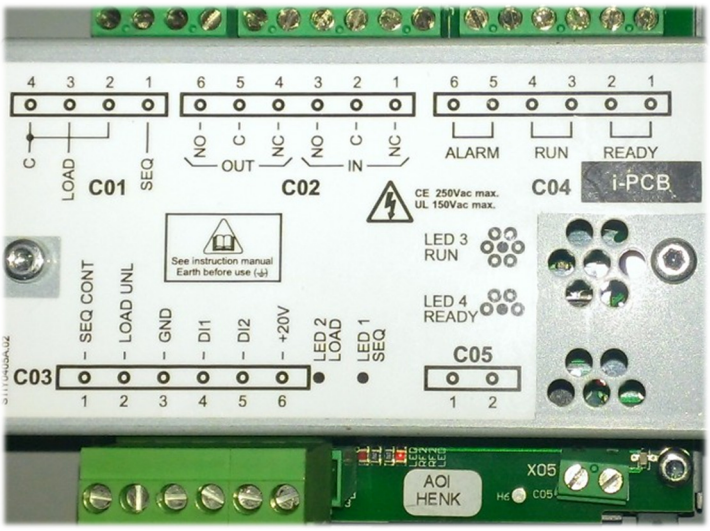
Tech Notes

COMPRESSOR PRODUCTS

To: Distributors, Representatives and Personnel
Coded for Tech Notes

Tech Notes Memo No. 50
Version 00
March 8, 2017

Connect 4 i-PCB Installation Guide

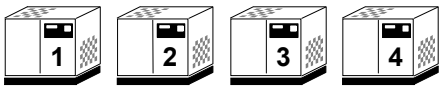


Dimensions: 3.75” x 3.75” x 2.25” (above DIN rail)
Mounting: DIN rail (top hat, 35mm)

The i-PCB is intended for use with the Connect 4 air compressor management controller range providing the interface between an air compressor and the Connect 4 unit. An i-PCB isn’t required on controllers that can communicate directly with the Connect 4.

The i-PCB is a DIN rail mountable unit designed to be installed within the compressor control area and connected to the Connect 4 using a six-wire cable no greater than 100 meters in length.

The i-PCB is a DIN rail mountable unit designed to be installed within the compressor control area and connected to the Connect 4 using a six-wire cable no greater than 100 meters in length.

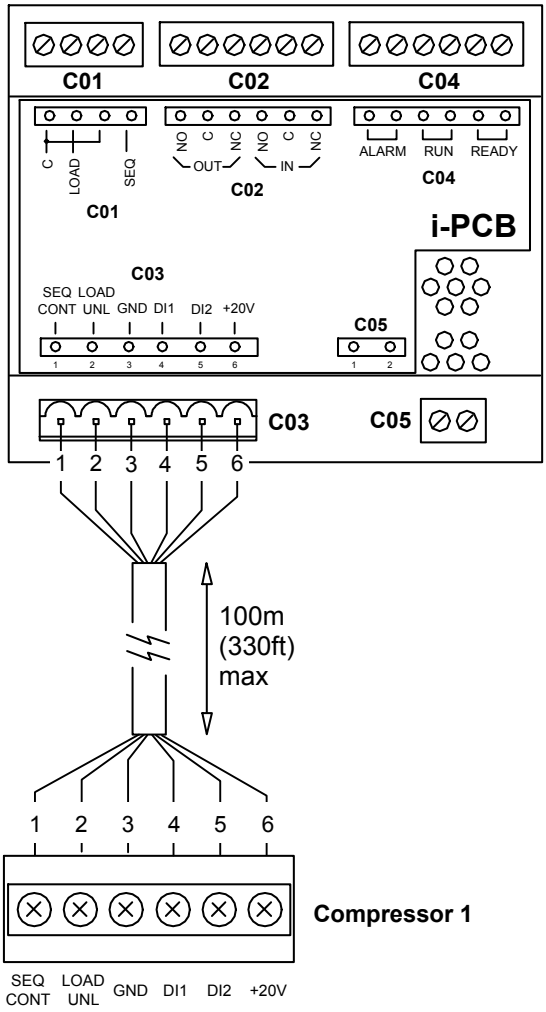


Each compressor in the system must be assigned an identification number from 1 up to the number of compressors in the system. The identification number should be clearly marked on each compressor for operational reference.

The i-PCB installed in a particular compressor must be connected to the terminals of the Connect 4 that are dedicated to the compressor identification number.

For example:
The six-wire cable from the i-PCB installed in compressor number 1 must be connected to the Connect 4 terminals that are dedicated to compressor number 1.

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.



If a compressor is connected to the Connect 4 using RS485 network communications, the six-wire i-PCB terminals for the compressor number must have no connection.

Consult the air compressor manual or your air compressor supplier/specialist for details before installing the i-PCB and Connect 4 unit.

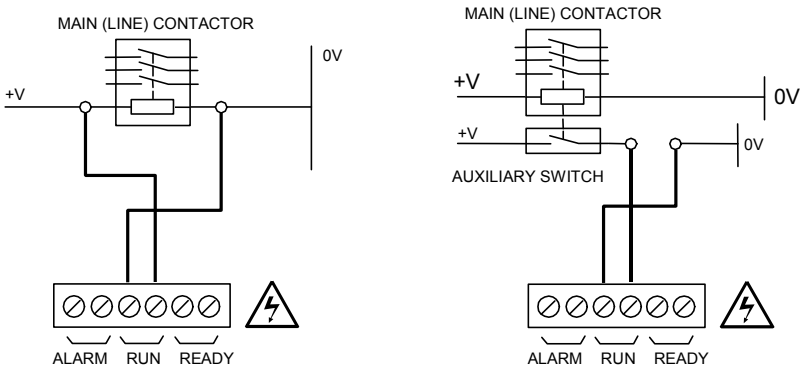
Interface PCB (i-PCB):

The i-PCB uses a 12V minimum to 250V maximum ac (50/60Hz) or DC input voltage detection system and universal relay contact control outputs (250Vac/dc @ 5A maximum). Integrated directly into the circuits of an air compressor, the i-PCB avoids the need for additional relays or remote inputs. The i-PCB also acts as an electrical barrier between the compressor and the Connect 4 providing protection and voltage isolation.

1. Input Functions

The i-PCB is fitted with a six-pin terminal C04 for compressor monitoring. The i-PCB uses two inputs (Run and Ready) 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 control.

1.1 Run Input



The RUN input will accept 12V minimum to 250V maximum, ac (50/60Hz) only.
⚠ ***DC voltage cannot be used for the RUN input.***
⚠ Do not connect a voltage greater than 250V to this input.

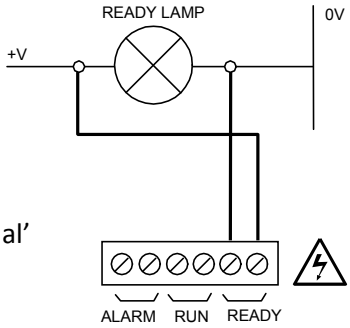
The input can be connected to the control terminals A1 and A2 (coil) of the main starter contactor of the compressor. When the compressor control system energizes the main contactor, the i-PCB will detect the voltage across the contactor coil terminals and signal the Connect 4 that the compressor is 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 energized when the compressor is running can be monitored. For example: fan contactor or voltage signal to a soft-start or remote starter.

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

1.2 Ready Input



The READY input will accept 12V minimum to 250V maximum, ac (50/60Hz) or DC.

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

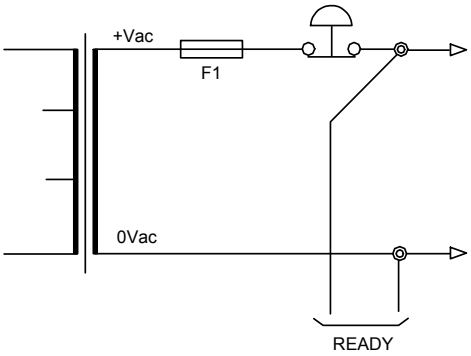
The input must be connected to the terminals of a 'ready' or 'operational' lamp or other circuit of the compressor control system that will be energized when the compressor is in standby, started or running condition.

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

When the compressor ready lamp, or other control circuit, is energized the i-PCB will detect the voltage and signal the Connect 4 that the compressor is ready and available to load and produce air when a load request signal is given.

Note: the i-PCB input common terminal must always be connected to the neutral, common or 0V line of the applied input

1.2.1 Ready Input, Alternative Connection Method:



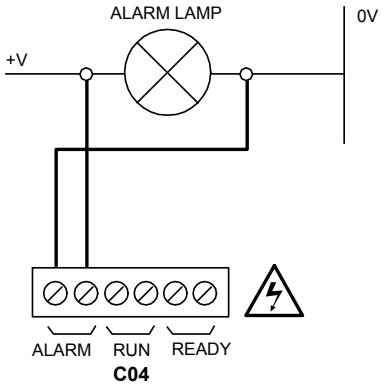
In instances where a convenient voltage signal for a compressor ready condition is not available the 'Ready' input can be connected directly to a constant compressor control system power supply voltage (12V to 250Vac or dc). This will signal the Connect 4 that the compressor is ready and available at all times when power is applied to the compressor. The Connect 4 has a built-in function to determine when a compressor is not responding, or is in a shutdown condition, regardless of the constant ready signal.
If the Connect 4 requests a compressor to load, but fails to detect a RUN signal within 10 seconds, the Connect 4 will pulse the load request signal for one second and wait a further 10 seconds for a RUN signal response. The Connect 4 will continue this cycle for a period of one minute. If a compressor RUN signal is not detected within one minute the Connect 4 will regard the compressor as not ready and indicate the compressor as not available. If a RUN signal is detected at any time, the Connect 4 will automatically accept the compressor as available for use and reset the 'not available' or 'Trip fault' indication.

❗ *Never connect the READY input positive connection directly to the output terminal 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 available condition if the Emergency Stop button is activated.

1.3 Alarm Input (Optional)

The ALARM input will accept 12V minimum to 250V maximum, ac (50/60Hz) or DC.



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

The input can be connected to the terminals of an alarm lamp or other circuit of the compressor that is energized when an alarm (warning or non-shutdown fault) occurs.

The i-PCB will detect the voltage and signal the Connect 4 that an alarm condition is present. If the compressor has no accessible alarm circuit, or this function is not required, the i-PCB alarm terminals can be ignored.

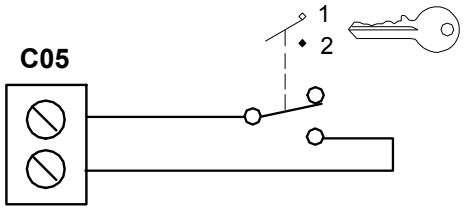
In the instant that an alarm circuit voltage is available that is constantly energized and de-energizes in the event of an alarm condition, the Connect 4 can be set to accept the removal of voltage from the i-PCB alarm terminals to indicate an alarm condition.

Note: A fault, that stops the compressor, and/or prevents the compressor from running, is determined from the 'Run' and 'Ready' inputs.

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

1.4 Service Maintenance Switch (Optional Dependent on Connect 4 Model)

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



When the 'Service Maintenance Switch' input terminal pins are connected together, using a volt-free switching contact, the Connect 4 will indicate that the compressor is not available but will not generate an Alarm, Trip or Shutdown condition. The Connect 4 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 utilized 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.

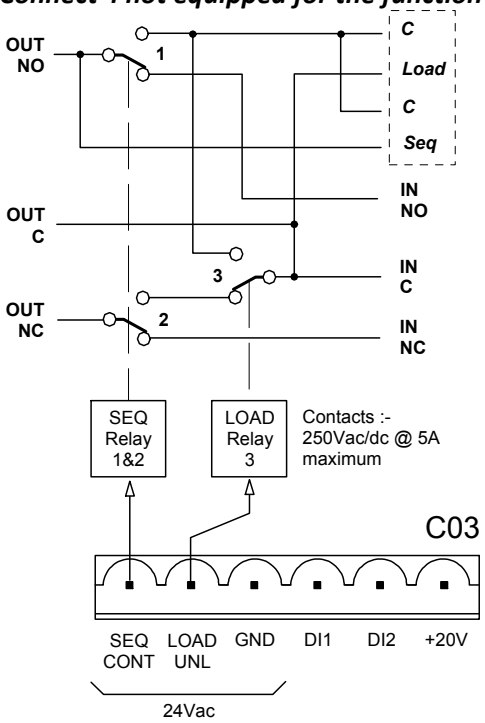
DO NOT connect any external voltage source to the pins of terminal C05.

Note: This function is only available with Connect 4 models equipped with 'Service Maintenance Switch' functionality. For Connect 4 units that do not provide this function the pins of terminal C05 must not be utilized. Activating the 'Service Maintenance Switch' function with a Connect 4 not equipped for the function will disrupt the Alarm detection facility.

2. Output Functions

2.1 i-PCB Internal Output Circuits

The output function of the i-PCB is to control load and unload regulation of the compressor. The i-PCB outputs are not intended to stop and start a compressor.



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

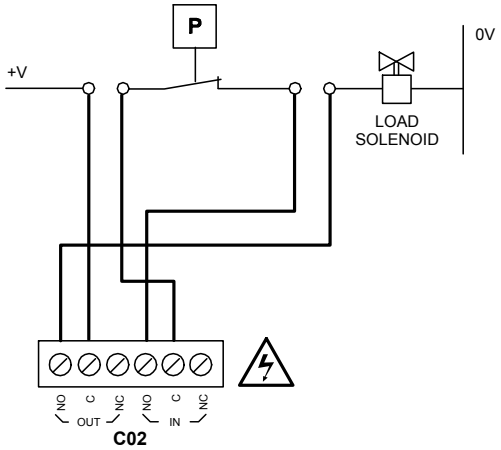
When connected the pressure switch remains in circuit. If the Connect 4 is stopped or experiences a failure or loss of power, pressure control will automatically revert back to the pressure switch and the compressor will continue to operate.

Note: The pressure switch settings of all compressors in the system should be set in a cascaded sequence manner such that the system will operate normally in the event of Connect 4 inoperability.

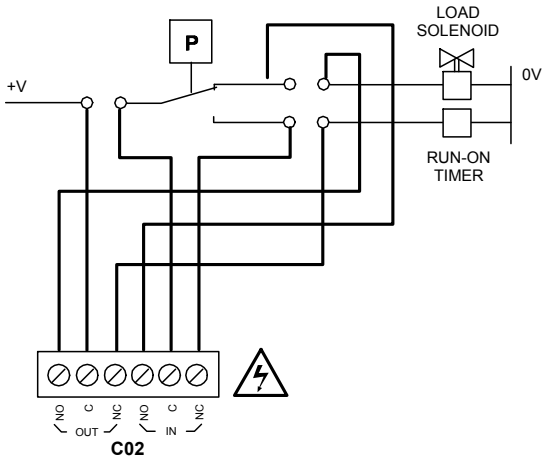
Note: the NC (normally closed) and NO (normally open) terminal references of the 'i-PCB' are related to internal connection functions and should not be referenced to the connections of a compressor pressure switch (which will generally be in reverse order).

Lethal voltages may be present on the terminals of the air compressor pressure switch while the compressor is under Connect 4 control. Isolate the air compressor power supply before starting any work.

Two Wire Pressure Switch Connections:



Three Wire Pressure Switch Connections:



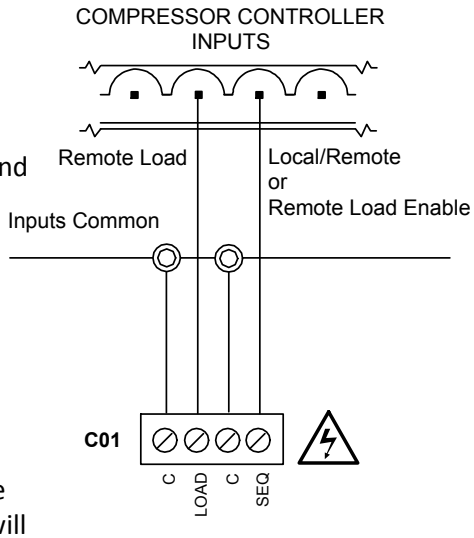
When an i-PCB is installed the compressor's pressure switch can no longer provide over-pressure protection. For compressors that are not equipped with independent over-pressure detection it is recommended that a pressure switch be incorporated in the compressor fault circuit(s) such that any local over-pressure condition will stop the compressor independently from the Connect 4 system.

2.2 Electronic Pressure Sensor Type

For air compressors fitted with electronic pressure detection, which are equipped with a remote input enabling remote load/unload regulation to be achieved, a four-pin terminal C01 has been provided.

This terminal provides volt free contact closure for load control and also provides a volt free contact closure for remote load control enable (Local/Remote Regulation Control).

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 load enable (local/remote) feature will not automatically revert to local control if the Connect 4 is stopped or experiences a fault or loss of power.

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

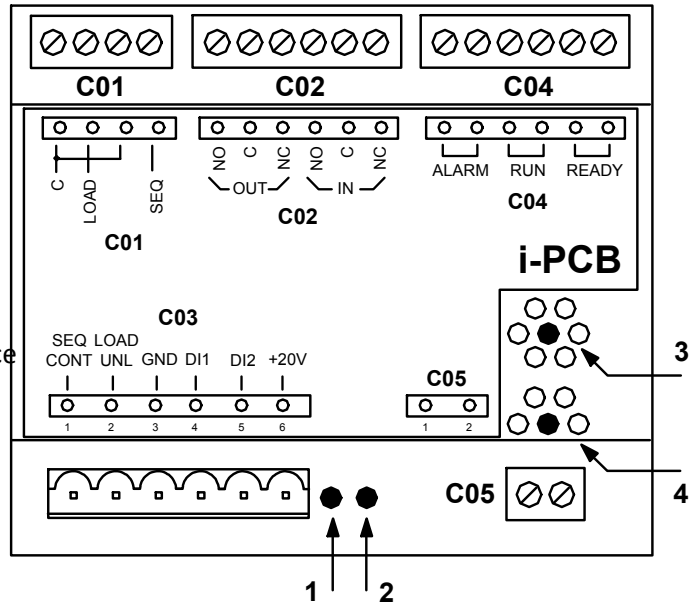
Note: The local/remote pressure regulation input and/or remote load input logics of some electronic pressure sensor type controllers are reversed, in this instance the 'pressure switch' outputs (terminal C02) can be used to establish the correct logic control connections.

Do not attempt to utilise the Load/Seq 'Electronic Pressure Control' (terminal C01) and the 'Pressure Switch Control' (terminal C02) output connections at the same time. These two output functions are internally connected and a short circuit condition and/or malfunction may result.

NOTE:
The i-PCB connections shown in this document 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.

3. Diagnostics i-PCB

The i-PCB is equipped with 4 LED indicators.



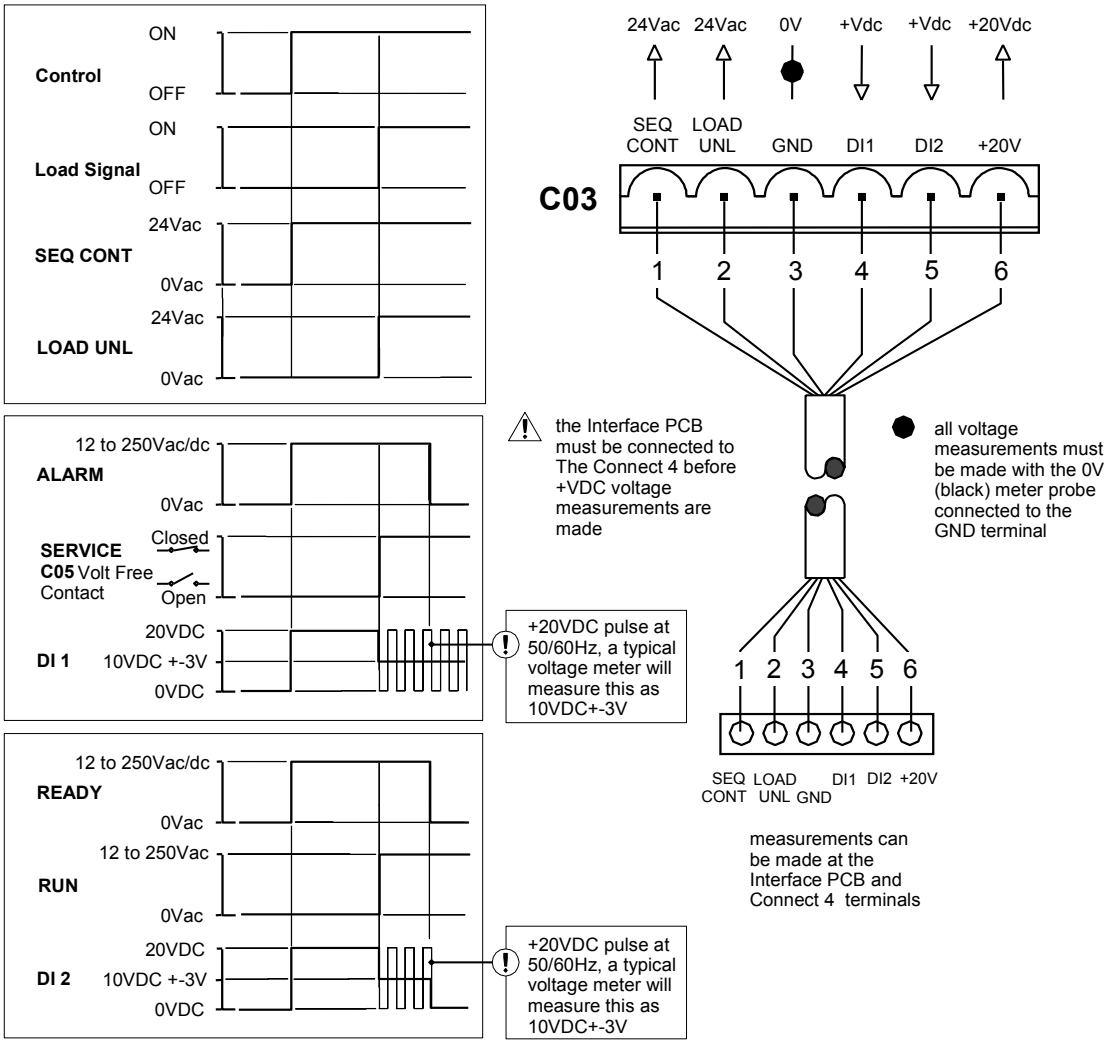
Command signals from Connect 4:

1 – Load/UNL (load request)
Will illuminate when there is a 24Vac signal on C03 pin 2 (load/unl) of the 'i-PCB'; with reference to pin 3 (GND).
2 – Seq Cont (sequence control)
Will illuminate when there is a 24Vac signal on C03 pin 1 (seq cont) of the i-PCB; with reference to pin 3 (GND). The sequence control signal is used to switch the i-PCB from local to remote pressure control configuration.

Monitoring signals from compressor:

3 – Run (Run input) ***ac only***
Will illuminate when there is a voltage greater than 12Vac on the 'Run' terminals of the i-PCB
4 – Ready (Ready input)
Will illuminate when there is a voltage greater than 12Vac/dc on the 'Ready' terminals of the i-PCB

Note: *LED indicators 3 and 4 are mounted on the PCB within the enclosure. To view the indicators look through the enclosure air ventilation holes indicated. The LED indicators can clearly been seen when illuminated in all external lighting conditions.*



Load Test:

After installation it is convenient to be able to load and unload the compressor manually using the Interface PCB Load Function. This test provides a functional confirmation that connections are correct and that the compressor will function correctly according to the Connect 4 load command during commissioning.

With the Connect 4 in an operational (ON) condition there will be a constant 24Vac signal on the wire from the Connect 4 to the Interface PCB 'Seq Cont' terminal. Remove, and isolate, the 'Load Unl' wire from the Interface PCB terminal and use a short length of wire to connect the 'Seq Cont' terminal to the 'Load Unl' terminal. This will provide a 24Vac signal to the 'Seq Cont' and 'Load Unl' terminals causing the Interface PCB to load the compressor.