APC

APPLICATION NOTE #79

NetworkAIR FM and IR Input/Output Modules

Abstract

This note helps to clearly explain the uses and typical configurations for the PCIOM modules.

Introduction

Each NetworkAIR FM and IR unit is supplied with one Programmable Customer Input/Output Module (PCIOM) as a standard configuration and up to three more modules can be added to each unit if required.

Application and Features

PCIOMs are mainly used for the following applications:

- **Exporting Events ---** Use to monitor events that occur internal to the FM/IR Computer Room Air Conditioner (CRAC) such as alarms, maintenance schedule reminder, environmental conditions, sensor failures or failure of equipment.
- **Control Remote Equipment** --- To control remote flow valves, solenoids or additional equipment external to the CRAC.
- **Switches** --- To connect remote airflow, water or pressure switches to the controller.
- **Remote Shutdown** --- A pushbutton in a remote panel or a digital signal from a remote controller can be used for a remote shutdown.
- **Legacy Monitoring** – Use to integrate alarm & monitoring functionality of older or non-APC cooling systems with the FM or IR.

PCIOM Configuration

Each PCIOM includes the following inputs and outputs:

Legendary Reliability®

PCIOM board	Type	Voltage / Amp rating
(4) Digital Inputs	Voltage thru input	12 -30 V AC/DC input voltage or 24 VDC/ 50mA max per PCIOM board outlet voltage
(4) Digital Outputs	Each Digital Output has one NC and NO contact It can be a dry output or voltage thru output	30V AC/DC @ 2A Resistive per Digital Output

Table 1 – PCIOM Configuration.

A digital input is a digital signal that is sensed by the CRAC. Depending on the switch's open/closed status, the sensing device detects a voltage or no voltage condition. The signal must conform to the specification for Digital Inputs defined in Table 1.

A digital output is a signal that is generated by the CRAC and it consists of a switch that either opens or closes the circuit between two terminals depending on the state of the output. Note that the CRAC does not supply the voltage levels for the output, it merely closes or opens the internal relay. The digital output signal characteristics must conform to the specification for digital outputs defined in Table 1.

A LED indicates if voltage is present at the output or input contact. ***Figure 1*** represents the configuration of the PCIOM board.

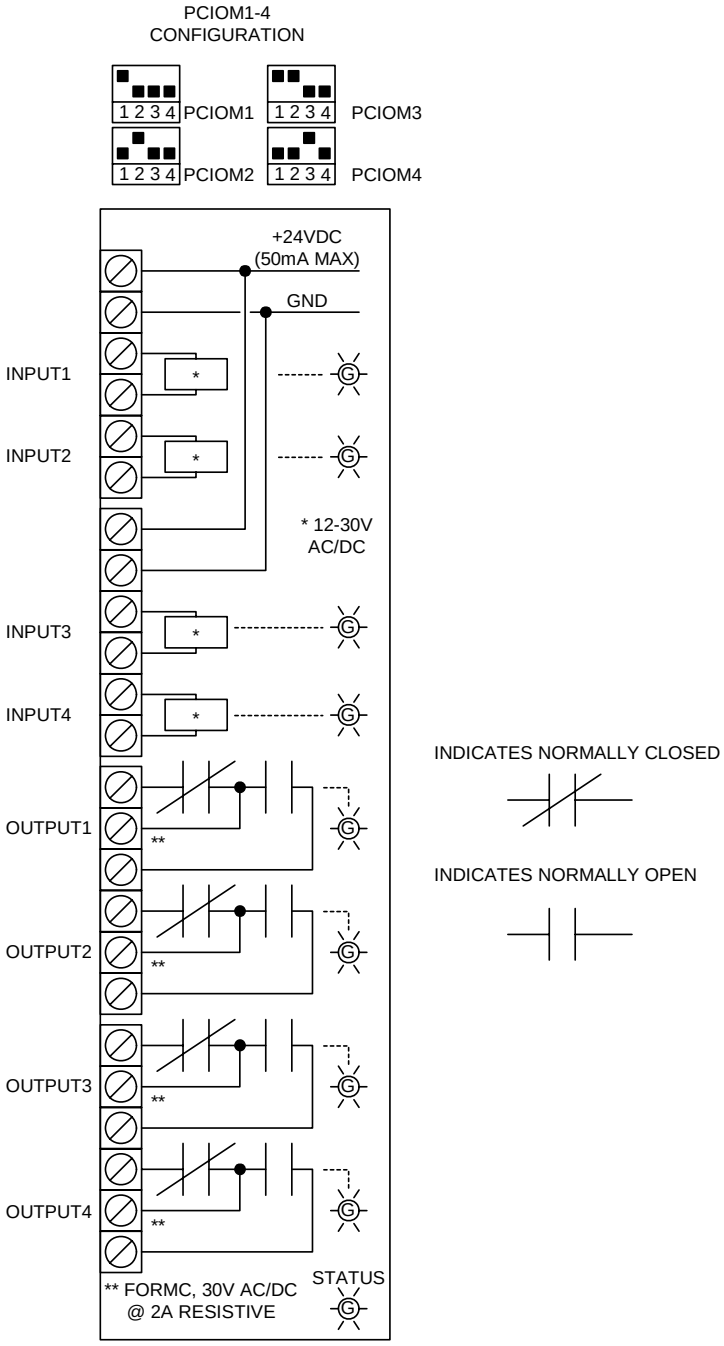

Figure 1 – PCIOM configuration

INPUTs are commonly used to wire Switches or for Remote Shutdown. OUTPUTs are used to map an EVENT and send a signal to a remote panel, valve or an alarm system.

PCIOM Output Mapping Definitions

Table 2 on page 4 and Table 3 on page 5 define the set of events or alarms that can be mapped to PCIOM outputs:

- The column named ***MAP*** indicates if the event is a system event or a module event. If the event is a module event, then the event can be mapped to each module.
- The column named ***EVENT NAME*** indicates the name of the event as it appears on the screen of Power View.
- The column named ***CONSISTS OF*** indicates the event or the set of events that comprise that **EVENT NAME.** Note that any of the events outlined in the column CONSISTS OF will trigger the EVENT.
- The column ***NOTE*** indicates if the event is mapped in a specific application or if the event will cause the loss or degradation of a primary system function.

Recommendations and Conclusions

When configuring the equipment it is necessary to define the amount of inputs and the amount of events or outputs that the customer will require for that application. It is recommended to setup outputs for alarms that will cause the cooling system to shutdown or that will disable cooling, in order to provide the customer notification as soon as the event occurs. If the number of inputs or outputs required for the application is more than four, then it will be necessary to add additional PCIOMs to the unit.

Additional features that the PCIOM's offer are that multiple events can be mapped to one output, outputs can be mapped to other outputs and inputs can be mapped to outputs.

The maximum number of outputs and inputs that can be setup per FM or IR unit is 16 of each (4 inputs & 4 outputs per PCIOM with a maximum configuration of 4 PCIOMs per unit)

MAP	EVENT NAME	CONSISTS OF	NOTE
System	**Any Alarm**	Any minor or major alarm in the system	
System	**High Environmental Temperature**	High Environmental Temperature	
System	**Low Environmental Temperature**	Low Environmental Temperature	
System	**High Environmental Humidity**	High Environmental Humidity	
System	**Low Environmental Humidity**	Low Environmental Humidity	
System	**Fire**	Fire	If Fire Detection option is provided with the system. Event will shutdown the unit.
System	**Smoke**	Smoke Detected	If Smoke Detection option is provided with the system. Event will shutdown the unit.
System	**Econ Isolator**	Econ Isolator	Option if a water isolation valve is provided for the Econ Isolator system. This event name is used to open thru a PCIOM output the water isolation valve to the condenser when cooling mode is required.
System	**System On**	System On	
System	**Supply Sensor Failure**	Supply Sensor Failure	
System	**Return Sensor Failure**	Return Sensor Failure	
System	**Remote Sensor Fail**	Remote Sensor Removed	If Remote Sensor is provided with the unit.
System	**Primary Sensor Failed**	Primary Sensor Failed	
System	**Secondary Sensor Failed**	Secondary Sensor Failed	If Secondary Sensor is provided with the unit.
System	**Secondary Sensor Active**	Secondary Sensor Active	If Secondary Sensor is provided with the unit.
Module	**Maintenance Required** **(This Event is Mapped based on running hours of the equipment)**	Compressor 1 Maintenance Required	
		Compressor 2 Maintenance Required	
		Heater Maintenance Required	If Reheat is provided with the unit.
		Humidifier Maintenance Required	If Humidification is provided with the unit.
		Blower 1 Maintenance Required	
		Blower 2 Maintenance Required	
		VFD 1 Maintenance Required	
		VFD 2 Maintenance Required	
Module	**Cooling Failure**	Water Regulator Actuator Failure	For Water Cooled Condenser Valve
		PC/Multicool Actuator Failure	For Chilled Water Coil Valve
		High Head Pressure	
		Low Suction Pressure	
		High Suction Pressure	
		Loss of Coolant Flow to Multi-Cool Coil	If Flow Switch is provided with the unit.
		Loss of Coolant Flow to Condenser (Econ Coil)	If Flow Switch is provided with the unit. Event will disable cooling.
		Inlet MC/Econ Water Temperature High	
		Inlet MC/Econ Water Temperature Low	
		Inlet MC/Econ Temperature Sensor Failure	
Module	**Humidifier Failure**	Humidifier High Water Conductivity	
		Humidifier Excessive Foaming	
		Humidifier High Current	
		Humidifier No Power	
		Humidifier Internal Memory Error	
		Humidifier Lack of Water	
		Humidifier Excessive Output Reduction	
		Humidifier Drain Malfunction	
		Humidifier Cylinder Full When Unit Off	
		Humidifier Replace Cylinder	
		Humidifier RS485 Communication Error	
		Humidifier Fault Tolerance Exceeded	

Table 2 – PCIOM Output Mapping Definitions

MAP	EVENT NAME	CONSISTS OF	NOTE
Module	**VFD 1 Failure**	VFD 1 Over Current During Acceleration	
		VFD 1 Over Current During Deceleration	
		VFD 1 Over Current During Steady Operation	
		VFD 1 Over Voltage During Acceleration	
		VFD 1 Over Voltage During Deceleration	
		VFD 1 Over Voltage During Steady Operation	
		VFD 1 DC Under Voltage	
		VFD 1 Power Supply Open Phase	
		VFD 1 Output Wiring Error	
		VFD 1 Heat Sink Over Temp	
		VFD 1 Motor 1 Overload	
		VFD 1 Overload	
		VFD 1 Overheat Outside Thermal	
		VFD 1 Overheat DB Resistor	
		VFD 1 Motor 2 Overload	
		VFD 1 Memory Error	
		VFD 1 Keypad Transmission Error	
		VFD 1 CPU Error	
		VFD 1 Option Communication Error	
		VFD 1 Option Error	
		VFD 1 PL Error	
		VFD 1 RS485 Communication Error	
		VFD 1 Fault Tolerance Exceeded	
Module	**VFD 2 Failure**	VFD 2 Over Current During Acceleration	
		VFD 2 Over Current During Deceleration	
		VFD 2 Over Current During Steady Operation	
		VFD 2 Over Voltage During Acceleration	
		VFD 2 Over Voltage During Deceleration	
		VFD 2 Over Voltage During Steady Operation	
		VFD 2 DC Under Voltage	
		VFD 2 Power Supply Open Phase	
		VFD 2 Output Wiring Error	
		VFD 2 Heat Sink Over Temp	
		VFD 2 Motor 1 Overload	
		VFD 2 Overload	
		VFD 2 Overheat Outside Thermal	
		VFD 2 Overheat DB Resistor	
		VFD 2 Motor 2 Overload	
		VFD 2 Memory Error	
		VFD 2 Keypad Transmission Error	
		VFD 2 CPU Error	
		VFD 2 Option Communication Error	
		VFD 2 Option Error	
		VFD 2 PL Error	
		VFD 2 RS485 Communication Error	
		VFD 2 Fault Tolerance Exceeded	
Module	**High Filter Differential Pressure**	High Filter Differential Pressure	
Module	**High Supply Temperature**	High Supply Temperature	
Module	**Low Supply Temperature**	Low Supply Temperature	
Module	**Loss or Low Airflow**	Loss or Low Airflow	Event will immediately disable Cooling, Reheat, Humidification and Dehumidification
Module	**Humidifier Replace Cylinder**	Humidifier Replace Cylinder	
Module	**Air Block Interlock Open**	Air Block Interlock Open	Event will shut down the cooling unit.
Module	**Water Detected**	Water Detected	If Water Detection is provided with the unit.
Module	**Condensate Pump Failure**	Condensate Pump Failure	Event will immediately disable Cooling, Reheat, Humidification and Dehumidification
Module	**Any Alarm**	Any minor or major alarm in the module	
System	**System Offline**	System Offline due to internal failure	Event will immediately disable Cooling, Reheat, Humidification and Dehumidification

Table 3 – PCIOM Output Mapping Definitions