

**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**.

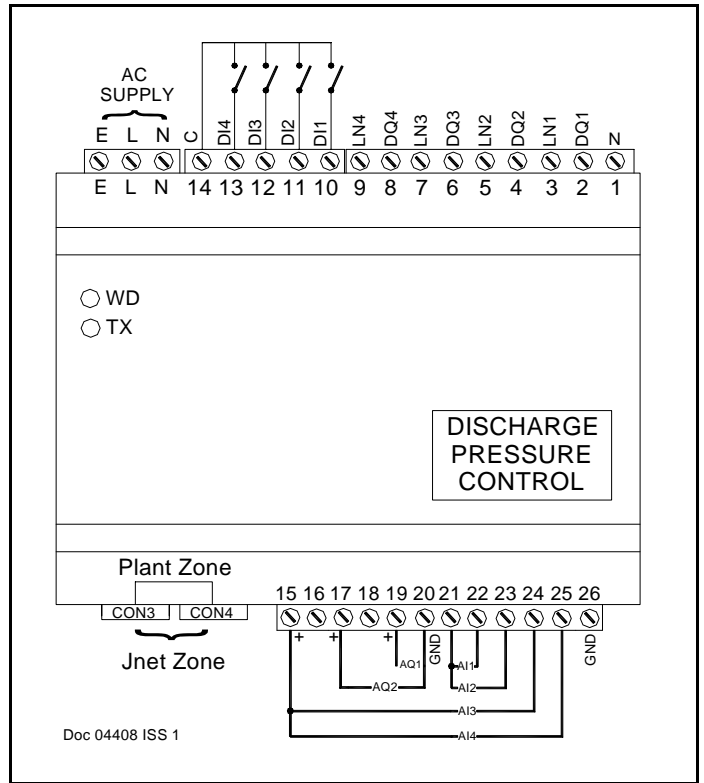
The plant inputs are electrically isolated. A volt free contact should be connected for the logical conditions stated below between the input and common **C** (14).

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 Cooler 1
2	LN LD	5 4	Suppressed	Multifunction output
3	LN LD	7 6	Suppressed	Run Cooler 2
4	LN LD	8 9	Unsuppressed	High discharge pressure
Digital Inputs				
1		14 10	Volt Free	Cooler 1 Healthy
2		14 11	Volt Free	Cooler 2 Healthy
3		14 12	Volt Free	Plant Healthy
4		14 13	Volt Free	Auto
Analogue OUTPUT				
1	+ -	19 20	0-10 V	Gas Cooler 1 fan speed
2	+ -	17 20	0-10 V	Gas Cooler 2 fan speed
Analogue INPUT				
1		21 22	5k Thermistor	Cooler 1 Discharge Temperature
2		21 23	5k Thermistor	Cooler 2 Discharge Temperature
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 3 set 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. 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. 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.

**COOLER 1 Pressure Display**

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

The HP140 controller drives the JTL LCD14 display using a CAB75 cable. Various cable lengths are available.

**Control Strategies**

There are three choices of control strategies selected on item 386.

- a) Discharge pressure
- b) Liquid pressure
- c) Discharge superheat

**Multifunction Output**

Relay 2 can be programmed to operate in three ways using item 166.

- a) Split circuit
- b) General alarm relay
- c) Low pressure control

**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.

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.

**Low Pressure Control**

There is a low pressure control output which is used for associated heat exchange value control.

The output is energised when the discharge pressure is above the setpoint on item 59.

There is a fixed hysteresis

**Liquid Pressure Control Strategy**

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

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

**Discharge Superheat Control Strategy**

The discharge superheat is controlled against a setpoint by adjusting the fan speed as necessary

**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**

The HP140 can operate with a split circuit condenser. The split 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 time constant (item 54) to adjust the response of the control.

**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.

**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.

**COOLER 2 Control Strategies**

There are three choices of control strategy selected on item 490

- a) off
- b) Simple on/off
- c) Fan speed control

**Discharge Temperature Control Strategy**

The discharge temperature is controlled against a fixed setpoint.

**Simple on/off Control**

The discharge temperature is compared to the fixed setpoint (item 480) taking into account an adjustable deadband (item 483) which is symetrial about the setpoint. When the temperature is high the cooler is enabled.

**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 467. When this is set >0 then there is also a minimum pressure cutout setting on Item 482. When the fans reach minimum speed they stay running until the cutout level is reached.

**Control Response**

The controller uses proportional and integrated control algorithms to control the fan speed. These require speed gain (item 495) and time constant (item 494) to adjust the response of the control.

**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.

**Nighttime Operation**

Both coolers can be set to run at a reduced speed at night. Nighttime is defined on the JTL network by a timer. The appropriate timer has to be selected

ADJUSTABLE PARAMETERS				HP140
	Item	Function	Range	Units
COOLER 1 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	
	363	Floating discharge temperature differential	0 - 15	K
	386	Control pressure selection	0=Discharge 1 = Liquid	
COOLER 1 PRESSURE ALARM	55	Discharge safety level	140 - 400	psi
	59	EVD valve control pressure	300 - 500	psi
	52	High discharge pressure	140 to 300	psi
	51	Low discharge pressure	100 to 200	psi
COOLER 1 PRESSURE TRANSDUCERS	362	Low discharge pressure alarm delay	0 to 20	mins
	384	Minimum liquid pressure differential	0 to 15	psi
	122	Discharge transducer	0=Disabled 1=Enabled	
	422	Discharge transducer full scale (at 20 mA)	300 to 500	psi
COOLER 1 DISCHARGE SUPERHEAT	426	Discharge transducer zero scale (at 4mA)	-15 to 0	psi
	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
	144	Discharge superheat setpoint	2-10	K
COOLER 1 FAN SPEED CONTROL	131	Discharge temperature sensor	0-Disabled, 1-Enabled	K
	145	Maximum superheat	0-15 (0-disable)	K
	54	Time constant	0 - 250	
	395	Gain	0 - 100	
	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	%
COOLER 2 TEMPERATURE CONTROL	351	Analogue control cut out pressure	0 - 500	psi
	166	Relay 2 function	0=Split circuit 1=General alarm	
	480	Discharge temperature setpoint	100 to 250	
	490	Control Strategy	0=off 1=on/off 2=Analogue speed control	
COOLER 2 TEMPERATURE	483	Temperature deadband	1 - 10	K
	132	Discharge temperature sensor	0-Disabled 1-Enable	
COOLER 2 FAN SPEED CONTROL	494	Time constant	0 - 250	
	495	Gain	0 - 100	
	468	Maximum speed at night	50 - 100	%
	469	Timer for nighttime operation	0=Disabled	
	497	No of steps in backup	0 - 100	
	467	Minimum fan speed	0 - 25	%
	482	Analogue control cut out temperature	30 - 50	°C
DISPLAY	179	Display units	1 - psi, 2 - bar, 3- kPa	
	178	Display Units (Temperature)	0-Celcius, 1-Fahrenheit	
	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 COOLER 1			
Item	Function	Item	Function
22	PRESSURE Discharge pressure	391	SPEED CONTROL Fan speed
23	Liquid pressure	392	Forced speed
383	Liquid pressure differential	31	SPEED CONTROL Discharge temperature Discharge superheat
148	Average discharge pressure (1hr)		
149	Average liquid pressure (1hr)		
370	CONTROL Optimised setpoint		
364	Minimum discharge temperature		
365	Condenser operating temperature		
899	Outside temperature		

OTHER USEFUL ITEMS COOLER 2	
Item	Function
32	TEMPERATURE Discharge temperature
491	SPEED CONTROL Fan speed
492	Forced speed

**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. 4196

Firmware Variations  
Doc No. 04197

Connections Diagram  
Doc No. 04190

Installation Requirements  
Doc No. 4257

**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.