

NETL PECCE System Design Component Functionality and Relationships with Installation Guides

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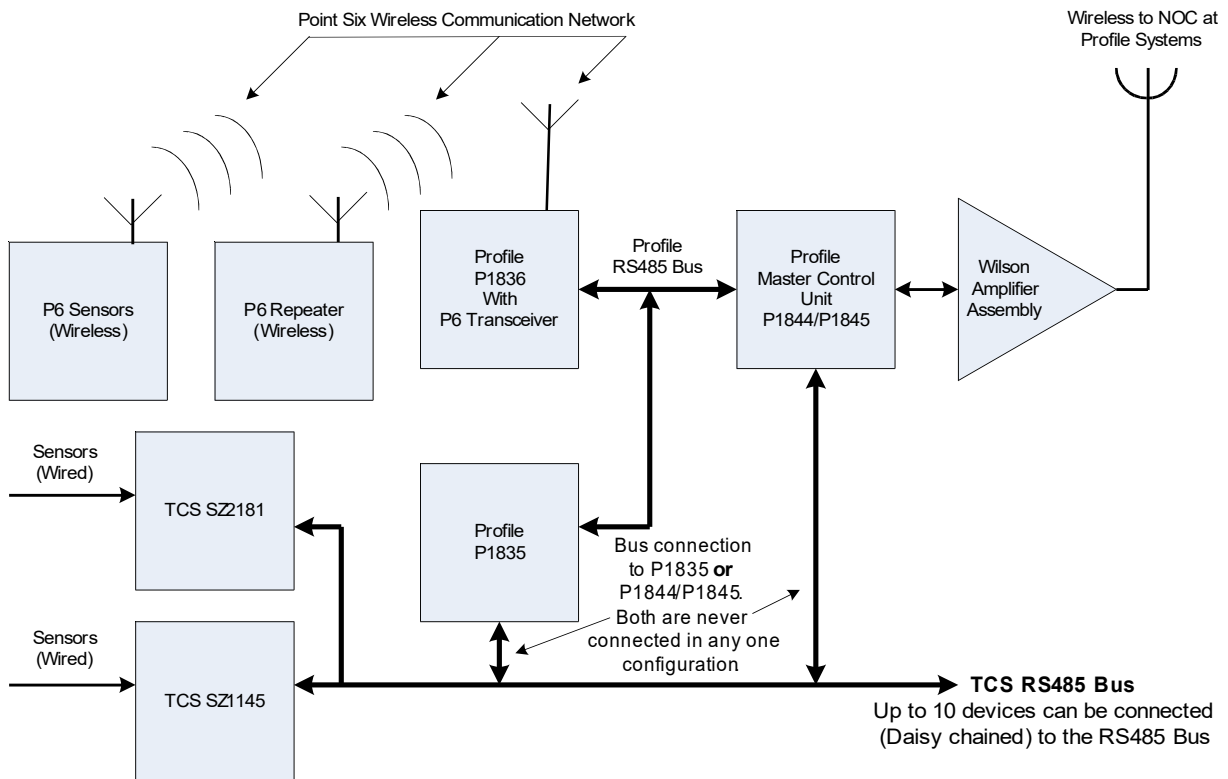
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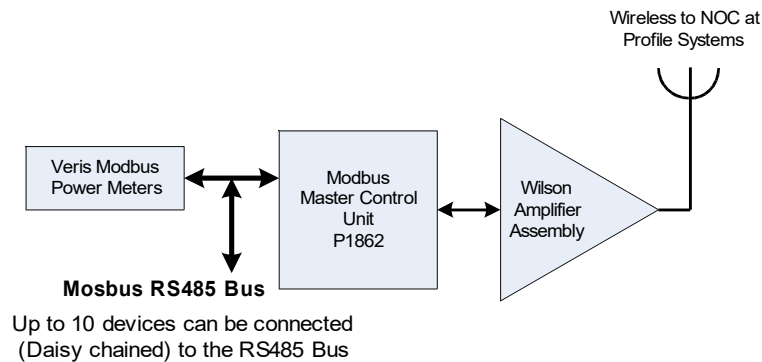
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Section 1.0 - P1800 System Introduction



P1800 System Communication



P1800 System Power Monitoring

Profile P1800 System - Simplified Block Diagram

P1800 System

The P1800 is a building Energy Management System that controls HVAC and lighting needs according to any schedule, while reducing peak usage and lowering energy costs. Wireless sensors and wired sensors are used to monitor conditions such as lighting, temperature, humidity, etc.

P1800 System Communication

Refer to above diagram. The P6 sensors (wireless) transmit to a P6 Transceiver within the Profile Controller P1836. The P1836 processes the signals and applies the inputs to the Master Control Unit (MCU) P1844/P1845 via the Profile RS485 Bus. The P6 Repeater is used to relay P6 Sensor wireless signals if P6 sensors are not close enough to the P1836 for good reception.

The P1844/P1845 MCU processes the signals from the Profile RS485 Bus and the TCS RS485 Bus and applies the processed radio frequency output to the Wilson Amplifier Assembly which amplifies and transmits the radio frequency signals to the Profile Network Operation Center (NOC).

Some wired sensor inputs are applied to Controller TCS SZ2181 and some wired sensor inputs are applied to Controller TCS SZ1145. The processed outputs of these controllers are applied to the TCS RS485 Bus. The TCS RS485 Bus is connected from TCS SZ2181 and TCS SZ1145 only to Profile Controller P1835 or only to MCU P1844/P1845 for any one configuration.

The outputs applied to P1835 are processed and applied to the MCU via the Profile RS485 Bus. In either configuration, the MCU processes the signals and applies its radio frequency output to the Wilson Amplifier Assembly which amplifies the radio frequency signals for transmission to the NOC. This manual contains the description and installation instructions of all components of a complete P1800 system.

P1800 System Power Monitoring

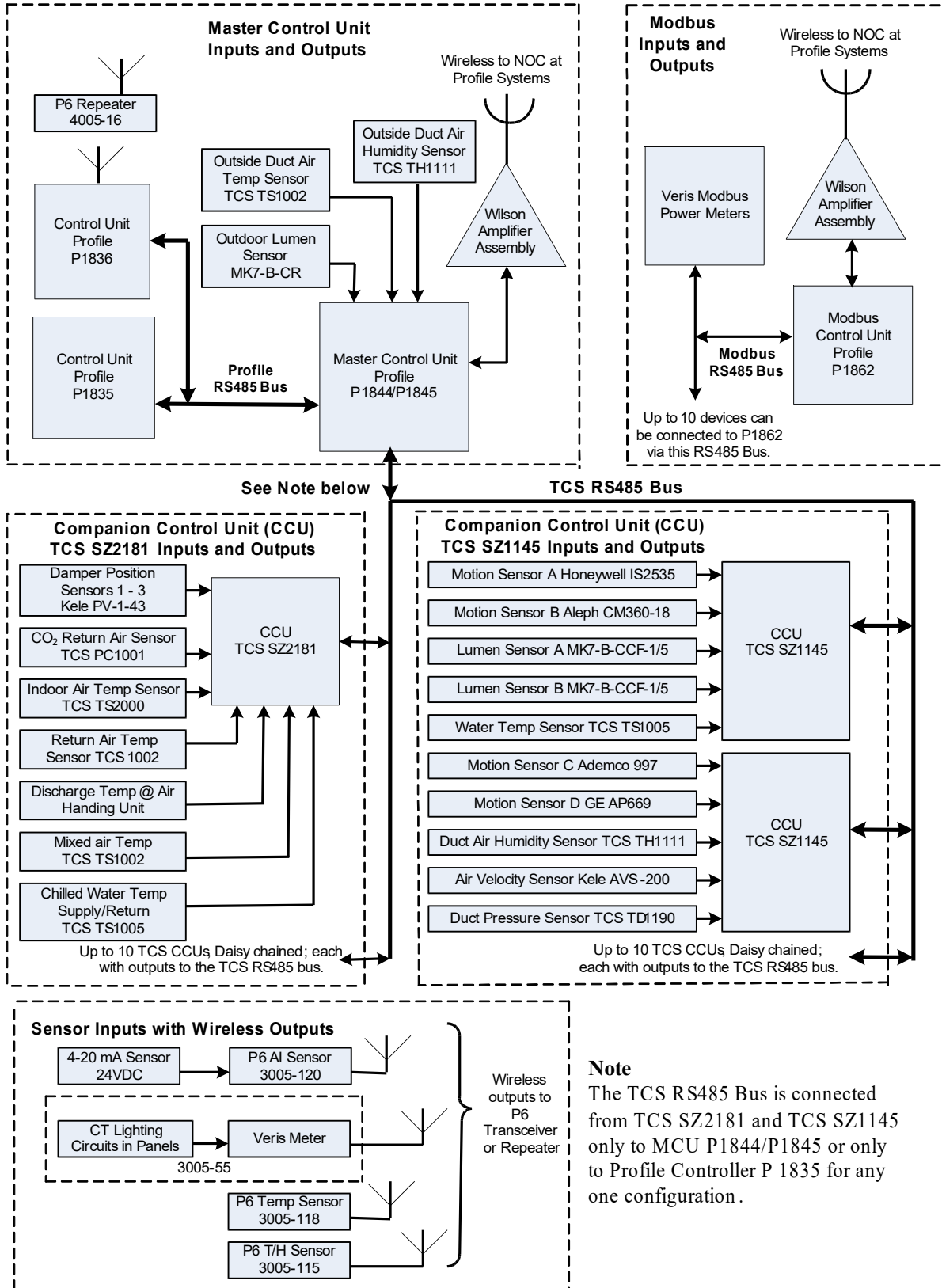
Refer to above diagram. The Veris Enercept Power Meters are quick-connect power line metering and communication devices to measure energy consumption or other electrical characteristics on a power line and for communicating the measured information to a remote location.

The Modbus MCU processes the signals from the Modbus RS485 Bus and applies the processed radio frequency output to the Wilson Amplifier Assembly which amplifies and transmits the radio frequency signals to the Profile Network Operation Center (NOC).

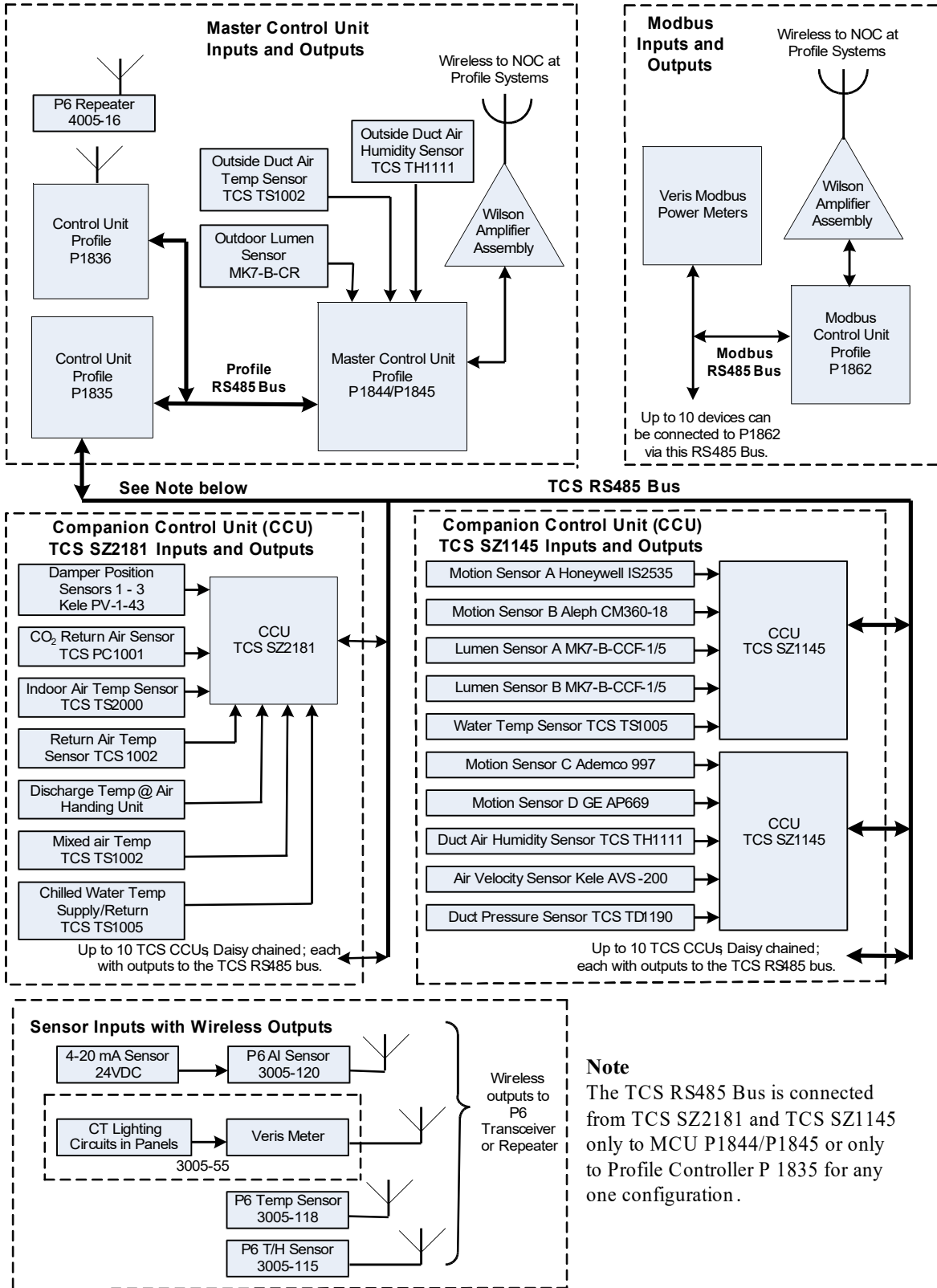
Note

The Companion Control Units CCU TCS SZ2181 and CCU TCS SZ1145 shown in the following Block Diagram 1 and Block Diagram 2, indicate the type of sensors specific to each CCU. This means that any sensor shown connected to the CCU TCS SZ2181 will always be connected to a CCU TCS SZ2181, and any sensor shown connected to the CCU TCS SZ1145s will always be connected to a CCU TCS SZ1145.

Communication and Component Relationship Block Diagram 1



Communication and Component Relationship Block Diagram 2



1.1 Communication and Component Relationships

Refer to P1800 Communication and Component Relationship Block Diagrams. The P1800 system design consists of:

- Master Control Unit Inputs and Outputs
- Modbus Inputs and Outputs
- Companion Control Unit (CCU) TCS SZ2181 Inputs and Outputs
- Companion Control Unit (CCU) TCS SZ1145 Inputs and Outputs
- Sensor Inputs with Wireless Outputs

Master Control Unit Inputs and Outputs – This section consists of the Master Control Unit (MCU), P1844/P1845. The MCU processes communication input signals from Control Units P1835 and P1836 via Profile RS485 Bus. Additionally, an Outdoor Lumen Sensor, MK7-B-CR-VTI; Outdoor Temperature Sensor, TCS TS1002; and Outside Air Duct Humidity Sensor, TCS TH1111 are inputted directly to P1844/P1845.

The outputs of CCU, TCS SZ2181 and CCU, TCS SZ1145 are applied via the TCS RS485 Bus to the inputs of Control Unit P1844/P1845 (Block Diagram 1) or Controller P1835 (Block Diagram 2). The inputs to Control Unit P1836 are applied from the P6 Transceiver 4007-06 within Control Unit P1836, which receives wireless output signals from the Sensor Inputs with Wireless Outputs section. The MCU processed signals are amplified by a Wilson Amplifier Assembly and transmitted to the Profile Network Operation Center (NOC).

Modbus Inputs and Outputs – This section consists of Control Unit P1862 that receives data from the Veris Modbus Power Meters via the Modbus RS485 Bus. The P1862 processed signals are amplified by the Wilson Amplifier Assembly and transmitted to the Profile NOC.

CCU, TCS SZ2181 Inputs and Outputs – Monitors and outputs signals from the following sensors:

- Damper Position Sensor, Kele PV-1-43 – Monitors damper position on Air Handling Units (AHUs).
- CO₂ Return Air Sensor, TCS PC1001 – Monitors carbon dioxide levels.
- Indoor Air Temp Sensor, TCS TS2000 – Monitors indoor air temperature.
- Return Air Temp Sensor, TCS TS1002 – Monitors return air temperature.
- Discharge Temp @ Air Handling Unit, TCS TS1002 – Monitors discharge temperature.
- Mixed Air Temp Sensor, TCS TS1002 – Monitors mixed air temperature.
- Chilled Water Temp Sensor, TCS TS1005 – Monitors water temperature supply/return.

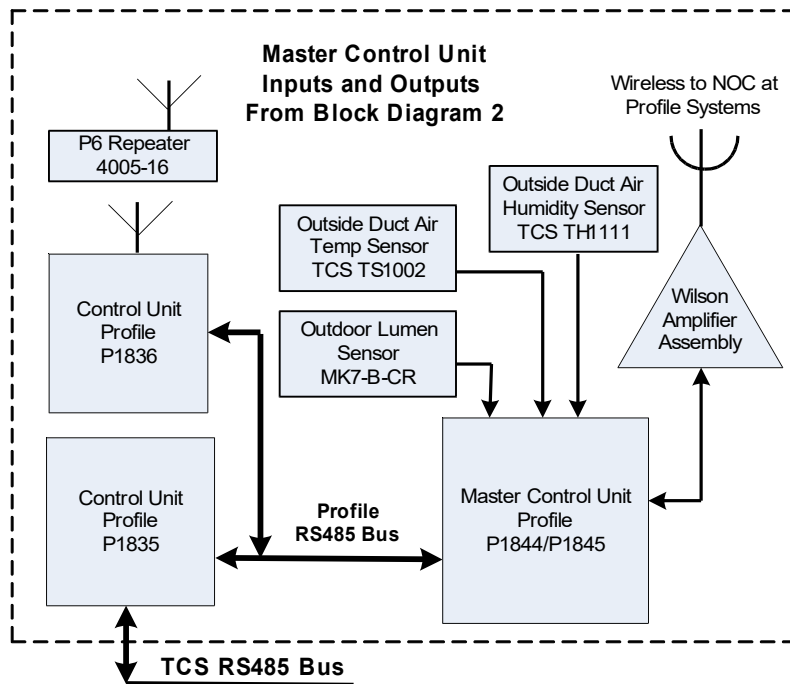
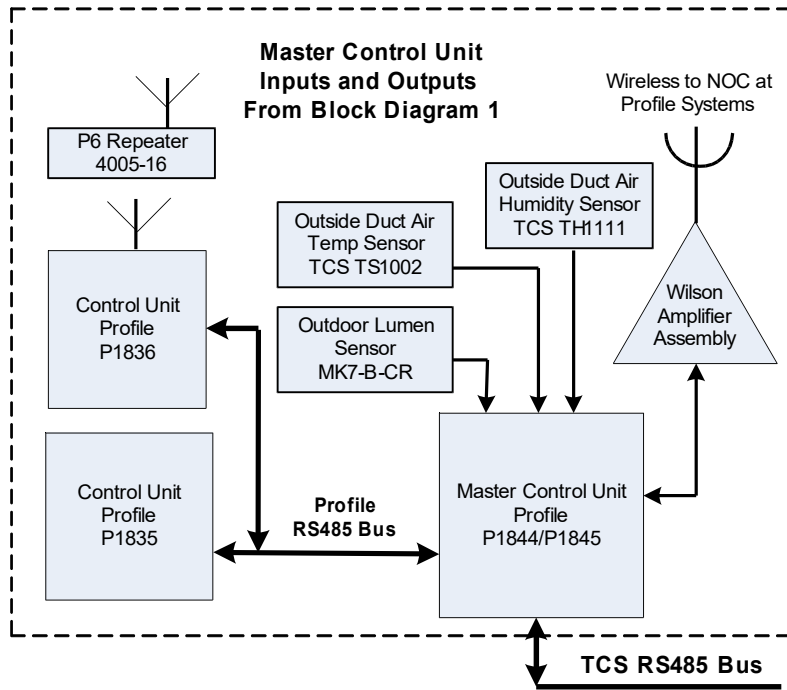
CCU, TCS SZ1145 Inputs and Outputs – Monitors and outputs signals from the following sensors:

- Indoor Motion Sensor A, Honeywell IS2535 – Detects motion.
- Indoor Motion Sensor B, Aleph CM360-18 – Detects motion.
- Indoor Lumen Sensor A, MK7-B-CCF-1/5 – Monitors indoor lighting.
- Indoor Lumen Sensor B, MK7-B-CCF-1/5 – Monitors indoor lighting.
- Water Temp Sensor, TCS TS1005 – Monitors water temperature.
- Indoor Motion Sensor C, Ademco 967 Ceiling PIR – Detects motion.
- Indoor Motion Sensor D, GE Surity AP669 – Detects motion.
- Duct Air Humidity Sensor, TCS TH1111 – Monitors duct air humidity.
- Air Velocity Sensor, Kele AVS-200 – Monitors air velocity.
- Duct Pressure Sensor, TCS TD1190 – Monitors duct air pressure.

Sensor Inputs with Wireless Outputs – This section consists of the following sensors that transmit wireless outputs to the P6 Repeater and/or P6 Transceiver of P1836.:

- 4-20 mA – Monitors line current and sends 4-20 mA output to AI Sensor 3005-120.
- P6 Power Monitor 3005-55 – Monitors current transducer (CT) output and transmits results.
- P6 Temp Sensor 3005-118 – Monitors temperature and transmits results.
- P6 T/H Sensor 3005-115 – Monitors temperature and humidity, and transmits results.

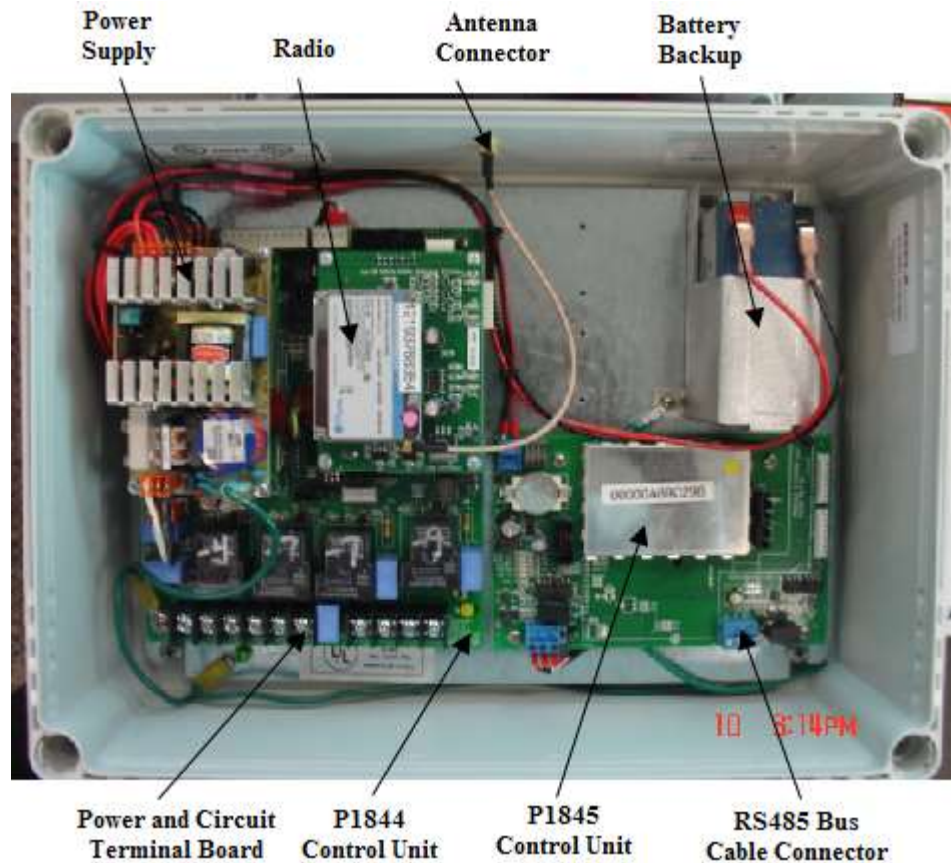
Section 2.0 - Master Control Unit Inputs and Outputs



Note

The TCS RS485 Bus is connected from TCS SZ2181 and TCS SZ1145 only to MCU P1844/P1845 or only to Profile Controller P1835 for any one configuration.

2.1 Master Control Unit, Profile P1844/P1845 Description



Master Control Unit, Profile P1844/P1845

The P1800 Master Controller Unit (MCU) consists of the P1844 MCU and the P1845 MCU. The two units communicate using an RS485 bus. The P1844 uses an independent 120VAC dedicated power source. The P1845 is powered by 15VDC from the power supply. This device has a battery powered backup to provide communication to the NOC upon power failure. Requirements for installation are as follows:

2.2 Master Control Unit, Profile P1844/P1845 Installation

Note

Inspect the Profile P1800 System components prior to installation for any damage which may have occurred during shipping. Report any damage found to Profile Systems, LLC immediately

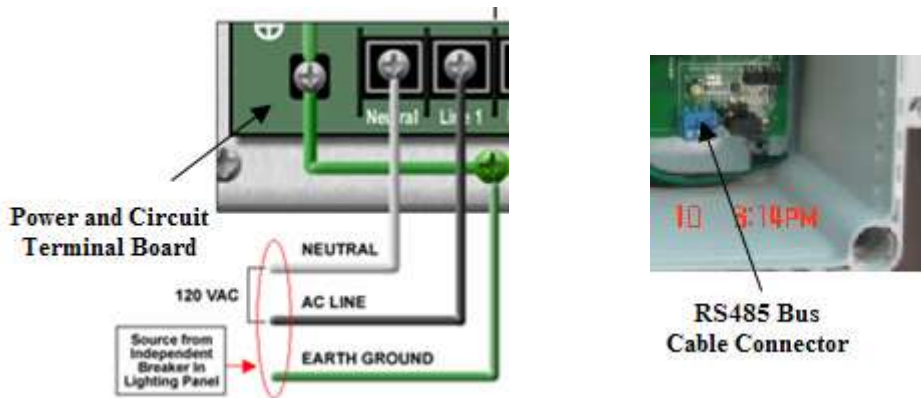
Warning

Installation of Profile P1800 System equipment presents potential unsafe conditions, including, but not limited to, electrical shock, improper voltage to components and improper operation that may cause personal injury or damage to property.

Note

Check Item 1, Appendix B – Special Environmental Requirements.

Installation of Profile P1800 System equipment must be performed by qualified electrical or mechanical contractors in good standing who are properly licensed to perform work in the municipality, county, and state where installation of Profile P1800 System equipment will occur. Installation practices should follow recommendations and procedures as determined by the original equipment manufacturer(s) and should adhere to the application and use of the equipment as intended by the original equipment manufacturer(s).



P1844/P1845 System Wiring Diagram

P1800 System Mounting

Refer to diagram above. Mount the P1844/P1845 unit through the holes indicated in a manner that satisfies the following criteria:

1. Mount the unit in a plumb and level fashion using appropriate anchoring hardware near existing lighting electrical panel and/or contactors such that high voltage wiring and conduit requirements are minimized.
2. Check that the unit is mounted away from high traffic or commonly used work spaces.

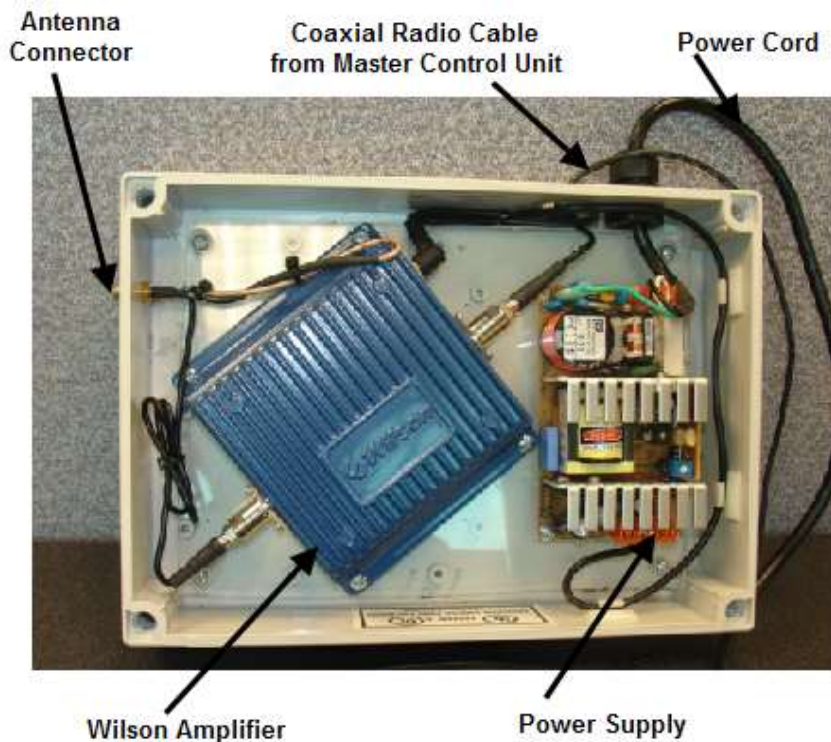
P1800 System Power and RS485 Bus Connections

1. At the Power and Circuit Terminal Board, connect a 120VAC or 240VAC input power source to the P1844/1845 unit from an independent circuit breaker.
2. At the RS485 Bus Cable Connector, connect the RS485 communications bus IN DAISY-CHAIN FASHION (“A” to “A”, “B” to “B”, “Ref” to “Ref”) terminating the communications wiring at the “A”-“B”-“Ref” input on the P1845 unit.

Caution

Make sure that only the correct loads/circuits are controlled by the P1844/P1845 unit per site requirements to avoid damage or erratic operation of the system

2.3 Wilson Amplifier Assembly Description



Wilson Amplifier Assembly

Amplifier box (9x7x3) shall be mounted near the P1844/P1845 MCU to minimize distance from adaptor connection to radio. The Assembly shall be powered with a 120VAC power source. The amplifier will have a 12VDC power supply which will power the amplifier. The assembly must have both the externally mounted antenna and connector attached before the amplifier is powered up. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

2.4 Wilson Amplifier Assembly Installation

Note

Check Item 2, Appendix B – Special Environmental Requirements.

Mounting

Refer to Wilson Amplifier Assembly diagram above. Mount the assembly through the mounting holes in a manner that satisfies the following criteria:

1. Mount the unit in a plumb and level fashion using appropriate anchoring hardware near existing lighting electrical panel and/or contactors such that high voltage wiring and conduit requirements are minimized.
2. Check that the unit is mounted away from high traffic or commonly used work spaces.

Warning

Do not power the amplifier on until both antenna connections are made.

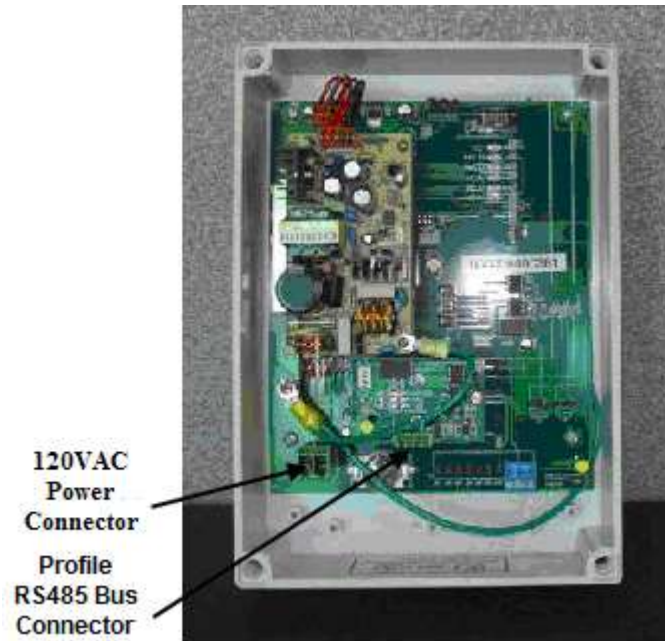
Connections

1. Connect the coaxial radio cable from the Master Control Unit to the amplifier input connector.
2. Connect the antenna cable to the antenna connector.

Profile P1844/P1845 MCU and Wilson Amplifier Assembly Checkout

When all connections are verified to be correct and the power is turned on, call Profile Customer Support at 1-898-5483 to ensure that communication takes place between the MCU and the NOC.

2.5 Control Unit, Profile P1835 Description



Control Unit, Profile P1835

The P1835 is a Companion Control Unit (CCU) which is capable of increasing the MCU's monitoring capabilities by 10 TCS Basys devices for each P1835 used. The P1835 will be used in conjunction with TCS Basys control devices to allow for the proper amount of monitoring points to communicate to the MCU. The P1835 is powered by 120VAC power source and communicates to the MCU via RS485 half duplex communications bus. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

2.6 Control Unit, Profile P1835 Installation

Note

Check Item 1, Appendix B – Special Environmental Requirements

Mounting

Refer to P1835 diagram above. Mount the P1835 unit through the mounting holes in a manner that satisfies the following criteria:

1. Mount the unit in a plumb and level fashion using appropriate anchoring hardware near existing lighting electrical panel and/or contactors such that high voltage wiring and conduit requirements are minimized.
2. Check that the unit is mounted away from high traffic or commonly used work spaces.

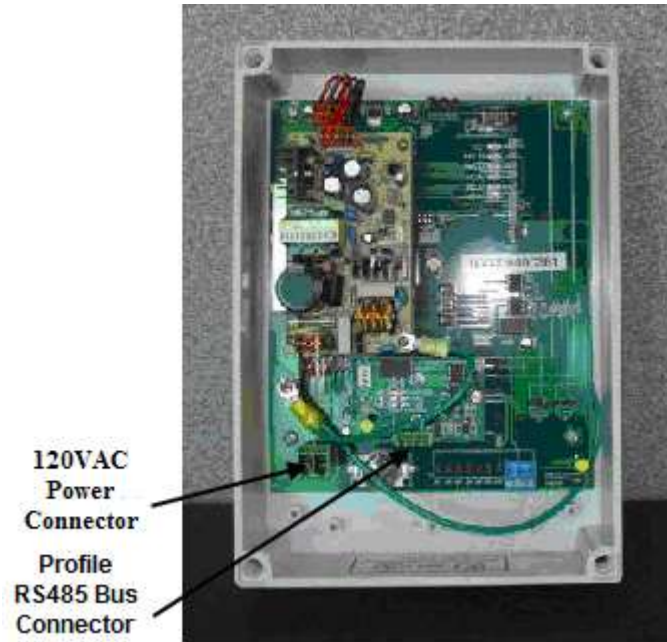
Connections

1. Connect the 120 VAC power source to the P1835 power connector.
2. Connect the RS485 bus to the P1835 bus connector terminals as follows: Red lead to A terminal, black lead to B terminal, and white lead to REF terminal.

Profile P1835 Checkout

When all connections are verified to be correct and the power is turned on, call Profile Customer Support at 1-898-5483 to ensure that communication takes place between the P1835 and the NOC.

2.7 Control Unit, Profile P1836 Description



Control Unit, Profile P1836

The P1836 is a Companion Control Unit (CCU) which is capable of increasing the MCU's monitoring capabilities by 10 Point Six transceivers for each P1836 used. A Point Six Transceiver 4007-06 is installed within the P1836 Control Unit. The P1836 is powered by 120VAC power source. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

2.8 Control Unit, Profile P1836 Installation

Note

Check Item 1, Appendix B – Special Environmental Requirements

Mounting

Refer to P1836 diagram above. Mount the P1836 unit through the mounting holes in a manner that satisfies the following criteria:

1. Mount the unit in a plumb and level fashion using appropriate anchoring hardware near existing lighting electrical panel and/or contactors such that high voltage wiring and conduit requirements are minimized.
2. Check that the unit is mounted away from high traffic or commonly used work spaces, and in a location that enables the transceiver to transmit and receive radio signals to and from the designated sensor and control units with no interference.

Connections

1. Connect the 120 VAC power source to the P1836 power connector.
2. Connect the RS485 bus to the P1836 bus connector terminals as follows: Red lead to A terminal, black lead to B terminal, and white lead to REF terminal.

Profile P1836 Checkout

When all connections are verified to be correct and the power is turned on, call Profile Customer Support at 1-898-5483 to ensure that communication takes place between the P1836 and the NOC.

2.9 Point Transceiver, 4007-06 Description



Point Transceiver, 4007-06

The Point Transceiver is installed within the P1836 Control Unit. The Point Transceiver is a general purpose compact data transceiver with a wireless modem that transfers data at a 9600 or 19200 baud rate. The transceiver is used to capture all data from point sensors/repeaters within range. The transceiver communicates to the P1836 Control Unit via RS232 communications port. It captures FCC approved, frequency hopping spread spectrum data from all wireless transmitters/repeaters within range on the same network. It acts as a virtual half-duplex parallel-wired network. The unit is powered using a

supplied DC power source. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

2.10 Point Transceiver, 4007-06 Installation

Note

Check Item 3, Appendix B – Special Environmental Requirements

The Point Transceiver is installed within a P1836 Controller which is mounted in a location that enables the transceiver to receive radio transmission from designated wireless sensors with no interference.

Point Transceiver, 4007-06 Checkout

For checkout, use Point Temperature Sensor, 3005-118 to transmit signals to the Point Transceiver. More to be determined.

2.11 Point Repeater, 4005-16 Description



Point Repeater, 4005-16

The Point Repeater receives CRC-16 error checked data packets, processes the data, and then transmits it to other repeaters, servers, or receivers. The repeater is used to connect sensor points to the receiver that communicates to the MCU/CCU. It is powered using 6-24VDC power supply. (Communications on this product are wireless and therefore there is no communication wiring related to this product). It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes (Please refer to the provided manufacturer installation/product guidelines for more information). Requirements for installation are as follows:

2.12 Point Repeater, 4005-16 Installation

Note

Check Item 3, Appendix B – Special Environmental Requirements

Point Repeater, 4005-16 Mounting

Mount the Point Repeater in a location that enables the repeater to receive radio transmission from designated wireless sensors and transmit radio signals to designated transceivers with no interference.

Point Repeater, 4005-16 Checkout

For checkout, use Point Temperature Sensor, 3005-118 to transmit signal to the Point Repeater. More to be determined.

2.13 Outdoor Lumen Sensor, MK7-B-CR Description



Outdoor Lumen Sensor, MK7-B-CR

The MK7-B-CR is an exterior ambient light detector which contains a precision photodiode-type cell. It is capable of detecting light levels up to 250ft. candles. It is powered by 15VDC and has a 0-5V output range. The sensor must be connected using three-conductor stranded shielded twisted 18AWG plenum wire. The sensor is to be installed horizontally facing the northern sky with the hood protecting it from direct sunlight. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the

provided manufacturer installation/product guidelines for more information.)
Requirements for installation are as follows:

2.14 Outdoor Lumen Sensor, MK7-B-CR Installation

Note

Check Item 12, Appendix B – Special Environmental Requirements

Mounting

Mount the outdoor sensor in a standard threaded ½” conduit or ½” knockout. Locate the sensor on the roof or somewhere that is exposed to full daylight and is not shadowed or directly exposed to any nighttime illumination. Sensor must be mounted horizontally, facing North, with the hooded portion on top.

Connections

To prevent electrical shock, disconnect power coming from the controller prior to hookup. Wiring from the sensor to the controller should be with 20 or 22 gauge stranded wire. Do not run the low voltage wire with or near power wiring. For long wire runs, run the low voltage wire using shielded cable or cable in conduit. Cable length should not exceed 500ft. Wire the sensor to the appropriate analog part of the controller according to the controller manufacturer’s instructions. Connect outdoor lumen sensor as follows:

1. Connect black wire from sensor to P1844, black COM wire.
2. Connect yellow wire from sensor to P1844, orange 0 – 5V IN.
3. Connect red wire from sensor to P1844, red +15V wire.

Outdoor Lumen Sensor Checkout.

To be determined.

2.15 Outside Duct Air Temp Sensor, TCS TS1002 Description



Outside Duct Air Temp Sensor, TCS TS1002

The TS1002 is a 1000Ω RTD that is required to be mounted in accordance with the duct mount provided. It is expected to be wired back using two-conductor stranded shielded 18awg plenum wire to the Profile P1844 controller to monitor the outside air duct temperature. It is recommended that wire runs be no farther than 250 ft. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

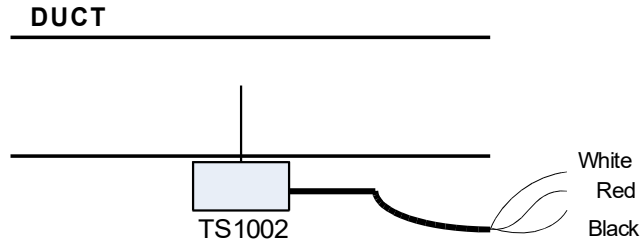
2.16 Outside Duct Air Temp Sensor, TCS TS1002 Installation

Note

Check Item 7, Appendix B – Special Environmental Requirements

Mounting

The TCS TS1002 sensor is to be mounted in a duct. The device is equipped with a standard 2” x 4” handy box (NEMA 1) enclosure for easy mounting. By punching out the standard ½” knock outs, conduit can be added if required.



Connections

Connect the sensor wires (no further than 250 feet) to the Profile P1844 controller as follows:

1. Connect white and red wire together to one terminal of either T1 through T4.
2. Connect black wire to the other terminal of either T1 through T4.

Outside Duct Air Temp Sensor Checkout

To be determined

2.17 Outside Duct Air Humidity Sensor, TCS TH1111

Description



Outside Duct Air Humidity Sensor, TCS TH1111

The TH1111 is a duct mount relative humidity sensor that can read humidity from 0-100%. It is loop powered with a 4-20mA output. It is accurate within +/-1%. It is to be connected to an applicable power supply providing 13-35VDC. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer

installation/product guidelines for more information.) Requirements for installation are as follows:

2.18 Outside Duct Air Humidity Sensor, TCS TH1111 Installation

Note

Check Item 8, Appendix B – Special Environmental Requirements

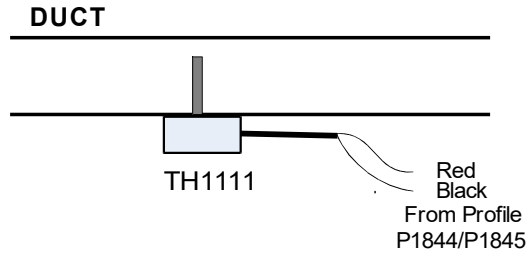


TCS TH1111 Mounting Box

Mounting

The TCS TH1111 is required to be mounted in accordance with the duct mount provided. It is expected to be wired back using two-conductor stranded shielded 18awg plenum wire to the Profile P1844 controller to monitor the duct's relative humidity. It is recommended that wire runs be no farther than 250 ft. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

TCS TH1111 Mounting Box



TCS TH1111 Connection Diagram

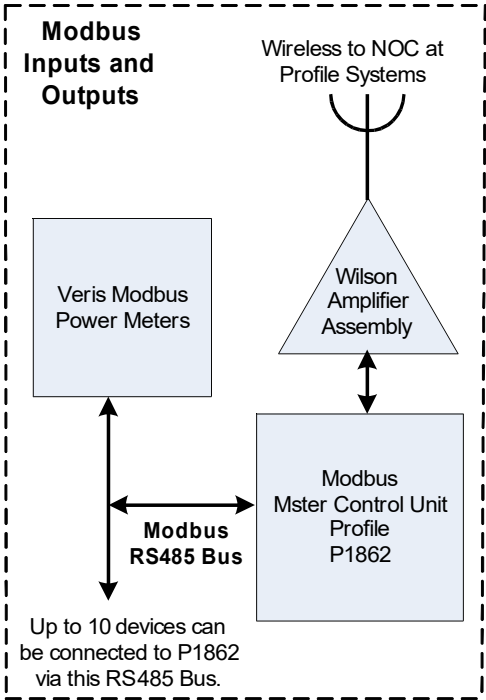
Connections

1. Connect the positive (+) terminal of the TH1111 loop connector to +P terminal of the Profile P1844/P1845 MCU.
2. Connect the negative (-) terminal of the TH1111 loop connector to IN1 or IN2 terminal of the Profile 1844 controller. (For two TH1111s, the positive terminal of each will connect together to +P of controller. The negative terminal of one TH1111 will connect to IN1 and the negative terminal of the second TH1111 will connect to IN2.)

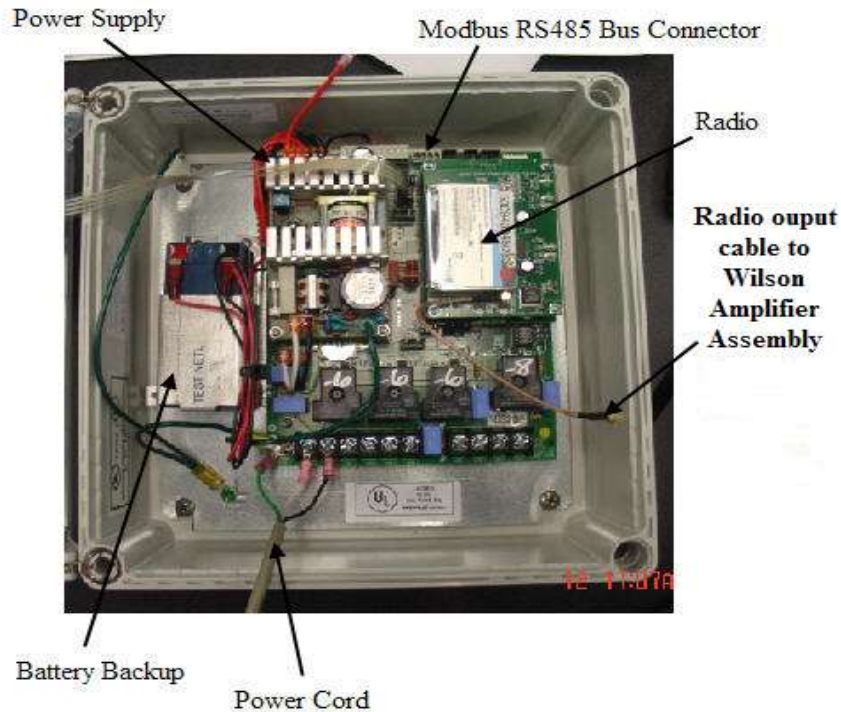
Outside Duct Air Humidity Sensor Checkout

To be determined

Section 3.0 - Modbus Inputs and Outputs



3.1 Modbus Control Unit, Profile P1862 Description



Modbus Control Unit, Profile P1862

The P1862 is a Profile System Master Control Unit (MCU) that is used to monitor the Veris power meters. It is capable of communication with the NOC via a supplied cellular radio. The P1862 requires an independent 120VAC dedicated power source. This device has a battery powered backup to provide communication to the NOC upon power failure. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

3.2 Modbus Control Unit, Profile P1862 Installation

Note

Check Item 1, Appendix B – Special Environmental Requirements

Mounting

Refer to P1862 diagram above. Mount the P1862 unit through the mounting holes in a manner that satisfies the following criteria:

1. Mount the unit in a plumb and level fashion using appropriate anchoring hardware near existing lighting electrical panel and/or contactors such that high voltage wiring and conduit requirements are minimized.

2. Check that the unit is mounted away from high traffic or commonly used work spaces.

Connections

1. Connect 120VAC to live/neutral of P1862 board.
2. Connect Modbus RS485 cable to Veris Modbus.

<p>Warning</p>

<p>Do not power the amplifier assembly on until both antenna connections are made.</p>
--

3. Refer to paragraph 2.4 for Wilson Antenna Assembly installation. Connect the coaxial radio cable from P1862 to the Amplifier Assembly input connector.
4. Connect the antenna cable to the antenna connector.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
16. Connect radio output connector to the Amplifier Assembly.
17. Make sure that the antenna connections are secure.

When all connections are verified to be correct and the power is turned on, call Profile Customer Support at 1-898-5483 to ensure that communication takes place between the P1862 and the NOC.

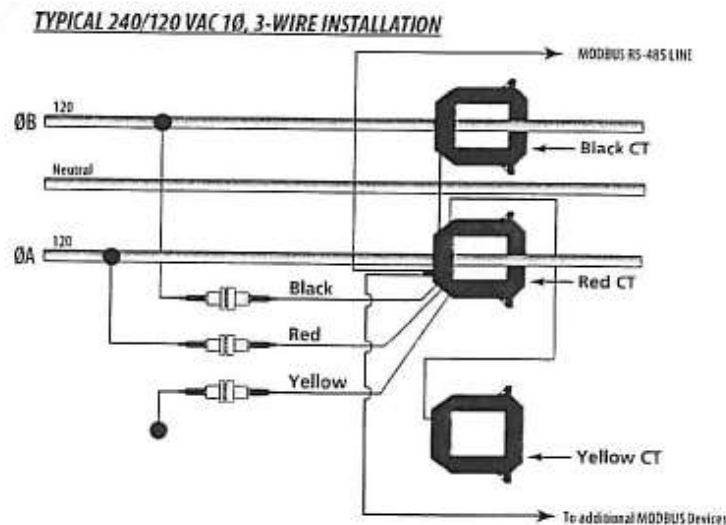
3.3 Veris Enercept Power Meters Description



Veris Enercept Power Meters

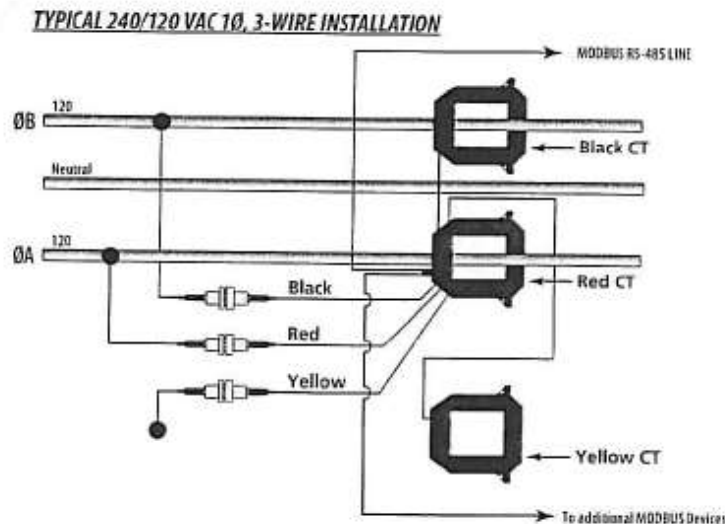
The Veris Enercept Power Meters are quick-connect power line metering and communication device and method for measuring energy consumption or other electrical characteristics on a power line and for communicating the measured information to a remote location. The apparatus includes a housing, and a coupling mechanism attached to the housing to physically connect the housing to a suspended portion of the power line, and to provide an electrical connection to at least one conductor of the power line. A metering apparatus is provided within the housing, and is electrically coupled to the power line conductors via the coupling mechanism to measure energy consumption. The metering apparatus includes a current [monitor](#) and a voltage monitor to measure the energy consumption on the power line. A communications apparatus is provided within the housing, and is electrically coupled to the metering apparatus. The communications apparatus communicates information corresponding to the measured energy consumption to a remote location.

3.4 Veris Enercept Power Meters Installation



Note

Check Item 13, Appendix B – Special Environmental Requirements



Veris Enercept Power Meters Wiring Diagram

Meters must only be installed to power source where the equipment is off and locked out. You are required to attach the voltage leads to each one of the power leads as well as the corresponding current transducer (CT). All meters are attached to the designated power source and are used to measure true power, instantaneous power, and power consumption. The device communicates using a RS485 half duplex communications bus. They are interconnected using a daisy-chained three-conductor stranded shielded 18awg plenum wire. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.)

Warning

Do not connect voltage inputs live! Disconnect power and lock-out all power sources during installation.

Connections

The voltage leads must be connected to the line side of the 3-phase conductors as shown in diagram. Because the meter requires voltage to communicate, the leads are connected to a location which is not normally switched off.

1. Connect the Red lead to Phase A.

2. After connecting the Red lead to Phase A, connect the Black lead to Phase B.
3. Attach CTs to conductors. Each CT must be attached to the same conductor as the correspondingly colored voltage lead (see wiring diagram). The unit will automatically detect phase reversal, so it is not important to orient a particular side of each CT towards the load.

Caution

Do not connect H8000 series meters to the load side of a variable frequency drive. Doing this will permanently damage the electronics.

4. Remove the terminal block and attach the RS485 wires to P1862 with positive lead to B, negative lead to A, and shield wires to REF.

Notes

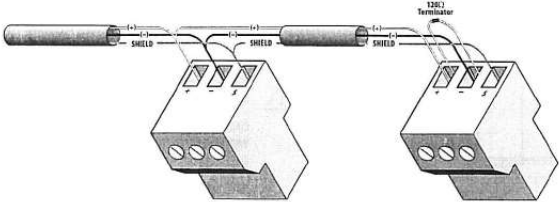
- If necessary, insulate any exposed wiring. Ensure that insulation complies with local and national electrical codes.
- The meter cannot communicate on the network bus without power. Therefore, it is best to connect the voltage leads ahead of switching devices.
- This document does not include software setup procedures. Software setup requirements can vary. If changes are required, contact Profile Customer Support.
- There is no need to set the switches because an address number has been preset to a number that is not in use. If changes are required, contact Profile Customer Support.
- Do not ground the shield inside the electrical panel. All Modbus wires, including the shield should be insulated to prevent accidental contact to high voltage conductors.
- The Modbus cable should be mechanically secured where it enters the electrical panel.
- A maximum of 10 Modbus devices may be connected together in a daisy-chain fashion. The first and last devices in the chain should have a 120 ohm terminating resistor between (+) and (-). A 120 ohm terminating resistor may be required at the last device for this installation.
- The Modbus cable should be shielded twisted pair wire Belden 1120A or similar.

Warning

After wiring the Modbus cable, remove all scraps of wire or foil shield from the electrical panel. It could be dangerous if wire scraps come into contact with high voltage wires.

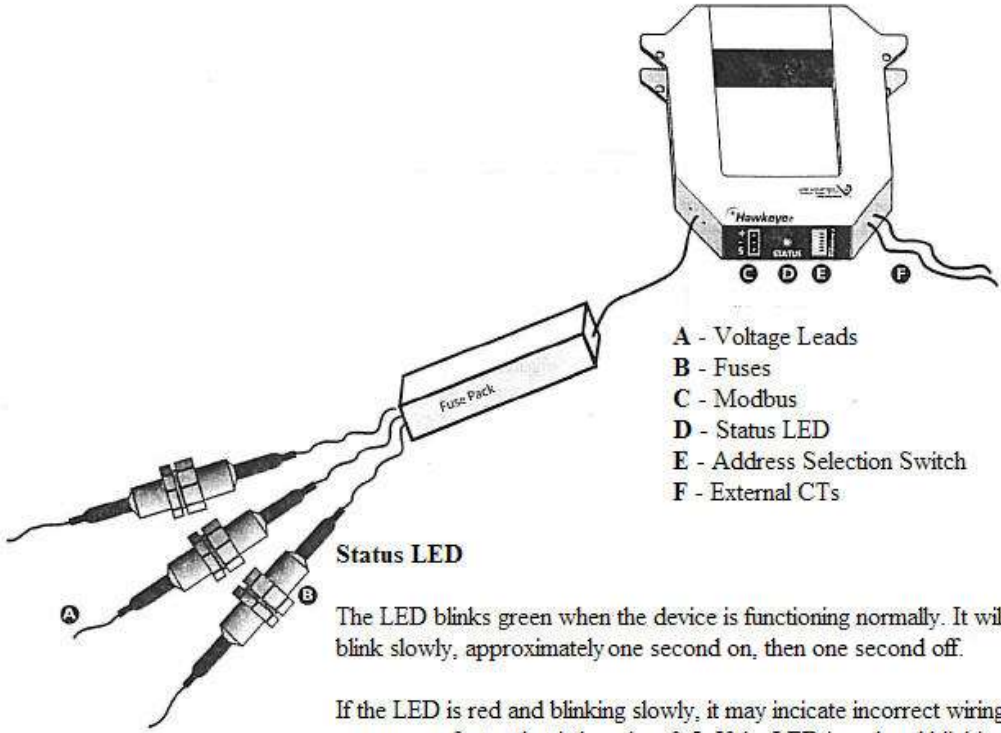
Check of Power Reading

Approximate Check of Power Reading is performed to check actual current with a clamp meter. Refer to Item 6, Appendix A – Recommended Test Equipment.

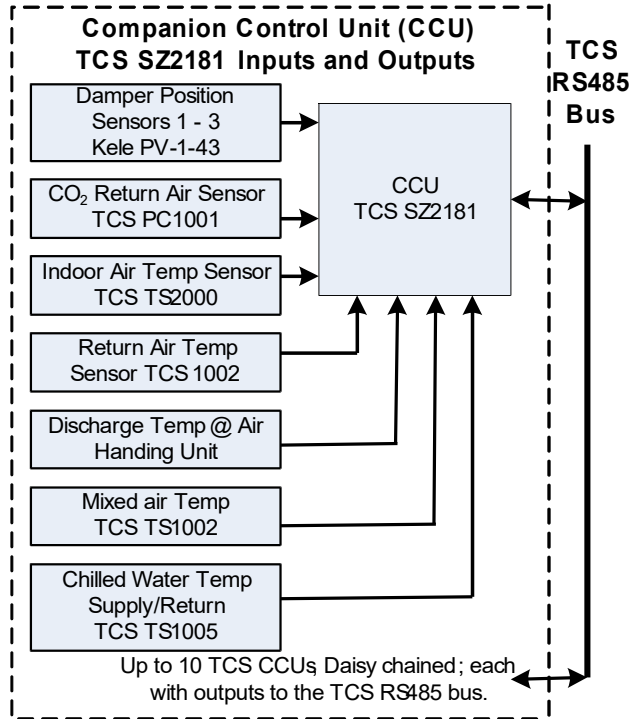


Expected power is:

$$kW = \text{Volts} \times \text{Amps} \times 1.73 \times \text{PF} \text{ divided by } 1000 \text{ kW} = \text{Horsepower} \times 0.746$$



Section 4.0 - Companion Control Unit (CCU)
TCS SZ2181 Inputs and Outputs



4.1 Companion Control Unit, TCS SZ2181 Description



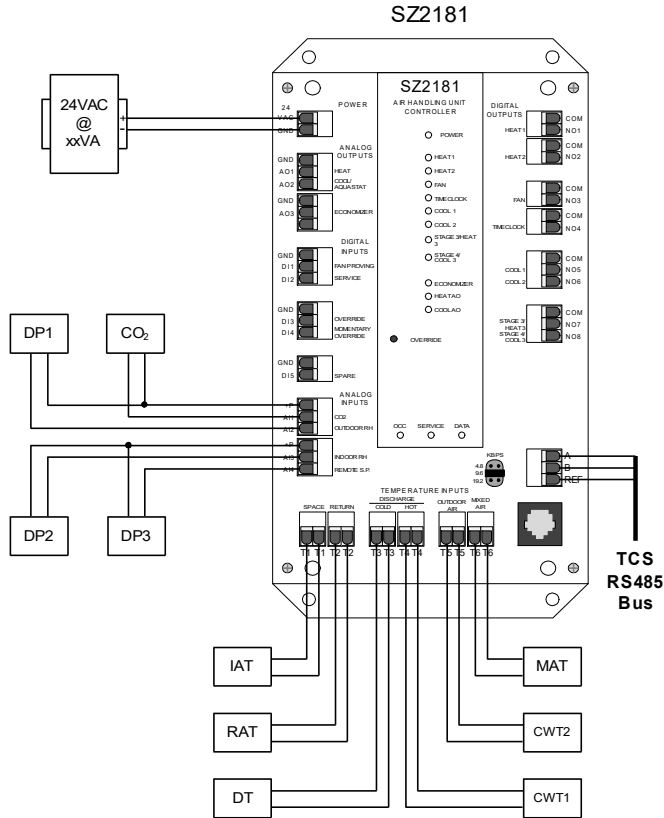
Companion Control Unit, TCS SZ2181

The TCS SZ2181 is capable of accepting six, 1000 ohm RTD sensors. (Wiring length for connected sensors should not exceed 250ft.) The TCS SZ2181 is to be used as a companion controller (CCU) to the P1835 which it communicates to using a RS485 half duplex communications bus. The TCS SZ2181 is to be powered from an external 24VAC power supply. Polarity of the wiring must be maintained because all of TCS Basys devices are half wave rectified and have common return paths. This device is used to extend the monitoring capabilities of a standard MCU. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) The TCS SZ2181 accepts sensor inputs from the sensing devices described in this section. Requirements for installation are as follows:

4.2 Companion Control Unit, TCS SZ2181 Installation

Note

Check Item 5, Appendix B – Special Environmental Requirements



Companion Control Unit, TCS SZ2181

Item	Function	Component	Voltage
DP1, 2, & 3	Damper Positions	Kele PVI-1-43	15VDC
CO ₂	CO ₂ Return Air	TCS PC1001	15VDC
IAT	Indoor Air Temp	TCS TS2000	15VDC
RAT	Return Air Temp	TCS TS1002	15VDC
DT	Discharge Temp @ Air Handling Unit	TCS TS1002	15VDC
MAT	Mixed Air Temp	TCS TS1002	15VDC
CWT1 & 2	Chilled Water Temp Supply/Return	TCS TS1005	15VDC

Mounting and Connections

Wiring connections are made as indicated in the diagram and as indicated for the sensors described in this section.

1. Mount the TCS SZ2181 with two screws.
2. Connect three-conductor, shielded RS485 bus to connectors A and B with shield connected to REF.

Note

When using three-wire sensors, use the black and red leads and either clip or twist off the remaining lead. Make sure that the dip switches are set for the sensors being used.

Caution

Do not connect to 120 VAC. When multiple TCS/Basys Controls devices are using a single transformer, the polarity of the power wiring must be maintained because all TCS devices are half-wave rectified and have common return paths.

3. Connect 24 VAC +/-20% to power terminals 24VAC and GND as indicated in diagram.
4. Connect communications power wiring separately, up to nominal 28 VAC from transformer, with twisted, shielded 18 AWG. When wiring for communications, dedicated power must be used to power the TCS SZ2181. Several "S" series controllers may be powered from the same transformer, provided that the transformer has sufficient power.

SZ2181 Checkout

1. Be sure to check and verify all wiring before powering the SZ2181.
2. Turn power on. The SZ2181 "Power" LED should light up. Then the Service LED will blink for 15 seconds while the electronics stabilize.
3. Increase and decrease the Heat and Cool set points. This must be done from a PC. .
4. Observe the operation of the relay stages and/or analog output(s). The SZ2181 is now ready for use.

Note

The operation of the SZ2181 will depend on how it is programmed.

SZ2181 Troubleshooting

Power LED will not come on

Check for 24 VAC on terminals "24 VAC" and "GND" (polarity must also be correct).

The rest of the trouble shooting must be done with a PC and the Revelation Professional software.

Note

The steps that follow may be done with the support of Profile Customer Support. Call Profile Customer Support at 1-800-898-5483.

No communications

Make sure baud rate selection jumper for the QD1010 and the SZ2181 are the same, and that Revelation is configured for that same baud rate. Address 248 will always work provided that the SZ2181 is NOT connected to a network.

Inputs do not read correctly

The SZ2181 is calibrated at the factory. For the supply temperature and other temperature readings make slight adjustments (+/- 12% of the input span) on "Screen D" of the SZ2181 programming screens.

The six temperature inputs are factory calibrated. However, depending on the application (long wire runs, etc.), there may need to be a field adjustment done to these readings. The "Adjusted Reading" is the reading that the SZ2181 actually uses for control. The "Offset Value" is the number of degrees that the actual input temperature has been adjusted.

For example: You measure the space temperature and it reads 71°. The SZ2181 reading is 72° and the space temperature already has an offset of -2.0°. All you need to do is change the offset value to -3.0° and you're done. The SZ2181 will now read 71°.

The Space and Return temperature inputs are scaled 20 to 120°F (-6.7 to 48.9°C). Both Discharge Air temperature inputs are scaled 20 to 220°F (-6.7 to 104.4°C). The Mixed Air temperature input is scaled 20 to 220°F (-6.7 to 104.4°C). The Outdoor input is scaled -40 to 160°F (-40 to 71.1°C). These ranges are fixed and cannot be changed.

Output operation is not correct

Check programmed parameters, in particular "Reverse" and "Direct" acting selections and "Heat" or "Cool" selections for the analog outputs, and "Offset" and "Differential" selections and "Delay Times" for the relay outputs. Check wiring.

4.3 Damper Position Sensor, Kele PV-1-43 Description



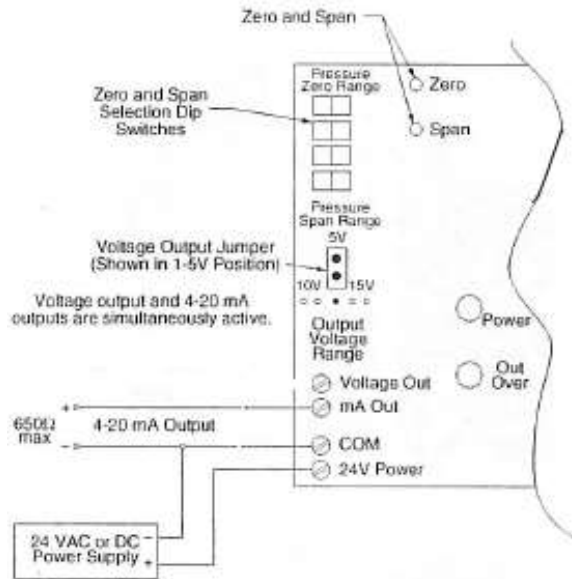
Damper Position Sensor, Kele PVI-1-43

The PV-1-43 Pressure Transmitter is capable of monitoring the damper position on AHUs. It reads pressure at the input and then relates that pressure to the position of the damper. The output is to be selected as the 4-20mA output and then terminated at the monitoring point. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.)

4.4 Damper Position Sensor, Kele PV-1-43 Installation

Note

Check Item 11, Appendix B – Special Environmental Requirements



Damper Position Sensor, Model PVI-1-43 Wiring Diagram

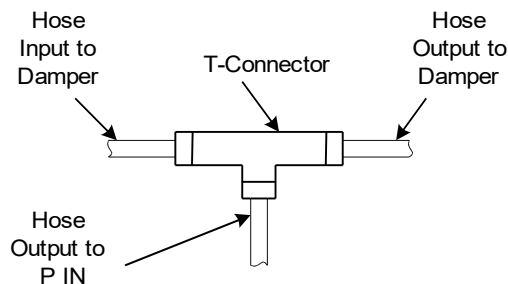
Mounting

Use two of the four mounting holes to mount the unit to a flat surface.

Connections

Make connections to the terminal block of PVI-1 as follows:

1. Connect 24VAC Power Supply + lead to 24V Power terminal.
2. Connect 24VAC Power Supply – lead to COM terminal.
3. Verify using a digital multi-meter to measure the 24VAC at the 24V Power and COM terminals.
4. Connect 4-20mA signal output to CCU, TCS SZ2181, terminal AI2.



T-Connector for P IN Connection

5. At the duct's pressure-operated damper, connect a T-connector as shown in above diagram.

Damper Position Sensor Checkout

To be determined

4.5 CO₂ Sensor, TCS PC1001 Description



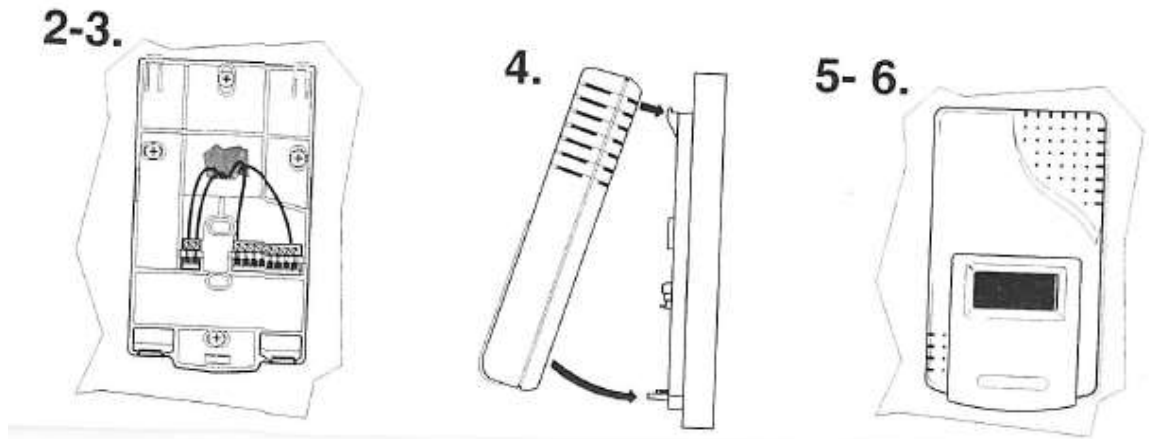
CO₂ Sensor TCS PC1001

The PC1001 is a wall mounted carbon dioxide sensor designed to monitor carbon dioxide levels in rooms and ducts. It is required to be mounted in accordance with the design plan. It requires mounting to a secure object. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

4.6 CO₂ Sensor, TCS PC1001 Installation

Note

Check Item 6, Appendix B – Special Environmental Requirements



Basic Installation of TCS PC1001 Mounting Plate and Sensor Diagram

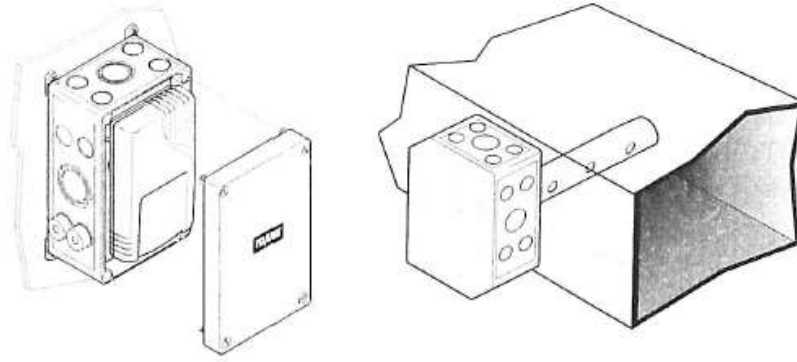
Mounting and Connections

1. Prepare for installation by using the mounting holes configured for the Model 1508 Duct Mount Enclosure and refer to following steps as shown in diagram:
2. Refer to item 2-3 in diagram. Use the mounting plate as a template to mark mounting holes.
3. Secure the mounting plate to the Model 1508 Duct Mount Enclosure and make wire connections as follows:

Caution

The 24VAC polarity must be observed or damage may result.

- a. Connect 24VAC + lead to terminal 1.
 - b. Connect 24VAC – lead to terminal 2.
 - c. Verify using a digital multi-meter is used to measure the 24VAC at terminals 1 and 2.
 - d. Connect signal output to 4-20mA, terminal 6.
4. Refer to item 4 in diagram. Mount the Controller on the base by aligning the top clips and then securing to the bottom clips. A “snap” sound will indicate that the sensor is secure. The sensor will now have power. A two minute warm-up will take place. After two minutes, the sensor will stabilize and display the “Normal Mode” (current CO₂ readings).
 5. Refer to item 2-3 in diagram. The sensor is pre-configured with no need for further configuration.
 6. Finish installation by sliding the cover over the menu keys and secure with the supplied screw.



Model 1508 Duct Mount Enclosure with TCS PC1001

Installation of Model 1508 Duct Mount Enclosure with TCS PC1001

1. Install and secure the enclosure cover.
2. Follow the Model 1508 Duct Mount Enclosure instructions to install enclosure with TCS PC1001 as shown in diagram.

CO2 Sensor TCS PC1001 Checkout

To be determined

4.7 Duct Air Temp Sensor, TCS TS1002 Description



Duct Air Temp Sensor, TCS TS1002

The TS1002 is a 1000Ω RTD that is required to be mounted in accordance with the duct mount provided. It is expected to be wired back using two-conductor stranded shielded 18awg plenum wire to the TCS TS1145 controller to monitor air temperature. It is recommended that wire runs be no farther than 250 ft. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

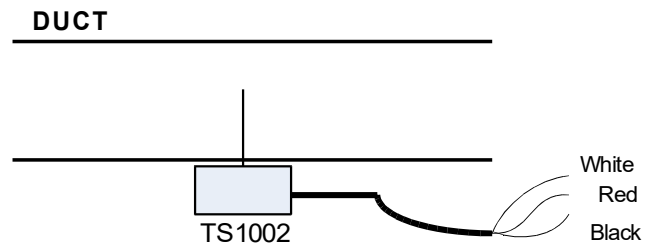
4.8 Duct Air Temp Sensor, TCS TS1002 Installation

Note

Check Item 7, Appendix B – Special Environmental Requirements

Mounting

The TCS TS1002 sensor is to be mounted in a duct. The device is equipped with a standard 2" x 4" handy box (Nema 1) enclosure for easy mounting. By punching out the standard ½" knock outs, conduit can be added if required.



Connections

Connect the sensor wires (no further than 250 feet) to the TCS SZ1145 as follows:

1. Connect white and red wire together to one terminal of either T1 through T4.
2. Connect black wire to the other terminal of either T1 through T4.

Duct Air Temp Sensor, TCS TS1002 Checkout

To be determined

4.9 Water Temp Sensor, TCS TS1005 Description



Water Temp Sensor, TCS TS1005

The TS1005 is a 1000 Ω RTD that is required to be mounted in accordance with the strap on mount provided. It is expected to be wired back using two-conductor stranded shielded 18awg plenum wire to the TCS SZ2181 controller that is able to read the temperature as shown in the design drawing. It is recommended that wire runs be no farther than 250 ft. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

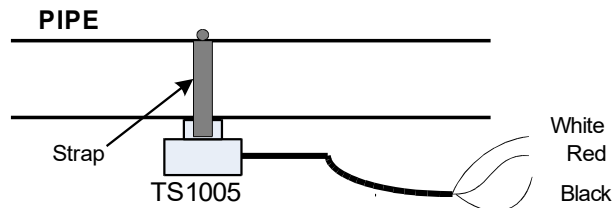
4.10 Water Temp Sensor, TCS TS1005 Installation

Note

Check Item 7, Appendix B – Special Environmental Requirements

Mounting

The TCS TS1005 sensor has a 5" pipe strap. The strap on mount sensor is designed to mount on a pipe. By punching out the standard 1/2" knock outs, conduit can be added if required.



Connections

Connect the sensor wires (no further than 250 feet) to the TCS SZ1145 as follows:

1. Connect white and red wire together to one terminal of either T1 through T4.
2. Connect black wire to the other corresponding terminal of either T1 through T4.

Water Temp Sensor, TCS TS1005 Checkout

To be determined

4.11 Indoor Air Temp Sensor, TCS TS2000 Description



Indoor Air Temp Sensor TCS TS2000

The TS2000 is a wall mounted 1000 Ω RTD that is required to be mounted in accordance with the design plan. It requires mounting to a secure object. The sensor requires a two conductor stranded shielded 18awg plenum wire to be connected to the sensor and ran to the TCS SZ2181. It is recommended that wire runs be no farther than 250 ft. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

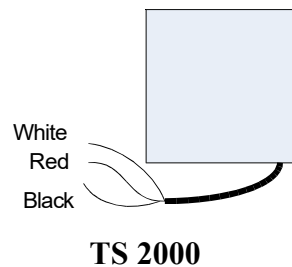
4.12 Indoor Air Temp Sensor, TCS TS2000 Installation

Note

Check Item 7, Appendix B – Special Environmental Requirements

Mounting

Mount the TCS TS2000 unit vertically on an interior wall which reflects the average room temperature at a height of approximately five feet from the floor. Avoid areas that are unventilated, near windows or open doors, and areas that are exposed to direct sunlight or unusual heat sources.



Connections

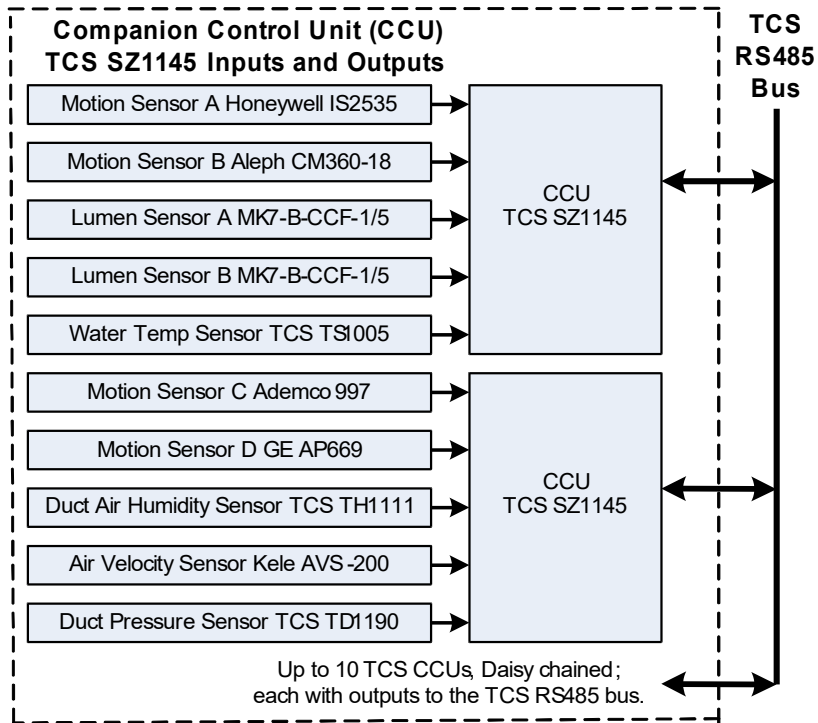
Connect the sensor wires (no further than 250 feet) to the TCS SZ2181 as follows:

1. Remove the cover of the TS2000.
2. Within the TS 2000, connect the white lead together with the red lead.
3. Connect the red and black wires from TCS SZ2181, terminals T1, to the terminals with the red and black wires of TS2000 respectively. The white wire from TCS SZ2181 is not used.
4. Replace the cover.

Indoor Air Temp Sensor, TCS TS2000 Checkout

To be determined

Section 5.0 - Companion Control Unit (CCU) TCS SZ1145 Inputs and Outputs



5.1 Companion Control Unit, TCS SZ1145 Description



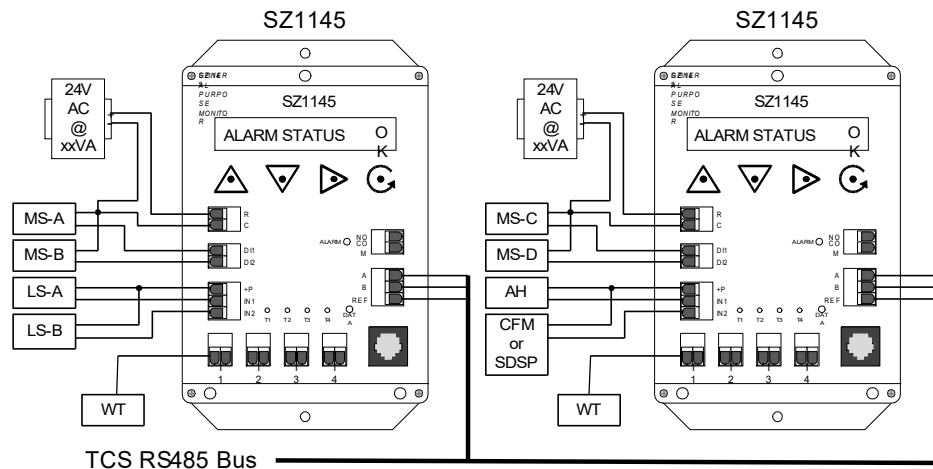
Companion Control Unit, TCS SZ1145

The TCS SZ1145 is capable of accepting up to four 1000 ohm resistive thermal device (RTD), two 4-20mA inputs, and two digital inputs. The unit is used to be a companion controller unit (CCU) to the MCU which it communicates to using a RS485 half duplex communications bus. The TCS SZ1145 is to be powered from an external 24VAC power supply. Polarity of the wiring must be maintained because all of TCS Basys devices are half wave rectified and have common return paths. This device is used to extend the monitoring capabilities of a standard MCU. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) The TCS SZ1145 accepts sensor inputs from the sensing devices described in this section. Requirements for installation are as follows:

5.2 Companion Control Unit, TCS SZ1145 Installation

Note

Check Item 5, Appendix B – Special Environmental Requirements



CCU, TCS SZ1145 Connection Diagram

Item	Function	Component	Voltage
MS-A	Indoor Motion Sensor Type A	Honeywell IS2535	15VDC
MS-B	Indoor Motion Sensor Type B	Aleph CM360-18	15VDC
LS-A	Indoor Lumen Sensor Type A	MK7-B-CCF-1/5	15VDC
LS-B	Indoor Lumen Sensor Type B	MK7-B-CCF-1/5	15VDC
WT	Water Temp Sensor	TCS TS1005	15VDC
MS-C	Indoor Motion Sensor Type C	Ademco 997 Ceiling PIR	*12VDC
MS-D	Indoor Motion Sensor Type D	GE Security AP669	15VDC
AH	Duct Air Humidity Sensor	TCS TH1111	15VDC
CFM	Air Velocity Sensor	Kele AVS-200	15VDC

SDSP	Duct Pressure Sensor	TCS TD1190	15VDC
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*** CAUTION: The Ademco 997 must not be set at more than 12VDC.
If set at more than 12VDC, the resistor may burn out.**

SZ1145 Mounting and Connections

Wiring connections are made as indicated in the diagram and as indicated for the sensors described in this section.

1. Mount the TCS SZ1145 with two sheet metal screws.
2. Connect three-conductor, shielded RS485 bus to connectors A and B with shield connected to REF.

Caution

Do not connect to 120 VAC. When multiple TCS/Basys Controls devices are using a single transformer, the polarity of the power wiring must be maintained because all TCS devices are half-wave rectified and have common return paths.

3. Connect 24 VAC +/-20% to power terminals +24VAC (B) and GND (C) as indicated in diagram.
4. Connect communications power wiring separately, up to nominal 28 VAC from transformer, with twisted, shielded 18 AWG. When wiring for communications, dedicated power must be used to power the TCS SZ1145. Several "S" series controllers may be powered from the same transformer, provided that the transformer has sufficient power.

SZ1145 Checkout

1. Verify all wiring prior to powering the controller.
2. Turn power on. The controller will display a momentary screen with the model and version number, and then the main monitoring screen. The "Alarm LED" will blink for 15 seconds. During this time no alarms will be generated. This gives the circuit time to stabilize and prevents false alarm conditions immediately after a power outage.
3. Press the "Scroll" key to verify the status of the alarm, relay output, and all of the inputs in the monitoring screens.
4. Take note of the current temperature and other input readings. If the SZ1145 is used only for monitoring and the readings appear to be correct, the checkout is complete.

Note

The steps that follow may be done with the support of Profile Customer Support. Call Profile Customer Support at 1-800-898-5483.

5. For all analog inputs which will be used to generate an alarm condition, go into programming mode and adjust the high and/or low limits below and/or above the current readings.
6. For all digital inputs which will be used to generate an alarm condition, go into programming mode and change the setting from open to closed (or vice versa).
7. Through the monitoring screens, verify that the alarm condition(s) is/are recognized.
8. If the relay output is not disabled, verify its operation when at least one alarm is present and also when no alarms are present.
9. If using the alarm time-out feature, verify that once an alarm occurs, the relay goes back to its non-alarm state after the programmed time.
10. If DI1 will be set to "Toggle Momentary" mode when there are no alarms present, momentarily short DI1 to C.
11. Through the monitoring screens, verify that the "Override" is on and that the "Time Remaining" number counts down.
12. Go back into programming mode and set up the SZ1145 with all of the desired settings.

SZ1145 Troubleshooting

No Display

Check for 24 VAC on terminals "R" and "C".

Relay Output Does Not Come On

Check the High and Low Limits for analog inputs, and open or closed settings for digital inputs. Check to be sure that the relay output has been selected to be open or closed upon alarm. Verify through the monitoring screens that indeed there is an alarm present.

Relay Output Does Not Shut Off

Verify that the "Alarm Status" in the monitoring menu is "OK", signifying that there are no alarms present. If this is the case, verify that the relay output is set to normally closed for an alarm condition. Remove power from the SZ1145. Remove the wires (or terminal block) from terminals "NO" to "COM". Measure W from terminals "NO" to "COM". If the reading is 0W, the mechanical relay is defective.

Wrong Temperature Display

If either of the four temperature input readings is slightly high or low +/- 5°F, they can be adjusted. The "T1" input adjustment pot is labeled "T1" and so on. You should also

remove the wires from (or terminal block) from terminals "T1" to "T1", etc., and measure Ω on the wires. The sensor will read 1000 Ω at 32°F (0°C). The sensor has a positive temperature coefficient and the reading will change 2.16 Ω per °F. If the actual temperature was 70°F the reading would be 1082 Ω (refer to Appendix C – Temperature Resistance Conversion). Using this knowledge, you can determine whether the problem is with the controller or sensor, or a wiring problem.

Wrong Analog Input Display

If either of the two analog input readings is slightly high or low, the respective Low and High scaling limits can be adjusted slightly. Let's say that the AI1 value is 5°F low and AI1 has a span from -40°F to 160°F. Change the scaling for the Low and High Limits to be -35°F to 165°F, instead of -40°F to 160°F. You can also measure DC voltage from "AI1" to "C" and "AI2" to "C". The 4 to 20mA inputs are represented as 1 to 5VDC signals here. Using this knowledge, you can determine whether the problem is with the controller, your input device, or a wiring problem.

5.3 Motion Sensor, Honeywell IS2535 Description



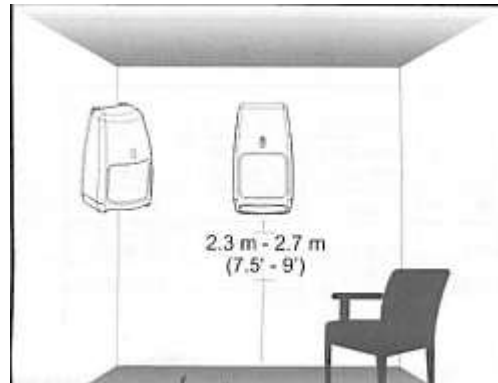
Motion Sensor, Honeywell IS2535

The Honeywell IS2535 IntelliSense Passive Infrared Motion Sensor is capable of detecting motion.

5.4 Motion Sensor, Honeywell IS2535 Installation

Note

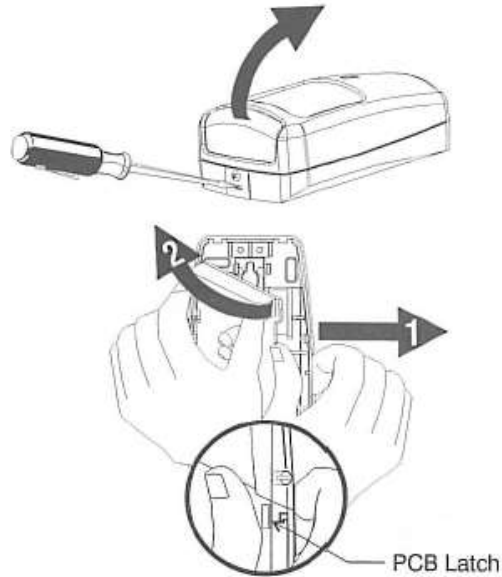
Check Item 10, Appendix B – Special Environmental Requirements



Motion Sensor Mounting Location Diagram

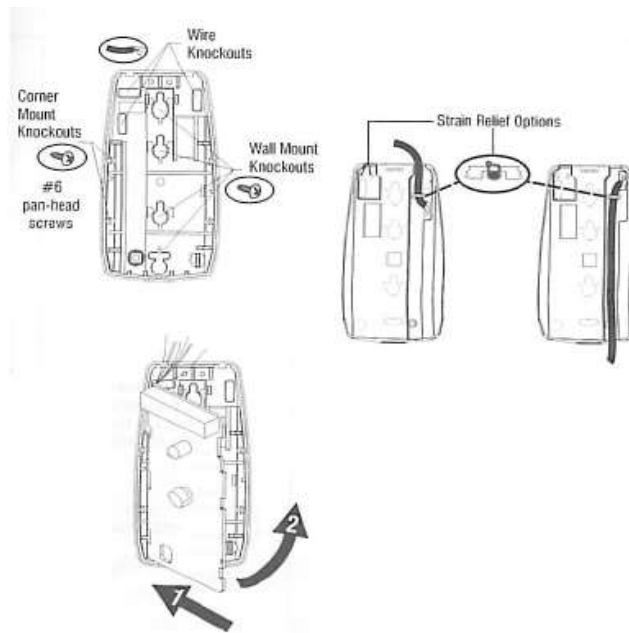
Mounting

1. Select the mounting location using criteria in the diagram above:
 - Mounting height should be 7.5 to 9.0 feet.
 - Avoid direct or reflected sunlight.
 - Aim sensor away from windows or heating/cooling devices.
 - Sensor must have a clear line-of-sight to protected area.
 - If using in a non-pet application, remove the Pet immune lens and replace with the High Security lens.



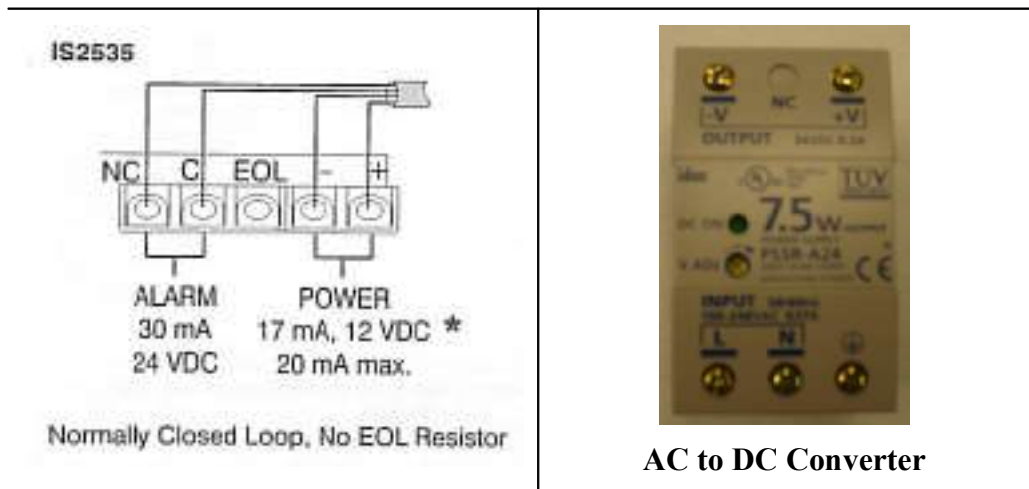
Printed Circuit Board Removal Diagram

2. Refer to above diagram and following instructions to separate the housing and remove printed circuit board (PCB).
 - a. Use a small screwdriver to remove the cover screw (if installed).
 - b. Push in the housing latch at the bottom of the sensor.
 - c. Gently pull apart the housings.
 - d. Push outward on the PCB latch and lift the PCB out of the housing.



Motion Sensor Mounting Diagram

3. Mount the unit as shown in the above diagram:
 - a. Slide the wire through the wire knockouts in the back housing.
 - b. Attach the wire with a wire tie.
 - c. Cut off the excess wire tie.
 - d. Mount the back housing flat against a wall or in a corner using #6 screws supplied. (Note: If using a mounting bracket, follow the instructions supplied with the bracket.)
 - e. Replace the PCB.
 - f. Seal any openings with RTV compound.

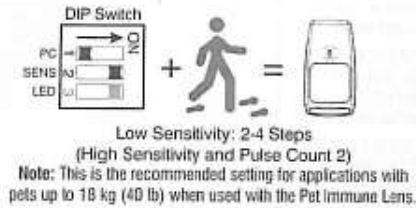
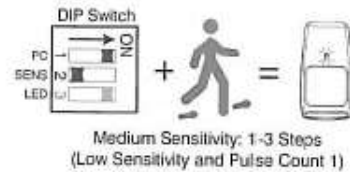
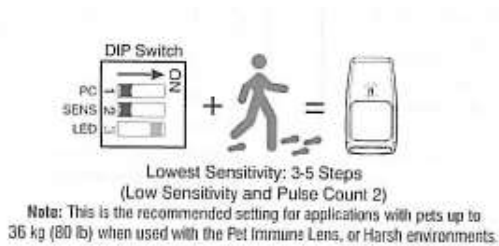


IS2535 Terminals and AC to DC Converter

Connections

Refer to above diagram. Observe proper polarity and connect wires to terminal as shown using wire size 22 – 16 AWG. Connect indoor motion sensor IS 2535 and AC to DC Converter as follows:

1. Connect IS 2535, terminal C to TCS SZ1145 controller, terminal C.
2. Connect IS 2535, terminal NC to TCS SZ1145 controller, terminal DI1 or DI2.
3. Connect AC to DC Converter, terminal -V to IS 2535 negative (-) terminal.
4. Connect AC to DC Converter, terminal +V to IS 2535 positive (+) terminal.
5. Connect 120VAC, green wire to AC to DC Converter, ground terminal.
6. Connect 120VAC, white wire to AC to DC Converter, terminal N.
7. Connect 120VAC, black wire to AC to DC Converter, terminal L.



Note: For High Security applications, use the High Security lens, disable the LED (S3=OFF), and set the sensitivity to High (S1 and S2=ON).

Motion Sensor Sensitivity Settings Diagram

Motion Sensor, Honeywell IS2535 Checkout

Set the sensitivity appropriate for the application (see options in above diagram).

1. Replace the front cover.
2. Apply power to the sensor.
3. Begin walk-test after the LED stops flashing.
4. Walk through the detection zones and observe the sensor's LED whenever motion is detected. The red LED shows actual alarm relay operation.

Note

The absolute range of all Passive Infrared (PIR) units is subject to variation because of different types of clothing, backgrounds, and ambient temperature. For this reason, make sure that the most likely intruder routes are well within the PIR's detection zones and that walk-testing is carried out along those routes.

5.5 Motion Sensor, Aleph CM360-18 Description



Motion Sensor, Aleph CM360-18

The Aleph CM360 ceiling mount sensor is a dedicated high ceiling, omniview, PIR Intrusion Detector. Each model allows the choice of four independent dual pyro detection patterns: 90°, 180°, 270°, or 360°. Intrusion detection is indicated via four independent LEDs (one per quadrant). With selectable Pulse Count and Sensitivity adjustments, the CM360 allows absolute detection in extreme security applications.

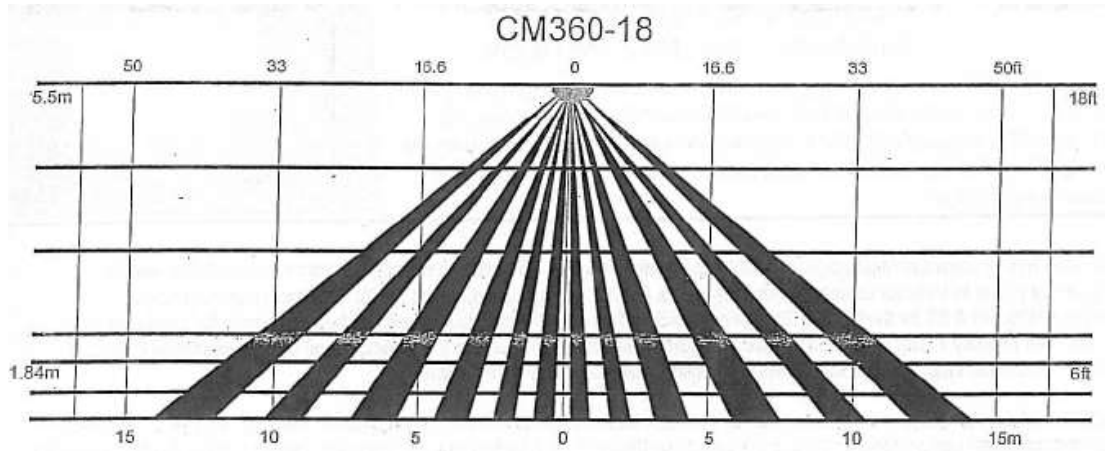
5.6 Motion Sensor, Aleph CM360-18 Installation

Note

Check Item 14, Appendix B – Special Environmental Requirements

Caution

The CM360 is for indoor use only. Do not mount in open or outdoor areas. Avoid installations where the detector directly views heating, cooling, sun, or automobile headlight sources. Do not mount in areas where water or oil vapors are present. Avoid mounting so that screens or curtains are blocking the detector's field of view.



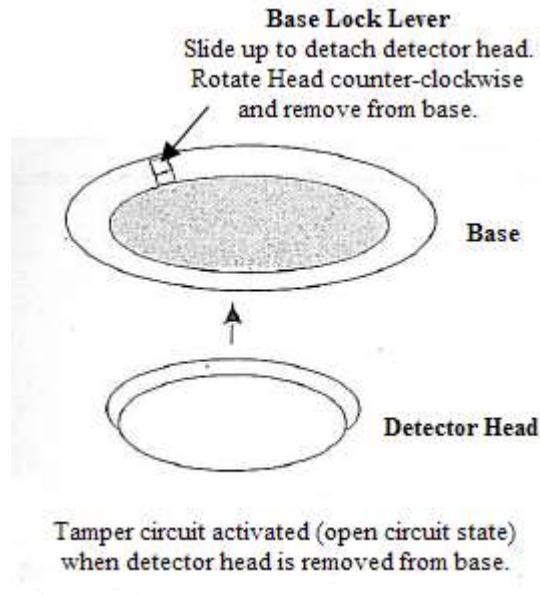
Detection Pattern Radius

Mounting Height	/	Detection Area
18ft / 5.5m	=	40ft / 12.1m radius
15ft / 4.7m	=	28.3ft / 8.7m radius
13ft / 4m	=	23.3ft / 7.1m radius
11ft / 3.3m	=	18.3ft / 5.5m radius
9ft / 2.8m	=	13.3ft / 4m radius
7ft / 2.1m	=	8.3ft / 2.5m radius

Mounting Height vs Detection Area

Mounting

1. Refer to diagram and table above. Determine the type of coverage required (90° to 360°) and select mounting orientation to match. Detection area is determined by mounting height. Maximum mounting height is 18 feet. For correct detection, a level ceiling is required.

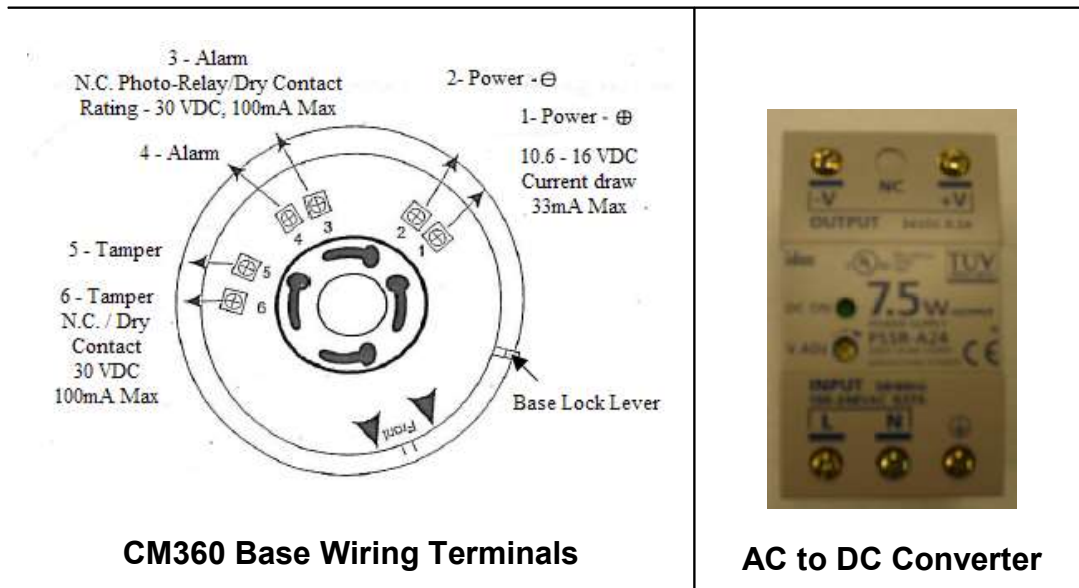


Detector Head Detached From Base

2. Separate the base assembly from the detector head by sliding the base lock lever away from the sensor and rotating the detector head counter-clockwise to the short mark on the base.
3. When rotation movement is completed, pull head away from the base.
4. Use three screws to secure the base to the selected location.

Note

The CM360 requires a power supply of 10.6 to 16 VDC. Maximum current draw is 33mA (16mA nominal). Use 24-18 gauge non-shielded, four conductor wire material for all wiring connections. Do not run wiring parallel, in close proximity to existing AC wiring. For UL installations, all wiring must be in accordance with NEC, NPFA 70 standards.



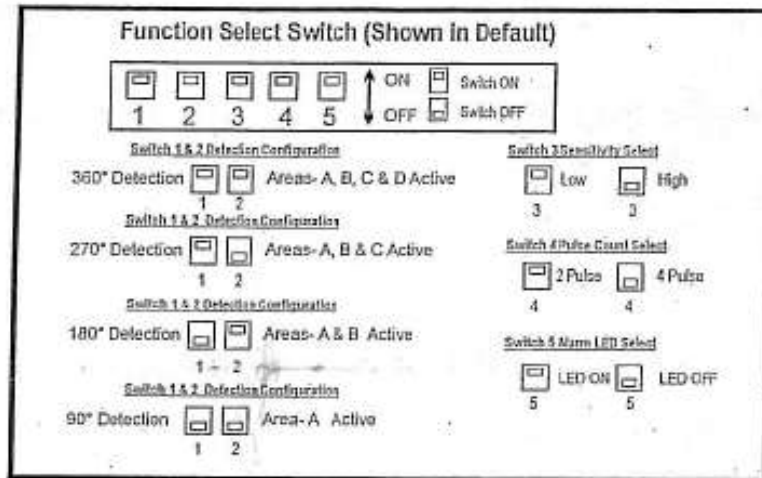
CM360 Base and AC to DC Converter

Connections

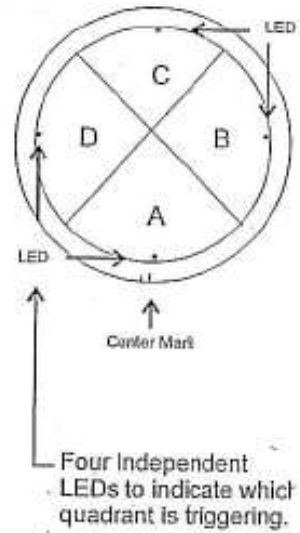
Refer to above diagram to make the wiring connections. Observe proper polarity and connect wires to terminal indicated using wire size 24 – 18 AWG. Connect indoor motion sensor CM360 and AC to DC Converter as follows:

1. Connect Aleph CM360, terminal 4 to TCS SZ1145 controller, terminal C.
2. Connect Aleph CM360, terminal 3 to TCS SZ1145 controller, terminal DI1 or DI2.
3. Connect AC to DC Converter, terminal -V to Aleph CM360 negative (-) terminal 2.
4. Connect AC to DC Converter, terminal +V to Aleph CM360 positive (+) terminal 1.
5. Connect 120VAC, green wire to AC to DC Converter, ground terminal.
6. Connect 120VAC, white wire to AC to DC Converter, terminal N.
7. Connect 120VAC, black wire to AC to DC Converter, terminal L.

Function Select Switch Settings



Detection Pattern Layout



Function Select Switch Settings Diagram

Switch Configuration Settings

Refer to above diagram. Make appropriate switch configuration settings (Detection Area type, Sensitivity, Setting, Pulse Count selection, and LED enable).

- A Pulse Count setting of 4 should be appropriate for installations at standard mount heights.
- Where a quick catch is required (or in smaller installation areas) select Pulse Count 2. Additional Catch performance can be gained by switching the Sensitivity Switch to High. A High Sensitivity setting lowers the alarm threshold level for a detection.
- The LED switch enables / disables all LED functions.

When completed, reattach head to base and re-secure Latch Lock lever.

Checkout

After installation is complete, perform a walk test to ensure that detection is matching the desired coverage. Readjust settings if detection characteristics need improvement. Only one quadrant can be in alarm at any given time. For multi-quadrant configurations, make sure there is no other activity within the scope of detection during walk test. After initial walk test, the security system should be tested routinely to ensure correct operation. At a minimum, the system needs to be tested once per year.

Note

The CM360 is designed to be incorporated into an overall

alarm system. As it is part of the system, Aleph cannot assume responsibility for theft or damage if the system fails to operate.

Troubleshooting

Trouble	Cause	Remedy
Unit does not power up. Unit does not warm up. (LED continues to flash 30 sec after power up.	No or low input power	Apply proper input voltage.
	Input power polarity reversed.	Correct wiring polarity
	The sensor head to base connection is faulty	Reset head to base connection
Alarm LED does not light up.	Select Switch 5 is set to "OFF".	Set to "ON" / up.
	"Detection Area" settings incorrect.	Reset Switch 1 & 2 to match coverage area and/or remount sensor.
	Incorrect Sensor Mounting height.	Increase mounting height. Low mounting heights reduce detection area.
	Sensitivity / Pulse Count Settings incorrect for secured area.	Reset Switch 3 & 4 to match detection characteristics required.
Alarm LED / Relay triggers without movement in detection area.	Unsecured environment; animals or rodents in detection area.	Block access of animals or rodents
	Heater / Air conditioning equipment in sensor view.	Remove the hazard equipment. Re-aim sensor so it is not viewing the equipment.
	Direct Sun or headlights in sensor view.	Add curtain / shade to block light sources.
LED indicates Alarm when no alarm output.	Incorrect wiring at base / alarm output terminals.	Correct the wiring fault.
	Open circuit in wiring between detector and control panel.	Replace or repair wiring.
	Lightening damage to detector.	Replace detector.
Alarm LED on constantly when no fault in protected area or wiring.	Abnormal supply voltage.	Ensure that there is correct voltage (10.6 to 16 VDC) at power terminals.

Testing and Maintenance

Inspection

An inspection of the CM360 should be made periodically, consisting of, but not limited to all mounting, wiring, and the condition of the interior components.

Cleaning

Clean the plastic parts of the CM360 with a soft, clean, damp, cloth.

Testing

The CM360 should be tested routinely for proper operation. At a minimum, the unit's operation needs to be fully checked yearly.

5.7 Indoor Lumen Sensor, MK7-B-CCF-VTI Description



Indoor Lumen Sensor, MK7-B-CCF-VTI

The MK7-B-CCF-VTI is an interior ambient light detector which contains a precision photodiode-type cell. It is capable of detecting light levels up to 250ft. candles. It is powered by 15VDC and has a 0-5V output range. The sensor must be connector using three-conductor shielded twisted 18AWG plenum wire. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

5.8 Indoor Lumen Sensor, MK7-B-CCF-VTI Installation

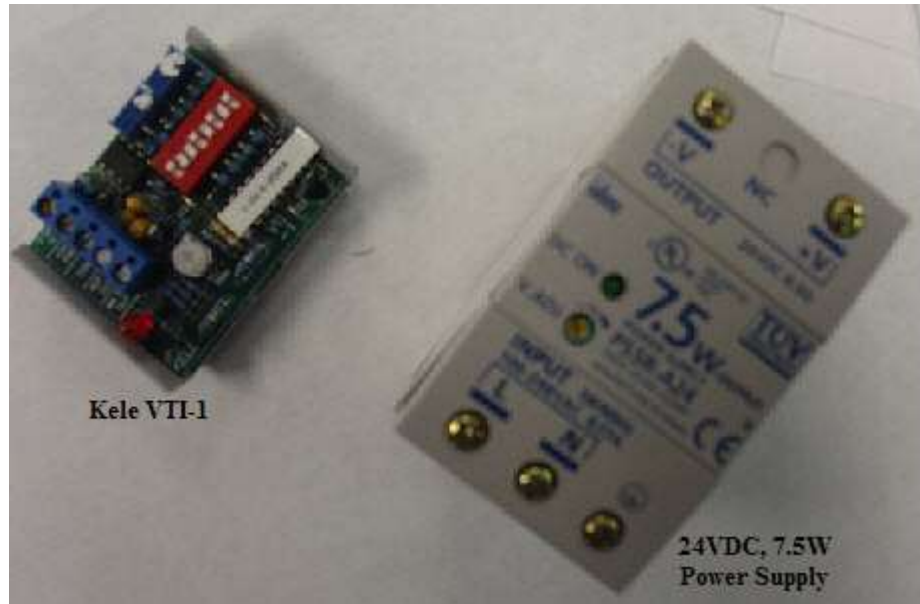
Note

Check Item 12, Appendix B – Special Environmental Requirements

The installation of this sensor applies to types A and B.

Mounting

1. Mount the indoor lumen sensor in a 3/8" hole in the false ceiling tile using the adhesive backing. For most general applications, the sensor should be mounted between 6-8 feet of the window area, central to the area illuminated by the electrical lighting that will be controlled. In all cases the sensor must be mounted so that it looks at reflected light only and not at any direct light.
2. Mount the voltage and current converter/rescaler Model VTI-1 at a location that is convenient for connecting the sensor wires.



Kele VTI-1 and 24VDC, 7.5W Power Supply

Connections

To prevent electrical shock, disconnect power coming from the controller prior to hookup. Wiring from the sensor to the controller should be with 20 or 22 gauge stranded wire. Do not run the low voltage wire with or near power wiring. For long wire runs, run the low voltage wire using shielded cable or cable in conduit. Cable length should not exceed 500ft. Wire the sensor to the appropriate analog part of the controller according to the controller manufacturer's instructions. Connect indoor lumen sensor, interface board VTI-1, and AC to DC Converter as follows:

1. Connect output from VTI-1, MA SIG OUT to TCS SZ1145 controller, IN1 or IN2 terminal.
2. Connect black wire from sensor to VTI-1, COM terminal.
3. Connect yellow wire from sensor to VTI-1, V SIG IN terminal.
4. Connect red wire from sensor to VTI-1, +24V PWR terminal.

5. Connect AC to DC Converter, terminal V- to VTI-1, COM terminal.
6. Connect AC to DC Converter, terminal V- to TCS SZ1145, C terminal.
7. Connect AC to DC Converter, terminal V+ to VTI-1, +24V PWR terminal.
8. Connect 120VAC power, green wire to AC to DC Converter, ground terminal.
9. Connect 120VAC power, white wire to AC to DC Converter, N terminal.
10. Connect 120VAC power, black wire to AC to DC Converter, L terminal.

Indoor Lumen Sensor, MK7-B-CCF-VTI Checkout

To be determined

5.9 Water Temp Sensor, TCS TS1005 Description



Water Temp Sensor, TCS TS1005

The TS1005 is a 1000 Ω RTD that is required to be mounted in accordance with the strap on mount provided. It is expected to be wired back using two-conductor stranded shielded 18awg plenum wire to the TCS SZ1145 controller that is able to read the temperature as shown in the design drawing. It is recommended that wire runs be no farther than 250 ft. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

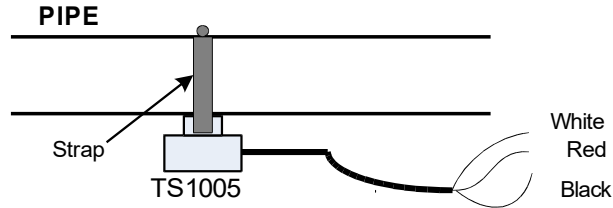
5.10 Water Temp Sensor, TCS TS1005 Installation

Note

Check Item 7, Appendix B – Special Environmental Requirements

Mounting

The TCS TS1005 sensor has a 5” pipe strap. The strap on mount sensor is designed to mount on a pipe. By punching out the standard ½” knock outs, conduit can be added if required.



Connections

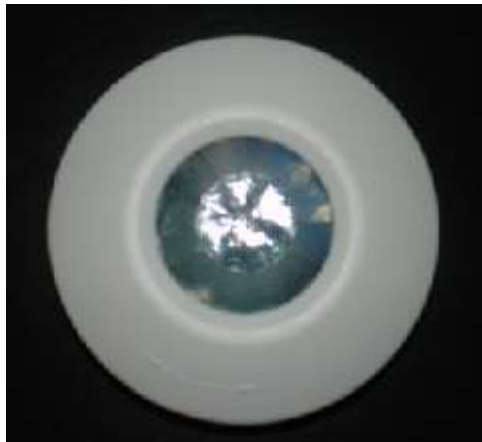
Connect the sensor wires (no further than 250 feet) to the TCS SZ1145 as follows:

1. Connect white and red wire together to one terminal of either T1 through T4.
2. Connect black wire to the other terminal of either T1 through T4.

Water Temp Sensor, TCS TS1005 Checkout

To be determined

**5.11 Motion Sensor, Ademco 997 Ceiling PIR
Description**



Motion Sensor, Ademco 997 Ceiling PIR

The Ademco 997 passive infrared (PIR) motion detector is a ceiling-mounted unit employing a 360°, 31 zone Fresnel lens and offering an efficient protection pattern for commercial and residential applications. The detector senses sudden and slight changes in temperature with the area of detection; thus, when an intruder crosses or enters any zone, the resulting change in infrared energy is detected for alarm reporting. The detector features installer-selectable Alternate Polarity Pulse Count, which provides protection against false alarms, and an LED enable/disable feature (installer-selectable).

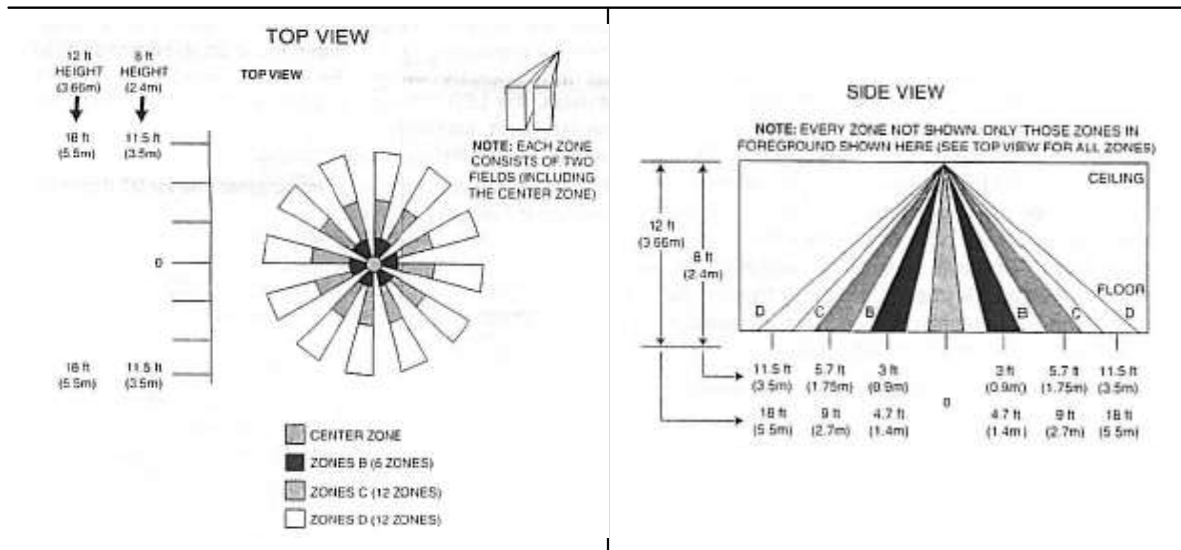
5.12 Motion Sensor, Ademco 997 Ceiling PIR Installation

Note

Check Item 15, Appendix B – Special Environmental Requirements

Installation Hints

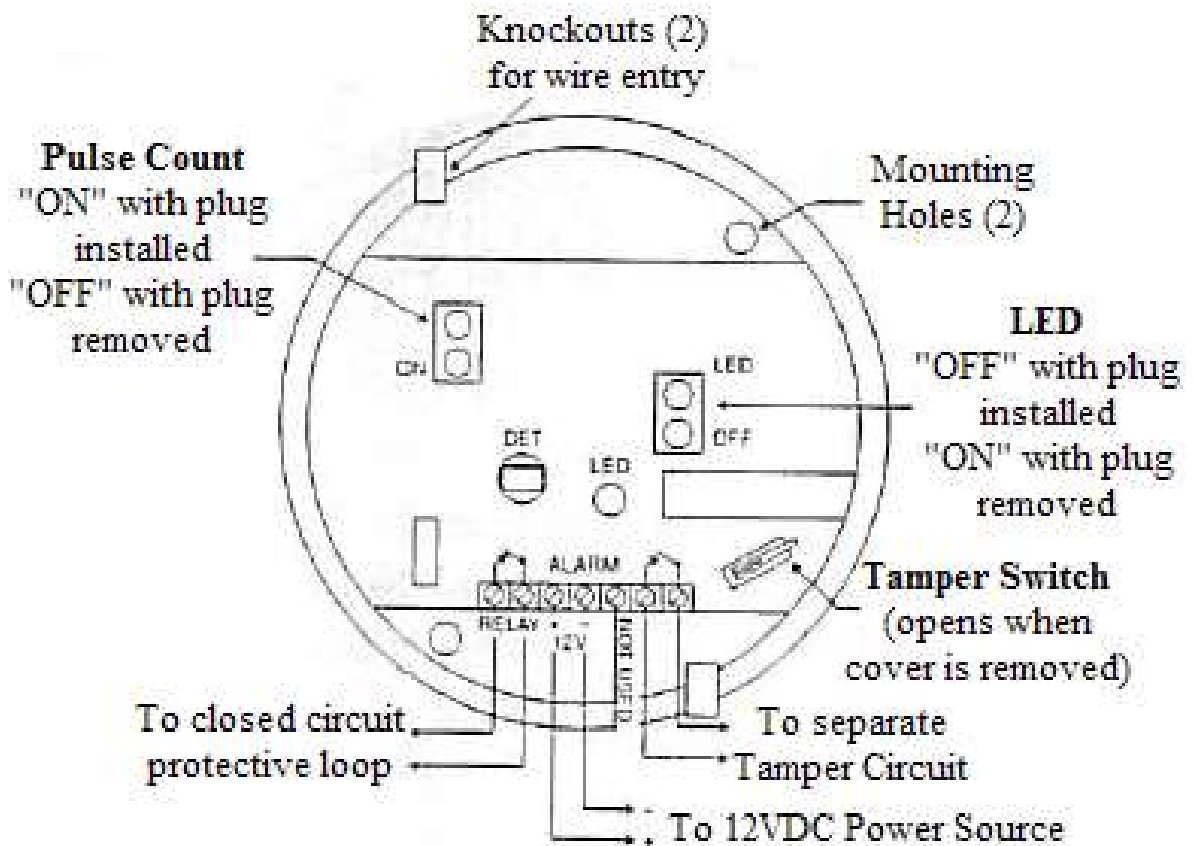
- Do not install where the detector is exposed to direct sunlight or directly above strong sources of heat.
- Make sure the detection area does not have obstructions (curtains, screens, large pieces of furniture, plants, etc.) that may block the pattern of coverage.
- Avoid locating a detector in areas that contain objects likely to produce a rapid change in temperature, such as central heating, radiators or ducts (or heaters of any kind), air conditioners, open flame, etc.
- Do not mount on unstable surface.
- Avoid running alarm wiring close to heavy-duty electrical power cables.



Detection Area – Standard Lens

Protection Patterns

The PIR's protection pattern with the standard lens is shown in diagram above.



Optimum Mounting Orientation

Mounting

The ceiling on which the PIR is to be mounted must be firm and vibration-free.

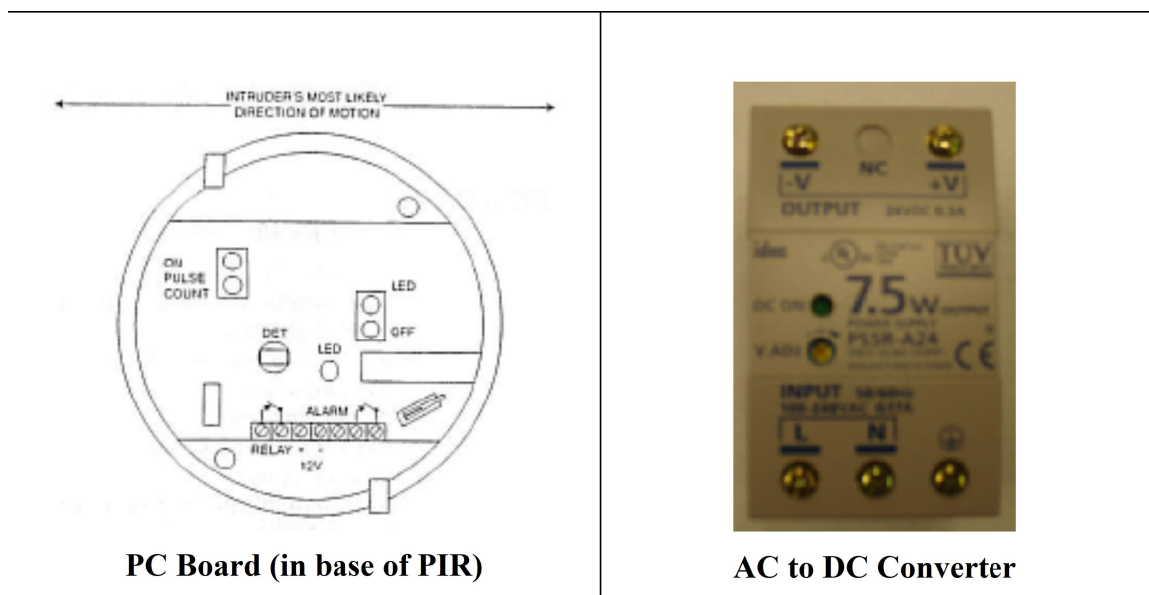
Select a location that will provide the coverage desired for the standard lens in use. Wiring (from the control, etc.) to be connected to the PIR should be brought to this location. The ceiling wiring hole should be no more than 5/16 inch (8mm) in diameter.

1. Remove the cover from the PIR by pressing it in gently and turning it counterclockwise (to the left).

Note

Refer to the Optimum Mounting Orientation diagram above. Mount the PIR in such a manner that the likely path of an intruder is in the direction shown. This will ensure maximum effectiveness of the Alternate Polarity feature.

2. Break out one of the two knockouts that have been provided for wire access and pass the wires into the base of the PIR. Make certain that wires do not obstruct the detector's field of view.
3. Use two screws in the mounting holes to secure the PIR to its location.
4. Mount the AC to DC Converter in a convenient location.



PC Board (in base of PIR)

AC to DC Converter

Mounting and Connecting Components of the PIR

Connections

1. Refer to PC Board and AC to DC Converter diagrams to make the wiring connections. Observe proper polarity and connect wires to terminal indicated using wire size 24 – 18 AWG.

*** CAUTION: The Ademco 997 must not be set at more than 12VDC.
If set at more than 12VDC the resistor may burn out.**

2. Connect AC to DC Converter, terminal -V to Ademco 997 negative (-) terminal.
3. Connect AC to DC Converter, terminal +V to Ademco 997 positive (+) terminal.
4. Connect 120VAC, green wire to AC to DC Converter, ground terminal.
5. Connect 120VAC, white wire to AC to DC Converter, terminal N.
6. Connect 120VAC, black wire to AC to DC Converter, terminal L.
7. Connect Ademco 997, terminal C to TCS SZ1145 controller, terminal C.
8. Connect Ademco 997, terminal RELAY to TCS SZ1145 controller, terminal DI1 or DI2.
9. Seal all openings in the base with foam or RTV (not supplied) to prevent drafts or insects from entering the unit.

Checkout

Note

Two minute warm-up time is required after applying power. Testing should be conducted with the protected area cleared of all people. Disarm the protective system's control during the test procedure to prevent reporting of unwanted alarms.

1. Remove the Pulse Count jumper to provide instant response to a walk-test.
2. Remove the LED jumper to enable the Alarm LED.

Note

To prevent the loss of the jumpers, install the jumper on one pin when the jumper is not in use.

3. With the cover installed on the PIR, walk through the protective zones, observing that the PIR's LED lights whenever motion is detected (LED serves as a walk-test indicator during this procedure).

Note

With Pulse Count “OFF” (instant), the LED stays lit (and the alarm relay contacts remain open) for approximately one to three seconds after detecting motion.

- If pulse count is to be used in this installatio, install thee pulse count jumper plug on the pulse count pins, and repeat the walk test procedure. With pulse count “ON,” the LED serves as an alarm indicator.

Note

The absolute range of all PIR units is subject to variation because of different types of clothing, backgrounds, and ambient temperature. For this reason, ensure that the most likely intruder routes are well with the PIR’s protective zones and that walk-testing is carried out along these routes.

- After the walk-test is complete, the LED may be disabled if desired (LED enable/disable plug installed).

Troubleshooting

Trouble	Cause	Remedy
Intermittent Alarm (LED operative).	Rapid temperature change. Check for electric or gas heaters, open flames, electric arcs, etc.	Locate source and reposition detector if necessary.
	Drafts causing drapes, light fixtures, display material to move.	Eliminate source of motion.
Intermittent or continuous alarm	DC voltage supplied to detector is inadequate, intermittent or polarity reversed.	Ensure that proper polarity and adequate voltage is supplied and that wiring is intact (no opens or shorts) and connections secure.
	Protective loop is interrupted (open).	Determine whether interruption is in protective loop wiring or at a detector’s alarm relay contacts. Disconnect protective loop at detector relay contact terminals and check continuity across terminals. If absent at terminals (and proper voltage is supplied to the

		detector), return unit for service. If present, check protective loop wiring.
LED inoperative	LED enable/disable jumper is installed	Remove LED enable/disable jumper.
	LED malfunction. Check for broken/shorted leads.	Return unit for service.
No alarm when motion takes place in the protected area (LED does not light)	Detection area has changed; possibly due to repositioned furniture or equipment in the protected area.	Caution customer about layout changes.
	Lightening damage to detector.	Replace detector.

Maintenance

- In order to maintain the detector in proper working condition, it is important that the following be observed by the user.
- Power should be provided at all times. Loss of power to the unit will result in the alarm contacts reverting to an alarm state. The unit's DC source should have standby power available for at least four hours of operation during emergencies.
- Units should never be relocated without the advice or assistance of the alarm service company.
- The physical surroundings of the protected area should not be changed. If furniture or stock is moved, or air-conditioning or additional heating is installed, the system may have to be readjusted by the alarm service company.
- Walk-tests should be conducted frequently (at least weekly) to confirm continued proper coverage by each detector.

To the installer

Regular maintenance and inspection (at least annually) by the installer and frequent testing by the user are vital to continuous satisfactory operation of any alarm system. The installer should assume the responsibility of developing and offering a regular maintenance program to the user, as well as acquainting the user with the proper operation and limitations of the alarm system and its component parts. Recommendations must be included for a specific program of frequent testing (at least weekly) to ensure the system's operation at all times.

5.13 Motion Sensor, GE Security AP669 Description



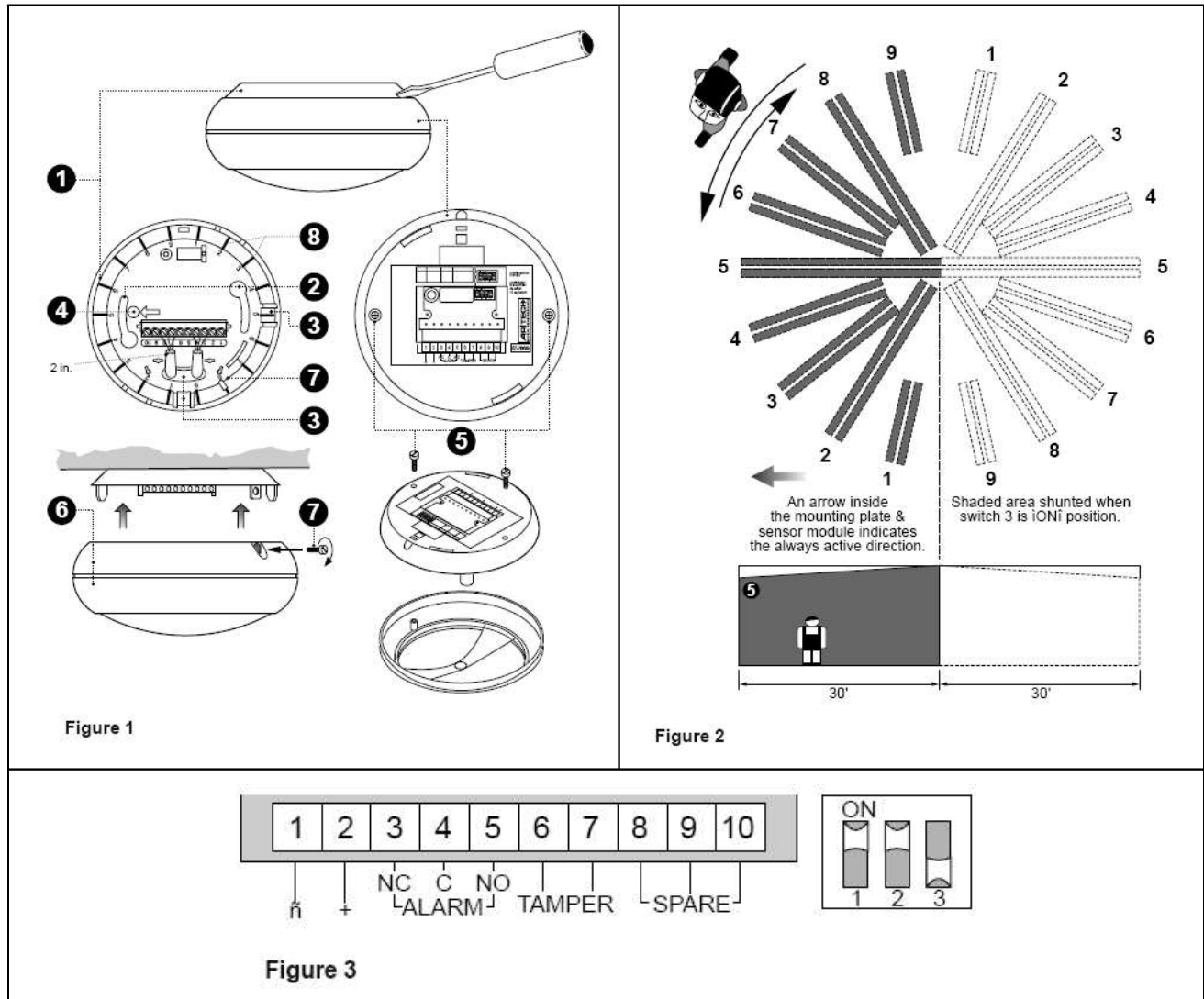
Motion Sensor, GE Security AP669

The AP Series Ceiling Mount PIR with Dual Optic Technology (DOT) combines two independent pyros, two individual ASICs and two 180 mirror segments that offer two independent 180 fields of vision. This design allows the detector to substantially advance the overall volume of its coverage zone, providing excellent detection performance and improved false alarm immunity. Unlike other ceiling-mount PIRs, the AP669 exclusive mirror optical system yields 18 solid curtains that flood the whole room with monitoring. Features and Benefits Uses Dual Optic Technology (DOT) Two 180 mirror segments, two pyros and also two ASICs for pristine detection and advanced false alarm protection Features AP Series Adaptive Passive Infrared Technology 60-ft. diameter 360deg zone coverage 18 full curtains offer superior detection at any mounting heights (8-16) Head and base type unit adjusts 15 in either direction for easier targeting 180 shunt provides ability to use only one-half of the units vision when necessary.

5.14 Motion Sensor, GE Security AP669 Installation

Note

Check Item 16, Appendix B – Special Environmental Requirements



Mounting Instructions

- Lift off mounting plate (1) as shown in Figure 1. Fasten the mounting plate to the ceiling in the required position using mounting holes (2). The detection pattern can be adjusted by up to $\pm 15^\circ$ (max 30°) by rotation of the mounting plate prior to tightening the screws.
- Strip outer jacket approximately 2 inches (50mm) and pull it through the cable entry hole (3) and strain relief.
- Wire the detector and select the appropriate processing options as shown in Figure 3 and replace the sensor module (6).
- To mount the sensor module to the mounting plate use the screw (7) which is placed for transport in the mounting plate.

The curtain directions 1-9 clockwise (8), are indicated in the mounting plate. (Curtain number 5 is the center curtain.)

Selecting a Mounting Location

Install the detector so that the expected movement of an intruder will be across the fields of view. This is the direction best suited for PIR detectors.

Avoid possible false alarm sources such as:

- Direct sunlight onto the detector.
- Heat/cold sources in a field of view (heaters, air conditioning, radiators, etc.).
- Moving objects in the field of view (fans, pets, etc.).

Increasing mounting heights beyond the specified range will reduce sensitivity.

Switch	Description	On	Off
1	LED enable	LED on	LED off
2	Processing	Bi-curtain	Standard-4D
3	Detection pattern	180°	360°

Connection and Programming

Switch 1: Programming the LED

ON LED enabled

OFF LED disabled

Switch 2: Programming the processing

ON Enables Bi-curtain processing designed for harsh environment.

OFF Provides the standard 4D processing.

Switch 3: Programming the detection pattern

ON Provides a 180° field of view for special applications.

OFF Gives the normal 360° field of view.

Note

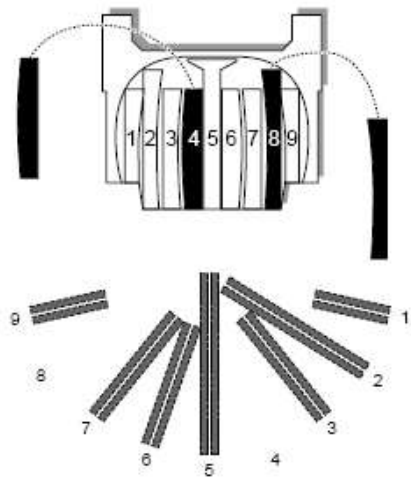
An arrow in the mounting plate (4) (see Figure 1 and Figure 2) and inside the sensor module shows the always active coverage pattern. The coverage pattern opposite to the arrow can be disabled by setting switch 3 in the “ON” position.

Access to the Mirror Inside the Sensor Module

This access is only required when masking individual curtains.

Undo the screw (5) and open the sensor module (6) (see Figure 1). The two mirrors are accessible now.

Masking Coverage Patterns



Field of View

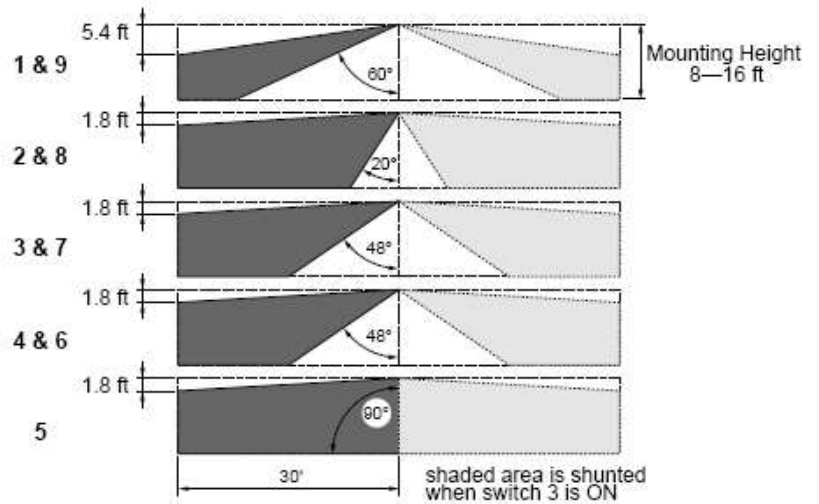


Figure 4

Selecting the Coverage Patterns

Mask the appropriate mirror curtains with the adhesive labels provided and reassemble the sensor module. For example, see Figure 4 for mirror curtain coverage pattern corresponding to curtain 4 and 8 masked.

Mounting Height Application Note

When increased mounting heights are used outside the specified mounting height range of 8 - 16 ft (2.4 - 4.8m), sensitivity will be reduced.

5.15 Duct Air Humidity Sensor, TCS TH1111 Description



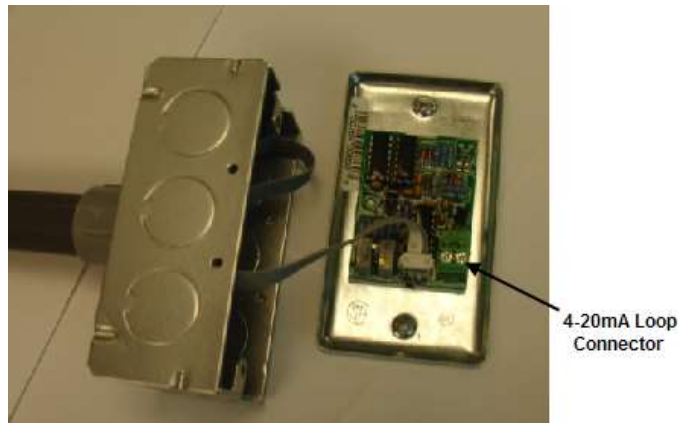
Duct Air Humidity Sensor, TCS TH1111

The TH1111 is a duct mount relative humidity sensor that can read humidity from 0-100%. It is loop powered with a 4-20mA output. It is accurate within +/-1%. It is to be connected to an applicable power supply providing 13-35VDC. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

5.16 Duct Air Humidity Sensor, TCS TH1111 Installation

Note

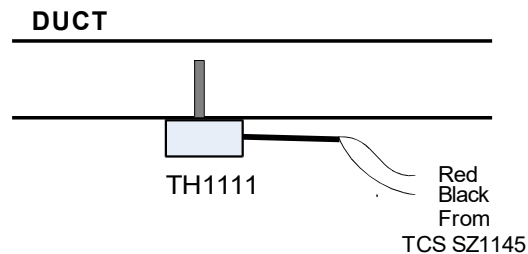
Check Item 8, Appendix B – Special Environmental Requirements



Duct Air Humidity Sensor, TCS TH1111 Mounting Box

Mounting

The TCS TH1111 is required to be mounted in accordance with the duct mount provided. It is expected to be wired back using two-conductor stranded shielded 18awg plenum wire to the TCS TS1145 controller to monitor the duct's relative humidity. It is recommended that wire runs be no farther than 250 ft. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:



Duct Air Humidity Sensor TCS TH1111 Connection Diagram

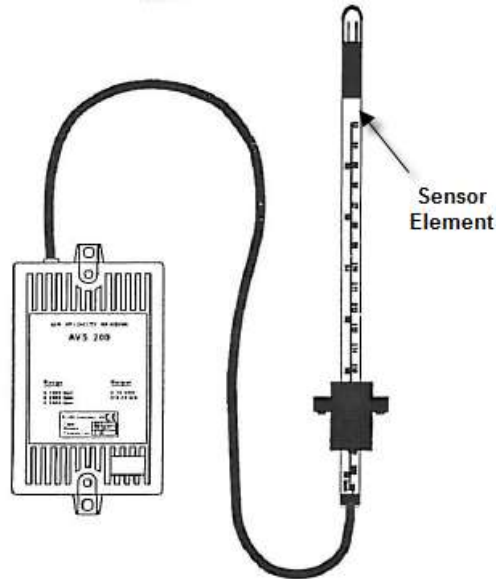
Connections

1. Connect the positive (+) terminal of the TH1111 loop connector to +P terminal of the TCS SZ1145 controller.
2. Connect the negative (-) terminal of the TH1111 loop connector to IN1 or IN2 terminal of the TCS SZ1145 controller. (For two TH1111s, the positive terminal of each will connect together to +P of controller. (The negative terminal of one TH1111 will connect to IN1 and the negative terminal of the second TH1111 will connect to IN2.)

Duct Air Humidity Sensor, TCS TH1111 Checkout

To be determined

5.17 Air Velocity Sensor, Kele AVS-200 Description



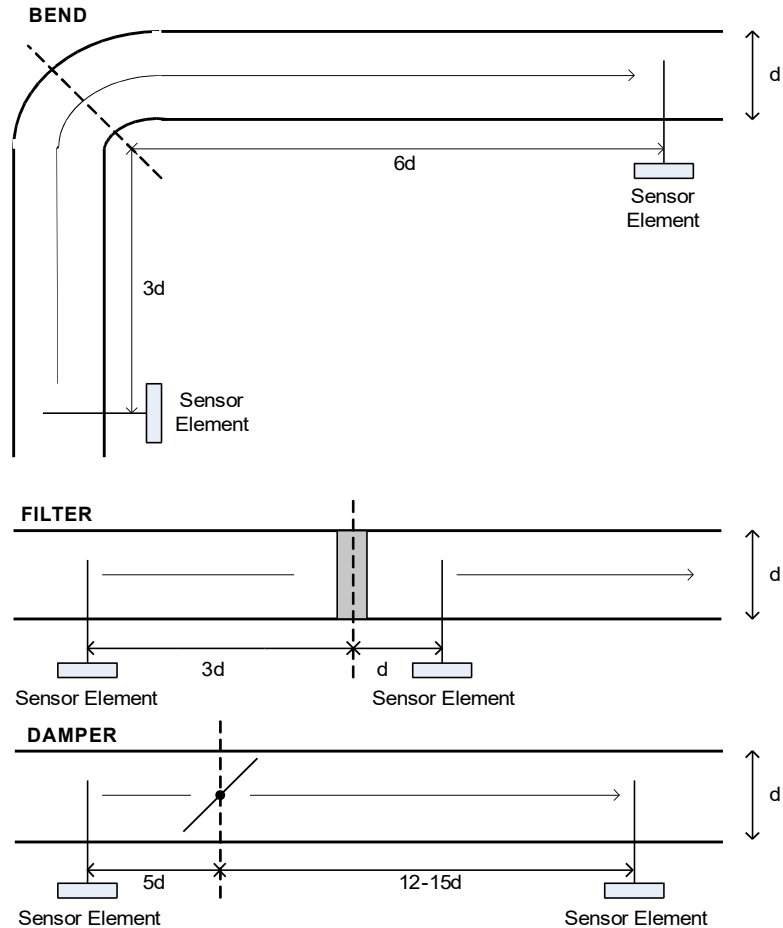
Air Velocity Sensor, Kele AVS-200

The AVS-200 is an electronic air velocity transmitter that has an adjustable probe to sense air velocity. The sensor is wired to a monitoring/transmitter device that has 4-20mA inputs. The device is powered by an external 24VAC power supply. The probe is required to be installed downstream of filters and coils. It is recommended to locate the sensor probe a minimum of three duct diameters upstream of any obstruction and a minimum of five duct diameters downstream. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

5.18 Air Velocity Sensor, Kele AVS-200 Installation

Note

Check Item 11, Appendix B – Special Environmental Requirements



Air Velocity Sensor, Kele AVS-200 Mounting Diagram

Caution

Do not place sensor element before filter and heater in system for inlet air as this can cause corrosion.

Mounting

1. Mount the sensor box to a flat surface near the location where the air flow is to be monitored. When mounting the sensor element, it should be surrounded by an even air flow and positioned with regard to the direction of flow as shown by the arrows on the sensor element holder. This means that it may be installed laying or upright, in a vertical or horizontal air stream.
2. Place the sensor element at least as far from the heater and cooling batteries or the humidifying equipment as normal duct temperature detectors. The sensor element should also be placed such that the distance to the nearest air disturbance (for example: bend, filter, or damper where d =diameter of duct) is at least in one of the locations for each example as shown in above diagram.

Connections

1. Connect 24VAC to terminals 1 and 2.
2. Connect common (minus) from +P of SZ2181 to terminal 3 of AVS-200. (Terminal 4 is not used.)
3. Connect Output current 0-20 mA or 4-20 mA of terminal 5 of AVS-200 to analog input terminals AI1 and AI2, or AI3 and AI4 of TCS SZ2181.

Air Velocity Sensor, Kele AVS-200 Checkout

To be determined

5.19 Duct Pressure Sensor, TCS TD1190 Description



Duct Pressure Sensor, TCS TD1190

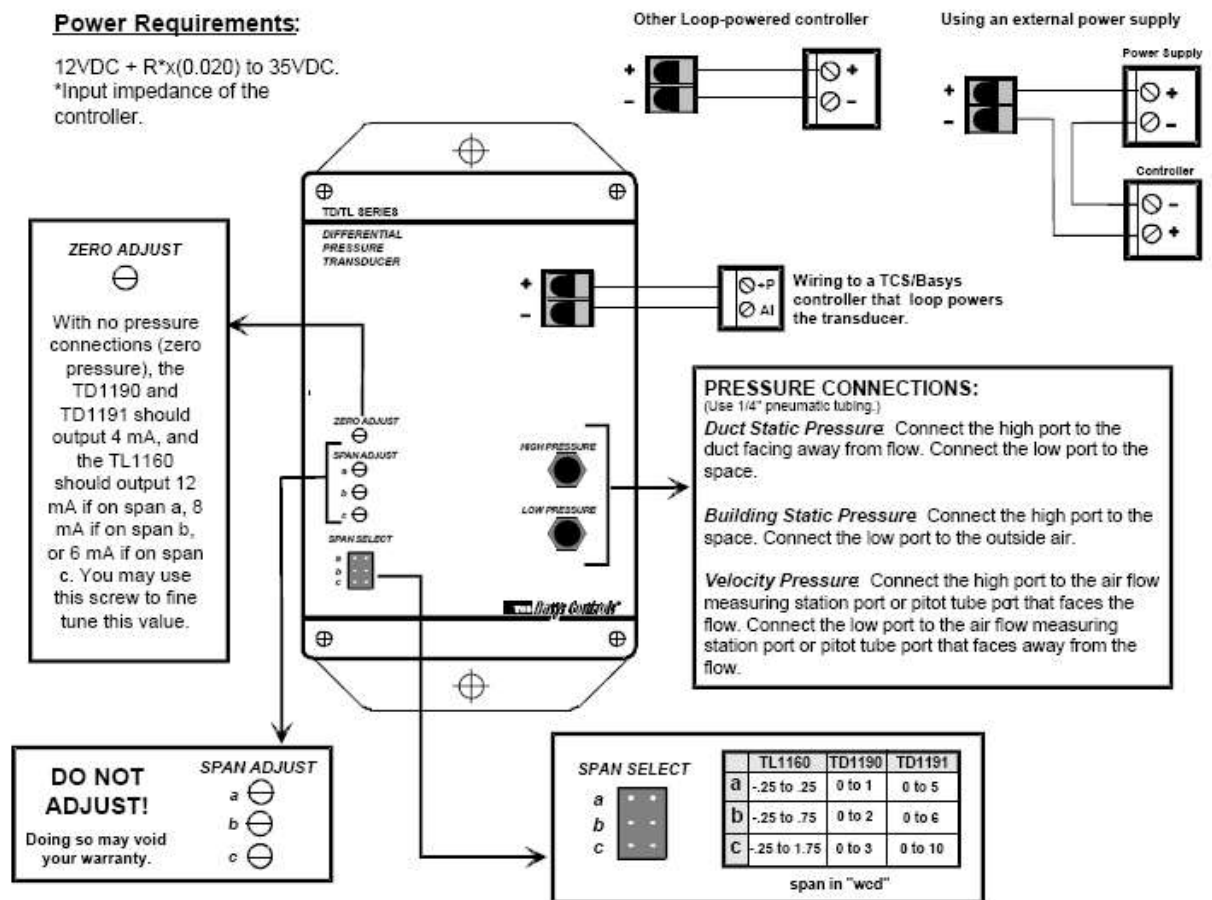
The TD1190 is a differential pressure transducer designed to provide accurate pressure measurements in the range of 0 to 1, 2, or 3" wcd. The TD1190 is designed for general air differential pressure sensing. It provides a two-wire, 4 to 20mA output that is linear

and proportional to the sensed differential pressure. It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

5.20 Duct Pressure Sensor, TCS TD1190 Installation

Note

Check Item 9, Appendix B – Special Environmental Requirements



Duct Pressure Sensor, TCS TD1190 Connection Diagram

Mounting and Connections

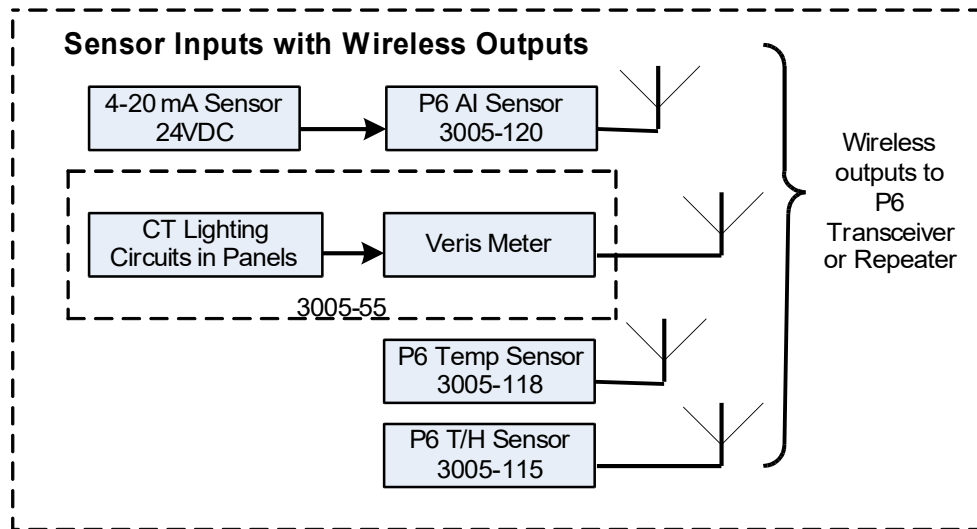
1. Mount the TD1190 to a flat surface with two sheet metal screws.
2. Connect 12VDC to 35VDC, to positive (+) and negative (-) connectors.

3. Use ¼” pneumatic tubing for dual static pressure connection of the high port to the duct facing away from flow.
4. Connect the low port to the space.

Duct Pressure Sensor, TCS TD1190 Checkout

To be determined

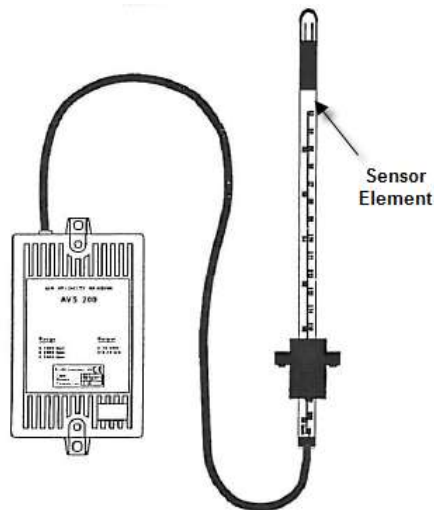
Section 6.0 - Sensor Inputs with Wireless Outputs



6.1 4-20 mA Sensor 24VDC Description



TCS PC1001



Kele AVS-200

4-20 mA Sensor 24VDC

Refer to above illustration. The 4-20 mA Sensor 24VDC will be either the CO₂ Sensor, TCS PC1001 or the Air Velocity Sensor, Kele AVS-200 sensing device. Refer to Section

4.0 for a description of CO₂ Sensor, TCS PC1001 and Section 5.0 for a description of Air Velocity Sensor, Kele AVS-200. Requirements for installation are as follows:

6.2 4-20 mA Sensor 24VDC Installation

Refer to Section 4.1 for installation instructions of CO₂ Sensor, TCS PC1001 and Section 5.1 for installation of Air Velocity Sensor, Kele AVS-200.

6.3 Point Analog Input Sensor, 3005-120 Description



Point Analog Input Sensor, 3005-120

The Point Analog Input Sensor is a battery operated 12-bit analog-digital converter with a microprocessor controlled 900 MHz FCC certified radio transmitter. The Point Analog Input Sensor communicates wirelessly with repeaters/receivers in range on the network with its own unique ID. The Point Analog Input Sensors are capable of receiving any 4-20mA output device then transmit the data wirelessly. (Communications on this product are wireless and therefore there is no communication wiring related to this product). It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

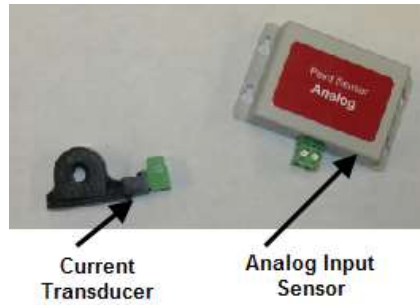
6.4 Point Analog Input Sensor, 3005-120 Installation

Note

Check Item 4, Appendix B – Special Environmental Requirements

Mount the Point Analog Input Sensor in a location that enables the sensor to transmit radio signals to the designated control units with no interference.

6.5 Point Power Monitor, 3005-55 Description



Point Power Monitor 3005-55

The Point Power Monitor wireless transmitter is a battery operated 12 bit analog-to-digital converter with a microprocessor controlled 418 MHz FCC certified radio transmitter. The Point Power Monitor communicates the current wirelessly with repeaters/receivers in range on the network with its own unique ID. (Communications on this product are wireless and therefore there is no communication wiring related to this product). It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

6.6 Point Power Monitor, 3005-55 Installation

Note

Check Item 4, Appendix B – Special Environmental Requirements

Mounting

Mount the Point Power Monitor in a location that enables the sensor to transmit radio signals to the designated receivers or repeaters with no interference.

Connections

Connect the output of the current transducer to the Point Analog Input (AI) Sensor as follows:

Warning

Turn off power before performing the following instructions.

1. At the lighting panel circuit breaker, disconnect one lead and insert the lead through the opening in the current transducer.
2. Position and secure the current transducer inside the lighting panel.
3. Reconnect the circuit breaker lead.
4. Connect the current transducer positive (+) terminal to the AI Sensor positive (+) terminal and the current transducer negative (-) terminal to the AI Sensor negative (-) terminal.

6.7 Point Temperature Sensor, 3005-118 Description



Point Temperature Sensor, 3005-118

The Point Sensor Temperature Sensor is a battery operated digital temperature sensor with a microprocessor controlled 900 MHz FCC certified radio transmitter. The Point sensor communicates the temperature wirelessly with repeaters/receivers in range on the network with its own unique ID. (Communications on this product are wireless and therefore there is no communication wiring related to this product). It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

6.8 Point Temperature Sensor, 3005-118 Installation

Note

Check Item 4, Appendix B – Special Environmental Requirements

Mounting

Mount the Point Sensor Temperature Sensor in a location that enables the sensor to transmit radio signals to the designated receivers or repeaters with no interference.

Note

Make sure that the antenna is secure.

6.9 Point Temp/Humidity Sensor, 3005-115 Description



Point Temp/Humidity Sensor, 3005-115

The Point Temp/Humidity Sensor is a battery operated digital temperature/humidity sensor with a microprocessor controlled 900 MHz FCC certified radio transmitter. The Point Temp/Humidity Sensor communicates the temperature and humidity wirelessly with repeaters/receivers in range on the network with its own unique ID. (Communications on this product are wireless and therefore there is no communication wiring related to this product). It is required that the component be installed to manufacturer specifications and in compliance with all federal, state, and local electrical codes. (Please refer to the provided manufacturer installation/product guidelines for more information.) Requirements for installation are as follows:

6.10 Point Temp/Humidity Sensor, 3005-115 Installation

Note

Check Item 4, Appendix B – Special Environmental Requirements

Mounting

Mount the Point Temp/Humidity Sensor in a location that enables the sensor to transmit radio signals to the designated receivers or repeaters with no interference.

Note

Make sure that the antenna is secure.

Appendix A – Recommended Test Equipment

- 1 - Digital Multi-meter for milli-volts and mili-ohms
- 2 - Temperature Meter
- 3 - Amp Probe
- 4 - Camera
- 5 - General Hand Tools



**6 - Fluke 345
Power Quality Clamp Meter**



**7 - EXTECH 401036
Datalogging Light Meter**



**8 - Fluke 725
Multi-Function Process Meter**



**9 - Fluke 700P24
Fluke Pressure Module
0-15 PSID, WET**



**10 - Fluke 700LTP
Low Pressure Test Pump**



11 - Fluke 922 Airflow Meter Kit



12 - Fluke 975 Air Meter



13 – Fluke 922 Air Flow Meter

Appendix B – Special Environmental Requirements

Item	Device
1	<p>Master Control Unit P1844/P1845 Control Unit P1835 Control Unit P1836 Master Control Unit P1862 Operating Temperature: -40 to 185°F (-40 to 85°C) Operating Humidity 90% RH, non-condensing Storage Temperature: -40 to 185°F (-40 to 85°C)</p>
2	<p>Wilson Amplifier Assembly The aluminum casing of the Wilson Amplifier will adjust very quickly to the ambient temperature of its environment. For example, in the summer, when the inside of a car can reach 140°F (60°C), the amplifier temperature may be 150°F (66°C) or higher. The casing will be hot to the touch, similar to a metal door handle or a steering wheel. Such high temperatures will not damage the amplifier, nor do they pose a fire risk to the vehicle. As recommended in these instructions, install the amplifier in a location with adequate ventilation. Keep the area free of items that could block air flow to the amplifier.</p>
3	<p>Point Transceiver 4007-06 Point Repeater 4007-16 Operating Temperature: 32 to 170°F (0 to 77°C) Operating Humidity 95% RH, non-condensing</p>
4	<p>Point Analog Input Sensor 3005-120 Point Power Monitor 3005-55 Point Temperature Sensor 3005-118 Point Temp/Humidity Sensor 3005-115 Operating Temperature: -40 to 185°F (-40 to 85°C) Operating Humidity 95% RH, non-condensing Storage Temperature: -40 to 185°F (-40 to 85°C)</p>
5	<p>Controller TCS SZ1145 Controller TCS SZ2181 Operating Temperature: 32 to 131°F (0 to 55°C) Operating humidity: 0 to 100% RH, non-condensing Storage temperature: 14 to 140°F (-10 to 60°C)</p>
6	<p>CO₂ Sensor PC1001 Operating Temperature: 60 to 90°F (15 to 32°C) Operating humidity: 0 to 95% RH, non-condensing Storage temperature: -40 to 158°F (-40 to 70°C)</p>
7	<p>Outside Duct Air Temp Sensor TS1002 Water Temp Sensor TS1005 Indoor Air Temp Sensor TS2000 Operating Temperature: -50 to 375°F (-45.6 to 190.6°C)</p>

Item	Device
8	Duct Air Humidity Sensor TH1111 Operating Temperature: Transmitter: 32 to 122°F (0 to 50°C) Sensor: -15 to 170°F (-40 to 70°C) Operating humidity: 0 to 100% RH, non-condensing Storage temperature: 14 to 176°F (-10 to 80°C)
9	Duct Pressure Sensor TD1190 Operating Temperature: 32 to 122°F (0 to 50°C) Operating humidity: 0 to 100% RH, non-condensing Storage temperature: 14 to 176°F (-10 to 80°C)
10	Motion Sensor Honeywell IS2535 Operating Temperature: -10 to 55°C (14 to 131°F) Relative Humidity: 5% to 95%, non-condensing Temperature Compensation: Advanced Dual Slope Temperature Compensation
11	Air Velocity Sensor Kele AVS-200 Damper Position Sensor Kele PV-1-43 Ambient Temperature Sensor -4 to 140°F (-20 to 60°C) Electronics 32° to 122°F (0° to 50°C)
12	Outdoor Lumen Sensor MK7-B-CR Indoor Lumen Sensor MK7-B-CCF Operating temp 13 to 140°F (-10 to 60°C)
13	Veris Enercept Power Meters Temperature Range 0 to 60°C, 50°C for 2400A Humidity Range 0 - 95% non-condensing
14	Aleph CM360-18 Operating Temperature: -4°F - 122°F (-20°C to 50°C) Operating humidity: 95% RH max.
15	Ademco 997 Ceiling PIR Operating Temperature: 32°F - 122°F (0°C - 50°C) Operating Humidity: Up to 95% RH (max), non-condensing
16	GE Security 996 Temperature limit: 0°F - 131°F (-18°C - 55°C) Relative Humidity max. 93%

Appendix C – Temperature Resistance Conversion

Support Resources



Temperature - Resistance Conversion Chart

Conversion Table

DEG. F to OHMS (1000 Ω PtRTD) -50.00°F thru 250.00°F

Deg. F	Ohms	Deg. F	Ohms	Deg. F	Ohms	Deg. F	Ohms
-50.000	- 820.560	-20.000	- 886.541	10.000	- 952.069	40.000	- 1017.394
-49.000	- 822.765	-19.000	- 888.738	11.000	- 954.247	41.000	- 1019.572
-48.000	- 824.970	-18.000	- 890.935	12.000	- 956.424	42.000	- 1021.749
-47.000	- 827.175	-17.000	- 893.132	13.000	- 958.602	43.000	- 1023.927
-46.000	- 829.380	-16.000	- 895.329	14.000	- 960.779	44.000	- 1026.104
-45.000	- 831.585	-15.000	- 897.526	15.000	- 962.957	45.000	- 1028.282
-44.000	- 833.790	-14.000	- 899.723	16.000	- 965.134	46.000	- 1030.379
-43.000	- 835.995	-13.000	- 901.920	17.000	- 967.312	47.000	- 1032.549
-42.000	- 838.200	-12.000	- 904.117	18.000	- 969.489	48.000	- 1034.719
-41.000	- 840.405	-11.000	- 906.314	19.000	- 971.667	49.000	- 1036.889
-40.000	- 842.590	-10.000	- 908.511	20.000	- 973.844	50.000	- 1039.059
-39.000	- 844.790	-9.000	- 910.708	21.000	- 976.022	51.000	- 1041.229
-38.000	- 846.990	-8.000	- 912.905	22.000	- 978.199	52.000	- 1043.399
-37.000	- 849.190	-7.000	- 915.102	23.000	- 980.377	53.000	- 1045.569
-36.000	- 851.390	-6.000	- 917.299	24.000	- 982.554	54.000	- 1047.739
-35.000	- 853.591	-5.000	- 919.496	25.000	- 984.732	55.000	- 1049.909
-34.000	- 855.791	-4.000	- 921.693	26.000	- 986.909	56.000	- 1052.079
-33.000	- 857.991	-3.000	- 923.890	27.000	- 989.087	57.000	- 1054.249
-32.000	- 860.191	-2.000	- 925.935	28.000	- 991.264	58.000	- 1056.419
-31.000	- 862.391	-1.000	- 928.125	29.000	- 993.442	59.000	- 1058.589
-30.000	- 864.570	0.000	- 930.290	30.000	- 995.619	60.000	- 1060.759
-29.000	- 866.767	1.000	- 932.472	31.000	- 997.797	61.000	- 1062.832
-28.000	- 868.964	2.000	- 934.649	32.000	- 999.974	62.000	- 1064.994
-27.000	- 871.162	3.000	- 936.827	33.000	- 1002.152	63.000	- 1067.157
-26.000	- 873.359	4.000	- 939.004	34.000	- 1004.329	64.000	- 1069.319
-25.000	- 875.556	5.000	- 941.182	35.000	- 1006.507	65.000	- 1071.482
-24.000	- 877.753	6.000	- 943.359	36.000	- 1008.684	66.000	- 1073.644
-23.000	- 879.950	7.000	- 945.537	37.000	- 1010.862	67.000	- 1075.807
-22.000	- 882.147	8.000	- 947.714	38.000	- 1013.039	68.000	- 1077.969
-21.000	- 884.344	9.000	- 949.892	39.000	- 1015.217	69.000	- 1080.132

Deg. F	Ohms
70.000	- 1082.294
71.000	- 1084.457
72.000	- 1086.619
73.000	- 1088.782
74.000	- 1090.944
75.000	- 1093.062
76.000	- 1095.220
77.000	- 1097.379
78.000	- 1099.537
79.000	- 1101.696
80.000	- 1103.854
81.000	- 1106.013
82.000	- 1108.171
83.000	- 1110.330
84.000	- 1112.488
85.000	- 1114.647
86.000	- 1116.805
87.000	- 1118.964
88.000	- 1121.122
89.000	- 1123.281
90.000	- 1125.439
91.000	- 1127.598
92.000	- 1129.756
93.000	- 1131.915
94.000	- 1133.963
95.000	- 1136.114
96.000	- 1138.265
97.000	- 1140.416
98.000	- 1142.567
99.000	- 1144.718
100.000	- 1146.869
101.000	- 1149.020
102.000	- 1151.171
103.000	- 1153.322
104.000	- 1155.473
105.000	- 1157.624
106.000	- 1159.775
107.000	- 1161.926
108.000	- 1164.077
109.000	- 1166.228
110.000	- 1168.379
111.000	- 1170.530
112.000	- 1172.681
113.000	- 1174.832
114.000	- 1176.983
115.000	- 1179.134
116.000	- 1181.285
117.000	- 1183.436
118.000	- 1185.587
119.000	- 1187.738
120.000	- 1189.889
121.000	- 1191.849
122.000	- 1193.989
123.000	- 1196.128

Deg. F	Ohms
124.000	- 1198.268
125.000	- 1200.407
126.000	- 1202.547
127.000	- 1204.686
128.000	- 1206.826
129.000	- 1208.965
130.000	- 1211.105
131.000	- 1213.244
132.000	- 1215.384
133.000	- 1217.523
134.000	- 1219.663
135.000	- 1221.802
136.000	- 1223.942
137.000	- 1226.081
138.000	- 1228.221
139.000	- 1230.360
140.000	- 1232.500
141.000	- 1234.639
142.000	- 1236.694
143.000	- 1238.825
144.000	- 1240.957
145.000	- 1243.088
146.000	- 1245.220
147.000	- 1247.351
148.000	- 1249.483
149.000	- 1251.614
150.000	- 1253.746
151.000	- 1255.877
152.000	- 1258.009
153.000	- 1260.140
154.000	- 1262.272
155.000	- 1264.403
156.000	- 1266.535
157.000	- 1268.626
158.000	- 1270.754
159.000	- 1272.882
160.000	- 1275.010
161.000	- 1277.138
162.000	- 1279.266
163.000	- 1281.394
164.000	- 1283.522
165.000	- 1285.650
166.000	- 1287.778
167.000	- 1289.906
168.000	- 1292.034
169.000	- 1294.162
170.000	- 1296.290
171.000	- 1298.418
172.000	- 1300.546
173.000	- 1302.674
174.000	- 1304.802
175.000	- 1306.930
176.000	- 1309.058
177.000	- 1311.186

Deg. F	Ohms
178.000	- 1313.314
179.000	- 1315.442
180.000	- 1317.570
181.000	- 1319.698
182.000	- 1321.826
183.000	- 1323.954
184.000	- 1326.082
185.000	- 1328.210
186.000	- 1330.338
187.000	- 1332.466
188.000	- 1334.594
189.000	- 1336.722
190.000	- 1338.850
191.000	- 1340.694
192.000	- 1342.807
193.000	- 1344.921
194.000	- 1347.034
195.000	- 1349.148
196.000	- 1351.261
197.000	- 1353.375
198.000	- 1355.488
199.000	- 1357.602
200.000	- 1359.715
201.000	- 1361.829
202.000	- 1363.942
203.000	- 1366.056
204.000	- 1368.169
205.000	- 1370.283
206.000	- 1372.396
207.000	- 1374.510
208.000	- 1376.623
209.000	- 1378.737
210.000	- 1380.790
211.000	- 1382.896
212.000	- 1385.003
213.000	- 1387.109
214.000	- 1389.216
215.000	- 1391.322
216.000	- 1393.429
217.000	- 1395.535
218.000	- 1397.642
219.000	- 1399.748
220.000	- 1401.855
221.000	- 1403.961
222.000	- 1406.068
223.000	- 1408.174
224.000	- 1410.281
225.000	- 1412.387
226.000	- 1414.494
227.000	- 1416.600
228.000	- 1418.707
229.000	- 1420.813
230.000	- 1422.920
231.000	- 1425.026

Deg. F	Ohms
232.000	- 1427.133
233.000	- 1429.239
234.000	- 1431.346
235.000	- 1433.452
236.000	- 1435.559
237.000	- 1437.665
238.000	- 1439.644
239.000	- 1441.743
240.000	- 1444.830
241.000	- 1446.926
242.000	- 1449.021
243.000	- 1451.117
244.000	- 1453.212
245.000	- 1455.308
246.000	- 1457.404
247.000	- 1459.499
248.000	- 1461.595
249.000	- 1463.690
250.000	- 1464.770