

**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 **DQ**.

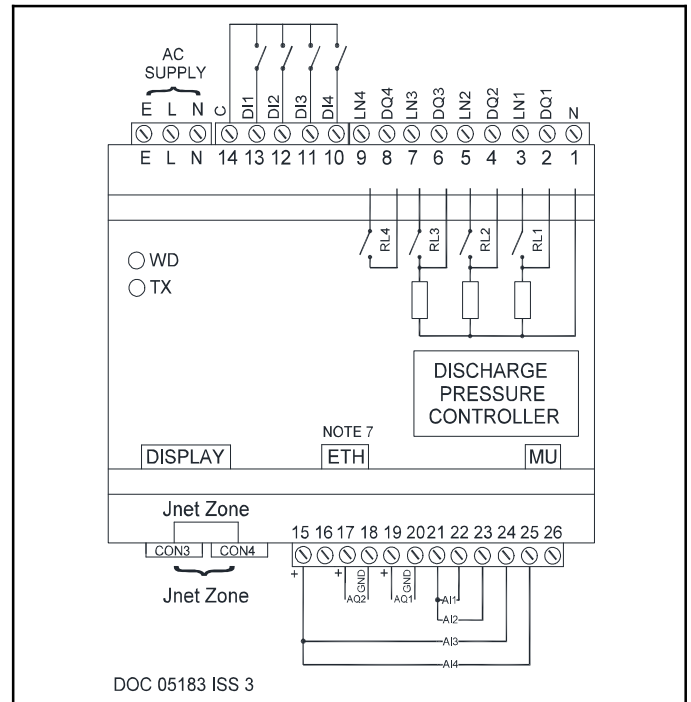
The plant inputs are electrically isolated. A volt free contact should be connected for the logical conditions stated below between the input and common **C** (14).

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 DQ	3 2	Suppressed	Run Fans
2	LN DQ	5 4	Suppressed	Full circuit enable/ Alarms healthy
3	LN DQ	7 6	Suppressed	Watchdog or Run Adiabatic cooling (selectable)
4	LN DQ	8 9	Unsuppressed	High discharge pressure Adiabatic System Healthy
Digital Inputs				
1		14 13	Volt Free	Auto
2		14 12	Volt Free	Plant Healthy
3		14 11	Volt Free	Fans Healthy
4		14 10	Volt Free	Adiabatic System Healthy
Analogue OUTPUT				
1	+	19 -	20	0-10 V Fan Speed
2	+	17 -	18	0-10 V Not used
Analogue INPUT				
1		21 22	5k Thermistor	Condenser exit temperature
2		21 23	5k Thermistor	Condenser inlet OR Liquid temperature (selectable)
3	+	15 -	24	4-20 mA Discharge Pressure
4	+	15 -	25	4-20 mA Liquid 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 22 press: **ITEM** **2** **2** **ENTER**

To set item 50 to 150.0 press:

**ITEM** **5** **0** **ENTER** **SET** **1** **5** **0** **0** **ENTER**

To correct errors press: **CANCEL**

To select next or previous items press: **+** and **-**

**Initial Commissioning Settings**

The controller has 1 set of data built in to its program for use during commissioning. Initialize to this data by setting item 9 to 1234. This loads into the controller a suitable set of data, adjustments should then be made as necessary.

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 9393.

The HP320 controller drives the JTL LCD14 display using a CAB75 cable. Various cable lengths are available.

**Discharge Pressure Control Strategy**

The discharge pressure is controlled against a fixed or dynamic setpoint, the floating discharge pressure setpoint, which is calculated based on the ambient and plant conditions.

The head pressure is floated to give fixed differential temperature above the ambient condition. This should be set to the condenser design condition (item 363) to give maximum condenser efficiency. Setting 0.0 disables floating head (FH) control.

The minimum pressure setpoint (item 50) is used when floating head is disabled or when the outside air temperature is not available.

The maximum pressure setpoint (item 350) for the condenser is used to limit the floating head pressure.

The refrigerant type for the plant (item 157) is used to convert pressures to temperatures and vice versa.

The outside ambient temperature from the JTL network (item 899). If the outside temperature is not available FH control is disabled.

The condenser operating (item 365) temperature is calculated from the discharge pressure and the refrigerant type taking into account refrigerant glide by using the midpoint of the Dew and Bubble data.

The target temperature for the condenser control is calculated from the outside air temperature plus the design differential temperature. (item 899 + item 363).

The floating discharge pressure setpoint (item 370) is calculated from the target temperature and the selected refrigerant, limited by the minimum and maximum values above.

**Liquid pressure control**

The controller can be set to control the liquid pressure as an alternative to the discharge pressure using (item 386).

When floating head control is operation in operational the control option to control on the liquid pressure is disabled.

**Fan Speed Control**

The controller can vary the speed of the fans using a 0 - 10 signal. 0 V is for minimum speed and 10 V is maximum speed.

There is a minimum fan speed control setting on Item 352. When this is set >0 then there is also a minimum pressure cutout setting on Item 351. When the fans reach minimum speed they stay running until the cutout level is reached.

**Split Circuit Operation**

HP320 can operate with a split circuit condenser. The full circuit valve is opened at the fan speed set on Item 366 and closed when the fan speed falls to the setting on Item 367.

**Control Response**

The controller uses proportional and integrated control algorithms to control the fan speed. These require speed gain (item 395) and speed integral gain (item 54) to adjust the response of the control.

**Adiabatic Cooling**

Adiabatic cooling can be energised when the condenser is not performing adequately under normal control. This is determined by measuring the exit temperature of the cooler and comparing it with a target temperature (item 336) which is based on the ambient temperature (item 32) plus a fixed differential (item 335). When the error exceeds a set differential (item 5174) if the ambient temperature is above the set level (item 5173) then the adiabatic cooling is initiated.

There are settable minimum run (item 5172) and minimum off (item 5171) times.

**Adiabatic Test**

Adiabatic test can automatically be run on a weekly period basis by setting the period between tests (item 5180), the time of day (item 5182) and day of week (item 5181). The test takes into account the time since the adiabatic last ran and the ambient temperature.

The test can be forced using (item 5184).

**Pressure Healthy**

The HP320 can be used in conjunction with other controllers. There is an output which indicates if the discharge pressure is within acceptable limits which can be connected to other systems. The acceptable pressure level is set as item 55.

**Pressure Alarms**

The discharge suction pressure is constantly monitored and compared with the high alarm level (item 52) and low alarm level (item 51).

If the current 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.

The low level alarm can be delayed for up to 20 minutes.

**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 pressure transducer fault, the output is set to a settable backup value.

**Exit Temperature Alarm**

The exit temperature (item 31) is compared with the calculated exit temperature setpoint (item 336) which is based on the outside ambient temperature. The difference is averaged over the period deferred on (item 154). When the actual and average error exceeds the setting on (item 153) an alarm is given provided the actual exit temperature exceeds the minimum value set on (item 334).

**Outside Ambient Temperature Alarm**

The outside ambient temperature is delivered from an external sensor over the JTL network (Jnet). This is compared with data from the Met Office which is also delivered over the network. If the temperature difference exceeds a settable level (item 139) for more than 15 mins then the alarm is given.

**General Alarm Output**

Relay 2 can be programmed to run as a split circuit control or a general alarm output.

The alarm output is energized (contact closed) for no alarms.

The alarms are

- Plant fault
- Pressure transducer fault
- High discharge pressure
- Condenser fan fault

**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.dP	High discharge pressure
Lo.L.p	Low liquid differential pressure
FAn	Condenser fan failure (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

**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.

ADJUSTABLE PARAMETERS				HP320
	Item	Function	Range	Units
PRESSURE CONTROL	50	Discharge pressure setpoint (minimum)	100 to 250	psi
	350	Discharge pressure (maximum)	175 to 380	psi
	157	Refrigeration type	3=404A, 4=407A, 5=407B,6=507,7=408,11=407F 13=407C, 14=448A, 15=449A	
	363	Floating discharge temperature differential	0 - 15	K
	386	Control pressure selection	0=Discharge 1=Liquid	
	55	Discharge safety level	140 - 400	psi
	351	Discharge pressure cutout	100 - 200	psi
PRESSURE ALARM	52	High discharge pressure	140 to 300	psi
	51	Low discharge pressure	100 to 200	psi
	362	Low discharge pressure alarm delay	0 to 20	mins
	384	Minimum liquid pressure differential	0 to 15	psi
PRESSURE TRANSDUCERS	122	Discharge transducer	0=Disabled 1=Enabled	
	422	Discharge transducer full scale (at 20 mA)	300 to 500	psi
	426	Discharge transducer zero scale (at 4mA)	-15 to 0	psi
	101	IP data set 1 discharge pressure		
	102	IP data set 2 discharge pressure		
	123	Liquid transducer	0=disable 1=enable	
	423	liquid transducer full scale (at 20 mA)	300 to 500	psi
	428	liquid transducer zero scale (at 4mA)	-15 to 0	psi
	103	IP data set 1 liquid pressure		
	104	IP data set 2 liquid pressure		
TEMPERATURES	131	Condenser exit	0=disabled 1=enabled	
	132	Sensor 2	0=disabled 1=enabled	
	135	Sensor 2 function	0=condenser inlet 1=liquid	
	137	Outside ambient	0=disabled 1=enabled	
	105	IP data set 5 condenser exit		
106	IP data set 6 condenser inlet			
TEMPERATURE ALARMS	39	Ambient difference error	3 - 10	K
	334	Minimum condenser exit	5 - 15	°C
	153	Condenser exit tolerance	0 - 5	K
	154	Condenser exit alarm period	00:30 - 06:00	hr:min
FANS SPEED CONTROL	54	Integral gain	0 - 1.00	
	395	Proportional gain	0.01 - 99.99	
	368	Maximum speed at night	50 - 100	%
	369	Timer for nighttime operation	0=disabled 1-8=timer selection	
	397	No of steps in backup	0 - 100	%
	366	Full circuit enable level	0 - 100	%
	367	Full circuit disable level	0 - 100	%
	352	Minimum fan speed	0 - 25	%
	389	Fan speed smoothing	0 - 5 0=disabled	
	380	Output voltage for minimum speed	0 - 2	V
OUTPUT CONTROL	166	Relay 2 function	0=Split circuit 1=General alarm	
ADIABATIC CONTROL	5170	Adiabatic control	0=disabled 1=enabled	
	5171	Minimum off time	2 - 10	min
	5172	Minimum run time	5 - 30	min
	5173	Minimum ambient temperature to enable cooling	2 - 10	°C
	5174	Exit temperature error to run cooling	1 - 5	°C
	5175	Trigger delay	1 - 10	min
	5180	Period between automatic tests	0 - 4	week
	5181	Test day of week	0=sun, 1=mon, 2=tues, 3=wed, 4=thurs, 5=fri, 6=sat, 7=any day	
	5182	Test time of day		hr:min
5183	Test cycles	1 - 5		
DISPLAY	9393	Display units	0 - Mpa, 1 - psi, 2 - barg, 3- kPa, 4 - bara	
	189	Backlight control	0 - off 1 - on 2 - off flashes alarm 3 - on flashes alarm	
JNET FUNCTION	1	Unit number	0.1 - 899.7	
	18	Daylight saving operation	0= standard time, 1 daylight saving time	

OTHER USEFUL ITEMS					
Item	Function	Item	Function	Item	Function
22	PRESSURE Discharge Pressure	391	SPEED CONTROL Steps running	31	TEMPERATURE Condenser exit
23	Liquid pressure	392	Forced speed	32	Outside ambient
383	Liquid pressure differential			34	Condenser inlet
148	Average discharge pressure (1hr)		ADIABATIC COOLING	43	Liquid
149	Average liquid pressure (1hr)	5184	Force test	337	Condenser Sub cooling
155	Boiling point (Dew)	5185	Time since last	44	Liquid sub cooling
156	Boiling point (Bubble)		operation (hours)	820	Met Office
	CONTROL			336	Condenser exit setpoint
370	Optimised setpoint			151	Condenser exit error
364	Minimum discharge temperature			152	Average condenser exit error
365	Refrigerant boiling point				
899	Outside air temperature				

**Relay Output Rating**

2A resistive

**Supply Requirements**

Installation Information  
230 V ac 48-62 Hz Supply 3 VA maximum inputs  
2 mA maximum

24 Vac (optional)



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

**Applicable Documentation**

Item Numbers Doc No. 05178	Firmware Variations Doc No. 05179	Connections Diagram Doc No. 05173
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Installation Requirements  
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.