

For installation/wiring information, refer to the FCS Installation Manual
which is available at www.critical-environment.com



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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 the instructions indicated in the FCS Installation Manual and this manual. This instrument should be inspected and maintained on a regular basis by a qualified and trained technician to ensure it is operating correctly.

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

INSTRUMENT SERIAL NUMBER:

PURCHASE DATE:

PURCHASED FROM:

1.2 Warranty Policy

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

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

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

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

1.3 Service Policy

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

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

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

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

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

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

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

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

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

1.4 Copyrights 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.

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

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 at the following address:

Critical Environment Technologies Canada Inc.

Unit 145, 7391 Vantage Way, Delta, BC, V4G 1M3, Canada

Toll Free: +1.877.940.8741

Telephone: +1.604.940.8741

Fax: +1.604.940.8745

Email: marketing@cetci.com

Website: www.critical-environment.com

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

2 INTRODUCTION

2.1 General Description

NOTE: *If you require information about how to install and wire the FCS system, please download the FCS Installation 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") graphic, 1/4 VGA full colour resistive touch LCD display and LED indicators for "POWER", "STATUS 1, 2 and 3", "FAULT"
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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 RS-485 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	Four 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

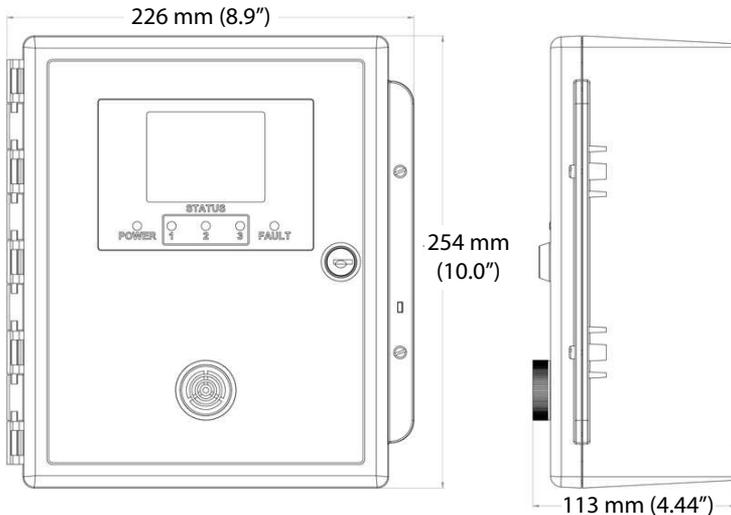
Conforms to: EMC Directive 2004/108/EC, EN 50270:2006, Type 1, EN61010

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 peripheral devices).

Analog and/or Digital Transmitters	Output Signal	Gases	Sensor Type
AST-IS18-M CO ₂ Transmitter	Modbus®	CO ₂	Infrared
AST-IS12 CO ₂ Transmitter	Modbus®	CO ₂	Infrared
all other AST-IS CO ₂ Transmitters	4-20 mA	CO ₂	Infrared

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 Analog Transmitters	4-20 mA	CO ₂	Infrared
CGAS-D Digital Transmitters	Modbus®	NH ₃ , CO, NO, 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, Infrared
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 ₂ H ₅	Electrochemical, Infrared, Catalytic
LPT Low Power	4-20 mA	NH ₃ , CO, NO, Cl ₂ , O ₂ , O ₃	Electrochemical
LPT-A Analog	4-20 mA	same as CGAS-D	Electrochemical, Solid State, Catalytic
LPT-M Modbus	Modbus®	same as CGAS-D	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	**
RSH-24VDC Remote Strobe/Horn RSH-24V-R, RSH-24V-A & RSH-24V-B		Use relay or strobe drive	2	2

* 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.

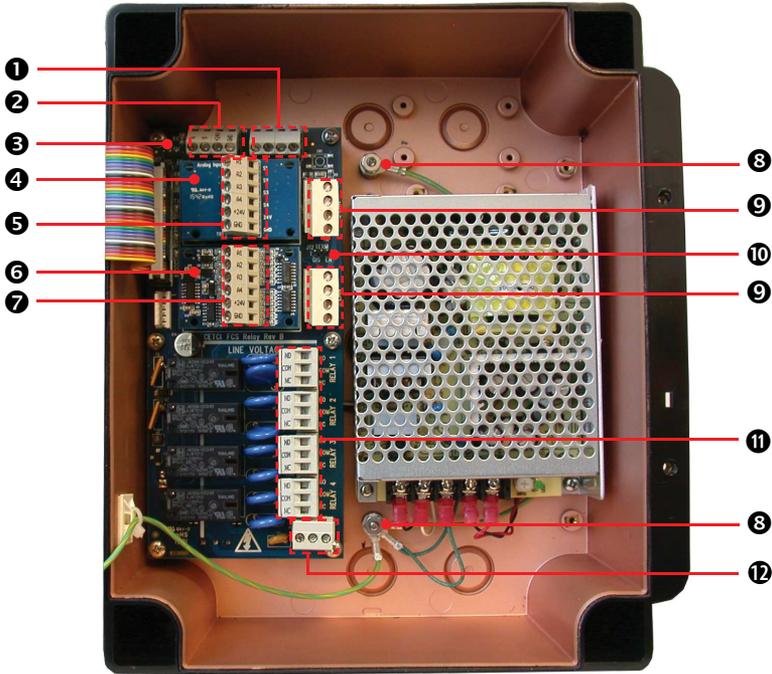
5 INSTRUMENT FEATURES

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

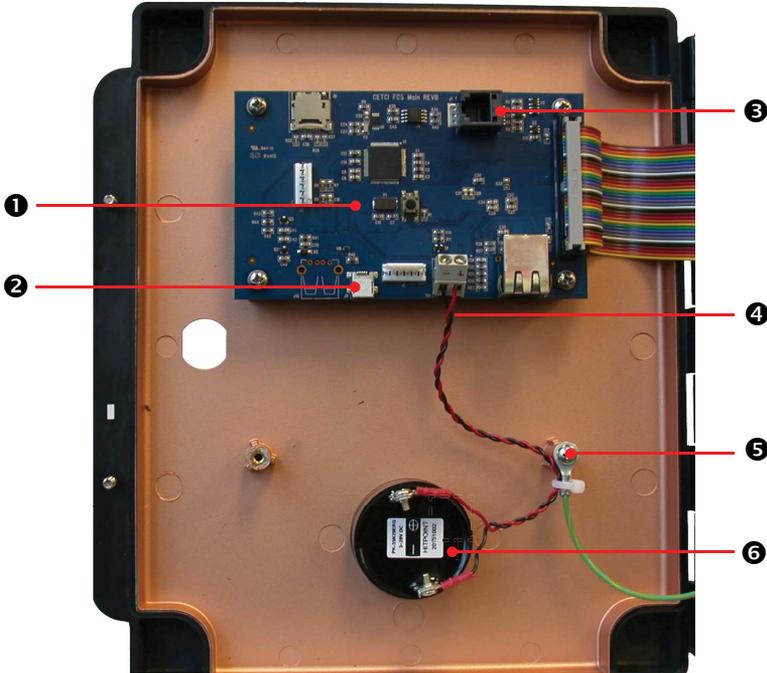
5.2 Interior System Layout (Base) Shown with Options -AO and -AI Installed



NUMBER	FEATURE	FUNCTION
1	Remote Horn / Strobe 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)

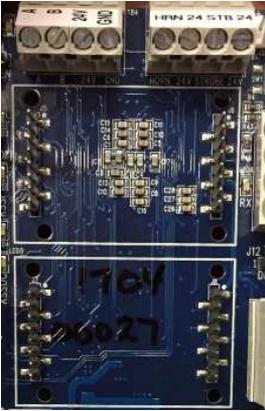


NUMBER	FEATURE	FUNCTION
①	Reset/Restart Button	Turns FCS off and back on. Hold for approx. 15 sec and let go. Used during recalibrating the display and bypassing the 2 minute start up countdown*.
②	Micro USB Connector	For system updates and downloading data logging files
③	Programming Port	For factory system programming
④	Buzzer Terminal	Connection for door mounted buzzer
⑤	Earth Ground	Earth / safety ground connection
⑥	Buzzer	Internal audible alarm

***WARNING:** Only bypass the 2 minutes startup countdown if you know there are no power issues with the system. If there is a power interruption during the start up of the FCS the SD card and the configuration files may be corrupted.

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

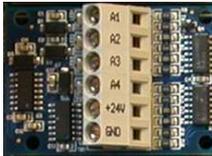
The FCS does not have any internal analog inputs or analog outputs without the optional -AI and -AO boards installed. These boards are independent of each other and plug into the main FCS board.



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 the *FCS Installation Manual* 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 the *FCS Installation Manual* 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 (4x15 = 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 (4x2 = 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

Please refer to the *FCS Installation Manual* for information regarding:

- General Safety Warnings
- Protection Against Electrical Risks
- Protection Against Mechanical Risks
- Location of System Installation
- Standard Enclosure Mounting Components
- Wiring Power Supply Connections
- Wire Gauge vs Run Length
- Wiring a Remote Power Supply (RPS-24VDC)
- Wiring Internal Analog Outputs (Option-A0)
- Wiring Internal Analog Inputs (Option-AI)
- Wiring LNK-AO Peripheral Devices (additional analog outputs)
- Wiring LNK-AI Peripheral Devices (additional analog inputs)
- Wiring Digital Inputs (LPT-P and LPT-M Transmitters)
- Wiring LNK-XT Network Extender Peripheral Devices
- Wiring to a Building Automation System (BAS)
- Wiring the Remote Strobe / Horn Output Terminal
- Wiring Internal Relay Connections
- Wiring Remote Relay Connections (RLY-4 and RLY-8)
- Wiring QCC-RDM Remote Display Connections

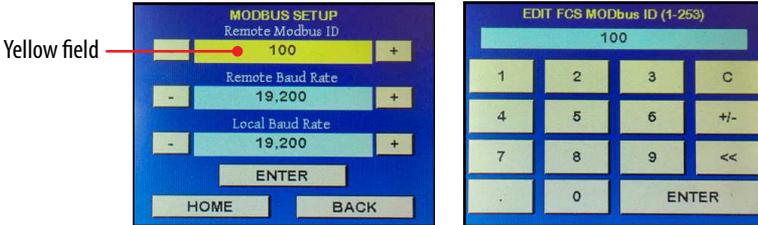
7 SYSTEM OPERATION

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. If you are still experiencing issues with the touch response, you can recalibrate the display. Refer to Section 7.10 *Recalibrating the Display to Improve Response*.

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 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 auto save function. If you are going through more channels (or relays or priorities) on the same screen, the system will auto save 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 Outputs (VFD)
1001	Basic	Set Clock, Set Data Logger, Modbus® Setup / BACnet® Setup

1014	Display	Configure QCC-RDM Remote Display(s)
2012	Alarms	<p>Channel Alarms</p> <ul style="list-style-type: none"> • Set Channel Alarms (LOW, MID, HIGH) • Set Channel Alarms (DES, ASC) • Set Channel Alarms Differential <p>Channel Disable</p> <ul style="list-style-type: none"> • Enable / Disable Channels <p>Channel STEL / TWA Alarms</p> <ul style="list-style-type: none"> • Set STEL, TWA & IDLH Alarms • Enable/Disable STEL, TWA & IDLH Alarms <p>Relay Disable</p> <ul style="list-style-type: none"> • Enable/Disable Relays, Audible, Strobe, Horn <p>System STEL, TWA & IDLH Alarms</p> <ul style="list-style-type: none"> • Enable / Disable STEL, TWA & IDLH Alarms • Enable / Disable Title-24 Faults • Enable / Disable Calibration Expired Faults <p>Relay Override</p> <ul style="list-style-type: none"> • Set / Clear Relay for specific length of time
3022	Configure	<p>Configure Channel Hardware</p> <ul style="list-style-type: none"> • Enable / Disable Channels • Set Channel Communication Type (analog/digital) • Set Channel ID • Assign Sensor Number <p>Configure Channel Config</p> <ul style="list-style-type: none"> • Set Channel Name • Set Channel Units • Set Channel Decimals • Set Channel Zero • Set Channel Range <p>Configure Channel Logic</p> <p>Set Channel Calibration Date</p> <p>Configure Relay Hardware</p> <ul style="list-style-type: none"> • Set Relay Number • Set Relay Modbus® ID • Set Mode (failsafe, normal, latching, not silencing) • Enable / Disable Relays <p>Relay Timers</p> <ul style="list-style-type: none"> • Set ON / OFF DELAYS for Relays <p>Configure Relay Logic (including strobe/horn logic)</p> <p>Configure Priority Logic</p> <ul style="list-style-type: none"> • Gas Concentration • Time of Day • Calibration Expired • Title-24 Occupied Time • RDM Channel Select

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, Channel No and Type • Enable / Disable Analog Output Configure Analog Output Logic <ul style="list-style-type: none"> • Set Mode (Peak, Average, Step, VFD, Manual, Off, etc.) Analog Input Calibration Analog Output Calibration
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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.



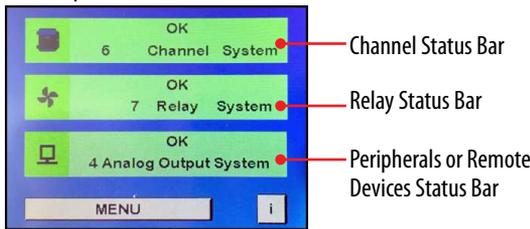


NOTE: In the event the FCS shows a blank screen, power cycle the device.

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 / Remote Devices Status bar.



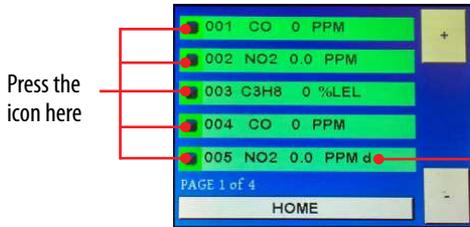
7.5 Channel Status Bar Operation

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:



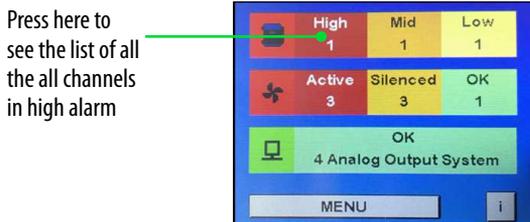
STEL/TWA/IDLH disabled



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 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.

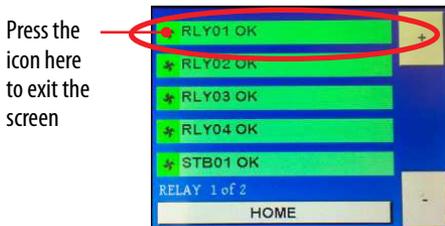
NOTE: Remote strobe / horns and the internal audible buzzer are included in the relay system configuration.

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:

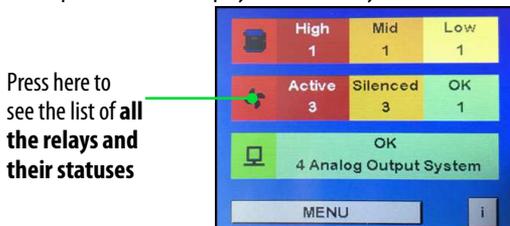


To view information about each individual relay, press on the icon on the Relay Status Bar indicated by the circle above and a more detailed screen will appear.



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.



Press the icon here to exit the screen



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



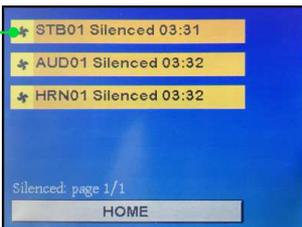
Press the icon here to exit the screen



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



Press the icon here to exit the screen

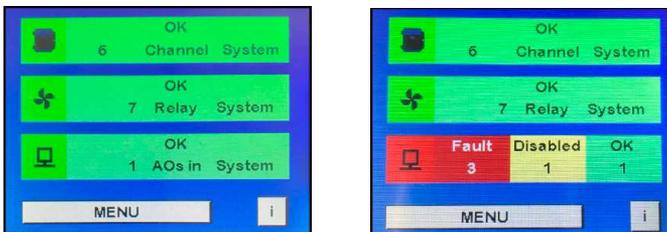


The status of a relay, horn, strobe or audible is indicated by colours and text added to the end of the line as follows:

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.

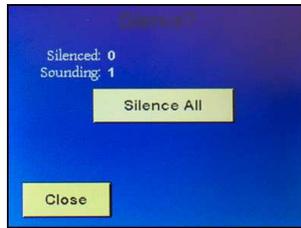
NOTE: The FCS only communicates with the device it is immediately connected to. It does not communicate with the device(s) the LNK-AO or the Modbus® VFD is connected to.

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 Internal Audible Alarm, Terminal Connected Strobe/Horn and Remote Strobe/Horn Operation

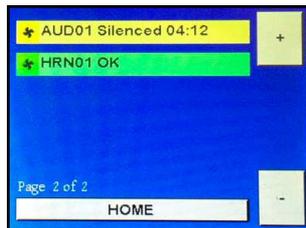
The FCS comes with a door mounted, audible alarm. This alarm and any remote strobe/horn devices connected to the Remote Strobe/Horn Terminal and/or the relays (if configured to do so) will sound when the set alarm is reached. Upon sounding, the Silence? screen will appear, giving you the ability to silence all the alarms for a predetermined amount of time or close the screen without silencing any of the alarms. 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. To silence the alarm, push the Silence All button and the buzzer/strobe 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).

Pressing the Silence All button stops the audibles from sounding that are assigned to the particular channel that triggered the alarm. Meaning, in the event one channel alarm has been silenced, if a different channel goes into alarm, the buzzer and any configured remote strobe/horns will go off again.

When the Silence All 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.

To let the alarm(s) continue sounding, press the Close button. Each alarm will continue sounding until the cause of the alarm comes to an end.

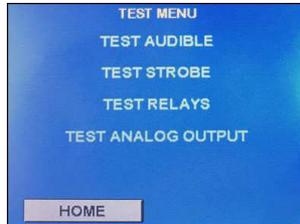
NOTE: The Silencing functionality applies to ALL relays that have been configured as silenceable. However, it is intended for AUDIBLE devices (horns, integral buzzer, etc.) directly

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:

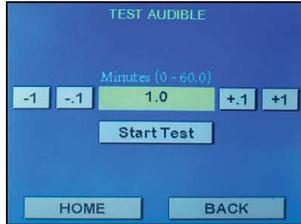
- + .1 will increase the time by six seconds each time it is pressed
- + 1 will increase the time by one minute each time it is pressed
- 1 will decrease the time by one minute each time it is pressed
- .1 will decrease the time by six seconds each time it is pressed

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.



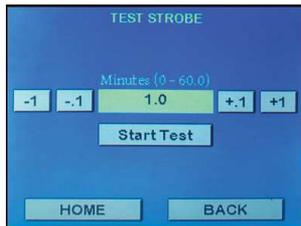
Enter the length of time you want to test the audible for. Press Start Test to begin the test.

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.

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.

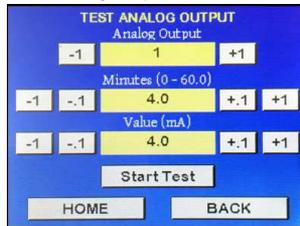
NOTE: Relay ON and OFF delays do NOT apply in test mode.

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.



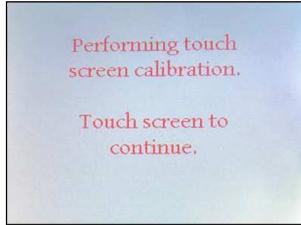
Enter the corresponding number for the analog output that you want to test and enter the length of time you want to test the test to last. Enter the output value in mA that you want tested. Press Start Test to begin the test.

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

8.1 Factory Default Settings

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

ITEM	DEFAULT SETTING	FIELD CONFIGURABLE SETTINGS
Door Mounted Buzzer	Enabled - Normal	Enable, Disable - Normal, Failsafe
Alarm Level	High	Low, Mid, High
Silence Interval	300 seconds (5 minutes)	0 to 9999 seconds
Strobe	Enabled - Normal	Enable, Disable - Failsafe, Normal
ON Delay	10 seconds	value is application dependant
Silence Interval	300 seconds (5 minutes)	0 to 9999 seconds
Data Logger (if installed)	5 minutes	1 to 1080 (18 hrs)
Relay 1	Low - Failsafe	Low, Mid, High - Failsafe, Normal
Relay 2	Mid - Failsafe	Low, Mid, High - Failsafe, Normal
Relay 3	High - Failsafe	Low, Mid, High - Failsafe, Normal
ON Delay (each relay)	10 seconds	value is application dependant
OFF Delay (each relay)	10 seconds	value is application dependant

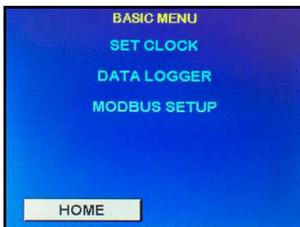
Alarm Setpoints	values are gas dependant Ascending	values are gas dependant Ascending, Descending (ie. O ₂)
LAN Modbus® Baud Rate	19,200	changing is not recommended
WAN Modbus® Baud Rate Modbus ID	19,200 100	Refer to Section 8.4 for list of baud rates 1 to 127
WAN BACnet® Baud Rate Base Address MAC Address Instance ID	76,800 270 100 270100	Refer to Section 8.4 for list of baud rates 1 to 999 1 to 127 Base Address x 1000 + MAC Address
Analog Input Calibration	4 - 20 mA	0 - 20 mA
Analog Output Calibration	4 - 20 mA	0 - 20 mA
STEL/TWA Display Channel Alarm Global Alarm	Off Disabled Disabled	On, Off Disable, Enable Disable, Enable

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

8.2 Set Clock

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

Press 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 enter the current Year, Month, Day, Hour and Minute. Press Enter to save.



8.3 Set Data Logger Sample Rate

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

Data logging includes internal logging memory that will store over one year’s worth of readings (when set at a rate of logging once per minute). Data is saved in a format and can be extracted from the unit with a

standard USB connection. Once the data is downloaded, copy the file to a name that has an extension of .csv. Users can then analyze and graph data using Microsoft® Excel® or any program that works with .csv files. The files are stored in directories organized by months and years.

The data logging functionality will only be relevant for use if it is maintained on a regular basis. While the SD card can store many months of data (depending on the sample rate set), at some point the data will be overwritten. That history can only be maintained if downloaded before it gets overwritten.

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.

8.4. 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.

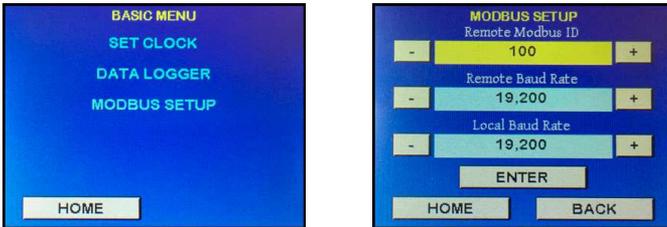
FCS default WAN BACnet® MS/TP (version 1 rev 14), RS-485 communication parameters:

- 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).

8.4.1 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.



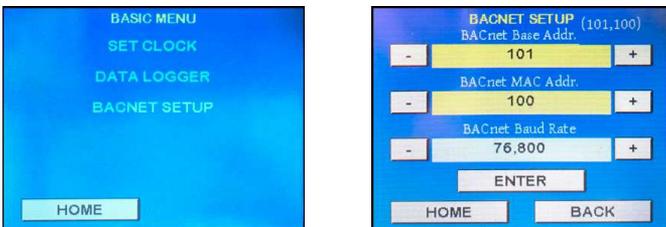
Remote Modbus® ID: Use the + and - buttons to increase or decrease the number until the correct Remote Modbus® ID is displayed, or press the yellow field and use the keypad to enter the number. Press ENTER to save.

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.

8.4.2 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.

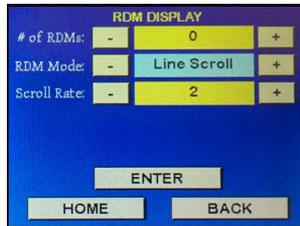
BACnet MAC Addr.: Use the + or - to increase or decrease the number or press the yellow field and use the keypad to choose the correct MAC address. The FCS factory default is 100. Press ENTER to save.

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

8.5 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.

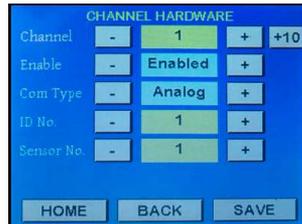
9 CHANNEL SETTINGS AND CONFIGURATIONS

The FCS has up to 128 channels (the FCS-8 has up to 8 channels) that can be enabled/disabled, named, defined, assigned alarm levels, priority levels and relay and priority logic parameters.

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 & 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 gas and the gas range.

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

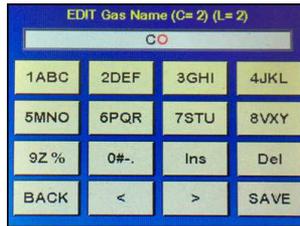
Press Menu and enter passcode “3022” to enter the Config Channel menu and select Channel Config.

CHANNEL CONFIG			
Channel	-	1	+ +10
Name		CO	Edit
Units		PPM	Edit
Decimals	-	0	+
Zero	-	0	+
Range	-	200	+
<input type="button" value="HOME"/> <input type="button" value="BACK"/> <input type="button" value="SAVE"/>			

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.

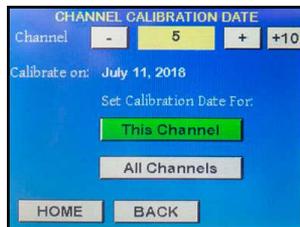
Range: For most gas detection applications, where the channel is a gas channel, the Range value is the sensor range as specified by CETCI for that sensor. For example, if the channel was being configured for monitoring CO, a CO sensor from CETCI has a range of 0 to 200 ppm. The Range value to enter in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

This setting allows you to set today's date as the calibration date either channel by channel or to all channels at once. The default calibration date is the date the device was manufactured. This functionality works with the Calibration Expired Priority and can be used as a reminder for routine calibration. Refer to Section 11.3.3 *Calibration Expired Priority Logic* for more information.

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



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 press the yellow field and use the keypad to enter the desired channel number.

To change the settings, use the + or - buttons to choose the channel number or press the yellow field and use the keypad.

To change the calibrated date for the one channel you have chosen, press This Channel. To change the calibrated date for all channels, press All Channels. The calibrated date will be set to today's date.

9.4 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.

9.5 Quickly Enable / Disable Channels Only

This is an alternate way to enable / disable a channel, rather than using the Channel Hardware screen (press Menu and enter passcode “3022” to enter the Config Channel menu and select Channel Hardware). If a channel is disabled, it will show on the Channel Status details display with a “d” at the end of the line.

NOTE: While disabled, the gas readings provided by that channel will not be used to control the relays and/or alarms. Data logging entries will not be recorded for a disabled channel.

Press Menu and enter passcode “2012” to enter the Set Alarm menu and select Channel Disable.



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

10 RELAY, STROBE, HORN AND AUDIBLE SETTINGS AND CONFIGURATIONS

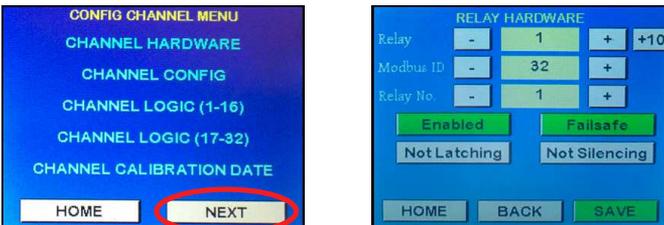
The FCS has four on board relays that can be configured to be enabled or disabled, operate in a failsafe or not failsafe manner, and be configured with ON delays and/or OFF delays. Relays can be overridden for a forced, timed action such as during maintenance or testing.

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, failsafe, latched, silencing/not silencing).

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: 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.

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 (internal FCS, RLY-4, RLY-8). 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.

10.3 Quick Enable / Disable For Relays, Strobe, Horn and Audible

This setting allows you to enable or disable the relays, the strobe, horn and/or audible.

Press Menu and enter passcode “3022” to enter the Set Alarm menu and select Relay Disable. Use the + and - buttons or enter the specific relay number by pressing the yellow field and using the keypad to choose the relay number, Audible, Strobe or Horn you want to disable.



Select Enabled or Disabled. The Save button will turn green after a change has been made. If you are going through more relays on the same screen, the system will auto save when you press the + or - to proceed or return to the next relay number. If you press Home or Back, the change will not be saved. You can choose to press Save if in doubt.

10.4 How to Override Relays

This setting allows the relays, the audible and/or horn/strobe to be overridden; either forced on or forced off for a given length of time. This may be useful in situations where maintenance is being done or a special event is occurring and requires extra safety precautions.

Press Menu and enter passcode “2012” to enter the Set Alarm menu. Press Next and select Relay Override.



Use the + and - buttons or enter the specific relay number by pressing the yellow field and using the keypad to choose the relay number, Audible, Strobe or Horn you want to override.

Enter the number of minutes (up to a maximum of 999) that you would like the override to be in effect for. Use the -H and +H buttons to change by 60 minute/1 hour increments and the -M and +M by one minute at a time.

Set: Select to force the relay into its active state immediately upon pressing Save. The override will continue for the duration of the time specified.

Clear: Select to force the relay into normal mode, to not activate even if it is configured to do so. For example, the relay will NOT activate if the gas readings reach or surpass the alarm set point. The override will start immediately upon pressing Save and will continue for the duration of the time specified.

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.

NOTE: A latched relay cannot be overridden.

The override status along with the amount of time left for it to be in that state can be viewed by pressing on the Relay Status Bar and using the + or - buttons to scroll to the relay that has been overridden.



10.5 How to Clear a Latched Relay

A latched relay is a relay that has triggered an event and will remain active until it is manually cleared/turned off. This functionality is commonly used in situations where the desire is for the alarm to remain on until it is properly dealt with by someone who knows what they are doing. It prevents someone turning off the alarm, ignoring the reason for it and continuing to work in a potentially dangerous area. This feature could be used for safety interlocks where the shutoff of equipment is triggered and latched such as shutting of the ammonia compressor if there is an ammonia leak.

For more information about enabling or disabling relay latching, refer to Section 10.1 *Enable / Disable Relays, Assign Modbus ID & Change Mode of Operation*.

To clear a latched relay, press on the Relay Status Bar. Use the + or - buttons to scroll to the relay that is latched. Press on the Clear Latched button.



NOTE: A latched relay cannot be cleared if the cause of the relay activation is still present or has not resolved. For example, if the gas level reading is still above the alarm setpoint, pressing the Clear Latched button will not work.

11 LOGIC AND PRIORITY SETTINGS AND CONFIGURATIONS

11.1 Assign Priority Levels to Channels

This setting enables you to assign priority levels to each channel. One channel can be assigned to none through 32 priority levels and multiple channels can be assigned to the same or different priority levels. A priority level can indicate a physical location (zoning) or a set of logic (if this happens, do this or if that happens, do that). To configure the logic for the priority levels, refer to *11.3 Configure Priority Logic*.

To enter the Config Channel menu, enter code “3022” on the password screen and select Channel Logic (1-16) or Channel Logic (17 to 32).



If you want to review the current priority settings for each channel, keep pressing the + button to scroll through the summary screen of each channel or enter the specific channel number by pressing the yellow field and using the keypad. The buttons highlighted in green indicate the priorities that are active for that channel.

To change the priority settings, press on the priority button(s) you want to activate (green) or deactivate (grey). You can assign up to 32 priority levels to each channel.

11.2 Assign Priority Levels to Relays, Strobe, Horn & Audible

This setting enables you to assign priority levels to each relay, strobe, horn and/or audible buzzer. One relay, strobe, horn or audible can be assigned to three priorities in combinations of:

- AND (both priorities must be met to activate the relay)
- OR (either priority can activate the relay)

Using this AND and OR logic, the priorities can be combined in multiple ways, increasing the number of possible configurable relay combinations.

To enter the Config Channel menu, enter code “3022” on the password screen, press Next and select Relay Logic.



Select the relay number you want to configure using the + or - buttons or enter the specific relay number by pressing the yellow field and using the keypad. Continue entering the parameters using the + or - buttons:

T1: Choose the first priority/trigger level the relay will respond to (0 through 32) for the relay selected

Alrm: Choose a condition upon which the relay will be activated:

- L = Low low gas level reading
- M = Mid mid gas level reading
- H = High high gas level reading
- I = IDLH IDLH gas level reading
- F = Fault system Fault
- - = none will not be activated
- D = Digital non gas related logic (such as Time of Day)
- T = TWA TWA calculation
- S = STEL STEL calculation

Logic: Assign the type of logic condition(s). Up to three levels of logic can be assigned to each relay. Choose from ###, OR, AND.

- If no additional condition needs to be met, choose ###.
- If one OR another condition needs to be met, use OR.
- If one AND another condition needs to be met, choose AND.

If required, repeat for the second and third trigger level (T2 and T3) that the relay, strobe and/or audible are assigned to. 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.

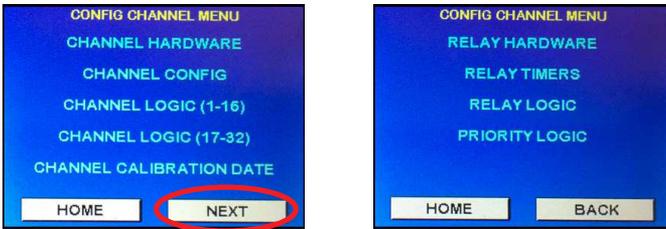
NOTE: If you have a requirement that needs combinations of multiple channels and timing, contact CETCI Service with an explanation of your needs.

11.3 Configure Priority Logic

You can choose to configure the priority logic for gas concentration settings, time of day settings, expired calibration date, Title-24 occupied time settings and selected channels to display on the QCC-RDM. There are a total of 32 priorities that can be configured. They are evaluated by the FCS in order from 1 to 32; if there is any conflict between the priorities, the last one evaluated will be applied. To assign priorities to Channels, refer to Section 11.1 *Assign Priority Levels to Channels*.

To enter the Config Channel menu, enter code "3022" on the password screen, press Next and select

Priority Logic.



NOTE: The Priority Logic screen that is displayed first could be any one of four depending on what priority logic type was last saved. Regardless of the priority logic type, you first must select the Priority number you want to configure using the + or - buttons. To jump ahead by 10 consecutively numbered priorities, press on the +10 button. Then use the + or - buttons to choose the priority logic type:

- Gas Concentration (refer to Section 11.3.1)
- Time of Day (refer to Section 11.3.2)
- Calibration Expired (refer to Section 11.3.3)
- Title-24 Occupied (refer to Section 11.3.4)
- RDM Channel Select (refer to Section 11.3.5)

11.3.1 Gas Concentration Priority Logic

This setting allows you to configure the number of channels that are required to trigger this priority based on gas concentration level, set allow remote disable and/or remote override and set a timer (JTimer) that will escalate the event to a higher priority if required.



Use the - and + buttons to ensure Gas Concentration is showing.

Priority: Choose a priority number that will be assigned to the channels that you want to assign the Gas Concentration Priority to.

Qty: Select the channel quantity (0 to the number of channels that will have that priority). This is the number of channels that need to be in alarm before the priority will be triggered.

DRE: (DRE = Disable Remote Enable) Choose On to allow remote disable and Off to disable remote enable. If the gas detection system is not connected to a remote interface such as a DDC, BAS, FIRE

PANEL etc., the flag should be set to Off. If set to On, it means the priorities can be enabled from a remote device (such as a BAS or DDC system).

ORE: (ORE = Override Remote Enable). If set to On means the remote enable can be overridden.

J Level: Specify which priority level (1 to 32) to jump forward to if the length of time set in JTimer runs out.

JTimer: Specify the length of time in seconds (0 to 30,000 / 500 minutes maximum) before the priority escalates to the next level.

The J Level and JTimer can be used to trigger additional actions if the first priority has not generated resolution to the alarm condition. The priority being jumped to normally will not monitor any channels but will be assigned to a Relay or Strobe or Audible or Analog Output. The timer will normally be set to a value large enough to give the first priority time to complete or resolve the cause of the issue. The jump to priority is used as an escalation tool.

Once the priority has been created, you need to go to Channel Logic and assign the priority to each applicable channel. Refer to Section 11.1 Assign Priority Levels to Channels.

For an example of using the Gas Concentration Priority, refer to Section 11.4.1 Gas Concentration Priority Example.

11.3.2 Time of Day Priority Logic

Use this feature to trigger events such as tripping relays and/or setting analog output levels (VFD control) during certain times of the day. For example, in an underground parking lot there may be a buildup of CO during the time period people are arriving at work due to the high number of vehicles being parked.

NOTE: If the STEL/TWA functionality is enabled, both values will be zeroed at the start time of the time of day priority configuration. This would be useful if you were required to monitor the STEL/TWA throughout a work shift.



Use the - and + buttons to ensure Time of Day is showing.

Priority: Choose a priority number that will be assigned to the channel(s) that you want to assign the Time of Day Priority to.

S-Hour: Enter the hour at which the priority will start. This is a 24 hour clock. (ie. 6am = 6 and 3pm = 15).

S-Min: Enter the minute(s) at which the priority will start.

M, T, W, T, F, S, S: Choose the day(s) of the week that this priority will be active. The button will turn green when pressed, indicating that day has been selected. To unselect, press the button again.

E-Hour: Enter the hour at which the priority will end. This is a 24 hour clock. (ie. 9am = 9 and 1pm = 13).

E-Min: Enter the minute(s) at which the priority will end.

Once the priority has been created, you need to go to Channel Logic and assign the priority to each applicable channel. Refer to Section 11.1 Assign Priority Levels to Channels.

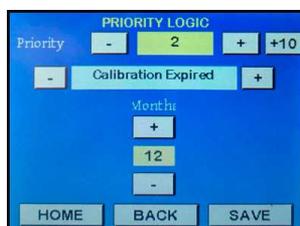
For an example of using the Time of Day Priority, refer to Section 11.4.2 *Time of Day Priority Example*.

11.3.3 Calibration Expired Priority Logic

Calibration frequency depends on many factors such as: the type of gas detection system, how it is being used, the required accuracy of the system, manufacturer's recommendations, application specific health and safety laws and regulations, whether you suspect there are environmental conditions or potential damage that has occurred to the instrument that could affect its performance, whether bump tests are part of your regular maintenance program, etc. At the bare minimum, fixed gas detection systems in underground parking garages, refrigeration applications and other less frequently occupied areas or occupied on a short term basis should be calibrated annually. Applications like swimming pools (chlorine), arenas (ammonia) and frequently occupied or occupied for long periods of time areas should be calibrated a minimum of every 6 months. Be sure to follow the Occupational Health and Safety standards and regulations for the type of application and jurisdiction.

Use the Calibration Expired Priority to set the number of months within which the sensor(s) should be calibrated. If /when the time expires, the FCS will trip that priority as a fault. If the fault occurs, the sensor should be calibrated as soon as possible. The system will remain operational, monitoring the gas levels but scheduling a calibration is highly recommended. Once the sensor has been calibrated, the Set Channel Calibration Date should be updated. Refer to Section 9.3 *Set Date the Channel was Calibrated*.

NOTE: The Calibration Expired Priority Logic will not work if the Calib. Expired Faults flag is set to Dis (disabled) in the System STEL/TWA screen in the Set Alarm Menu (passcode 2012).



Use the - and + buttons to ensure Calibration Expired is showing.

Priority: If all the sensors require the same length of time before calibration, choose one priority number to assign to the channels for which you want to use as the Calibration Expired Priority. If some sensors need to be calibrated in 6 months and others in 12, set up two priority numbers.

Months: Enter the number of months that the calibration is valid for. 12 months (1 year) is the default factory setting. The reference used for counting the months is the current date of the real time clock in the FCS, which is set by the factory when the device was manufactured. To change or update the date and/or time, refer to Section 8.2 *Set Clock*.

NOTE: The priority must be assigned to the Channel Logic screen. In the Relay Logic screen, the priority number should be set and the alarm type should be set to F.

Once the priority has been created, you need to go to Channel Logic and assign the priority to each applicable channel. Refer to Section 11.1 *Assign Priority Levels to Channels*.

For an example of using the Calibration Expired Priority, refer to Section 11.4.3 *Calibration Expired Priority Example*.

11.3.4 Title-24 Occupied Priority Logic

NOTE: The Title-24 Occupied Priority Logic will not work if the Title-24 Faults flag is set to Dis (disabled) in the System STEL/TWA screen in the Set Alarm Menu (passcode 2012). Refer to Section 13.2 *Enable/Disable System (GLOBAL) STEL & TWA Alarms*.

NOTE: To comply with the Title-24 requirements, you must also configure the Calibration Expiry Date functionality (refer to Section 9.3 *Set Date the Channel was Calibrated*) and Calibration Expired Priority (refer to the previous Section 11.3.3).

Title-24 is a California Building Standards Code that governs the design and construction of all building occupancies and associated facilities and equipment throughout California relating to fire, life safety, structural safety and access compliance. The Title-24 Occupied Priority Logic functionality complies to the California Title-24 requirements for parking garages and is applicable in the state of California only. It detects and signals faults as per the Title-24 requirements.

If more than one occupied time needs to be set up, you will need to set up another priority.

Time that is not set as occupied is considered to be unoccupied, as per the Title-24 requirements.

NOTE: The occupied time functionality uses a 24 hour clock. (ie. 9am = 9 and 1pm = 13).

Use the - and + buttons to ensure Title-24 Occupied is showing.

Priority: Choose a priority number that will be assigned to the channel(s) that you want to assign the Title-24 Occupied Priority to.

S-Hour: Enter the hour at which the priority will start.

S-Min: Enter the minute(s) at which the priority will start.

M, T, W, T, F, S: Choose the day(s) of the week that this priority will be active. The button will turn green when pressed, indicating that day has been selected. To unselect, press the button again.

E-Hour: Enter the hour at which the priority will end.

E-Min: Enter the minute(s) at which the priority will end.

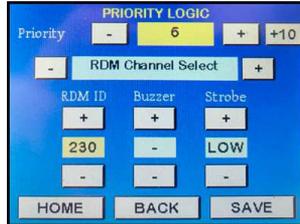
If the occupied time includes a range that spans over midnight, you will need to set up two priorities. For example, if the occupied time is from 9:30pm to 3am - you would configure the first priority with the S-Hour at 21, S-Min at 30, E-Hour at 23 and E-Min at 59. The second priority would be set with S-Hour at 0, S-Min at 0, E-Hour at 3 and E-Min at 0.

Once the priority has been created, you need to go to Channel Logic and assign the priority to each applicable channel. Refer to Section 11.1 Assign Priority Levels to Channels.

For an example of using the Title-24 Occupied Priority, refer to Section 11.4.4 Title-24 Occupied Priority Example.

11.3.5 QCC-RDM Channel Selection Priority Logic

There may be applications where instead of displaying all the channel readings on the QCC-RDM, you want to show only particular channels. Use the RDM Channel Select priority logic feature to select the specific channels you want displayed on the QCC-RDM. First create a priority and then assign it to each of the channels you want displayed.



Use the - and + buttons to ensure that the RDM Channel Select is showing.

Priority: Choose a priority number that will be assigned to the channels that you want displayed on the QCC-RDM you are configuring.

RDM ID: This is the Modbus ID of the QCC-RDM you are configuring. When selective channel display is desired on a system with more than one QCC-RDM, an RDM Channel Select Priority must be set up for each QCC-RDM.

Buzzer: Use the - or + to choose a condition upon which the internal buzzer of the QCC-RDM will respond:

- L = Low low alarm level reading
- M = Mid mid alarm level reading
- H = High high alarm level reading
- I = IDLH IDLH alarm level reading
- F = Fault system Fault
- - = none will not be activated
- D = Digital non gas related logic (such as Time of Day)
- T = TWA TWA calculation
- S = STEL STEL calculation

Strobe: If there is a remote strobe (or strobe/horn combo) connected to the QCC-RDM, use the - or + to choose a condition upon which the strobe will respond:

- L = Low low alarm level reading
- M = Mid mid alarm level reading
- H = High high alarm level reading
- I = IDLH IDLH alarm level reading
- F = Fault system Fault
- - = none will not be activated
- D = Digital non gas related logic (such as Time of Day)

- T = TWA TWA calculation
- S = STEL STEL calculation

NOTE: The buzzer and strobe that is connected to the QCC-RDM will only be triggered by the channels being displayed on that QCC-RDM.

Once the priority has been created, you need to go to Channel Logic and assign the priority to each channel you want to be displayed on the QCC-RDM. Refer to Section 11.1 Assign Priority Levels to Channels.

NOTE: You can also choose how the selected channels are displayed - either scrolling by line or scrolling by page. Refer to Section 8.5 Configure QCC-RDM Remote Display(s).

For an example of using the RDM Channel Select Priority, refer to Section 11.4.5 QCC-RDM Channel Select Priority Example.

11.4 Examples of Using Priorities

The logic control and flexibility of the priority level structure in the FCS is unlimited, allowing numerous monitoring and alarming configurations. Here are a few examples of how to use the different priority types.

NOTE: The priority numbers, channel numbers and relay numbers used in the examples are arbitrarily chosen. In real life it is common to start with the first unused number and proceed from there.

11.4.1 Gas Concentration Priority Example

SCENARIO: There are 3 single channel, CO gas detectors covering an area monitoring the levels of CO gas. Each gas detector has been assigned a channel number on the FCS. Relay 1 on the FCS has been configured to control an exhaust fan. There are several workers in this area and it is company policy that the CO levels should never be allowed to reach the standard 25 ppm for occupancy. However, you do not want the fans continuously running.

In the Config Channel Menu / NEXT / **Relay Logic:**

For Relay 1:

- Set trigger level (T1) to 1 (the 1 indicates P1)
- Set Alarm to L, for Low alarm
- Set Logic to OR
- Set trigger level (T2) to 1 (the 1 indicates P2)
- Set Alarm to M, for Mid alarm
- Set Logic to ###
- Leave trigger level T3 as 0 and the last Alarm value blank
- Press Save

For more information on Relay Logic, refer to Section 11.2 Assign Priority Levels to Relay, Strobe, Horn & Audible.

In the Set Alarm Menu (passcode 2012) / **Channel Alarms:**

For EACH of the 3 Channels (sensors):

- Set High Alarm 100 ppm
- Set Mid Alarm point at 25 ppm
- Set Low Alarm at 10 ppm
- Set ASC - ascending

For more information on Channel Alarms, refer to Section 9.4 Set Channel Alarm Setpoints.

In the Config Channel Menu (passcode 3022) / **Priority Logic:**

For Priority 1:

- Choose Gas Concentration
- Set QTY to 3
- Leave DRE and ORE OFF
- Leave J Level and J Timer as 0
- Press Save

For Priority 2:

- Choose Gas Concentration
- Set QTY to 1
- Leave DRE and ORE OFF
- Leave J Level and J Timer as 0
- Press Save

For more information on Priority Logic, refer to Section 11.3.1 Gas Concentration Priority Logic.

In the Config Channel Menu (passcode 3022) / **Channel Logic** (1-16):

- Assign each Channel (sensor) in the area to P1 (Priority 1) and P2 (Priority 2)
- Press Save

For more information on Channel Logic, refer to Section 11.1 Assign Priority Levels to Channels.

This configuration will keep the standard occupancy CO levels below 25 ppm and the exhaust fan will keep the average CO level below 10 ppm. If the CO levels reach 10 ppm, and all 3 channels go into Low Alarm, OR if the CO level reaches 25 ppm and if any of the channels goes into Mid Alarm, the exhaust fan will be turned on.

11.4.2 Time of Day Priority Example

SCENARIO: During the time that people arrive for work and park in the underground parking lot, you want to make sure that the CO levels are kept at a safe level and the gas detector alarms don't go off. People do start at different times but usually arrive between 6:30am and 8:30am Monday through Friday.

NOTE: The priority numbers, channel numbers and relay numbers used in the examples are arbitrarily chosen. In real life it is common to start with the first unused number and proceed from there.

NOTE: The time functionality uses a 24 hour clock. (ie. 9am = 9 and 1pm = 13).

In the Config Channel Menu (passcode 3022) / NEXT / **Relay Logic:**

For Relay 2:

- Set trigger level (T1) to 3 (the 3 indicates P3, Priority 3)
- Set Alarm to D, for digital non gas related logic
- Leave the remaining settings T2 and T3 as ###, and Logic 0
- Press Save

For more information on Relay Logic, refer to Section 11.2 Assign Priority Levels to Relay, Strobe, Horn & Audible

In the Config Channel Menu / **Priority Logic:**

For Priority 3:

- Choose Time of Day
- Set S-Hour to 6
- Set S-Minute to 30
- Select M, T, W, T, F (buttons turn green when selected)
- Set E-Hour to 8
- Set E-Min to 30
- Press Save

For more information on Priority Logic, refer to Section 11.3.2 Time of Day Priority Logic.

This configuration will keep the exhaust fans on between the hours of 6:30am to 8:30am on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays. If you wanted to set more time of day settings for those days or the weekend, you would need to use another priority number; each time of day setting requires its own priority number.

If you required the fan to be on during a period of time that includes midnight, you would need to set a minimum of 2 priorities. For example, if you wanted the fan to be on from 10pm until 2am, you would set one priority to start at 22 and end at 23:59 and set a second priority to start at 0 and end at 2.

11.4.3 Calibration Expired Priority Example

SCENARIO: Channels 1, 2 and 3 have sensors that should be calibrated every year and channels 4 and 5 have sensors that should be calibrated every 6 months. You would like the system to keep track of when these sensors should be calibrated next.

Press the “I” button on the normal display and make sure the real time system date is set and is correct on the FCS.

Make sure the Calib. Expired Faults flag is set to En (enabled). Go to Set Alarm Menu (passcode 2012) / System STEL/TWA (refer to Section 13.2 *Enable / Disable System (GLOBAL) STEL & TWA Alarms*).

Check that the calibrated date listed for each of the 6 channels makes sense. This is the date from which the number of months you specify in the Calibration Expired Priority will start counting from. Go to Config Channel Menu (passcode 3022) / Channel Calibration Date (refer to Section 9.3 *Set Date the Channel was Calibrated*).

NOTE: If you need to change the calibrated date for individual channels or for all channels, **it can only be changed to today’s date**. Refer to Section 9.3 *Set Date the Channel was Calibrated* for more information.

NOTE: The priority numbers and relay numbers used in the examples are arbitrarily chosen. In real life it is common to start with the first unused number and proceed from there.

In the Config Channel Menu (passcode 3022) / **Channel Logic** (1-16):

- Assign each Channel (sensor) that needs to be calibrated every 12 months to P4 (Priority 4)
- Assign each Channel (sensor) that needs to be calibrated every 6 months to P5 (Priority 5)
- Press Save

For more information on Channel Logic, refer to Section 11.1 Assign Priority Levels to Channels.

In the Config Channel Menu / **Priority Logic**:

For Priority 4:

- Choose Calibration Expired
- Use the + button to enter 12
- Press SAVE

For Priority 5:

- Choose Calibration Expired
- Use the + button to enter 6
- Press SAVE

For more information on Priority Logic, refer to Section 11.3.3 Calibration Expiry Priority Logic.

In the Config Channel Menu / **Relay Logic:**

For Relay 1:

- Use the + button to enter 4 in the T1 field.
- Set Alarm to F, for Fault
- Leave the remaining fields their default values
- Press SAVE.

For Relay 2:

- Use the + button to enter 5 in the T1 field.
- Set Alarm to F, for Fault
- Leave the remaining fields their default values
- Press SAVE.

For more information on Relay Logic, refer to Section 11.2 Assign Priority Levels to Relay, Strobe, Horn & Audible

Relay 1 will trip when the 12 month time period from the channel calibration date has expired and Relay 2 will trip when the 6 month time period from the channel calibration date has expired. The FCS will show a Fault on the channel status details for the channel for which the channel calibration date has expired.

11.4.4 Title-24 Occupied Priority Example

NOTE: This priority setting should only be used for systems that must comply with California's Title-24 requirements for enclosed parking garages.

Title 24 Section 120.6 (c) requires that enclosed parking garages have the design and system to:

1. Detect contaminant levels and stage fans or modulate fan airflow rates to 50% or less of design capacity provided acceptable contaminant levels are maintained.
2. Have controls and/or devices that will result in fan motor demand of no more than 30% of design wattage at 50% of design airflow.
3. CO shall be monitored with at least 1 sensor per 5,000 ft², with sensor located in the highest expected concentration locations, with at least 2 sensors per zone.
4. CO concentration at all sensors is maintained at 25 ppm or less at all times.
5. The ventilation rate shall be at least 0.15 cfm.ft² when the garage is scheduled to be occupied.
6. System shall maintain the garage at negative or neutral pressure relative to other occupied spaces when the garage is scheduled to be occupied.
7. CO sensors shall be:
 - Certified by the manufacturer to be accurate within $\pm 5\%$ of measurement
 - Factory calibrated
 - Certified by the manufacturer to drift no more than 5% per year
 - Certified by the manufacturer to require calibration no more frequently than once a year
 - Monitored by control system that transmits:
 - An alarm to facility operator on fault detection
 - Resets to design ventilation rates on fault detection

- Checks for and reports a sensor fault if:
 - Sensor not calibrated within the specified calibration period (once per year)
 - During unoccupied periods a sensor deviates from the average for the zone by more than ± 15 ppm for 4 hours.
 - During occupied periods a sensor's 30 minute rolling average deviates from the 30 minute rolling average of other sensors in the proximity zone.

For more information relating to Title-24 please consult the appropriate documents available on the California Building Standards Commission website <http://www.bsc.ca.gov/>

SCENARIO: Building with an underground parking area is occupied from 8am to 5pm on weekdays and on Saturdays from 8:30am to noon. It is unoccupied the rest of the time.

NOTE: This example assumes the Channel gas name and alarm setting configurations and the Relay configurations for exhaust fans have been set up already.

To use the Title-24 functionality, make sure the Title-24 Faults flag is set to En (enabled). Go to Set Alarm Menu (passcode 2012) / System STEL/TWA (refer to Section 13.2).

Make sure the Calib. Expired Faults flag is set to En (enabled). Go to Set Alarm Menu (passcode 2012) / System STEL/TWA (refer to Section 13.2).

Make sure the Calibration Expired Priority is configured and assigned to all the appropriate channels. Go to Config Channel Menu / Priority Logic (refer to Section 11.3.3).

NOTE: The priority numbers and relay numbers used in the examples are arbitrarily chosen. In real life it is common to start with the first unused number and proceed from there.

In the Config Channel Menu / **Priority Logic:**

For Priority 6:

- Choose Title-24 Occupied
- Set S-Hour to 8
- Set S-Minute to 0
- Select M, T, W, T, F (buttons turn green when selected)
- Set E-Hour to 17
- Set E-Min to 0
- Press Save

For Priority 7:

- Choose Title-24 Occupied
- Set S-Hour to 8

- Set S-Minute to 30
- Select the first S (buttons turn green when selected)
- Set E-Hour to 12
- Set E-Min to 0
- Press Save

For more information on Title-24 Priority Logic, refer to Section 11.3.4 Title-24 Occupied Priority Logic.

NOTE: The time (hour and minute) functionality uses a 24 hour clock. (ie. 9am = 9 and 1pm = 13).

In the Config Channel Menu (passcode 3022) / NEXT / **Relay Logic:**

For Relay 3:

- Set trigger level (T1) to 6 (the 6 indicates P6, Priority 6)
- Set Alarm to F (Fault)
- Set trigger level (T2) to 7 (the 7 indicates P7, Priority 7)
- Leave the remaining settings as their default values (-, ###, 0)
- Press Save

For more information on Relay logic, refer to Section 11.2

With these settings, the system will follow the Title-24 requirements. The system will go into fault if the STEL or TWA values exceed the pre-programmed levels. When the start time (8am on weekdays or 8:30am on Saturday) passes, the STEL and TWA value will be zeroed. The system will indicate a fault if the calibration expired date has passed.

11.4.5 QCC-RDM Channel Selection Priority Example

SCENARIO: In a facility with an ice rink and a restaurant, you want the QCC-RDM in the restaurant to only display the Carbon dioxide (CO₂) gas readings from the sensor in the CO2 tank room and the QCC-RDM mounted at the second door entrance of the chiller room to display only Ammonia (NH₃) readings. Each QCC-RDM is attached to a remote strobe.

NOTE: The priority numbers, channel numbers and relay numbers used in the examples are arbitrarily chosen. In real life it is common to start with the first unused number and proceed from there. Let's say Channel 1 is CO₂ and Channel 2 is NH₃.

In the Config Channel Menu / **Priority Logic:**

For Priority 8:

- Choose RDM Channel Select
- Set the Modbus ID of the QCC-RDM you want to have display the CO₂
- Set the trigger for the Buzzer to -

- Set the trigger for the Strobe to LOW
- Press Save

For Priority 9:

- Choose RDM Channel Select
- Set the Modbus ID of the QCC-RDM you want to have display the NH₃
- Set the trigger for the Buzzer to LOW
- Set the trigger for the Strobe to LOW
- Press Save

In the Config Channel Menu / **Channel Logic (1-16)**:

For Channel 1:

- Add P8
- Press Save

For Channel 2:

- Add P9
- Press Save

With these settings the QCC-RDM in the restaurant will only show the CO₂ gas readings and if the level reaches the LOW alarm setpoint, the remote strobe will come on as a visual alert. The internal buzzer will remain off so as to not cause an audible alarm for patrons. The QCC-RDM at the chiller room entrance will show the Ammonia levels inside the room and if the level reaches the LOW alarm setpoint, the remote strobe and the internal buzzer will be triggered.

Each QCC-RDM requires its own single priority logic. The system knows which QCC-RDM is which based on its Modbus ID. If you set more than one priority for one QCC-RDM, the priority logic will conflict and the channels will not display as expected.

If you have more than 4 channels displaying on one QCC-RDM, you can choose to have the channels scroll on the display line by line or page by page. Refer to Section 8.5 *Configure QCC-RDM Remote Display(s)*.

12 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.

Each analog input can be assigned to one or more channels, providing the gas concentration (for example) for the channel. Refer to Section 9.1 *Enable/Disable Channels, Assign ID, Channel Number & Communication Type*.

Up to 32 priority levels can be assigned to analog outputs. Refer to Section 12.3 *Assign Priority Levels & Logic Conditions to Analog Outputs*.

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

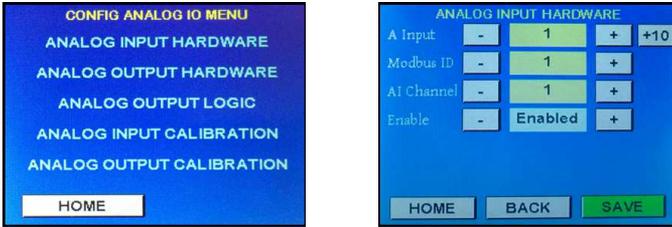
The maximum number of combined analog output devices for the FCS is:
 8 internal + 15 LNK-AOs + 9 Modbus® VFDs

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

12.1 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.

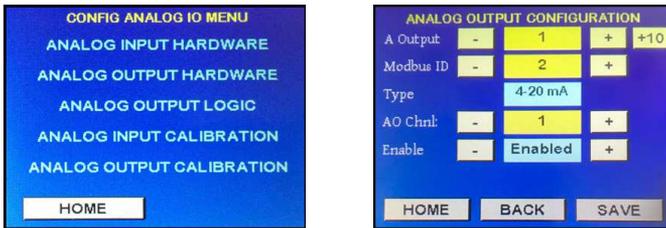
Press Save to save the changes.

12.2 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 was 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.

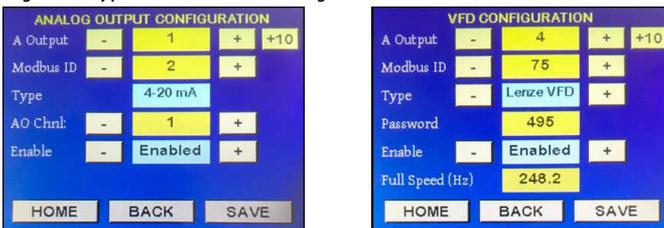
Modbus ID: Set the Modbus® ID for the analog output device. For an internal -AO Option choose 1 (if the AO board is installed in the top position) or 2 (if the AO board is installed in the bottom position). For an LNK-AO peripheral device or Modbus® VFD, choose a number from 75 to 99. For the last output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

NOTE: 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.

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.

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



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 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.

12.3 Assign Priority Levels & Logic Conditions to Analog Outputs

There are three ways to control the analog output:

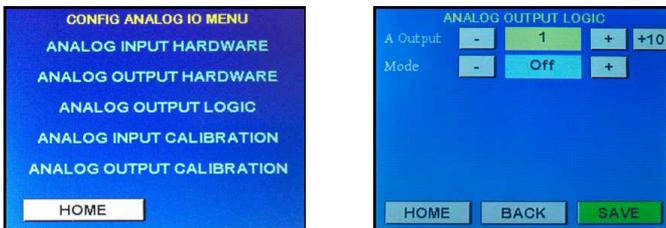
- First is to monitor a priority and follow either Peak, Average or Step.
- Second is follow a specific Channel.
- Third is to output a specific value under specific conditions.

This setting enables you to assign priority levels to each analog output. One analog output can be assigned to none through 32 priority levels and multiple analog outputs can be assigned to the same or different priority levels. The actual value output will be the highest value determined from all the priorities it is configured to look at.

A priority level can indicate a physical connection to a device (controlling that device) or a set of logic (if this happens, do this or if that happens, do that).

NOTE: Depending on the Type selected in the Analog Output Configuration screen for the analog output you are setting the logic for, the fields to fill in on the Analog Output Logic screen will either be a mA value or, the percentage of the maximum Full Speed (Hz) value entered in the VFD Configuration screen. Refer to Section 12.2.

To enter the Config Analog IO menu, enter code “3032” in the password screen and select Analog Output Logic.



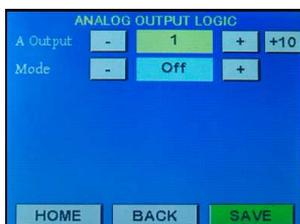
If you want to review the current priority settings for each output, press the + or - buttons. To skip ahead by 10 devices at a time, press the +10 button. Or press the yellow field and use the keypad to enter the specific number.

Use the + and - buttons or press on the yellow fields to use the keypad to change the settings:

A. Output: Choose the analog output for which you want to configure the logic using the appropriate mode.

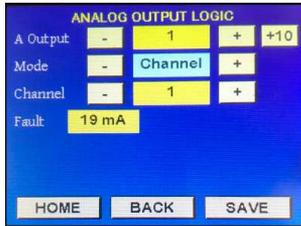
Mode: Choose the mode the analog output will operate in. The screen will change depending on which mode you choose:

- OFF will result in a 0 current or percentage output. The OFF feature allows you to set any analog outputs you are not using to OFF or to stop the analog output from controlling whatever it is configured to control.

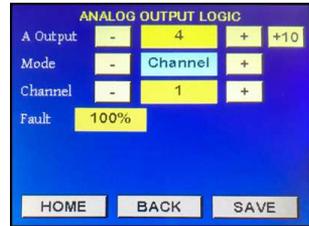


Press SAVE to save the changes.

- CHANNEL allows you to choose a specific channel (1 through 128 or 1 through 8 for the FCS-8) that the analog output will monitor.



mA output



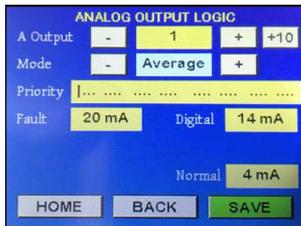
percentage output for VFDs

Channel: Choose the channel number that the analog output will monitor.

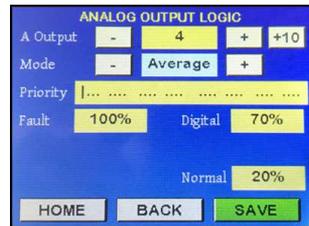
Fault: Output this value if the channel goes into fault.

Press SAVE to save the changes.

- AVERAGE is the average gas concentration reading that is calculated by looking at all the channels assigned to each chosen priority level. All channels in the first priority level are averaged, then all the channels in the next priority level are averaged, etc. The priority level that has the highest average is the value that is used to drive the analog output.



mA output



percentage output for VFDs

Priority: Add, change or remove the priority levels this analog output will look at

Fault: Output this value if any of the channels in the priorities selected go into fault.

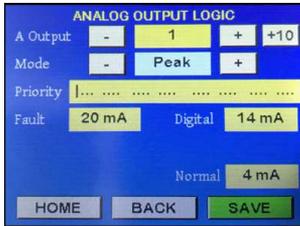
Digital: Output this value if one or more of the channels in the selected priorities has a time of day priority engaged.

Normal: Output this value if the channels in the selected priorities are reporting everything is normal but you want the the analog output to remain on.

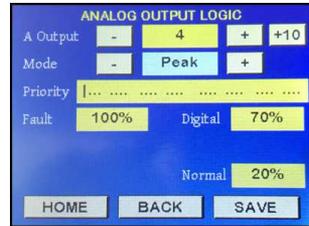
Press SAVE to save the changes.

NOTE: The AVERAGE and the PEAK are based on the value of the channel relative to its range. Meaning be aware for example, that an Oxygen sensor has a range of 0 - 25% vol and a normal reading is 20.9%, which is 83% of the sensor's range. CO has a range of 0 - 200 ppm and the low alarm is set at 30 ppm, which is 15% of the sensor's range. If you were to group these two channels together in the same priority, it would result in skewed average or peak calculations. It is best to group channels together and assign them to the same priority.

- PEAK is the highest gas concentration indicated by the channels assigned to that chosen priority level.



mA output



percentage output for VFDs

Priority: Add, change or remove the priority levels this analog output will look at

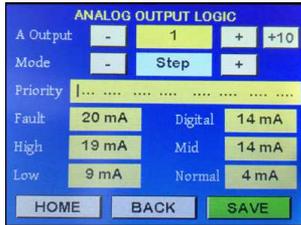
Fault: Output this value if any of the channels in the priorities selected go into fault.

Digital: Output this value if one or more of the channels in the selected priorities has a time of day priority engaged.

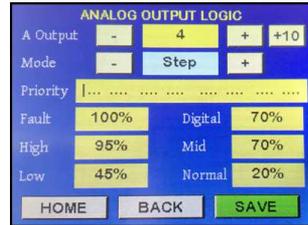
Normal: Output this value if the channels in the selected priorities are reporting everything is normal but you want the analog output to remain on.

Press SAVE to save the changes.

- STEP allows you to specify a Low, Mid and High percentage of the maximum output for a particular analog output. This is useful for controlling variable speed fans (VFDs). The STEP value increases or decreases by 5% increments for VFDs (otherwise 1 mA) if you use the + or - buttons. If you use the keypad to enter a number it will be rounded to the nearest 5% or 1 mA. For the specified priority, if a channel goes into Low Alarm, it will output the percentage value that is entered in the Low field; at Mid Alarm, it will output the percentage value that is entered in the Mid field, etc.



mA output



percentage output for VFDs

Priority: Add, change or remove the priority levels this analog output will look at

Fault: Output this value if any of the channels go into fault.

High: Output this value if any of the channels go into high alarm.

Low: Output this value if any of the channels go into low alarm.

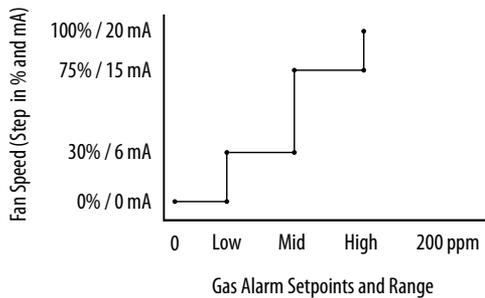
Digital: Output this value if a priority has a time of day priority engaged.

Mid: Output this value if any of the channels go into mid alarm.

Normal: Output this value if all priorities are reporting everything is normal but you want the analog output to remain on.

Press SAVE to save the changes.

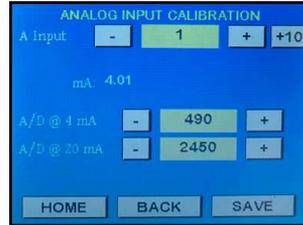
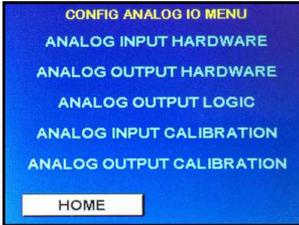
NOTE: The step functionality does not cause the fan to ramp up, it is a step up action. The VFD may have a ramping function in its own configuration.



12.4 Analog Input Calibration *(requires a 4-20 mA source)*

If it is necessary to recalibrate the analog inputs, use an accurate current source and adjust the A/D counts to reach the required 4 mA and 20 mA input values.

To enter the Config Analog IO menu, enter code "3032" on the password screen and select Analog Input Calibration.



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: Select the analog input number (1 to 60) of the analog input you are setting the current values for.

mA: This is the measured input current, what the FCS thinks the current is; this value will change as you change the A/D values or the 4 - 20 mA source.

A/D @ 4 mA: While applying 4 mA, change the number until the mA value is 4 mA.

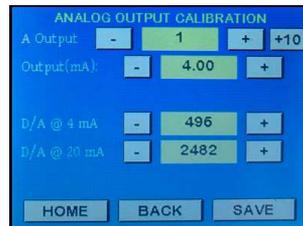
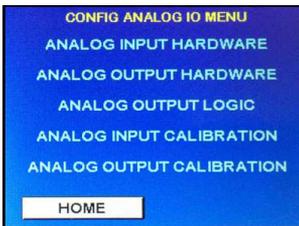
A/D @ 20 mA: While applying 20 mA, change the number until the mA value is 20 mA.

Press SAVE to save the changes.

12.5 Analog Output Calibration *(requires a 4-20 mA meter)*

To calibrate the analog output, use an amp meter and adjust the D/A counts to reach the required current output values.

To enter the Config Analog IO menu, enter code “3032” on the password screen and select Analog Output Calibration.



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: Select the analog output number of the analog output you are calibrating.

Output (mA): Enter the desired output value (ie. 4 mA or 20 mA).

D/A @ 4 mA: When requesting 4 mA output, change the number until the amp meter reads 4 mA.

D/A @ 20 mA: When requesting 20 mA output, change the number until the amp meter reads 20 mA.

Press SAVE to save the changes.

NOTE: Each AO channel number must be calibrated for a low and a high range (ie. 4 mA and 20 mA). Because the D/A counts can fluctuate in relation to each other, when finished, double check to ensure both values have remained acceptable. Adjust if required.

NOTE: CETCI uses 4 mA and 20 mA defaults, if other mA values are desired, follow the same steps using the preferred mA value instead of 4 mA and 20 mA.

13 STEL AND TWA SETTINGS

STEL (Short-term Exposure Limit)

The STEL is the acceptable average exposure over a short period of time, usually 15 minutes as long as the time-weighted average is not exceeded at any time or so many times in succession (depends on local regulations) during a workday. The concentrations are given in ppm. For example, the STEL for CO is 100 ppm.

TWA (Time Weighted Average)

The TWA indicates a time-weighted average concentration for up to an 8 hour (OSHA) or a 10 hour (NIOSH) workday during a 40 hour week. The concentrations are given in ppm. For example, the TWA for CO is 25 ppm.

IDLH (Immediately Dangerous to Life and Health)

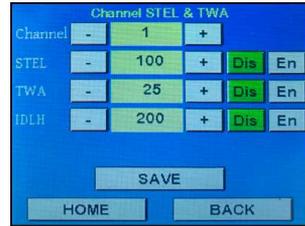
IDLH is defined by NIOSH and OSHA as exposure to airborne contaminants that is "likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment".

NOTE: IDLH level for a particular gas may be above the measurement range. For example, the measurement range for CO is 0 to 200 ppm. The IDLH is 1,000ppm.

13.1 Enable / Disable & Set Channel (INDIVIDUAL) STEL & TWA Alarms

This setting allows you set the STEL, TWA and IDLH values channel by channel and choose to see or not see these values on the channel status detail screen.

To enter the Set Alarm menu, enter the code "2012" on the password screen and select Channel STEL & TWA.

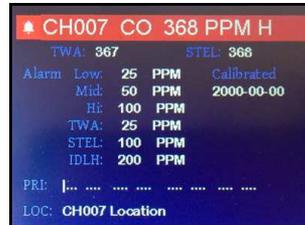


If you want to review the current STEL & TWA settings for each channel, press the + or - buttons. Or use the yellow field to use the keypad and enter the specific channel number.

Use the + and - buttons or press the yellow field to use the keypad to change the values in the STEL, TWA and IDLH fields. For each measurement you can disable or enable it by pressing on the Dis or En buttons. If disabled, the channel will not alarm based on STEL, TWA or IDLH levels and the channel detail screen will not display the STEL, TWA or IDLH readings.



Disabled



Enabled



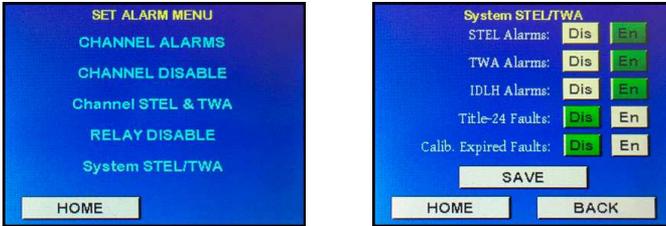
Press SAVE to save the changes.

13.2 Enable / Disable System (GLOBAL) STEL & TWA Alarms

This setting allows you to enable or disable the STEL, TWA and IDLH alarms for the entire system at once (a global enable or disable). The flags in this screen will override the functionality of the enable/disable flags in the Channel STEL & TWA screen, but will not reset the individual channel flags. If the system STEL, TWA and IDLH are disabled, the functionality of the channel settings is used. Thus it is important to check if the global system flags are enabled or disabled if you are trying to show the STEL, TWA & IDLH for individual channels only.

NOTE: The factory default is the System STEL, TWA and IDLH flag is Dis (disabled).

NOTE: For Title-24 functionality to work properly, the Title-24 Faults flag and the Calib. Expired Faults flag must all be En (enabled).



Press on Dis (disable) or En (enable) for each of the STEL, TWA and/or IDLH alarms.

Press SAVE to save the changes.

NOTE: The Title-24 Faults flag and Calib Expired Faults flag settings are explained in Sections 11.3.4, 11.4.4, 11.3.3 and 11.4.3.

NOTE: If the STEL, TWS and IDLH alarm levels are not set (ie. are 0) and the global functionality is enabled, it may cause the system to go into alarm. Either enter appropriate values in the Channel STEL & TWA screen or disable the global functionality in the System STEL & TWA screen.

14 FCS MODBUS® HOLDING REGISTERS

14.1 Introduction

The FCS Controller is configured to communicate with a Building Automation System or Direct Digital Control System on an RS-485 network using Modbus® RTU protocol (version 1.1b3, RS-485). In order for communication to be successful between devices, be sure your network connection is complete, the network termination switches are set appropriately and all the devices are configured with the same baud rate, character format, etc. Each device will have its own unique Modbus® ID.

If you have specific requirements, have any questions or require clarification about these holding registers, please contact CETCI for assistance.

14.2 Read Coil (Relays, Buzzer, Strobe)

The discrete outputs registers are the present state of the relays, strobe, buzzer and remote relays. These reflect the alarm condition. They are read only

Alarm Conditions: **0 = Normal (non-active)**
 1 = alarm (active)

Modbus Function1 (Read Coils). Reply from the device is 1 bit per coil, packed in bytes.

Coil	Register	Description	Range
1	0	Relay 1	0 or 1
2	1	Relay 2	0 or 1
3	2	Relay 3	0 or 1
4	3	Relay 4	0 or 1
5	4	Strobe (connected to remote strobe/horn terminal)	0 or 1
6	5	Audible (internal)	0 or 1
7	6	Horn (connected to remote strobe/horn terminal)	0 or 1
8	7	Remote_Relay 1	0 or 1 up to 57 remote relays equaling 64 relays in total
9	8	Remote_Relay 2	
10	9	Remote_Relay 3	
11	10	Remote_Relay 4	
12	11	Remote_Relay 5	
13	12	Remote_Relay 6	
...	
64	63	Remote_Relay 57	

14.3 Input Registers

Input registers are the present channel/sensor readings. They are read only. Units are defined in the configuration holding registers for each channel (for example, Channel 1 registers are 50,028, 50,029 and 50,030).

Scaler: $10^{(\text{decimals} + 1)}$

Every channel has its own scaler value. For example, an NO2 gas measurement normally has 1 decimal place, so its scaler value is 100. An ambient NO2 gas measurement of 0.4 ppm would be represented in the register as $0.4 \times 100 = 40$

NOTE: The STEL and TWA values are not valid if the configuration does not enable STEL and TWA calculations.

Modbus Function 4 (Read Input Registers) or Function 3 (Read Holding Registers)

Register	Address	Description	Range	Units
30,001	30,001	Channel 1 Reading	present gas reading x scaler	LEL, ppm, % vol, etc.
30,002	30,002	Channel 1 STEL	present STEL reading x scaler	LEL, ppm, % vol, etc.
30,003	30,003	Channel 1 TWA	present TWA reading x scaler	LEL, ppm, % vol, etc.
30,004	30,004	Channel 1 Alarms	bit encoded contact CETCI for bit allocation	LEL, ppm, % vol, etc.
30,005	30,005	Channel 2 Reading		
30,006	30,006	Channel 2 STEL		
30,007	30,007	Channel 2 TWA		
30,008	30,008	Channel 2 Alarms		
30,009	30,009	Channel 3 Reading		
30,010	30,010	Channel 3 STEL		
30,011	30,011	Channel 3 TWA		
30,012	30,012	Channel 3 Alarms	repeat functionality of Chanel 1 for channels 2 through to the number of channels used in the system (up to a maximum of 128 for the FCS models and up to a maximum of 8 for the FCS-8 models)	
	30,013	Channel 4 Reading		
	30,014	Channel 4 STEL		
	30,015	Channel 4 TWA		
	30,016	Channel 4 Alarms		
	30,017	Channel 5 Reading		
	30,018	Channel 5 STEL		
	30,019	Channel 5 TWA		
	30,020	Channel 5 Alarms		
...		
30,561	30,561	Channel 128 Alarms		

14.4 Priority Status Registers

Priority Status registers are the present status of the priorities. They are read only.

Register	Description	Range
31,001	Priority_[0].status	
31,002	Priority_[1].status	
31,003	Priority_[2].status	
31,004	Priority_[3].status	
31,005	Priority_[4].status	31,001 - 30,032
31,006	Priority_[5].status	bit encoded
31,007	Priority_[6].status	contact CETCI for more details
31,008	Priority_[7].status	
31,009	Priority_[8].status	
31,010	Priority_[9].status	
	etc.	

14.5 Analog Output Registers

Analog output registers are the present value being output to the analog output channels and are read only. The value is dependent on the present status and configuration of the system.

Scaled to: 0 to 2000 (mA x 100)

Register	Description	Range	Units
40,001	Analog Output Value 1		
40,002	Analog Output Value 2		
40,003	Analog Output Value 3		
40,004	Analog Output Value 4		
40,005	Analog Output Value 5	40,001 - 40,060	
40,006	Analog Output Value 6		
40,007	Analog Output Value 7	Range: 0 - 20 (scaled 0-2000)	Units: mA
40,008	Analog Output Value 8		
40,009	Analog Output Value 9		
40,010	Analog Output Value 10		
	etc.		

14.6 Internal and Peripheral Devices Preassigned Modbus® IDs

Below is a list of the Modbus IDs that have been factory assigned to the internal relays and analog inputs/outputs and the remote peripheral devices.

Device	Modbus ID
Internal relays	1
Internal Strobe/Horn	2
Internal Analog Input (Option -AI or 2AI)	1 or 2
Internal Analog Output (Option -AO or 2AO)	1 or 2
Internal Analog Input and Output (Option -AIAO)	1 or 2
RLY-4 or RLY-8	30 to 49
LNK-AI	50 to 74
LNK-AO	75 to 99
LPT-M or LPT-P	100 to 228
QCC-RDM	230 to 249
End of list mark	229

15 OPTIONS AND ACCESSORIES

15.1 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, weather and corrosion resistant and a long life LED technology. It is made of polycarbonate and has an IP65 rating.

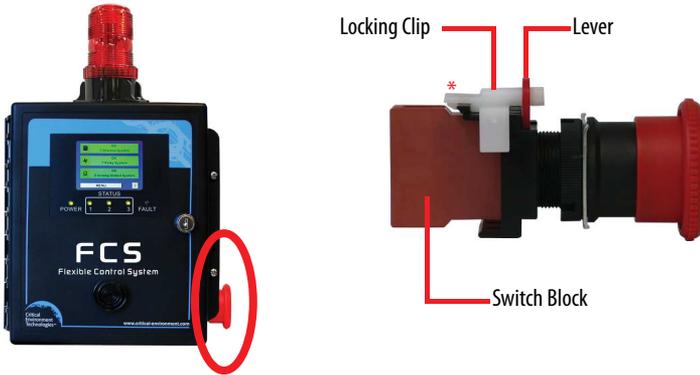


Voltage	10 - 30 VDC
Power	0.3 W
Size	6.1 cm dia x 13 cm H / 2.4 in dia x 5.2 in H

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

15.2 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 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.



To Remove For Wiring:

Remove the white locking clip by pulling up gently on the bottom clip part (see * in diagram above) 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 detailed instructions, refer to the *Manual Shutoff Switch Datasheet*.

Voltage Rating	1100 VAC, 24 VDC
Current Rating	10A (AC/DC)
Button Size	40 mm (1.57 in) diameter
Mode of Operation	1 NC contact, SPST-NC
Switch Function	ON-OFF
Features	Push-Lock, Turn-Reset

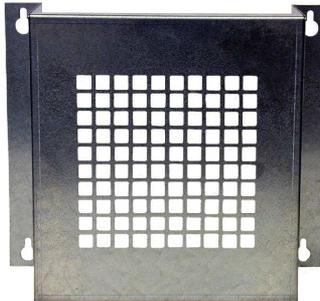
15.3 Enclosure Door Lock and Keys (Option -DL)

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.



15.4 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 (1/2") 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.



NOTE: The metal guard will not fit over an FCS that has a Manual Shutoff Switch installed.

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" W x 9.5" H x 4.8" D)

15.5 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.**



16 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.

17 TROUBLESHOOTING

FCS won't power up.

Is the power properly connected? Check the connections. Refer to Section 6.6 *Wiring Power Supply Connections* in the *FCS Installation Manual* for more information.

Number won't change when using the numeric key pad.

Press the C to clear the current value, or use 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 8.5 *Set Number of 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.

NOTE: If you know that the power to the system is without issue, the 2 minute countdown upon start-up may be sped up. When you see ‘Waiting for stable power’, press the Rest/Restart button on the circuit board on the inside of the door for approximately 15 seconds, then let go. The device will turn off /on and after 10 seconds will start the regular warm-up process.

Touch response of the screen is not working as well as it used to.

Recalibrate the display. Refer to Section 7.10 *Recalibrating the Display for Improved Response*.

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