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. Volt free contacts should be connected for the logical conditions stated below.
The control supply neutral must be connected to terminal 1 for EMC operation.

CE Conformance

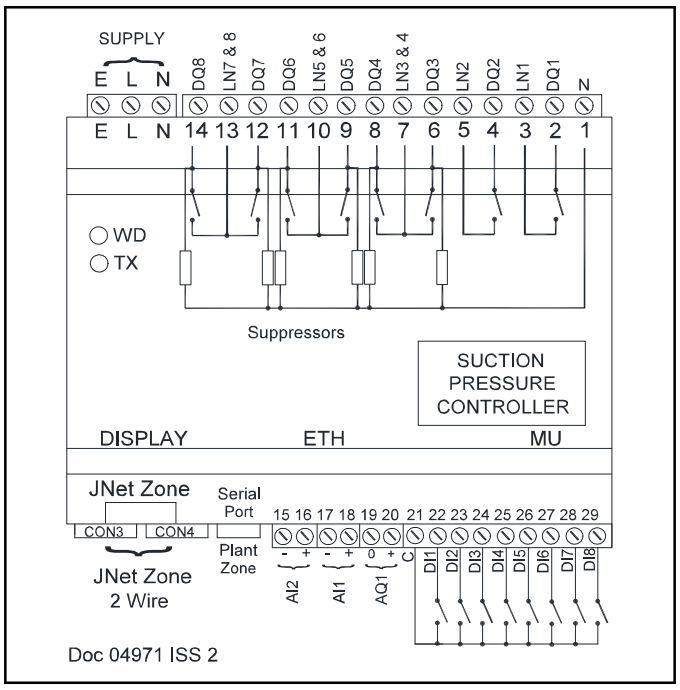
This unit conforms with the relevant EU standards when installed according to the JTL Installation Requirements for this product.

Digital Connections

OUTPUT				
1	2 3	DQ1 LN1	Unsuppressed	Not used
2	4 5	DQ2 LN2	Unsuppressed	General purpose
3	6 7	DQ3 LN3	Suppressed	Oil System
4	8 7	DQ4 LN4	Suppressed	Hot Gas Injection
5	9 10	DQ5 LN5	Suppressed	Liquid injection
6	11 10	DQ6 LN6	Suppressed	Not used
7	12 13	DQ7 LN7	Suppressed	Not used
8	14 13	DQ8 LN8	Suppressed	Watchdog
INPUT				
1	22 21	DI1	Volt Free	Auto/Manual
2	23 21	DI2	Volt Free	High Discharge Pressure
3	24 21	DI3	Volt Free	Enable Optimiser
4	25 21	DI4	Volt Free	Low Refrigerant
5	26 21	DI5	Volt Free	Low Oil Level
6	27 21	DI6	Volt Free	Plant Healthy
7	28 21	DI7	Volt Free	High Oil Level
8	29 21	DI8	Volt Free	Not used

Analogue Connections

INPUT				
1	+18 17	AI1	4-20 mA	Suction Pressure
2	+16 15	AI2	4-20mA	Liquid Pressure or oil pressure



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 4 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 kPa or bar absolute as selected by item 179.

The LP46x 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 (item 21) and attempting to maintain this at a constant set value within certain constraints. The suction pressure of the compressor pack is controlled by varying the number of steps of compression. The controller can control an inverter trim compressors. When the inverter trim control is available the inverter varies the compressor speed on the trim machines to maintain the pressure. Only when the inverter driven compressors are running at minimum or maximum speed will the other compressors be stopped or started as required.

When a change in compressor capacity is required the controller decides which step of capacity is to be changed. The decision is based on the following:

- The maximum number of starts per hour on an individual compressor.
- The compressor running hours are balanced.
- All machines are run periodically.
- Unnecessary starts and stops of the compressors are avoided.
- Capacity of compressors when unequal.

The suction pressure is maintained within the deadband if sufficient capacity is available. The deadband is positioned symmetrically about the suction pressure setpoint so that for example, if the setpoint is set to 8 psi and the deadband is set to 4 psi, then the bottom of the deadband is 6 psi and the top 10 psi.

Under normal conditions when the suction pressure is within the deadband no increase or decrease in staged capacity will occur.

Suction Pressure Optimisation
When used in conjunction with a JTL suction pressure optimiser (SPO) and appropriate JTL evaporator controllers/monitors, the suction pressure can be optimised to save energy.

The optimiser monitors the evaporator conditions and sets the suction pressure to the appropriate level to maintain the evaporator at the optimiser level to achieve the desired temperatures at the lowest energy.

The allowed range of pressure is set on items 40 (minimum) and 152 (maximum) optimisation is enabled on item 150.

CAPACITY CHANGES (STAGE CONTROL)

The stage control is implemented using additional digital interface (IF) modules. One or two IF31 modules are used depending on the number of compressors and stages on the compressors. Up to 8 stages can be controlled using one IF31 module and up to 16 stages can be controlled using IF31 modules.

Note: Output functions need to be set using items 5x0, 5x2, 5x3 and 5x4 for each compressor.

Compressor Healthy State
There is an input on the IF31 & IF35 interface module(s) for each compressor that is used to indicate that the compressor is healthy.

No compressor is allowed to run unless its associated healthy input is present. There is an adjustable delay (item 180) which is applied to the healthy inputs to ensure that the input is valid.

Capacity Increase
When the suction pressure goes above the control deadband the controller will decide when and how an increase in capacity will occur. If capacity is available and the pressure does not return within the deadband a change in capacity will eventually occur.

However, the capacity change does not occur immediately the pressure goes outside the deadband. There is a minimum delay between each increase in capacity regardless of demand.

The size and duration of the difference (or error) between the desired pressure and the actual pressure is taken into account. This error is integrated with respect to time. When the integrated error is large enough a capacity increase will occur.

To put this more simply, if the pressure error is large a capacity change will occur more quickly than if the error is small.

When increasing the stage capacity it is possible to reduce the inverter capacity by a specified amount to "smooth" the increase in capacity (item 403).

Capacity Increase Response Time
The speed of response of the system can be adjusted using the increase gain (item 44). The larger the gain, the sooner a capacity increase occurs.

Capacity Decrease
When the suction pressure goes below the control deadband the controller program will decide when and how a decrease in capacity will occur. If the pressure does not return within the deadband a change in capacity will eventually occur.

As for the increase in capacity there is a minimum delay between each decrease in capacity and the pressure error is integrated with respect to time. When the integrated error is large enough a capacity decrease will occur.

When decreasing the stage capacity it is possible to increase the inverter capacity by a specified amount to "smooth" the increase in capacity (item 410).

Capacity Decrease Response Time
The speed of response of the system can be adjusted using the decrease gain (item 45). The larger the gain, the sooner a capacity decrease occurs.

The use of separate increase and decrease gains allows the compressors to unload faster than loading if desired. This feature is of particular benefit on low temperature stages to prevent the suction pressure going too low.

Change Of Pressure
The change of pressure is also considered. If the pressure is going towards the setpoint fast enough for the suction pressure to reach the deadband in an acceptable time then, no capacity change is made.

Starts Per hour
Each compressor can be programmed to have a maximum number of starts per hour. The item numbers for this selection are 219 for compressor 1, 229 for compressor 2 up to 329 for compressor 12. Once a compressor has started it is not allowed to restart again until the restart timer, which ensures the starts per hour are observed, has timed out.

Compressor Capacity
Each compressor can be programmed to have a capacity. The items for this data are 216 for compressor 1, 226 for compressor 2 up to 326 for compressor 12.

The capacity control takes account of the capacity that can be started and stopped to ensure optimum control. Where a small capacity change can be made by starting and stopping two machines to give a net change in capacity this is done. In this condition the machine to be started always starts before the machine to be stopped regardless of whether capacity is to be increased or decreased.

High Discharge Pressure
If the discharge pressure exceeds the pressure safety level (on input 2) then, the compressor capacity is reduced. There is a choice of two actions in this condition on item 197 either the reduction in capacity is controlled by the normal sequence of unloading or all compressors are stopped immediately.

When the pressure falls below the safety level the capacity is allowed to increase again according to the normal requirements of the suction pressure.

Low load Condition
When the refrigeration load is low enough for the compressors to run on 1 step only (including the trim compressor) then, to prevent the last compressor stopping unnecessarily, the deadband lower limit is automatically lowered, reducing the pressure at which the last compressor would be stopped.

In this condition the deadband lower limit is set to the 1st stage hold on pressure setpoint (item 48).

There is a very low suction pressure setting (item 196) below which, if enabled by item 195, will stop all compressors instantly.

VARIABLE CAPACITY COMPRESSOR INVERTER CONTROL

Inverter Speed Control
The inverters require the use of an analogue interface module which can vary the frequency of the inverter drive is varied 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.

Capacity Control
The controller starts and stops the compressors as required taking account of any other compressors controlled by the same suction pressure. The inverters automatically act as trim compressors and all the normal compressor capacity control functions are operational. The capacity of the compressors at 50Hz is programmed on item x335.

Minimum Speed
When there are no other compressors running one inverter will stay on at minimum speed until the minimum pressure set on item 341 is achieved.

Control Response
The controller uses proportional and integrated control algorithms to control the inverters. These require P gain (item 339) I gain (item 340) and D gain (item 404) to adjust the response of the control of inverters.

Speed Output Limits
The speed output can be limited at both maximum and minimum speed. The settings for the limits are item x342 for maximum and item x343 for minimum speed (in Hz). These values should match the inverter settings.

AUXILIARY CONTROL FUNCTIONS

Liquid Pressure Control
The liquid pressure is controlled using a pressure regulating valve using a 4-20mA output on the LP462. The output is varied by comparing the pressure (item 22) against liquid pressure setpoint (item 5016) using standard PID control. The PID gain settings are on (items 5010-12.

When the pressure is higher than setpoint the valve is opened by increasing the output and vice versa.

The maximum and minimum valve open states can be set on items 5006 and 5007 as required.

Suction Superheat Measurement
This function requires the use of an interface type IF39 which has the suction temperature input to enable the Suction Superheat to be calculated.

Discharge Temperature Measurement
This function requires the use of an interface type IF39 which has the discharge temperature input.

Liquid Injection Control
Output 5 is pulsed during a settable period (item 486) with a settable duty (item 485) if the suction superheat is too high. The control Setpoint is set on item 483 and a deadband centred on the setpoint is set on item 484. For example, if the setpoint is set to 20K and the deadband is set to 2K then the output will pulse when the superheat exceeds 21K and continue to pulse until the superheat is less than 19K.

If item 493 is set on liquid injection also occurs on high discharge temperature. If the discharge temperature reaches a level set at item 494 and any HT gas pressure is running then the liquid injection output is enabled. There is a deadband on item 495.

Gas Injection Control
Output 4 is pulsed during a settable period (item 490) with a settable duty (item 489) if the suction superheat is too low. The control setpoint is set on item 487 and a deadband centred on the setpoint is set on item 488. For example, if the setpoint is set to 10K and the deadband is set to 2K then the output will pulse when the superheat is less than 9K and continue to pulse until the superheat exceeds 11K.

Oil Supply Control
Up to v13 the oil supply is controlled by high oil level. From v14 the oil supply can also be controlled by measuring the oil pressure. This choice is made on item 5090.

a) Oil level control.
When there is a high oil level signal present and there is at least one HT compressor running then output 3 is pulsed continuously according to a settable period (item 492) and duty (item 491)
Once the output is on, it will stay on until the on period has terminated regardless of the other conditions.

b) Oil pressure control.
The oil injection control output is enabled when the pressure is above the setting on item 5092 and is disabled when the pressure falls below the setting on item 5091.

Ambient Rejecter Control
The LP462 includes control of ambient rejecter fans and bypass valve. The control of the ambient rejecter is to maintain the suction superheat (item 141) at a set value (item 5042) when the superheat is above this level the fans are controlled using standard PID algorithms. There is an adjustable deadband (item 5043).
When the superheat falls below the setpoint and deadband the ambient rejecter bypass valve is controlled using PID.

High Pressure Interlock
Where the controller is controlling compressors in a cascade system where the suction pressure is connected to the discharge of other packs an interlock output facility is provided on relay 2 (see general purpose output). The interlock is energised if the pressure exceeds a set level (item 46).

General Purpose Output
There is a general purpose output on output 2 which can be selected for different functions using item 166.
0. High suction pressure alarm
1. General Alarm
2. High pressure interlock
3. High pressure OR No compressors running interlock.

Selections 2 and 3 are for interlocking with other plant controls.

INTERFACE SELECTION
The inputs and outputs for the LP46x are mostly on auxiliary interface unit connected to the LP46x using a Modbus serial bus connection.

There are various schemes that can be configured using various interfaces. The interfaces require item numbers to be set according to the appropriate scheme. The relevant item numbers and associated schemes are;

135	Liquid pressure control	3 - Interface IF39 8 - Interface IF69
136	Suction temperature input	3 - Interface IF39 5 - Interface IF66 6 - Interface IF66 8 - Interface IF69
137	Discharge temperature input	3 - Interface IF39 or IF69 5 - Interface IF66 6 - Interface IF66 8 - Interface IF69
138	Inverter compressor drive	3 - Interface IF39 or IF69 5 - Interface IF35 6 - Interface IF66 8 - Interface IF69
139	Staged compressor outputs	1 - Interface IF31 or IF61 4 - Interface IF35 6 - Interface IF66

NOTE: Only 1 interface is allowed for interface number eg. only one of the interfaces can be set to value 5 but there can be more than one IF66 as long as only one is set to 5.

MAINTENANCE FACILITY

Forcing a Compressor to Run

A particular compressor may be forced to run by the maintenance unit (MU) (items 217, 227 up to 327) for compressors 1 to 12 respectively.

Any compressor may be forced off by the maintenance unit (items 218, 228 up to 328) for compressors 1 to 12 respectively.

Resulting loading and unloading of the steps of the forced compressor(s) follows all the normal rules specified above except that the controller ignores the suction pressure on the forced compressor(s).

Forced functions remain in operation for 30 minutes after the MU is unplugged, after which time the controller will reset to normal control.

Forcing the Liquid Valve

The liquid valve can be forced to open to a set level or shut as required using items 5008 and 5009 as required.

ALARMS

Compressor Faults

The compressor fault is delayed before presentation of the alarm system using a delay set on item 206. If the alarm remains it can be repeated to the alarm system periodically as set on item 58. Setting the repeat period to 00.00 disables the repeat function.

Pressure Alarms

The individual compressors are continuously monitored. The state of these inputs for compressor 1 is shown on item 213 of the maintenance unit. Compressor 2 is on item 223 up to compressor 12 which is shown on item 323.

The state is indicated by the following messages:

rdy	=	ready to run (no faults)
0	=	not ready (fault)

If any compressor is not ready to run then this is indicated as a compressor fault (item 97).

The compressor suction pressure is constantly monitored and compared with the high and low alarm level items 42 & 43.If the current suction pressure goes outside the set range for a short time period then an alarm is given.

The liquid pressure is constantly compared with the high and low alarm levels (items 5001& 5002).
If the current liquid pressure goes outside the set range for the adjustable period (5003) then an alarm is given.

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.

Low Liquid Level

An input is available to monitor low liquid level in the receiver. The input should be shorted out when there is an alarm condition. An alarm is given after an adjustable delay (item 175) once the contact is closed.

Low Oil Level

An input is available to monitor low oil level in the system. The input should be shorted when there is an alarm condition. The alarm is given 10 seconds after the input occurs.

Alarm Display

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

Hi.Sp	High suction pressure
Hi.dP	High discharge pressure
Pt.Ft	Pressure transducer fault
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					LP46x
		Item	Function	Range	Units
SUCTION	Pressure Control	40	Suction pressure setpoint (minimum)	0 to 20, 5 to 100, 100 to 250, 300 to 550	psi
		150	Suction optimisation	0=Disabled 1=Enabled	
		152	Suction pressure (maximum)	5 to 20, 15 to 60, 175 to 225, 300 to 700	psi
		43	Deadband	0 to 5, 0 to 15, 0 to 20, 0 to 100	
		44	Increase gain	0 to 99	
		45	Decrease gain	0 to 99	
		48	1st stage and fast unload set point	-5 to 20, 0 to 60, 100 to 150, 250 to 450	psi
		195	Low suction pressure safety	0=Disabled 1=Enabled	
		196	Low suction pressure safety level	-8 to 10, 10 to 40, 50 to 150, 100 to 400	psi
		180	Compressor ok input delay	0 - 10	seg
		197	Instant high discharge pressure shutdown	0=Disabled 1=Enabled	
		46	High pressure interlock	10 - 650	psi
	Pressure Alarm	42	High suction pressure	10 to 50, 25 to 110, 200 to 300, 450 to 650	psi
		41	Low suction pressure	-5 to 15, 5 to 60, 100 to 150, 200 to 450	psi
	Pressure Transducers	121	Transducer	0=Disabled 1=Enabled	
		421	Transducer full scale (at 20mA)	50 to 200, 300 to 900, 300 to 950	psi
		426	Transducer zero scale (at 4mA)	-15 to 0	psi
	Compressor Common	200	Number of compressors	0 to 4	
		205	Maximum allowed to run	1 to 4	
		208	Minimum stop time	1 to 240	sec
		177	High discharge pressure input delay	0 - 10	secs
	Compressor (where x is compressor)	2x5	Owner scope	0= not in use 1= in use	
		2x6	Capacity	1-100	kW
		2x0	Control	0= not stage controlled 1= stage controlled, 2=2 stages (50/100% (compressor 1-3 only) 3=3 stages (33/66/100%) (compressors 1-3 only) 4=4 stages (25/50/75/100%) (compressors 1-3 only) 5=2 stages (66/100%)(compressors 1-3 only) 6=3 stages (50/75/100%) (compressors 1-3 only)	
		2X9	Starts per hours	4-20	
		5x0	Compressor run output station	0=Off 1=IF1.1 8=IF1.8 9=IF2.1 16 IF2.8	
		5x2	Unloader 1 output selection	0=Off 1=IF1.1 8=IF1.8 9=IF2.1 16 IF2.8	
		5x3	Unloader 2 output selection	0=Off 1=IF1.1 8=IF1.8 9=IF2.1 16 IF2.8	
		5x4	Unloader 3 output selection	0=Off 1=IF1.1 8=IF1.8 9=IF2.1 16 IF2.8	
	Compressor Inverter (where x is inverter)	x330	Select	0=Disabled 1=Enabled	
		341	Minimum pressure	-8 to 10, 10 to 60, 50 to 150, 100 to 100	psi
		339	P Gain	0 to 99.99	
		340	I Gain	0 to 99.99	
		404	D Gain	0 - 99.99	
		x343	Minimum speed	0 to 50	Hz
		x342	Maximum speed	40 to 100	Hz
		x335	Capacity at 50Hz	1 - 100	kW
		403	Step change adjustment for increasing capacity	0 - 200	%
		410	Step change adjustment for decreasing capacity	0 - 200	%
	Compressor Alarms	206	Fault alarm delay	0 - 10	min
		158	Fault alarm repeat delay	00:01 - 24:00 (00:00 off)	hr:min
		175	Low refrigerant alarm delay	15 - 240	min
LIQUID	Pressure control	5000	Liquid pressure control	0-disabled 1-enabled	psi
		5016	Liquid pressure setpoint	400 - 750	
		5010	P gain	0 - 99	
		5011	I gain	0 - 99	
		5012	D gain	0 - 99	
	Pressure Alarms	5001	High liquid pressure alarm level	550 - 900	psi
		5002	Low liquid pressure alarm level	400 - 750	psi
		5003	Liquid pressure alarm delay	0 - 20	min
	Pressure Transducer	122	Transducer	0-disabled 1-enabled	
		422	Transducer full scale (at 20mA)	50 - 2200	psi
		427	Transducer zero scale (at 4mA)	-15 - 0	psi
	Valve	5006	Maximum valve opening	0 - 100	%
		5007	Minimum valve opening	0 - 100	%
		5004	Valve opening full scale (at 20mA)	0 - 100	%
		5005	Valve opening zero scale (at 0mA)	0 - 100	%
OIL	Pressure Control	5090	Oil supply control	0-High level 1-oil pressure	
		5092	High oil level	500 - 800	psi
		5091	Low oil level	450 - 750	psi
	Pressure Alarms	5093	Low oil level alarm delay	0 - 900	secs
	Pressure Transducer	123	Transducer	0-disabled 1-enabled	
		423	Transducer full scale (at 20mA)	50 - 2200	psi
		428	Transducer zero scale (at 4mA)	-15 - 0	psi

AMBIENT REJECTER	Superheat	5042 5043	Superheat setpoint superheat deadband	0 - 40 0 - 20	K K
	Fans	5048 5049 5050 5044 5045	Proportional gain Integral gain Derivative gain Minimum speed Maximum speed	0 - 99.99 0 - 99.99 0 - 99.99 0 - 100 0 - 100	 % %
	Bypass Valve	5053 5054 5055 5051 5052	Proportional gain Integral gain Derivative gain Minimum speed Maximum speed	0 - 99.99 0 - 99.99 0 - 99.99 0 - 100 0 - 100	 % %
Liquid Injection		483 484 485 486 493 494 495	Superheat setpoint Deadband Output duty Output period Discharge temperature control Discharge temperature setpoint Discharge temperature deadband	0-40 0.2-5.0 0-100 5-60 0=Off 1=on 80.0 to 160.0 2.0 to 30.0	K K % secs °C °C
Gas Injection		487 488 489 490	Superheat setpoint Deadband Output duty Output period	0-20 0.2-5.0 0-100 5-60	K K % secs
Oil Supply		491 492	Output duty Output period	0-100 5-120	% secs
General		163	Relay output 2 function	0 - High suction pressure 1 - General alarm 2 - High pressure interlock 3 - High pressure OR No compressors running interlock	
Interface Selection		135 136 137 138 139	Liquid pressure control Suction temperature Discharge temperature Inverter compressor outputs Staged compressor outputs	3, 8 3. 5, 6, 8 3, 5, 6, 8 3, 4, 6, 7, 8 1, 4, 6	
Display		9392 9393	Temperature display units Pressure display units	0 - Celsius, 1 - Fahrenheit, 2 - Kelvin 1 - psi, 2 - bar, 3- kPa, 4 - bar absolute	
Jnet Functions		1	Unit number	0.1 - 899.7	
Broadcast Data Sets		690 691 5066 5061 5063 5064 5067 5060 5062 5068 5065	Suction pressure 1 Suction pressure 2 Suction pressure for pressure optimisation Suction temperature Liquid pressure Liquid temperature Current suction pressure setpoint Current compressor capacity loaded Discharge temperature Compressor stages loaded Enable non-legacy pressure set broadcasting	0 - 9999 0 - 9999 0 - 9999 0 - 9999 0 - 9999 0 - 9999 0 - 9999 0 - 9999 0 - 9999 0 - 9999 0 - off 1 - on	
Received Data Sets		156	Optimised pressure	0 - 9999	

Virtual Bitswitch	966	Bitswitch Selection	0=LT (HFC) 1=HT (HFC) 2= LT(CO2) 3= HT(CO2) Where 0-3 is the virtual bitswitch setting on item 966.	

OTHER USEFUL ITEMS

Item	Function	Item	Function	Item	Function
	PRESSURE		**COMPRESSOR DATA (WHERE x IS COMPRESSOR NO.)**		**LIQUID VALVE**
21	Suction pressure	2x3	Status	5018	Valve output (%)
22	Liquid pressure	2x2	Run hours (10 s of hours)	5014	P term
23	Oil pressure	37x	Run time (last 24 hours)	5015	I term
146	Average suction pressure (1hr)	2x4	Restart timer	5016	D term
147	Average liquid pressure (1hr)	35x	Starts per hour (last 24 hours)	5008	Forced valve output
162	High suction pressure output state	45x	Compressor availability	5009	Force valve closed
164	High pressure interlock	5x5	Compressor ok input status		**LIQUID INJECTION**
165	High pressure OR No compressors running interlock	5x6	Capacity loaded (kW)	169	Output state
	TEMPERATURE		**COMPRESSOR INVERTERS WHERE x IS THE INVERTER No.**		**GAS INJECTION**
31	Suction temperature			168	Output state
32	Discharge temperature	345	Current proportional term		**OIL SUPPLY**
33	Liquid temperature	346	Current integral term	167	Output state
	COMPRESSOR CONTROL	405	Current derivative term	188	High oil level input state
151	Optimised LT setpoint	409	Inverter integrated pressure error.	176	Low oil level input state
153	Optimised HT setpoint	x331	Speed (Hz)		**GENERAL**
191	Integrated pressure error	x332	Run hours (10s of hours)	172	Auto/Manual input state
181	Next increase site (kW)	x333	inverter/ compressor status	189	Plant fault input state
182	Next decrease step (kW)			163	General alarm output state
172	High discharge pressure input state	x344	Capacity loaded	161	Watchdog output state
173	Enable optimisers input state		**AMBIENT REJECTER**		
	PACK DATA	5058	Fan speed		
201	No. of steps on load	5059	Valve position		
202	No. of compressors running	5080	Current fan P term		
203	Loaded capacity (kW)	5081	Current fan I term		
		5082	Current fan D term		
		5083	Current bypass valve P term		
		5084	Current bypass valve I term		
		5085	Current bypass valve D term		

Relay Output Rating
2A resistive

Supply Requirements

230 V ac 48-62 Hz Supply 6 VA maximum inputs 2 mA maximum

24 Vac (optional

CE 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.

Applicable Documentation

Item Numbers	Firmware Variations	Connections Diagram
Doc No. 04969	Doc No. 04970	Doc No. 04904

Installation Information
Doc No.

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.

www.jtl.co.uk
JTL Systems Ltd . 41 Kingfisher Court . Hambridge Road . Newbury . Berks . RG14 5SJ Tel: (01635) 263646 Fax: (01635) 263647
JTL Help Desk Tel:08713157535