UPM II

INSTALLATION AND OPERATION MANUAL

UNIT PROTECTION MODULE HARDWARE OPERATION

IMPORTANT: This manual is for UPM board part numbers 8733 800 260. See controller label as shown in figure 1 to verify correct part number.

TABLE OF CONTENTS

Specifications

Power:	24VAC ± 10%, 50-60Hz, 1.4 VA of standby power consumption (Single Class II 70VA or 100VA option available)
Physical:	Printed Circuit Board and plastic stand offs.
Environmental Operating Range:	-40° to 176°F (-40 °C to 80°C); 10 to 90% relative humidity, non-condensing All controls are conformal coated for environmental protection.
Digital Outputs:	Three digital outputs relay contacts rated at 10A resistive @ 125 VAC; Two dedicated for the compressor contactor 24VAC when “ON” and one dedicated for alarm purposes dry contact Normally Open (NO)
Inputs:	Four (9) inputs. Dedicated inputs for: • 2 High Pressure Switches (HPC) • 2 Low Pressure Switches (LPC) • 2 Freeze Sensors (FREEZE) 10 K @ 77F Thermistor • 1 Condensate Overflow Sensor (CON) 230 K +/- 15% • 2 Compressor Call (Y) Signals
Status Indication:	Visual (LED) status of power and alarms status indication.
Protection:	Surge and transient protection circuitry.
Weight:	0.25 lbs. (0.12 Kg).
Overall Dimensions:	5 -13/16” (width) by 4 -1/4” (height) by 1-3/4” (recommended panel depth). 147.32 mm (width) by 108 mm (height) by 32mm (recommended panel depth).
Listed By:	**UL**
Mounting Hole Dimensions:	Four mounting holes in rectangular pattern with dimensions between them as follows: 5-5/16” (width) by 3-3/4” (height). 135mm (width) by 95 mm (height).

Unit Protection Module (UPM)

The Unit Protection Module (UPM) as shown in figure 1, is a printed circuit board (PCB) that interfaces with the thermostat or the digital direct controller.

The main purpose of this device is to protect the compressors by monitoring the different states of switches and sensors of each refrigerant circuit, this device provides time delays and protects the unit against freezing of the water and refrigerant heat exchangers as well as condensate overflow when the appropriate sensors are installed.

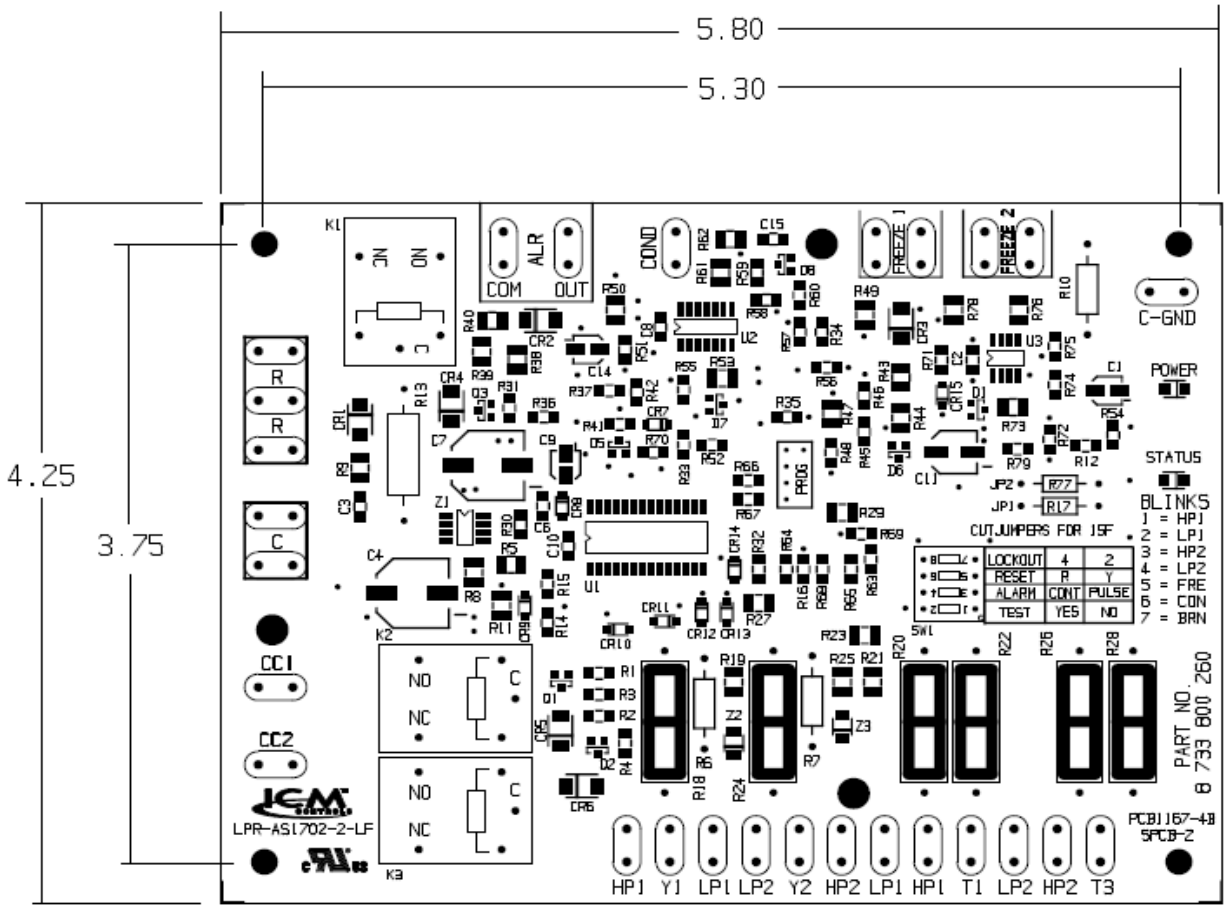


Figure 1 - UPM Two Stage

Alarm output is Normally Open (NO) dry contact. If 24 VAC output is needed R must be wired to the ALR-COM terminal; 24VAC will be available on the ALR-OUT terminal when the unit is in alarm condition. If pulse is selected the alarm output will be pulsed.

Power Random Start Up

This feature prevents multiple units sharing same electrical circuit or network from starting at the same time.

It assures that Heat Pumps sharing the same electrical circuit do not demand high inrush currents simultaneously when starting back up after a power failure.

If the controller has been completely powered down for more than **28 milliseconds**, a random delay is initiated typically the unit will start between the time range of 270 and 300 seconds, this only if the controller is set to **normal** operation (test switch set to **NO**).

In order for the random sequence to initiate the unit power must be removed completely.

IMPORTANT:
If the board is set to "TEST" mode through the "TEST" DIP switch SW1 delay will be 10 seconds.

Anti short cycle delay

This feature protects the compressor short cycling if the Y call is set and removed.

The anti short cycle delay is 300sec delay on break during normal operation.

NOTE:
If the board is set to test mode through the "TEST" DIP switch the delay will be 5 seconds.

Y Call

The UPM will energize the compressor's output (CC) in an event of a "Y" call from a thermostat or controller (after the random start up and/or the anti short cycle delays have elapsed). Y input terminal must be energized with a 24 VAC signal.

High and Low pressure protection

The UPM monitors the state of the High and Low pressure Switch inputs of each refrigerant circuit, HP1, LP1 and HP2 and LP2 on the board respectively, these switches must be closed in order for the controller to energize the compressor output (CC1 and CC2). The CC output will only be energized when the switches are closed and the **anti short cycle** (and /or random start up when applicable) has expired.

High pressure protection

If the HP1 or HP2 switches are open upon a Y1 or Y2 call the UPM will not energize the respective CC1 or CC2 outputs and therefore the correspondent compressor will remain off, the fault LED will flash one (1) time for the HP1 and 3 times for HP2 and the alarm contact will remain off.

If a compressor is running in normal mode on a Y call (Could be Y1 or Y2 or both) and the high pressure switch opens, the UPM will shut down the compressor output and will keep it off until the switch closes and the **anti short cycle** has expired. The controller will keep track of the number of times the switch opens, if within one (1) hour period the switch opens the number of times set via the DIP switch the controller will shut the compressor down and perform a hard lockout condition under this condition the alarm contact will be energized.

The UPM allows the user to configure the counts that the HP will be allowed to open within one hour before the UPM performs a hard lockout on the compressor. The user can select either two or four times by changing switch four (4) on the DIP switch SW1 (shown on table 3) on the UPM board.

Low pressure protection

If the LP1 or LP2 switches are open upon a Y1 or Y2 call (Could be Y1 or Y2 or both) the UPM will not energize the CC1 or CC2 outputs and therefore the correspondent compressor will remain off, the fault LED will flash two (2) times for the LP1 and 4 times for the LP2 and the alarm contact will remain off.

If the compressor is running in normal mode on a Y call (Could be Y1 or Y2 or both) and the low pressure switch opens, the UPM will keep the compressor running for two (2) minutes if the condition remains after this period of time the compressor will shut down and the UPM will start a soft lockout. The UPM will flash two (2) times for the LP1, four (4) times for the LP2 and the alarm contact will remain off.

If the switches close, the UPM will start the compressor after the **anti short cycle** has expired UPM will energize the compressor output.

IMPORTANT:
To exit the hard lockout the controller must be reset from the Y or R terminal by removing the power from the selected terminal. The user can choose which will be the reset point via the DIP switch SW1.

Ground

The UPM controller takes its ground reference from the unit chassis which is connected to the controller via the C-GND spade terminal.

DIP Switch Settings

The DIP switch is used to configure most of the available features of the UPM as follows:

- Alarm mode, Constant or Pulse
- Reset mode, Y signal or R signal
- Lockout mode, two (2) or four (4) Strikes
- Test mode, Normal or Test operation

The settings shown below are factory default for most heat pump applications, however the Unit wiring diagram is the ultimate guide for factory DIP switch default settings.

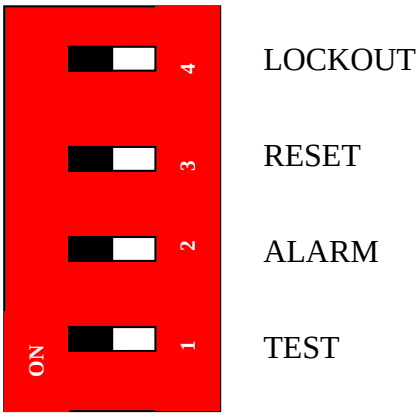


Figure 2 - Dip switch settings

The following table is available on the UPM board as well and it depicts the switch position and its associated functionality.

UPM DIP SWITCH CONFIGURATION			
4	LOCKOUT	4	2
3	RESET	R	Y
2	ALARM	CONT	PULSE
1	TEST	YES	NO

Figure 3 - DIP switch table

Selectable Alarm Mode

The UPM controller can be configured to have either a constant signal or a pulse.

If constant (CONT) is selected the UPM will provide a closed contact until the alarm is cleared.

If pulsed (PULSE) is selected the UPM will sequence the alarm contact with the fault LED flashes.

Freeze protection

The default setting for the freeze limit trip is 30°F; however this can be changed to 15°F by cutting the R17 for Compressor 1 and R77 for Compressor 2 resistor located on top of the DIP switch SW1.

The UPM controller will constantly monitor the refrigerant temperature with the sensor mounted close to the condensing water coil between the thermal expansion valve and water coil as shown in figure 4.

If temperature drops below or remains at the freeze limit trip for 30 seconds, the controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the Alarm contact will be active. The LED will flash (five (5) times) the code associated with this alarm condition.

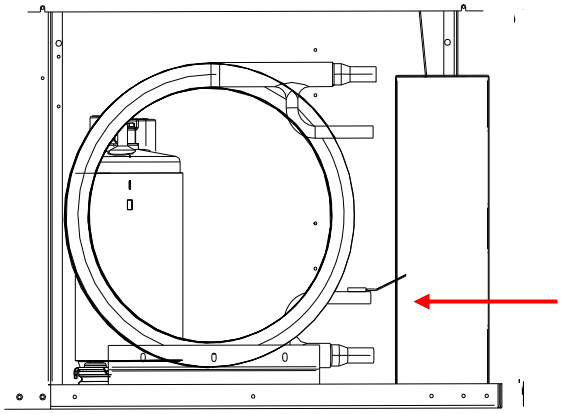


Figure 4 - Freeze sensor location

Brownout protection

The UPM controller will constantly monitor the power supply, if the nominal voltage drops below 25% of its value. (18 VAC approximately), the unit will enter brownout protection mode. The compressor CC outputs will be de-energized and the unit will enter the soft lockout mode.

The controller **will not** monitor the power supply during the first **500 milliseconds** of compressor start up to avoid noise and false alarms.

Once the UPM detects a brownout condition its fault LED will flash seven (7) times as error code indication.

Condensation overflow

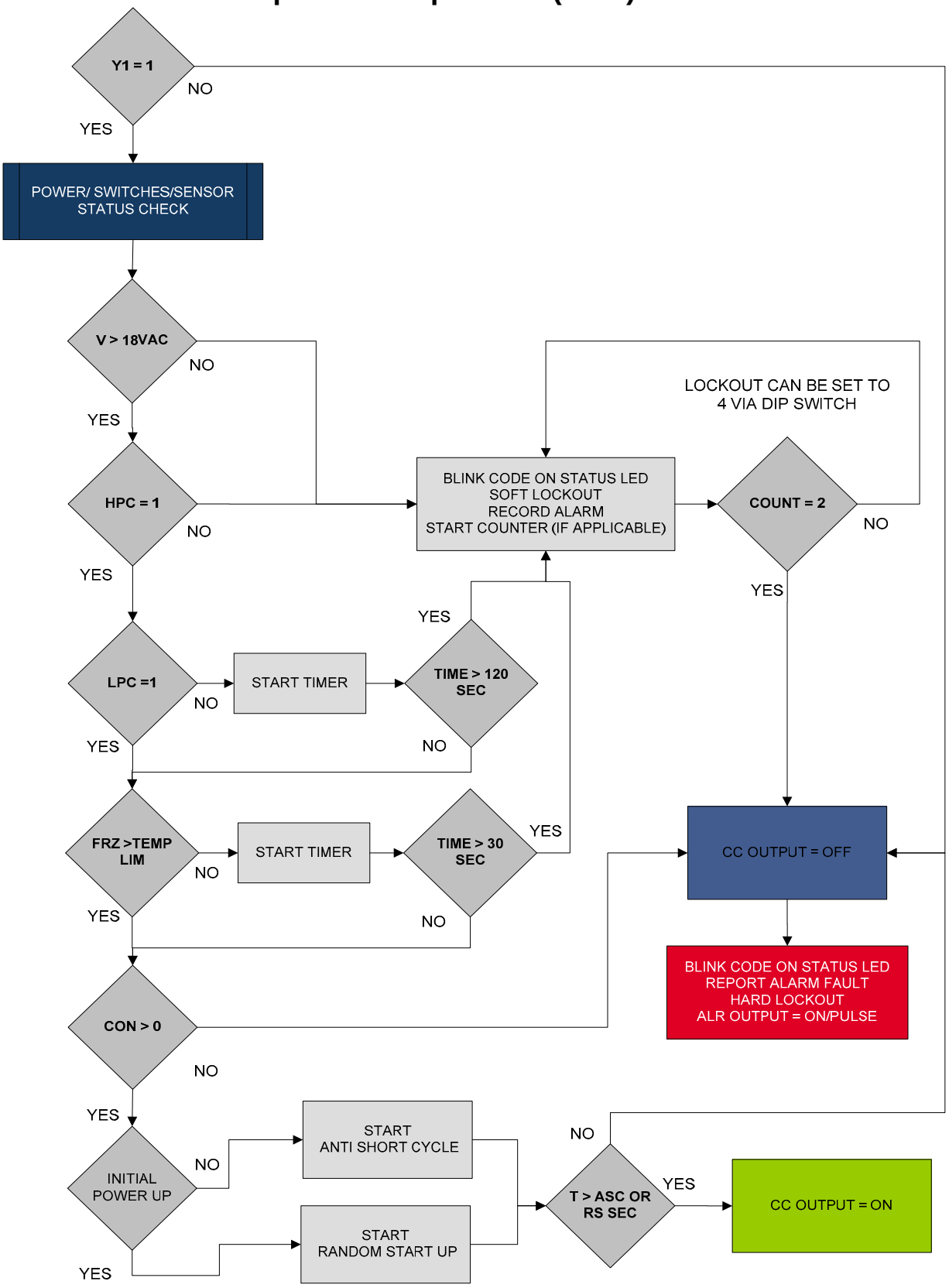
The UPM controller continuously monitors the drain pan for high condensate water level, and to do so it utilizes a sensor and identifies an alarm condition when the sensor's impedance drops below 230KΩ +/- 15 %. (**ONLY** when condensate sensor option is present) Once the UPM senses this resistance value it enters into a hard lockout and reports the correspondent code via its status LED (6 flashes).

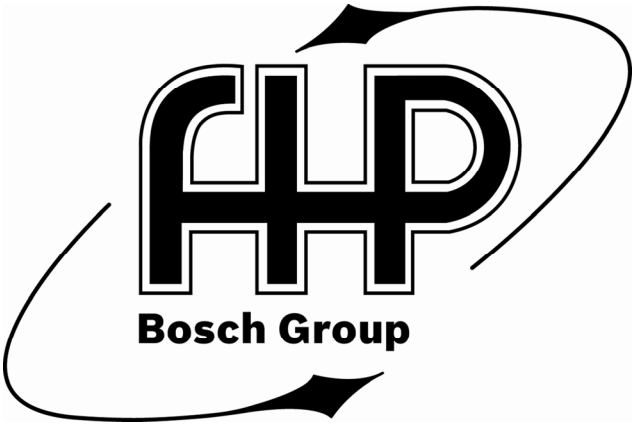
To exit the hard lockout water has to return to its normal level and UPM has to be reset by removing the power from the Y terminal (R if set on the DIP switch) the compressors will be turned on **after anti short cycle** expires.

Sequence of Operation

The UPM sequence of operation illustrated in the flow chart applies for both refrigerant circuits. The second compressor is energized 10 seconds after the first if both Y1 and Y2 signals are applied at the simultaneously.

UPM Sequence of Operation (SOO) Flow Chart





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