SPLat CONTROLS

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HVAC26A Control Board Specification

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1 FEATURES:

The HVAC26A controller is an advanced microprocessor based controller for 2 stage air conditioning units. The use of latest FLASH based microprocessor technology has meant that additional functionality has been included whilst keeping costs down. This has also resulted in a design utilising fewer components, improving reliability.

The microprocessor has a “watchdog” circuit that will reset this system in the unlikely event of the processor malfunction.

To reduce wiring, all but the compressors are directly controlled by on board relays and most connections are plug in for ease of manufacture and service. As much of the control wiring as possible has been included on the board to further reduce manufacturing labour.

To prevent miss wiring, all connectors on the PCB have differing numbers of pins or connector style, hence no two connectors are the same.

Defrost sensor short/open circuit detection.

The controller is part of an intrinsically safe overall system. The safety interlock sensors/switches act directly by interrupting the 24 VAC power to the various control outputs, regardless of the microprocessor control. A relay on each stage bypasses the low-pressure switch contact to prevent nuisance fault tripping during defrosts. On-board fusing is also provided for both the control circuits and the thermostat 24 VAC supply.

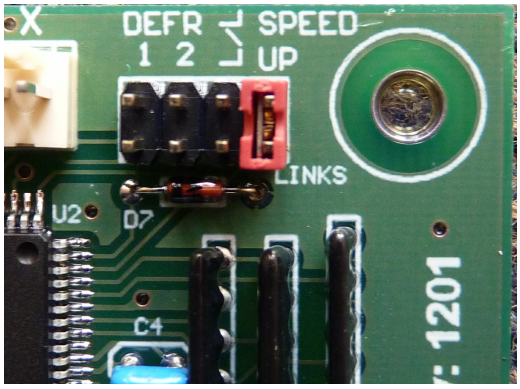
The controller has an integral 2 line by 16 character LCD display that is programmed to show operating status information and fault status. The display is backlit for low light applications and can also be clearly read in direct sunlight. Two buttons provided on the board allow service personnel to access status and fault history information. Faults are remembered, even if the power to the controller is interrupted and can be read out by a technician to aid in fault finding. The fault history can also be cleared so that only the latest fault history is available at the next service visit.

The board has four option links to allow selection of the defrost time, enable lead/lag operation and enable system speed up to aid in fault finding.

In addition, the board has an expansion port to allow for future expansion interfaces, such as a BMS interface, data logging, internet access, extra I/O etc. It also allows two HVAC26A controllers to be connected together to create a 4 stage controller.

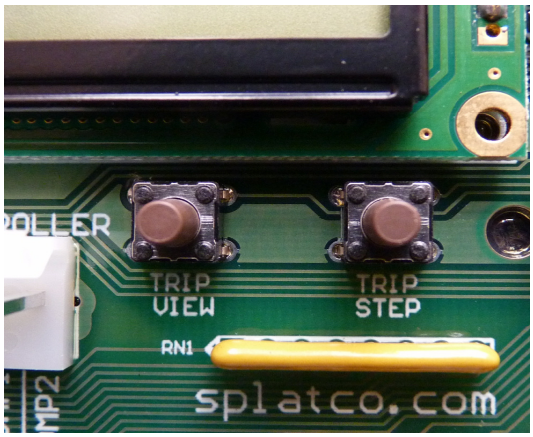
2 BOARD FEATURES, QUICK REFERNCE:

2.1 Option Links:



The four option links are located in the top right hand corner of the board. The function of each link is written on the PCB. The defrost time is selected using the two left-hand option links. Refer to the software documentation for the model of air conditioner for the exact details when selecting defrost times. The L/L link selects lead/lag operation, while the speed-up link is used during service to speed up the timing control sequences.

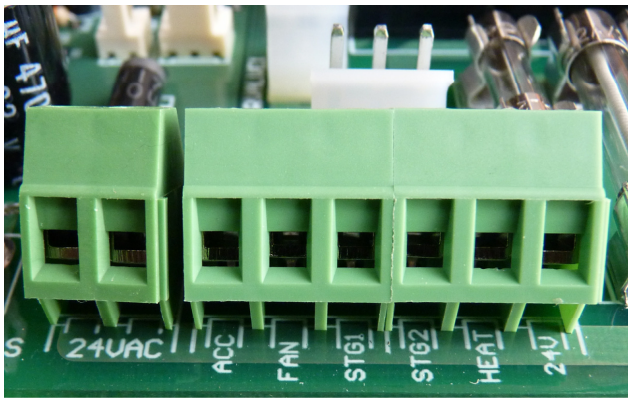
2.2 Push Buttons:



Two push buttons mounted in the top right hand corner of the PCB allow the fault trip history to be displayed. Refer to the software specification for the model of air conditioner for fault codes. Pressing the “Trip View” button will display the most recent fault trip code. Holding this button down and pressing the “Trip Step” button will step through the fault history. Holding these two buttons down continuously for 10 seconds will erase the trip history.

Electrical Connections:

3.0 24 VAC Power Supply and Thermostat Connections:



The transformer is connected to the board via a 2-way screw terminal block marked “24VAC” next to the thermostat terminal block. **Note that the transformer terminal closest to the thermostat terminal block is the circuit common connection.**

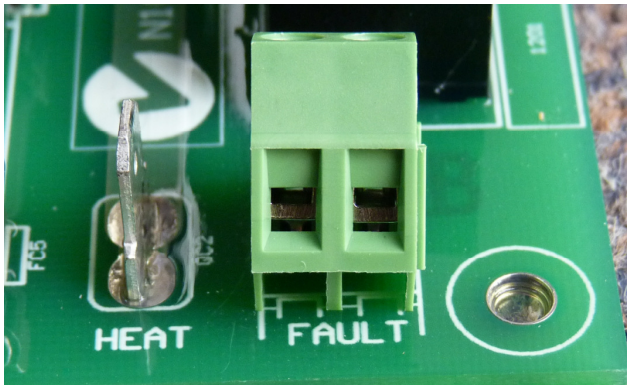
The connections for the thermostat are located to the right of the 24VAC power connection.

The named function of each terminal is as follows:

ACC	circuit common terminal (AC common)
FAN	indoor fan activation terminal – active when connected to 24V
STG1	stage1/lead stage activation terminal – active when connected to 24V
STG2	stage2/lag stage activation terminal – active when connected to 24V
HEAT	HEAT mode activation terminal – active when connected to 24V
24V	24 Volt AC thermostat power terminal, fused on board

The 24V terminal is fused by a one amp delayed action M205 glass fuse located immediately behind the 24V terminal.

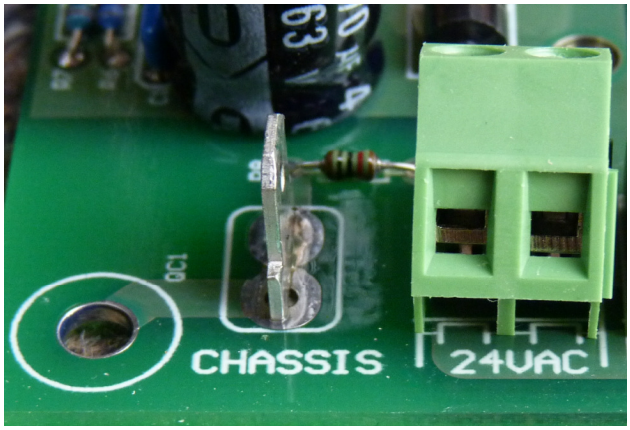
3.1 Heat and Fault Outputs:



The heat output is available on a 6.3mm quick connect terminal and provides 24 VAC relative to AC common, when the unit is in heat mode (HEAT terminal on thermostat terminal block energised). This connection can be used to control auxiliary functions when the system is in HEAT mode.

The fault output is available on a two way terminal block and is a “dry contact” output – meaning that the terminal block connects directly and only to a set of normally open relay contacts.

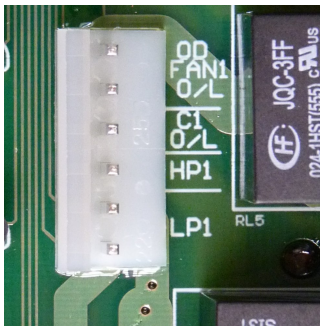
3.2 Chassis Connection:

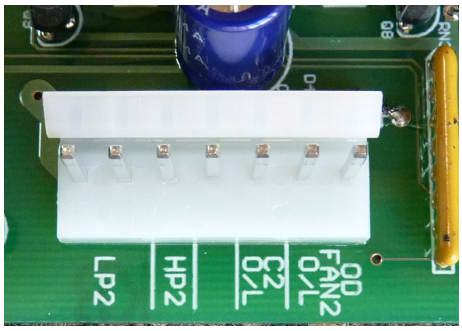


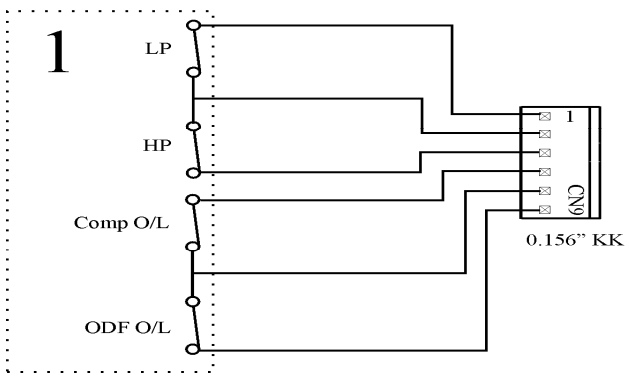
Located next to the transformer power in terminal block, this terminal must be connected to the chassis of the machine. It is connected internally to circuit ground via a 10 Kilo-Ohm resistor. The purpose of this connection is to prevent the electronics from “floating” to a potential much above mains earth.

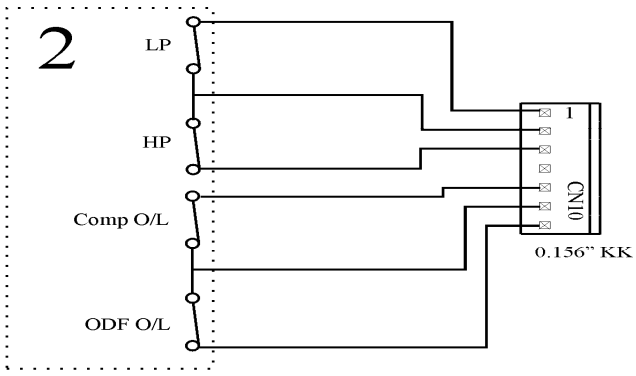
3.3 Stage Interlock Connections:

Refer to appendix 1 for overall fault trip interlock chain wiring diagram. The stage 1 and stage 2 specific fault interlock chains are wired directly to individual connectors CN9 and CN10:





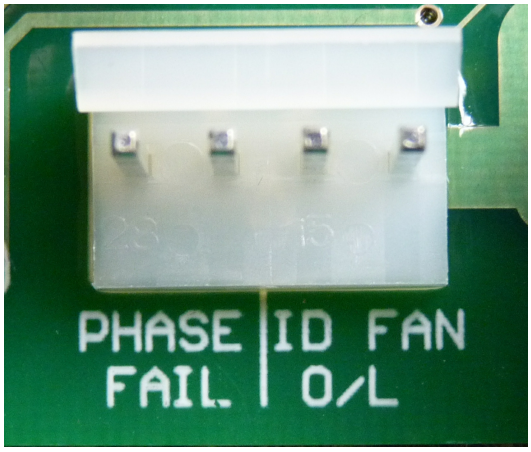


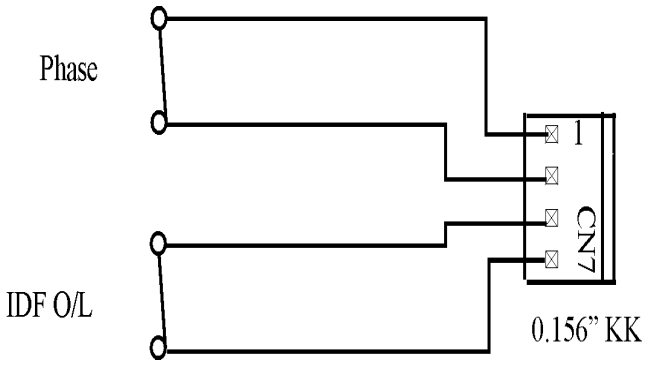


where LP is the low pressure switch, HP is the high pressure switch, Comp O/L is the compressor overload trip switch contacts and ODF O/L is the out door fan overload switch contacts.

3.4 Phase Fail and In Door Fan Interlock connection:

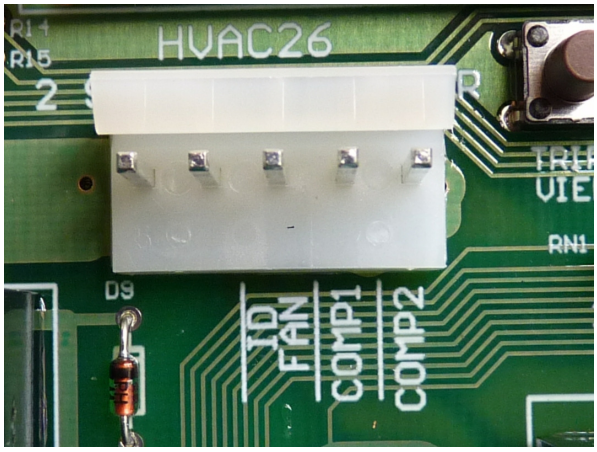
Refer to appendix 1 for over all fault trip interlock chain wiring diagram. The phase fail relay contact and the indoor fan overload switch contact are wired directly to CN7:

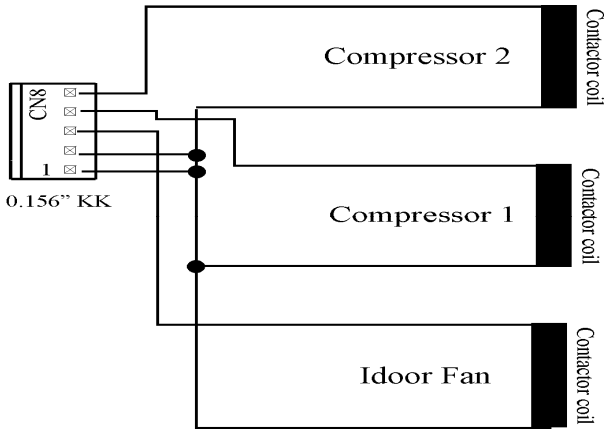




3.5 Compressor 1 and 2, Indoor Fan Contactor Connection:

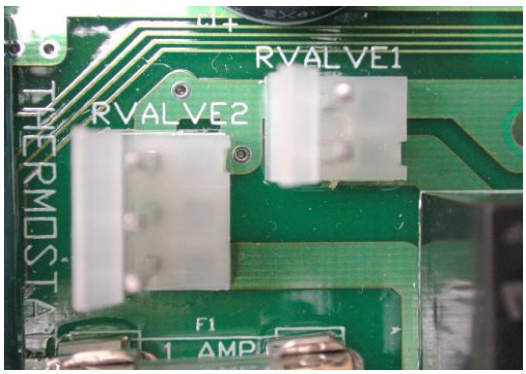
Refer to appendix 1 for over all fault trip interlock chain wiring diagram. The two compressor contactors and the indoor fan contactor are wired to CN8:

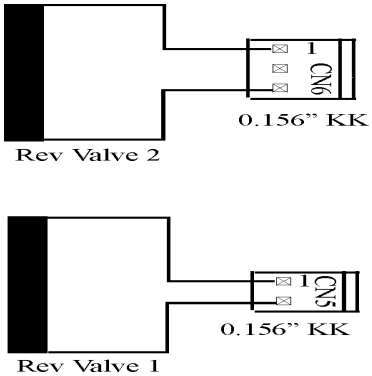




3.6 Reversing Valves Connection:

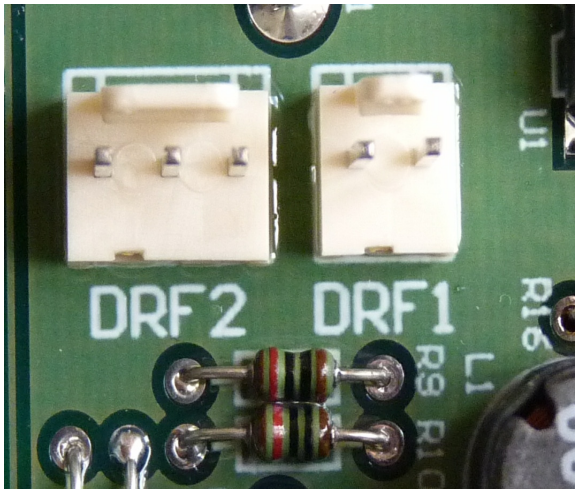
The two reversing valve to CN5 and CN6:

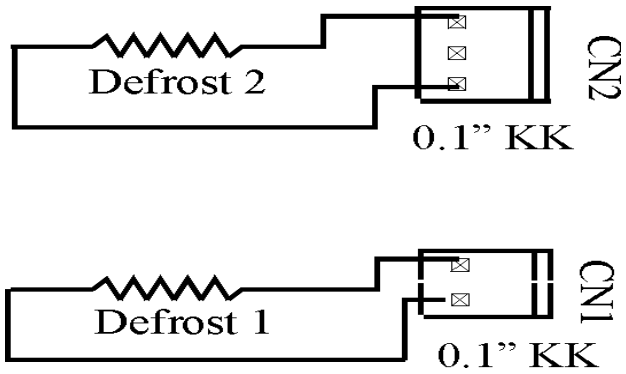




3.7 Thermistor Connection:

Each stage has a defrost thermistor mounted on the outdoor coil for sensing when a defrost is required:





4 ELECTRICAL SPECIFICATION:

All figures given for 24 Volts AC supply voltage unless otherwise noted.

4.1 Controller Power Supply:

Power source	24 Volts AC ±10%, 50/60 Hz
Maximum controller current draw, all outputs on, no external loads	0.30 Amps RMS 7.2 VA
Current draw of out door fan relay circuits from each fault chain (not included in above)	0.14 Amps RMS, 3.4 VA, per relay
Fusing of electronic circuitry	Fusible trace on PCB
Maximum total current input to controller (sum of controller, thermostat, indoor fan contactor and compressor contactors	10 Amps RMS continuous

4.2 Thermostat:

Maximum RMS thermostat current (fuse limited)	1 Amp
Input loading fan, stage 1, stage 2 and heat signal inputs	9mA per input, 36mA total
Minimum AC voltage per input at input terminal	12VAC RMS

4.3 Environmental:

Operating Temperature Range	-5^0C to + 65^0C
Operating Humidity Range	5% to 95% RH
Storage Temperature Range	-20^0C to $+80^0$C
Storage Humidity Range	5% to 95% RH

4.4 Fault Chain Input Current:

At each stage of the fault chain there is an input to the controller to allow fault recognition/reporting by the controller. The current draw for each input is 100uA. Fault chain operation depends on contactor current to keep fault chain switch contacts conductive.

Input Current per stage branch of the fault chain	400uA, 0.01VA
Phase fail and indoor fan overload inputs	200uA, 0.005VA

Total transformer current for all fault chain inputs is 1mA or 0.024 VA.

4.5 Thermistor Inputs:

Thermistor excitation voltage	5 Volts DC
Maximum thermistor circuit current	500uA
Resistance at 25°C	10K ohms
Thermistor Beta value	3970
Resolution	In the range -20°C → 60°C = 0.2° C

4.6 Fault Relay Output:

Maximum switching voltage	24 VAC nominal
Maximum switching current	10 Amps, resistive load
Minimum switching current and voltage	10mA / 6 VDC, 6 Vrms

4.7 Fuse Ratings:

- The thermostat circuit is protected by F1 and uses a dedicated M205 1 Amp delayed action fuse.
- The heat output and reversing valve circuits are protected by F2. Maximum value for this fuse is 7 Amps.
- The indoor fan and compressor contactor circuits are protected by F3. Maximum value for this fuse is 7 Amps.

All fuses are to be delayed action types to avoid nuisance tripping due to inrush currents. Actual fuse ratings depend on the model of air conditioning plant. **Note that the total current flowing in the controller power terminal inputs shall not exceed 10 Amps (see section 4.1).**

5 PCB dimensions and mounting centres:

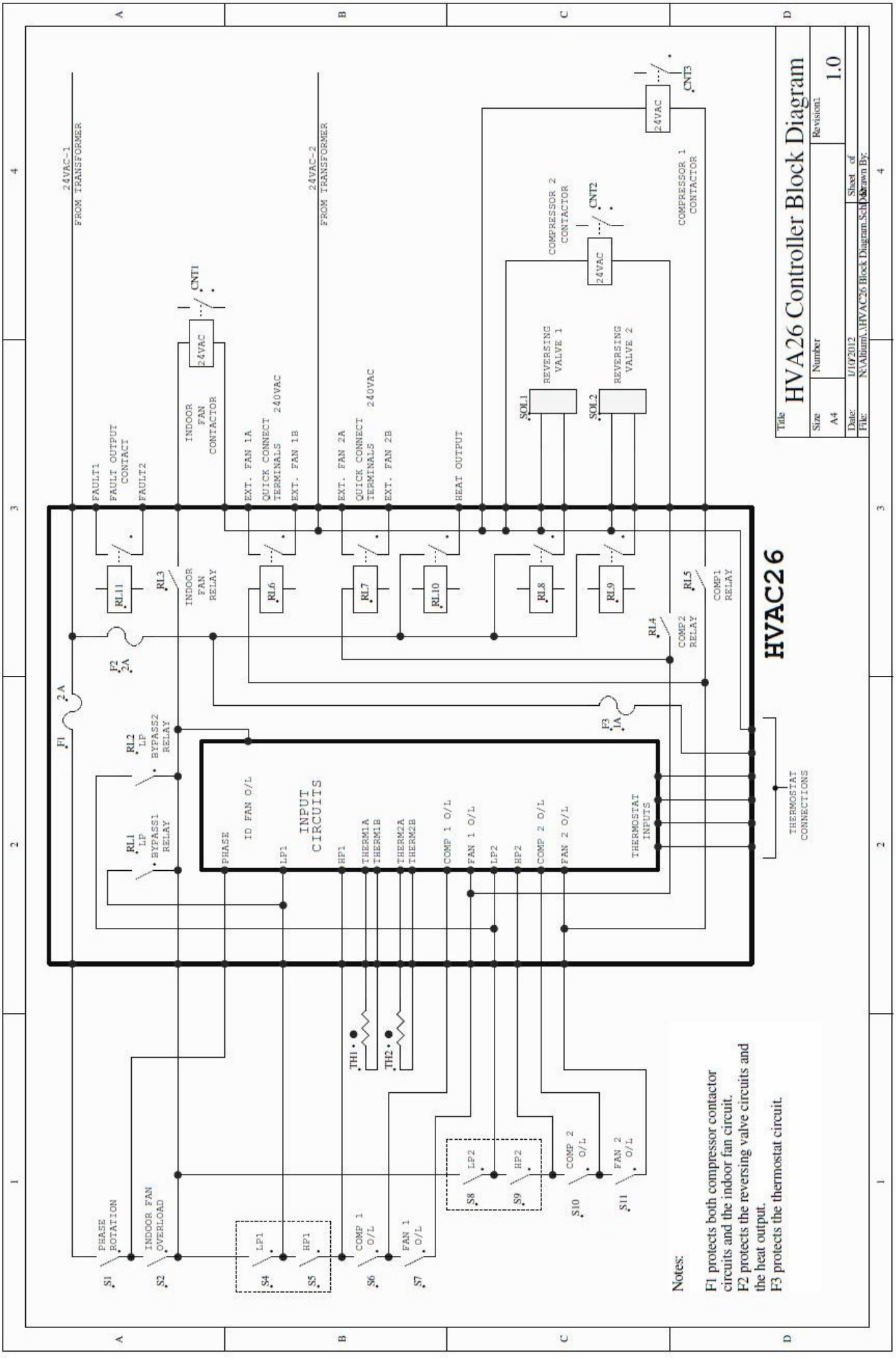
Refer to drawing in appendix 2.

NOTE: If the mounting hole at location 131.47, 31.75 is to be used, this hole can **ONLY** be secured with a plastic spacer as it passes through a PCB track carrying 24 VAC in the fault chain.

The PCB should be mounted such that there is a 10mm gap between the bottom of the PCB and the mounting surface.

The highest components on the PCB are the out door fan relays. The maximum height from the bottom surface of the PCB to the top of the quick connect tabs on these relays is 26mm.

The PCB should be orientated with the LCD display towards the top of the enclosure.


HVA26 Controller Block Diagram
Revision: 1.0
Size A4
Number
Date: 1/10/2012
File: N:\Altium\..\HVAC26 Block Diagram.SchDoc
Drawn By:
HVAC26
INPUT CIRCUITS
24VAC-1 FROM TRANSFORMER
24VAC-2 FROM TRANSFORMER
FAULT1
FAULT OUTPUT CONTACT
FAULT2
INDOOR FAN CONTACTOR
CNT1
24VAC
EXT. FAN 1A
QUICK CONNECT TERMINALS
240VAC
EXT. FAN 1B
EXT. FAN 2A
EXT. FAN 2B
HEAT OUTPUT
REVERSING VALVE 1
REVERSING VALVE 2
SOL1
SOL2
COMPRESSOR 2 CONTACTOR
CNT2
COMPRESSOR 1 CONTACTOR
CNT3
RL1 LP BYPASS1 RELAY
RL2 LP BYPASS2 RELAY
RL3 INDOOR FAN RELAY
RL4 COMP2 RELAY
RL5 COMP1 RELAY
RL6
RL7
RL8
RL9
RL10
RL11
F1 2A
F2 2A
F3 1A
PHASE
ID FAN O/L
LP1
HP1
THERM1A
THERM1B
THERM2A
THERM2B
COMP 1 O/L
FAN 1 O/L
LP2
HP2
COMP 2 O/L
FAN 2 O/L
THERMOSTAT INPUTS
THERMOSTAT CONNECTIONS
TH1
TH2
PHASE ROTATION
INDOOR FAN OVERLOAD
COMP 1 O/L
FAN 1 O/L
COMP 2 O/L
FAN 2 O/L
S1
S2
S4
S5
S6
S7
S8
S9
S10
S11
Notes:
F1 protects both compressor contactor circuits and the indoor fan circuit.
F2 protects the reversing valve circuits and the heat output.
F3 protects the thermostat circuit.

Appendix 2: Dimensions and mounting hole centres