Application Engineering

Sentronic and Sentronic+ Electronic Oil Pressure Control

BULLETIN NO: AE8-1275 R10

Contents

COPELAND

Safety

Important Safety Information

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

Responsibilities, Qualifications and Training

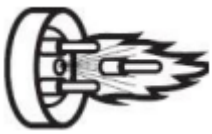
• OEMs are responsible for system design, selection of appropriate components, integration of this component into the system, and testing the system. OEMs must ensure that staff involved in these activities are competent and qualified.

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

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

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

Terminal Venting and Other Pressurized System Hazards



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

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

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

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

Flammable Refrigerant Hazards

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

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

Electrical Hazards

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

Hot Surface and Fire Hazards

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

Lifting Hazards

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

POE Oil Hazards

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

Precautions

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

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

• Keep clear of the compressor when power is applied.

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

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

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

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

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

- Discharge capacitors for a minimum of two minutes

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

• Allow time for the compressor to cool before servicing.

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

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

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

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

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

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

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

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

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

• Before energizing the system:

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

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

Signal Word Definitions

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

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

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

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

Introduction

The current Copeland® Sentronic® electronic oil pressure safety control (see Figure 1) replaces two older Sentronics; the four terminal, triac output style, and the five terminal, relay output style (see Figure 2). The current Sentronic has all the features of previous Sentronic, with valuable additions.

All Sentronics utilize a pressure sensor and an electronic control module to precisely measure oil pump differential pressure. The main advantage of Sentronic is the elimination of the traditional capillary tubes, bellows, and pressure connections that mechanical pressure switches require to measure differential oil pressure. These require careful handling and are known to be a source of leaks in refrigeration systems.

A second advantage of Sentronic is in the use of a precise electronic clock for the two-minute time out circuit. Traditional mechanical controls use resistance heaters to provide the time to trip in the event of low oil pressure. 208-volt systems, low ambient temperatures or brown-out type conditions cause the heater output to be reduced, thus increasing the time out period from two minutes to three or four minutes when low oil pressure conditions exist. With the electronic clock, the time out will always be the same.

As a result of the elimination of the capillary tube measuring system and a more precise timing circuit, Sentronic will improve the overall reliability of the refrigeration system.

Any Copeland® compressor with the new oil pump design (see AE4-1166) can utilize Sentronic. Any Sentronic can replace existing capillary tube controls in the field.

As in the past, all new and replacement Copelametic® compressors equipped with oil pumps require the use of a Copeland approved oil pressure safety switch. Failure to use an approved oil pressure safety switch will be considered as misuse of the compressor and can adversely affect warranty replacement of the compressor should a lubrication connected failure occur.

To meet Copeland specifications, an oil pressure safety switch must meet many requirements. These include maintaining its pressure setting and time delay calibration within close limits over the widest variation in operating conditions to be expected and must successfully pass a life test with a minimum of 200,000 cycles. Controls must be of the non-adjustable, manual reset type with a 120 second nominal time delay at rated voltage, have a cut-out pressure setting of 7 to 9 PSID (Pounds per Square Inch Differential, the difference between crankcase pressure and oil-pump outlet pressure) and a cut-in (timer delay off) pressure of 12-14 PSID.

Basic Control Operation

The Sentronic Sensor

The same oil pressure sensor is used for all Sentronics. It mounts directly into the oil pump. The Sentronic sensor measures oil pump differential pressure. It has an internal contact that opens on low oil pressure and signals the Sentronic electronic control module to begin time out. The same contact closes when proper oil pressure is present and stops the module time out.

Should oil pressure fall below 7-9 PSID for a period of two minutes, the Sentronic module will open the control circuit, using its Normally Closed (N.C.) contact, and shut the compressor off.

Approximate oil pressure can be measured in the field. Oil pumps are furnished with a Schrader valve mounted on the oil pump discharge port. To measure oil pressure, subtract crankcase pressure from discharge oil pressure.

Tripping of the oil pressure safety switch is a warning that the system has been without proper lubrication for too long a time. Repeated trips of the oil pressure safety control are a clear indication that something in the system requires immediate remedial action. On a well-designed system there should be no trips of the oil pressure safety control, and repeated trips should never be accepted as a normal part of the system operation.

Caution: An electronic timer may be placed in series with the compressor contactor to force a delay before each start and prevent possible short cycling. The timer must be located so it also prevents the Sentronic from energizing during the timing period. SOME INEXPENSIVE TIMERS

MAY “LEAK” ENOUGH POWER, WHILE “TIMING OUT”, TO ENERGIZE THE SENTRONIC EVEN THOUGH THERE MAY NOT BE ENOUGH “LEAKAGE” TO CLOSE THE COMPRESSOR CONTACTOR. THIS CAN CAUSE A PREMATURE SENTRONIC TRIP. If there is doubt, the circuit should be checked before placing it in operation.

The Sentronic Module

The Sentronic has in addition to the (N.C.) contact, used for compressor shutdown, a Normally Open (N.O.) contact that can be used in an alarm circuit (See Diagram 4A).

The Single Pole Double Throw (S.P.D.T.) contact of Sentronic can be electrically isolated from the control circuit power supply and used to control a circuit with a different voltage (See Diagram 6).

Sentronic has a timing circuit that actually compares the amount of time with good oil pressure to that with insufficient oil pressure and has a memory that will shut the compressor down after a period of more than two minutes if the compressor has a “history” of oil pressure fluctuations with more unacceptable than acceptable pressures.

Sentronic also has a memory that retains the compressor oil pressure “history” for up to one minute in the event of a power loss.

Sentronic uses a permanent magnet integral with the reset button to reset its output control relay in the event of a trip. When the reset button is depressed, it magnetically pulls the Sentronic relay's armature to its original, reset position. Sentronic needs no voltage present to reset.

Installing Sentronic

All OEM Copeland® compressors with oil pumps shipped after September 1986, have a plug fitting in the oil pump for mounting the sensor. The oil pump is designed to accept either the Sentronic sensor or a capillary tube for the traditional mechanical oil pressure control.

To Install the Sensor, Figure 1:

1. Remove the plug fitting from the oil pump housing. Discard the copper washer from under the head of the plug fitting.

2. Install a new O ring into the groove on the sensor. Use refrigeration oil to pre-lube the O ring before installation. Use care not to cut the O ring.

3. Install a new copper washer under the hex flange of the sensor. Do not reuse the copper washer removed with the plug fitting. Screw the sensor into the pump body. Torque the sensor to 60-65 Ft./lb.

To Install the Module, Figure 1:

4. When using the bracket above the oil pump use two 10-32 pan head slotted screws with washers. The maximum screw length is .265 plus bracket thickness. Longer screws could damage the circuit board.

5. Plug the cable from the module into the end of the sensor. Care should be taken not to wrap the cable around a current carrying conductor.

Hi-Potting: Excessive hi-potting can cause damage to the Sentronic module. Copeland hi-pots the module as part of final processing. If hi-potting is required, we recommend it to be limited to single time.

Electrostatic Painting: Static electricity discharges from electrostatic painting can damage the Sentronic module. We recommend that the module not be mounted until such painting is completed.

Remote Mounting the Sentronic Module

The Sentronic sensor sends a low voltage signal to the Sentronic module. When the Sentronic module is mounted on the compressor the sensor will normally experience no disturbance from nearby electrical sources. The radiating power sources that can cause problems are almost always in grounded metallic enclosures. However, if the Module is located remotely from the compressor, and the sensor leads are extended, and/or routed along with other wiring, provisions must be made to prevent interference with the

sensor signal which can cause nuisance trips or even damage to the module itself. Observe these precautions:

1. Sensor leads must be replaced with a shielded cable. The shield should extend from the Sentronic module to the female sensor connector and should be grounded only at the module end.

2. The Sentronic module has a good grounding source when mounted to the compressor. When it is remote mounted, it must have sufficient grounding area to minimize the effects of high-level electrical transients and secondary lightning effects. A metal enclosure with minimum mounting surface area of 75 sq. in. is required.

3. Copeland makes available an optional 10' shielded cable designed especially for the Sentronic. The cable is grounded per instruction 1.

Field Installation Checks

Before installing Sentronic, determine if the existing oil pump is equipped with the plug fitting for mounting the sensor. If not, order the Sentronic Oil Pump Kit.

All Sentronics can be used to replace conventional capillary tube style oil pressure controls in the field.

Earlier four and five terminal Sentronics (see Fig. 2) were electrically reset oil pressure switches. They were wired to have power to reset! The current Sentronic requires no power to reset and may be directly mechanically and electrically interchanged with any mechanical oil pressure switch.

If the Sentronic module is to be remote mounted from the compressor and/or its sensor leads are to be routed along with other voltage lines, the Sentronic Remote Mount Instructions must be followed.

Wiring differences exist from one system manufacturer’s unit to another. If wiring modifications are unclear, consult a certified electrician. No wiring modifications are required for compressors using solid state motor protectors.

Start-Up Quick Checks

Checking The Sensor

Unplug the sensor and start the compressor. Simultaneously measure the oil pump differential pressure. Monitor the two terminals at the back of the sensor with an ohmmeter or continuity measuring set. If the differential pressure is below the range of 7 to 9 PSID, the sensor circuit should be open (no continuity, infinite resistance). If the pressure is above 12-14 PSID, the sensor circuit should be closed.

Checking the Installed Sentronic Module*

Shut off the compressor. Unplug the sensor. Verify the module is powered by reading control voltage between the 208-230/240 (or 115/120) terminal and the L (or 2 if separate control is used) terminal.

Start the compressor with the sensor unplugged. Recheck to make sure the module voltage is still present. After 120 seconds ±15 seconds, the L-M contact should open and shut off the compressor.

With the module off on oil pressure, wait 2 minutes and press the reset button. Module power is required to reset the 4 and 5 terminal Sentronics. The contactor should close and start the compressor.

*NOTE: More complete step-by-step procedures for bench and system Sentronic checks are included on pages 7 and 8 of this bulletin.

Sentronic Specifications

Cut-Out	7-9 PSID
Cut-In	12-14 PSID
Time Delay	120 Seconds ±15 Seconds
Max Control	720 VA; 120/240V

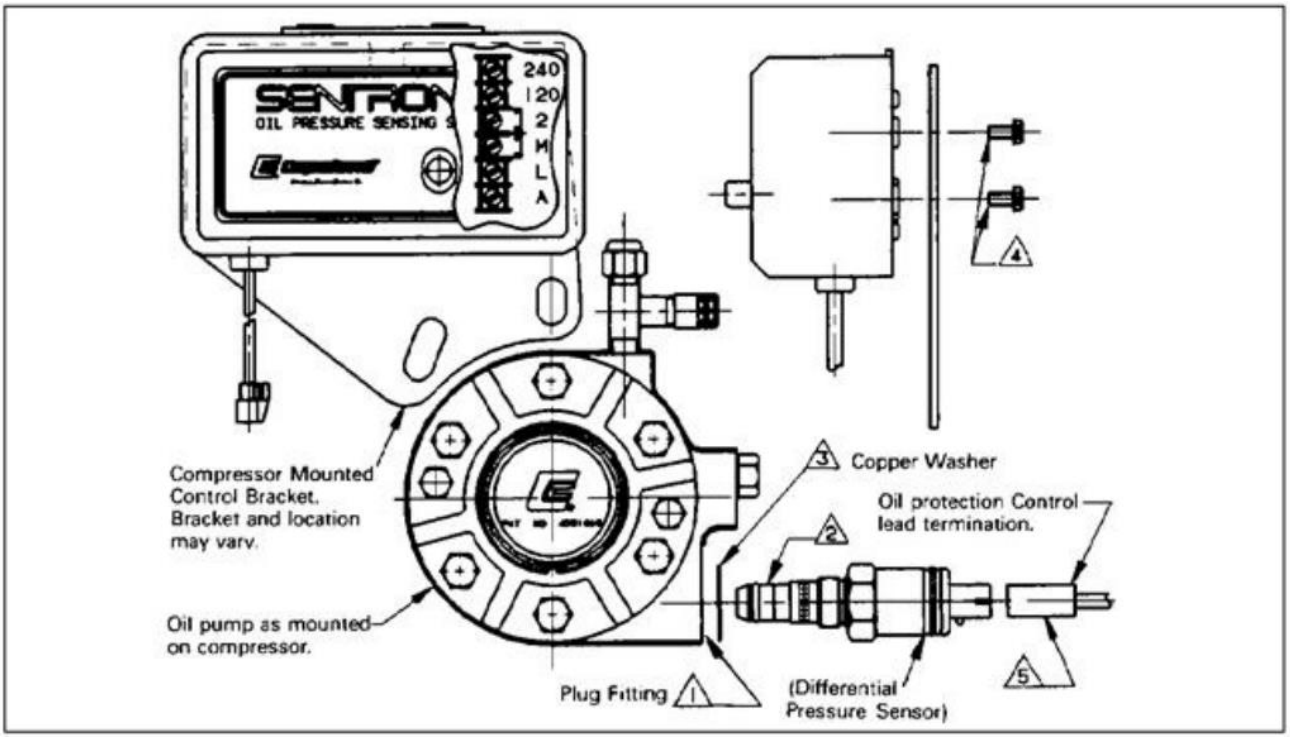


Figure 1

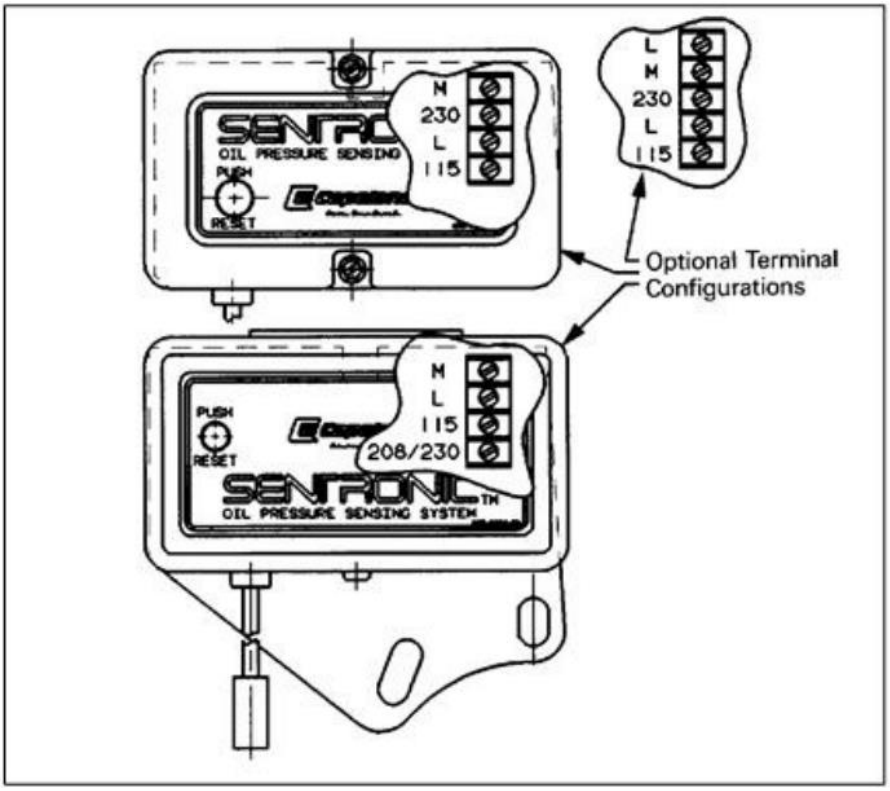


Figure 2

Electrical Connection Instructions

CAUTION!! Damage to the Sentronic module will result if the “M” terminal of the Sentronic is connected to ground or directly to line voltage!

When changing components or making any kind of electrical alterations to any installation, existing or new, all ground connections must be specifically checked to make sure they are secure. If there is any doubt about component or system grounding, the local electrical inspector should be consulted.

The electrical connection diagrams included in this bulletin are intended to represent the most common Sentronic application control circuits. The system manufacturer should be consulted when more complex circuits are encountered.

Standard Control Circuits

Both Diagrams 3A (new Sentronic) and 3B (previous Sentronic) show typical wiring connections and the similarity of Sentronic and Sentronic oil pressure switches used on three-phase motor compressors.

Sentronics are energized when they are connected to a voltage source. In both diagrams 3A and 3B, if the compressor controlling and overload devices are closed, the compressor starts and at the same time, a circuit is made from one side of the power two incoming lines to the “L” terminal. The “L” terminal is one side of the “L”-“M”, N.C. contact of the Sentronic module. The "M" side of the N.C. contact is usually connected to the compressor contactor coil. The circuit for the electronic module power is completed by the connection of the 230/ 240 (or 115/120) volt terminal to the other side of the incoming power line.

The electronic two-minute timing circuit operates whenever voltage is applied to a Sentronic, and it has not tripped. The timing will be interrupted when oil pressure rises above 12-14 PSID and closes the Sentronic sensor. Should oil pressure not build up sufficiently for 120 seconds, the electronic delay will time out, open its L-M contact, break the control circuit, and de-energize the compressor contactor to stop compressor operation.

While the compressor is running, if the compressor net oil pressure falls below the cut-out setting of the sensor while operating and does not re-establish sufficient pressure within an acceptable time, the time delay circuit will open the L-M contacts, stopping compressor operation. Once the oil pressure switch has tripped, it must be manually reset to restore the system to operation.

IMPORTANT: If a power interruption occurs after an oil pressure safety trip, wait two minutes before resetting after power is restored.

Control With Alarm

Diagrams 4A (new Sentronic) and 4B (previous Sentronic) use an added alarm circuit. To contrast the 4 and 5 terminal Sentronics with the new Sentronic. The new Sentronic does not require an extra relay or auxiliary contact for an alarm circuit.

The Current Sensing Relay Used With Compressor Inherent Motor Protectors:

Compressors equipped with internal inherent protection and oil pressure safety controls, will trip the oil pressure safety control if the internal inherent protector should open due to motor overheating or a temporary motor overload.

After an overload trip of a compressor with an inherent protector the control circuit will still be closed, and the Sentronic energized, although the compressor motor is not operating. The two-minute timing circuit will activate due to a lack of oil pressure, and after the 120 second time delay, the oil pressure safety switch will trip. Even though the compressor motor cools sufficiently for the internal inherent protector to automatically reset, the compressor cannot start until the oil pressure safety control is manually reset.

This is normally not a problem, since the compressor, if properly applied, will seldom if ever trip on the internal inherent protector. If it should happen to do so, the fact that a protector trip has occurred, indicates that the system operation should be reviewed. However, on frozen food or other critical applications where a product loss may occur, if a compressor shutdown should occur during the night, or over the weekend when the equipment in unattended, it

may be desirable to prevent a possible nuisance trip by means of a current sensing relay.

The Penn R10A (Johnson Controls) current sensing relay has been developed for this purpose. It is mounted on the load side of the contactor, senses by induction the full operating current of one phase of the motor, closes on a rise in current above 14 amps, and opens if the load current falls below 4 amps.

The use of the current sensing relay allows the compressor to cycle on the internal inherent protector without affecting the operation of the oil pressure safety control.

Both Diagrams 5A and 5B use a current relay (C.S.). When the current relay is not energized by motor current, its Normally Open (N.O.) contact opens the circuit that powers the Sentronic to avoid a nuisance trip.

Diagram 5B shows the circuit used with the older model Sentronic. An external control relay, "R", is required to maintain power to the module in the event of an oil pressure safety trip since the module requires power to reset. When the module is tripped on low oil pressure, relay "R" is not energized, and the relay "R" Normally Closed (N.C.) contact provides a voltage path to the module.

The circuit of Diagram 5A uses the new Sentronic. The current relay operates in the same manner as in Diagram 5B, but the oil pressure switch requires no power to reset, so it needs no external relay to provide a reset power path.

NOTE: On some 550-volt motor-compressors, it may be necessary to loop the current carrying wire so that it passes through the current sensing relay twice in order to increase the metered amperage to close the relay contacts.

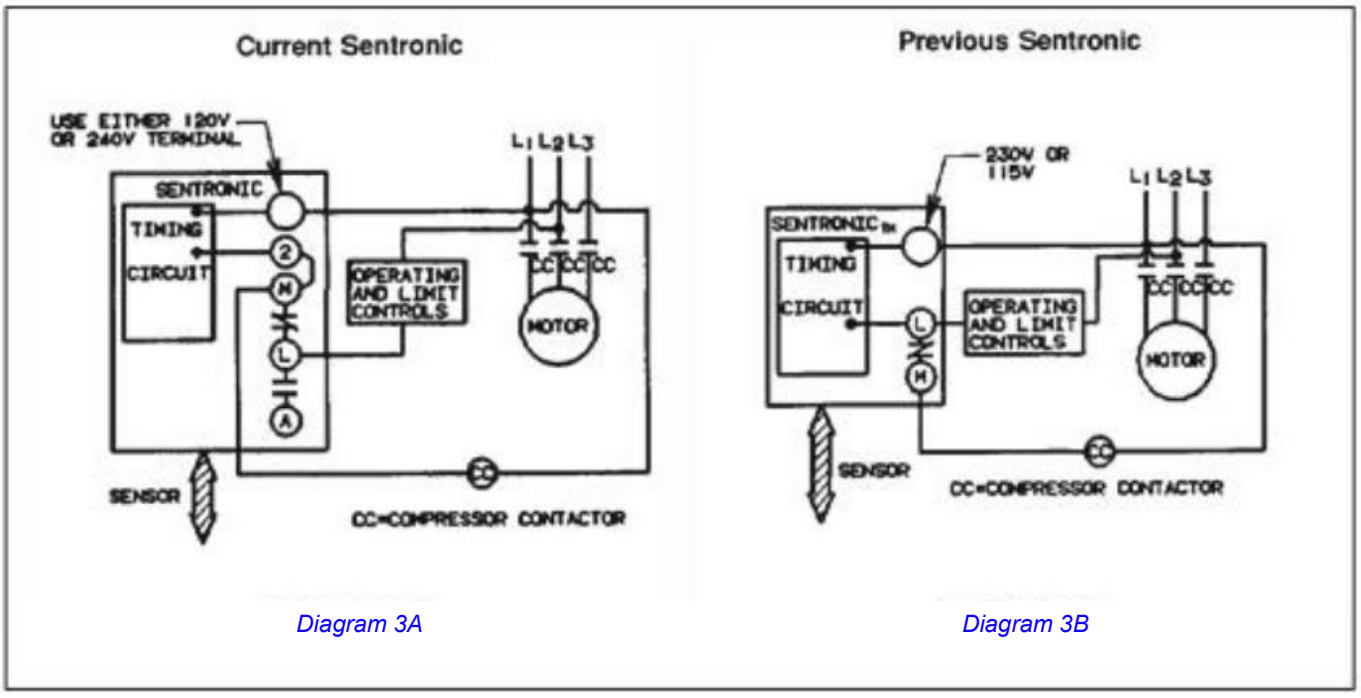


Diagram 3A

Diagram 3B

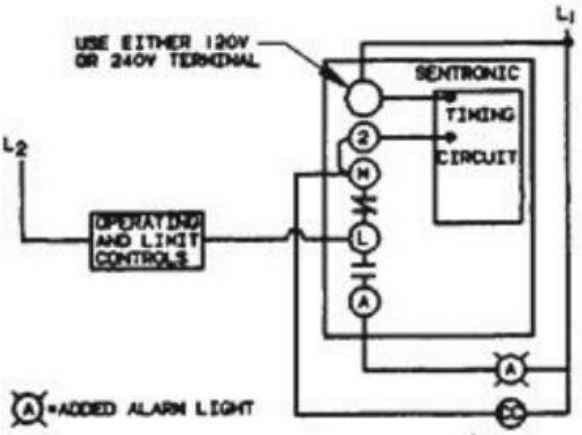


Diagram 4A

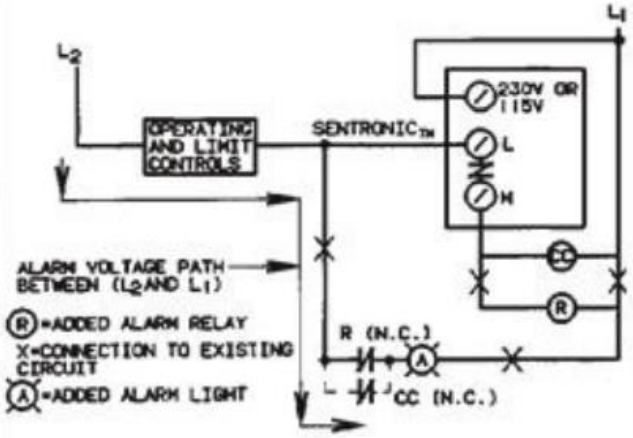


Diagram 4B

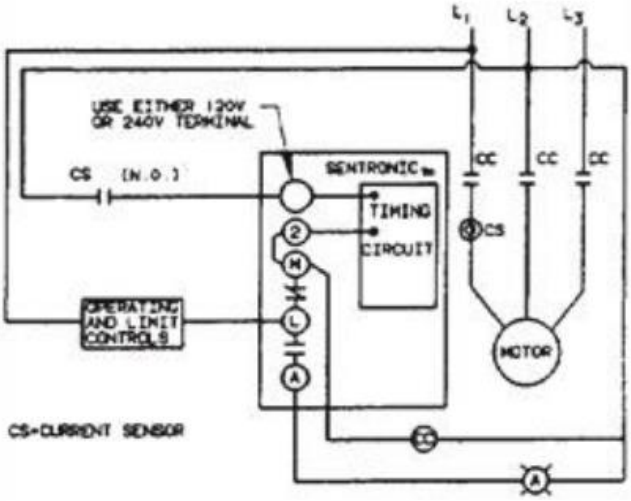


Diagram 5A

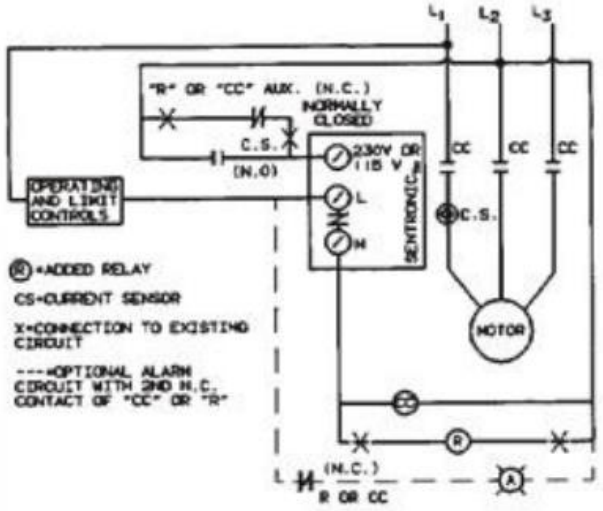


Diagram 5B

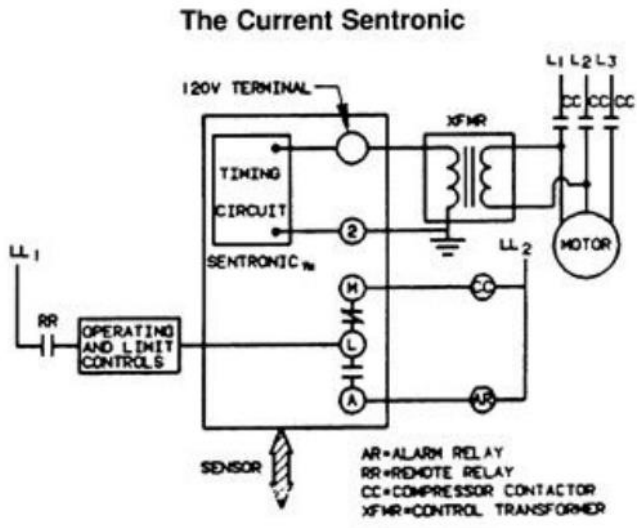


Diagram 6

Using a Separate Control Voltage with the New Sentronic:

Diagram 6 shows how the current Sentronic might be used with a voltage on its S.P.D.T. contact that is different from the voltage that supplies its power. Any A.C. voltage up to and including 240V might be used.

To use the Sentronic contact (S.P.D.T.) for a separate voltage, remove the jumper between terminals "2" and "M". In this diagram, the separate control voltage is supplied by "LL1" and "LL2". The separate voltage powers the compressor contactor (CC), by means of a Remote Relay. When the Remote Relay is energized, requesting the compressor to run, its contact, (RR), closes to deliver "LL1" voltage to the operating and limit contacts. If the contacts in the operating and limit circuit are closed, "LL1" voltage energizes the compressors contactor coil (CC). When the compressor contactor closes, it provides the power, through a control circuit transformer (XFMR), to energize the Sentronic. If the Sentronic trips, it contact ("L" to "M") in the "LL1-LL2" control circuit opens to deenergize the compressor contactor and stop the compressor. The Sentronic contact ("L" to "A") closes to energize an Alarm Relay (AR).

Electrical Bench Checkout Procedure

This instruction sheet describes how the Sentronic may be easily bench-checked using only a voltmeter and a 120VAC electrical extension cord.

CAUTION! Damage to the Sentronic module may result if the “M” terminal of the Sentronic is connected to ground or directly to a voltage line!

This test is conducted with 120VAC. A shock will result if the Sentronic terminals are touched when the Sentronic module is energized.

Use care whenever working with any voltage! Make sure your electrical outlet is grounded, the electrical extension cord used has a ground wire, and the ground wire is connected to the grounding screw of the Sentronic.

1. Apply 120VAC power to the Sentronic module terminals marked “120” and “L”. The Sentronic should have a jumper in place between terminals “M” and “2”.

2. Wait two minutes, then push the Sentronic reset button to reset the module and start the timing circuit.

3. With a voltmeter, measure line voltage (120VAC) between the “M” terminal and the “120” terminal. It should be the same as the electrical outlet voltage - about 120VAC.

4. Since there is no connection made to the pressure sensor, the module sees this as a no-oil pressure condition. After two minutes (plus or minus 15 seconds - dependent on 50 or 60 cycle frequency) the Sentronic internal timer will “time-out”. The module will trip; the circuit between “L” and “M” will open, and it will no longer pass current to the load.

5. With the voltmeter connected to terminals “M” and “120”, the voltage should now read zero volts because the circuit between “L” and “M” has been opened through the action of the electronic circuit.

6. Reset the Sentronic, then remove voltage from terminals “120” and “L”. With a small piece of wire, jumper the female sensor connections at the end of

the black sensor cord attached to the module. Reapply power to terminals “120” and “L” and wait two minutes. The module should not “time-out” after two minutes because jumpering the sensor connections makes the timing circuit “see” good oil pressure. The jumper imitates the action of a small pressure switch located in the sensor. This switch opens on low oil pressure and closes on good oil pressure.

7. Measure between the “120” terminal and the “M” terminal with the voltmeter. The meter should read full line voltage showing that the circuit has not opened.

8. To check if the module will operate on 208/240 volts as well as on 120 volts, change the scale of the voltmeter (if necessary), to read up to 250VAC. Without removing power, measure the voltage between the “M” terminal and the “240” terminal. You should read nearly twice the voltage as that read between the “M” terminal and the 120“ terminal. This is because Sentronic has a small control transformer connected so that it can accept either 120V or 208/240V. It’s self-transforming action actually enables it to step up its own voltage. By making this voltage check, the transformer is being checked.

9. If the module successfully passes the above test sequence it is fully functional. If the module fails any of the above steps, it is faulty and should be replaced.

The Sentronic+™ oil pressure safety control replaces the current Sentronic. The Sentronic+™ is a direct replacement for mechanical devices and the current Sentronic. The Sentronic+™ control offers the following features:

Cap Tube Elimination

Sentronic+™ continues to add system reliability by removing the traditional cap tube oil pressure controls that are prone to refrigerant leaks.

Precise Timing

Identical to the current Sentronic the Sentronic+™ uses a precise timing circuit that is not susceptible to low voltage or brown out conditions. The memory in the timing circuit remains the same, comparing low vs. sufficient oil pressure time.

Electrical Noise Suppression

The Sentronic+™ has added an electronic noise suppression feature that no longer requires the use of shielded cables.

LED Diagnostics

Additional diagnostic capabilities have been added to provide instant status of oil control.

- LED GREEN
  Compressor has sufficient oil pressure.
- LED RED
  Compressor has experienced insufficient oil pressure for longer than two minutes Compressor is off on oil control.
- RED/GREEN FLASHING
  Compressor is experiencing erratic oil pressure indicating a possible system issue.

Sentronic+™ Specifications

Cut-out	7-9 PSID
Cut-in	12-14 PSID
Time Delay	120 Seconds+/-15 Seconds
Max Control	500 VA; 120/240V
Sensor Torque	60-65 Ft./lb.

Wiring

The Sentronic+™ wiring remains the same. There are several wiring schemes depending on control circuit components. They are shown on pages 11 to 13.

Diagram (3A) - Standard control circuit

Diagram (4A) - Standard control with added alarm circuit

Diagram (5A) - Standard control with alarm and current sensing relay circuit

Diagram (6) - Standard control with alarm, current sensing relay and separate control voltage

Start-Up Quick Checks

Checking the Sensor

Unplug the sensor and start the compressor. The Sentronic module LED should be red. Simultaneously measure the oil pump pressure vs. crankcase pressure. Monitor the two terminals at the back of the sensor with an ohmmeter. If the differential pressure is below the range of 7 to 9 PSID, the sensor circuit should be open. If the pressure is above 12 to 14 PSID, the sensor circuit should be closed.

Checking the Installed Sentronic+™

Module Shut off the compressor. Unplug the sensor. Verify the module is powered by reading control voltage between the 240V (or 115V) terminal and the L (or 2 if separate control is used) terminal.

Start the compressor with the sensor unplugged. Recheck to make sure the module voltage is still present. After 120 seconds +/- 15 seconds, the L-M contact should open and shut off the compressor.

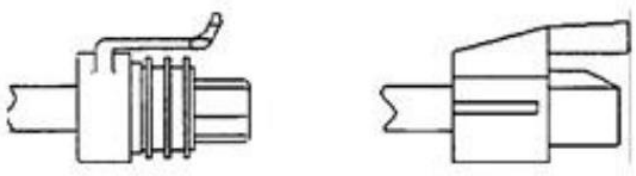
Interchangeability of Sentronic™ and Sentronic+™ Modules and Sensors

The new Sentronic+™ oil pressure control uses both a new module and a new sensor. The sensors and module can be made compatible with older generation components if the following steps are taken:

To use a Sentronic+ module with an older Sentronic™ sensor, the original Sentronic sensor cable must be wired to the new Sentronic+ module.

To use an older Sentronic module with a Sentronic+ sensor, the new Sentronic+ cable must be wired to the Sentronic module.

There is an older generation Sentronic module which is fully compatible with the new Sentronic+ sensor. It is supplied with the new (Sentronic+) cable which is gray for identification purposes, see illustration.



New Sentronic+ Old Sentronic

Connecting the Sentronic+ Module to an Older Sentronic Sensor

Removing the cable from the old Sentronic module:

- Disconnect power to the old module
- Disconnect the cable from the sensor
- Remove the cover from the old module
- Remove the two cable quick connections from the circuit board
- Using pliers, squeeze the strain relief slots and pull to remove the cable from the module
- Remove the old module from the compressor

Removing the cable from the new Sentronic+ module:

- Remove the cover from the Sentronic+ module
- Pull the 2-cable quick connects from the circuit board (these are labeled “Org” and “Red”)
- Remove the wires from the strain relief (note the routing of the wires for future reference) and lift the wires out
- Remove the wire cable from the module by twisting the conduit counterclockwise and gently pulling

Connecting the old cable to the Sentronic+ module:

- Trim approximately 2” of cable sheathing from the module end of the old cable, taking care not to nick the wire insulation
- Feed the wires into the module through the hole in the bottom of the case
- Leaving enough lead length to reach the quick connects, push the wires into the strain relief.
- Connect the 2 quick-connects to the “ORG” and “RED” spades. (Note: the connections may be

interchanged; there is no polarity on these wires). Refer to the figure below.
- Install the module to the compressor and make wiring and sensor connections per the general instructions.

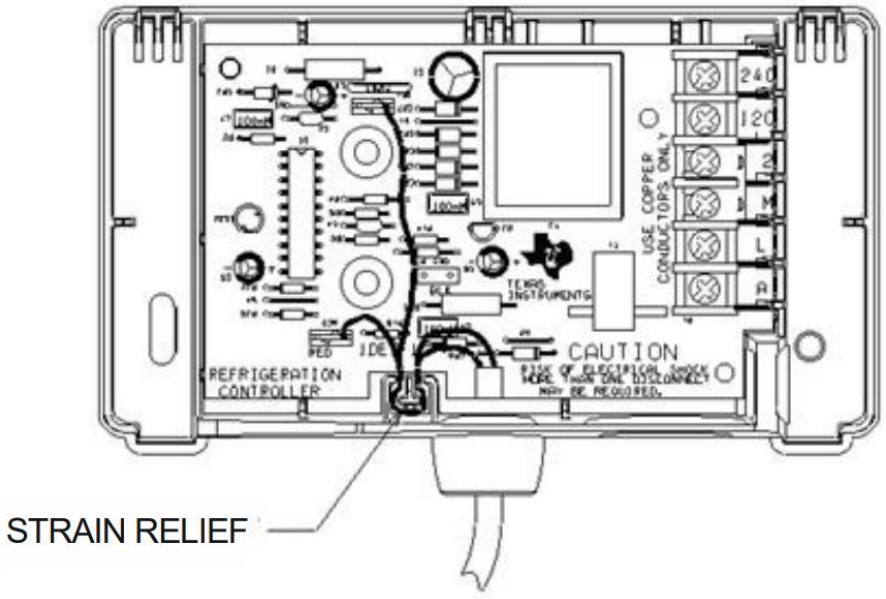
Connecting the old Sentronic Module to a Newer Sentronic+ Sensor

Removing the cable from the new Sentronic+ module:

- Disconnect power to the module Disconnect the cable from the sensor
- Remove the cover from the Sentronic+ module
- Pull the 2 cable quick connects from the circuit board (these are labeled “Org” and “Red”)
- Remove the wires from the strain relief by lifting the wires out
- Remove the wire cable from the module by twisting the conduit counterclockwise and gently pulling
- Removing the cable from the old Sentronic module:
- Remove the cover from the old module
- Remove the two cable quick connections from the circuit board
- Using pliers, squeeze the strain relief slots and pull to remove the cable from the module
- Retain the strain relief from the cable for use on the Sentronic+ cable
- Connecting the new cable to the old Sentronic module:
- Position the strain relief on the new cable at the termination of the conduit
- Feed the wires into the module through the hole in the bottom of the case
- Push the strain relief into position to lock it
- Connect the two quick connects to the circuit board. There is no polarity on the leads.
- Install the module on the compressor and make wiring and sensor connections per the general instructions

Sentronic+ Terminal Strip

- The Sentronic+ module terminal strip is designed to accept a bare wire end instead of a spade terminal
- If a Sentronic+ module is being retrofitted to a system with spade connections, the spade may be clipped off and ¼” of the wire end stripped. Or one leg of the spade may be clipped off for insertion into the terminal strip



How to Check a Sentronic Installed in a System

This page describes an electrical check for the Copeland Sentronic oil pressure module and sensor installed in an air-conditioning or refrigeration system.

This test must only be performed by qualified service personnel (see next page for further information and a bench test procedure for the Sentronic module).

Important! Before energizing this system, make sure the Sentronic is wired correctly. Refer to the wiring diagrams in the Sentronic brochure. Failure to do so may result in a damaged control unit.

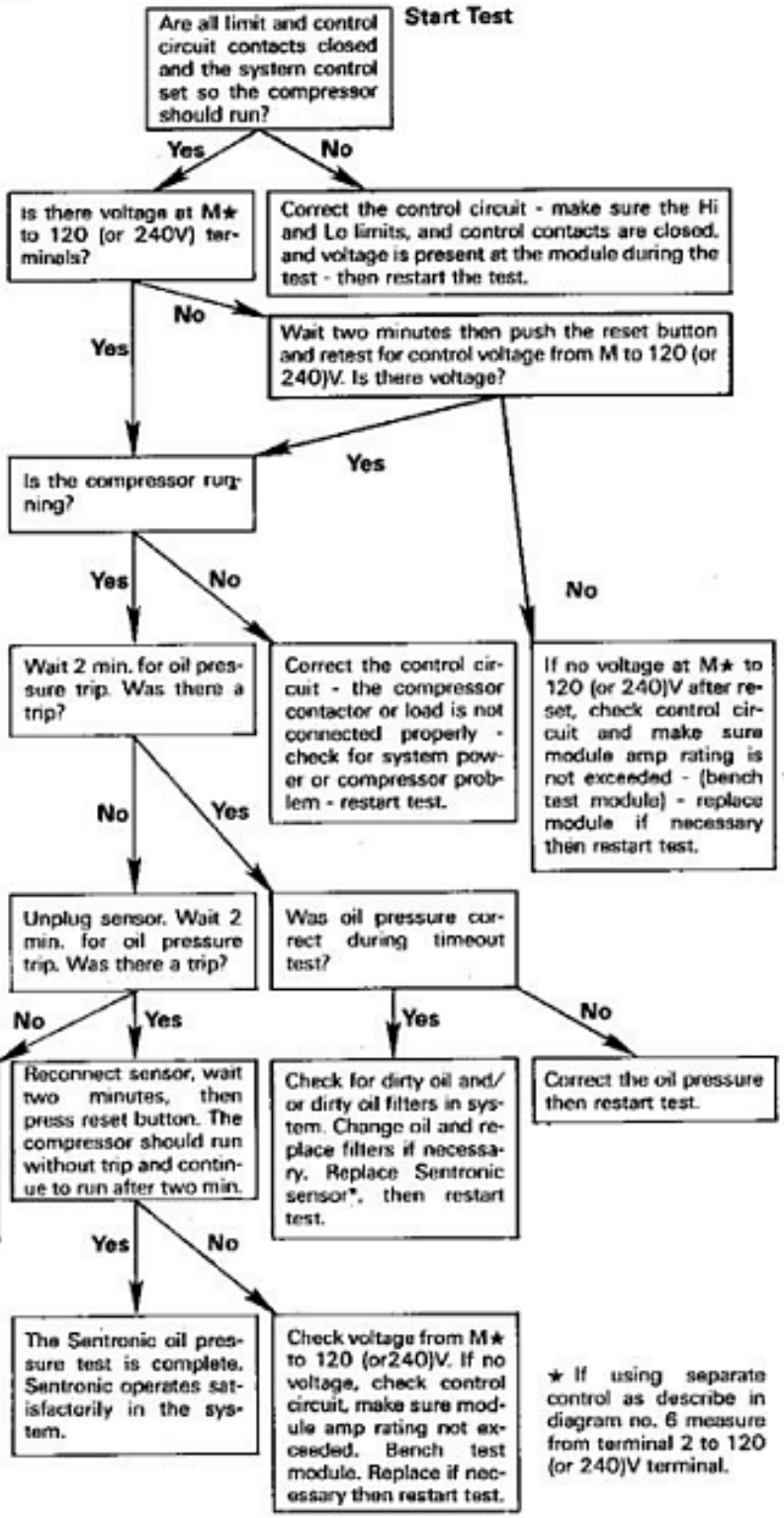
This test is to be performed with the Sentronic oil pressure module and sensor connected to the system, and the system energized at the start of the test.

If at any time during this test sequence the Sentronic module appears to be malfunctioning, it should be bench tested.

Sentronic Specifications:
Cut-in pressure 12-14 PSID
Cut-in pressure (Sensor contact closes)
Cut-out pressure 7 - 9 PSID
(Sensor contact opens)

Time Delay = 120 sec. ± 15 sec.

Maximum Allowable Controlled Load for the normally open and normally closed contacts =
120V, 6 Amps or
240V, 2.5 Amps.



* The Sentronic sensor differential pressure switch contacts should be closed when the compressor is running and open when the compressor is off or oil pressure is too low.

The switch contacts can be checked by removing the module connector from the sensor and using an ohmmeter on the sensor terminals.

★ If using separate control as describe in diagram no. 6 measure from terminal 2 to 120 (or 240)V terminal.

Revision Tracking R10

The document format has been updated to the new Copeland format.

All occurrences of "Emerson" have been removed.

A note regarding A3 and R290 venting has been updated.