Critical Environment Technologies™

Operation Manual

Rev. I | 2015.03

SCC Self Contained Controller

www.critical-environment.com

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1 POLICIES

1.1 Important Note

Read and understand this manual prior to using this instrument. Carefully read the warranty policy, service policy, notices, disclaimers and revisions on the following pages.

This product must be installed by a qualified electrician or factory trained technician and according to instructions indicated in this manual. This instrument should be inspected and calibrated regularly by a qualified and trained technician. For more information, refer to Sections *8 Calibration* and *10 Maintenance* of this manual.

This instrument has not been designed to be intrinsically safe. For your safety, **do not** use it in classified hazardous areas (explosion-rated environments).

INSTRUMENT SERIAL NUMBER:

_____

PURCHASE DATE:

_____

PURCHASED FROM:

_____

1.2 Warranty Policy

Critical Environment Technologies Canada Inc. (CETCI), also referred to as the manufacturer, warrants this instrument, (excluding sensors, battery packs, batteries, pumps and filters) to be free from defects in materials and workmanship for a period of **two years from the date of purchase from our facility.** The sensors have a warranty period of **one year on a pro-rated basis from the date of purchase from our facility**. If the product should become defective within this warranty period, we will repair or replace it at our discretion.

The warranty status may be affected if the instrument has not been used and maintained per the instructions in this manual or has been abused, damaged, or modified in any way. This instrument is only to be used for purposes stated herein. The manufacturer is not liable for auxiliary interfaced equipment or consequential damage.

Due to ongoing research, development, and product testing, the manufacturer reserves the right to change specifications without notice. The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data.

All goods must be shipped to the manufacturer by prepaid freight. All returned goods must be pre-authorized by obtaining a Returned Merchandise Authorization (RMA) number. Contact the manufacturer for a number and procedures required for product transport.

1.3 Service Policy

CETCI maintains an instrument service facility at the factory. Some CETCI distributors / agents may also have repair facilities; however, CETCI assumes no liability for service performed by anyone other than CETCI personnel.

Repairs are warranted for 90 days after date of shipment (sensors have individual warranties).

Should your instrument require non-warranty repair, you may contact the distributor from whom it was purchased or you may contact CETCI directly.

Prior to shipping equipment to CETCI, contact our office for an Returned Merchandise Authorization (RMA) number. All returned goods must be accompanied with an RMA number.

If CETCI is to do the repair work, you may send the instrument, prepaid, to:

Attention: Service Department
Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way
Delta, BC, V4G 1M3

Always include your RMA number, address, telephone number, contact name, shipping / billing information, and a description of the defect as you perceive it. You will be contacted with a cost estimate for expected repairs, prior to the performance of any service work.

For liability reasons, CETCI has a policy of performing all needed repairs to restore the instrument to full operating condition.

Pack the equipment well (in its original packing if possible), as we cannot be held responsible for any damage incurred during shipping to our facility.

1.4 Copyrights

This manual is subject to copyright protection; all rights are reserved. Under international and domestic copyright laws, this manual may not be copied or translated, in whole or in part, in any manner or format, without the written permission of CETCI.

All software which CETCI utilizes and / or distributes holds a proprietary interest and is also subject to copyright protection and all rights are reserved. No party may use or copy such software in any manner or format, except to the extent that CETCI grants them a license to do so. IF SOFTWARE IS BEING LOADED ONTO MORE THAN ONE COMPUTER, EXTRA SOFTWARE LICENSES MUST BE PURCHASED.

1.5 Disclaimer

Under no circumstances will CETCI be liable for any claims, losses or damages resulting from or arising out of the repair or modification of this equipment by a party other than CETCI service technicians, or by operation or use of the equipment other than in accordance with the printed instructions contained within this manual or if the equipment has been improperly maintained or subjected to neglect or accident. Any of the foregoing will void the warranty.

Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires. It is CETCI policy that all wiring of our products meet this requirement. It is CETCI policy that all wiring be within properly grounded (earth or safety) conduit.

1.6 Revisions

This manual was written and published by CETCI. The manufacturer makes no warranty or representation, expressed or implied including any warranty of merchantability or fitness for purpose, with respect to this manual.

All information contained in this manual is believed to be true and accurate at the time of printing. However, as part of its continuing efforts to improve its products and their documentation, the manufacturer reserves the right to make changes at any time without notice. Revised copies of this manual can be obtained by contacting CETCI or visiting **www.critical-environment.com**.

Should you detect any error or omission in this manual, please contact CETCI at the following address:

Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way, Delta, BC, V4G 1M3, Canada
Toll Free: +1.877.940.8741
Telephone: +1.604.940.8741
Fax: +1.604.940.8745
Email: marketing@cetci.com
Website: www.critical-environment.com

In no event will CETCI, its officers or employees be liable for any direct, special, incidental or consequential damages resulting from any defect in any manual, even if advised of the possibility of such damages.

2 INTRODUCTION

2.1 General Description

Thank you for purchasing our SCC Self Contained Controller. The SCC combines toxic and/or combustible gas detection with basic control functionality for non-hazardous, non-explosion rated, commercial applications.

Available in one or two channel configurations for monitoring toxic and/or combustible gas types by means of an integral electrochemical Carbon monoxide (CO) or Nitrogen dioxide (NO_2) sensor and one of three remote catalytic combustible sensors used to detect Hydrogen (H_2), Propane (C_3H_8) or Methane (CH_4). Monitoring of CO or NO_2 may also be achieved remotely by combining the SCC with a 4 – 20 mA transmitter such as the LPT-TCO or LPT-END.

The SCC also features two alarm level line voltage relays with field configurable time delays and trigger levels, field selectable integral audible alarm and an LED panel indicating power, channel alarm status and fault conditions. Automated calibration and other maintenance procedures are simple and easily performed in the field, and our proprietary Calibration Extending Firmware (CEF) takes into account the aging of the toxic sensors so that less frequent calibrations are required in less-critical applications such as parking garages.

If after reading through the manual, you have any questions, please do not hesitate to contact our service department for technical support.

2.2 Key Features

- Single or dual channel operation
- Integral or remote sensor configurations
- Six conduit entry ports
- Thermal resetting fuse
- LED light indicators for Power, CH1, CH2 and Fault
- Two 5-amps SPDT dry contact relays
- Optional 4 - 20 mA input (alternative to remote combustible sensor)
- RoHS compliant circuit boards

3 INSTRUMENT SPECIFICATIONS

3.1 Technical Specifications

GAS TYPE
Carbon Monoxide (CO)
Nitrogen Dioxide (NO_2)
Combustible Gas (catalytic) Hydrogen (H_2), Methane (CH_4), Propane (C_3H_8), etc.

MECHANICAL	
Enclosure	ABS / Polycarbonate, rated UL94-5VA
Weight	600 g (1.4 lb)
Size	10.0" x 8.6" x 4.3" (254 mm x 218 mm x 109 mm)

ELECTRICAL	
Power Requirement	
Low Voltage	16 - 30 VDC or 12 - 28 VAC, 10W, Class 2
Line Voltage	90 - 240 VAC, 50 - 60 Hz
Current Draw	
Low Voltage	400 mA @ 24 VDC
Line Voltage (110 VAC)	Approximately 90 mA
Line Voltage (220 VAC)	Approximately 45 mA
Wiring	24VDC or 24VAC two-conductor shielded 18 awg stranded within conduit VAC (line voltage) three-conductor (Line, Neutral, Ground) shielded 18 awg stranded within conduit
Circuit	ARM Cortex based analog signal processing board with jumpers for user interface.
Relays	Two SPDT dry contact relays, rated 5 amps @ 240 VAC
Distance	Maximum 80 ft between controller and remote sensor (ESH) using minimum 18 gauge wire. *See pg 25 for more information.*
Fuse	Automatic resetting thermal

USER INTERFACE

Display	LED Panel indicating "POWER", "CH1" state, "CH2" state, and FAULT"
Audible Alarm	Integral piezo audible alarm rated 76 dB @ 10 ft

ENVIRONMENTAL *(sensor dependent)*

Operating Temperature *(depends on sensor)*	-20°C to 50°C (-4°F to 122°F) -40°C to 50°C (-40°F to 122°F)
Operating Humidity	15 - 90% RH non-condensing

CERTIFICATION

Model: SCC-X-XX
S/N: SCCA1401G000101
Rating: 90-240 VAC, 50-60 Hz
16-30 VDC or 12-28 VAC, 10W, Class 2
Max Temp: -40°C to 50°C (-40°F to 122°F)

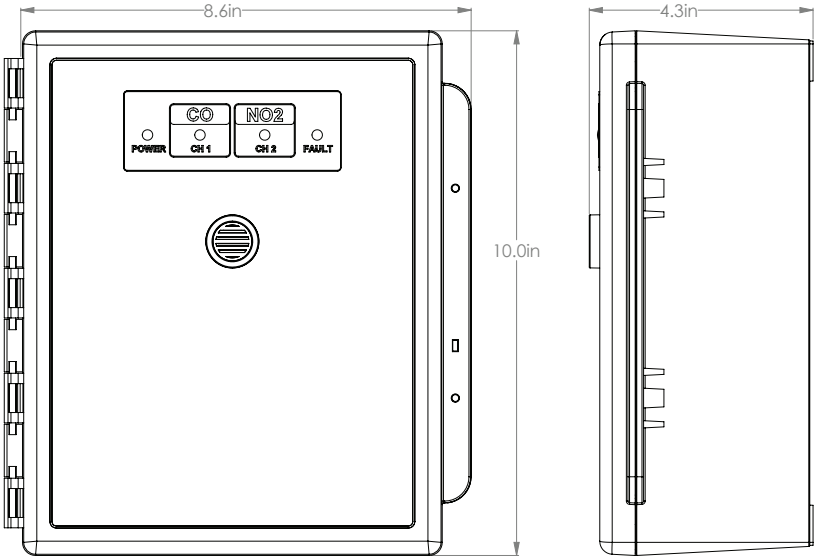
CERTIFIED FOR ELECTRIC SHOCK & ELECTRICAL FIRE HAZARD ONLY. LA CERTIFICATION ACNOR COUVRE UNIQUEMENT LES RISQUES DE CHOC ELECTRIQUE ET D'INCENDIE D'ORIGINE ELECTRIQUE.

Conforms to: CSA-C22.2 No. 205-M1983 (R2009) / UL508 (Edition 17):2007
Conforms to: EMC Directive 2004/108/EC, EN 50270:2006, Type 1, EN61010
Conforms to: FCC. This device complies with part 15 of the FCC Rules, Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTES:

- System is configured such that all relays are "FAIL SAFE" (relay coils are always energized in non-alarm state).
- Relays are "common" to both channels (activated by either channel).

3.2 Enclosure Dimensions



4 SENSOR SPECIFICATIONS

4.1 Common Sensor Specifications

Carbon Monoxide (CO)

Type	Electrochemical
Range	0 - 200 ppm
Sensor Response Time (T_{90})	60 seconds
Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity	5 - 95% RH non-condensing
Operating Pressure	80 - 120 kPa
Operating Pressure Atmospheric	N/A
Resolution	0.5 ppm
Accuracy	No data available
Repeatability	< 2% of signal
Maximum Zero Shift	N/A

Clean Air Output Drift	< 10 ppm equivalent per year
Expected Life Span	6 years in air (under normal conditions)
Calibration	Every 6 months or once a year (depending on application)
Cross Sensitivity	H_2S @ 20 ppm = < 0.1 ppm NO_2 @ 10 ppm = < 0.1 ppm Cl_2 @ 10 ppm = < 0.1 ppm NO @ 50 ppm = < 5 ppm SO_2 @ 20 ppm = < 0.1 ppm H_2 @ 20°C (68°F) @ 400 ppm = < 60 ppm C_2H_4 @ 400 ppm = < 25 ppm NH_3 @ 20 ppm = < 0.01 ppm

Nitrogen Dioxide (NO_2)

Type	Electrochemical
Range	0 - 10 ppm
Sensor Response Time (T_{90})	< 30 seconds
Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity	15 - 90% non- condensing
Operating Pressure Atmospheric	± 10%
Resolution	0.02 ppm
Accuracy	No data available
Repeatability	< 2% of signal
Maximum Zero Shift	± 0.2 ppm equivalent
Long Term Drift	< 2% signal loss / month
Clean Air Output Drift	< 2% signal loss / year
Expected Life Span	6 years in air (under normal conditions)
Calibration	Every 6 months (depending on application)

Cross Sensitivity	H_2S @ 20 ppm = < -40 ppm Cl_2 @ 10 ppm = 100 ppm NO @ 50 ppm = < 0.5 ppm SO_2 @ 20 ppm = < -2.5 ppm CO @ 400 ppm = < 0.1 ppm H_2 @ 400 ppm = < 0.1 ppm C_2H_4 @ 50 ppm = < 0.1 ppm NH_3 @ 20 ppm = < 0.1 ppm CO_2 @ 5% volume = < 0.1 ppm

4.2 Remote Sensor Specifications

Combustibles (e.g. CH_4, H_2, C_3H_8)	
Type	Catalytic
Range	0 - 50% LEL
Sensor Response Time (T_{90})	< 12 seconds from 0 - 50% LEL
Operating Temperature	-20°C to 40°C (-4°F to 104°F)
Operating Humidity	20 - 90% non- condensing
Resolution	1% LEL
Accuracy	No data available
Long Term Drift	N/A
Expected Life Span	6 - 8 years
Calibration	Every 6 months (depending on application)
Cross Sensitivity	Any combustible gas

NOTES:

- Some of the above sensors have cross sensitivities to other gases (interfering gases). Please refer to the sensor specification chart before ordering a specific sensor if your application may have some of the interfering gases present.

4.3 Calibration Extending Firmware (CEF) and Sensor Aging

SCC systems with integral electrochemical sensors have been programmed with our CEF. This firmware takes into consideration the aging of the electrochemical CO and NO_2 sensors so that

less frequent calibrations are required in less-critical applications such as parking garages. The system tracks the age of the sensor and automatically compensates for the reduced output of the sensor as it ages.

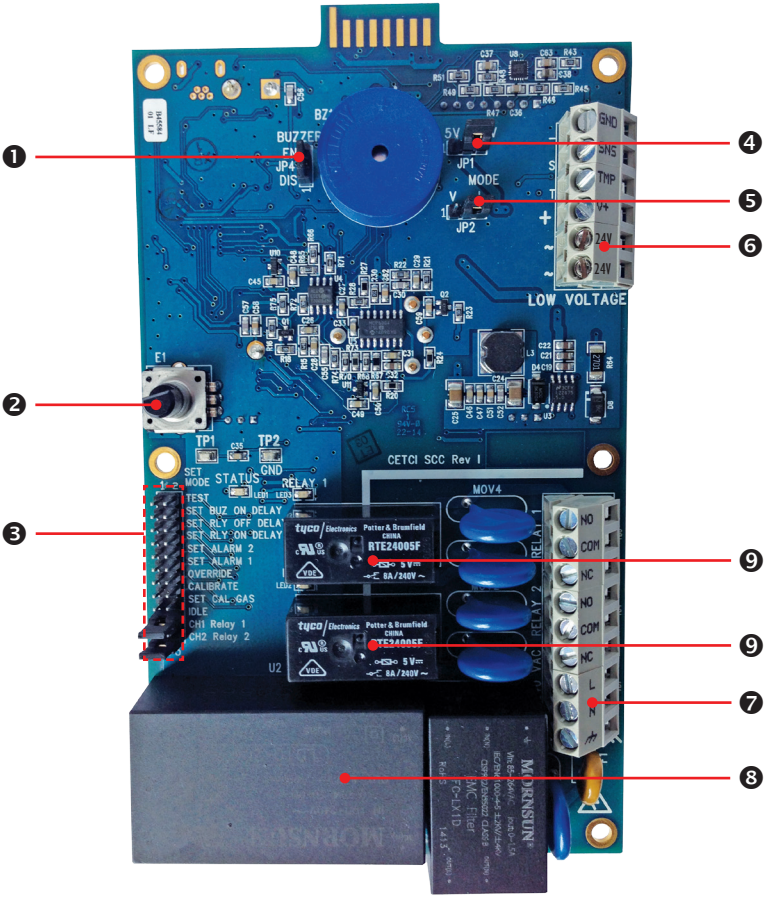
5 FEATURES

5.1 Front Exterior Enclosure

NUMBER	FEATURE	FUNCTION
❶	Power LED	Indicates unit power.
❷	Sensor Channel LEDs	Indicates channel alarm status.
❸	Fault LED	Indicates unit fault condition.
❹	Sensor Opening	To monitor diffused air and gas.
❺	Door Screws	Secures door.
❻	Secure Tag Opening	For securing door with zip tie or dated tag.

❼	Magnetic Calibration Trigger point	To enter calibration for Channel 1
❽		To enter calibration for Channel 2

5.2 Interior System Layout



NUMBER	FEATURE	FUNCTION
❶	JP4	Buzzer enable / disable
❷	Rotary Encoder	Used for setting values in conjunction with jumpers.

❸	JP3 Config / Cal / Test Jumpers	Used to select different configuration and calibration modes.
❹	JP1 Remote Sensor Voltage	Selects the voltage used to power remote sensor; 5 V, 24 V.
❺	Jumper JP2	Select voltage or current loop remote sensor.
❻	Low Voltage Wiring Terminal	For low voltage power connections and remote sensor hookup.
❼	High Voltage Wiring Terminal	For high voltage power connections and relay hookups.
❽	Power Supply Transformer	Provides low VDC power from 120 or 240 VAC input.
❾	Dry Contact Relays	For high & low alarm.
❿	Test Points TP1 TP2	Monitoring config values with a voltmeter.

6 INSTALLATION

6.1 General Safety Warnings

The SCC is intended for indoor use, permanently mounted at breathing zone height (4 to 6 ft above ground) in parking garages and light industrial applications. It should be protected from extreme weather conditions.

The SCC requires no assembly and virtually no maintenance other than regular calibration of the integral and/or remote sensors and ensuring that excess water or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components. There are no serviceable elements other than the calibration instructions outlined in this manual. There are no replaceable components except the sensors.

6.2 Protection Against Electrical Risks

Warning High Voltage. Indicates hazardous voltage may be present in the area inside the SCC enclosure marked with this symbol.

Disconnect all power before servicing. There may be multiple power sources.
Power supply must have a building installed circuit breaker /switch that is suitably located and

easy to access when servicing is required and should be labelled as SCC supply (disconnecting power to the SCC). Appropriate markings should be visible at the circuit breaker / switch that is supplying power to the SCC.

This device may interfer with pacemakers. Modern pacemakers have built-in features to protect them from most types of interference produced by other electrical devices you might encounter in your daily routine. If you a have a pacemaker, follow your healthcare provider's instructions about being around this type of equipment.

6.3 Protection Against Mechanical Risks

Be aware that the SCC enclosure has a hinged door that could potentially pinch fingers and the sharp edges and/or jumper pins on the board could potentially prick or cut fingers if not handled carefully.

6.4 System Installation

The SCC should be installed on a flat vertical surface using the four 0.175" (4.4 mm) diameter mounting holes provided to maintain water tight status. There are also four areas that can be drilled out for mounting to a double gang electrical box.

Care should be taken to ensure that the face of the SCC is not obstructed in order to maximize the sensor's exposure to the environment being monitored. If the SCC is to be installed in a potential hose-down application or any other application whereby liquid could be directed towards the sensor opening, the SCC should be ordered with the optional splash guard (factory installed).

If used in a wet or wash down application, the conduit hub entering the SCC enclosure must be a liquid tight type. Any water or physical damage to the SCC that occurs from the installer drilling their own installation holes will not be covered under CETCI's warranty.

There are six conduit entry points for the standard mounting setup (against a flat surface). Three entry points are located along the top of the enclosure and three are located along the bottom. These points must be drilled out as needed. If mounting to a double gang electrical box there is an entry point provided that must also be drilled out of the back of the enclosure. Refer to Section *6.6 Standard Enclosure Mounting Components*.

NOTE: When mounting the enclosure, allow enough room to allow the end user to open the door fully to access the internal adjustments.

When finished installing or servicing it is recommend you perform a bump test to ensure the unit and all relays are working properly.

6.5 Sensor Mounting Heights

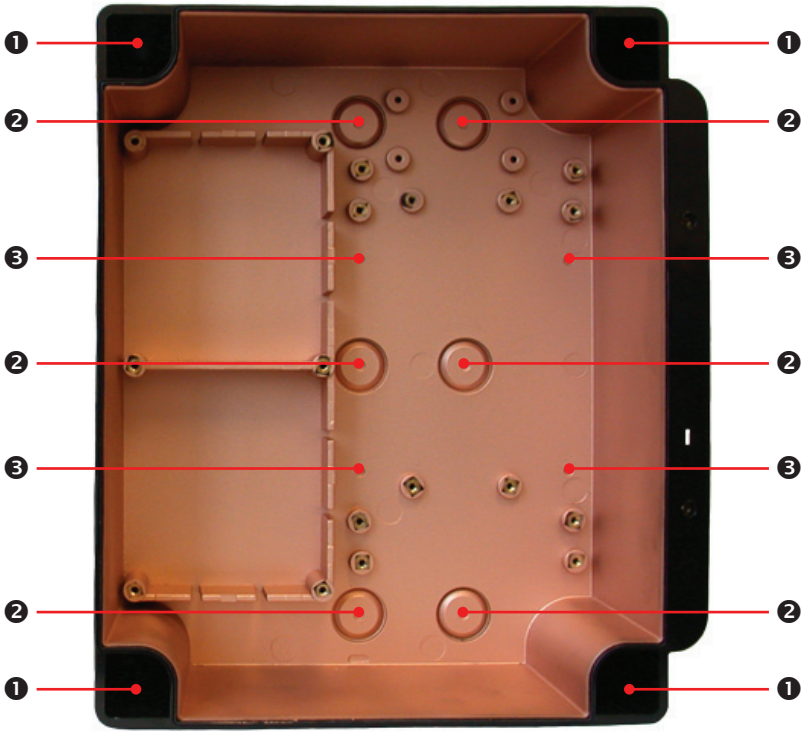
The sensor mounting height depends on the density of the gas relative to air. Heavier than air gases should be detected 6 inches from the floor, lighter than air gas sensors should be placed on or near the ceiling, and gases which have a density close to that of air should have sensors installed in the "breathing zone" 4 - 6 feet from the floor. The breathing zone refers to the area 4 - 6 feet from the floor, where most human breathing takes place. This is a good default location for sensors, as many gases are often well dispersed in air.

GAS	APPLICATIONS / TYPES	SUGGESTED MOUNTING HEIGHT
Carbon Monoxide (CO)	Gas engine exhaust	4 - 6 ft above the floor
Nitrogen Dioxide (NO_2)	Diesel engine exhaust	4 - 6 ft above the floor
Propane (C_3H_8)	Propane fuel	6" above the floor
Hydrogen (H_2)	Lead acid battery charging rooms	On or near the ceiling
Methane (CH_4)	Buildings built on landfill sites	On or near the ceiling

NOTE: CETCI considers 4 - 6 ft from the floor as the "Breathing Zone" when it applies to sensors installed for vehicle exhaust applications.

6.6 Standard Enclosure Mounting Components

6.6.1 Enclosure Interior Base



NUMBER	FUNCTION
❶	Molded-in mounting holes
❷	Conduit entry
❸	Alternative mounting holes

6.6.2 Enclosure Top

NUMBER	FUNCTION
❶	Molded-in mounting holes
❷	Conduit entry

6.6.3 Enclosure Bottom

NUMBER	FUNCTION
❶	Molded-in mounting bracket
❷	Conduit entry

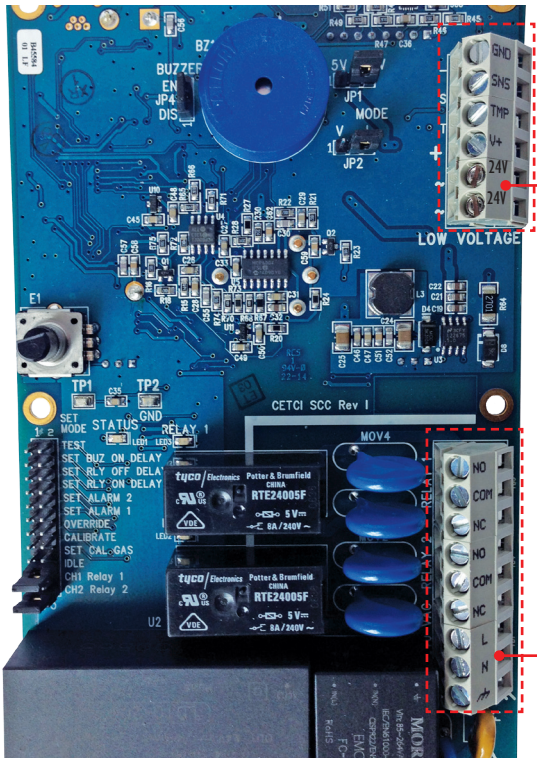
6.7 Wiring Connections

The SCC provides screw down wiring terminals connecting a remote 4 - 20 mA transmitter such as an LPT or to a remote catalytic sensor head. Terminal blocks are also provided to connect to the two 5A / 250 VAC - 30 VDC relays.

All wiring should be run within properly grounded (earth or safety) conduit. Low voltage wiring must not be within the same conduit as line voltage wiring.

6.7.1 Power

Drill out one or more of the PVC conduit entry hole plugs located on the top, bottom or back of the system enclosure base. Refer to Section *6.6 Standard Enclosure Mounting Components*.



If supplying 24 VAC / VDC operational power, pull two wires suitable for low voltage from power source to both terminals labeled 24 V on block TB3.

If supplying line voltage, wire to terminals L, N and earth ground on block TB1.

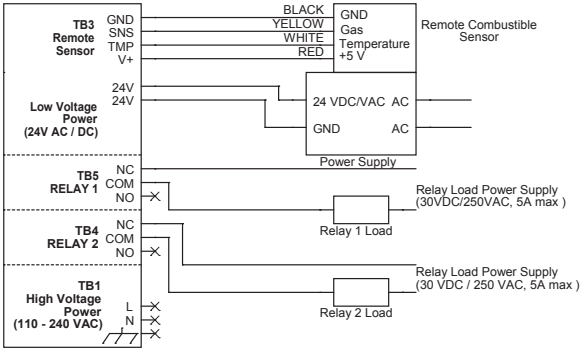
6.7.2 AC & DC Low Voltage Power Wiring

If supplying 24 VAC or VDC, connect both lines from your power supply to the "24V" terminals on connector TB3 located at the top right of the circuit board. A class 2 or better transformer must be used. The stated max current draw of the SCC in this mode is 0.5 A.

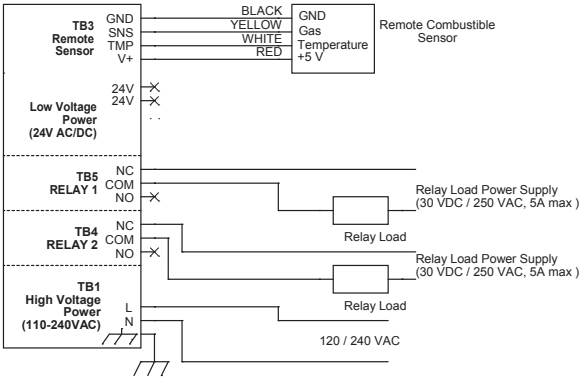
6.7.3 AC Line Voltage Power Wiring

If supplying line voltage (110 - 240 VAC), connect L1 to L on TB1 located at the bottom right of the board. Connect L2 to N and earth ground to the chassis ground terminal on the same block.

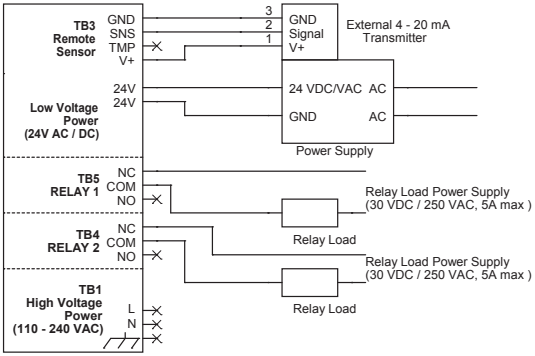
Wiring Example: 24V Remote Combustible Sensor



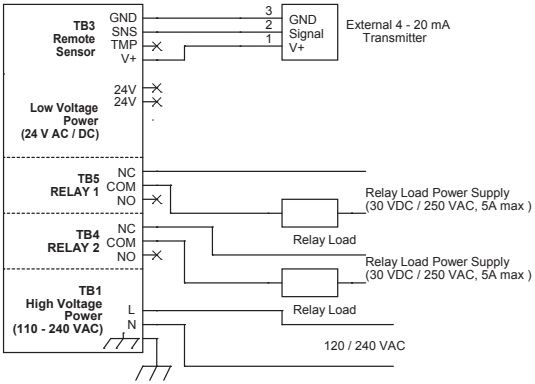
Wiring Example: Line Voltage Remote Combustible Sensor



Wiring Example: 24V Remote 4 - 20 mA Transmitter

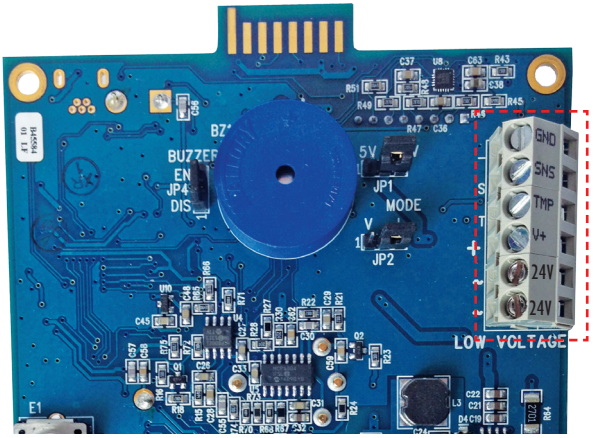


Wiring Example: Line Voltage Remote 4 - 20 mA Transmitter



6.7.4 Wiring to Remote Transmitter

To connect a remote 4 - 20 mA current loop transmitter use terminal block TB3 located at the top right of the circuit board. For a two-wire connection, wire to positions V+ and SNS. If connecting a remote transmitter using a three-wire setup connect the third wire to the GND position of TB3.



Three-conductor, 16 - 18 gauge wire / cable must be shielded when connecting to a remote analog transmitter. The LPT series remote analog transmitter enclosures have several conduit entry locations (general purpose enclosure). Under most local electrical codes, low voltage wires cannot not be run within the same conduit as line voltage wires.

NOTE: DO NOT use solid-core wire for connection to wiring terminal strip. Any damage caused by using solid-core wire will void warranty. Use stranded wire ONLY.

6.7.5 Wiring to Remote Combustible Sensor Head

Four-conductor, 16 - 18 gauge, shielded cable wire is required between the SCC and the remote sensor. Under most local electrical codes, low voltage wires cannot not be run within the same conduit as line voltage wires.

NOTE: DO NOT use solid-core wire for connection to wiring terminal strip. Any damage caused by using solid-core wire will void warranty. Use stranded wire ONLY.

6.7.6 Voltage to Remote Transmitter

Voltage supplied by the controller to the remote analog transmitters should measure approximately 24 VDC nominal. If these voltages are not attained after installation, the wrong gauge wire may have been used or the wiring run is too long.

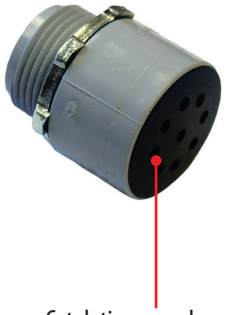
NOTE: Check the positions of jumpers JP1 and JP2 before powering up a setup with a remote transmitter. Reference Section 7.4 to determine the appropriate positions. Incorrect positions of the jumpers will result in the remote transmitter not turing on and the SCC will require a restart.

6.7.7 Voltage to Remote Combustible Sensor Head

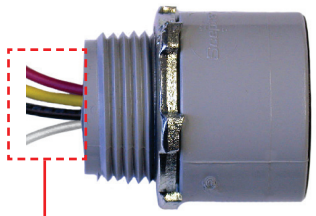
The voltage supplied by the SCC controller to the remote sensor should measure 5.0 VDC ± 10%, at the remote sensor.

The remote solid-state sensor housing comes with a 3/4" conduit thread and nut to allow installation in any standard electrical junction box (to be supplied by the installer). Connect four low voltage wires between it and the controller and observe polarity.

VERY IMPORTANT NOTE: Check the positions of jumpers JP1 and JP2 before powering up a setup with a remote sensor head. Reference Section *7.4 Jumpers* to determine the appropriate positions. Incorrect positions of the jumpers will destroy the sensor.



Catalytic sensor breathes through these openings.



Wiring:

- Red (V+)
- Yellow (Signal)
- Black (Ground)
- White (Temperature)

Maximum distance between the SCC and a remote sensor (ESH) should not exceed 80 ft (24 m) of wire connecting the two together. Any length of wire over 10 ft (3 m) will need a re-calibration of the Zero.

NOTE: Wiring between an SCC and the remote sensor should be four-conductor, shielded, 16 - 18 gauge stranded wire in a separate conduit from all other wiring.

6.7.8 Relay Connections

System relays are dry contacts and designed to operate fan starters or coils to control equipment that draws no more than 5 amps start-up and / or operational current.

NOTES:

- The system does not provide any power from these terminals. Dry contacts operate like a switch to simply activate (switch on) or de-activate (switch off) equipment to be controlled, such as fan starters.
- System relays are SPDT (single pole, double throw) thereby providing one set of usable dry contacts for each relay. Because the SCC series systems are designed to be fail-safe, any equipment to be controlled by the system relays should be wired to the "NC" (Normally closed) and "COM" (Common) terminals. **The relay coils are normally energized in non-alarm state for failsafe operation.**

7 OPERATION

7.1 System Operation

The SCC continuously monitors gas concentrations on the configured channels. In the event of a gas build up in excess of the level set for ALARM 1, RELAY 1 will be triggered and the front LED for the appropriate channel will change from GREEN to AMBER. If an ON DELAY has been set, the LED will change colour and blink but the relay will remain unchanged until the time delay has expired, at which time the relay will "trip" and the LED will change from flashing amber to solid amber. If the gas level falls below the set ALARM level before the delay has finished, the alarm will be cancelled and the delay will be reset for the next alarm.

Similarly, if the gas level builds up to a level in excess of the level set for ALARM 2, RELAY 2 will be triggered, and the LED for the appropriate channel will change from AMBER to RED. In addition to the above, ALARM 2 will also trigger the audible alarm, if enabled.

When the gas level drops below the appropriate alarm threshold the RELAYS and LEDS will return to the state of the next lowest alarm point. If an off delay has been set, the LED will remain in its current colour and the relay will stay tripped for the duration of the relay off delay.

The current gas level can be monitored at any time during normal operation by using a volt meter connected to test pins TP1 and TP2. These pins will show a voltage from 0 - 4 V indicating the current gas level read by the channel selected using the Channel Select jumpers on JP3. To relate the voltage to a gas level reading refer to Section 7.5 or use the following equation:

[Voltage Reading / 4 V] x [Sensor Full Scale Range] = Gas Reading

or

[Gas Reading / Sensor Full Scale Range] x [4 V] = Voltage Reading

Example: For a CO sensor with a full scale range of 200 ppm and a test point voltage reading of 0.8 volts, the gas level would be [0.8 V / 4 V] x [200 ppm] = 40 ppm.

Upon application of power the power LED will turn solid on and the channel LED for each installed channel will blink Green. All alarms are disabled for two minutes for a system warm up period. After the warm up period, the system may exhibit gas alarm condition(s) if one or both of the sensors has not completely stabilized during the warm up period. This is normal and the length of time the gas alarms exist is dependent upon the length of time since the unit was last powered up and the state of the environment it is installed in. After warm up, only the green power LED and the green channel LED for each installed channel illuminate indicating normal operation and the relays are energized indicating normal "Fail-safe" NO ALARM status.

7.2 Test Functions

To enter test mode move the jumper on JP3 from IDLE to TEST. When in test mode the buzzer will beep three times (if jumper enabled on JP4) and the test points will output 4V. The external LEDs will cycle to test their function, watch for both red and green on the channel LEDs if damage is suspected. To test Relay 1, turn the encoder clockwise 1 half turn. The test point will output 3 volts and Relay 1 should produce an audible click (de-energizing) with its corresponding internal LED turning off. To test Relay 2, turn the encoder counter clockwise 1 half turn. The test points will output 2V and the relay will produce an audible click (de-energizing) with its internal LED turning off.

Test mode will exit after 5 minutes of no activity or once the jumper is removed from the test position. Upon exit the unit will return to standard measurement mode. The SCC cannot enter test mode if an alarm level is detected on either channel.

NOTE: Relay ON delays do NOT apply in test mode, however Relay OFF delays will apply when test mode times out or the jumper is removed if the relays were tested (tripped) they will remain so after test mode for the duration of their respective OFF delay.

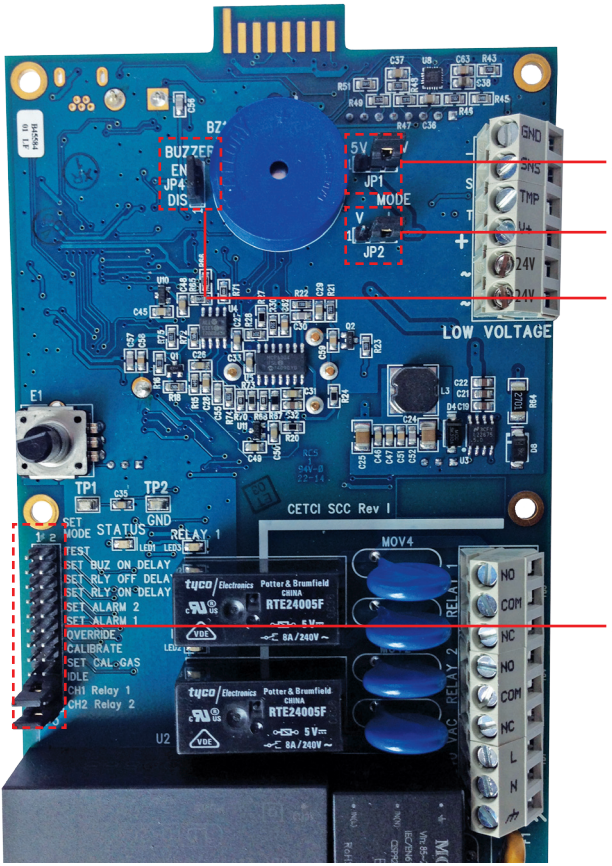
7.3 Internal Audible Alarm Operation

The SCC contains an audible alarm linked to the second alarm point for each installed channel. The buzzer will sound once the gas for a specific channel passes the second set point (Channel LED shows red). If the configurable buzzer on delay has been set the delay will begin counting down the moment the set point is reached. If the gas level drops below the set point before the

delay completes the buzzer will not sound. The buzzer can be enabled and disabled using the jumper on JP4. The buzzer is enabled by default.

7.4 Jumpers

There are three single jumper positions (JP1, JP2 and JP4) and one bank of 12 jumpers (JP3).



The first single jumper position JP1 located at the top right corner of the board sets the voltage (5 V / 24 V) used to power a remote sensor. JP2 located directly below JP1 sets whether or not a voltage or current loop signal is received from the remote sensor or remote analog transmitter (LPT series). The last single jumper position JP4 is located near the top left of the board and is used to enable / disable the internal audible alarm buzzer.

The jumper bank JP3 provides the ability to monitor and configure a wide range of values. In order to set these values you will need a 10mV resolution Voltmeter. Clip the voltmeter leads to the test points TP1 and TP2. First place one jumper on one of the channel / relay select jumpers at the bottom of the group. The other jumper can then be placed in one of the other positions the functions of which are stated in the following table:

POSITION NAME	FUNCTION
TEST	Puts the unit into test mode (see Section 7.2)
SET BUZ ON DELAY	Configure internal audible alarm ON delay
SET RLY OFF DELAY	Configure selected Relay OFF delay
SET RLY ON DELAY	Configure selected Relay ON delay
SET ALARM 2	set selected channel alarm 2 lvl
SET ALARM 1	set selected channel alarm 1 lvl
OVERRIDE	Used during calibration to override a zero or span value that is out nominal range
CALIBRATE	Begin the calibration procedure
SET CAL GAS	Adjust the gas concentration used in calibration
IDLE	jumper default position (no connection)
CH1 Relay 1	select CH1 or Relay 1
CH2 Relay2	select CH2 or Relay 2

7.5 Adjusting Alarm Set Points

Equipment Required: Voltmeter 10 mV resolution

The SCC is configurable as single or dual channel detector and has two gas alarm set points for each channel. Almost all installations of the SCC will use the factory default alarm set points.

Default set points are as follows:

SENSOR / GAS	MEASURMENT RANGE	LOW ALARM (ALARM 1) SET VOLTAGE	HIGH ALARM SET VOLTAGE	
CO	0 - 200 ppm	25 ppm / 0.50 VDC	100 ppm / 2.00 VDC	default
CO	0 - 200 ppm	35 ppm / 0.70 VDC	200 ppm / 4.00 VDC	
NO_2	0 - 10 ppm	0.7 ppm / 0.28 VDC	1.0 ppm / 0.40 VDC	default
NO_2	0 - 10 ppm	2.0 ppm / 0.8 VDC	5.00 ppm / 2.00 VDC	
C_3H_8	0 - 50% LEL	10% LEL / 0.8 VDC	20% LEL / 1.60 VDC	default
C_3H_8	0 - 50% LEL	20% LEL / 1.60 VDC	40% LEL / 3.20 VDC	

NOTE: Alarm values for CH_4 and H_2 are the same as for C_3H_8.

To change an alarm point first begin by placing the channel select jumper at the bottom of JP3 on the desired channel. Next move the second JP3 jumper to either SET ALARM 1 or SET ALARM 2 depending on the alarm you wish to set. Once the jumpers are in position the test points TP1 and TP2 will show a voltage corresponding to the current alarm point. Turn encoder E1 to increase or decrease the level. The alarm points change in 1% FSR increments. That is for a CO sensor with a 200 ppm full scale reading each encoder click will change the alarm point by 2 ppm. Use the equation in Section 7.1 to determine the correct voltage reading.

NOTE: Alarm 1 is "low alarm" and Alarm 2 is "high alarm" by default. The set points can be changed so that Alarm 1 is higher than Alarm 2. However, LED and relay behaviour will not change, i.e. once alarm point 2 is reached, Relay 2 will trip and the channel LED will show red, regardless of whether alarm point 1 has been reached.

7.6 Setting Relay ON / OFF Delays

The SCC comes with configurable ON and OFF delays for each relay. For a description of the operation of these delays see Section 7.1 and Section 7.4. To set a delay first ensure the channel/ relay select jumper is on the correct position for the relay to be configured.

NOTE: Each delay is local to the relay and independent of the tripping channel.

Place the second jumper on JP3 on either SET RLY ON DELAY or SET RLY OFF DELAY depending on the delay you wish to set. Once the jumpers are in position the test points TP1 and TP2 will output a voltage corresponding to the current time delay. The voltage is related to the delay using the following equation:

[Current Delay / Max Delay] x [4 V] = Test Point Voltage

or

[Test Point Voltage / 4 V] x [Max Delay] = Current Delay

The factory set max delay is 20 minutes for both delays on both relays. Turn encoder E1 to increase or decrease the desired delay. The encoder changes the delay time in 10 second increments.

7.7 Setting Buzzer ON Delay

To set the ON delay for the on board buzzer place a Jumper on SET BUZ ON DELAY on jumper bank JP3. The test points will then output the current buzzer delay based on the equations described in section 7.6. The max delay for the buzzer is also 15 minutes and the encoder E1 increments it in 10 second steps.

NOTE: The buzzer delay is local to the buzzer and applies regardless of the channel causing the alarm.

8 CALIBRATION

8.1 Calibration Specifications

8.1.1 Gas

Calibration span gases should have at least ± 5% accuracy and have a current date stamp. Gas generators should have a current dated cell installed. Service personnel should flow zero emissions air or 20.9% volume O_2 (scrubbed of hydrocarbons) before attempting to null adjust toxic gas sensors. In some cases N_2 can be substituted for zero air. Contact CETCI for clarification.

Every SCC controller is calibrated in a chamber by true diffusion method prior to leaving our facility. This method more closely emulates actual "real world" conditions. Field calibration using gas cylinder, regulator and hose directing span gas into the sensor may result in slightly higher readings. It is important to note that the type of gas mixture, how old the gas is and what temperature it has been stored at will also affect repeatability during field calibration.

8.1.2 Regulators & Flow

Calibration gases that are lighter than or the same weight as air (ie. CO) should be flowed at 0.5 LPM. Gases heavier than air (NO_2, etc.) should be flowed between 0.5 and 1.0 LPM. Fixed flow regulators provide more accuracy.

8.1.3 Adapters

The proper calibration adapter should be utilized to allow the gas to properly diffuse around the sensor. They are available from CETCI under part number **CET-7000-CAP**.

8.2 Calibration Sensors

8.2.1 Calibration Frequency

- Parking garage detectors: Once every 12 months
- OHS applications: Once every 6 months (OHS: Occupational Health & Safety)

8.2.2 Gas Testing Frequency (Bump Testing)

For the purpose of safety in OHS applications, sensors should be gas tested (bump tested) once every month to confirm response and alarm activation.

NOTE: A calibration label should be applied after every calibration to confirm work performed and the date it was confirmed. If a controller is involved, the alarm set points should be indicated on a label on the front door of the enclosure so anyone working in the environment can be aware.

Required Equipment: Calibration kit, Calibration gases
Optional: Digital multi-meter

Users can order the calibration kit, calibration accessories and / or gases from any CETCI authorized distributor or they can supply their own gas and equipment as long as the gas meets the minimum specifications.

8.3 Calibration Procedure

The calibration procedure within the SCC controller is jumper automated (there are no potentiometers to adjust). To achieve calibration the user must first set the concentration for the span gas to be used. This setting is done using the 4 V test points TP1 and TP2. The range of 0 - 4.0 VDC is equal to the full measurement range of the sensor. e.g. HVAC CO sensor has a standard measurement range of 0 - 200 ppm. Therefore 4.0 VDC = 200 ppm. Prior to attempting to calibrate, determine or calculate the voltage value required. Consult equation in Section 7.1 to calculate the voltage. If the value desired is not indicted, use the following formula to calculate the voltage required.

[Test Point Voltage / 4 V] x [Sensor Full Scale Range]= Span Gas Concentration

or

[Span Gas Concentration / Sensor Full Scale Range] x [4 V] = Test Point Voltage

8.4 Calibrating the Internal Sensor

NOTE: If an inappropriate concentration of span gas is applied during calibration, calibration may succeed but it does not mean the equipment has been calibrated properly. CETCI is not responsible for improperly calibrated transmitters. Follow the manual instructions carefully.

To calibrate the SCC's internal sensor the user must do the following:

Step 1:
Set the calibration gas concentration. Ensure the channel select jumper on JP3 is set to the desired channel and move the other jumper from idle to "SET CAL GAS". The current level of the calibration gas will be indicated by the voltage output on the test points TP1 and TP2 (see equation in Section 8.3). Use the encoder E1 to set the cal gas level to match the gas to be used. Once the calibration gas level has been set move the jumper from SET CAL GAS to the IDLE position.

Step 2:
Attach the regulator to the cylinder of zero air, insert calibration adapter into the sensor opening in the front of the enclosure door, and open regulator valve fully allowing zero air to flow over sensor for one minute.

Use a slight twisting motion as you gently push the calibration adapter into the sensor opening. If the calibration adapter is hard to insert, moisten the O-ring seal slightly then try re-inserting it.

If the splash guard is installed, use calibration adapter P/N CET-8000-GRS. **NOTE:** Response time will be slower with the splash guard installed.

Step 3:
Move the jumper on JP3 from "IDLE" to "CALIBRATE". The internal status LED will turn solid red and the front channel LED will blink 50/50 orange/green, indicating calibration has started.

Step 4:
If this level (possible residual gas) is too high, but still within override range, the internal LED will flash with a short OFF time and long ON time. This indicates that an override is needed. To override, move the Channel select jumper to the OVERRIDE position. If the jumper is not moved to the OVERRIDE position in 30 seconds, the zeroing will be cancelled and will return to normal mode. After using the OVERRIDE position, the jumper should be returned to the channel selection position (CH1 RELAY 1, CH2 RELAY 2). If outside of the OVERRIDE range, Fault LED will blink 50% ON 50% OFF until either the calibration jumper is removed or the main calibration timer (5 min) times out.

Step 5:
Once successfully zeroed, the internal LED will first flash 8 times, and then repeatedly flash 4 times and then pause with the LED off. This indicates that it is time to flow the gas.

NOTE: The new zero value is saved at this point. If a zero shift is all that is desired remove the jumper from the calibrate position once the unit has confirmed successful zero as stated above.

If the digital multi-meter leads are attached to test points TP1 and TP2, the voltage should be 0.0 VDC.

Step 6:
Attach regulator to cylinder of span gas.

Step 7:
Insert the calibration adapter into the sensor opening in the front of the enclosure door.

Step 8:
Open regulator valve fully and allow span gas to flow over sensor.

If no gas is detected after one minute, the controller returns to normal operation and the procedure will need to be performed from Step 2.

Step 9:
Once gas flow is detected, the internal LED pattern will change to flash four times and then pause with the LED on. The test point voltage will follow the level of gas detected based on the previous calibration.

The spanning can be cancelled by removing the jumper from the CALIBRATE position and move to IDLE position before the spanning is finished and the controller will return to normal operation (solid green light on the front, internal LED off). Once gas is detected, spanning takes 2 minutes.

NOTE: If calibration is canceled at this point, the previous span value will be used in conjunction with the new zero vaule. CETCI is not responsiblefor incorrect calibration due to zero effect.

Step 10:
Once the span readings have been taken, a sensitivity is calculated and compared to the original sensitivity of the sensor at the time of installation. If this sensitivity is below the override range, but above the fault limit, the LED will flash as it did for zero override range (short OFF, long ON). To override, move the channel select jumper to the OVERRIDE position. If the jumper is not moved to the OVERRIDE position in 30 seconds, the test point will output 4.0 V and will stay there until you move the Jumper. After using the OVERRIDE position, the jumper should be returned to the channel select position (CH1 RELAY 1, CH2 RELAY 2).

If the sensitivity of the sensor is calculated out of range more than the OVERRIDE can compensate for, the internal LED will turn on solid, the front LED will turn off and the test points will output 4 V indicating the sensor cannot be calibrated. You can try to recalibrate, starting from Step 2, to confirm the procedure was followed correctly and this may correct the fault.

If this does not correct the fault, please contact our service department at service@cetci.com.

To exit calibration mode, remove the jumper from the CALIBRATE position and return it to the IDLE position.

If the digital multi-meter leads are attached to test points TP-1 and TP-2, the measured voltage will start moving towards the voltage calculated for the span gas value.

Step 11:
If spanning has been successful the internal LED will begin to flash with a short ON long OFF for 5 minutes. To exit calibration move the jumper from the CALIBRATE to the IDLE position.

During this 5 minute period if the jumper is not moved the unit can be told that a new sensor is installed. This will set the original sensitivity and original zero to those just calibrated. To indicate a new sensor installation turn the encoder E1 counter clockwise 2 turns. The internal LED will turn solid to confirm new sensor values have been set.

NOTE: Only reset original sensor values when a new sensor is installed, this operation is NOT REVERSABLE. CETCI is not responsible for improper calibration or un-calibratable sensors due to improper use of this function.

8.5 Calibrating Second Internal Sensor

To calibrate a second internal sensor, if installed, simply follow the instructions in Section 8.4 while ensuring the channel select jumper is placed on the desired channel.

8.6 Calibrating Remote Combustible Sensor

To calibrate a remote combustible sensor first ensure the sensor has been continually powered for 24 hours. Place the channel select jumper on the appropriate channel. Follow the previously stated procedure in Section 8.4 with the exception of Step 7. Substitute the remote sensor calibration adapter for the standard adapter and place firmly over the remote sensor housing.

8.7 Non-Intrusive Calibration

In dirty or wet applications calibration can be initiated without opening the unit by using the magnetic sensors included within the SCC. A magnet of sufficient strength will be required to trip the sensors. Such a magnet is included in the calibration kit (reference Section 9.3 Calibration Kit) and can also be ordered separately from CETCI under part number CET-MW.

To initiate calibration touch the magnet to the mark on the enclosure door. Both marks should be slightly below and to either side of the sensor opening. The left position initiates calibration of channel 1, the right position initiates calibration of channel 2. Once calibration has begun follow the steps listed above while watching the channel LED in place of the internal calibration LED. To cancel calibration simply repeat the magnet touch used to initiate the process.

NOTE: Overrides cannot be done non-intrusively. If an override is required the door will need to be opened so the OVERRIDE jumper can be accessed.

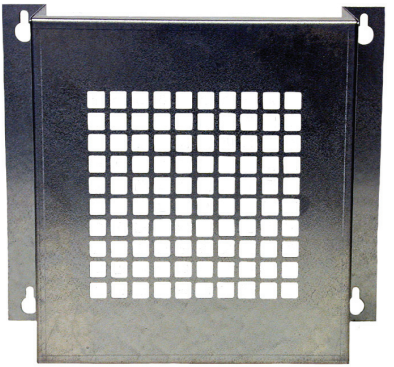
9 ACCESSORIES

9.1 Splash Guard

The splash guard attaches to the front of the enclosure and when attached the enclosure meets IP54 standards. Factory installed only.

NOTE: The splash guard will slow down the response time of the sensor.

9.2 Metal Protective Guard



Part Code: SCS-8000-SPG

The metal protective guard is made of heavy duty metal and helps to protect against abrasive damage, theft or vandalism to the transmitter. It is made from 16-gauge galvanized steel and has ½" (13 mm) square openings in the front to allow gas and air to flow through to the sensor.

With only four slotted mounting holes, installation and removal for gas detector servicing is easy.

Enclosure	16 gauge galvanized steel
Weight	1.7 kg (3.8 lbs)
Size	10.0"W x 9.5"H x 4.8"D (254 mm W x 241 mm H x 121 mm D)

9.3 Magnetic Wand

The magnetic wand is used for non intrusive calibration.

Lifts	½ lb solid steel
Size	2 5/8"X 1/4"Hexagon

9.4 Calibration Kit

Part Code: CET-715A-CK1

Calibration kits and gases are available from the CETCI factory. Many gases are carried in inventory but not all. Check with any CETCI authorized distributor for availability of specific gas

types. Gas cylinders cannot be shipped overseas.

10 MAINTENANCE

The SCC requires no assembly and virtually no maintenance other than regular calibration of the integral and/or remote sensors. It is important to ensure that excess water and/or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components. There are no serviceable elements other than the calibration instructions outlined in this manual. There are no replaceable components except the sensors.

11 TROUBLE SHOOTING

SCC won't power up. (Outer LEDs off)

Is the power properly connected? Refer to *Wiring Examples* in *Section 6.7.3*. Check the connections.

The channel LED flashes red and the fault LED is ON

The SCC is in fault mode for the indicated channel. If re-calibrating the sensor fails it will need to be replaced. Depending on the sensor this can be done in the field or require a return to factory.

Outer LEDs flash four times then pauses

The SCC is in uninitialized mode. Return the SCC to factory.

SCC is constantly in alarm condition (Channel LED shows amber or red)

Sensor may be out of calibration, attempt to recalibrate. If calibration fails, contact support.

SCC Channel connected to remote 4-20mA transmitter constantly in alarm condition (Channel LED shows red)

JP2 may be removed or in the wrong position. For current loop applications JP2 should be set to I (Current).

Remote transmitter will not power up even though SCC is powered.

Check for short between V+, SNS and GND lines from SCC to remote transmitter.

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