ACTROL™

Issued – July 2019

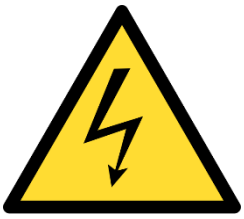
Installation & Operation Instruction

Acpac Condensing Units with Tecumseh Semi Hermetic Compressor and EC Condenser Fans

Index

This document should be kept with the installed Acpac unit.

1. SAFETY WARNINGS FOR END USERS, INSTALLATION AND MAINTENANCE PERSONNEL



DANGER - High Voltage - this condensing unit contains electrical parts, isolate the power supply before working on this unit. All field wiring must be carried out by a licensed electrical contractor and all wiring must be in accordance with the equipment specification, local and national codes.

DANGER - Moving Machinery – this condensing unit has moving parts which may start and stop without warning.

CAUTION - Auto Start – this unit and its moving parts can start automatically without warning.

CAUTION - High Pressure – this condensing unit contains high pressure refrigerant and oil.

CAUTION - High and Low Temperature Surfaces – during normal operation and during fault conditions some components will reach high and/or low temperatures.

CAUTION - Sharp Edges – this condensing unit contains parts with sharp edges, appropriate personal safety equipment must be worn.

Only fully qualified licensed personnel should install service or carry out maintenance to this condensing unit.

acpac

2. END USER INFORMATION

Design usage

This condensing unit is designed for commercial refrigeration duty within the limits of the published application data, ambient temperature range, refrigerant type or types and electrical specification. This unit is not intended for environments that are corrosive or flammable including marine environments. If subjected to corrosive environments this unit should receive additional protection/s.

Maintenance intervals

It is good practice to have regular preventative maintenance performed to ensure this condensing unit continues to perform efficiently.
Only fully qualified licensed personnel should carry out maintenance to this condensing unit.

3 to 6 monthly – dependent on location and duty

- Air cooled condenser check, clean as required
- Operational checks including but not limited to electrical connections, voltages, amperages, pressures, temperatures including compressor superheat, discharge temperature, unit sub-cooling, refrigerant leak check, moisture indicator check and compressor oil level.

Use of genuine spare parts from Actrol is recommended.

Decommissioning

This condensing unit contains refrigerant and oil that is harmful to the environment; these must be recovered and returned to an approved recycling or destruction facility.
Only fully qualified and licensed personnel should carry out decommissioning of this unit.
It is illegal to vent some types of refrigerant to the atmosphere.

3. INSTALLATION INSTRUCTIONS

Safety first

- All refrigeration and electrical work must be carried out by fully qualified and licensed personnel.
- Personal safety protection equipment must be worn when working with this condensing unit.
- Refer to the safety warnings in “Section 1” of this instruction.

Initial inspection and damage notification

This unit must be inspected for damage **‘before’** installation and any damage found reported to Actrol so appropriate action can be taken.

Lifting and handling of unit

Ensure this condensing unit is balanced when lifting as the weight is not central.

Design conditions and refrigerant type

Confirm the application is to operate within the published design limits before installing this unit. Ensure the refrigerant type matches the published data, **‘flammable refrigerants or ammonia refrigerant must not be used’**.

Oil Type

POE (Polyol-ester) oil is used to lubricate this compressor. Only use POE oil of the correct viscosity as listed in the compressor data when adding or replacing oil.

Positioning and Mounting of Unit

Clearance dimensions

- Avoid short cycling the condenser air by ensuring no obstruction of the discharged air.
- A minimum of half one fan diameter clearance must be allowed between the condenser coil and a wall on the inlet air side/s for correct air flow.
- Safe access for service and maintenance must be provided including clear access to all serviceable components within the unit
- A minimum of 800mm clearance should be provided adjacent all removable panels.

Noise considerations

- Consideration should be given to ensure noise from this unit will not be of concern to surrounding sound sensitive environments. Information on noise control is available from Actrol.

Mounting and fixing

- This condensing unit must be installed level on the horizontal plane.
- The unit is to be fixed to a solid base using anti vibration mounts or rubber pads.

System pipe sizing and design

Pipe Sizing

Every installation is different so the field pipe sizes may differ from the unit connection sizes. Please select appropriate pipe sizes using published pipe sizing information or contact Actrol for advice.

Holding pressure

This unit has a holding charge of nitrogen which must be released in a safe manner.

Maximum design and test pressure

This condensing unit is designed for a maximum design pressure (PS) of 31bar.
Test pressure of the suction side must not exceed 20.5bar as indicated on the compressor name plate.
The pressure relief device fitted is set at 31bar (1 x PS) in accordance with AS/NZS-5149.2:2016.

Oil return

Pipe design must allow for adequate oil return to this condensing unit, the use of “P” traps and double risers may be required; all horizontal sections of the suction line must fall towards the condensing unit.

Soldering

Nitrogen must be used when soldering the field pipe work to stop the formation of copper oxides.

Pressure testing

The entire system must be pressure tested and any leaks repaired prior to charging with refrigerant.

Pipe insulation

The suction line must be adequately insulated to minimize heat absorption into the return vapour. The National Construction Code of Australia lists the minimum insulation R Values for refrigerant pipes.

Electrical connection

- A licensed electrical contractor must carry out all electrical work.
- All electrical work must meet local and national requirements.
- Care must be taken to ensure no damage is done to internal unit components when mounting the electrical isolator.
- An electrical diagram is attached to the inside of the service panel.
- The control safety circuit must not be bypassed.

Commissioning and start-up

Visual pre-start check

A visual check must be carried out to ensure the unit has been installed with the correct companion equipment and in the correct location.
All pipe work and electrical work must be complete and safe.
All electrical connections must be checked for tightness as connections can loosen during transport.
The yellow compressor anti vibration transport mounts must be removed before starting the compressor.

Crank case heater

The crankcase heater must have power applied for a minimum of 12 hours prior to starting the compressor.

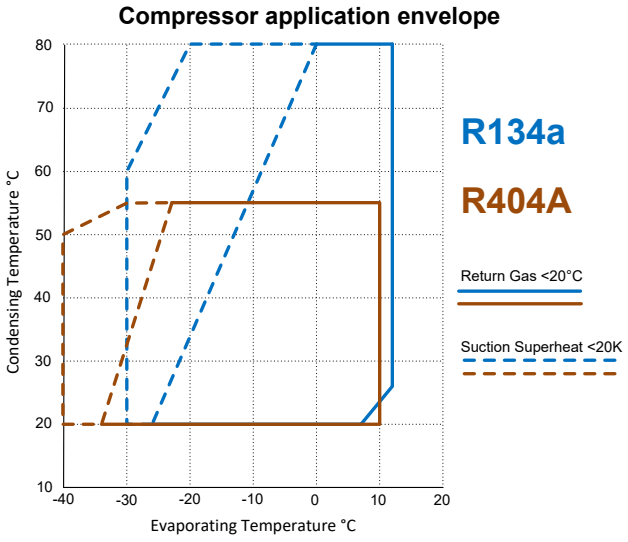
Evacuation

A vacuum of less than 500 microns must be achieved and held before breaking the vacuum with liquid refrigerant into the liquid line.

Safety pressure switch settings

Use a temperature pressure chart to determine the pressures to set the high and low safety pressure switches on this condensing unit. The pressures must be set within the limits shown in the compressor application envelope.
The HP safety switch must set no greater than 0.9 x PS (0.9 x 31 bar = 27.9 bar).

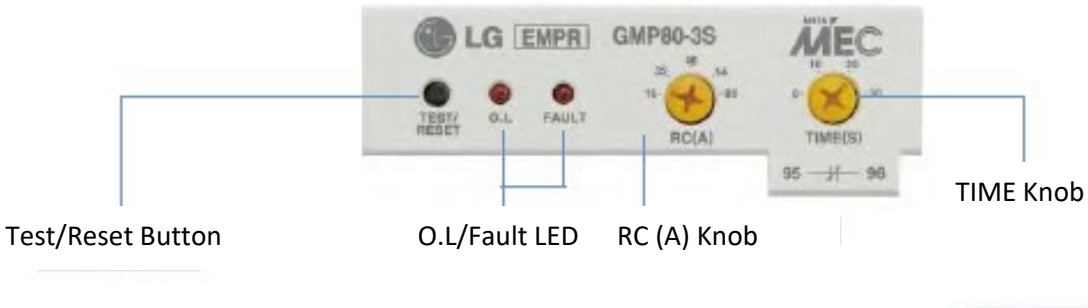
The compressor must never operate in a vacuum as internal parts will overheat and arcing between the electrical terminals will occur within the compressor.



System charging

The vacuum should be broken by charging liquid refrigerant into the liquid line.
Fine tuning the refrigerant charge can be achieved by adding small quantities of liquid into the suction service valve port while the compressor is running.
Under no circumstances should excessive liquid refrigerant enter the compressor.

Electronic overload setting



1. Turn the “RC (A)” (Rated Current) knob clockwise to its maximum position then start the compressor.
2. Turn the “RC (A)” knob anti-clockwise to the MOC of the compressor.
   a. MOC = Maximum Operating Current is found on the compressor nameplate.
      i. The overload will trip at approximately 110% of this setting.
3. The “TIME” knob adjusts the time delay (in seconds) before the overload trips when 600% of the “RC” value is exceeded. This is usually set to 5 seconds to allow for the normal compressor starting current.

Overload operation and fault LED indication

Condition			Red O.L LED		Green Fault LED		Note
Operation	Normal		Off		Off		
	Over current		On & Off		Off		0.4 second interval
	Over current		On		Off		
Trip	Phase failure (3CT)	R	On		On & Off		1 Times for 3second
		S	On		On & Off		2 Times for 3second
		T	On		On & Off		3 Times for 3second
	Phase failure(2CT)		On & Off		Protect 2phases of 3phases, trips within 3sec.		
	Reverse phase(3CT)		On & Off		On & Off		One after the other

Compressor Part Winding Start (PWS) Time Delay Setting

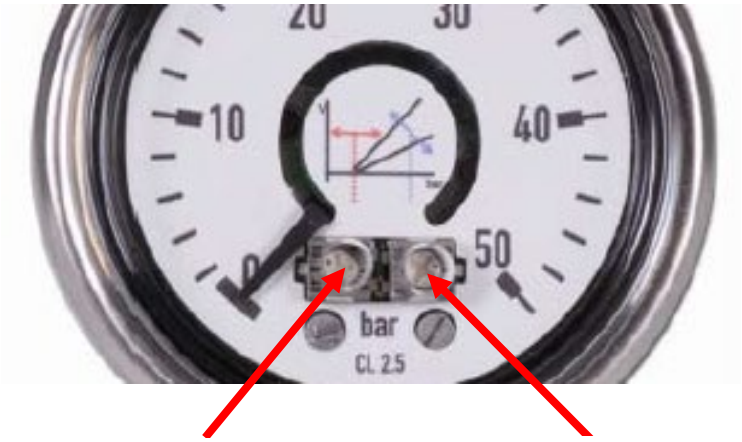
The PWS time delay must be set to 0.8 seconds to ensure the compressor starts correctly.
The delay timer ‘T1’ must be checked and adjusted if required to a setting of 0.8 seconds.
Incorrect time delay setting will result in compressor failure.

Fan speed control setting and operation

The two EC condenser fans in the unit are designed to reduce energy use and to operate over a wide speed range. The three phase fan supply is switched via the fan contactor which operates with the compressor.

The fans are speed controlled by a pressure control connected to the liquid line.

The desired pressure and control range must set during commissioning; the control provides a 0 to 10 Volt signal to the fans.



1. Set the 'Set Point' value
2. Set the 'Control Range' value

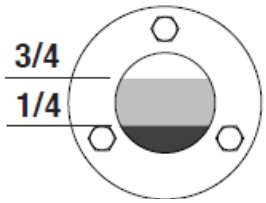
   The scale is in bar; 100 kPa = 1 bar

The fan speed control will operate the fans between 0 and 100% speed to maintain the condensing pressure as close as possible to the set point.

Unit Operational checks

Operation checks include but are not limited to the following,

- Voltages of all phases
- Compressor PWS start delay timer is set to 0.8 seconds
- Amperages of compressor and fans
- Suction and discharge pressures
- Compressor suction superheat *
- Evaporator suction superheat *
- Liquid sub-cooling
- Liquid line moisture indicator colour and sight glass clearness
- Compressor discharge temperature
- Compressor oil sight glass level
- Confirm oil is returning to compressor
- Refrigerant charge
- Vibration and noise
- Observe on/off cycle after reaching design temperature and ensure;
- No liquid slugging at compressor start-up
- Pump down pressure is within published operating envelope (if pump down is used)
- Cycle times (no more than 8 compressor starts per hour)



Correct compressor oil level

* When refrigerated space is at or near design temperature

Handover to end user

When the commissioning is complete the contractor should provide a full explanation of system usage to the end user.
Section 5 of this instruction should be completed and this instruction left with the end user to keep so the unit base data is known.

4. MAINTENANCE AND DECOMMISSIONING GUIDELINES

Maintenance guidelines

It is good practice to have regular preventative maintenance performed to ensure this condensing unit continues to **perform efficiently.**

- 3 to 6 monthly – Air cooled condenser check, clean as required
- 3 to 6 monthly – Operational check including but not limited to electrical connections, voltages, amperages, pressures, temperatures including compressor superheat, unit sub-cooling and discharge temperature, refrigerant leak check, moisture indicator check and correct compressor oil level.

Use of genuine spare parts from Actrol is recommended.

De-commissioning guidelines

- This condensing unit contains refrigerant and oil that is harmful to the environment; these must be recovered and returned to an approved recycling or destruction facility.
- Only fully qualified licensed personnel should carry out decommissioning of this unit.
- It is illegal to vent some types of refrigerant to the atmosphere.
- Disconnection of electricity supply wiring must be carried out by fully qualified and licensed personnel.
- This unit should be disposed of in a responsible manner.

CAUTION - This unit contains high pressure refrigerant and oil.

Glossary of terms

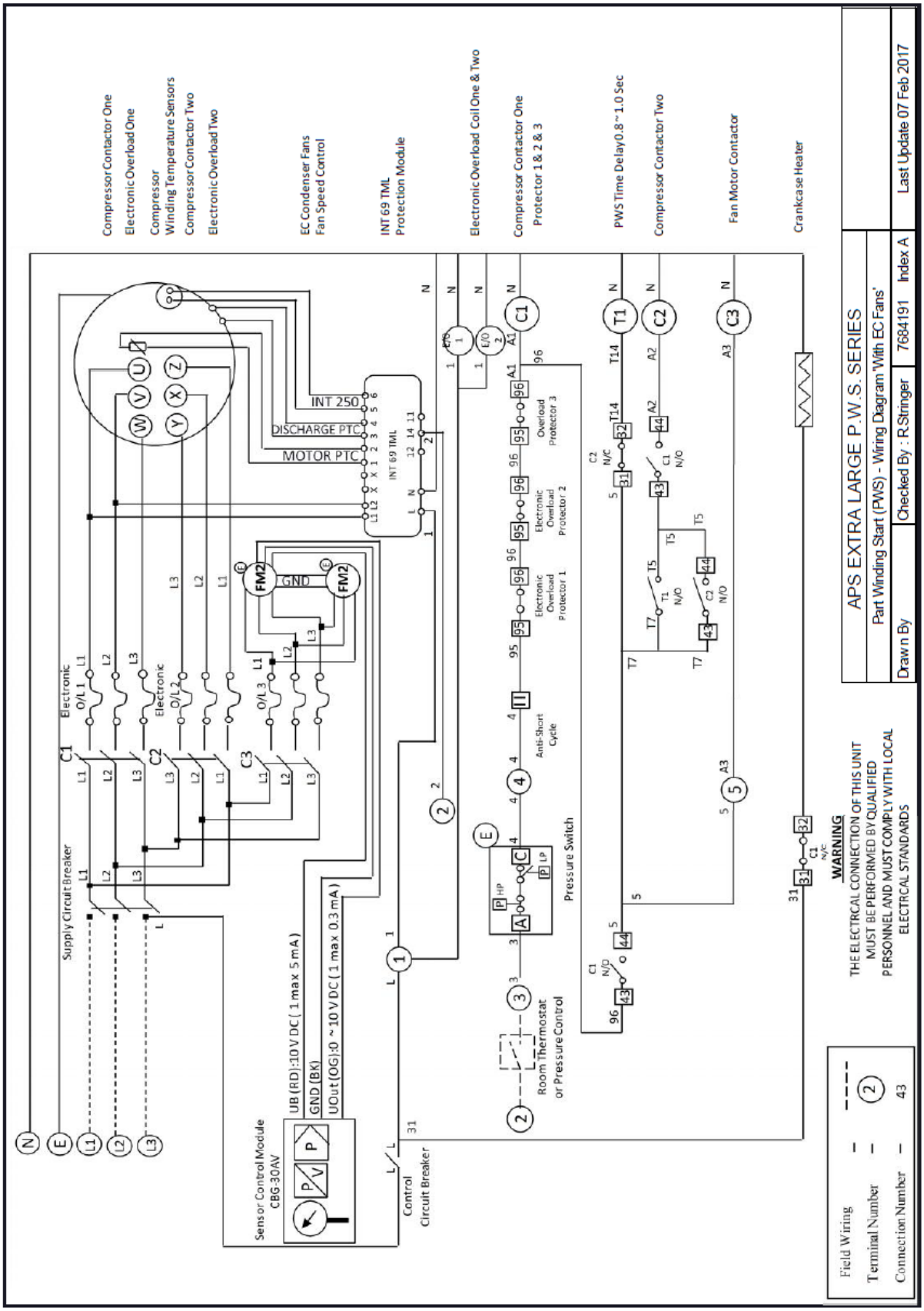
- Condensing unit - unit comprising compressor, condenser with associated components to recirculate refrigerant via external components and back through the condensing unit.
- HFC refrigerant – hydro-fluoro-carbon fluid circulated around a refrigeration system used to transfer heat energy by changing phase from vapour to liquid and back to vapour.
- Ambient temperature – the air temperature surrounding the equipment.

Ongoing product improvement

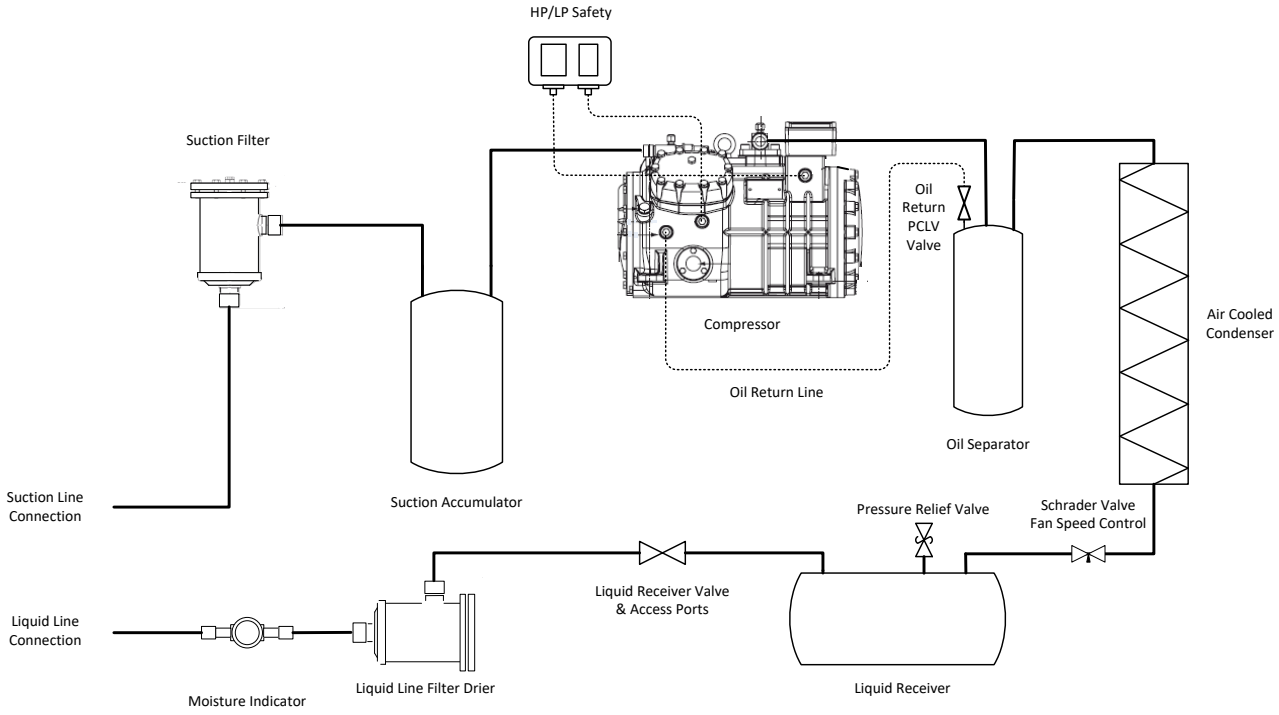
Due to ongoing product improvement Actrol reserves the right to change equipment specification without notice.

5. ELECTRICAL WIRING AND UNIT PIPING SCHEMATIC DIAGRAMS

Wiring diagram for models APS39.5ML2-1, APS46.5ML2-1, APS56.4ML2-1 and APS64.2ML2-1



Unit piping schematic diagram



NOTES

6. COMMISSIONING AND OPERATION DETAILS

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Commissioning and Operation Details

CUSTOMER/SITE: _____ **DATE:** _____

SERVICE TECHNICIAN: _____ **JOB #** _____

Application: _____ Unit ID Code _____
(Coolroom, Freezer Room, Air Conditioning, Chiller, Process Cooling, Etc) (i.e. Coolroom # 2.1)

Ambient Temperature ('C) _____ Application Temperature ('C) _____

EQUIPMENT DETAILS

Compressor / Unit Model # _____ Refrigerant _____

Evaporator (Make & Model) _____

Condenser / Condensing Unit (Make & Model) _____

Pipe Run & Sizes (Equivalent Length) _____
(Add Approx 1m to Length per Elbow)

SYSTEM OPERATIONAL OBSERVATIONS

Refrigerant Type _____ Charge Quantity _____

Charge Condition _____
(Liquid Level, Sight Glass - Full Head of Liquid, Some Flash Gas, etc)

Suction Pressure _____ (Gauge) Equivalent Saturated Suction Temp. ('C) (A) _____
(Measured at Evap) (At Stabilised Conditions) (Use a Pressure Temperature Chart)

Suction Vapour Temperature ('C) (B) _____ **Calculated Evaporator Superheat (K)** (B-A) _____
(Measured at Evap Before Liquid/Suction Heat Exchanger) (Measured Suction Line Temp (B) - Saturated Refrigerant Temp (A))

Suction Pressure _____ (Gauge) Equivalent Saturated Suction Temp. ('C) (D) _____
(Measured at Compressor) (Use a Pressure Temperature Chart)

Suction Vapour Temperature ('C) (E) _____ **Calculated Superheat at Compressor (K)** (E-D) _____
(Measured at Compressor Suction Line 150mm from Compressor) (Measured Suction Line Temp (E) - Saturated Refrigerant Temp (D))

Discharge Pressure _____ (Gauge) Equivalent Saturated Discharge Temp. ('C) (G) _____
(Measured at Compressor) (At Stabilised Conditions) (Use a Pressure Temperature Chart)

Discharge Line Temperature ('C) (F) _____ **Calculated Discharge Superheat (K)** (F-G) _____
(Measured 50mm from compressor) (Measured Discharge Line Temp (F) - Saturated Refrigerant Temp (G))

Liquid Pressure _____ (Gauge) Equivalent Saturated Liquid Temp. ('C) (H) _____
(Measured at Liquid Line) (At Stabilised Conditions) (Use a Pressure Temperature Chart)

Liquid Line Temperature ('C) (J) _____ **Calculated Liquid Subcooling (K)** (J-H) _____
(Measured 100mm from Receiver Outlet) (Measured Liquid Line Temp (J) - Saturated Refrigerant Temp (H))

Measured Suction Pressure After Defrost _____ Oil Condition _____
(Applicable to Freezers Only - CPR or MOP TX Valve Fitted) (Clean, Clear, Honey, Brown, Black, Carried Out Acid Test)

Compressor Oil Level _____ Compressor/Pump Measured Oil Pressure _____
(Force Feed Compressors Only)

Sump Heater Fitted (& Operational During Compressor off Cycle) _____ (Measured Current Draw)

CONDENSER Air on to Coil _____ Temp 'C **EVAPORATOR** Air on to Coil _____ Temp 'C
Air off Coil _____ Temp 'C Air off Coil _____ Temp 'C

CONTROLS

Pressure Controls
L.P. Cut In _____ L.P. Cut Out _____
H.P. Cut In _____ H.P. Cut Out _____

Temperature Control - Make & Model _____
Set Point _____
Differential _____
# of Defrosts/24hrs _____
Defrost Period _____
Termination Temp. _____

ELECTRICAL

Supply Requirement _____ Volts _____ Hz _____ Phase Anti-Cycle Timer Fitted _____ Duration
(Maximum 8 Starts per Hour)
Measured Volts _____ L1 _____ L2 _____ L3 (Maximum 2% Imbalance)
Measured Current _____ L1 _____ L2 _____ L3 (Maximum 10% Imbalance)

Other Observations (Make further notes on back)

Full Name _____

Signature _____