

## CoreSense™ Communications for 20 to 40 Ton Copeland Scroll™ Air Conditioning Compressors

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## Safety Instructions

Copeland Scroll™ compressors with CoreSense™ Communications are manufactured according to the latest U.S. and European Safety Standards. Particular emphasis has been placed on the user's safety. Safety icons are explained below and safety instructions applicable to the products in this bulletin are grouped on page 3. These instructions should be retained throughout the lifetime of the compressor. **You are strongly advised to follow these safety instructions.**

### Safety Icon Explanation



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.



NOTICE is used to address practices not related to personal injury.



CAUTION, without the safety alert symbol, is used to address practices not related to personal injury.

### Instructions Pertaining to Risk of Electrical Shock, Fire, or Injury to Persons

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p><b>ELECTRICAL SHOCK HAZARD</b></p> <ul style="list-style-type: none"> <li>• Failure to follow these warnings could result in serious personal injury.</li> <li>• Disconnect and lock out power before servicing.</li> <li>• Discharge all capacitors before servicing.</li> <li>• Use compressor with grounded system only.</li> <li>• Molded electrical plug must be used when required.</li> <li>• Refer to original equipment wiring diagrams.</li> <li>• Electrical connections must be made by qualified electrical personnel.</li> </ul>                                                                                                                                                                                 |
|    | <p><b>PRESSURIZED SYSTEM HAZARD</b></p> <ul style="list-style-type: none"> <li>• Failure to follow these warnings could result in serious personal injury.</li> <li>• System contains refrigerant and oil under pressure.</li> <li>• Remove refrigerant from both the high and low compressor side before removing compressor.</li> <li>• Use appropriate back up wrenches on rotalock fittings when servicing.</li> <li>• 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.</li> <li>• Use only approved refrigerants and refrigeration oils.</li> <li>• Personal safety equipment must be used.</li> </ul> |
|  | <p><b>BURN HAZARD</b></p> <ul style="list-style-type: none"> <li>• Failure to follow these warnings could result in serious personal injury or property damage.</li> <li>• Do not touch the compressor until it has cooled down.</li> <li>• Ensure that materials and wiring do not touch high temperature areas of the compressor.</li> <li>• Use caution when brazing system components.</li> <li>• Personal safety equipment must be used.</li> </ul>                                                                                                                                                                                                                                                                          |
|  | <p><b>COMPRESSOR HANDLING</b></p> <ul style="list-style-type: none"> <li>• Failure to follow these warnings could result in personal injury or property damage.</li> <li>• Use the appropriate lifting devices to move compressors.</li> <li>• Personal safety equipment must be used.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                 |

### Safety Statements

- Refrigerant compressors must be employed only for their intended use.
- Only qualified and authorized HVAC or refrigeration personnel are permitted to install, commission and maintain this equipment.
- Electrical connections must be made by qualified electrical personnel.
- All valid standards and codes for installing, servicing, and maintaining electrical and refrigeration equipment must be observed.

## INTRODUCTION

### Overview

CoreSense™ Communications is a breakthrough innovation for 20 to 40 ton Copeland Scroll™ air conditioning compressors. The CoreSense Communications module, installed in the compressor electrical box, provides advanced diagnostics, protection, and communications that enhance compressor performance and reliability.

### Features

CoreSense Communications has the following key features:

1. Motor temperature protection
2. Scroll high temperature protection
3. Missing phase protection
4. Reverse phase protection
5. Low control circuit voltage protection
6. Short cycling detection and alert
7. Communication to system controller through RS485/Modbus
8. Storage of operational history, runtime information, fault counters, etc.
9. Display of status, warning, and alert information via LEDs

CoreSense Communications provides compressor and system protection through its proprietary lockout feature. Depending on the severity and frequency of the fault that caused the trip condition, the CoreSense Communications module can lockout the compressor contactor to prevent damage to the compressor and system components. Less severe fault conditions resulting in an occasional trip will not result in a lockout condition.

Flashing red and green LEDs communicate **Status**, **Warning**, and **Alert** codes to the service technician and the master controller.

### Application Usage



**CoreSense Communications modules are not interchangeable with any other brand of motor protection module that may have been previously used with Copeland Scroll compressors.**

CoreSense Communications modules are not intended to be used as field retrofits for other motor protection

modules that may have been previously used with Copeland Scroll compressors. The motor and scroll thermistor circuits are configured differently for Copeland Scroll with CoreSense Communications and are not compatible with motor protection modules that were previously used.

Copeland Scroll compressors equipped with CoreSense Communications will have an “E” in the electrical code. An example is the 40-ton scroll, ZP485KCE-**TE**D.

### Module Part Numbers

OEM and service compressors will have the CoreSense Communications module installed in the compressor electrical box. Individually packaged modules are available to the aftermarket for component replacement. Part numbers for OEM and service applications are listed in **Table 1**.

### Agency Recognition

CoreSense Communications carries the following agency recognitions:

- U.L. file E253322, Volume 7, Software Class B
- CB Test Certificate

### Product Specifications

CoreSense specifications are shown in **Table 2**. Many of the electrical specifications are the same as previously used electronic motor protection modules.

## INSTALLATION

### Mounting

As mentioned above, CoreSense Communications will be shipped already installed in the compressor electrical box. Two holding tabs secure the module in the box. To remove the module depress the holding tabs and remove the module.



**Always disconnect and lockout the power supply before removing the compressor electrical box cover for servicing.**

### Terminal Description and Basic Field Wiring

**Figure 1** shows the CoreSense Communications module and **Figure 2** illustrates the required OEM/field wiring. **Figure 3** is the terminal box wiring diagram. An explanation of the terminal designations follows:

**T2-T1:** Module power supply, 24 or 120/240 VAC.

**L1-L2-L3:** Phase inputs corresponding to compressor input power L1-L2-L3.

**M2-M1:** Normally open control circuit contacts; M2-M1 should be wired in series with the compressor contactor.

**A (+), GND, B (-):** RS485 communications.

**Temperature Plug:** See **Figure 4** for identification of the PTC, NTC, and common connections.

When multiple CoreSense Communications modules are networked, a shielded, twisted pair cable such as Belden #8761 (22 AWG) should be used for the communication wiring.

### NOTICE

**The RS485 is polarity sensitive. When “daisy chaining” modules the A (+) must connect to other A (+) terminals and B (-) must connect to other B (-) terminals.**

### Dielectric (Hipot) Testing



**Use caution with high voltage and never hipot when compressor is in a vacuum.**

U.L. sets the requirement for dielectric strength testing and should be consulted for the appropriate voltage and leakage values. Emerson Climate Technologies does not recommend hipot testing at voltages higher than 1,000 VAC.

### OPERATION



**The CoreSense Communications module is a recognized safety device and must be used with all compressors that have TE\* electrical codes.**

A solid green LED indicates the module is powered and operation is normal. A solid red LED indicates an internal problem with the module. See the **Troubleshooting** section of this bulletin for more information on what to do if the red LED is solid.

CoreSense Communications communicates **Warning** codes via a green flashing LED. Warning codes do not result in a trip or lockout condition. **Alert** codes are communicated via a red flashing LED. **Alert** codes will result in a trip condition and possibly a lockout condition.

### Warning Codes (Green LED Flash Code)

#### Code 1 – Loss of Communication

The module will flash the green **Warning** LED one time indicating the module has not communicated with the master controller for longer than 5 minutes. Once communication is reinitiated, the **Warning** will be cleared.

#### Code 2 – Reserved For Future Use

#### Code 3 – Short Cycling

The module will flash the green **Warning** LED three times indicating the compressor has short cycled more than 48 times in 24 hours. A short cycle is defined as compressor runtime of less than 1 minute. The **Warning** will be activated when the “Short Cycling” dipswitch (#10) is “off” or in the “down” position. When fewer than 48 short cycles are accumulated in 24 hours the **Warning** code will be cleared.

#### Code 4 – Open/Shorted Scroll Thermistor

The module will flash the green **Warning** LED four times indicating the scroll NTC thermistor has a resistance value that indicates an open/shorted thermistor (see **Table 2**). The **Warning** will be cleared when the resistance value is in the normal range.

### Alert/Lockout Codes (Red LED Flash Code)

#### Code 1 – Motor High Temperature

The module will flash the red **Alert** LED one time indicating the motor PTC circuit has exceeded 4.5K Ohms. A code 1 **Alert** will open the M2-M1 contacts. The **Alert** will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the motor PTC circuit is below 2.75K Ohms. Five consecutive Code 1 **Alerts** will lockout the compressor. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required for the lockout to be cleared.

#### Code 2 – Open/Shorted Motor Thermistor

The module will flash the red **Alert** LED two times indicating the motor PTC thermistor circuit has a resistance value that indicates an open/shorted thermistor chain (see **Table 2**). A Code 2 **Alert** will open the M2-M1 contacts. The **Alert** will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the motor PTC circuit is back in the normal range. The module will lockout the compressor if the trip condition exists for longer than 6 hours.

Once the module has locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

#### Code 3 – Short Cycling

The module will flash the red **Alert** LED three times indicating the compressor is locked out due to short cycling. A Code 3 **Alert** will open the M2-M1 contacts. Code 3 will be enabled when the "Short Cycling" dipswitch (#10) is "on" or in the "up" position and the compressor has exceeded the number of short cycles configured by the user in a 24 hour period. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

#### Code 4 – Scroll High Temperature

The module will flash the red **Alert** LED four times indicating the scroll NTC circuit is less than 2.4K Ohms. A Code 4 **Alert** will open the M2-M1 contacts. The **Alert** will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the scroll NTC circuit is higher than 5.1K Ohms. The module will lockout the compressor if the number of Code 4 **Alerts** exceeds the user configurable number of Code 4 events within a 24 hour period. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

#### Code 5 – Reserved for Future Use

#### Code 6 – Missing Phase

The module will flash the red **Alert** LED six times indicating a missing phase in one of the three leads to the compressor. A Code 6 **Alert** will open the M2-M1 contacts. The **Alert** will reset after 5 minutes and the M2-M1 contacts will close if the missing phase condition is not present. The module will lockout the compressor after 10 consecutive Code 6 **Alerts**. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

#### Code 7 – Reverse Phase

The module will flash the red **Alert** LED seven times indicating a reverse phase in two of the three leads to the compressor. A Code 7 **Alert** will open the M2-M1 contacts. The module will lockout the compressor after one Code 7 **Alert**. A power cycle or Modbus reset command will be required to clear the lockout.

#### Code 8 – Reserved For Future Use

#### Code 9 – Module Low Voltage

The module will flash the red **Alert** LED nine times

indicating low module voltage (see **Table 2**) on the T2-T1 terminals for more than 5 seconds. A Code 9 **Alert** will open the M2-M1 contacts. The **Alert** will reset after 5 minutes and the M2-M1 contacts will close if the T2-T1 voltage is above the reset value in **Table 2**.

Please see **Table 6** for a summary of **Warning** and **Alert** codes and troubleshooting information.

### Resetting Alert Codes

Resetting **Alert** codes can be accomplished in two different ways. First, **Alert** codes can be reset manually by cycling power to the module (disconnect T2 or T1 for 5 seconds). The second way to reset **Alert** codes is to send a Modbus reset command from the master controller.

If the fault that initiated the **Alert** code is absent after one of the above resets is performed, the **Alert** code will be cleared and CoreSense will allow normal operation. If the fault is still present after the reset is performed the fault code will continue to be displayed via the green or red flashing LED.

### COMMISSIONING

#### Communications

Programming knowledge and a familiarity with Modbus will be required by the system designer to use the communications features of CoreSense Communications. CoreSense Communications has opto-isolated RS485 for the physical layer. The communication protocol is Standard Modbus and Emerson Climate Technologies Modbus. CoreSense Communications will act as the Modbus slave, while the master will be implemented in a system controller, PC software, or any other equivalent external device. Use of the communications feature of CoreSense Communications allows the master access to much of the data that resides in the CoreSense Communications module. Emerson Climate Technologies Modbus has six message categories:

1. Device ID Messages
2. CoreSense Status Messages
3. CoreSense History Status Messages
4. Configuration Messages
5. Command Messages
6. Firmware Update Messages

CoreSense status, configuration, history, and device information messages available to the master include those listed in **Table 4**.

The history status messages give the order in which the **Warning/Alert** has happened, with the total compressor run time. Information about the **Warning/Alert** occurrence during the last 7 days and the cumulative **Warning/Alert** counter are also available.

For more information on CoreSense™ Communications features and to request Modbus maps please contact your Application Engineer.

### DIP Switch Configuration

DIP switch selection for the Modbus address, baud rate, parity, and other operating conditions simplify service and start-up procedures. **Table 5** lists the purpose of each switch. See **Figures 5** and **6** for more information on DIP switch settings. A "darkened" switch setting in the illustrative figures indicates the switch setting is depressed or in the "down" position.

#### NOTICE

***The module must be reset after changing any of the DIP switch settings for changes to take effect.***

CoreSense Communications modules are shipped from the factory with the DIP switches set to default settings for standalone operation. Default settings are shown in **Figure 5**. Switch 1 is turned "on" as part of a quality control check to verify communications capability of the module before it leaves the compressor manufacturing plant. Switch 9 is also turned "on" for TE\* motor code. All other DIP switch default settings are in the "off" position.

#### NOTICE

***If DIP switch settings are inadvertently changed, the compressor will operate, but could have some loss of protection. Scroll temperature protection and short cycle protection could be disabled.***

The following steps cover the DIP switch settings throughout the commissioning process for a multiple compressor system with communications.

- Switches 1 through 5 are used for setting the device address. DIP switch 1 is the least significant bit (LSB) and switch 5 is the most significant bit (MSB). DIP switch addresses 0 through 31 are shown in **Figure 6**. Each CoreSense Communications module that is daisy chained and connected to a master controller must have a unique node address (as determined by the DIP switch settings).
- Switch 6 defines the communication baud rate for the CoreSense Communications module. If the switch is "off", the baud rate is 19200. If the switch

is "on" the baud rate is 9600. The baud rate of each CoreSense Communications module should be set to match the master controller baud rate.

- Switch 7 defines the communications parity. The default parity setting for the CoreSense Communications module is no parity. If the switch is set to "on" the module will communicate using even parity. The parity setting must match the parity setting of the master controller.
- Switch 8 defines the control mode. The default setting is standalone mode (off). If communications with a master controller is desired, switch 8 should be turned "on" to network.
- Switch 9 defines the thermistor configuration. If the compressor has a voltage code of TE\*, the compressor has PTC and NTC thermistors for motor and scroll temperature protection. If the compressor voltage code is TW\*, the compressor has only PTC thermistors for motor and scroll temperature protection. The default setting is "on" for PTC and NTC thermistor types.
- Switch 10 enables short cycling protection if turned "on". The default setting is "off".

### Jumper Setting

CoreSense Communications modules are shipped with the jumper installed. For standalone operation the jumper should remain installed. For daisy chained applications the jumper should remain installed for the modules on the ends of the daisy chain. All other jumpers in the sequence of daisy chained modules should be removed. The jumper can be removed using miniature electronics needle nose pliers

### PC Interface Software

PC interface software is available from Emerson Climate Technologies, Inc. The PC interface software allows the design engineer access to status, configuration, history, and data logging via a computer. This method of connecting and communicating with CoreSense is very helpful during the unit development stage if CoreSense is in stand-alone mode and not communicating with a master controller.

The RS-485/USB adapter used to connect the laptop to the CoreSense is B & B Electronics model number USOPTL4. **Figure 7** illustrates the wiring and DIP switch settings necessary to enable communications.

For more information on the PC interface software, how to obtain it, and a tutorial on its use, please contact your Application Engineer.

## SERVICE

### Field Service

Service compressors will be shipped with the CoreSense Communications module installed in the compressor terminal box. Special attention should be given to the module DIP switch settings of the compressor being replaced so the DIP switch settings can be transferred to the module of the replacement compressor. As mentioned earlier, the CoreSense Communications module is a recognized safety device and shall be used only with approved compressors with TE\* motor codes.

### NOTICE

***If a compressor with CoreSense Communications fails in the field, the CoreSense module should remain with the failed compressor so Emerson technicians can download the CoreSense data to assist with determining the root cause of compressor failure.***

### Troubleshooting

#### WARNING

***Always disconnect and lockout the power supply before removing the compressor electrical box cover for servicing.***

For troubleshooting purposes the scroll and motor thermistor circuits are similar to those of other Copeland Scrolls with one exception, the scroll thermistor is a negative temperature coefficient (NTC) type thermistor. This means that as the discharge temperature

increases, the resistance of the thermistor decreases. The motor has positive temperature coefficient (PTC) type thermistors; as the motor temperature increases, so does the resistance of the thermistor chain. To measure the resistance of the PTC and NTC circuits simply remove the temperature plug from the CoreSense module and measure the resistance in the appropriate pins shown in **Figure 4**. The measured values should be in the ranges listed in **Table 2**. For information on trouble shooting causes of high motor and scroll temperatures please refer to the application engineering bulletin for the compressor.

A loss of communications with the master controller for more than five minutes is communicated via a green flash code 1 if DIP switch #8 is enabled. CoreSense Communications has no provisions to detect incorrect wiring neither between daisy chained modules nor to the master controller. Ideally, the master controller will contain advanced troubleshooting menus for help in diagnosing communications issues between the master controller and the CoreSense module.

**Table 1**  
**CoreSense Communications Module Part Numbers**

| Voltage | OEM Part Number | Service Part Number |
|---------|-----------------|---------------------|
| 24      | 571-0065-04     | 971-0065-04         |
| 120/240 | 571-0064-05     | 971-0064-05         |

**Table 2**  
**CoreSense Communications Module Specifications**

| Module Part Number                        | 571-0065-04                  | 571-0064-05                             |
|-------------------------------------------|------------------------------|-----------------------------------------|
| Module Voltage & Frequency                | 24 VAC, 50/60 HZ             | 120/240 VAC, 60HZ<br>115/230 VAC, 50 HZ |
| Allowable Voltage Range                   | 18 - 30 VAC                  | 85 - 265 VAC                            |
| T2/T1 Low Voltage Trip                    | 18 VAC                       | 85/170 VAC                              |
| T2/T1 Low Voltage Reset                   | 19 VAC                       | 95/185 VAC                              |
| Power Consumption                         | 5 VA                         | 5 VA                                    |
| M1/M2 Contact Rating                      | 2.5A Max                     | 2.5A Max                                |
| Motor Temperature Trip Resistance         | > 4.5KΩ                      | > 4.5KΩ                                 |
| Open Motor Thermistor Trip Resistance     | >220KΩ                       | >220KΩ                                  |
| Shorted Motor Thermistor Trip Resistance  | <100Ω                        | <100Ω                                   |
| Motor Temperature Reset Resistance        | < 2.75KΩ                     | < 2.75KΩ                                |
| Scroll Temperature Trip Resistance        | < 2.4KΩ                      | < 2.4KΩ                                 |
| Open Scroll Thermistor Trip Resistance    | >370KΩ                       | >370KΩ                                  |
| Shorted Scroll Thermistor Trip Resistance | <1KΩ                         | <1KΩ                                    |
| Scroll Temperature Reset Resistance       | > 5.1KΩ                      | > 5.1KΩ                                 |
| Reset Time After Trip                     | 30 minutes                   | 30 minutes                              |
| Operating Temperature                     | -40° to 150°F (-40° to 65°C) | -40° to 150°F (-40° to 65°C)            |
| Storage Temperature                       | -60° to 175°F (-51° to 80°C) | -60° to 175°F (-51° to 80°C)            |

**Table 3**  
**CoreSense Communications Accessory Parts**

| Part Description                | Part Number |
|---------------------------------|-------------|
| Scroll/Motor Thermistor Harness | 529-0102-00 |
| Phase Sensing Wires             | 529-0101-00 |

**Table 4 – CoreSense Modbus Map**

**Note:** Number of registers value to be send in the query = Number in the column "Message Length With Zero Stuffing" / 2  
(e.g. number of reg required to read "Seven day Warning history with cumulative count" is 36 (72/2))

|                 |
|-----------------|
| Read Only Data  |
| Read Write Data |
| Write Only Data |

| Parameters can be read using Function code 4 (Read Input Register) |                                                 |                         |                                   |
|--------------------------------------------------------------------|-------------------------------------------------|-------------------------|-----------------------------------|
| Location in Hex                                                    | Parameter                                       | Message Length in Bytes | Message Length With Zero Stuffing |
| 300                                                                | CoreSense Module Firmware Version               | 8                       | 16                                |
| 308                                                                | CoreSense Module Model Number                   | 12                      | 24                                |
| 314                                                                | ASSET Serial Number                             | 12                      | 24                                |
| 320                                                                | ASSET Model Number                              | 18                      | 36                                |
| 332                                                                | CoreSense Module Serial Number                  | 11                      | 22                                |
| 33D                                                                | Division Name                                   | 29                      | 58                                |
| 35A                                                                | Product Code                                    | 9                       | 18                                |
| 363                                                                | Product Name                                    | 7                       | 14                                |
| 36A                                                                | Product type                                    | 1                       | 2                                 |
| 36B                                                                | Endian Convention                               | 1                       | 2                                 |
| 36C                                                                | Dip switch Setting                              | 2                       | 2                                 |
| Unused (18 bytes)                                                  |                                                 |                         |                                   |
| 380                                                                | Alarm Code                                      | 1                       | 2                                 |
| 381                                                                | Input and Output status                         | 4                       | 4                                 |
| 385                                                                | Scroll Temperature Value                        | 2                       | 2                                 |
| 387                                                                | Spare Temperature Value                         | 2                       | 2                                 |
| 389                                                                | Pilot Voltage Value                             | 2                       | 2                                 |
| Unused (117 bytes)                                                 |                                                 |                         |                                   |
| 400                                                                | Ten most recent alarms with time stamp          | 40                      | 60                                |
| 428                                                                | Compressor run history with cumulative count    | 11                      | 20                                |
| 433                                                                | Compressor start history with cumulative count  | 19                      | 20                                |
| 446                                                                | Short Cycle history with cumulative count       | 11                      | 20                                |
| Unused (30 bytes)                                                  |                                                 |                         |                                   |
| 46F                                                                | Seven day Warning history with cumulative count | 40                      | 72                                |
| 497                                                                | Seven day Trip history with cumulative count    | 60                      | 108                               |
| 4D3                                                                | Seven day Lockout history with cumulative count | 70                      | 126                               |

Table 4 – CoreSense Modbus Map Continued

| Parameters can be read using Function code 3 (Read Holding Register) |                                              |                         |                                   |
|----------------------------------------------------------------------|----------------------------------------------|-------------------------|-----------------------------------|
| Location in Hex                                                      | Parameter                                    | Message Length in Bytes | Message Length With Zero Stuffing |
| 100                                                                  | Customer Id Code                             | 4                       | 8                                 |
| 104                                                                  | Customer Location                            | 17                      | 34                                |
| 115                                                                  | Customer Name                                | 17                      | 34                                |
| 126                                                                  | Compressor Model Number Modified             | 18                      | 36                                |
| 138                                                                  | Compressor serial number                     | 12                      | 24                                |
| 144                                                                  | Application code                             | 3                       | 6                                 |
| 147                                                                  | Temperature code                             | 4                       | 8                                 |
| 14B                                                                  | Refrigerant code                             | 7                       | 14                                |
| 152                                                                  | Functional Configuration                     | 2                       | 2                                 |
| 154                                                                  | Compressor run time to count as short cycle  | 1                       | 2                                 |
| 155                                                                  | Scroll High Temp Trip                        | 2                       | 2                                 |
| 157                                                                  | Scroll High Temp Reset                       | 2                       | 2                                 |
| 159                                                                  | No.of Events to Phase Loss Lockout           | 1                       | 2                                 |
| 15A                                                                  | No.of Events to Oil Lubrication Temp Lockout | 1                       | 2                                 |
| 15B                                                                  | Oil Lubrication Temp Trip                    | 2                       | 2                                 |
| 15D                                                                  | Oil Lubrication Temp Reset                   | 2                       | 2                                 |
| 15F                                                                  | No.of Events to Scroll High Temp Lockout     | 1                       | 2                                 |
| 160                                                                  | No.of Events to Short Cycling Warning        | 1                       | 2                                 |

Table 4 – CoreSense Modbus Map Continued

| Parameters can be write using Function code 16 (Preset Multiple Registers) |                                                       |                         |                                   |                                                                                |
|----------------------------------------------------------------------------|-------------------------------------------------------|-------------------------|-----------------------------------|--------------------------------------------------------------------------------|
| Location in Hex                                                            | Parameter                                             | Message Length in Bytes | Message Length With Zero Stuffing |                                                                                |
| 100                                                                        | Customer Id Code                                      | 4                       | 8                                 |                                                                                |
| 104                                                                        | Customer Location                                     | 17                      | 34                                |                                                                                |
| 115                                                                        | Customer Name                                         | 17                      | 34                                |                                                                                |
| 126                                                                        | Compressor Model Number Modified                      | 18                      | 36                                |                                                                                |
| 138                                                                        | Compressor serial number                              | 12                      | 24                                |                                                                                |
| 144                                                                        | Application code                                      | 3                       | 6                                 |                                                                                |
| 147                                                                        | Temperature code                                      | 4                       | 8                                 |                                                                                |
| 14B                                                                        | Refrigerant code                                      | 7                       | 14                                |                                                                                |
| 152                                                                        | Functional Configuration                              | 2                       | 2                                 |                                                                                |
| 154                                                                        | Compressor run time to count as short cycle           | 1                       | 2                                 | Range: 1 min to 6 min                                                          |
| 155                                                                        | Scroll High Temp Trip                                 | 2                       | 2                                 | Range: 110 deg C to 150 deg C                                                  |
| 157                                                                        | Scroll High Temp Reset                                | 2                       | 2                                 | Note: Reset set point value should be always (Trip set point value - 30 deg C) |
| 159                                                                        | No.of Events to Phase Loss Lockout                    | 1                       | 2                                 | Range: 4 to 24                                                                 |
| 15A                                                                        | No.of Events to Oil Lubrication Temp Lockout (future) | 1                       | 2                                 | Range: 4 to 24                                                                 |
| 15B                                                                        | Oil Lubrication Temp Trip (future)                    | 2                       | 2                                 | Range: 110 deg C to 150 deg C                                                  |
| 15D                                                                        | Oil Lubrication Temp Reset (future)                   | 2                       | 2                                 | Note: Reset set point value should be always (Trip set point value - 30 deg C) |
| 15F                                                                        | No.of Events to Scroll High Temp Lockout              | 1                       | 2                                 | Range: 4 to 36                                                                 |
| 160                                                                        | No.of Events to Short Cycling Warning                 | 1                       | 2                                 | Range: 20 to 200                                                               |
| 16A                                                                        | Write Command                                         | 2                       | 2                                 | Options: 0x0800(Alarm Reset) & 0x8000(Module Reset)                            |

**Table 5 – DIP Switch Purpose**

| DIP Switch Number | On                            | Off                            |
|-------------------|-------------------------------|--------------------------------|
| 1 through 5       | Modbus Module Address         |                                |
| 6                 | Baud Rate = 9600              | Baud Rate = 19200              |
| 7                 | Even Parity                   | No Parity                      |
| 8                 | Network Mode                  | Stand Alone                    |
| 9 <sup>1</sup>    | TE*                           | TW*                            |
| 10                | Enable Short Cycle Protection | Disable Short Cycle Protection |

<sup>1</sup> Thermistor Configuration: TE\* = PTC & NTC, TW\* = PTC Only

**Table 6 – CoreSense™ Communications LED Flash Code Information**

The flash code number corresponds to the number of LED flashes, followed by a pause, and then the flash code is repeated. A lockout condition produces a red flash, followed by a pause, a solid red, a second pause, and then repeated.

| Status                   | Fault Condition                       | Code Fault Description                                                                        | Code Reset Description            | Trouble Shooting Information                                                                                                                  |
|--------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Solid Green              | <b>Normal Operation</b>               | Module is powered and operation is normal                                                     | N/A                               | N/A                                                                                                                                           |
| Solid Red                | <b>Module Malfunction</b>             | Module has internal fault                                                                     | N/A                               | 1) Reset module by removing power from T2-T1<br>2) Replace module                                                                             |
| <b>Warning LED Flash</b> |                                       |                                                                                               |                                   |                                                                                                                                               |
| Green Flash Code 1       | <b>Loss of Communication</b>          | Module and master controller have lost communications with each other for more than 5 minutes | When communications are confirmed | 1) Check the control wiring<br>2) Verify dipswitch 8 is "on"                                                                                  |
| Green Flash Code 2       | <b>Future Use</b>                     | N/A                                                                                           | N/A                               | N/A                                                                                                                                           |
| Green Flash Code 3       | <b>Short Cycling</b>                  | Run time of less than 1 minute; number of short cycles exceeds 48 in 24 hours                 | < 48 short cycles in 24 hours     | 1) Check system charge and pressure control setting<br>2) Adjust set-point of temperature controller<br>3) Install anti-short cycling control |
| Green Flash Code 4       | <b>Open/Shorted Scroll Thermistor</b> | $\Omega > 370K$ or $\Omega < 1K$                                                              | $5.1K < \Omega < 370K$            | 1) Check for poor connections at module and thermistor fusite<br>2) Check continuity of thermistor wiring harness                             |
| Green Flash Code 5       | <b>Future Use</b>                     | N/A                                                                                           | N/A                               | N/A                                                                                                                                           |

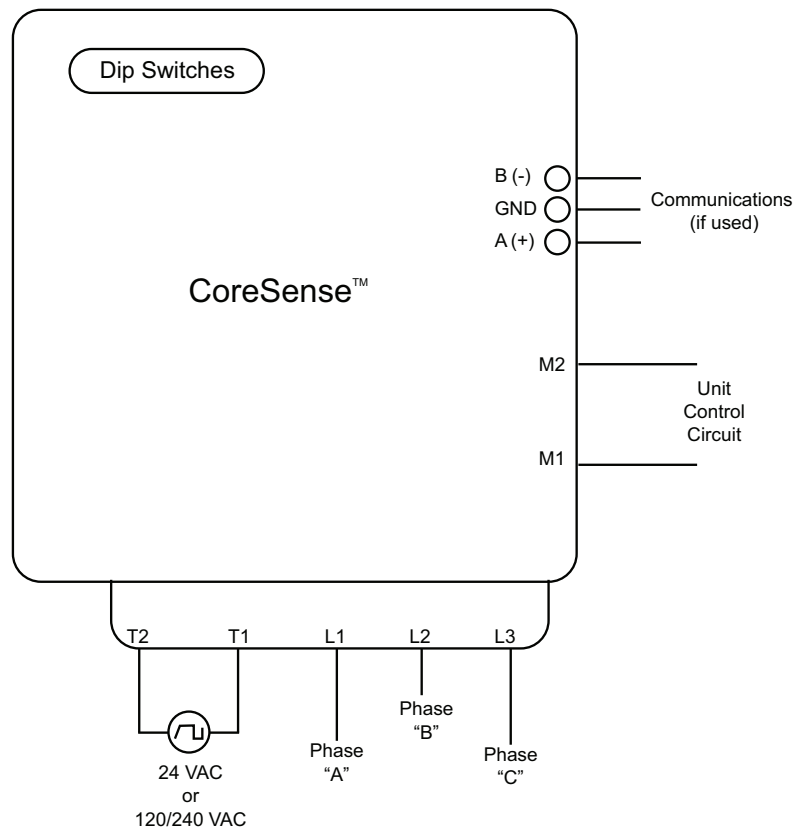
Table 6 Continued

| Alert/Lockout LED Flash |                                      |                                                                                                                       |                                                             |                                                                                                                                               |
|-------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Red Flash Code 1        | <b>Motor High Temperature</b>        | $\Omega > 4.5K$ ; Lockout after 5 Alerts                                                                              | $\Omega < 2.75K$ and 30 minutes                             | 1) Check supply voltage<br>2) Check system charge & superheat<br>3) Check contactor                                                           |
| Red Flash Code 2        | <b>Open/Shorted Motor Thermistor</b> | $\Omega > 220K$ or $\Omega < 100$ ; lockout after 6 hours                                                             | $100 < \Omega < 2.75K$ and 30 minutes                       | 1) Check for poor connections at module and thermistor fuse 2) Check continuity of thermistor wiring harness                                  |
| Red Flash Code 3        | <b>Short Cycling</b>                 | Run time of less than 1 minute; lockout if the number of Alerts exceeds the number configured by the user in 24 hours | Interrupt power to T2-T1 or perform Modbus reset command    | 1) Check system charge and pressure control setting<br>2) Adjust set-point of temperature controller<br>3) Install anti-short cycling control |
| Red Flash Code 4        | <b>Scroll High Temperature</b>       | $\Omega < 2.4K$ ; Lockout if the number of Alerts exceeds the number configured by the user in 24 hours               | Interrupt power to T2-T1 or perform Modbus reset command    | 1) Check system charge and superheat<br>2) Check system operating conditions<br>3) Check for abnormally low suction pressure                  |
| Red Flash Code 5        | <b>Future Use</b>                    | N/A                                                                                                                   | N/A                                                         | N/A                                                                                                                                           |
| Red Flash Code 6        | <b>Missing Phase</b>                 | Missing phase; Lockout after 10 consecutive Alerts                                                                    | After 5 minutes and missing phase condition is not present  | 1) Check incoming power<br>2) Check fuses/breakers<br>3) Check contactor                                                                      |
| Red Flash Code 7        | <b>Reverse Phase</b>                 | Reverse phase; Lockout after 1 Alert                                                                                  | Interrupt power to T2-T1 or perform Modbus reset command    | 1) Check incoming phase sequence<br>2) Check contactor<br>3) Check module phasing wires A-B-C                                                 |
| Red Flash Code 8        | <b>Future Use</b>                    | N/A                                                                                                                   | N/A                                                         | N/A                                                                                                                                           |
| Red Flash Code 9        | <b>Module Low Voltage</b>            | Low voltage on T2-T1 terminals <sup>1</sup>                                                                           | After 5 minutes and the voltage is back in the normal range | 1) Verify correct module p/n 2) Check VA rating of transformer<br>3) Check for blown fuse in transformer secondary                            |

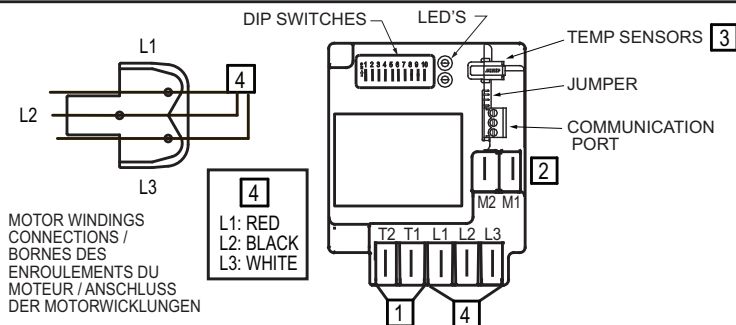
<sup>1</sup> This Alert does not result in a Lockout



**Figure 1**  
**CoreSense Communications Module**



**Figure 2**  
**Required OEM Wiring**



| ALERT CODE (RED) | TYPE         | EVENT                        |
|------------------|--------------|------------------------------|
| SOLID            | LOCKOUT      | LOSS OF FUNCTION             |
| 1                | TRIP         | MOTOR HIGH TEMPERATURE       |
| 2                | LOCKOUT/TRIP | OPEN/SHORT MOTOR THERMISTOR  |
| 3                | LOCKOUT      | SHORT CYCLING                |
| 4                | LOCKOUT/TRIP | SCROLL HIGH TEMPERATURE      |
| 5                | N/A          | FUTURE USE                   |
| 6                | LOCKOUT/TRIP | MISSING PHASE                |
| 7                | LOCKOUT      | REVERSE PHASE                |
| 8                | N/A          | FUTURE USE                   |
| 9                | TRIP         | MODULE LOW VOLTAGE           |
| WARNING (GREEN)  | TYPE         | EVENT                        |
| SOLID            | NORMAL       | NORMAL OPERATION             |
| 1                | WARNING      | LOSS OF COMMUNICATION        |
| 2                | WARNING      | FUTURE USE                   |
| 3                | WARNING      | SHORT CYCLING                |
| 4                | WARNING      | OPEN/SHORT SCROLL THERMISTOR |
| 5                | WARNING      | FUTURE USE                   |

**WARNING:** GREEN FLASHING + PAUSE 2 SEC.

**TRIP:** RED FLASHING + PAUSE 2 SEC.

**LOCKOUT:** RED FLASHING + PAUSE 2 SEC. + SOLID 3 SEC. + PAUSE 2 SEC.

| DIP SWITCH | PURPOSE                       | UP = 1  | DOWN = 0   |
|------------|-------------------------------|---------|------------|
| 1 - LSB    |                               |         | 0          |
| 2          | UNIQUE ADDRESS                |         | 0          |
| 3          |                               |         |            |
| 4          | RANGE 1 TO 32 (EXAMPLE = 12)  | 1       |            |
| 5 - MSB    |                               | 1       |            |
| 6          | BAUD RATE                     | 9,600   | 19,200     |
| 7          | PARITY                        | EVEN    | NONE       |
| 8          | COMMUNICATION                 | NETWORK | STANDALONE |
| 9          | TEMP. CONNECTOR CONFIGURATION | TE*     | TW*        |
| 10         | SHORT CYCLE PROTECTION        | ENABLE  | DISABLE    |

#### SYMBOLS / SYMBOLES / SYMBOLE

- 1 PROTECTOR MODULE VOLTAGE / TENSION DU MODULE DE PROTECTION / ANSCHLUSSPANNUNG DES SCHUTZGERÄTES
- 2 TO CONTROL CIRCUIT / VERS LE CIRCUIT DE COMMANDE / ZUM STEUERSTROMKREIS
- 3 THERMAL SENSORS DO NOT SHORT / NE PAS PONTER LES CAPTEURS THERMIQUES / TEMPERATURSENSOREN NICHT UEBERBRUECKEN
- 4 PHASE SENSING / DETECTION PHASES / PHASEN UEBERWACHUNG

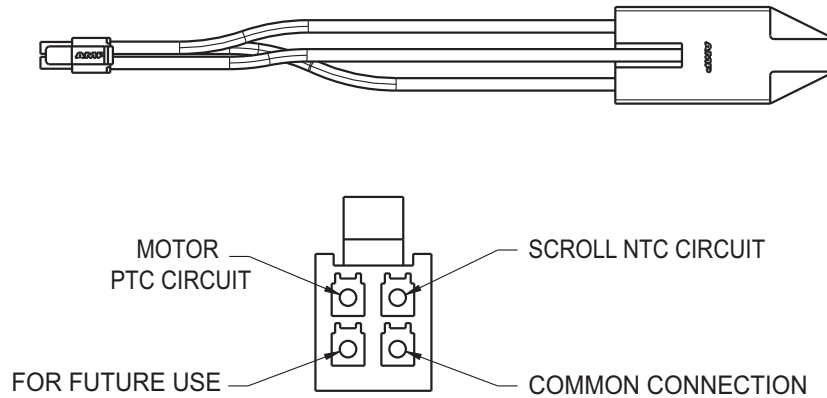
USE COPPER CONDUCTORS ONLY.  
USE MINIMUM 75° C WIRE FOR AMPACITY DETERMINATION.  
USE THIS EQUIPMENT ON A GROUNDED SYSTEM ONLY.  
PRIMARY SINGLE PHASE FAILURE PROTECTION IS PROVIDED.  
PROTECTOR MODULE AND OPTIONAL CRANKCASE HEATER MUST BE CONNECTED ONLY TO THEIR RATED VOLTAGE.  
OVERCURRENT PROTECTION DEVICE RATING AND TYPE MUST BE IN ACCORDANCE WITH REGULATORY AGENCY END PRODUCT APPROVALS  
- SEE SYSTEM NAMEPLATE.

UTILISER SEULEMENT DES CONDUCTEURS EN CUIVRE.  
UTILISER UN FIL DE 75° C MINIMUM POUR LA DETERMINATION DU COURANT ADMISSIBLE.  
UTILISER CET EQUIPEMENT SEULEMENT SUR UN SYSTEME MIS A LA TERRE.  
LA PROTECTION CONTRE LA DEFAILLANCE DU COURANT PRIMAIRE MONOPHASE EST FOURNIE. LE MODULE DE PROTECTION ET LE RECHAUFFEUR DE CARTER OPTIONNEL DOIVENT ETRE CONNECTES SEULEMENT A LEUR TENSION NOMINALE. LA VALEUR NOMINALE ET LE TYPE DE L' APPAREIL DE PROTECTION DE SURINTENSITE DOIVENT ETRE CONFORMES A LA SPECIFICATION DE PRODUIT FINI DE L' ORGANISME DE REGULATION  
- VOIR LA PLAQUE SIGNALETIQUE DU SYSTEME.

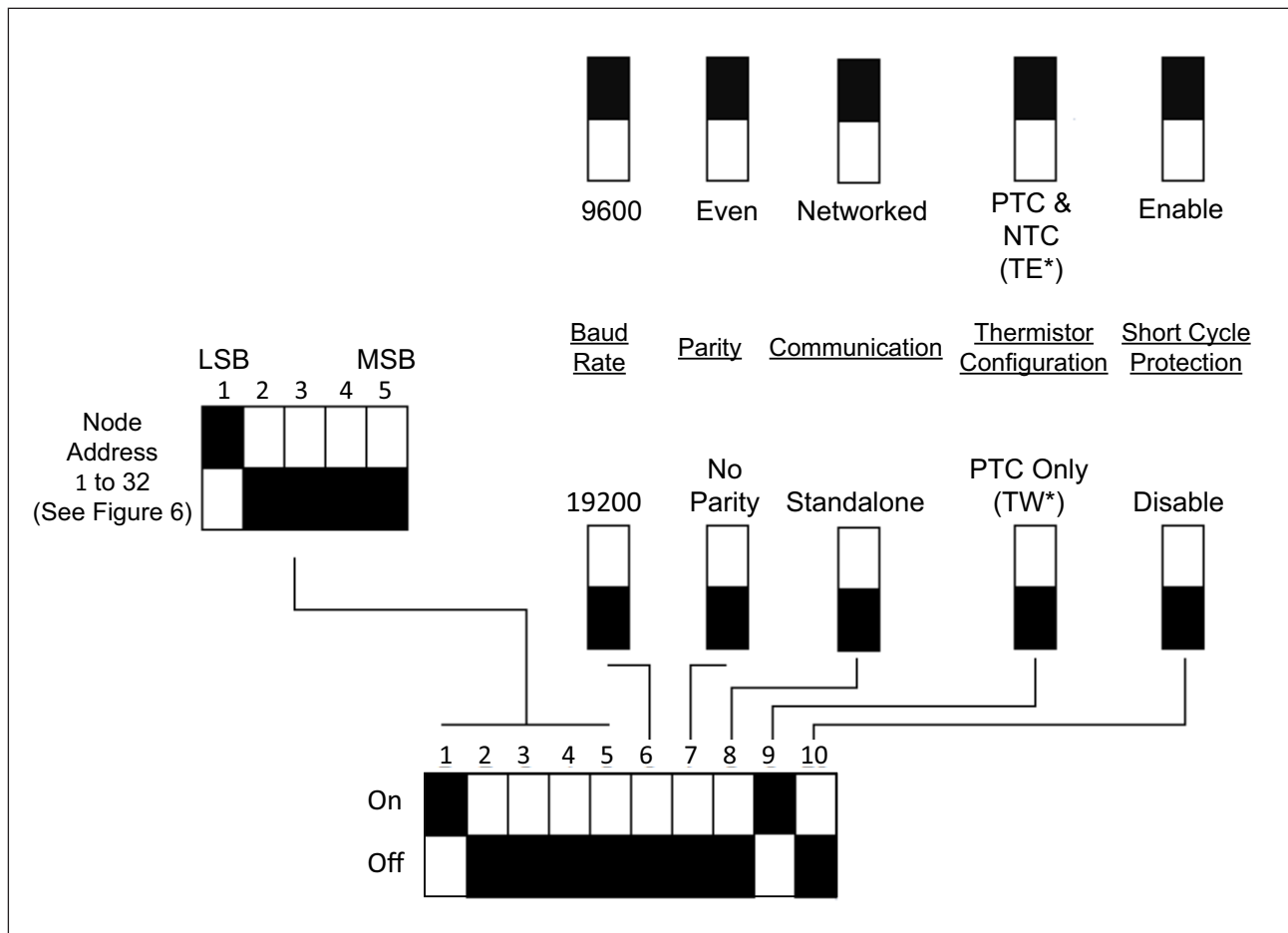
NUR KUPFERLEITUNGEN VERWENDEN.  
ZUR BESTIMMUNG DER ZULÄSSIGEN STROMSTÄRKE MÜSSEN KABEL VERWENDET WERDEN, DIE FÜR MINDESTENS 75° C AUSGELEGT SIND, SETZEN SIE DIESES GERÄT NUR IN EINEM GEERDETEN SYSTEM EIN. SCHUTZ VOR PRIMÄRSEITIGEM EINPHASENAUSFALL IST VORHANDEN. DAS SCHUTZMODUL UND DIE OPTIONALE KURBELGEHÄUSEHEIZUNG DÜRFEN NUR AN DIE VORGESEHENE NENNSPANNUNG ANGESCHLOSSEN WERDEN. NENNLEISTUNG UND TYP DER ÜBERSTROMSCHUTZEINRICHTUNG MÜSSEN DEN ZULASSUNGSBESTIMMUNGEN FÜR ENDPRODUKTE DER AUFSICHTSBEHÖRDEN ENTSPRECHEN.  
- SYSTEM-TYPENSCHILD BEACHTEN.

12-10 052-2511-00

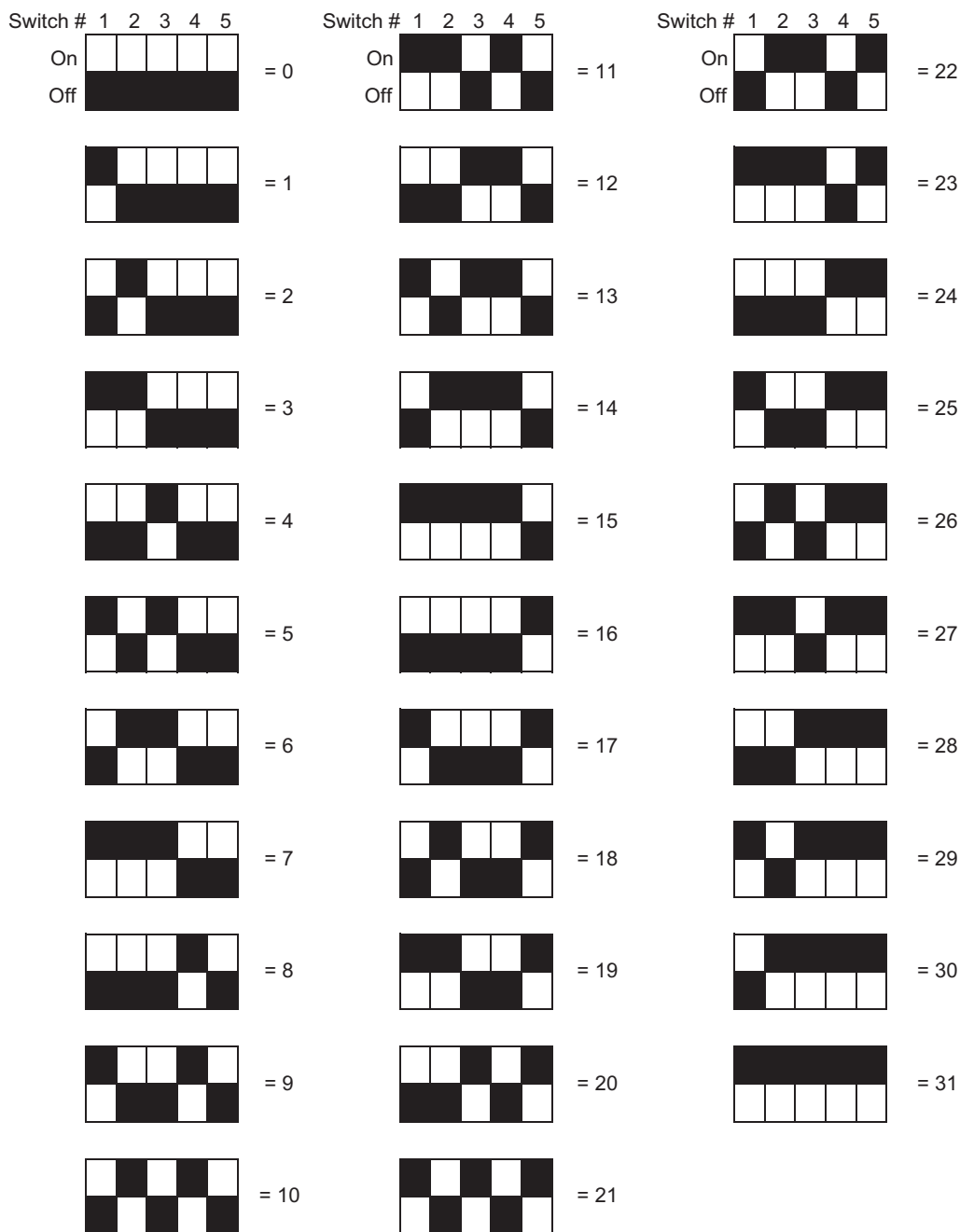
**Figure 3**  
**Terminal Box Wiring Diagram**



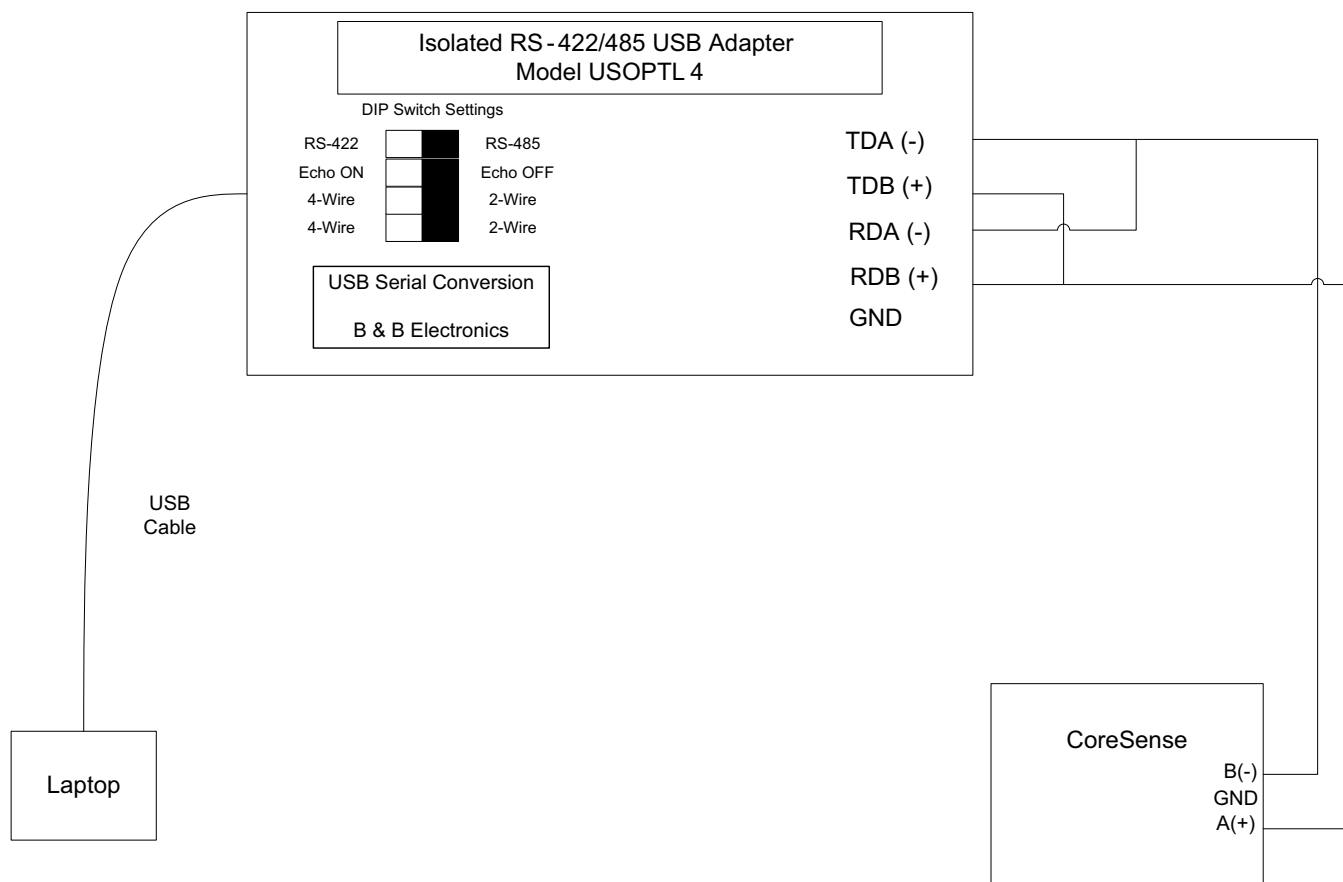
**Figure 4**  
Thermistor Circuit Cable



**Figure 5**  
Binary Diagram



**Figure 6**  
**Modbus Addressing**



**Figure 7**  
**PC Interface Wiring**

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