Installation Manual

Critical Environment Technologies™

Rev. C | Firmware 2.0 onwards | 2023.08

FCS **Flexible Control System Controllers**

www.critical-environment.com

NEED MORE INFORMATION?

This is the **FCS Installation Manual** for the FCS Flexible Control System with firmware v2.0 onwards.

For information on the following topics, please refer to the applicable **FCS Operation Manual**:

- Channel Settings and Configurations

- Configuring Alarm Setpoints

- Relay, Strobe and Horn and Audible Settings and Configurations

- Analog Input and Analog Output Settings

- STEL and TWA Settings

- Modbus / BACnet Setup

- Modbus Holding Registers

- Logic and Priority Settings and Configurations

- Title-24 Settings

- Calibration Expired Settings

- Add CET Devices to Existing FCS Network

- Deleting, Restoring and Updating System Configuration Files

- Maintenance

- Troubleshooting

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If you would like to view or download the **FCS Operation Manual** from our website click here

The most up-to-date version of the manual will always be on our website.

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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 maintained on a regular basis by a qualified and trained technician.

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. warrants the products we manufacture (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. Sensors are consumable items and once they leave our factory, we cannot reuse or resell them. As such, all sensor sales are final. Should the sensor itself be faulty, there is a one-year pro-rated warranty that would apply from the date of purchase from our facility. The warranty status may be affected if the instrument has not been used and maintained as per the instructions in the manual or has been abused, damaged, or modified in any way. The product is only to be used for the purposes stated in the manual. Critical Environment Technologies is not liable for auxiliary interfaced equipment or consequential damage.

Prior to shipping equipment to CETCI, contact our office for an RMA #. All returned goods, regardless of reason, must be accompanied with an RMA number. Please read our Warranty and Returns Policy and follow our RMA Instructions and Form.

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.

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 RMA #. All returned goods, regardless of reason, must be accompanied with an RMA number. Please read our Warranty and Returns Policy and follow our RMA Instructions and Form.

If the product is deemed repairable, for liability reasons, CETCI will perform all necessary repairs to restore the instrument to its full operating condition.

1.4 Copyrights and Registered Trademarks

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Modbus® is a registered trademark of Gould Inc. Corporation.
BACnet® is a registered trademark of American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

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.

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. In addition, due to improvements made to our products, there may be information in this manual that does not exist in the version of the product the user has. Should you detect any error or omission in this manual, or should you want to inquire regarding upgrading the

device's firmware, please contact CETCI at the following address:

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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.

The most up-to-date version of the manual will always be on our website.

2 INTRODUCTION

2.1 General Description

NOTE: The FCS Installation Manual outlines the basic features and functionality of the FCS and includes information about installing and wiring the system. If you require more in depth information about how the FCS can be configured (channels, relays, strobe/audible and analog input and output settings), using passcodes, logic and priority settings and the Modbus® holding registers, please download the FCS Operation Manual from our website.

Thank you for purchasing our FSC Flexible Control System. The FCS Flexible Control System is a sophisticated, high performance controller that offers multi-channel configurations for monitoring toxic, combustible and refrigerant gases with versatile control functionality for non-hazardous, non-explosion rated, commercial and light industrial applications. The FCS is designed to accept inputs from digital and/or analog transmitters and/or peripheral devices (in various combinations), using Modbus® RTU RS-485 or 4-20 mA analog input.

The FCS is available in 4 channel, 8 channel, 32 channel and 128 channel models with either Modbus® RTU RS-485 WAN output or with BACnet® MS/TP RS-485 WAN output for communicating with a Building Automation System (BAS).

All models include, four configurable SPDT dry contact relays with field configurable time delays and trigger levels, a full colour LCD resistive touch screen with LED panel indicating configurable channel alarm status, relay status and fault conditions, extensive menu system with password protection, enhanced logic control, priorities/zoning capabilities, a USB port for firmware upgrades, data logging and a door-mounted, audible alarm. The FCS has flexible configuration settings for analog outputs and supports 4-20 mA and Modbus® driven VFDs.

2.2 Key Features

- A 1/4 VGA full colour, resistive touch LCD display with an LED panel for alarm status fault conditions

- Easy to navigate menu system with password protection

- Has a USB port for in the field firmware upgrades and data logging downloads

- Configured with either a Modbus® RTU RS-485 or a BACnet® MS/TP RS-485 digital output signal for WAN communications (for communicating with a BAS)

- Supports Modbus® driven VFDs

- Flexible configuration of analog outputs

- Enhanced logic control, zoning and priority structure capabilities

- With the optional Analog Output board(s) (Option -AO or -2AO) installed, the FCS can be configured to have up to 8 internal 4-20 mA outputs* for VFD control or usable by any other device requiring a signal representing the levels of gases detected

- With the optional Analog Input board(s) (Option -AI or -2AI) installed, the FCS can be configured to have up to 8 internal analog inputs*

- A door mounted, loud audible alarm that is ideal for noisy environments.

- Four 5-amp SPDT dry contact relays with field configurable time delays and trigger levels

- Two horn/strobe output drives

- Additional application specific options include: enclosure door lock and key, a top mounted strobe, internal heater and a water tight, door mounted audible alarm.

- The FCS can be connected to a remote strobe/horn combo, an RDM Remote Display Module, and the following peripheral devices: LNK-AO Analog Output, LNK-AI Analog Input, LNK-XT Network Extender, RLY-4 Remote Relay, RLY-8 Remote Relay and RPS-24VDC Remote Power Supply.

- Six conduit entry ports

- Thermal resetting fuses

- RoHS compliant circuit boards

* The maximum number of combined INTERNAL analog inputs and analog outputs is 4 of each.

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

3 INSTRUMENT SPECIFICATIONS

3.1 Technical Specifications

GAS TYPE

No internal gas sensors. Connects to remote digital or analog transmitters.

MECHANICAL

Enclosure	ABS / Polycarbonate, rated UL94-HB. Copper coated interior to reduce RF interference. IP54 rating with door mounted, water tight buzzer installed.
Weight	1.8 kg / 4 lbs

Size	254 mm x 226 mm x 113 mm / 10 in x 8.9 in x 4.44 in

USER INTERFACE

Display	8.1 cm / 3.2 in graphic, 1/4 VGA full colour resistive touch LCD display and LED indicators for "POWER", "STATUS 1, 2 and 3" , "FAULT"

INPUT/OUTPUT

Inputs	- Modbus® RTU RS-485 - 4 or 8 internal 4-20 mA analog inputs (Option -AI or -2AI) - Peripheral devices on Modbus® RTU RS-485 network
Outputs	- Modbus® RTU RS-485 or BACnet® MS/TP to BAS - 4 or 8 internal 4-20 mA analog outputs (Option -AO or -2AO) - Remote and Peripheral devices on a Modbus® RTU RS-485 network - 2 drive outputs for strobe/horn (0.5 Amp @ 24 VDC)
Relays (internal)	4 internal SPDT dry contact relays, rated 5A @ 240 VAC
Audible Alarm	- Standard door mounted buzzer, rated 90 dB @ 30 cm (1 ft) - Optional door mounted water tight buzzer (Option -WA), rated 85 dB @ 60.96 cm / 2 ft
Top Mounted Strobe	24 V, 114 mm H x 76 mm dia / 4.5 in H x 3 in diameter (Option -L)

ELECTRICAL

Power Requirement	90 - 240 VAC, 50 - 60 Hz, 75 W Line Voltage
Current Draw Line Voltage (110 VAC) Line Voltage (220 VAC)	 Approximately 1.0 Amp Approximately 0.5 Amp
Power Distribution	Total power available to Remote and Peripheral Devices and Options 65 W @ 24 VDC
Wiring	- VAC (line voltage) three-conductor (Line, Neutral, Ground) shielded minimum 18 AWG stranded within conduit - LAN Modbus® RTU RS-485 4-conductor, 16 AWG, stranded shielded - WAN (output to BAS): 4-conductor, 16 AWG, stranded shielded Modbus® RTU (version 1.1b3) RS-485 or BACnet® MS/TP (version 1 rev 14) RS-485

LAN / WAN Communication: Modbus® RTU over RS-485	LAN Baud rate: 19,200 (default, configurable) WAN Baud rate: 19,200 (default, configurable) WAN Modbus ID: 100 (factory default) Data bits: 8 Stop bits: 1 Parity: none
WAN Communication: BACnet® MS/TP	Baud rate: 76,800 (default, configurable) Base Address: 270 (factory default) MAC Address: 100 (factory default) Instance ID: 270100 (the Base Address x 1000 + the MAC Address) Data Bits: 8 Stop Bits: 1 Parity: none
Fuses	Automatic resetting thermal

ENVIRONMENTAL

Operating Temperature	-20°C to 40°C (-4°F to 104°F)
Operating Humidity	15 - 90% RH non-condensing

CERTIFICATION

Models: FCS-M-xx, FCS-B-x, FCS-4-M-xx, FCS-4-B-xx,
FCS-8-M-xx, FCS-8-B-xx, FCS-32-M-xx, FCS-32-B-xx
S/N: FCS4M1603B00001 (example)
Rating: 90-240 VAC, 50-60 Hz, 75 W

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. 205-12, 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.

3.2 Maximums by Model

	FCS-4	FCS-8	FCS-32	FCS 128
Gas Channels	4	8	32	128
Analog Inputs	4	8	32	60
Analog Outputs	8	8	60	60
Relays	4 internal 4 remote	4 internal 8 remote	*	*
Horn/Strobe Drives	2 internal 2 remote	2 internal 4 remote	*	*
RDM Remote Displays	4	4	20	20
LNK-XT Network Extenders			3**	3**

*The maximum number of relays (internal + remote) is 64. The 4 internal relays plus 2 strobe/horn drives plus 1 internal buzzer equals 7 relay connections if all are in use (default). The RLY-4 offers an additional 4 remote relays plus 2 strobe/horn drives and the RLY-8 offers 8 remote relays plus 4 strobe/horn drives. Depending on how many relays are being used and how many strobe/horns are connected will determine the maximum number of RLY-4 or RLY-8 remote relay devices you can connect.

**If more than 3 LNK-XT Network Extenders are required, contact CETCI for more information)

3.3 Enclosure Dimensions
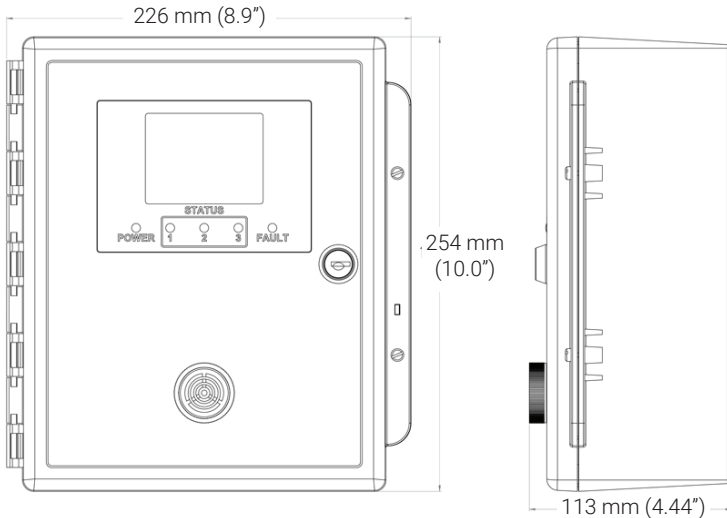
4 LIST OF COMPATIBLE DEVICES

NOTE: The FCS does not have any internal gas sensors. It is strictly a controller that can accept digital and analog inputs (ie. transmitters and other remote and/or peripheral devices).

Analog and/or Digital Transmitters	Output Signal	Gases	Sensor Type
CGAS-A	4-20 mA	CO_2, NH_3, CO, NO_2, CLO_2, Cl_2, C_3H_4, C_2H_4O, CH_2, H_2, H_2S, HCl, HCN, NO, O_2, O_3, PH_3, SIH_4, SO_2, CH_4, C_3H_8, TVOCs, Refrigerants	Infrared
CGAS-AP Public Spaces	4-20 mA	CO_2, CO, CH_2O, Refrigerants, C_3H_8, TVOCs, Particulates	Various - Infrared, Solid State, Catalytic, PID
CGAS-D Digital	Modbus®	CO_2, NH_3, CO, NO_2, CLO_2, Cl_2, C_3H_4, C_2H_4O, CH_2, H_2, H_2S, HCl, HCN, NO, O_2, O_3, PH_3, SIH_4, SO_2, CH_4, C_3H_8, TVOCs, Refrigerants	Various - Infrared, Electrochemical, Catalytic, Solid State
CGAS-DP Public Spaces	Modbus®	CO_2, CO, CH_2O, Refrigerants, C_3H_8, TVOCs, Particulates	Various - Infrared, Solid State, Catalytic, PID
CXT2 Explosion Proof	4-20 mA or Modbus®	NH_3, CO, CO_2, H_2, H_2S, NO_2, O_2, PH_3, SO_2, CH_4, C_3H_8, C_5H_{12}	Electrochemical, Infrared, Catalytic
LPT Low Power	4-20 mA	NH_3, CO, NO_2, Cl_2, O_2, O_3	Electrochemical
LPT-M Modbus	Modbus®	NH_3, CO, NO_2, CLO_2, Cl_2, C_3H_4, C_2H_4O, CH_2, H_2, H_2S, HCl, HCN, NO, O_2, O_3, PH_3, SIH_4, SO_2, CH_4, C_3H_8, TVOCs, Refrigerants	same as LPT-A
LPT-P Digital Car Park	Modbus®	CO, NO_2, H_2, CH_4, C_3H_8	Electrochemical and Catalytic

CETCI Peripheral and Remote Devices	Output Signal	
LNK-AO Analog Output	Modbus®	Four 4-20 mA outputs
LNK-AI Analog Input	Modbus®	Four 4-20 mA inputs
LNK-XT Network Extender	Modbus®	BUS Network Extender

| RDM Remote Display	Modbus®	Displays gas readings
RLY-4 Remote Relay	Modbus®	Four relays, 5 Amp, 120/240 VAC Two strobe/horn outputs (0.5 Amp @ 24 VDC)
RLY-8 Remote Relay	Modbus®	Eight relays, 5 Amp, 120/240 VAC Four strobe/horn outputs (0.5 Amp @ 24 VDC)
RPS-24VDC Remote Power Supply	Modbus®	24 VDC, 75 watts (3 Amps)

5 INSTRUMENT FEATURES

5.1 Front Exterior Enclosure

NUMBER	FEATURE	FUNCTION
❶	Display	1/4 VGA full colour resistive touch LCD display, indicates controller operation
❷	Power LED	Indicates unit power status
❸	Status 1, 2, 3 LEDs	Indicates channel status - OK, Low / Mid / High alarm
❹	Fault LED	Indicates unit fault condition

❺	Key Lock (Option -DL)	Allows enclosure to be locked
❻	Door Screws	Secures the door of the enclosure
❼	Door Mounted Alarm	Audible buzzer that sounds when a channel has gone into alarm

## 5.2 Interior System Layout (Bottom)
Shown with Options -AI and -AO Installed
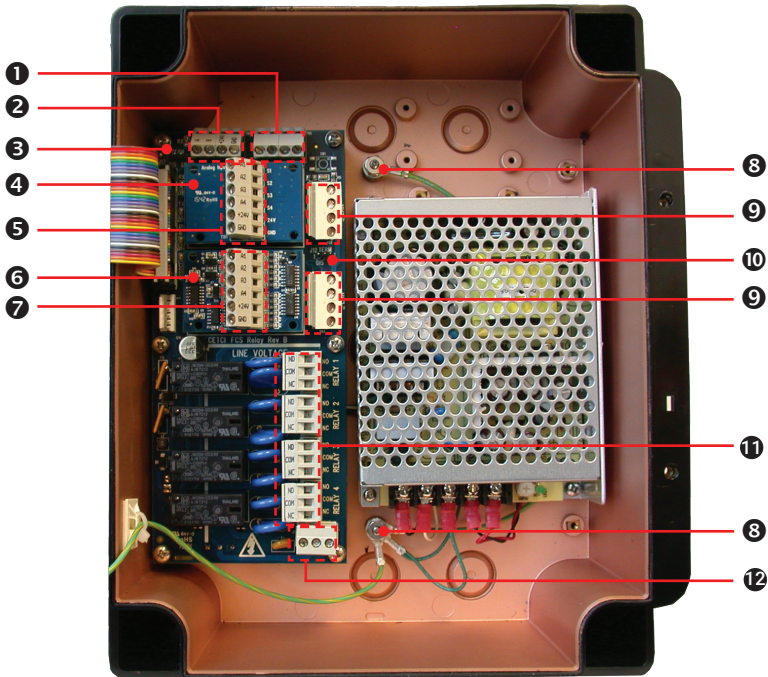
NUMBER	FEATURE	FUNCTION
❶	Horn/Strobe Output Terminal	Two connections for a remote 24 VDC horn and/or strobe combination (ie. RSH-24V) 0.5 Amps max.
❷	WAN Terminal	For connection to BAS (Modbus® or BACnet®) (no 24 VDC connection)
❸	WAN End of Line Jumper	120 ohm line termination
❹	Optional board for Analog Output or Analog Input	Option -AI shown with 4 analog inputs

❺	Analog Input Terminal	Connection for up to four 4-20 mA transmitters
❻	Optional board for Analog Output or Analog Input	Option -AO shown with 4 analog outputs
❼	Analog Output Terminal	Connection for up to four 4-20 mA outputs
❽	Earth Ground	Earth / safety ground connection
❾	LAN Terminals	Connections for Modbus® transmitters and/ or peripheral devices
❿	LAN End of Line Jumper	120 ohm line termination
⓫	Relay Terminals	Four SPDT relays, rated 5 amps @ 240 V
⓬	Line Voltage Terminal	120 or 240 VAC input

## 5.3 Interior System Layout (Door)
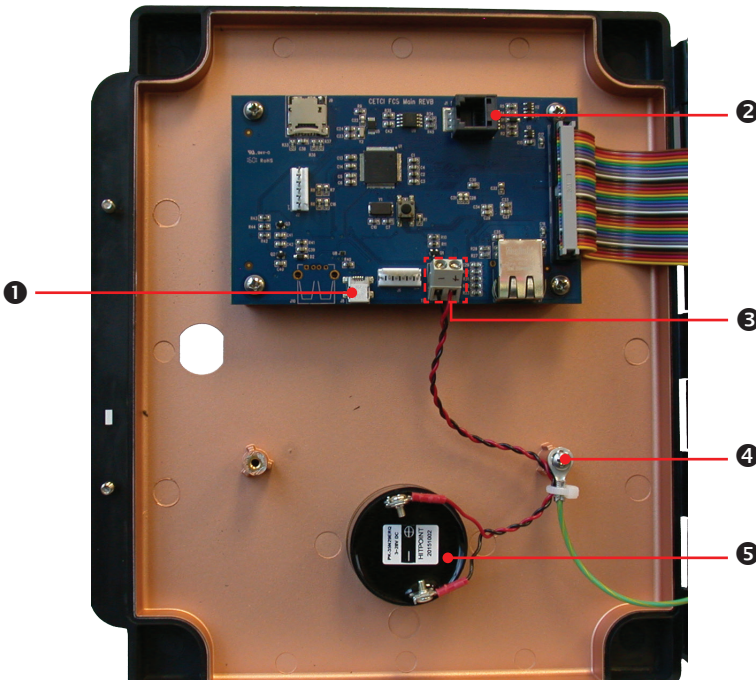
NUMBER	FEATURE	FUNCTION
❶	Micro USB Connector	For system updates and downloading data logging

| ❷	Programming Port	For factory system programming
❸	Buzzer Terminal	Connection for door mounted buzzer
❹	Earth Ground	Earth / safety ground connection
❺	Buzzer	Internal audible alarm

5.4 Optional Internal Analog Inputs and Analog Outputs (Options -AI and -AO))

The FCS does not have any internal analog inputs or analog outputs without the optional -AI and -AO boards installed. These boards are independent of each other and plug into the main FCS board.
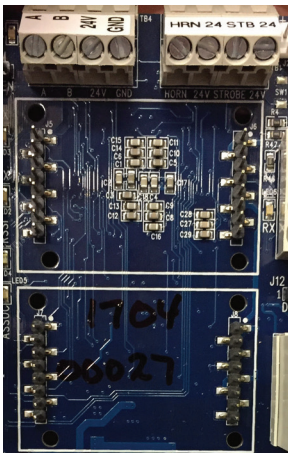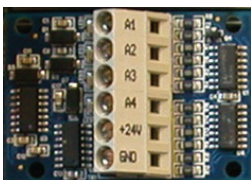

FCS main board without the optional Analog Input (-AI) or Analog Output (-AO) boards installed.

The Analog Input board (Option –AI) has four analog inputs.
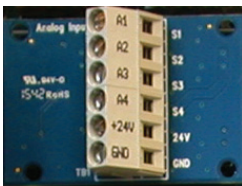
The Analog Output board (Option –AO) has four analog outputs.

The optional boards can be installed in the same FCS in combinations of (each line is exclusive of the other):

- One –AI board, adding 4 Analog Inputs (Option -AI)

- Two –AI boards, adding 8 Analog Inputs (Option -2AI) (not available with FCS-4)

- One –AO board, adding 4 Analog Outputs (Option -AO)

- Two AO boards, therefore 8 Analog Outputs (Option -2AO)

- One –AI and one –AO board, therefore 4 Analog Inputs and 4 Analog Outputs (Option -AIAO)

6 INSTALLATION

6.1 General Safety Warnings

The FCS is intended for indoor use, permanently mounted in a locked electrical room. It should be protected from extreme weather conditions.

The FCS requires no assembly and virtually no maintenance other than configuration of the channels and ensuring that excess water or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components.

6.2 Protection Against Electrical Risks

Warning High Voltage. Indicates hazardous voltage may be present in the area inside the FCS 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 FCS supply (disconnecting power to the FCS). Appropriate markings should be visible at the circuit breaker/switch that is supplying power to the FCS. The relays should be connected to alternate circuit breakers and these should be appropriately marked.

This device may interfere 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 FCS 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 Location of System Installation

The FCS should be installed on a flat vertical surface using the four 0.175" (4.4 mm) diameter mounting holes in the corners of the enclosure that are provided. This will help maintain the water tight status of the enclosure.

There are ten available conduit entry points - three are located along the top of the enclosure, three are located along the bottom and four are located on the back. These points may be drilled out as needed. Refer to Section 6.5 Standard Enclosure Mounting Components for more information.

NOTE: When mounting the enclosure, allow enough room to allow the end user to open the door fully to access the internal adjustments (23 cm / 9 in of space on the left side of the enclosure).

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

6.4.1 Wet Environment Considerations

If the FCS is to be installed in a potential hose-down application or any application whereby liquid could be directed towards the buzzer, the FCS should be ordered with an optional watertight door mounted buzzer (factory installed).

If used in a wet environment application, the conduit hubs entering the FCS enclosure must be a liquid tight type.

Any water or physical damage to the FCS that occurs from the installer drilling their own installation holes will not be covered under CETCI's warranty.

6.4.2 EMI and RF Interference Considerations

All electronic devices are susceptible to EMI (Electromagnetic Interference) and RFI (Radio Frequency Interference). Our controllers and detectors have been designed to reduce the effects of these interferences and we meet CSA, FCC and CE requirements for these type of devices. However there are still circumstances and levels of interference that may cause our equipment to respond to these interferences and cause them to react as if there has been gas detected.

There are some installation procedures that will reduce the likelihood of getting faulty readings:

1. Locate the detectors and controllers out of the way from normal foot traffic and high energy equipment.

2. Confirm the devices are properly grounded using conduit and shielded cabling.

3. Inform operators and technical staff working in the surrounding area to be aware of these possible conditions and that two way radios, Bluetooth enabled devices, cell phones and other electrical equipment may interfere with the response of the gas detectors.

6.5 Standard Enclosure Mounting Components
6.5.1 Enclosure Interior Base
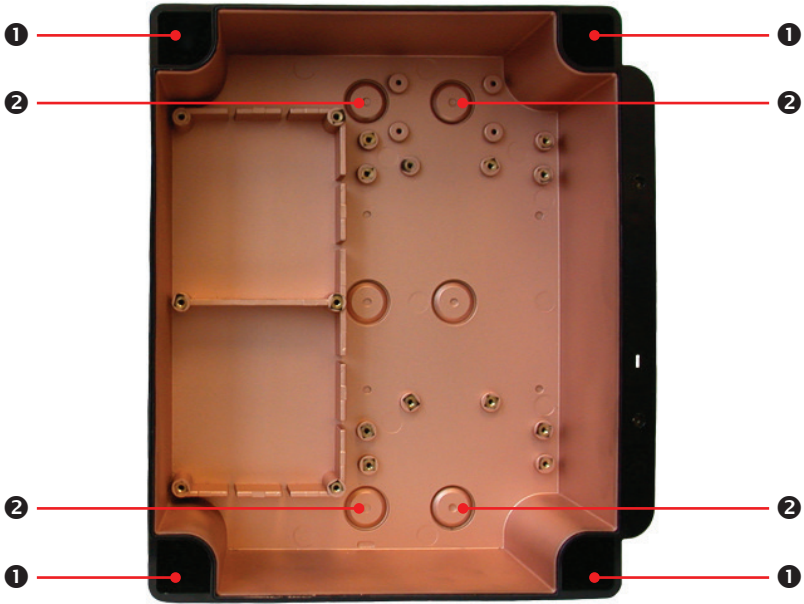
NUMBER	FUNCTION
❶	Molded-in mounting holes
❷	Conduit entry points

6.5.2 Enclosure Top and Bottom
The top and bottom of the enclosure are identical, each offering molded-in mounting holes and three conduit entry points.

NUMBER	FUNCTION
❶	Molded-in mounting bracket
❷	Conduit entry points

6.6 Wiring Power Supply Connections
The FCS requires a 90 - 240 VAC power supply (line voltage power). This source should be on an independent breaker that is properly marked.

Very carefully, 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 6.5 Standard Enclosure Mounting Components for the locations of the conduit entry holes.

Wire the field wiring to the Line Voltage Terminal (J15), refer to Section 5.2 Interior System Layout (Bottom). These are the power connections and should be supplied with a minimum 3-conductor, 18 AWG stranded wiring.

All wiring should be run in EMT (or better) conduit properly grounded (earth or safety). Building code requires low voltage wiring not to be within the same conduit as line voltage wiring. All communications (network) wiring must be in shielded cabling. **Wire shielding must be connected together at each device and taped off so it cannot cause a short on the circuit board when the door is closed.** The wire shielding should be connected to earth ground close to the primary supply connection only, and must have a contiguous connection throughout the network. It should be left taped and floating at the last device in the network.

6.7 Wire Gauge vs Run Length
It is important to use the appropriate gauge of wire for the required length of the run to ensure sufficient available voltage, noise reduction, dissipation of heat, and overall optimum performance along the entire wire run. Large wire sizes will have less voltage drop than smaller wires sizes of the same length. Similarly, shorter wire lengths will have less voltage drop than longer wires for the same wire size. The longer the wire run, the more attention there should be made to preventing voltage drop.

CETCI highly recommends 4-conductor, 16 AWG, shielded, stranded wire cable types such as AlphaWire 79220, AlphaWire 5534, Belden 9954 or equivalent. Do not use solid core wire.

Minimum Cable Length vs Size (AWG) for Modbus® and Power Supply

Cable Length		# of Sensors	4	6	8	10	12	14	16
Meters	Feet								
0.3 to 1552	1 to 500	AWG #	18	18	18	18	18	18	18
153 to 305	501 to 1, 000	AWG #	18	18	18	18	18	18	18
306 to 457	1,001 to 1,500	AWG #	18	18	18	16	16	16	16
458 to 914	1,501 to 3,000	AWG #	18	16	16	16	16	16	16

NOTE: WARRANTY MAY BE VOID IF DAMAGE OCCURS TO CIRCUIT BOARD COMPONENTS FROM THE USE OF SOLID CORE WIRE ATTACHED DIRECTLY TO THE WIRING TERMINALS.

When using solid core wiring for distribution (in the conduit), use stranded wire pigtails 18 awg within the enclosure to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

Communication wiring uses a daisy chain configuration. From one digital device to the next digital device, A goes to A; B goes to B; GND goes to GND; 24V goes to 24V. No tee taps. No star configurations. An end of line jumper must be installed at both ends of the network.

6.8 Wiring a Remote Power Supply (RPS-24VDC)

The RPS-24VDC is a remote power supply designed for use with system installations that require a large number of remote digital transmitters or very long wiring runs. As a general rule, the FCS Controller will supply up to 65 watts of power. The total number of transmitters that can be powered by the FCS without a remote power supply will depend on the number and type of devices:

Digital Gas Detectors	Peak Power Consumption
CGAS-D-CO, CGAS-DP-CO	1.2 watts
CGAS-D-CO2, CGAS-DP-CO2	1.5 watts
CGAS-D-NO2	1.2 watts
CGAS-D-H2S	1.2 watts
CGAS-D-CO-NO2	1.3 watts
CGAS-D-CO-H2S	1.3 watts
CGAS-D-R + ESH-A	2.5 watts
CGAS-D with internal solid state or catalytic sensor	1.5 watts

CGAS-D-IR refrigerants	1.8 watts
CGAS-DP-CO-CO2	1.9 watts
CGAS-DP-CO2-PM	1.9 watts
CGAS-DP-CO-PM	1.7 watts
CGAS-DP-PM	1.6 watts
CGAS-DP-RD + ESH-B refrigerant	2.1 watts
LPT-P or LPT-M with internal sensor(s)	1 watt
LPT-P or LPT-M with an ESH-A remote sensor	3 watts
CXT2-D Explosion Proof (all relays energized)	6.5 watts

Analog Gas Detectors*	
CGAS-A-CO, CGAS-A-AP-CO	1.7 watts
CGAS-A-CO2, CGAS-AP-CO2	1.8 watts
CGAS-A-NO2	1.7 watts
CGAS-A-H2S	1.7 watts
CGAS-A-R + ESH-A	3 watts
CGAS-A with internal solid state or catalytic sensor	2 watts
CGAS-A-IR refrigerants	2.3 watts
CGAS-AP-PM	2.5 watts
CGAS-AP-RD + ESH-B refrigerant	2.6 watts
ESH-A	1.6 watts
CXT2-A Explosion Proof (all relays energized)	6.5 watts

*An FCS system with analog gas detectors requires the addition of Option -AI or -2AI and/or the LNK-AI device

Add if installed	
CGAS Relay + Buzzer (standard or Option -RBZ)	0.7 watts
CGAS Relay (Option -RLY)	0.15 watts

| Other Devices	
LNK-AI (not including the devices connected to it)	1 watt

LNK-AO	3 watts
RLY-4 Remote Relay (4 relays)	3 watts
RLY-8 Remote Relay (8 relays)	6 watts
CET-RDM, CET-RDM-L2 Remote Display	3 watts
RSA-24V Remote LED Strobe Light	7.2 watts

As a general rule, systems with more than 32 digital transmitters require a remote power supply for additional power. Some installations may use fewer transmitters, but have very long wiring runs that may present a voltage loss condition. (If the overall length of wiring is more than 609 m / 2,000 ft or if the area is electronically noisy, an LNK-XT Network Extender is required to extend the range of the Modbus® RS-485 network.) The number of ESH-A Remote Sensors used will also determine the need for remote power supply(ies).

The RPS-24VDC Remote Power Supply operates from 90 to 240 VAC @ 47 to 63 Hz with a maximum load output of 3 Amps and requires a source of line voltage power to operate. Once installed in a long wiring run, it will provide power to the transmitters it is connected to. The enclosure provides four mounting holes inside in the base and two ground studs inside.

NOTE: Observe polarity when connecting DC load to the output of the power supply.

For more information about the RPS-24VDC, refer to the RPS-24VDC Remote Power Supply Operation Manual.
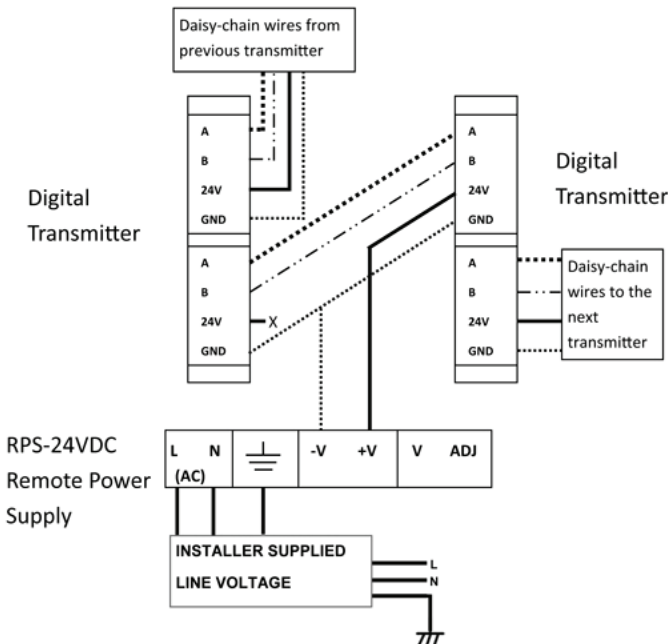
6.9 Wiring <u>Internal</u> Analog Outputs (Option -AO)

The FCS does not have any internal analog outputs unless the optional Analog Output board has been installed (Option -AO) on the main board. Option -AO and Option -2AO are factory installed at the time of order.
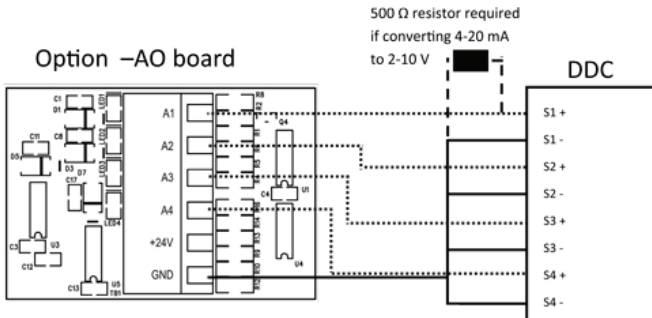
The FCS provides 24 VDC (low voltage power) to the Analog Output Terminal on the optional -AO board, which can accommodate up to a total of eight internal analog outputs, if two -AO boards are installed (Option -2AO). The analog output is a 4 - 20 mA current source. If required the output can be converted to 2 - 10V by using a 500 ohm resistor in parallel.

NOTE: If two -AO boards are installed, there cannot be any <u>internal</u> analog inputs (Option -AI). If required, <u>remote</u> analog inputs may be added by using one or more LNK-AI Peripheral Devices connected to the LAN Terminal on the main FCS board. Refer to Section 6.12 Wiring LNK-AI Peripheral Device (additional Analog Inputs).
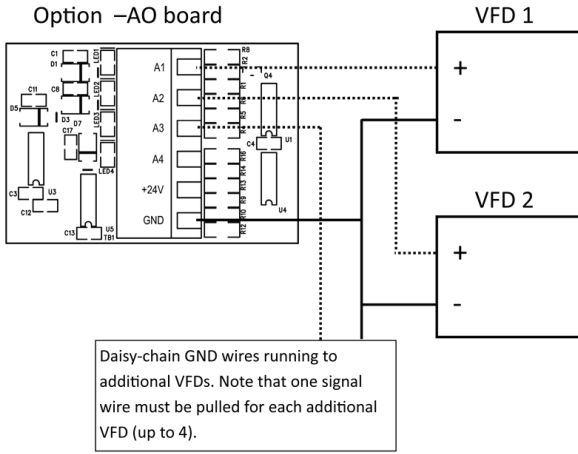
A1 through A4 on the Analog Output Terminal on the -AO board provides up to four connections designed to be used for VFD control, BAS / DDC / control panel monitoring, connecting analog remote displays, etc. Eight connections are available if two -AO boards are installed.

Four-conductor, 16 gauge, stranded wire / cable shielded in conduit should be used when connecting the FCS to an analog output device. If the device is being powered by the FCS, the voltage supplied by the FCS Controller to each remote analog device should measure approximately 24 VDC nominal at the device. If this voltage is not attained after installation, the wrong gauge wire may have been used or the wiring run is too long.

NOTE: Under most local electrical codes, low voltage wires cannot 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 pigtails 18 awg within the enclosure to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

Option –AO board

VFD 1

VFD 2

Daisy-chain GND wires running to additional VFDs. Note that one signal wire must be pulled for each additional VFD (up to 4).

6.10 Wiring Internal Analog Inputs (Option -AI)

The FCS does not have any internal analog inputs unless the optional Analog Input board has been installed (Option -AI) on the main board. Option -AI and Option -2AI are factory installed at the time of order.

The FCS provides 24 VDC (low voltage power) to the Analog Input Terminal on the optional -AI board, which can accommodate up to a total of eight internal analog inputs, if two -AI boards are installed (Option -2AI).

NOTE: If two -AI boards are installed, there cannot be any internal analog outputs (Option -AO). If required, remote analog outputs may be added by using one or more LNK-AO Peripheral Devices connected to the LAN Terminal on the main FCS board. Refer to Section 6.11 Wiring LNK-AO Peripheral Device (additional Analog Outputs) for wiring the LNK-AO to the FCS.

A1 through A4 on the Analog Input Terminal on the -AI board provides up to four connections for analog inputs such as the LPT and/or the LPT-A transmitters. Eight connections are available if two -AI boards are installed.

Four-conductor, 16 gauge, stranded wire / cable shielded in conduit should be used when connecting the FCS to an analog transmitter. The voltage supplied by the FCS Controller to each remote analog transmitter should measure approximately 24 VDC nominal at the transmitter(s). If this voltage is not attained after installation, the wrong gauge wire may have been used or the wiring run is too long.

NOTE: Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires.

The enclosures of the LPT family of transmitters and CGAS-A Gas Detectors have several conduit entry locations (general purpose enclosure). Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires.

Commonly used wire colours for positive, negative and analog VDC wires are:

- Red for positive (+) 24 VDC power
- Black for negative (-) Ground
- White or Green for analog signal
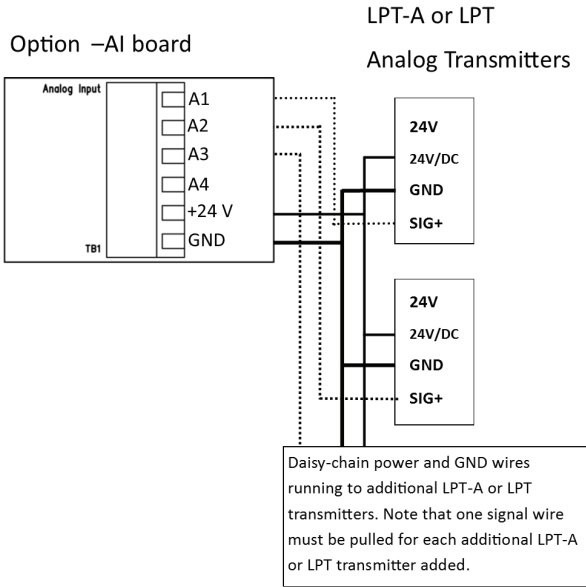
Option -AI board to CGAS-A Analog Gas Detector
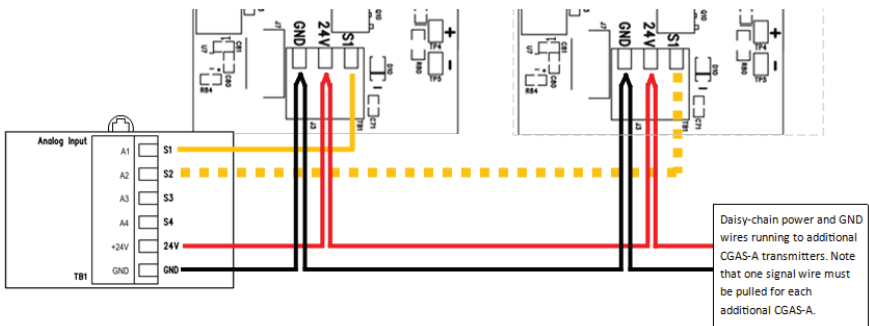
NOTE: DO NOT USE solid-core wire for connection to wiring terminal strip. Any damage caused by using solid-core wire will void warranty. Use stranded wire pigtails 18 awg within the enclousre to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

6.11 Wiring LNK-AO Peripheral Device (additional Analog Outputs)

If more than four (or eight) analog outputs are required, one or more LNK-AO Peripheral Devices may be connected to the FCS.

Each LNK-AO Peripheral Device offers four analog outputs and connects to the FCS through the LAN Terminal on the main board. Multiple LNK-AO Peripheral Devices can be connected to each other in a daisy-chain fashion.

Maximum number of LNK-AO peripheral devices by FCS model:

FCS-4	FCS-8	FCS-32	FCS 128
2 max (with no internal AO)	2 max (with no internal AO)	15 max (with no internal AO)	15 max (with no internal AO)
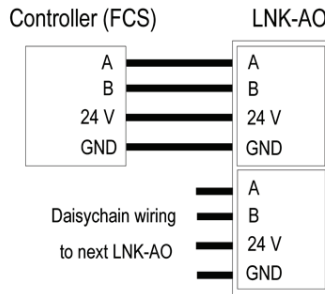
For more information on the LNK-AO, refer to the LNK-AO Analog Output Peripheral Device Operation Manual.

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 pigtails 18 awg within the enclosure to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

6.12 Wiring LNK-AI Peripheral Device (additional Analog Inputs)

Each LNK-AI Peripheral Device offers four analog inputs and connects to the FCS through the LAN Terminal on the main board. Multiple LNK-AI Peripheral Devices can be connected to each other in a daisy-chain fashion.

Maximum number of LNK-AI peripheral devices by FCS model:

FCS-4	FCS-8	FCS-32	FCS 128
1 max (with no internal AI)	2 max (with no internal AI)	8 max (with no internal AI)	15 max (with no internal AI)
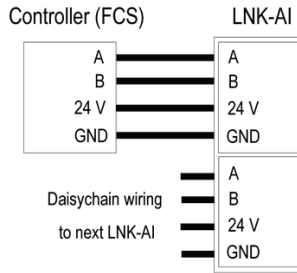
For more information on the LNK-AI, refer to the LNK-AI Analog Input Peripheral Device Operation Manual.

6.13 Wiring Digital Inputs (CGAS-D, LPT-P & LPT-M Transmitters)
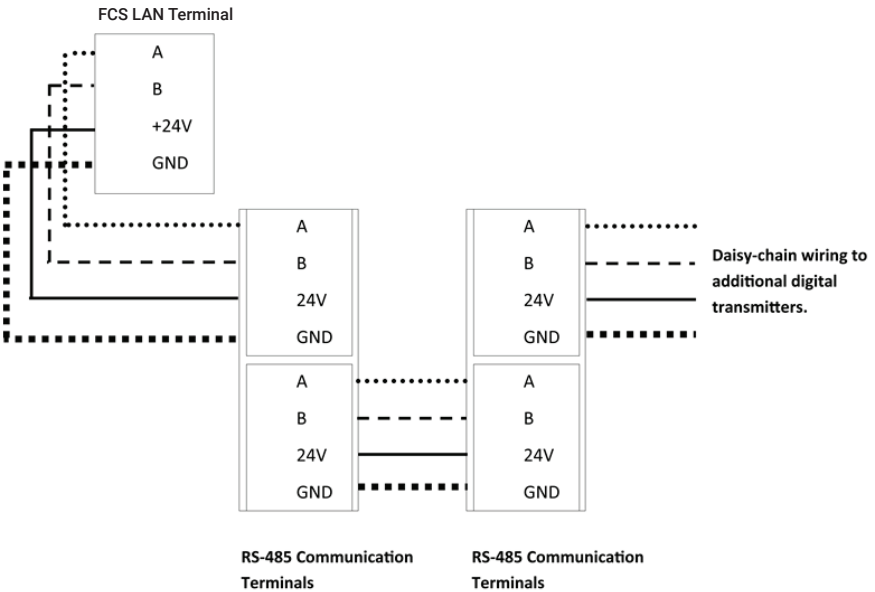
The FCS provides 24 VDC (low voltage power) at the two LAN Terminals on the main board. Each LAN terminal offers an A and B connection. Multiple digital transmitters must be connected to each other in a daisy-chain fashion to ensure robust data communications. From one digital device to the next digital device, A goes to A; B goes to B; GND goes to GND; 24V goes to 24V. In addition, the RS-485 bus must be terminated at the beginning and the end of the wire run so the signal waves are absorbed rather than reflected back.

NOTE: LPT-M and LPT-P digital transmitters can be configured as 1, 2 or 3 channel systems depending on the application requirements. Each channel occupies one of the available gas channels. Similarly, a CGAS-D gas detector with two internal sensors plus RH and Temperature sensors would occupy 4 channels of the FCS.

Four-conductor, 16 gauge, stranded wire / cable must be shielded when connecting to digital transmitters. The voltage supplied by the FCS Controller to the remote digital transmitter should measure approximately 24 VDC nominal at the transmitter(s). If this voltage is not attained after installation, the wrong gauge wire may have been used or the wiring run is too long. 14 gauge wire should be used for longer wire runs to minimize voltage drop.

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 pigtails 18 awg within the enclosure to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

The CGAS-D, LPT-P and LPT-M transmitter enclosures have several conduit entry locations. Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires.

Commonly used wire colours for positive, negative and signal VDC wires are:

- Red for positive (+) 24 VDC power
- Black for negative (-) Ground
- White, Yellow or Green for signal (A and B)

WARNING: Maximum distance information between the FCS and a remote digital transmitter can be found in that particular product's Operation Manual.

6.14 Wiring LNK-XT Network Extender Peripheral Device

The LNK-XT Network Extender Peripheral Device works as a signal booster, allowing transmission and receipt of gas readings over a larger total area. It extends the range of the Modbus® communication network allowing a longer distance between the Controller and the network of gas detectors. The micro controller quickly passes Modbus® information packets from the master side of the LNK-XT to the extension side, seamlessly without interruption.

If the overall length of the wire run is more than 609 m / 2,000 ft, or if the area is electronically noisy, you will require an LNK-XT Network Extender to extend the range of the RS-485 network. The LNK-XT is a digital device and must be connected in a daisy-chain fashion.

Maximum number of LNK-XT peripheral devices by FCS model:

| FCS-4	FCS-8	FCS-32	FCS 128
unlikely to need	unlikely to need, 1 max	3*	3*

***If more than 3 LNK-XT Network Extenders are required, contact CETCI for more information)

For more information about the LNK-XT, refer to the LNK-XT Peripheral Device Operation Manual.
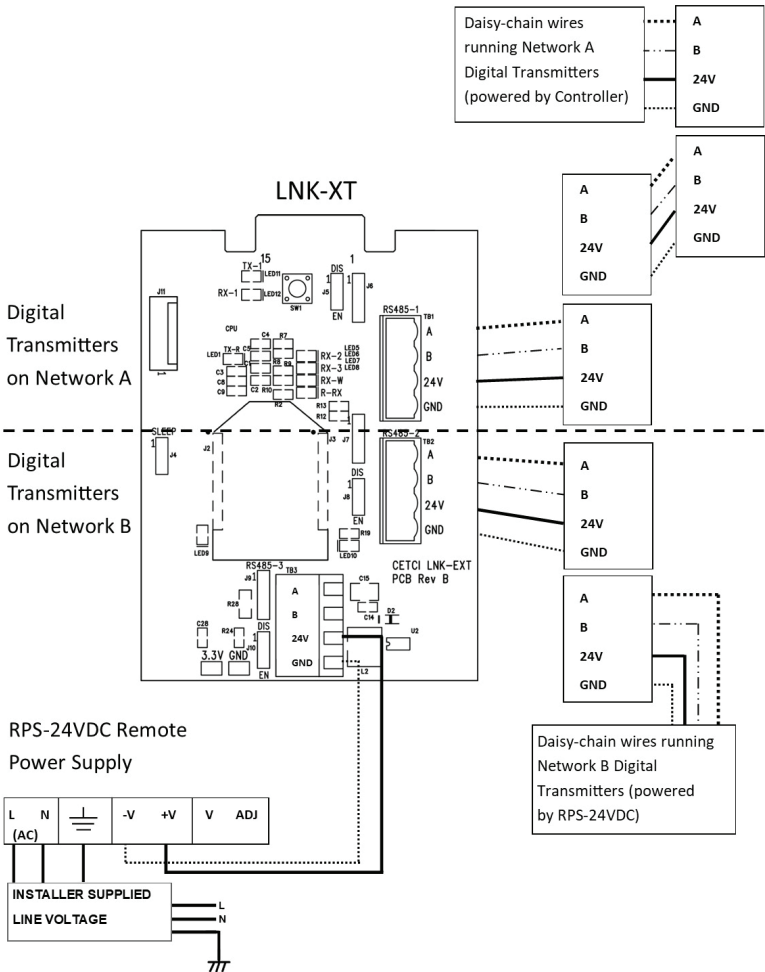
6.15 Wiring to a Building Automation System (BAS)

The WAN Terminal is used to connect the FCS to a Building Automation System (BAS) or other type monitoring system or control panel. Refer to Section 5.2 Interior System Layout (Bottom) for the location of the WAN Terminal.
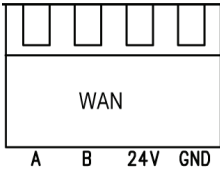
A and B - RS-485 differential signal pair, A is + and B is -

24V - 24 volts DC, not required, no connection on board

GND - ground reference

6.16 Wiring Remote Strobe/Horn Using Output Terminal

The FCS provides two output drives of 24 VDC @ 500 mA for connecting up to two remote horn/strobe devices at the Remote Strobe & Horn Terminal. Refer to Section 5.2 Interior System Layout (Bottom) for location.

More than two horn/strobe devices can be accommodated by additional relays and power supplies.
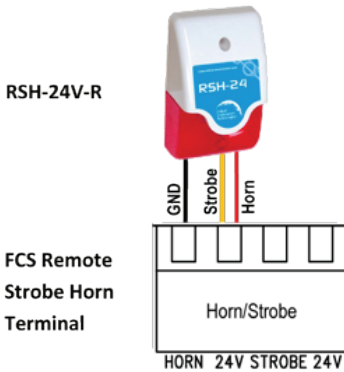
As shown, Strobe & Horn operate together.

To enable Strobe only, connect the yellow wire and the black (GND) wire. To enable Horn only, connect the red wire and the black (GND) wire.

6.17 Wiring Internal Relay Connections

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

The FCS has four SPDT dry contact relays rated MAX 5A at 240 VAC or 30 VDC each. These relays can be used to control fan starters or coils used for HVAC equipment. The contacts can also be used for signaling other equipment like fire panels or alarm systems. Terminal blocks are provided to connect to the four MAX 5A / 250 VAC - 30 VDC internal relays.

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. Because the FCS series systems are designed to be fail-safe, the

relay coils are normally energized in non-alarm state for failsafe operation. If required, the FCS can be configured for normal Relay operation. Refer to the FCS Operation Manual for more information.

NOTE: DO NOT USE solid core wire for connection to relay terminal strip. Use stranded wire only.
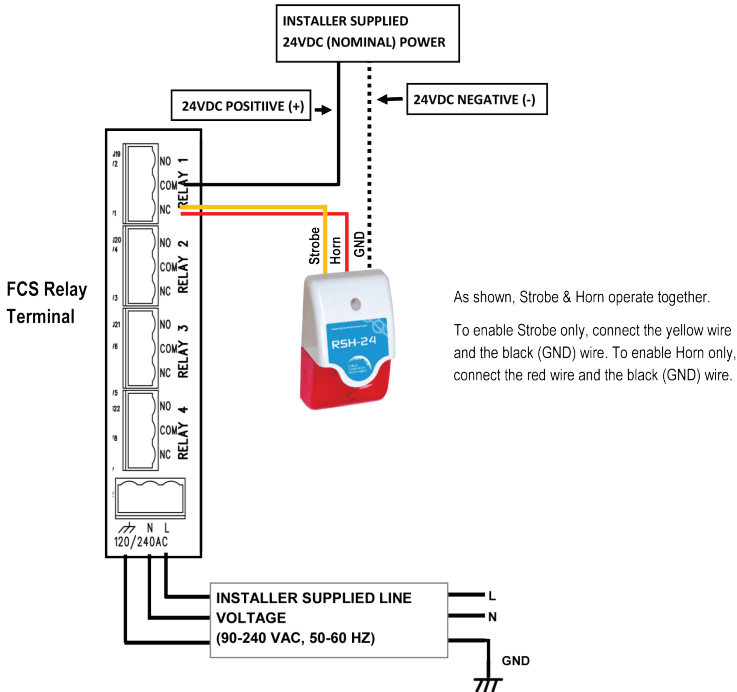
6.18 Wiring Remote Relay Connections (RLY-4 and RLY-8)

The RLY-4 Remote Relay offers four additional SPDT dry contact relays plus two horn/strobe 24 VDC drives to a fixed gas detection system. Similarly, the RLY-8 Remote Relay offers eight additional SPDT dry contact relays plus four horn/strobe 24 VDC drives to a fixed gas detection system. The wiring is the same as described in Section 6.16 Wiring Remote Strobe/Horn Using Output Terminal.

The remote relay devices communicate with the FCS using Modbus® communications protocol. In the event that the connection is lost between the controller and the remote relay, a factory configurable default state can be set to ensure the relays continue to operate as required.

The relays are rated 5 amps @ 240 VAC each and can be used to control remote alarms, strobes, exhaust fan starters, make up air fan contactors, or signaling other equipment like fire panels or alarm systems, etc.

Maximum number of RLY-4 and RLY-8 remote relay devices by FCS model:

	FCS-4	FCS-8	FCS-32	FCS 128
RLY-4	1 max	2 max (no RLY-8)	Total # of available relays (internal + remote) plus strobe/horn drives is 64. Max number of RLY-4 and/or RLY-8 varies depending on number of strobe/horn drives used and internal relays used.	
RLY-8	0	1 max (no RLY-4)		

NOTE: The remote relays are in addition to the four internal relays that come standard with each FCS model.

One or more Remote Relay devices can be wired directly to the FCS, followed by digital transmitters connected in a daisy-chain configuration or they can be wired anywhere along the digital network in a daisy-chain configuration as required. A goes to A; B goes to B; GND goes to GND; 24V goes to 24V.

4-Wire 24 VDC Wiring Connection
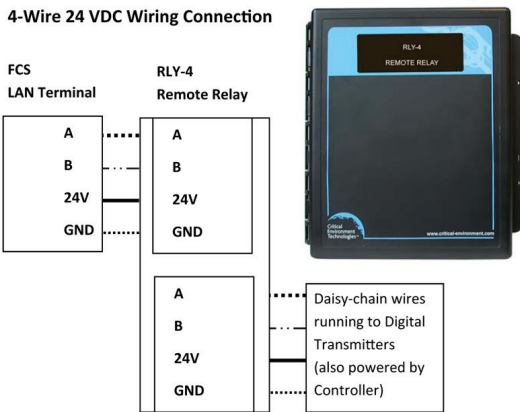
6.19 Wiring RDM Remote Display Connections

The RDM Remote Display is a device that is designed to communicate with the FCS using Modbus® communication protocol. It displays the real time gas readings from the FCS and is intended to be mounted and viewed from a remote, relevant location such as a refrigeration (or other) application where there are two entrances to the room being monitored. It will provide visual confirmation of the gas level readings inside the room prior to entry. Simple configurations such as adjusting the display contrast and setting the Modbus® ID and baud rate can be done in the field. Other configurations can be set through the FCS menus. For more information, refer to the FCS Operation Manual.

Once the RDM Remote Display is wired to the FCS, the controller needs to be told that the RDM exists as a remote device. This is done at the controller. Refer to the FCS Operation Manual for instructions.

Similarly, in order for the controller to communicate with the RDM, the two devices must have the same baud rate. The factory default baud rate for all CETCI Modbus® devices is 19,200. If you need to change the baud rate, refer to the RDM Operation Manual for instructions.

The read and write default RDM Modbus® ID is 230. The RDM will automatically broadcast the display information to Modbus® ID 253. This is the common Modbus® ID for all RDMs on the network and is used to listen for broadcasts from the controller and receive screen updates from the controller.

24VDC power is supplied to the RDM from the FCS. Four-conductor, 16 gauge stranded wire / cable must be shielded when connecting the controller to the RDM. It should be connected in a daisy-chain configuration and can be placed anywhere along the digital network as required. A goes to A; B goes to B; GND goes to GND; 24V goes to 24V.
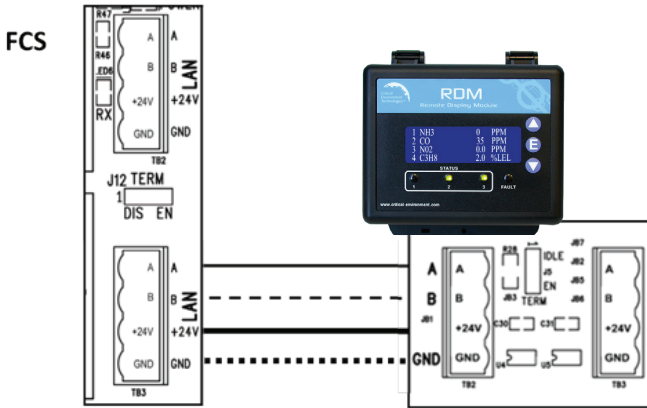
For more information on the RDM Remote Display, refer to the RDM Remote Display Operation Manual and the FCS Operation Manual.

6.20 Wired Example of an FCS Gas Detection System

First and last device in BUS requires a termination resistor.
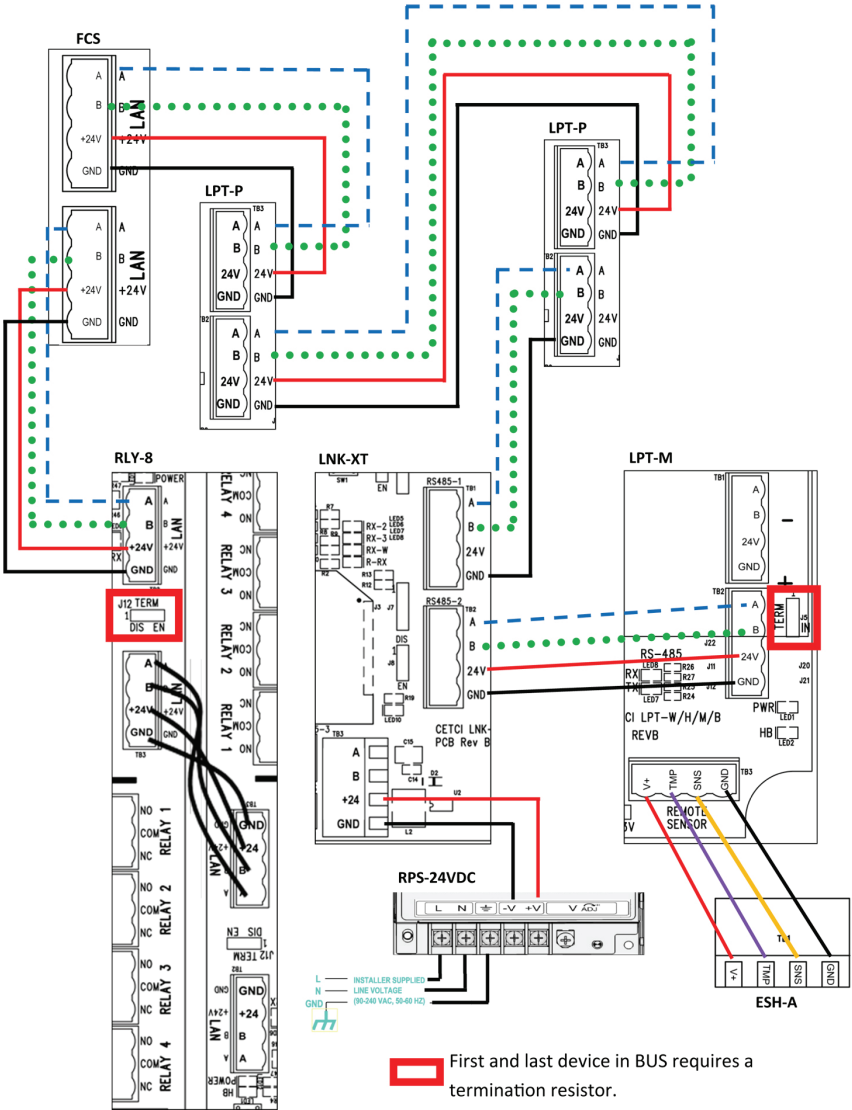
7 BASIC SYSTEM OPERATION

NOTE: For functions that do not appear in this section, refer to the FCS Operation Manual.

7.1 Power Up and Warm-up

Upon power up, the FCS delays the initializing start-up sequence with a 30 second countdown while it waits to make sure there isn't a power issue with the system. This process reduces the possibility of corrupting the SD card and the configuration of the FCS if the power is interrupted during start-up and the device is forced to reboot before initializing.

Most power issues occur and are resolved at the first system start-up. Power issues may be caused by events such as:

- Overloaded building mains (for the breaker)

- Incorrectly wiring the FCS LAN connections and/or analog inputs or outputs

- Connecting too many peripherals without splitting the BUS at a RPS-24VDC Remote Power Supply

- Pulling too much power from LNK-AI devices

During the countdown, the message on the screen will display, 'Waiting for stable power'. If there are no power issues, after the countdown is finished, the FCS will show the initializing screen for about four seconds of warm-up followed by a brief display of the device model number and date/time splash screen. Then the home screen display will be shown.

NOTE: In the event the FCS shows a blank screen, power cycle the device.

After the warm up period, the system may exhibit gas alarm condition(s) if any of the sensors have 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 display should be active, indicating normal operation, and the relays should be energized indicating normal "Fail-safe" status.

7.2 Home Screen Display

There are two configurations for the home screen - the Summary Display or the Channel Display. The Summary Display is the factory default display setting. It shows the status, number of channels, relays and other devices.
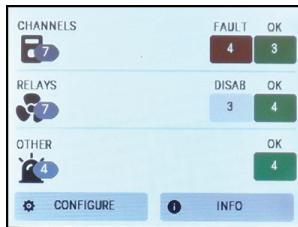
All devices can be viewed by tapping the category icon & badge on the left-hand side of the screen. A maximum of five colored statuses are displayed per category. In the unlikely event that more than five statuses are active at the same time for a category, the five highest-

priority statuses will be displayed. The statuses below are listed in order of priority from lowest to highest.

CHANNELS

The CHANNELS category on the main display of the FCS shows a summary of the status of the channels. If the channels are in different statuses, it will display the highest status from left to right and indicate the number of items that have that status. Each bar and each section of the bar will change colour depending on the severity of the status.

STATUS ABBREVIATION	STATUS	DESCRIPTION
OK	OK	Not in alarm or fault
DISAB	Disabled	Triggers when a channel is set to disabled.
LOW	Low Alarm	Triggers when a channel is in low alarm state
MID	Mid Alarm	Triggers when a channel is in mid alarm state
HIGH	High Alarm	Triggers when a channel is in high alarm state
STEL	STEL Alarm	Triggers when STEL alarms are enabled & channel is in the state
TWA	TWA Alarm	Triggers when TWA alarms are enabled & channel is in the state
IDLH	IDLH Alarm	Triggers when IDLH alarms are enabled & channel is in the state
FAULT	FAULT	There is a problem with the channel source

STEL Alarm
The short term exposure limit (STEL) is the maximum permissible gas concentration a worker can be safely exposed to for short periods of time (5-15 minutes maximum).

TWA Alarm
The time-weighted average (TWA) is a safety measure used to determine accumulated averages of gases. An average is determined using the Occupational Safety and Health Administration (OSHA) method to ensure the worker leaves an area when the maximum average is accumulated.

IDLH Alarm
Immediately dangerous to life and health (level that interferes with the ability to escape)

RELAYS

The FCS has four internal SPDT dry contact relays labeled RL1, RL2, RL3 and RL4. Strobe, horns and the internal audible buzzer are also counted as relays. The FCS may also have remote relays (RLY-4 and/or RLY-8) connected to it.

The RELAYS category on the main display of the FCS shows a summary of the status of the relays, which includes the internal relays, remote relays and any remote strobes and horns. If the relays are in different statuses, it will display the three most important statuses in order from left to right. The bar will also change colour depending on the severity of the status.

STATUS ABBREVIATION	STATUS	DESCRIPTION
OK	OK	Relay is not tripped by alarm level, time, fault, etc.
DISAB	Disabled	Triggers when a relay is set to disabled
SILENC	Silenced	Relay has been tripped and silenced
ON TD	In On Time Delay	Relay will trip after the on delay
OFF TD	In OFF Time Delay	Relay will un-trip after the off delay
LATCH	Latched	Relay has tripped and will remain tripped until manually un-tripped
TIME	Tripped Time of Day	Relay has tripped because of time-of-day priority
GAS T	Tripped Gas	Relay has tripped because of gas level
FAULT	FAULT	At least one channel is in Fault condition.

OTHER

The OTHER category on the main display of the FCS may show system SD card problems or self check troubles. It also shows the status of the analog outputs, which includes the internal and any remote LNK-AO devices or Modbus® VFDs. If the analog outputs are in different states, it will display the three most important states in order from left to right. The bar will also change colour depending on the severity of the state.

The state "Fault" is displayed in red and shows the number of devices that the FCS cannot communicate with. The communication failure is between the FCS and an LNK-AO, Modbus® VFD or the internal analog output connection. An example of what could cause a "Fault" is a broken or unconnected wire.

NOTE: The FCS only communicates with the device it is immediately connected to. It does not communicate with the device(s) the LNK-AO or the Modbus® VFD is connected to.

The state "DISAB" is displayed in grey and specifies the number of analog outputs that have been disabled. An analog output connection may be disabled for period of time to clean or maintain the equipment that is driven by the analog output.

STATUS ABBREVIATION	STATUS	DESCRIPTION
OK	OK	Analog output is working normally
DISAB	Disabled	Triggers when a channel is set to disabled
FAULT	FAULT	There is a problem with the LNK-AO communication

LED INDICATORS

There are 5 LED lights on the front of the FCS that indicate the following:

LED INDICATORS*	DESCRIPTION
All are Green	All channels are not detecting gas at any alarm level, the air is safe
Status 1 is Red	At least one channel is in low alarm
Status 1 & 2 are Red	At least one channel is in mid alarm
Status 1, 2 & 3 are Red	At least one channel is in high alarm
Fault is Red	At least one channel is in Fault condition. Also can indicate problems with relays, analog inputs/outputs, RDM, self check

*exclusive of other possible states occurring at the same time

Pressing the CONFIGURE button will take you to the ENTER PASSWORD screen. Refer to Section 7.3 Accessing the Menu. Pressing INFO will show the part number, serial number, firmware version and communication type.

Press EXIT to return to the main display.

7.2.1 Changing the Summary Display to the Channel Display

The Channel Display shows the channel status bars for each channel. You can press on any bar and see the channel details. If the system has more than 5 channels, you can set the scroll rate so all channels can be viewed in rotation.
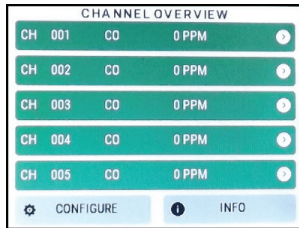
Press CONFIGURE and enter password 2019. Press the SUBMIT button.
Press DISPLAY and then FCS DISPLAY.
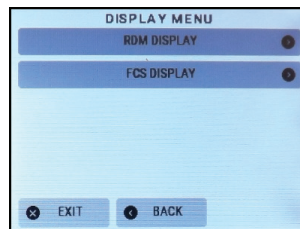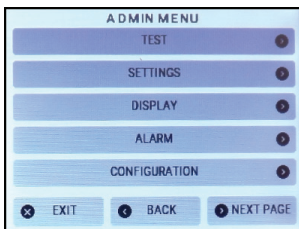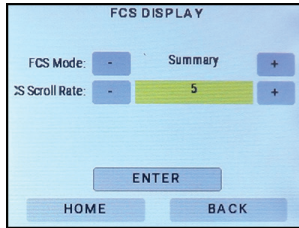
Press the - or + buttons to change Summary to Channel. Change the scroll rate as desired. Press ENTER. Press HOME and the main display will now look like this:


7.2.2 Display Touch Location Calibration
The FCS has a 1/4 VGA full colour resistive touch LCD display. A certain amount of pressure is required to engage the buttons, as is a certain length of time. If the touch response is not working as well as it used to, you can recalibrate the display.

Hold the Reset/Restart button for approximately 15 seconds and let go. As soon as the screen goes blank immediately touch and hold the display anywhere on the screen until you see the 'Performing touch screen calibration' message.
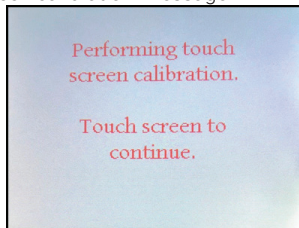
Touch the screen to continue.
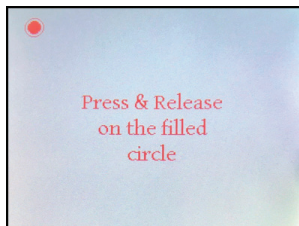
Follow the directions until the process is complete. When you exit the screen calibration, the system will go through a 10 second countdown and then display the home screen again.

7.3 Accessing the Menu

From the Summary Display or the Channel Display screen press CONFIGURE to bring up the ENTER PASSWORD screen.
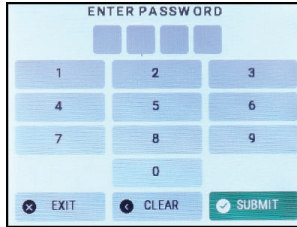
Enter one of the following passwords below and then press SUBMIT.

- Service Password: 2020
- Admin Password: 2019

NOTE: Service Password 2020 is ideal for service technicians or anyone who only needs quick access to Testing, Calibration and some basic system setup.

7.4 Navigating the Menu Structure

The FCS has a 1/4 VGA full colour resistive touch LCD display and an intuitive menu structure that is aided by colour coding. Press firmly and purposefully using your fingertip or a dull pointed instrument such as a stylus to navigate through the menu.

After entering a menu item, BACK will take you back one menu level and EXIT will return you to the main display, logging you out of the password protected menus.

Depending on your preference you can enter values using the - or + buttons or if you press on the yellow field you can use a keypad to input your selection. If you are entering a number, the numeric keypad will appear. If you are entering text the alphanumeric keypad will appear.
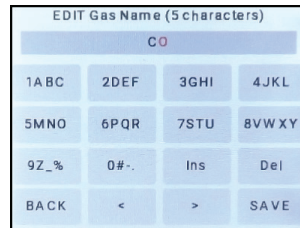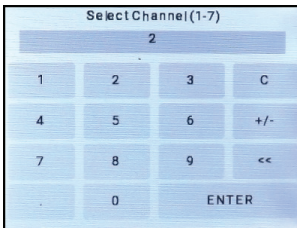

To use the keypad:

- Use the **Del** key to delete existing characters (one character will always remain). The red character is the character you are currently on, meaning if you press a letter/ number key, the red character will change.

- To add a character, press the **Ins** key.

- Choose the desired number, letter or symbol by pressing on the key repeatedly until the desired character appears. For example, if you want the letter C you have to press on the first button (1ABC) 4 times to get to the letter C.

When a value is changed, the SAVE button will turn green. Press it to save the changes and it will change to its standard colour indicating the change has been made.

Many of the channel, relay and priority set up screens have an autosave function. If you are going through more channels (or relays or priorities) on the same screen, the system will autosave when you press the + or - to proceed or return to the next channel (relay, priority) number. If you press HOME or BACK, the changes will not be saved. The SAVE button will turn green after a change has been made and you can choose to press SAVE if in doubt.

7.5 Silencing the Internal Audible Alarm, Terminal Connected and/or Remote Horns and Strobes

The FCS comes with a door mounted, audible alarm. This alarm and any remote strobe/horn devices connected to the Remote Strobe/Horn Terminal and/or the relays (if configured to do so) will sound when the high alarm is reached. Upon sounding, the Silence? screen will appear, giving you the ability to silence all the alarms for a predetermined amount of time. You will also be able to see how many alarms have been previously silenced and how many are currently sounding.
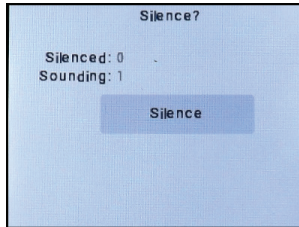
You can silence all or none of the alarms. When the Silence is pushed, all sounding alarms will be silenced. If another channel starts to indicate high alarm, the system works through the configuration and the audible alarm will come back on for that channel. Pressing Silence will stop the alarm from sounding and restart the silence interval for the previous channel(s) causing the alarm.

The alarms will stop for a preconfigured amount of time (the factory default is 5 minutes). Refer to the FCS Operation Manual for how to Set ON / OFF Delays to change the silence interval (OFF Delay) for each device (Strobe, Horn, Audible).

When the Silence button is pressed, the associated horn/strobe/audible/buzzer detailed relay information will show as SILENED in the relay overview screen.
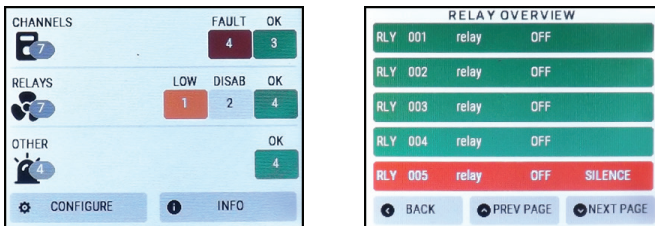
When the preconfigured silenced amount of time (OFF Delay) has passed, the strobe/horn and buzzer will sound and the Silence? screen will appear again. The silence interval is

specific to each audible relay. The OFF Delay for that relay sets the silence duration.

To let the alarm(s) continue sounding, don't press Silence All. Each alarm will continue sounding until the cause of the alarm comes to an end.

NOTE: The Silencing functionality applies to ALL relays that have been configured as silenceable. However, it is intended for AUDIBLE devices (horns, integral buzzer, etc.) directly connected to the FCS or the relays (including the RLY-4 or RLY-8); but any relay can be configured as silenceable.

7.6 Test Menu Functions

In the Test menu, you can test the audible alarm, strobe, relays and analog output to ensure they are working correctly. For each test you can set the length of time for the test to last. The range that can be set is 0 seconds to 60 minutes.

The test starts when you press the Start Test button and it will continue for as long as the time was set. You can exit the Test menu without affecting the time. If you want to end the test before the time is up, you must re-enter the Test menu and enter a value of "0" for the test length of that function.

The + and - buttons on all the Test screens function like this:

+.1	will increase the time by six seconds each time it is pressed
+ 1	will increase the time by one minute each time it is pressed
⁻ 1	will decrease the time by one minute each time it is pressed
⁻ .1	will decrease the time by six seconds each time it is pressed

Or you can enter the desired number by pressing on the yellow field and using the keypad to enter the number.

7.6.1 Test Audible (Buzzer)

NOTE: Before testing the audible alarm, warn people in the vicinity of where the sound will be heard so it does not cause unnecessary distress or response.

Press CONFIGURE and enter password 2020. Press the SUBMIT button.
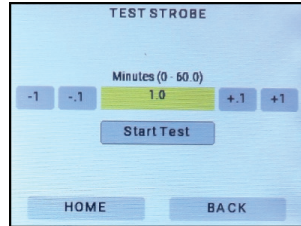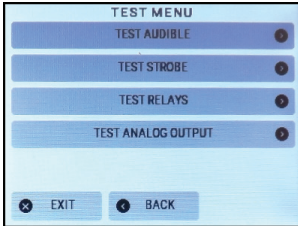Press TEST and then TEST AUDIBLE.
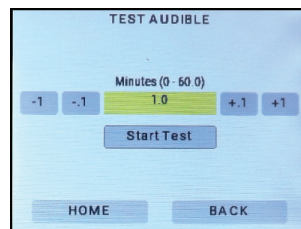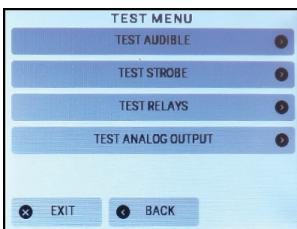
Enter the length of time you want to test the audible for. Press Start Test to begin the test.

To cancel the test, go back into the TEST MENU, open the TEST AUDIBLE screen and enter 0 in the Minutes field and press Start Test.

7.6.2 Test Strobe

NOTE: Before testing the strobe, warn people in the vicinity of where the strobe will be seen so it does not cause unnecessary distress or response.

Press CONFIGURE and enter password 2020. Press the SUBMIT button.
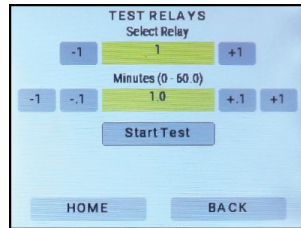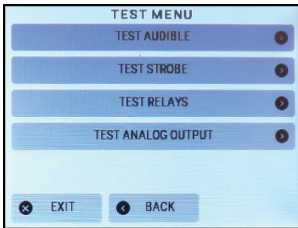Press TEST and then TEST STROBE.

Enter the length of time you want to test the strobe for. Press Start Test to begin the test.

To cancel the test, go back into the TEST MENU, open the TEST STROBE screen and enter 0 in the Minutes field and press Start Test.

7.6.3 Test Relays
NOTE: Before testing the relays, notify the appropriate people so unnecessary distress or response is not caused.

Press CONFIGURE and enter password 2020. Press the SUBMIT button.
Press TEST and then TEST RELAYS.

Enter the relay number you want to test and enter the length of time you want to test the relay for. Press Start Test to begin the test.

To cancel the test, go back into the TEST MENU open the TEST RELAYS screen and enter 0 in the Minutes field and press Start Test.

**NOTE:** Relay ON and OFF delays do NOT apply in test mode.

7.6.4 Test Analog Outputs
The purpose of this test is to make sure the wiring is correct and the connected devices operate as expected.

NOTE: Before testing the analog outputs notify the appropriate people so unnecessary distress or response is not caused.

Press CONFIGURE and enter password 2020. Press the SUBMIT button.

Press TEST and then TEST ANALOG OUTPUTS.
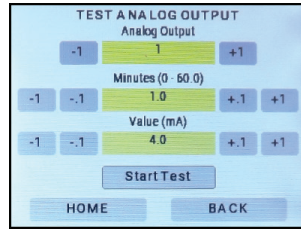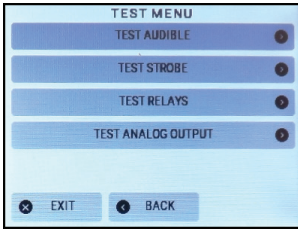
Enter the corresponding number for the analog output that you want to test and enter the length of time you want to test the test to last. Enter the output value in mA that you want tested. Press Start Test to begin the test.

To cancel the test, go back into the Test MENU, open the TEST ANALOG OUTPUT screen and enter 0 in the Minutes field and press Start Test.

8 BASIC SETTINGS AND CONFIGURATIONS

8.1 Factory Default Settings

The channel/gas operation type settings are configured at the factory according to the specifications at time of order. The remaining settings are usually configured in the factory according the default settings listed below. (There may be some differences in the default settings depending on application.) If changes to the default settings are desired, the settings can be changed in the field as indicated in the table below.

ITEM	DEFAULT SETTING	FIELD CONFIGURABLE SETTINGS

Door Mounted Buzzer
    Alarm Level
    ON Delay
    Silence Interval
	Enabled - Normal
	High
	10 seconds
	300 seconds (5 min)
		Enable, Disable - Failsafe, Normal
		Low, Mid, High
		value is application dependant
		0 to 9999 seconds

Strobe / Horn
    ON Delay
    Silence Interval
	Enabled - Normal
	10 seconds
	300 seconds (5 min)
		Enable, Disable - Failsafe, Normal
		value is application dependant
		0 to 9999 seconds

Data Logger	Disabled 5 minutes	Enable, Disable 1 to 1080 (18 hrs)
Relay 1 Relay 2 Relay 3 Relay 4 ON Delay (each relay) OFF Delay (each relay)	Low - Failsafe Mid - Failsafe High - Failsafe Fault - Failsafe 10 seconds 10 seconds	Low, Mid, High - Failsafe, Normal Low, Mid, High - Failsafe, Normal Low, Mid, HIgh - Failsafe, Normal Failsafe, Normal value is application dependant value is application dependant
Alarm Setpoints	values are gas dependant Ascending	values are gas dependant Ascending, Descending (ie. O_2)

LAN Modbus® Baud Rate	19,200	changing is not recommended
WAN Modbus® Baud Rate Modbus ID	19,200 100	See FCS Operations Manual for list 1 to 127
WAN BACnet® Baud Rate MAC Address Instance ID	76,800 100 270100	Refer to Section 7.1 1 to 127 1 to 4,194,302 per BACnet definition
Analog Input Calibration	4 - 20 mA	0 - 20 mA
Analog Output Calibration	4 - 20 mA	0 - 20 mA
STEL / TWA / IDLH Display Channel Alarm Global Alarm	Off Disabled Disabled	On, Off Disable, Enable Disable, Enable

The Basic menu allows you to set parameters such as the date and time, data logging sample rate, Modbus® ID and baud rates (or BACnet® ID and baud rate if an FCS-B model).

8.2 Set Clock
Allows you to set the correct date and time.
This is a 24 hour clock (ie. 9am = 09 and 1pm = 13).

Press CONFIGURE and enter password 2020. Press the SUBMIT button.
Press SETTINGS and then SET CLOCK.

Use the + or − buttons to increase or decrease the numbers or press the yellow fields and use the keypad to match the current Year, Month, Day, Hour and Minute. Press ENTER to save.

8.3 How to Enable / Disable Data Logging and Change Logging Interval

NOTE: The correct time and date should be set prior to enabling data logging. Refer to Section 8.2 Set Clock for more information.

Data logging includes internal logging memory that will store over one year's worth of readings (when set at a rate of logging once per minute). Data is saved in a format and can be extracted from the unit with a standard USB connection. Once the data is downloaded, copy the file to a name that has an extension of .csv. Users can then analyze and graph data using Microsoft® Excel® or any program that works with .csv files. The files are stored in directories organized by months and years.

The default logging interval is every 5 minutes and the value recorded is the value at each 5 minute mark. An alarm condition and a large change between the current and last value will also create a log. A log file is created every 24 hours at midnight local time and every time the FCS is powered up/restarted.

Press CONFIGURE and enter password 2020. Press the SUBMIT button.
Press SETTINGS and then DATA LOGGER.

Use the **+** or **-** button to increase or decrease the sampling rate (in minutes), or press the yellow field and use the keypad.

> **Minutes:** Enter the logging interval you want to set. Factory default is 5 minutes. The system will log the value at each 5 minute mark. Minimum is 1 minute, maximum is 1080 minutes (18 hours).

> **Enable/Disable:** Use the + or - buttons to choose to enable or disable the data logging functionality.

Data logging is disabled by default and can be enabled by using the + or - to change Disabled to Enabled. Press ENTER to save.
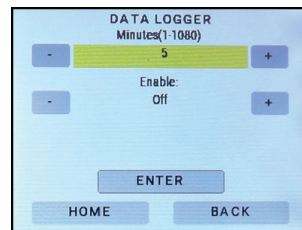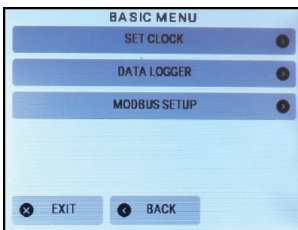
NOTE: If the message "SD Card Not Present" shows on the display, check to make sure the SD card is properly installed. If the SD card is missing or dislodged, UNPOWER the FCS before using your finger to pull the metal cover down very gently. Put in the SD card or fix the position of the card and close the slot door. Power the FCS back on and set data logging Enabled/Disabled as desired.

8.4 How to Clear a Data Logging Failure Fault

If something happens to the SD card - it becomes corrupt, dislodged or full - the data logging functionality will be disabled and the data log failure will be shown as a FAULT in the OTHER category of the Summary Display and T-CODE 0x0020 on the OTHER OVERVIEW.

To clear the fault, fix the SD card issue and go into SETTINGS and enable data logging in the DATA LOGGER menu.

For more information on data logging configurations and files, refer to the FCS Operation Manual.

8.5 Configure RDM Remote Display(s)

The RDM Remote Display is designed to communicate with the FCS and provide convenient viewing of the gas readings, channel status and faults from an alternate and relevant location to the Controller, such as a refrigeration application where there are two entrances to the chiller room. This setting allows you to tell the FCS how many RDMs are connected to it, choose the display mode and a scroll rate.

Maximum number of RDM Remote Displays by FCS model:

FCS-4	FCS-8	FCS-32	FCS 128
4 max	4 max	20 max	20 max

Press CONFIGURE and enter password 2020. Press the SUBMIT button.
Press SETTINGS and then RDM DISPLAY.
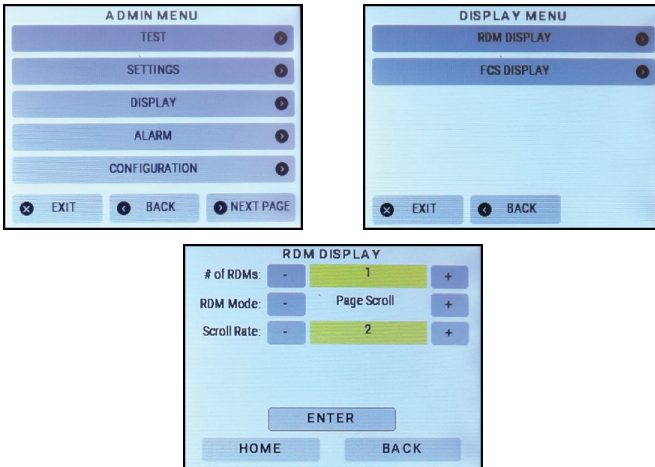
# of RDMs: Use the + or - buttons or press the yellow field to use the keypad to enter the number of remote displays connected to the FCS.

RDM Mode: Choose from these display modes:
- Line Scroll - ALL channels in the system will be displayed and the four line display will scroll up by one line at a time

- Page Scroll - ALL channels in the system will be displayed and the four line display will scroll up page by page (four lines at a time)

- High Channels - the four line display will show the FOUR channels with the current highest gas readings in order of highest to lowest (based on percentage of range, not measure of unit). This display setting is primarily used with the FCS-4, because the display will only show a maximum of four channels.

- Selected Page - SELECTED channels will be displayed and the four line display will scroll by page.

- Selected Line - SELECTED channels will be displayed and the four line display will scroll by line

Scroll Rate: Enter how fast (in seconds) you want the display to scroll through the information. Choose from 0 to 63 seconds. For line scroll, a scroll rate of 2 is a suggestion. For a page scroll, a scroll rate of 5 is a suggestion.

Press ENTER to save.

NOTE: Because the DM has a four line display, the scrolling feature (line or page) only applies if there are more than 4 channels to display. If desired, any of the four lines can be hidden. Refer to the RDM Operation Manual for more information.

NOTE: Only the channels being displayed by the RDM Remote Display can trigger the buzzer or strobe connected to the RDM. Only the channels being displayed by the RDM can be silenced.

NOTE: If the display mode is changed in the field and the channels being displayed are not showing as expected, a restart of the FCS is required for the changes to take effect. Push and hold the button on the FCS circuit board until the buzzer chirps (approximately a count of 10), let go and the FCS will do a restart. Restarting the FCS only resets the FCS, the transmitters and peripherals are not affected.

For more information on the RDM, see the RDM Remote Display Operation Manual. For more information on how to configure the RDM to display selected channels (ie. one specific gas channel or selection of channels), see the FCS Operation Manual.

8.6 Enable / Disable Channels
If a channel is disabled, it will show on the Channel Status details display with a "d" at the end of the line. While disabled, the gas readings provided by that channel will not be used to control the relays and/or alarms. Data logging entries will not be recorded for a disabled channel.

Press CONFIGURE and enter password 2019. Press the SUBMIT button.
Press CONFIGURATION and then CHANNEL HARDWARE.
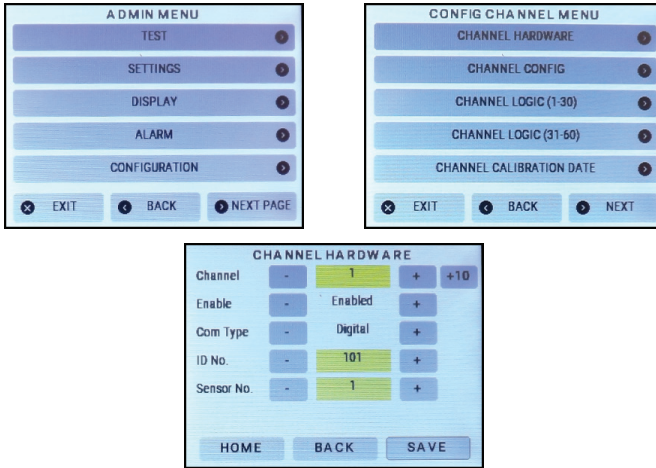
Use the + or - button or enter the specific channel number by pressing the yellow field and using the keypad to choose the desired channel. Press Enabled or Disabled for that channel. The Save button will turn green after a change has been made.
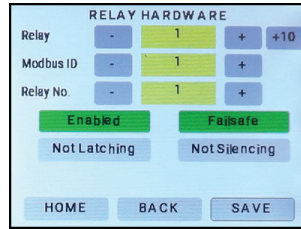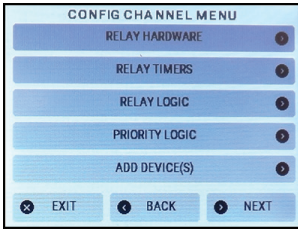
If you are going through more channels on the same screen, the system will auto save when you press the + or - to proceed or return to the next channel number. If you press Home or Back, the change will not be saved. You can choose to press Save if in doubt.

8.7 Enable / Disable Relays, Audible, Horns and Strobes
This setting allows you to enable or disable the relays, the strobe, horn and/or internal audible.

Press CONFIGURE and enter password 2019. Press the SUBMIT button.
Press CONFIGURATION, then NEXT and press RELAY HARDWARE.
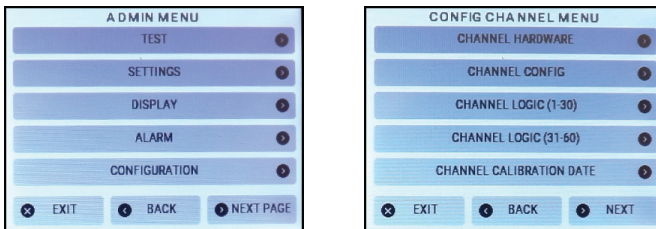
Use the + and - buttons or enter the specific relay number by pressing the yellow field and using the keypad to choose the relay number, Audible, Strobe or Horn you want to disable. Press Enabled or Disabled. The Save button will turn green after a change has been made.

If you are going through more relays on the same screen, the system will auto save when you press the + or - to proceed or return to the next relay number. If you press Home or Back, the change will not be saved. You can choose to press Save if in doubt.

9 OPTIONS AND ACCESSORIES

9.1 Top Mounted Strobe (Option -L)

High powered, red LED flashing beacon factory installed on the top of the FCS enclosure. Offers excellent flash intensity, durable vibration resistant construction and a long life 100,000 hour LED technology. Made of tough Lexan welded to the base to completely seal out moisture.


Voltage	10 - 30 VDC
Power	0.3 W
Size	6.1 cm dia x 13 cm H / 2.4 in dia x 5.2 in H
Lens Colour	Red (other colours may be available upon request)
Enclosure	PC cover and base
# of Flash Patterns	4

Operating Temperature	-20°C to 65°C (-4°F to 149°F)
Certification	IP65 rated, NEMA 4X and UL recognized

9.2 Manual Shutoff Switch (Option -SW)

An optional emergency stop, push button switch that is factory installed on the side of the FCS enclosure.
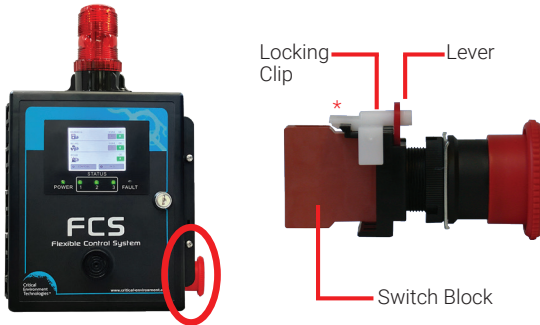
Allows manual control of the ventilation system or manual shutdown of equipment in the event of an emergency such as a gas leak. Ideal for refrigeration applications; when combined with the Top Mounted Strobe, meets B52 code requirements

Voltage Rating	110 VAC, 24 VDC
Current Rating	10A (AC/DC)
Button Size	40 mm (1.57 in) dia
Mode of Operation	1 NC contact, SPST-NC
Switch Function	ON-OFF
Features	Push-Lock, Turn-Reset

To Remove For Wiring:
Remove the white locking clip by pulling up gently on the bottom clip part (see * in diagram on previous page) and twist slightly to remove. Rotate the red lever and remove the switch block. Connect the wires. Put the switch block back on, rotate the lever back in place and replace the locking clip.

For more information and detailed instructions, refer to the Manual Shutoff Switch Datasheet.

9.3 Enclosure Door Lock and Keys (Option -DL)

The optional door lock is factory installed at the time of order. Together with the password protected menus, the lock prevents unauthorized access and eliminates tampering within the system. Comes with two keys.

9.4 Metal Protective Guard (p/n: 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 controller. It is made from 16-gauge powder coated steel and has 13 mm (½") square openings in the front to allow gas and air to flow through to the sensor. With four slotted mounting holes, installation and removal for equipment servicing is easy.
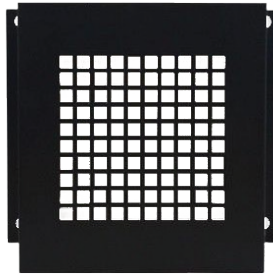
Enclosure	16 gauge powder coated steel
Weight	1.7 kg / 3.8 lbs
Size	254 mm W x 241 mm H x 121 mm D / 10.0" in W x 9.5 in H x 4.8 in D

10 MAINTENANCE

The FCS requires no assembly and virtually no maintenance. It is important to ensure that water and/or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components.

11 TROUBLESHOOTING

FCS won't power up.
Is the power properly connected? Check the connections. Refer to Section 6.6 Wiring Power Supply Connections for more information.

Number won't change when using the numeric keypad.
Press the C to clear the current value , or use the the << to delete by one digit at a time and then enter new value.

How to exit the numeric key pad without making changes.
If you enter the numeric key pad and change a value but you don't want to save that value, to exit without saving changes, press the C to clear. The ENTER button will change to CANCEL. Press CANCEL to exit.

On the home screen display, one of the channels shows a C at the end of the line, indicating the FCS cannot communicate with the transmitter assigned to that channel.

- Check to make sure the Com Type ANALOG or DIGITAL is correctly set for the type of transmitter (analog or digital) assigned to that channel. Refer to Channel Settings and Configurations in the FCS Operation Manual.

- Check that local area network wiring is correct, especially the A and B lines to make sure they are not swapped between devices on the network.

- Check that the remote device is working properly itself.

RDM constantly shows "Connection Lost". Check that the # of RDMs is set correctly. Refer to Section 8.5 Configure RDM Remote Display(s) for more information.

Changes made to the RDM standard or selected channels display and priority configurations are not working as expected. After a change in configuration, it is recommended to do a restart of the FCS. Push and hold the button on the FCS circuit board until the buzzer chirps (approximately a count of 12), let go and the FCS will do a restart.

NOTE: Restarting the FCS only resets the FCS, the transmitters and peripherals are not affected.

For more information on the operation of the FCS, please refer to the FCS Operation Manual that is available on our website.

NOTES

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