

# metacentre<sup>TM</sup>

# SX

*EnergAir*



## Index

### 1.0 Safety Precautions

- 1.1 Installation
- 1.2 Operational
- 1.3 Maintenance and Repair

### 2.0 Introduction

- 2.1 Compressor Connectivity
- 2.2 Pressure Detection and Control

### 3.0 Features and Functions

- 3.1 Pressure Control
- 3.2 Tolerance
- 3.3 Damping
- 3.4 System Volume
- 3.5 Sequence Control Strategies
- 3.6 Priority Settings
- 3.7 Prefill
- 3.8 Pressure Schedule
- 3.9 Insufficient Capacity Alarm
- 3.10 Restricted Capacity Alarm

### 4.0 Installation

- 4.1 Unit Location
- 4.2 Power Supply
- 4.3 Pressure Sensor Location
- 4.4 Pressure Sensor Connection
- 4.5 Compressor Interface PCB
- 4.6 Compressor Multi485 Interface
- 4.7 'iX' Expansion Module (option)
- 4.8 Auxiliary Input 'AI'
- 4.9 Auxiliary Output 'AO'
- 4.10 RS485 Communications

### 5.0 Commissioning

- 5.1 Physical Checks
- 5.2 Pressure Display
- 5.3 Unit Configuration
- 5.4 Optional Features and Functions

### 6.0 Menu Navigation

- 6.1 Menus
- 6.2 Menu Items
- 6.3 Diagnostics

### 7.0 Operation

- 7.1 User Interface
- 7.2 Unit Status
- 7.3 Compressor Status Indicators
- 7.4 System Alarms
- 7.5 Unit Functions
- 7.6 User Menu
- 7.7 Information Displays
- 7.8 Manual Sequence Rotation
- 7.9 Compressor Identification
- 7.10 Stop
- 7.11 Start
- 7.12 Power Failure Auto-Restart
- 7.13 Failure Mode
- 7.14 Reset
- 7.15 Compressor Fault Indications
- 7.16 Fault Codes

### 8.0 Parts List

### 9.0 Technical Data

### 10.0 Wiring Connection Diagram



**Refere to Section Indicated**



**Note**



**Important or Caution, Safety**

## 1. Safety Precautions

### ALWAYS EMPLOY SAFE WORKING PRACTISE AND PROCEDURES



**WARNING: Risk of Danger**



**WARNING: Risk of Electric Shock**



**WARNING: Risk of High Pressure**



**WARNING: Consult Manual**

When installing, commissioning, operating or carrying out service or maintenance on a product, personnel must use safe working practise and observe all relevant local health and safety requirements and regulations. Attention of users in the UK is drawn to the Health and Safety at Work Act, 1974, and to the Regulations and Recommendations of the Institution of Electrical Engineers (IEE).

Lethal voltages are used within the product. Use extreme caution when carrying out electrical checks. Isolate the power supply before starting any maintenance work.

It is not possible to anticipate every circumstance that might represent a potential hazard. If the user employs an operating procedure, an item of equipment or a method of working which is not specifically recommended the user must ensure the product will not be damaged or made unsafe and that there is no risk to persons or property. Failure to observe safety precautions or implement safe working practises may be considered dangerous practice or misuse of the product.

### 1.2 Installation

Installation work must only be carried out by a competent person under qualified supervision.

A fused isolation switch must be fitted between the main power supply and the product.

The product should be mounted in such a location as to allow operational and maintenance access without obstruction or hazard and to allow clear visibility of indicators at all times.

If raised platforms are required to provide access to the product they must not interfere with normal operation or obstruct access. Platforms and stairs should be of grid or plate construction with safety rails on all open sides.

### 1.3 Operation

The product must only be operated by competent personnel under qualified supervision.

Never remove or tamper with safety devices, guards or insulation materials fitted to the unit.

The product must only be operated at the supply voltage and frequency for which it is designed.

When mains power is switched on, lethal voltages are present in the electrical circuits and extreme caution must be exercised whenever it is necessary to carry out any work on the unit.

Do not open access panels or touch electrical components while voltage is applied unless it is necessary for measurements, tests or adjustments. This work must only be carried out by a qualified electrician or technician equipped with the correct tools and appropriate protection against electrical hazards.

All air compressors and/or other machine equipment connected too, and controlled by, the product should have a warning sign attached stating 'THIS UNIT MAY START WITHOUT WARNING' next to the display panel.

If an air compressor and/or other machine equipment connected too, and controlled by, the product is to be started remotely, attach warning signs to the machine stating 'THIS UNIT CAN BE STARTED REMOTELY' in a prominent location, one on the outside of the machine, the other inside the machine control compartment.

### 1.3 Service Maintenance and Repair

Service, maintenance, repairs or modifications must only be carried out by competent personnel under qualified supervision.

If replacement parts are required use only genuine parts from the original equipment manufacturer, or an alternative approved source.

Carry out the following operations before opening or removing any access panels or carrying out any work on the product :-

- Isolate from the main electrical power supply. Lock the isolator in the 'OFF' position and remove the fuses.
- Attach a label to the isolator switch and to the product stating 'WORK IN PROGRESS - DO NOT APPLY VOLTAGE'. Do not switch on electrical power or attempt to start the unit if such a warning label is attached.

Ensure that all instructions concerning operation and maintenance are strictly followed and that the complete product, with all accessories and safety devices, is kept in good working order.

The accuracy of sensor devices must be checked on a regular basis. They must be renewed when acceptable tolerances are exceeded. Always ensure any pressure within a compressed air system is safely vented to atmosphere before attempting to remove or install a sensor device.

The product must only be cleaned with a damp cloth, using mild detergents if necessary. Avoid the use of any substances containing corrosive acids or alkalis.

Do not paint the control facial or obscure any indications, controls, instructions or warnings.

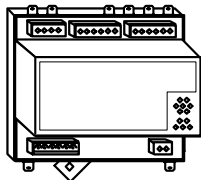
## 2. INTRODUCTION

The EnergAir Metacentre SX is a specialised supervisory and control product designed to provide energy efficient optimised pressure and sequence management of up to 12 air compressors operating on a common air system. The EnergAir Metacentre SX general operating mode can be modified by a number of adjustable parameters and priorities to enable operation to be matched to site requirements and characteristics.

### 2.1 Compressor Connectivity

Each air compressor in the system can be integrated with the SX using a number of methods:

- 1) Two wire data communications; for compressor controllers equipped with an RS485 port utilising the Multi485 protocol
- 2) One of several optional integration units designed to accommodate various types of compressor and regulation methods.
- 3) Direct connect utilising an interface module that is designed to enable connection to almost any positive displacement air compressor (regardless of make or manufacturer) that operates using a single pressure switch type control with a control voltage between 12V to 250V, 50 or 60Hz.



The direct connect interface module (i-PCB) is installed within the compressor control area and connected to the SX using a six-wire cable.

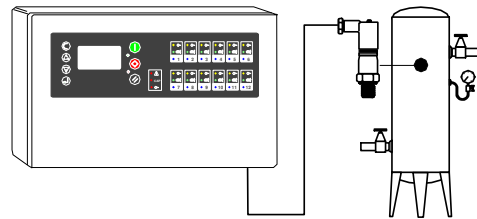
Each air compressor must be equipped with a load/unload regulation system and, if not regulated with a single electro-mechanical pressure switch, have a facility for a remote load/unload control with the ability to accept a volt free switching contact input for remote load/unload.

As default the SX is supplied with four direct connect terminals and a data communications network port enabling a further eight compressors to be integrated using remote integration modules. Further direct connect terminals (up to a maximum of 12 in total) can be added to the SX using optional local direct connect modules (iX Modules).

⚠ Consult the air compressor manual or your air compressor supplier/specialist for details before installing the SX unit.

### 2.2 Pressure Detection and Control

The EnergAir Metacentre SX utilises the signal from an electronic pressure sensor that can be mounted remotely from the Metacentre SX in a suitable location in the compressed air system.

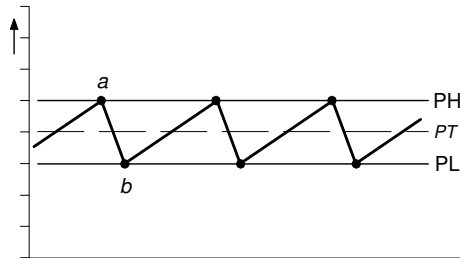


As default the EnergAir Metacentre SX is set-up for operation with a 16bar (232psi) pressure sensor but can accept input from any 4-20mA type pressure sensor with a range from 1.0bar (14.5psi) up to 600bar (8700psi).

### 3. Features and Functions

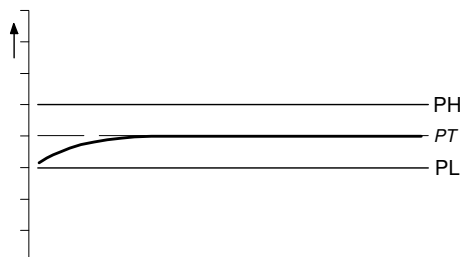
#### 3.1 Pressure Control:

The primary function of the SX's pressure control strategy is to maintain system pressure between the 'High Pressure' set point (PH - adjustable) and the 'Low Pressure' set point (PL - adjustable) in conjunction with targeting optimum achievable system energy efficiency. The SX calculates a 'Target' pressure level (PT), the mid-point between the two set points, which is used as the nominal 'target' pressure level for the system.



When system pressure increases to the High Pressure set point (a) a compressor is unloaded. Pressure is allowed to decrease to the Low Pressure set point (b) before a compressor is loaded again to add capacity output and increase pressure. This process will continue under a steady demand for air in a continuous stable cycle.

For systems that consist of a variable capacity (or variable speed) compressor, the compressor must be set, or controlled, to achieve and maintain the calculated system 'Target' pressure level (PT).

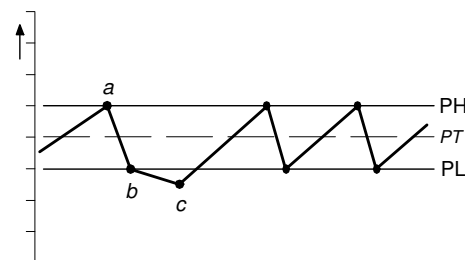


Where abrupt, or significant, changes in air demand, beyond the capacity scope of the variable capacity compressor, are experienced, the loading and unloading of other compressors is implemented in exactly the same way as described above.

If demand for air is abruptly, or significantly, increased, and the capacity output of the compressor loaded at the Low Pressure set point (b) is insufficient, the pressure will continue to decrease at a reduced rate.

The SX will accommodate for this event by loading an additional compressor.

The instance at which the additional compressor is loaded (c) is dynamically calculated and is determined by the rate of pressure decrease (the urgency or time limit) and the acceptable deviation of system pressure (the 'Tolerance') from the normal control limits.

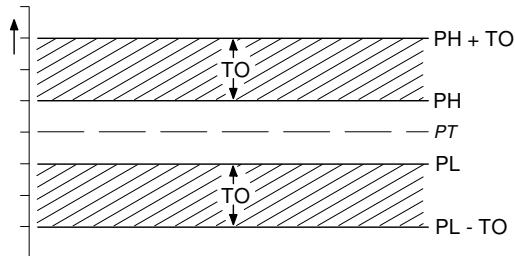


The same method is implemented in reverse (above the High Pressure set point) when an abrupt, or significant, decrease for air demand is experienced.

Rate of change of pressure, and the stability of pressure control, is largely determined by system volume and the scale, and/or abruptness, of air demand fluctuations; these characteristics will differ from installation to installation. To accommodate for variations in installation characteristics the 'Tolerance' pressure level (TO) and an influence on the dynamic reaction time (or 'Damping') of the SX (DA) is adjustable.

### 3.2 Tolerance:

Tolerance is a pressure band above and below the set pressure control levels that accommodates for an exceptional instance of abrupt and/or significant increase, or decrease, in demand without compromise to optimal energy efficient control.



Tolerance (TO) is expressed as a pressure defining the width of the tolerance 'band'.

For example; a tolerance setting of 3psi (0.2bar) means the SX will implement appropriate optimal energy efficient response(s) during a deviation of pressure 3psi below the set PL pressure level. If pressure ever deviates beyond the 'tolerance' limit the SX will proportionally increment an emergency response, abandoning optimum energy efficiency, until pressure is returned to normal levels.

If system volume is inadequate, and/or demand fluctuations are significantly large, it is advisable to increase the 'Tolerance' band to maintain optimum energy efficiency, and reduce over-reaction, during such transition periods.

If system volume is generous, rate of pressure change is slow and demand fluctuations are insignificant and gradual, the 'Tolerance' band can be reduced to improve pressure control without compromise to optimum energy efficiency.

### 3.3 Damping:

In situations where the loading of an additional compressor, at the PL pressure set point, is inadequate to match a significant and/or abrupt increase in air demand the additional reaction of the SX, while pressure deviates into the 'tolerance' limit, is dynamically calculated. The time before an additional compressor is loaded, to increase generation capacity further, will vary in accordance with the urgency of the situation.

The SX's dynamic reaction algorithm is pre-set by default to accommodate for the majority of installation characteristics.

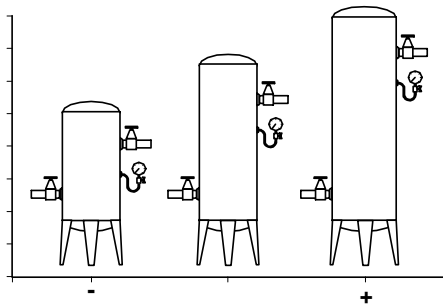
In some situations, of which the following are examples, the rate of pressure change may be aggressive and disproportionate:

- a) Inadequate system volume
- b) Excessive air treatment equipment pressure differential
- c) Inadequately sized pipe work
- d) Delayed compressor response

In such instances the SX may over-react and attempt to load an additional compressor that may not be necessary once the initial compressor is running, loaded, and able to contribute adequate additional generation capacity. If an increase in the 'tolerance' band is insufficient, the SX's dynamic reaction response can be influenced by increasing the 'Damping' factor (DA) reducing tendency to over-react.

The 'Damping' factor is adjustable and scaled from 0.1 to 10 with a default factor of 1. A factor of 0.1 equates to 10 times faster than default and a factor of 10 equates to 10 times slower than default.

### 3.4 System Volume:



Pressure control of a system is a 'feedback loop' response derived from increasing, or decreasing, air generation output capacity. If output capacity is greater than demand for air the pressure in a system will increase, if demand is greater than output capacity system pressure will decrease. The rate of change of pressure to changing generation and demand capacity situations is largely dependant on system volume. If system volume is small in comparison to recommended size the rate of change of pressure will be fast and abrupt inhibiting effective control and compromising optimum system energy efficiency. If system volume is large the rate of change of pressure will be slow and gradual. In this instance an enhanced control of pressure can be achieved, the system response times can be reduced and optimum system energy efficiency will generally be increased as a result.

The rule below provides an approximation for recommended minimum system volume:

- 1) For systems comprising of fixed capacity output (or fixed speed) compressors:

$$m^3 = (m^3/min) / (bar.g - 1)$$

⚠ *The approximation only works in metric units; convert psi and ft<sup>3</sup> to metric units first.*

1.0 m <sup>3</sup>	= 35.315 ft <sup>3</sup>
1.0 m <sup>3</sup> /min	= 35.315 cfm
1.0 bar	= 14.5 psi

Example: for a system that operates with a maximum normal demand air flow of 36m<sup>3</sup>/min at a nominal pressure of 7.0bar =

$$36m^3/min / (7.0bar - 1) = 6.0 m^3 (212 ft^3)$$

- 2) For systems consisting of variable output capacity (or variable speed) compressor(s) the system volume should be doubled.

$$m^3 = 2 \times ((m^3/min) / (bar.g - 1))$$

### 3.5 Sequence Control Strategies:

The SX provides three basic sequence control strategies or modes. Each sequence control strategy consists of two sub strategies:

- 1) The compressor 'Rotation' strategy
- 2) The compressor load 'Control' strategy

↻ The 'Rotation' strategy defines how the compressors are re-arranged, or re-ordered, in to a new sequence at each routine 'Rotation' event. Rotation events are triggered by a cyclic interval time, a set time of day each day, or a set time of day once a week.

⊙ The compressor load 'Control' strategy defines how the compressors are utilised in response to variations in system pressure.

Compressor Sequence Arrangements:

Each compressor in a system is initially assigned to the SX with a fixed and unchanging number reference, 1 to 4.

The 'duty' that a compressor is assigned in any set 'Rotation' sequence arrangement is defined by a letter, A to D.

A = the 'Duty' compressor, the first to be utilised.

B = The 'Standby' compressor, the second to be utilised.

C = The 'Second Standby' compressor, the third to be utilised.

D = The 'Third Standby' compressor, the forth to be utilised.

Compressor 'duty' assignments are reviewed, and re-arranged as appropriate in accordance with the selected rotation strategy, at each rotation event.



#### Equal Hours Run Mode

The primary function of EHR mode is to maintain a close relationship between the running hours of each compressor in the system. This provides an opportunity to service all compressors at the same time (providing the service interval times for all compressors are the same or similar).

⚠ EHR is not an energy efficient focused mode of operation.

**Rotation:**

Each time the rotation interval elapses, or the rotation time is reached, the sequence order of compressors is reviewed and re-arranged dependant on the running hours recorded for each compressor. The compressor with the least recorded running hours is assigned as the 'duty' compressor, the compressor with the greatest recorded running hours is assigned as the 'last standby' compressor. For systems with more than two compressors, the remaining compressor(s) are assigned in accordance with there recorded running hours in the same way.

**Example:** The compressors in a four-compressor system have the following recorded running hours at the 'Rotation' time.

Compressor 1 = 2200 hrs  
 Compressor 2 = 2150 hrs  
 Compressor 3 = 2020 hrs  
 Compressor 4 = 2180 hrs

The new sequence order arrangement after a rotation event would be:

Compressor 1 = D  
 Compressor 2 = B  
 Compressor 3 = A  
 Compressor 4 = C

Compressor 3, that has the least recorded running hours, will now be utilised to a greater extent in the new sequence arrangement; potentially increasing the running hours at a faster rate.

The SX continuously monitors the running status of each compressor and maintains a record of the accumulated running hours. These are available, and adjustable, in the SX's compressor running hour's menu. The SX uses these values in EHR mode. The SX's running hours record should be routinely checked, and adjusted if necessary, to ensure a close match with the actual run hours displayed on each compressor.

❗ If a compressor is operated independently from the SX the running hours record may not be accurately updated.

❗ The running hours meter display on most compressors are intended for approximate service interval indication only and may deviate in accuracy over a period of time.

**Control:**

Compressors are utilised, in response to changing demand, using a 'FILO' (First In, Last Out) strategy. The 'duty' compressor (A) is utilised first followed by (B) if demand is greater than the output capacity of (A). As demand increases (C) is utilised followed by (D) if demand increases further. As demand reduces (D) is the first compressor to be unloaded, followed by (C) and then (B) if demand continuous to reduce. The last compressor to be unloaded, if demand reduces significantly, is (A). The compressor assigned as (A) in the sequence is the first to be loaded and the last to be unloaded.

**Timer Rotation Mode**

The primary function of Timer Rotation mode is to efficiently operate a compressed air system consisting of fixed capacity output compressors. The routine rotation assignments can be modified using 'Priority' settings to accommodate for a differentially sized or variable capacity output compressor(s).

**Rotation:**

Each time the rotation interval elapses, or the rotation time is reached, a sequence rotation occurs and the sequence assignment for each compressor is re-arranged. The compressor that was assigned for duty (A) is re-assigned as last standby (D) and all other compressor assignments are incremented by one.

	A	B	C	D
	D	A	B	C
	C	D	A	B
	B	C	D	A

The sequence assignment pattern can be modified by 'Priority' settings.

**Tables; Priority Settings****Control:**

Compressors are utilised, in response to changing demand, using a 'FILO' (First In, Last Out) strategy.



The 'duty' compressor (A) is utilised first followed by (B) if demand is greater than the output capacity of (A). As demand increases (C) is utilised followed by (D) if demand increases further.

As demand reduces (D) is the first compressor to be unloaded, followed by (C) and then (B) if demand continues to reduce.

The last compressor to be unloaded, if demand reduces significantly, is (A). The compressor assigned as (A) in the sequence is the first to be loaded and the last to be unloaded.



### Energy Control Mode

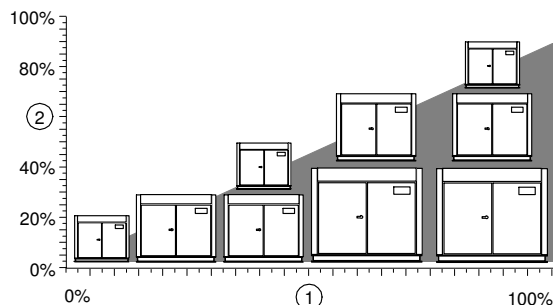
The primary function of Energy Control mode is achieving and maintaining demand matched optimum system efficiency. Energy Control mode can accommodate differential capacity, variable capacity and variable speed air compressor types in any combination or configuration.

#### Control and Rotation:

Compressor control and utilisation is dynamically automated and is not based on pre-determined rotation configurations or time intervals.

The system management unit is aware of compressor capacity relationships and variable capacity capabilities, where applicable, and is able to dynamically implement and continuously review 'best fit' configurations as demand variations occur.

The basic principle of the Energy Control strategy is the efficient utilisation of available resources matched to fluctuations in demand.



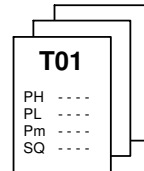
1: Demand

2: Generation

Not all potential combinations are shown.

Energy Control mode incorporates adaptive strategies and dynamic responses that continuously modify basic principles. With 'built-in' knowledge of individual compressor capabilities the management unit adapts to accommodate system characteristics under varying demand situations.

### Tables:



The SX operates in accordance with settings that are programmed in to a number of menu 'Tables'. Each table defines the operational parameters and mode of operation of the SX.

The SX can be instructed to change from one table to another at any time from an external remote source or from settings in the real time clock 'Pressure Schedule'

This functionality enables the SX to switch from one set of operational parameters, and/or from one mode of operation, to another at any time without disruption to routine control.

#### Table Parameters:

Each table consists of the following parameters; the parameters can be set differently in each table.

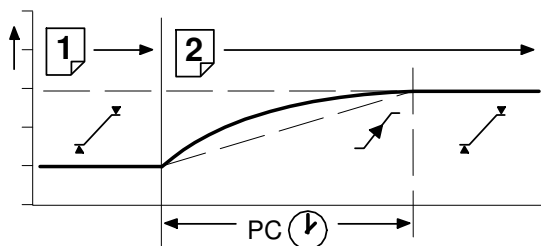
- 1) PH: High pressure set point
- 2) PL: Low pressure set point
- 3) Pm: Minimum pressure warning level
- 4) SQ: Sequence rotation mode
- 5) 01: Compressor 1 Priority setting
- 6) 02: Compressor 2 Priority setting
- 7) 03: Compressor 3 Priority setting
- 8) 04: Compressor 4 Priority setting

❗ The 'maximum' pressure fault level and the rotation interval, or rotation time, are set independently in a configuration menu and are unchanging regardless of Table selected.

#### Pressure Change Time:

When pressure set points change, a change from one 'Table' to another, the SX will increase, or decrease, the pressure target levels towards the new table settings in a gradual transition over a period of time.

This feature is intended to allow the system to react to changes in pressure target levels in a smooth and energy efficient manner without abrupt overreaction.



The time the system will take to complete the transition from one pressure target to another is determined by the 'Pressure Change' time (PC). This value can be adjusted to accommodate installation characteristics to achieve the transition at optimal energy efficiency.

If the SX is able to achieve the transition without compromising energy efficiency in a shorter time than set, the pressure change event time will be automatically reduced.

ⓘ An aggressively short time setting will compromise system optimal energy efficiency.

### Sequence Rotation:

⌚ A sequence 'Rotation' event can be automatically triggered on a routine basis using a pre-determined interval, a pre-determined time each day or a pre-determined day and time each week.

<b>S01</b>	<b>04.01</b>	<b>RP</b>
		<b>18:00</b>

Enter the rotation period menu item (RP); the 'day' setting will flash.

⌚ Select the 'day' or day function as required:

#1 = Monday to #7 = Sunday  
 #8 = each working day of the week, excluding Saturday and Sunday  
 #9 = each working day of the week.  
 #- (dash) = deactivate

Select the required hour and minutes of the day(s) using the same method.

ⓘ A day starts at 00:00hrs and ends at 23:59hrs (24hr clock system).

⌚ To define an interval time (more than one rotation event a day) select '#t' for the day function and press Enter:

<b>S01</b>	<b>04.02</b>	<b>RP</b>
	# t	12:00

An 'intervals per day' value will appear and flash. Select the required number of rotation events per day (1 to 96). The hour and minutes display will now show the interval time between each rotation event; 1 = every 24hrs to 96 = every 15 minutes (example: 2 = every 12hrs).

ⓘ The first automated rotation event each day will occur at 00:00hrs and then every set rotation interval time throughout the day.

### 3.6 Priority Settings:










📄 Priority settings can be used to modify the 'Rotation' sequence assignment. Compressors can be assigned a 'priority' of 1 to 12; where 1 is the highest priority. Any compressor can be assigned any priority and any number of compressors can have the same priority.

Example 1:

For a four-compressor system, that includes a single variable speed compressor assigned as compressor number '1', it may be desirable to ensure the variable speed compressor is continuously utilised in any sequence arrangement as the 'duty' or 'top-up' unit.

To achieve this assign compressor number 1 with a higher priority than the remaining three fixed speed compressors.










Compressor 1 (variable speed) = priority 1  
 Compressors 2 to 4 (fixed speed) = priority 2

				
	1	2	2	2
	A	B	C	D
	A	C	D	B
	A	D	B	C
	A	B	C	D

#### Example 2:

For a four-compressor system, that includes a compressor (for example compressor 4) that is less efficient, or otherwise less desirable to operate for other reasons, it may be convenient to ensure the compressor is only utilised as an emergency backup. To achieve this assign compressor number 4 with a lower priority.










Compressors 1 to 3 = priority 1  
Compressor 4 = priority 2

				
	1	1	1	2
	A	B	C	D
	B	C	A	D
	C	A	B	D
	A	B	C	D

#### Example 3:










For a four-compressor system that includes a variable speed compressor (compressor number 1) and a fixed speed compressor that is only required as an emergency backup (compressor number 4) it may be desirable to ensure the variable speed compressor is always utilised first, and the backup compressor utilised last, in any sequence arrangement.

Compressor 1 (variable speed) = priority 1  
Compressors 2 and 3 = priority 2  
Compressor 4 (back-up) = priority 3

				
	1	2	2	3
	A	B	C	D
	A	C	B	D
	A	B	C	D
	A	C	B	D

#### Example 4:

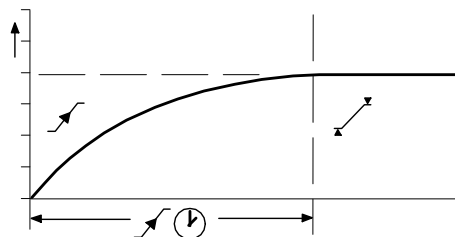
Compressors can be separated in to rotation groups. In this example compressors 1 and 2, of a four-compressor system, have been set as a high priority group and compressors 3 and 4 as a lower priority group. Compressors 1 and 2 will always be utilised first in any sequence arrangement and will be rotated at each 'Rotation' event. Compressors 3 and 4 will always be utilised as lower priority in any sequence arrangement and will be rotated at each 'Rotation' event.

				
	1	1	2	2
	A	B	C	D
	B	A	D	C
	A	B	C	D
	B	A	D	C

### 3.7 Prefill:



The Prefill feature provides a controlled and energy efficient method of increasing pressure to normal operating levels at system start. This feature avoids the inefficient potential for all available system compressors to start and load before pressure reaches the normal operating level.





At system start (manual start or automated start from standby) the SX will only load compressors that have been pre-determined for prefill operation, for a pre-set period of time. The prefill time (PT) can be adjusted to suit system characteristics. The aim is to increase pressure to normal operational levels, using only the pre-determined compressors, prior to the prefill time expiring.

If normal operational pressure is reached prior to the set prefill time, the prefill function will automatically cease and normal operational control begin. If normal operational pressure is not reached by the end of the prefill time the SX will utilise as many available compressors as required to achieve normal operational pressure as quickly as possible. Normal operational control will then begin.

Three prefill modes are available. 'Backup' and 'Standard' modes require compressor pre-selection and function in the same way; differing only in response to a failure, or loss, of a prefill compressor. Automatic mode requires no compressor pre-selection.


✓ Backup Mode: Compressor(s) can be pre-selected as 'Primary Prefill' compressor(s) or 'Backup Prefill' compressor(s). If a primary prefill compressor experiences a shutdown, or is stopped, a pre-defined backup compressor replaces it and prefill continues.

✓  Standard Mode: If one or more of the pre-defined prefill compressors experiences a shutdown, or is stopped, the prefill function is cancelled and normal operation begins.







✓  Automatic Mode: No Prefill compressor selection is necessary; any selection set is ignored. The management unit automatically selects compressor(s) dynamically to achieve pressure in accordance with the set Prefill time. If a compressor is stopped, or shuts down, it is automatically substituted with an alternative compressor.

❗ To manually skip Prefill mode, press and hold Start for several seconds.

### 3.8 Pressure Schedule:

 The SX is equipped with a real time clock feature and pressure schedule facility. The 'Pressure Schedule' function can be used to provide automation of the system.

The pressure schedule consists of 28 individual settings that instruct the system to change from one 'Table' to another, or put the system in to 'Standby' mode, dependant on time of day and day of the week. The pressure schedule will cycle from 00:00 hours Monday (day #1) to 23:59 hours on Sunday (day #7) each calendar week.

<b>P01</b>	<b>01.0#</b>	<b>01</b>
	 -	 - -
	 -	 - -
0# =	01	02      04      03

#### 01) Day of the Week

#1 = Monday to #7 = Sunday

#8 = every working day of the week;

Monday to Friday, excluding Saturday and Sunday.

#9 = every working day of the week.

❗ Select "-" (dash) and enter to delete a setting from the schedule.

02) Hours; time of day (24hr format)

03) Minutes; time of day

04) The required table, T01 to T04, or

"-X-" = Standby (unload all compressors).

Adjust the 'day of the week' sub-setting first and then press Enter to increment to the next setting. Repeat until all item sub-settings are entered. The complete 'Pressure Schedule' item will not be set in SX memory until the last sub-setting is entered. Press Escape to step back one sub-item if required.

### 3.9 Insufficient Capacity Alarm



The Metacentre is equipped with a dedicated 'Insufficient Capacity' Advisory Alarm (Warning) indication.

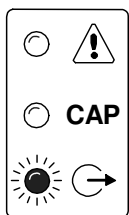
This indication will illuminate if all available compressors are loaded and system pressure is continuing to decrease. The indication will generally occur prior to any set low pressure Alarm (Warning) and is intended to provide an advanced warning of a potential 'Low Pressure' situation.

The 'Insufficient Capacity' advisory alarm is intended as an advanced warning and is not recorded in the fault history log but is included as a Group Alarm (Warning), or Group Fault item.

'Insufficient Capacity' is available as a dedicated data communications item and as a dedicated 'virtual relay' function.

❗ The 'Insufficient Capacity' advisory alarm function can be de-activated. In this instance the unit's Alarm indicator will still illuminate but no group alarm, group fault, 'virtual relay' or remote indication is generated.

### 3.10 Restricted Capacity Alarm



The Metacentre is equipped with a dedicated 'Restricted Capacity' Advisory Alarm (Warning) indication.

This indication will flash if all available compressors are loaded and further capacity is required but one, or more, compressors are:

- a) inhibited from use in a 'Table' priority setting
- b) inhibited from use by the short-term Service/Maintenance function
- c) inhibited from use in the long term maintenance menu.

The 'Restricted Capacity' advisory alarm is intended to indicate that all available compressors are already loaded and further capacity is required but one, or more, system compressor(s) have been restricted from use.

The 'Restricted Capacity' advisory alarm is not recorded in the fault history log but is included as a Group Alarm (Warning), or Group Fault item.

'Restricted Capacity' is available as a dedicated data communications item and as a dedicated 'virtual relay' function.

❗ The 'Restricted Capacity' advisory alarm function can be de-activated. In this instance the unit's Alarm indicator will still flash but no group alarm, group fault, 'virtual relay' or remote indication is generated.

## 4. Installation

It is recommended that installation and commissioning be carried out by an authorised and trained product supplier.

### 4.1 Unit Location

The SX is wall mounting using conventional screw fixings. The SX can be located remote from the compressors but within 100 m (330ft) cable length from each compressor and within 100 m (330ft) cable length from the system pressure sensor.

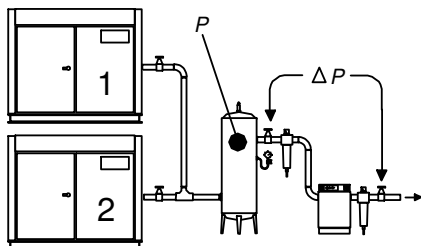
### 4.2 Power Supply

A fused switching isolator must be installed to the main incoming power supply, external to the SX. The isolator must be fitted with a fuse of the correct rating to provide adequate protection to the power supply cable used (in accordance with local electrical and safety regulations).

### 4.3 Pressure Sensor Location

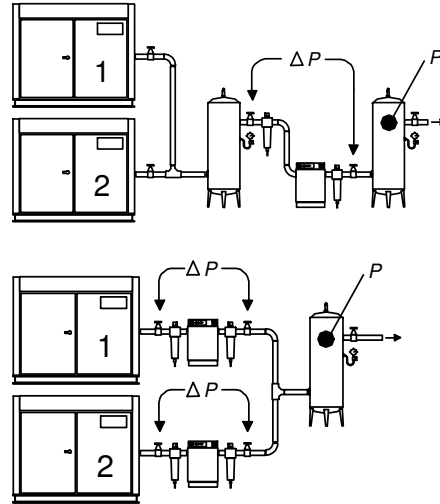
The system pressure sensor (P) must be located in a position that will continuously experience pressure that is common to all compressors.

Generation Side Pressure Control:



⚠ System pressure will be lower than the set 'generation' pressure due to pressure differential losses across air treatment equipment. The nominal system pressure will reduce as the air treatment differential pressure increases.

System (Demand Side) Pressure Control:

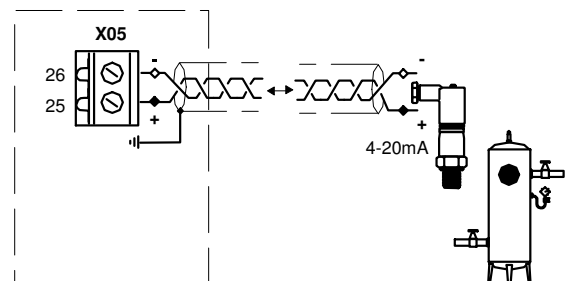


⚠ Ensure each compressor is equipped with independent excess pressure shutdown; an increase in pressure differential across air treatment equipment can result in excess compressor discharge pressure.

⚠ Regular routine monitoring of pressure differential across air treatment equipment is recommended.

### 4.4 Pressure Sensor Connection

The pressure sensor must be connected to terminal X05 of the SX using an earth screened, two-core (0.5mm<sup>2</sup> CSA minimum), cable no greater than (100m) 330ft in length.



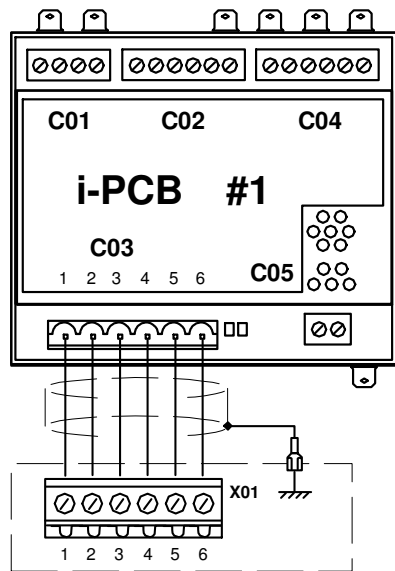
⚠ Wire polarity is important

## 4.5 Compressor Interface PCB

The 'i-PCB' is designed to interface a compressor with the SX using a 6-core, earth shielded, cable no greater than 100m (330ft) in length.

Each compressor in the system must be assigned a unique identification number from 1 up to the number of compressors in the system. The identification number should be clearly indicated on each compressor for operational reference.

For each compressor connected to the SX utilising an 'i-PCB,' the signal wires must be connected to the SX terminals dedicated for the assigned compressor reference number.



The 'i-PCB' is a DIN rail mountable module designed to be installed within the compressor control or switchgear area.

Each air compressor must be equipped with a load/unload regulation system and, if not regulated with a single electro-mechanical pressure switch, have a facility for a remote load/unload control with the ability to accept a volt-free switching contact input for remote load/unload.

❗ Consult the air compressor manual or your air compressor supplier/specialist for details before installing the SX.

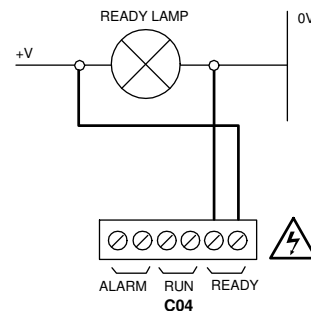
The 'i-PCB' uses a 12V to 250V input voltage detection system and universal relay contact control outputs (250V 'CE' / 115V 'UL' @ 5A maximum). Integrated directly into the circuits of an air compressor, the 'i-PCB' avoids the need for additional relays or remote inputs. The 'i-PCB' also acts as an electrical barrier between the compressor and the SX providing protection and voltage isolation.

### 4.5.1 Input Functions

The 'i-PCB' is fitted with a six-pin terminal C04 for compressor monitoring. The 'i-PCB' uses two inputs (Ready and Run) to determine compressor status. An Alarm input can be used if compressor alarm indication is available and required. The Alarm input is optional and is not necessary for system operation.

Ready Input:

The 'Ready' connection is intended to indicate that the compressor is in a 'started' state, has no operational inhibiting fault condition and is ready to respond to SX regulation without manual intervention.



The READY input will accept 12V to 250V ac (50/60Hz) or dc.

❗ Do not connect a voltage greater than 250Vac/dc to this input.

This input must be connected to the terminals of a 'ready' or 'operational' lamp, or other circuit of the compressor control system, that will be energised when the compressor is in a started (standby or running) condition.

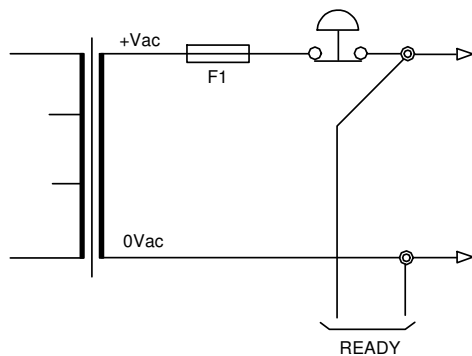
The voltage to this input must de-energise when the compressor is stopped and unavailable to produce air upon a load signal, or the Emergency Stop button is pressed, or when the compressor experiences a fault that prevents the compressor from running.

When the compressor ready lamp, or other control circuit, is energised the 'i-PCB' will detect the voltage and signal the SX that the compressor is ready and available to load and produce air when a load request signal is given.

❗ The 'i-PCB' input common terminal must always be connected to the neutral, common or 0V line of the applied input voltage.

#### Ready Input, Alternative Connection Method:

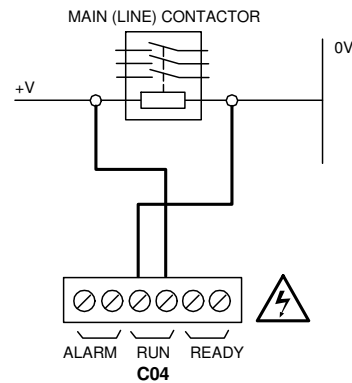
In instances where a convenient voltage signal for a compressor ready condition is not available the 'Ready' input can be connected directly to a constant compressor control system power supply voltage (12V to 250Vac or dc). This will signal the SX that the compressor is ready and available at all times when power is applied to the compressor. The SX has a built-in function to determine when a compressor is not responding, or is in a shutdown condition, regardless of a constant ready signal. If the SX requests a compressor to run/load, but fails to detect a RUN signal within 60 seconds, the SX will regard the compressor as 'not ready' and indicate the compressor as not available. If a RUN signal is detected at any time, the SX will automatically reset the compressor 'not ready' condition and re-establish control.



❗ Never connect the READY input positive connection directly to the output of a control system transformer, always connect after a fuse or circuit breaker.

If a normally closed contact of an Emergency Stop button is included in the compressor power supply circuit, connect after the Emergency Stop button contacts. This will instantly indicate a compressor 'not ready' condition if the Emergency Stop button is activated.

#### Run Input:



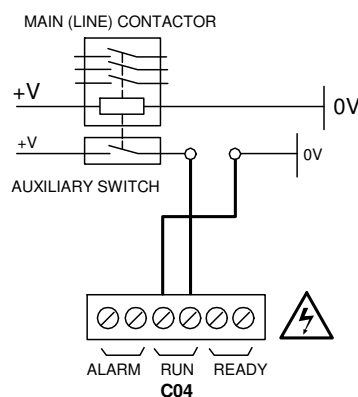
The RUN input will accept 12V to 250V ac (50/60Hz) only (DC cannot be used).

❗ Do not connect a voltage greater than 250V to this input.

12V to 250Vac must be applied to the 'Run' terminals when the compressor motor is running.

This input can be connected to the control terminals A1 and A2 (coil) of the main starter contactor of the compressor. When the compressor control system energises the main contactor, the 'i-PCB' will detect the voltage across the contactor coil terminals and signal the SX that the compressor is running.

Alternatively, if the main contactor coil voltage is greater than 250Vac, a contactor auxiliary switch can be used to apply a suitable voltage to the 'Run' input terminals.



In instances where a motor starter contactor is not available or accessible, any part of a compressor control circuit that is energised when the compressor is running can be monitored. For example: fan contactor or voltage signal to a remote starter.

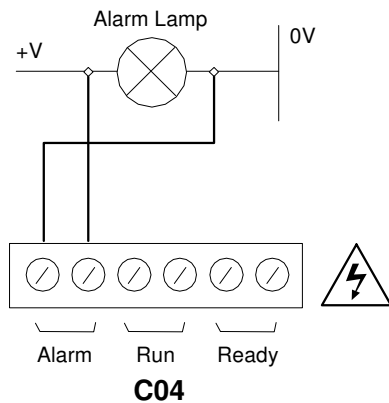


❗ The 'i-PCB' input common terminal must always be connected to the neutral, common or 0V line of the applied input voltage.

Alarm Input (optional):

The 'i-PCB' is equipped with an alarm (or warning) input that can be used to detect alarm or warning conditions.

❗ A fault, that stops the compressor, and/or prevents the compressor from running, is determined from the 'Run' and 'Ready' inputs; Alarm detection is optional and is not a requirement.



The Alarm input will accept 12V to 250V ac (50/60Hz) or dc.

❗ Do not connect a voltage greater than 250Vac/dc to this input.

This input can be connected to the terminals of an alarm lamp or other accessible part of the control circuit that is energised when the compressor is in an alarm condition.

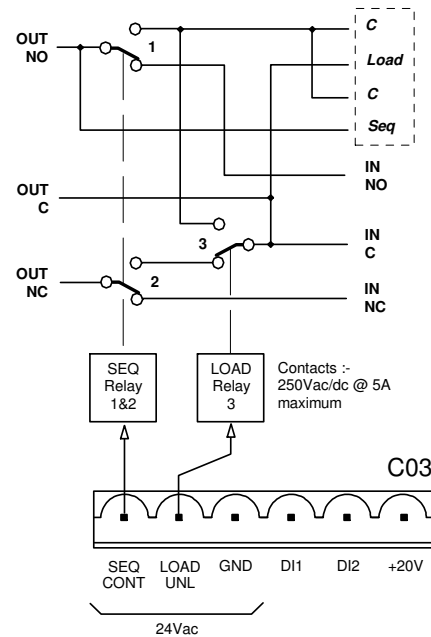
If an alarm condition is experienced the compressor alarm lamp, or alarm circuit, will energise. The 'i-PCB' will detect the voltage and signal the SX that an alarm has occurred. If the compressor has no accessible alarm circuit, or this function is not required, the 'i-PCB' alarm terminals can be ignored.

❗ The 'i-PCB' input common terminal must always be connected to the neutral, common or 0V line of the applied input voltage.

#### 4.5.2 Output Functions

The SX will control the 'i-PCB' load/unload relay outputs in accordance with the active system load and unload pressure set points. The 'i-PCB' load/unload relay contacts can be used for compressor controllers that have 'pressure switch' load/unload regulation.

##### 'i-PCB' Internal Output Circuits



The C01 and C02 terminal functions of the 'i-PCB' are intended to control load and unload regulation of the compressor.

##### Pressure Switch Regulation:

For air compressors fitted with an electro-mechanical pressure switch a six-pin terminal C02 has been provided to enable connection to a pressure switch that has a two wire or three-wire connection.

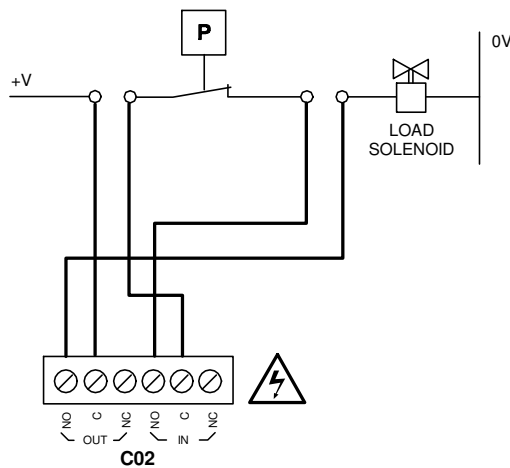
When connected the pressure switch can be switched in and out of circuit automatically. If the SX is stopped or experiences a failure or loss of power, pressure control will automatically revert back to the pressure switch and the compressor will continue to operate in 'Local' mode.

❗ The local pressure settings of all compressors in the system should be set in a cascaded manner such that the system will operate normally in the event of SX inoperability.

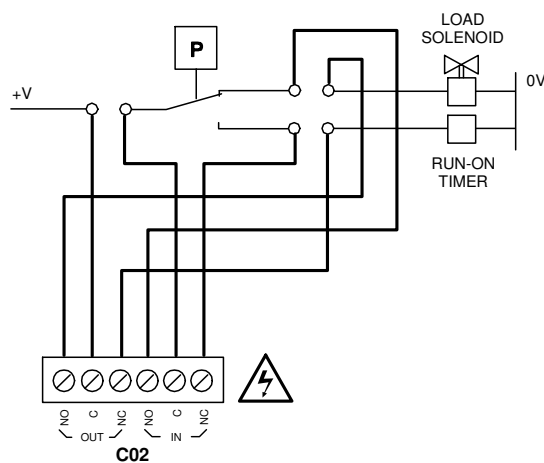
❗ The NC (normally closed) and NO (normally open) terminal references of the 'i-PCB' are related to internal connection functions and should not be referenced to the connections of a compressor pressure switch; which will generally be in reverse order.

❗ Lethal voltages may be present on the terminals of the air compressor pressure switch. Isolate the air compressor power supply before starting any work.

#### Two Wire Pressure Switch Connections:



#### Three Wire Pressure Switch Connections:



#### Remote Load/Unload Regulation:

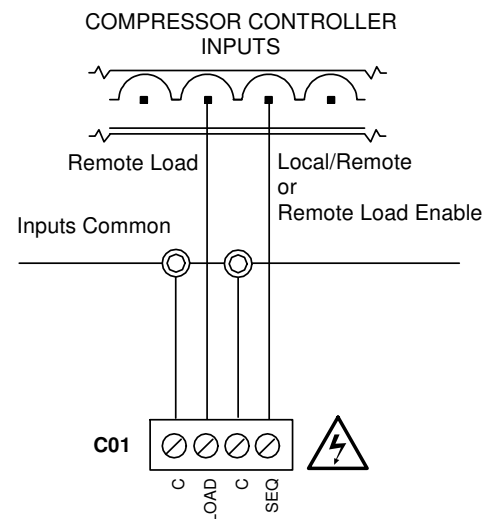
For air compressors controllers fitted with 'Remote/Local Pressure Regulation' digital inputs, a 4-pin connector C01 has been provided.

This terminal provides volt free contact closure for load control and also provides volt free contact closure for remote pressure control enable.

A remote load enable input provides the facility to change the compressor load regulation from internal control to a remote switching source.

**Note:** Compressors that use electronic pressure detection but are not equipped with a remote pressure control enable feature will not automatically revert to local control if the SX is stopped or experiences a fault or loss of power.

#### Load and Sequence Connection:



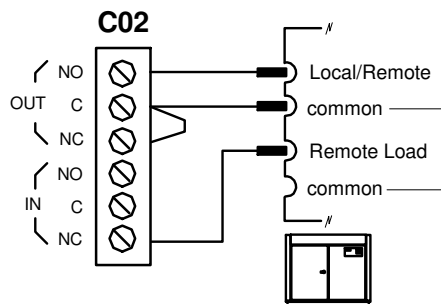
❗ Compressors that use electronic pressure detection but are not equipped with a remote pressure control enable feature will not automatically revert to local control if the SX is stopped or experiences a fault or loss of power.

❗ Compressor controller inputs common voltage may be 0V or +V.

The local/remote pressure regulation input and/or remote load input logic of some electronic pressure sensor type controllers are reversed, in this instance the 'pressure switch' outputs (terminal C02) can be used to establish alternative logic control connections.

For Example:

If the compressor controller 'Local/Remote Pressure Control' input is a normally open type; remote when closed, but the 'Remote Load' input is a normally closed type; load when open, the 'i-PCB' pressure switch terminal contacts can be used to achieve the correct switching logic.



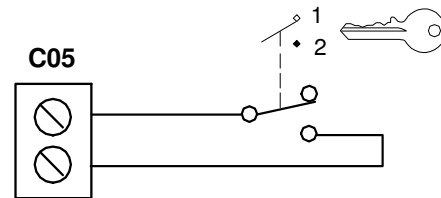
Examine the 'i-PCB' internal output circuit diagram to establish any desired switching logic that may differ from normal practise.

**!** Do not attempt to utilise 'Digital Pressure Regulation Control' (terminal C01) and the 'Pressure Switch Control' (terminal C02) output connections at the same time for different products. These two output functions are internally connected and a short circuit condition and/or malfunction may result.

**The 'i-PCB' connection examples shown in this manual are intended to provide a guide for the majority of compressor control systems in use. Some compressors have variations in operation and/or function; consult your compressor supplier/specialist for advice.**

Service Maintenance Switch:

The 'i-PCB' is equipped with a volt-free input (terminal C05) that can be used to remove the compressor from SX control, without generating a fault condition, during short-term maintenance or servicing periods.



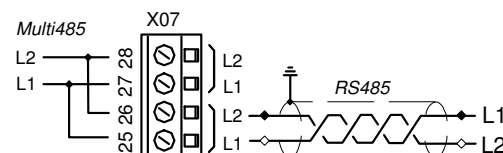
When the 'Service Maintenance Switch' input terminal pins are connected together, using a volt-free switching contact, the SX will indicate that the compressor is not available but will not generate an Alarm, Trip or Shutdown condition. The SX will also remove the compressor from the sequence strategy and substitute with an alternative available compressor if necessary. When the 'Service Maintenance Switch' inputs are open circuit again the compressor will automatically be accepted back in to the sequence strategy and will be utilised as and when next required.

The use of a 'key switch' is recommended for this purpose in order to prevent the switch contacts being inadvertently left in the closed circuit condition after service maintenance is complete.

**!** DO NOT connect any external voltage source to the pins of terminal C05.

#### 4.6 Compressor Multi485 Interface

Each air compressor in the system can be integrated with the EnergyAir Metacentre SX using a Multi485 network connection, for compressor controller's equipped with Multi485 communications, or using one of a number of networkable EnergyAir Metacentre compressor integration products.

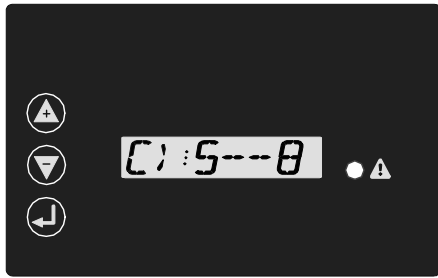


**!** The Metacentre SX is not equipped with any direct connect, hardwire, 'i-PCB' interface terminals as standard.

#### 4.7 'iX' Expansion Modules (Option)

Direct connect, hardwire 'i-PCB' interface modules, can be added with the use of optional 'iX' Module(s). Each 'iX' module adds four direct connect 'i-PCB' terminals. Up to three 'iX' modules can be connected to the SX to provide a maximum of 12 direct connect 'i-PCB' terminals.

The 'iX' Module is wall mounting and must be located adjacent to the Metacentre SX unit.



The 'iX' Expansion Module can be set to function as 'i-PCB' connections for:

- a) **C:5-8** Compressors 5 to 8
- b) **C:9-12** Compressors 9 to 12

⚠ The SX is already equipped with 'i-PCB' terminals dedicated for compressors 1 to 4; do not set the 'iX' for 'C:1-4' mode in this instance.

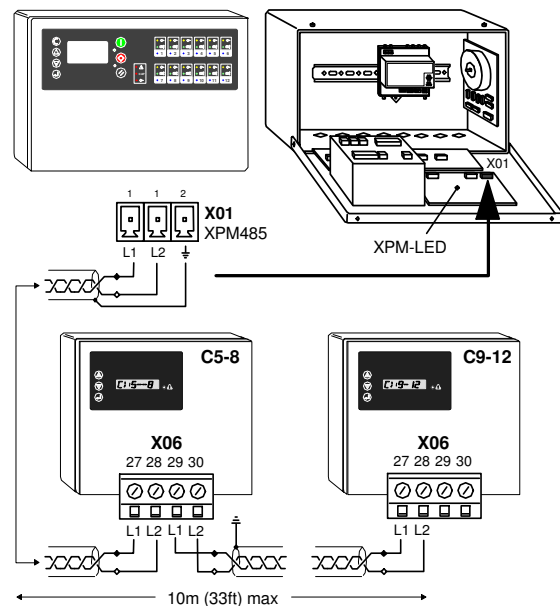
##### To set the 'iX' module function:

- a) Press the Up and Down buttons simultaneously. The display will show an 'Access Code' entry screen.
- b) Enter access code '0021' and press Enter.
- c) Press Down to select the 'P01' menu and press Enter.
- d) Press Enter to select the first menu item; the setting will flash.
- e) Press Up or Down to select the required function (C:5-8 or C:9-12) and Enter.

The SX will register the presence of an 'iX' Module(s) at power-up. After registration the appropriate compressor(s) can be selected for 'i-PCB' type in the SX compressor configuration menu.

Failure to continuously detect an 'iX' Module after initial registration and compressor configuration will result in an Error condition.

##### 'iX' module connection:



⚠ Use a twisted pair, earth shielded, 0.25mm<sup>2</sup>-1.0mm<sup>2</sup> data communications cable with a total length no greater than 10m (33ft).

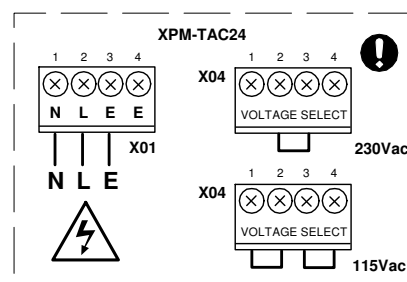
SX: Terminal X01 of the 'XPM-LED' PCB

Expansion Module(s): Terminal X06

⚠ Polarity is important.

##### 'iX' module power supply:

Each 'iX' Module is equipped with the same type of power supply PCB as the SX and requires a dedicated 115Vac or 230Vac (+10%), 50/60Hz @ 50VA power supply connection.



⚠ Before applying power to the 'iX' Module ensure that the power supply connections are correct and secure and that the operating voltage selector is set correctly for the power supply voltage in use; 115Vac or 230Vac (+10%), 50/60Hz.

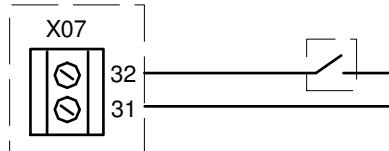
#### 4.8 Auxiliary Input (Option)

The SX is equipped with an auxiliary input; terminals 31 and 32 (X07).

The function of the input is menu selectable and can be adapted for differing application requirements.



Menu Items – S02:AI



The input is designed to detect a remote 'voltage-free' switching contact (rated for a minimum 24VDC @ 10mA).

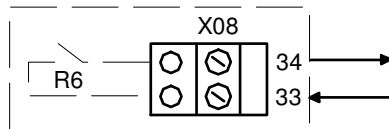
#### 4.9 Auxiliary Output (Option)

The SX is equipped with a remote relay contact output; terminals 33 and 34 (X08).

The function of the output is menu selectable and can be adapted for differing application requirements.



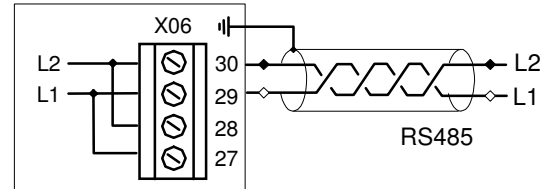
Menu Items – S02:AO



The remote output relay contacts are rated for 240V 'CE' / 115V 'UL' @ 5A maximum.

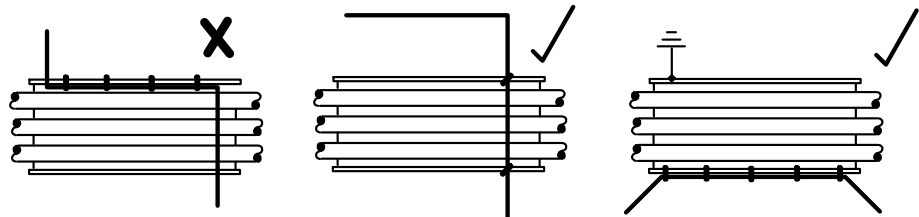
#### 4.10 RS485 Communications

The SX is equipped with an RS485 network communications capability using the Multi485 protocol. This facility can be used for remote connectivity to optional networked units and modules with Multi485 communications capabilities.



⚡ RS485 data communications and other low voltage signals can be subject to electrical interference. This potential can result in intermittent malfunction or anomaly that is difficult to diagnose. To avoid this possibility always use earth shielded cables, securely bonded to a known good earth at one end. In addition, give careful consideration to cable routing during installation.


- Never route an RS485 data communications or low voltage signal cable alongside a high voltage or 3-phase power supply cable. If it is necessary to cross the path of a power supply cable(s), always cross at a right angle.
- If it is necessary to follow the route of power supply cables for a short distance (for example: from a compressor SX to a wall along a suspended cable tray) attach the RS485 or signal cable on the outside of an earthed cable tray such that the cable tray forms an earthed electrical interference shield.
- Where possible, never route an RS485 or signal cable near to equipment or devices that may be a source of electrical interference (for example: 3-phase power supply transformer, high voltage switchgear unit, frequency inverter drive module, radio communications antenna).



## 5.0 COMMISSIONING

### Commissioning Procedure

When commissioning the SX, carry out the following procedures before attempting to start.

 It is recommended that an authorised and trained product supplier carry out commissioning.

### 5.1 Physical Checks

Before applying power to the SX ensure that the power supply connections are correct and secure and that the operating voltage selector is set correctly for the power supply voltage in use; 115Vac or 230Vac (+/-10%), 50/60Hz.

Open the front panel of the SX and check the location of the link(s) connected to the 'Voltage Selection' terminals of the power supply PCB. If necessary, change the link wire locations.



#### Installation

Switch on the power supply to the SX.

The control program identification will be displayed for a short period followed by the normal operational User display.

### 5.2 Pressure Display

Check the displayed system pressure. If the pressure is incorrect, or inaccurate, check the type and range of the sensor and carry out the pressure sensor commissioning and calibration procedure.



#### Menu Navigation



#### Menus and Menu Items

<b>S04 – 1O</b>	Sensor Offset Calibration
<b>S04 – 1R</b>	Sensor Range Calibration

### 5.3 Unit Configuration

Before successful basic operation can be established the following items must be set (in the order show) to suit installation requirements.



#### Features and Functions; Menu Items

<b>S02 - NC</b>	Number of Compressors
<b>S02 - PM</b>	Maximum Pressure Alarm
<b>S02 - CF</b>	Stop Control Function

<b>S01 - Ct</b>	Real Time Clock Set
<b>S01 - AR</b>	Auto Restart Enable
<b>S01 - RP</b>	Rotation Interval

<b>C03 – 01/12</b>	Compressor #1-12 Configuration
--------------------	--------------------------------

<b>C01 - 01/12</b>	Compressor #1-12 Running Hours
--------------------	--------------------------------

<b>T01 - PH</b>	High Pressure Set Point
<b>T01 - PL</b>	Low Pressure Set Point
<b>T01 - Pm</b>	Minimum Pressure Alarm
<b>T01 - SQ</b>	Sequence Algorithm
<b>T01 – 01/12</b>	Compressor #1-12 Priority

### 5.4 Optional Features and Functions

Installation requirements may involve the implementation of additional or optional functions and features; implement as required.



#### Features and Functions; Menu Items

## 6.0 Menu Navigation

### Display Item Structure:

All operational system status and values are accessible from the normal User display. To view status or values, that are not normally visible on the default screen, press UP or DOWN. All standard User display items are view only and cannot be adjusted. The standard User display items are regarded as 'Menu Page 00' items.

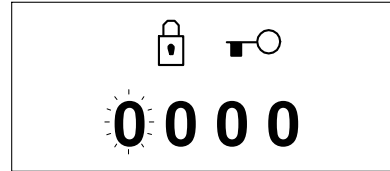
All adjustable value, parameter or option item displays are grouped into 'menu mode' lists. Items are assigned to a list according to type and classification. Item lists are identified by page number (or menu number); All adjustable parameters and options are assigned to menu mode pages 'P01' or higher.

### Normal Operational Display (Menu Page P00):

At controller initialisation, all LED indicators are switched on for several seconds before initialisation is complete and the normal operating display (Page P00) is shown. In normal operational display mode the main display will continuously show the detected system pressure and the Item display will show the first item of the 'Page 00' menu. User menu 'Items' can be selected using the Up or Down buttons at any time. Pressing the Enter button will lock any selected Item display and inhibit return to the default display. When an Item display is locked the lock key symbol will be shown. To unlock an Item display press Up or Down to view an alternative Item display or press Reset or Escape. No Item values, options or parameters can be adjusted in page 'P00'. If a fault condition occurs the fault code becomes the first list item and the display will automatically jump to display the fault code. More than one active fault code item can exist at any one time and can be viewed by pressing UP or DOWN. The most recent 'active' fault will be at the top of the list.

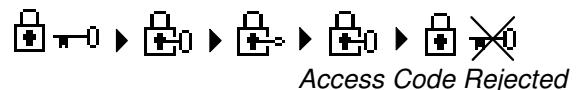
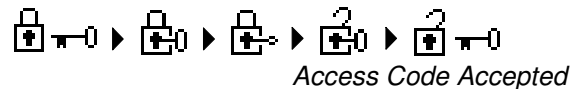
### Access Code:

Access to adjustable menu page items is restricted by access code. To access menu mode pages press MENU (or UP and DOWN together); an access code entry display is shown and the first code character will flash.



Use UP(plus) or DOWN(minus) to adjust the value of the first code character then press ENTER. The next code character will flash; use UP or DOWN to adjust then press ENTER. Repeat for all four code characters.

If the code number is less than 1000 then the first code character will be 0(zero). To return to a previous code character press ESCAPE. When all four code characters have been set to an authorized code number press ENTER. An invalid code will return the display to normal operational mode; page 'P00'.



### Access Code Timeout:

When in menu mode, if no key activity is detected for a period of time the access code is cancelled and the display will automatically reset to the normal operational display.

### Menu Mode Navigation:

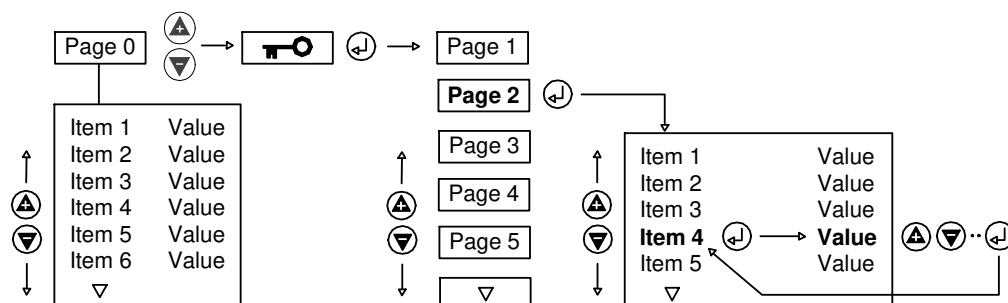
In menu mode the menu 'page' number will be highlighted at the top of the display.



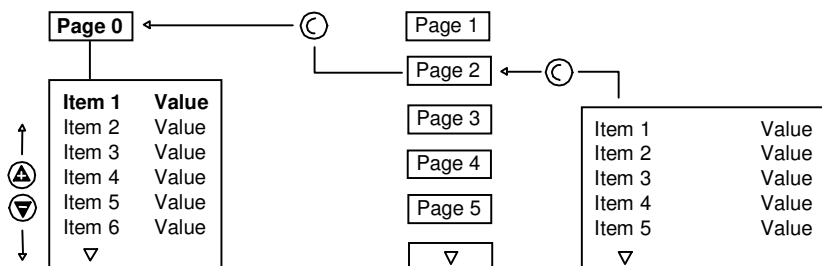
To select a menu 'page' press UP or DOWN. To enter the highlighted menu 'page' press ENTER; the first item of the menu 'page' will be highlighted. Press UP or DOWN to scroll through the selected menu 'page' items.

To select an item value or parameter for modification press ENTER; an adjustment screen for the item will be displayed.

The value or option can now be modified by pressing UP(Plus) or DOWN(Minus). To enter a modified value or option in to memory press ENTER.



Press ESCAPE at any time in menu mode to step backwards one stage in the navigation process. Pressing ESCAPE when the page number is flashing will exit menu mode and return the display to normal operational mode.



All menu items have a unique reference consisting of the menu page ID (a) and the menu page item number (b). Each item in a menu also has a unique two alphanumeric character code (c). All three references are visible at the top of every menu item display.

(a)	(b)	(c)
P01	01.02	AB

Some menu items may consist of several individual settings. Each setting of the menu item is also referenced as a sub-item number. For example: P01-01.02 references sub-item '02' of menu item '01' in menu page 'P01'. Sub-item settings, where applicable, are always displayed together on the same 'Item' adjustment display screen. Most menu items are single value or single option only in which case the single item is referenced as sub-item number '01' (for example: P01-01.01).

Press and hold RESET for several seconds at any time to immediately exit menu mode and return to the normal operational display. Any value or option adjustment that has not been confirmed and entered into memory will be abandoned and the original setting maintained.

The SX will retain an 'access code' for a short period after menu exit allowing the menu structure to be re-entered without the need to re-enter the access code again. To immediately clear access code retention press and hold RESET for several seconds.

A 'locked' symbol displayed with any item indicates the item is locked and cannot be modified. This will occur if the Item is view only (not adjustable) or in instances where the item cannot be adjusted while the SX is in an operational state; stop the SX first.



## 6.1 Menus

### USER Level Menus (0011)

#### **1** TABLE #1

**T01**

**PH** High Pressure Set Point  
**PL** Low Pressure Set Point  
**Pm** Minimum Pressure Alarm  
**SQ** Sequence Algorithm  
**01** Compressor #1 Priority  
to **12** Compressor #12 Priority

#### **2** TABLE #2

**T02**

**PH** High Pressure Set Point  
**PL** Low Pressure Set Point  
**Pm** Minimum Pressure Alarm  
**SQ** Sequence Algorithm  
**01** Compressor #1 Priority  
to **12** Compressor #12 Priority

#### **3** TABLE #3

**T03**

**PH** High Pressure Set Point  
**PL** Low Pressure Set Point  
**Pm** Minimum Pressure Alarm  
**SQ** Sequence Algorithm  
**01** Compressor #1 Priority  
to **12** Compressor #12 Priority

#### **4** TABLE #4

**T04**

**PH** High Pressure Set Point  
**PL** Low Pressure Set Point  
**Pm** Minimum Pressure Alarm  
**SQ** Sequence Algorithm  
**01** Compressor #1 Priority  
to **12** Compressor #12 Priority

#### **Pressure Schedule**

**P01**

**01** Schedule Setting #1  
to **28** Schedule Setting #28

#### **Prefill**

**P02**

**PF** Prefill Function  
**PT** Prefill Time  
**PP** Prefill Pressure  
**01** Compressor #1  
to **12** Compressor #12

#### **User Configuration**

**S01**

**Ct** Real Time Clock Set  
**PS** Pressure Schedule Enable  
**AR** Auto Restart Enable  
**RP** Rotation Interval  
**TS** Default Table Select  
**BL** Display Backlit Adjust

#### **1 2 3** **Compressor Running Hours**

**C01**

**01** Compressor #1 Running Hours  
to **12** Compressor #12 Running Hours

#### **Compressor Maintenance**

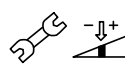
**C02**

**01** Compressor #1 Maintenance  
to **12** Compressor #12 Maintenance

#### **Fault Log**

**E01**

**01** Fault Log #1 (most recent)  
to **15** Fault Log #15

**SERVICE Level Menus (0021)****Configuration****S02**

**P>** Pressure Units  
**NC** Number Of Compressors  
**PM** Maximum Pressure Alarm  
**CF** Stop Control Function  
**TO** Tolerance  
**DA** Damping  
**PC** Pressure Change Time  
**AI** Auxiliary Input Function  
**AO** Auxiliary Output Function  
**CA** CAP Alarm Inhibit  
**MA** Max Cap Restricted Alarm Inhibit  
**ER** Error Log Reset

**Auxiliary Box Monitoring****S03**

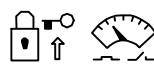
**01** Auxiliary Box #1 Enable  
**02** Auxiliary Box #2 Enable  
**BT** RS485 Timeout

**Sensor Calibration****S04**

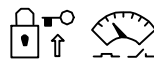
**10** Pressure Offset  
**1R** Pressure Range

**Compressor Configuration****C03**

**01** Compressor #1 Configuration  
 to  
**12** Compressor #12 Configuration

**High Level Menus (0032)****Diagnostic Menu 1****D01**

**D1** Digital Input #1 (Di 1)  
 to  
**D8** Digital Input #8 (Di 8)  
**R1** Output Relay #1 (R1)  
 to  
**R6** Output Relay #6 (R6)  
**A1** Analogue Input #1 (Ai1)  
**A2** Analogue Input #2 (Ai2)  
**A3** Analogue Input #3 (Ai3)  
**Ao** Analogue Output (Ao)

**Diagnostic Menu 2****D02**

**SI** Screen Invert  
**LT** LED Panel Test

## 6.2 Menu Items:

▲		T01	▼
16	12	1	
01	PH	7.0 bar	
02	PL	6.8 bar	
03	Pm	0 bar	
04	SQ	TR (⌚)	



### Tables

**T0# – PH** High Pressure Set Point  
The 'upper' or 'unload' pressure set point that will be used when the 'Table' is active.

**T0# - PL** Low Pressure Set Point  
The 'lower' or 'load' pressure set point that will be used when the 'Table' is active.

**T0# - Pm** Minimum Pressure Alarm  
The minimum pressure 'Warning' or 'Alarm' level that will be used when the 'Table' is active.

**T0# - SQ** Sequence Strategy  
The sequence control strategy mode that will be used when the table is active.

**T0# - 01** Compressor #1 Priority  
The 'priority' setting for compressor number 1 that will be used when the table is active.

**T0# - 02** Compressor #2 Priority  
The 'priority' setting for compressor number 2 that will be used when the table is active.

**T0# - 'n'** Compressor #'n' Priority  
The 'priority' setting for compressor number 'n' that will be used when the table is active.

'n' = number of compressors in the system.  
# = Table T01 to T04

ⓘ Priority Settings:

✗: compressor(s) can be inhibited from use while a table is active by selecting "X" priority. The compressor will be held offload and will not be utilised under any circumstances.

▲		P01	▼
28	28	- . - - : - - -	
01	01	- . - - : - - -	
02	02	- . - - : - - -	
03	03	- . - - : - - -	
04	04	- . - - : - - -	



### Pressure Schedule

**P01 – 01 to 28**  
The 'Pressure Schedule' items 01 to 28

▲		P02	▼
07	04	X	
01	PF	X	
02	PT	- MIN	
03	PP	0 BAR	
04	01	X	



### Prefill

**P02 - PF** Prefill Function  
Determines the 'Prefill' strategy or function that will be used at system startup.

- ✗ = Prefill function OFF
- ✓ = Prefill, Back-up Mode
- ✓ [!→X] = Prefill, Standard Mode
- ✓ [A^^] = Prefill, Automatic Mode

**P02 - PT** Prefill Time  
Sets the maximum time allowed for a system 'Prefill' at startup.

**P02 - PP** Prefill Pressure  
If pressure is at, or above, this setting at system startup the prefill function will be abandoned immediately and normal pressure control and sequence strategy will be implemented. This setting is intended to inhibit 'Prefill' operation if pressure is already at an acceptable level at system startup.

**P02 – 01 to 04** Compressor 1 to 'n'

The function of compressor 1 to 'n' during the 'Prefill' period.

'n' = number of compressors in the system.

- ✕ = do not use  
 ✓ = use for primary prefill  
 ! = use for emergency backup

ⓘ These settings are applicable to Prefill – Standard and Prefill - Back-up modes only. In Automatic mode the system management unit dynamically utilises compressors as required.

ⓘ Press and hold 'Start' for 5 seconds to manually skip Prefill mode at startup.

▲		S01	▼
06	BL	5	
08	Ct	1 . 18:00	
08	PS	X	
08	AR	✓	
08	RP	9 . 00:00	



## Features and Functions

**S01 - Ct** Real Time Clock Set

Adjustment for the internal real time clock. (Hours, Minutes, Date, Month, Year)

The 'Day of the Week' (1=Monday to 7=Sunday) is automatically calculated and set in accordance with the Day, Month and Year.

**S01 - PS** Pressure Schedule Enable

- ✕ = inhibit Pressure Schedule  
 ✓ = enable Pressure Schedule

**S01 - AR** Auto Restart Enable

- ✕ = inhibit Power Failure Auto Restart  
 ✓ = enable Power Failure Auto Restart

The SX will only automatically restart when power is restored if the SX was in an operational 'Started' state when the power loss or disruption occurred.

**S01 - RP** Rotation Interval

Sets the sequence 'Rotation' interval or time.

**S01 - TS** Default Table Select

Determines the 'Table' that will be used by default when 'Pressure Schedule' is not active and no table is selected remotely on a digital input.

**S01 - BL** Display Backlight Adjust

Adjustable: 1 to 7, default 5

The display will temporarily increase brightness by 2 levels when a key is pressed and return to normal setting after a period of no keypad activity. The default display backlight level has been set to enable a 'continuous use service life' in excess of 90000 hours while providing good readability in all ambient light conditions. LCD display 'service life' is defined as the time period before the backlight reduces to 50% of initial brightness. Typically the display will remain usable for a much longer period for time. Adjusting the backlight to high levels will reduce service life.

▲		C01	▼
01	01	0 hrs	
02	02	0 hrs	
03	03	0 hrs	
04	04	0 hrs	



## Control - Equal Hours Run Mode

Record of detected 'running' hours for each compressor. The run hours value can be manually adjusted, at any time, to match the running hours meter/display value of each compressor.

**C01 - 01** Run Hours; Compressor 1 to**C01 - 'n'** Run Hours; Compressor 'n'

'n' = number of compressors in the system.

▲		C02	▼
01	01	✓	
02	02	✓	
03	03	✓	
04	04	✓	

✗ = Remove compressor from operation  
 ✓ = Compressor can be utilised

For a compressor(s) that is unavailable for use for a prolonged period for time due to maintenance or repair. The compressor will not be utilised under any circumstances; any Alarm (Warning) or Trip (shutdown) fault will be ignored.

▲		E01	▼
15	- : - - - . - -		
01	E : ERR . 01	↔●↔	
02	- : - - - . - -		
03	- : - - - . - -		
04	- : - - - . - -		

#### E01 – 01 to 15

Error Log; presented in chronological order; entry 01 = most recent.

Each error log item will show the error code. To view details for the selected error log item press Enter.

E01	01.01	🔑
<b>E: ERR.01</b>		
16/05/2006	14:25	🔑
↩	🔄	1

The first information display shows the:

- The Error Code
- Error Code symbols (if applicable)
- The date the error occurred
- The time the error occurred
- The active operational functions of the SX at the time the error occurred; (see: SX Status Display)

To return to the main error log menu screen press Escape.

To view the second information screen press Enter.

E01	01.01	🔑
1	2	3
4	5	6

The operational status of each compressor, at the time the error occurred, is displayed symbolically (see: Compressor Status Displays).

To return to the first information screen press Enter or Escape.

▲		S02	▼
10	ER	X	
01	P>	BAR	
02	NC	4	
03	PM	10.0 BAR	
04	CF	X	



Pressure Control; Tables

**S02 - P>** Pressure Units  
 Selects the display pressure units: Bar, psi or kPa.

**S02 - NC** Number of Compressors  
 Sets the number of compressors connected to, and controlled by, the SX. This value must be set to match the system at commissioning.

**S02 - PM** Maximum Pressure Alarm  
 High pressure 'Fault' level. This value remains active at all times and is the same for all 'Tables'. Set just below system pressure relief value(s) and below the maximum system pressure rating of all air system components

**S02 - CF** Stop Control Function  
Determines if the SX maintains control of the compressors when the SX is stopped.

✕ = Stop: return pressure control to the compressors.


✓ = Standby: maintain control and continuously hold compressors 'off load'.

**S02 - TO** Tolerance  
The pressure control 'Tolerance' band setting.

**S02 - DA** Damping  
The pressure control 'Damping' setting.

**S02 - PC** Pressure Change Time  
The time that the SX will implement a smooth and controlled change from one 'target' pressure level to another when a table change is made.

**S02 - AI** Auxiliary Input Function

S02	08.01	AI
	01:T1	NO —/—

The function of the Auxiliary input.

- 01:T1** Override > Table 1  
**02:T2** Override > Table 2  
**03:T3** Override > Table 3  
**04:T4** Override > Table 4  
**05:TS** Override > Standby  
**06:SS** Remote Start/Stop \*\*  
**07:AA** Remote Alarm (always active)  
**08:AR** Remote Alarm (active when unit running, inhibited when unit stopped or in Standby)  
**09:TA** Remote Trip (always active)  
**10:TR** Remote Trip (active when unit running, inhibited when unit stopped or in Standby)

—/— **NO** (Normally Open)

The selected function is activated when the input is closed circuit (input terminals are connected together by remote volt-free contacts)

— — **NC** (Normally Closed)


The selected function is activated when the input is open circuit (input terminals are open circuit)

## \*\* Remote Start/Stop

Remote Start and Stop commands are activated by a 'change of state' of the Auxiliary input (a transition from open circuit to closed circuit or visa versa). The local panel Start and Stop functions remain active; both local and remote Start/Stop functions will function. The most recent command, from a local or remote source, will override any previous command, from a local or remote source.

⚠ The Remote Start/Stop function can be selected for normally open (NO) or normally closed (NC) operation. For 'fail safe' operation select normally closed (NC); the SX will start if the Auxiliary input changes state from 'open circuit' to 'closed circuit' and stop if the input changes state from 'closed circuit' to 'open circuit'. Any remote cabling or switch contact failure that results in an open circuit condition will stop the SX.

**S02 - AO** Auxiliary Output Function

S02	09.01	AO
	01:AF	NO —/—

The function of the Auxiliary output 'volt-free' relay contacts.

- 01:AF Any Fault**  
Any Alarm (Warning), Shutdown (Trip) or Compressor Not Available.  
**02:AT Any Trip**  
any Shutdown (Trip) or Compressor Not Available.  
**03:CF Compressor Fault**  
Any compressor Alarm (Warning), Shutdown (Trip) or Not Available  
**04:CA Compressor Alarm**  
Any compressor Alarm (Warning)  
**05:CT Compressor Trip**  
Any compressor Shutdown (Trip) or Not Available  
**06:SF System Fault**  
Any unit Alarm (Warning) or Shutdown (Trip)  
**07:ON System On**  
Unit Started and Active, including Pre-Fill period and Standby (not active when unit stopped)

**08:SA System Active**

Unit Active, including Pre-Fill period (not active when unit stopped or in standby)

**09:SP System Pressure Control Active**

Unit Active excluding Pre-Fill (not active when unit stopped, or in standby, or in Pre-Fill mode)

**10:LP Low Pressure Alarm**

**11:HP High Pressure Alarm**

**12:PO Pressure Control Override**

Normal, or Pressure Schedule' operation is being manually overridden

— **NO** (Normally Open)

The auxiliary output relay contacts are normally open and will close circuit when the set function is active or true.

— **NC** (Normally Closed)

The auxiliary output relay contacts are normally closed and will open circuit when the set function is active or true; or in the event of a P4 shutdown or power supply disruption.

❗ The contacts of the Auxiliary output relay are rated for 115V (UL), 240V (CE), at 5 Amps maximum.

**S02 – CA Capacity Alarm Enable**

✗ = inhibit Capacity Alarm

✓ = enable Capacity Alarm

❗ When inhibited the Capacity Alarm panel indication will still function; alarm code generation and remote alarm indications are inhibited.

**S02 – MA Restricted Cap. Alarm Enable**

✗ = inhibit Restricted Capacity Alarm

✓ = enable Restricted Capacity Alarm

❗ When inhibited the Restricted Capacity Alarm panel indication will still function; alarm code generation and remote alarm indications are inhibited.

**S02 - ER Error Log Reset**

Clears and resets the 'Error Log'. Adjust the item setting to '✓' and press ENTER. The display will return to the main menu and all existing entries in the error log will be permanently deleted.

		S03	
01	01	✗	
02	02	✗	
03	BT	60	sec

**S03 – 01 or 02 I/O Box Monitoring**

✗ = Disabled

✓ = Enabled

The SX will monitor the selected I/O Box and display any 'Fault' detected on the I/O Box inputs; dependant on I/O Box set-up.

❗ Examine the I/O Box manual for details.

**S03 – BT Communications Timeout**

The general operation of the selected I/O Box is also monitored. If the I/O Box fails to communicate on the RS485 network within the set 'Communications Broadcast Timeout' (BT) the SX will display an I/O Box RS485 communications Error.

		S04	
01	1O	0	BAR
02	1R	16.0	BAR

**S04 - 1O Pressure Sensor Offset**

**S04 - 1R Pressure Sensor Range**

Pressure Sensor Calibration Procedure:

1) Commissioning

Initially set the 'Offset' (minimum) to the minimum or lowest pressure value for the sensor. Set the 'Range' (maximum) to the maximum or highest value for the sensor.

For example:

If the pressure sensor is a 0 to 16bar (0 to 232psi) type set the 'offset' to 0bar (0psi) and the 'Range' to 16.0bar (232psi).

If the sensor is a -1.0(minus one bar.g) to 15.0bar type, set the 'offset' to -1.0bar (minus one bar) and the range to 15.0bar.

Note: The 'range' value equates to the maximum value not the scope of the sensor.

Execute the calibration procedure.

## 2) Calibration Procedure

a) Offset: Expose the sensor to atmosphere and adjust the 'offset' setting (if necessary) until the detected pressure display shows 0.0bar (0psi).

b) Range: Apply an accurately know pressure to the pressure sensor and adjust the 'Range' setting until the detected pressure display matches the applied pressure. An applied pressure equal too, or greater than, the nominal system working pressure is recommended.

❗ The detected pressure is displayed with the calibration menu item and will change to match the new calibration setting as the setting is adjusted.

❗ There is no need for the applied pressure to be static; it can be dynamic and changing. This enables calibration to be carried out on a fully operational system where changing system pressure can be accurately verified from another source.

❗ Correct pressure sensor set-up and calibration is critical for successful system operation. It is recommended that pressure sensor calibration is examined, and adjusted if necessary, annually or a pre-determined routine periodic basis.

C03		
01	01	I-PCB
02	02	I-PCB
03	03	I-PCB
04	04	I-PCB



## Installation – Compressor Connections







The type, method of connection, and the control functionality, of each compressor connected to the SX.

**C02 - 01** Compressor 1

to

**C02 – 'n'** Compressor 'n'

'n' = number of compressors in the system.

C03	01.01	01
		 100 %
V-485		50 %
 10 sec		60 %

Compressor connectivity and functionality settings.



## Compressor Connectivity:

**I-PCB** Fixed speed, load/unload; connected to SX, or 'IX' Expansion Module (option), using 'i-PCB'.  
(0/100%) 0% or 100% regulation

**I-485** Fixed speed, load/unload; connected to SX on Multi485 network.  
(0/100%) 0% or 100% regulation

**V-485** Variable Capacity/Speed; connected to SX on Multi485 network.  
(0 . . 100%) variable %Load regulation



## Compressor Start Time:

Set to match the time that the compressor takes to start it's main motor and load. This time will typically be equivalent to the compressors 'Star/Delta' time. If unknown, the time can be established by experiment; manually start the compressor, from a stopped condition, and determine the time from pressing the start button until the compressor loads and contributes capacity output to the system.



This time is used by the SX for 'staggered starting' of multiple compressors and other operational calculations. An accurate time is important for successful SX operation.



## i-PCB Alarm Input:

For 'i-PCB' connectivity applications the voltage detection function for the 'i-PCB' Alarm input can be inverted.



**+V=!** An Alarm condition is generated if the 'i-PCB' Alarm input detects a voltage between 12-250Vac/dc (*default*).

**0V=!** An Alarm condition is generated if the 'i-PCB' Alarm input detects no voltage.

 % Maximum Output Capacity

The maximum output capacity of each compressor must be set as a percentage with reference to the highest output capacity (the largest) compressor in the system. The highest output capacity compressor must be assigned with 100% capacity. Equal capacity (equal sized) compressors should be assigned the same % capacity value.

For example:

Compressor 1	5 m <sup>3</sup> /min	25%
Compressor 2	10 m <sup>3</sup> /min	50%
Compressor 3	12 m <sup>3</sup> /min	60%
Compressor 4	12 m <sup>3</sup> /min	60 %
Compressor 5	20 m <sup>3</sup> /min	100%
Compressor 6	20 m <sup>3</sup> /min	100%

 % Minimum Output Capacity

❗ Only applicable for a variable output compressor (V-485).

The minimum output capacity of a variable output compressor must be set as a percentage of the compressor's maximum output scaled in accordance with the % maximum capacity output value. Minimum output capacity is regarded as the output capacity at the lowest possible speed (variable speed compressor) or the minimal output achievable (stepping or other variable regulation control compressor).

For example 1:

For a variable speed compressor that has been assigned a maximum capacity output percentage of 100%, and is able to reduce speed to 50% of maximum speed:  
Minimum Output Capacity = 50%


For example 2:

For a variable speed compressor that has been assigned a maximum capacity output percentage of 50%, and is able to reduce speed to 50% of maximum speed:  
Minimum Output Capacity = 25%

For example 3:

For a 3-step (0/50/100) reciprocating compressor that has been assigned a maximum capacity output percentage of 60%, the minimum output capacity is the half-output regulation step:

Minimum Output Capacity = 30%

 % Minimum Efficiency

❗ Only applicable for a variable output compressor (V-485).

The minimum efficiency point is regarded as the speed, or step, below which another smaller capacity compressor in the system could achieve the equivalent output at a higher efficiency.

The percentage value is directly related, and scaled, to the maximum and minimum output percentage values.

For example:

For a variable speed compressor that is able to reduce speed to 50% of full speed, which has been assigned a maximum output capacity of 50% and a minimum output capacity of 25%. If another compressor in the system is able to provide 60% of the compressor's full speed output more efficiently, set the % Minimum Efficiency value to 30%. This percentage value represents 60% of the full speed output of the compressor.

When the compressor is detected as operating below the % Minimum Efficiency value the system management unit will re-evaluate utilisation and re-configure, if possible, to utilise a smaller capacity compressor, or combination of compressors. This process is automatic and executed dynamically in accordance with prevailing operational conditions at the time.

The intent of this feature is to prevent a variable output capacity compressor operating at minimal speed, or minimal output, for prolonged periods of time. Generally a variable output compressor operating at minimal capacity is less efficient than a smaller capacity compressor that is able to achieve the same output at higher, or maximum, output capacity.

### 6.3 Diagnostics

#### D01 Diagnostics

D01			
20	Ao	4.00	mA
01	D1	0	---
02	D2	0	---
03	D3	1	—/—
04	D4	2	⏏⏏⏏

The SX is equipped with comprehensive diagnostic functions. Each input can be examined individually and each output can be manually activated or manipulated individually.

#### AirMaster T1 Controller Diagnostics:

D1	Digital Input 1		
D2	Digital Input 2	---	ON
D3	Digital Input 3	—/—	OFF
D4	Digital Input 4	---	OFF
D5	Digital Input 5	---	Pulsing
D6	Digital Input 6	---	
D7	Digital Input 7		
D8	Digital Input 8		
D9	Digital signal detected on A2		
DA	Digital signal detected on A3		
R1	Relay Output 1		
R2	Relay Output 2	0	OFF
R3	Relay Output 3		
R4	Relay Output 4	1	ON
R5	Relay Output 5		
R6	Relay Output 6		
A1	Analogue Input 1	bar <> mA	
A2	Analogue Input 2	v (i-PCB#4)	
A3	Analogue Input 3	v (AI)	
Ao	Analogue Output	0.0 to 20.0mA	

#### Digital Inputs:

—/— OFF (open circuit)

--- ON (closed circuit)

⏏⏏⏏ Pulsing

The pulse signal from an 'i-PCB' is 0V to 24VDC at 50/60Hz. A typical DC voltage meter, or multimeter, will detect this as 12VDC +4V.

#### Relay Outputs:

Each relay output can be energised and de-energised manually by selecting the item. Use UP(plus) and DOWN(minus) to adjust and ENTER.

#### Analogue Inputs:

The item will alternate between the detected value and the electrical measurement on the controller input terminals. An independent measuring device can be used to check the displayed electrical measurement.

A1: System Pressure, 4-20mA

A2: Digital Input #9, voltage

A3: Auxiliary Digital Input, voltage

ⓘ Analogue inputs 2 and 3 are equipped with voltage ACM modules designed to function as a digital inputs in conjunction with pre-conditioning components on the Terminal PCB.

#### Analogue Output:

The analogue output can be manually adjusted. Use UP(plus) and DOWN(Minus) to adjust and ENTER. The output will return to normal operational value upon menu exit.

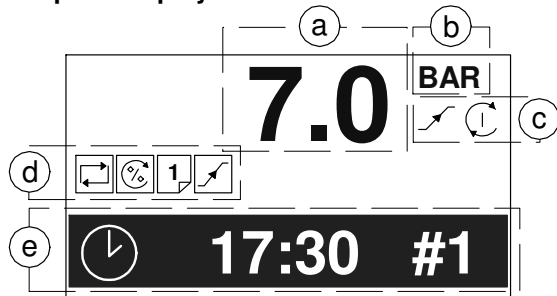
#### ⓘ To Display the Software Version:

Press and hold Reset then press Escape.

## 7.0 OPERATION

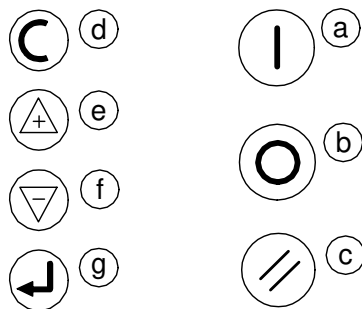
### 7.1 User Interface

#### Graphic Display:



- a) System Pressure Value
- b) System Pressure Units
- c) Unit Status
- d) Unit Active Functions
- e) User Menu Item

#### Keypad:



- a) Start
- b) Stop
- c) Reset
- d) Escape (Cancel)
- e) Up (Plus)
- f) Down (Minus)
- g) Enter

### 7.2 Unit Status:

#### System Pressure:

- ↗ Increasing to normal operational levels (Prefill, target pressure change or at system start)
- ↘ Below the active lower, or load, pressure set point
- ↔ Between the lower, or load, and upper, or unload, active pressure set points
- ↗ Above the upper, or unload, active pressure set point

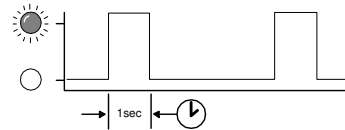
#### Unit Status:

- Stopped
- Standby
- Started and Running
- ⚠ Alarm (Warning)
- ❗ Shutdown (Trip)

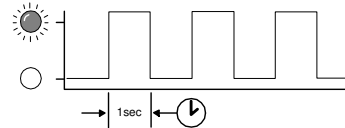
#### Indicators

- Off
- On

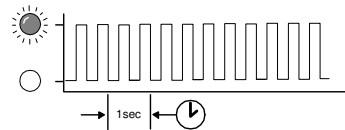
#### Intermittant:



#### Slow Flash:



#### Fast Flash:

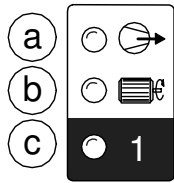


#### Unit Indicators

- ✓ Unit Run Indicator (Green LED)
  - OFF – Not Active, Stopped
  - ON – Active, Running
- ⚠ Unit Fault Indicator (Red LED)
  - Fast Flash: Shutdown (Trip)
  - Slow Flash: Alarm (Warning)

❗ The SX fault indicator does not indicate compressor fault states; see Compressor Status Indicators.

### 7.3 Compressor Status Indicators:



Each compressor in the system has a set of dedicated status indicators. The indicators will continuously show the status of each compressor at all times.

#### a) Load Status

- OFF – Not Loaded, Offload
- Slow Flash – The compressor has been requested to load but is not loaded (load or re-load delay period)
- ON – Loaded

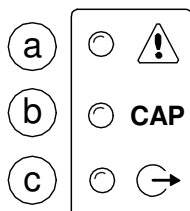
#### b) Run Status

- OFF – Not Running
- Slow Flash – The compressor has been requested to load but is not running (blowdown delay or other start delay)
- ON – Running

#### c) Available (Started)

- OFF – No Compressor Connected
- Fast Flash – Not Available, Shutdown Fault or Stopped
- Slow Flash – Alarm (Warning)
- Intermittent Flash – The compressor has been intentionally removed from service.
- Available, OK

### 7.4 System Alarms (Warnings):



#### a) Group Compressor Fault

- OFF – All Compressors OK

Fast Flash – One or more compressors Not Available, Shutdown Fault or Stopped

Slow Flash – One or more compressors Alarm (Warning)

#### b) Insufficient Capacity Alarm (Warning)

- On – Insufficient Capacity

#### c) Restricted Capacity Alarm (Warning)

Slow Flash – Restricted Capacity

### 7.5 Unit Functions:

#### Operating Mode:

- Equal Hours Run
- Timer Rotation
- Energy Control

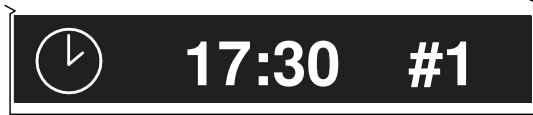
#### Active Functions:

- Power Failure Auto-Restart
- Table #1 Active
- Table #2 Active
- Table #3 Active
- Table #4 Active
- Standby Mode Active
- Prefill Function
- Pressure Schedule
- Function Inhibited (manual override)
- Remote Manual Override

## 7.6 User Menu

A number of User menu information displays are available that can be accessed directly from the front panel using the Up and Down navigation buttons.

### Real Time Clock:



17:30 (24hr system)

#1 = Monday to #7 = Sunday

### Compressor Detailed Status:



Compressor 1

'A' (Duty) sequence assignment

'100%' percentage load

Status Symbol:



Standby



Running, Offload



Running, Loaded



Removed From Service in Table  
Priority Selection (# = Table Number)



Removed From Service in Long Term  
Maintenance Menu



Removed From Service by Short Term  
I-PCB Maintenance Switch Function



Alarm (Warning)



Not Available, Shutdown (Trip), Stopped



Network Communications Error  
(RS485 connectivity only)

The detailed status of each compressor in the system is shown separately.

### Primary Detected Pressure:



The pressure detected on the unit's primary pressure sensor.

### Next Scheduled Sequence Rotation:




The next scheduled sequence rotation:


00:00 Time (24hr system)

#1 Monday








ⓘ A setting of zero hundred hours (00:00hrs) on Monday (#1) equates to a sequence rotation at one second past midnight on Sunday.

## 7.7 Information Displays

 To view detailed information applicable to the selected User menu display item press Enter.


 Press Escape to return to the normal user menu display items.

### Real Time Clock:











P00			
		 #1	18:30 
		T2	
			

Shows the next Pressure Schedule event.


- 1: The Current Active Table
- 2: Day (#1=Monday, #7=Sunday)
- 3: Time (24hr system)
- 4: Table

 Items 2 and 3 show the day and time that the unit will change to use the 'Table' shown in item 4.








### Compressor Status:

P00			
			V-485 
		100 % 	
		20 % 	
		30% 	

- 1: Compressor Number
- 2: Priority Setting
- 3: Compressor/Connection Type
- 4: Maximum Capacity % Setting
- 5: Minimum Capacity % Setting
- 6: Minimum Efficiency % Setting




 Item values 5 and 6 are only shown if compressor type is V-485 (variable capacity/speed).



### Primary Detected Pressure:


P00	
	 7.2 bar 
	 6.8 bar 
	 6.0 bar 

- 1: Active Table
- 2: Upper (Unload) Pressure Set Point
- 3: Lower (Load) Pressure Set Point
- 4: Minimum Pressure Alarm (Warning)

### Sequence Rotation:

P00	
	 #4 18:00
	18 / 05 / 2006
	A B C D


  Day of the week (#4: Thursday), the time of day (18:00) and the date (18/05/2006) of the next automated sequence rotation event.

 The active 'mode' of operation

"ABCD" The current active rotation sequence assignment.

### 7.8 Manual Sequence Rotation:

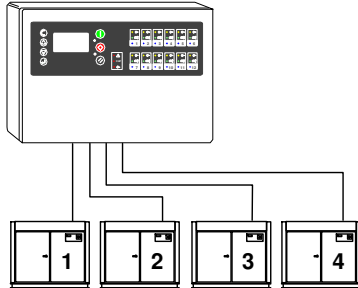
The sequence assignment can be manually rotated at any time. When viewing the 'Sequence Rotation' information screen press Enter:

 The manual rotation symbols will appear and flash. Press Enter again to execute a manual rotation or Escape to abandon the manual rotation.

Automated sequence rotation is not disrupted by a manual rotation; the next scheduled automated sequence rotation event will still occur.

## 7.9 Compressor Identification

Each compressor connected to the SX will have a unique assigned compressor identification number; starting at compressor 1 increasing sequentially to the number of compressors connected to the SX.



### 7.10 Stop:



To stop the SX press Stop.  
The SX will respond dependant on the setup of item 'CF' in menu S02:

✗ Pressure regulation control is automatically transferred back to each compressor. The compressor(s) will continue to operate using the pressure settings programmed or set in the individual compressor controller(s).

✓ The SX will hold each compressor in an offload state. If the compressor is equipped with a main motor run-on-time function the compressor will run offload for a period of time and then stop in to a 'standby' or 'auto restart' state.

ⓘ The design of some air compressor control systems may inhibit automatic transfer of pressure regulation control to local operation mode. In this instance the compressor will not continue production of compressed air – consult the air compressor manual or your air compressor supplier / specialist for details before installing the SX.

### 7.11 Start:



To start the SX press Start.  
If the 'Start Function' is enabled there will be a period of time before any compressor is requested to load.



Start Function

ⓘ To manually skip the Start function, press and hold Start for several seconds.

If the Prefill function is enabled, and system pressure is below the set prefill pressure, the system will enter Prefill mode for the set Prefill time.



Prefill

ⓘ To manually skip the Prefill function, press and hold Start for several seconds.

When Prefill is complete, if applicable, the SX will enter normal operating mode.

The SX will operate in accordance with the parameters and options set in the active 'Table'.



Tables

ⓘ Each compressor in the system must be started (running or in a standby or auto restart condition) before SX control of the compressor can be established. The SX will not start a compressor that is in a stopped condition.

### 7.12 Power Failure Auto-Restart



If the power failure auto-restart function is enabled the SX will automatically start, when power is restored after a disruption or failure, if the SX was in a 'started' state when the power disruption or failure occurred.

The SX will not automatically restart if the SX was in a stopped state when the power disruption or failure occurred.

### 7.13 Failure Mode

If the SX experiences a disruption to normal control, or an SX shutdown fault occurs, pressure regulation control is automatically transferred back to each compressor. The compressor(s) will continue to operate using the pressure settings programmed or set in the individual compressor controller(s).

### 7.14 Reset



To reset an SX Alarm (Warning) or Shutdown condition press Reset.

Compressor Alarm (Warning) conditions are automatically reset when the condition has been resolved and reset on the compressor.

Compressor Not Available (Shutdown, Trip) conditions are automatically reset when the condition has been resolved and reset on the compressor; and the compressor has been restarted.

### 7.15 Compressor Fault Indications

Compressor fault conditions are displayed by the compressor indicators and in the user menu status screen. Compressor fault conditions are not regarded as SX unit fault conditions.



Compressor Status Symbols and Compressor Status Indicators

### 7.16 Fault Codes

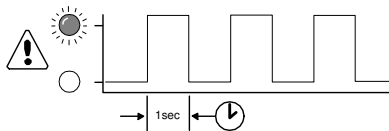
Fault codes are separated in to unit faults 'ERR' and system Alarms (Warning) 'SYS'.

**ERR:** Unit faults are errors with the SX controller itself and are all conditions that prevent normal operation from continuing.

**SYS:** System faults are items that arise from conditions external to the SX controller; the SX itself continues to function correctly.

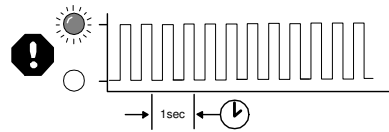
There are two types of Fault condition:

#### Alarm (Warning):



The Fault LED will 'slow flash' to indicate an Alarm (Warning) condition. An Alarm (Warning) indicates that the SX is continuing with normal operation but user attention is required. All Alarm (Warning) conditions are registered in the SX Error Log. All Alarm (Warning) conditions must be manually reset.

#### Trip (Shutdown):



The Fault LED will 'fast flash' to indicate a Trip (Shutdown) condition. A Trip (Shutdown) condition will stop normal operation of the SX. Pressure regulation control will automatically revert to the individual compressors that will continue to operate using the pressure settings for their own control systems. All Trip (Shutdown) conditions are registered in the SX Error Log. All Trip (Shutdown) conditions must be manually reset.

#### Fault Codes:

Each individual fault has a unique numeric code.

**ERR.01** Pressure Sensor Fault  
The signal from the control pressure sensor is out-of-range (<3.5mA or >21.8mA).

**ERR.04** Internal 24V Fault  
The 24VDC power supply, internal to the unit's controller, is below 19.2V (internal controller fault)


**ERR.05** Emergency Stop  
The wire link between terminals '+C' and 'C1' of the unit's controller is open circuit. These terminals are permanently connected together on the SX Terminal PCB: this error will never occur in normal operational circumstances.


**ERR.06** Real Time Clock Error  
The Real Time Clock device, internal to the unit's controller, has failed.


**ERR.07** XPM-LED Module Error  
Data communications with the internal XPM-LED (Status LED Display) module have been disrupted or lost.



**ERR.12** I-PCB Expansion Module C5-8  
Data communications with the external I-PCB Expansion module 'C:5-8' have been disrupted or lost.






**ERR.13**  I-PCB Expansion Module C5-8  
Short Circuit condition detected on external I-PCB Expansion module 'C:5-8'.


**ERR.14**  I-PCB Expansion Module C9-12  
Data communications with the external I-PCB Expansion module 'C:9-12' have been disrupted or lost.

**ERR.15**  I-PCB Expansion Module C9-12  
Short Circuit condition detected on external I-PCB Expansion module 'C:9-12'.


**SYS.01**   Excess Pressure (PM)  
Pressure has eSceeded the set Maximum Pressure Limit.

**SYS.02**   Min Pressure (Pm)  
Pressure has fallen below the set Minimum Pressure Limit (see 'Tables')


**SYS.04**  Capacity Alarm (Warning)  
Insufficient Capacity; all available compressors are loaded and pressure is still decreasing.

**SYS.05**  Remote Alarm (Warning)  
Auxiliary Input Function 'AA'

The auxiliary Input is set for 'Alarm (always active)' function and is in a Fault condition.

**SYS.06**  Remote Alarm (Warning)  
Auxiliary Input Function 'AR'

The auxiliary Input is set for 'Alarm (active when unit running)' function and is in a Fault condition.

**SYS.07**  Remote Trip (Shutdown)  
Auxiliary Input Function 'TA'

The auxiliary Input is set for 'Trip/Shutdown (always active)' function and is in a Fault condition.

**SYS.08**  Remote Trip (Shutdown)  
Auxiliary Input Function 'TR'

The auxiliary Input is set for 'Trip/Shutdown (active when unit is running)' function and is in a Fault condition.

**Internal Controller Fault 'E' Codes:**

'E' code errors are specific to the unit's 'internal to controller' digital logic circuits and will only occur in the most exceptional of circumstances.



*All 'E' code conditions are Trip (Shutdown) type faults. The 'Fault' (red) LED will 'fast flash' and the condition is registered in the Error Log. If an 'E' code fault condition persists, consult your product supplier for advice or renew the unit's controller.*

**E0836:** PLL Unlock; Internal failure or excessively high external electrical interference detected.

The main timing circuit (processor clock) has been disrupted and the processor is running on an 'internal to chip' back-up clock.

The back-up clock is intended to keep the processor running, at a much slower processing speed, to enable emergency actions to be taken. The controller is unable to continue running the main software application in this condition.

The unit will Shutdown; compressors will continue to operate using local pressure regulation.

The controller's main power supply must be removed and re-applied to reset this condition.

**E0866:** Controller internal power supply fault  
The low voltage logic processing power supply, internal to the unit's controller, is below minimum operational levels; internal to controller fault. Renew the controller if this fault condition persists. The Trip must be manually reset from the keypad.

**E5000:** Internal memory map error  
The unit's controller has detected disruption to the internal operational memory storage (RAM). The integrity of the RAM memory contents are suspect; the controller must be reset to clear and re-map the memory. Renew the controller if this fault condition persists. The controller's main power supply must be removed and re-applied to reset this condition.

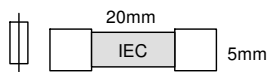
**E5001:** Internal memory failure  
The unit's controller has detected disruption to the internal permanent application memory storage (FLASH). The integrity of the FLASH memory contents is suspect. Re-load the main application software in the first instance; re-new the controller if the condition persists. The controller's main power supply must be removed and re-applied to reset this condition.

**To Display the Software Version:**

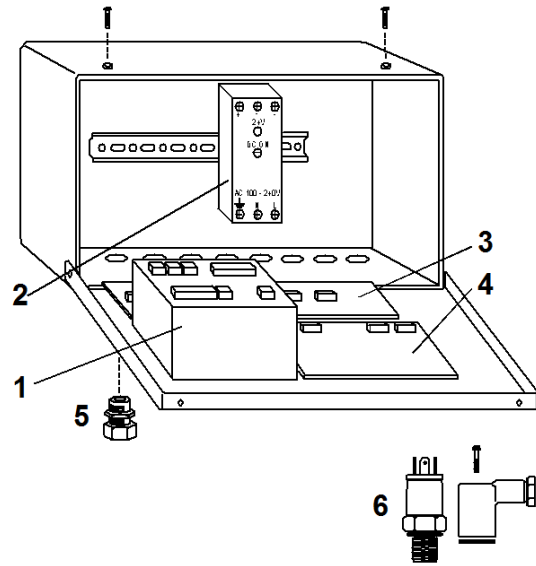
Press and hold Reset then press Escape. The user menu display item will show the software version ID (example: "E01").

## 8.0 Parts List

Item	Part No.	Description
-	Y07ENER06.00	Metacentre SX
-	Y07ENER14.00	Manual, User CD
1	Y06CM36.00	Unit, Controller
2	Y17CM01.00	Unit, PSU – 24Vdc
3	KPY06AJ.01C	PCB, Terminal
4	Y05CM32.00	Unit, XPM-LED
5	Y07CM49.00	Gland, Set - Pg13.5
6	Y04CM29.00	Sensor, Pressure 4-20mA, 232psi (16bar)



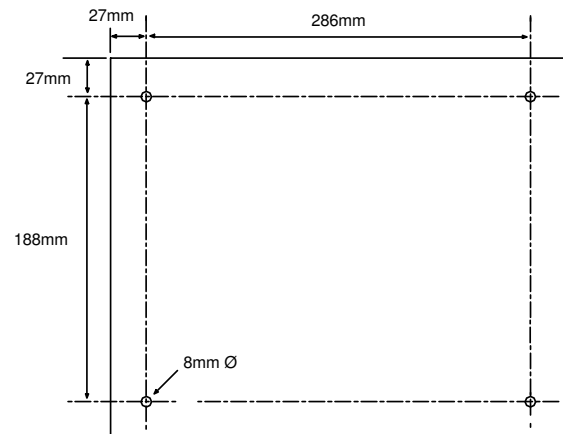
Qty	Part No.	Description
10	Y06CM42.00	IEC Fuse T1.0A
10	Y06CM43.00	IEC Fuse T1.6A
10	Y06CM44.00	IEC Fuse T3.15A



## 9.0 Technical Data

Dimensions	340mm x 241mm x 152mm 13.40" x 9.45" x 6.0"
Weight	7.5kg (16.5lb)
Mounting	wall, 4 x screw fixings
Enclosure	IP54, NEMA 12
Supply	230Vac +/- 10% 115Vac +/- 10%
Power	100VA
Temperature	0°C to 46°C (32°F to 115°F)
Humidity	95% RH, non-condensing

### Mounting Dimensions:









metacentre

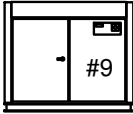
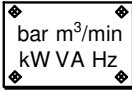
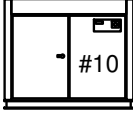
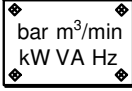
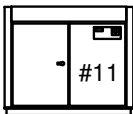
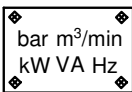
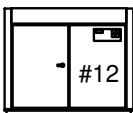
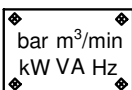
## SX Commissioning Form

Customer	Contact	Customer Ref:
	Phone	Internal Ref:
Installation/Site		Commission Date
Software	Ser No.	Commission Engineer

	 bar m <sup>3</sup> /min kW VA Hz	Comp #1 Manufacturer	
		Comp #1 Model/Type	
		Comp #1 Working Pressure	bar/psi
		Comp #1 Full Load Capacity	m <sup>3</sup> /min
	 bar m <sup>3</sup> /min kW VA Hz	Comp #2 Manufacturer	
		Comp #2 Model/Type	
		Comp #2 Working Pressure	bar/psi
		Comp #2 Full Load Capacity	m <sup>3</sup> /min
	 bar m <sup>3</sup> /min kW VA Hz	Comp #3 Manufacturer	
		Comp #3 Model/Type	
		Comp #3 Working Pressure	bar/psi
		Comp #3 Full Load Capacity	m <sup>3</sup> /min
	 bar m <sup>3</sup> /min kW VA Hz	Comp #4 Manufacturer	
		Comp #4 Model/Type	
		Comp #4 Working Pressure	bar/psi
		Comp #4 Full Load Capacity	m <sup>3</sup> /min

	 bar m <sup>3</sup> /min kW VA Hz	Comp #5 Manufacturer	
		Comp #5 Model/Type	
		Comp #5 Working Pressure	bar/psi
		Comp #5 Full Load Capacity	m <sup>3</sup> /min
	 bar m <sup>3</sup> /min kW VA Hz	Comp #6 Manufacturer	
		Comp #6 Model/Type	
		Comp #6 Working Pressure	bar/psi
		Comp #6 Full Load Capacity	m <sup>3</sup> /min
	 bar m <sup>3</sup> /min kW VA Hz	Comp #7 Manufacturer	
		Comp #7 Model/Type	
		Comp #7 Working Pressure	bar/psi
		Comp #7 Full Load Capacity	m <sup>3</sup> /min
	 bar m <sup>3</sup> /min kW VA Hz	Comp #8 Manufacturer	
		Comp #8 Model/Type	
		Comp #8 Working Pressure	bar/psi
		Comp #8 Full Load Capacity	m <sup>3</sup> /min

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		Comp #9 Manufacturer	
		Comp #9 Model/Type	
		Comp #9 Working Pressure	bar/psi
		Comp #9 Full Load Capacity	m <sup>3</sup> /min
		Comp #10 Manufacturer	
		Comp #10 Model/Type	
		Comp #10 Working Pressure	bar/psi
		Comp #10 Full Load Capacity	m <sup>3</sup> /min
		Comp #11 Manufacturer	
		Comp #11 Model/Type	
		Comp #11 Working Pressure	bar/psi
		Comp #11 Full Load Capacity	m <sup>3</sup> /min
		Comp #12 Manufacturer	
		Comp #12 Model/Type	
		Comp #12 Working Pressure	bar/psi
		Comp #12 Full Load Capacity	m <sup>3</sup> /min

T01	PH	High Pressure Set Point	bar/psi
T01	PL	Low pressure Set Point	bar/psi
T01	Pm	Minimum Pressure Alarm	bar/psi
T01	SQ	Sequence Rotation Mode	<input type="checkbox"/> EHR <input type="checkbox"/> TR <input type="checkbox"/> ENERGY
T01	01	Comp #1 Priority	
T01	02	Comp #2 Priority	
T01	03	Comp #3 Priority	
T01	04	Comp #4 Priority	
T01	05	Comp #5 Priority	
T01	06	Comp #6 Priority	
T01	07	Comp #7 Priority	
T01	08	Comp #8 Priority	
T01	09	Comp #9 Priority	
T01	10	Comp #10 Priority	
T01	11	Comp #11 Priority	
T01	12	Comp #12 Priority	
T02	PH	High Pressure Set Point	bar/psi
T02	PL	Low pressure Set Point	bar/psi
T02	Pm	Minimum Pressure Alarm	bar/psi
T02	SQ	Sequence Rotation Mode	<input type="checkbox"/> EHR <input type="checkbox"/> TR <input type="checkbox"/> ENERGY
T02	01	Comp #1 Priority	
T02	02	Comp #2 Priority	
T02	03	Comp #3 Priority	
T02	04	Comp #4 Priority	
T02	05	Comp #5 Priority	
T02	06	Comp #6 Priority	
T02	07	Comp #7 Priority	
T02	08	Comp #8 Priority	
T02	09	Comp #9 Priority	
T02	10	Comp #10 Priority	
T02	11	Comp #11 Priority	
T02	12	Comp #12 Priority	
T03	PH	High Pressure Set Point	bar/psi
T03	PL	Low pressure Set Point	bar/psi
T03	Pm	Minimum Pressure Alarm	bar/psi
T03	SQ	Sequence Rotation Mode	<input type="checkbox"/> EHR <input type="checkbox"/> TR <input type="checkbox"/> ENERGY
T03	01	Comp #1 Priority	
T03	02	Comp #2 Priority	
T03	03	Comp #3 Priority	
T03	04	Comp #4 Priority	

T03	05	Comp #5 Priority	
T03	06	Comp #6 Priority	
T03	07	Comp #7 Priority	
T03	08	Comp #8 Priority	
T03	09	Comp #9 Priority	
T03	10	Comp #10 Priority	
T03	11	Comp #11 Priority	
T03	12	Comp #12 Priority	
T04	PH	High Pressure Set Point	bar/psi
T04	PL	Low pressure Set Point	bar/psi
T04	Pm	Minimum Pressure Alarm	bar/psi
T04	SQ	Sequence Rotation Mode	<input type="checkbox"/> EHR <input type="checkbox"/> TR <input type="checkbox"/> ENERGY
T04	01	Comp #1 Priority	
T04	02	Comp #2 Priority	
T04	03	Comp #3 Priority	
T04	04	Comp #4 Priority	
T04	05	Comp #5 Priority	
T04	06	Comp #6 Priority	
T04	07	Comp #7 Priority	
T04	08	Comp #8 Priority	
T04	09	Comp #9 Priority	
T04	10	Comp #10 Priority	
T04	11	Comp #11 Priority	
T04	12	Comp #12 Priority	
P02	PF	Prefill Function	<input type="checkbox"/> X <input type="checkbox"/> √ <input type="checkbox"/> √ !>X <input type="checkbox"/> √ A^^
P02	PT	Prefill Time	sec
P02	PP	Prefill Pressure	bar/psi
P02	-	Primary Compressors	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12
P02	-	Backup Compressors	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12
S01	PS	Pressure Schedule	<input type="checkbox"/> X <input type="checkbox"/> √
S01	AR	Auto Restart	<input type="checkbox"/> X <input type="checkbox"/> √
S01	RP	Rotation Interval	
S01	TS	Default Table Select	
S02	NC	Number of Compressors	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12
S02	PM	Max Pressure Alarm	bar/psi
S02	CF	Stop Control Function	<input type="checkbox"/> X <input type="checkbox"/> √
S02	TO	Tolerance	
S02	DA	Damping	
S02	PC	Pressure Change Time	min
S02	AI	Auxiliary Input	
S02	AO	Auxiliary Output	
S02	CA	Capacity Alarm	<input type="checkbox"/> X <input type="checkbox"/> √
S02	MA	Capacity Restricted Alarm	<input type="checkbox"/> X <input type="checkbox"/> √
S03	01	Aux I/O Box #1	<input type="checkbox"/> X <input type="checkbox"/> √
S03	02	Aux I/O Box #2	<input type="checkbox"/> X <input type="checkbox"/> √
S03	BT	RS485 Timeout	sec
S04	1o	Pressure Offset	bar/psi
S04	1r	Pressure Range	bar/psi



C01	01	Compressor #1 Hours	hrs
C01	02	Compressor #2 Hours	hrs
C01	03	Compressor #3 Hours	hrs
C01	04	Compressor #4 Hours	hrs
C01	05	Compressor #5 Hours	hrs
C01	06	Compressor #6 Hours	hrs
C01	07	Compressor #7 Hours	hrs
C01	08	Compressor #8 Hours	hrs
C01	09	Compressor #9 Hours	hrs
C01	10	Compressor #10 Hours	hrs
C01	11	Compressor #11 Hours	hrs
C01	12	Compressor #12 Hours	hrs

C03	01	Compressor #1 Type	<input type="checkbox"/> I-PCB <input type="checkbox"/> I-485 <input type="checkbox"/> V-485
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	02	Compressor #2 Type	<input type="checkbox"/> I-PCB <input type="checkbox"/> I-485 <input type="checkbox"/> V-485
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	03	Compressor #3 Type	<input type="checkbox"/> I-PCB <input type="checkbox"/> I-485 <input type="checkbox"/> V-485
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	04	Compressor #4 Type	<input type="checkbox"/> I-PCB <input type="checkbox"/> I-485 <input type="checkbox"/> V-485
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	05	Compressor #5 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	06	Compressor #6 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	07	Compressor #7 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	08	Compressor #8 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%

C03	09	Compressor #9 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	10	Compressor #10 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	11	Compressor #11 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%
C03	12	Compressor #12 Type	<input type="checkbox"/> I-485 <input type="checkbox"/> V-485 <input type="checkbox"/> I-PCB
C03	-	Start Time	sec
C03	-	Max Capacity	%
C03	-	Min Capacity	%
C03	-	Min Efficiency	%