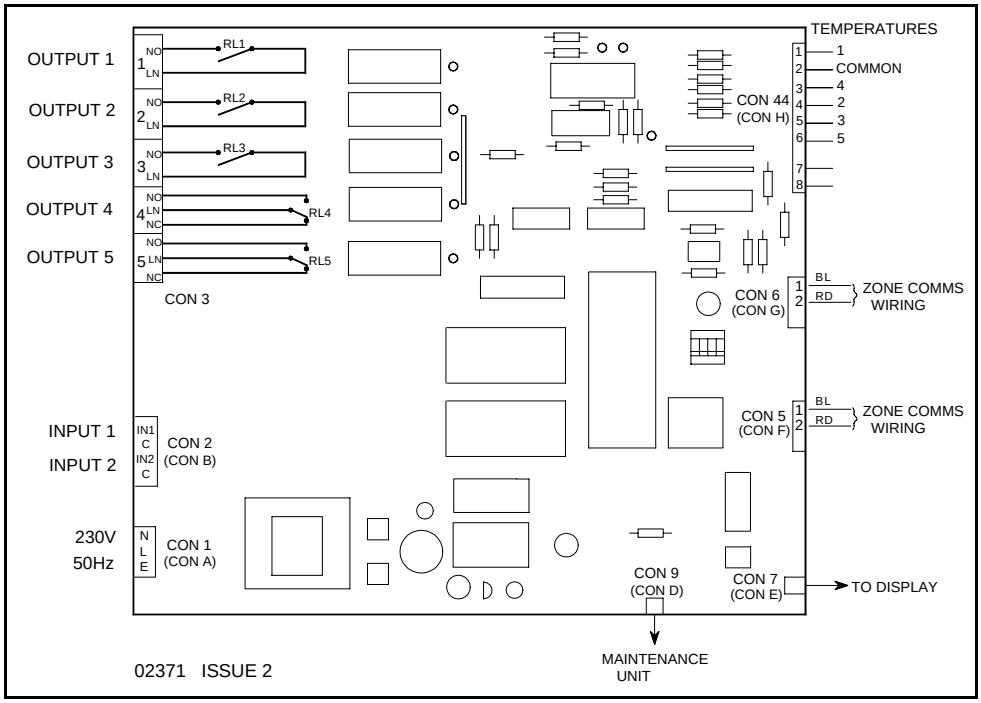
Electrical Installation Requirements
Care should be taken to separate the power and signal cables to prevent electrical interference and possible damage due to inadvertent connection.

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 loads to **NO** or **NC**.

The plant inputs are electrically isolated. A line voltage should be connected for the logical conditions **door closed, defrost on** or **plant alarm.** 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.



Inputs

Input (Connector B)			
IN1 C	INPUT 1	(LINE) (NEUTRAL)	DOOR CLOSED
IN2 C	INPUT 2	(LINE) (NEUTRAL)	DEFROST ON OR PLANT ALARM OR SHUTDOWN

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		
8		

Outputs

Outputs (Connector C)			
1 NO 1 LN	OUTPUT 1	(N/O LOAD) (LINE)	PAN HEATER or SUCTION VALVE
2 NO 2 LN	OUTPUT 2	(N/O LOAD) (LINE)	FANS
3 NO 3 LN	OUTPUT 3	(N/O LOAD) (LINE)	LIQUID SOLENOID VALVE 1
4 NO 4 LN 4 NC	OUTPUT 4	(N/O LOAD) (LINE) (N/C LOAD)	DEFROST
5 NO 5 LN 5 NC	OUTPUT 5	(N/O LOAD) (LINE) (N/C LOAD)	LIQUID SOLENOID VALVE 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 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 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.

Temperature display
The temperature display shows the air on temperatures. The temperature can be displayed in Celsius or Fahrenheit as selected on item 122.

The LC2C controller will drive the following JTL LED displays when used with the extension cables shown in the table.

Display	Cable
LED1	CAB40
LED5	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 1 or 2 liquid line solenoid valves with mechanical expansion valves.

The computed air off temperature setpoint is calculated by comparing the air on temperature with the air on temperature setpoint. The computed setpoint is raised or lowered depending on whether the air on temperature is below or above the temperature setpoint. The computed air off setpoint cannot go more than 4°C below the air on setpoint.

If the air off temperature falls below the computed setpoint the 1st liquid valve is closed. There is an adjustable deadband (item 140) controlled at a temperature above the 1st setpoint using an offset (item 136). The second valve also uses the deadband. Setting the offset to 0 disables the 2nd valve.

Defrost Initiation Strategies
The defrost strategy can be initiated in 4 fundamental 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.

Network initiated defrost can be divided into 2 groups; coordinated and scheduled.

Coordinated timed defrost requires a timed defrost or defrost coordinator to be present in the network. When coordinated timed request is selected then the controller requests a defrost as defined by the number of defrosts a day as set on item 69. The defrost coordinator coordinates the defrost as required. The backup strategy can be chosen to fall to learned defrost schedule or real time backup.

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

Backup Defrost Initiation Strategies
For network initiated defrost, 2 defrost backup strategies are included. The strategy choice is made on item 107.

For learned backup the last 24 hours defrost operation is continuously monitored and the defrost schedule is learned. For real time backup the defrost schedule as set up for real time defrost on items 51-56 is used.

If network communication fails, the selected backup strategy is automatically used. The unit reverts to network control whenever the network communications is operational.

The backup strategy is also invoked if the network signals that communications has failed to the defrost scheduler or if there is a fault at the defrost scheduler.

Defrost
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 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.

The display shows "dEF "

Defrost Termination
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.

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.

The display shows "Def".

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.

Fan Control
The fans can be controlled in various ways.

If item 108 is set to "fans off during defrost" then during defrost recovery the fans can be controlled depending on the evaporator temperature or time delay after defrost. If item 109 is set to 00:00 when the evaporator temperature is low enough, the fans start. There is a 5 degree deadband. If item 109 is set to a time then the fans are held off until the time delay has occurred.

High Temperature Alarm
The coldroom temperature is monitored continually. The temperature is averaged over the period set on item 47. If the average temperature 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 can be cancelled during defrost and defrost recovery by setting item 127.

The temperature tolerance is set on item 32. Setting the tolerance to 0.0°C disables the alarm.

Inputs
Input 2 function can be selected using item 138. The selection allows for Plant alarm or Shutdown control. The input status is shown on item 139. NOTE when item 107 is set to 4 (contact initiated defrost), this input is assigned as a defrost input.

Network Shutdown and Fans Only Mode
This controller supports the JTL Network shutdown and fans only facilities. When these facilities are enabled by item 62. If a shutdown or fans only command is received over the JTL Network, the refrigeration is stopped and alarms are disabled. The high temperature alarm sequence is initialised.

Coldstore Door Functions
When the coldstore door is opened, refrigeration is stopped by shutting the liquid solenoid valve and stopping the evaporator fans. If the door remains open for a time longer than the value set on item 64 then refrigeration is restarted. If the door remains open for a time longer than set on item 33 then an alarm is given. The door open alarm can be set to be critical using item 126.

Coldroom Isolation
The controller can be isolated for standby operations using item 67. When isolated, all output relays are de-energised and the alarms disabled.

Switch Controlled Shutdown
The controller can be shutdown for servicing purposes using an external switch. This feature is enabled by item 138.

Plant Alarm
A general purpose alarm input is available for alarm indication on the JTL network. The input can be configured as normally open or closed on item 66. This function is enabled using item 138.

Suction Pressure Optimisation
When used in conjunction with JTL pack control and suction optimisers this unit is normally included in the suction pressure optimiser algorithm. It can be explicitly excluded by setting item 200 to 1.

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				LC2C
	Item	Function	Range	Units
TEMPS & ALARMS	36-39	Sensor selections	0=off 1=on	
	147	Termination sensor selection	0=off 1=on	
	32	Overtemperature tolerance	0 to +20	°C
	47	Alarm averaging time	00:30 to 03:00	hr:mn
CONTROL	30	Temperature setpoint	-30 to +25	°C
	136	Differential for 2nd liquid solenoid output	0 - 5	
	140	Deadband	0.4 - 3.0	°C
	48	Compressor starts/hour	unlimited /10/15/20	
	75	Defrost control mode	0=termination 1=control	
	76	Auxiliary output selection	0=Auxiliary heater 1=Suction valve	
	67	Isolate coldroom	0=normal 1=isolated	
DEFROST INITIATION	107	Defrost strategy	0=none 1=Suction 2=Network (learned backup)3=Time 4=Contact 7=Network (real time backup) 8=Coordinated (learned) 9=Coordinated (real time)	
	69	Number of defrosts expected or required	0 to 6	
	61	Pump down time	00:00 - 00:10	hr:mn
	51-56	Defrost schedule	00:01 - 23:59	hr:mn
	60	Defrost schedule 12/24 hour clock	0=24hr 1=12hr	
	58	Defrost initiation temp (suction)	-5 to +30	°C
	65	Invert defrost input	0=no 1=yes	
	211	Evaporator group	0=none 1=Lt 2=Ht 3=Satellite	
	213	Defrost heater circuit	0=none 1-7=circuit	
	214	Defrost method	0=red phase 1=yellow phase 2=blue phase 3=3 phase 4=2 pipe gas 5=3 pipe gas 6=off cycle	
	223	Defrost requirement priority	1 to 8	hours
DEFROST TERMINATION	144	Defrost termination method	1=Evaporator 2= Air off 3=Termination 4=Time only	
	50	Defrost termination temp	0 to +20	°C
	145	Minimum defrost time	00:00 - 00:30	hr:mn
	57	Defrost termination time	00:05 to 00:59	hr:mn
	59	Drain down time	00:00 to 00:10	hr:mn
	49	Refrigeration delay after defrost	00:00 to 00:10	hr:mn
FAN CONTROL	108	Fan control	1=run always 2=off during defrost	
	146	Temperature to turn fans off during defrost	-12 to +20	hr:mn
	109	Fan delay after defrost	00:00 - 00:10	
DOOR FUNCTIONS	128	Select door functions	0=off 1=on	
	126	Door alarms critical	0=not critical 1=critical	
	33	Door open alarm delay	00:00 to 00:30	hr:mn
	64	Door open refrigeration delay	00:00 to 00:30	hr:mn
Jnet FUNCTIONS	1	Unit number	0.1 - 899.8	
	62	Jnet network shutdown selection	0=disabled 1=enabled	
	133	Enable plant to override temp control	0=off 1=on	
	134	Enable plant to cut off refrigeration	0=disabled 1=enabled	
	200	Exclude from suction optimisation	0=include 1=exclude	
	18	Daylight saving operation	0=standard time 1=daylight saving time	
DISPLAY	122	Temperature display choice	0=celsius 1=fahrenheit	
INPUTS	138	Input 2 function NOTE defrost when 107 set to 4	0=Unused 1=Shutdown 2=Plant alarm	
	66	Input plant alarm input	0=Alarm when input present 1=Alarm when input absent	

OTHER USEFUL ITEMS

Item	Function	Item	Function	Item	Function
	TEMPERATURES		**DEFROST**		**Jnet NETWORK FUNCTIONS**
20	Coldroom temperature	40	Duration of last defrost	63	Network shutdown and fans only command states
21	Air on temperature	41	Time since end of last defrost		
22	Air off temperature	42	Duration of this defrost	203	Associated plant suction line
23	Evaporator temperature	46	Communications defrost command		**MODE INPUTS & OUTPUTS**
24	Suction line temperature	77	Forced defrost	70	Operating mode
141	Termination sensor temperature	78	Inhibit defrost	71	Defrost input state
	CONTROL	79	Forced refrigeration	72	Defrost output state
28	Effective air off setpoint	261-272	Learned defrost schedule	73	Liquid valve output state
240	Liquid valve open %	219	Defrost arrangement from network	137	Liquid valve 2 output state
241	Average liquid valve open %	221	Forced defrost requirement	74	Auxiliary output state
		222	Enable forced defrost requirement	139	Input 2 state
					DOOR FUNCTIONS
				34	Time door presently open
				35	Time door has been open in last 24 hours

OUTPUT STATE DIAGRAM FOR JTL CONTROLLER — LCCU

MODE OF OPERATION		OUTPUT & FUNCTION				
		RL1	RL2	RL3	RL4	
		PAN HEATER or SUCTION VALVE (N/O)	FANS (N/O) can be set to run always [108]	LIQUID SOLENOID VALVE (N/O)	DEFROST (C/O)	
					ITEM 75 CONTROL	ITEM 75 TERMINATION
NORMAL REFRIGERATION CYCLE	**REFRIGERATION**	OFF	ON (See note 2)	CYCLES ON AIR OFF TEMPERATURE (See note 2)	OFF	ON ABOVE TERMINATION TEMP
	PUMP DOWN Adjustable time [61]	OFF	OFF	OFF	OFF (from version 0.00.7)	OFF
	DEFROST Time/temp terminated [57]/[50]	ON	OFF	OFF	CYCLES ON TERMINATION TEMP (from version 0.00.8)	OFF
	DRAIN DOWN Adjustable time [59]	ON	OFF	OFF	OFF	ON
	LIQUID HOLD OFF Adjustable time [49]	OFF	OFF	OFF	OFF	ON
	RECOVERY TIME Time/temp terminated	OFF	CYCLES ON EVAPORATOR TEMPERATURE	CYCLES ON AIR OFF TEMPERATURE	OFF	ON
	REFRIGERATION	OFF	ON	CYCLES ON AIR OFF TEMPERATURE	OFF	ON ABOVE TERMINATION TEMP
PLANT FAULT		OFF	OFF	OFF	OFF	ON
ISOLATED		OFF	OFF	OFF	OFF	OFF
UNIT SHUTDOWN		OFF	OFF	OFF	OFF	OFF
FORCED DEFROST		ON	OFF	OFF	ON	OFF
FORCED REFRIGERATION		OFF	ON	ON	OFF	ON
INHIBIT DEFROST		OFF	ON	CYCLES ON AIR OFF TEMPERATURE	OFF	ON

NOTE 1: SOLENOID VALVE 2 OPERATES ON A DIFFERENTIAL TO SOLENOID 1 (ITEM 136)
NOTE 2: REFRIGERATION AND FANS CAN BE TURNED OFF WHEN DOOR OPENS (ITEM 64)
NOTE 3: [NN] REPRESENTS ITEM NN ON THE JTL MAINTENANCE UNIT

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

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

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.

Applicable Documentation

Item Numbers	Wiring Diagrams	Installation Requirements
Doc No. 01886	Doc No. 00867	Doc No. 01662
Software Variations Doc No. 01887	Evaporator Manual Doc No. 01923	Outline Details Doc No. n/a

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