

EMALLAIR

A fresh approach to air conditioning

SERVICE & INSTALLATION MANUAL

ELECTRONIC CONTROLS AND CONTROL OPTIONS FOR KRS CONTROLLERS

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ELECTRONIC CONTROL SYSTEM FUNCTION AND OPERATION DETAILS

The electronic controller, fitted in the unit control box, provides a number of options to allow the consultant or installing contractor to tailor the mode of the unit's operation to suit the installation requirements. In some instances it may be necessary to set switches (dip switches) on the electronic controller board to ensure that it responds appropriately to the particular type of thermostat selected.

MAIN CONTROLLER FEATURES

- 240VAC, 12 VA input
- 22±2VAC, 120 mA, fused supply for electronic thermostats.
- 14 @ 16 amp relay outputs individually fused.
- LED indicators for:
 - ▲ each output
 - ▲ each input
 - ▲ HP & O/L fault circuit for each system
 - ▲ LP fault circuit for each system
 - ▲ Indoor fan O/L
 - ▲ power
 - ▲ processor CPU
 - ▲ system fault (4 off)
- choice of control options.

CONTROLLER SOFTWARE FEATURES

- switching of compressor stages (T/stat logic)
- compressor limit start timers
- minimum off cycle timers
- delay between stages
- two speed outdoor fan control
- indoor fan switching
- indoor fan safety lockout
- reversing valve control
- time/temperature de-ice control
- individual fault lockout circuits:
 - ▲ one instant trip and
 - ▲ one delay trip – (per system)
- auto reset after power failure
- compressor lead-lag sequence changeover (selectable)
- speed mode for service and commissioning
- self diagnostic fault indication

CAUTION

The electronic controller has been matched to a range of standardised Emailair thermostats. The controller will not operate correctly if connected to thermostats with solid state switching. These thermostats incorporate a bleed of current through the output terminals to power the thermostat and therefore cannot be used.

Some electromechanical thermostats also use the 24V supply to power a heating resistor as a heat anticipator to improve thermostat response. This anticipator cannot be used with the unit's controller and must be disabled by disconnecting the 24V neutral.

The Emailair controller options detailed in this publication all have normal relay switched outputs.

LOW VOLTAGE SWITCHING

The controller provides a 22±2VAC supply for powering electronic controllers.

- All switches and thermostat contacts must be voltage free i.e. they MUST NOT switch the low voltage supply to the output.
- Maximum load imposed must not exceed 0.12 amps.

The controller has a fuse on board which provides short circuit protection and is rated at 0.6 amps. Do not fit larger fuses.

ELECTRONIC CONTROL SYSTEM FUNCTION AND OPERATION

DETAILS — cont.

DESCRIPTION OF OPERATION

Start up sequence at first start or after power failure.
If controls are calling for cooling or heating:

- Energise rev. valve (if heating)
- Start indoor fan.
- Time out 4 minute compressor OFF cycle.
- Time-out (6 sec.) compressor start delay then:
- Start compressor #1 and outdoor fan.
- Delay (6 sec.) between stages.
- Start compressor #2, #3, #4.

Note: If cooling is called for the outdoor fan may be delayed until the outdoor coil temperature rises.

If controls are calling for fan only:
The controller will start the indoor fan immediately provided Fan input is ON and the Fan O/L safety is closed.

Cycling sequence under thermostat control.
The system, running under thermostat control with a call for heating or cooling, will have compressor(s) on, outdoor fan(s) running high or low speed (depending on ambient temperature and coil temperature), and indoor fan running. The reversing valve will be energised if the call is for heating.

When the thermostat drops the call for heat or cool the compressors sequence OFF in response as the airconditioning call is satisfied. Note that the reversing valve will stay energised if the call was for heating. A limit start timer begins counting to ensure that the compressor stays off for at least 4 minutes and that 10 minutes has elapsed since the last start.

Provided this timer is satisfied the compressor start sequence begins immediately at the next call for heating or cooling, ie: the compressors start, and the outdoor fan(s) switches on.

SPEED MODE

A test mode is provided which overrides the compressor limit start time delays to assist factory and service/commissioning use.

The controller is placed into the SPEED mode by switching dip switch Group 1 No. 4 ON. This mode is provided to save time when trouble-shooting or commissioning the unit.

Note that care should be exercised not to short cycle the compressor when using this mode.

The speed mode is cancelled by switching dip switch Group 1 No. 4 OFF. If left in speed mode the system will cancel the speed mode automatically after approximately 15 minutes. The computer LED on the controller board flashes at a faster rate to indicate speed mode is selected.

LED SYSTEM STATUS INDICATORS

A LED is provided to indicate the status of each switched input and each output relay on the controller board. This is a valuable aid to service and trouble-shooting.
LED's are also provided to indicate:

- each fault lockout circuit (red LEDs)
- main power to controller
- 24 volt power
- microcomputer healthy (also flash rate indicates speed or normal mode).

SAFETY LOCKOUT CIRCUITS

Each compressor has its own associated lockout circuit which will shut down the compressor if any of the connected safety devices trip. The remaining compressor will continue to run. The fault LEDs on the controller indicate which system has detected a fault, or if the INDOOR FAN O/L is detected all LEDs indicate fault lockout (All Red LEDs).
The fault LED's in conjunction with the CPU LED are used to indicate the type of fault which caused the current lockout state (Ref. Troubleshooting section in this publication).
In addition to the on board LED indicators a relay output is provided giving a summary fault indication — this relay may be used to bring up a fault signal at a remote location. (This feature does not apply as standard to all models refer wiring diagram of applicable model. An additional relay expansion board may be required.)

RESET

Reset is accomplished by switching off the FAN and AC inputs or by dropping the 240 V supply (power failure reset).

COMPRESSOR SEQUENCING

Provision is made to automatically change the loading sequence of compressors at pre-determined intervals (normally 200 hours of system run time). This feature is preferred by some users to equalise the wear rate on multiple compressor systems. Dip switch Group 2 No 4 • OFF no lead-lag • ON lead-lag charge at 200 hours.

REMOTE RUN AND FAULT

The electronic controller provides a relay switching function for remote Fault indication.
The Fault relay is energised during any fault lock-out condition.
This relay provides voltage free contacts suitable for voltages below 250 volts.
A run signal can be obtained by utilising the N.O. auxiliary contact on the indoor fan contactor. A run signal will be provided whenever the indoor fan is switched on. (This signal will remain during all fault conditions except power failure.) (This feature does not apply as standard to all models refer wiring diagram of applicable model. An additional relay expansion board may be required.)

CONTROLLER LOGIC

SAFETY CIRCUIT

Separate inputs are provided for various safety devices to allow the controller to discriminate between the various types of faults and to log the fault into memory for later recall.

Indoor fan O/L faults cause the controller to shut down all outputs except the fault signal relay. All fault LED's on the main board will indicate red.

Individual refrigeration system fault signals are input to a lockout circuit which shuts down the appropriate compressor until deliberate reset action is taken.

The appropriate system fault LED shows red to indicate a lockout fault and the fault signal relay will close, providing an output for remote fault indication. The LP is separated as it operates via a 10 minute delay to prevent nuisance trips.

The fault lockout circuit for each system consists of:

- HP and O/L (comp) in series
- LP (fault trip is delayed 10 minutes)
- DT (discharge temp)

Discharge temperature sensors

The discharge temperature of the compressor is continuously monitored by a thermostat (Clixon) or an analogue sensor. The controller shuts the compressor down and initiates a fault lockout if the temperature exceeds 140°C.

INDOOR FAN

Provided:

- FAN input is ON
- FAN O/L closed

then the indoor fan will start immediately.

Note: a dip switch selection (switch 2-1 = ON) is provided to allow for auto fan operation. With this selection the indoor fan will be delayed until 15 seconds after the compressor starts or when the discharge temp reaches 70°C. Normal commercial applications require continuous ventilation therefore Dip switch 2-1 = OFF.

COMPRESSOR

Provided:

- FAN input is ON
- FAN O/L closed
- AC input is ON
- COMP safeties closed
- COMP timing functions are completed
- COMP is called for by thermostat

then compressor will start

Compressor timing functions:

- sequence start = 6 sec. between compressors
- minimum start to start = 10 minutes
- minimum off time = 4 minutes

OUTDOOR FAN

Cooling cycle

The outdoor fans start on low speed when the compressor(s) starts. They switch to high speed automatically when the coil temp rises above 48°C. The outdoor fans may switch OFF if the coil temperature drops below 20°C. The fans switch OFF when the compressor cycles OFF and the logic is repeated at the next compressor start.

PLEASE NOTE

The controller constantly monitors the condensing temperature on cooling cycle and will detect if the unit is operated below 16°C (ambient). Continued use of the unit in this manner will result in a system fault lockout (signalled by the controller as a head pressure fault).

This occurrence can be prevented by fitting head pressure control (optional).

Heating Cycle

The outdoor fans start 1 second after the compressor and runs at low speed for the first five minutes. If at the end of this time the coil temp is below 5°C the fans switch to high speed. The fans switch OFF when the compressor cycles OFF and the logic is repeated at the next compressor start.

The outdoor fans are switched OFF during the de-ice cycle.

DE-ICE (All KRS controlled units)

The basic de-ice logic is as follows:

The de-ice cycle is controlled by outdoor coil temperature and time overrides.

De-ice is prevented until the compressor has run for at least 20 minutes since the last de-ice cycle. Then if the OD Coil temp is below the de-ice setpoint -5°C for five minutes, a de-ice cycle is initiated as follows:

- OD Fans are switched OFF

- Reversing valve is switched OFF

- The OD Coil temp is monitored during the de-ice cycle and the unit is returned to normal heating cycle when the coil temp reaches 10°C or when the time reaches 10 minutes from the start of the de-ice cycle

2 & 3 Compressor Units

Interlock logic is provided to ensure only one compressor can de-ice at a time, and that idle compressors are brought on line to supplement the heating performance while on system is in de-ice.

4 Compressor Units

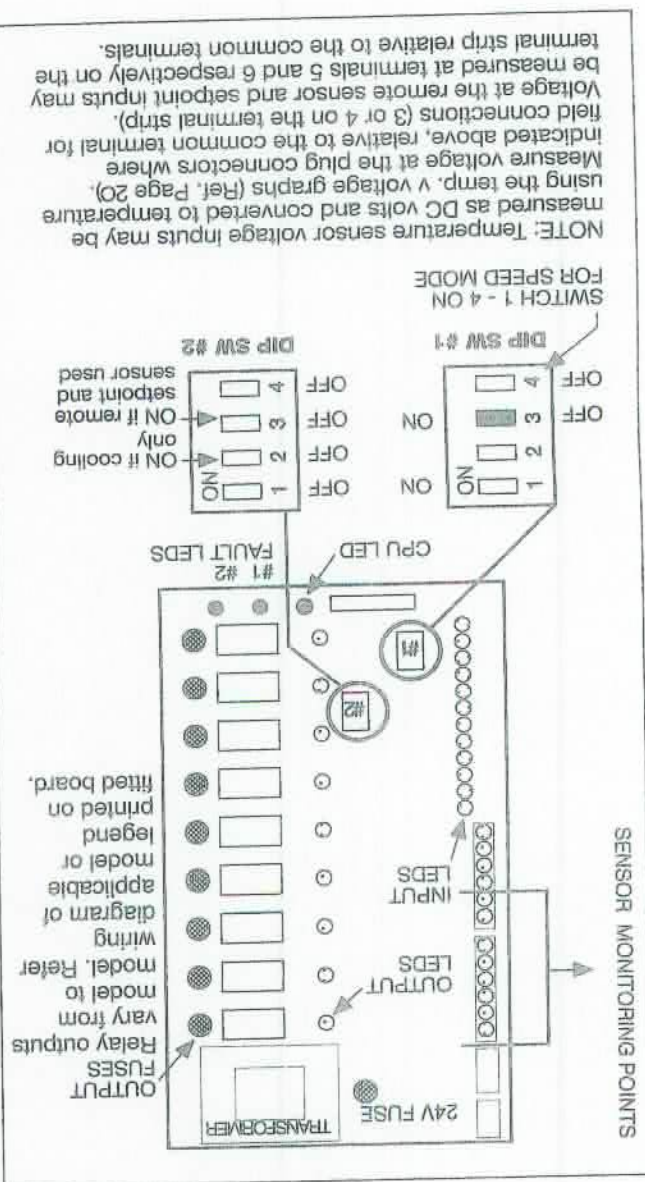
These units have 4 compressors grouped as two pairs sharing a pair of OD fans, the first compressor of the pair requires de-ice initiates a de-ice cycle for both compressors. Both systems OD Coil temps are monitored and the first reach termination causes the compressor for that system to be shut down. The de-ice cycle continues for the remaining system and terminates normally, reverting to heating cycle. The compressor which was shut down then responds normally to thermostat signals and compressor timing restraints.

RM255H & RM305H

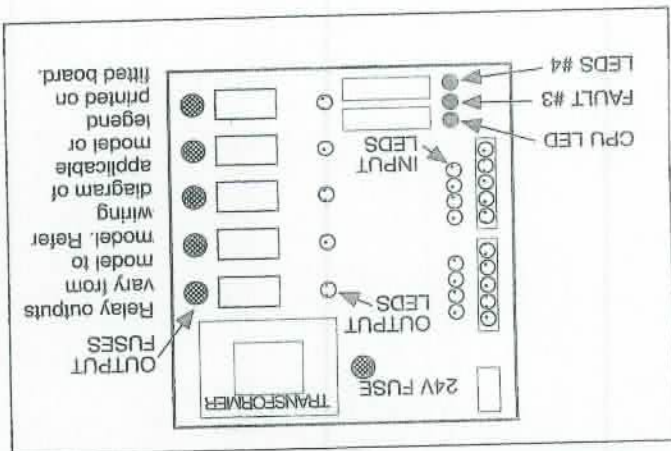
A special case exists for these models as both compressors share 1 OD fan. In these cases the first compressor of the pair to require de-ice initiates a de-ice cycle for both compressors. Both systems OD Coil temps are monitored and the first to reach termination causes the compressor that remaining system and terminates normally, reverting to heating cycle. The compressor which was shut down then responds normally to thermostat signals and compressor timing restraints.

SETTING DIP SWITCHES

Main Electronic Controller Board Layout



Relay Expansion Board Layout



DIP SWITCH FUNCTIONS

The following provides information on the functions controlled by Dip Switch settings.

Dip Switch Group #1

These are preset at the factory and must be correct for the Model to which the controller is fitted.

See table below.

SWITCH NO.	MODEL	1-1	1-2	1-3
RM105-125-155-185-235	DN205-255-305	OFF	OFF	OFF
RM255-305	RM405-505-605	ON	OFF	OFF
RM752-902	RM1300	ON	OFF	OFF
DN1300		ON	OFF	OFF

● 1-4 OFF = normal time delays
(ON = speed mode for 15 min.)

Dip Switch Group #2

- 2-1 should be off
- 2-2 OFF = reverse cycle model
- (ON = cooling only model)
- 2-3 OFF = conventional thermostat
- (ON = remote set point and sensor)
- 2-4 OFF = no lead-lag.

(ON = lead-lag change at 200 hrs)

SETTING DIP SWITCHES

Two banks of four Dip Switches are fitted to the controller board.

All are set and tested at the factory and should not need adjustment unless either of the following circumstances applies:

- 1-4 ● Speed mode is required for service or commissioning – see SPEED MODE below.
- 2-3 ● The ROOM SENSOR AND REMOTE SET POINT is used instead of a conventional switching thermostat.

SPEED MODE

The controller is placed into the SPEED mode by switching dip switch #1-4 ON. This mode is provided to save time when trouble-shooting or commissioning the unit.

Note that care should be exercised not to short cycle the compressor when using this mode.

The speed mode is cancelled by switching dip switch #1-4 OFF. If left in speed mode the system will cancel the speed mode automatically after approximately 15 minutes.

The computer LED on the controller board flashes at a faster rate to indicate speed mode is selected.

CONTROL OPTIONS

The electronic controller fitted to these units gives the installer the choice of using the built in thermostat switching logic or a remote thermostat/controller to provide the switched input to the P.C.B.

Six options are available for room temp control and set point:

A: Emailair sensor and remote set point unit. All KRS

Controlled Units.

B: Emailair Climate Controller Single Stage Units

C: Emailair Timer/Climate Controller. Single stage units.

D: Emailair climate controller. 2 stage units.

E: Emailair programmable controller. 3 & 4 stage units.

F: Suitable alternative controller.

Emailair recommends Option "A"

A. Room sensor and remote set point unit

Wiring Diagrams, see pages 8 & 9.

The installer can choose from the range of items detailed below. ON / OFF switch or time clock has to be provided separately.

● Room Sensor with concealed set point, run and

fault indication.

This room sensor (XB01035) may be used either as a

room sensor only, or as a combined room

sensor/concealed adjustment remote set point. If

used as a room sensor only a XB01040 remote set

point is also required.

● Room Sensor with face exposed set point, run

and fault indication.

This remote set point unit (XB01040) can be used

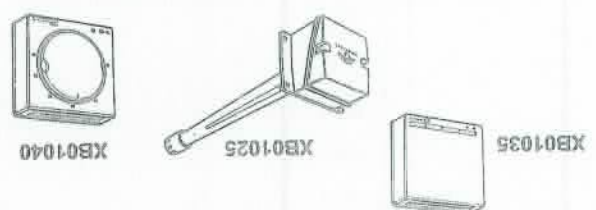
either as a remote set point only, or as a combined

room sensor/face adjustable set point.

● Duct mounted return air sensor

This duct sensor (XB01025) is a sensor only and

must be used with an XB01040 remote set point.



All the above items must be wired with shielded cable and must not be run in conduits with power wiring (240/415 volt).

REMOTE SENSOR/CONTROLLER WIRING REQUIREMENTS

All remote sensors must be wired with shielded cable and must not be run in conduits with power wiring (240/415 volt) (2 core Part No. VD00335, 3 core Part No. VD00340).

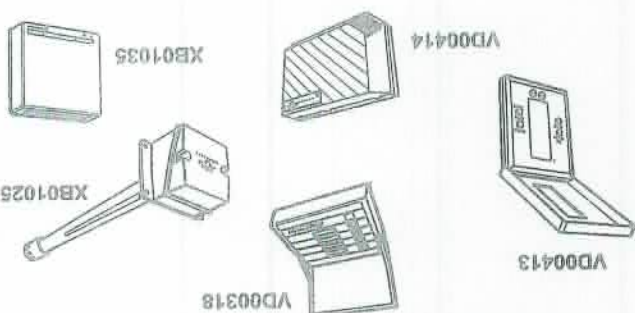
PLEASE NOTE: As the unit controller requires a specific input from the room sensor and remote setpoint, alternative systems cannot be used.

B. Emailair Electronic Climate Controller (Pt. No. VD00413) Single Stage Units

Wiring Diagrams, see page 10.

Remote Sensor Wiring Diagrams, see pages 16 & 17.

This control centre is a single stage heat/cool thermostat with independently set heat and cool set points that also can be connected to an outdoor air temperature sensor to display outdoor temperature and has an inbuilt 2 zone changeover switch. This thermostat also has the facility to use a variety of remote sensors.

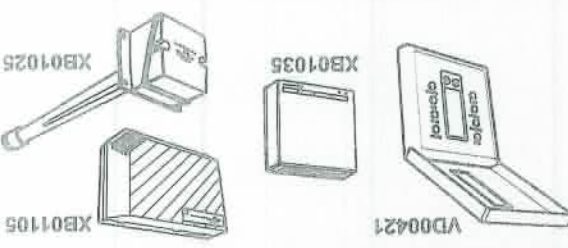


C. Emailair Electronic Timer/Climate Controller (Pt. No. VD00421) Single Stage Units

Wiring Diagrams, see page 11.

Remote Sensor Wiring Diagrams, see pages 18 & 19.

This thermostat is a single stage heat/cool timer incorporating control switches, 4 programmable temperature settings and a set-back or set up electronic timer. An ON/OFF time clock function is not available.



Where it is desired to use a remote temperature sensor, a variety of options are available as included above.

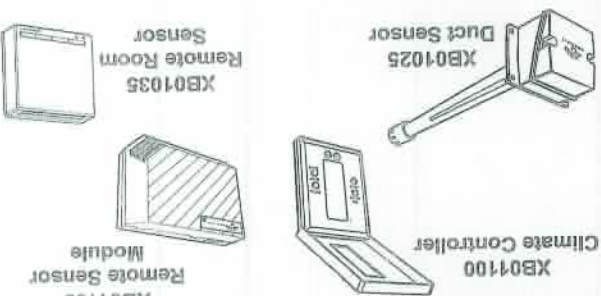
D. Two Stage Climate Controller XB01100

Wiring Diagram, see page 12.

Remote Sensor Wiring Diagrams, see pages 18 & 19.

This thermostat has inbuilt delays which add to the above start delays. Up to 20 minutes delay is built in at initial start up or after power failure before the thermostat sends a signal to the air conditioner.

Please Note: This Thermostat can be used with a remote sensor.



CONTROL OPTIONS cont.

E. Alternative Controllers.

Wiring Diagrams, see page 13

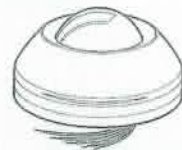
Any alternative controller or T/stat can be used providing it has voltage free contacts. Controllers with solid state switching **MUST NOT BE USED**, and Electro-mechanical thermostats fitted with heat anticipation must have the heat anticipator disabled. Maximum additional load imposed on the A/C unit controller transformer must not exceed 0.12 Amps 24 Volt.

Time Clock (By others)

An Analogue time clock (supplied by others) can be used with Emailair control options.

Occupancy Sensor

E.C.P. can supply a motion sensing occupancy sensor for use with Emailair control options.



VD00424

Thermostat / Sensor Location

It is essential that the location selected for the thermostat sensor is representative of the space to be controlled and where it will be readily affected by changes to the general space temperature.

Locations adjacent to or in line with supply air outlets, or where its operation may be affected by direct sunlight, outside doors or other external influences must be avoided.

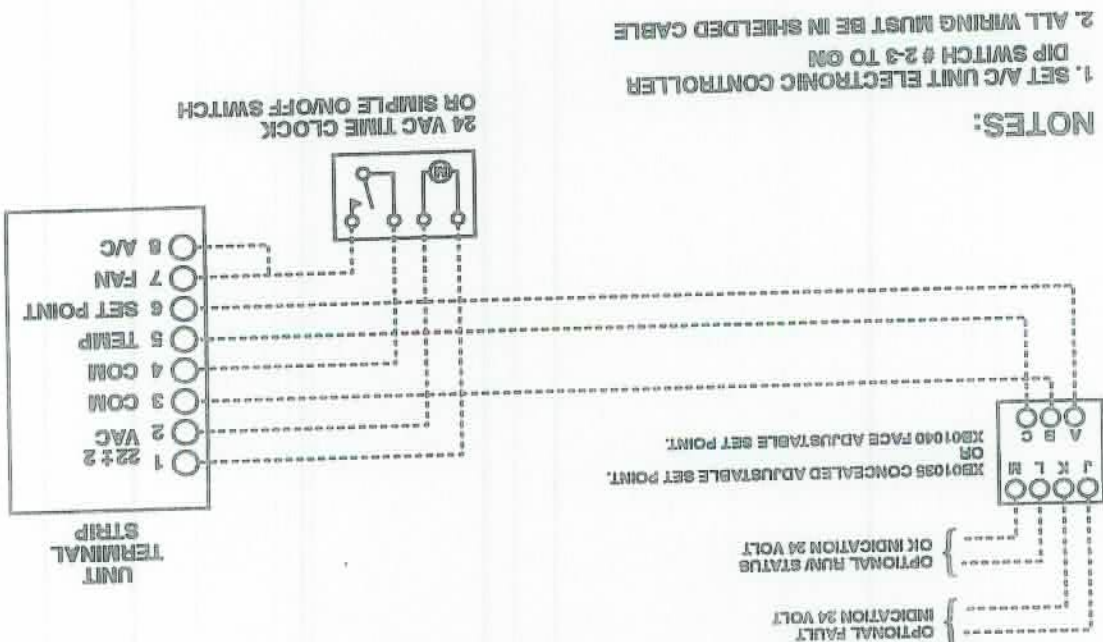
The wire entry point must also be thoroughly sealed to prevent draughts influencing the operation of the sensor.

If using a thermostat controller and remote sensor it is not recommended to mount the controller in the units control box.

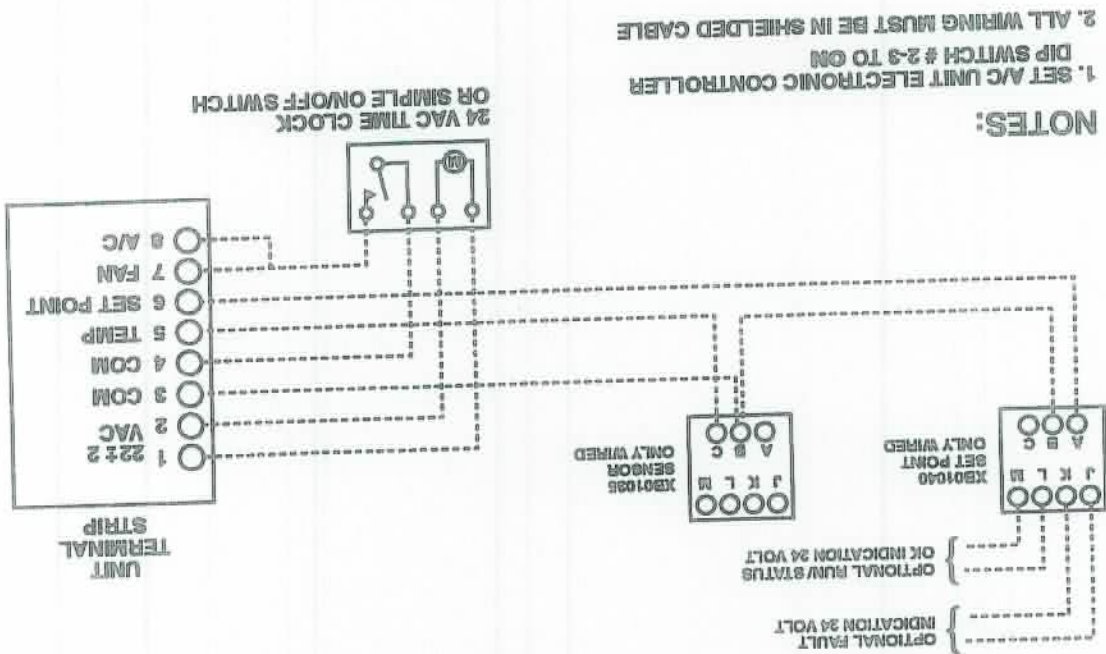
All control wiring must be wired in Shielded Cable (See Wiring Requirements Page 6).

Failure to observe the above requirements may result in erratic and unreliable operation of the unit and will result in warranty on equipment being void.

A.



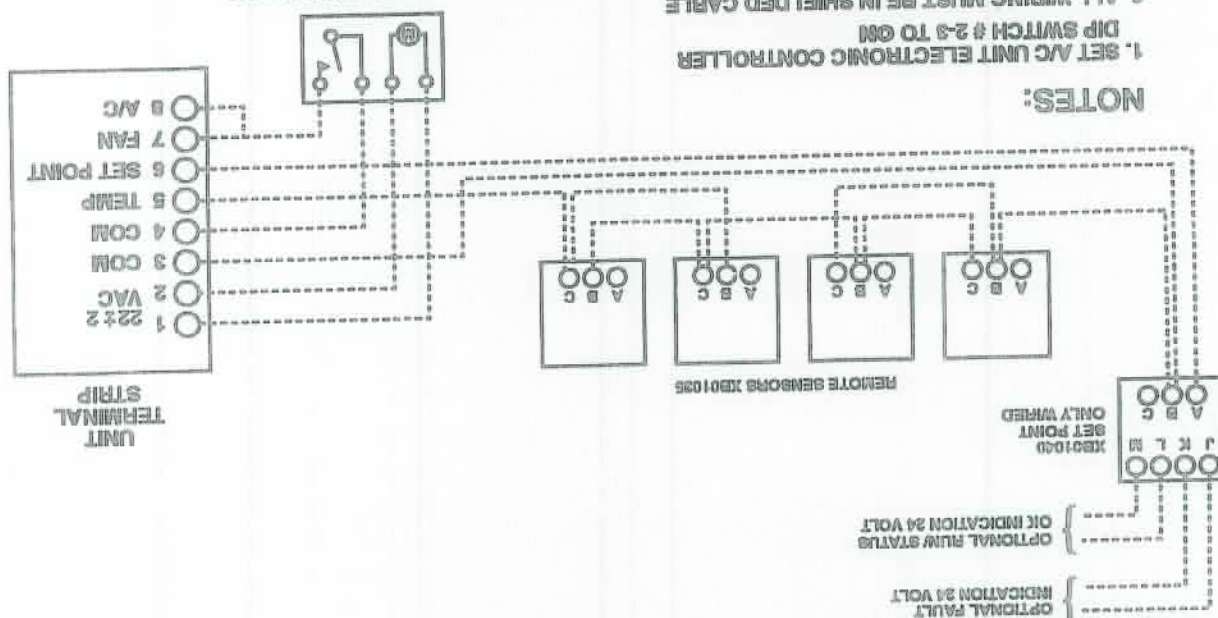
REMOTE SENSOR & SETPOINT FOR ALL KRS CONTROLLED UNITS



COMBINATION OF SEPARATE SENSOR & SETPOINT FOR ALL KRS CONTROLLED UNITS

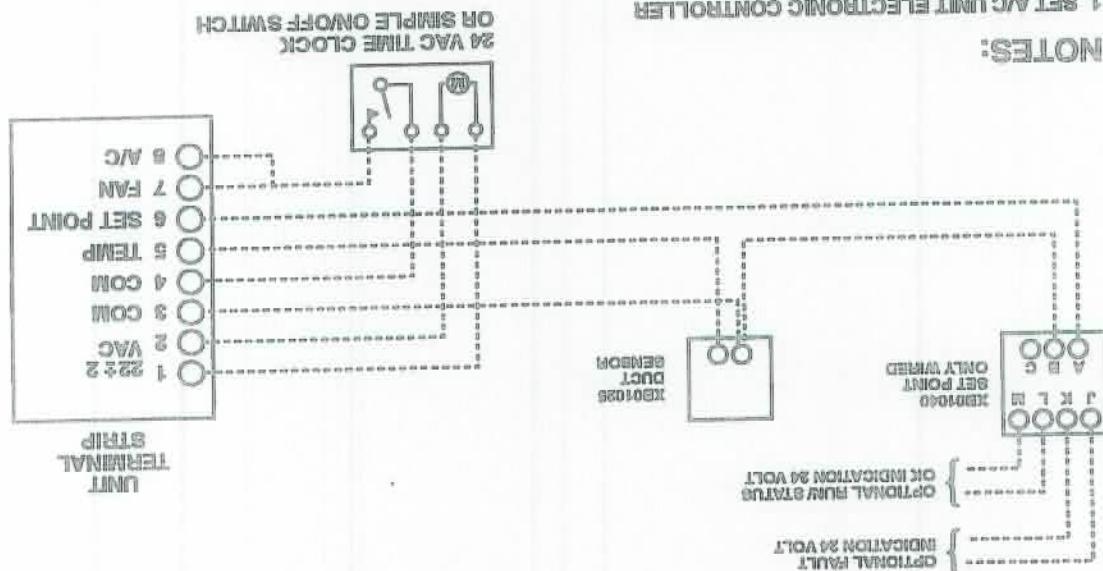
4 SENSOR AVERAGING & REMOTE SETPOINT
FOR ALL KRS CONTROLLED UNITS

1. SET A/C UNIT ELECTRONIC CONTROLLER DIP SWITCH # 2-3 TO ON
2. ALL WIRING MUST BE IN SHIELDED CABLE
3. WIRING CONNECTION SEQUENCE IS CRITICAL AND 4 SENSORS MUST BE USED.



COMBINATION OF REMOTE SETPOINT & RETURN AIR DUCT SENSOR FOR ALL KRS CONTROLLED UNITS

- NOTES:
1. SET A/C UNIT ELECTRONIC CONTROLLER DIP SWITCH # 2-3 TO ON
 2. ALL WIRING MUST BE IN SHIELDED CABLE



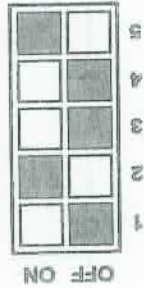
B.

EMAILAIR VD00413 CLIMATE CONTROLLER SINGLE STAGE UNITS

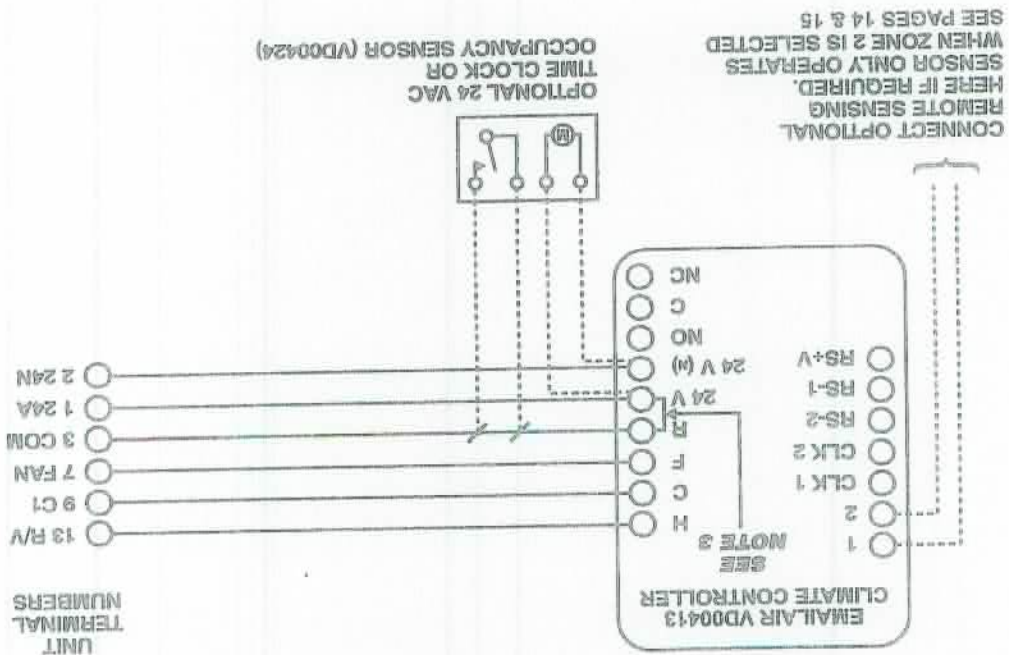
CLIMATE CONTROLLER SWITCH FUNCTIONS

1. ON Keyboard locked
OFF Keyboard unlocked.
 2. When OFF the CLK1-CLK2 input allows the selection of ZONE 1 or ZONE 2
CLK 1-CLK2 open: ZONE 1 is selected
CLK 1-CLK2 closed: ZONE 2 is selected.
When ON, the CLK1-CLK2 input controls the unit operation.
CLK 1-CLK2 open: Unit is allowed to operate
CLK 1-CLK2 closed: Unit is forced OFF and flashing OFF is displayed.
 3. Not used, leave OFF.
- 4&5. These two slide switches work as a pair. Slide switch 4 ON 5 OFF: Remote sensor must be fitted, sensor is required.
Slide switch 4 OFF 5 ON: No remote sensor required (remote sensor disabled if fitted).

SWITCH SETTINGS



- NOTES:**
1. ALL CONTROL WIRING MUST BE WIRED IN SHIELDED CABLE. (8 CORE VD00340) (2 CORE VD00335)
 2. SET A/C UNIT ELECTRONIC CONTROLLER DIP SWITCH #1 TO ON.
 3. IF A LINK EXISTS BETWEEN R-24V IT MUST BE REMOVED BEFORE APPLYING POWER.

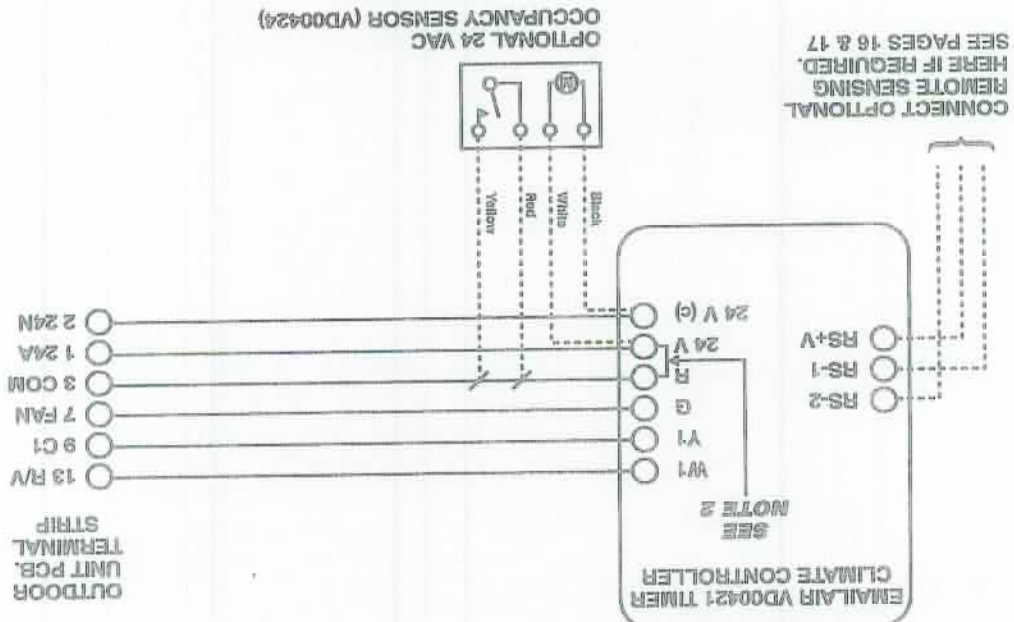


EMAILAIR VD00421 TIMER / CLIMATE CONTROLLER SINGLE STAGE UNITS

TIMER/ CLIMATE CONTROLLER SLIDE SWITCH FUNCTIONS

SWITCH SETTINGS	
OFF ON	
4 Events/day	1
Smart fan disabled	2
2 Minute (min. On)	3
Keypad unlocked	4
Fan immediate with heat call	5
Smart fan enabled	2
2 Events/day	1
Smart fan enabled	2
2 Minute (min. On)	3
Keypad locked	4
Fan On with plenum switch	5

- NOTES:**
1. ALL CONTROL WIRING MUST BE WIRED IN SHIELDED CABLE. (8 CORE VD00340) (2 CORE VD00335)
 2. SET A/C UNIT ELECTRONIC CONTROLLER DIP SWITCH #1 TO ON.
 3. IF A LINK EXISTS BETWEEN R-24V IT MUST BE REMOVED BEFORE APPLYING POWER.

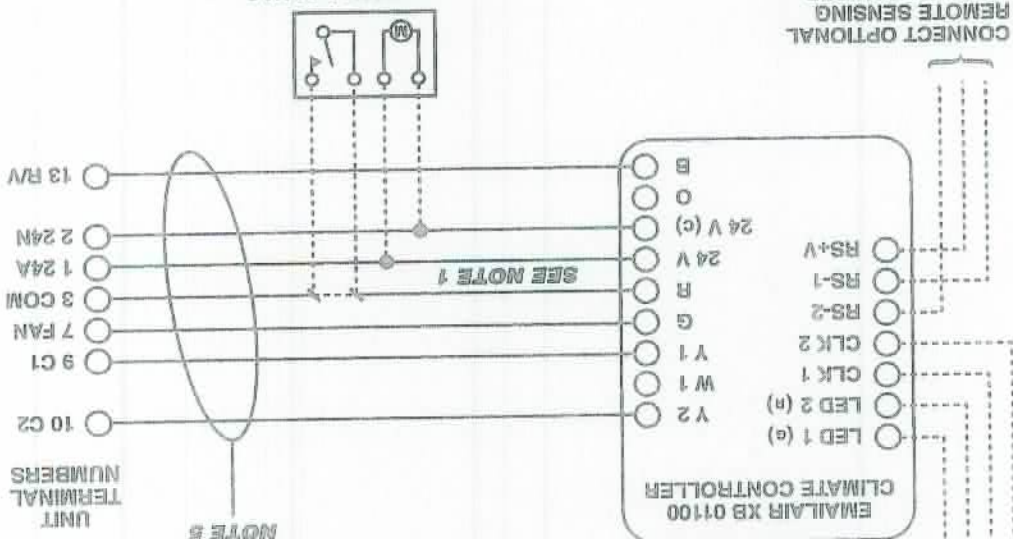


EMAILAIR XB01100 CLIMATE CONTROLLER

2 STAGE UNITS

D.

NIGHT SETBACK
TIMECLOCK OR
SWITCH (CLOSED
FOR SETBACK)
INPUT TO SWITCH
ON 24 VAC LEADS
FOR STATUS OK/ FAULT
INDICATION



CONNECT OPTIONAL
REMOTE SENSING
HERE IF REQUIRED
SEE PAGES 16 & 17

NOTES:

1. REMOVE CLIMATE CONTROLLER LINK BETWEEN R-24V BEFORE APPLYING POWER
2. SLIDE SWITCH #6 WITHIN CLIMATE CONTROLLER MUST BE SET TO ON
3. SET A/C UNIT ELECTRONIC CONTROLLER DIP SWITCH #2-3 TO OFF
4. THE CLIMATE CONTROLLER LOGIC MAY PROVIDE SIGNIFICANT TIME DELAYS AT INITIAL START-UP
5. ALL CONTROL WIRING MUST BE WIRED IN SHIELDED CABLE (8 CORE VD00340) (2 CORE VD00335)

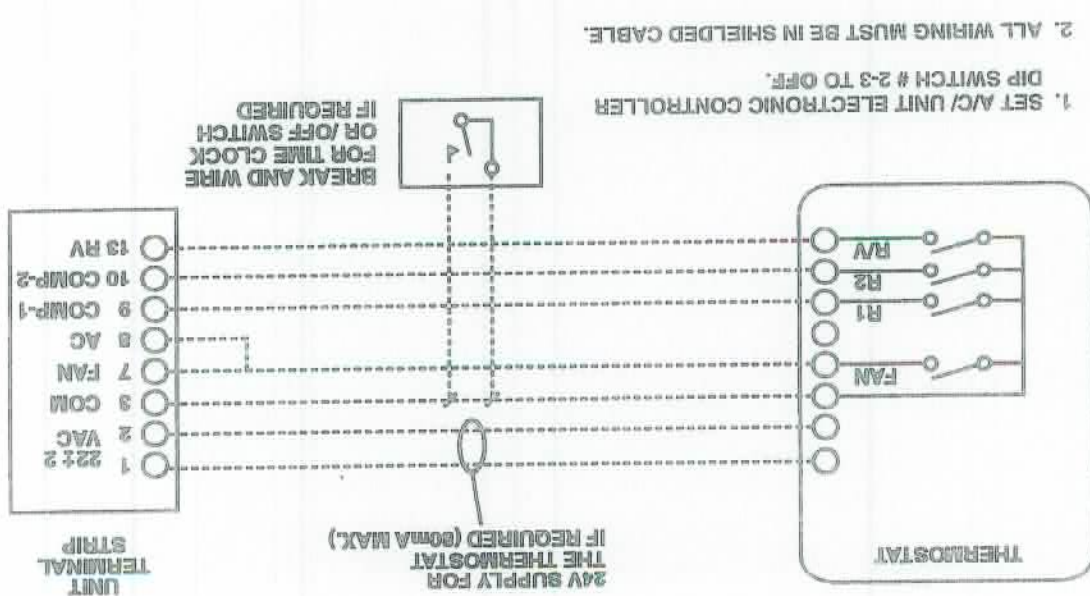
CLIMATE CONTROLLER SLIDE SWITCH FUNCTIONS

Normal	1	Not used	2	2 Minute (min. On)	3	Keypad unlocked	4	Economy	5	Single stage	6	Led 1- icon off	7	Led 2- icon off	8
Add on		Not used		2 Minute (min. On)		Keypad locked		Economy		Single stage		Led 1- icon off		Led 2- icon off	
Multi stage		Not used		2 Minute (min. On)		Keypad locked		Economy		Single stage		Led 1- icon off		Led 2- icon off	
Comfort		Not used		2 Minute (min. On)		Keypad locked		Economy		Single stage		Led 1- icon off		Led 2- icon off	
Multi stage		Not used		2 Minute (min. On)		Keypad locked		Economy		Single stage		Led 1- icon off		Led 2- icon off	
Led 1- Filter icon		Not used		2 Minute (min. On)		Keypad locked		Economy		Single stage		Led 1- icon off		Led 2- icon off	
Led 2- Fault icon		Not used		2 Minute (min. On)		Keypad locked		Economy		Single stage		Led 1- icon off		Led 2- icon off	

SWITCH SETTINGS



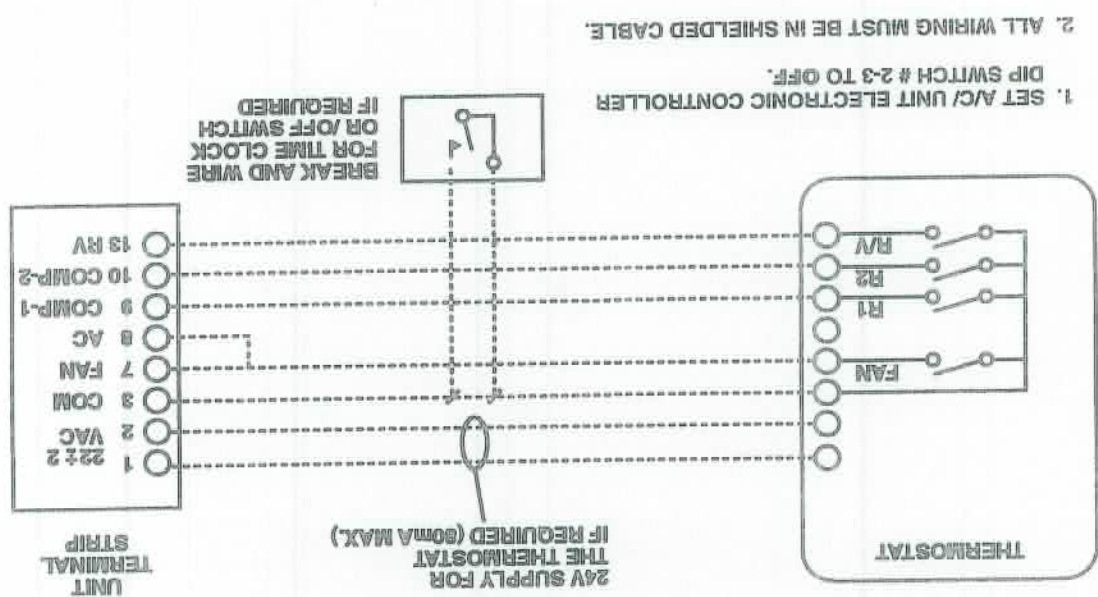
ALTERNATIVE CONTROLLER WIRING REQUIREMENTS FOR 1 & 2 STAGE UNITS



1. SET A/C UNIT ELECTRONIC CONTROLLER DIP SWITCH # 2-3 TO OFF.
2. ALL WIRING MUST BE IN SHIELDED CABLE.

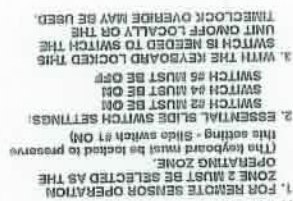


ALTERNATIVE CONTROLLER WIRING REQUIREMENTS 3 & 4 STAGE UNITS

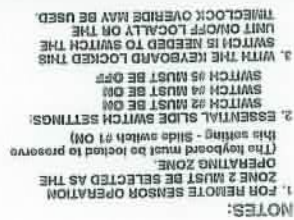


1. SET A/C UNIT ELECTRONIC CONTROLLER DIP SWITCH # 2-3 TO OFF.
2. ALL WIRING MUST BE IN SHIELDED CABLE.

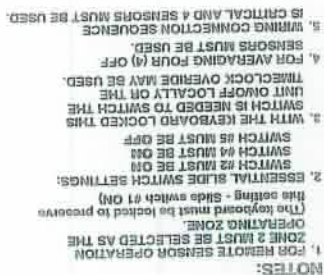
1. SINGLE ZONE APPLICATION WITH
REMOTE ROOM SENSOR XB01035



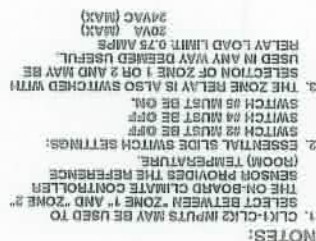
REMOTE DUCT SENSOR XB01025



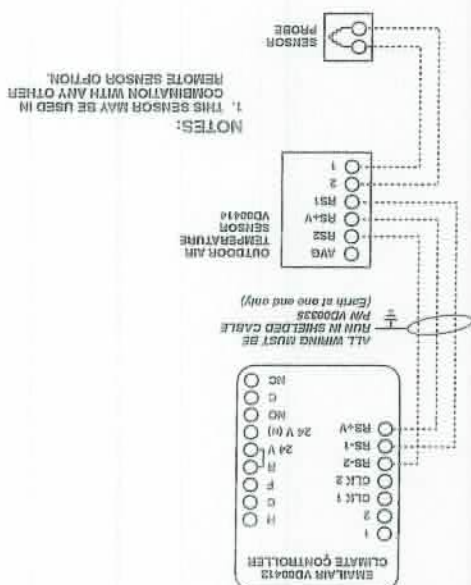
3. SINGLE ZONE APPLICATION WITH ROOM TEMPERATURE AVERAGING



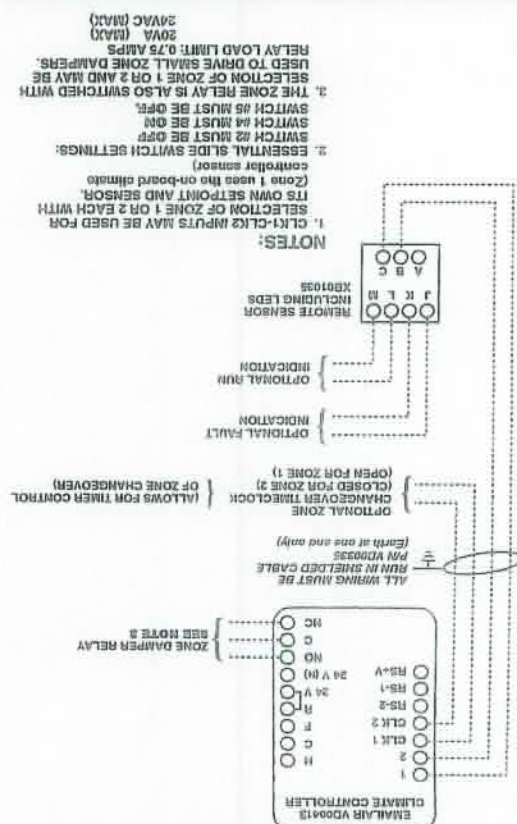
4. TWO ZONE APPLICATION WITHOUT REMOTE SENSOR



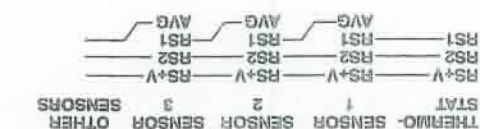
6. OPTIONAL OUTDOOR AIR SENSOR



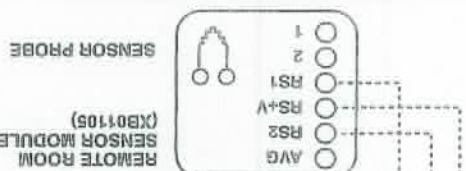
5. TWO ZONE APPLICATION WITH
REMOTE ROOM SENSOR XB01035



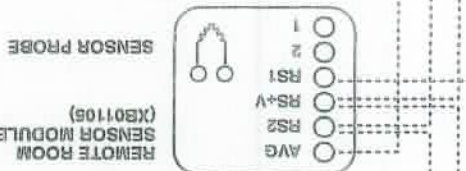
REMOTE SENSOR OPTIONS FOR XB01100 & VD00421 CONTROLLERS



CONNECT WIRE TO ADDITIONAL SENSORS IN THE FOLLOWING MANNER
STAT 1 THERMO-SENSOR 2 SENSOR 3 OTHER SENSORS

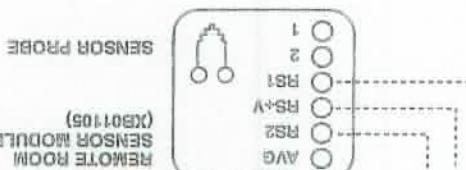


ALL WIRING MUST BE RUN IN SHIELDED CABLE (Earth at one end only)



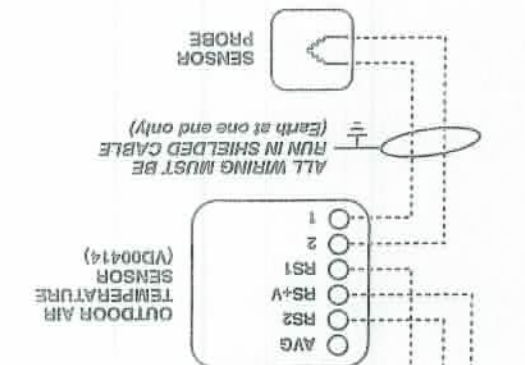
ALL WIRING MUST BE RUN IN SHIELDED CABLE (Earth at one end only)

3. ROOM TEMPERATURE AVERAGING (XB01105)

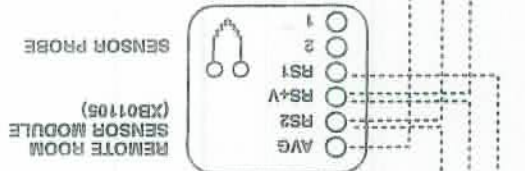


ALL WIRING MUST BE RUN IN SHIELDED CABLE (Earth at one end only)

1. REMOTE ROOM SENSOR XB01105

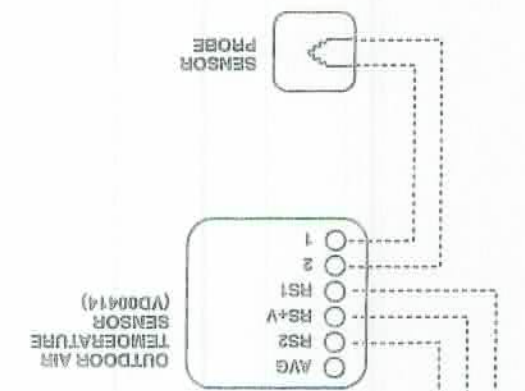


ALL WIRING MUST BE RUN IN SHIELDED CABLE (Earth at one end only)



ALL WIRING MUST BE RUN IN SHIELDED CABLE (Earth at one end only)

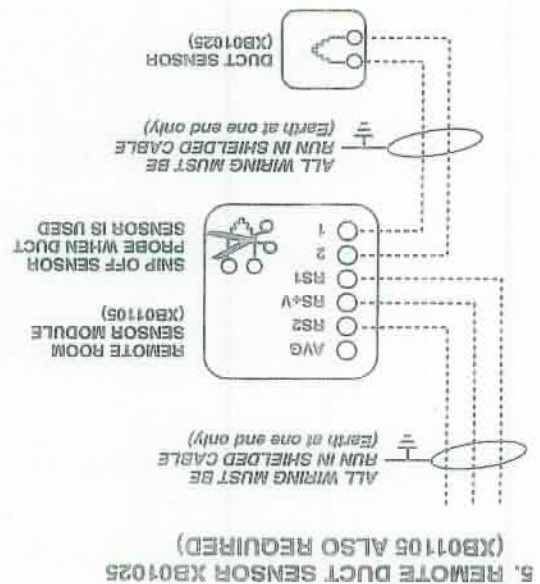
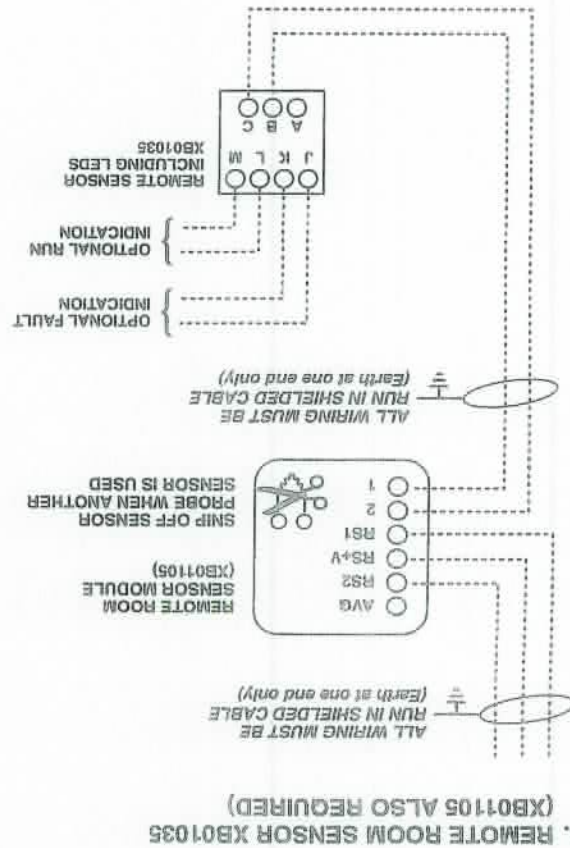
4. REMOTE ROOM SENSOR AND OUTDOOR AIR TEMPERATURE SENSOR



ALL WIRING MUST BE RUN IN SHIELDED CABLE (Earth at one end only)

2. OUTDOOR AIR TEMPERATURE SENSOR (VD00414)

REMOTE SENSOR OPTIONS FOR XB01100 & VD00421 CONTROLLERS



TROUBLESHOOTING INTERPRETATION OF LED INDICATORS

BASIC OPERATION

All switched inputs and outputs are indicated by LEDs, and fault conditions are indicated by LEDs.

Power and computer healthy LEDs are provided.

Note also that the function of the fault lockout circuits is to hold the system off after a safety device has tripped, even though the safety device itself may have reset. For this reason it is possible for the unit to be locked out on fault but for all of the safety input LEDs to indicate closed circuits.

NOTE

1 & 2 Stage Units
The DLT (discharge temp sensors) are not indicated by LEDs but are inputs to the fault lockout circuits, and as such can cause lockout trip.

3 & 4 Stage Units
The discharge temp protection is by manual reset clickons each with its own input to the compressors safety circuit via the relay expansion board. (Each has its own LED).

FAULT LEDs

The controller board has a red fault LED for each compressor system. The LEDs indicate red if a lockout circuit fault exists and indicate which compressor system is in lockout. If the fault is common to both systems (such as a FAN O/L fault) then both fault LEDs show red (refer fault codes on next page).

System #3 & #4 compressors are controlled by the outputs from the relay expansion board. This board has its own input and output LEDs and also CPU and FAULT LEDs for systems #3 & #4.

OUTPUT LEDs

Each output LED indicates when the control logic has switched on the related output relay. Labels indicate the function of each relay i.e.: if the COMP#1 relay is switched on but the compressor is not running then the PCB output fuse for that relay should be checked. If that is OK then the fault lies external to the controller board.

INPUT LEDs

Main Controller Board

LED STATUS	FUNCTION	LED	EXTERNAL CONTROL INPUTS	SAFETY CIRCUITS
ON	FAN signal from thermostat	Fan	A/C	INS 1
ON	Compressors can run if called	A/C	C 1	DLY 1
ON	#1 compressor called	C 1		INS 2
ON	#2 compressor called	C 2		DLY 2
ON	#3 compressor called	C 3		INS 3
ON	#4 compressor called	C 4		DLY 3
ON	Heating signal from thermostat	R/V		INS 4
ON	Indoor fan overload	Fan O/L		DLY 4
ON	#1 comp O/L and H/P OK			DT 1
ON	#2 comp O/L and H/P OK			DT 2
ON	#2 L/P OK			DT 3
ON	#3 comp O/L + HP OK			DT 4
ON	#3 L/P OK			
ON	#4 comp O/L + HP OK			
ON	#4 L/P OK			
ON	#1 disch. temp. OK			
ON	#2 disch. temp. OK			
ON	#3 disch. temp. OK			
ON	#4 disch. temp. OK			

NOTES

- 1 FAN + FAN O/L LEDs must be on before anything will run.
- 2 A/C LED must be on before compressors will run.
- 3 Safety circuit LEDs may show a closed safety circuit while a fault lockout exists. Refer note under BASIC OPERATION (above).
4. Input LEDs Compressor LEDs C1 to C4 and R/V are not used if Emailair remote set point and sensors are used.

TROUBLESHOOTING – cont.

FAULT CODES

Main Controller Board (All Models)

CPU	SYS #1	SYS #2	Description of fault
SF	OFF	OFF	No fault – normal speed
FF	OFF	OFF	No fault – speed mode
SF	ON	ON	Indoor fan O/L
FF	SF	SF	Model Dip Switches set wrong #1 - 1 - 3
SF	FF	FF	Sys #1 – sensor open circuit
FF	SF	FF	Sys #1 – discharge temperature
OFF	SF	OFF	Sys #1 – low pressure
ON	SF	OFF	Sys #1 – HP or compressor O/L
SF	OFF	FF	Sys #2 – sensor open circuit
FF	FF	FF	Sys #2 – discharge temperature
OFF	FF	SF	Sys #2 – low pressure
ON	FF	SF	Sys #2 – HP or compressor O/L
SF	FF	FF	Room sensor open circuit

The fault code for the most recent fault is displayed for 5 seconds whenever the controller is placed into speed mode.

FAULT MEMORY

OFF LED is off
ON LED is on continuously (not flashing)
SF LED flashing slowly
FF LED flashing fast

Legend:

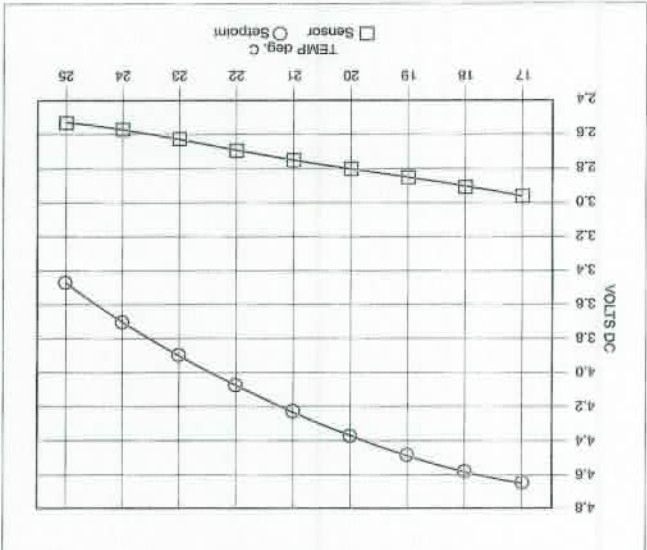
Note: Room sensor open circuit indication is only applicable if remote setpoint and sensor are used (Dip switch #2-3 ON).

Relay Expansion Board (3 + 4 stage models)

CPU	SYS #3	SYS #4	Description of fault
SF	OFF	OFF	No fault – normal speed
FF	OFF	OFF	No fault – speed mode
SF	ON	ON	Indoor fan O/L
FF	SF	SF	Model Dip Switches set wrong #1 - 1 - 3
SF	FF	FF	Sys #3 – sensor open circuit
FF	SF	FF	Sys #3 – discharge temperature
OFF	SF	OFF	Sys #3 – low pressure
ON	SF	OFF	Sys #3 – HP or compressor O/L
SF	FF	FF	Sys #4 – sensor open circuit
FF	FF	FF	Sys #4 – discharge temperature
OFF	FF	SF	Sys #4 – low pressure
ON	FF	SF	Sys #4 – HP or compressor O/L
SF	FF	FF	Room sensor open circuit

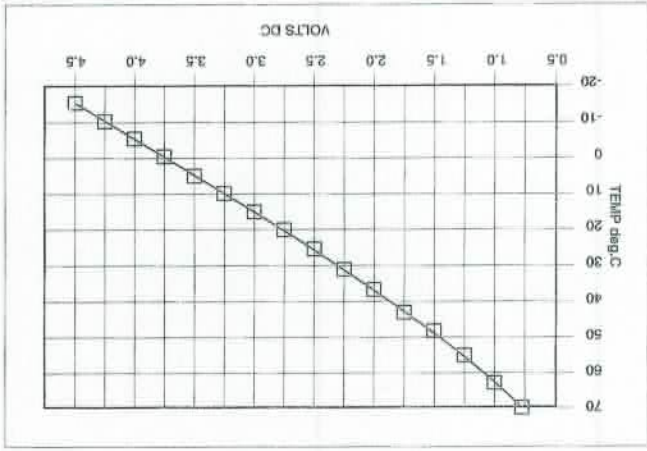
TROUBLESHOOTING – cont. MEASURING INPUT VOLTAGES TO DETERMINE SENSOR TEMPERATURE

A. Room Sensor and Remote Set Point Unit.



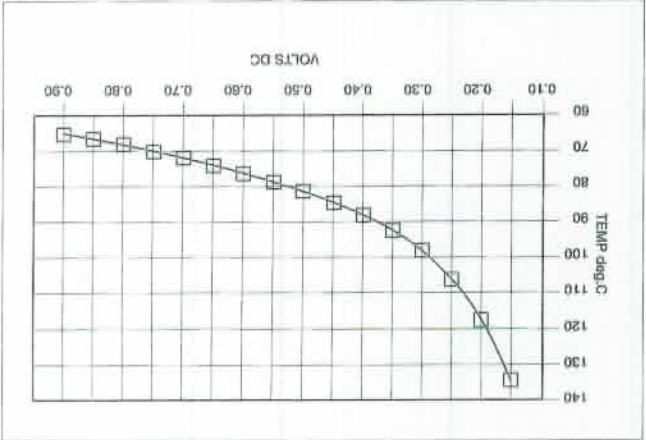
Monitoring points on unit terminal strip:
 • Room sensor – across terminals 3 and 5.
 • Remote set point – across terminals 3 and 6.

B. Condenser Coil Temperature Sensor.



See wiring diagrams of applicable model for location of monitoring points.

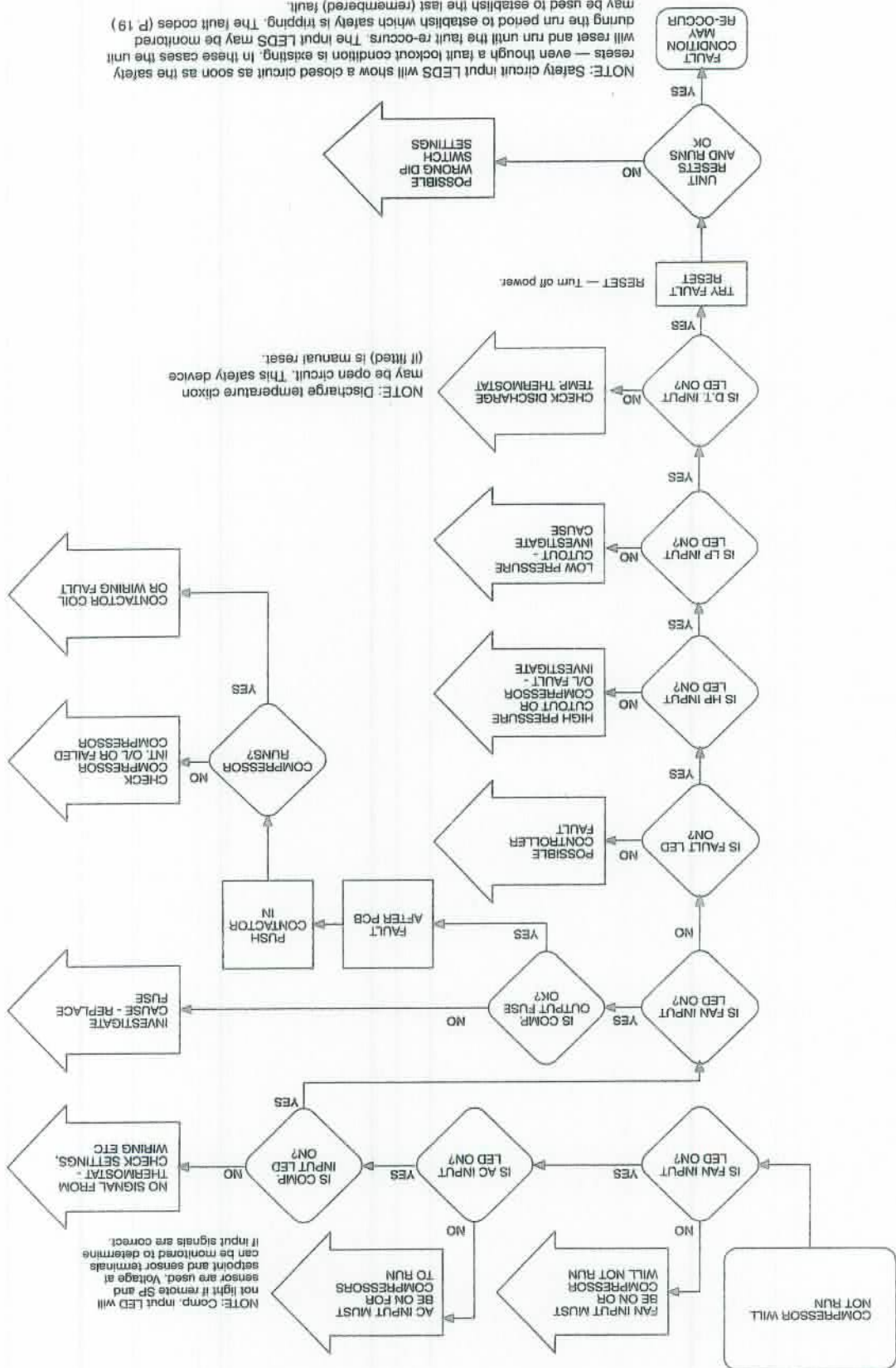
C. Discharge Line Temperature Sensor.
(Fitted to two stage units only)



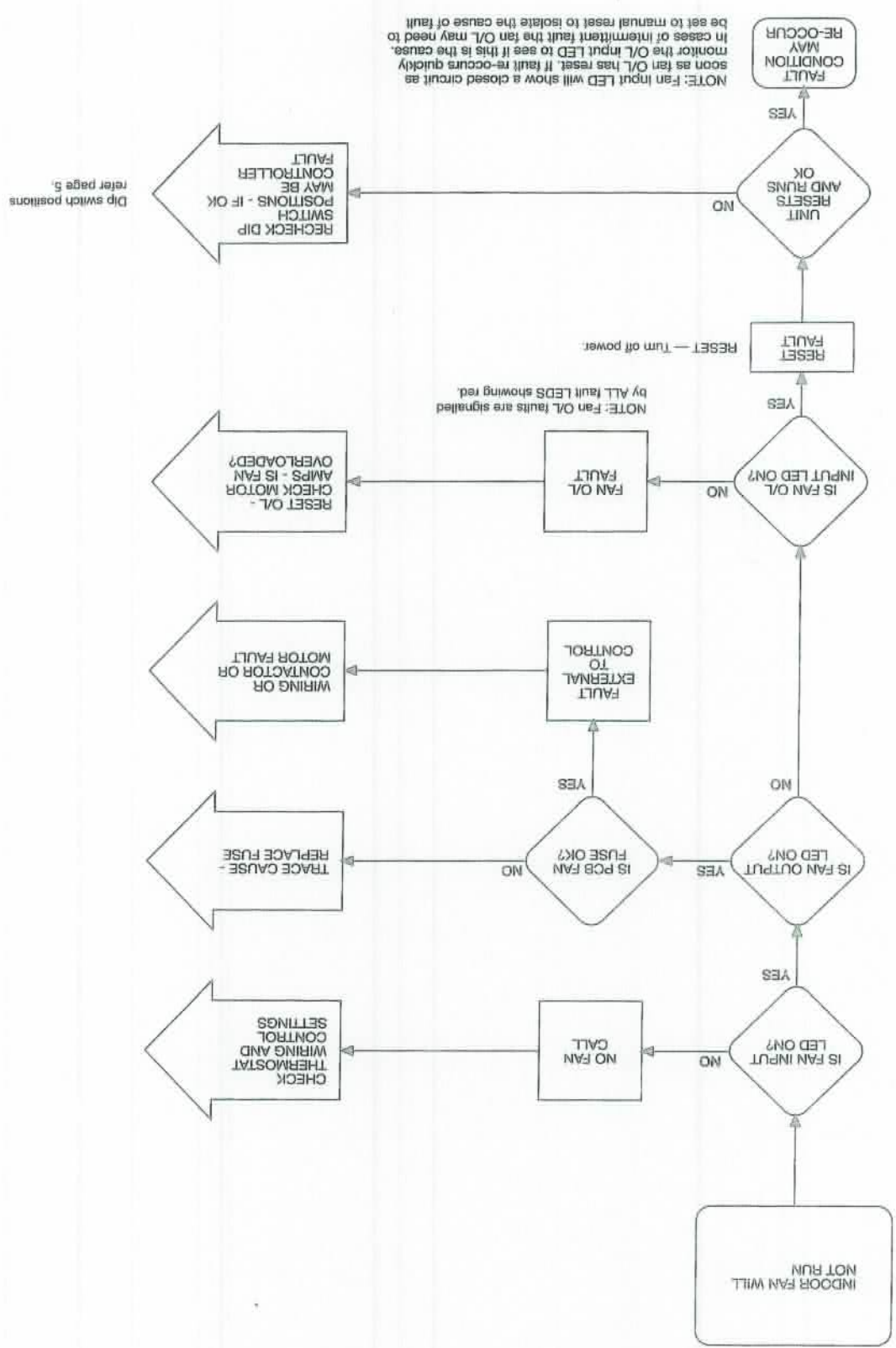
See wiring diagrams of applicable model for location of monitoring points.

TROUBLE SHOOTING PROCEDURE 1

NOTE: The first step in all troubleshooting should be to check for a red LED and if one is found follow the fault code indicated. (Ref. P. 14).



TROUBLE SHOOTING PROCEDURE 2 INDOOR FAN WILL NOT RUN



SUPPLY CABLE SIZING – AIRCONDITIONING UNITS

The manual provides a method of selecting cable sizes which are large enough to ensure adequate voltage at the unit terminals when starting and during normal full load operation. The sizes determined are the minimum acceptable to Emalair to ensure satisfactory operation of the equipment.

Local wiring rules may appear to allow smaller wire sizes to be used, however use of smaller sizes may lead to operational problems and will void your warranty.

- Selection of supply cables must be determined by the following criteria:**
1. Length of run of supply cables.
 2. Maximum starting current of unit — cables must supply adequate voltage at unit terminals for starting.
 3. Method of installation of supply cables.
 4. Capability of cables to carry unit full load current. (Starting and full load currents are provided on the units circuit diagram.)

Procedure

1. Select minimum acceptable wire size to handle starting current — fig 1.
2. Check that wire size from step 1 is adequate for full load current — increase size as necessary — fig. 2.
3. Check that larger wire size determined from 1 or 2 is acceptable under local wiring rules.

CABLE SIZE FOR ACCEPTABLE VOLTAGE DROP WHEN STARTING

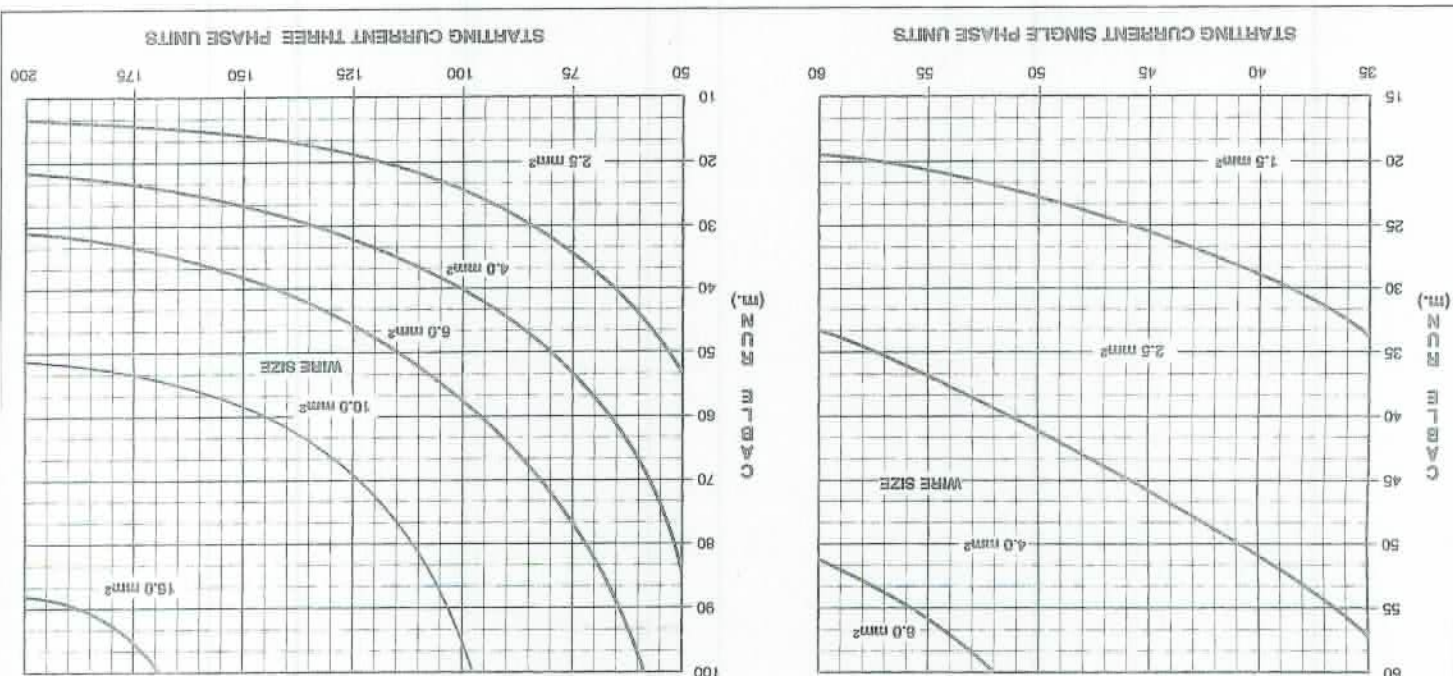


Fig. 1

CURRENT CARRYING CAPACITY — AMPS. (Normal full load current)									
SINGLE PHASE					THREE PHASE				
1.5	2.5	4.0	6.0		2.5	4.0	6.0	10.0	16.0
10	12	16	20	25	12	16	20	25	32
16	20	25	32		16	20	25	32	
16	20	25	32		20	25	32	40	50
20	25	32			20	25	32	40	50
25	32	40			25	32	40	50	63
32	40				32	40	50	63	80
40					40	50	63	80	100
50					50	63	80	100	120
CABLE SIZE — mm²					CABLE SIZE — mm²				
Completely surrounded by thermal insulation					Completely surrounded by thermal insulation				
Partially surrounded by thermal insulation					Partially surrounded by thermal insulation				
Enclosed in air					Enclosed in air				
Unenclosed in air					Unenclosed in air				
Buried in ground or underground enclosure					Buried in ground or underground enclosure				



COMMISSIONING DATA LOG SHEET

Installers please complete details for future service reference.

INSTALLATION DETAILS

NAME		ADDRESS	
SERVICE COMPANY NAME		ADDRESS	
CONTROL SYSTEM		MAKE	
UNIT		MODEL	
		SERIAL	

SUPPLY AIR FLOW	L/S	
AIR ON INDOOR COIL	°C	
AIR OFF INDOOR COIL	°C	
AIR ON OUTDOOR COIL	°C	
AIR OFF OUTDOOR COIL	°C	
AMBIENT TEMPERATURE	°C	
INDOOR FAN MOTOR	AMPS	RED
		BLUE
		WHITE
VOLTAGE		R-B
		B-W
		W-R

OPERATING PARAMETERS

SUCTON PRESS	kPa				
DISCHARGE PRESS	kPa				
SUCTON TEMP	°C				
DISCHARGE TEMP	°C				
SUCTON SUPERHEAT	°C				
LIQUID REFRIG TEMP	°C				
COMP MOTOR CURRENT	AMPS	RED	BLUE	WHITE	
OUTDOOR FAN CURRENT	AMPS	LOW	HIGH		



WARRANTY SERVICE REQUEST PROFORMA

Photocopy for your requirements

EMAILAIR OFFICE	FAX
-----------------	-----

CALL TYPE NORMAL	URGENT
------------------	--------

FROM

COMPANY NAME
CONTACT
PHONE
FAX

CALL DETAILS

CONTACT PERSON
PHONE
FAX

OWNERS NAME

PHONE

ADDRESS

SITE ADDRESS

SPECIAL INSTRUCTIONS

REPORTED FAULT

PARTS REQUIRED

EQUIPMENT DETAILS

OUTDOOR		
INDOOR		
CONTROL		

INSTALLED BY

DATE

TYPE OF INSTALLATION

RESIDENTIAL

COMMERCIAL

WARRANTY LABOUR INVOICE No.

BOOKING DETAILS

SERVICE PROVIDER	FAX	WH No.
DATE	DISCUSSED WITH	

EMAILAIR



QUESTIONNAIRE FOR PC BOARD CHANGEOVER

Photocopy for your requirements

BOARD REMOVED BY:	
MODEL OF A/C UNIT	
SERIAL NO. OF A/C UNIT	
SERIAL NO. OF BOARD	
TERMOSTAT FITTED (model OR email part no.):	

WHY DID YOU CHANGE THE BOARD?

OBVIOUS BOARD FAILURE If you have ticked any of these three reasons for removal please comment on possible cause.
BOARD IS DEAD (NO LIGHTS & FUSE OK) **COMMENT:** If this section used then no further data is then required.

VISIBLE COMPONENT FAILURE
MASSIVE FAILURE (i.e. BURNING, SHORT CIRCUIT)

AUTHORISATION NO.	
APPROX. HOW LONG SINCE THIS A/C UNIT WAS INSTALLED	
HAS THE BOARD IN THIS UNIT BEEN CHANGED BEFORE	
DID REPLACING THE BOARD FIX THE PROBLEM	
IS CONTROL WIRE RUN IN SHIELDED CABLE	
IS CONTROL WIRE RUN WITH POWER WIRING	

CONTROL WIRING (circle terminals with connections)

1	COMMON
2	COMMON
3	COMMON
4	COMMON
5	ROOM SENSOR
6	SET POINT
7	FAN
8	A/C
9	COMP 1
10	COMP 2
13	R/VALVES

* Warning Do NOT connect 1 or 2 to other control inputs

* Dip sw #2-3 ON if these terminals are used

A/C UNIT BEHAVIOUR (With fault present) WHAT DOESN'T RUN

☐	NOTHING RUNS
☐	INDOOR FAN
☐	COMPRESSOR(S)
☐	OUTDOOR FAN(S)
☐	REV VALVE(S)

TESTS CARRIED OUT (Y or N)

☐	OPERATES OK?
☐	NO IMPROVEMENT

ELECTRICAL CHECKS (With fault mode present)

AC VOLTS AT TERMINALS 1-2
DC VOLTS ACROSS COIL SENSOR #1
DC VOLTS ACROSS COIL SENSOR #2
24 volt SUPPLY FUSE CHECKED
IF A SENSOR IS SUSPECT
RESISTANCE OF COIL SENSOR
at APPROX. TEMP. deg C.
COIL SENSOR VISUAL CHECK OK?

OTHER REASONS FOR BOARD CHANGE

☐	UNEXPLAINED LOCKOUTS (tick one)
☐	COULD NOT FIND ANY FAULTS
☐	INDOOR FAN CYCLES ON/OFF
☐	OTHER (DESCRIBE)

LED INDICATIONS (With fault mode present) (Tick if lit and circle FAST, SLOW, or ON)

☐	FAST	SLOW	ON	CPU (GREEN)
☐	FAST	SLOW	ON	SYS #1 (RED)
☐	FAST	SLOW	ON	SYS #2 (RED)

INPUT & OUTPUT LEDS ON (Tick if ON)

☐	C1	FANS
☐	RV1	
☐	LOFAN1	
☐	HIFAN1	
☐	C2	
☐	RV2	
☐	LOFAN2	
☐	HIFAN2	
☐	I/DFAN	

FUSES CHECKED (Tick if FUSE checked)

☐
☐
☐
☐
☐
☐
☐
☐

DIP SWITCH SETTINGS (mark settings)

☐	1	MODEL	☐	1	MODEL
☐	2	MODEL	☐	2	MODEL
☐	3	MODEL	☐	3	SET POINT/SENSOR
☐	4	SPEED	☐	4	LEAD LAG

DIP SW #1 ON
DIP SW #2 ON

This questionnaire must be completed whenever a PC Board is returned for credit under warranty. The completed questionnaire is to be enclosed with the returned PCB inside the protective packaging. Credit will automatically be refused if PC Boards are damaged or information is inadequate.