Application Engineering

Copeland Performance Alert Diagnostic Module

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Safety

Important Safety Information

Those involved in the design, manufacture, and installation of a system, system purchasers, and service personnel may need to be aware of hazards and precautions discussed in this section and throughout this document. OEMs integrating the compressor into a system should ensure that their own employees follow this bulletin and provide any necessary safety information to those involved in manufacturing, installing, purchasing, and servicing the system.

Responsibilities, Qualifications and Training

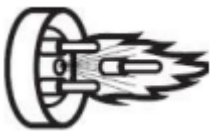
• OEMs are responsible for system design, selection of appropriate components, integration of this component into the system, and testing the system. OEMs must ensure that staff involved in these activities are competent and qualified.

• OEMs are also responsible for ensuring that all product, service, and cautionary labels remain visible or are appropriately added in a conspicuous location on the system to ensure they are clear to any personnel involved in the installation, commissioning, troubleshooting or maintenance of this equipment.

• Only qualified and authorized HVAC or refrigeration personnel are permitted to install, commission, troubleshoot and maintain this equipment. Electrical connections must be made by qualified electrical personnel.

• Observe all applicable standards and codes for installing, servicing, and maintaining electrical and refrigeration equipment.

Terminal Venting and Other Pressurized System Hazards



If a compressor's electrical terminal pin loses its seal, pressurized oil, refrigerant, and debris may spray out. This is called "terminal venting".

The ejected debris, oil, and refrigerant can injure people or damage property. The oil and refrigerant spray can be ignited by electrical arcing at the terminal or any nearby ignition source, producing flames that may project a significant distance from the compressor. The distance depends on the pressure and the amount of refrigerant and oil mixture in the system. The flames can cause serious or fatal burns and ignite nearby materials.

Each compressor has a terminal cover or molded plug that covers electrical connections. The cover or plug helps to protect against electric shock and the risks of terminal venting. If terminal venting occurs, the cover or plug helps contain the spray of refrigerant and oil and reduces the risk of ignition. If ignition occurs, the plug or cover helps contain the flames. However, neither the terminal cover nor the molded plug can completely eliminate the risk of venting, ignition, or electric shock.

See copeland.com/terminal-venting for more details about terminal venting. Additionally, a compressor's refrigerant lines keep refrigerant and oil under pressure. When removing or recharging refrigerant from this component during service, this can pose a pressurized fluid hazard.

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Flammable Refrigerant Hazards



If flammable refrigerant is released from a system, an explosive concentration can be present in the air near the system. If there is an ignition source nearby, a release of flammable refrigerant can result in a fire or explosion. While systems using flammable refrigerant are designed to mitigate the risk of ignition if the refrigerant is released, fire and explosion can still occur.

See copeland.com/flammable-refrigerants for more information on flammable refrigerant safety.

Electrical Hazards



Until a system is de-energized, and capacitors have been discharged, the system presents a risk of electric shock.

Hot Surface and Fire Hazards



While the system is energized, and for some time after it is deenergized, the compressor may be hot. Touching the compressor before it has cooled can result in severe burns. When brazing system components during service, the flames can cause severe burns and ignite nearby combustible materials.

Lifting Hazards



Certain system components may be very heavy. Improperly lifting system components or the compressor can result in serious personal injury. Use proper lifting techniques when moving.

POE Oil Hazards

This equipment contains polyol ester (POE) oils. Certain polymers (e.g., PVC/CPVC and polycarbonate) can be harmed if they come into contact with POE oils. If POE oil contacts bare skin, it may cause an allergic skin reaction.

Precautions

• Always wear personal protective equipment (gloves, eye protection, etc.).

• Keep a fire extinguisher at the jobsite at all times.

• Keep clear of the compressor when power is applied.

- IMMEDIATELY GET AWAY **if you hear unusual sounds in the compressor. They can indicate that terminal pin ejection may be imminent. This may sound like electrical arcing (sizzling, sputtering or popping). However, terminal venting may still occur even if you do not hear any unusual sounds.**

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• Never reset a breaker or replace a blown fuse without performing appropriate electrical testing

- **A tripped breaker or blown fuse may indicate an electrical fault in the compressor. Energizing a compressor with an electrical fault can cause terminal venting. Perform checks to rule out an electrical fault.**

• Disconnect power and use lock-out/tag-out procedures before servicing.

- Before removing the terminal cover or molded plug, check that ALL electrical power is disconnected from the unit. Make sure that all power legs are open. (Note: The system may have more than one power supply.)

- Discharge capacitors for a minimum of two minutes

- Always use control of hazardous energy (lock-out/tag-out) procedures to ensure that power is not reconnected while the unit is being serviced.

• Allow time for the compressor to cool before servicing.

- Ensure that materials and wiring do not touch high temperature areas of the compressor.

• Keep all non-essential personnel away from the compressor during service.

• For A3 refrigerants (R290) remove refrigerant from both the high and low sides of the compressor. Use a recovery machine and cylinder designed for flammable refrigerants. Do not use standard recovery machines because they contain sources of ignition such as switches, high- and low-pressure controls and relays. Only vent the R290 refrigerant into the atmosphere if the system is in a well-ventilated area.

• Never use a torch to remove the compressor. Only tubing cutters should be used for both A2L and A3 refrigerants.

• Use an appropriate lifting device to install or remove the compressor.

• Never install a system and leave it unattended when it has no charge, a holding charge, or with the service valves closed without electrically locking out the system.

• Always wear appropriate safety glasses and gloves when brazing or unbrazing system components.

• Charge the system with only approved refrigerants and refrigeration oils.

• Keep POE oils away from certain polymers (e.g., PVC/CPVC and polycarbonate) and any other surface or material that might be harmed by POE oils. Proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. Handle POE oil with care. Refer to the Safety Data Sheet (SDS) for further details.

• Before energizing the system:

1. Securely fasten the protective terminal cover or molded plug to the compressor, and

2. Check that the compressor is properly grounded per the applicable system and compressor requirements.

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Signal Word Definitions

The signal word explained below are used throughout the document to indicate safety messages.



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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Introduction

The Copeland Performance Alert diagnostic module (referred to as “the module” in this document) is a breakthrough innovation for troubleshooting refrigeration system faults. The module can be installed in the electrical box of the condensing unit near the compressor contactor or in the electrical panel of a refrigeration rack system. By monitoring and analyzing data from the Copeland brand compressors, the module can accurately detect the cause of electrical and system related issues. A flashing LED indicator communicates the ALERT code and guides the service technician more quickly and accurately to the root cause of a problem. See Table 7.

The module can provide both compressor protection and lockout capability. Compressor protection means that the module will trip the compressor when any of the following severe alert conditions (codes 1,4,6,7 or 9) are detected (refer to Table 8). A trip condition is when the protector on a compressor opens and stops current flow into the compressor motor. As a result, the compressor shuts down. A trip condition will reset after short cycle time and when trip condition is not present. See Table 4. For 543-0057-xx and 543-0055-xx if lockout is enabled and a preset number of alarm events happen, the module will not allow the compressor to start until the situation is corrected and the module is manually reset (see Lockout Configuration in Section 12.3.6.4, Jumper Settings).

Suggested applications, subject to module specifications, include Supermarket, walk-in unit, and reach-in coolers/freezers.

NOTE: The Copeland Performance Alert diagnostic module, under severe conditions, has the ability to shut down the compressor if the protection is wired through the compressor contactor coil.

Table 1 Copeland Performance Alert Part Numbers

OEM P/N	Service P/N	Application
543-0053-xx	943-0053-00	1-phase
543-0057-xx	943-0057-00	3-phase Scroll
543-0055-xx	943-0055-00	3-phase Recip

Application Restrictions

The Copeland Performance Alert diagnostic module cannot be used with variable speed compressor drives. In most cases the module is not compatible with A-Model compressors but consult compressor current draw to further clarify.

Product Specifications

Operating Temp: -40° to 150°F (-40° to 65°C)

Storage Temp: -40° to 175°F (-40° to 80°C)

Power Supply Range: 85-265VAC, 48-62 Hz

Working amperage for module; 3.0-200A.

Note: The module is not accurate below 3 Amps. If the current drawn by the compressor during operation falls below 3 Amps, the module may indicate a nuisance fault condition and alarm. See Section 5.4 for wiring suggestions.

Note: If at any time during normal operation of the compressor, the current is between the minimum 3 Amps and 6 Amps, nuisance alarms are possible. To avoid nuisance alarms, “doubling the current sensed by the module” is recommended. Wrap the T1 wire up and over the module and back through the T1 hole a second time to double the current reading. Wrap the T3 wire up and over the module and back through the T3 hole a second time to double the current reading.

Maximum wire size for wiring into the module terminals is 14 gauge stranded.

Maximum contactor coil current is 5 amps.

Module Dimensions

A. 1.85 in (47 mm)

B. 2.44 in (62 mm)

C. 1.46 in (37 mm)

D. 4.40 in (112mm)

E. 2.44 in (62 mm)

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Figure 1

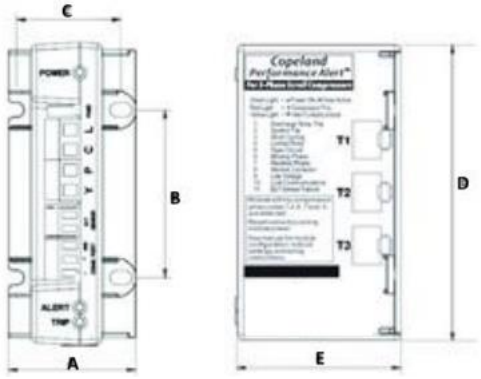
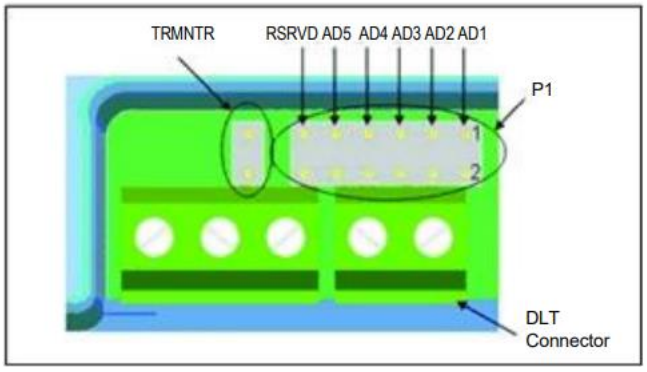


Figure 2



Hardware Installation

Warning! Hazardous voltage inside refrigeration system. Disconnect power before installing or servicing module. Module must be installed and serviced only by qualified personnel.

Jumper Settings

The module has a 7-position header with 6 jumper positions that are user configurable where jumpers can be set. These jumpers are used to configure the modules address to select network termination. The module comes with all jumpers in place.

Jumpers AD1 thru AD5 are used for module address selection. Valid module addresses are from 1 to 30 (31 external LED). Address 0 is invalid and occurs when all jumpers are left open; with this setting no communication may be possible with the device.

Note: When there is only one module, any address in the valid range can be selected. In a network application, each address can only be used once. Each module should have a different address when communicating in a network/daisy chain.

Table 2 Jumper Settings

Address	AD5	AD4	AD3	AD2	AD1
01	-	-	-	-	Jumper
02	-	-	-	Jumper	-
03	-	-	-	Jumper	Jumper
04	-	-	Jumper	-	-
05	-	-	Jumper	-	Jumper
06	-	-	Jumper	Jumper	-
07	-	-	Jumper	Jumper	Jumper
08	-	Jumper	-	-	-
09	-	Jumper	-	-	Jumper
10	-	Jumper	-	Jumper	-
11	-	Jumper	-	Jumper	Jumper
12	-	Jumper	Jumper	-	-
13	-	Jumper	Jumper	-	Jumper
14	-	Jumper	Jumper	Jumper	-
15	-	Jumper	Jumper	Jumper	Jumper
16	Jumper	-	-	-	-
17	Jumper	-	-	-	Jumper
18	Jumper	-	-	Jumper	-
19	Jumper	-	-	Jumper	Jumper
20	Jumper	-	Jumper	-	-
21	Jumper	-	Jumper	-	Jumper
22	Jumper	-	Jumper	Jumper	-
23	Jumper	-	Jumper	Jumper	Jumper
24	Jumper	Jumper	-	-	-
25	Jumper	Jumper	-	-	Jumper
26	Jumper	Jumper	-	Jumper	-
27	Jumper	Jumper	-	Jumper	Jumper
28	Jumper	Jumper	Jumper	-	-
29	Jumper	Jumper	Jumper	-	Jumper
30	Jumper	Jumper	Jumper	Jumper	-
Remote/External LED Blink	Jumper	Jumper	Jumper	Jumper	Jumper
Invalid Address	-	-	-	-	-

The jumper labeled RSRVD is currently not used. The Jumper labeled TRMNTR is used to terminate each end of the buss in a network application.

Jumpers should be set before mounting the module.

Compressor Lead Wiring

The compressor leads are routed through the holes in the module marked “T1”, “T2”, and “T3.” The hole sizes are .33” x .47” (8.4mm x 12mm).

The wiring should be set to monitor only the compressor and not any extra load, for example condenser fan or head fan. Figure 3a shows the module monitoring only the compressor. Figure 3b shows the preferred way to connect any extra load, represented by a fan.

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Figure 3c is an example of a non desirable connection for any extra load (e.g. fan.) The extra load should never be connected between T1 and T3, because it can lead to nuisance code 6 alarms.

Figure 3

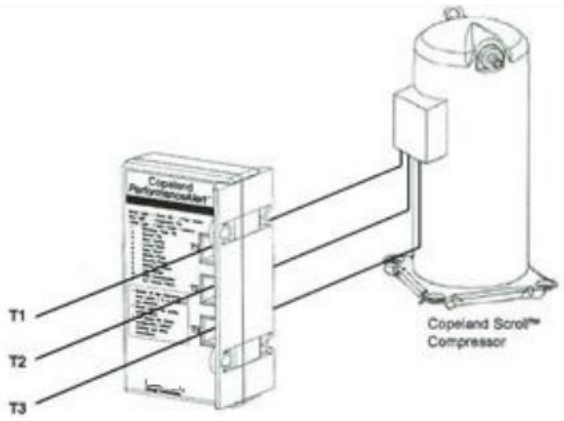


Figure 4

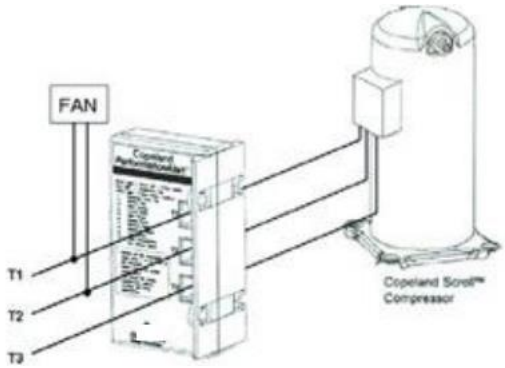
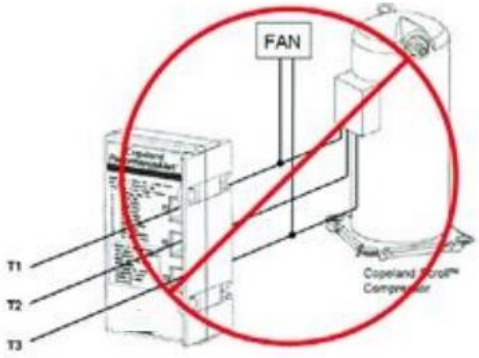


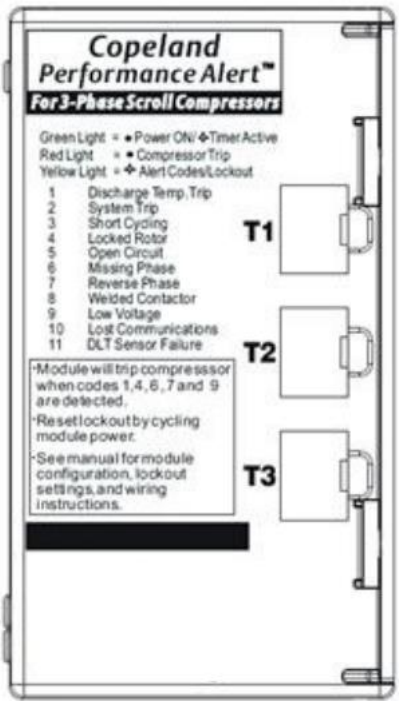
Figure 5



Module Mounting

Four #8 or #10 self drilling or sheet metal screws, at least ½" (12mm length), are required for installation of the module. Locate the module near the compressor contactor (wire routing for compressor leads will be easier in this position). Mount the module so all LEDs are visible from a comfortable viewing position. The module will operate in any mounting orientation.

Figure 6



c UL us

UL File #E253322

110-220VAC Module Power Wiring

The module requires 110-220VAC power between L and C terminals. The module should remain powered through all states of operation. Refer to wiring schematic in Figures 6, 7 and 8.

Schematic Abbreviation Descriptions:

L Line

C Common

P Protection/Contactor Control

Y Demand Signal Input (Electrical call for cooling)

HPCO High Pressure Cut Out Switch

LPCO Low Pressure Cut Out Switch

CNTR Compressor Contactor Coil

CPA Copeland Performance Alert module

DLT Discharge Line Temperature

Demand Wiring

The module requires a demand signal to operate properly. The demand signal input, labeled Y on the module, should always be connected to the compressor demand so that the demand signal input is 110 or 220VAC with respect to Common (C). When the coil is not energized, the demand signal input should be less than 0.5VAC. See Figures 6, 7 and 8 for proper wiring diagrams. Choose the appropriate diagram depending on how the demand signal will be fed to the module.

Figure 7

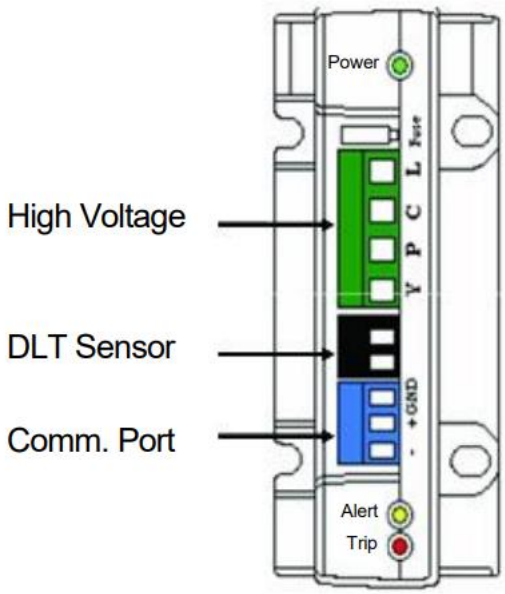


Figure 8

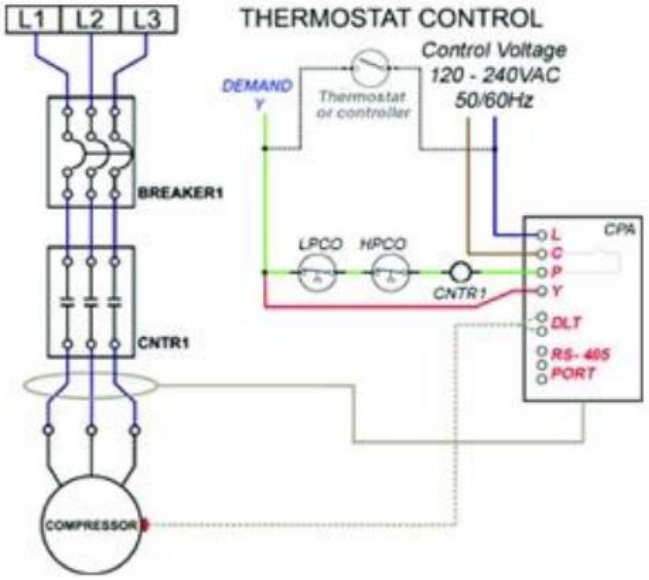


Figure 9

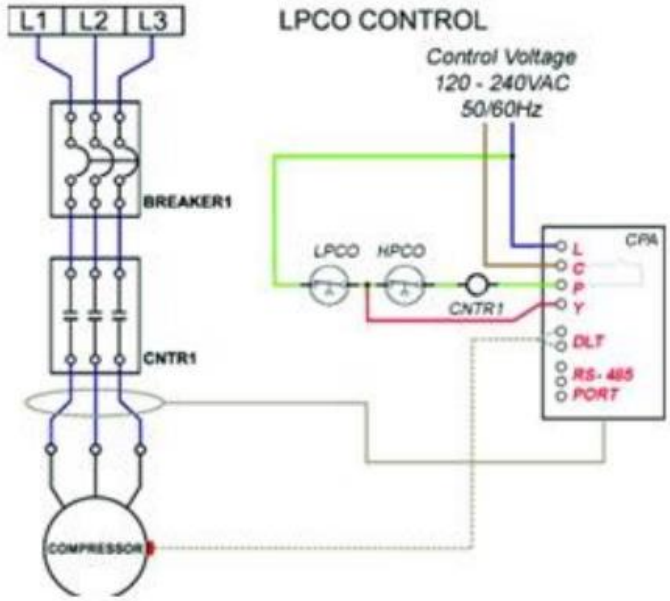
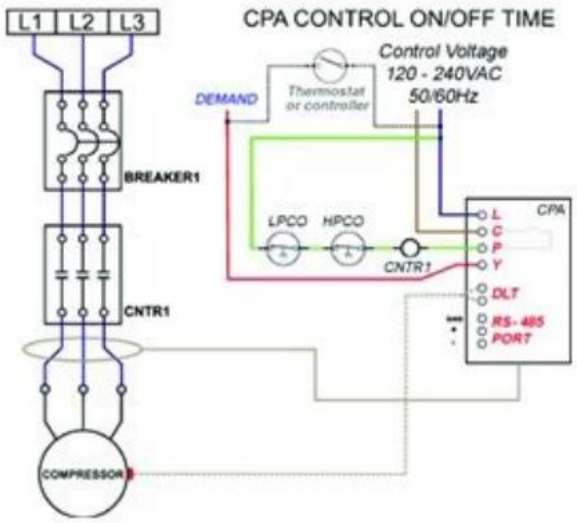


Figure 10



NOTE: After the demand signal is connected, verify 110/220V across Y and C when demand is present. The demand threshold is 65VAC, however low voltage is detected when the supply is at or below 85VAC for 110V and 170VAC for 220V.

Protection/Contactor Control Wiring

In order for protection to operate properly, the Copeland Performance Alert diagnostic module requires the return side of the contactor coil to be connected to the protection terminal labeled P on the module; see Figure 7. With this configuration, the module has the capability to open the contactor which will trip the compressor. During the codes 1, 4, 6, 7, and 9, the module will trip the compressor. See Table 7 for Code description. Also, protection must be connected for minimum off time and lockout to work.

Discharge Line Thermistor Installation

The nominal resistance of the discharge line thermistor is 100,000 Ohms at 77° F / 25° C. The discharge line thermistor has a negative temperature coefficient. This means that the resistance of the thermistor drops as temperature increases, and vice versa.

To detect the temperature of the discharge line, the DLT has to be connected to the discharge line not farther than 6 inches from the cylinder head. Straps from the single pack are available to connect the Discharge Line Thermistor to the discharge line. See Table 6 for part numbers.

When connecting the discharge temperature probe to the module, the length of the wire may need to be extended. When doing this it is best practice to solder the extension wires to the leads of the probe. If a soldering iron is not available a barrel wire splice is acceptable.

When extending the length of the discharge temperature probe, shielded wire must be used. The shield of the wire has to be connected to ground in the electrical panel as close to the module as practical. It is best not to make the wire any longer than what is required, and the wire must never be bundled with high voltage wire.

External LED or Communication Wiring

The remote LED flashes the alert code in unison with the alert LED on the module. In order to communicate to the module using a PC, the user must connect the PC to the module using an RS 485 adapter. See Figure 11.

Note: External/remote LED and the communications cable can not be connected and used at the same time.

External/Remote LED Wiring

An external/remote LED is available for use in the single pack kit; see Table 6 for the part number. The external/remote LED should be connected to the Communications Port, to pins Data + and Ground. D31, all jumpers must be in place to use the external/ remote LED; for jumper settings refer to Table 2.

Installation Verification

To verify the installation of the module is correct, a functional test should be performed:

Disconnect power from the compressor and force a call for cooling. The Trip LED (red) should turn on indicating a compressor trip as long as demand of 110VAC or 220VAC is present at the Y terminal. If the Trip LED (red) does not function as described, refer to Table 3 to verify the wiring.

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Installation Troubleshooting

Depending on the system configuration, some ALERT Flash codes may not be active. The presence of safety switches affects which system alerts are detected by the module. Refer to Figures 6 or 7 for wiring with a safety switch.

NOTE: Miswiring the Copeland Performance Alert module will cause false Alert codes. Table 3 describes LED operation when the module is miswired and what troubleshooting action is required to correct the problem. Miswiring the module may cause damage to the module or the system, and will not provide protection.

NOTE 1: The correct module must be matched to the compressor for which it is applied, refer to Table 1. If the wrong module is installed, the ALERT Flash Codes for system faults will function incorrectly: the module may indicate system faults that are not present or fail to indicate system faults that are present.

Module LED Descriptions

POWER LED (Green): Indicates voltage is present at the power connection of the module.

When flashing, the Power LED (Green): Indicates that the module is holding the compressor in the off state for the duration set in the minimum off time menu.

ALERT LED (Yellow): Communicates an abnormal system condition through a unique flash code, see Section 9.

TRIP LED (Red): Indicates there is a demand signal but no current to the compressor is detected by the module. The TRIP LED typically indicates the compressor protector is open or may indicate missing supply power to the compressor.

Interpreting the Diagnostic LEDs

When an abnormal system condition occurs, the module displays the appropriate ALERT and/or TRIP LED. The ALERT LED (yellow) will flash a number of times consecutively, pause and then repeat the process. To identify a Flash Code number, count the number of consecutive flashes. Detailed descriptions of specific ALERT Flash Codes are shown in Table 8. The module will continue to display the alert code until the condition returns to normal or if module power is cycled from the module.

Table 3 Miswiring

Miswired Module Indication	Recommended Troubleshooting Action
Power LED (Green) is not on, module does not power up	1. Determine if both C and L module terminals are connected. 2. Verify line voltage is present at module's C and L terminals. 3. Review wiring diagram.
Power LED (Green) intermittent, module powers up only when compressor runs	1. Determine if L and Y terminals are wired in reverse. 2. Verify module's C and L terminals have constant source from line side of contactor.
Trip LED (Red) is on but system and compressor check OK	1. Verify that the demand is connected to the Y terminal. 2. Review wiring diagram.
Trip LED (Red) and ALERT LED flashing together	1. Verify C and L module terminals are supplied with 85- 265VAC. 2. Check if contactor coil terminal is connected to P.
Compressor does not run	1. Check if P and Y cables are swapped 2. Review wiring Diagram.
Compressor runs when it should be off	1. Review wiring diagram for P connection 2. Check if P and C are shorted. 3. Review wiring Diagram
No communication with module	1. Check if communications wiring is right 2. Check module address setting. It should not be 0 or 15.
Check sum error during communications	1. Check if data+ and data- wires are swapped.

LED. The ALERT LED (yellow) will flash a number of times consecutively, pause and then repeat the process. To identify a Flash Code number, count the number of consecutive flashes. Detailed descriptions of specific ALERT Flash Codes are shown in Table 8. The module will

continue to display the alert code until the condition returns to normal or if module power is cycled from the module.

One long flash of the Yellow LED (before a flash code) indicates that the module is in LOCKOUT condition.

Every time the module powers up, the last ALERT Flash Code that occurred prior to lose of power is displayed for one minute.

Resetting Alert Codes

Alert codes can be reset manually and automatically. The manual method to reset an Alert code is to cycle the power to the module off and on. For automatic reset, the module continues to monitor the compressor and system after an Alert is detected. If conditions return to normal, the Alert code is turned off automatically.

Communications

The Copeland Performance Alert module can indicate an alert in two ways:

Digital:

Computer

Using the module communications port and the USB adaptor, the module can communicate to a computer.

CPC Rack Controller

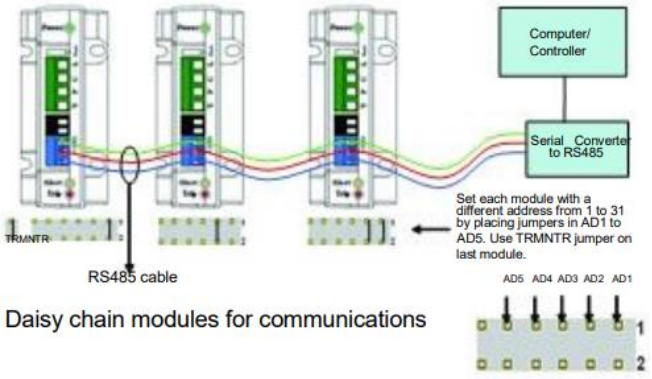
Using the communications port, the module can communicate directly with an E2 rack controller or via a gateway board to CPC rack controllers RMCC, or Einstein. For third party controller communications, the Controller must have modbus mapping capability. The gateway board is Copeland part number 943-3730-00, and includes complete documentation on installation and configuration. The gateway can be configured to pass only an “Alarm On” signal to all three generations of controllers (Condensed Mode), or can be configured to pass detailed alarm status and data to Einstein or E2 controllers (Expanded Mode).

When several modules are present and communications is needed, it is possible to daisy chain the communications ports of all modules and establish communication between a computer/controller and the modules as can be seen in the Figure 9.

Note: In a daisy chain connection, make sure address assigned to each module is different from any other component address connected to the E2.

Note: In a daisy chain connection the module in the extreme that is not connected to the computer/ controller has to have the jumper TRMNTR placed to terminate the communication bus (See Figure 2 and Figure 9).

Figure 11



Daisy chain modules for communications

Visual

The module can display a visual alert through two methods:

ALERT LED

The module’s ALERT LED (yellow) will display the alert code. In some installations it is possible that the LED will not be visible. In these cases an EXTERNAL LED should be mounted on the outside of the installation place to view the alarm codes.

External/Remote LED

When installed (See Section 5.8.1), the EXTERNAL LED will function in the same manner as the module ALERT LED.

When connecting the discharge temperature probe to the module, the length of the wire may need to be extended. When doing this it is best practice to solder the extension wires to the leads of the probe. If a soldering iron is not available a barrel wire splice is acceptable.

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When extending the length of the discharge temperature probe, shielded wire must be used. The shield of the wire has to be connected to ground in the electrical panel as close to the module as practical. It is best not to make the wire any longer than what is required, and the wire must never be bundled with high voltage wire.

Diagnostic Software

The module can be connected to a desktop or laptop computer for diagnostic purposes, changing default settings, and accessing previously logged data as well as the current status of the compressor, see Section 12.3. A detailed User Manual is available on the PC Software CD.

Software Installation

Minimum Hardware and Software Requirements

Windows 2000/XP

Pentium III, 300MHz processor

Internet Explorer 5.1

Windows installer 3.1

microsoft.net framework 2.0

Dependency Software Installation

Install the Windows Installer and the DotNetFramework which are pre-requisite software packages before installing the Copeland Performance Alert interface software.

Installation CD

To install the software, close all applications running on your computer. Insert the CD in the CD-ROM drive.

The software can be installed in two ways.

Auto Run

Auto runs the CD and starts the setup automatically.

Manual Installation

If user does not run the setup through Auto Run feature, they can install it manually also.

For manual installation,

- Open/Explore the contents of the CD.
- Double click the “Copeland Performance Alert PC Communication Software” icon and the setup starts. OR
- Click the Start button on the Windows task bar and then choose Run. In the Run dialog box, type “D:\ Copeland Performance Alert PC Communication Software”, where D is the name of your CD-ROM drive. Click OK.

Follow on-screen installation directions.

The software will be installed in "C:\Program Files\ Copeland Performance Alert PC Communication Software” directory by default. You can specify another directory, if desired. Upon successful installation, an icon will be placed on your desktop (computer monitor) along with a shortcut in the "Start Menu" for "Copeland Performance Alert PC Communication Software".

Connecting Module to Computer

Copeland has a USB device for communications between the module and a computer. The device converts the module’s RS-485 to the computer’s USB. This device is a user friendly converter and includes Windows drivers for easy installation and configuration. The Copeland Communication Kit part number is 943-0143-00. The module’s communication pin out is shown in Figure 5 under Comm. Port.

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Figure 12



Communication Wiring (RS485)

The D+ terminal of the adapter should be connected to the - terminal of the port on the module. The D- terminal of the adapter should be connected to the + terminal of the port on the module. The Gnd terminal of the adapter should be connected to the Gnd terminal of the port on the module. See Figure 11.

Note: Some vendors use reverse polarity on their adapters. If communication does not work, reverse the - and + connection terminals on the module.

Figure 11 depicts how to connect the Copeland PerformanceAlert™ module to the computer, using USB to RS-485 converter, where the user can directly connect the module to the converter and the converter USB cable to the USB port of the computer.

Note: User may need to install drivers for the USB to Serial Converter if the user wishes to make use of the USB to serial converter.



How to Use the Software

To use the software, make sure that proper connections are made between the module and the computer. Open the program by double clicking on the Copeland Performance Alert icon. The software will automatically scan to find all modules connected to the network.

Once all the connected modules are found the user may stop scanning, otherwise the software will continue searching through all available addresses which may take 30 seconds. To manually select a single module, stop the scanning and select the desired module, from the drop down module provided in the configuration window as shown in Figure 12.

Configuration Screen

Default Settings have been provided for Parity (NONE), Baud Rate (9600 & 19.2k) and Port Number (User selectable) at the initial Run. Figure 12 shows the list of modules found in the network or added manually using ‘Add Module to the List’ button. It also shows the status of the device during each data polling.

If proper communication is established between the module and the computer, the response status column will be ‘Response Received’ in Green color. If there is a problem in the communication, the Response status column will show ‘Error: No Response Received’ marked in Red color.

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Main Status Screen

The status screen Figure 13 shows the status of the compressor using analog data, digital data, warnings and code alerts.

The program retrieves the diagnostics information from the module every 10 seconds (Default Polling Interval). The program displays updated Active Alarm and Warning Messages every 10 seconds. The polling interval can be changed by clicking on the clock icon on the tool bar. The range is from 5 seconds to 20 minutes.

History Screen

The History Screen Figure 15 displays the last 7 days Alarm History, Weekly Total and Cumulative Total of Compressor Starts and Run Time and Cumulative Total for each alert code event. User can save the history information using the “Save History” button. Information can be saved in an Excel file for history comparison and off-site review.

This Excel file contains all the information i.e. Analog Data, Module Configuration, Device Information, Ten Most Recent Alarms, etc. User can track analog values from this Excel file.

The history information can be found in the second sheet of the downloaded Excel file in a single row format. If a specific compressor installation is to be monitored, the history from each visit can be added as rows which can be used for analysis and troubleshooting.

Module Device Information Screen

The Device Information Screen Figure 16 is to show the Copeland Performance Alert Model (Three Phase Scroll or Three Phase Recip), Communication Settings in the module, Lockout Settings (Based on jumper) and Firmware Version.

Module Data Logging Screen

The Data Logging Screen Figure 17 is to log the digital status (like Demand Present is 1 or Demand absent is 0) and analog data on a periodic basis (set by the polling interval). This real-time information can be used to trouble-shoot the system.

Module Configuration Screen

With the help of Figure 14, the user can program the module for various parameters in the following sections: Compressor Asset Information, Module Configuration and Lockout Configuration. Detailed information about the setting is provided in the Help file.

Note: Modifications to the lock out settings will be activated when the module is powered off then on.

Default Settings

Default Settings have been provided for Module Configuration parameters and Lockout Configuration parameters on the first Module power-up. User is able to change the settings as per his configuration after the initial run of the software.

Compressor Asset Information

This information can be configured during compressor installation:

Compressor Model Number - Max. 17 Alphanumeric Characters

Compressor Serial Number - Max. 10 Alphanumeric Characters

Identification Number - Number from 0 to 255

Date Of Installation - MM/DD/YYYY format

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Figure 13

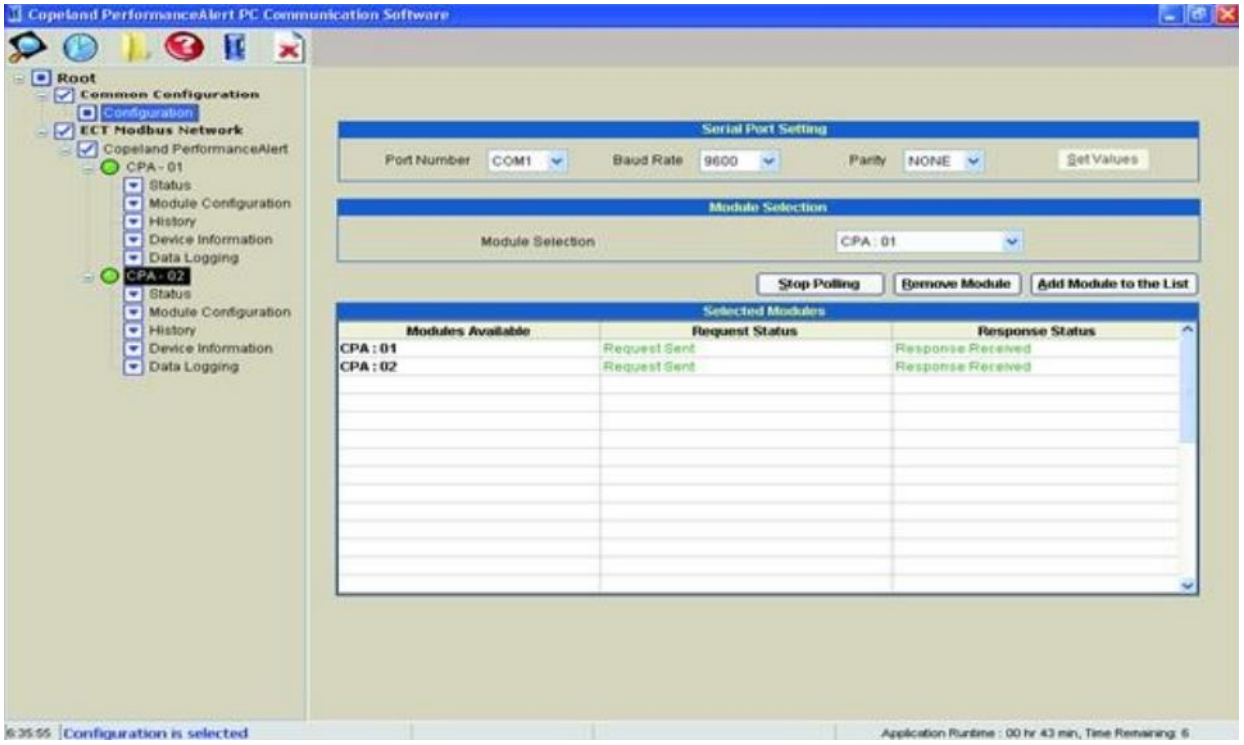


Figure 14

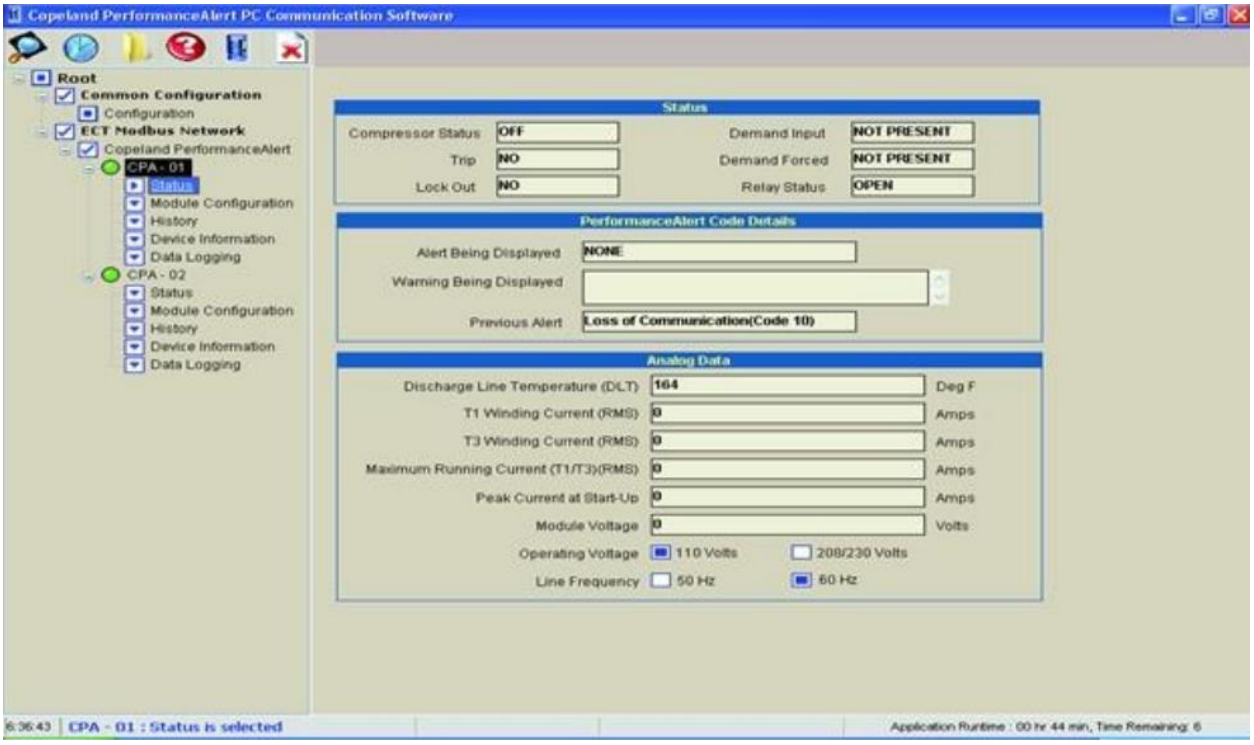


Figure 15

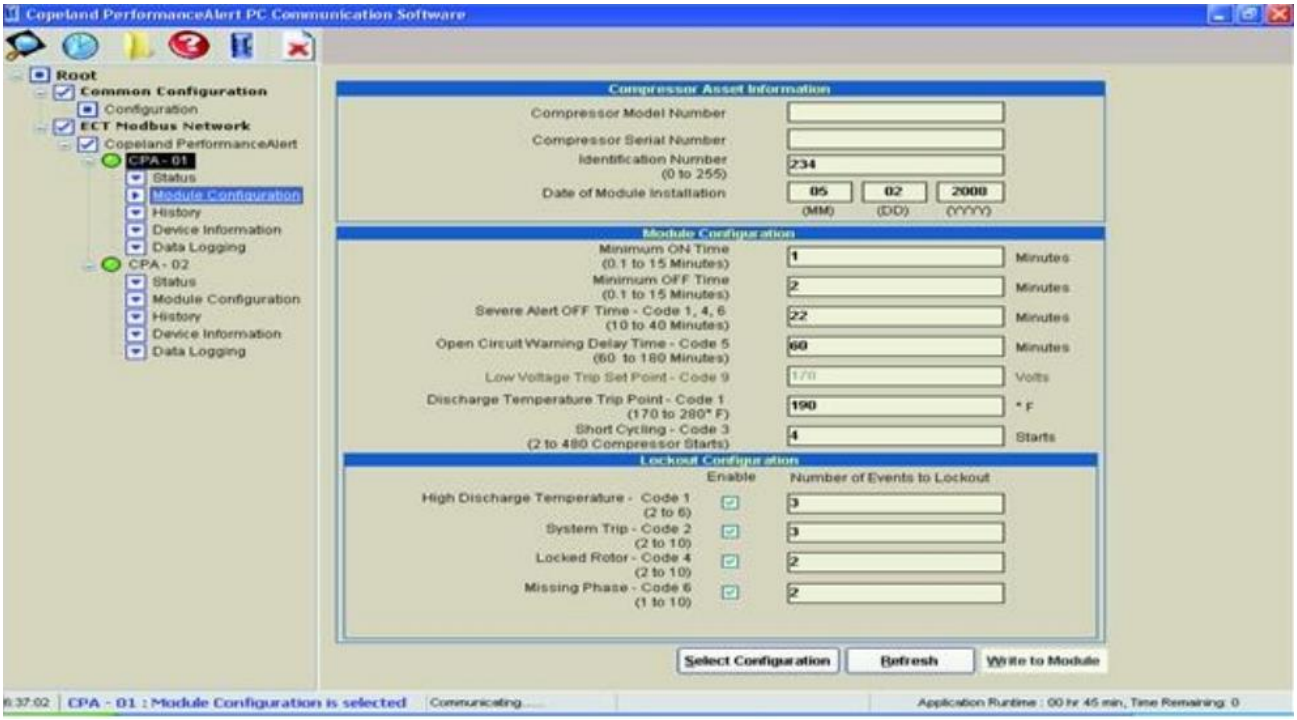


Figure 16

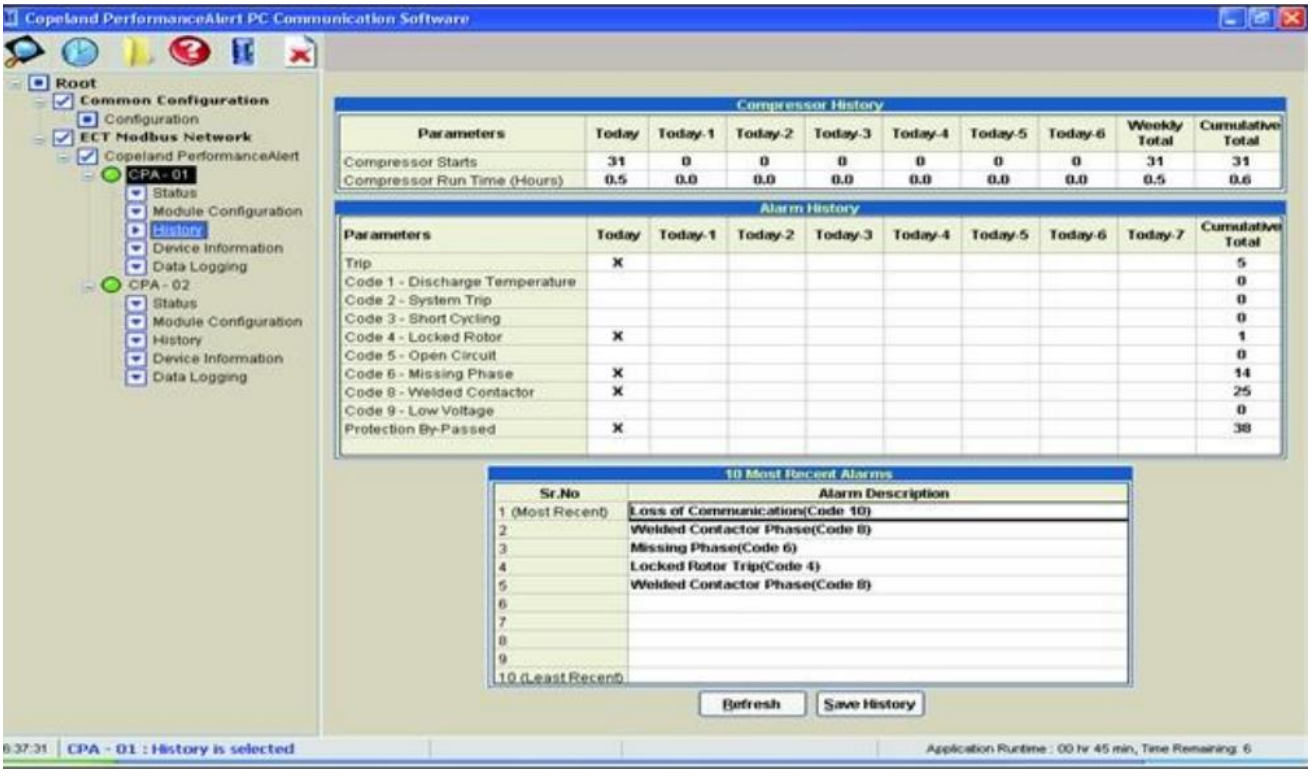


Figure 17

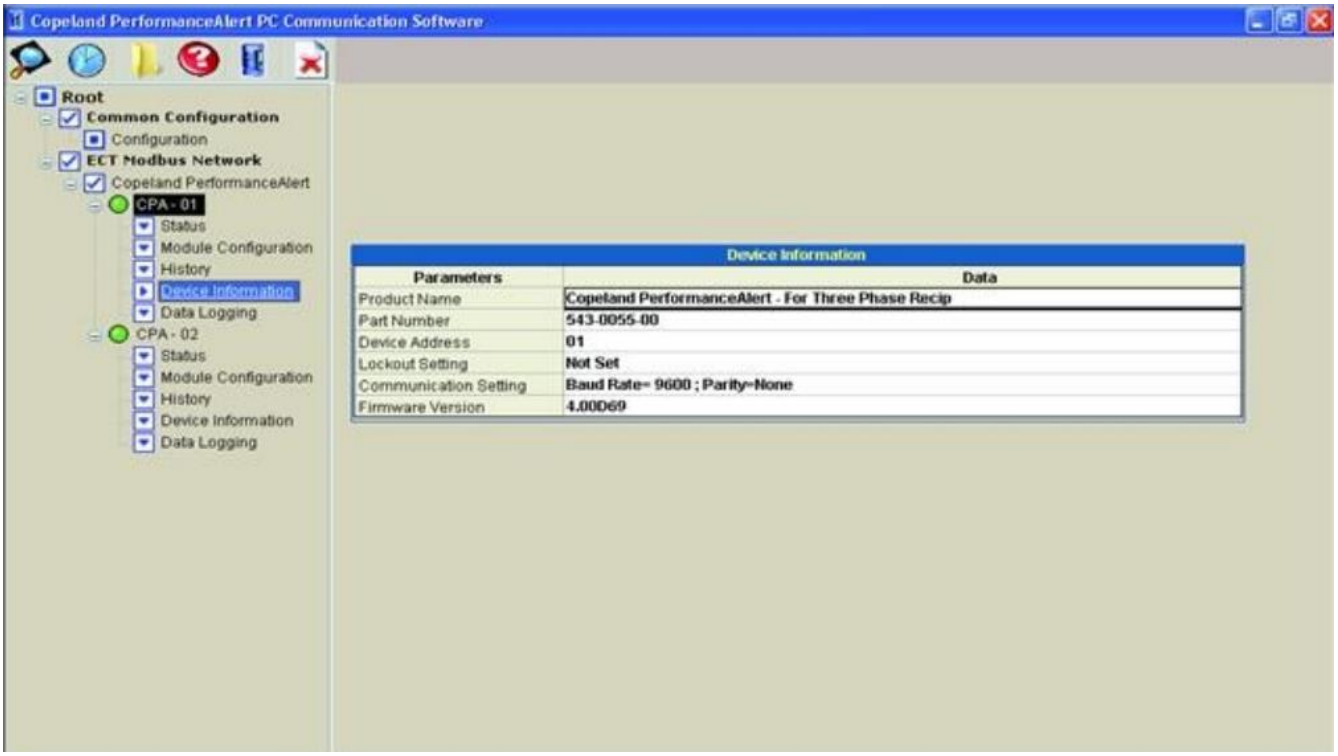
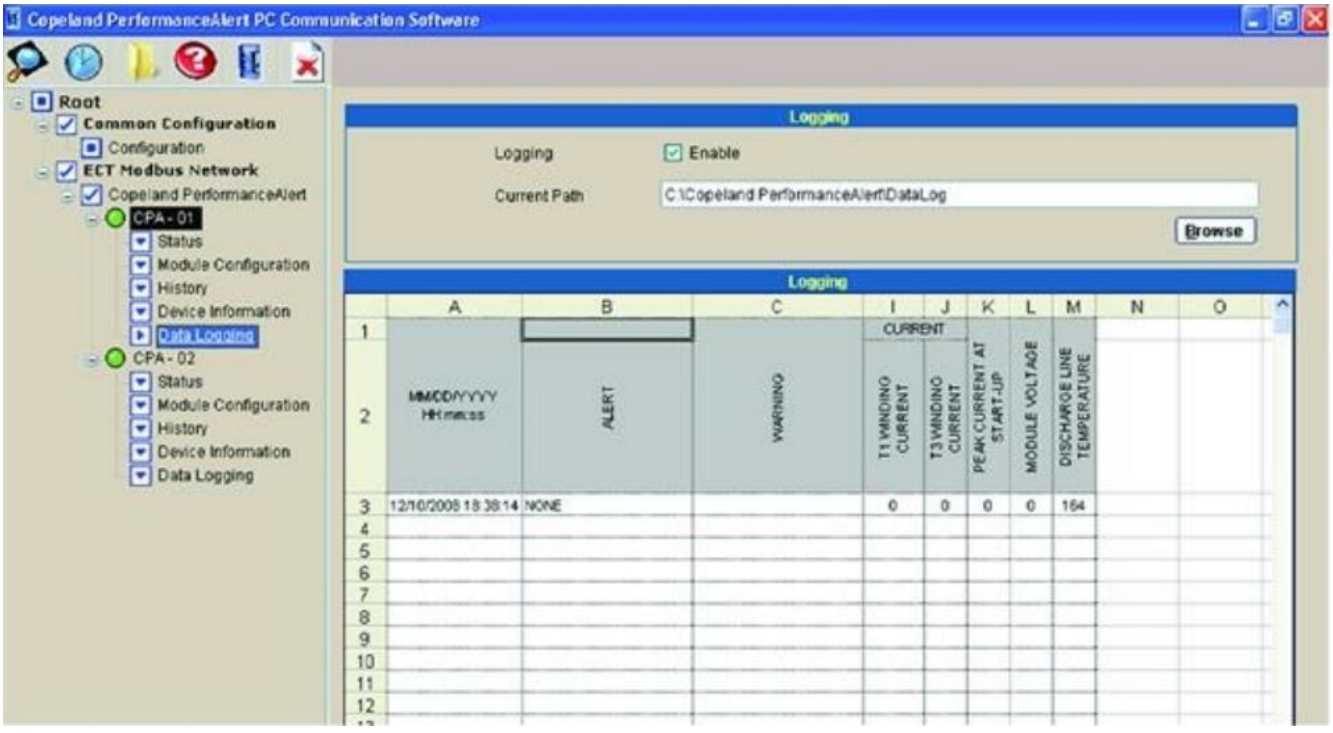


Figure 18



Module Configuration

Table 4 below shows the minimum, maximum and default settings for the module configuration parameters.

Table 4

Module Configuration	Minimum	Default	Maximum
Minimum On Time	0.1 Minutes	0.1 Minutes	15 Minutes
Minimum Off Time	0.1 Minutes	0.1 Minutes	15 Minutes
Severe Alert Off Time	10 Minutes	20 Minutes	40 Minutes
Open Circuit Warning Delay Time	60 Minutes	90 Minutes	180 Minutes
Discharge Temp Trip Point	170F/76.7C	230F/110C	280F/137.8C
Short Cycling (Even Numbers Only)	2 Starts per Day	240 Starts per Day	480 Starts per Day

Lockout Configuration

Lockout features are initially disabled in the module configuration. Each of the alert lockouts can be individually enabled or disabled based on application requirement. See Figure 14. On enabling the lockout, the user can also enter the number of events before compressor lockout. The Lockout feature has to be enabled using the software. See Table 5 for lockout configuration. Power to the module must be cycled to activate lockout.

Note: If lockout is enabled and a preset number of alarm events happen, the module will not allow the compressor to start until the situation is corrected and the module is manually reset (see Lockout Configuration in Section 5.1 Jumper settings).

Table 5

Lockout Configuration				
Code		Minimum	Default	Maximum
1	High Discharge Temp	2	4	6
2	System Trip	2	4	10
4	Locked Rotor	2	4	10
6	Missing Phase	1	10	10
7	Reverse Phase	1	1	1

Warranty Information

Copeland warrants its enclosed diagnostic module to be free from defects in materials and workmanship under normal use for a period of one year from the date of purchase. During this period, Copeland will replace any defective diagnostic module without charge.

This warranty is valid for the original purchaser from the date of initial purchase and is not transferable. Keep the original sales receipt. Proof of purchase is required to obtain warranty replacement. Dealers or service centers selling this product do not have the right to alter, modify or in any way change the terms and conditions of this warranty.

This warranty does not cover normal wear of parts or Time damage resulting from any of the following: negligent use or misuse of the product, use on improper voltage or current, use contrary to the operating instructions, disassembly, repair or alteration by anyone other than Copeland Further, the warranty does not cover acts of God, such as fire, flood, hurricanes and tornadoes.

Units under warranty and in need of repair should be returned to an authorized wholesaler or original equipment manufacturer.

COPELAND MAKES NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE WITH RESPECT TO THE Copeland Performance Alert MODULE.

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Copeland shall not be liable for any incidental or consequential damages caused by the breach of any express or implied warranty. Some states, provinces, or jurisdictions do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state, or province to province.

Support

For more information visit Copeland.com or contact Copeland at 888-367-9950.

Table 6 Additional Part Numbers:

Item	Part Number	Tube Size (Inches)
Tube/Line Clip	032-0688-00	0.375
	032-0688-01	0.313
	032-0688-02	0.5
	032-0688-03	1.125
	032-0688-04	0.875
	032-0688-05	1.625
	032-0688-06	1.375
	032-0688-07	0.25
Discharge Temperature Probe (NTC) or Thermistor	085-0204-00	
External / Remote LED	039-0020-00	
Strap	032-0689-00	
USB Kit	943-0143-00	
Connector for USB	021-0341-00	
Gateway kit	943-3730-00	

Table 7 Table of Alert Codes

Code	Three Phase Recip	Three Phase Scroll	Single Phase
1	Discharge Temperature Trip	Discharge Temperature Trip	Discharge Temperature Trip

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2	System Trip	System Trip	System Trip
3	Short Cycling	Short Cycling	Short Cycling
4	Locked Rotor	Locked Rotor	Locked Rotor
5	Open Circuit	Open Circuit	Open Circuit
6	Missing Phase	Missing Phase	Missing Phase
7	NA	Reverse Phase	Open Run
8	Welded Contactor	Welded Contactor	Welded Contactor
9	Low Voltage	Low Voltage	Low Voltage
10	Lost communications	Lost communications	Lost communications
11	DLT Sensor Failure	DLT Sensor Failure	DLT Sensor Failure

Table 8 Troubleshooting

Status LED	Status LED Description	Status LED Troubleshooting Information
Green "POWER"	Module has power	Supply voltage is present at module terminals
Green flashing	Module has power; demand signal is present and minimum off time is active	Once minimum off time is met compressor will start normally
Red "TRIP"	Thermostat demand signal Y is present, but the compressor is not running	1. Compressor protector is open -Check for high head pressure -Check compressor supply voltage 2. Compressor circuit breaker or fuse(s) is open 3. Broken wire or connector is not making contact 4. Safety cutout switches open (HPCO, LPCO, etc) 5. Compressor contactor has failed open 6. Module will trip compressor when codes 1,4,6,7 and 9 are present
Yellow "ALERT" Flash Code 1	High Discharge Line Temperature Trip	1. Possible loss of refrigerant charge 2. Blocked condenser 3. Verify that discharge valve is open 4. On low temperature scroll compressors check liquid injection
Yellow "ALERT" Flash Code 2	System Trip Four consecutive compressor trips after run time of 1-15 minutes	1. Excessive suction pressure or discharge pressure 2. Improper wiring 3. Defective run or start capacitor or relay

Yellow "ALERT" Flash Code 3	Short Cycling 2 to 480 run cycles in 24 hours ending with normal Shutdown Default set at 240 run cycles	1. Check pressure or temperature control 2. Possible loss of refrigerant 3. Blocked condenser 4. High suction pressure
Yellow "ALERT" Flash Code 4	Locked Rotor Compressor is drawing current without rotating or four consecutive compressor trips after run time of 1-15 seconds	1. Run capacitor has failed (on some single-phase compressors) 2. Low line voltage (contact utility if voltage at disconnect is low) -Check wiring connections 3. Excessive liquid refrigerant in compressor 4. Compressor bearings are seized - Measure oil level in compressor 5. Verify operating current
Yellow "ALERT" Flash Code 5	Open Circuit Demand signal is present but no compressor current for four hours	1. Compressor circuit breaker or fuse(s) is open 2. Compressor contactor has failed open -Check compressor contactor wiring and connectors - Check for compressor contactor failure (burned, pitted, or open) -Check wiring and connectors between supply and compressor -Check for low pilot voltage at compressor contactor coil 3. High pressure switch is open and requires manual reset 4. Open circuit in compressor supply wiring or connections 5. Unusually long compressor protector reset time due to extreme ambient temperature 6. Compressor windings are damaged -Check compressor motor winding resistance
Yellow "ALERT" Flash Code 6	1- Phase Open Start Circuit Demand is present but current is missing in start circuit	1. Run capacitor has failed. 2. Open circuit in compressor start winding or connections: -Check wiring and connectors between supply and “S” terminal. 3. Compressor start windings are damaged: - Check compressor winding resistance. 4. Compressor current could be to low: - Refer to specifications. 5. Verify power on all legs.
	3-PHASE (Recip and Scroll) Missing Phase Demand signal is present but current is missing in one phase	1. Improper wiring. Correct order of phases in wires. 2. Failed contactor. Check contacts for piting. 3. Compressor current could be too low. Refer to specifications. 4. Verify presence of all legs of power line

Yellow "ALERT" Flash Code 7	1- Phase Open Start Circuit Demand is present but current is missing in run circuit	1. Open circuit in compressor run winding or connections: -Check wiring and connectors between supply and “R” terminal. 2. Compressor run windings are damaged: -Check compressor winding resistance. 3. Compressor current could be too low: - Refer to specifications. 4. Verify power on all legs.
	3-PHASE (Scroll only) Reverse Phase Demand signal is present but current is not detected in the correct sequence	1. Improper wiring. Correct order of phases in wires. 2. Compressor current could be too low. Refer to specifications. 3. Verify presence of all legs of power line
Yellow "ALERT" Flash Code 8	Welded Contactor No demand signal, but current has been detected in one or both phases	1. Control circuit transformer is overloaded 2. Thermostat demand signal not connected to module 3. Check wiring diagram; see figures 6, 7, and 8
Yellow "ALERT" Flash Code 9	Low Voltage Detect Control voltage dips below 85V for 110V or 170V for 220V	1. Low line voltage (contact utility if voltage at disconnect is low) 2. Check wiring connections
Yellow "ALERT" Flash Code 10	Loss of Communication Communication lost between rack controller and module for 10 minutes or more	1. Check communications wiring
Yellow "ALERT" Flash Code 11	Discharge Temperature Sensor Short or Open Circuit	1. Check discharge temperature sensor wiring and mounting

Flash Code number corresponds to a number of LED flashes, followed by a pause and then repeated.

Compressor's MPM (Motor Protector Module)	Rack controller calling compressor to run, but compressor is off. However Performance Alert does not indicate a trip.	Check for MPM presence and status.

Copeland Performance Alert Modbus Specifications

Introduction

The Copeland Performance Alert diagnostics module is a breakthrough innovation for troubleshooting refrigeration system faults. The module can be installed in the electrical box of the condensing unit near the compressor contactor or in the electrical panel of a refrigeration rack system. By monitoring and analyzing data from the Copeland brand compressors, the module can accurately detect the cause of electrical and system related issues. A flashing LED indicator communicates the ALERT code and guides the service technician to the root cause of a problem quicker.

Copeland Performance Alert has a RS485 isolated communication port, by which the modules communicate with the system controller or the network master. The details of the communication are provided in this document.

Abbreviations

Table 9 Abbreviations

Abbreviation	Meaning
RTU	Remote Terminal Unit
LRA	Locked Rotor Amps
T1, T2, T3	Current Transformer on Copeland Performance Alert
RMS	Root Mean Square
DLT	Discharge Line Temperature
MCC	Maximum Continuous Current
ADC	Analog-to-Digital Converter
ASC	Anti-Short Cycling
CPA	Copeland Performance Alert

Intent

This document defines the module's standard usage of the Modbus protocol specification. This will allow 3rd party controllers to easily communicate to our products using a standard Modbus interface.

Scope

This document only defines the Modbus options that are used in the Copeland Performance Alert module, it is not intended to replace the Modbus protocol specification. Also, this specification defines the common usage of the physical layer and data link layers and some parts of the application layer interface.

References

For the details of the Modbus specification, refer to the Modicon Modbus Protocol Reference Guide PI-MBUS-300 Rev. J.

General Description

Modbus uses a three layer protocol:

Physical Layer: The hardware interface.

Data Link Layer: Defines the reliable exchange of messages.

Application Layer: Defines message structures for the exchange of application specific information.

Modbus has some required features, some recommended features, and some optional features. This specification will define the features that are used in Copeland Performance Alert production. This specification starts with the physical layer and then works up to the application layer. The application layer defined in this specification defines the standard Modbus memory map and data interchange.

Modbus is a protocol with a single master and multiple slave devices. The master device initiates all messages. The master device is typically a system controller and the slave devices are the Copeland Performance Alert modules.

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Physical Layer

This layer defines the hardware interface to the network.

Topology

The Copeland Performance Alert uses a 'two-wire' configuration (two signal wires plus a ground). The standard configuration will be to directly wire to the cable forming a daisy-chain.

Wire Used

The recommended wire will be Belden 8761 that is a 22 AWG shielded twisted pair. The shield is also used as the circuit ground.

Figure 19 Recommended Communication Wire



Bus Bias

The master device must provide a means to bias the network. The recommended pull-down on the RS485 '+' output is a 511 ohm resistor, but up to a 1K ohm resistor is acceptable. The recommended pull-up resistor on the RS485 '-' output is a 511 ohm resistor, but up to 1K ohms is acceptable. These bias resistors can either be always enabled or they can be enabled through jumpers. The bias is applied at one point in the network.

Figure 20 Copeland Performance Alert Jumpers and Connections



Termination

The last slave in the network must have a 150Ω resistor for termination. In Copeland Performance Alert, there is a jumper provision to enable this termination. The jumper is labeled as 'TRMNTR'. The last Copeland Performance e Alert module in the network shall be populated with a header on this jumper. For the other Copeland Performance Alert modules in the network, this jumper does not need to be populated.

Data Signaling Rate

The default communications port default settings are 19200, no Parity, 8 data, 2 Stop bits.

Labeling

Copeland Performance Alert modules use a 'COMM PORT' with connector pins, labeled from left to right as:

- ' - + GND '

For cables labeled with A and B, connect as follows:

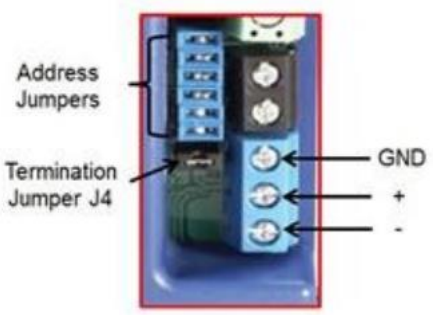
- - = 'A' circuit connection
- ▪ + = 'B' circuit connection
- GND = Common

Wiring and Connections

The Modbus wiring connects directly to the screw terminals on the module, '-', '+', 'GND'.

Important! Note that RS485 is polarity sensitive. '+' wires must connect to other '+' terminals and '-' wires must connect to other '-' terminals. The shield wire is connected to the GND terminal.

Figure 21 Connections



Data Link Layer

Modbus uses master/slave protocol where there is a single master device that initiates all messages. The data link layer defines the reliable transfer of a message transferred from the master to one or more slave devices and the reliable transfer of the response message (when the command message is sent to a single device). The Performance Alert module is a slave in the network and the rack controller is the master.

Node Address

The CPA uses jumper combinations to setting the node address. The jumper combination positions 1 through 5 will be used to define a node address from 1 to 30. See Table 2 for address combinations.

Note: To enable a jumper changes, power to the module must be cycled.

Table 10 Communication Addresses

Node Address	Jumper Status				
	AD1	AD2	AD3	AD4	AD5
Invalid	No	No	No	No	No
#1	Yes	No	No	No	No
#2	No	Yes	No	No	No
#3	Yes	Yes	No	No	No
#4	No	No	Yes	No	No
#5	No	No	Yes	No	No
#6	No	Yes	Yes	No	No
#7	Yes	Yes	Yes	No	No
#8	No	No	No	Yes	No
#9	Yes	No	No	Yes	No
#10	No	Yes	No	Yes	No
#11	Yes	Yes	No	Yes	No
#12	No	No	Yes	Yes	No
#13	Yes	No	Yes	Yes	No
#14	No	Yes	Yes	Yes	No
#15	Yes	Yes	Yes	Yes	No
#16	No	No	No	No	Yes
#17	Yes	No	No	No	Yes
#18	No	Yes	No	No	Yes
#19	Yes	Yes	No	No	Yes
#20	No	No	Yes	No	Yes
#21	Yes	No	Yes	No	Yes
#22	No	Yes	Yes	No	Yes
#23	Yes	Yes	Yes	No	Yes
#24	No	No	No	Yes	Yes
#25	Yes	No	No	Yes	Yes

#26	No	Yes	No	Yes	Yes
#27	Yes	Yes	No	Yes	Yes
#28	No	No	Yes	Yes	Yes
#29	Yes	No	Yes	Yes	Yes
#30	No	Yes	Yes	Yes	Yes
Invalid Address 1. Default Set by Manufacturer 2. Special Mode 3. No Communication	Yes	Yes	Yes	Yes	Yes

RTU Transmission Mode

The Modbus communication of Copeland Performance Alert modules use the RTU mode. The default character framing will be an 11 bit character as follows:

- 1 start bit
- 8 data bits
- 2 stop bit

A standard 2 byte CRC is used for frame verification

Response Message Timeout

As per the Modbus specification each device can define its own maximum timeout for the response to be sent to a request, the maximum timeout for the Copeland Performance Alert module is 800 milliseconds.

Application Layer

The Application Layer defines the type of messages that will be sent and the format of the messages.

Available Functions

Table 11 Standard Modbus Function Codes

Standard Modbus Function Codes Supported by Copeland Performance Alert				
Switch Number	**Function Code**	**Function Name**	**Register**	**Access**
1	0x04	Read Input Registers	Input Register	Read Only
2	0x03	Read Holding Registers	Holding Register	Read/Write
3	0x06	Write Single Register	Holding Register	Read/Write
4	0x10	Multiple Registers	Holding Register	Read/Write

Data Types

Modbus requires that all multiple byte data be sent in Big Endian format (most significant byte to least significant byte). In Big Endian system, the most significant value in the sequence is stored at the lowest storage address (i.e. first).

Functions Supported

Input Register (Command 0x04)

Module Information (Command 0x04)

Table 12 Module Information

Address (Hex)		Data	Bytes	
Start	Stop			
0	0	Module Type Major No	1	For Internal Use
1	1	Module Type Minor No	1	For Internal Use
2	9	CPA FW Version (X.YYRZZ)	8	Module Firmware version string 'X.YyRZZ' X=Major revision Yy=Minor revision Y = feature change y=bug fix R= release type D = development A = Alpha - QA B = Beta - Customer Field Test F = Full production release X = Special release ZZ=release number (in D, A, and B)
A	12	Product Code	9	'526-####'\0
13	16	Division Name	4	'ECT'\0
17	1B	Product Name	5	'PA2R'\0
1C	1C	Endian Selection	1	Val =0x80, Big-Endian type
1D	1D	Product Type	1	Val=56
1E	1E	Temperature Code	1	°F

Analog Data (Command 0x04)

Table 13 Analog Data

Address (Hex)		Data	Bytes	
Start	Stop			
1F	20	Module Voltage	2	Line Voltage Sensed by the Module
21	22	T1 RMS	2	T1 Current Sensed by the Module
23	24	T2 RMS	2	T2 Current Sensed by the Module
25	26	LRA Peak	2	Peak LRA Sensed by the Module
27	28	Maximum Running Current	2	Maximum Running Current Sensed by the Module from T1 or T3
29	2A	Live DLT	2	Discharge Line Temperature in °F

Status Information (Command 0x04)

Table 14 Status Information

Address (Hex)		Data	Bytes	
Start	Stop			
2B	2B	Input Status (Bit Field)	1	Bit0 - Demand Status (1 = Demand Present) Bit1 - Not Used Bit2 - Run Current (1 = IR Present) Bit3 - Start Current (1 = IS Present) Bit4 - Forced Demand (1 = IS Present) Bit5 - Min OFF Time Active (1 = Active) Bit6 - Operating Voltage (1= Line Voltage >160Volts) Bit7 - Line Frequency (1 = Frequency is 50Hz.)
2C	2C	Output Status (Bit Field)	1	Bit0 - Relay Status (1 = Relay Closed) Bit1 - Not Used Bit2 - Not Used Bit3 - Not Used

				Bit4 - Not Used Bit5 - Not Used Bit6 - Not Used Bit7 - Not Used
2D	2D	Modbus Device Address	1	Device address from Selection Jumper
2E	2E	Communication Settings	1	Bits indication Parity, Baud Rate etc.
2F	2F	System Status	1	Bit0 - Trip Status (1 = TRIP) Bit1 - Not Used Bit2 - Not Used Bit3 - Lockout Status (1 = Locked out) Bit4 to Bit7 Locked out Error Code
30	30	Warning Flags (Bit Field)	1	Bit0 - High DLT Warning Bit1 - Locked Rotor 1st trip Warning(Time Based Logic) Bit2 - Open Circuit Warning (Trip Time> 4) Bit3 - Low Voltage Warning Bit4 - MCC Warning (For Future Use) Bit5 - DLT Open Sensor Warning Bit6 - DLT Short Sensor Warning Bit7 - Not Used

History Information (Command 0x04)

Table 15 History Information

Address (Hex)		Data	Bytes	
Start	Stop			
36	36	Active Alert (being displayed)	1	Active Alert (being displayed)
37	37	Alert last displayed	1	Alert last displayed
38	38	Most recent alert position Byte	1	Most Recent alert position Byte(Range 0 to 9)
39	42	Most Recent Alarms	10	10 Most Recent Alarms
43	45	Compressor runtime	3	Compressor runtime
46	48	Number of Compressor starts	3	Number of Compressor starts
49	4B	NA	3	NA
4C	4C	Protector trips 7 day History	1	Protector trips 7 day History

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4D	4F	Cumulative Protector trips Count	3	Cumulative Protector trips Count
50	50	Code 1- 7 day History	1	Code 1- 7 day History
51	53	Code 1- Cumulative Count	3	Code 1- Cumulative Count
54	54	Code 2- 7 day History	1	Code 2- 7 day History
55	57	Code 2- Cumulative Count	3	Code 2- Cumulative Count
58	58	Code 3- 7 day History	1	Code 3- 7 day History
59	5B	Code 3- Cumulative Count	3	Code 3- Cumulative Count
5C	5C	Code 4- 7 day History	1	Code 4- 7 day History
5D	5F	Code 4- Cumulative Count	3	Code 4- Cumulative Count
60	60	Code 5- 7 day History	1	Code 5- 7 day History
61	63	Code 5- Cumulative Count	3	Code 5- Cumulative Count
64	64	Code 6- 7 day History	1	Code 6- 7 day History
65	67	Code 6- Cumulative Count	3	Code 6- Cumulative Count
68	68	Code 7- 7 day History	1	Code 7- 7 day History
69	6B	Code 7- Cumulative Count	3	Code 7- Cumulative Count
6C	6C	Code 8- 7 day History	1	Code 8- 7 day History
6D	6F	Code 8- Cumulative Count	3	Code 8- Cumulative Count
70	70	Code 9- 7 day History	1	Code 9- 7 day History
71	73	Code 9- Cumulative Count	3	Code 9- Cumulative Count
74	74	By-Pass Counter 7 Day History	1	By-Pass Counter 7 Day History
75	77	By-pass Counter Cum Count	3	By-pass Counter Cum Count
78	79	Cumulative Compressor start Day 1	2	Cumulative Compressor start Day 1
7A	7B	Cumulative Compressor start Day 2	2	Cumulative Compressor start Day 2
7C	7D	Cumulative Compressor start Day 3	2	Cumulative Compressor start Day 3
7E	7F	Cumulative Compressor start Day 4	2	Cumulative Compressor start Day 4
80	81	Cumulative Compressor start Day 5	2	Cumulative Compressor start Day 5
82	83	Cumulative Compressor start Day 6	2	Cumulative Compressor start Day 6
84	85	Cumulative Compressor start Day 7	2	Cumulative Compressor start Day 7
86	87	Compressor Run Time Day 1 History	2	Compressor Run Time Day 1 History

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88	89	Compressor Run Time Day 2 History	2	Compressor Run Time Day 2 History
8A	8B	Compressor Run Time Day 3 History	2	Compressor Run Time Day 3 History
8C	8D	Compressor Run Time Day 4 History	2	Compressor Run Time Day 4 History
8E	8F	Compressor Run Time Day 5 History	2	Compressor Run Time Day 5 History
90	91	Compressor Run Time Day 6 History	2	Compressor Run Time Day 6 History
92	93	Compressor Run Time Day 7 History	2	Compressor Run Time Day 7 History

Hold Register (Command 0x03, 0x06, 0x10)

Table 16 Hold Register

Address (Hex)		Data	Bytes	
Start	Stop			
D4	D5	DLT Temp Trip Point	2	Range 0 - 655 °F ex: 230°F = 0x00e6
D6	D6	DLT Wait Time	1	Range 0 - 255 (Delay time before Compressor Restart)
D7	DF	Number of Events to Lockout on Code x	9	Number of Events to Lockout on Code x Range from 0 to 0xFF, default value = 0xFF -Disable lockout. Byte 1 for Code1 Byte 2 for Code2 Byte 3 for Code3 Byte 4 for Code4 Byte 5 for Code5 Byte 6 for Code6 Byte 7 for Code7 Byte 8 for Code8 Byte 9 for Code9
E0	E1	Low Voltage Set-Point	2	Range 0 - 655 Volts Values are Hardcode by the Firmware, set points are 85 for 110V and 170 for 220V (Read only Value , cannot be modified by the master)
E2	E2	ASC Time	1	Range 0 - 25.5 min in steps of 0.1 min (6seconds)
E3	E3	Open Circuit Delay Time	1	Range 0 - 255 Hours
E4	E4	Minimum ON Time	1	Range 0 - 25.5 Minutes (in 0.1Min Steps)
E5	E5	Minimum OFF Time	1	Range 0 - 25.5 Minutes (in 0.1Min Steps)

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E6	E6	Tester Present	1	Bit0 - Not Used Bit1 - TESTER PRESENT (Bit is set whenever the COMM program is connected) Bit2 - Not Used Bit3 - Not Used Bit4 - Not Used Bit5 - Not Used Bit6 - Not Used Bit7 - Not Used
E7	E7	Product type numeric value	1	Default 255
E8	F9	Asset Model Number	18	'XXXXXXXXX-XXX XXX'\0
FA	104	Asset Serial Number	11	'XX-XXXX-XX'\0
105	105	Rack Number	1	0 -255
106	110	Date Of Installation	11	Format 'YYYY -MM -DD' \ 0 X = year (e.g. 2006) Y= Month (1 - 12) Z =Date (1 - 31)
111	114	Customer ID Code	4	'XXX' \ 0

Troubleshooting

If the module communication doesn't respond, here is a list with some general steps for troubleshooting:

1. Check the wiring connection. Ensure the wiring is correctly connected and the connector is not loose.

2. Check the power to the Copeland Performance Alert module. Check the power supply line and ensure the power is on and green LED is on.

3. Check the module network address. The address should match the address that the master has requested. Note: for the module, the address 0 is invalid.

4. Check your master data format setting. Ensure the master node data format setting is: RTU mode, 1 start bit, 8 data bit, no parity bit, 2 stop bit.

5. Check the master node baud rate setting. Set your master node baud rate as 19200 and then try to communicate with the module. If the module does not respond, then set to 9600 baud rate and try again.

A third party PC debugging tool can also be used by sending the query shown in Table 9 for getting the firmware version number.

The response indicates the version number as 1.01R00 (this version number is only for an example, may change for different models).

Table 17 Debugging Tool

Address	Bytes	1		0	1	R	0	0	CRC
08	04 00	10	01 0E	00	2	0	30 01	30 10	20 50	10 01	30 17	40	3	81

	Address		Start		Length		CRC		The request and response is hex value.
Request for version number	08	04	00	02	00	08	50	95	

Revision Tracking R4

The document format has been updated to the new Copeland format

All occurrences of "Emerson" have been removed

A note regarding A3 and R290 venting has been updated

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