Electrical Installation Requirements

Care should be taken to separate the power and signal cables to prevent electrical interference and possible damage due to inadvertent connection.

The power outputs are fitted with suppressors to protect against electrical interference when switching off solenoid valves or contactors. It is therefore essential to observe the output polarity. The line voltage should be connected to the terminals marked **LN** and the switched loads to **LD.**

The plant inputs are electrically isolated. A volt free contact should be connected for the logical conditions stated below between the input and common **C** (14).

The control supply neutral must be connected to terminal 1 for EMC operation.

CE Conformance

This unit conforms with the relevant EU standards when installed according to the JTL Installation Requirements for this product

Digital Output

1	LN LD	3 2	Suppressed	Run Compressor
2	LN LD	5 4	Suppressed	Pressure Control ok
3	LN LD	7 6	Suppressed	Not used
4	LN LD	8 9	Unsuppressed	Enable Heat Exchanger

Digital Inputs

1	14 13	Volt Free	Auto
2	14 12	Volt Free	Plant Healthy
3	14 11	Volt Free	Unload Heat Exchanger
4	14 10	Volt Free	Inverter & Compressor Healthy

Analogue OUTPUT

1	+ -	19 20	0-10 V	Inverter Speed
2	+ -	17 20	4-20mA	Heat Exchanger Drive
		26 16	0V +24v	External supply

Analogue INPUT

1	+ -	21 22	5k Thermistor	Suction Temperature
2	+ -	21 23	5k Thermistor	Not used
3	+ -	15 24	4-20 mA	Suction Pressure
4	+ -	17 20	4-20 mA	Not used

Doc 05022 ISS 2
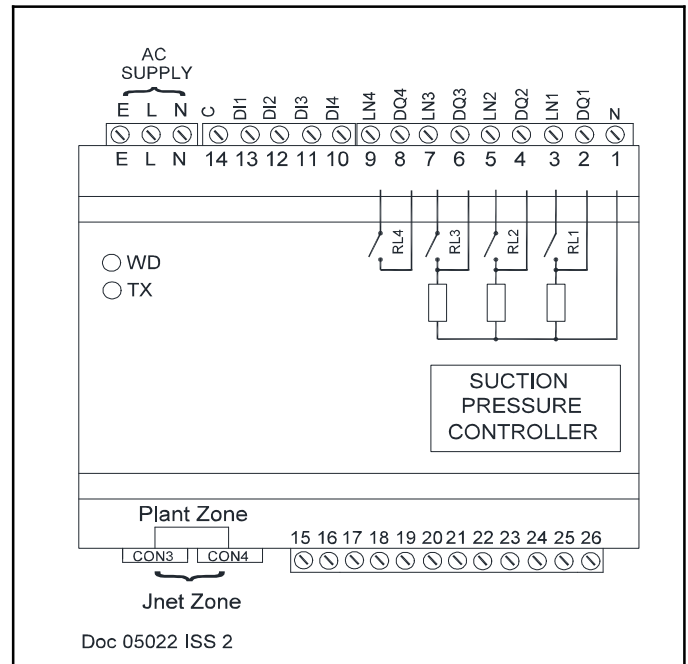
Use of Maintenance Unit

The controller can be checked and the operation adjusted using a JTL portable maintenance unit which plugs into the controller. Each item of information has an item number. The more important items are listed in the tables overleaf.

Examples:

To read item 21 press: [ITEM] [2] [1] [ENTER]

To set item 41 to –4.0 press:

[ITEM] [4] [1] [ENTER] [SET] [-] [0] [4] [0] [ENTER]

To correct errors press: [CANCEL]

To select next or previous items press: [+] and [−]

initial Commissioning and Bitswitch Settings

The controller has 3 sets of data built in to its program for use during commissioning. These can be accessed by setting the virtual bitswitches as shown in the table overleaf. The virtual bitswitches are set using item 966. Then set item 9 to 1234. This loads into the controller a suitable set of data for the selected type of case. Adjustments should then be made as necessary. The range over which the settings can be adjusted is also defined by the bitswitch setting.

If a JTL communications network is connected to the controller then the unit number should be set on item 1.

Pressure Display

The pressure can be displayed in psi, bar or kPa as selected by item 179.

The LP170 controller drives the JTL LCD14 display using a CAB75 cable. Various cable lengths are available.

Suction Pressure Control Strategy

The compressor capacity is controlled by measuring the suction gas pressure (item21) and attempting to maintain this at a constant set value within certain constraints. The suction pressure is controlled by varying inverter driven compressor. The inverter varies the compressor speed to maintain the pressure.

Inverter Speed Control

The controller can vary frequency of the inverter using a 0 - 10 signal. The inverter should be set up so that 0 V is for minimum speed and 10 V is maximum speed.

Minimum Speed
The inverter will stay on at minimum speed until the minimum pressure set on item 341 is achieved. If the inverter stops then it will restart when the pressure set on item 64 is reached.

Heat Exchanger Control
The LP170 drives a valve using a 4-20mA output to control the superheat of a heat exchanger.

The superheat is controlled to a fixed setpoint (item 142) using PI control with adjustable gain (item 50) and time constant (item 51). The rate of change of the output to the valve can be limited (item 52) and the output smoothed to avoid instability if there are discontinuities in the pressure and temperature readings.

Valve Output
The output can be limited by maximum and minimum values.
If when the output is at a minimum the superheat falls below the minimum level the valve is shut.

Manual Control
The heat exchanger can be selected to run in manual control if required using item 145.

Daylight Saving
When connected to a JTL network this controller can operate by displaying daylight saving time for its time and defrost schedule. Daylight saving operation is selected by setting item 18. The connected network controller then adjusts the times automatically during the daylight saving period.

Control Response
The controller uses proportional and integrated control algorithms to control the inverter. These require speed gain (item 339) and time constant (item 340) to adjust the response of the control of inverter.

Speed Output Limits
The speed output can be limited at both maximum and minimum speed. The settings for the limits are item 342 for maximum and item 343 for minimum speed.

Pressure Healthy
The LP170 can be used in conjunction with other controllers. There is an output which indicates if the suction pressure is within acceptable limits which can be connected to other systems. This function is enabled when the compressor is required to run.
There is a settable delay (item 48) after the compressor is required before the healthy output is deactivated due to unhealthy pressure.

If the ambient temperature level setting is enabled and the ambient temperature is below the set level then the pressure healthy output is disabled.

The pressure healthy output can also be disabled by selecting a broadcast time function from one of eight possible broadcast timers.

If the inverter or compressor is faulty the pressure healthy output is disabled.

Pressure Alarms
The compressor suction pressure is constantly monitored and compared with the high alarm level (item 42).

If the current suction pressure goes outside the set range for a short time period then an alarm is given.

The time delay is achieved by integrating the difference between the alarm level and the actual pressure over a period of 30 seconds. This means that the larger the difference the faster the alarm occurs.

Pressure Transducer Alarm
The pressure transducer is constantly checked and if, after a 15 minute time delay, the output goes outside the acceptable range an alarm is given (item 91).

If there is a suction pressure transducer fault, the number of compression steps is set to the maximum available. Control then reverts to the compressor LP safety switches. All normal sequencing restart delays, etc will be maintained in this mode of operation.

Alarm Display
Various alarms are indicated on the pressure displays. Typical messages displayed are:

P.Flt	Plant fault (auto input not present) - (highest priority)
Hi.Sp	High suction pressure
Hi.dP	High discharge pressure
Lo.Li	Low level liquid
Cpr	Compressor fault - (lowest priority)

The alarm conditions are flashed alternately with the pressure. In the event of there being more than one alarm the highest priority alarm is displayed

ADJUSTABLE PARAMETERS				LP170/ LP175
	Item	Function	Range	Units
PRESSURE CONTROL	40 49 48 50 51 341 64 157	Suction pressure setpoint Suction pressure healthy Suction pressure healthy delay Low ambient temperature level Low ambient temperature level Minimum pressure Restart pressure Refrigerant type	0 to 60 0 to 10 10 to 60 5 to 15 0= Disabled 1= Enabled -8 to 40 0 to 60 3=404A, 4=407A, 5=407B, 6=507, 7=408, 11=407F	psi psi secs °C psi psi psi
PRESSURE ALARM	42 41	High suction pressure Low suction pressure	10 to 80 -5 to 40	psi psi
PRESSURE TRANSDUCER	121 421 426	Transducer Transducer full scale (at 20mA) Transducer zero scale (at 4mA)	0=Disabled 1=Enabled 50 to 200 -15 to 0	 psi psi
INVERTER	330 340 339 343 342 335 336	Select Time constant Gain Minimum steps Maximum steps Capacity at minimum speed Capacity at maximum speed	0=Disabled 1=Enabled 1 - 240 1 - 250 1 - 63 64 - 127 1 - 100 1 - 100	 kW kW
SUPERHEAT CONTROL	140 142 145 50 57 52 143 55 56 148	Strategy Superheat setpoint Enable in manual Valve proportional gain Value time constant Rate of change of output Minimum Superheat Maximum valve opening Minimum valve opening Valve smoothing	2=superheat monitoring 3=superheat control 4=off 4.0 - 12.0 0=no 1=yes 0 - 100 0=disabled 1 - 250 1 - 20 0 - 5.0 10 - 100 0 - 50 0 - 5	 K %/sec % %
TEMPERATURE	131	Suction temperature	0=Disabled 1=Enabled	
DISPLAY	178 179	Temperature display units Pressure Display units	0 - Celsius 1 - Fahrenheit 1 - psi, 2 - bar, 3- kPa	
COMPRESSOR ALARMS	206 158	Fault alarm delay Fault alarm repeat delay	0 - 10 00:01 - 24:00 (00:00 off)	min hr:min
JNET FUNCTION	1 18 52	Unit number Daylight saving operation Broadcast timer disable pressure healthy	0.1 - 899.7 0= standard time, 1 daylight saving time 0=Disabled 1-8=Timer number	

VIRTUAL BITSWITCH	966	Bitswitch Selection	0=Frozen Food (HFC) 1=Chilled (HFC) Where 0-1 is the virtual bitswitch setting on item 966.	

OTHER USEFUL ITEMS							
Item	Function		Item	Function		Item	Heat Exchanger
21 146 331 899 31	**PRESSURE** Pressure Average pressure (1hr) CONTROL Ambient temperature **TEMPERATURE** Suction temperature		345 346 331 332 333 344	**INVERTER** Current proportional term Current integral term Steps running Run hours (10s of hours) Inverter/compressor status Capacity loaded		57 53 54 58	**VALVE** Current opening (%) Proportional output (P) Integral output (I) Forced output (%)

Relay Output Rating
2A resistive

Supply Requirements
230 V ac 48-62 Hz Supply 6 VA maximum inputs

2 mA maximum

24 Vac (optional)

Applicable Documentation

Item Numbers	Firmware Variations	Connections Diagram
Doc No. 04988	Doc No. 04989	Doc No. 04990

Installation Information
Doc No. 04257

Note: The information contained in this document applies to the current version of the unit supplied with it. Full operating manuals, item number and software variation information can be obtained from the supplier JTL Systems.

C E   This unit conforms with the relevant EU standards when fitted in accordance with its installation instructions.

PREDICT® is the patented JTL pattern recognition algorithm for providing defrost on demand for the cabinets on a system.