

**Electrical installation requirements**

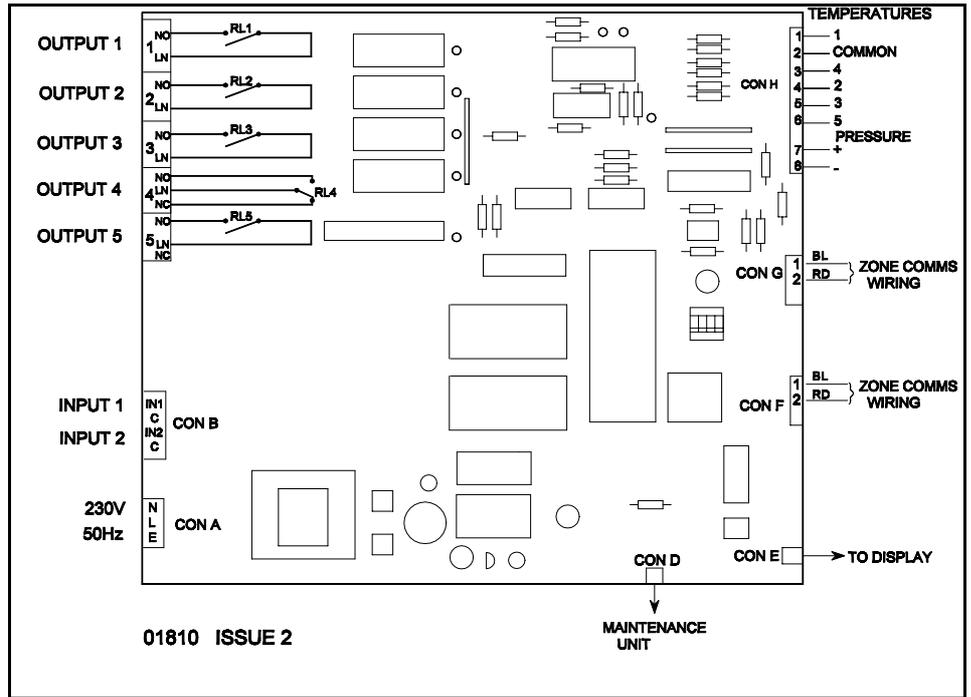
Care should be taken to separate the power and signal cables to prevent electrical interference and possible damage due to inadvertent connection.

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 **NO** or **NC**.

The plant inputs are electrically isolated. A line voltage should be connected for the logical conditions **lighting override** and **defrost on**. The terminals marked **C** should be connected to the supply voltage neutral.

**CE Conformance**

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



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**Inputs**

Input (Connector B)			
IN1 C	INPUT 1	(LINE) (NEUTRAL)	DEFROST ON
IN2 C	INPUT 2	(LINE) (NEUTRAL)	LIGHTING OVERRIDE
Temperatures and Pressure (Connector H)			
1	TEMP 1		AIR ON
2	COMMON		
3	TEMP 4		SUCTION LINE
4	TEMP 2		AIR OFF
5	TEMP 3		EVAPORATOR
6	TEMP 5		TERMINATION
7	PRESSURE +		SUCTION LINE
8	PRESSURE -		

**Outputs**

Outputs (Connector C)			
1 NO 1 LN	OUTPUT 1	(N/O LOAD) (LINE)	LIGHTING & BLINDS CONTACTOR
2 NO 2 LN	OUTPUT 2	(N/O LOAD) (LINE)	FANS / HEATERS
3 NO 3 LN	OUTPUT 3	(N/O LOAD) (LINE)	LIQUID SOLENOID VALVE
4 NO 4 LN 4 NC	OUTPUT 4	(N/O LOAD) (LINE) (N/C LOAD)	DEFROST
5 NO 5 LN	OUTPUT 5	(N/O LOAD) (LINE)	PULSED EXPANSION VALVE
5 NC	NOT USED		

**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 30 to -20.0 press:  
**ITEM** **3** **0** **ENTER** **SET** **-** **2** **0** **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 bitswitches as shown in the table overleaf and then setting item 9 to 1. 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.

**Temperature display**

The temperature displayed is computed from the air on and air off temperatures. A factor is used to proportion the air off and air on temperatures.

The LCIP controller will drive the following JTL display when used with the extension cable shown in the table.

Display	Cable
LCD3	CAB34

The cables are available in various lengths.

### Control strategy

The air off temperature is controlled to a computed setpoint shown on item 28, by controlling either a pulsed expansion valve or liquid line solenoid valve with a mechanical expansion valve. The choice is selected on item 160.

The computed air off temperature setpoint is calculated by comparing the displayed temperature with the current cabinet temperature setpoint. The computed setpoint is raised or lowered depending on whether the cabinet temperature is below or above the current cabinet temperature setpoint. The computed air off setpoint cannot go below the value set on item 31.

There is a choice of 2 cabinet temperature setpoints on items 124 and 125. The setpoint in use is selected by using pushbuttons on the cabinet display. The current setpoint is displayed on item 30. Separate instructions are available for the display pushbutton operation.

For liquid solenoid control, if the air off temperature falls below the computed setpoint the liquid valve is closed. There is a deadband of  $\pm 0.2$  C.

For pulsed expansion valve control, the valve opening is controlled primarily using a PI strategy on the air off temperature. The valve is opened and shut over a fixed period of time (normally 6.25 s) to meter the appropriate amount of refrigeration. The proportional gain and the integral time constant for the PI control are adjustable.

On PEV control, if the superheat falls below the minimum level set on item 162, the PEV is progressively shut to effect recovery from excess liquid supply. This is called override.

After override is complete, ie. superheat recovers, PI control will be resumed but with a modified (reduced) value. The modifier is shown on item 190 and the output to the PEV valve is shown on item 168.

### Defrost strategies

The defrost strategy can be initiated in 4 ways using item 107. Defrost initiation can be by real time clock, by deduction from the suction temperature, by command on the JTL communications network, or by contact input.

There is a choice of 2 methods of defrost operation, termination or control, using item 75. In termination mode the defrost output relay is energised during defrost recovery period and at any time when the termination temperature is exceeded. In control mode the defrost output relay is energised during the defrost period.

The liquid solenoid or PEV is closed during all forms of defrost. The auxiliary output can be selected for fan or heater control. During defrost the fans can be stopped or the auxiliary heater energised.

For network, real time and contact initiated defrost a pump down delay can be applied (item 61) before the defrost/output and heater are energised. During pump down the liquid outputs are deenergised.

For network initiated defrost a defrost schedule learning strategy is included. The last 24 hours defrost operation is continuously monitored and the defrost schedule is learned. If network communication fails, the learned schedule is automatically used. The unit reverts to network control whenever the network communications is operational.

The controller stays in defrost at least until the minimum defrost time, on item 145, is exceeded. If the termination temperature is reached before the minimum defrost time then the defrost heater is cycled.

The display shows "dEF "

**NOTE:** No suction initiated defrost can be detected within 3 hours of the previous defrost.

### Defrost recovery

When the termination temperature or time is reached the controller enters defrost recovery. The heater is de-energised.

The termination method can be chosen using item 144.

For network, real time and contact initiated defrost a time delay can be applied (item 49) after defrost before the liquid valve is reopened.

A drain down time delay can be applied (item 59) after defrost before the liquid valve is reopened. During drain down if the auxiliary heater output is selected it is energised.

During defrost recovery the fans can be controlled depending on the evaporator temperature. When the evaporator temperature is low enough, the fans start. There is a 5 degree deadband. The display shows "dEFr".

### Forced Refrigeration and Defrost

The maintenance unit can be used to force controller into a particular mode. This is done using items 77-79. While the maintenance unit is plugged in the controller will remain in the selected mode permanently. Once the maintenance unit is unplugged the controller will revert to normal control after 30 minutes.

When the network initiated defrost strategy is selected, forced defrost will send a command to the JTL defrost scheduler to initiate a defrost and does not act locally. **NOTE** this feature was introduced in Oct 1996 and requires the JTL defrost scheduler and JTL network controller to support this function.

### Lighting and Night Blind Control

The cabinet lights and night blinds can be sequenced on and off by command from the JTL network. An override switch input facility is provided which raises the blinds and turns the lights on.

### Energy Saving - Fan Control

If energy saving is selected using item 130, then the fans will be cycled during normal refrigeration. When the energy saving temperature, item 131, goes below the energy saving setpoint, item 132, the fans stop. There is a deadband of  $\pm 0.5$  C

### High Temperature Alarms

The cabinet and air off temperatures are monitored continually. The temperatures are averaged over the period set on item 47. If either of the average temperatures exceeds the alarm level then an alarm is given which is shown on the display and available, for remote indication, on the JTL alarm system. High temperature alarms are cancelled during defrost and defrost recovery.

### Excessive Superheat Alarms (PEV control only)

If the measured Superheat exceeds 50°C then a sensor fault is assumed and the maximum opening of the expansion valve is reduced to 50% of the maximum allowed. When the measured Superheat is between 30 and 50°C the fault condition is activated if the suction temperature exceeds the air on temperature.

### Network Shutdown

This controller supports the JTL Network shutdown facility. When this facility is enabled if a shutdown command is received over the JTL Network, the refrigeration is stopped and alarms are disabled. The high temperature alarm sequence is initialised.

### Display Controlled Shutdown

The controller can be shutdown for servicing purposes using the display pushbuttons. This feature is enabled by item 138.

ADJUSTABLE PARAMETERS				LCIP
Item	Function	Range	Units	Bitswitch settings
1	Unit number	0.1 to 899.9		4321
31	Air off temperature setpoint	-39 to +5		xxCC Frozen food
32	Overtemperature tolerance	0 to +20	°C	xxCO Ice cream
33	Cabinet temperature factor	20 to 80	°C	xxOC Chillers
36-39	Probe selections	0=off 1=on		xxOO Produce
47	Alarm averaging time	00:30 to 03:00		
48	Compressor starts/hour	unlimited /10/15/20	hr:mn	where
49	Refrigeration delay after defrost	00:00 to 00:10		C = closed
50	Defrost termination temp (air off)	0 to +20	hr:mn	O = open
51-56	Defrost schedule	00:01 - 23:59	°C	x = don't care
57	Defrost termination time	00:05 to 01:00	hr:mn	
58	Defrost initiation temp (suction)	-5 to +20	hr:mn	closed = dot visible
59	Drain down time	00:00 - 00:10	°C	
60	Defrost schedule 12/24 hour clock	0=24hr 1=12hr	hr:mn	
61	Pump down time	00:00 - 00:10		
62	Network shutdown command	0=disabled 1=enabled	hr:mn	
65	Invert defrost input	0=no 1=yes		
69	Number of defrosts expected	0 to 6		
75	Defrost control mode	0=termination 1=control		
106	Auxiliary output selection	0=off 1=Fan 2=Heater		
107	Defrost strategy	0=none 1=Suction 2=Network 3=Time 4=Contact		
108	Fan control	1=run always 2=off during defrost		
110	Lighting control selection	0=off 1=on		
118	Lighting contractor selection	0=n.o 1=n.c		
123	Enable 2nd setpoint	0=disabled 1=enabled		
124	Cabinet temperature setpoint	-30 to +10	°C	
125	Alternative setpoint	-30 to +10	°C	
130	Energy saving probe selection	0=off 1=on		
132	Fan control temperature setpoint	-30 to +8	°C	
133	Enable plant to override temp control	0=disabled 1=enabled		
134	Enable plant to cut off refrigeration	0=disabled 1=enabled		
138	Enable display controlled shutdown	0=disabled 1=enabled		
144	Defrost termination method	1=Evaporator 2= Air off 3=Termination 4=Time only		
145	Minimum defrost time	00:00 - 00:30	hr:mn	
147	Termination sensor selection	0=Off 1=On		
<b>PULSED EXPANSION VALVE FUNCTIONS</b>				
157	Refrigerant type	0 - 6 (R type shown on MU display)		
158	Pressure transducers zero offset	-7 to +7 psi		
160	Control valve	0=Liquid solenoid 1=PEV		
161	Control strategy	1=2 temperature 2=pressure		
162	Minimum superheat	0 - 10	°C	
163	Maximum valve opening	10 - 100		
164	Minimum valve opening	0 - 50		
170	PEV proportional gain	1 - 100		
171	PEV integral time constant	1 - 250		
174	High suction pressure shutdown	0=disabled 1=enabled		
175	Pressure transducer type	1=18 bar (mk1 board) 2=18 bar (mk2 board) 3=7 bar (mk2 board)		
177	Auto zero pressure enable	0=disabled 1=enabled		

OTHER USEFUL ITEMS			
Item	Function	Item	Function
20	Cabinet temperature	72	Defrost output state
21	Air on temperature	73	Liquid valve output state
22	Air off temperature	74	Auxiliary output state
23	Evaporator temperature	77	Forced defrost
24	Suction line temperature	78	Inhibit defrost
28	Effective air off setpoint	79	Forced refrigeration
30	Cabinet temperature setpoint	111	Communications lighting command
40	Duration of last defrost	112	Lighting override input state
41	Time since end of last defrost	113	Lighting output state
42	Duration of this defrost	114	Force lights on
46	Communications defrost command	115	Force lights off
63	Network shutdown command state	126	Setpoint in operation
70	Operating mode	131	Energy saving temperature
71	Defrost input state	141	Termination sensor temperature
<b>PULSED EXPANSION VALVE FUNCTIONS</b>			
155	Suction pressure	169	PEV status
156	Superheat	181	Time since last override
159	Auto zero offset	182	Duration of last override
166	Force PEV opening	190	Modifier output
168	PEV valve opening		

# OUTPUT STATE DIAGRAM FOR JTL CONTROLLER

**LCIP**

MODE OF OPERATION	OUTPUT & FUNCTION (See note 5)					
	RL2		RL3	RL4		RL5
	AUXILIARY (N/O) can be set to run always [108] See Note 2		LIQUID SOLENOID VALVE (N/O)  See Note 1	DEFROST (C/O)		ELECTRONIC EXPANSION VALVE (N/O) Solid state output See Note 1
	ITEM 106			ITEM 75		
Heater	Fans		CONTROL	TERMINATION		
<b>REFRIGERATION</b>	OFF	ON (See note 4)	CYCLES ON AIR OFF TEMPERATURE	OFF	ON ABOVE TERMINATION TEMP	CYCLES ON AIR OFF TEMPERATURE
<b>PUMP DOWN</b> Adjustable time [61]	OFF	OFF	OFF	OFF (from version 0.01.0)	OFF	OFF
<b>DEFROST</b> Time/temp terminated [57]/[50]	ON	OFF	OFF	CYCLES ON TERMINATION TEMP (from version 0.01.3)	OFF	OFF
<b>DRAIN DOWN</b> Adjustable time [59]	ON	OFF	OFF	OFF	ON	OFF
<b>LIQUID HOLD OFF</b> Adjustable time [49]	OFF	OFF	OFF	OFF	ON	OFF
<b>RECOVERY TIME</b> Time/temp terminated	OFF	CYCLES ON EVAPORATOR TEMPERATURE	CYCLES ON AIR OFF TEMPERATURE	OFF	ON	CYCLES ON AIR OFF TEMPERATURE
<b>REFRIGERATION</b>	OFF	ON (See note 4)	CYCLES ON AIR OFF TEMPERATURE	OFF	ON ABOVE TERMINATION TEMP	CYCLES ON AIR OFF TEMPERATURE
<b>PLANT FAULT</b>	OFF	OFF	OFF	OFF	ON	OFF
<b>UNIT SHUTDOWN</b>	OFF	ON	OFF	OFF	OFF	OFF
<b>FORCED DEFROST</b>	ON	ON	OFF	ON	OFF	OFF
<b>FORCED REFRIGERATION</b>	OFF	ON	ON	OFF	ON	CYCLES ON AIR OFF TEMPERATURE
<b>INHIBIT DEFROST</b>	OFF	ON	CYCLES ON AIR OFF TEMPERATURE	OFF	ON	CYCLES ON AIR OFF TEMPERATURE

NOTE 1: EITHER RL3 OR RL5 IS OPERATED DEPENDING ON SETTING [160]

NOTE 2: CAN BE SET TO OFF USING ITEM 106

NOTE 3: [NN] REPRESENTS ITEM NN ON THE JTL MAINTENANCE UNIT

NOTE 4: CAN CYCLE ON ENERGY SAVING TEMPERATURE (SELECTED BY ITEM 130)

NOTE 5: RL1 IS FOR LIGHTING CONTROL

## Supply Requirements

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

**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 your supplier or JTL Systems.



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

## Applicable Documentation

Item Numbers

Doc No. 01485

Software Variations

Doc No. 01486

Wiring Diagrams

Doc No. 01657, 01770

Evaporator Manual

Doc No. 01923

Installation Requirements

Doc No. 01662

Outline Details

Doc No. n/a