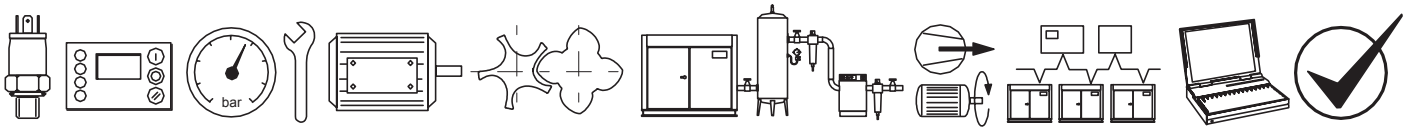


Net$sync II

Conductor 12

Quincy COMPRESSOR

Index

Refere to Section Indicated

Note

Important or Caution, Safety

1. Safety Precautions

ALWAYS EMPLOY SAFE WORKING PRACTESES 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 practices 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.

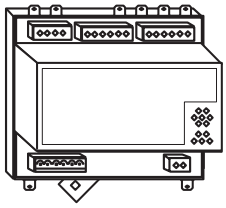
Do not paint the control facial or obscure any indications, controls, instructions or warnings.

2. INTRODUCTION

The Net$ync II Conductor 12 is a specialised supervisory and control product designed to provide energy efficient optimised pressure and sequence management of up to 12 air compressors operating on a common air system. The Net$ync II Conductor 12 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 Conductor 12 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 (Q485) is installed within the compressor control area and connected to the Conductor 12 using a six-wire cable.

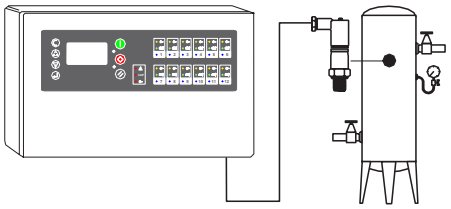
Each air compressor must be equipped with a load/unload regulation system and, if not regulated with a single electro-mechanical pressure switch, have a facility for a remote load/unload control with the ability to accept a volt free switching contact input for remote load/unload.

As default the Conductor 12 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 Conductor 12 using optional local direct connect modules (iX Modules).

(!) Consult the air compressor manual or your air compressor supplier/specialist for details before installing the Conductor 12 unit.

2.2 Pressure Detection and Control

The Net$ync II Conductor 12 utilises the signal from an electronic pressure sensor that can be mounted remotely from the Net$ync II Conductor 12 in a suitable location in the compressed air system.

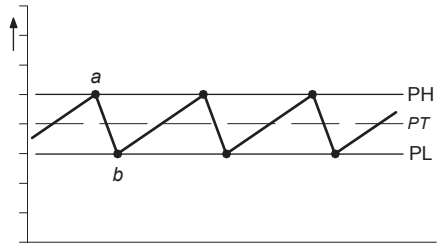


As default the Net$ync II Conductor 12 is setup for operation with a 16bar (232psi) pressure sensor but can accept input from any 4-20mA type pressure sensor with a range from 1.0bar (14.5psi) up to 600bar (8700psi).

3. Features and Functions

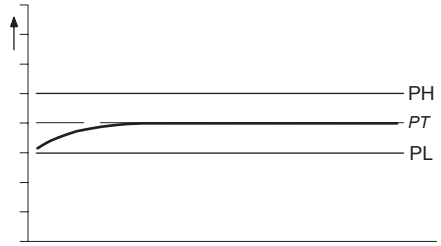
3.1 Pressure Control:

The primary function of the Conductor 12'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 Conductor 12 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).

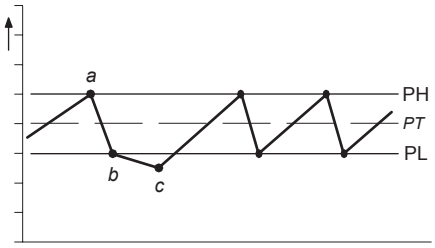


Where abrupt, or significant, changes in air demand, beyond the capacity scope of the variable capacity compressor, are experienced, the loading and unloading of other compressors is implemented in exactly the same way as described above.

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 Conductor 12 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.

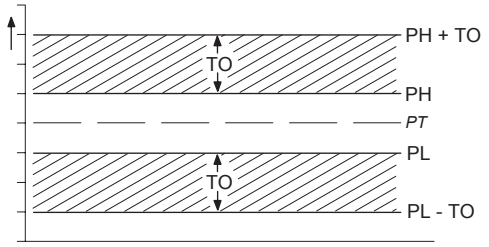


The same method is implemented in reverse (above the High Pressure set point) when an abrupt, or significant, decrease for air demand is experienced.

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 Conductor 12 (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 Conductor 12 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 Conductor 12 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 Conductor 12, 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 Conductor 12'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

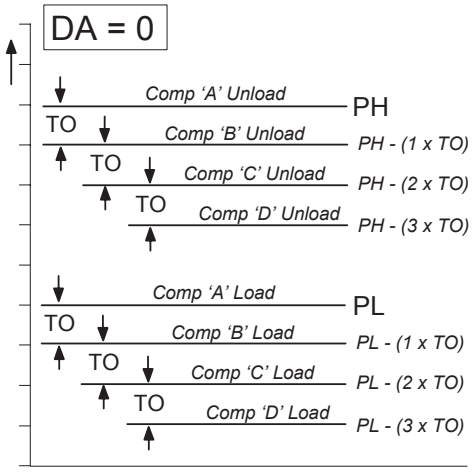
In such instances the Conductor 12 may over-react and attempt to load an additional compressor that may not be necessary once the initial compressor is running, loaded, and able to contribute adequate additional generation capacity. If an increase in the 'tolerance' band is insufficient, the Conductor 12'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.

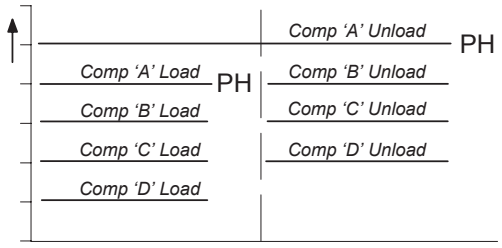
3.3.1 Fixed Cascade Mode

This mode is intended for special applications and is not recommended for use in normal situations. Avoid setting the damping factor to '0.0' unless the installation specifically requires this mode of operation.

To implement fixed pressure set point 'cascade' mode adjust the 'damping' factor (DA) to 0.0(zero). In this mode automated single pressure band control is disabled and each compressor is assigned fixed load and unload pressure set points; simulating a multiple pressure switch cascade system. The set points are determined by the PH (unload) and PL (load) pressure levels and are 'cascaded' below these settings at differentials determined by the set 'tolerance' band (TO).



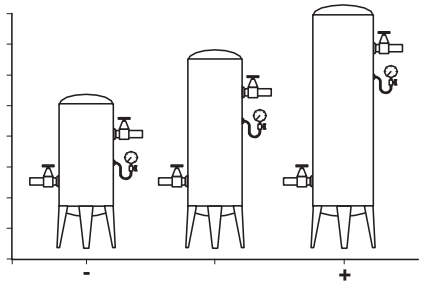
It is permissible for the 'Unload' and 'Load' levels to overlap if the 'PH' and 'PL' levels are set close together.



The pressure set points are not dynamic and remain fixed and unchanging. The 'average' system pressure will decrease dependant on the number of compressor(s) running as demand increases.

This is not an energy efficient focused mode of operation.

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 ft3 to metric units first.

1.0 m^3	= 35.315 ft^3
1.0 m^3/min	= 35.315 cfm
1.0 bar	= 14.5 psi

Example: for a system that operates with a maximum normal demand air flow of 36m3/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 x ((m^3/min) / (bar.g – 1))

3.5 Sequence Control Strategies:

The Conductor 12 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 Conductor 12 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 fourcompressor 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 Conductor 12 continuously monitors the running status of each compressor and maintains a record of the accumulated running hours. These are available, and adjustable, in the Conductor 12's compressor running hour's menu. The Conductor 12 uses these values in EHR mode. The Conductor 12'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 Conductor 12 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.

	1	2	3	4
#1	A	B	C	D
#2	D	A	B	C
#3	C	D	A	B
#4	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.

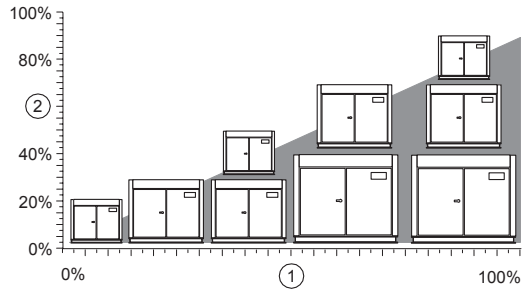
Energy Control Mode

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.

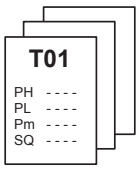
The basic principle of the Energy Control strategy is the efficient utilisation of available resources matched to fluctuations in demand.



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 Conductor 12 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 Conductor 12. The Conductor 12 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 Conductor 12 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.

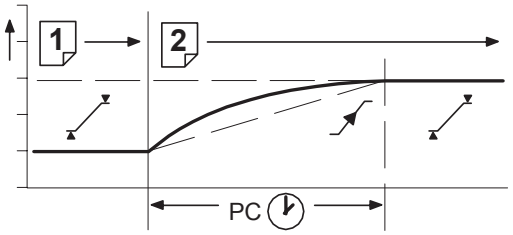
1) PH: High pressure set point
2) PL: Low pressure set point
3) Pm: Minimum pressure warning level
4) SQ: Sequence rotation mode
5) 01: Compressor 1 Priority setting
6) 02: Compressor 2 Priority setting
7) 03: Compressor 3 Priority setting
8) 04: Compressor 4 Priority setting

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 Conductor 12 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.



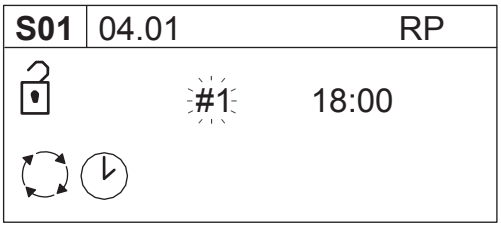
The time the system will take to complete the transition from one pressure target to another is determined by the 'Pressure Change' time (PC). This value can be adjusted to accommodate installation characteristics to achieve the transition at optimal energy efficiency.

If the Conductor 12 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 predetermined time each day or a pre-determined day and time each week.



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

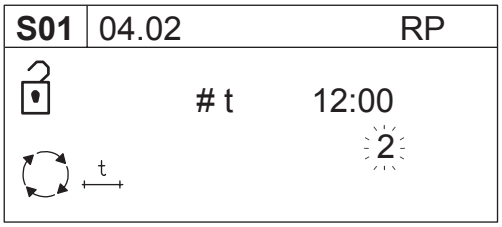
Select the 'day' or day function as required:

#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:



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	3	4
	1	**2**	**2**	**2**
#1	A	B	C	D
#2	A	C	D	B
#3	A	D	B	C
#4	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	2	3	4
	1	**1**	**1**	**2**
#1	A	B	C	D
#2	B	C	A	D
#3	C	A	B	D
#4	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

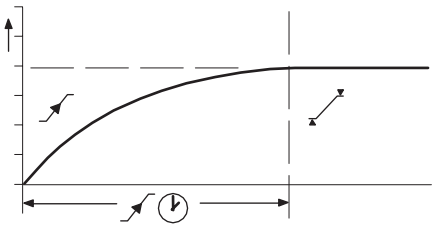
	1	2	3	4
	1	**2**	**2**	**3**
#1	A	B	C	D
#2	A	C	B	D
#3	A	B	C	D
#4	A	C	B	D

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	2	3	4
	1	**1**	**2**	**2**
#1	A	B	C	D
#2	B	A	D	C
#3	A	B	C	D
#4	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 Conductor 12 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 Conductor 12 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 preselection 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 preselected 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.

√ [!→X] 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.

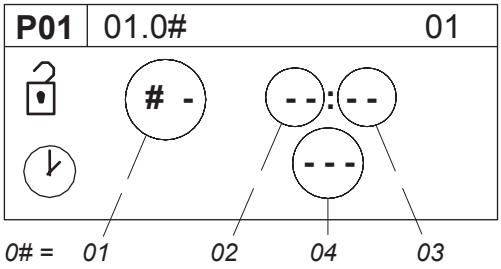
√ [A^^] Automatic Mode: No Prefill compressor selection is necessary; any selection set is ignored. The management unit automatically selects compressor(s) dynamically to achieve pressure in accordance with the set Prefill time. If a compressor is stopped, or shuts down, it is automatically substituted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

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

3.8 Pressure Schedule:

The Conductor 12 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.

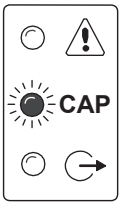


01) Day of the Week
#1 = Monday to #7 = Sunday
#8 = every working day of the week; Monday to Friday, eSXluding Saturday and Sunday.
#9 = every working day of the week.
Select "-" (dash) and enter to delete a setting from the schedule.

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 Conductor 12 memory until the last sub-setting is entered. Press Escape to step back one sub-item if required.

3.9 Insufficient Capacity Alarm



The Net$ync II 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 Net$ync II 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

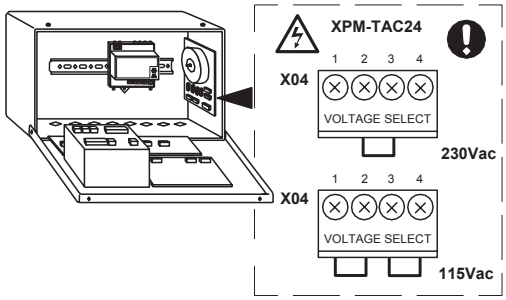
It is recommended that installation and commissioning be carried out by an authorised and trained product supplier.

4.1 Unit Location

The Conductor 12 is wall mounting using conventional screw fixings. The Conductor 12 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 Conductor 12. 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).

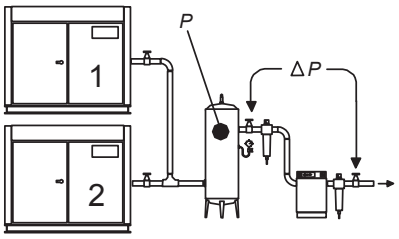


Check the input voltage select links on the Conductor 12 power supply PCB (XPM-TAC24). Adjust if necessary.

4.3 Pressure Sensor Location

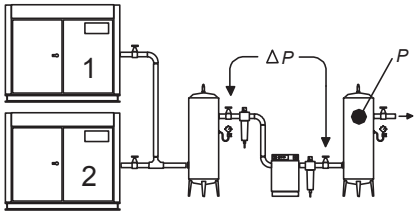
The system pressure sensor (P) must be located in a position that will continuously experience pressure that is common to all compressors.

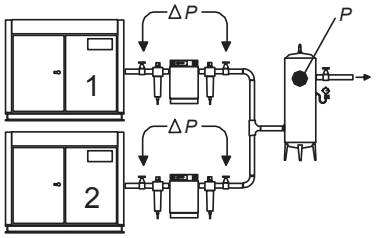
Generation Side Pressure Control:



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:



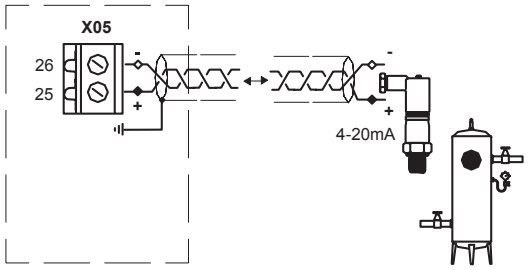


Ensure each compressor is equipped with independent excess pressure shutdown; an increase in pressure differential across air treatment equipment can result in excess compressor discharge pressure.

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 Conductor 12 using an earth screened, two-core (0.5mm2 CSA minimum), cable no greater than (100m) 330ft in length.



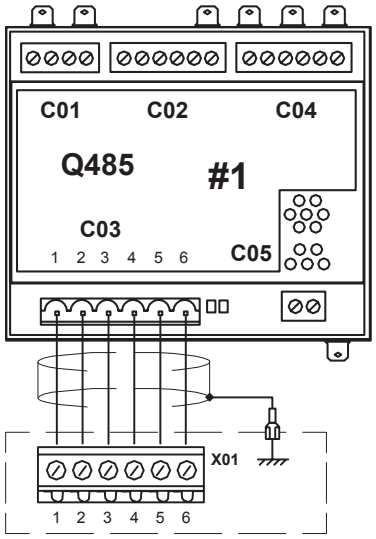
Wire polarity is important

4.5 Compressor Interface PCB

The ‘Q485’ is designed to interface a compressor with the Conductor 12 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 Conductor 12 utilising an ‘Q485,’ the signal wires must be connected to the Conductor 12 terminals dedicated for the assigned compressor reference number.



The ‘Q485’ 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 Conductor 12.

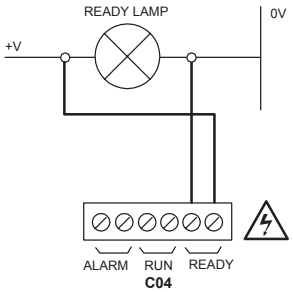
The ‘Q485’ uses a 12V to 250V input voltage detection system and universal relay contact control outputs (250V ‘CE’ / 115V ‘UL’ @ 5A maximum). Integrated directly into the circuits of an air compressor, the ‘Q485’ avoids the need for additional relays or remote inputs. The ‘Q485’ also acts as an electrical barrier between the compressor and the Conductor 12 providing protection and voltage isolation.

4.5.1 Input Functions

The ‘Q485’ is fitted with a six-pin terminal C04 for compressor monitoring. The ‘Q485’ 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 Conductor 12 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.

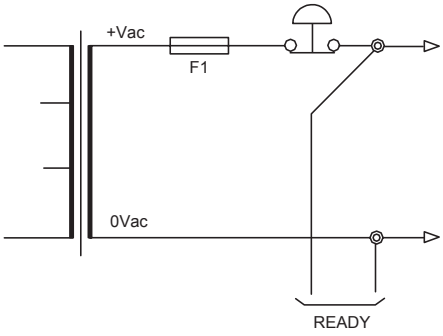
The voltage to this input must de-energise when the compressor is stopped and unavailable to produce air upon a load signal, or the Emergency Stop button is pressed, or when the compressor experiences a fault that prevents the compressor from running.

When the compressor ready lamp, or other control circuit, is energised the 'Q485' will detect the voltage and signal the Conductor 12 that the compressor is ready and available to load and produce air when a load request signal is given.

The 'Q485' input common terminal must always be connected to the neutral, common or 0V line of the applied input voltage.

Ready Input, Alternative Connection Method:

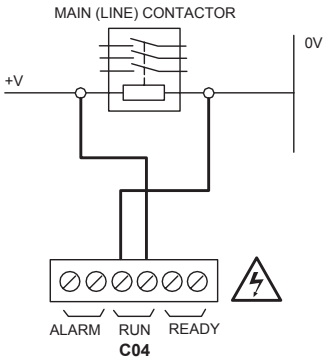
In instances where a convenient voltage signal for a compressor ready condition is not available the 'Ready' input can be connected directly to a constant compressor control system power supply voltage (12V to 250Vac or dc). This will signal the Conductor 12 that the compressor is ready and available at all times when power is applied to the compressor. The Conductor 12 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 Conductor 12 requests a compressor to run/load, but fails to detect a RUN signal within 60 seconds, the Conductor 12 will regard the compressor as 'not ready' and indicate the compressor as not available. If a RUN signal is detected at any time, the Conductor 12 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:



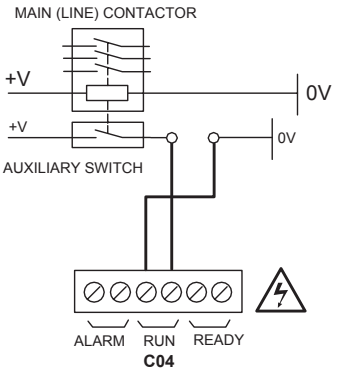
The RUN input will accept 12V to 250V ac (50/60Hz) only (DC cannot be used).

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 'Q485' will detect the voltage across the contactor coil terminals and signal the Conductor 12 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.



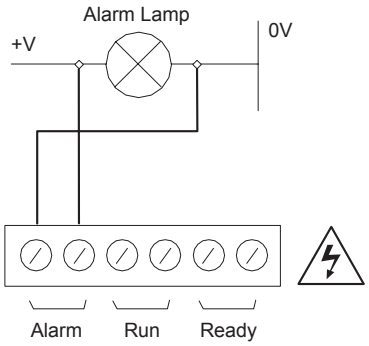
In instances where a motor starter contactor is not available or accessible, any part of a compressor control circuit that is energised when the compressor is running can be monitored. For example: fan contactor or voltage signal to a remote starter.

The ‘Q485’ input common terminal must always be connected to the neutral, common or 0V line of the applied input voltage.

Alarm Input (optional):

The ‘Q485’ 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.



C04

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.

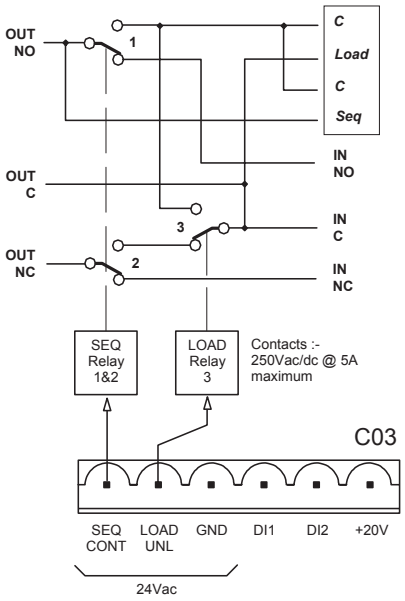
If an alarm condition is experienced the compressor alarm lamp, or alarm circuit, will energise. The ‘Q485’ will detect the voltage and signal the Conductor 12 that an alarm has occurred. If the compressor has no accessible alarm circuit, or this function is not required, the ‘Q485’ alarm terminals can be ignored.

The ‘Q485’ 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 Conductor 12 will control the ‘Q485’ load/unload relay outputs in accordance with the active system load and unload pressure set points. The ‘Q485’ load/unload relay contacts can be used for compressor controllers that have ‘pressure switch’ load/unload regulation.

‘Q485’ Internal Output Circuits



The C01 and C02 terminal functions of the ‘Q485’ are intended to control load and unload regulation of the compressor.

Pressure Switch Regulation:

For air compressors fitted with an electromechanical 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.

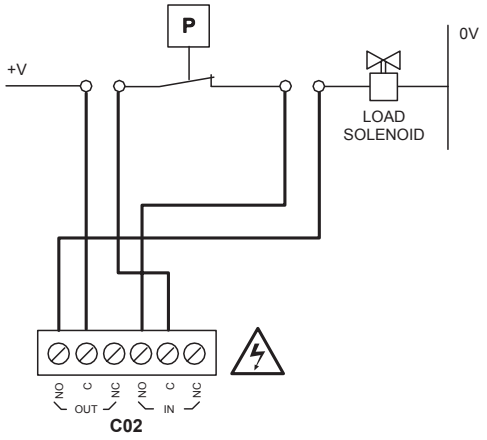
When connected the pressure switch can be switched in and out of circuit automatically. If the Conductor 12 is stopped or experiences a failure or loss of power, pressure control will automatically revert back to the pressure switch and the compressor will continue to operate in ‘Local’ mode.

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 Conductor 12 inoperability.

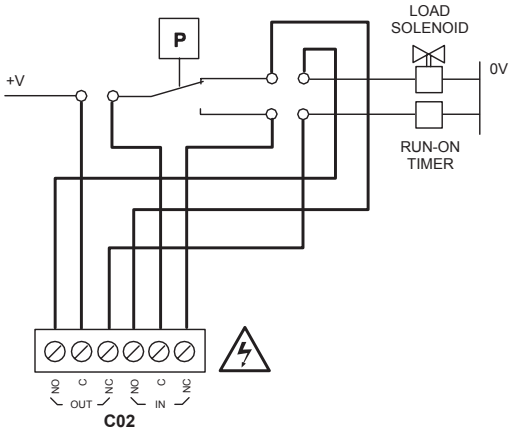
The NC (normally closed) and NO (normally open) terminal references of the 'Q485' are related to internal connection functions and should not be referenced to the connections of a compressor pressure switch; which will generally be in reverse order.

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:

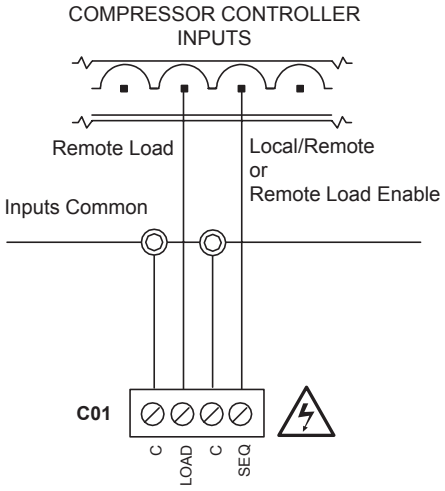
For air compressors controllers fitted with 'Remote/Local Pressure Regulation' digital inputs, a 4-pin connector C01 has been provided.

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 Conductor 12 is stopped or experiences a fault or loss of power.

Load and Sequence Connection:

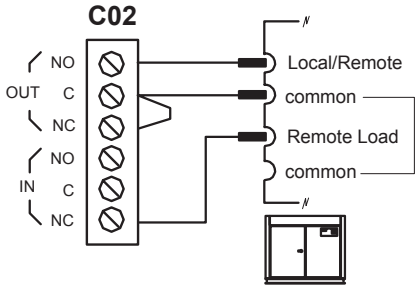


Compressors that use electronic pressure detection but are not equipped with a remote pressure control enable feature will not automatically revert to local control if the Conductor 12 is stopped or experiences a fault or loss of power.

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 'Q485' pressure switch terminal contacts can be used to achieve the correct switching logic.



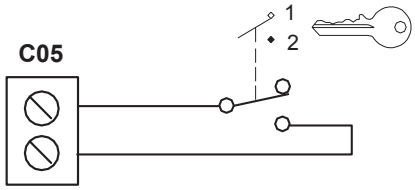
Examine the 'Q485' internal output circuit diagram to establish any desired switching logic that may differ from normal practise.

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 'Q485' 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 'Q485' is equipped with a volt-free input (terminal C05) that can be used to remove the compressor from Conductor 12 control, without generating a fault condition, during short-term maintenance or servicing periods.



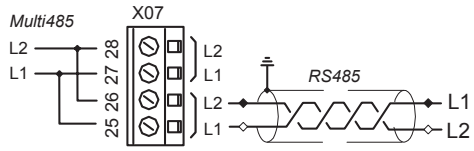
When the 'Service Maintenance Switch' input terminal pins are connected together, using a volt-free switching contact, the Conductor 12 will indicate that the compressor is not available but will not generate an Alarm, Trip or Shutdown condition. The Conductor 12 will also remove the compressor from 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 EnergAir Net$ync II Conductor 12 using a Multi485 network connection, for compressor controller's equipped with Multi485 communications, or using one of a number of networkable EnergAir Net$ync II compressor integration products.

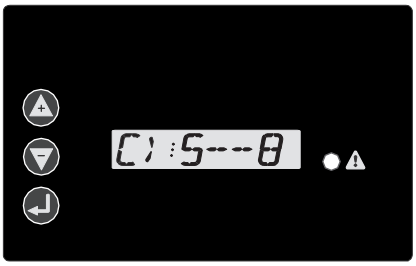


The Net$ync II Conductor 12 is not equipped with any direct connect, hardwire, 'Q485' interface terminals as standard.

4.7 'Direct Connect Gateway' Expansion Modules (Option)

Direct connect, hardwire 'Q485' interface modules, can be added with the use of optional 'Direct Connect Gateway' Module(s). Each 'Direct Connect Gateway' module adds four direct connect 'Q485' terminals. Up to three 'Direct Connect Gateway' modules can be connected to the Conductor 12 to provide a maximum of 12 direct connect 'Q485' terminals.

The 'Direct Connect Gateway' Module is wall mounting and must be located adjacent to the Net$ync II Conductor 12 unit.



The 'Direct Connect Gateway' Expansion Module can be set to function as 'Q485' connections for:

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

(!) The Conductor 12 is already equipped with 'Q485' terminals dedicated for compressors 1 to 4; do not set the 'Direct Connect Gateway' for 'C:1-4' mode in this instance.

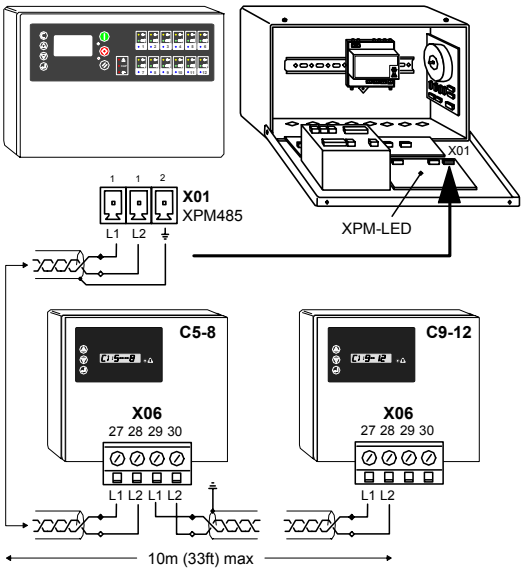
To set the 'Direct Connect Gateway' module function:

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 Conductor 12 will register the presence of an 'Direct Connect Gateway' Module(s) at power-up. After registration the appropriate compressor(s) can be selected for 'Q485' type in the Conductor 12 compressor configuration menu.

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

'Direct Connect Gateway' module connection:



(!) Use a twisted pair, earth shielded, 0.25mm2-1.0mm2 data communications cable with a total length no greater than 10m (33ft).

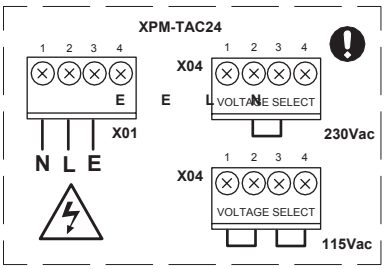
Conductor: Terminal X01 of the 'XPM-LED' PCB

Expansion Module(s): Terminal X06

(!) Polarity is important.

'Direct Connect Gateway' module power supply:

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



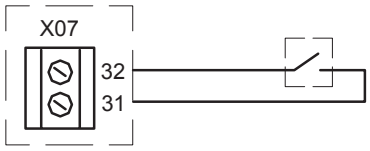
(!) Before applying power to the 'Direct Connect Gateway' Module ensure that the power supply connections are correct and secure and that the operating voltage selector is set correctly for the power supply voltage in use; 115Vac or 230Vac (+-10%), 50/60Hz.

4.8 Auxiliary Input (Option)

The Conductor 12 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



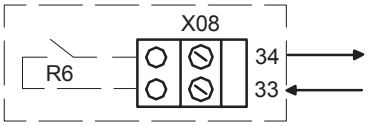
The input is designed to detect a remote 'voltfree' switching contact (rated for a minimum 24VDC @ 10mA).

4.9 Auxiliary Output (Option)

The Conductor 12 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.

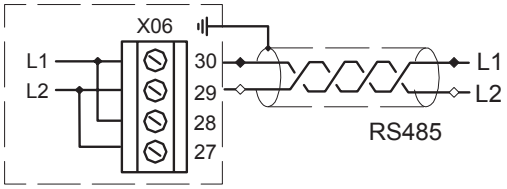
Menu Items – S02:AO



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

4.10 RS485 Communications

The Conductor 12 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.

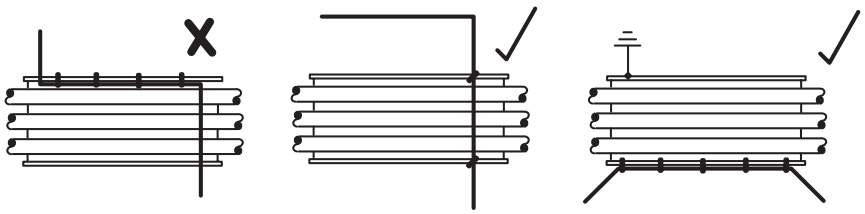


RS485 data communications and other low voltage signals can be subject to electrical interference. This potential can result in intermittent malfunction or anomaly that is difficult to diagnose. To avoid this possibility always use earth shielded cables, securely bonded to a known good earth at one end.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

a) 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.

b) If it is necessary to follow the route of power supply cables for a short distance (for example: from a compressor Conductor 12 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.

c) 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 Conductor 12, 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 Conductor 12 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 Conductor 12 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 Conductor 12.

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

S04 – 1O	Sensor Offset Calibration
S04 – 1R	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

S02 - NC	Number of Compressors
S02 - PM	Maximum Pressure Alarm
S02 - CF	Stop Control Function
S01 - Ct	Real Time Clock Set
S01 - AR	Auto Restart Enable
S01 - RP	Rotation Interval
C03 – 01/12	Compressor #1-12 Configuration
C01 - 01/12	Compressor #1-12 Running Hours
T01 - PH	High Pressure Set Point
T01 - PL	Low Pressure Set Point
T01 - Pm	Minimum Pressure Alarm
T01 - SQ	Sequence Algorithm
T01 – 01/12	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.

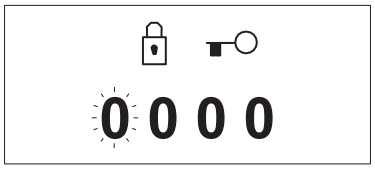
All adjustable value, parameter or option item displays are grouped into ‘menu mode’ lists. Items are assigned to a list according to type and classification. Item lists are identified by page number (or menu number); All adjustable parameters and options are assigned to menu mode pages ‘P01’ or higher.

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 Accepted

Access Code Rejected

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.

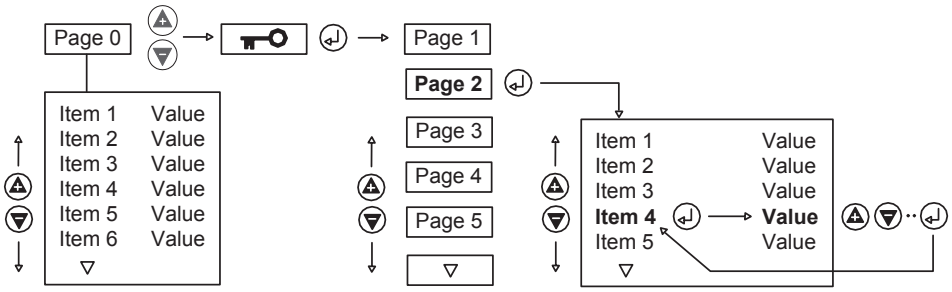
Menu Mode Navigation:

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

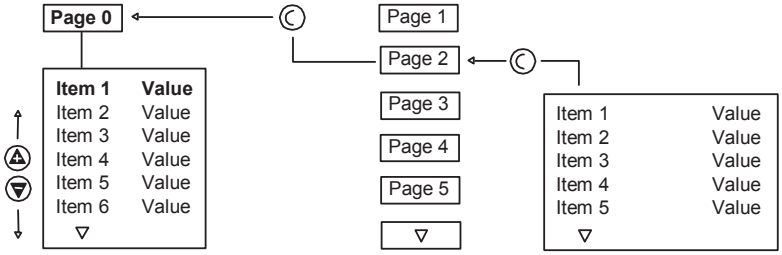
To select a menu ‘page’ press UP or DOWN. To enter the highlighted menu ‘page’ press ENTER; the first item of the menu ‘page’ will be highlighted. Press UP or DOWN to scroll though the selected menu ‘page’ items.

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

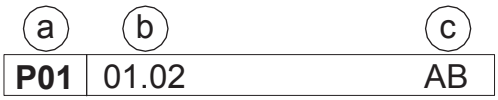
The value or option can now be modified by pressing UP(Plus) or DOWN(Minus). To enter a modified value or option in to memory press ENTER.



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) 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.



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 Conductor 12 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 Conductor 12 is in an operational state; stop the Conductor 12 first.

6.1 Menus

USER Level Menus *(0011)*

TABLE #1

T01

PH H igh Pressure Set Point
PL L ow Pressure Set Point
Pm M inimum Pressure Alarm
SQ S equence Algorithm
01 C ompressor #1 Priority
to **12** C ompressor #12 Priority

TABLE #2

T02

PH H igh Pressure Set Point
PL L ow Pressure Set Point
Pm M inimum Pressure Alarm
SQ S equence Algorithm
01 C ompressor #1 Priority
to **12** C ompressor #12 Priority

TABLE #3

T03

PH H igh Pressure Set Point
PL L ow Pressure Set Point
Pm M inimum Pressure Alarm
SQ S equence Algorithm
01 C ompressor #1 Priority
to **12** C ompressor #12 Priority

TABLE #4

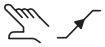
T04

PH H igh Pressure Set Point
PL L ow Pressure Set Point
Pm M inimum Pressure Alarm
SQ S equence Algorithm
01 C ompressor #1 Priority
to **12** C ompressor #12 Priority

Pressure Schedule

P01

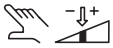
01 S chedule Setting #1
to **28** S chedule Setting #28



Prefill

P02

PF P refill Function
PT P refill Time
PP P refill Pressure
01 C ompressor #1
to **12** C ompressor #12



User Configuration

S01

Ct R eal Time Clock Set
PS P ressure Schedule Enable
AR A uto Restart Enable
RP R otation Interval
TS D efault Table Select
BL D isplay Backlit Adjust

Compressor Running Hours

C01

01 C ompressor #1 Running Hours
to **12** C ompressor #12 Running Hours

Compressor Maintenance

C02

01 C ompressor #1 Maintenance
to **12** C ompressor #12 Maintenance

Fault Log

E01

01 F ault Log #1 (most recent)
to **15** F ault Log #15

SERVICE Level Menus *(0021)*

Configuration

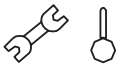
S02

P> P ressure Units
NC N umber Of Compressors
PM M aximum Pressure Alarm
CF S top Control Function
TO T olerance
DA D amping
PC P ressure Change Time
AI A uxiliary Input Function
AO A uxiliary Output Function
CA C AP Alarm Inhibit
MA M ax Cap Restricted Alarm Inhibit
ER E rror Log Reset

Auxiliary Box Monitoring

S03

01 A uxiliary Box #1 Enable
02 A uxiliary Box #2 Enable
BT R S485 Timeout



Sensor Calibration

S04

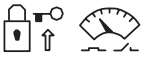
1O P ressure Offset
1R P ressure Range

Compressor Configuration

C03

01 C ompressor #1 Configuration
to
12 C ompressor #12 Configuration

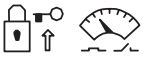
High Level Menus *(0032)*



Diagnostic Menu 1

D01

D1 D igital Input #1 (Di 1)
to
D8 D igital Input #8 (Di 8)
R1 O utput Relay #1 (R1)
to
R6 Output Relay #6 (R6)
A1 A nalogue Input #1 (Ai1)
A2 Analogue Input #2 (Ai2)
A3 Analogue Input #3 (Ai3)
Ao Analogue Output (Ao)

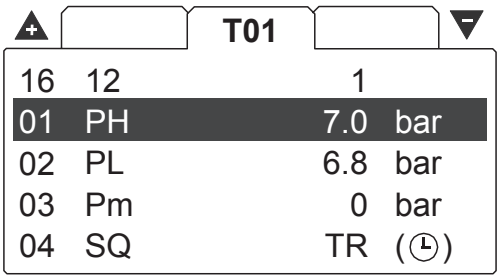


Diagnostic Menu 2

D02

SI Screen Invert
LT L ED Panel Test

6.2 Menu Items:



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 miniumum 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.

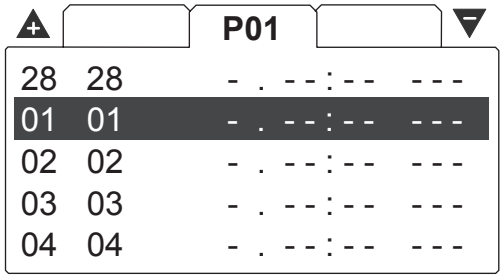
T0# - 02 Compressor #2 Priority
The 'priority' setting for compressor number 2 that will be used when the table is active.

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*

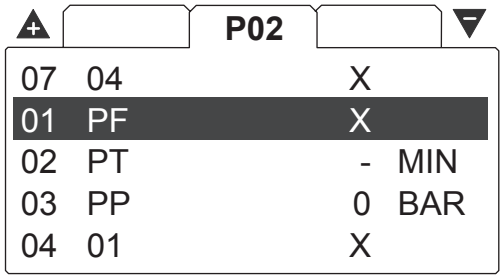
Priority Settings:

X : 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.



Pressure Schedule

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



Prefill

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

X = 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 acceptible 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.

X = 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.

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

X = inhibit Pressure Schedule

√ = enable Pressure Schedule

S01 - AR Auto Restart Enable

X = inhibit Power Failure Auto Restart

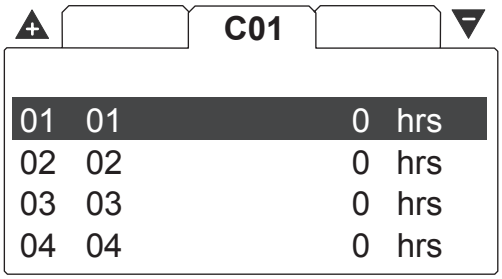
√ = enable Power Failure Auto Restart

The SX will only automatically restart when power is restored if the Conductor 12 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.

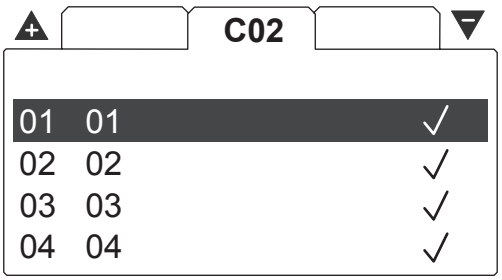


Control - Equal Hours Run Mode

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*'

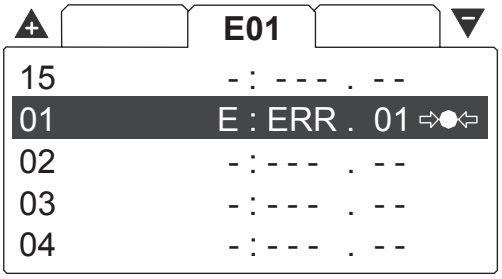
'***n***' = number of compressors in the system.



✕ = Remove compressor from operation

✓ = Compressor can be utilised

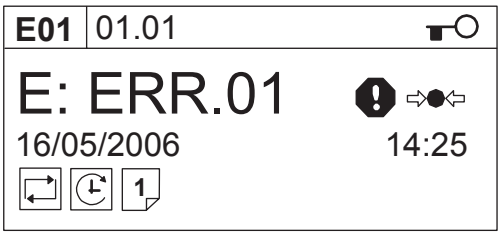
For a compressor(s) that is unavailable for use for a prelonged period for time due to maintenance or repair. The compressor will not be utilised under any circumtances; any Alarm (Warning) or Trip (shutdown) fault will be ignored.



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.

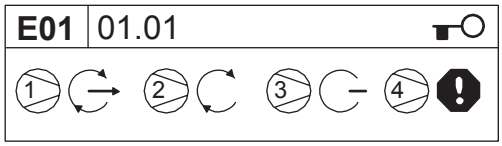


The first information display shows the:

a) The Error Code
b) Error Code symbols (if applicable)
c) The date the error occurred
d) The time the error occurred
e) The active operational functions of the SX at the time the error occurred; (see: Conductor 12 Status Display)

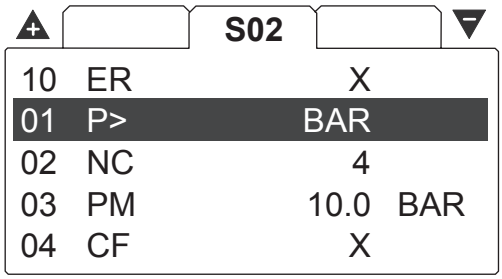
To return to the main error log menu screen press Escape.

To view the second information screen press Enter.



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

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



Pressure Control; Tables

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

S02 – F> Air Flow Meter Units
Selects the display units for the optional 4-20mA air flow sensor monitoring feature:
m^3/min: cubic meters per minute
cfm: cubic feet per minute

S02 - NC Number of Compressors
Sets the number of compressors connected to, and controlled by, the Conductor 12. 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 Conductor 12 maintains control of the compressors when the Conductor 12 is stopped.

╳ = Stop: return pressure control to the compressors.

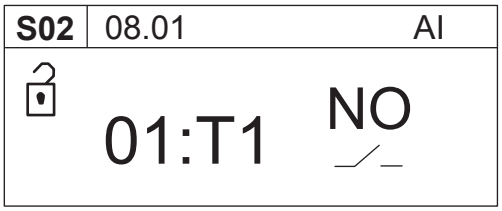
√ = Standby: maintain control and continouosly hold compressors 'off load'.

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 Conductor 12 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



The function of the Auxiliary input.

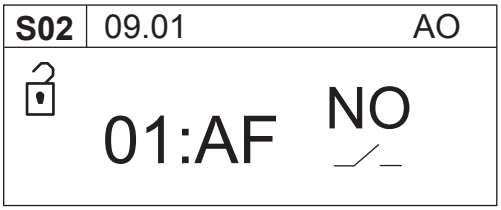
01:T1 Override > Table 1
02:T2 Override > Table 2
03:T3 Override > Table 3
04:T4 Override > Table 4
05:TS Override > Standby
06:SS Remote Start/Stop **
07:AA Remote Alarm (always active)
08:AR Remote Alarm (active when unit running, inhibited when unit stopped or in Standby)
09:TA Remote Trip (always 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 Conductor 12 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 Conductor 12.

S02 - AO Auxiliary Output Function



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

X = 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.

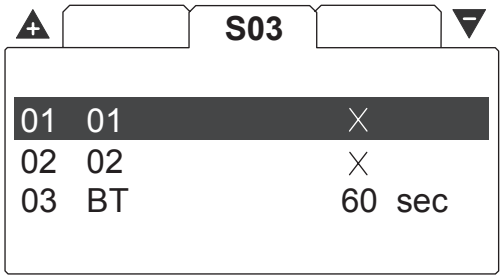
S02 – MA Restricted Cap. Alarm Enable

X = 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 perminantly deleted.



S03 – **01** or **02** I/O Gateway Monitoring

X = Disabled

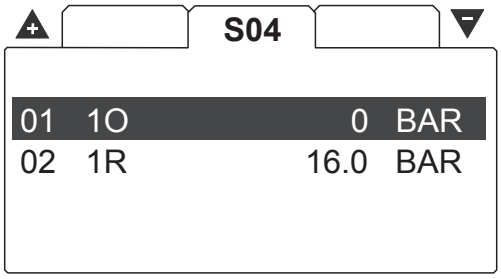
√ = Enabled

The Conductor 12 will monitor the selected I/O Gateway and display any 'Fault' detected on the I/O Gateway inputs; dependant on I/O Gateway set-up.

Examine the I/O Box manual for details.

S03 – BT Communications Timeout

The general operation of the selected I/O Gateway is also monitored. If the I/O Gateway fails to communicate on the RS485 network within the set 'Communications Broadcast Timeout' (BT) the Conductor 12 will display an I/O Gateway RS485 communications Error.



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

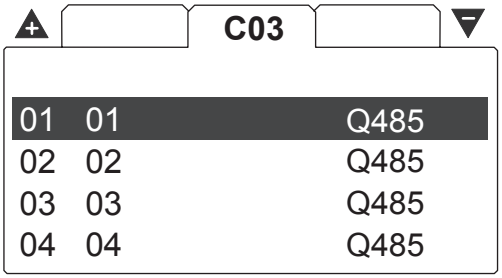
a) Offset: Expose the sensor to atmosphere and adjust the 'offset' setting (if necessary) until the detected pressure display shows 0.0bar (0psi).

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.

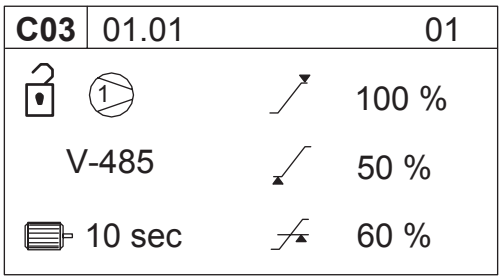


Installation – Compressor Connections

The type, method of connection, and the control functionality, of each compressor connected to the Conductor 12.

C02 - 01 Compressor **1**
to
C02 – *'n'* Compressor '*n*'

'*n*' = number of compressors in the system.



Compressor connectivity and functionality settings.

Compressor Connectivity:

Q485 Fixed speed, load/unload; connected to Conductor 12, or 'Direct Connect Gateway' Expansion Module (option), using 'Q485'. (0/100%) 0% or 100% regulation

I-485 Fixed speed, load/unload; connected to Conductor 12 on Multi485 network. (0/100%) 0% or 100% regulation

V-485 Variable Capacity/Speed; connected to Conductor 12 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 Conductor 12 for 'staggered starting' of multiple compressors and other operational calculations. An accurate time is important for successful Conductor 12 operation.

% 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 heist 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 m³/min	25%
Compressor 2	10 m³/min	50%
Compressor 3	12 m³/min	60%
Compressor 4	12 m³/min	60 %
Compressor 5	20 m³/min	100%
Compressor 6	20 m³/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.

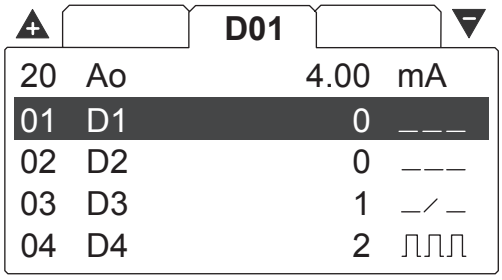
For example:
For a variable speed compressor that is able to reduce speed to 50% of full speed, which has been assigned a maximum output capacity of 50% and a minimum output capacity of 25%.
If another compressor in the system is able to provide 60% of the compressor's full speed output more efficiently, 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



The Conductor 12 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		
D4 Digital Input 4	OFF	
D5 Digital Input 5		
D6 Digital Input 6	Pulsing	
D7 Digital Input 7		
D8 Digital Input 8		
D9 Digital signal detected on A2		
DA Digital signal detected on A3		
R1 Relay Output 1	0	OFF
R2 Relay Output 2		
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 ‘Conductor 12’ 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 deenergised 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 preconditioning components on the Terminal PCB.

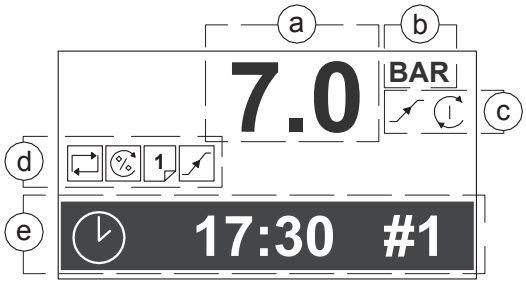
Analogue Output:
The analogue output can be manually adjusted. Use UP(plus) and DOWN(Minus) to adjust and ENTER. The output will return to normal operational value upon menu exit.

(!) **To Display the Software Version:**
Press and hold Reset then press Escape.

7.0 OPERATION

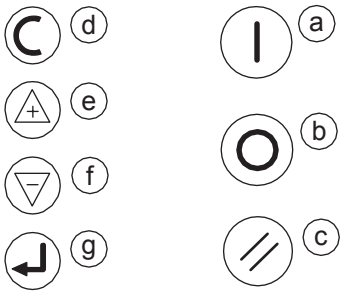
7.1 User Interface

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

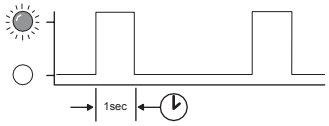
Unit Status:

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

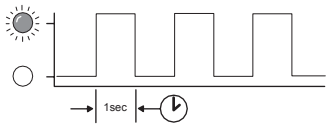
Indicators

- Off
- On

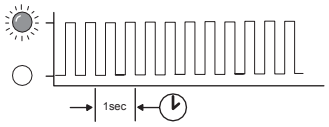
Intermittant:



Slow Flash:



Fast Flash:

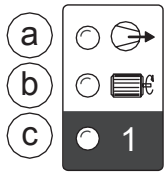


Unit Indicators

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

The Conductor 12 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

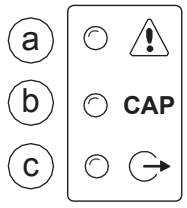
b) Run Status

- 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 Commpressor 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

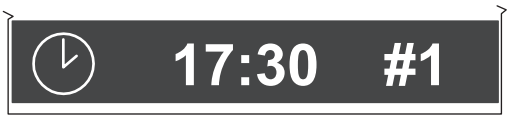
Active Functions:

- 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 Q485 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

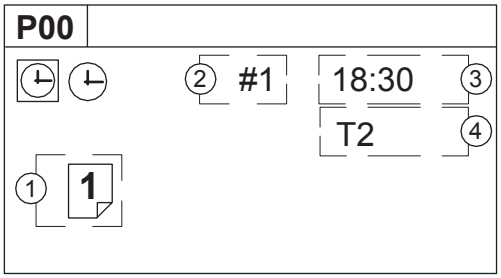
A setting of zero hundred hours (00:00hrs) on Monday (#1) equates to a sequence rotation at one second past midnight on Sunday.

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:

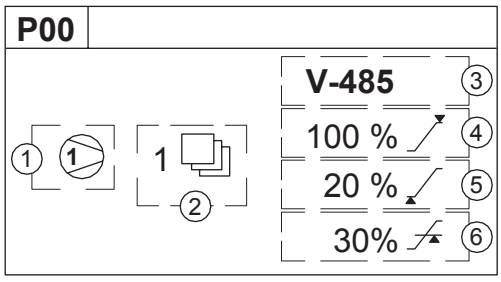


Shows the next Pressure Schedule event.

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.

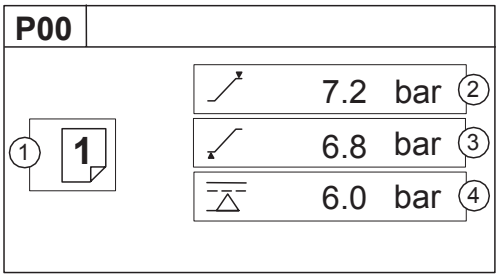
Compressor Status:



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

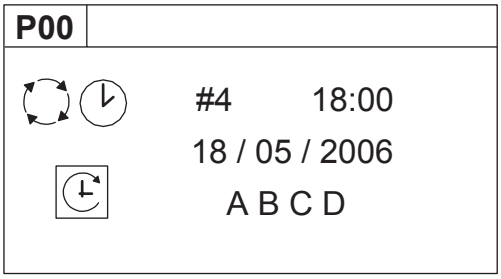
Item values 5 and 6 are only shown if compressor type is V-485 (variable capacity/speed).

Primary Detected Pressure:



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

Sequence Rotation:



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:

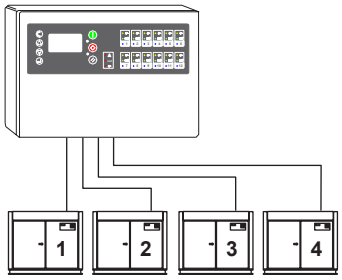
The sequence assignment can be manually rotated at any time. When viewing the 'Sequence Rotation' information screen press Enter:

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 Conductor 12 will have a unique assigned compressor identification number; starting at compressor 1 increasing sequentially to the number of compressors connected to the Conductor 12.



7.10 Stop:

To stop the Conductor 12 press Stop. The Conductor 12 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 Conductor 12 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 Conductor 12.

7.11 Start:

To start the Conductor 12 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 Conductor 12 will enter normal operating mode.

The Conductor 12 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 Conductor 12 control of the compressor can be established. The Conductor 12 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 Conductor 12 will automatically start, when power is restored after a disruption or failure, if the Conductor 12 was in a 'started' state when the power disruption or failure occurred.

The Conductor 12 will not automatically restart if the Conductor 12 was in a stopped state when the power disruption or failure occurred.

7.13 Failure Mode

If the Conductor 12 experiences a disruption to normal control, or an Conductor 12 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 Conductor 12 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 user menu status screen. Compressor fault conditions are not regarded as Conductor 12 unit fault conditions.

Compressor Status Sysmbols and Comressor Status Indicators

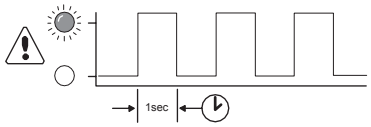
7.16 Fault Codes

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

ERR: Unit faults are errors with the Conductor 12 controller itself and are all conditions that prevent normal operation from continuing.
SYS: System faults are items that arise from conditions external to the Conductor 12 controller; the Conductor 12 itself continues to function correctly.

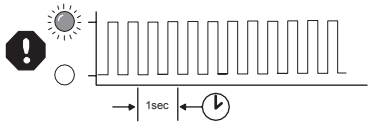
There are two types of Fault condition:

Alarm (Warning):



The Fault LED will 'slow flash' to indicate an Alarm (Warning) condition. An Alarm (Warning) indicates that the Conductor 12 is continuing with normal operation but user attention is required. All Alarm (Warning) conditions are registered in the Conductor 12 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 Conductor 12. 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 Conductor 12 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 XPMLED (Status LED Display) module have been disrupted or lost.

ERR.12 Q485 Expansion Module C5-8
Data communications with the external Q485 Expansion module 'C:5-8' have been disrupted or lost.

ERR.13 Q485 Expansion Module C5-8
Short Circuit condition detected on external Q485 Expansion module ‘C:5-8’.

ERR.14 Q485 Expansion Module C9-12
Data communications with the external Q485 Expansion module ‘C:9-12’ have been disrupted or lost.

ERR.15 Q485 Expansion Module C9-12
Short Circuit condition detected on external Q485 Expansion module ‘C:9-12’.

SYS.01 Excess Pressure (PM)
Pressure has eSXeeded 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 advise 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.

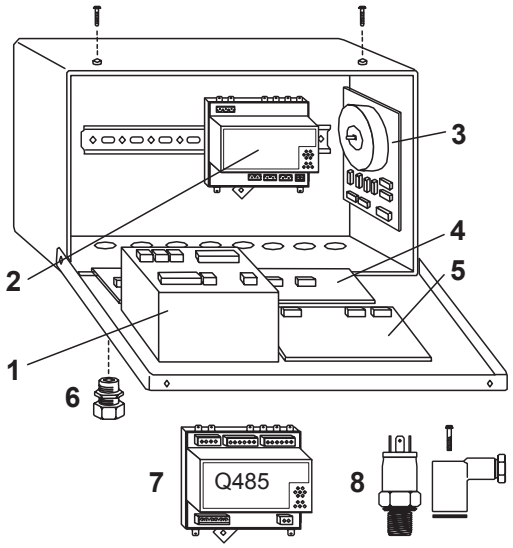
E5001: Internal memory failure
The unit's controller has detected disruption to the internal permanent application memory storage (FLASH). The integrity of the FLASH memory contents is suspect. Re-load the main application software in the first instance; renew the controller if the condition persists.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

To Display the Software Version:

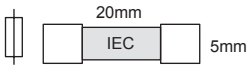
Press and hold Reset then press Escape.
The user menu display item will show the software version ID (example: "E01").

8.0 Parts List

Item	Part No.	Description
-	2014000026	Net$ync II Conductor 12, Kit
-	2014000025	Net$ync II Conductor 12
-		Manual, User CD
1		Unit, Controller
2		Unit, XPM-PSU24
3		Unit, XPM-TAC24
4		PCB, Terminal
5		Unit, XPM-LED
6		Gland, Set - Pg13.5
7	2014000029	Module, Q485
8	2014000042	Y04CM29.00 Sensor, Pressure 4-20mA, 232psi (16bar)



Engineering

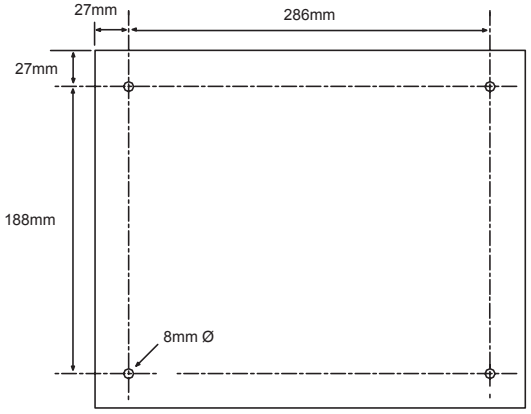


Qty	Part No.	Description
10		IEC Fuse T1.0A
10		IEC Fuse T1.6A
10		IEC Fuse T3.15A

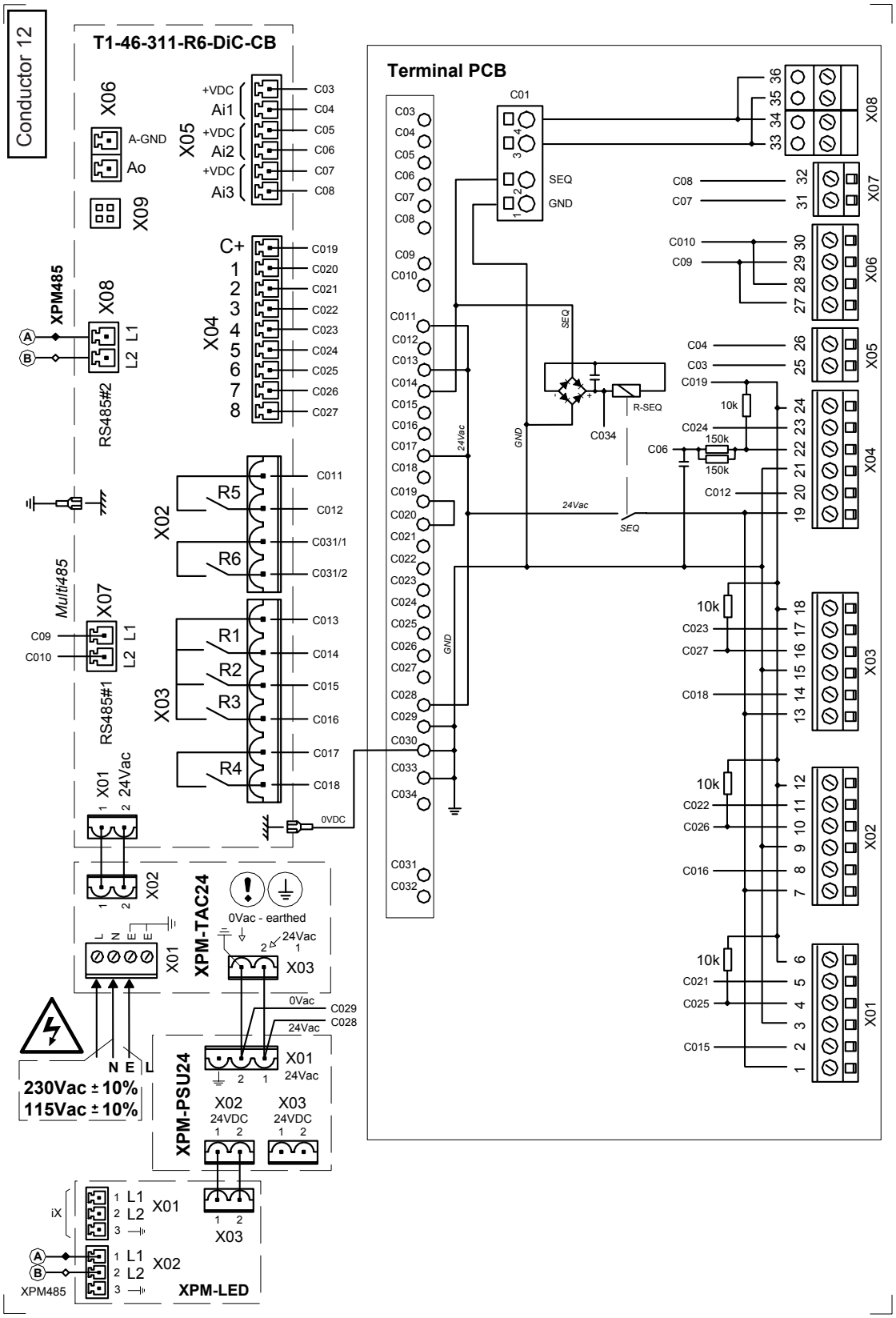
9.0 Technical Data

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

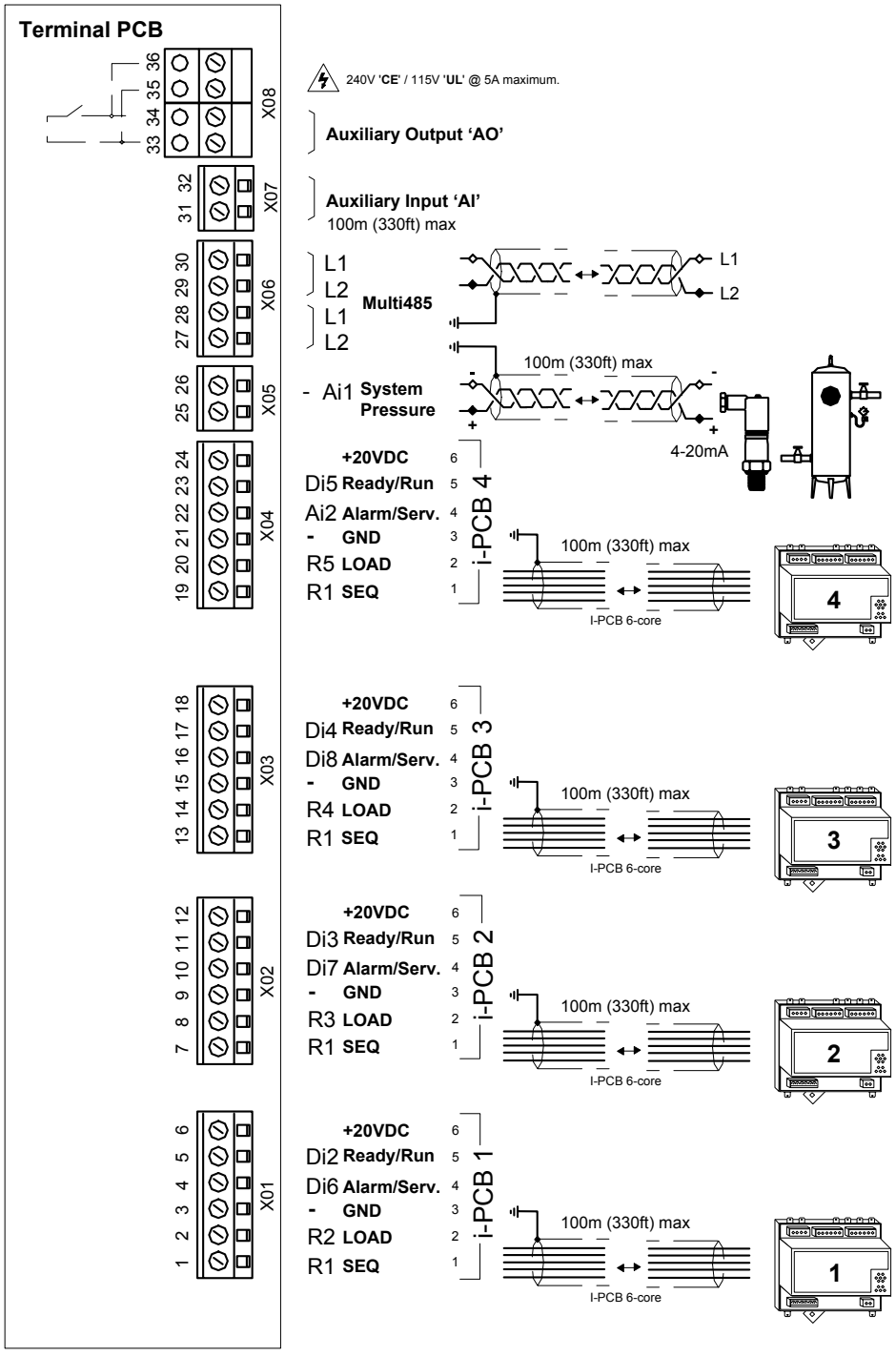
Mounting Dimensions:



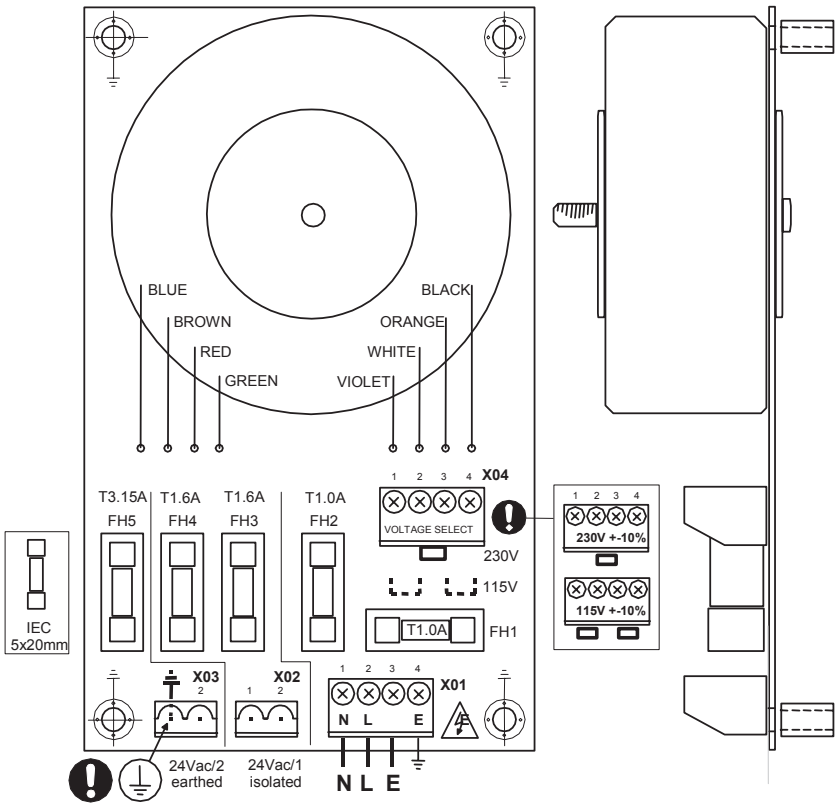
10.0 Wiring Connection Diagram



Conductor 12



XPM-TAC24

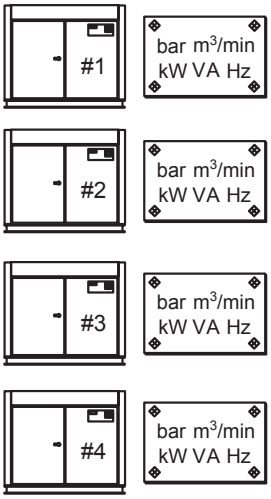

BLUE
BROWN
RED
GREEN
BLACK
ORANGE
WHITE
VIOLET
T3.15A
FH5
T1.6A
FH4
T1.6A
FH3
T1.0A
FH2
X04
VOLTAGE SELECT
230V
115V
T1.0A
FH1
230V +-10%
115V +-10%
IEC
5x20mm
X03
X02
X01
N L E
24Vac/2
earthed
24Vac/1
isolated
N L E

Net$ync II

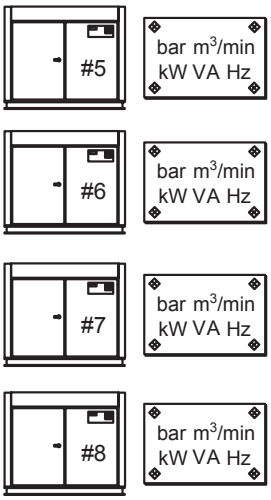
Conductor 12 Commissioning Form

Customer	Contact	Customer Ref:
	Phone	Internal Ref:

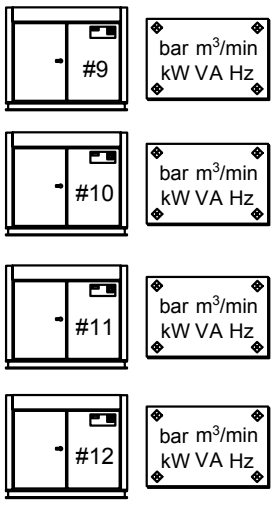
Installation/Site		Commission Date
Software	Ser No.	Commission Engineer



Comp #1 Manufacturer	
Comp #1 Model/Type	
Comp #1 Working Pressure	bar/psi
Comp #1 Full Load Capacity	m^3/min
Comp #2 Manufacturer	
Comp #2 Model/Type	
Comp #2 Working Pressure	bar/psi
Comp #2 Full Load Capacity	m^3/min
Comp #3 Manufacturer	
Comp #3 Model/Type	
Comp #3 Working Pressure	bar/psi
Comp #3 Full Load Capacity	m^3/min
Comp #4 Manufacturer	
Comp #4 Model/Type	
Comp #4 Working Pressure	bar/psi
Comp #4 Full Load Capacity	m^3/min



Comp #5 Manufacturer	
Comp #5 Model/Type	
Comp #5 Working Pressure	bar/psi
Comp #5 Full Load Capacity	m^3/min
Comp #6 Manufacturer	
Comp #6 Model/Type	
Comp #6 Working Pressure	bar/psi
Comp #6 Full Load Capacity	m^3/min
Comp #7 Manufacturer	
Comp #7 Model/Type	
Comp #7 Working Pressure	bar/psi
Comp #7 Full Load Capacity	m^3/min
Comp #8 Manufacturer	
Comp #8 Model/Type	
Comp #8 Working Pressure	bar/psi
Comp #8 Full Load Capacity	m^3/min



Comp #9 Manufacturer	
Comp #9 Model/Type	
Comp #9 Working Pressure	bar/psi
Comp #9 Full Load Capacity	m^3/min
Comp #10 Manufacturer	
Comp #10 Model/Type	
Comp #10 Working Pressure	bar/psi
Comp #10 Full Load Capacity	m^3/min
Comp #11 Manufacturer	
Comp #11 Model/Type	
Comp #11 Working Pressure	bar/psi
Comp #11 Full Load Capacity	m^3/min
Comp #12 Manufacturer	
Comp #12 Model/Type	
Comp #12 Working Pressure	bar/psi
Comp #12 Full Load Capacity	m^3/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	☐ EHR ☐ TR ☐ 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	☐ EHR ☐ TR ☐ 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	☐ EHR ☐ TR ☐ 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	☐ EHR ☐ TR ☐ 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	☐ X ☐ ✓ ☐ ✓ !>X ☐ ✓ A^^
P02	PT	Prefill Time	sec
P02	PP	Prefill Pressure	bar/psi
P02	-	Primary Compressors	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12
P02	-	Backup Compressors	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12
S01	PS	Pressure Schedule	☐ X ☐ ✓
S01	AR	Auto Restart	☐ X ☐ ✓
S01	RP	Rotation Interval	
S01	TS	Default Table Select	
S02	NC	Number of Compressors	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12
S02	PM	Max Pressure Alarm	bar/psi
S02	CF	Stop Control Function	☐ X ☐ ✓
S02	TO	Tolerance	
S02	DA	Damping	
S02	PC	Pressure Change Time	min
S02	AI	Auxiliary Input	
S02	AO	Auxiliary Output	
S02	CA	Capacity Alarm	☐ X ☐ ✓
S02	MA	Capacity Restricted Alarm	☐ X ☐ ✓
S03	01	Aux I/O Box #1	☐ X ☐ ✓
S03	02	Aux I/O Box #2	☐ X ☐ ✓
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	☐ I-PCB ☐ I-485 ☐ V-485	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	02	Compressor #2 Type	☐ I-PCB ☐ I-485 ☐ V-485	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	03	Compressor #3 Type	☐ I-PCB ☐ I-485 ☐ V-485	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	04	Compressor #4 Type	☐ I-PCB ☐ I-485 ☐ V-485	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	05	Compressor #5 Type	☐ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	06	Compressor #6 Type	☐ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	07	Compressor #7 Type	☐ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	08	Compressor #8 Type	☐ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%

C03	09	Compressor #9 Type	❒ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	10	Compressor #10 Type	❒ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	11	Compressor #11 Type	❒ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%
C03	12	Compressor #12 Type	❒ I-485 ☐ V-485 ☐ I-PCB	
C03	-	Start Time		sec
C03	-	Max Capacity		%
C03	-	Min Capacity		%
C03	-	Min Efficiency		%