

**INSTRUCTIONS**  
**for**  
**Volt-Pac<sup>®</sup>**  
**Variable Transformer Controller**  
  
**9T92PVC2 Series**

The following models are covered in this manual:  
9T92PVC2-1, 9T92PVC2-2, 9T92PVC2-3  
Revision D

Superior Electric reserves the right to make engineering changes on all its products. Such refinements may affect information given in the instructions. Therefore, USE ONLY THE INSTRUCTIONS THAT ARE PACKED WITH THE PRODUCT.



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### INSPECTION

#### UNPACKING

When unpacking the unit, examine it carefully for any shipping damage. The "Damage and Shortage" instructions packed with the unit outlines the procedure to follow if any parts are missing or damaged.

### DESCRIPTION

#### GENERAL

The 9T92PVC2 series of Variable Transformer Controllers can be configured for one to three control channels. Each channel measures the output voltage from a variable transformer and controls the motor drive on the variable transformer to control the output voltage to a desired set point within a specified dead band. The unit can be programmed from an integral keypad or read and programmed remotely via a serial RS-232 port.

#### CONNECTIONS

Connect the 9T92PVC2 series Variable Transformer Controller as shown on page 5.

#### MODEL NUMBER ASSIGNED

The model number for each 9T92PVC2 Series Variable Transformer Controller identifies the various characteristics of that specific unit. All models can measure 4 channels and the number of motor drive the unit can control is determined by the model number. An RS232 serial interface is standard and an optional RS422 or RS485 can be provided on special models. The table below lists the characteristics and options for each model number.

| Model Number | Controlled Motor Drives | Serial Interface |
|--------------|-------------------------|------------------|
| 9T92PVC2-1   | 1                       | RS232            |
| 9T92PVC2-2   | 2                       | RS232            |
| 9T92PVC2-3   | 3                       | RS232            |
| 9T92PVC2-1B  | 1                       | RS422            |
| 9T92PVC2-2B  | 2                       | RS422            |
| 9T92PVC2-3B  | 3                       | RS422            |
| 9T92PVC2-1C  | 1                       | RS485            |
| 9T92PVC2-2C  | 2                       | RS485            |
| 9T92PVC2-3C  | 3                       | RS485            |

## SPECIFICATIONS

### CONFIGURATIONS

Designed for Single Phase 120, 240, or 277 line to neutral  
Three Phase 208Y/120, 240Y/138, 380Y/220, 480Y/277 or 600Y/346

### INPUT VOLTAGE SIGNALS

Measurement Controlled 0 to 500 VAC Line - Neutral  
Instrument Power \* 120 VAC @ 5 watts max  
\*Instrument Power source also supplies motor voltage.

### OUTPUT CONTROL

Contact Closure 2 per motor drive  
Type Solid State Relay  
Contact Ratings 3.0A, 240VAC

### DISPLAY

LED, 5 Digits, 0.5"H XXX.X VAC

### KEYPAD ENTRY

Increase Manual A  
Decrease Manual B  
Phase Select C  
Function Select D  
Enter Selection E  
Auto/Manual F

### ACCURACY

Voltage Display  $\pm 0.4$ VAC RMS  
Serial Data  $\pm 0.4$ VAC RMS

### RESPONSE TIME

Less than 0.1 sec

### ENCLOSURE

Type NEMA 1  
Size (H x W x D) 10.0" x 8.0" x 3.0"

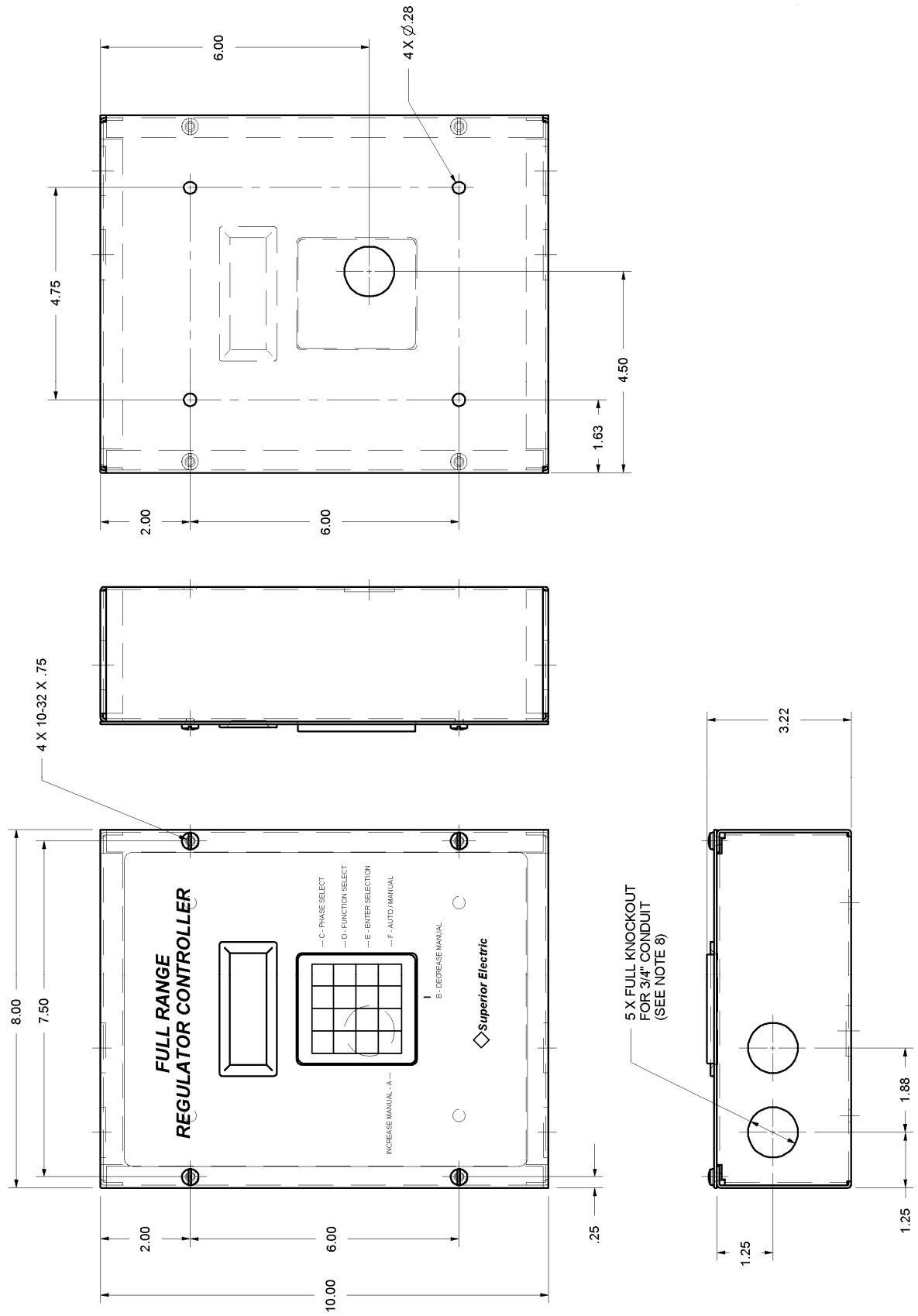
### ELECTRICAL CONNECTOR

PC Board Mount Header and Plug

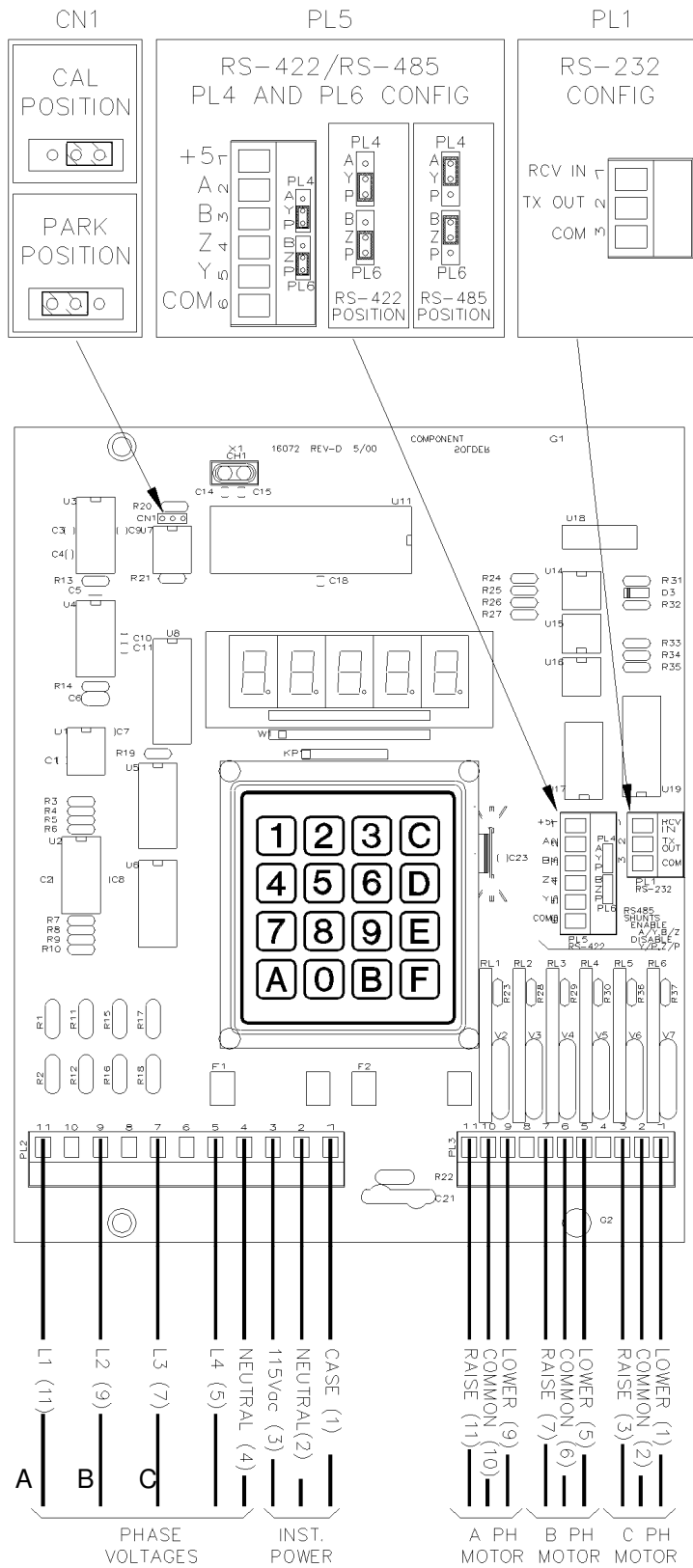
### FUSES

Instrument Power 1/8 Amp  
Motor Power, Total 4 Amps

# OUTLINE



# CONNECTIONS



## CONTROL MODES AND FEATURES

|           |  |
|-----------|--|
| Set Point | This is the value to which the unit controls the output of a variable transformer. To enter a set point, press the "D" key until the display says "A.", on the left side, Enter a set point and then press "E".  |
| Dead Band | This is the tolerance around the set point to which the unit will keep the variable transformer. A dead band of 10 volts means $\pm 5$ volts around the set point. To enter a dead band, press the "D" key until the display says "Ad" on the left side. Enter a dead band in the form XX.X volts and then press "E".  |
| "A"       | Phases A, B & C will all be controlled by the A phase control parameters (set point and dead band). To enter this mode, press the "D" key repeatedly until "A" appears on the display and then press the "E" key.  |
| "AbC"     | Phases A, B & C will be individually controlled by their respective control parameters (set point and dead band). To enter this mode, press the "D" key repeatedly until "AbC" appears on the display and then press the "E" key.  |
| "bPASS"   | Phases A, B, & C will be controlled to a set point equal to the voltage measured on channel D. The dead band will be set at 1.0V. While in this mode, the display will slowly step through the instantaneous voltage readings of each phase (A, B, C & D). What is displayed is not the instantaneous voltage; but instead the difference between the measured voltage on "D" phase and the set point for the phase that the display is currently showing. To enter this mode, press the "D" key repeatedly until "bPASS" appears on the display and then press the "E" key.   |
| "F 50"    | Used for operation on 50Hz power. To set the unit for 50Hz operation, press the "D" key repeatedly until "F 50" appears on the display and then press the "E" key.   |
| "F 60"    | Used for operation on 60Hz power. To set the unit for 60Hz operation, press the "D" key repeatedly until "F 60" appears on the display and then press the "E" key.   |
| "HI XX"   | Used for operation with high speed motors (motor speeds less than 10 seconds). XX is a 2 digit number entered from the keypad representing the voltage point above or below the set point at which slow speed pulsing begins. When the instantaneous voltage is approaching the set point and reaches this value, the motor transitions from moving continuously to moving in pulses in an effort to prevent an overshoot of the set point. To set the unit for a high speed motor, press the "D" key repeatedly until "HI" appears on the left side of the display; and then enter a 1 or 2 digit numerical value up to 25 representing volts. Press the "E" key. |
| "LO XX"   | Used for operation with low speed motors (motor speeds greater than 10 seconds). The explanation on why this is needed can be read in the explanation for "HI XX". To set the unit for a low speed motor, press the "D" key repeatedly until "LO" appears on the left side of the display; and then enter up to a 1 or 2 digit numerical value up to 25 representing volts. Press the "E" key.   |

## SERIAL COMMUNICATION

Serial interface is provided which can be used to remotely read and write the following:

### READ

Voltage  
set point  
dead band  
control  
address

### Write

set point  
dead band  
control  
address  
keypad lock toggle

**Set Point** This is the value to which the unit controls the output of a variable transformer. To enter a set point, press the "D" key until the display says "A.", on the left side, Enter a set point and then press "E".

## KEY FUNCTION DESCRIPTION

| KEY | FUNCTION        | DESCRIPTION  |
|-----|-----------------|--|
| A   | Increase Manual | With the "A" key depressed, the motor for the selected phase will run in the increase voltage direction. The instantaneous voltage display must be selected, and the unit must be in manual control mode. If the A phase parameters are used to control B & C phases (A mode), all three motors will operate simultaneously. |
| B   | Decrease Manual | With the "B" key depressed, the motor for the selected phase will run in the decrease voltage direction, The instantaneous voltage display must be selected, and the unit must be in manual control mode. If the A phase parameters are used to control B & C phases (A mode), all three motors will operate simultaneously. |
| C   | Phase Select    | Pressing the "C" key will cause the display to step to the next phase (A, B, C or D) making it the active phase.   |
| D   | Function Select | Each press of the "D" key will step to the next function for the active phase.   |

| <u>LED DISPLAY</u> | <u>FUNCTION</u>  |
|--------------------|--|
| AXXX.X             | instantaneous voltage (default)                          |
| A.XXX.X            | set Point  |
| AdXX.X             | dead band (total, 0.5V min.)                             |
| A                  | A mode   |
| AbC                | AbC mode   |
| bPASS              | bypass mode  |
| F 60               | 60Hz   |
| F 50               | 50Hz   |
| HI XX              | high speed. { volts from set point at which slow speed } |
| LO XX              | low speed { pulsing begins. 25 volts max. }              |

After 10 seconds, the selected function will return to the default

|   |             |  |
|---|-------------|--|
| E | Enter       | Pressing the “E” key will lock in and store data that was entered or shown on the display i.e., (set point, dead band, frequency, voltage pulse point while in slow speed).<br>Pressing the “E” key three times in succession within a span of about 2 seconds will toggle the keypad between locked and active.                           |
| F | Auto/Manual | Pressing the “F” key while the instantaneous voltage mode is displayed will toggle the selected phase between automatic and manual control modes. In manual mode the “A” & “B” keys may be used to raise and lower the voltage for the selected phase. If a phase is in manual mode, its instantaneous voltage display will flash quickly. |

## ASCII COMMUNICATIONS

Communication with the 9T92PVC2 series Variable Transformer Controller is a simple ASCII protocol with defined commands and responses.

Communication Parameters: 9600 Baud, 8 Bits, No Parity, 1 Stop Bit

Message Format: All commands and responses have the same general format. The format is as follows: **STX ADDR CMD (DATA) ETX**

|      |   |
|------|---|
| STX  | An ASCII start of text control character, 02 Hex, control B, (^B).                                  |
| ADDR | A meter’s unique character identification (address). A single hexadecimal character (0-9, A-F).     |
| CMD  | A two character command for which there is a defined response.                                      |
| DATA | Information associated with the command, or response data as needed; some commands require no DATA. |
| ETX  | An ASCII end of text control character, 03 Hex, control C, (^C).                                    |

The command string to the PVC does not contain spaces. Spaces only appear for purposes of readability in the document. Case sensitivity is not an issue.

## READ/WRITE COMMANDS AND RESPONSES

RA (read address)

Cmd: STX 0<sup>1</sup> RA ETX  
Rsp: STX ADDR ETX

<sup>1</sup> 0 is the universal address to which all controllers respond.

WA (write address)

Cmd: STX ADDR WA X<sup>2</sup> ETX  
Rsp: STX WA ETX

<sup>2</sup> X is a character 1-9 or A-F representing the unit address.

RC (read control)

Cmd: STX ADDR RC ETX  
Rsp: STX ADDR AA<sup>3</sup> BB<sup>3</sup> CC<sup>3</sup> F<sup>4</sup> Ø<sup>5</sup> S<sup>6</sup> XX<sup>7</sup> ETX

WC (write control)

Cmd: STX ADDR WC AA<sup>3</sup> BB<sup>3</sup> CC<sup>3</sup> F<sup>4</sup> Ø<sup>5</sup> S<sup>6</sup> XX<sup>7</sup> ETX  
Rsp: STX WC ETX

<sup>3</sup> Two character per channel control code; The first or left most character is used to control the motor when in manual mode. The letters L, R & O are used respectively to cause the motor to run in the lower voltage direction (L), raise voltage direction (R) or off(O). The second character is either the letter A or M to put the channel in automatic control mode (A) or manual control mode (M). The default control codes are motor off in manual mode. i.e. letters OM



<sup>4</sup> “F” is the single digit 5 or 6 representing powerline frequency of 50Hz or 60Hz.

<sup>5</sup> “Ø” is either the letter I, S or B causing the phases to be individually controlled (I), controlled from “A” phase (S) or controlled from “D” phase (B) respectively.

<sup>6</sup> “S” is either the letter H or L representing high speed (H) or low speed (L) motors.

<sup>7</sup> XX is a 2 digit number representing the voltage point above or below the set point at which slow speed pulsing begins.

RD (read dead bands)

Cmd: STX ADDR RD ETX  
Rsp: STX ADDR AA.A<sup>8</sup> BB.B<sup>8</sup> CC.C<sup>8</sup> ETX

WD (write dead bands)

Cmd: STX ADDR WD AA.A<sup>8</sup> BB.B<sup>8</sup> CC.C<sup>8</sup> ETX  
Rsp: STX WD ETX

<sup>8</sup> AA.A BB.B CC.C are the channel A, B & C dead band setting; i.e. 00.5, 02.0,10.6

NOTE: When a dead band value is entered, the value represents the entire voltage width of the dead band. Example: A value of 5.0 is entered - this means  $\pm 2.5V$ . The dead band minimum is .5V.

RS (read set points)

Cmd: STX ADDR RS ETX  
Rsp: STX ADDR AAA.A<sup>9</sup> BBB.B<sup>9</sup> CCC.C<sup>9</sup> ETX

WS (write set points)

Cmd: STX ADDR WS AAA.A<sup>9</sup> BBB.B<sup>9</sup> CCC.C<sup>9</sup> ETX  
Rsp: STX WS ETX

<sup>9</sup> AAA.A, BBB.B, CCC.C are the channel A, B & C voltage set point values. i.e. 002.0, 048.6, 322.9.

RV (read voltages)

Cmd: STX ADDR RV ETX  
Rsp: STX ADDR AAA.A<sup>10</sup> BBB.B<sup>10</sup> CCC.C<sup>10</sup> DDD.D<sup>10</sup> ETX

<sup>10</sup> AAA.A, BBB.B, CCC.C, DDD.D are the channel A, B, C & D voltage values. i.e. 002.0, 048.6, 322.9

KL (keypad lock toggle)

Cmd: STX ADDR KL ETX  
Rsp: STX KL ETX

NOTE: This lock method only prevents parameters from being changed. You can still view parameters with the phase and function select keys. The “E” key lock method prevents the entire keypad from being used except for the “E” key. In the event that serial communications are lost after the keypad has been locked via the serial port, a hardware lockout release is provided. Open the front cover and place the calibration jumper in the calibration position. Press the “E” key three times in succession within a span of 2 seconds to lock the keypad and perform this procedure again to unlock both types of keypad locks. If the keypad was originally locked with the “E” key, the lockout release needs only to be performed once. Be sure to return the calibration jumper to the “park” position.

# Available Coast-To-Coast and Internationally

## Voltage Control Components

|                        |                       |
|------------------------|-----------------------|
| POWERSTAT <sup>®</sup> | Variable Transformers |
| Volt-Pac <sup>®</sup>  | Variable Transformers |
| LUXTROL <sup>®</sup>   | Lighting Controls     |
| 5-WAY <sup>®</sup>     | Binding Posts         |
| SUPERCON <sup>®</sup>  | Electrical Connectors |

Voltage Control Components are available worldwide through an extensive Authorized Stocking Distributor network. These Distributors offer literature, technical assistance and a wide range of models off-the-shelf for fastest possible delivery and service.

## Power Quality Solutions

|                        |                                     |
|------------------------|-------------------------------------|
| STABILINE <sup>®</sup> | Automatic Voltage Regulators        |
| STABILINE <sup>®</sup> | Transient Voltage Surge Suppressors |
| STABILINE <sup>®</sup> | Uninterruptible Power Supplies      |
| STABILINE <sup>®</sup> | Power Conditioners                  |

STABILINE Power Quality Solutions are available worldwide through an extensive Authorized Distributor and Reseller network, which offer literature, technical assistance and a select range of models off-the-shelf for fastest possible delivery and service.

In addition, Superior Electric Manufacturer's Representatives are available to provide prompt attention to customer needs. Call or fax for ordering and application information or for the address of the closest Manufacturer's Representative, Authorized Distributor or Reseller.



# Superior Electric

An ISO9000  
Registered Company

## Telephone and Fax Numbers

|                                       |                         |                      |                           |
|---------------------------------------|-------------------------|----------------------|---------------------------|
| Telephone                             | 860-507-2025            | Telephone            | 1-800-787-3532            |
| Fax:                                  | 860-507-2050            | Fax:                 | 1-800-821-1369            |
| Customer Service:                     | 860-507-2025 Ext. 70782 | Customer Service:    | 1-800-787-3532 Ext. 70782 |
| Product Application                   | 860-507-2025 Ext. 72058 | Product Application: | 1-800-787-3532 Ext. 72058 |
| Toll-Free (in U.S.A. and Canada only) |                         |                      |                           |

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