

**JTL SYSTEMS LIMITED**  
**COMPRESSOR PACK**  
**INSTALLATION MANUAL**  
**(FOR ALL CONTROLLER TYPES)**



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## 1. INSTALLATION PRACTICE

### 1.1 CABLE INSTALLATION REQUIREMENTS

When installing JTL Systems controllers into equipment it is essential that the following requirements are observed:

#### 1.1.1 Cable Segregation

All JTL controllers are fitted with plugs and sockets for all connections so that units may be unplugged for servicing.

Connections are divided in to two groups:

- (i) Power/Control
- (ii) Signal

It is essential that the cable connections to these groups be segregated. For full information about which connection is which see the relevant wiring diagram which, if is not supplied with the controller, may be obtained from JTL Systems or your supplier.

As a guide the following applies:

Circular DIN Audio connectors are always signal.

2 part Klippon connectors are generally power connections but not always. Exceptions to this rule are the voltage free inputs to coldstore and cabinet controllers and monitors in the product ranges RC and EC.

#### 1.1.2 Signal Cables

Low voltage signals should be run in multicore cable to minimise EMC problems and to avoid any confusion with power cables during installation or subsequently.

Signal cables should have a minimum insulation voltage of 250 V ac.

Signal cables must have a minimum cross section of 0.2 mm and be flexible with a minimum of 7 strands.

Telephone cable is not permitted under any circumstances.

Flexible cables connected to JTL screw connectors and other connectors connected to JTL equipment within the enclosure should be bootlace ferruled with the correct ferrule using an appropriate crimp tool.

Signal cables should be identified if possible.

JTL manufacture cables for all DIN connectors in various lengths to the above standards.

Signal cables are separated in to 2 groups, common ground and RS485 communication cables.

Common ground cables must obey the above rules totally.

RS485 communication cables are more tolerant of problems so some relaxation may be allowed.

No signal cable should be run in trunking with power cables.

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### 1.1.3 Power and Control Cables

All JTL controllers which drive electrical equipment have specified ratings. For full details see appropriate manuals.

Generally however the following rules apply:

Max	ac	voltage	230 V
	dc	voltage	50 V
Max	ac/dc	current	1 A continuous resistive

All ac outputs are suppressed internally on the controller. This is done by the use of a resistor/capacitor network connected from the LOAD to the neutral. It is ESSENTIAL that the relays are wired correctly and all relay terminals are marked:

LN	for	line
LD	for	load
C	for	line (common)
NO	for	load (normally open)
NC	for	load (normally closed)

As suppressors are internally connected to neutral it is ESSENTIAL that LINE (L) NEUTRAL (N) polarity is observed on all power connections.

If this polarity is not observed data corruption or processor mis-operation may occur.

### 1.1.4 High Voltage Testing

No JTL controllers should be connected in circuit during high voltage "flash" testing.

### 1.1.5 Cable Installation Within Enclosures

Within the enclosure separation must occur with a minimum of 150 mm between parallel runs of power and signal cables. These must not be run in common trunking.

### 1.1.6 External Cable to JTL Control Equipment (site wiring)

A minimum spacing of 350 mm must be maintained between parallel runs of power and signal cables. These must not be run in common trunking.

Where separation of 350 mm is not possible the signal cable should be screened and run in conduit or separate section steel trunking.

All external cables should be clearly identified as to destination.

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## 1.2 CABLE SPECIFICATION

### 1.2.1 Pressure Transducer Cable

The recommended cable for the purpose is a 4 core cable with overall Screen.

Equivalent to BICC type 7-2-4C to DEF STAN 61-12-4.

#### Possible Suppliers

FES      Order Code      030701X

Farnell   Order Code      140-481

RS        Order Code      367-454

**Note:** Telephone cable and other low voltage insulated cables are not permitted.

### 1.2.2 Temperature Sensor Extension Cable

The recommended cable for the purpose is a twin core cable.

Equivalent to BICC type 7-2-2A to DEF STAN 61-12 part 4.

#### Possible Suppliers

FES      Order Code      030704E

RS        Order Code      362-897

**Note:** Telephone cable and other low voltage insulated cables are not permitted.

### 1.2.3 JTL Controllers to JTL Comms Unit

The recommended cable for the purpose is a twin core cable.

Equivalent to BICC type 7-2-2A to DEF STAN 61-12 part 4.

#### Possible Suppliers

FES      Order Code      030704E

RS        Order Code      362-897

**Note:** Telephone cable and other low voltage insulated cables are not permitted.

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## **2. ELECTRICAL NOISE SUPPRESSION & EMC REQUIREMENTS**

### **2.1 PRINCIPLES**

All JTL controllers have built in suppressors to suppress electrical interference that is generated by relays, solenoids and contactors when power to such devices is removed.

The suppressor provides a path for the stored energy in the coil and thus prevents high voltages and sparks which generate the interference.

### **2.2 OUTPUTS**

The JTL pack controller comprises 2 fundamental parts, the main pack controller and the interface cards. With the exception of the liquid differential pressure valve, all power outputs are driven by the interface cards.

Where the valves are driven directly by the JTL cards the built in suppression is adequate. Problems arise where the JTL output indirectly drives the valves which are therefore unsuppressed.

Where these indirectly driven valves are controlled by equipment mounted in the same section as the JTL pack controller then extra suppression is required. This should be applied across each coil.

### **2.3 SEGREGATION**

Ideally the JTL pack controller should be in a different section to the interface cards. This requirement is satisfied by the use of the JTL enclosure for the pack controller, however, it is still recommended that the interface cards are mounted with the control equipment and not with the main controller.

### **2.4 HEAT RECLAIM AND LIQUID DIFFERENTIAL VALVES**

Specific care should be taken with the heat reclaim and liquid differential valves. If these are not directly driven by JTL control equipment they must be suppressed.

### **2.5 SUPPRESSOR TYPE**

Suppressors should be series resistor - capacitor type. JTL can provide information on procurement or supply suitable parts from stock.

### **2.6 CABLE SCREENING**

EMC guidelines indicate in some circumstances that screens of cables should be earthed at both ends to ensure EMC capability. This should only be done when the earth is guaranteed to be perfect (low inductance to all frequencies) at both ends of the screened cable. If the earth is not perfect then connection of the screen at both ends will cause severe problems.

Connections of the screen should be made to the earth terminals shown or specified on the installation documents.

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## **2.7 EARTH CONNECTION**

Earth connections must be copper or aluminium to earth. Steel plates, trunking, armouring forming part of the earth system are not acceptable.

## **2.8 SIGNAL GROUNDS**

Signals and signal grounds must be run in the same cable. Under no circumstances should the ground be run in a separate cable to the signal.

### 3. PACK COMMISSIONING

#### 3.1 INTERFACE CARD ADDRESSING

The main controller communicates with the interface cards via a 4-wire serial data bus, 2 wires are for transmit and 2 wires for receive. Each interface card has an address which is specified by switches or item numbers on the interface card. These settings must be correct position for the pack to work.

##### 3.1.1 Compressors

ALL TYPES EXCEPT CPLT & EPLx							
COMPRESSOR	LEGACY INTERFACE TYPES IF1 & IF2			PROGRAMMABLE INTERFACE IF11 & IF12			
	SW1	SW2		ITEM 30	ITEM 31	ITEM 32	ITEM 33
1	1	XC00 X = don't care c = closed o = open  SW2 May use wire links  Dot showing = closed		1	3	See note	0
2	2			2			
3	3			3			
4	4			4			
5	5			5			
6	6			6			
7	7			7			
8	8			8			
9	9			9			
10	0			0			

TYPE CPLT, EPLx							
COMPRESSOR	LEGACY INTERFACE TYPE IF1			PROGRAMMABLE INTERFACE IF11			
	SW1	SW2		ITEM 30	ITEM 31	ITEM 32	ITEM 33
1-7	1	XC00 X=don't care c=closed o=open Dot showing = closed		1	3	See note	1
8-10	2			2			

Note: For true legacy support, set item 32 to 0. For the recommended enhanced control strategy, set item 32 to 1 (see relevant product manual/interface user guide).



### 3.1.2 Condensers

ALL TYPES EXCEPT EP6x, EPLx, CP5H, CPLT, CPST							
FUNCTION	LEGACY INTERFACE IF1 (IF4)			PROGRAMMABLE INTERFACE IF11 (IF14)			
	SW1	SW2		ITEM 30	ITEM 31	ITEM 32	ITEM 33
CONDENSER	1	XOCC	Note: x = don't care c = closed o = open  SW2 May use wire links	1	4	0	X

TYPES CP5H, CPLT, CPST							
FUNCTION	LEGACY INTERFACE IF1 (IF4)			PROGRAMMABLE INTERFACE IF11 (IF14)			
	SW1	SW2		ITEM 30	ITEM 31	ITEM 32	ITEM 33
CONDENSER	0	XOCC	X = don't care c = closed o = open  SW2 May use wire links  Dot showing = closed	0	4	0	X

TYPES EP6x, EPLx				
FUNCTION	PROGRAMMABLE INTERFACE IF11 (IF14)			
	ITEM 30	ITEM 31	ITEM 32	ITEM 33
CONDENSER OUTPUTS 1 - 7	0	4	0	X
CONDENSER OUTPUTS 8 - 14*	0	5	0	X

\* Available on later firmware enhancements

Note: IF4 and IF14 are for use with variable speed condenser fan controllers.

### 3.1.3 Defrost

ALL TYPES EXCEPT EP6x, EPLx, CP5H, CPLT, CPST							
FUNCTION	LEGACY INTERFACE IF3			PROGRAMMABLE INTERFACE IF13			
	SW1	SW2		ITEM 30	ITEM 31	ITEM 32	ITEM 33
Defrost system 1-7	2	X0CC	Note: x = don't care c = closed o = open  SW2 May use wire links	2	4	0	X
Defrost system 8-14	3			3			
Defrost system 15-21	4			4			
Defrost system 22-28	5			5			
Drain down valve 1-7	6			6			
Drain down valve 8-14	7			7			
Drain down valve 15-21	8			8			
Drain down valve 22-28	9			9			

TYPES EP6U & CP5H							
FUNCTION	LEGACY INTERFACE IF3			PROGRAMMABLE INTERFACE IF13			
	SW1	SW2		ITEM 30	ITEM 31	ITEM 32	ITEM 33
Defrost system 1-7	1	X0CC	X = don't care c = closed o = open  SW2 May use wire links	1	4	0	X
Defrost system 8-14	2			2			
Defrost system 15-21	3			3			
Defrost system 22-28	4			4			
Drain down valve 1-7	1	X00C	Dot showing = closed	1			
Drain down valve 8-14	2			2			
Drain down valve 15-21	3			3			
Drain down valve 22-28	4			4			

Note: EPLT, EPLA, EP6A, CPLT and CPST do not support defrost & drain down interfaces.

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## 3.2 WATCHDOG DEFAULT SETTINGS

All interface cards have a built in watchdog which checks the communications link. If no messages are received after 90 seconds then the watchdog times out. When the power is first applied the red LED indicator on the card is on and the watchdog is healthy.

When the power to the card is on and the indicator is off the watchdog has timed out. In this mode the default switches SW1 (programmable interface) or SW3 (legacy interface) active. There is a switch on SW3 equivalent to every relay. When the switch is closed the relay is energised.

This mode can be used to check the full electrical connections to the output relays from the JTL equipment prior to the full sequence testing.

To do this set all the default switches on all interface cards, to open. Disconnect the power to the main controller and power up all the interface cards. Use the appropriate bit of default switch to operate the appropriate relay.

After commissioning these switches should be left in the appropriate position for operating the equipment in the event of a main controller failure.

### 3.3 INITIAL SETTINGS

Once the electrical tests are complete the main controller should be set up, if necessary. Care should be taken to see if the data has already been set up for this installation. If the data is sensible do not erase it and start again as this may involve a lot of unnecessary work.

Note: If the controller has been despatched direct from JTL Systems it will contain the standard default data.

To check if the data is sensible, check the following using the hand unit on items as shown:

	CPxS,CP2x,CPSA	CP3x	EP6x, CP5x, CP4x, EPLT, CPLT, CPST
No. of compressors	100	100	200
No. of fans	190	290	390
No of defrost systems	200	300	400

If the items are in agreement with the actual equipment, it is reasonably safe to assume that the data has already been set up sensibly.

If it has not been, set up the bitswitches on the main controller as follows:

PACK TYPE	SWITCH POSITION	FUNCTION	x = don't care c = closed (dot showing) o = open
CPCS, CPRS, CPSA	XXXC	LT pack	
	XXXO	HT pack	
CPLS	XCCC	LT pack gas	
	XXCO	HT pack gas	
	XXOC	LT pack electric	
	XXOO	HT pack electric	
	XOCC	LT pack migros	
All other controllers	xxxx	all types	

Perform an initiation sequence with the maintenance unit, as follows:



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### 3.4 DISPLAY TEST

Check the JTL displays are functioning sensibly. If there is "garbage" on displays check the display type on the maintenance unit.

When there is a display splitter for up to 4 displays or a 4 way display panel then the display type selected should be LED2. If there is a display splitter for only 2 displays then the display type is LED1. The display type is selected using the maintenance unit by setting the following items:

PACK TYPE	ITEM	FUNCTION
CPxS,CP2x, CP3x, CPSA	39	0 = LED1 1 = LED2
CP4x, CP5x, EP6U	139	
CPLT, CPST, EPLx, EP6A	-	LED2 ONLY

Once the display is selected correctly, it can be tested by setting item 99 to 1.

### 3.5 PRESSURE TRANSDUCERS TEST

There are four types of pressure transducer associated with the JTL equipment:

PT1-G (PT1)	0 - 100	psi	gauge
PT2-G (PT2)	0 - 200	psi	gauge
PT3-G (PT3)	0 - 300	psi	gauge
PT1A-G (PT1A)	-15 - + 85	psi	gauge

The discharge pressure is always a PT3-G (PT3)

The HT suction pressure is always a PT1-G (PT1)

The LT and satellite suction pressures can use either PT1-G (PT1) or PT1A-G (PT1A).

The LT and satellite suction pressure transducers can thus be selected by the maintenance unit item numbers.

PACK TYPE	LT	SATELLITE	FUNCTION
CPxS, CP3x, CPSA	26	29	0 = PT1-G 1 = PT1A-G
CP4x, CP5x, EP6x, CPST, CPLT, EPLx	126	129	

Connect the transducers or transducer simulators one at a time to the pack wiring. The correct pressures should be indicated on the displays.

The supply voltage of  $8 \pm 0.2$  Vdc should be checked from the "+" to the "-". The output from the transducer should be checked to the "-".

TYPE	ATMOSPHERIC PRESSURE	FULL SCALE	FULL SCALE PRESSURE	V/psi
PT1A-G	1.75 V	6 V	85 psi	20
PT1-G	1 V	6 V	100 psi	20
PT2-G	1 V	6 V	200 psi	40
PT3-G	1 V	6 V	300 psi	60

### 3.6 TEMPERATURE SENSORS

The 7 temperature sensor readings are indicated on items 31-37 respectively.

Unused sensors can be de-selected.

PACK TYPE	ITEM	FUNCTION
CPxS, CP2x, CP3x	103-109	0 = Disable 1 = Enable
CPSA (4 only)	103-106	
All other types	131-137	

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### 3.7 AUTO INPUT

To enable full operation of the pack the auto input must be enabled. A contact closure must be made on I/P1 of the main controller. This may be a simple wire link as auto/manual changover is not often fitted.

PACK TYPE	ITEM	DISPLAY
CPxS, CP2x, CPSA, CP3x	71	"OFF" = Manual "AUTO" = Auto
All other types	171	

It should display auto when the input is closed.

### 3.8 LOW LIQUID OR REFRIGERANT LEAK INPUT

Check the input on IP2 of the main controller. A closed input is OK. An open input is an alarm condition after 30 minute time delay.

PACK TYPE	ITEM	DISPLAY
CPxS, CP2x, CPSA, CP3x,	72	CLr = No alarm Lo.Li = Open input
All other types	172	
	173	CLr = No alarm reF.L = Open input

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### 3.9 PACK COMMUNICATIONS

All interface boards communicate with the main JTL controller. If the main controller was initialised above using the Item 9 function then program in the number of compressors, fans and defrost systems as listed in that section.

On some pack types defrost stub and drain down interfaces can be de-selected using the following item numbers:

PACK TYPE	ITEM	DISPLAY
CPSA	209	"On" Defrost Interface fitted
CP4x, CP5x, EP6x	409	"Off" Defrost Interface not fitted
CPSA	208	"On" Drain Down Interface fitted
CP4x, CP5x, EP6x	408	"Off" Drain Down Interface not fitted

Each of the interface cards should now be communicating with the main controller. The red LED indicators on each interface board should be on, and stay on, continuously. This indicates that each board is receiving the message. The reply communications status is indicated on the alarm status function on the maintenance unit.

INTERFACE TYPE	ITEM	DISPLAY
Defrost	95	CLR = no fault
Compressor	96	
Condenser	98 88 (CPSA only)	



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## 3.10 INSTALLATION SET-UP

### 3.10.1 Condenser

The condenser can be sequenced in 7 simple steps or a more complex sequence for up to 12 fans.

If simple steps up to 7 are required set the number of fans to the number of steps.

For 8, 10 or 12 fans with summer / winter solenoid set 8, 10 or 12 OR 9, 11 or 13.

The sequence varies depending on the value set. Output 7 is used to control the summer/winter solenoid. When half the selected fans are running the summer/winter output is energised and the fan control outputs revert to 1 or 0 fans depending on whether 8, 10, 12 or 9, 11, 13 are selected (see the CP4X manual for details).

### 3.10.2 Number of steps per compressor

The JTL controller supports up to 4 steps per compressor using 3 unloading stages.

For each compressor set the number of steps using the item no. in the table as follows:

COMPRESSOR	CPxS, CP2x	CPSA	CP3x	CP4x, CP5x, EP6x, CPLT, EPLx
1	110	110	110	210
2	120	120	120	220
3	130	130	130	230
4	140	140	140	240
5	150		150	250
6	160		160	260
7	170		170	270
8	180		180	280
9			190	290
10			200	300

Note: CPxS, CP2x, CP3x and CP4x support up to 3 steps/compressor  
CP5x and EP6x support up to 4 steps/compressor  
CPLT and EPLx support 1 step/compressor  
CPSA supports 2 steps/compressor  
CPST has an analogue (4-20mA) output per compressor

### 3.10.3 Type of Compressor

Set the type of compressor using the item no. in the table as follows:

COMPRESSOR	CP2x	CP3x	CP4x, CP5x, EP6x, CPLT, CPST, EPLx	DISPLAY
1	115	115	215	0 = Not Controlled 1 = LT Compressor 2 = HT Compressor 3 = Satellite
2	125	125	225	
3	135	135	235	
4	145	145	245	
5	155	155	255	
6	165	165	265	
7	175	175	275	
8	185	185	285	
9		195	295	
10		205	305	

### 3.10.4 Defrost System Set Up

No further set up is required for setting

## 3.11 ELECTRICAL TESTING WITHOUT LOAD

Before electrical testing check:

- a) All commons to interface card fault inputs are definitely connected to neutral
- b) All line and load outputs from interface and main controller cards have correct polarity. LN or LINE must be to the ac supply side and LD or LOAD must be connected directly or indirectly to the output load.

Remove all necessary output fuses or isolate any necessary circuit breakers. Arrange to defeat any electrical fault circuits, pressure switches, etc. that may not allow the equipment the equipment to "run".

### 3.11.1 Condenser

Use the forced function to stage the condenser 1 stage at a time.

PACK TYPE	ITEM	FUNCTION
CPxS, CP2x	192	Set to 0 for Auto Set to 1-13 for forced stages
CP3x	292	
All other types	392	

Check the outputs on the electrical equipment sequence correctly. At each stage check the confirmation back to each input on condenser card.

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### 3.11.2 Compressor Type CPxS, CP2x, CP3x, CPSA

If there is an auto manual switch for each compressor then select 1 compressor at a time and turn it to auto.

Check the compressor is ready to run with the following items.

COMPRESSOR	CPSA	CPxS, CP2x	CP3x	DISPLAY
1	113	113	113	"rdy" = ready "0" = not ready
2	123	123	123	
3	133	133	133	
4	143	143	143	
5		153	153	
6		163	163	
7		173	173	
8		183	183	
9			193	
10			203	

### 3.11.3 Compressor type CP4x, CP5x, EP6x, CPLT, CPST, EPLx

Use the forced number of stages item 102 to sequence up stages on that compressor 1 at a time.

Check the outputs sequence correctly and repeat for each compressor.

Select auto on any auto manual switch for all compressors.

Check the compressors are ready to run.

COMPRESSOR	ITEM	DISPLAY
1	213	"rdy" = ready to run "0" = Off
2	223	
3	233	
4	243	
5	253	
6	263	
7	273	
8	283	
9	293	
10	303	

Use the forced number of stages for each compressor to sequence the compressors.

COMPRESSOR	FORCED STAGES	FORCED OFF	DISPLAY
1	217	218	"0" = Auto "CP.En" = Enabled "C.OFF" = Disabled
2	227	228	
3	237	238	
4	247	248	
5	257	258	
6	267	268	
7	277	278	
8	287	288	
9	297	298	
10	307	308	

Check the outputs sequence correctly for each compressor.

Note: CPST has an analogue output for minimum stages set 1 and maximum set 127.

### 3.11.4 Defrost System

Check each system using the forced functions. Any systems that are on defrost, force off to refrigeration using the following items:

Note: CPST, CPLT, EP6A and EPLx only support JTL network initiated defrosting. No defrost interface cards can be used with these types.

SYSTEM	CPSA,CPxS, CP2x	CP3x	All other types	FUNCTION
1	214	314	414	0 = Normal  1 = Forced Refrigeration
2	224	324	424	
3	234	334	434	
4	244	344	444	
5	254	354	454	
6	264	364	464	
7	274	374	474	
8	284	384	484	
9	294	394	494	
10	304	404	504	
11	314	414	514	
12	324	424	524	
13	334	434	534	
14	344	444	544	
15	354	454	554	
16	364	464	564	
17	374	474	574	
18	284	484	584	
19	394	494	594	
20	404	504	604	
21		514	614	
22		524	624	
23		534	634	
24		544	644	
25		554	654	
26		564	664	
27		574	674	
28		584	684	

One system at a time force defrosts on and off 1 at a time using the following items:

SYSTEM	CP5A,CPxS, CP2x	CP3x	All other types	FUNCTION
1	213	313	413	o = Normal 1 = Forced Defrost
2	223	323	423	
3	234	333	433	
4	243	334	443	
5	253	353	453	
6	263	363	463	
7	273	373	473	
8	283	383	483	
9	293	393	493	
10	303	403	503	
11	313	413	513	
12	323	423	523	
13	333	433	533	
14	334	443	543	
15	353	453	553	
16	363	463	563	
17	373	473	573	
18	383	483	583	
19	393	493	593	
20	403	503	603	
21		513	613	
22		523	623	
23		533	633	
24		543	643	
25		553	653	
26		563	663	
27		573	673	
28		583	683	

Check all the outputs as appropriate.

### 3.11.5 Drain Down System

If drain down boards are used then on returning from forced defrost condition to normal refrigeration each drain down output should energise.