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FCS Flexible Control System Controller

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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. As a reminder, 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.

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

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 must be accompanied with an RMA number.

If CETCI is to do the repair work, after receiving an RMA # you may send the instrument, prepaid, to:

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

You must include your Returned Merchandise Authorization (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. 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. All incurred shipping charges, duties and taxes are your responsibility.

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

1.4 Copyrights and Registered Trademarks

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.

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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.

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:

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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

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.*

If you have purchased the FCS-8, the majority of the functionality outlined in this manual applies, with the exception of number of channels and number of Peripheral Devices that the FCS-8 can accommodate. For a list of the differences, refer to Section 4 List of Compatible Devices.

Thank you for purchasing our FCS Flexible Control System. The FCS Flexible Control System is a sophisticated, high performance controller that offers up to 128 (or limited to 8) gas channel configurations for monitoring toxic, combustible or 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 models:

- **FCS-M** - up to 128 channels with Modbus® RTU RS-485 WAN output to BAS
- **FCS-8-M** - maximum 8 channels with Modbus® RTU RS-485 WAN output to BAS
- **FCS-B** - up to 128 channels with BACnet® MS/TP RS-485 WAN output to BAS
- **FCS-8-B** - maximum 8 channels with BACnet® MS/TP RS-485 WAN output to BAS

2.2 Key Features

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

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

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	<ul style="list-style-type: none"> - Modbus® RTU RS-485 - Four or eight internal 4-20 mA analog inputs (Option -AI or -2AI) - Peripheral devices on Modbus® RTU RS-485 network
Outputs	<ul style="list-style-type: none"> - Modbus® RTU RS-485 (models: FCS-M, FCS-8-M) - BACnet® MS/TP to BAS (models: FCS-B, FCS-8-B) - Four or eight internal 4-20 mA analog outputs (Option -AO or -2AO) - Remote and Peripheral devices on a Modbus® RTU RS-485 network - Two drive outputs for strobe/horn (0.5 Amp @ 24 V max)
Relays (internal)	Four internal SPDT dry contact relays, rated 5A @ 240 VAC
Audible Alarm	<ul style="list-style-type: none"> - 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)	Approximately 1.0 Amp
Line Voltage (220 VAC)	Approximately 0.5 Amp
Power Distribution	Total power available to Remote and Peripheral Devices and Options 65 W @ 24 VDC
Wiring	<ul style="list-style-type: none"> - 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 / FCX-8-M-xx or FCS-B-xx / FCS-8-B-xx
 S/N: FCSM1603B00001 (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

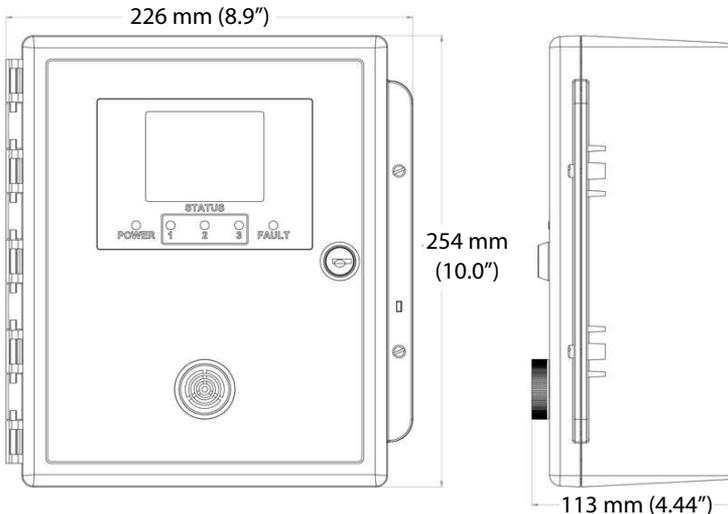
Conforms to: EMC Directive 2004/108/EC, EN 50270:2006, Type 1, EN61010

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.

NOTES:

- 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).

3.2 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
ART Infrared Refrigerant	4-20 mA or Modbus®	R134A, R404A, R407A, R407C, R407F, R410A, R427A, R448A, R449A, R507, HF01233ZD, R422A, R422D, R45sA, R513A, HF01234YF, HF01234ZE, R22, R32	Infrared
CGAS-A CO2	4-20 mA	CO ₂	Infrared
CGAS-AP Public Spaces (Analog)	4-20 mA	CO ₂ , CO, CH ₂ O, Refrigerants, C ₃ H 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 ₃ H ₄ , C ₂ H ₄ O, CH ₂ , H ₂ , H ₂ S, HCl, HCN, NO, O ₂ , O ₃ , PH ₃ , SiH ₄ , SO ₂ , CH ₄ , C ₃ H ₈ , TVOCs, Refrigerants	Various - Infrared, Electrochemical, Catalytic, Solid State
CGAS-DP Public Spaces (Digital)	Modbus®	CO ₂ , CO, CH ₂ O, Refrigerants, C ₃ H ₈ , TVOCs, Particulates	Various - Infrared, Solid State, Catalytic, PID
CXT Explosion Proof	4-20 mA or Modbus®	NH ₃ , CO, CO ₂ , H ₂ , H ₂ S, NO ₂ , O ₂ , PH ₃ , SO ₂ , CH ₄ , C ₃ H ₈ , C ₃ H ₁₂	Electrochemical, Infrared, Catalytic
LPT Low Power	4-20 mA	NH ₃ , CO, NO ₂ , Cl ₂ , O ₂ , O ₃	Electrochemical
LPT-A Analog	4-20 mA	NH ₃ , CO, NO ₂ , ClO ₂ , Cl ₂ , C ₃ H ₄ , C ₂ H ₄ O, CH ₂ , H ₂ , H ₂ S, HCl, HCN, NO, O ₂ , O ₃ , PH ₃ , SiH ₄ , SO ₂ , CH ₄ , C ₃ H ₈ , TVOCs, Refrigerants	Electrochemical, Solid State, Catalytic
LPT-M Modbus	Modbus®	same as LPT-A	same as LPT-A
LPT-P Digital Car Park	Modbus®	CO, NO ₂ , H ₂ , CH ₄ , C ₃ H ₈	Electrochemical and Catalytic

CETCI Peripheral and Remote Devices	Output Signal		# of Devices Limit *	
			FCS	FCS-8
LNK-AO Analog Output	Modbus [®]	Four 4-20 mA outputs	15	2
LNK-AI Analog Input	Modbus [®]	Four 4-20 mA inputs	15	2
LNK-XT Network Extender	Modbus [®]	BUS Network Extender	6	**
QCC-RDM Remote Display	Modbus [®]	Displays gas readings	20	4
RLY-4 Remote Relay	Modbus [®]	Four, 5 Amp, 120/240 VAC	14	2
RLY-8 Remote Relay	Modbus [®]	Eight, 5 Amp, 120/240 VAC	7	1
RPS-24VDC Remote Power Supply	Modbus [®]	24 VDC, 2 Amp	6	**

* This is the total number possible on an individual/absolute basis without consideration of other internal options installed or devices on the network. Limits will change depending on what internal options are installed and the number of and type of devices connected to the network.

** It is unlikely that an LNK-XT Network Extender or an Remote Power Supply will be needed with an FCS-8 system.

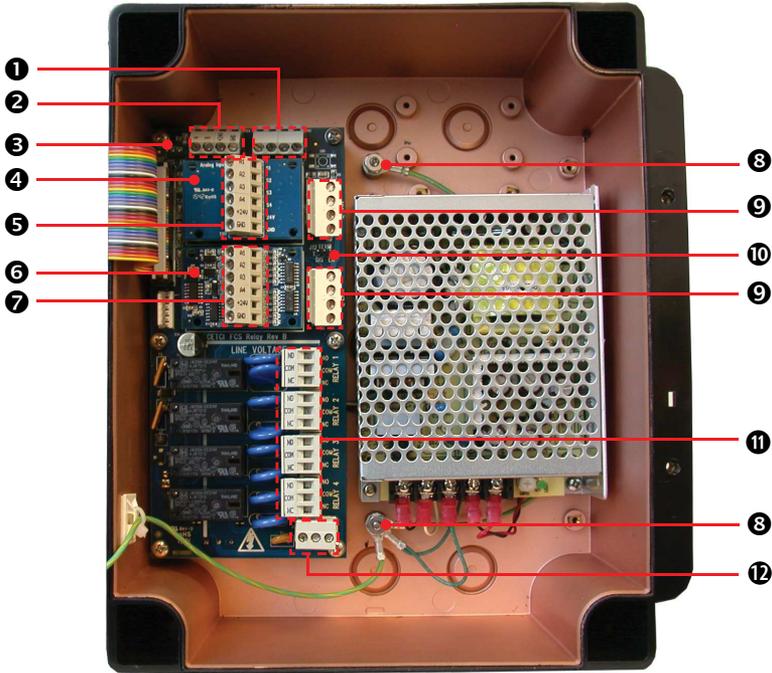
5 INSTRUMENT FEATURES

5.1 Front Exterior Enclosure



NUMBER	FEATURE	FUNCTION
1	Display	1/4 VGA full colour resistive touch LCD display, indicates controller operation
2	Power LED	Indicates unit power status
3	Status 1, 2, 3 LEDs	Indicates channel status - OK, Low / Mid / High alarm
4	Fault LED	Indicates unit fault condition
5	Key Lock (Option -DL)	Allows enclosure to be locked
6	Door Screws	Secures the door of the enclosure
7	Door Mounted Alarm	Audible buzzer that sounds when a channel has gone into alarm

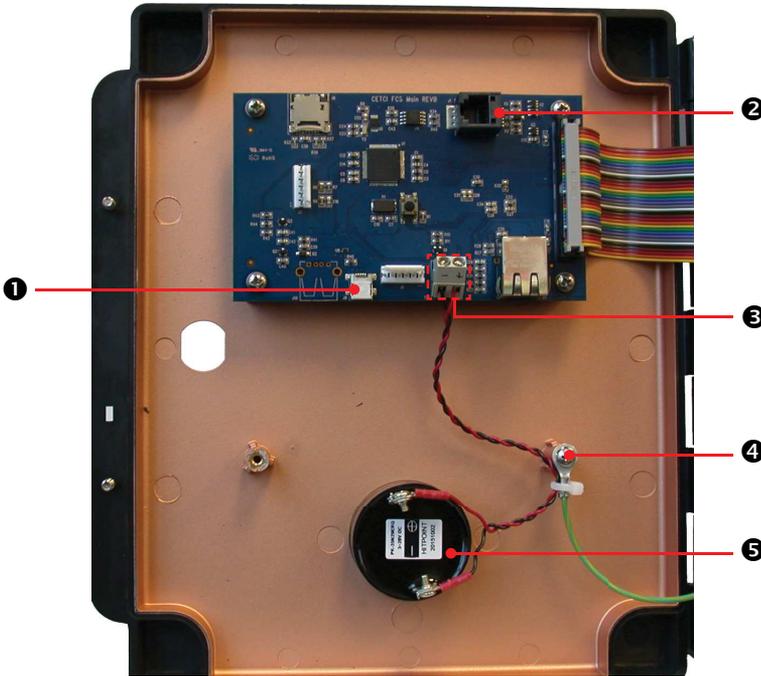
5.2 Interior System Layout (Bottom) Shown with Options -AI and -AO Installed



NUMBER	FEATURE	FUNCTION
1	Horn/Strobe Output Terminal	Two connections for a remote 24VDC horn and/or strobe combination (ie. RSH-24VDC) 0.5 Amps max.
2	WAN Terminal	For connection to BAS (Modbus® or BACnet®) (no 24 VDC connection)
3	WAN End of Line Jumper	120 ohm line termination
4	Option -AI or Option -AO	An optional board with 4 analog inputs or Outputs
5	Analog Input Terminal	Connection for up to four 4-20 mA transmitters
6	Option -AO	An optional board with 4 analog outputs NOTE: this could be Option -AI instead. Refer to Section 5.4 for more information
7	Analog Output Terminal	Connection for up to four 4-20 mA outputs
8	Earth Ground	Earth / safety ground connection

⑨	LAN Terminals	Connections for Modbus® transmitters and/or peripheral devices
⑩	LAN End of Line Jumper	120 ohm line termination
⑪	Relay Terminals	Four SPDT relays, rated 5 amps @ 240 V
⑫	Line Voltage Terminal	120 or 240 VAC input

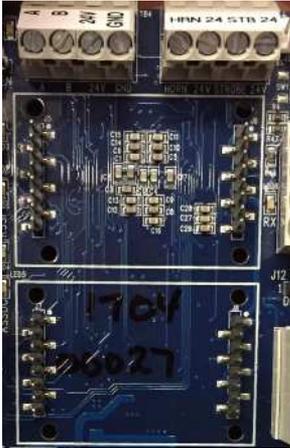
5.3 Interior System Layout (Door)



NUMBER	FEATURE	FUNCTION
①	Micro USB Connector	For system updates and downloading data logging
②	Programming Port	For factory system programming
③	Buzzer Terminal	Connection for door mounted buzzer
④	Earth Ground	Earth / safety ground connection
⑤	Buzzer	Internal audible alarm

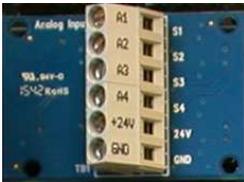
5.4 Optional Internal Analog Inputs and Analog Outputs (Options -AI and -AO)

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.

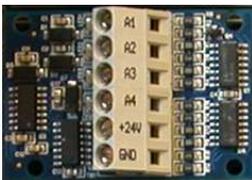


FCS main board without the optional Analog Input (-AI) or Analog Output (-AO) boards installed.

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, therefore 4 Analog Inputs (Option -AI)
- Two -AI boards, therefore 8 Analog Inputs (Option -2AI)
- One -AO board, therefore 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)

5.4.1 Maximum Number of Analog Inputs - FCS 128 Channel Model

The maximum number of **internal analog inputs** that can be accommodated by the FCS is eight (two factory installed -AI boards).

If more analog inputs are required, they can be added by using one or more LNK-AI Analog Input Peripheral Devices. Each LNK-AI has four analog inputs, Modbus® communication and an LED power indicator. The LNK-AI connects to the LAN Terminal on the FCS and to other devices in a daisy-chain fashion. Refer to Section 6.12 *Wiring LNK-AI Peripheral Device (additional Analog Inputs)* for information on wiring an LNK-AI to the FCS.

The **maximum number of analog inputs (internal + remote)** the FCS can support is 60. This can be made up of 2 -AI boards (8 internal analog inputs) plus 13 LNK-AI Peripheral Devices (4x13 analog inputs = 52) 8 internal + 52 remote = 60 total. **Or** no internal analog inputs and 15 LNK-AI Peripheral Devices (4x15 = 60).

NOTE: Each configured analog input will take up one of the 128 available sensor channels. For example, if the system is configured with 48 analog inputs (and no digital transmitters), 80 gas channels remain for use.

5.4.2 Maximum Number of Analog Inputs - FCS-8 8 Channel Model

The maximum number of **internal analog inputs** that can be accommodated by the FCS-8 is the same as the FCS, which is eight (two factory installed -AI boards).

The **maximum number of analog inputs (internal + remote)** the FCS-8 can support is 8. This can be made up of 1 -AI board (4 internal analog inputs) plus 1 LNK-AI Peripheral Device (4 remote analog inputs) 4 internal + 4 remote = 8 total. **Or** no internal analog inputs and 2 LNK-AI Peripheral Devices (4x2 = 8).

NOTE: Each configured analog input will take up one of the 8 available sensor channels. For example, if the system is configured with 4 analog inputs (and no digital transmitters), 4 gas channels remain for use.

5.4.3 Maximum Number of Analog Outputs - FCS 128 Channel Model

The maximum number of **internal analog outputs** that can be accommodated by the FCS is eight (two factory installed -AO boards).

If more analog outputs are required, they can be added by using one or more LNK-AO Analog Output Peripheral Devices. Each LNK-AO has 4 analog outputs, Modbus® communication and an LED power indicator. The LNK-AO connects to the LAN Terminal on the FCS and to other devices in a daisy-chain fashion. Refer to Section 6.11 *Wiring LNK-AO Peripheral Device (additional Analog Outputs)* for information on wiring an LNK-AO to the FCS.

The **maximum number of analog outputs (internal +remote)** the FCS can support is 60. This can be made up of 2 -AO boards (8 internal analog outputs) plus 13 LNK-AO Peripheral Devices (4x13 analog

outputs = 52). 8 internal + 52 remote = 60 total. **Or** no internal analog outputs and 15 LNK-AO Peripheral Devices ($4 \times 15 = 60$).

5.4.4 Maximum Number of Analog Outputs - FCS-8 8 Channel Model

The maximum number of **internal analog outputs** that can be accommodated by the FCS-8 is the same as the FCS, which is eight (two factory installed -AO boards).

The **maximum number of analog outputs (internal + remote)** the FCS-8 can support is 8. This can be made up of 1 -AO board (4 internal analog outputs) plus 1 LNK-AO Peripheral Device (4 remote analog outputs) 4 internal + 4 remote = 8 total. **Or** no internal analog outputs and 2 LNK-AO Peripheral Devices ($4 \times 2 = 8$).

NOTE: The maximum number of analog outputs will be different if configured as Modbus® VFDs. Refer to Section 12 *Analog Input and Analog Output Settings* for more information.

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 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

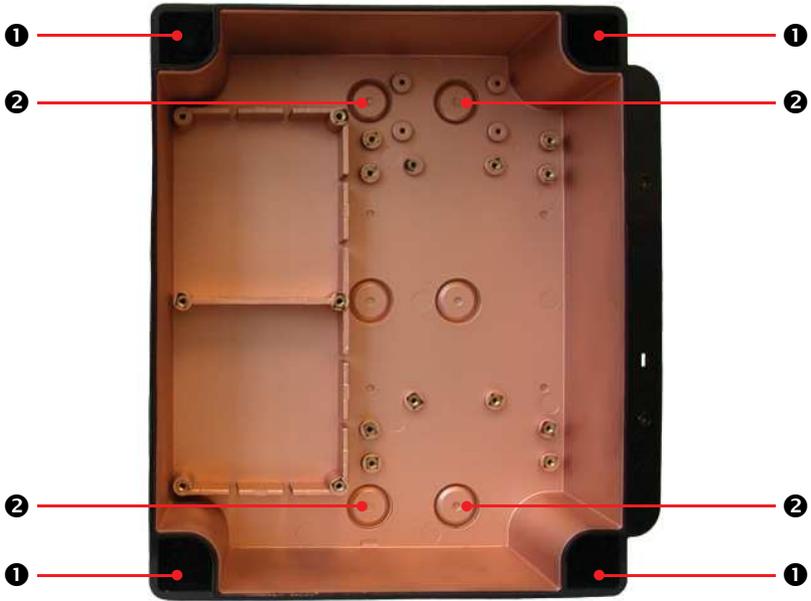
All electronic devices are susceptible to EMI (Electromagnetic Interference) and RFI (Radio Frequency Interference). Our controllers and detectors have been designed to reduce the effects of these interferences and we meet CSA, FCC and CE requirements for these type of devices. However there are still 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

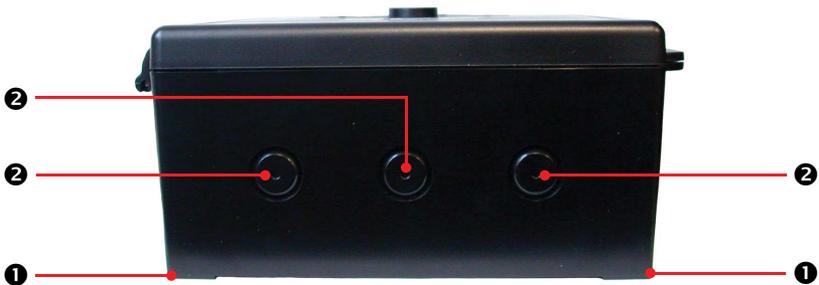
6.5.1 Enclosure Interior Base



NUMBER	FUNCTION
1	Molded-in mounting holes
2	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
①	Molded-in mounting bracket
②	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:

Each Single Device	Power Consumption
LPT-P or LPT-M Transmitter with internal sensor(s)	1 watt
LPT-P or LPT-M Transmitter with an ESH-A remote sensor	3 watts
RLY-4 Remote Relay (4 relays)	3 watts
RLY-8 Remote Relay (8 relays)	6 watts
LNK-AI Analog Input Peripheral Device (not including the analog devices it is connected to)	1 watt
LNK-AO Analog Output Peripheral Device	3 watts
QCC-RDM Remote Display	0.5 watts
CXT Explosion Proof Transmitter	6 watts
RSH-24VDC Remote Horn/Strobe Combo	3 watts
ART Infrared Refrigerant Transmitter	4 watts
LPT-A Transmitter (with internal electrochemical sensor)	1 watt
LPT-A Transmitter (with internal solid state or catalytic sensor)	3 watts

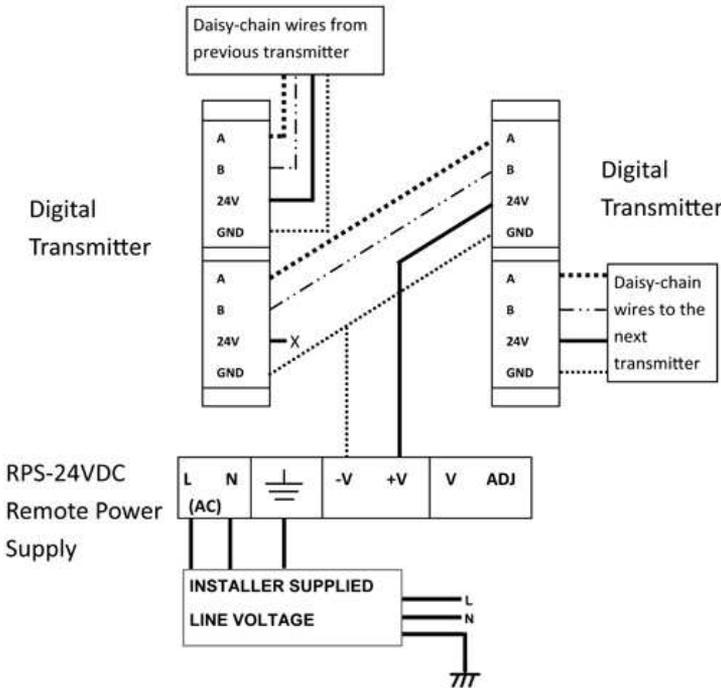
As a general rule, systems with more than 32 digital transmitters require a remote power supply for additional power. Some installations may use fewer transmitters, but have very long wiring runs that may present a voltage loss condition. (If the overall length of wiring is more than 609 m / 2,000 ft 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 2 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 on the metal mounting plate.

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 Internal 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.

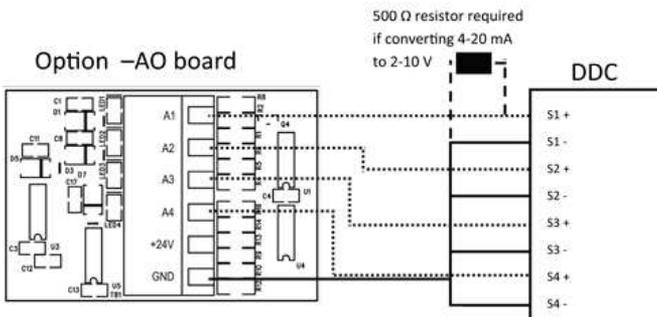
The FCS provides 24 VDC (low voltage power) to the Analog Output Terminal on the optional -AO board, which can accommodate up to a total of eight internal analog outputs, if two -AO boards are installed (Option -2AO). The analog output is a 4 - 20 mA current source. If required the output can be converted to 2 - 10V by using a 500 ohm resistor in parallel.

NOTE: If two -AO boards are installed, there cannot be any internal analog inputs (Option -AI). If required, remote 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)*.

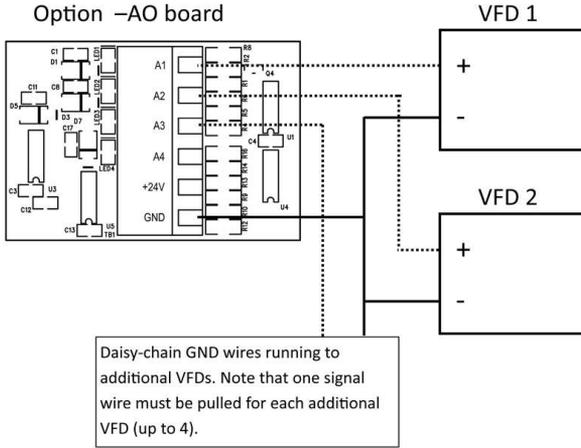
A1 through A4 on the Analog Output Terminal on the -AO board provides up to four connections designed to be used for VFD control, BAS / DDC / control panel monitoring, connecting analog remote displays, etc. Eight connections are available if two -AO boards are installed.

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.



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.

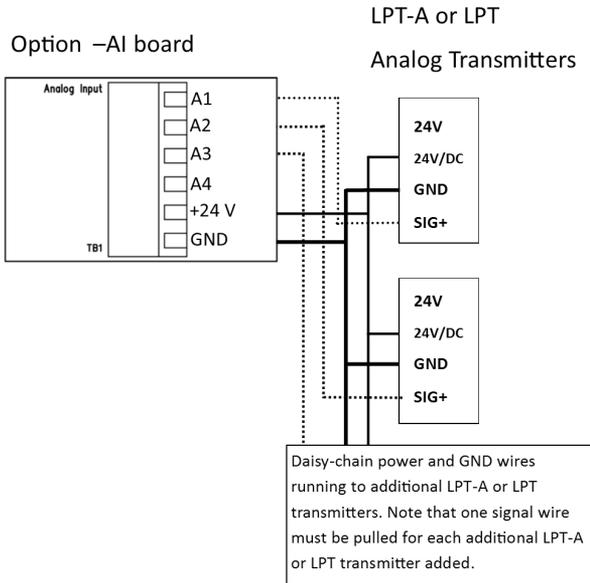
NOTE: Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires.

The enclosures of the LPT family of transmitters 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

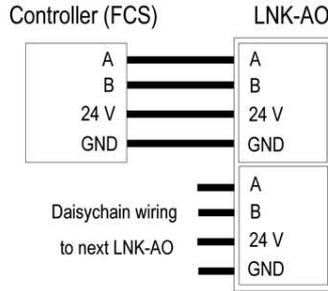


NOTE: DO NOT USE solid-core wire for connection to wiring terminal strip. Any damage caused by using solid-core wire will void warranty. Use stranded wire pigtails 18 awg within the enclosure to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

6.11 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 can 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. A maximum of fifteen LNK-AO Peripheral Devices can be connected to the FCS (if no internal -AO Options are installed). A maximum of two LNK-AO Peripheral Devices can be connected to the FCS-8 (if no internal -AO Options are installed).



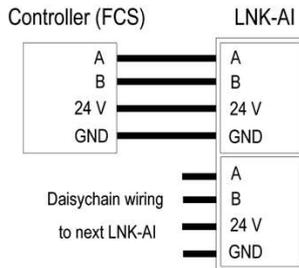
For more information on the LNK-AO, refer to the *LNK-AO Analog Output Peripheral Device Operation Manual*.

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 pigtailed 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)

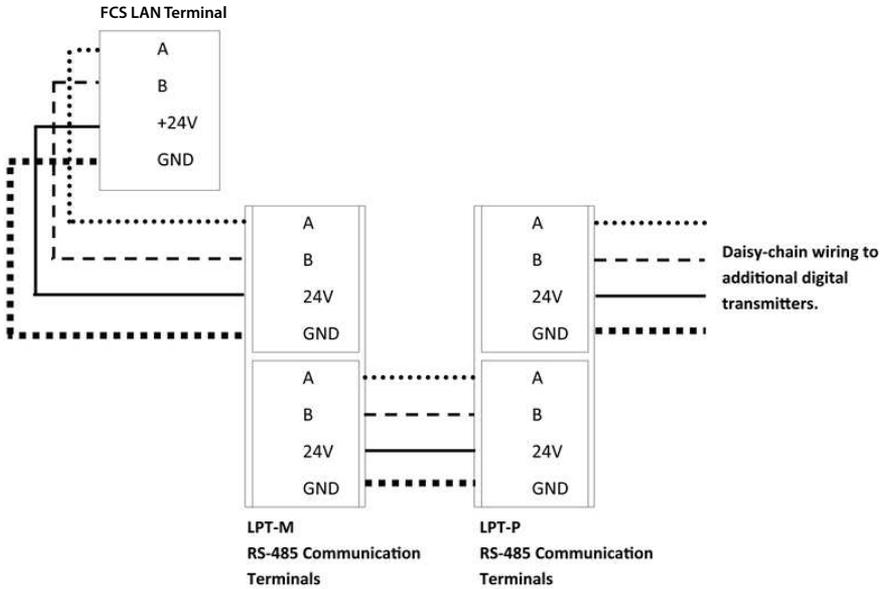
If more than four (or eight) analog inputs are required, one or more LNK-AI Peripheral Devices can be connected to the FCS.

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. A maximum of fifteen LNK-AI Peripheral Devices can be connected to the FCS (if no internal -AO Options are installed). A maximum of two LNK-AI Peripheral Devices can be connected to the FCS-8 (if no internal -AO Options are installed).



For more information on the LNK-AI, refer to the *LNK-AI Analog Input Peripheral Device Operation Manual*.

6.13 Wiring Digital Inputs (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 and together a maximum of 8 (FCS-8) or 128 gas channels (FCS), if there are no configured analog inputs. 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: CETCI 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.

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 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.

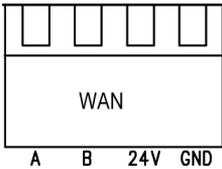
If the overall length of the wire run is more than 609 m / 2,000 ft, or if the area is electronically noisy, you will require an LNK-XT Network Extender to extend the range of the RS-485 network. The LNK-XT is a digital device and must be connected in a daisy-chain fashion.

Up to six LNK-XT devices can be connected to the FCS. It is unlikely that an LNK-XT would be needed in an FCS-8 system. In the event that it is, one LNK-XT can be connected to the FCS-8.

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 -

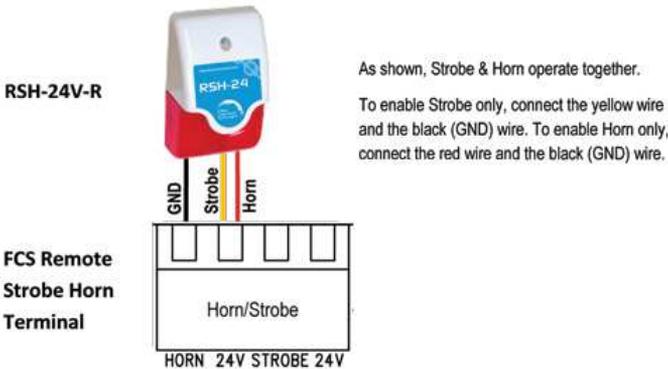
24V - 24 volts DC, not required, no connection on board

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

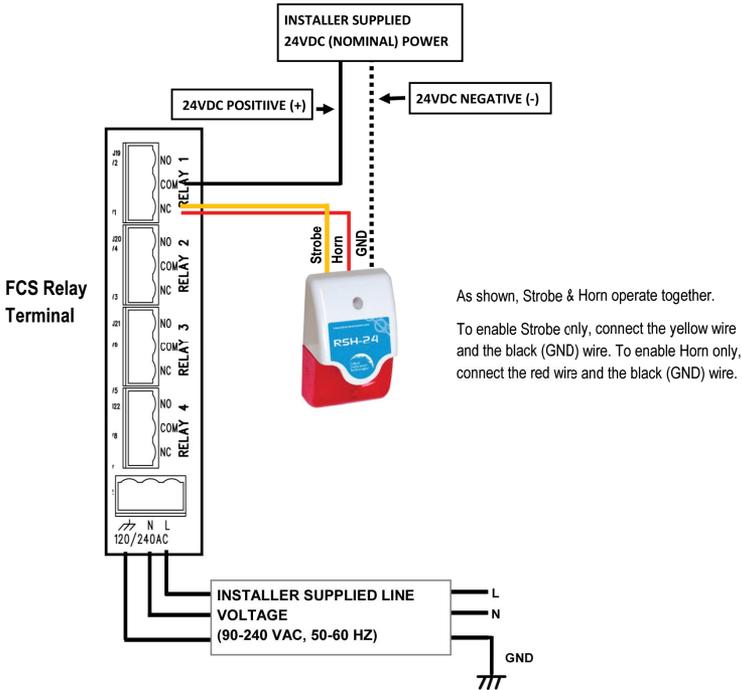
The FCS has four SPDT dry contact relays rated MAX 5A at 240 VAC or 30 VDC each. These relays can be used to control fan starters or coils used for HVAC equipment. The contacts can also be used for signaling other equipment like fire panels or alarm systems. Terminal blocks are provided to connect to 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 up to four additional SPDT dry contact relays to a fixed gas detection system. Similarly, the RLY-8 Remote Relay offers up to eight additional SPDT dry contact relays to a fixed gas detection system. Both RLY devices have a horn/strobe output terminal with two connections for a remote 24VDC horn/strobe combo. 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.

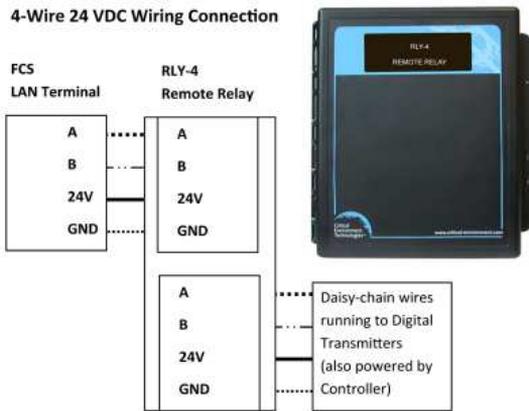
The relays are rated 5 amps @ 240 VAC each and can be used to control remote alarms, strobes, exhaust fan starters, make up air fan contactors, or signaling other equipment like fire panels or alarm systems, etc.

The FCS can accommodate a maximum of 56 remote relays, consisting of a maximum of fourteen RLY-4 devices or a maximum of seven RLY-8 devices.

The FCS-8 can accommodate up to a maximum of 8 remote relays, consisting of two RLY-4 devices or one RLY-8.

NOTE: The remote relays are in addition to the four internal relays.

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.



6.19 Wiring QCC-RDM Remote Display Connections

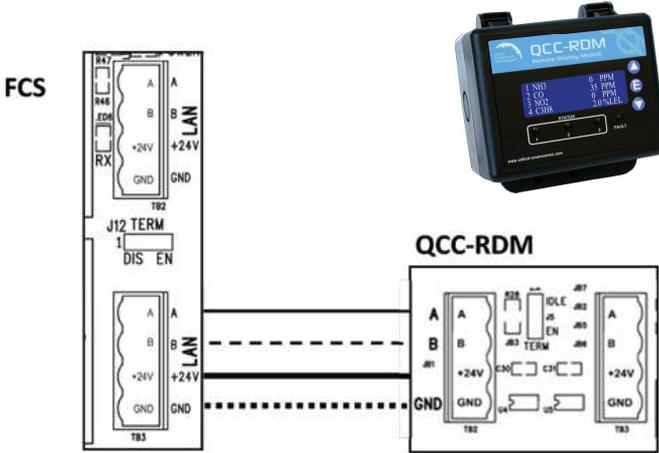
The QCC-RDM Remote Display is a device that is designed to communicate with the FCS using Modbus® communication protocol. It displays the real time gas readings from the FCS and is intended to be mounted and viewed from a remote, relevant location such as a refrigeration (or other) application where 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 QCC-RDM Remote Display is wired to the FCS, the controller needs to be told that the QCC-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 QCC-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 *QCC-RDM Operation Manual* for instructions. The read and write default QCC-RDM Modbus® ID is 230. The QCC-RDM will automatically broadcast the display information to

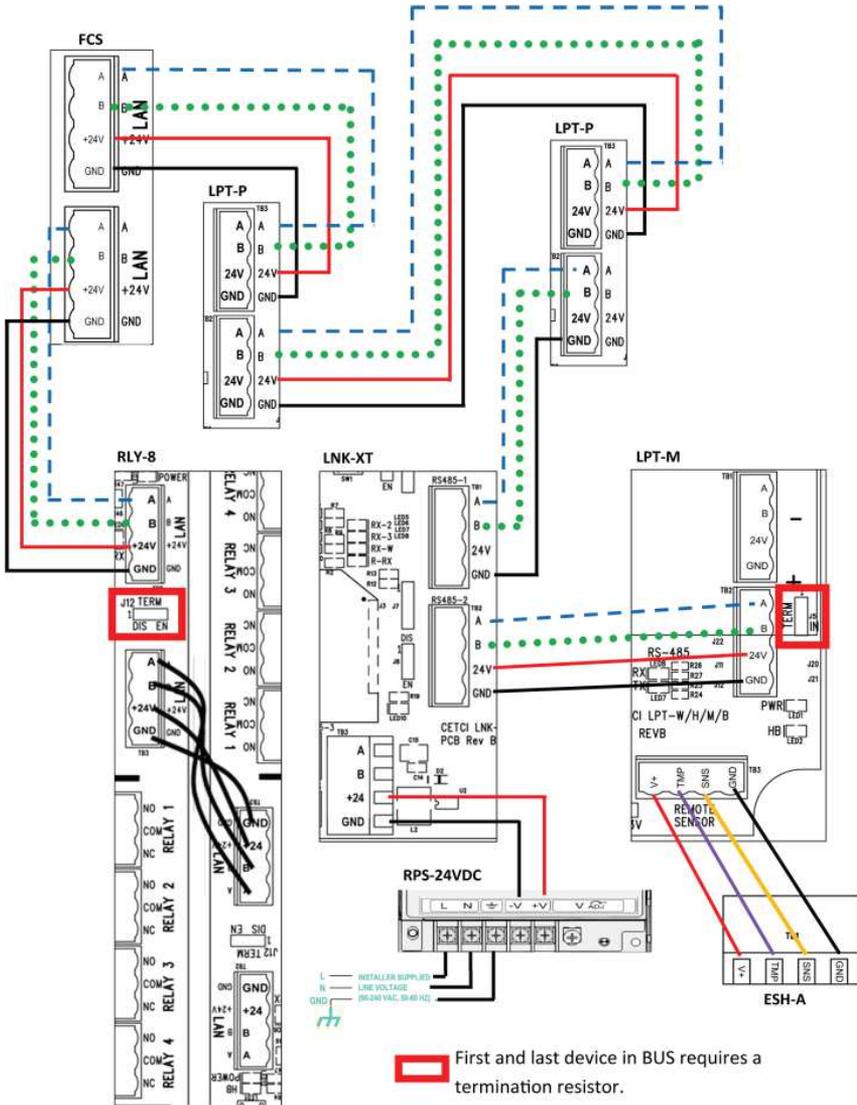
Modbus® ID 253. This is the common Modbus® ID for all QCC-RDMs on the network and is used to listen for broadcasts from the controller and receive screen updates from the controller.

24VDC power is supplied to the QCC-RDM from the FCS. Four-conductor, 16 gauge stranded wire / cable must be shielded when connecting the controller to the QCC-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 QCC-RDM, refer to the *QCC-RDM Remote Display Operation Manual* and the *FCS Operation Manual*.

6.20 Wired Example of an FCS Gas Detection System



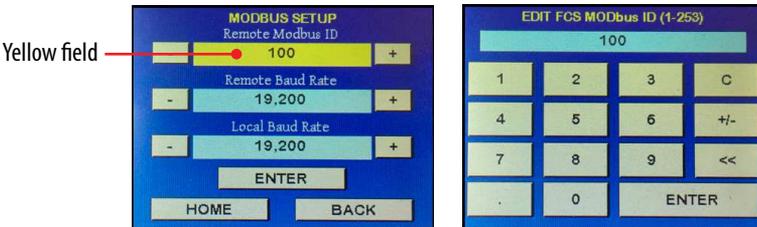
7 SYSTEM OPERATION

7.1 Navigating the Menu Structure

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. To indicate the button has acknowledged the pressure, it will turn colour as you press it and upon release will return to normal. Press firmly and purposefully using your fingernail or a dull pointed instrument such as a stylus to navigate through the menu. If the expected change doesn't occur, reduce the speed at which you are pressing.

After entering a menu item, the BACK button will return you one screen previous to where you were. The HOME button will return you to the normal display screen, logging you out of the password protected menu items.

Some screens have data fields that are yellow. If you press on the yellow data field, a numeric (or alphanumeric) key pad will appear, allowing you to enter a value more easily than using the + or - buttons.



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.

When a value is changed, the ENTER or SAVE button will turn green, indicating a change has been made and pressing the green button will commit the change. If you change the value back to its preceding value, the ENTER or SAVE button will change from green, back to standard colour.

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.

7.2 Accessing the Menu with Passcodes

The main menu structure is broken down by the passcode access entry. Press on the MENU button to access the Enter Password screen.



These passcodes allow for direct access to the parts of the menu system of interest:

CODE*	NAME	DESCRIPTION
1	Test	Test Audible, Test Strobe, Test Relays, Test Analog Output
1001	Basic	Set Clock, Set Data Logger, Modbus® Setup / BACnet® Setup
1014	Display	Configure QCC-RDM Remote Display(s)
		Configure Channel Hardware <ul style="list-style-type: none"> • Enable / Disable Channels • Set Channel Communication Type (analog/digital) • Set Channel ID • Assign Sensor Number Configure Channel Config <ul style="list-style-type: none"> • Set Channel Name • Set Channel Units • Set Channel Decimals • Set Channel Zero • Set Channel Range Configure Relay Hardware <ul style="list-style-type: none"> • Set Relay No • Set Relay Modbus ID • Set Mode (failsafe, normal, latching, not silencing) • Enable / Disable Relays Set ON/OFF DELAYS for Relays
3022*	Configure	
3032*	Analog	Configure Analog Input Hardware <ul style="list-style-type: none"> • Set Modbus® ID and Channel No • Enable / Disable Analog Input Configure Analog Output Hardware <ul style="list-style-type: none"> • Set Modbus® ID and Channel No and Type • Enable / Disable Analog Output

*Not all passcodes or passcode menu items are listed or described in this manual. For information on the menu items that do not appear in this manual, refer to the *FCS Operation Manual*.

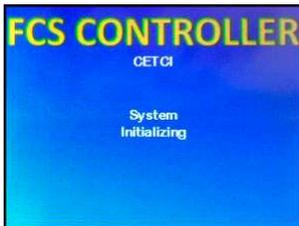
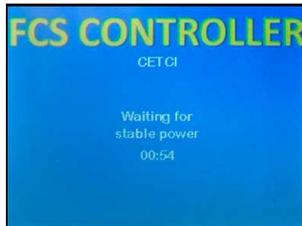
7.3 Power Up and Warm-up

Upon power up, the FCS delays the initializing start-up sequence with a 2 minute 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.

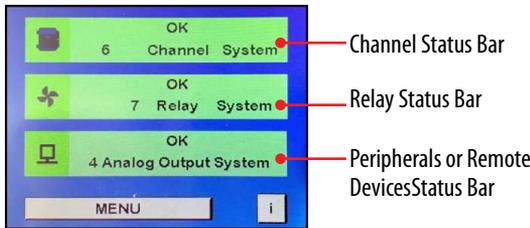


NOTE: In the event the FCS shows a blank screen, power cycle the device.

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.

7.4 Home Screen Display

There are three bars on the home screen. The first is the Channel Status bar, the second is the Relay Status bar and the third is the Peripherals or Remote Devices Status bar.



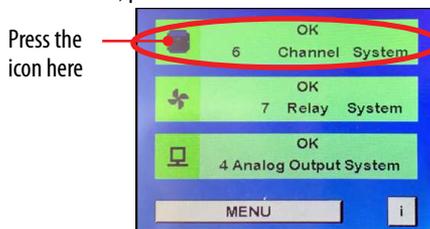
7.5 Channel Status Bar Operation

The Channel Status Bar 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.

Colour	Text	LED Indicators*	Description
Green	OK, # of Channels	All are Green	All channels are not detecting gas at any alarm level, the air is safe
Yellow	Low-Alarm	Status 1 is Red	At least one channel is in low alarm
Orange	Mid-Alarm	Status 1 & 2 are Red	At least one channel is in mid alarm
Red	Hi-Alarm	Status 1, 2 & 3 are Red	At least one channel is in high alarm
Red	Fault	Fault is Red	At least one channel is in Fault condition

*exclusive of other possible statuses occurring at the same time

To view more details about the channels, press on the icon on the left side of the Channel Status Bar.





Use the + or - buttons to scroll to the channel you want to look at and press on icon on the bar for the particular channel of interest:



STEL/TWA/IDLH disabled



STEL/TWA/IDLH enabled

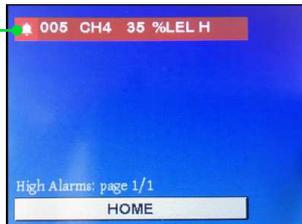
NOTE: If the STEL, TWA and IDLH alarm levels have been enabled, they will appear on the screen as well. See Section 13 *STEL and TWA Settings* for more information.

Here is an example of the main display that has a channel status other than OK/normal operation.

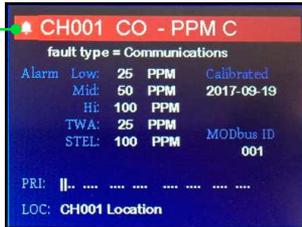
Press here to see the list of all the all channels in high alarm



Press here to see the details for the channel in high alarm



Press the icon here to exit the details screen



The details screen allows you to view the alarm level setpoints, priorities it is assigned to, the type of fault, when it was last calibrated, its Modbus® ID, and a description of the location of the transmitter for that particular channel.

The status of a channel is indicated by colours and text added to the end of the line as follows:

Colour of Bar	Additional Text	LED Indicator	Description
Green		All are Green	Channel is working normally
Green	d	All are Green	Channel is disabled
Yellow	L	Status 1 is Red	Channel is in low alarm
Orange	M	Status 1 & 2 are Red	Channel is in mid alarm
Red	F	Fault is Red	Channel is in a Fault condition
Red	C	Fault is Red	Controller cannot communicate with channel/transmitter
Red	H	Status 1, 2 & 3 are Red	Channel is in high alarm
Red	S	Status 1, 2 & 3 are Red	Channel has a STEL alarm
Red	T	Status 1, 2 & 3 are Red	Channel has a TWA alarm
Red	I	Status 1, 2 & 3 are Red	Channel has an IDLH alarm

*exclusive of other possible statuses occurring at the same time

7.6 Relay, Strobe, Horn and Audible Status Bar Operation

The FCS has four internal SPDT dry contact relays labeled RL1, RL2, RL3 and RL4. Up to an additional 56 remote relays (RLY-4 or RLY-8 peripheral devices) may be added to the system. Strobe, horns and the internal audible buzzer are included with the relays.

NOTE: Remote strobe / horns and the internal audible buzzer are included in the relay system configuration.

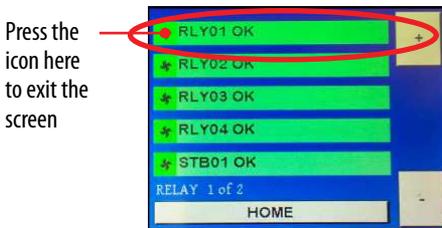
The Relay Status Bar on the main display of the FCS shows a summary of the status of the relays, which includes the internal and any remote strobes and horns. If the relays are in different statuses, it will display

the three most important statuses in order from left to right. The bar will also change colour depending on the severity of the status.

This example indicates no relays are active and none are in ON or OFF delay:

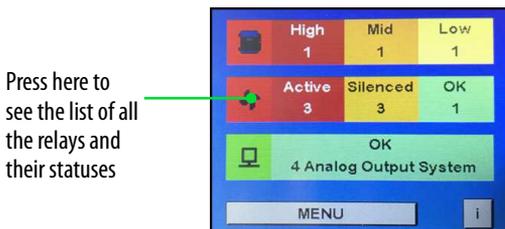


To view information about each individual relay, press on the icon on the Relay Status Bar indicated by the circle above and a more detailed screen will appear.



Use the + and - buttons to scroll through page by page.

Here is an example of the main display that has a relay status other than OK/normal operation.



Or press here to see the list of only the active relays



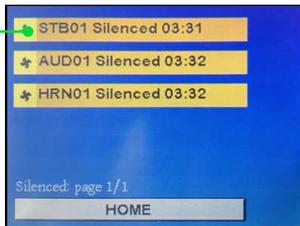
Press the icon here to exit the screen



Or press here to see the list of only the silenced horns/strobes



Press the icon here to exit the screen



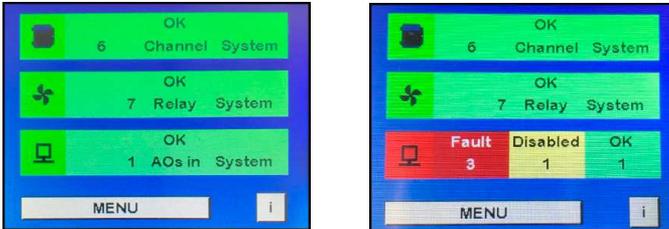
The status of a relay, horn, strobe or audible is indicated by colours and text added to the end of the line as follows:

Colour of Bar	Additional Text	Description
Green	OK	Relay, Strobe/Horn are not active
Orange	Silenced	Audible device has been silenced for a preconfigured amount of time, with visual countdown
Yellow	On Delay	Relay is active and has an ON Delay for a preconfigured amount of time, with a visual countdown
Orange	Off Delay	Relay is active and has an OFF Delay for a preconfigured amount of time, with a visual countdown

Red	Alarm	Relay, Strobe/Horn has been triggered and is active
Red	Latched	Relay is active and latched and requires a manual clear

7.7 Peripherals and Remote Devices Status Bar Operation

The Peripherals Status Bar on the main display of the FCS shows a summary of 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 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.



The status “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.

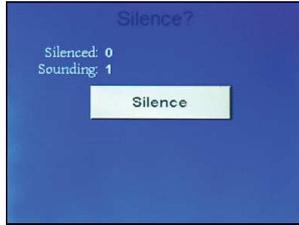
NOTE: The FCS only communicates with the device it is immediately connected to. It does not communicate with the device(s) the LNK-AO or the Modbus® VFD is connected to.

The status “Disabled” is displayed in yellow 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.

NOTE: You can temporarily view the details of the FCS (model number, device type, serial number, firmware revision, etc.) and the date and time of day by pressing on the “i” button on the home screen display.

7.8 Integral Audible Alarm, Terminal Connected Strobe/Horn and Remote Strobe/Horn Operation

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 channels that are causing the audible alarm 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 Section 10.2 *Using Relay Timers 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 a yellow bar:



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.

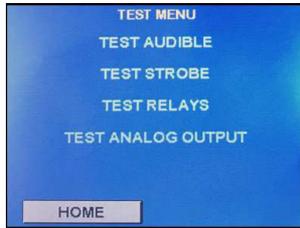
To let the alarm(s) continue sounding, don't press Silence All. Each alarm will continue sounding until the cause of the alarm comes to an end.

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.

7.9 Test Menu Functions

In the Test menu, you can test the audible alarm, strobe and 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.

Press Menu and enter passcode "1" to enter the Test Menu.



The maximum length of time each test can be set to last is 1 hour. The range that can be set is 0 seconds to 60 minutes.

When the test starts, it will continue 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:

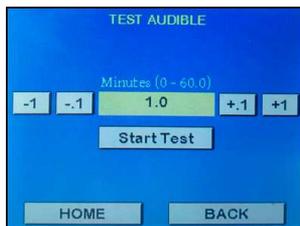
- + .1 will increase the time by six seconds each time it is pressed
- + 1 will increase the time by one minute each time it is pressed
- 1 will decrease the time by one minute each time it is pressed
- .1 will decrease the time by six seconds each time it is pressed

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

7.9.1 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.

In Test menu (passcode 1), press on Test Audible.



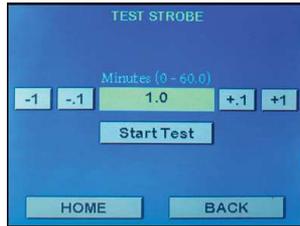
Enter the length of time you want to test the audible for. Press Start Test to begin the test.

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.

7.9.2 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.

In Test menu (passcode 1), press on Test Strobe.



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

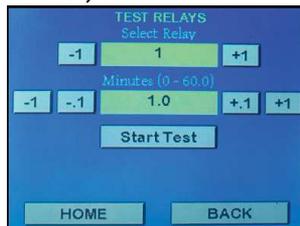
To cancel the test, go back into the Test menu, open the Test Strobe screen and enter 0 in the Minutes field and press Start Test.

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.

7.9.3 Test Relays

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

In Test menu (passcode 1), press on 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.

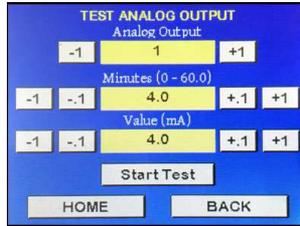
NOTE: Relay ON and OFF delays do NOT apply in test mode.

7.9.4 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.

In Test menu (passcode 1), press on Test Analog Output.



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.

7.10 Recalibrating the Display to Improve Response

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.

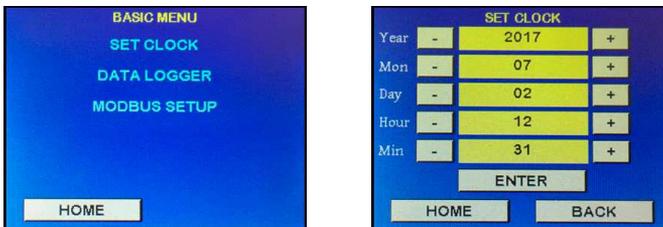
8 BASIC SETTINGS AND CONFIGURATIONS

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 installed).

8.1 Set Clock

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

Press Menu and enter passcode “1001” to enter the Basic menu and select 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.



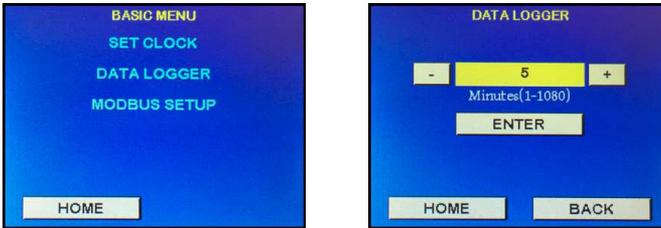
8.2 Set Data Logger Sample Rate

NOTE: The correct time and date should be set prior to commencing data logging. Refer to Section 8.1 *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.

Press Menu and enter passcode “1001” to enter the Basic menu and select Data Logger. Use the + or - button to increase or decrease the sampling rate (in minutes), or press the yellow field and use the keypad. The minimum sample rate is every one minute. The maximum sample rate is every 1080 minutes

(18 hours). 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 gently depressing the card slot door and slide up to open. Put in the SD card or fix the position of the card and close the slot door. Power the FCS back on.

8.3. Modbus® Setup / BACnet® Setup

NOTE: If the FCS Controller is an FCS-B with BACnet® WAN output, see the FCS default WAN BACnet® communications parameters further along in this section.

NOTE: All devices on each network must be set to the same baud rate.

The FCS can be configured for the following baud rates:

- 9,600 (LAN Modbus® for AST-IS18-M)
- 14,400
- 19,200 (LAN / WAN Modbus® factory default)
- 38,400
- 57,600
- 76,800 (WAN BACnet® factory default)
- 115,200

There are two networks on the FCS. The first is the local area Modbus® RS-485 RTU network (LAN) used for communications with connected CETCI digital transmitters and peripheral devices.

FCS default LAN Modbus® communications parameters:

- Baud rate = 19,200
- BUS Controller is the FCS
- Parity = no parity
- Stop bits = 1
- Data bits = 8

NOTE: The FCS has been designed to operate with these parameters and any changes made could affect its ability to work as intended. If these values are changed, CETCI will not troubleshoot the system for communication faults until they are returned to factory defaults.

The second network is the wide area Modbus® or BACnet® network (WAN) used for communications with building automation systems.

FCS default **WAN Modbus® RTU** (version 1.1b3), RS-485 communications parameters:

- Baud rate = 19,200
- BUS Controller is the BAS/DDC
- Modbus® ID of QCC = 100
- Parity = no parity
- Stop bits = 1
- Data bits = 8

NOTE: It is the customer's responsibility to supply the correct wiring for the communication back to their BAS. The baud rate and Modbus® ID can be changed to match the BAS system.

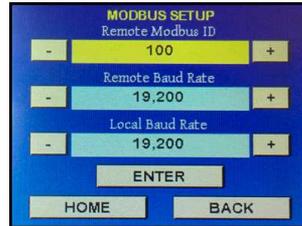
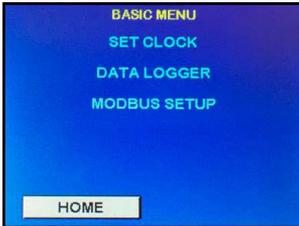
FCS default **WAN BACnet® MS/TP** (version 1 rev 14), RS-485 communication parameters:

- Baud rate = 76,800
- Base address = 270
- MAC address = 100
- Instance ID = 270100 (the Base Address x 1000 + the MAC Address)
- Parity = no parity
- Stop bits = 1
- Data bits = 8

NOTE: For Modbus® network communications wiring, use 4-conductor, 16 AWG stranded shielded wire. As per the requirements of the RS-485 protocol, a termination resistor must be installed / enabled on the last device at the end of the network wiring. This includes the Building Management System (if used).

8.3.1 Set Modbus® ID, Remote Baud Rate and Local Baud Rate

For an FCS-M or FCS-M-8, press Menu and enter passcode "1001" to enter the Basic menu and select Modbus Setup.



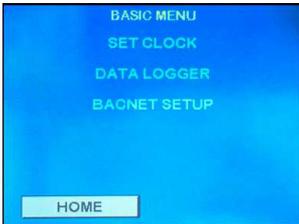
Remote Modbus® ID: Use the + and - buttons to increase or decrease the number until the correct Remote Modbus® ID is displayed, or press the yellow field and use the keypad to enter the number. Press ENTER to save.

Remote Baud Rate: Use the + or - to increase or decrease the number or press the yellow field and use the keypad to choose the correct Remote Baud Rate. Press ENTER to save.

Local Baud Rate: Use the + or - to increase or decrease the number until the correct Local Baud Rate is displayed. Press ENTER to save.

8.3.2 Set WAN BACnet® Base Address, MAC Address and Baud Rate

For an FCS-B or FCS-B-8, press Menu and enter passcode "1001" to enter the Basic menu and select Bacnet Setup.



BACnet Base Addr.: Use the + and - buttons to increase or decrease the number until the correct BACnet base address is displayed, or press the yellow field and use the keypad to enter the number. The FCS factory default base address is 270. Press ENTER to save.

BACnet MAC Addr.: Use the + or - to increase or decrease the number or press the yellow field and use the keypad to choose the correct MAC address. The FCS factory default is 100. Press ENTER to save.

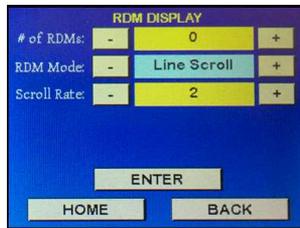
BACnet Baud Rate: Use the + or - to increase or decrease the number until the correct baud rate is displayed. The FCS factory default baud rate is 76,800. Press ENTER to save.

8.4 Configure QCC-RDM Remote Display(s)

The QCC-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.

Press Menu and enter passcode "1014" to enter the Display menu and select 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. The FCS can have a maximum of twenty QCC-RDM devices connected to it. The FCC-8 can have a maximum of four.

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 QCC Quad Channel Controller, 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

NOTE: For more information on SELECTED channels to display, refer to Section 11.3.5 *QCC-RDM Channel Selection Priority Logic*.

NOTE: Because the QCC-RDM 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 *QCC-RDM Operation Manual* for more information.

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: Only the channels being displayed by the QCC-RDM can trigger the buzzer or strobe connected to the QCC-RDM. Only the channels being displayed by the QCC-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.

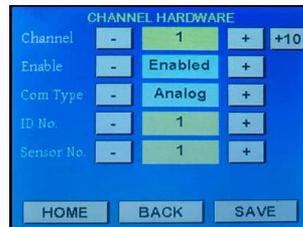
For more information on the QCC-RDM, see the *QCC-RDM Remote Display Operation Manual*. For more information on how to configure the QCC-RDM to display selected channels (ie. one specific gas channel or selection of channels), see the *FCS Operation Manual*.

9 CHANNEL SETTINGS AND CONFIGURATIONS

9.1 Enable / Disable Channels, Assign ID, Channel Number & Communication Type

This setting allows you to enable or disable each channel, and specify the channel ID number, choose the communication type (analog or digital) and specify the channel sensor number.

Press Menu and enter passcode “3022” to enter the Config Channel menu and select Channel Hardware.



If you want to review the current settings channel by channel, press the + or - buttons. To skip ahead by 10 channels at a time, press the +10 button. To change the settings, choose the channel number and use the + or - buttons to change the values, or press the yellow fields and use the keypad.

For each channel you can enter:

Enabled or disabled: If a channel is disabled, it will show on the normal display with a “d” at the end of the line, unless that line has been removed from showing on the display.

NOTE: A disabled channel acts as if it does not exist - it will not show gas readings and there will be no data logging information gathered or saved while it is disabled.

Com Type: Analog or Digital (communication type between the FCS and the Transmitter assigned to that channel). “Analog” should be assigned to 4-20 mA transmitters and “Digital” to digital

(Modbus®) transmitters. If the wrong Com Type is assigned to the transmitter the FCS will go into Communication Fault.

NOTE: If you are connecting a digital CXT Explosion Proof Transmitter, ART Infrared Refrigerant Transmitter, AST-IS18-M or AST-IS-12 CO₂ Transmitter or a CGAS-D Digital Transmitter, choose the respective transmitter name from the list. This will enable the correct Modbus Holding Registers for that transmitter. If connecting LPT-M or LPT-P Transmitters, choose Digital.

ID No.: (enter up to 3 digits). Analog transmitters have an ID starting at 1. Digital transmitters have an ID starting at 101.

NOTE: Choose ID No. 229 only if you want to remove all subsequent existing channel configurations. For example, if you are editing channel 10 and you enter 229 in the ID No. field, channel 10, 11, 12 and so on will be deleted. Channel 1 to 9 will remain intact.

Sensor No.: (choice of 1 through 128 (FCS) or 8 (FCS-8)). Single channel analog transmitters or other 4-20 mA analog inputs are assigned on a one to one basis. Digital transmitters may be 1, 2 or 3 channels and each sensor needs to be assigned a unique Sensor No.

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 autosave 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.

9.2 Set Channel Name, UOM and Gas Range Values

This setting enables you to give each channel a name, specify the units of measure, number of decimal places and enter a value for the Zero and the Range.

NOTE: It is important that the FCS settings be consistent with the settings of the transmitter that is providing the information.

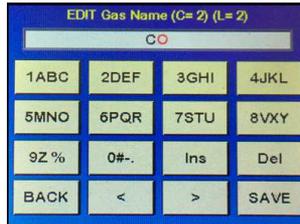
Press Menu and enter passcode "3022" to enter the Config Channel menu and select Channel Config.

CHANNEL CONFIG			
Channel	-	1	+ +10
Name		CO	Edit
Units		PPM	Edit
Decimals	-	0	+
Zero	-	0	+
Range	-	200	+
<div style="display: flex; justify-content: space-around;"> HOME BACK SAVE </div>			

If you want to review the current setting channel by channel, press the + or - buttons. To skip ahead by 10 channels at a time, press the +10 button. To change the settings, choose the channel number and use the Edit and the + or - buttons to change the values, or press the yellow fields and use the keypad.

For each channel you can enter:

Name: Enter a name for the channel. For most gas detection applications, where the channel is a gas channel, the formula of the gas is normally used. For example, CO or NO₂, but any 5 letter name can be assigned.



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.

Del = deletes characters

Ins = inserts a space

< and > moves the cursor backwards or forwards

Units: For most gas detection applications, where the channel is a gas channel, the unit is the unit of measure for the particular gas. For example, %LEL or PPM. To change the unit of measure press on the desired number, letter or symbol button repeatedly until the desired character appears.

Press Save to save the edits made to the Name or Units.

For each channel, you can change the Decimals, Zero and Range by using the + or - buttons to change the values:

Decimals: For gas measurements that require decimal places, you can configure the reading to show up to two decimal places.

NOTE: Setting a decimal place of 1 or 2 does not increase the sensitivity of that sensor. It is not recommended to set decimal places for ranges larger than 100.

Zero: For most gas detection applications, where the channel is a gas channel, the Zero value will be set to 0.

Range: For most gas detection applications, where the channel is a gas channel, the Range value is the sensor range as specified by CETCI for that sensor. For example, if the channel was being configured for monitoring CO, a CO sensor from CETCI has a range of 0 to 200 ppm. The Range value to enter in this example would be 200.

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 autosave 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.

9.3 Set Channel Alarm Setpoints

This setting allows you to set ascending and descending LOW, MID and HIGH alarm setpoints for each channel. The number entered as the setpoint is the gas concentration at which the alarm will be triggered.

Press MENU and enter passcode "2012" to enter the Set Alarm menu and select Channel Alarms.



If you want to review the current settings for each channel, press the + or - button to scroll through the summary screen of each channel or use the keypad to enter the specific channel number.

To change the settings, choose the channel number and use the + or - buttons or press the yellow fields to use the keypad and change the values:

HIGH, MED and LOW gas reading level at which the alarm is triggered.

Des or Asc: Choose the direction of the alarm point - descending or ascending. For most gases, the alarm direction is ascending (as the gas level increases, the alarm is set to go off). For Oxygen, it is usually descending (as the oxygen level decreases, the alarm is set to go off).

Diff: Also referred to as hysteresis. This is the difference between the ON point and OFF point of the alarm. For example, if the alarm is set to come on at 100 ppm and the hysteresis is set for 10 ppm, the alarm will not turn off until the gas is below 90 ppm. This prevents the alarm from chattering on and off repetitively if the gas fluctuates just above and just below 100 ppm.

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 autosave 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.

10 RELAY, STROBE, HORN AND AUDIBLE SETTINGS AND CONFIGURATIONS

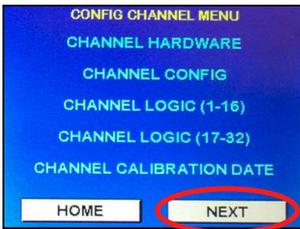
The FCS has four on board relays that can be configured to be enabled or disabled, operate in a failsafe or not failsafe manner, and be configured with ON delays and/or OFF delays. Relays can be overridden for a forced, timed action such as during maintenance or testing.

NOTE: The door mounted buzzer and the terminal connected horn and/or strobe devices are considered to be relays by the FCS. However, instead of using relay numbers, the words AUDIBLE, STROBE and HORN are displayed in the relay fields of the various configuration screens.

10.1 Enable / Disable Relays, Assign Modbus ID & Change Mode of Operation

This setting allows you to specify the relay number, associated Modbus ID, enable or disable relays and choose the mode of operation (normal or failsafe, latching, silencing, not silencing, etc.).

Press Menu and enter passcode "3022" to enter the Config Channel menu. Select Next and then Relay Hardware.



If you want to review the current settings relay by relay, press the Relay + or - buttons. To skip ahead by 10 sequential relays at a time, press the +10 button. Or press the yellow field to reveal the keypad to enter a specific number.

To change the settings, choose the relay number and use the + or - buttons or press the yellow fields to use the keypad to change the values.

To enable or disable the channel, latching, failsafe mode or silencing, press on the corresponding button - green indicates the feature is enabled and white indicates the feature is disabled.

For each relay you can select:

Modbus ID: The address of the device that houses the relay (ie. the FCS and/or RLY-4 or RLY-8). If it is an internal relay (in the FCS), the Modbus ID will be 1 (for the 4 internal relays) or 2 (for the audible horn or strobe). If it is a remote relay it will be a number between 30 to 49. The value of 229 is the default if a relay is not configured.

NOTE: Choose Modbus ID 229 only if you want to remove all subsequent existing relay configurations.

For example, if you are editing relay 10 and you enter 229 in the Modbus ID No. field, relays 11, 12, 13 and so on will be deleted. Relay 10 will remain unconfigured/inactive. Relays 1 to 9 will remain intact as configured.

Relay No: The relay number 1, 2, 3 etc. or STROBE, HORN, AUDIBLE that you are configuring. The relay number is sequential for the relays within each device (FCS, RLY-4, RLY-). So there will be a relay number 1 in the FCS and a relay number 1 in the RLY-4, for example.

NOTE: If you are configuring the internal or terminal connected STROBE, HORN or AUDIBLE it is best not to change the Modbus ID or the Relay No that was assigned at the factory.

Enabled/Disabled: To enable a channel, press the button to turn it green and the word Enabled will be displayed. To disable a channel press the button so it is white and the word Disabled is displayed. A disabled channel will show on the normal display with a "d" at the end of the line, unless the line has been removed from showing on the display.

NOTE: A disabled relay acts as if it does not exist therefore it will not be triggered by any gas or priority event.

Latching/Not Latching: A latched relay is a relay that has triggered an event/it is active and it will remain so until it is manually cleared/turned off. To enable relay latching, press the button to turn it green with the word Latching displayed. To disable relay latching, press the button to turn it white with the words Not Latching displayed.

NOTE: If the relay latching has been enabled, the relay will not un-trip until the cause of tripping (alarm level, time of day, etc.) has cleared AND the Clear Latched button is pressed on the Relay Status bar details. For more information, refer to Section 10.5 *How to Clear a Latched Relay*.

Silencing/Not Silencing: If you would like to silence the channel of the internal audible buzzer, a terminal connected strobe or horn or a remote strobe or horn, press the button so it is green and with the word Silencing displayed. To not use the silencing feature, press the button so it is white with the words Not Silencing displayed.

NOTE: Any relay defined with the silencing functionality will respond to the Silence ? button activity. Meaning if a relay that controls a fan is set to Silencing, when the relay is triggered, the Silence ? notification will appear and if you press Yes, the relay (the fan) will be turned off, "silenced". Therefore make sure the logic behind the setting is appropriate.

Failsafe/Normal: The FCS is designed to be fail-safe so the relay is energized in a non-alarm state for failsafe operation. When the channel has been set to trigger in a failsafe mode, the button will be green and the word Failsafe will be displayed (this is the factory default). If required, the FCS can be configured for normal relay operation by choosing Normal. When a channel is set to trigger in a normal mode, the button will be white and the word Normal will be displayed.

NOTE: The flexibility built into configuring relays may allow parameters to be set that don't make a lot of sense. The system does not stop you from setting nonsense combinations such

as enabling latching and silencing on the same relay or setting a time of day priority tripping a relay that is defined to be latching. Make sure the logic behind your settings is appropriate.

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 autosave 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. To continue changing or reviewing the settings for each relay press use the + to proceed to the next relay number.

10.2 Using Relay Timers to Set ON / OFF Delays

The relay timers functionality offer a high degree of flexibility, allowing for many variations in settings for turning on and off relay triggered events such as fans and/or signaling a Building Automation System.

ON Delays are useful for addressing spikes in gas levels that only occur for short moments during which there is no need to turn on the fans. For example, a car that is parked near the gas detector is stationary idling for a few moments before leaving. The gas level in that area could increase above the alarm setpoint and then drop a few moments later when the car leaves. The ON Delay tells the system to wait a specified length of time before taking the gas level seriously and to turn on the fans.

OFF Delays are useful for clearing a full cycle of air in the area that caused the gas level alarm. Instead of turning off the fans as soon as the gas level drops below the alarm setpoint the system keeps the fans activated for a specified amount of time to allow the air to clear completely and then turns them off. This is especially useful in situations where the fan is farther away from the area of gas and clearing the air takes more time.

Press Menu and enter passcode "3022" to enter the Config Channel menu. Select Next and then Relay Timers.



If you want to review the current settings relay by relay, press the Relay + or - buttons. To skip ahead by 10 sequential relays at a time, press the +10 button. Or press the yellow field to reveal the keypad to enter a specific number.

To change the settings, choose the relay number or STROBE, HORN, AUDIBLE and use the + or - buttons or press the yellow fields to use the keypad to change the values.

Enter the time (in seconds) for each function required. Use the +10 button to jump ahead by 10 seconds at a time.

D-ON: ON Delay is the length of time *before* the relay is activated after an alarm condition has been triggered. This is useful for example, if you want the audible buzzer and strobe to come on at different times, or if the monitored area has frequent gas level readings that could trigger an alarm but not last very long (such as an idling car in a parking garage/car park).

D-OFF: OFF Delay is the length of time *after* the alarm condition has gone back to normal and the relay continues to be activated. This is useful for example if you want to allow extra time for the ventilation of the area. Setting an OFF Delay for a horn, strobe or audible will be the amount of time that the device will be silenced after having sounded and the Silence All button on the Silence? screen is pushed.

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. To continue changing or reviewing the settings for each relay press use the + to proceed to the next relay number.

11 ANALOG INPUT AND ANALOG OUTPUT SETTINGS

The FCS can be configured to accept analog inputs from transmitters and connect internal or remotely to analog output devices such as 4-20 mA fans, heaters, Modbus® VFDs, etc. For more information please refer to the *FCS Operation Manual* (with the same main and display revision).

Each analog input can be assigned to one or more channels, providing the gas concentration (for example) for the channel. Up to 32 priority levels can be assigned to analog outputs. For more information please refer to the *FCS Operation Manual* (with the same main and display revision).

The summary information for the analog inputs and/or outputs will be displayed on the third coloured bar on the home screen display.

Maximum Number of Singular Analog Input or Output Devices Accepted by the FCS and FCS-8

Analog Inputs	Device	# of Analog Inputs per Device	Maximum # of Devices (exclusive of combinations)	
			FCS	FCS-8
Internal	Option -AI	Four 4-20 mA inputs	2 (2 = Option -2AI)	2 (2 = Option -2AI)
Remote	LNK-AI	Four 4-20 mA inputs	15	2

Analog Outputs	Device	# of Analog Outputs per Device	Maximum # of Devices (exclusive of combinations)	
			FCS	FCS-8

Internal	Option -AO	Four 4-20 mA outputs	2 (2 = Option -2AO)	2 (2 = Option -2AO)
Remote	LNK-AO	Four 4-20 mA outputs	15	2
Modbus VFD	VFDs can be driven as an analog 4-20 mA or Modbus® connection.		25	8

Maximum Number of Combination Analog Input or Output Devices Accepted by the FCS and FCS-8

The maximum number of devices will change depending on the combinations of internal and remote analog devices you are configuring for the system. Below are the maximum number of each type of analog devices in combination with each other. Mixing and matching the types up to these maximums is acceptable.

The maximum number combined analog input devices for the FCS is:
 8 internal + 56 remote = 60 total

The maximum number of combined analog input devices the FCS-8 can accommodate is:
 4 internal + 1 LNK-AI

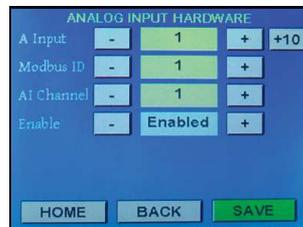
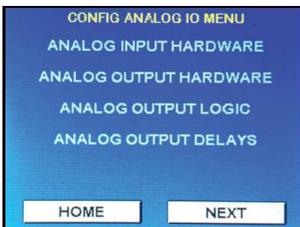
The maximum number of combined analog output devices for the FCS is:
 8 internal + 15 LNK-AOs + 9 Modbus® VFDs

The maximum number of combined analog output devices the FCS-8 can accommodate is:
 4 internal + 1 LNK-AO + 4 Modbus VFDs

11.1 Enable / Disable Internal & Remote Analog INPUTS, Assign Modbus® ID & Channel Number

These settings allow you to enable or disable each analog input, specify the Modbus® ID number, and associated analog input channel number. Using these settings, the FCS can obtain readings from any analog input device such as CETCI’s 4-20 mA analog transmitters that may be connected to the internal -AI Option(s) and/or the LNK-AI peripheral device(s) and associated analog input channels.

Press Menu and enter passcode “3032” to enter the Config Analog IO menu. Select Analog Input Hardware.



If you want to review the current settings for other analog inputs, press the + or - buttons. To skip ahead by 10 devices at a time, press the +10 button. Or press the yellow field and use the keypad to enter a specific number.

Use the + or - buttons or press the yellow fields and use the keypad to change the values for each analog input. You can select:

A. Input: Choose the analog input number/channel that you want to configure. The FCS can have a total of 60 analog inputs (internal and remote combined), therefore this number will be 1 to 60. The FCS-8 can have a total of 8 analog inputs, therefore this number will be 1 to 8.

Modbus ID: Set the Modbus® ID for the analog input device. For an internal -AI Option choose 1 (if the AI board is installed in the top position) or 2 (if the AI board is installed in the bottom position). For an LNK-AI peripheral device, choose a number from 50 to 74. For the last input channel, choose 229 to indicate that this and all higher analog input channels are not being used.

NOTE: Modbus® ID 1 or 2 reserved for the internal analog boards and are strictly 4-20 mA. When selected, you will not be able to change the Type field, it will automatically populate with 4-20 mA.

NOTE: Every digital device in the system must have a unique Modbus ID. Choose a number that hasn't yet been assigned to another device in the system. The number entered here must match the Modbus ID number of the actual device.

AI Channel: Choose the channel (1 to 4) you are enabling or disabling on the analog input device.

NOTE: Each internal -AI Option has four 4-20 mA analog input channels. Each LNK-AI peripheral device has four 4-20 mA analog input channels.

Enable/Disable: Select Enable or Disable for the chosen channel.

Press Save to save the changes.

11.2 Enable / Disable Internal & Remote Analog OUTPUTS, Assign Modbus ID & Channel Number and Type

These settings allow you to enable or disable each analog output, specify the Modbus® ID number for each analog output. Using these settings, the FCS can signal devices such as a data / trend / logging system or a BAS or DDC or VFDs that are connected to the internal -AO Option(s) and/or the LNK-AO peripheral device(s) and associated analog output channels.

VFDs can be driven as an analog 4-20 mA or Modbus® connection. The VFD Configuration screen is for Modbus® VFD configuration. Configuring 4-20 mA VFDs is done the same as any other 4-20 mA analog output. The FCS has been designed to work with the Lenze AC Tech and the ABB ACH 550 VFD product lines.

Press Menu and enter passcode “3032” to enter the Config Analog IO menu. Select Analog Output Hardware.



If you want to review the current settings for other analog outputs, press the + or - buttons. To skip ahead by 10 devices at a time, press the +10 button. Or press the yellow field and use the keypad to enter a specific number.

Use the + or - buttons or press the yellow fields and use the keypad to change the values for each analog output. You can select:

A. Output: Choose the analog output number/channel that you want to configure. Generally speaking, the minimum number can be 1 and the maximum number can be 60, but conditions apply depending on the number of Modbus® VFDs that are included. For the FCS-8 which can have a total of 8 analog outputs, this number can be 1 through 8.

Modbus ID: Set the Modbus® ID for the analog output device. For an internal -AO Option choose 1 (if the AO board is installed in the top position) or 2 (if the AO board is installed in the bottom position). For an LNK-AO peripheral device or Modbus® VFD, choose a number from 75 to 99. For the last output channel, choose 229 to indicate that this one and all higher analog output channels are not being used.

NOTE: Every digital device in the system must have a unique Modbus ID. Choose a number that hasn't yet been assigned to another device in the system. The number entered here must match the Modbus ID number of the actual device.

Type: Choose the type of analog output. You can choose 4-20 mA output or a preconfigured VFD output. If you choose a preconfigured VFD output, the communication is Modbus. To use a 4-20 mA connection to a VFD, use the Analog Output Configuration.

NOTE: Modbus® ID 1 or 2 reserved for the internal analog boards and are strictly 4-20 mA. When selected, you will not be able to change the Type field, it will automatically populate with 4-20 mA.

Depending on the Type choice, the fields change on the screen.

ANALOG OUTPUT CONFIGURATION				
A Output	-	1	+	+10
Modbus ID	-	2	+	
Type		4-20 mA		
AO Chnl:	-	1	+	
Enable	-	Enabled	+	
<div style="display: flex; justify-content: space-around;"> HOME BACK SAVE </div>				

VFD CONFIGURATION				
A Output	-	4	+	+10
Modbus ID	-	75	+	
Type	-	Lenze VFD	+	
Password		495		
Enable	-	Enabled	+	
Full Speed (Hz)		248.2		
<div style="display: flex; justify-content: space-around;"> HOME BACK SAVE </div>				

For 4-20 mA configuration:

AO Chanl: Choose the channel (1 to 4) you are enabling or disabling on the analog output device.

NOTE: Each internal -AO Option has four 4-20 mA analog outputs. Each LNK-AO peripheral device has four 4-20 mA analog outputs.

Enable/Disable: Select Enable or Disable for the chosen channel.

For Modbus® VFD configuration:

Password: Enter the same password that gives you access to the VFD (applicable for the Lenze VFD only).

Enable/Disable: Select Enable or Disable for the chosen VFD.

Full Speed (Hz): Enter the top speed frequency in Hz for that VFD. This value should match the specs of the VFD.

Press Save to save the changes.

11.3 Default Analog Output Logic and Delays

Analog outputs can be configured with ON/OFF delays. The parameters for the delays are set in the Config Analog Menu (passcode 3032), Analog Output Delays screen.

Analog output delays can:

- Only be active if the analog output logic for that analog output number/channel is set to Step Mode.
- Only be applied to LOW, MID and HIGH alarm triggered events
- Range from 0 to 30 minutes
- Default factory setting is 0 minutes (ie. no delay)

NOTE: For information regarding Analog Output Logic, Analog Output Delays, Analog Input Calibration or Analog Output Calibration, refer to the *FCS Operation Manual*.

12 OPTIONS AND ACCESSORIES

12.1 Top Mounted Strobe (Option -L)

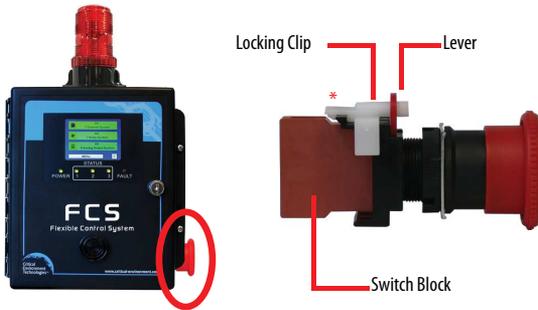
High powered, red LED flashing beacon factory installed on the top of the FCS enclosure. Offers excellent flash intensity, durable vibration resistant construction and a long life 100,000 hour LED technology. Made of tough Lexan welded to the base to completely seal out moisture. NEMA 4X and UL recognized.



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

12.2 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	1100 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*.

12.3 Enclosure Door Lock and Keys (Option -DL)

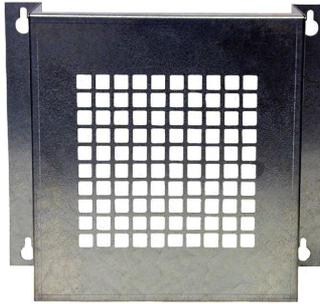
The optional door lock is factory installed at the time of order. Together with the password protected menus, the lock prevents unauthorized access and eliminates tampering within the system. Comes with two keys.



12.4 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 galvanized steel and has 13 mm (½") 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 equipment servicing is easy.

Enclosure	16 gauge galvanized 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



12.5 Calibration Kit (p/n: CET-715A-CK1)

The Calibration Kit contains the items necessary for common field and shop calibration. It comes in a durable, hard plastic carrying case. **Gas cylinders are not included in the Kit.** They must be ordered separately 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 from Canada to other countries, including the USA.**



13 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.

14 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 normal 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 Section 9.1 *Enable/Disable Channels, Assign ID, Channel Number & Communication Type* for more information.
- 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.

QCC-RDM constantly shows "Connection Lost". Check that the # of RDMs is set correctly. Refer to Section 8.4 *Configure QCC-RDM Remote Display(s)* for more information.

Changes made to the QCC-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. There are several versions of the manual. Use the manual that states the same main and display version as the FCS you have. Press the i on the main display screen of the FCS to see the version information.

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FCS20200908-C

