated with fire resistant (according to ISO 3582) and CFC-free polyurethane foam. The nominal density of the foam is 32 kg/m ³ (2 lbs/ft ³). Average thickness is 52 mm (2 inches). All aluminum material is 5000 or 6000 series.
Dimensions	Width 2 025.5 mm (79.75 in) Height 2 235.2 mm (88.00 in) Depth 420.0 mm (16.44 in) from back of the flange
Weight	532 kg (1173 lbs)
Electrical System Design	Electrical system designed to comply with ISO 1496 Standard.
Designed to operate on	400 to 500 Vac 3 Ø 60 Hz ±2,5% 360 to 460 Vac 3 Ø 50 Hz ±2,5%
Control Circuit	24 Vac
Method of Heating	Electric resistance
Fresh Air Exchange Rate	Adjustable from 0 to 125 m ³ /h, 150 m ³ /h, 225 m ³ /h, 285 m ³ /h 60 Hz 0 to 104 m ³ /h, 125 m ³ /h, 187 m ³ /h, 237 m ³ /h 50 Hz
Unit Air Leakage	Less than 0.5 m ³ /h at 76 mm WG (0.29 cfm at 3.0 in WG)
Unit Heat Leakage	Less than 3.4 kCal/h/°C (3.95 W/°C)
Paint Color (Powder or Liquid)	Off-white RAL 9016/85 (Unit) / Black (Tubing/Receiver Tank)
Aluminum Corrosion Protection (Unit White 'Powder' Paint)	The unit is treated with a Chromicoat washed surface according to DIN 50939 and is painted with Infralit Polyester powder according to ISO test 7253 and 2409 classification 1. A Polyester Powder topcoat is then applied to a film thickness of 100 µ meters.
Refrigerant	R134a – 4.9 kg (10.8 lb)

The equipment is designed to withstand and operate satisfactorily under sea-going and environmental conditions as follows:

Ocean Environment	Salt-laden air, sea spray, high humidity and severe atmospheric conditions.
Rolling	Amplitude of 30° on each side, periods of 13 seconds
Pitching	Amplitude of 6° periods of 8 seconds
Permanent List	10° on each side
Shock	Acceleration of 2g in all directions
Vibrations	Of the types encountered on ships, land vehicles and rails

THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 4 of	21

DESIGN STANDARD INFORMATION

The machinery is designed for long distance transportation of deep frozen, frozen, chilled, or heated cargoes in a temperature range of -30°C (-22°F) to 30°C (86°F).
The machinery will be fully functional and work satisfactorily, in ambient temperatures from -30°C (-22 F) to 50°C (122°F). Components are specified to withstand temperatures up to 70°C (158°F).
The noise level of units fitted into the container will not exceed 76dB in 250 Hz band. Measurement taken in front of the unit 1.5 m (59 inch) distance and 1.2 m (47 ¼ inch) above ground, with the unit operating at 50 Hz.
ARI - test method for rating refrigerated equipment.
Machinery complies with International Customs Regulations for Containers.
Machinery complies with relevant ISO recommendations.
Machinery complies with rules of B.V., ABS, and Lloyds.
Unit air leakage complies with Controlled Atmosphere requirements.
Refrigeration machinery complies with the requirements of the ATP regulations.
Unit complies with Australia and New Zealand Health Requirements.
Unit control system is prepared for power management (according to customer's requirements).
Unit complies with ATO (former Springer Institute) requirement regarding airflow.

UNIT CAPACITY REFRIGERANT R134a

Test method according to ARI standard no. 1110-69 approval Unit mounted in test room			
Net cooling capacity at 37.8°C (100°F) ambient temperature at 60 Hz power			
Evaporator Return Air Temperature	Watts	KCal/hr	BTU/hr
21°C (70°F)	13 541	11 642	46 200
2°C (35°F)	11 753	10 105	40 100
-18°C (0°F)	6 009	5 166	20 500
-29°C (-20°F)	3 107	2 671	10 600
Net heating capacity (including fan heat) at 60 Hz power			
System heating capacity	5 800	4 984	19 800

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 5 of	21

TEMPERATURE CONTROL

CHILLED MODE

If the unit is started at a set temperature of -9.9°C (14.2°F) or above, the control will be from the supply air sensor. After approximately 40 seconds the evaporator fans will start running high speed and 10 seconds later the cooling or heating sequence will be initiated. Depending on the temperature difference between setpoint and supply air sensor, the program will initiate the compressor or the heater elements according to the temperature requirements.

The cooling capacity is managed by means of PID modulated valve control. Pulsing the heaters in cycles of 30 seconds controls the heating capacity.

FROZEN MODE

With the temperature setpoint at -10°C (14°F) or below the unit will function from the return air sensor. If the return air temperature decrease 1°C (1.8°F) below setpoint, the compressor stops until the temperature has risen to 1°C (1.8°F) above setpoint. The evaporator fans run continuously in low speed except during defrost.

ON - OFF cycling of the compressor is minimum 6 minutes on and minimum 6 minutes off. Both, heating and modulation control are locked in frozen mode.

DEFROST

The defrost cycle is controlled by the defrost sensor, located in the evaporator coil. This sensor will activate the microprocessor thermostat when the temperature difference between return air sensor and defrost sensor increases to a pre-set value. The defrost sensor terminates the defrost cycle automatically when the temperature in the evaporator coil rises to:

- 30 C or higher than 18°C (64.4°F) for 35 minutes in chilled mode.
- 30 C or higher than 8°C (50°F) in 35 minutes in frozen mode.

For additional security defrost will be initiated by a timer.

Chilled mode

When starting the unit with supply air temperature at 5°C (41°F) or below, the initial defrost timer interval is three hours and increases by 30 minutes up to 6-hour intervals whilst on timer activated defrosts.

When starting the unit with supply air temperature at 5.1°C (41.2°F) or above, the defrost timer interval is eight hours.

Frozen mode

If the unit is started in frozen mode (below -10°C / 14°F), the initial defrost timer interval will be eight compressor hours and increases by two hours up to a twenty-four hour interval whilst on timer activated defrosts.

If the unit has been switched off for more than twelve hours or if the setpoint has been changed more than 5°C (9°F), the timer will be reset. If not, the unit will start with the same defrost sequence.

THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 6 of	21

DETAIL INFORMATION ON UNIT

COMPRESSOR			
Manufacturer	Copeland	Type	3DSTA-075E-TFD-253
Cylinders	3	Bore and Stroke	61.9 x63.5 mm 2 7/16 x 2 1/2"
Displacement	60 m ³ /h (35.3 CFM)	Speed	1750 rpm at 60 Hz
		Finish	Pre-treatment: 5 Stage iron Phosphate. Finish: Listed in application order: 1. Black epoxy powder paint, 91-125 μ meter (.0036 - .0049 in) 2. Polyamide-epoxy, 102 – 203 μ meter (.004 - .008 in) 3. Acrylic-aliphatic urethane enamel, 25 – 51 μ meter (.001 - .002 in)
Protection	Internal thermal automatic reset	Approved Oils	Copeland Ultra 22CC Mobil EAL 22CC ICI Emkarate RL32CF

EVAPORATOR COIL			
Tube Material	Copper	Fin Material	Special Aluminum DIN 1712/A199
Fin Space	3.17 mm	Configuration	Horizontal
Pipe Copper	According to DIN 1787 wall thickness 0.45 mm	Protection	Treated with hydrophilic surface and to resist corrosion induced by saltspray atmosphere.
Surface Area	60 m ² (645 ft ²)	Circuits	16

THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 7 of	21

CONDENSER COIL (AIR COOLED)

Tube Material	Copper	Fin Material	Copper
Fin Space	2.00 mm	Configuration	Circular
Pipe Copper	According to DIN 1787 wall thickness 0.45 mm	Protection	Complete coil immersed in clear water based lacquer.
Surface Area	34.5 m ² (372 ft ²)		

EVAPORATOR FAN

Type	Propeller	Diameter	355 mm (14 in)
Number of Fans	2	High Speed	3 450 rpm at 60 Hz
		Low Speed	1 725 rpm at 60 Hz
Blade Material	Glass reinforced polyamide	Drive	Direct on motor shaft
Hubs Material	Glass reinforced PBT, and stainless steel ring	Number of Blades	8
Air Flows	see graph	Pitch	25°

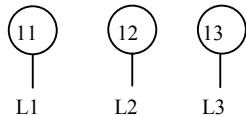
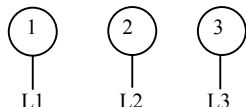
CONDENSER FAN

Type	Propeller	Diameter	550 mm (22 in)
Number of Fans	1	Speed	1 160 rpm at 60 Hz
Blade Material	Glass reinforced polyamide	Drive	Direct on motor shaft
Air Flow	4 835 m ³ /h 2 846 CFM	Number of Blades	10
Hubs Material	Glass reinforced PBT, and stainless steel ring	Pitch	40°

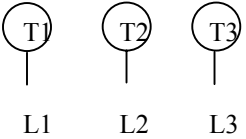
THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 8 of	21

EVAPORATOR FAN MOTORS

Nominal KW	0.75 kW 1.0 – 0.25 hp (60 Hz) 0.83 – 0.20 hp (50 Hz) 3 Phase	Type	Completely enclosed with separate windings for high speed, low speed, and non-ventilated
Speed	3 450 - 1 725 rpm (60Hz) 2 875 - 1 440 rpm (50Hz)	Protection	Internal thermal automatic reset (each winding)
Shaft Material	303 Stainless steel	Bearing	Ball – double sealed full contact seals (Grease - Mobil 28)
Finish	Iron phosphate pre-treatment, cathodic epoxy e-coat prime coat, black epoxy top coat	Lead Connections	High Speed  Low Speed 
No. of Motors	2	IP	56

CONDENSER FAN MOTOR

Nominal kW	0.55 kW 0.5 hp (60 Hz) 0.4 hp (50 Hz)	Type	Completely enclosed non-ventilated
Speed	1 160 rpm (60 Hz) 970 rpm (50 Hz)	Bearing	Ball – double sealed full contact seals (Grease – Mobil 28)
Shaft Material	303 Stainless steel	Protection	Internal thermal auto. reset
No. of Motors	1	IP	56
Finish	Iron phosphate pre-treatment, cathodic epoxy e-coat prime coat, black epoxy top coat	Lead Connections	

THERMO KING CORPORATION

CREATED
BY

W. BENSON

REVISION

F

BASE
UNIT

CRR40

REV. DATE

20/03/02

PAGE 9 of 21

DEFROST / HEATERS

Defrost drain pan with high edges, 2 drains and plastic hose. Drain complies with TIR requirements. Drains are located in close proximity to condenser coil and compressor to prevent icing in cold ambient.

Defrost Heater

680 W each (460V)

No. of Defrost Heaters

6

ELECTRICAL SAFETY CONTROLS

Overheat Klixon

Cut-out: 54°C (130°F) Cut-in: 32°C (90°F)

Compressor Motor
Condenser Motor
Evaporator Motor

Internal thermal automatic reset

Main Circuit Breaker

25 A

REFRIGERATION VALVES

Valve	Voltage	Cold Resistance	Current	Normal Position
Evaporator Pressure Regulator	24 Vdc	22 Ohm	Variable	N/A
Liquid Injection Valve	24 Vac	5.6 Ohm	0.85 A	Closed
Liquid Line Solenoid	24 Vac	5.6 Ohm	0.85 A	Closed

REFRIGERATION SAFETY CONTROLS

High Pressure Switch

Cut-out: 22.4 bar (325 psig ±10 psig)
Cut-in: 15.9 bar (230 psig ±10 psig)

Fusible Plug (Receiver)

Relief Temperature 100°C (212°F)

ELECTRICAL PANEL COMPONENTS

Contactors	Compressor CI25	Main Circuit Breaker	25A
Relays	Condenser Fan, Heater, Evaporator Fan (2 pcs.) and Phase Selection (2 pcs.)	Phase Sensor	Automatic selection
Transformer	Primary 500 Vac Secondary 29/28/40 Vac	Fuse	3 x 20 A on Main Relay Board
Switch	Unit "ON / OFF"	Battery Backup	12 Volt service free 1.9 A Capacity

POWER PLUG

Type CEE 17 (ISO 1496-2, Annex 0 0,1)

4 pole 400 / 460 Volt
50/60 Hz

Amps

32

Earth

3h pos.

THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 10 of	21

POWER CABLE

Storage for power cable provided in condenser section

Length	18.3 m (60 ft)	Cable	4 x 4 mm ² , 450/750 V QWPK (11ga/4 conductor)
Temperature Range	-37° C (-35° F) to 90° C (194°F)	Color	Yellow

DATALOGGER DOWNLOAD PLUG

Location	One on the electrical box and one on back side of container unit.	Type	Deutsch HD10-5-16-P
----------	---	------	---------------------

USDA RECEPTACLE

Receptacle type 4 pole	Cannon CA 3102E-14S-2S-B-A176	Quantity	3 pcs.
Receptacle	Female socket	Location	Rear left side

MISCELLANEOUS

Auto PTI Includes function tests and fault diagnostics
Dual speed, double winding evaporator motors
One piece hinged and removable evaporator access door with quick release stainless steel latches
Solid State Microprocessor Controller with Backlit LCD digital display, 28 mm (1.1 inch)
Sequential component start to minimize peak amp draw
Unique fresh air change system integral ducting for wall to wall air distribution
Safety harness hooks and grab-handle
Large diameter, low speed condenser fan for quiet operation
Power saving "on demand" automatic defrost system
Tin-plated and numbered wires according to UL1647
Light weight composite condenser and evaporator fans.
420 mm deep from back of flange
Manual operated control by-pass mode
Economy mode can be selected in both chilled and frozen range
Refrigerant service connections per SAE J639 (R134a automotive type) located on suction and discharge side of the compressor

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 11 of	21

MICROPROCESSOR CONTROLLER MP-3000

The MP-3000 is an advanced microprocessor temperature controller based on the latest computer technology and is developed especially for reefer control and monitoring. The controller is designed with an integrated datalogger with a link to an optional power line communications module.

Frequently used functions such as Temperature Setpoint and Defrost have been given separate hot keys for ease of operation.

Vital data are/can be shown on an LED-display with 20.32 mm high characters, ensuring easy viewing even from a long distance. The controller is equipped with the following parts:

- 1 4 line by 20 character LCD display
- 1 5 segment LED display
- 8 LED's
- 1 16 key general-purpose keyboard plus 4 hot keys

The control system consists of the following:

MP-3000 Microprocessor Controller w/ Integrated Data logger
Main Relay Board (PCB)
Temperature Sensors (7)

With exception of the sensors, all components are mounted in the control box. The design of the microprocessor provides permanent accuracy, reliability, and expandability.

In the case of a control sensor failure, another sensor will take over and automatically compensate for the difference between supply and return air temperatures.

A permanently stored base program is built into the controller and a non-volatile memory for additions or changes in software is present.

Both heating and modulation modes are locked out in frozen mode (Setpoints of -10° C or less).

Overall accuracy is $\pm 0.25^{\circ}\text{C}$ ($\pm 0.4^{\circ}\text{F}$) and verification of temperatures should be done using an instrument with equal or better performance.

LCD DISPLAY

The LCD display is used for all purposes of the operator / unit interface showing menu information, data fields, etc.

LED DISPLAY

The main purpose of the LED display is to show the sensor currently used in the control algorithm. This temperature will either be return or supply. The LED displays the controlling sensor. If a temperature is out of range the display will show "Err". A +/- sign will indicate if the out of range value is positive or negative. The first 10 seconds after power up, the LED display will show the current setpoint. The setpoint will also be shown for 5 seconds in the LED display after a new setpoint has been accepted.

Additionally, the LED display is used during PTI to show the current stage of the PTI.

THERMO KING CORPORATION

CREATED
BY

W. BENSON

REVISION

F

BASE
UNIT

CRR40

REV. DATE

20/03/02

PAGE 12 of 21

LED DEFINITION

The use of the LED's is defined as follows: (reading right to left)

- 1 Red FLASHING if error
- 2 Green ON if temperature is in range
- 3 Yellow ON if defrost is active
- 4 Yellow ON if heaters are activated
- 5 Yellow ON if compressor is running
- 6 Yellow ON if humidity control is selected
- 7 Yellow ON if supply air temperature is displayed
- 8 Yellow ON if return air temperature is displayed

If LED 7 and LED 8 (return and supply) are ON at the same time, the Setpoint is shown in the LED display. The Setpoint can be set from -30° C (-22° F) to 30° C (86° F).

At Setpoints below -10° C (14° F) the controlling sensor is return air. Heat and capacity reduction will be locked out and evaporator fan motors will be operating on low speed.

At Setpoints above -9.9° C (14.2° F), the controlling sensor is supply air. The evaporator fan motors will be operating on high speed.

DATALOGGER

The integrated datalogger is a microprocessor-based recorder specifically developed for refrigerated containers. The datalogger contains a memory area for storing temperatures.

All registrations are stored in the flash memory, which contains temperatures logged at user selectable intervals of ½, 1, 2 or 4 hours. The sensors logged are: supply air, return air, USDA, ambient and the Setpoint. Using a one-hour logging interval, temperature information covering the last 625 days is available. The logging of the USDA sensors are fixed at a one-hour interval automatically to comply with the USDA regulations.

One-minute log is only for calibration of USDA sensors. Maximum 72 minutes, self-terminating.

All logs are stored at time and date of occurrence. The Real Time Clock in the controller is set at UTC time at the factory and is backed up by a built-in extended life Lithium battery. The datalogger is equipped with high-speed serial communications port. The logs can be inspected on the LCD display of the controller.

Retrieving the datalogger can either be done by use of York Controls Logman handheld data retriever equipment, Thermo King Smart Sponge or via the REFCON power line remote monitoring system. Retrieving by the REFCON system requires that the controllers are equipped with ISO standard 10 368 high data rate, wide band, and power cable communication modems.

The datalogger will continue to log, 120 entries (at 1 hour interval) after the container has been turned OFF or disconnected from mains power source.

Ambient Temperature	-25° C to +70° C	Humidity	95% rh non-condensing
Temperature Accuracy	±0.15 °C	Capacity	15 000 Logs equal to 625 days continuous logging of all sensors

RETRIEVABLE DATA

The controller contains three memory areas for data: 1. Events / Alarms, 2. Auto PTI, 3. Comments

1. Event and Alarms:

This record contains the last 1 024 events, such as information on alarms, power on/off, defrost start/end, etc.

2. Auto PTI

Records of the last two Auto PTI's performed.

3. Comments:

Entering using the keyboard on the controller, sending by the Logman handheld data retriever, or by the Thermo King Smart Sponge, comments can be entered to the controller memory.

All logs are stored at time and date of occurrence. The Real Time Clock in the controller is set at UTC time at the factory and is backed up by a built-in extended life Lithium battery. The datalogger is equipped with high-speed serial communications port. The logs can be inspected on the LCD display of the controller.

Retrieving the datalogger can either be done by use of York Controls Logman handheld data retriever equipment, Thermo King Smart Sponge or via the REFCON power line remote monitoring system. Retrieving by the REFCON system requires that the controllers are equipped with ISO standard 10 368 high data rate, wide band, and power cable communication modems.

FUNCTION AND PTI TEST

There are three test modes programmed in the microprocessor.

Test Mode 1

Function test. Automatically tests individual components including the controller display, sensors, condenser fan, evaporator fans and compressor. The test includes measurement of component power consumption and compares results to expected values.

Test Mode 2

Auto PTI. Automatically checks unit refrigeration capacity, heating capacity, temperature control, and individual components including controller display, contactors, fans, protection devices and sensors. The test includes measurement of component power consumption and compares results to expected values. This test mode generates a PTI log file.

Test Mode 3

Manual Function test. Allows a technician to perform specific diagnostic tests on individual components or turn several components ON at the same time to perform a system test.

CONTROL ALARMS

Three types of alarms may occur.

1. Shutdown Alarm (Level 1): The alarm LED flashes and the unit stops. A shutdown alarm indicates that the unit has stopped to prevent damage to the unit or cargo. The condition must be corrected before the unit will restart.
2. Check Alarm (Level 2): The alarm LED flashes until the alarm is acknowledged but the unit continues to operate. A check alarm indicates corrective action should be taken.
3. Log Alarm (Level 3): The alarm is recorded in the data logger only; the alarm LED does not flash.

Sensor Alarms:

- If any sensor is defective (evaporator coil, return air, supply air, condenser coil, ambient air, or compressor discharge temperature).
- If the temperature difference between the evaporator coil, return air, or supply air sensors get either too high or too low in accordance with actual conditions.
- If the temperature difference between the two-supply air sensors is too high.

Temperature Alarm Chilling:

If temperature is not in range of $\pm 1.5^{\circ}\text{C}$ ($\pm 2.7^{\circ}\text{F}$) of the Setpoint within one hour of running, at settings of -9.9°C (14.2°F) or higher. This in-range temperature tolerance is user selectable. The alarm is ignored if the temperature is falling / rising towards the Setpoint greater than 0.1°C (0.2°F) per hour when the temperature is within 5°C (9°F) of the Setpoint. This applies to both cooling and heating.

Temperature Alarm Freezing:

If temperature is not in range of $\pm 1.5^{\circ}\text{C}$ ($\pm 2.7^{\circ}\text{F}$) of the Setpoint within one hour of running, at settings of -10°C (14°F) or below. This in-range temperature tolerance is user selectable. The alarm is ignored if the temperature is falling / rising towards the Setpoint greater than 0.1°C (0.2°F) per hour when the temperature is within 5°C (9°F) of the Setpoint.

Defrost Alarm:

If defrost interval lasts more than 90 minutes or if return air temperature is $> 38^{\circ}\text{C}$ (100°F) at 60Hz operation or 120 minutes at 50 Hz operation.

Compressor Discharge Temperature: $> 130^{\circ}\text{C}$ (266°F).

Phase Sensing: If after 20 seconds, the controller is not able to decide the correct phase direction.

Pressure: If the discharge or suction pressure exceeds programmed limits.

Power: If the voltage, frequency, or total unit current exceeds programmed limits.

TEMPERATURE SENSORS

The sensors (7) are of a thermistor design. They are linked to the controller via a two-conductor cable.

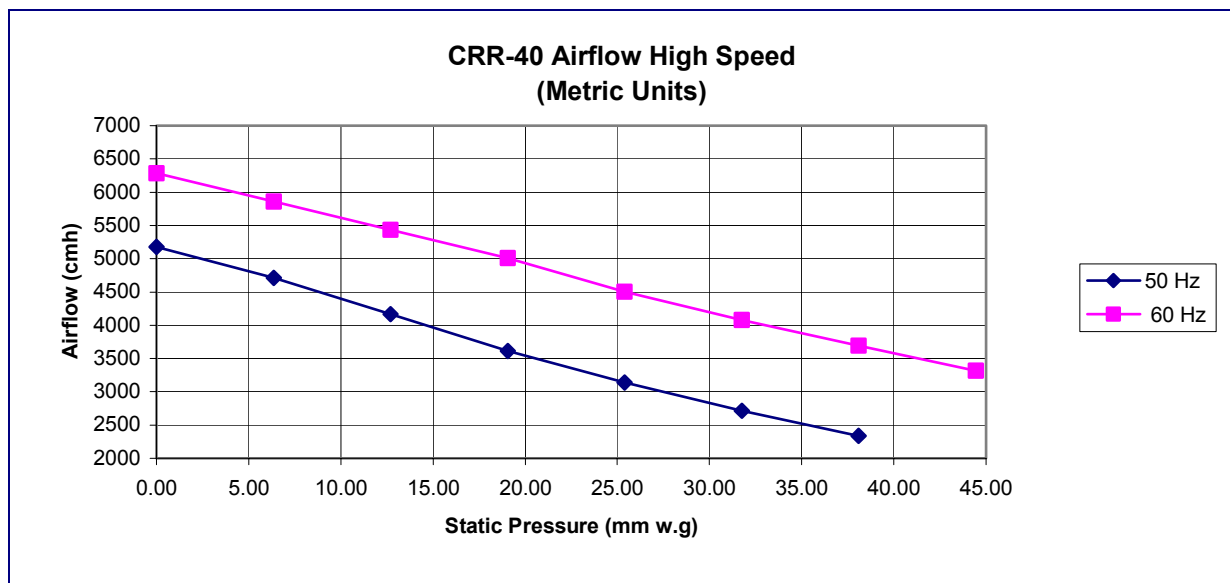
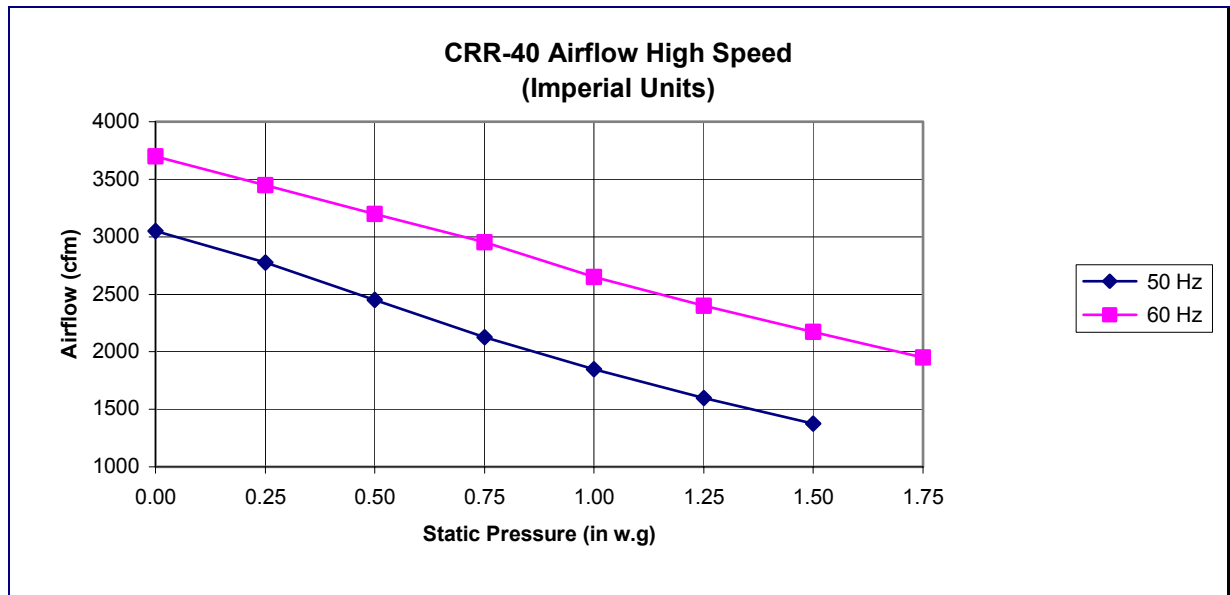
1. Evaporator Coil - Located in the center of the evaporator coil
2. Return Air - Located in the return air section
3. Supply Air - Located in the supply air section, right hand
4. Supply Air - Located in the supply air section, left hand
5. Condenser Coil - Located in the condenser coil
6. Ambient Air - Located on the unit front wall
7. Compressor - Located on the compressor discharge line

THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 15 of	21

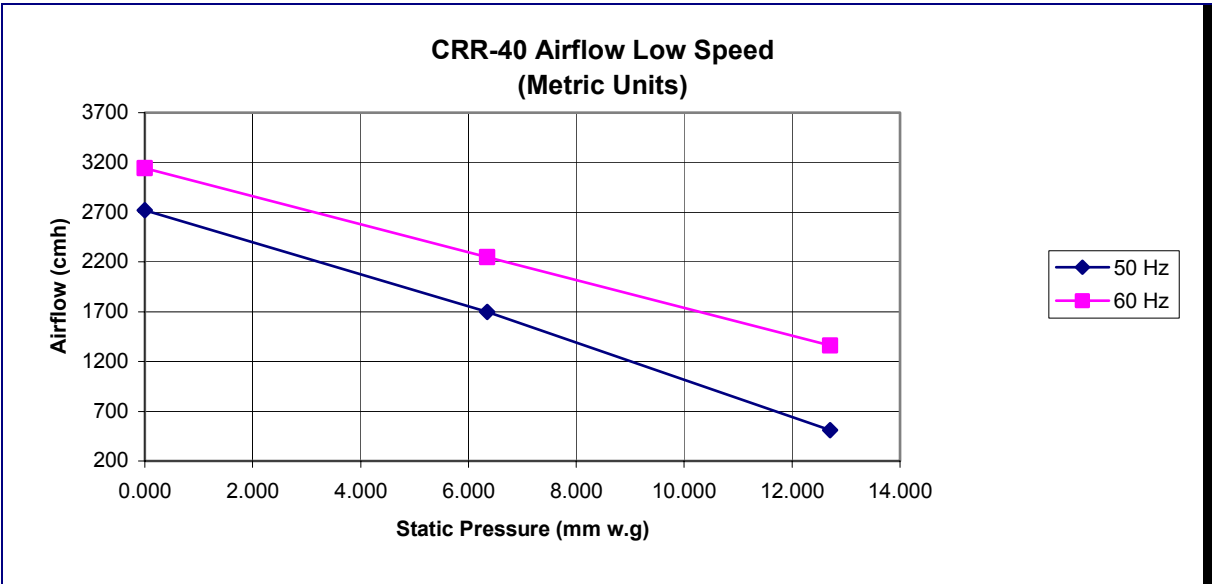
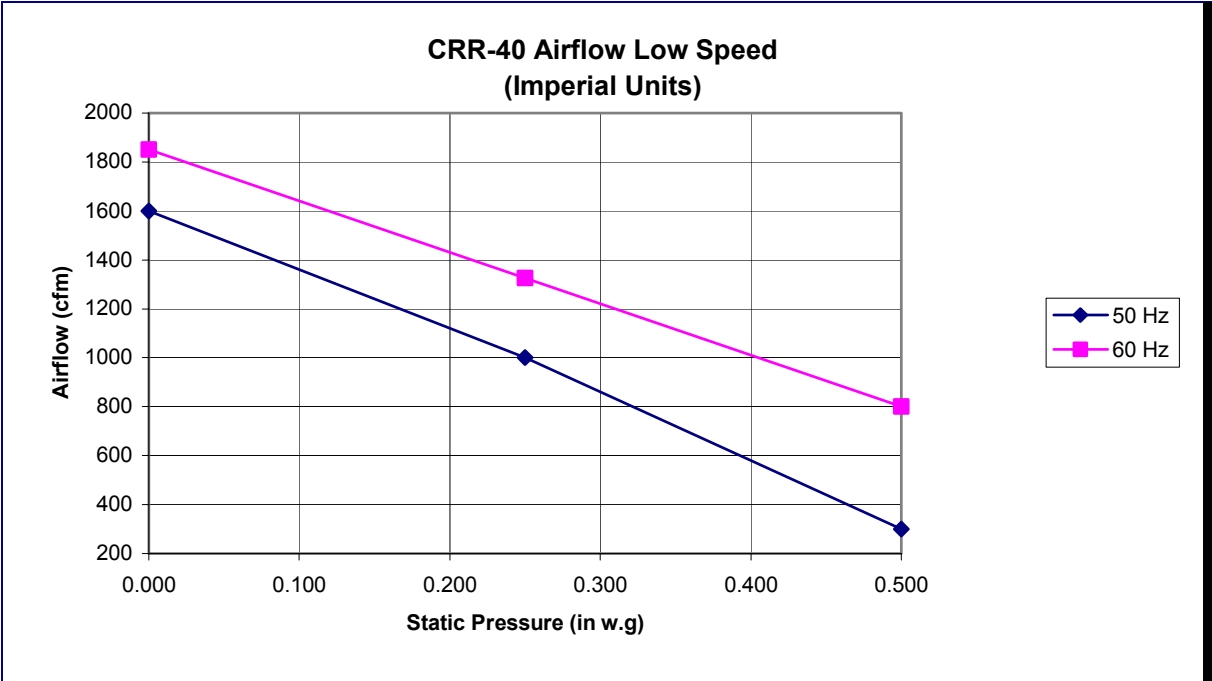
GRAPHS, DRAWINGS AND DIAGRAMS

AIR FLOW CRR-40



THERMO KING CORPORATION

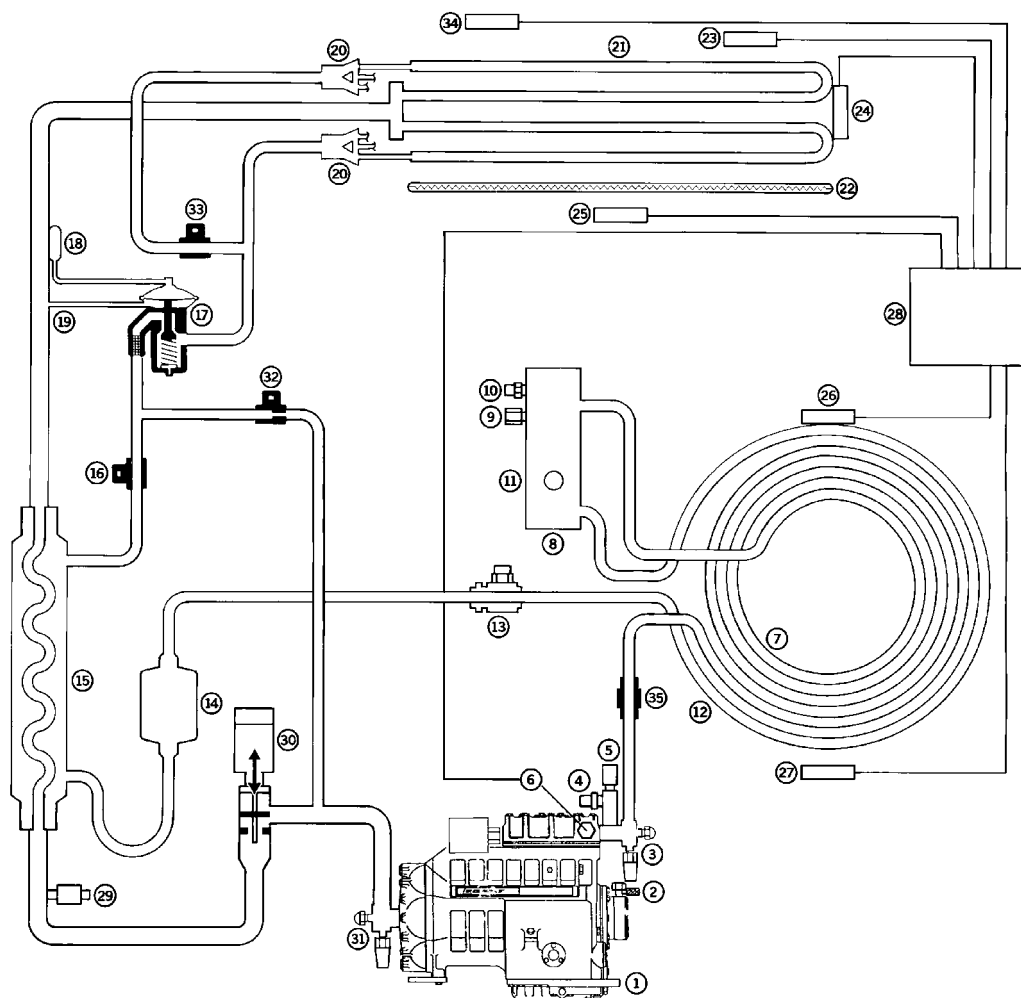
CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 16 of 21	



THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 17 of	21

PIPING DIAGRAM



- | | |
|--|---|
| 1. 3DS Compressor | 19. Equalizer Line |
| 2. Oil Fill / Drain Fitting | 20. Distributor |
| 3. Discharge Service Valve (DSV) | 21. Evaporator Coil |
| 4. Condenser Fan Pressure Switch (CFPS) | 22. Electric Heaters |
| 5. High Pressure Cutout Switch (HPCO) | 23. Return Air Sensor (RET) |
| 6. Compressor Head Discharge Temperature Sensor (CDTS) | 24. Evaporator Coil Sensor (ECOIL) |
| 7. Condenser Coil (Circular) | 25. Supply Air Sensor (SUP) |
| 8. Receiver Tank | 26. Condenser Coil Sensor (CCOIL) |
| 9. High Pressure Relief (Fusible Plug) | 27. Ambient Sensor (AMBT) |
| 10. Receiver Tank Service Fitting | 28. Controller (MP-3000) |
| 11. Sight Glass | 29. Not Available |
| 12. Condenser Coil Subcooler Circuit | 30. Evaporator Pressure Regulator (KVQ Valve) |
| 13. Liquid Line Service Valve | 31. Suction Service Valve (SSV) (Option) |
| 14. Dehydrator (Filter Drier) | 32. Liquid Injection Valve (LIV) |
| 15. Heat Exchanger | 33. Dehumidify Solenoid Valve (DSV) (Option) |
| 16. Liquid Line Solenoid (LLS) | 34. Dehumidify Sensor (rH) (Option) |
| 17. Expansion Valve (TXV) | 35. Condenser Check Valve (CCV) |
| 18. Expansion Valve Feeler Bulb | |

THERMO KING CORPORATION

CREATED
BY
BASE
UNIT

W. BENSON
CRR40

REVISION

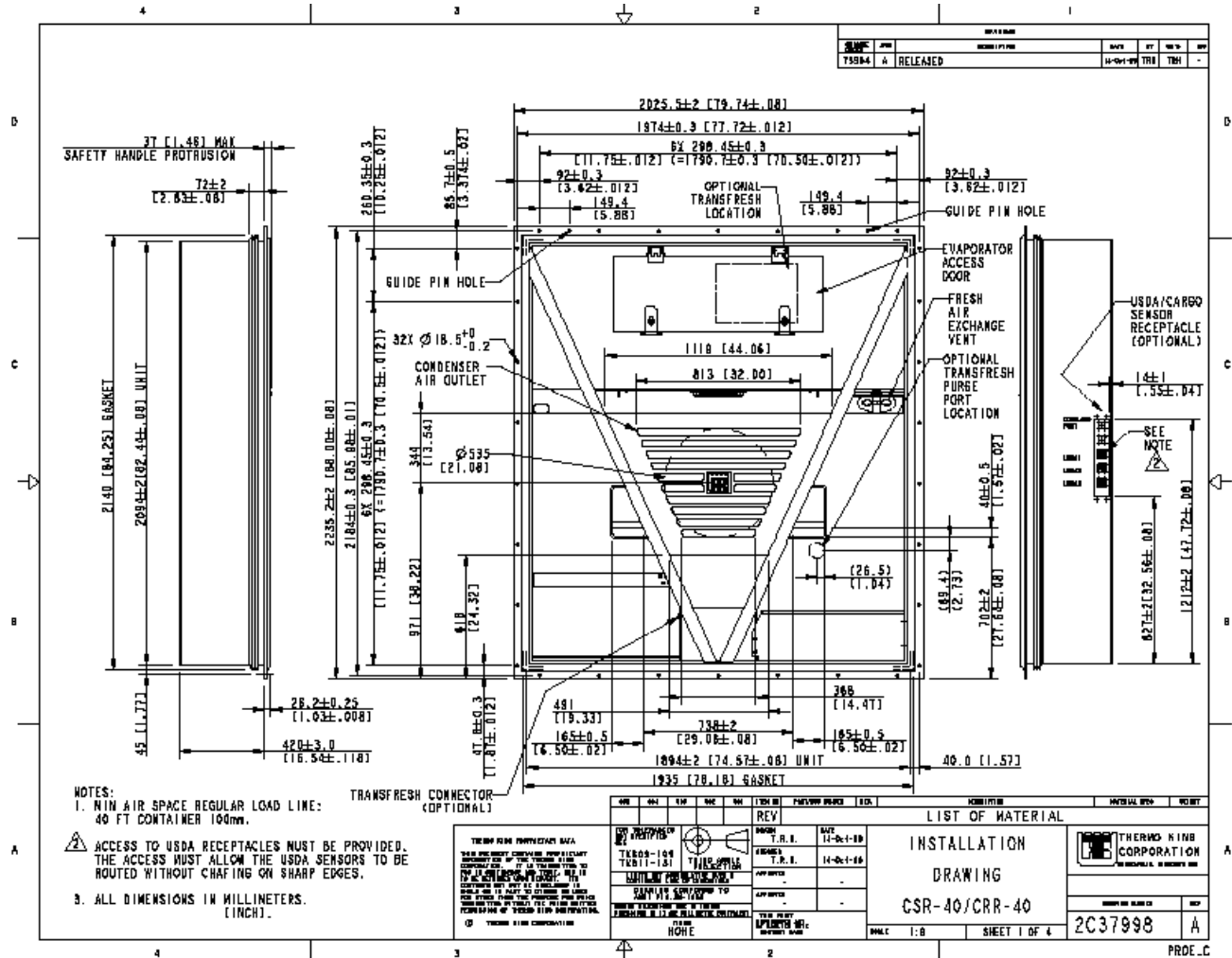
F

REV. DATE

20/03/02

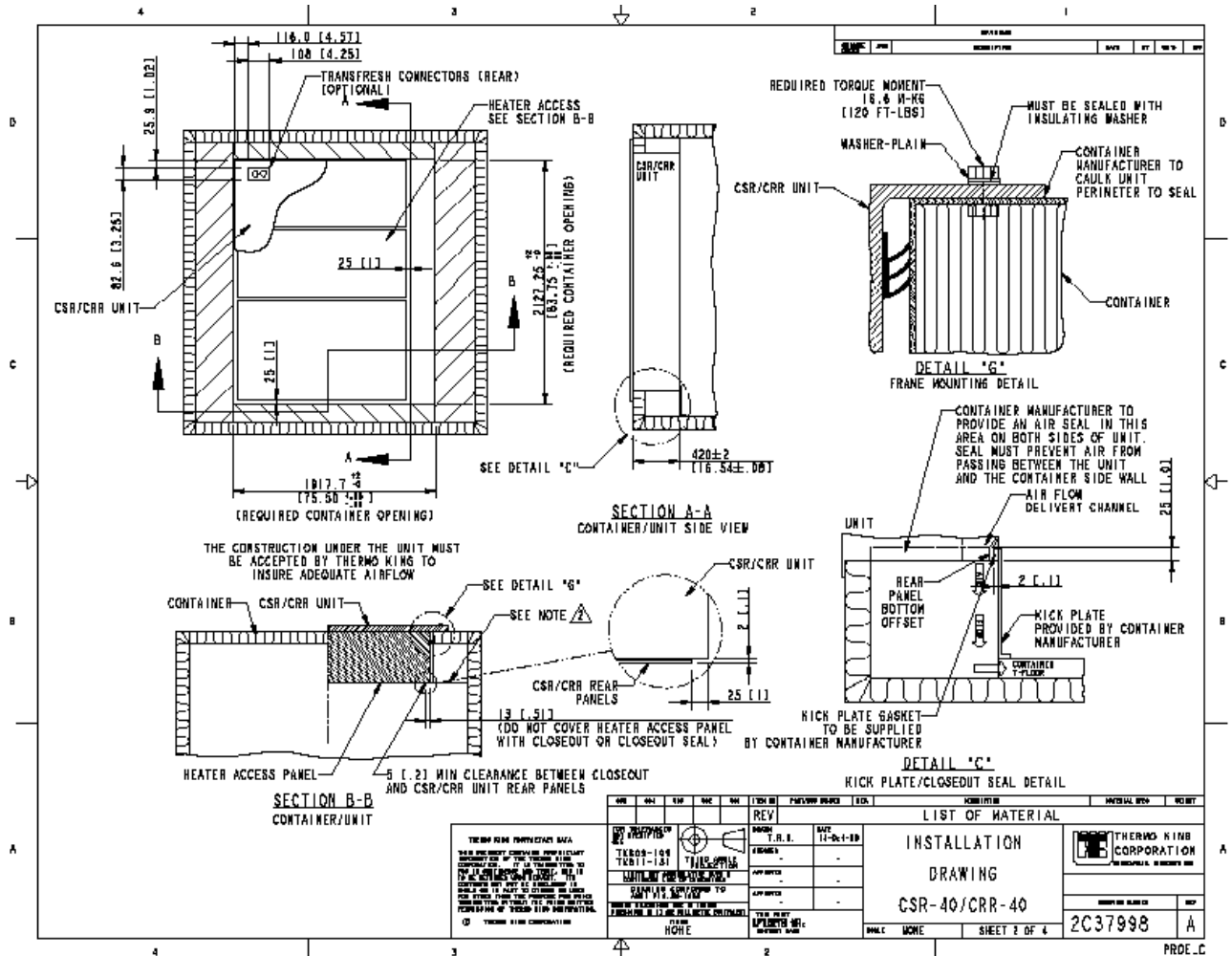
PAGE 18 of 21

INSTALLATION DIAGRAMS

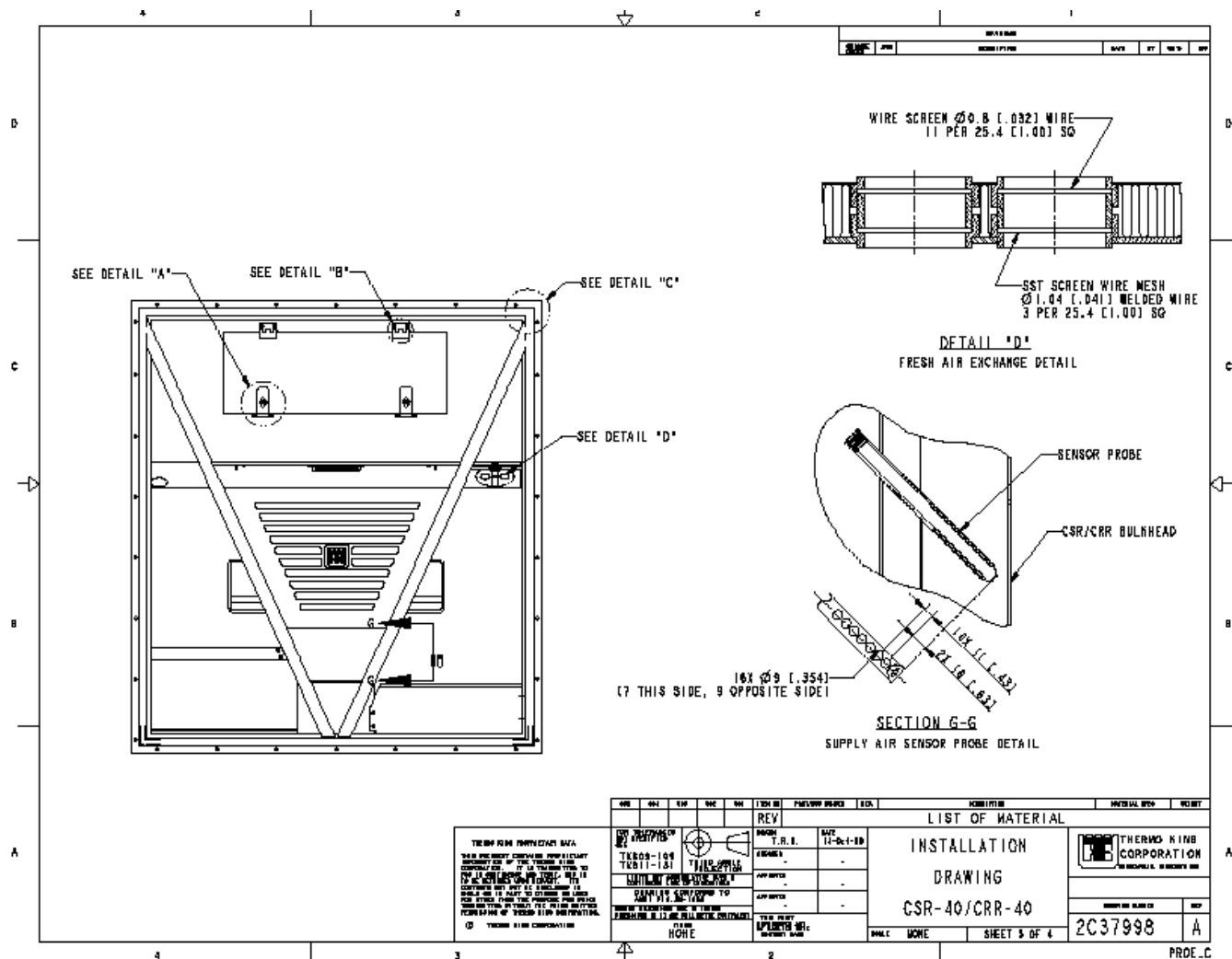


THERMO KING CORPORATION

CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 19 of	21



CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 20 of 21	



CREATED BY	W. BENSON	REVISION	F
BASE UNIT	CRR40		
REV. DATE	20/03/02	PAGE 21 of 21	

