TELEDYNE
GAS AND FLAME DETECTION

User Guide

MERIDIAN

UNIVERSAL GAS DETECTOR

STOP

WARNING: ALL INDIVIDUALS WHO, HAVE OR WILL HAVE, RESPONSIBILITY FOR USING, MAINTAINING, OR SERVICING THIS PRODUCT, MUST READ THIS ENTIRE MANUAL CAREFULLY. FAILURE TO USE THIS EQUIPMENT PROPERLY COULD RESULT IN SERIOUS INJURY OR DEATH.

087-0049, Rev. G.1 / January 2024

Revision History

Rev. No.	Rev. Date	Reason
A	—	Initial Release
B		Updated CSA approvals, added information for Tech Support in Houston; added or clarified several other notes and specifications.
C		Numerous updates to configuration, maintenance, specification and sensor chapters to support 8 new combustible IR part numbers and cat-bead k-factors. FW updated to 1.12; expanded maintenance & troubleshooting sections.
D		Numerous updates in conjunction with FW update to 1.14. Wiring diagrams updated for clarity, added pipe-mounting brackets. Sensor bias module and related notes and warnings modified. Added PN for INMETRO product variations.
E		Numerous updates in conjunction with FW update to 1.14. Wiring diagrams updated for clarity, added pipe-mounting brackets. Sensor bias module and related notes and warnings modified. Added PN for INMETRO product variations.
F	April 2018	Removed all TYCO branding; corrected mislabeled figures in various sections.
G	May. 2020	Removed all 3M/Scott Safety branding; reformatted entire document; updated certifications.
G.1	January 2024	Updated USA address

Related Product Documentation

Document Title	Document No.	Purpose
Meridian Communication Guide	087-0050	Provides information on the various Optional Communication Expansion Cards (CEC) PCBs.
Cross Sensitivity Table Reference	062-0064	Provides cross sensitivity information for Meridian electrochemical sensors to other common gases.
Sensor Data Sheet Reference	099-0083	Provides detailed sensor specifications for each of the Meridian sensors.
WiredHART® Communications Guide	099-0014	Provides detailed information about theWiredHART® communications system.

This page is intentionally left blank.

LEGAL STATEMENT

Teledyne Gas and Flame Technologies, the Teledyne Gas and Flame Technologies logo, the Teledyne rhomboid, and Meridian are registered and/or unregistered marks of Teledyne Gas and Flame Technologies, also referred to as "the Company."

The Company reserves the right to revise this documentation and to make changes in content from time to time without obligation on the part of the Company to provide notification of such revision or change.

The Company provides this documentation without warranty, term, or condition of any kind, either implied or expressed, including, but not limited to, the implied warranties, terms or conditions of merchantability, satisfactory quality, and fitness for a particular purpose. The Company may make improvements or changes in the product(s) described in this documentation at any time.

While every effort has been made to ensure accuracy in this guide, no responsibility can be accepted for errors or omissions. This publication is not intended to form the basis of a contract, and the Company reserves the right to amend the design, content, and specifications of the detector without notice.

Microsoft, Windows, Windows 2000, Windows Me, Windows XP, Windows NT, Windows Vista, Windows 7, Internet Explorer and MS-DOS are either trademarks or registered trademarks of Microsoft Corporation in the United States and other countries. Solaris and JAVA are either trademarks or registered trademarks of Sun Microsystems, Inc. All other products or service names are the property of their respective owners.

The international transport of this device is regulated under United States export regulations and may be regulated by the import regulations of other countries.

This page is intentionally left blank.

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

List of Figures

List of Figures (Continued)

List of Tables

List of Tables (Continued)

List of Tables (Continued)

This page is intentionally left blank.

1. About This Guide

This guide instructs gas detection personnel on the features and usage of the Meridian Universal Gas Detector (also referred to as "the device"). It also provides information on configuration, operation, maintenance, specifications and trouble shooting. This user guide assumes the reader has a basic knowledge of gas detection procedures.

1.1. Guide Conventions

The following visual elements are used throughout this guide:

WARNING: THIS ICON AND TEXT INDICATE A POTENTIALLY HAZARDOUS SITUATION, WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR INJURY.

CAUTION: This icon and text indicate an action or situation, which, if not avoided, could result in damage to the equipment.

NOTE: This icon and text designates information of special note to the operator.

1.2. Certifications and Approvals

Table 1-1: Certifications and Approvals - Aluminum Transmitter through Table 1-4: Certifications and Approvals - Stainless Steel Junction Box show the items have been tested and comply with the following directives, standards, or standardized documents for the applicable transmitter and junction box model numbers.

Transmitter and junction box special conditions for safe use include the following:

- Only use Meridian 3 or 4-wire transmitter models 096-3522 and 096-3526 with detector head models 96-3484-01 or 096-3484-02.
- Only use Meridian 2-wire transmitter models 096-3521 and 096-3525 with detector head models 96-3484-03 or 096-3484-04.
- Always seal all openings to the transmitter with suitable flame-proof, type 'db' stopping boxes or type 'db' glands with a minimum IP rating of IP66.
- Always seal all openings to the junction box with suitable glands with a minimum IP rating of IP66.
- Always bond the transmitter and junction box to ground both internally and externally with suitably sized con-ductors (IEC/EN 60079-0, cl. 15.3).
- Only use the 2-wire system with a single electrochemical sensor and always install it in accordance with con-trol drawing 096-3507-B.
- Use the 3 or 4-wire system with one, two, or three sensors and always install it in accordance with control drawing 096-3506-B.
- Specify connection wire in accordance with the following conditions:
  - For transmitter installations Ta < 60°C, use field use 105ºC minimum.
  - For transmitter installations Ta > 60°C, use field wire 120ºC minimum.
  - For input power and relays, use field wire 18AWG (1.0mm² minimum).
  - For communications, use field wire 24AWG (0.2mm² minimum).
- Regularly clean the equipment to remove dust accumulations on the surface in excess of 5mm.
- ATEX traceability to date manufactured is displayed on the product nameplate in MM/YYYY format.

Table 1-1: Certifications and Approvals - Aluminum Transmitter

Mark	
TRAC13ATEX0049X II 2(1) G Ex d [ia Ga] IIC T4 Gb II 2(1) D Ex tb [ia Da] III C T85° C Db -40°C < Ta < +75°C IP66 Transmitter and Junction Box IP64 Detector Head *See Special Conditions for Safe Use	EN 60079-0 :2012+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X IECEx MSC14.0021X Ex d [ia Ga] IIC T4 Gb Ex tb [ia Da] III C T85° C Db -40°C < Ta < +75°C IP66 Transmitter and Junction Box IP64 Detector Head *See Special Conditions for Safe Use	IEC 60079-0 :2011 IEC 60079-26 :2006 IEC 60079-1 :2007-4 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2011 IEC 60079-31 :2008
See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 CAN/CSA-C22.2 No. 152

Table 1-1: Certifications and Approvals - Aluminum Transmitter (Continued)

Mark	
	FM 3600 FM 3615 UL 913 FM 6310/6320 ANSI/ISA-12.13.01
See 096-3506-B and 096-3507-B	
	EMC
Industry Canada	EMC
	EMC Directive ATEX Directive
	IEC 61508 Series

Table 1-2: Certifications and Approvals - Stainless Steel Transmitter

Mark	
 TRAC13ATEX0049X I M2(M1) Ex d [ia Ma] I Mb II 2(1) G Ex d [ia Ga] IIC T4 Gb II 2(1) D Ex td [ia Da] IIIC T85° C Db -40°C < Ta < +75°C IP66 Transmitter and Junction Box IP64 Detector Head *See Special Conditions for Safe Use	EN 60079-0 :2012+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X IECEx MSC14.0021X Ex d [ia Ma] I Mb Ex d [ia Ga] IIC T4 Gb Ex td [ia Da] IIIC T85° C Db -40°C < Ta < +75°C IP66 Transmitter and Junction Box IP64 Detector Head *See Special Conditions for Safe Use	IEC 60079-0 :2011 IEC 60079-26 IEC 60079-1 :2007-04 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2011 IEC 60079-31 :2008
 See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 CAN/CSA-C22.2 No. 152

Table 1-2: Certifications and Approvals - Stainless Steel Transmitter (Continued)

Mark	
 See 096-3506-B and 096-3507-B	FM 3600 FM 3615 UL 913 FM 6310/6320 ANSI/ISA-12.13.01
	EMC
Industry Canada	EMC
	EMC Directive ATEX Directive
	IEC 61508 Series

Table 1-3: Certifications and Approvals - Aluminum Junction Box

Mark	
 TRAC13ATEX0049X II 2 G Ex ia IIC T4 Ga II 2 D Ex ia IIIC T80°C Da -40°C < Ta < +75°C IP64 *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X IECEx MSC14.0021X Ex ia IIC T4 Ga Ex ia IIIC T80°C Da -40°C < Ta < +75°C IP64 *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
 See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 UL 913
	EMC Directive ATEX Directive

Table 1-4: Certifications and Approvals - Stainless Steel Junction Box

Mark	
 TRAC13ATEX0049X I M2 Ex ia I Ma II 2 G Ex ia IIC T4 Ga II 2 D Ex ia IIIC T80°C Da -40°C < Ta < +75°C IP64 *See Special Conditions for Safe Use	EN 60079-0 :2012+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X IECEx MSC14.0021X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T80°C Da -40°C < Ta < +75°C IP64 *See Special Conditions for Safe Use	IEC 60079-0 :2011 IEC 60079-26 :2006 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :20121 IEC 60079-31 :2008
CE	ATEX Directive 2014/34/EU EMC Directive (2004/108/EC)

Table 1-4: Certifications and Approvals - Stainless Steel Junction Box (Continued)

Mark	
C US See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 UL 913

Table 1-5: Certifications and Approvals - 3-4 Wire Detector Head and Table 1-6: Certifications and Approvals - 2 Wire Detector Head show the items have been tested and comply with the following directives, standards, or standardized documents for the applicable detector head with sensors model numbers.

Detector head with sensors special conditions for safe use include the following:

- Only use Meridian detector head models 096-3484-01 and 096-3484-02 with Meridian 3 or 4-wire Transmitter Models 096-3522 or 096-3526.
- Only use Meridian detector head models 096-3484-03 and 096-3484-04 with meridian 2-wire transmitter models 096-3521 or 096-3525.
- Only use the 2-wire system with a single Electrochemical sensor and must installed in accordance with control drawing 096-3507-B.
- Use the 3 or 4-wire system with one, two, or three sensors, and always install it in accordance with control drawing 096-3506-B.
- Keep the detector head end cap (PN 096-3437-1 or 096-3437-2) installed and securely fastened during normal operations.
- Only install or remove sensors when the area is clean and dry.
- Only use the sensor simulator temporarily and only under direct supervisions with the following conditions:
  - Use only in clean, dry environments
  - Always protect from impact
- Regularly clean the equipment to remove dust accumulations on the surface in excess of 5mm.
- ATEX traceability to date manufactured is displayed on the product nameplate in MM/YYYY format.

Table 1-5: Certifications and Approvals: 3 or 4-Wire Detector Head

Model No. with Sensor 096-3484-01 & 096-3484-02	Specific Directives, Standards
 TRAC13ATEX0049X I M2 Ex d ia I Mb II 2 G Ex d ia IIC T4 Gb II 2 D Ex ia IIIC T185°C Db -40°C < Ta < +75°C IP64 For Integral Connection to Transmitter. Any Meridian Sensor Installed. *See Special Conditions for Safe Use	EN 60079-0 :20122+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X IECEx MSC14.0021X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T185°C Db -40°C < Ta < +75°C IP64 For Integral Connection to Transmitter. Any Meridian Sensor Installed. *See Special Conditions for Safe Use	IEC 60079-0 :2011 IEC 60079-26 :2006 IEC 60079-1 :2007-04 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2011 IEC 60079-31 :2008

Table 1-5: Certifications and Approvals: 3 or 4-Wire Detector Head (Continued)

Model No. with Sensor 096-3484-01 & 096-3484-02	Specific Directives, Standards
 See 096-3506-B and 096-3507-B For Integral Connection to Transmitter. Any Meridian Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 UL 913
 TRAX13ATEX0049X I M1 Ex ia I Ma II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T185°C Da -40°C < Ta < +75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. Without IR Type Sensor Installed. *See Special Conditions for Safe Use	EN 60079-0 :2012+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010

Table 1-5: Certifications and Approvals: 3 or 4-Wire Detector Head (Continued)

Model No. with Sensor 096-3484-01 & 096-3484-02	Specific Directives, Standards
TRAC13ATEX0049X I M1 Ex ia I Ma II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T185°C Da -40°C < Ta < +75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. Without IR Type Sensor Installed. *See Special Conditions for Safe Use	EN 60079-0 :2012+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
C US See 096-3506-B and 096-3507-B For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. Without IR Type Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 UL 913

Table 1-5: Certifications and Approvals: 3 or 4-Wire Detector Head (Continued)

Model No. with Sensor 096-3484-01 & 096-3484-02	Specific Directives, Standards
IECEx TRC 13.0017X IECEx MSC14.0021X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T110°C Db -40°C < Ta < +75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. With IR Type Sensor Installed. *See Special Conditions for Safe Use	IEC 60079-0 :2011 IEC 60079-26 :2006 IEC 60079-1 :2007-04 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2011 IEC 60079-31 :2008
IECEx TRC 13.0017X IECEx MSC14.0021X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T110°C Db -40°C < Ta < +75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. With IR Type Sensor Installed. *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009

Table 1-5: Certifications and Approvals: 3 or 4-Wire Detector Head (Continued)

Model No. with Sensor 096-3484-01 & 096-3484-02	Specific Directives, Standards
C US See 096-3506-B and 096-3507-B For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. With IR Type Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 UL 913
FC	EMC
Industry Canada	EMC
CE	EMC Directive ATEX Directive

Table 1-6: Certifications and Approvals: 2-Wire Detector Head

Model No. with Sensor 096-3484-03 & 096-3484-04	Specific Directives, Standards
 TRAC13ATEX0049X I M2 Ex d ia I Mb II 2 G Ex d ia IIC T4 Gb II 2 D Ex ia IIIC T80°C Db -40°C < Ta < +75°C IP64 For Integral Connection to Transmitter. *See Special Conditions for Safe Use	EN 60079-0 :2012+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X IECEx MSC14.0021X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T80°C Db -40°C < Ta < +75°C IP64 For Integral Connection to Transmitter. *See Special Conditions for Safe Use	IEC 60079-0 :2011 IEC 60079-26 :2006 IEC 60079-1 :2007-04 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2011 IEC 60079-31 :2008

Table 1-6: Certifications and Approvals: 2-Wire Detector Head (Continued)

Model No. with Sensor 096-3484-03 & 096-3484-04	Specific Directives, Standards
C US See 096-3506-B and 096-3507-B For Integral Connection to Transmitter. Any Meridian Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 UL 913
Ex TRAC13ATEX0049X I M1 Ex ia I Ma II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T80°C Da -40°C < Ta < +75°C IP64 For Remote Connection. *See Special Conditions for Safe Use	EN 60079-0 :2012+A11:2013 EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270: 2015 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010

Table 1-6: Certifications and Approvals: 2-Wire Detector Head (Continued)

Model No. with Sensor 096-3484-03 & 096-3484-04	Specific Directives, Standards
IECEx TRC 13.0017X IECEx MSC14.0021X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T80°C Da -40°C < Ta < +75°C IP64 For Remote Connection. *See Special Conditions for Safe Use	IEC 60079-0 :2011 IEC 60079-26 :2006 IEC 60079-1 :2007-04 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2011 IEC 60079-31 :2008
 See 096-3506-B and 096-3507-B For Remote Connection.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 UL 913
	EMC Directive ATEX Directive
	EMC
Industry Canada	EMC

Table 1-7: Certifications and Approvals - E-Chem Sensors through Table 1-9: Certifications and Approvals - IR Sensors show the items have been tested and comply with the following directives, standards, or standardized documents for the applicable sensor model numbers.

Table 1-7: Certifications and Approvals - E-Chem Sensors

Model No. 096-3473-01 to 096-3473-54	Specific Directives, Standards
 TRAC13ATEX0049X IECEx TRC 13.0017X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T80° C Da	IEC/EN 60079-0 :2012 IEC/EN 60079-26 :2007 EN 50104 :2010 IEC/EN 60079-26 EN 55011 :2009 +A1 :2010 IEC/EN 60079-1 :2007 IEC/EN 60079-29-1 :2007 EN 50270: 2015 IEC/EN 61010-1 :2010 IEC/EN 60079-11 :2012 IEC/EN 60079-31 :2009 EN 50271 :2010
	EMC
Industry Canada	EMC

Table 1-8: Certifications and Approvals - Cat-Bead Sensors

Model No. 096-3473-55	Specific Directives, Standards
 TRAC13ATEX0049X IECEx TRC 13.0017X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T185° C Da	IEC/EN 60079-0 :2012 IEC/EN 60079-26 :2007 IEC/EN 60079-26 IEC/EN 60079-1 :2007 IEC/EN 60079-29-1 :2007 IEC/EN 61010-1 :2010 IEC/EN 60079-11 :2012 IEC/EN 60079-31 :2009
	EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 50270 EN 50271 :2010
	EMC
Industry Canada	EMC

Table 1-9: Certifications and Approvals - IR Sensors

Model No. 096-3473-56 & 096-3473-58	Specific Directives, Standards
 TRAC13ATEX0049X IECEx TRC 13.0017X Ex ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T110°C Db	IEC/EN 60079-0 :2012 IEC/EN 60079-26 :2007 IEC/EN 60079-26 IEC/EN 60079-1 :2007 IEC/EN 60079-29-1 :2007 IEC/EN 61010-1 :2010 IEC/EN 60079-11 :2012 IEC/EN 60079-31 :2009

Table 1-9: Certifications and Approvals - IR Sensors (Continued)

Model No. 096-3473-56 & 096-3473-58	Specific Directives, Standards
	EN 50104 :2010 EN 55011 :2009 +A1 :2010 EN 50270: 2015 EN 50271 :2010
FC	EMC
Industry Canada	EMC

Table 1-10: Certifications and Approvals

All Models
Certificate #NCC 14.3110X

1.3. General Safety Information

WARNING: READ, UNDERSTAND AND FOLLOW THE ENTIRE CONTENT OF THIS GUIDE PRIOR TO USE. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING: ALL INDIVIDUALS WHO HAVE OR WILL HAVE RESPONSIBILITY FOR USING OR TESTING THIS PRODUCT MUST READ AND UNDERSTAND THE CONTENTS OF THIS MANUAL. THE PRODUCT WILL PERFORM AS DESIGNED ONLY IF USED AND TESTED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. FAILURE TO FOLLOW MANUFACTURER'S INSTRUCTIONS WILL RENDER THE WARRANTY AND APPROVALS NULL AND VOID. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY ALSO RESULT IN SERIOUS INJURY OR DEATH

The Company takes no responsibility for use of its equipment if it is not used in accordance with the instructions. If further operational or maintenance details are required but not provided in this guide, contact the Company or their agent. The Company shall not be liable for any incidental or consequential damages in connection with any modifications, errors, or omissions in this guide.

Observed all pertinent regional and local safety regulations when installing and using this product. For reasons of safety, and to assure compliance with documented system data, only the manufacturer may perform repairs to components.

Additionally, industry standards, codes, and legislation are subject to change. Users must obtain updated copies to ensure the most recently issued regulations, standards and guidelines are available.

Observed all pertinent regional and local safety regulations when handling and disposing of hazardous material, Toxic (E-Chem) Sensors, batteries, and other similar items that may fall under the classification of hazardous material.

1.4. Warnings and Cautions – Device Use and Care

WARNING: ONLY QUALIFIED PERSONNEL — AS DEFINED ACCORDING TO LOCAL, COUNTY, STATE, FEDERAL AND INDIVIDUAL COMPANY STANDARDS — MAY OPERATE AND SERVICE THIS EQUIPMENT. READ AND UNDERSTAND THE GUIDE COMPLETELY BEFORE OPERATING OR SERVICING.

WARNING: WHEN IN DOUBT VACATE THE AREA IMMEDIATELY. YOU SHOULD VACATE THE AREA IMMEDIATELY SHOULD THE DEVICE INDICATE A WARNING OR ALARM CONDITION. YOU SHOULD KNOW, UNDERSTAND AND FOLLOW YOUR COMPANY'S SAFETY PROTOCOLS.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING ANY OF THE PROCEDURES. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: THE DEVICE ONLY DETECTS GASES WHILE POWERED. FAILURE TO HEED THIS WARNING COULD RESULT IN INJURY OR DEATH.

WARNING: WHEN THE PRIMARY DEVICE IS OFF LINE, ENSURE YOU HAVE ANOTHER ONLINE DEVICE TO ACTIVELY DETECT GASES. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: IF THE DEVICE DOES NOT FUNCTION AS DESCRIBED HEREIN, REMOVE FROM SERVICE AND MARK FOR MAINTENANCE. ONLY USE TELEDYNE GAS AND FLAME DETECTION REPLACEMENT PARTS WHERE APPLICABLE.

WARNING: ONLY USE THE DEVICE IN ATMOSPHERES FOR WHICH IT IS INTENDED. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: VERIFY THE COVER, INTERNAL PCBS AND FIELD WIRING ARE SECURELY IN PLACE BEFORE APPLYING POWER AND OPERATION. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: DO NOT USE THE DEVICE IF ITS ENCLOSURE IS DAMAGED, CRACKED, OR HAS MISSING COMPONENTS. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

CAUTION: Do not expose the device to continuous, severe mechanical or electrical shock. Doing so could seriously damage the device.

CAUTION: Protect the device from dripping liquids and high power sprays. Failure to do so could seriously damage the device.

CAUTION: Do not expose the device to continuous, severe mechanical or electrical shock. Doing so could seriously damage the device.

CAUTION: Use only a sensor assembly compatible with the device and approved by the Company.

CAUTION: Periodically verify alarm operation by exposing the device to a gas concentration above the high alarm set point.

CAUTION: Periodically calibrate, taking into account device use and environmental conditions. Calibrate with known target gas at start-up, and check on a regular schedule. Always re-calibrate after exposure to high concentrations of toxic or combustible gases or vapors.

1.5. Warnings and Cautions – Sensor Use and Care

WARNING: EXTENDED EXPOSURE OF THE DEVICE TO HIGH CONCENTRATIONS OF TOXIC GASES MAY RESULT IN DEGRADED SENSOR PERFORMANCE. IF AN ALARM OCCURS DUE TO HIGH CONCENTRATION OF TOXIC GASES, EXIT TO A SAFE AREA AND BUMP TEST OR RECALIBRATE AS NECESSARY.

CAUTION: Be aware of poisoned combustible sensors. The operation of catalytic type combustible gas sensors may be seriously affected by silicones, free halogens, halogenated hydrocarbons and metallic oxides present in the ambient air being monitored. If the presence of any of these substances is suspected, increased frequency of calibration verification is recommended.

CAUTION: Exposure to sulfur compounds, halogens, silicone or lead containing compounds, or phosphorus containing compounds can adversely affect the sensitivity of the combustible gas sensor. Avoid exposure to these substances. Should you suspect that the device has been exposed to such substances, perform a gas test to verify its accuracy and proper calibration.

This page is intentionally left blank.

2. Quick Reference

WARNING: THIS QUICK REFERENCE GUIDE DOES NOT SERVE AS A SUBSTITUTE FOR THE USER GUIDE. ALL INDIVIDUALS WHO HAVE, OR WILL HAVE, THE RESPONSIBILITY OF USING OR SERVICING THE DEVICE MUST READ AND UNDERSTAND THE ENTIRE CONTENTS OF THE USER GUIDE PRIOR TO OPERATION. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

Table 2-1: Quick Reference Guide

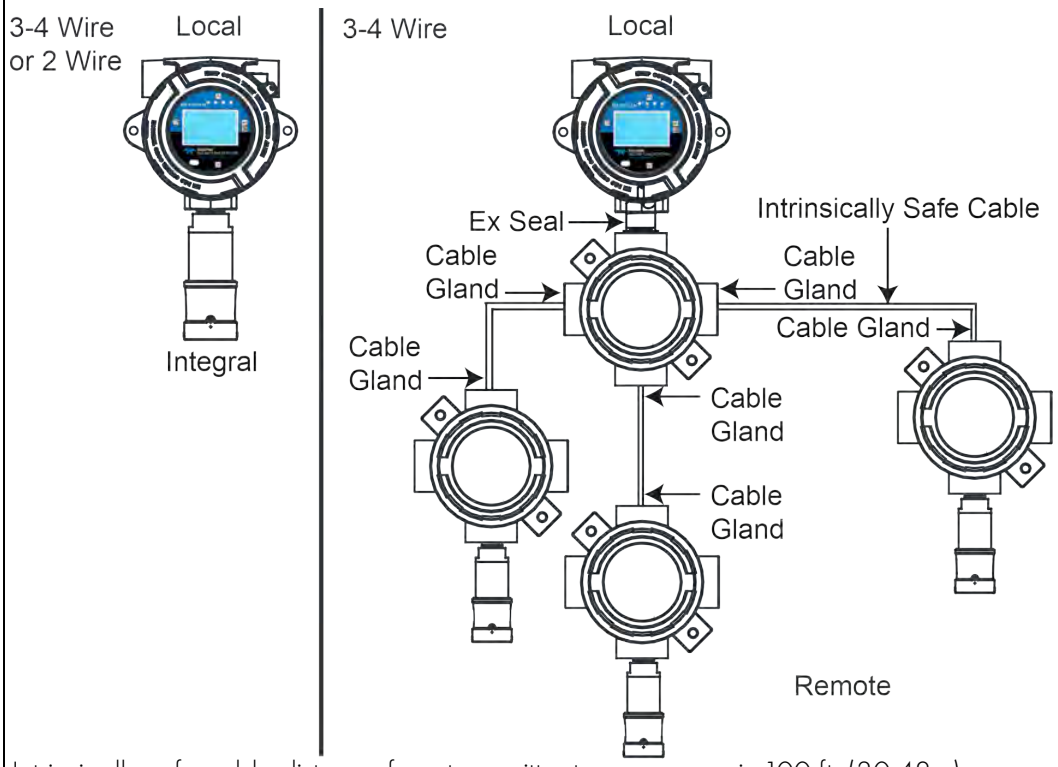
Item	Object
Typical Configurations (Remote)	 Intrinsically safe cable distance from transmitter to any sensor is 100 ft. (30.48m) max. Reference control drawings: 096-3506-B for 3-4 wire and 096-3507-B for 2-wire.

Table 2-1: Quick Reference Guide

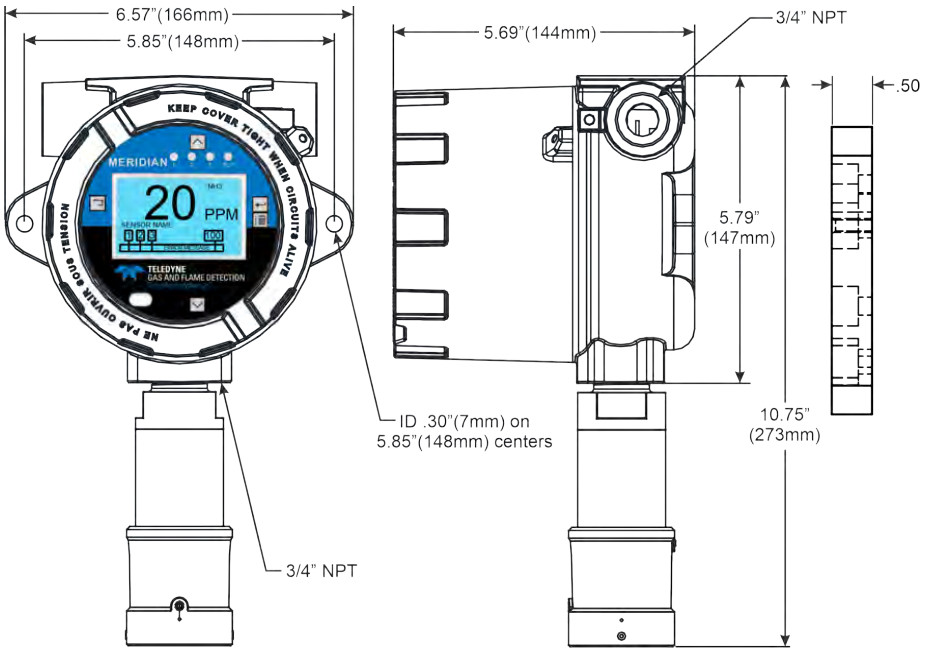
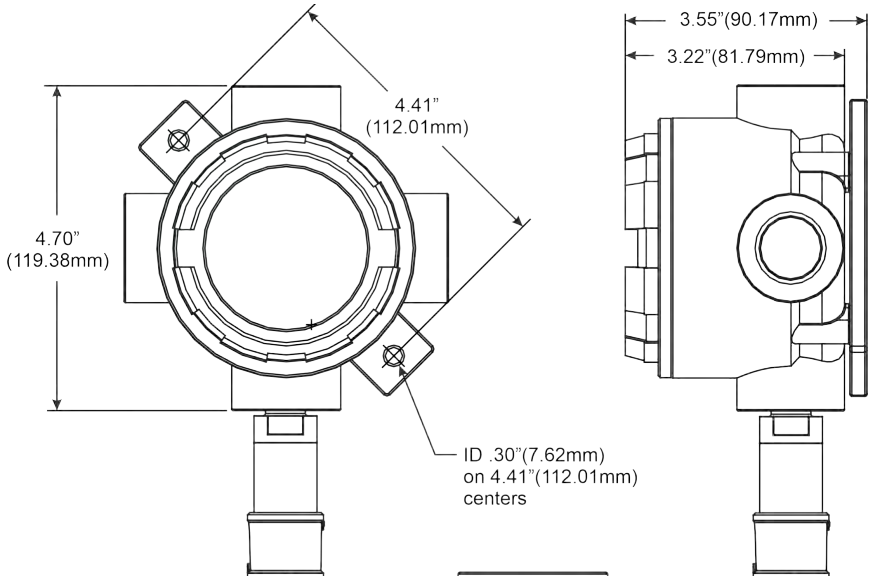
Item	Object
Mounting – Aluminum Device (Local)	
Mounting – Meridian J-Box Assembly (Al)	

Table 2-1: Quick Reference Guide

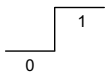
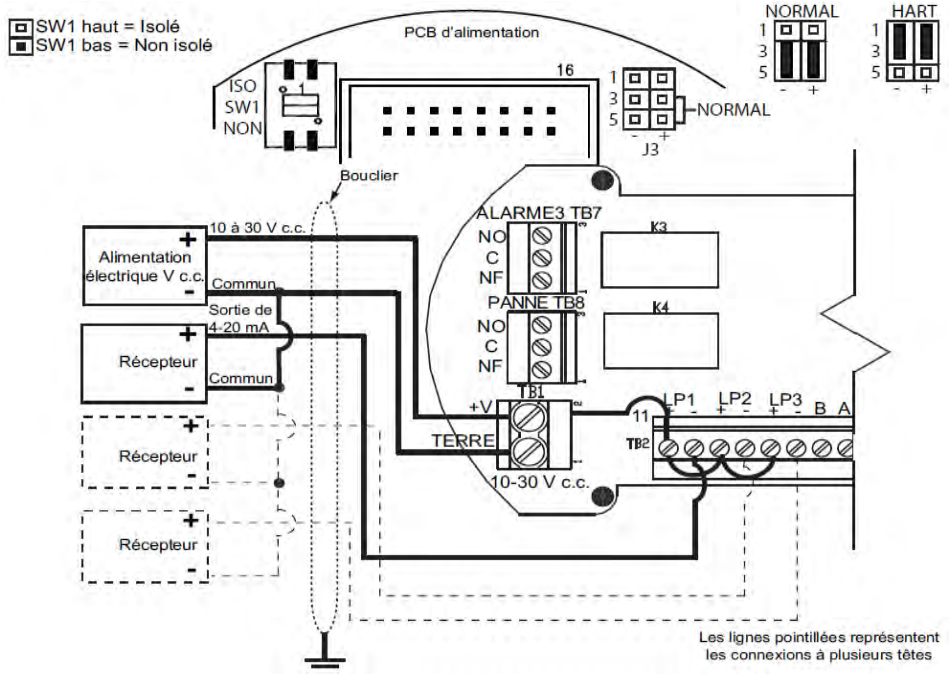
Item	Object
Typical Wiring – 3 Wire Sourcing  	This is an example. Other wiring configurations are possible and vary based on each application. 

Table 2-1: Quick Reference Guide

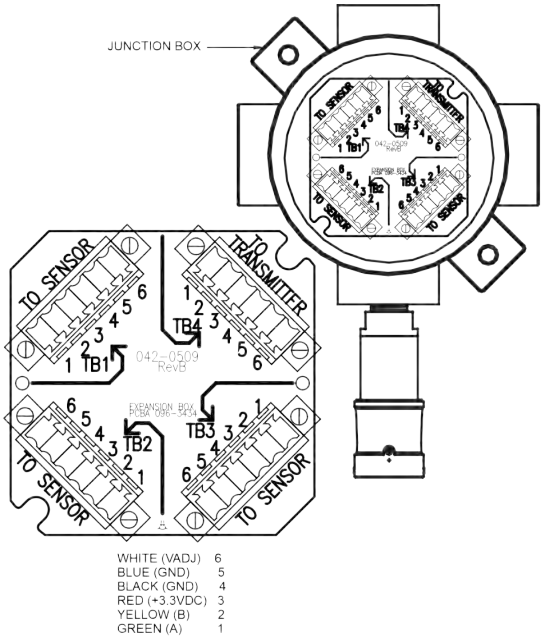
Item	Object
Wiring – Meridian J-Box Assembly	Light blue terminal blocks indicate intrinsically safe circuits. Tighten plug retention screws.  Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum. Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

Table 2-1: Quick Reference Guide

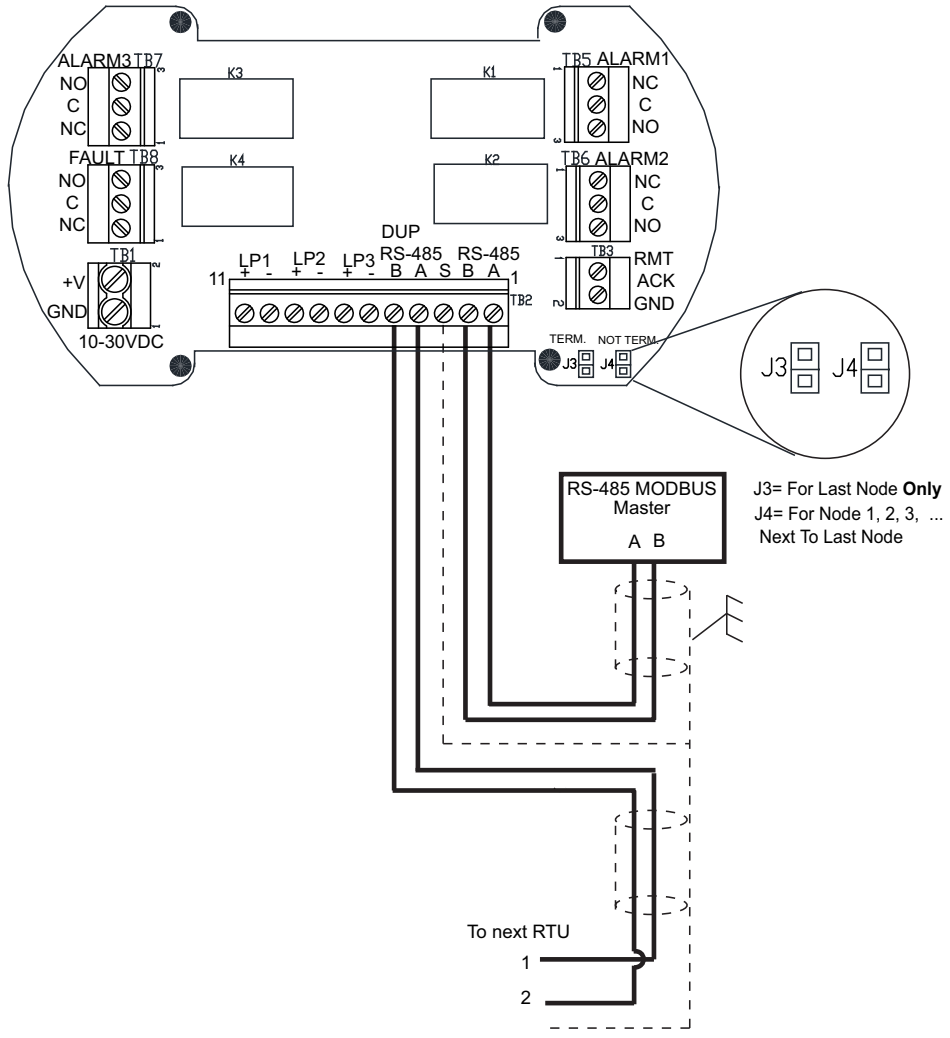
Item	Object
Wiring – MODBUS	

Table 2-1: Quick Reference Guide

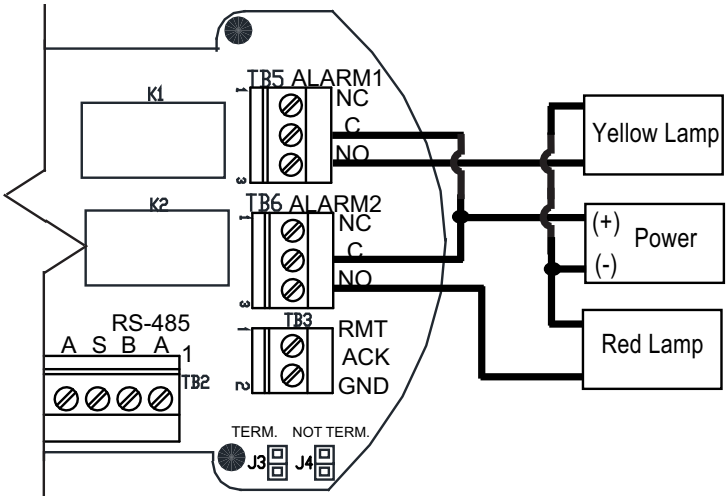
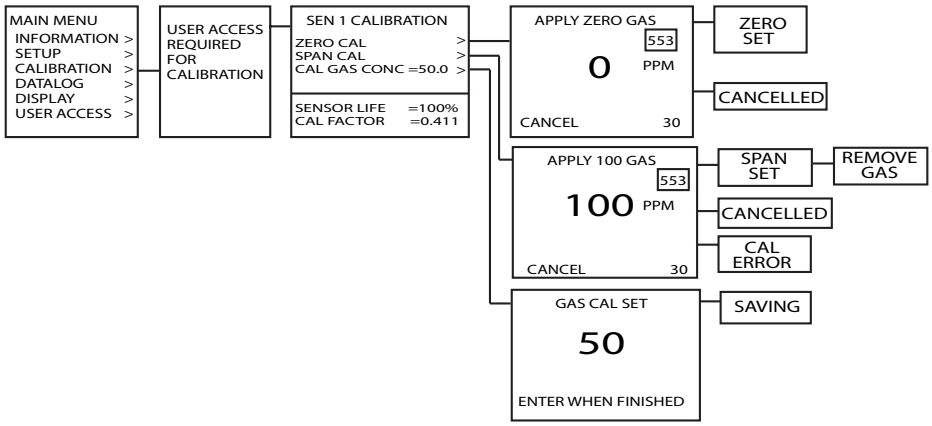
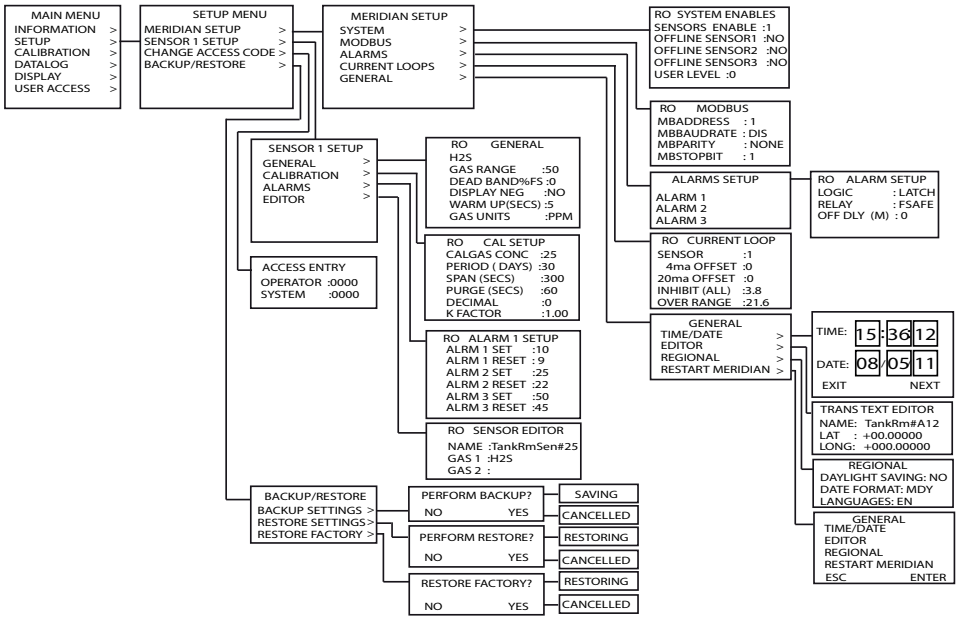
Item	Object
Wiring – Alarm/ Relay	
Calibration – Zero/ Span	Access main menu to configure via LCD. To access calibration requires a user-level password. The default password is 0000. 

Table 2-1: Quick Reference Guide

Item	Object
Setup – Alarm/Relay	Access main menu to configure via LCD. RO on LCD indicates a password is required. To access setup requires a user-level password. The default password is 0000.



This page is intentionally left blank.

3. Introduction

3.1. Device Overview

The Meridian Universal Gas Detector (also referred to as "the device") is a fixed-point detector designed to provide continuous monitoring of combustible gases (range = 0 to 100% LEL) and toxic gases (range varies based on sensor type).

The device receives inputs from up to three (3) Meridian detector bodies and transmits the output to a remote monitoring system. The Meridian detector bodies can be used for these applications based on the installed sensor:

- To detect toxic gases in ambient atmospheres, the device accepts electrochemical (E-Chem) sensors. Traditional, as well as Rock Solid, sensors are available.
- To detect hydrocarbon combustibles in ambient atmospheres, the device accepts either catalytic bead (Cat-bead) or miniaturized infrared (IR) sensors. Miniaturized IR sensors are also used to detect carbon dioxide (see Appendix A. Specifications).

NOTE: Except where noted, the type of sensor installed does not affect the functionality of the device.

Standard device features include:

- Selectable Sensor Ranges – Multiple ranges available to match your application needs.
- An LCD – Provides quick, easy user interface (UI) to menus. The LCD may be installed in multiple orientations using its pluggable design and is also visible in bright sunlight. An optional heated LCD is available for cold conditions.
- Four (4) Alarm LEDs (ALM1, ALM2, ALM3 and FAULT) – For field equipment alarm levels.
- Truly Universal – Accepts all sensor types and retains approvals regardless of which sensor is installed.
- Non-Volatile Memory (NV-EEPROM) – Retains all configuration parameters of the device in the event of a power interruption or loss.
- Equipped with MODBUS RTU (RS-485) Communications capabilities – Supports up to 247 addressed remote terminal units (RTUs). Up to 32 RTUs per loop.
- Automatic Calibration – Count down timer ensures sensor zero and span calibration for better detection and safety of personnel and property.
- Multiple Navigation Keys – Enables device configuration, calibration and fault analysis without opening the enclosure.

- Four (4) discrete relays and a remote reset connection. The four (4) discrete relays can be wired to notification alarm equipment (such as lights, and audible).
- Real Time Clock (RTC) and Calendar – Provides time stamp capability, allowing data logging of calibrations and alarm events for recall to the LCD or over the MODBUS RTU (RS-485) serial port.
- Plug-N-Play Intelligent Sensors – Automatically displays sensor gas types and technologies on LCD. Effortlessly hot-swappable to reduce downtime and equipped with microprocessor.
- Modular Design – Allows easy installation of up to three (3) sensor heads, configurable within permitted combinations for local and remote locations using 3 or 4-wire PCB.
- Housings – Two (2) available options:
  - Aluminum
  - Stainless Steel
- Optional Communications – Supports a variety of communication protocols via PCBs to meet your communications needs.

The device ships pre-configured using the factory default settings. You may, however, want to reconfigure some of the parameters based upon your application (see Section 5.3. Configuration Defaults).

NOTE: Factory-calibrated sensors ship with the device. Spare sensors, however, require calibration prior to use.

WARNING: ALWAYS PERFORM PERIODIC CALIBRATION CHECKS TO ASSURE DEPENDABLE PERFORMANCE. OPERATING A DEVICE THAT HAS EXCEEDED ITS CALIBRATION DATE CAN CAUSE FALSE READINGS OF DETECTED GASES, WHICH COULD LEAD TO INJURY OR DEATH.

Other accessories are available to aid in using the device. These include, but are not limited to:

- Meridian Junction Box Assembly – Allows mounting the sensor at remote locations for better detection since some gases rise and some sink.
- Duct Mount Adapter – Allows the monitoring of airflow in exhaust or ventilation ducts.
- Calibration Adapter – Allows direct calibration flow to the sensor face without dilution from environmental interferences such as wind.
- Sensor Simulator – Allows easy troubling shooting, acceptance testing (SAT), and commissioning. Simulator is for temporary use only.

For a complete list of accessories, see Appendix D. Parts List.

For all questions about the device or its operation, contact the Company (see Appendix E. Technical Support).

Figure 3-1: Major Parts of the Monitor shows the major parts of the monitor.

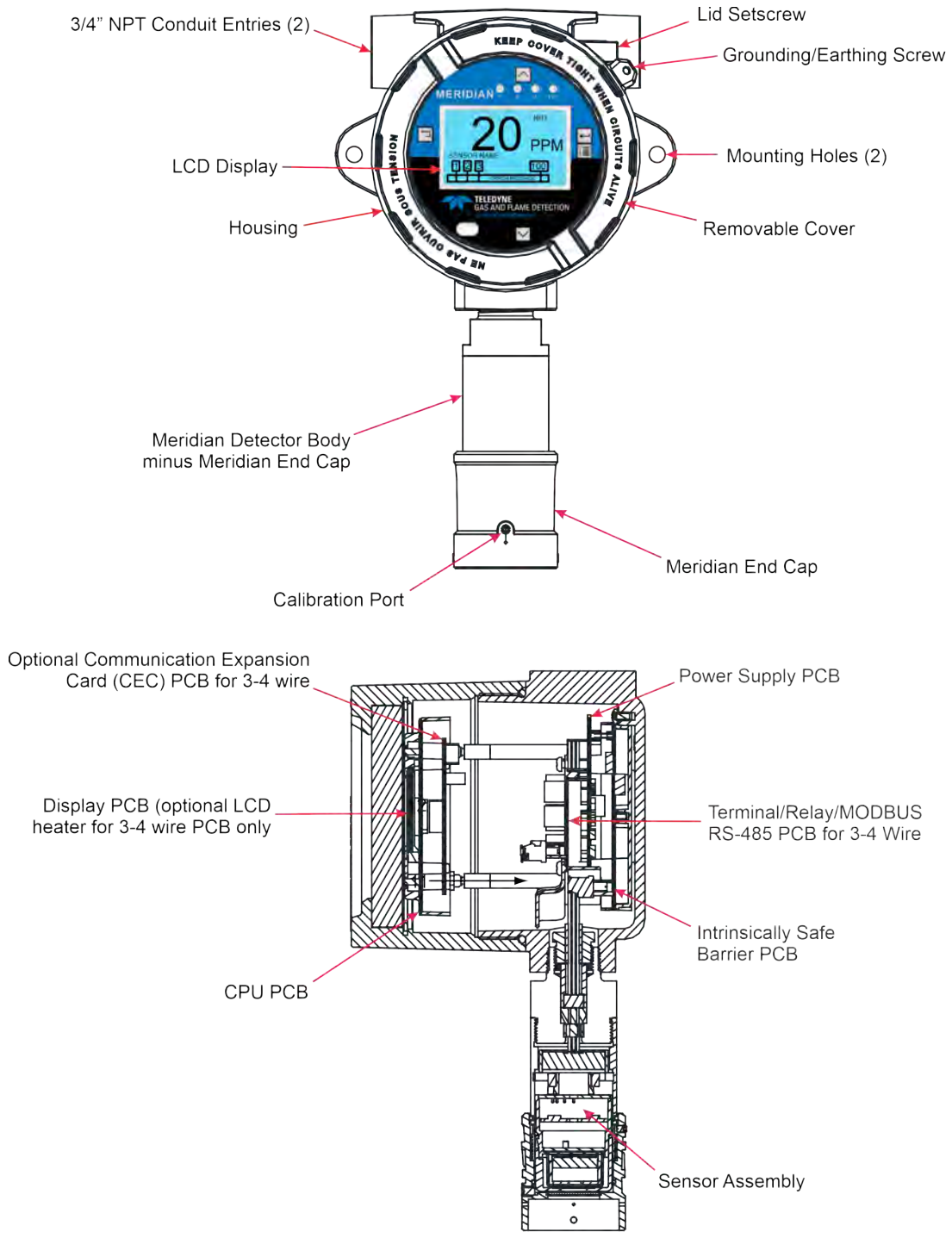


Figure 3-1: Major Parts of the Monitor

4. Installation

4.1. Planning for Installation

4.1.1 Verify Items Shipped

Ensure you have all items. If any are missing, see Appendix E. Technical Support.

- Device
- Magnet Tool
- CD
- Quick Reference User Notes

NOTE: Sensors are packaged separately.

4.1.2 Installation Considerations

NOTE: Each application is unique and needs to be assessed. These are only general guidelines.

Before installing the device, carefully consider the following:

- Orientation – when installing Rock Solid sensors, always mount the sensors pointing downwards, ±15º off the perpendicular.

CAUTION: Never mount the device with the sensor to be pointing upwards. Doing so can result in poor sensor performance.

- Gas Density – some gases rise and some sink depending on their density relative to air. For heavier-than-air gases, install the sensor near the floor. In these applications, take care to protect the sensors from physical damage. For lighter-than-air gases, place the device as high as possible above the potential source of the leak. For gases with densities equal-to-air, mount the device as close to the potential leak source as practical, or as close as possible to breathing level. Table 4-1: Gas Density Relative to Air and CAS No. – Combustibles (LEL) provides various gas densities for combustible gases (LEL) and Table 4-2: Gas Density Relative to Air and CAS No. – Toxic (E-Chem) provides various gas densities for toxic gases (E-Chem).

NOTE: Ensure you consult the CAS registry database (cas.org) for the latest and most current information. These tables are for reference only and not meant to be the most update source of information. The content of these tables were derived from the CAS registry. Additionally, review the applicable MSDS.

NOTE: Remote calibration fittings are available (see Appendix D. Parts List).

Table 4-1: Gas Density Relative to Air and CAS No. – Combustibles (LEL)

Gas	Symbol	CAS No.	Value
Acetone	CH_3COCH_3	67-64-1	2.0
Ammonia	NH_3	7664-41-7	0.6
Benzene	C_6H_6	71-43-2	2.7
1,3-Butadiene	CH_2=CH-CH=CH_2	106-99-0	1.9
Butane	$CH_3(CH_2)_2CH_3$	106-97-8	2.0
Carbon Monoxide	CO	630-08-0	1.0
Cyclohexane	C_6H_{12}	110-82-7	2.9
Ethane	C_2H_6	74-84-0	1.0
Ethanol	C_2H_5OH	64-17-5	1.6
Ethylene	CH_2=CH_2	74-85-1	1.0
Ethylene Oxide	C_2H_4O	75-21-8	1.5
Heptane	C_7H_6	142-82-5	3.5
Hexane	C_6H_{14}	110-54-3	3.0
Hydrogen	H_2	1333-74-0	0.1
Hydrogen Sulfide	H_2S	7783-06-4	1.2
Isobutylene	$CH_3C(CH_2)CH_3$	115-11-7	1.9
Isopropyl Alcohol	$CH_3CH(OH)CH_3$	67-63-0	2.1
Methane	CH_4	74-82-8	0.6
Methanol	CH_3OH	67-56-1	1.1
Methyl Ethyl Ketone	CH_3-CO-C_2H_5	78-93-3	2.5
Methyl Mercaptan	CH_3SH	74-93-1	1.7
Octane	C_8H_{18}	111-65-9	3.9

Table 4-1: Gas Density Relative to Air and CAS No. – Combustibles (LEL) (Continued)

Gas	Symbol	CAS No.	Value
Pentane	C_5H_{12}	109-66-0	
Propane	C_3H_8	74-98-6	1.5
Propylene	$CH_3CH=CH_2$	115-07-1	0.8
Toluene	$C_6H_5CH_3$	108-88-3	3.2
o-Xylene	$C_6H_4(CH_3)_2$	95-47-6	3.7

Note: Vapor densities (Air= 1.0 atmosphere @25°C). Therefore, values <1 raise and values >1 sink.

Table 4-2: Gas Density Relative to Air and CAS No. – Toxic (E-Chem)

Gas	Symbol	CAS No.	Value
Ammonia	NH_3	7664-41-7	0.6
Arsine	AsH_3	7784-42-1	2.7
Boron Trichloride	BCl_3	10294-34-5	6.1
Bromine	Br_2	7726-95-6	5.5
Carbon Dioxide	CO_2	124-38-9	1.5
Carbon Monoxide	CO	630-08-0	1.0
Chlorine	Cl_2	7782-50-5	2.4
Chlorine Dioxide	ClO_2	10049-04-4	2.3
Diborane	B_2H_6	19287-45-7	1.0
Dichlorosilane	SIH_4Cl_2	4109-96-0	3.5
Fluorine	F_2	7782-41-4	1.3
Germane	GeH_4	7782-65-2	2.6
Hydrogen	H_2	1333-74-0	0.1
Hydrogen Chloride	HCl	7647-01-0	1.3
Hydrogen Cyanide	HCN	74-90-8	0.9
Hydrogen Fluoride	HF	7664-39-3	0.7
Hydrogen Selenide	H_2Se	7783-07-5	2.8

Table 4-2: Gas Density Relative to Air and CAS No. – Toxic (E-Chem) (Continued)

Gas	Symbol	CAS No.	Value
Hydrogen Sulfide	H_2S	7783-06-4	1.2
Methanol	CH_3OH	67-56-1	1.1
Methylene Chloride	CH_2Cl_2	75-09-2	2.9
Methyl Iodide	CH_3I	74-88-4	4.9
Nitric Oxide	NO	10102-43-9	1.0
Nitrogen Dioxide	NO_2	10102-44-0	1.6
Nitrogen Trifluoride	NF_3	7783-54-2	2.5
Oxygen	O_2	7782-44-7	1.1
Ozone	O_3	10028-15-6	1.7
Phosphine	PH_3	7803-51-2	1.2
Silane	SiH_4	7803-62-5	1.1
Sulfur Dioxide	SO_2	7446-09-5	2.2

Note: Vapor densities (Air= 1.0 atmosphere @25°C). Therefore, values <1 raise and values >1 sink.

- Potential Gas Sources – the location and nature of potential vapor/gas sources (e.g., pressure, amount, source, temperature, and distance) need to be assessed. Locate the device where air currents are most likely to contain the highest concentration of escaping gas.
- Ambient Temperature – be sure to locate the device within an area that complies with the specified operating temperature range (see Appendix A. Specifications).
- Vibration – mount the device in a manner that minimizes vibration.
- Gas Release Temperature – evaluate the behavior of the gas when it is cooled or heated when released. For example, some heated heavier-than-air gases (e.g. hydrogen sulfide) rise when first released, but settle as they cool and their density increases above that of air.
- Accessibility – consider future maintenance and calibration requirements.
- Ingress and Egress – consider passing traffic areas in regards to personnel, forklifts, motor vehicles, mobile hoists, and the like.
- Water and Condensing Humidity – water inside the infrared optics adversely affects performance. Avoid mounting in locations where water can collect or splash on the sensor head. The Company recommends a deluge guard for outdoor installations.
- Use of the deluge guard will slow response time, but the device will remain compliant with performance certifications and T_{90} response time noted in product specifications.

- Electromagnetic Fields – although the device is designed to be RFI/EMI resistant, mounting the device near power transformers, walkie-talkies, or other strong EM fields may cause undesirable results. Avoid strong EM fields.
- IP ratings do not imply that the equipment will detect gas during and after exposure to those conditions.
- Conduit seals and drain loops – be sure to install explosion proof conduit and other materials required for electrical wiring in hazardous areas in accordance with National Electrical Code (NEC) and Canadian Electrical Code (CEC) requirements. Seal all conduit connections should and install a drain loop to protect the device electronics from moisture.
- Direct Bold Sunlight – use a sun shield when mounting the device in direct sunlight (see Appendix D. Parts List).
- Environmental Damage – make every effort to protect sensors from environmental damage caused by water, snow, shock, vibration, dirt, and debris.
- Air Variables – be sure to consider factors such as air movement, gas density in relation to air, emission sources, gas interferences, and environmental variables when determining the correct device location. Carefully evaluate air movement by fans, prevailing winds, exhaust ducts, strong air-flow through a room, and convection to determine if a leak is more likely to raise gas levels in certain areas within the facility. High air velocities result in inaccurate measurement and reduce sensor life.
- Distance – all systems that separate the transmitter from the sensor have distance limit specifications. Ensure that the application's distance requirements are within specifications and that the appropriate gauge wiring is used.

4.1.3 Following Electrical Codes

WARNING: TO AVOID AN EXPLOSION OR ELECTRICAL FIRE, ENCASE THE CABLE CONNECTION TO THE DEVICE IN CONDUIT. THE CONDUIT MUST MEET PREVAILING ELECTRICAL CODES FOR HAZARDOUS-AREA INSTALLATIONS, WHICH SPECIFY CONDUIT SEALING, EXPLOSION-PROOF FITTINGS, AND SPECIAL WIRING METHODS. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: CONNECT THE GROUND WIRE TO THE GROUNDING SCREW ON THE DEVICE'S HOUSING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

For North America installations:

- To meet prevailing electrical codes, use conduit and all other materials required for electrical wiring in hazardous areas. Install wiring according to National Electrical Code (NEC) Articles 501-517.
- As supplied, the Sensor Head wiring is already sealed and requires no additional sealing to conform to NEC requirements for explosion-proof installations, as long as the detector is mounted no further than 18" (457mm) from the device [NEC Article 501-5(a)(1)].

For International installations, Ensure installation meets prevailing electrical codes or standards for hazardous-area installations. For example, IEC/EN 60079-14 standard.

4.1.4 Following Shipboard & Off-shore Codes

For compliance to shipboard & off-shore code applications, install in accordance with IEC 60092-504, Electrical Installations in ships - Special Features - Control and Instrumentation, and applicable parts of IEC 60092 - Series standards for Electrical Installations in Ships.

4.1.5 Hard Wired Configurations

Table 4-3: Hard Wired Configurations – Typical and Table 4-4: Hard Wired Configurations – Sensor Types Supported for 3 or 4-Wire show some typical hard wired configurations. Table 4-5: Hard Wired Configurations – Sensor Types Supported for 2-Wire and Table 4-6: Typical Cable Data for Input Power Length Considerations list the sensor types allowed.

Table 4-3: Hard Wired Configurations – Typical

Wiring *	2-Wire PS PCB (4-20MA)	Terminal/Relay/ MODBUS RTU (RS-485) PCB	Optional Comm PCB	Local Integral Sensor	Local Multiple Sensors ***	Remote Sensors ***	Remote Sensor Distance *****	No. of Sensors/XMTR	Sensor Type
3 or 4-Wire	N/A	Yes	1**	No J-Box	J-Box	J-Box	100′	Up to 3	
2-Wire	Yes	No	N/A	No J-Box	J-Box	J-Box	100′	1	

* Power Consumption vary (see Appendix A.1. Device Specifications).

** System allows only one Comm PCB. Consult your service representative (see Appendix E. Technical Support) for available options.

*** Use the Seal when exiting the Device.

**** Allows different location of Sensor based on gas properties.

***** The distance is between a transmitter and any sensor (see Appendix A.1. Device Specifications).

Table 4-4: Hard Wired Configurations – Sensor Types Supported for 3 or 4-Wire

Sensor #1	Sensor #2	Sensor #3
E-Chem*	E-Chem	E-Chem
	O_2	E-Chem
	O_2	O_2
O_2 (096-3473-19)	E-Chem	E-Chem
	O_2	E-Chem
	O_2	O_2
Combustible Cat-Bead (096-3473-55)	E-Chem	E-Chem
	O_2	E-Chem
	O_2	O_2
IR - CO_2 (096-3473-58)	STOP	STOP
	O_2	STOP
	STOP	STOP
Combustible IR (096-3473-56)	STOP	STOP
	O_2	STOP
	STOP	STOP

* E-Chem Sensor P/Ns 096-3473-01 thru 096-3473-18 and 096-3473-20 thru 096-3473-54 and Sensor Simulator 096-3395 only. Simulator is for temporary use only.
Note: 3 or 4-Wire transmitter allowed sensor combinations, used only with IS barrier assembly 096-3448.

WARNING: STOP! DO NOT USE THESE COMBINATIONS UNDER ANY CIRCUMSTANCES. THEY ARE NOT INTRINSICALLY SAFE AND CAN CAUSE AN EXPLOSION. VIOLATING, OR ATTEMPTING TO VIOLATE, THESE RULES WILL CAUSE THE DEVICE TO AUTOMATICALLY ENTER AN IMMEDIATE FAULT MODE. FAILURE TO HEED THIS WARNING COULD RESULT IN INJURY OR DEATH.

Table 4-5: Hard Wired Configurations – Sensor Types Supported for 2-Wire

Sensor #1
E-Chem - E-Chem sensor P/Ns 096-3473-01 thru 096-3473-18 and 096-3473-20 thru 096-3473-54 and Sensor simulator 096-3395 only. Simulator is for temporary use only.
O_2 (096-3473-19)
Note: 2-Wire transmitter allowed sensor combinations, used only with IS barrier assembly 096-3449.

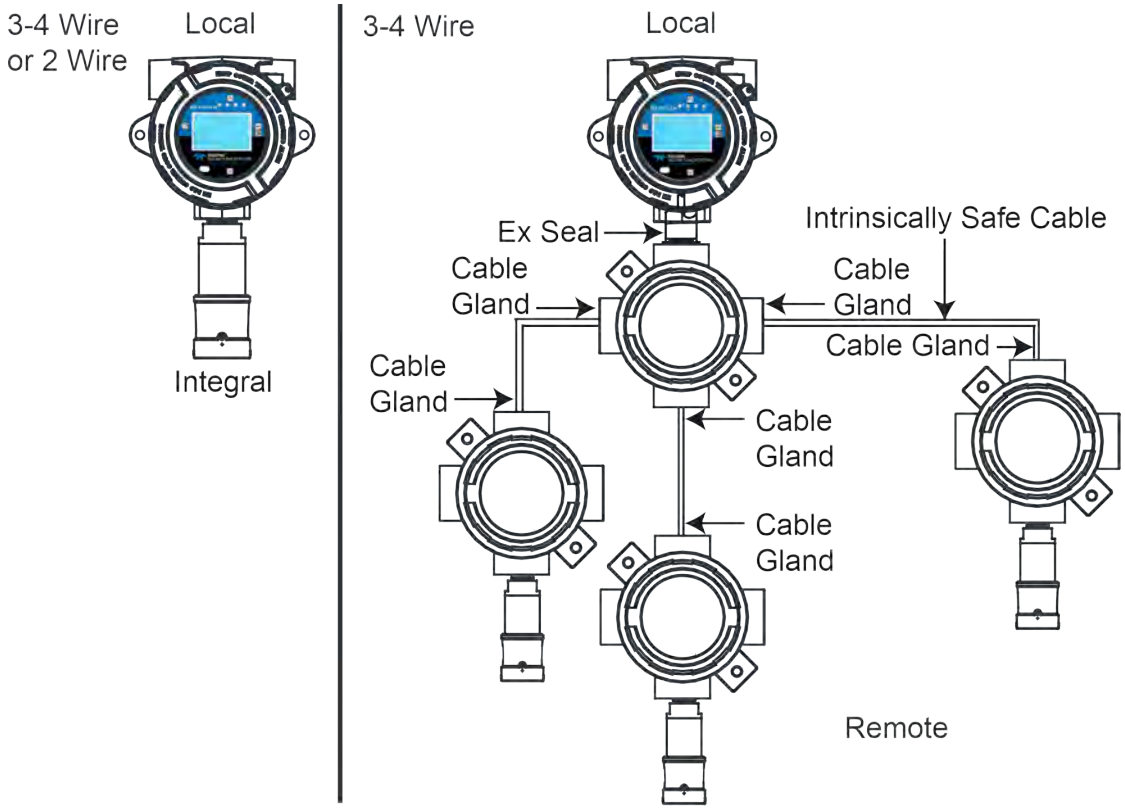


Figure 4-1: Hard Wired Sensor Configurations - Typical

NOTE: These are examples of typical configurations. Other combinations exist.

4.1.6 Determining Wire Length and Size for Input Power

Determine the proper wire length and size required to provide the proper voltage to the device(s). If the proper voltage does not reach the device, it will not function properly. This is referred to as voltage loss and must be planned for when installing. The formula for calculating the maximum wire length is:

$$Dir = \frac{VPowerSupply - VMin}{IMax \times RWire \times 2}$$

Where:

Dir = Maximum wire length in feet based on the wire's loop voltage
VPowerSupply = Power supply output voltage
VMin = Minimum current voltage of device
IMax = Maximum current in amperes
RWire = Resistance of wire in Ohms/foot

To determine the maximum wiring distance, calculate the wiring's maximum allowable voltage drop by subtracting the device's minimum operating voltage from the power supply's output voltage. Then, use Table 4-6: Typical Cable Data for Input Power Length Considerations to determine the maximum wiring distance.

Table 4-6: Typical Cable Data for Input Power Length Considerations

Cable Size (Awg)	Cable Size (Mm^2)	Conductor Cross Section Area (Mm^2)	Resistance (Ohms/foot)	Resistance (Ohms/meter)
22	0.50	0.33	0.0158	0.0518
20	0.60	0.50	0.0112	0.0367
18	0.90	0.82	0.0077	0.0253
16	1.5	1.50	0.0039	0.0127
14	2.5	2.00	0.0026	0.0085
12	4.0	3.30	0.0016	0.0054
10	6.0	5.26	0.0010	0.0034

Note: Maximum allowable voltage drop can be calculated based on power supply output voltage and the device minimum voltage and maximum current requirements. For 3 or 4-wire= 10VDC* Min. input, for 2-wire= 18VDC* Min. input.
*These values are subject to change.

WARNING: INSTALL ACCORDING TO APPLICABLE INTRINSICALLY SAFE WIRE PRACTICE OR STANDARDS (i.e. IEC/ECN 60079-14). SEE Table 4-6: Typical Cable Data for Input Power Length Considerations. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

4.1.7 Determining Wire Length for RS-485 Cable

The device supports up to 1,200 meters RS-485 wiring maximum distance.

4.1.8 Determining Wire Length for Remote Sensors

Figure 4-2: Examples of Remote Sensor Wire Length provides some examples of the maximum wire length for remote sensors.

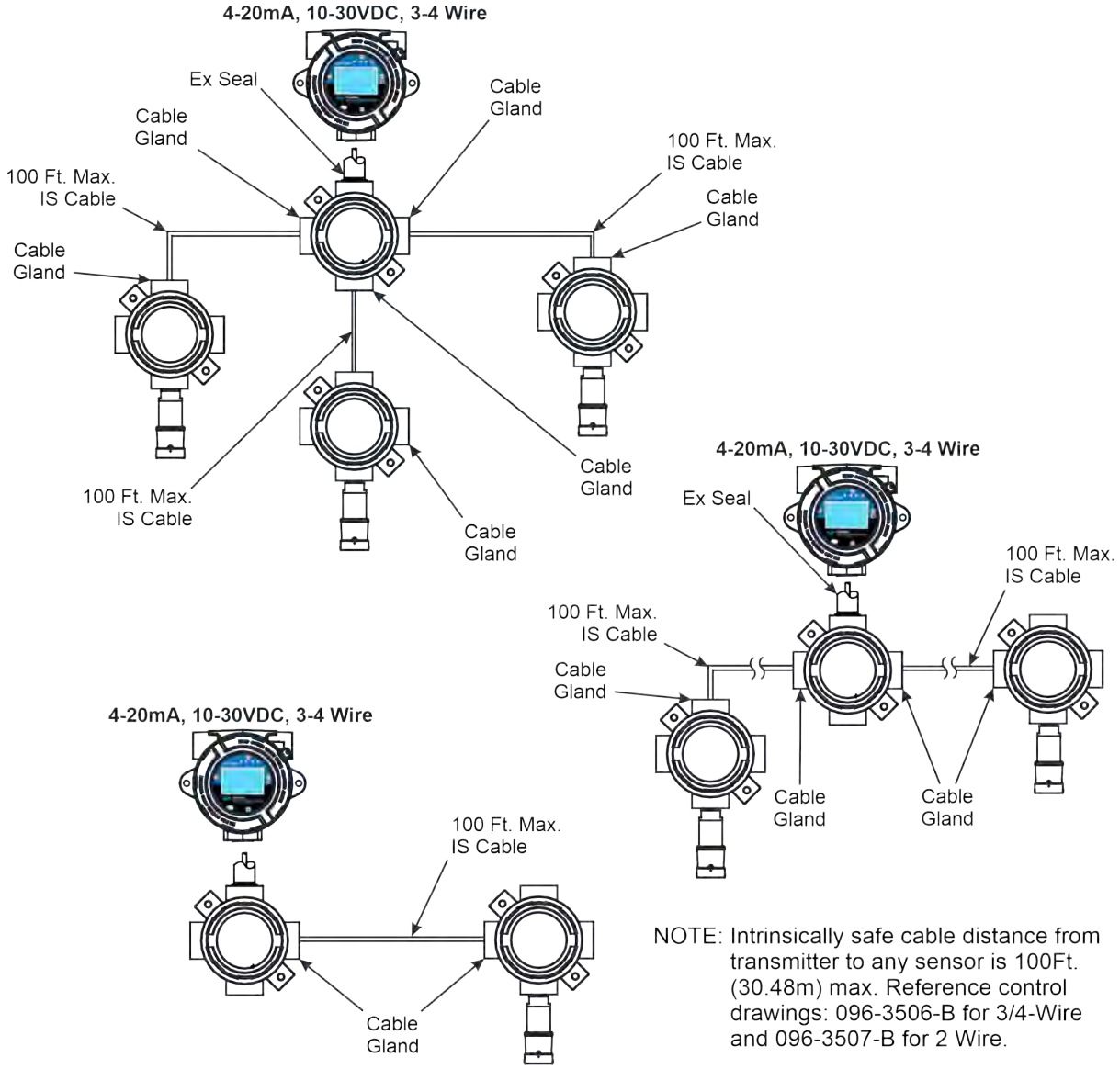


Figure 4-2: Examples of Remote Sensor Wire Length

4.1.9 An Application Solution

Below is an example of an application solution based on some specific requirements. See Table 4-7: Parts Required for Application Solution Example and Figure 4-3: Application Example.

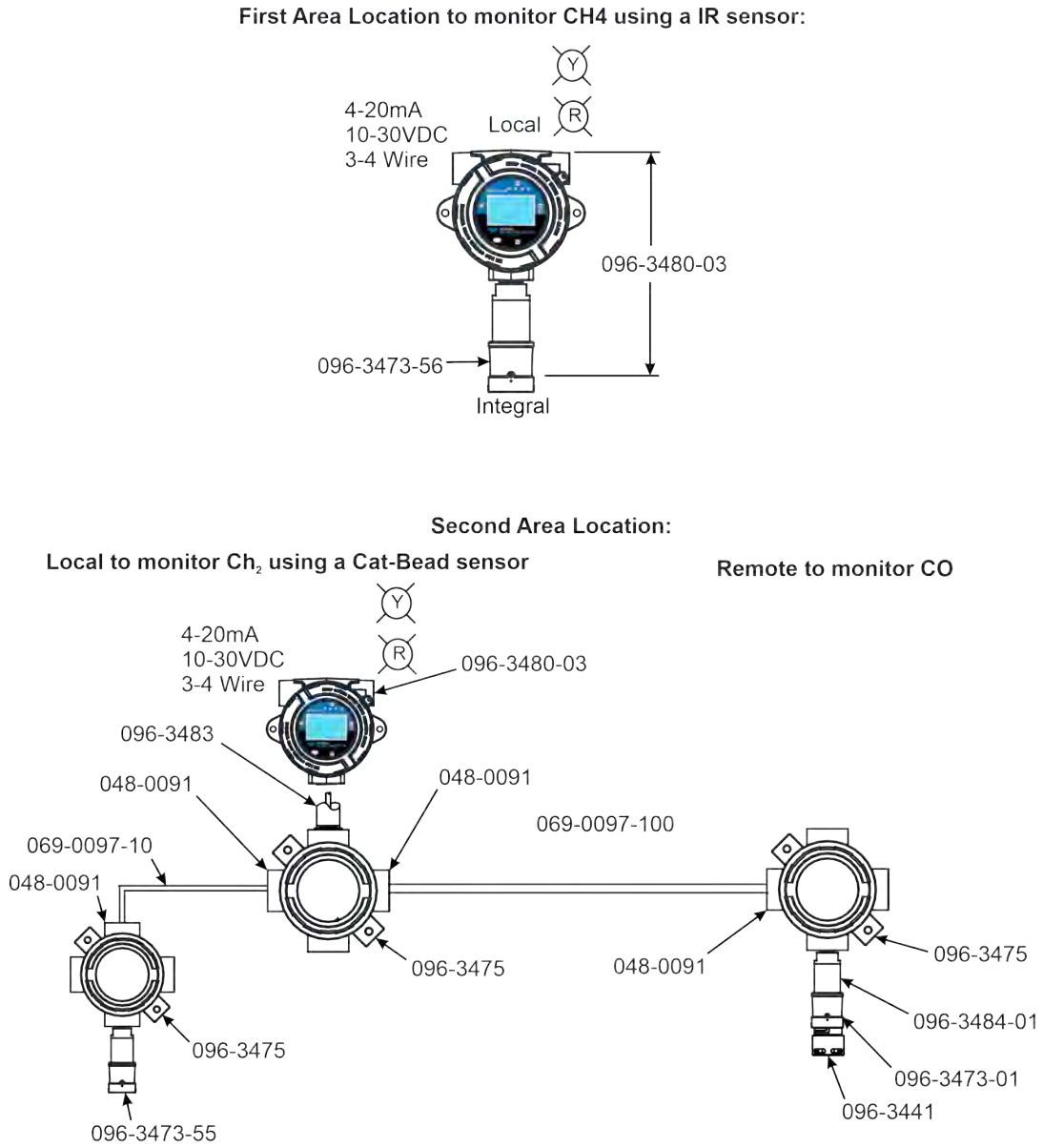
Application Requirements:

- In the first location, monitor for methane (CH_4) at one area different than the others, and be extremely accurate and stable.
- In the second location, monitor for both carbon monoxide (CO) and methane (CH_4) about 110' away total.
- Protect the CO sensor from wash downs in that area.
- Hook up field lights at the two locations.
- The site is in Canada, so it must meet Canadian CSA approval.

Table 4-7: Parts Required for Application Solution Example

Requirement	Description	P/N	Qty
Monitor 3 gases @ local & remote locations; meet CSA temp (-40°C); hook up field lights. Need 3 or 4-wire device w/heated LCD & relay PCB for field devices. Need 2: one very accurate CH_4 device, requiring IR sensor tech & higher power reqs.	3 or 4-wire, Al, heated, plastic end cap, Canada	096-3480-03	2*
Monitor CH_4 w/high accuracy & stability	CH_4 sensor combustible (LEL) IR	096-3473-56	1
Monitor CH_4	CH_4 sensor (LEL) Cat-Bead	096-3473-55	1
Monitor CO	CO sensor (E-Chem)	096-3473-01	1
Protect CO sensor from wash down activity	¼-turn deluge guard	096-3441	1
To accommodate remote locations of Cat-Bead CH_4 (LEL) sensor & CO (E-Chem) sensor, need: • IS cables w/lengths to point of gas detection for 2 sensors. • For each point in & out of each j-box assy, need a remote cable gland fitting	J-box assy IS cable (10') IS cable (100') Remote cable gland fitting	096-3475 069-0096-10 069-0096-100 048-0091	3 1 1 4
Accommodate remote location of CO sensor	Detector body assy 3 or 4-wire, plastic end cap	096-3484-01	1
For IS compliance, NPT Ex seal between transmitter & j-box assy	NPT Ex seal	096-3483	1

* To meet these specific requirements, we are going to get two 096-3480-03 and then remove the Meridian Detector Body and place one at the remote location for the CO sensor.



Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum.
Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

Figure 4-3: Application Example

NOTE: This represents only one example. The system solution varies on a case to case basis based on the application variables and its objectives. For each application, please contact your Company sales representative.

4.1.10 Installation Checklist

WARNING: ONLY QUALIFIED PERSONNEL - AS DEFINED ACCORDING TO LOCAL, COUNTY, STATE, FEDERAL, NATIONAL AND INDIVIDUAL COMPANY STANDARDS - SHOULD PERFORM THE INSTALLATION ACCORDING TO APPLICABLE ELECTRICAL CODES, LOCAL REGULATIONS, AND SAFETY STANDARDS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING ANY OF THE PROCEDURES. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

Table 4-8: Installation Checklist

Item	Details
Device Aluminum and Stainless Steel	Section 4.1.11 Mounting the Device
Device retrofit mounting plate	Section 4.1.12 Installing the Retrofit Plate
Meridian NPT ex seal	Section 4.1.13 Installing the NPT Ex Seal
Meridian junction box assembly (aluminum and stainless steel)	Section 4.1.14 Mounting & Wiring the Junction Box Assembly (AL or SS)
Meridian junction box assembly spacer kit	Section 4.1.16 Meridian Junction Box Assembly Spacer Kit
Duct mount fitting (both flat and round) for meridian detector body	Section 4.1.17 Mounting the Detector Body Using a Duct Mount Fitting
3-wire connections from the VDC power supply and receiver to the device	Section 4.1.18 Connecting a Device to a Power Supply & Receiver: 3-wire
2-wire connections from the VDC power supply to the device	Section 4.1.19 Connecting a Device to a Power Supply: 2-wire
4-wire connections from the VDC power supply and receiver to the device	Section 4.1.20 Connecting a Device to a Power Supply & Receiver: 4-wire
Connections from the device to various Teledyne Gas & Flame Detection receivers (controllers)	Section 4.1.21 Connecting a Device to Other Teledyne Gas & Flame Detection Receivers
Relays and remote alarm on the terminal/ relay/MODBUS RS-485 PCB	Section 4.1.22 Connecting Optional Relays & Remote Alarm Reset
Connections for MODBUS RS-485	Section 4.1.23 Connecting the Optional MODBUS RS-485

Table 4-8: Installation Checklist (Continued)

Item	Details
Optional communication expansion card (CEC) PCB	Section 4.1.24 Installing the Optional Communication Expansion Card (CEC) PCB
Sensor head	Section 4.1.25 Connecting a Sensor Head
Sensor	Section 4.1.26 Installing/Replacing a Sensor

4.1.11 Mounting the Device

Install the device to a wall or bracket using the pre-drilled mounting flanges (that are part of the housing). To facilitate wiring to the device enclosure, two-threaded ¾" NPT conduit fittings are provided. See Figure 4-4: Device Mounting Dimensions - Aluminum & Stainless Steel for details.

CAUTION: Do not attempt to mount the device using only the conduit.

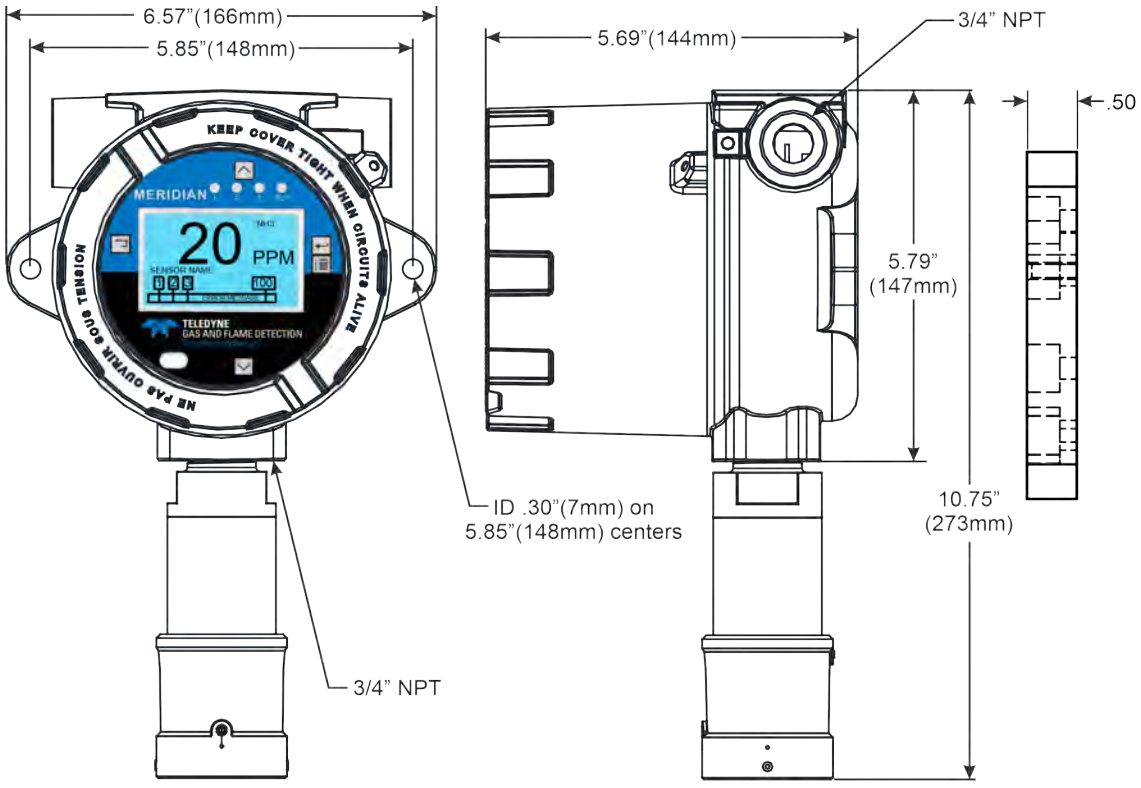


Figure 4-4: Device Mounting Dimensions - Aluminum & Stainless Steel

4.1.12 Installing the Retrofit Plate

Use the retrofit mounting plates when mounting the device where a previously mounted transmitter was located. The retrofit plates allow easier access to the Meridian end cap. See Figure 4-5: Retrofit Mounting Plate Dimensions - Al and Figure 4-6: Retrofit Mounting Plate Dimensions - HDPE.

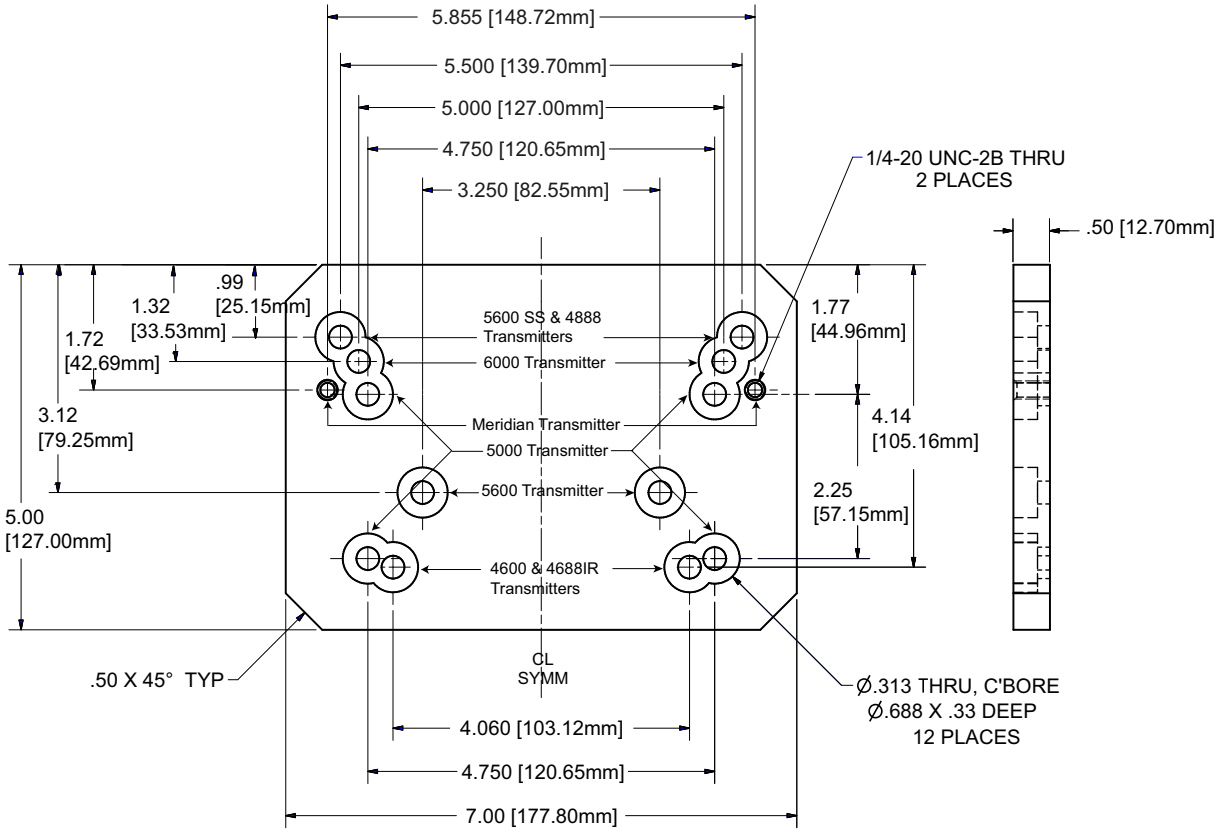


Figure 4-5: Retrofit Mounting Plate Dimensions - Al

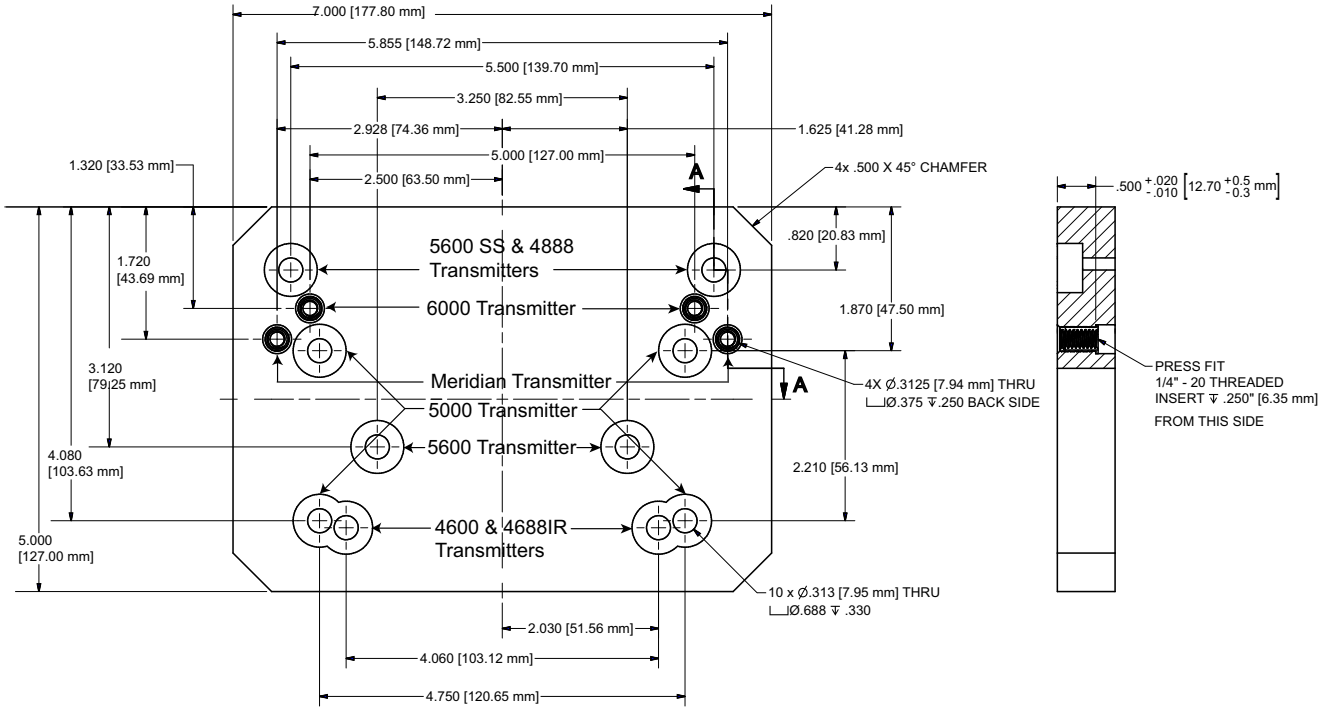


Figure 4-6: Retrofit Mounting Plate Dimensions - HDPE

4.1.13 Installing the NPT Ex Seal

The NPT Ex seal is used to maintain the explosion proof/flame proof integrity of the enclosure. The following describes installing between the device and a Meridian junction box assembly in the field. Refer to Figure 4-7: NPT Ex Seal Installation.

NOTE: This procedure is only necessary if you did not originally order the device configured in this manner from the factory.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

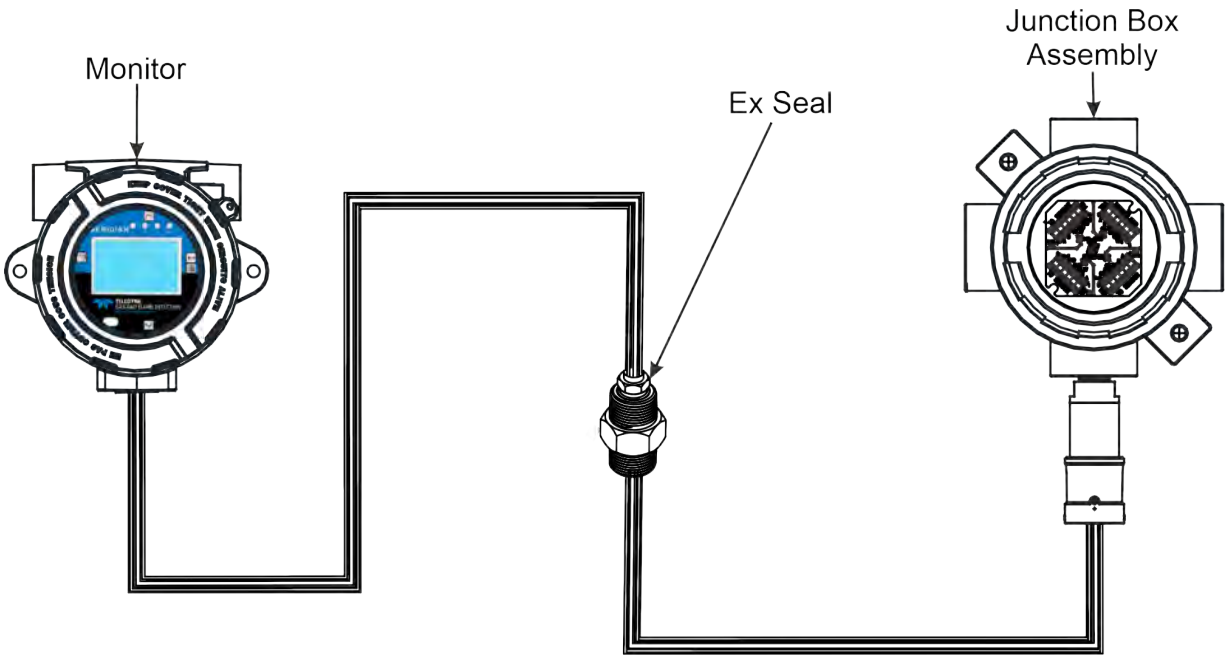


Figure 4-7: NPT Ex Seal Installation

1. Unscrew the setscrew and housing cover.
2. Pull on the LCD PCB/CPU PCB set away from the four (4) standoffs.

3. Remove the two (2) wires from the 10-30VDC TB1.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stack.

4. Unplug the top portion of the terminal blocks in use (MODBUS, alarms, fault, and remote acknowledge).
5. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
6. Unscrew the two (2) screws and remove the intrinsically safe (IS) terminal block (TB) cover.
7. Unscrew the two (2) retention screws on the blue IS terminal block, then unplug the top portion of the terminal block.

NOTE: The blue IS terminal block's two (2) retention screws prevent accidental dislodging of the connections.

8. Unscrew the screws on the light blue IS terminal block and remove the six (6) wires from the terminal block.
9. If a Meridian detector body assembly was installed to the device, then remove the Meridian End Cap, Sensor and the Sensor Assembly.
10. Pull the six (6) wires on top of the Meridian NPT Ex seal into the device's ¾" NPT hole.
11. Screw the Meridian NPT Ex Seal into the device.

NOTE: When installing the Meridian NPT Ex seal, thread into the ¾" NPT hole, hand tighten, then tighten an additional minimum of one and a half turns. Be careful not to twist or damage wires while threading in fitting.

WARNING: TO MAINTAIN EXPLOSION PROOF/FLAME PROOF A MINIMUM OF 5 THREADS OF ENGAGEMENT IS REQUIRED. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

12. Insert the six (6) wires into the light blue IS terminal block and screw them down (see Section 4.1.25 Connecting a Sensor Head).
13. Replace the IS terminal block cover and tighten the two (2) screws.
14. Ensure the top of all your applicable plugs with feeding wires are easily accessible prior to replacing the PCB stack to ease replugging.
15. Replace the PCB stack into the housing.
16. Replace the four (4) standoffs.

17. Reconnect the tops of the plugs for any other terminal blocks in use (10-30VDC, MODBUS, Alarms, Fault, and Remote Acknowledge).
18. Replace the two (2) wires to the 10-30VDC TB1.
19. Replace the LCD PCB/CPU PCB set into t he four (4) standoffs and screw the housing cover back on.
20. Unscrew the Meridian junction box assembly cover.
21. Pull the six (6) wires on bottom of the proof/flame proof seal into the Meridian junction box's ¾" NPT hole.
22. Screw the junction box assembly onto the Meridian NPT Ex seal.
23. Insert the six (6) wires into the light blue TB4 and screw them down (see Section 4.1.14 Mounting & Wiring the Junction Box Assembly (AL or SS)).
24. Replace the Meridian junction box assembly cover and secure the setscrew.

4.1.14 Mounting & Wiring the Junction Box Assembly (AL or SS)

If an application requires sensors be mounted remotely from the device, follow all code and regulatory requirements. In a remote application, the wiring distance (the max. length of the wire) from the sensor to the device must not exceed 100 feet. Exceeding this distance might cause the sensor to malfunction and/or compromise the intrinsic safety of the installation. Obtain all conduit from your local vendor. Refer to Figure 4-8: Meridian J-Box Assembly Wiring and Mounting – Aluminum and Figure 4-9: Meridian J-Box Assembly Wiring and Mounting – Stainless Steel.

NOTE: Sensor type does not affect wiring.

NOTE: Light blue terminal blocks indicate intrinsically safe circuits. Tighten plug retention screws.

CAUTION: Ensure separation between each connection is maintained in accordance with ICE/EN 60079-14 and ICE-EN 60079-11.

NOTE: For a 2-wire device wired to a Meridian junction box assembly, only one (1) sensor is allowed. Thus, only two (2) terminal blocks are used.

NOTE: Be sure to replace the cover and secure the setscrew.

NOTE: Intrinsically safe cable distance from transmitter to any sensor is 100 ft. (30.48 meters) max. Reference control drawings 096-3506-B for 3-4 wire and 096-3507-B for 2-wire.

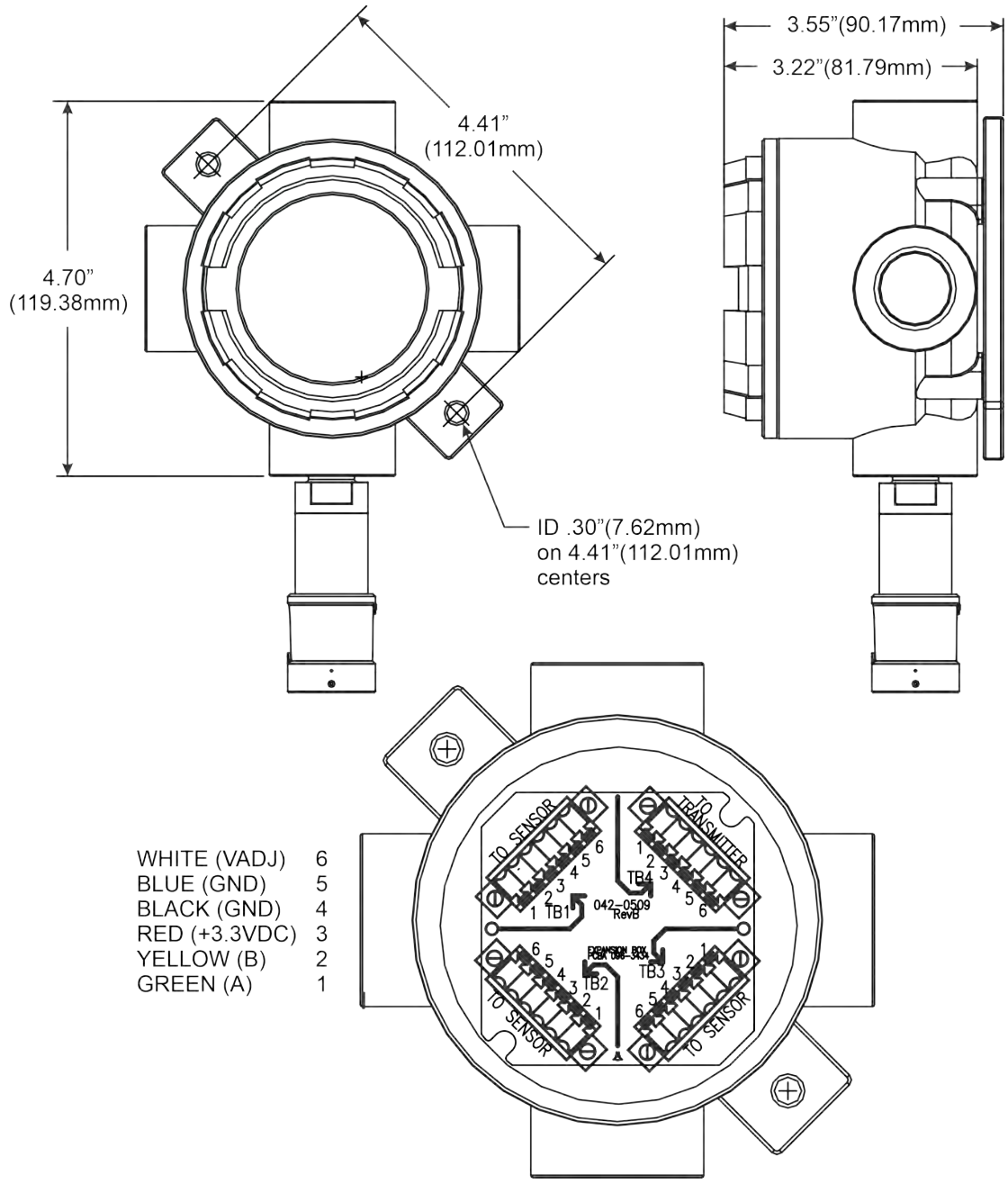


Figure 4-8: Meridian J-Box Assembly Wiring and Mounting – Aluminum

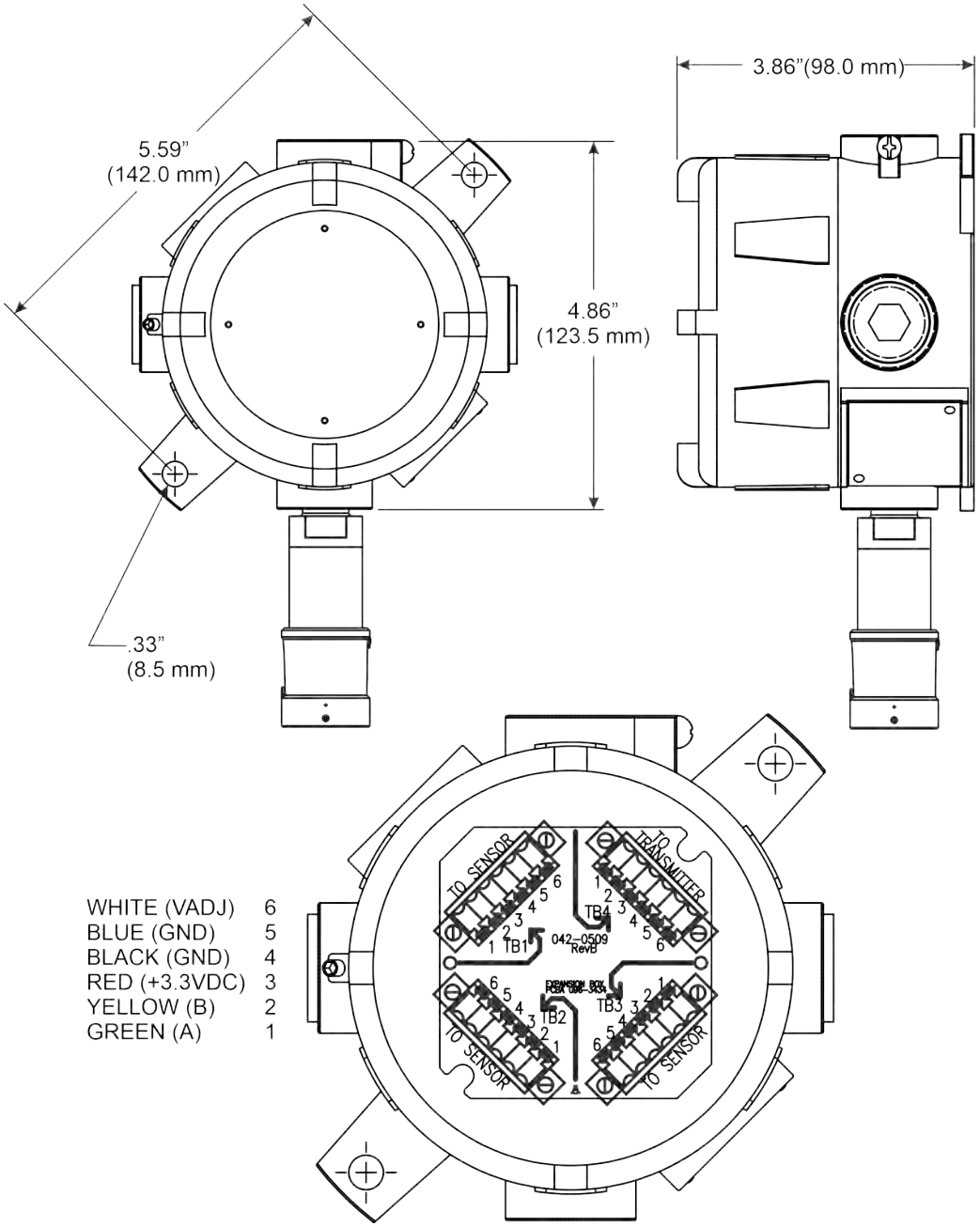


Figure 4-9: Meridian J-Box Assembly Wiring and Mounting – Stainless Steel

4.1.15 Remotely Mounted Sensor Calibration Fitting

When remote mounting the Meridian sensor head(s) over long distances, or at much lower or higher elevations than the Meridian transmitter, the sensors head(s) can be setup for remote calibration. Remote calibration fittings (077-1385 and 077-1386) screw directly into the Meridian sensor end cap. Refer to Figure 4-10: Remotely Mounted Sensor with Calibration Fitting.

1. Remove the screw on each end-cap.
2. Screw in the fitting.
3. Run the appropriate calibration tubing from the transmitter to the sensor head fitting.

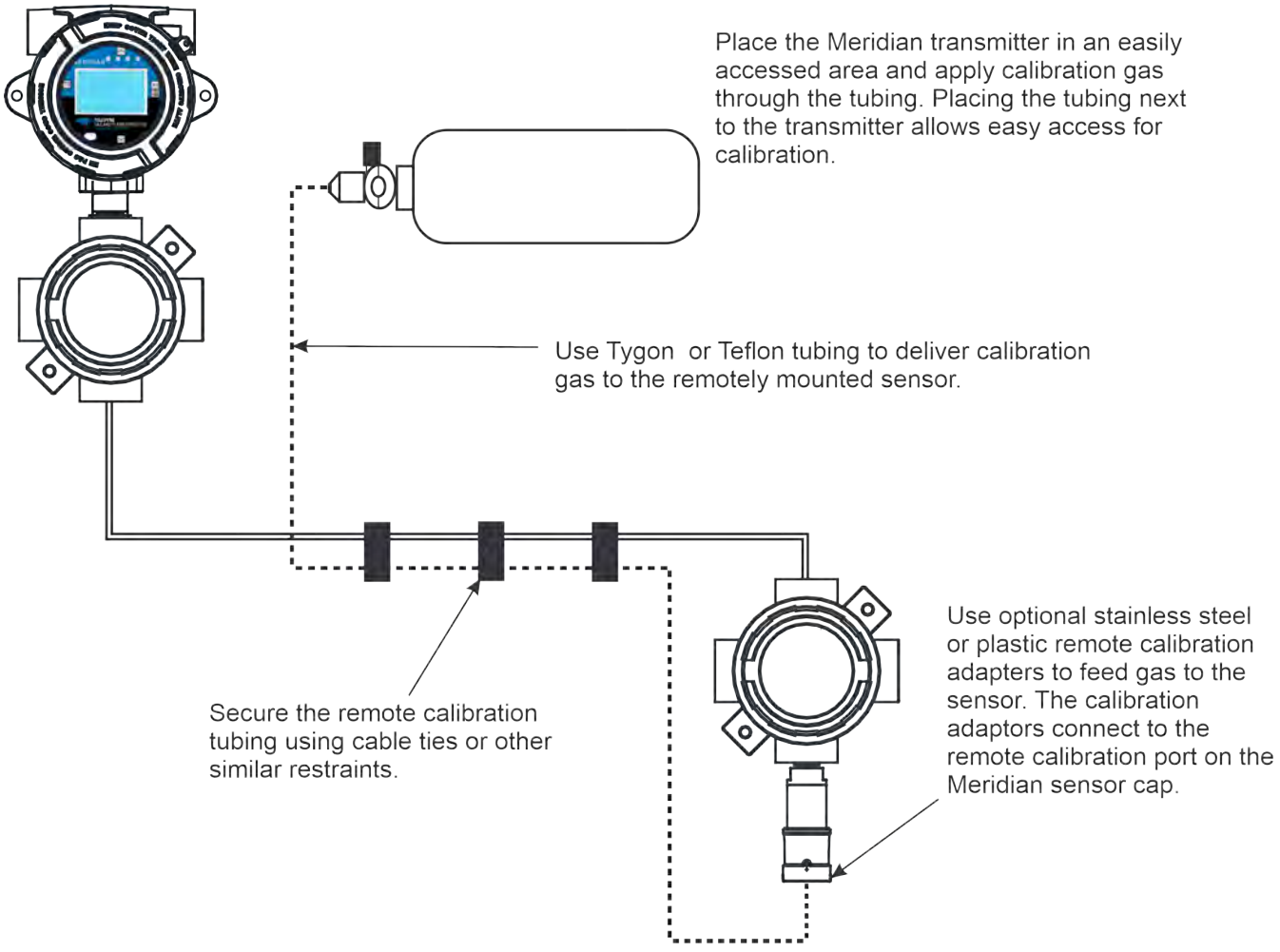


Figure 4-10: Remotely Mounted Sensor with Calibration Fitting

4.1.16 Meridian Junction Box Assembly Spacer Kit

When selecting the proper spacers based on the configuration, refer to Table 4-9: Meridian J-Box Assembly Spacer Configurations and Figure 4-11: Meridian J-Box Assembly Spacer Usage.

Table 4-9: Meridian J-Box Assembly Spacer Configurations

Retrofit Mounting Plate Behind Device	J-Box Material	Spacer
No Retrofit Mounting Plate	Al	(2) $^{5}/_{8}$"OD x.250"
With ½" Al Retrofit Mounting Plate	Al	(2) $^{5}/_{8}$"OD x.750"
No Retrofit Mounting Plate	SS	(2) $^{5}/_{8}$"OD x.750"
With ¾" HDPE Retrofit Mounting Plate	SS	(2) $^{5}/_{8}$"OD x 0.750" and (2) $^{5}/_{8}$"OD x 0.250" together for the 1.0" gap

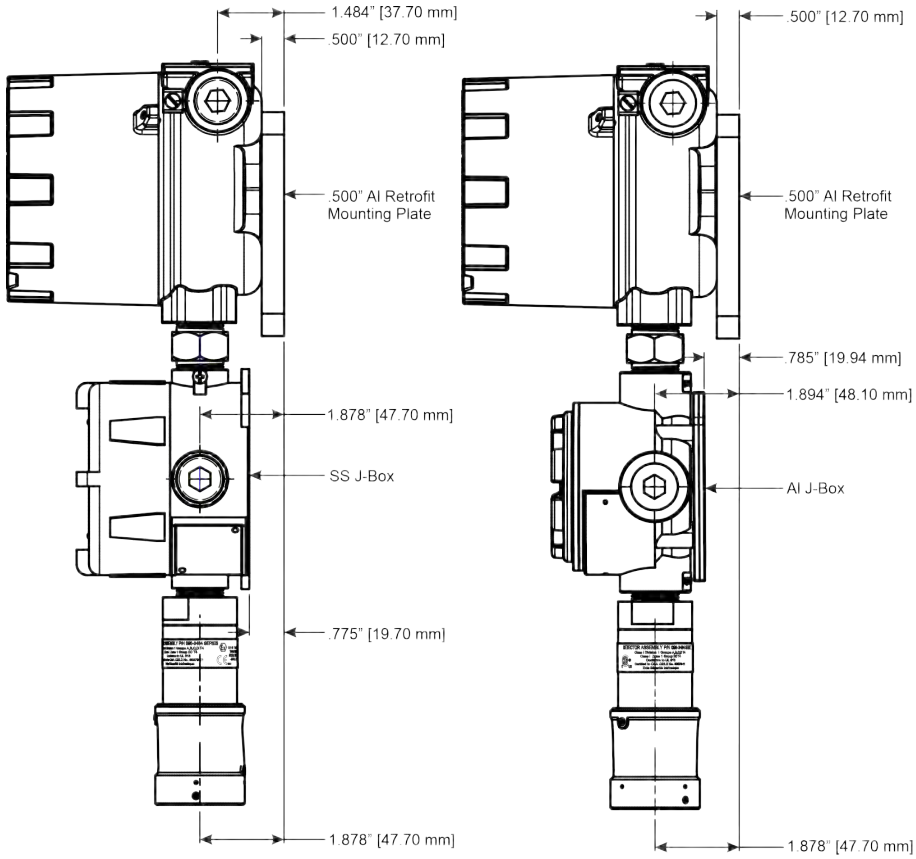


Figure 4-11: Meridian J-Box Assembly Spacer Usage

4.1.17 Mounting the Detector Body Using a Duct Mount Fitting

Using a duct mount fitting on the Meridian detector body allows the monitoring of airflow in exhaust or ventilation ducts without drying out the device's sensor. For details on flow velocities and duct compatibility, see Appendix A.1. Device Specifications.

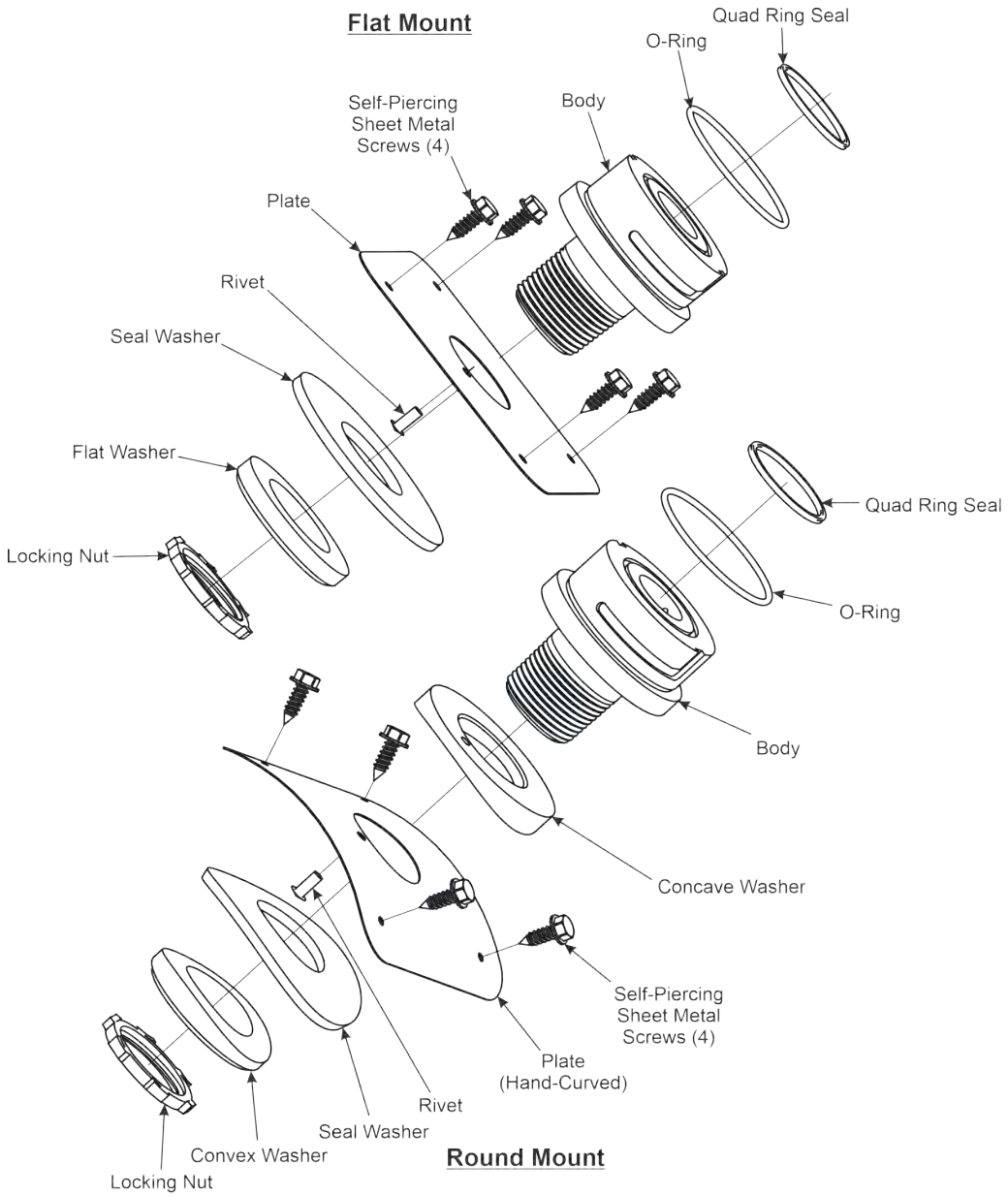


Figure 4-12: Meridian Duct Mount Fitting

NOTE: Only use with devices configured for remote sensor and without Meridian junction box assembly.

The duct mount fitting comes in a kit that designed for either flat or round applications. Either application uses most of the parts in the kit. The exceptions include: one (1) flat washer (2F) used for flat duct applications; two (2) curved washers (2C & 6C) used for round duct applications.

NOTE: For round duct applications, curve the flat plate (4) by hand to conform to different duct shapes.

Follow the instructions below to install the duct mount fitting.

1. Assemble the duct mount fitting properly for the particular duct application prior to tightening the locking nut. The locking nut digs into the washer for a lasting grip. Refer to Figure 4-12: Meridian Duct Mount Fitting for details.
2. Once assembled, position the duct mount fitting onto a duct and mark its position.
3. Remove the fitting and drill 1¾" diameter hole.
4. Position the fitting back on the duct over the 1¾" hole.
5. Using a drill, insert the 4 self-piercing sheet metal screws into place.
6. Next, align pins on the sensor body with slot on the body of the duct mount fitting and turn clockwise to seat. Refer to Figure 4-13: Attaching the Meridian Sensor to the Duct Mount Fitting for details.

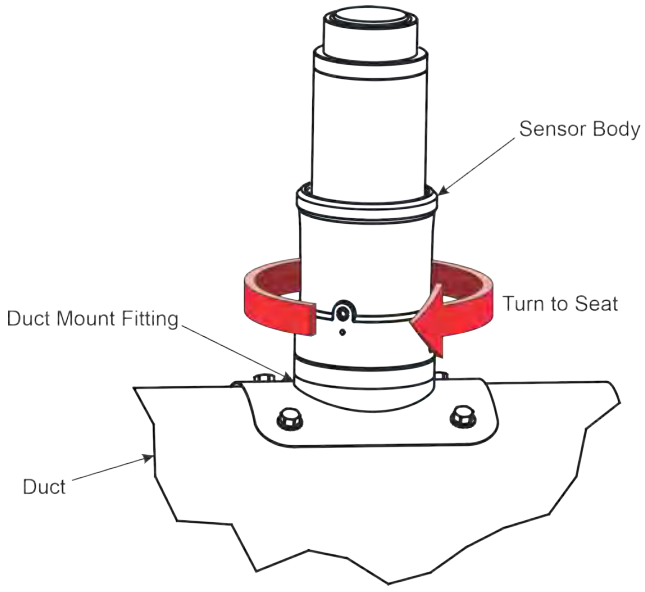


Figure 4-13: Attaching the Meridian Sensor to the Duct Mount Fitting

4.1.18 Connecting a Device to a Power Supply & Receiver: 3-wire

To correctly power the device, a 3-Wire connection (sourcing and sinking) is needed from the 10-30VDC Power Supply and a 4-20mA Receiver to the device.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Route wires of appropriate size from source through conduit runs into the device housing (see Field Wiring in Appendix A.1. Device Specifications).

CAUTION: RFI may be generated if wires are not appropriately shielded or share conduit with other AC power conductors. Protect wires with appropriate shielding practices to prevent negative equipment performance.

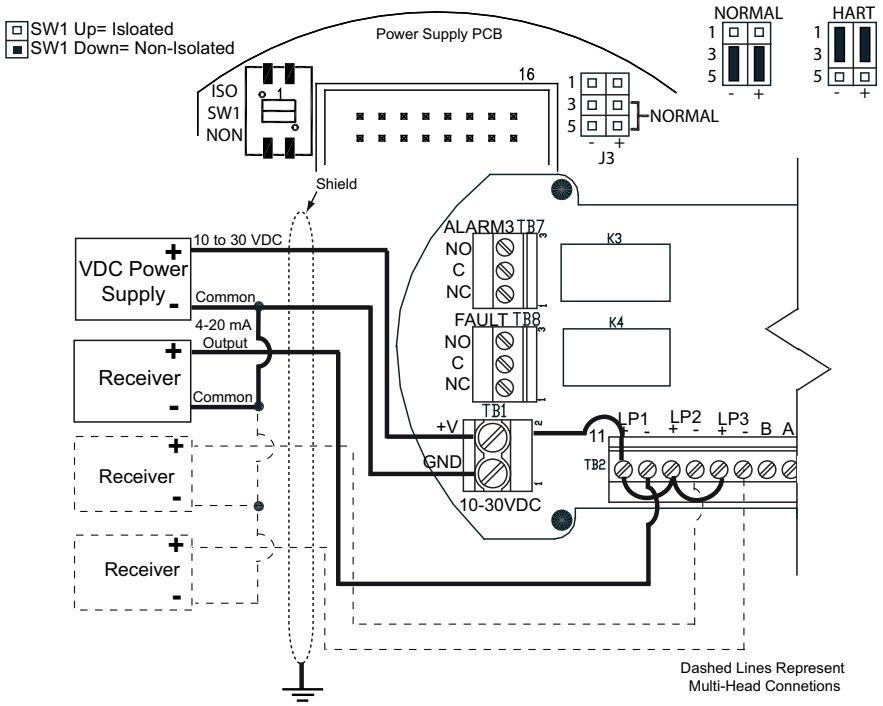


Figure 4-14: Connection for 3-Wire Sourcing

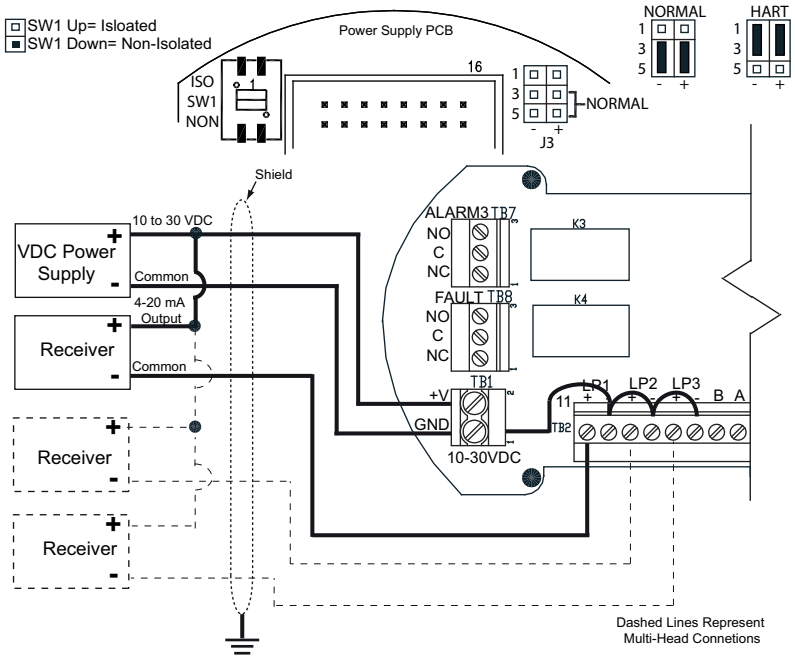


Figure 4-15: Connection for 3-Wire Sinking

NOTE: These are examples of typical configurations. Other combinations exist and vary based on each configuration.

2. Connect ground wire to device's grounding/earth screw on its housing.

NOTE: To prevent grounding issues, ensure you have a good ground/earth wire attached to the housing and back to the receiver's ground.

3. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB stack.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stacks.

4. Connect positive (+) and negative (-) leads from 10 to 30VDC power supply wires to TB1 on the terminal/relay/MODBUS RS-485 PCB. Specifically, the positive (+) connects to Pin2 (+V) and negative (-) connects to Pin1 (GND) on TB1.

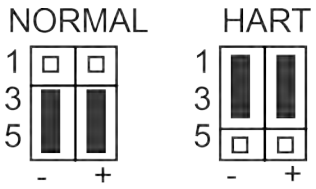
5. Connect positive (+) and negative (-) leads from devices to TB2 on the terminal/relay/MODBUS RS-485 PCB (refer to Figure 4-14: Connection for 3-Wire Sourcing and Figure 4-15: Connection for 3-Wire Sinking for details).
6. Locate SW1 (isolated/non-isolated) on the power supply PCB. Place SW1 in the DOWN position (refer to Table 4-10: Sourcing and Sinking Non-Isolated (SW1) Settings).

Table 4-10: Sourcing and Sinking Non-Isolated (SW1) Settings

SW1 Isolated/Non-Isolated	SW1 Settings
SW1 Up= Isloated SW1 Down= Non-Isolated	DOWN Position

7. Locate J3 (WiredHART) on the power supply PCB. Place J3 in the correct position to support your application (refer to Table 4-11: WiredHART (J3) Settings).

Table 4-11: WiredHART (J3) Settings

SW1 Isolated/Non-Isolated	SW1 Settings
	For Normal = Position 3&5 for -/+ For Hart = Position 1&3 for -/+

NOTE: J3 only pertains to the WiredHART PCB.

NOTE: Do not mix Sinking and Sourcing on the same PCB.

8. Insert the lower PCB stack into the housing after wiring the terminal blocks.
9. Insert and tighten the four (4) standoffs.
10. Push the LCD PCB/CPU PCB set into the four (4) standoffs.
11. Install housing cover, tighten and secure the setscrew.
12. Apply power to the receiver.

4.1.19 Connecting a Device to a Power Supply: 2-wire

To install a 2-wire connection from the VDC power supply and a 4-20mA receiver (or other devices capable of measuring 4-20mA inputs) to the device, follow the steps below.

1. A 2-wire connection (without any options) requires an operating voltage of 18-30 VDC from the power supply.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

2. Route wires of appropriate size from source through conduit runs into the device housing (see Field Wiring in Appendix A.1. Device Specifications).

CAUTION: RFI may be generated if wires are not appropriately shielded or share conduit with other AC power conductors. Protect wires with appropriate shielding practices to prevent negative equipment performance.

3. Connect ground wire the grounding/earth screw on the device's housing.

NOTE: To prevent grounding issues, ensure you have a good ground/earth wire attached to the housing and back to the receiver's ground.

4. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB stack.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stacks.

5. Connect positive (+) and negative (-) leads from VDC power supply wires to TB1 on the 2-wire power supply PCB. Specifically, the positive (+) connects to Pin1 (+V) and negative (-) connects to Pin2 (GND) on TB1 (refer to Figure 4-16: Connection for 2-Wire for details).

NOTE: The VDC power supply requirements are different when using the 2-wire PCB (see Appendix A.1. Device Specifications).

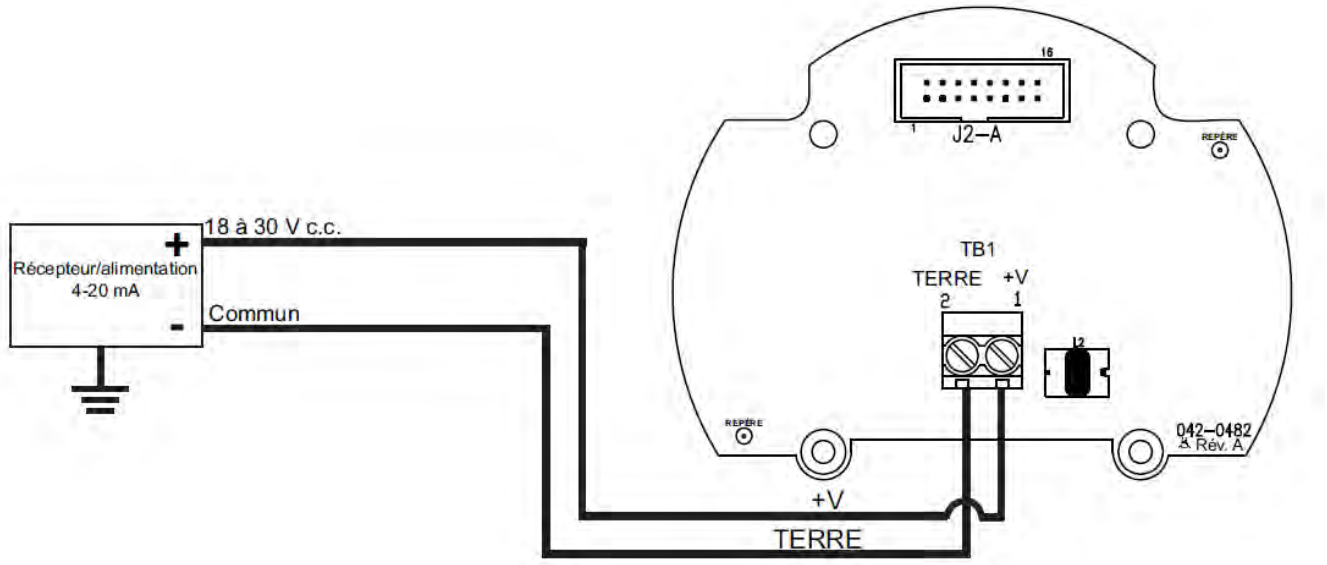


Figure 4-16: Connection for 2-Wire

6. Insert the lower PCB stack into the housing after wiring the terminal blocks.
7. Insert and tighten the four (4) standoffs.
8. Push the LCD PCB/CPU PCB set into the four (4) standoffs.
9. Install the housing cover, tighten and secure the setscrew.
10. Apply power to receiver.

4.1.20 Connecting a Device to a Power Supply & Receiver: 4-wire

To install the 4-wire connection (sourcing and sinking) from the VDC power supply and a 4-20mA receiver (or other devices capable of measuring 4-20mA inputs) to the device with isolated loop power, follow the steps below.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Route wires of appropriate size from source through conduit runs into the device housing (see Field Wiring in Appendix A.1. Device Specifications).

CAUTION: RFI may be generated if wires are not appropriately shielded or share conduit with other AC power conductors. Protect wires with appropriate shielding practices to prevent negative equipment performance.

2. Connect ground wire to device's grounding/earth screw on its housing.

NOTE: To prevent grounding issues, ensure you have a good ground/earth wire attached to the housing and back to the receiver's ground.

3. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB Stack.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stacks.

4. Connect positive (+) and negative (-) leads from 10 to 30VDC power supply wires to TB1 on the isolated 4-20mA PCB. specifically, the positive (+) connects to Pin2 (+V) and negative (-) connects to Pin1 (GND) on TB1.
5. Connect positive (+) and negative (-) leads from receivers) to TB2 on the terminal/relay/MODBUS RS-485 PCB (refer to Figure 4-17: Connection for 4-Wire Sourcing with Isolated Loop Power Supply and Figure 4-18: Connection for 4-Wire Sinking with Isolated Loop Power Supply for details).

6. Locate SW1 (isolated/non-isolated) on the power supply PCB. Place SW1 in the UP position (refer to Table 4-12: Sourcing and Sinking Isolated (SW1) Settings).

Table 4-12: Sourcing and Sinking Isolated (SW1) Settings

SW1 Isolated/Non-Isolated	SW1 Settings
SW1 Up= Isloated SW1 Down= Non-Isolated	UP Position

CAUTION: The SW1 switch can only electrically isolate sensor loop1. Connecting the Meridian to Sensor Loop2 and Loop3 will not isolate them. DO NOT use this type of wiring with multi-sensor headed Meridians.

7. Locate J3 (WiredHART) on the power supply PCB. Place J3 in the correct position to support your application, (refer to Table 4-13: WiredHART (J3) Settings.

Table 4-13: WiredHART (J3) Settings

SW1 Isolated/Non-Isolated	SW1 Settings
NORMAL 1 3 5 - + HART 1 3 5 - +	For Normal = Position 3&5 for -/+ For Hart = Position 1&3 for -/+

NOTE: J3 only pertains to the WiredHART PCB.

8. Insert and tighten the four (4) standoffs.
9. Push the LCD PCB/CPU PCB set into the four (4) standoffs.
10. Install housing cover, tighten and secure the setscrew.
11. Apply power to receiver.
12. Insert the lower PCB stack into the housing after wiring the terminal blocks.

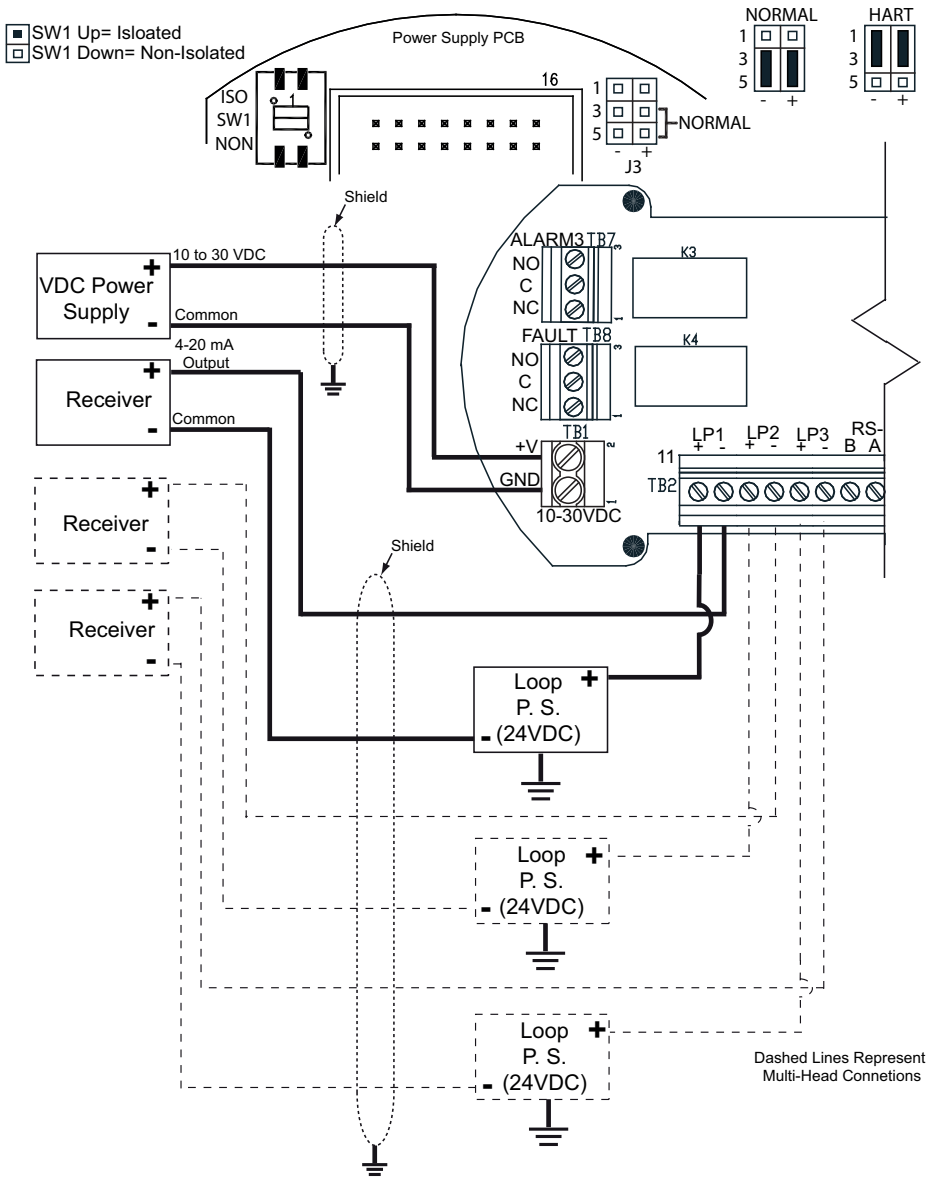


Figure 4-17: Connection for 4-Wire Sourcing with Isolated Loop Power Supply

NOTE: These are examples of typical configurations. Other combinations exist and vary based on each configuration.

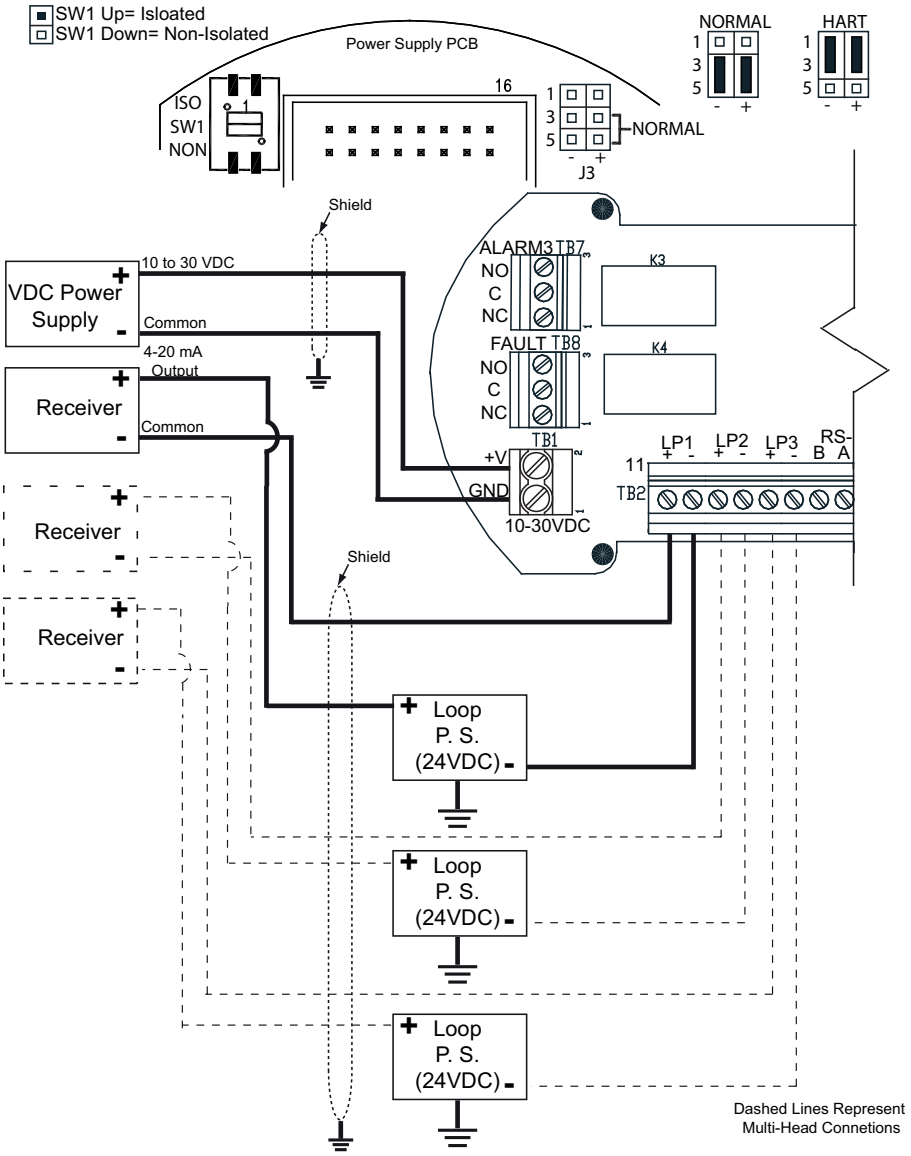


Figure 4-18: Connection for 4-Wire Sinking with Isolated Loop Power Supply

NOTE: Do not mix sinking and sourcing on the same PCB.

4.1.21 Connecting a Device to Other Teledyne Gas & Flame Detection Receivers

To connect the device to various Teledyne Gas & Flame Detection receivers (controllers), use MODBUS 12-bit resolution to ensure compatibility. Refer to following applicable sections based on your application. See Section 4.1.18 Connecting a Device to a Power Supply & Receiver: 3-wire, Section 4.1.19 Connecting a Device to a Power Supply: 2-wire, and Section 4.1.20 Connecting a Device to a Power Supply & Receiver: 4-wire.

CAUTION: Ensure you remap the MODBUS registers when retrofitting the device with an existing Teledyne Gas & Flame Detection controller that supports MODBUS registers.

4.1.22 Connecting Optional Relays & Remote Alarm Reset

To connect the relays and the remote alarm reset, follow the steps below (this feature is optional).

1. The terminal/relay/MODBUS RS-485 PCB contains four (4) relays (K1, K2, K3 and K4) and a remote reset.
2. Ensure you have already made the proper connections prior to connecting the terminal/relay/MODBUS RS-485 PCB (refer to Section 4.1.18 Connecting a Device to a Power Supply & Receiver: 3-wire and Section 4.1.21 Connecting a Device to Other Teledyne Gas & Flame Detection Receivers).

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

3. Route wires of appropriate size from source through conduit runs into the device housing (see Field Wiring in Appendix A.1. Device Specifications).
4. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB stack.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stacks.

5. If desired, connect the wiring from the receiver equipment to one or more of the four (4) relays on the terminal/relay/MODBUS RS-485 PCB. Relays are designated ALARM1 (TB5, K1 for Relay1), ALARM2 (TB6, K2 for Relay2), ALARM3 (TB7, K3 for Relay3) and FAULT (TB8, K4 for Relay4). Each relay has three (3) pins for wiring; a Normally Open (NO), a Normally Closed (NC), and a Common (C) (refer to Figure 4-19: Relay/

Alarm Connection Example – Terminal/Relay/MODBUS PCB and Figure 4-20: Relays/Remote Alarm Reset Connections – Terminal/Relay/MODBUS PCB for details).

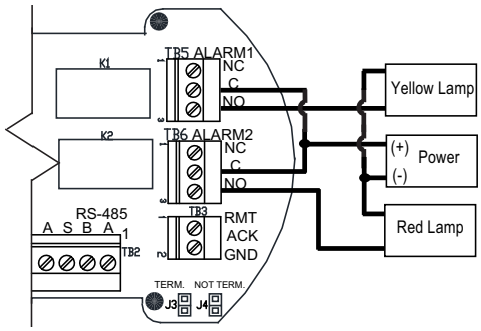


Figure 4-19: Relay/Alarm Connection Example – Terminal/Relay/MODBUS PCB

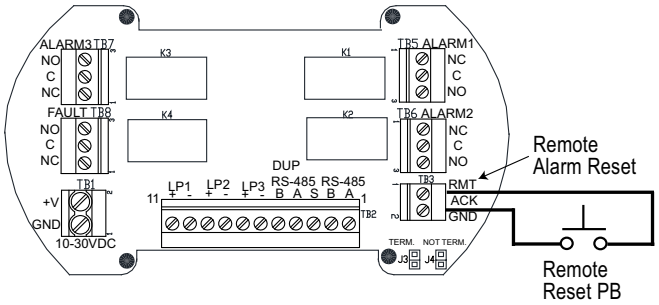


Figure 4-20: Relays/Remote Alarm Reset Connections – Terminal/Relay/MODBUS PCB

CAUTION: Contacts are rated for resistive loads; alarm relays have dry contacts (form C) and power must be supplied from an external source. Failure to do so could result in failure of alarm relays.

6. If desired, connect a remote switch to TB3 on the terminal/relay/MODBUS RS-485 PCB. This feature allows you to shut off and reset a sounding remote alarm (refer to Figure 4-20: Relays/Remote Alarm Reset Connections – Terminal/Relay/MODBUS PCB for details).

WARNING: EXTERNAL WIRING TO TB3 MUST BE SHIELDED AND PROTECTED FROM NOISE SPIKES TO PREVENT A FALSE ALARM RESET CONDITION. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH IF A FALSE ALARM RESET CONDITION OCCURS.

7. Insert the lower PCB stack into the housing after wiring the terminal blocks.
8. Insert and tighten the four (4) standoffs.
9. Push the LCD PCB/CPU PCB set into the four (4) standoffs.
10. Install housing cover, tighten and secure the setscrew.

4.1.23 Connecting the Optional MODBUS RS-485

To connect MODBUS RS-485 to multiple devices to use the MODBUS RS-485 communication protocol, follow the steps below.

MODBUS RS-485 connection allows a MODBUS network connection that is used to connect several devices to a single receiver for monitoring purposes. It supports up to 247 addressed RTUs. Up to 32 RTUs per loop. Each connected device becomes a remote terminal unit (RTU) and requires a unique RTU address.

Consult receiver equipment instructions for information on wiring in addition to what is provided in this manual, as various equipment may have additional specific requirements.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Determine if other devices (RTUs) are to be wired or if the current device (RTU) is the last device being wired on the MODBUS network.
2. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB stack.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stacks.

3. Set or verify J3 or J4 on the Terminal/Relay/MODBUS RS-485 PCB as follows:
4. For a device at the end of the network with no other RTUs to be wired, install the Terminating Resistor into J3.
5. For device with other RTUs to be wired from the current device, install the Terminating Resistor into J4 (refer to Table 4-14: Jumper (J1) Settings for the Device for details).

Table 4-14: Jumper (J1) Settings for the Device

Device's position on the MODBUS Network	Jumper Setting
Device is the last RTU	J3 (Termination)
Device is NOT the last RTU	J4 (Not Terminated)

6. Connect your MODBUS master input wire signals at TB2 Pin1 (A) and TB2 Pin2 (B) on the terminal/relay/ MODBUS RS-485 PCB.
7. Cable shielding must connect to TB2 Pin3 (S).
8. Route output wiring to next RTU from TB2 Pin4 (A) and TB2 Pin5 (B) (refer to Figure 4-21: MODBUS Connections – Terminal/Relay/MODBUS RS-485 PC).
9. For MODBUS connections to Teledyne Gas & Flame Detection, see 4.1.21 Connecting a Device to Other Teledyne Gas & Flame Detection Receivers.
10. TB2 Pin1 and Pin4 are connected internally as are TB2 Pins2 and Pin5.
11. Insert the lower PCB stack into the housing after wiring the terminal blocks.
12. Insert and tighten the four (4) standoffs.
13. Push the LCD PCB/CPU PCB set into the four (4) standoffs.
14. Install housing cover, tighten and secure the setscrew.
15. When powered up, assign unique RTU address to each of the devices on the MODBUS network using the MODBUS setup menu (See Section 5.1.3 Configuring the Setup Menu).

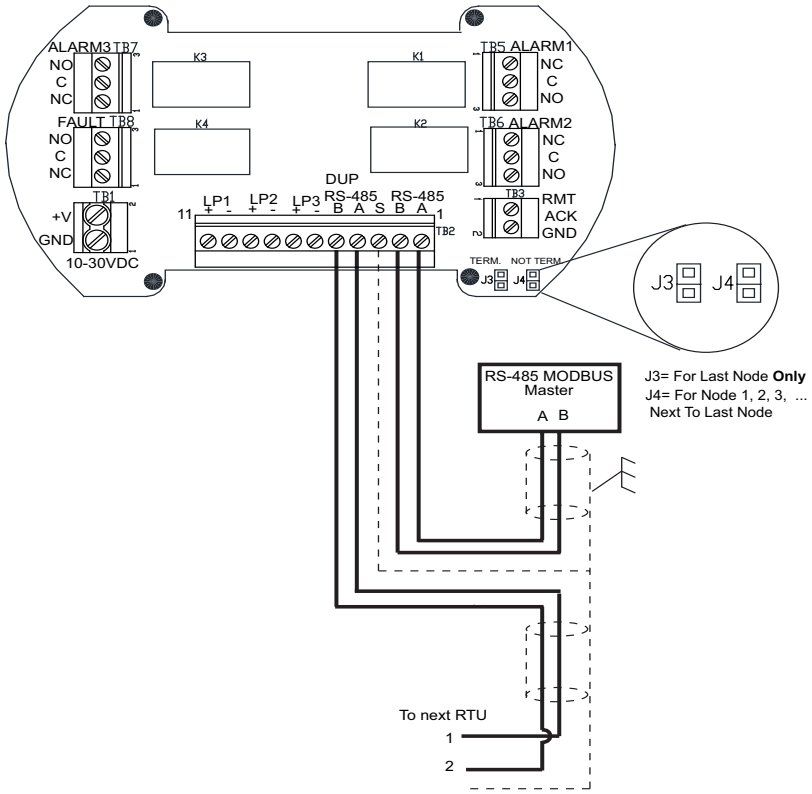


Figure 4-21: MODBUS Connections – Terminal/Relay/MODBUS RS-485 PC

4.1.24 Installing the Optional Communication Expansion Card (CEC) PCB

To install an optional communication expansion card (CEC) PCB when required, follow the steps below. The optional CEC PCB is automatically configured on installation.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set from the four (4) standoffs.
2. Connect the CEC PCB's female 20-pin connector (S3) into the male 20-pin connector (P3) on the CPU PCB (refer to Figure 4-22: Optional Communication Expansion Card (CEC) PCB Connection for details).

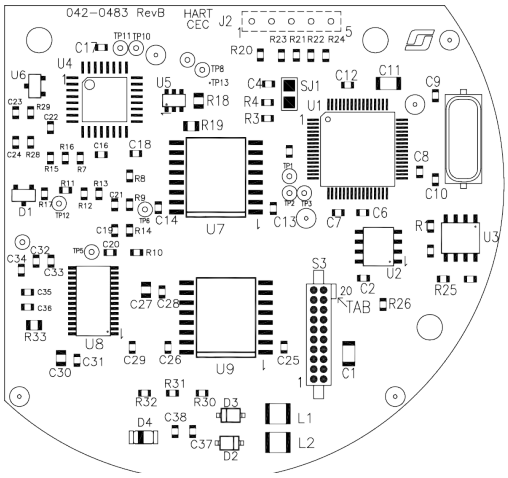


Figure 4-22: Optional Communication Expansion Card (CEC) PCB Connection

3. Secure the CEC PCB using the three (3) screws.

NOTE: Ensure all related switches and jumpers are properly set on other applicable PCBs.

4. Push the LCD PCB/CPU PCB and CEC PCB set into the four (4) standoffs.
5. Install housing cover and tighten the setscrew.
6. Apply power to receiver.

4.1.25 Connecting a Sensor Head

This section describes how to connect sensor head's 6-pin plug connector onto the intrinsically safe barrier PCB of the device.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB stack.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stacks.

2. Loosen and remove the four (4) standoffs.
3. Remove the entire PCB stack for easy wiring to terminal blocks.
4. Remove the two (2) Phillip head screws to the terminal block cover to access the 6-pin plug connector (TB1).
5. Insert the 6-wires from the Meridian detector body assembly through the bottom of the threaded hole of the device.
6. Insert the 6-wires into the 6-pin plug connector (TB1) 1, 2, 3, 4, 5 and 6 respectively, Green (A), yellow (B), red (3.3V), black (GND), blue (GND), and white (Vadj) (refer to Figure 4-23: Meridian Detector Body Assembly Connection).

NOTE: The light blue terminal blocks indicate intrinsically safe circuits. Tighten the plug retention screws.

7. Replace the terminal block cover using the two (2) Phillip head screws.
8. insert the entire PCB stack into the housing after wiring the terminal blocks.
9. insert and tighten the four (4) standoffs.
10. Push the LCD PCB/CPU PCB set into the four (4) standoffs.
11. install the housing cover, tighten and secure the setscrew.

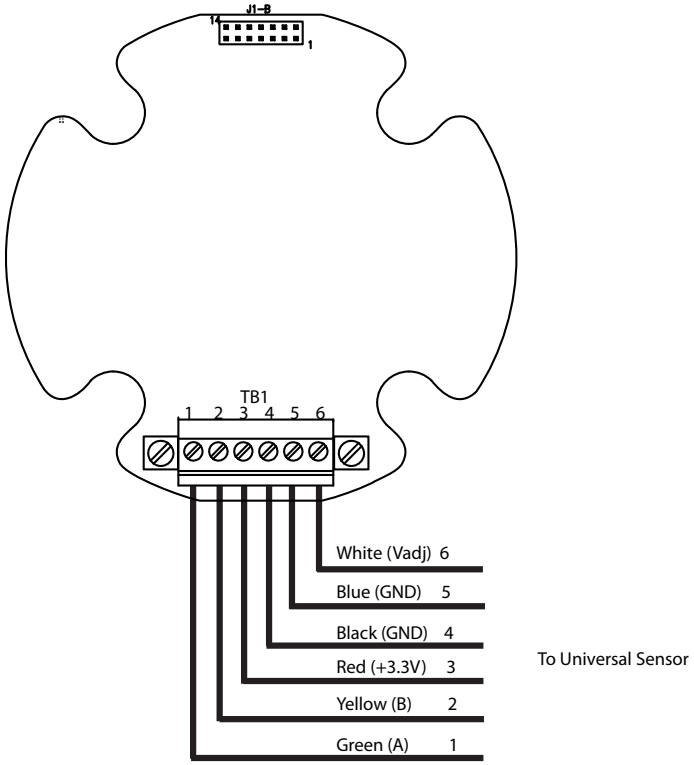


Figure 4-23: Meridian Detector Body Assembly Connection

4.1.26 Installing/Replacing a Sensor

The sensors do not ship installed into the device. Sensors originally ordered with the device are pre-configured and only require calibration. Additionally, sensors should be replaced as the need arises.

To install a new, or replace an existing, sensor:

NOTE: The light blue terminal blocks indicate intrinsically safe circuits. Tighten the plug retention screws.

WARNING: TO AVOID THE POSSIBLE NEED OF RE-CALIBRATING A CALIBRATED SENSOR, VERIFY THAT THE DEVICE DATE AND TIME AND CORRECT PRIOR TO ACCEPTING SENSORS). FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: THE DEVICE IS NOT ACTIVELY MONITORING TARGET GASES WHEN POWER IS REMOVED. VERIFY ATMOSPHERE IS SAFE OR DEVICE ATMOSPHERE WITH ANOTHER DEVICE WHILE INSTALLING A NEW SENSOR TO PREVENT RISK OF INJURY OR DEATH. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

NOTE: Removing power is not required when installing/replacing the sensor. Follow local procedures and safety regulations.

WARNING: ALARM SETTINGS ARE STORED IN THE SENSOR. CHANGING SENSOR CHANGES ALARM SETTINGS. VERIFY PRIOR TO PROCEEDING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

NOTE: Removing sensor(s) creates a fault condition (FLT LED blinks, error message alternates between SYSTEM FAULT and SENSOR OFFLINE on the LCD). To avoid this fault condition, using the menu, enter password, take sensor(s) offline and save the change, then remove the sensors). The device places the sensor(s) back online and begins its warm-up time.

1. Ensure the device has power.
2. Using the menu, set offline sensor to the number of sensors to be connected to the device (1, 2 or 3) to **YES**.
3. Set sensors enable to the number of sensors to be connected to the device (1, 2 or 3).
4. Loosen and remove the Meridian end cap.

WARNING: THE ORDER OF SENSOR INSTALLATION DEFINES THE CORRESPONDING LOOP. FOR EXAMPLE, THE DEVICE ASSIGNS THE 1st SENSOR INSTALLED TO LOOP1, THE 2nd SENSOR TO LOOP2, THE 3rd TO LOOP3. YOU MUST CONFORM TO THE SENSOR TYPE RULES PER SENSOR POSITION IN THE SYSTEM CONFIGURATION AS OUTLINED IN Table 4-4: Hard Wired Configurations – Sensor Types Supported for 3 or 4-Wire. VIOLATING, OR ARE ATTEMPTING TO VIOLATE, SENSOR CONFIGURATION RULES AUTOMATICALLY PLACES THE DEVICE INTO AN IMMEDIATE FAULT MODE. THIS IS AN ILLEGAL CONFIGURATION (NOT INTRINSICALLY SAFE). FAILURE TO ADHERE TO THE CORRECT SENSOR MAPPING COULD RESULT IN INJURY OR DEATH.

5. Insert Sensor1 into the sensor head, twist until it snaps into place and acknowledge via LCD. It self aligns in the sensor head, (see Figure 4-24: Meridian Detector Body Assembly).
6. The GAS TYPE, SENSOR #1 displays on the LCD. Repeat for others sensors.

NOTE: When a different sensor is detected, the LCD displays the option to Reject or Accept. If the selection is an Intrinsically safe violation, all LEDs flash and the LCD displays I.S. VIOLATION. CORRECT, HIT ENTER KEY TO REBOOT. Remove the violating sensor prior to rebooting.

7. Replace the Meridian end cap and secure the setscrew.

CAUTION: Meridian end cap must be attached to protect the device from ingress from water or dust. Ensure all sensors) are installed prior to operation. Ensure Meridian end cap is installed prior to operation. Only use Meridian end cap P/N 096-3437-1 or 096-3437-2 with mesh screen. 096-3437-3 and 096-3437-4 without mesh screen.

8. Allow a few minutes for the sensor to warm up. The warm up time depends on the sensor type. During warm-up the loop current is setup to inhibit automatically.

NOTE: To remove a sensor, remove Meridian end cap and then just pull it straight down, (see Figure 4-24: Meridian Detector Body Assembly).

NOTE: Do not attempt to service sensors in the field. If they need service, contact the factory (see Appendix E. Technical Support).

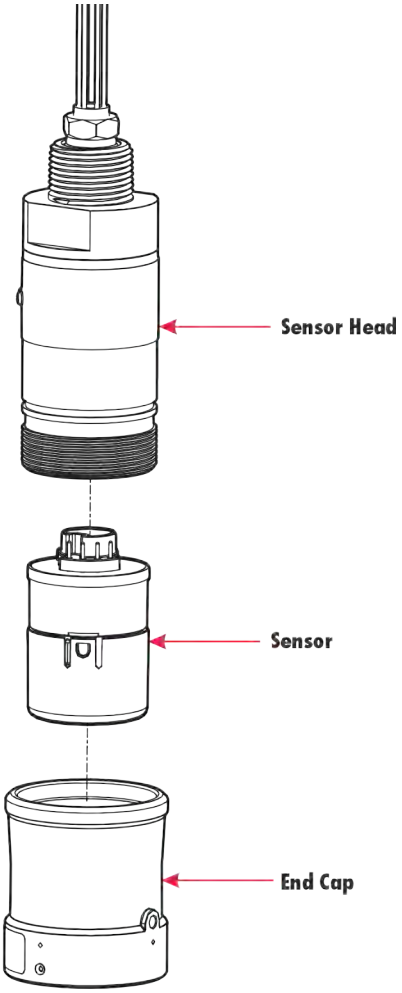


Figure 4-24: Meridian Detector Body Assembly

This page is intentionally left blank.

5. Configuration & Setup

5.1. Configuring the Device

WARNING: ONLY TRAINED INDIVIDUALS WHO HAVE READ THIS MANUAL AND UNDERSTAND THE CALIBRATION PROCEDURES SHOULD CONFIGURE THE DEVICE. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING: WHEN THE PRIMARY DEVICE IS OFF LINE, ENSURE YOU HAVE ANOTHER ON LINE DEVICE TO ACTIVELY DETECT GASES. THE DEVICE MAY BE OFF LINE DUE TO SUCH ACTIVITIES LIKE, BUT NOT LIMITED TO, CALIBRATION, INSTALLATION, MAINTENANCE, TROUBLESHOOTING, CONFIGURATION, WIRING, AND OTHER ACTIVITIES. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: WHEN CHANGING SETTINGS, BE SURE COMMUNICATE THOSE CHANGES TO ALL AFFECTED PERSONNEL. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: BEFORE YOU BEGIN, READ AND UNDERSTAND THE MSDS AND WARNING LABELS FOR THE CALIBRATION GASES. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.

All device configuration variables are selected via the menu screens and those variables are stored in its Non-volatile Memory (NV-EEPROM). Many menu items contain default values from the factory and require changes to better match your applicable application.

A device may be configured using the supplied magnet and the four (4) navigation keys in approximately 5-10 minutes. To enter the configuration menu, press the **ENT** key (see 6.1. Operating the Device).

Figure 5-1: Configuration Menu Structure – Sheet 1 of 2 and Figure 5-2: Configuration Menu Structure – Sheet 2of 2 outline the entire configuration menu structure. The configuration menu structure of a device is divided into six (6) menu trees. They are: Information (see Figure 5-3: Information Menu Structure), Setup (see Figure 5-4: Setup Menu Structure), Calibration (see Figure 5-5: Calibration Menu Structure), Datalog (see Figure 5-6: Datalog Menu Structure), Display (see Figure 5-7: Display Menu Structure) and User Access (see Figure 5-8: User Access Menu Structure).

NOTE: The menu screens in this chapter are based on the device's Firmware. Version 1.14. If your device has a different firmware version, then the menu screens will vary somewhat.

5.1.1 User Access Levels

The user levels and their associated privileges are:

- No user access:
  - Allows viewing of transmitter information
- Operator access – OA (factory default is 0000):
  - Allows viewing of transmitter information
  - Allows zeroing and spanning the sensors
- System manager access – SMA (factory default is 0000):
  - Allows viewing of transmitter information
  - Allows zeroing and spanning the sensors
  - Allows changing system parameters

NOTE: User access level determines the display of some parameters.

Access to certain value entry menus and individual parameters are restricted and denoted by RO (Read Only) located in the top left hand corner of the menu screens. They require a user access. Refer to Figure 5-1: Configuration Menu Structure – Sheet 1 of 2, Figure 5-2: Configuration Menu Structure – Sheet 2of 2, and Table 5-1: Information Menu Parameters to Table 5-9: User Access Menu Parameters.

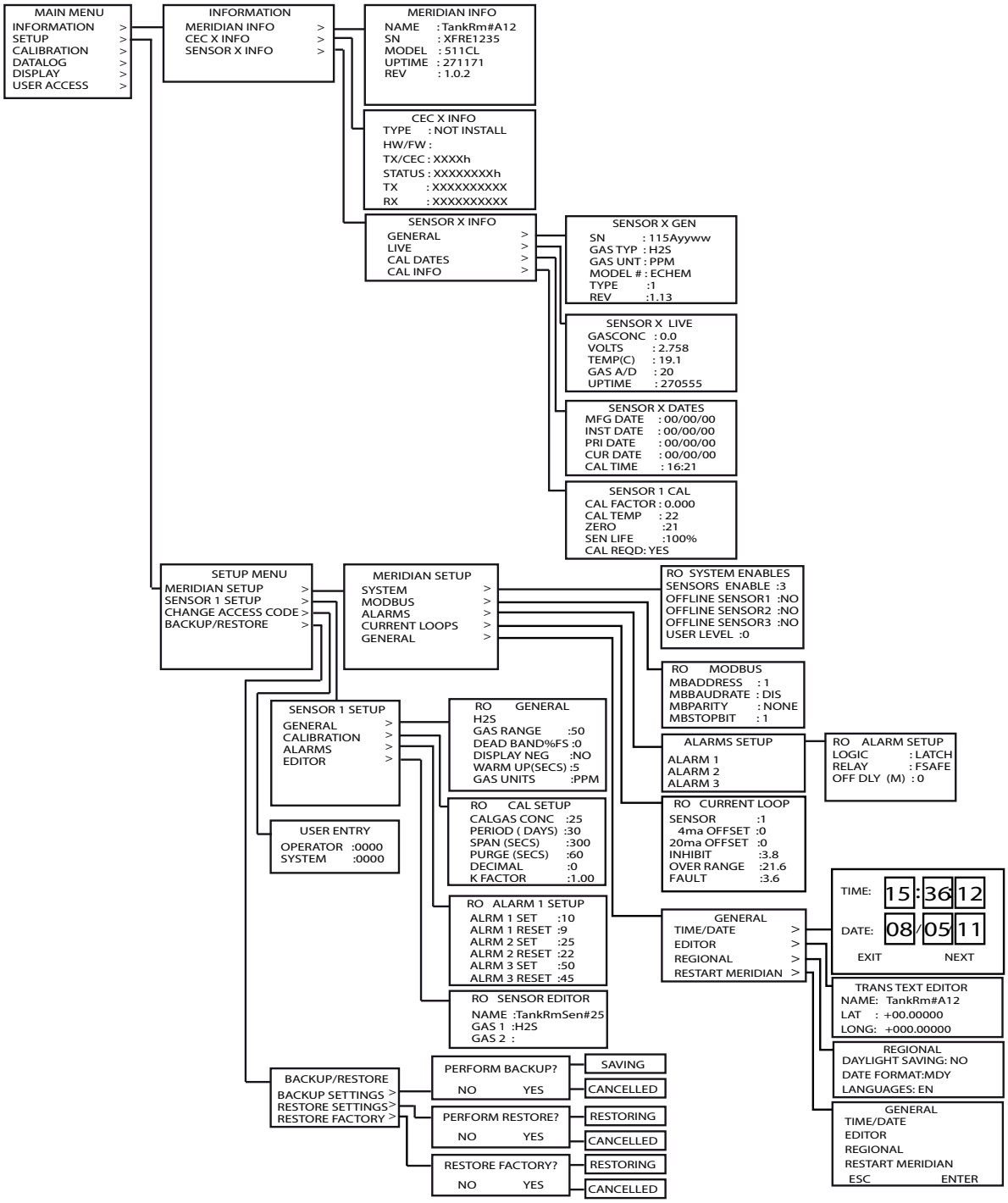


Figure 5-1: Configuration Menu Structure – Sheet 1 of 2

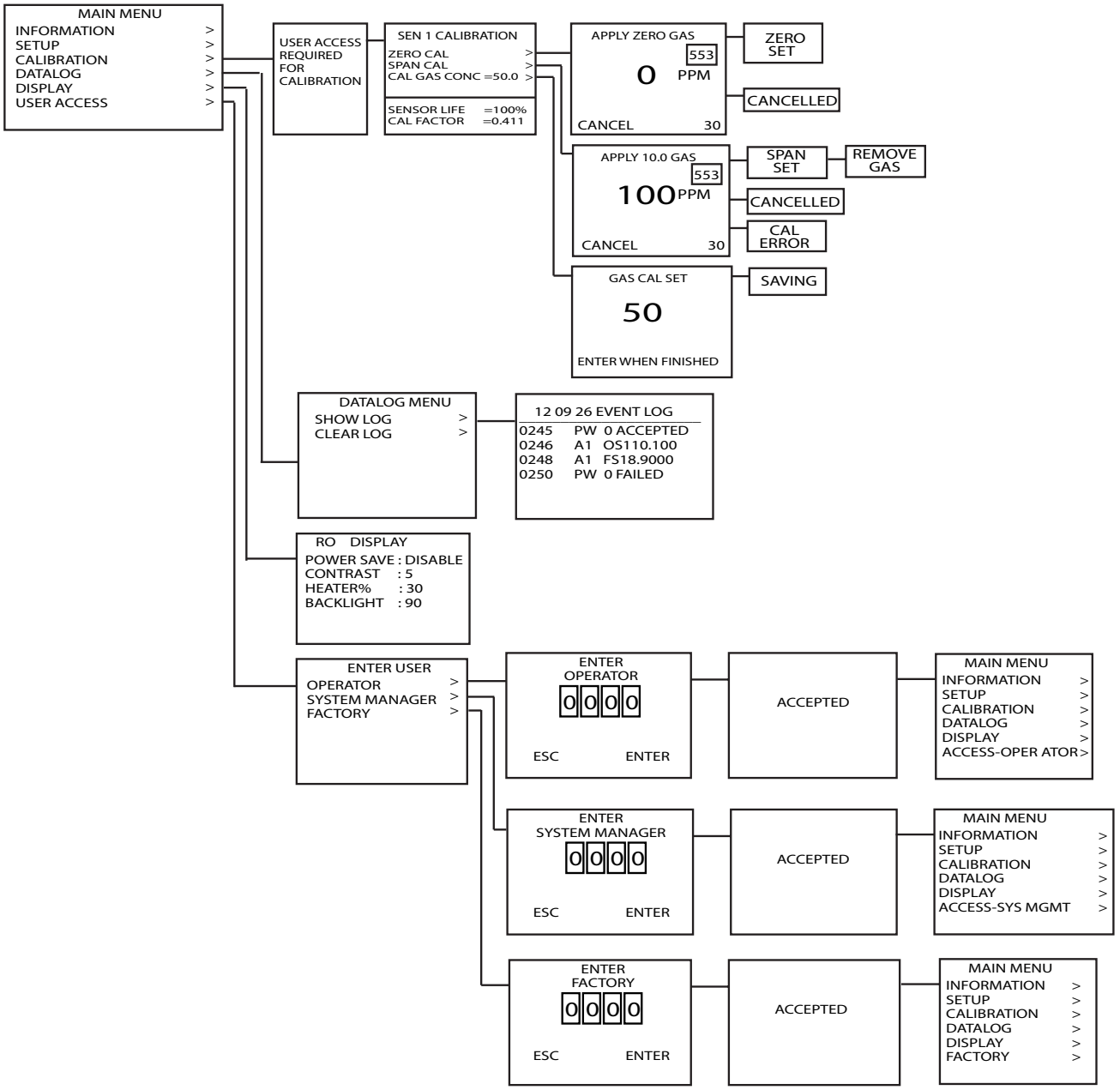


Figure 5-2: Configuration Menu Structure – Sheet 2of 2

5.1.2 Using the Information Menu

Use the magnetic keys to navigate through the menu structure as necessary. See Figure 5-3: Information Menu Structure. The parameters are detailed in Table 5-1: Information Menu Parameters.

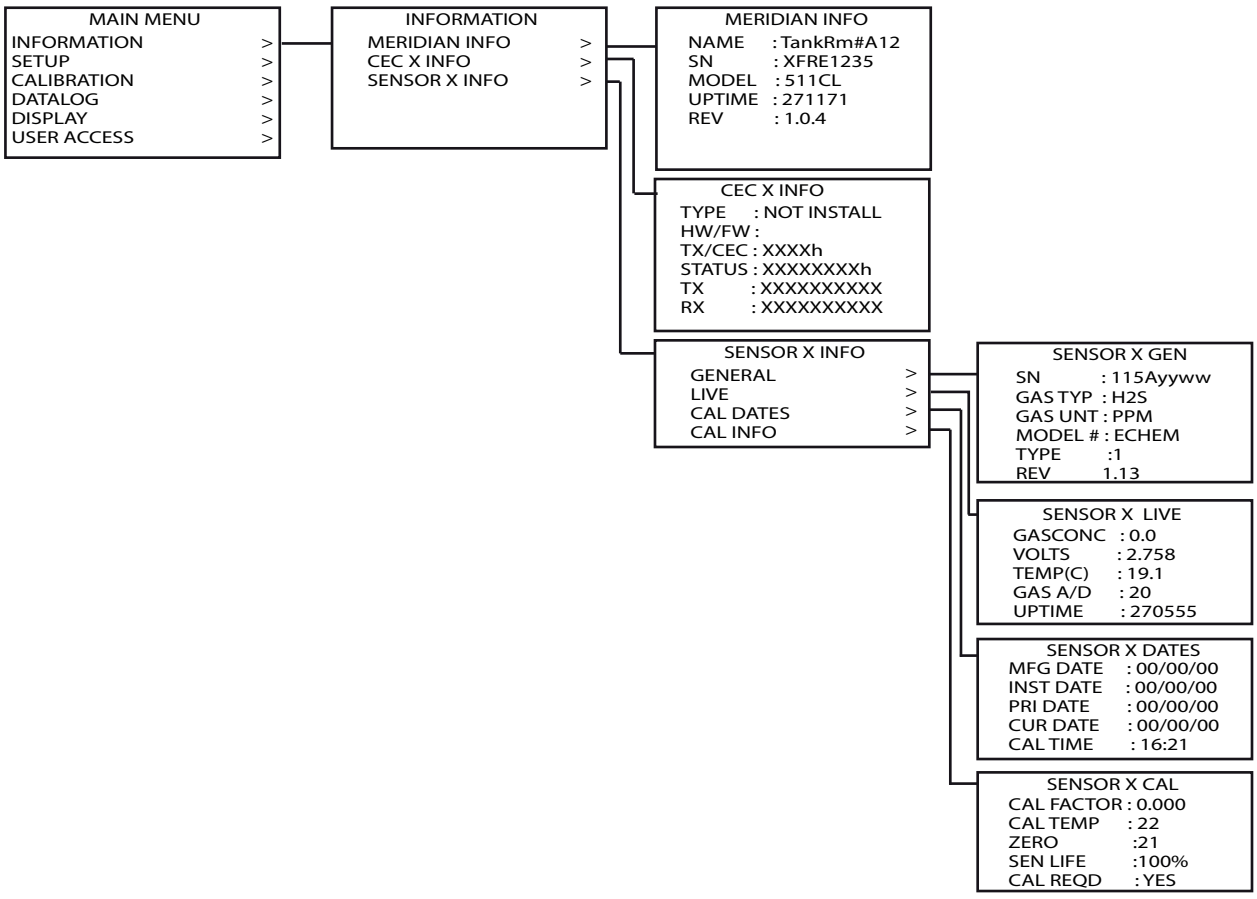


Figure 5-3: Information Menu Structure

Table 5-1: Information Menu Parameters

Item	Sub-Item	Description*
Tx Information	Name	Displays the monitored point by your tag # or other familiar terminology.
	SN	Displays the Serial Number.
	Model	Displays the Model Number.
	Uptime	Displays the power on time in Seconds for up to 4 billion.
	Revision	Displays the Revision of the Firmware.
CEC X Info (Communication Extension Card) Information	Type	The CEC_Type If Optional Communication PCB (CEC) is not installed in device, then Type displays "Not Installed".
	HW/FW	The CEC HW/FW This is a combined CEC hardware and firmware bytes.
	TX/CEC	This is a bit defined status of the TX/CEC interface based on this table. This table is defined in the TX MB register named CECStatus (40142). CECStatus Lower byte:CEC1 Status Upper byte:Reserved If 0=No CEC detected bit: 0=CEC EEPROM detected 1=CEC uP comms up 2=CEC requested DataBase 3=DB download complete 4=DB mismatch 5=DB CRC error 6=Protocol error 7=Undefined error

Table 5-1: Information Menu Parameters (Continued)

Item	Sub-Item	Description*
CEC X Info (Communication Extension Card) Information, cont.	Status	This is the 4byte status returned by the CEC. Device Status (byte): • bit0=Busy • bit1=Hardware Error • bit2=NVMEMORY at defaults • bit3=Spare • bit4=Spare • bit5=Spare • bit6=Lock Status • bit7=Initialize Complete Network Status (byte): • bit0=Ready to Communicate • bit1=Spare • bit2=Spare • bit3=Spare • bit4=Spare • bit5-Spare • bit6=Connection Status (States & Status below) • bit7=Connection Status (States & Status below) States & Status of bits6 & 7: • bit6&7state=0,0 Status=Reserved • bit6&7state=1,0 Status=Discovery:Field device is looking for other neighbors. • bit6&7state=0,1 Status=Joining: Field device is in the join process (typically 30S to 5Min) • bit6&7state=1,1 Status=Operational: Field device has established communications. Device Information (High byte): Bits are undefined, thus always 00. Device Information (Low byte): Bits are undefined, thus always 00.

Table 5-1: Information Menu Parameters (Continued)

Item	Sub-Item	Description*
CEC X Info (Communication Extension Card) Information, cont.	TX	This is a counter that the transmitter increments to count the bytes sent to the CEC. It is the interface between the transmitter and the CEC.
	RX	This is a counter that the transmitter increments to count the bytes received by the CEC. It is the interface between the transmitter and the CEC.
Sensor X General	SN	Displays the Serial Number.
	GasType	Displays the Gas Type.
	Gas Units	Displays Gas Units. %, %LEL, PPB, or PPM.
	Model#	Displays the Model Number.
	Type	Displays the Sensor's technology type: 1=E-Chem 2=IR 3=Cat Bead
	Rev	Displays the firmware revision installed on the Sensor. For example, 1.12.
Sensor X Live	GasConc	Displays gas concentration from the sensor. Displays with or without decimal points as appropriate.
	Volts	Displays the Sensor Voltage.
	Temp(C)	Displays the Sensor Temperature in °C.
	Gas A/D	Displays the A/D output, the raw count.
Sensor X Cal Dates	Mfg Date	Displays manufactured date. Read from the Sensor.
	Install Date	Displays installation date. Read from the Sensor.
	Prior Date	Displays prior calibration date.
	Current Date	Displays the most recent calibration date.
	Cal Time	Displays the last Cal Time.
Sensor X Cal Info	Cal Factor	Displays the resolution of the Sensor.
	Cal Temp	Displays the temperature (°C) of Sensor when calibrated.
	Zero	Displays A/D reading when zeroed.
	Sen Life	Display the sensor current life as %.
	Cal Required	Displays Yes or No.

* No user access required to access these particular parameters.

5.1.3 Configuring the Setup Menu

Use the magnetic keys to navigate through the menu structure as necessary (refer to Figure 5-4: Setup Menu Structure, Table 5-2: Transmitter Setup Menu Parameters, Table 5-3: Sensor X Setup Menu Parameters, Table 5-4: Change user Access Setup Menu Parameters, and Table 5-5: Backup/Restore Setup Menu Parameters).

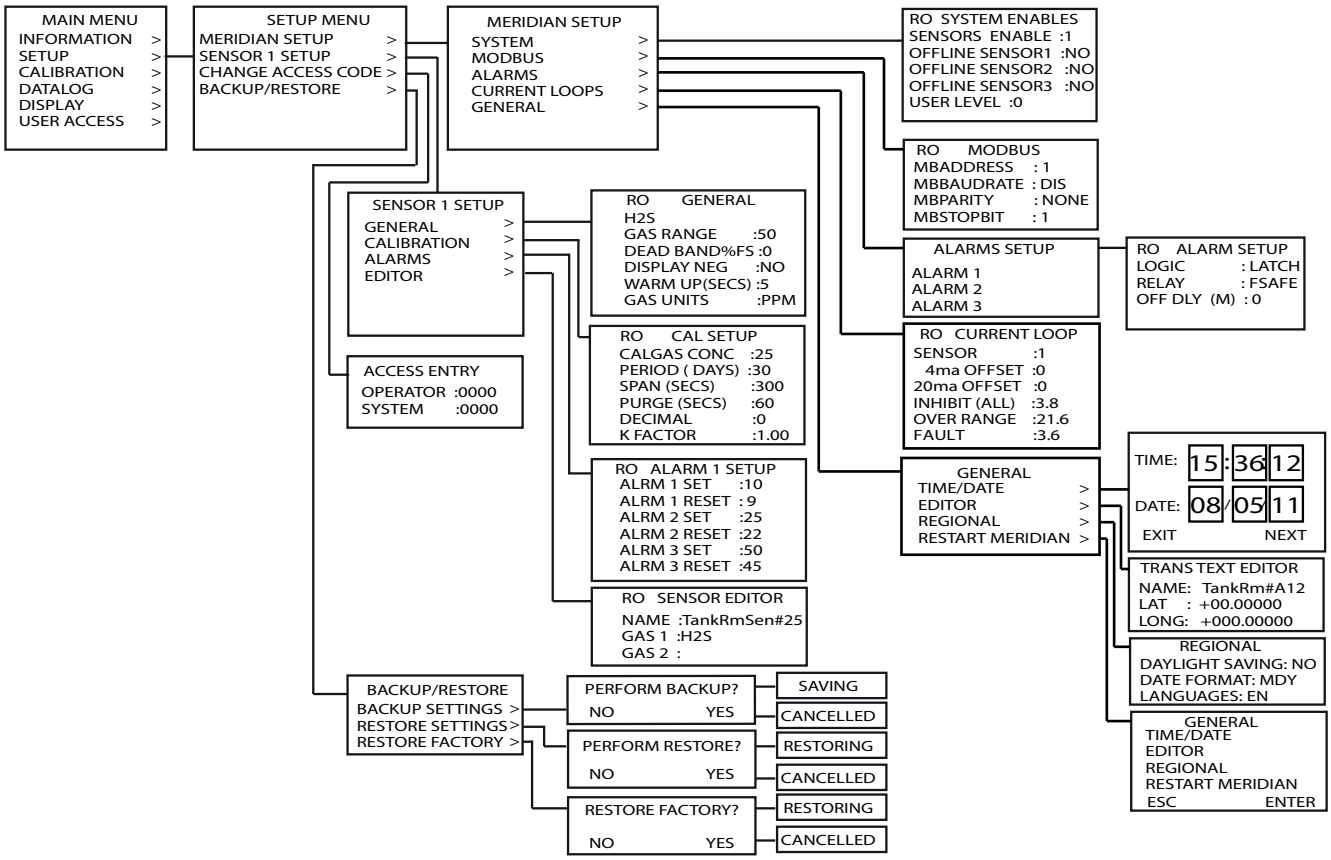


Figure 5-4: Setup Menu Structure

Table 5-2: Transmitter Setup Menu Parameters

Item	Sub-Item	Description*	OA	SMA
System	Sensors Enable	Enables 1, 2, or 3 sensors within the system.	†	
	Offline SensorX	No – Allows that specific sensor to remain online. Yes – Takes that specific sensor offline. Offline may be used to prevent an alarm when removing a sensor.	†	
	User Level	Sets the device's minimum/default access level. This setting is used during power up, after power failures and after 5 minutes while using a higher user access level. Select from: • 0, no access = Allows viewing of transmitter information. • 1, operator access (OA) = Allows viewing of transmitter information, zeroing and spanning the sensors. • 2, system manager access (SMA) = Allows viewing of transmitter information, zeroing and spanning the sensors, and changing system parameters. See Table 5-9: User Access Menu Parameters.		
MODBUS	MB Address	Used to map RTUs. Each device is assigned its own RTU address. Address range is 1 to 247. Up to 32 RTUs per loop are supported. Note: Each device must have its own RTU address while communicating on the same two (2) wire cable to prevent bus conflicts with receiving equipment. Default= 0		†
	MB BaudRate	Used to communicate with RTUs. Select from: 9600, 19200, DISABLED		†
	MBParity	Used to communicate with RTUs. Select from: Even, Odd, None		†
	MBStopBit	Used to communicate with RTUs. Select from: 0, 1, 2		†

Table 5-2: Transmitter Setup Menu Parameters (Continued)

Item	Sub-Item	Description*	OA	SMA
Alarms	Logic	Latch – Causes the alarm to remain active even after the condition is gone and only reset when acknowledged via one of these three (3) methods: MODBUS, user input via the four (4) Keys, or Remote Acknowledge Reset Button. No Latch – The alarm is active only while the condition exists; the alarm clears after the condition passes.		†
	Relay	Non-Failsafe – The relay energizes during alarm and de-energizes with no alarm. Failsafe – The relay de-energizes during alarm and energizes with no alarm. This is useful for signaling alarm when device power is lost. K4 is a fault alarm and is always failsafe. For example, in normal mode, power is on, and the alarm is off. In fail mode, power is off, and alarm is on.		†
	Off Delay(M)	Allows entering a delay before clearing an alarm after the alarm condition is gone. This is useful for continuing an alarm function, such as operation of an exhaust fan, for a period of time after the alarm condition clears. Range 0 to 120.		†
Current Loop	Sensor X	Selects the Sensor. Range 1 to 3 NOTE: For multi -sensor Meridians, the sensor number 1, 2, or 3 is determined by which sensor is connected first to the Meridian. The first sensor physically connected becomes sensor #1, the second becomes #2, and the third becomes #3. If all sensors are removed later for replacement simultaneously, this order will change again based on installation order.	†	
	4mA Offset	Allows adjustments to the current loop counts of the sensor. Range 0 to 127; 0 to -128. Note: If necessary, see *7.3.7 Trimming the 4-20MA Loop*		†
	20mA Offset	Allows adjustments to the current loop counts of the sensor. Range 0 to 127; 0 to -128. Note: If necessary, see *7.3.7 Trimming the 4-20MA Loop*		†

Table 5-2: Transmitter Setup Menu Parameters (Continued)

Item	Sub-Item	Description*	OA	SMA
Current Loop, cont.	Inhibit (ALL)	Takes the 4-20mA signal and adjusts it during Inhibit for either individual sensor or the entire device. Default= 3.8mA Range 3.8 to 24mA in .1mA steps		†
	Over Range	Used to select the current when the gas concentration is over range. Default =21.6mA Options: 3.6mA or 21.6mA		†
	Fault	Used to select the current when the transmitter reports a general fault. Default= 3.6mA Options: 1.0mA or 3.6mA		
General	Time/Date	Allows editing the time and date settings. Time in military format and date is mm/dd/yy format.	N/A	
	Editor	Name – An editable 16 ASCII charter text string. Typically used to identify the monitored point by your tag # or other familiar terminology. Lat – Allows entry of degrees and fraction of degrees. Long – Allows entry of degrees and fraction of degrees.		†
General, cont.	Regional	Daylight Savings – Select **YES** or **NO**. Date Format – Select **MDY**, **DMY** or **YMD**. Languages – Select from list provided.	†	
	Restart Meridian	Allows the reboot of the device. Select **ESC** or **ENTER**.		†

† Indicates the minimum user access level required to access this particular parameter.

Table 5-3: Sensor X Setup Menu Parameters

Item	Sub-Item	Description*	OA	SMA
General	Gas Type	Displays gas type based on the installed sensor. Note: Only IR-combustible sensors may be changed. Selection is limited per sensor. The combustible IR sensor (096-3473-56) allows the selection of different target gases, see 7.3.2 Changing the E-Chem Sensor's Range.		**
	GasRange	Current gas range. Displays on LCD. Also used to change the sensor's gas range for applicable sensor. Range varies based on installed sensor. Note: Changing a sensors gas range automatically changes its associated set and reset values. Therefore, ensure you verify these settings after changing its gas range, see 7.3.2 Changing the E-Chem Sensor's Range.		†
	Dead-Band %FS	Allows forcing low values to continue to read zero. This is useful when there are small amounts of background gases that cause fluctuating readouts above zero. The highest amount of deadband allowed is 5%. 0% FS= 0mA output. Range 0 to 5.		†
	Display Negative	Yes – Select to display negative gas monitor values. No – Select not to display negative monitor values. Causes negative values to read the (0%) value in data displays. Unit will flag -RNG fault if the reading drops below -5% FS, regardless of DisplayNegative selection.		†
	WarmUp (SECS, MIN, HRS)	Time delay set to prevent unwanted alarm trips while sensor is warming up. Ranges 10, 20, 30, 40, 50 Secs; 1 to 59 Mins; 1 to 180 Hrs		†
	Gas Units	Select from **%**, **%LEL**, **PPB**, or **PPM**.	N/A	
Cal	CalGas-Conc	Enter value for targeted gas. Value found on target gas cylinder. Accepts either %Volume, PPM, PPB or %LEL. For example, for Methane target gas, label indicates 2.5% (50%LEL). Range 0 to 100% of sensor range.	†	
	Period (DAYS)	Notifies when calibration is needed. Range 0 to 1024.		†
	Span (SECS)	Prevents activation of alarm relays, faults, and holding loop outputs while performing a span calibration. Range 0 to 1024		†

Table 5-3: Sensor X Setup Menu Parameters (Continued)

Item	Sub-Item	Description*	OA	SMA
Cal, cont.	Purge (SECS)	Enter the amount of time to allow the span gas to clear. Range 0 to 1024.		†
	Decimal	Number of decimal places in gas reading shown on LCD. Range 0, 1, or 2. Note: Range varies based on the installed sensor's range.	†	
	K Factor	Enter values for combustible cat-bead sensors. Default= 1.00 Range 0.10 to 1.50 See 2.3. Combustible Cat-Bead Sensor K-Factors		†
Alarms	AlarmX Set	Enter the engineering unit value. The set is the gas concentration level at which the alarm (activates), trips. The set and reset values are used to define a range between the upper and lower trigger points. Set and reset can be the same value. They address hysteresis. For example, if you are monitoring H_2S, you could make the SET 15 and the RESET 10. Conversely, if you are monitoring O_2, you could make the SET 19 and the RESET 20. This accommodates the different gas properties and provides you the flexibility to customize your settings. For combustible: Range 0 to 60% of sensor range. For toxic: Range 0 to 100% of sensor range.	†	
	AlarmX Reset	Enter the Engineering Unit value. The Reset is the gas concentration level at which the alarm (deactivates), clears. The Set and Reset values are used to define a range between the upper and lower trigger points. Set and Reset can be the same value. They address hysteresis. For example, if you are monitoring H_2S, you could make the SET 15 and the RESET 10. Conversely, if you are monitoring O_2, you could make the SET 19 and the RESET 20. This accommodates the different gas properties and provides you the flexibility to customize your settings. For Combustible: Range 0 to 60% of sensor range. For Toxic: Range 0 to 100% of sensor range. Note: Reset values cannot exceed corresponding set values.	†	

Table 5-3: Sensor X Setup Menu Parameters (Continued)

Item	Sub-Item	Description*	OA	SMA
Editor	Name	Allows editing of the sensor's name (16 ASCII character text string). Displays on the LCD.	†	
	Gas1	Allows editing of the sensor's gas 1 (8 ASCII character text string). Displays on the LCD.	†	
	Gas2	Allows editing of the sensor's gas 2 (8 ASCII character Text String). Displays on the LCD.	†	

† Indicates the minimum user access level required to access this particular parameter.

Table 5-4: Change user Access Setup Menu Parameters

Item	Sub-Item	Description*	OA	SMA
User Access	Operator	Allows changing the 4-digit access for operator access To change this parameter, you must already be at System manager level. If not, this parameter is RO. See Table 5-9: User Access Menu Parameters.		†
	System Manager	Allows changing the 4-digit access for system manager To change this parameter, you must already be at system manager level. If not, this parameter is RO. See Table 5-9: User Access Menu Parameters.		†

† Indicates the minimum user access level required to access this particular parameter.

Table 5-5: Backup/Restore Setup Menu Parameters

Item	Sub-Item	Description*	OA	SMA
Backup/ Restore	Backup Settings	Yes – Performs backup No – Cancells backup Note: Registers TX_OffsetMBSlaveAddress to TX_OffsetTXLongitude registers are all included in this function.		†
	Restore Settings	Yes – Performs restore No – Cancells restore Note:Registers TX_OffsetMBSlaveAddress to TX_OffsetTXLongitude registers are all included in this function.		†
	Restore Factory	Enter – Performs factory restore Esc – Cancells factory restore Note:The values are maintained for these registers: TX_OffsetTXModelNumber, TX_OffsetTXSerialNumber, TX_OffsetTXCodeVersion, TX_OffsetTXDataBaseVersion, TX_OffsetInhibitCurrent_FP32=3.8, TX_OffsetSensorsEnabled=1u. All others values are zero. Also, when a Restore is performed without a prior Backup, the Restore reflects the factory default values.		†

† Indicates the minimum user access level required to access this particular parameter.

5.1.4 Configuring the Calibration Menu

Use the magnetic keys to navigate through the menu structure as necessary (refer to Figure 5-5: Calibration Menu Structure and Table 5-6: Calibration Menu Parameters).

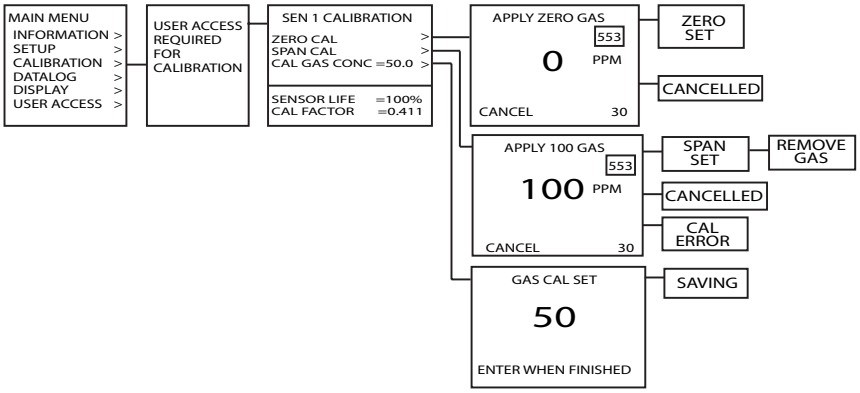


Figure 5-5: Calibration Menu Structure

Table 5-6: Calibration Menu Parameters

Item	Sub-Item	Description*	OA	SMA
SensorX	Zero Cal	Activates zero calibration process, once **Enter** is pressed. 30 second timer starts. Press **Escape** to abort.	†	
	Span Cal	Activates span calibration process, once **Enter** is pressed. 30 second timer starts. Press **Escape** to abort.	†	
	Cal Gas Conc	Sets the amount of cal gas used based on the value found on the target gas cylinder, once **Enter** is pressed. For example, for Methane target gas, label indicates 2.5% (50%LEL). The units of measure is sensor dependent. Displays results: ***Saved***, or ***Aborted***. Press **Escape** to abort.	†	
	Sensor Life	Displays the amount of sensor life remaining. Range 0 to 100%.	†	
	Cal Factor	Displays the resolution of the sensor. The bigger the value the less sensitive the sensor, conversely, the smaller the value the more sensitive the sensor. Range 0.000 to 10.		†

† Indicates the minimum user access level required to access this particular parameter.

5.1.5 Configuring the Datalog Menu

Use the magnetic keys to navigate through the menu structure as necessary (refer to Figure 5-6: Datalog Menu Structure and Table 5-7: Datalog Menu Parameters).

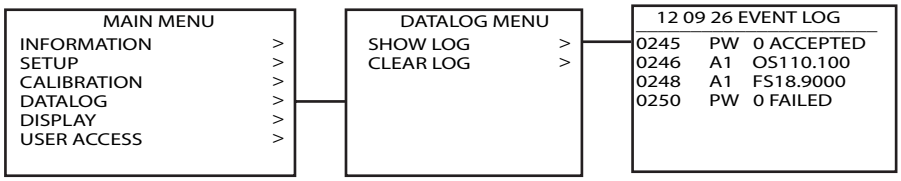


Figure 5-6: Datalog Menu Structure

Table 5-7: Datalog Menu Parameters

Item	Sub-Item	Description*
DataLog	Show Log*	Displays time stamped events. Events include: When device went in and out of Alarms and when device went in and out of Faults. YY MM DD: Year, month and day of the log. Each event line format is: HHMM: Hour and minutes from the date stamp, EC: Event Code from the logged event and EventData.
Event codes		EC EVENTDATA= DESCRIPTION
		SU YYMMDDHHMMSS=Startup
		SD YYMMDD=Set date, with YMD
		ST HHMMSS=Set time, with HMS
		FC Low Volts=Brownouts below 10V
		FC SV Mismatch=SV Mismatch
		FC XXXXXXXXWDog=SW WDT Fire
		FC XXXXXXXXDiag=Diag Safety
		FC MB_Address=MB Address Changed
		FC >1 HP Sensor=More than one high power sensor
		FC XXXXh SnF=Sensor fault
		LU Sn=Linkup, with S (Sensor number)
		Ax sss.s:rrr.s=Alarm set point/reset point (right after LU event)
		LD Sn=Linkdown, with S (Sensor number)
		IO Sn=Inhibit on, with S (Sensor number) or SYS

Table 5-7: Datalog Menu Parameters

Item	Sub-Item	Description *
Event codes, cont.		IF Sn=Ihhibit off, with S (Sensor number) or SYS
		NW XXXXXXXXX=New sensor, with last 9 digits of serial number
		DW XXXXXXXXX=Diff sensor x, with last 9 digits of serial number
		Ax (O/F) Sn XXXXXX=Alarm x, with (On/oFf), S (123), (gascons)
		FA (O/F) Sn SSSS=Fault, with (On/oFf), S (123), (sensorstatus)
		GD YYMMDD=Get Date, with year, month, day
		GT HHMMSS=Get Time, with hour, minute, second
		RC XXXX=RCON bits, with (RCON). Reserved for Technical Support.
		OS XXXX=OSCON bits. For Internal use only.
		CL =Clear log
		PW x accepted/Failed= X is user access level
		Sn GasConc=Only log when changed on screen
		TN TXName=
		TS TXSerialNumber=
		TV TXCodeVersion=
		RF =Restore factory default
		Rn No Latch:Fsafe=
		FC nXXXh NAN=Not a number float
		FC nXXXh INF=Infinity float
		FC nXXXh DEB=Debug mbregister
		C[123] message=Span
		Z[123] message=Zero
		SM nXXX yyyyyyyy=Save to sensormb register, nXXX isregister"
		address, yyyyyyyy isvalue otstring
		TM OOOO=Saveto TX
		mb register, OOOO is defined in gui_defines.hSETUP_PARMS. The function saves ALL to TX FRAM anyway (don't care what OOOOis)
		TT xxxCH [01]=TXtemperature, heater o or 1 (on/off)

Table 5-7: Datalog Menu Parameters

Item	Sub-Item	Description*
Event codes, cont.		T[123] xxxxC=Sensor temperature
		IN SensorName=(Right after LU event)
		IM SensorModelNumber=(Rightafter LU event)
		IS SensorSerialNumber=(Right after LU event)
		II SensorCodeVersion GasType GasRangeIndex NVSensorStatus=(Right after LU event)
		CI T [12] -CEC_TYPE
		V [12] -HW_FW"
		FC nXXXh DEB=Debug mb register
		C[123] message=Span
		Z[123] message=Zero
		SM nXXX yyyyyyyy=Save to sensormb register, nXXX isregister address, yyyyyyyy is value of string
		TM OOOO=Save to TX mb register, OOOO is defined in gui_defines.hSET-UP_PARMS. The function saves ALL to TX FRAM anyway (don't care what OOOOis)
		TT xxxCH [01]=TX temperature, heater o or 1 (on/off)
		T[123] xxxxC=Sensor temperature
		IM SensorModelNumber=(Rightafter LU event)
		IS SensorSerialNumber=(Right after LU event)
		II SensorCodeVersion GasType GasRangeIndex
		NVSensorStatus=(Right after LU event)
		CI T [12] -CEC_TYPE
		V [12] -HW_F
	Clear Log*	Used to delete all current Logged Events.

* No user access required to access these particular parameters.

5.1.6 Configuring the Display Menu

Use the magnetic keys to navigate through the menu structure as necessary (refer to Figure 5-7: Display Menu Structure and Table 5-8: Display Setup Menu Parameters).

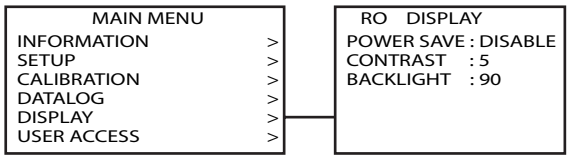


Figure 5-7: Display Menu Structure

Table 5-8: Display Setup Menu Parameters

Item	Sub-Item	Description*	OA	SMA
LCD Setup	Power Save	Enable: Lights when any key is hit and then times out to save power. Disabled: LCD stays on continuously.	†	
	Contrast	For adjusting the LCD's Contrast. Range 0 to 4.	N/A	
	Backlight	For adjusting the LCD's Backlight. Range 0 to 100.	N/A	

† Indicates the minimum user access level required to access this particular parameter.

5.1.7 Configuring the User Access Menu

Use the magnetic keys to navigate through the menu structure as necessary (refer to Figure 5-8: User Access Menu Structure and Table 5-9: User Access Menu Parameters).

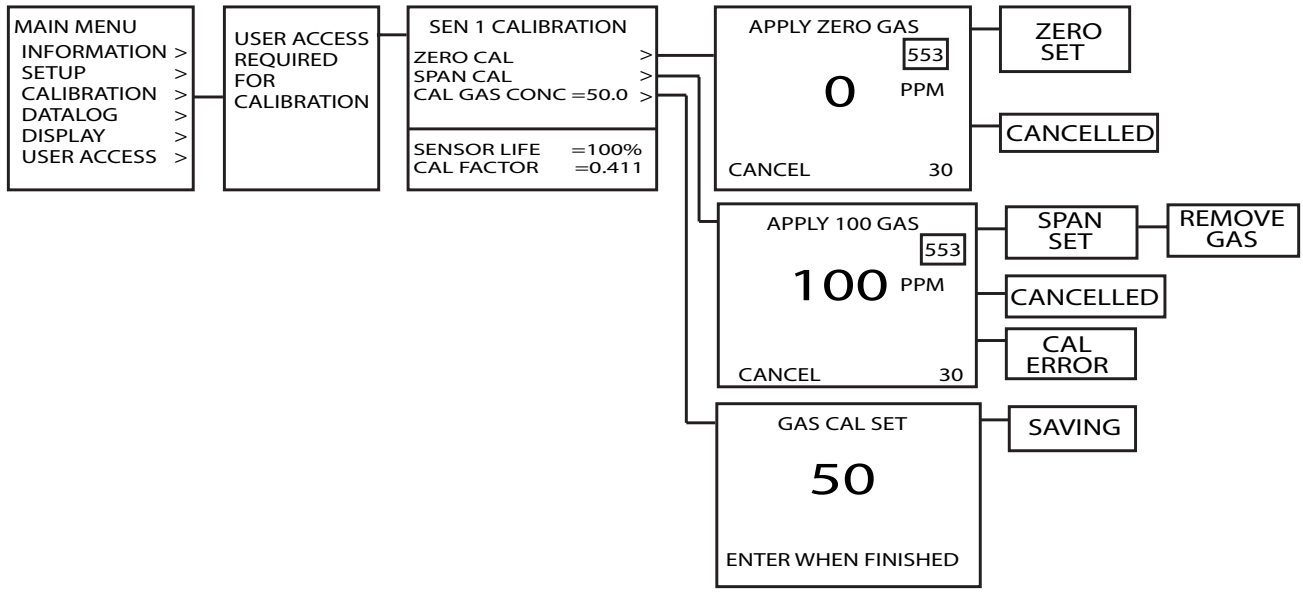


Figure 5-8: User Access Menu Structure

Table 5-9: User Access Menu Parameters

Item	Sub-Item	Description *
User Access	Operator Access (OA)	Used to enter Operator Access. Used to restrict access to certain parameters. Four (4) digit format. This setting times out after 5 minutes and then defaults to the access level. See Table 5-2: Transmitter Setup Menu Parameters.
	System Manager Access (SMA)	Used to enter System Manager Access. Used to restrict access to certain parameters. Four (4) digit format. This setting times out after 5 minutes and then defaults to the access level. See Table 5-2: Transmitter Setup Menu Parameters.
	Factory	For Company internal use only.

5.2. Device Configuration Examples

For examples for selected parameters (refer to Table 5-10: Combustible (LEL) Example — CH_4, Table 5-11: Toxic (E-Chem) Example — CO, and Table 5-12: Toxic (E-Chem) Example — O_2).

WARNING: DO NOT USE THESE SETTINGS AS RECOMMENDATIONS FOR ANY APPLICATION. EACH APPLICATION IS UNIQUE AND ITS SETTINGS WILL VARY ON A CASE BY CASE BASIS. THE COMPANY PROVIDES THESE AS EXAMPLES ONLY. WHEN WORKING IN A POTENTIALLY HAZARDOUS SITUATION, THE CHOICE OF IMPROPER SETTINGS FOR THE MERIDIAN GAS DETECTOR COULD RESULT IN INJURY OR DEATH. CONSULT YOUR ORGANIZATION'S SAFETY MANAGER OR THE COMPANY FOR GUIDANCE ON SETTING THE PROPER PARAMETERS FOR YOUR PARTICULAR APPLICATION.

Table 5-10: Combustible (LEL) Example — CH_4

Category	Item	Selection
Application	Sensor Technology	Cat-Bead
	Gas to Detect	CH_4 (Methane)
Displays Automatically when Sensor installed into Transmitter	Sensor 1 Methane New Sensor Reject Accept CH_4 50% Methane 0-100 Scale	Automatic
System	Sensors Enable	1
	Sensor #1	Online
	User Access	Enter 4-Digits
Sensor Calibration Setup	Cal Gas Conc	2.5% (50%LEL) from cylinder label
	Cal Gas Type	Methane
	Period (DAYS)	90

Table 5-10: Combustible (LEL) Example — CH_4 (Continued)

Category	Item	Selection
Sensor Calibration Setup, cont.	Span (SECS)	180
	Purge (SECS)	60
	Decimal	0
	K Factor	1.00 for Methane
Sensor Calibration	Zero Calibration	Perform
	Span Calibration	Perform (CH_4 default Cal Gas)
Transmitter	Alarm Logic	Latch
	Relay	Non-Failsafe (NO)
	Off Delay (MINS)	0
	Current Loops – 4mA Offset	0
	Current Loops – 20mA Offset	0
	Current Loops – Inhibit	3.8mA
	Time/Date	Set/Confirm
	Editor	Edit name, Lat or Long
Sensor	Range	100%
	Dead Band	0
	Display Negative	No
	Warm Up (SECS, MINS, HRS)	1M
	Gas Type	CH_4
	Gas Units	%
	Alarm Set 1	10% (default)
	Alarm Reset 1	9% (default)
	Alarm Set 2	25% (default)
	Alarm Reset 2	22% (default)
	Alarm Set 3	50% (default)
	Alarm Reset 3	45% (default)
	Editor – Name	Enter unique name
	Editor – Gas 1	Enter unique name

Table 5-10: Combustible (LEL) Example — CH_4 (Continued)

Category	Item	Selection
Sensor, cont.	Editor – Gas 2	Enter unique name
MODBUS	Address	1
	Baud Rate	9600
	Parity	None
	Stop Bit	1
Application	Sensor Technology	Cat-Bead
	Gas to Detect	CH_4 (Methane)

Table 5-11: Toxic (E-Chem) Example — CO

Category	Item	Selection
Application	Sensor Technology	E-Chem
	Gas to Detect	CO (Carbon Monoxide)
Displays Automatically when Sensor installed into Transmitter	Sensor 1 Carbon Monoxide New Sensor Reject Accept CO 0PPM Carbon Monoxide 0-50 Scale	Automatic
System	Sensors Enable	1
	Sensor #1	Online
	User Access	Enter 4-Digits
Sensor Calibration Setup	Cal Gas Conc	20 to 80% Full Scale of setting
	Cal Gas Type	CO
	Period (DAYS)	90
	Span (SECS)	300
	Purge (SECS)	60
	Decimal	1
Sensor Calibration	Zero Calibration	Perform
	Span Calibration	Perform (CO default Cal Gas)
Transmitter	Alarm Logic	Non-Latch
	Relay	Non-Failsafe (NO)
	Off Delay (M)	1
	Current Loops – 4mA Offset	0
	Current Loops – 20mA Offset	0
	Current Loops – Inhibit	3.8 mA
Transmitter, cont.	Time/Date	Set/Confirm
	Editor	Edit name, Lat or Long

Table 5-11: Toxic (E-Chem) Example — CO (Continued)

Category	Item	Selection
Sensor	Range	0 to 50% is used in this example. Note: Another range of 0 to 10% is selectable.
	Dead Band	0
	Display Negative	No
	Warm Up (SECS, MINS, HRS)	1M
	Gas Type	Carbon Monoxide
	Gas Units	0 to 50PPM
	Alarm Set 1	5PPM (default)
	Alarm Reset 1	4.5PPM (default)
	Alarm Set 2	12.5PPM (default)
	Alarm Reset 2	11PPM (default)
	Alarm Set 3	27.5PPM (default)
Sensor, cont.	Alarm Reset 3	22.5PPM(default)
	Editor – Name	Enter unique name
	Editor – Gas 1	Enter unique name
	Editor – Gas 2	Enter unique name
MODBUS	Address	1
	Baud Rate	9600
	Parity	None
	Stop Bit	1

Table 5-12: Toxic (E-Chem) Example — O_2

Category	Item	Selection
Application	Sensor Technology	E-Chem
	Gas to Detect	O_2 (Oxygen)
Displays Automatically when Sensor installed into Transmitter	Sensor 1 Oxygen New Sensor Reject Accept O_2 20.9% Oxygen 0-25% Scale	Automatic
System	Sensors Enable	1
	Sensor #1	Online
	User Access	Enter 4-Digits
Sensor Calibration Setup	Cal Gas Conc	Zero with N_2 (nitrogen) Span with Zero Air
	Cal Gas Type	Zero with N_2 (nitrogen) Span with Zero Air
	Period (DAYS)	30
	Span (SECS)	300
	Purge (SECS)	60
	Decimal	1
Sensor Calibration	Zero Calibration	Perform with N_2
	Span Calibration	Perform (Zero Air Cal Gas)
Transmitter	Alarm Logic	Non-Latch
	Relay	Non-Failsafe (NO)
	Off Delay (MINS)	0
	Current Loops – 4mA Offset	0

Table 5-12: Toxic (E-Chem) Example — O_2 (Continued)

Category	Item	Selection
Transmitter, cont.	Current Loops – 20mA Offset	0
	Current Loops – Inhibit	17.38mA
	Time/Date	Set/Confirm
	Editor	Edit name, Lat or Long
Sensor	Range	0 to 25% is used in this example. Note: Another range of 0 to 10% is selectable.
	Dead Band	0
	Display Negative	No
	Warm Up (SECS, MINS, HRS)	1M
	Gas Type	Oxygen
	Gas Units	%
	Alarm Set 1	19.5% (default)
	Alarm Reset 1	20.5% (default)
	Alarm Set 2	16.0% (default)
	Alarm Reset 2	17.0% (default)
	Alarm Set 3	22.5.0% (default)
	Alarm Reset 3	21.0% (default)
	Editor – Name	Enter unique name
	Editor – Gas 1	Enter unique name
	Editor – Gas 2	Enter unique name
MODBUS	Address	1
	Baud Rate	9600
	Parity	None
	Stop Bit	1
Application	Sensor Technology	E-Chem
	Gas to Detect	O_2 (Oxygen)
	Stop Bit	1

5.3. Configuration Defaults

Table 5-13: Key Device Configuration Defaults

Item	Sub-Item 1*	Sub-Item 2*	Factory Default	Customer Settings
TX Setup	Current Loops	Inhibit (ALL)	3.8mA	
TX Setup/ Alarms	Alarm1	Logic	No Latch	
		Relay	Non-Failsafe	
		OFF Delay(M)	0	
	Alarm2	Logic	No Latch	
		Relay	Non-Failsafe	
		OFF Delay(M)	0	
	Alarm3	Logic	No Latch	
		Relay	Non-Failsafe	
		OFF Delay(M)	0	
TX Setup	MODBUS	MBAddress	0	
		Baud Rate	DIS	
		Parity	None	
		Stop Bit	0	
Sensor X Setup	General	Deadband %FS	Sensor dependent	
Sensor X Setup	General	Display Negative	NO	
Sensor X Setup	General	Warm Up (SECS)	Sensor dependent	
Sensor X Setup	Calibration	Span	300SECS (5mins)	
Sensor X Setup	Calibration	Purge	Sensor dependent	
Sensor X Setup	Alarms	Alarm1 Set	These default values are sensor dependent and its selected range. Examples of sensor Alarm settings are shown in: Table 5-10:, Table 5-11: and Table 5-12:.	
		Alarm1 Reset		
		Alarm2 Set		
		Alarm2 Reset		
		Alarm3 Set		
		Alarm3 Reset		

Table 5-13: Key Device Configuration Defaults (Continued)

Item	Sub-Item 1*	Sub-Item 2*	Factory Default	Customer Settings
User Access	Operator		0000	
	System Manager		0000	

*Note: Blank cells indicate no corresponding Sub-Item.

NOTE: For Sensor defaults and ranges, see Table A-2: Combustible (LEL), IR, Cat-bead Sensor Specifications and Table A-3: Toxic (E-Chem) Sensor Specifications.

5.4. Using the MODBUS Registers

EXECUTING WRITE REGISTER FUNCTIONS WILL ALTER EXTERNAL DEVICES AND THUS THEIR BEHAVIOR. NEVER WRITE TO ANY PLC ADDRESS UNLESS YOU UNDERSTAND THE DEVICE PERFORMANCE OR OPERATION CHANGES THAT WILL RESULT AND HAVE DETERMINED THAT THE CHANGES WILL NOT CREATE AN UNSAFE SITUATION. ALWAYS FOLLOW THESE GUIDELINES WHEN CHANGING MODBUS REGISTERS:

- ONLY QUALIFIED PERSONNEL SHOULD MAKE CHANGES TO MODBUS REGISTERS.
- ALWAYS TEST YOUR CHANGES IN A TEST LAB ENVIRONMENT.
- ALWAYS VERIFY YOUR MODBUS REGISTER CHANGES PRIOR TO IMPLEMENTATION IN A FUNCTIONAL PLANT ENVIRONMENT.
- FOR REMOTE LOCATIONS, VERIFY ALL MODBUS CHANGES FUNCTION AS INTENDED PRIOR TO IMPLEMENTATION IN A FUNCTIONAL PLANT ENVIRONMENT.

FAILURE FOLLOW THESE GUIDELINES COULD RESULT IN SERIOUS INJURY OR DEATH.

Refer to Table 5-14: MODBUS Registers - Transmitter Dynamic through Table 5-16: MODBUS Registers - Sensor X Data for details about the MODBUS registers. Table 5-16: MODBUS Registers - Sensor X Data is used with the following to determine the specific MODBUS register addresses:

- the offset for Sensor1 is 4096 (base in decimal) and 1000 (base in Hex), denoted as 0x1001;
- the offset for Sensor2 is 8192 (base in decimal) and 2000 (base in Hex), denoted as 0x2001;
- the offset for Sensor3 is 12288 (base in decimal) and 3000 (base in Hex), denoted as 0x3001.

For example, to find the MODBUS register address for the data associated with GasConc for Sensor1, Table 5-16: MODBUS Registers - Sensor X Data shows D0 (Hex). The offset is 1000 (Hex) + D0 (Hex) is 4096 (decimal) + 208 (decimal) = 4304 (decimal). Next, take 4304 (decimal) + 40001 (decimal) = 44305 which is the MODBUS register address for the GasConc for Sensor1.

Table 5-14: MODBUS Registers - Transmitter Dynamic

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40002	1	R	Current TXTemperature -128 to +127°C	INT8U	1			
40081	50	R/W	TXCommand Bits 15-12 select the device: 1= Sensor 1 2= Sensor 2 3= Sensor 3 0= TX Some commands may have extra parameters, that is what TXParameter1-10 are for.	INT16U	2			
40082	51	R/W	TXCmdParameter1	INT16U	2			
40083	52	R/W	TXCmdParameter2	INT16U	2			
40084	53	R/W	TXCmdParameter3	INT16U	2			
40085	54	R/W	TXCmdParameter4	INT16U	2			
40086	55	R/W	TXCmdParameter5	INT16U	2			
40087	56	R/W	TXCmdParameter6	INT16U	2			
40088	57	R/W	TXCmdParameter7	INT16U	2			
40089	58	R/W	TXCmdParameter8	INT16U	2			
40090	59	R/W	TXCmdParameter9	INT16U	2			
40091	5A	R/W	TXCmdParameter10	INT16U	2			
40117	74	R	TXVoltage Voltage / 10. Example: 241=24.1V	INT16U	2			Normal Alarm
40118	75	R	Alarm1Status bit=1: Sensor in alarm bit 0: sensor 1 bit 1: sensor 2 bit 2: sensor 3	INT16U	2			

Table 5-14: MODBUS Registers - Transmitter Dynamic

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40119	76	R	Alarm2Status bit=1: Sensor in alarm bit 0: sensor 1 bit 1: sensor 2 bit 2: sensor 3	INT16U	2			
40120	77	R	Alarm3Status bit=1: Sensor in alarm bit 0: sensor 1 bit 1: sensor 2 bit 2: sensor 3	INT16U	2			
40121	78	R	FaultStatus bit=1: fault bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			
40122	79	R	InhibitStatus bit=1: Sensor is in Inhibit bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			
40123	7A	R	CalStatus bit=1: Sensor Cal Due bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			
40124	7B	R	SensorConnected bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			

Table 5-14: MODBUS Registers - Transmitter Dynamic

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40129	80	R	RelayStatus bit0: Relay1 Status 1=Energized bit1: Relay2 Status bit2: Relay3 Status bit3: Relay4 Status bit7: GUI Edit Mode	INT16U	2			Normal Alarm
40130	81	R/W	CurrentHumidity	INT16U	2			
40132	83	R	TXStatus bit0: TX Fault (fault record holds the fault code) bit1: Loop1 current halt, 1=halt bit2: Loop2 current halt, 1=halt bit3: Loop3 current halt, 1=halt bit4: Spare bit5: System inhibit, 1=inhibit bit6: GUI Edit Mode bit7 - 10: undefined bit11: remote configuration lockout bits12 - 15 undefined	INT16U	2		System Inhibit	Normal Alarm
40133	84	R	TXOptions bit0: 2 wire bit1: 3-4 wire bit2: battery option bit3: wired HART expansion bit4: wireless HART expansion bit5: wireless ISA100.11A	INT16U	2			

Table 5-14: MODBUS Registers - Transmitter Dynamic

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40134	85	R	Sensor1SensorStatusHL High level status of sensor. bit0: Sensor enabled bit1: Alarm 1 trip bit2: Alarm 2 trip bit3: Alarm 3 trip bit4: Sensor fault bit5: Sensor inhibited bit6: Sensor connected bit7: Sensor calibrating bit8: Sensor Cal due bit9: Loop signaling (0=live, 1=fixed) bit10: Spare bit11: Spare bit12: Spare bit13: Spare bit 14, 15: Reserved	INT16U	2			Normal Alarm
40135	86	R	Sensor2SensorStatusHL	INT16U	2			Normal Alarm
40136	87	R	Sensor3SensorStatusHL	INT16U	2			Normal Alarm
40137	88	R	Sensor1GasConc10Bit 200 = 0%Full Scale, 1000 = 100% Full Scale, 0 = -25%Full Scale	INT16U	2	RD		
40138	89	R	Sensor2GasConc10Bit	INT16U	2	RD		
40139	8A	R	Sensor3GasConc10Bit	INT16U	2	RD		

Table 5-14: MODBUS Registers - Transmitter Dynamic

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40142	8D	R	CECStatus Lower byte:CEC1Status Upper byte:CEC2Status If 0=No CEC detected bit: 0=CEC EEPROM detected 1=CEC uP comms up 2=CEC requested DataBase 3=DB download complete 4=DB mismatch 5=DB CRC error 6=Protocol error 7=Undefined error	INT16U	2			
40177	B0	R/W	TXCurrentDate Transmitter's current date. BCD format: 00, year, month, day	INT32U	4		Tx Info Tx Setup	
40179	B2	R/W	TXCurrentTime Transmitter's current time. BCD format: 00, hour, min, sec	INT32U	4		Tx Info Tx Setup	
40257	100	R	Sensor1GasConc Linearized and temp compensated gas concentration. These values are floats that match the decimal place and displayed.	FP32	4	RD (byte order= BADC)	PV Main	Normal Alarm
40259	102	R	Sensor2GasConc	FP32	4	RD (byte order= BADC)	SV Main	Normal Alarm

Table 5-14: MODBUS Registers - Transmitter Dynamic

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40261	104	R	Sensor3GasConc	FP32	4	RD (byte order= BADC)	TV Main	Normal Alarm
40263	106	R	LoopCurrent1	FP32	4			
40265	108	R	LoopCurrent2	FP32	4			
40267	10A	R	LoopCurrent3	FP32	4			
40337	150	R	Sensor1GasConcASCII 6 char string. This is what is displayed on the LCD, includes decimal point.	CHAR	8			
40341	154	R	Sensor1GasUnitsASCII 4 char string. This is what is on the display, gas units	CHAR	6			
40344	157	R	Sensor2GasConcASCII	CHAR	8			
40348	15B	R	Sensor2GasUnitsASCII	CHAR	6			
40351	15E	R	Sensor3GasConcASCII	CHAR	8			
40355	162	R	Sensor3GasUnitsASCII	CHAR	6			

Table 5-15: MODBUS Registers - Transmitter Configuration Parameters

Register	HEX Add.	Access	Description	Data Type	#Bytes 7800	Wired HART	Wireless HART & ISA100.11a
40513	200	R	MBSlaveAddress TX MODBUS address, 1-247	INT08	1		
40514	201	R	MBSlaveBaudIndex TX MODBUS baudrate, 1 = 9600, 2=19200, 2 is default	INT08	1		
40515	202	R	MBSlaveParity TX MODBUS parity type 0 = none, 1 = odd, 2 = even, even is default When parity even/odd, 1 stop bit When parity none, 2 stop bits	INT08	1		
40516	203	R	MBSlaveStopBit TX MODBUS stop bits, 1 or 2	INT08	1		

Table 5-15: MODBUS Registers - Transmitter Configuration Parameters (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes 7800	Wired HART	Wireless HART & ISA100.11a
40518	205	R/W	Regional Languages, Dates format, Daylight savings time bit3-0:Languages 0=English(en) 1=Spanish(es) 2=Portuguese(pt) 3=French(fr) 4=Russian(ru) 5=Chinese(zh) 6-15=Reserved bit5-4:Date format 0=MDY 1=DMY 2=YMD 3=Reserved bit7-6:Daylight saving time 0=Off 1=On 2=Reserved 3=Reserved	INT08	1		
40519	206	R/W	Alarm1Logic When latching, acknowledge is required bit0: 0 = nonlatching, 1 = latching bit1: 0 = nonfailsafe, 1 = failsafe	INT08	1	Tx Setup	
40520	207	R/W	Alarm2Logic	INT08	1	Tx Setup	
40521	208	R/W	Alarm3Logic	INT08	1	Tx Setup	

Table 5-15: MODBUS Registers - Transmitter Configuration Parameters (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes 7800	Wired HART	Wireless HART & ISA100.11a
40522	209	R/W	SensorsEnabled 0= disabled 1= enabled bit 0: reserved bit 1: sensor 2 enabled bit 2: sensor 3 enabled bit 3: sensor 1 offline bit 4: sensor 2 offline bit 5: sensor 3 offline Note: When Sensor3 is enabled, then Sensor2 is enabled by the TX.	INT08	1	Main Tx Setup	
40523	20A	R/W	S1CurrentLoopOffset signed byte -128 to 127	INT08	1	Tx Setup	
40524	20B	R/W	S2CurrentLoopOffset	INT08	1	Tx Setup	
40525	20C	R/W	S3CurrentLoopOffset	INT08	1	Tx Setup	
40529	210	R	S3PrevGasType	INT08	1		
40530	211	R/W	S1CurrentLoop20mAOffset signed byte -128 to 127	INT08	1	Tx Setup	
40531	212	R/W	S2CurrentLoop20mAOffset	INT08	1	Tx Setup	
40532	213	R/W	S3CurrentLoop20mAOffset	INT08	1	Tx Setup	
40594	251	R/W	Alarm1OffTimeDelay This time, in seconds, is the delay on or off time for the alarm relay/LED pair. Max is 120 minutes (2 hours)	INT16 U	2	Tx Setup	

Table 5-15: MODBUS Registers - Transmitter Configuration Parameters (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes 7800	Wired HART	Wireless HART & ISA100.11a
40596	253	R/W	Alarm2OffTimeDelay This time, in seconds, is the delay on or off time for the alarm relay/LED pair.	INT16 U	2	Tx Setup	
40598	255	R/W	Alarm3OffTimeDelay This time, in seconds, is the delay on or off time for the alarm relay/LED pair.	INT16 U	2	Tx Setup	
40599	256	R/W	UserPassword (Access) Access for enabling operator level functions. binary: 4 digit number . Ie '0000'	INT16 U	2		
40601	258	R/W	SysMgrPassword (Access) Access for enabling sys mgr functions. binary: 4 digit number . Ie '0000'	INT16 U	2		
40607	25E	R	TXDataBaseVersion High byte major, low byte minor	INT16 U	2		
40659	292	R/W	InhibitCurrent_FP32 The 4-20mA output that is sent when the device is in inhibit mode in .1mA steps.	FP32	4	Tx Setup	
40753	2F0	R/W	TXName User defined name/location 2 bytes per register - 16 chars ASCII and NULL, NULL.	CHAR	18	Tx Info	
40762	2F9	R	TXModelNumber Model Number 8 chars, ASCII	CHAR	10	Tx Info Tx Setup	

Table 5-15: MODBUS Registers - Transmitter Configuration Parameters (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes 7800	Wired HART	Wireless HART & ISA100.11a
40767	2FE	R	TXSerialNumber sn: example 115Ayywwnnnnnn 115 is the company(Monroe) A is assembly (s is subassy) 08 is the year of manufacture 16 is the week of manufacture xxxxxx is the sequential number produced within the week. 14 chars ASCII	CHAR	16	Tx Info	
40775	306	R	TXCodeVersion Firmware version 4 chars, ASCII	CHAR	6	Tx Info	
40778	309	R/W	TXLatitude 10 chars. Null terminated	CHAR	12	Tx Setup	
40784	30F	R/W	TXLongitude 10 chars. Null terminated	CHAR	12	Tx Setup	

Table 5-16: MODBUS Registers - Sensor X Data

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40059	3A	R	ZeroOffset	INT16U	2		Sensor Gen Sensor Info	
40097	60	R	CurrentCalTemperature Updated by the sensor when span is complete. xx.x°C	FP32	4		Sensor Gen Sensor Info	
40103	66	R/W	CalGasConc Default is 50% FS	FP32	4		Sensor Setup	
40105	68	R	CurrentCalFactor Updated by the sensor after a successful span	FP32	4		Sensor Gen Sensor Info Sensor Cal	

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40166	A5	R	SensorStatus bit0:Normal bit1:Set_Defaults (factory defaults) bit2:CRC_Fault bit3:Comb_Under_Volt_Fault (combust undervolt) bit4:Comb_Over_Fault (combust overvolt) bit5:Comb_Over_Rng (combustible over-range flag) bit6:Spare bit7:Spare bit8:Under_Volt_Fault (processor undervolts) bit9:Over_Volt_Fault (processor overvolts) bit10:Sensor_Fault (mainly ADC overrange) bit11:Spare bit12:NV_MEM_Fault (read verify failed after write) bit13:WDT_Fault bit14:Startup_Fault (EEPROM or proc DCO) bit15:IIC_Fault (I^2C bus error)	INT16U	2			
40167	A6	R	SensorVoltage (mV)	INT16U	2		Sensor Live	
40168	A7	R	GasAtoD 10bit, 0-1023, current AtoD output	INT16U	2		Sensor Live	
40209	D0	R	GasConc Linearized and temp compensated gas concentration	FP32	4		Sensor Live	
40211	D2	R	SensorTemp °C	FP32	4		Sensor Live	

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800 Wired HART	Wireless HART & ISA100.11a
40289	120	R	GasType This is used by the sensor to determine which code to run. Each sensor will have a specified number. Toxics:1-127, IR & CB:128-255. Note: The values are used for internal purposes to identify sensors to the transmitter.	INT08U	1	Sensor Gen Sensor Setup	
40290	121	R	GasUnits	INT08U	1	Sensor Gen Sensor Setup	
40291	122	R/W	GasRangeIndex Indicates current Gas Range Upper nibble displays decimal point. Bits 0-3:Index to ranges/gain indexes. Bit4,5:1,2:display DP 0=0, 1=1, 2=2	INT08U	1	Sensor Setup	
40293	124	R/W	DisplayNegative Display negative or 0 when negative bit0:0=no, 1=yes	INT08U	1	Sensor Setup	
40294	125	R	SensorLife Percentage of sensor life left. 0-100	INT08U	1	Sensor Gen Sensor Info Sensor Cal	
40353	160	R	SensorWarmupTime The amount of time, in 10 seconds, that the sensor needs to warmup. Inhibit during this time. Seconds x 10.	INT16U	2	Sensor Setup	

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40354	161	R	MfgCalTime Calibration times. hh:mm (BCD format)	INT16U	2			
40355	162	R	InstallCalTime Calibration times. hh:mm (BCD format)	INT16U	2			
40356	163	R	PriorCalTime Calibration times. hh:mm (BCD format)	INT16U	2			
40357	164	R	CurrentCalTime Calibration times. hh:mm (BCD format)	INT16U	2		Sensor Dates	
40358	165	R	MfgZeroOffset Zero offsets. ADC count	INT16U	2			
40359	166	R	InstallZeroOffset Zero offsets. ADC count	INT16U	2			
40360	167	R	S1PriorZeroOffset Zero offsets. ADC count	INT16U	2			
40361	168	R/W	CalibrationPeriod Number of days between calibrations	INT16U	2		Sensor Setup	
40362	169	R/W	SpanTimer This particular sensor timer is used during Span. In Seconds (Min. of 5 Mins., Max. of 10Mins)	INT16U	2		Sensor Setup	
40363	16A	R/W	PurgeTimer Time after span that output is inhibited for this sensor. In Seconds (Min. of 5 Mins., Max. of 10Mins)	INT16U	2		Sensor Setup	
40376	177	R	GasRange0 lowest range. Range; lowest to highest Note: The number of ranges vary based on the sensor. The min and max. values vary based on the sensor.	INT16U	2		Sensor Setup	

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40377	178	R	GainEunits0 Gain 1,0 & Eunits Split into 2 bytes: High byte:Reserved. The low byte is the Eunits. Eunits: 01=ppm 02=ppb 03=%LEL 04=%V/V bit7 indicates default range. Example: 0x0A01 Eunits=ppm	INT16U	2		Sensor Setup	
40378	179	R	S1MaxCalFactor0 Minimum acceptable cal factor	INT16U	2		Sensor Setup	
40379	17A	R	GasRange1	INT16U	2		Sensor Setup	
40380	17B	R	GainEunits1	INT16U	2		Sensor Setup	
40381	17C	R	MaxCalFactor1	INT16U	2		Sensor Setup	
40382	17D	R	GasRange2	INT16U	2		Sensor Setup	
40383	17E	R	GainEunits2	INT16U	2		Sensor Setup	
40384	17F	R	MaxCalFactor2	INT16U	2		Sensor Setup	
40385	180	R	GasRange3	INT16U	2		Sensor Setup	

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40386	181	R	GainEunits3	INT16U	2		Sensor Setup	
40387	182	R	MaxCalFactor3	INT16U	2		Sensor Setup	
40388	183	R	GasRange4	INT16U	2		Sensor Setup	
40389	184	R	GainEunits4	INT16U	2		Sensor Setup	
40390	185	R	MaxCalFactor4	INT16U	2		Sensor Setup	
40391	186	R	GasRange5	INT16U	2		Sensor Setup	
40392	187	R	GainEunits5	INT16U	2		Sensor Setup	
40393	188	R	MaxCalFactor5	INT16U	2		Sensor Setup	
40394	189	R	GasRange6	INT16U	2		Sensor Setup	
40395	18A	R	GainEunits6	INT16U	2			
40396	18B	R	MaxCalFactor6	INT16U	2			
40397	18C	R	GasRange7 Highest range	INT16U	2			
40398	18D	R	GainEunits7 Gain 1,0 & Eunits	INT16U	2			
40399	18E	R	MaxCalFactor7 Minimum acceptable cal factor	INT16U	2			

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40449	1C0	R	MfgCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	
40451	1C2	R	InstallCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	
40453	1C4	R	PriorCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	
40455	1C6	R	CurrentCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	
40529	210	R	KFactor This is the ratio between the calgastype and the gastype	FP32	4			
40531	212	R	MfgCalFactor Cal factors	FP32	4			
40533	214	R	InstallCalFactor Cal factors	FP32	4			
40535	216	R	PriorCalFactor Cal factors	FP32	4			
40537	218	R	MfgCalTemperature Cal temperatures xx.x°C	FP32	4			

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40539	21A	R	InstallCalTemperature Cal temperatures xx.x°C	FP32	4			
40541	21C	R	PriorCalTemperature Cal temperatures xx.x°C	FP32	4			
40543	21E	R/W	Alarm1Setpoint Alarm set/reset points xx.x (defaults to a 10% of FS)	FP32	4		Sensor Setup	
40545	220	R/W	Alarm1ResetPoint Alarm set/reset points xx.x (defaults to a 9% of FS)	FP32	4		Sensor Setup	
40547	222	R/W	Alarm2Setpoint Alarm set/reset points xx.x (defaults to a 25% of FS)	FP32	4		Sensor Setup	
40549	224	R/W	Alarm2ResetPoint Alarm set/reset points xx.x (defaults to a 22% of FS)	FP32	4		Sensor Setup	
40551	226	R/W	Alarm3Setpoint Alarm set/reset points xx.x (defaults to a 50% of FS)	FP32	4		Sensor Setup	
40553	228	R/W	Alarm3ResetPoint Alarm set/reset points xx.x (defaults to a 45% of FS)	FP32	4		Sensor Setup	
40555	22A	R/W	NegativeFaultSetpoint x.x % (5% is max)	FP32	4			
40557	22C	R/W	Deadband x.x % (5% is max)	FP32	4		Sensor Setup	

Table 5-16: MODBUS Registers - Sensor X Data (Continued)

Register	HEX Add.	Access	Description	Data Type	#Bytes	7800	Wired HART	Wireless HART & ISA100.11a
40657	290	R/W	GasNameLine1 ASCII gas name	CHAR8	10		Sensor Setup	
40662	295	R/W	GasNameLine2 ASCII gas name	CHAR8	10		Sensor Setup	
40667	29A	R/W	SensorName User defined name/location	CHAR16	18		Sensor Setup	
40676	2A3	R	SensorModelNumber ASCII date. 2 bytes per register	CHAR8	10		Sensor Gen	
40681	2A8	R	SensorSerialNumber sn: ex 115Ayywwnnnnnn. 115 is the company(Monroe) A is assembly (s is subassy) 08 is the year of manufacture 16 is the week of manufacture xxxxxx is the sequential number produced within the week.	CHAR14	16		Sensor Gen	
40689	2B0	R	SensorCodeVersion 4 char string, ASCII	CHAR4	6			
40692	2B3	R	SensorProperties 8 char string, ASCII	CHAR8	10			

5.4.1 MODBUS Message Framing

Setup standard MODBUS using either of three transmission modes: ASCII, RTU, or TCP.

In RTU mode, messages start with a silent interval of at least 3.5 character times. This is most easily implemented as a multiple of character times at the baud rate that is being used on the network. The first field then transmitted is the device address.

The allowable characters transmitted for all fields are hexadecimal 0 ... 9, A ... F. Networked devices monitor the network bus continuously, including during the silent intervals. When the first field (the address field) is received, each device decodes it to find out if it is the addressed device.

Following the last transmitted character, a similar interval of at least 3.5 character times marks the end of the message. A new message can begin after this interval.

The entire message frame must be transmitted as a continuous stream. If a silent interval of more than 1.5 character times occurs before completion of the frame, the receiving device flushes the incomplete message and assumes that the next byte will be the address field of a new message.

Similarly, if a new message begins earlier than 3.5 character times following a previous message, the receiving device will consider it a continuation of the previous message. This will set an error, as the value in the final CRC field will not be valid for the combined messages. Table 5-17: MODBUS RTU Framing shows a typical message frame.

Table 5-17: MODBUS RTU Framing

Start	Address	Function	Data	CRC	End
3.5 Char time	8Bit	8Bit	N * 8Bit	16Bit	3.5 Char time
	The Address field of a message frame contains two characters (ASCII) or eight bits (RTU). The individual slave devices are assigned addresses in the range of 1 ... 247.	The function code field tells the addressed slave what function to perform. The following functions are supported by MODBUS poll: 01 Read Coil Status 02 Read Input Status 03 Read Holding Registers 04 Read Input Registers 05 Write Single Coil 06 Write Single Register 15 Write Multiple Coils 16 Write Multiple Registers	The Data field contains the requested or send data.	Two kinds of error checking methods (ASCII or RTU) are used for standard MODBUS networks. The error checking field contents depend upon the method that is being used. When RTU mode is used for character framing, the error-checking field contains a 16-bit value implemented as two eight-bit bytes. The error check value is the result of a Cyclical Redundancy Check calculation performed on the message contents. The CRC field is appended to the message as the last field in the message. When this is done, the low-order byte of the field is appended first, followed by the high-order byte. The CRC high-order byte is the last byte to be sent in the message.	

5.5. Using the TXCommands

WARNING: EXECUTING WRITE REGISTER FUNCTIONS WILL ALTER EXTERNAL DEVICES AND THUS THEIR BEHAVIOR. NEVER WRITE TO ANY PLC ADDRESS UNLESS YOU UNDERSTAND THE DEVICE PERFORMANCE OR OPERATION CHANGES THAT WILL RESULT AND HAVE DETERMINED THAT THE CHANGES WILL NOT CREATE AN UNSAFE SITUATION. ALWAYS FOLLOW THESE GUIDELINES WHEN CHANGING MODBUS REGISTERS:

- ONLY QUALIFIED PERSONNEL SHOULD MAKE CHANGES TO MODBUS REGISTERS.
- ALWAYS TEST YOUR CHANGES IN A TEST LAB ENVIRONMENT.
- ALWAYS VERIFY YOUR MODBUS REGISTER CHANGES PRIOR TO IMPLEMENTATION IN A FUNCTIONAL PLANT ENVIRONMENT.
- FOR REMOTE LOCATIONS, VERIFY ALL MODBUS CHANGES FUNCTION AS INTENDED PRIOR TO IMPLEMENTATION IN A FUNCTIONAL PLANT ENVIRONMENT.

FAILURE FOLLOW THESE GUIDELINES COULD RESULT IN SERIOUS INJURY OR DEATH.

Use the TXCommand to execute a MODBUS function and to set configuration parameters. The individual registers are readable at their address. To write a command/parameter to the transmitter, use a write to the MODBUS TXCommand. There are different write commands for the various data types. Some commands require only the TXCommand register to be written, while other commands require addition parameters. They must be written to before the command is written into the command register. Table 5-18: Structure of Configuration Registers for TXCommand to Table 5-25: TxWriteString 0xX204 Upper Nibble with Param1 ... Param10 (2 of 2) provides details about the TXCommand structure and individuals TXCommands. TX=0, Sensor1=1, Sensor2=2, Sensor3=3.

NOTE: Consult the technical documentation provided with the receiving equipment in conjunction with the tables provided herein for configuration of MODBUS (WR and RD). The MODBUS register mapping may vary.

Table 5-18: Structure of Configuration Registers for TXCommand

Configuration Registers
TXCommand
TXCmdParameter1
TXCmdParameter2
TXCmdParameter3
TXCmdParameter4
TXCmdParameter5
TXCmdParameter6
TXCmdParameter7
TXCmdParameter8
TXCmdParameter9
TXCmdParameter10

Note: Upper nibble defined.
Bits 15-12 selects the device:
0= TX
1= Sensor1
2= Sensor2
3= Sensor3
Goes into high nibble of command and param1, when required.

Table 5-19: TxCommand 0xXXXX with No Parameters

TX Command	Description
0xX001 (The "X" refers to either sensor1, 2 or 3. For example, 0x1001 is for sensor1, 0x2001 is for sensor2, 0x3001 is for sensor3)	Zero Param1-10: N/A Examples: 0x1001= Zero Sensor1 0x2001=Zero Sensor2
0xX002	Span Param1-10: N/A Examples: 0x1002 Span Sensor1
0xX003	Inhibit (System and Sensor) Param1, bit15: 1=Inhibit, 0=Not inhibit Inhibit timer set to 5 Mins Examples: 0x1003 inhibit sensor1
0xX004	
0xX005	
0xX006	
0xX007	
0xX008	
0xX009	Reserved
0xX00A	
0xX00B	
0xX00C	
0xX00D	
0xX00E	
0x0020	Reset Transmitter
0x0300	AlarmAcknowledge
0x012A	Enter
0x013B	Escape

Table 5-20: TxWriteByte 0xX200 with Param1, Param2

TX Command	Description	Param1	Param2
0xX200	Write Byte (Sensor)	0xX000+ConfigRegisterAddress	Byte Data
		GasType (for IR Sensor only)	
		GasRangeIndex (for E-Chem Sensor only)	
		CalGasType	
		DisplayNegative	
0x0200	Write Byte (Transmitter)	Regional	Byte Data
		Alarm1Logic	
		Alarm2Logic	
		Alarm3Logic	
		SensorsEnabled	
		S1CurrentLoopOffset	
		S2CurrentLoopOffset	
		S3CurrentLoopOffset	
		S1CurrentLoop20mAOffset	
		S2CurrentLoop20mAOffset	
		S3CurrentLoop20mAOffset	

Note: Parameter1= Configuration register address. Parameter2= Byte data to write.

Table 5-21: TxWriteUnit 0xX201 Upper Nibble with Param1, Param2

TX Command	Description	Param1	Param2
0xX201	Write Unit (Sensor)	0xX000+ConfigRegisterAddress	Unit Data
		CalibrationPeriod	
		PurgeTimer	
0x0201	Write Unit (Transmitter)	Alarm1OffTimeDelay	Unit DataS
		Alarm2OffTimeDelay	
		Alarm3OffTimeDelay	
		OperatorPassword (Access)	
		SysMgrPassword (Access)	

Note: Parameter1= Configuration register address. Parameter2= Byte data to write.

Table 5-22: TxWriteLong 0xX202 with Param1, Param2, Param3

TX Command	Description	Param1	Param2	Param3
0xX202	Write Long (Sensor)	0xX000+ConfigRegisterAddress	Long Data Takes both Param2 & Param3. Format:B,A,D,C	
0x0202	Write Long (Transmitter)	TXCurrentDate	BCD format: 00,year,month,day	
		TXCurrentTime	BCD format: 00,hour,min,secs	

Note: Parameter1= Configuration register address. Parameter2= Long data to write. Parameter3= Long data to write.

Table 5-23: TxWriteFloat 0xX203 Upper Nibble with Param1, Param2, Param3

TX Command	Description	Param1	Param2	Param3
0xX203	Write Float (Sensor)	0xX000+ConfigRegisterAddress	Float Data Takes both Param2 & Param3. Format: B,A,D,C	
		Alarm1Setpoint		
		Alarm1ResetPoint		
		Alarm2Setpoint		
		Alarm2ResetPoint		
		Alarm3Setpoint		
		Alarm3ResetPoint		
		NegativeFaultSetpoint		
		Deadband		
0x0203	Write Float (Transmitter)	Inhibit Current	Float Data Takes both Param2 & Param3. Format: B,A,D,C	

Note:Parameter1= Configuration register address. Parameter2= Float data to write. Parameter3= Float data to write.

Table 5-24: TxWriteString 0xX204 Upper Nibble with Param1 ... Param10 (1 of 2)

TX Command	Description	Param1	Param2	Param3	Param4	Param5	Param6
0xX204	Write String (Sensor)	ConfigRegister Address					
		GasNameLine1	1st,2nd	3rd,4th	5th,6th	7th,8th	Null, Null
		GasNameLine2	1st,2nd	3rd,4th	5th,6th	7th,8th	Null, Null
		SensorName	1st,2nd	3rd,4th	5th,6th	7th,8th	9th, 10th
0x0204	Write String (Transmitter)	TXName	1st,2nd	3rd,4th	5th,6th	7th,8th	9th, 10th
		TXLatitude	1st,2nd	3rd,4th	5th,6th	7th,8th	9th, 10th
		TXLongitude	1st,2nd	3rd,4th	5th,6th	7th,8th	9th, 10th

Note: Parameter1= Configuration register address. Parameter2= Byte data to write.

Table 5-25: TxWriteString 0xX204 Upper Nibble with Param1 ... Param10 (2 of 2)

TX Command	Description	Param1	Param7	Param8	Param9	Param10
0xX204	Write String (Sensor)	ConfigRegisterAddress				
		GasNameLine1	1st,2nd	3rd,4th	5th,6th	7th,8th
		GasNameLine2	1st,2nd	3rd,4th	5th,6th	7th,8th
		SensorName	1st,2nd	3rd,4th	5th,6th	7th,8th
0x0204	Write String (Transmitter)	TXName	1st,2nd	3rd,4th	5th,6th	7th,8th
		TXLatitude	1st,2nd	3rd,4th	5th,6th	7th,8th
		TXLongitude	1st,2nd	3rd,4th	5th,6th	7th,8th

Note: Parameter1= Configuration register address. Parameter2= Byte data to write.

6. Operation

6.1. Operating the Device

The LCD is the primary user interface (UI) of the device. The LCD displays continuous data on gas concentrations and alarm conditions. It also provides access to the main menu. An optional device with no LCD (Blind LCD) is available for remote locations. The device defaults to the text and numerical display upon power up. This display shows real time data to (specifically, the current numerical value of gas concentration shown in engineering units).

WARNING: WHEN SETTINGS ARE CHANGED, BE SURE TO COMMUNICATE THOSE CHANGES TO ALL AFFECTED PERSONNEL. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

Use the supplied magnetic tool along with the 4 navigation keys (UP, ESCAPE, DOWN, and ENTER/MENU) to navigate the LCD displays. You do not need to remove the cover of the housing to activate these keys. The magnetic tool works in close proximity to the four (4) keys. Additionally, the magnetic tool must be removed and replaced to perform sequential key routines. Use a sweeping motion rather than an hitting move to activate the keys.

Figure 6-1: Text and Numeral Display shows the text and numerical display, as well as the navigation keys and the devices' LEDs. Additionally. Table 6-1: LCD Items and Descriptions lists these items along with their descriptions. Figure 6-2: Main Menu shows the main menu, Figure 6-3: Graphical Trending Display shows the graphical trending display, and Figure 6-4: Blind LCD shows the blind LCD. See Section 5. Configuration & Setup.

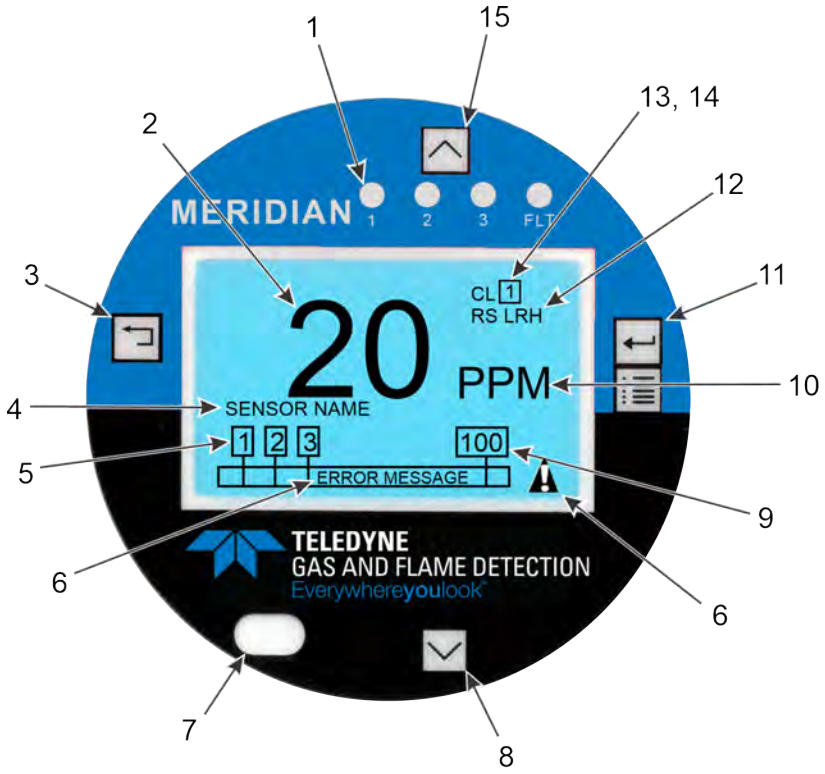


Figure 6-1: Text and Numeral Display

Table 6-1: LCD Items and Descriptions

Ref. No.	Item	Description
1	Alarm1	Indicates an alarm condition when red LED flashes. This LED functions in tandem with equipment configured to relay K1. To acknowledge this alarm, press any key and this LED changes from flashing to solid. Note: This LED functions regardless of whether the relays are used externally or not.
	Alarm2	Indicates an alarm condition when red LED flashes. This LED functions in tandem with equipment configured to relay K2. To acknowledge this alarm, press any key and this LED changes from flashing to solid. Note: This LED functions regardless of whether the relays are used externally or not.
	Alarm3	Indicates an alarm condition when red LED flashes. This LED functions in tandem with equipment configured to relay K3. To acknowledge this alarm, press any key and this LED changes from flashing to solid. Note: This LED functions regardless of whether the relays are used externally or not.
	Fault	Indicates an fault condition when amber LED flashes. Faults include: under range, over range, sensor offline, and sensor faults. This LED functions in tandem with equipment configured to relay K4. Note: This LED functions regardless of whether the relays are used externally or not.
2	Gas Concentration	Displays the concentration of the gas.
3	Escape and Shortcut	Key used to navigate previous menus. Key short cut – sensor calibration. Hold magnetic tool over this key to activate for 5 seconds. This parameter is password protected.
4	Sensor Name	Displays sensor name as entered. Displays the active sensor. Up to 16 characters maximum.
5	Alarm Setpoints	Displays alarm set point value settings. These coincide with ALARM1, ALARM2 and ALARM3 respectively.

Table 6-1: LCD Items and Descriptions (Continued)

Ref. No.	Item	Description
6	Error Message & Icon 	Typically displays fault message with Icon. Includes: • Under Range (-RNG) and FAULT LED • Over Range (+RNG) and FAULT LED • Cal Required • Sensor faults and FAULT LED Section 7.4. Troubleshooting the Device
	Sensor Inhibit 	Alarm inhibit icon. Applies to only a single sensor. Displays during power up, during zero and span calibration.
	System Inhibit 	Alarm system inhibit icon (with "S"). Applies to all 3 sensors. Displays after pressing **ESC** key for 3 seconds. System inhibit time limit is 5 minutes and is not configurable.
7	Ir Tx/rx Port	Used to upgrade the device's firmware. (Future feature)
8	Down and Shortcut	Used to navigate between text, numerical, and graphical trending displays (2Minute, 60Minute, 1Day and 7Day). Also maneuvers between the 4 graphical trending displays. See Figure 6-1: Text and Numeral Display and Figure 6-3: Graphical Trending Display. Press **DOWN** to maneuver arrow/cursor and to change individual items, such as a numerical value or ASCII characters.
9	Gas Range	Displays the full scale range of the gas.
10	Unit of Measure	Displays the unit of measure of the gas.
11	Enter/Menu	Used to navigate from gas monitoring screen to main menu screen, among sub-menu screens, and to select individual items from menu.
12	Sensor Characteristics	Displays additional sensor characteristics, if applicable. For example, RS means Rock Solid; LRH means Low Relative Humidity.
13	Gas Type	Displays applicable gas type entered. Up to 8 characters max. per line. For example, CL_2.

Table 6-1: LCD Items and Descriptions (Continued)

Ref. No.	Item	Description
14	Sensor Number	Indicates an alarm condition when red LED Flashes. Functions in tandem with equipment configured to relay K1. To acknowledge alarm, press any key; LED changes from flashing to solid. Note: This LED functions whether the relays are used externally or not.
15	Up and Shortcut	Indicates an alarm condition when red LED flashes. Functions in tandem with equipment configured to relay K2. To acknowledge alarm, press any Key; LED changes from flashing to solid. Note: This LED functions whether the relays are used externally or not.

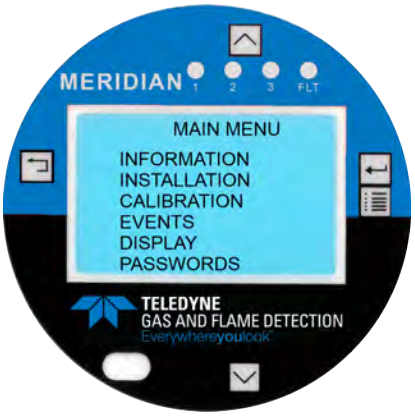


Figure 6-2: Main Menu

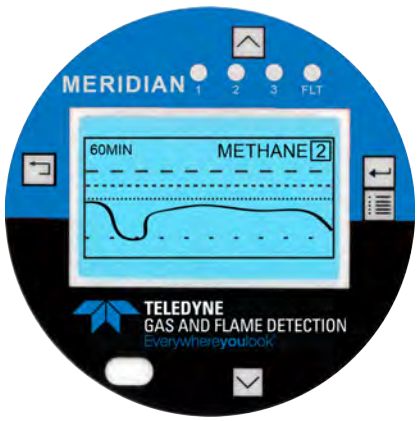


Figure 6-3: Graphical Trending Display

Figure 6-4: Blind LCD

The device ships pre-configured for standard operation. However, if an optional communication PCB is installed in the device, you may need to change some of the configuration parameters (refer to Section 5. Configuration & Setup).

Upon initial completion of the power up sequence, the device needs to be Calibrated to ensure proper operation of the Sensor. See Section 7.1. Calibrating the Device.

6.1.1 Powering Up

Once power is applied to the device, the four (4) LEDs emit solid, the LCD displays the Teledyne Gas & Flame DetectionN logo, Unit Information screens displays briefly (System Name, Model, Code, SN#), Waiting for System to Initialize screen displays with progress bar, then the Text and Numerical Display appears. The boot up process takes about eight (8) seconds to complete.

CAUTION: Calibrate the device prior to placing into operation, (see Section 7.1. Calibrating the Device).

WARNING: TO AVOID THE POSSIBLE NEED OF RE-CALIBRATING A CALIBRATED SENSOR, WHEN POWERING THE DEVICE FOR THE FIRST TIME, DO SO WITH THE SENSOR NOT INSTALLED. VERIFY DEVICE DATE AND TIME AND CORRECT IF NECESSARY. WHEN INSTALLING SENSOR, AGAIN VERIFY CORRECT DATE AND TIME OF DEVICE PRIOR TO ACCEPTING SENSOR. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

6.1.2 Powering Down

Powering down the device is not required to perform routine operations.

7. Maintenance

7.1. Calibrating the Device

WARNING: THE DEVICE SHIPS WITH FACTORY-CALIBRATED SENSORS. SPARE SENSORS DO NOT NOT ARRIVE PRE-CALIBRATED. ALWAYS CALIBRATE SPARE SENSORS BEFORE USING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: OPERATING A DEVICE THAT HAS EXCEEDED ITS CALIBRATION DATE CAN CAUSE FALSE READINGS OF DETECTED GASES. READINGS OBTAINED WHILE DEVICE IS OUT OF CALIBRATION ARE INVALID AND COULD LEAD TO INJURY OR DEATH.

WARNING: DURING CALIBRATION, THE DEVICE WILL NOT DETECT HAZARDOUS GASES. ENSURE YOU NOTIFY AFFECTED PERSONNEL WORKING IN THE AREA THAT IT WILL BE OUT OF SERVICE AND PROVIDE OTHER GAS DETECTION PROTECTION IN ITS PLACE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: BEFORE YOU BEGIN, READ AND UNDERSTAND THE MSDS AND WARNING LABELS FOR THE CALIBRATION GASES. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING: CALIBRATION MODE INHIBITS LOCAL ALARMS IN THE DEVICE (THAT IS, A TIME DELAY SET TO PREVENT UNWANTED ALARM TRIPS). VERIFY THE ENVIRONMENT IS CLEAN AND FREE OF HAZARDOUS GASES AND TOXINS OR HAVE MONITORING PERFORMED BY ANOTHER DEVICE PRIOR TO CALIBRATING. FAILURE TO DO SO COULD LEAD TO INJURY OR DEATH (SEE Section 5.1.3 Configuring the Setup Menu).

NOTE: The Company recommends that users consult 60079-29-2 for additional information on calibration and selection of appropriate calibration gas.

7.1.1 Calibration Hookup

There are two (2) hookup options for calibrating the sensors for both zero calibration and span calibration:

1. Using the ¼-turn calibration fitting.
2. Using the calibration port on the sensor head with the remote calibration quick disconnect fitting.

Figure 7-1: Calibration Hookup Method - Both Hookup Options and Table 7-1: Calibration Hookup Equipment show the required equipment for the hookup options.

NOTE: Various calibration kits are available to accommodate different applications, (see Appendix D. Parts List).

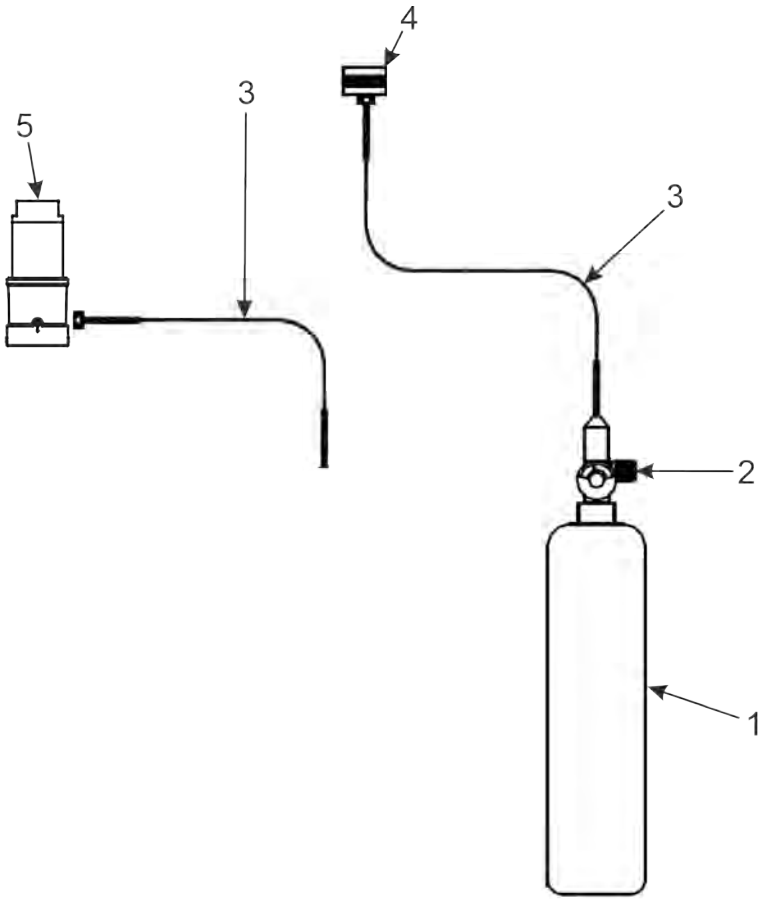


Figure 7-1: Calibration Hookup Method - Both Hookup Options

Table 7-1: Calibration Hookup Equipment

Ref. No.	Item	Using Cal. Adapter	Using Cal. Port on Sensor Head
1	Gas cylinder For zero gas calibration: Zero Gas Cylinder For span gas calibration*: Contact your sales representative or see Appendix E. Technical Support. OR For span gas calibration*: see Appendix B. Gas Sensor Information.	Same	Same
2	Regulator (male or female) See Appendix D. Parts List.	Same	Same
3	Tygon tubing*, $^{3}/_{16}$" ID soft Teflon type tubing*, hard (for sticky gases like HCl and NH_3) See Appendix D. Parts List.	Same	Same
4	¼-turn calibration fitting	Applicable	N/A
5	Sensor head (cal port)	N/A	Applicable

* For reactive gases, use a calibration gas with a tolerance of ± 2% stainless steel regulator 077-1430 and a Teflon type tubing. For non-reactive gases, use a calibration gas with a tolerance of ± 5% and a Tygon type tubing.

Note: various calibration kits are available. See Appendix D. Parts List.

7.2. Calibration Methods

The Company recognizes the potential of the device as a life saving tool when operated and maintained correctly. Verifying proper operation of the device with span calibration and zero calibration is essential to ensuring the device performs as intended in a potentially hazardous environment. Local regulatory standards, company policies, and industry best practices should determine the frequency at which span and zero calibrations occur. The Company bares no responsibility for setting policies or practices.

Table 7-2: Recommended Calibration Frequency Guidelines lists typical recommended calibration frequencies.

Table 7-2: Recommended Calibration Frequency Guidelines

Sensor Type	Frequency	Calibration Method
Cat Bead	Quarterly (3 months)	Zero & Span
IR	Twice per Year (6 months)	
E-Chem	Quarterly (3 months)	
Oxygen	Quarterly (3 months)	

Calibration methods include:

- Zero Calibration — performed to establish baseline readings of atmospheres known to be free of toxic or combustible gases.
- Span Calibration — performed to ensure the device detects target gases within specified operating parameters. Span calibration adjusts device's response to match a known concentration of gas. Sensors can lose sensitivity through normal degradation, exposure to high gas concentrations, or sensor poisoning. Only specific concentrations of the correct gases can accurately calibrate a sensor. Perform span calibration whenever a new sensor is installed and anytime a bump test fails. Perform zero calibration prior to a span calibration.

NOTE: Local alarm relays are inhibited during calibration. Inhibit time is an adjustable parameter. See Section 5.1.3 Configuring the Setup Menu.

Table 7-3: Recommended Calibration Matrix details the recommended calibration and test items for the device.

Table 7-3: Recommended Calibration Matrix

Item	Frequency	Details
Zero Calibration	When baseline readings are incorrect or suspect; also prior to a span calibration	See Section 7.2.1 Zero Calibration
Span Calibration	After installing new sensors	See Section 7.2.2 Span Calibration

7.2.1 Zero Calibration

WARNING: DURING CALIBRATION, THE DEVICE WILL NOT DETECT HAZARDOUS GASES. ALWAYS NOTIFY AFFECTED PERSONNEL WORKING IN THE AREA THAT IT WILL BE OUT OF SERVICE AND PROVIDE ALTERNATE GAS DETECTION. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

NOTE: Prior to starting the zero calibration, you may need to adjust the inhibit time on the device. This prevents unwanted alarm trips. Likewise, remember to reset it after calibration. See Section 5.1.3 Configuring the Setup Menu.

NOTE: An operator access or higher must be entered to perform a zero calibration.

1. To temporally change the access (refer to Section 5.1.7 Configuring the User Access Menu):
2. Apply calibration gas using the calibration adapter. The calibration gas and its flow depends on the sensor. (refer to Table 7-4: Gases and Flow Rates for Zero Calibration for Sensor Type).

Table 7-4: Gases and Flow Rates for Zero Calibration for Sensor Type

Sensor Type	Gas	Flow Rate (LPM)
Cat-Bead	Zero Air*	0.5**
IR	Zero Air, or Nitrogen	
E-Chem (Oxygen)	Nitrogen	0.5
E-Chem (Others)	Zero Air	

*Zero Air is 20.9% O_2 and the balance Nitrogen.
**Standard recommended rate is 0.5. However, some applications, such as remote sensor, may require 1.0, which is acceptable.
Note: A flow rate either above or below can result in a failed or inaccurate calibration.

3. Wait at least 3 to 5 minutes for stabilized readings.

NOTE: If the sensor's response to the gas fails to stabilize, the instrument will timeout and not set a new calibration value.

4. To perform zero calibration:
   A. From the main menu, select **CALIBRATION**
   B. Select **ZERO CAL**

C. Press **ENT/MENU** key

D. Screen displays ***APPLY ZERO GAS*** and the 30 second timer starts.

NOTE: You must wait for the 30 second timer to count down before a successful zero calibration. This timer allows the gas level to stabilize before the calibration is set for best accuracy.

5. After a successful zero calibration:

   A. Press **ENT/MENU** to accept.

   B. Screen displays ***ZERO SET*** then ***SENSOR X CALIBRATION***.

   C. Press **ESC** twice to return to text & numerical display.

6. If the sensor's output is higher than expected:

   A. ***ZERO ANYWAY?*** displays and flashes.

   B. Press **ENT/MENU** to accept.

   C. Screen displays ***ZERO SET***.

   If zero calibration fails, repeat procedure until successful.

   D. Press **ESC** twice to return to text & numerical display.

NOTE: If 5 minutes elapses before zeroing the device, the device times out and returns to the text & numerical display. If this happens, reselect **CALIBRATION**. To keep the time out from occurring, press either **UP** or **DN**. The 5 minute time out starts over after a key is activated. If more time is required for specific gases, adjust the span time parameter.

7. Remove calibration gas.
8. If span calibration is desired, continue to Section 7.2.2 Span Calibration.

7.2.2 Span Calibration

WARNING: DURING CALIBRATION, THE DEVICE WILL NOT DETECT HAZARDOUS GASES. ALWAYS NOTIFY AFFECTED PERSONNEL WORKING IN THE AREA THAT IT WILL BE OUT OF SERVICE AND PROVIDE ALTERNATE GAS DETECTION. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

NOTE: Prior to starting the span calibration procedure, you may need to adjust the inhibit time on the device. This prevents unwanted alarm trips. Likewise remember to reset it after calibration. See Section 5.1.3 Configuring the Setup Menu.

NOTE: Verify concentration level matches detection set points of the device and the expiration date of the cylinder has not passed.

NOTE: If the target gas concentration is not available for an E-Chem sensor, the sensor range may be changed. See Section 7.3.2 Changing the E-Chem Sensor's Range.

NOTE: For the combustible IR sensor (096-3473-56), select the target gas based on your application. See Section B.4. Combustible IR Sensor Surrogate Test Gas.

NOTE: For the combustible Cat-Bead sensor (096-3473-55), the K-factor field may be changed to match the target gas based on your application. See Section 7.3.3 Selecting the Combustible IR Sensor's Target Gas.

NOTE: A user access or higher must be entered to perform a span calibration.

1. To temporally change the access (refer to Section 5.1.7 Configuring the User Access Menu):
2. Determine the target calibration gas based on sensor type. Different sensors target different gases. Ensure the span gas being used is applicable to the sensor installed. See Table 7-5: Gases and Flow Rates for Span Calibration for Sensor Type and Table 7-6: Recommended Maintenance Matrix.

Table 7-5: Gases and Flow Rates for Span Calibration for Sensor Type

Sensor Type	Gas	Flow Rate (LPM)
Cat-Bead	See Appendix B.3. Combustible Cat-Bead Sensor K-Factors	0.5**
IR	Use target gas. See Appendix B.4. Combustible IR Sensor Surrogate Test Gas	
E-Chem (Oxygen)	Use Zero Air.*	0.5
E-Chem (Others)	If available, use target gas.	

*Zero Air is 20.9% O_2 and the balance Nitrogen (N).

**Standard recommended rate is 0.5, but some applications (e.g. remote sensor) may require 1.0, which is acceptable.

Note: A higher or lower flow rate can result in failed or inaccurate calibrations. You should always use the stainless steel flow regulator (PN 077-1430) and Teflon tubing with any sticky calibration gases (i.e. Cl_2, HCl, NH_3, HCN, and NO_2). Calibration kit (PN 096-3501) contains the SS regulator and Teflon tubing required for these reactive gases.

3. Attach the calibration adapter to the device and apply gas from the regulator.
4. Perform span calibration:
   A. From the main menu, select **CALIBRATION**.
   B. Select **SPAN CAL**.
   C. Press **ENT/MENU**.
   D. Screen displays ***APPLY XX GAS*** and the calibration timer starts (between 30 - 180 seconds depending on sensor).

WARNING: ALWAYS START THE CALIBRATION IMMEDIATELY BEFORE, OR SIMULTANEOUS WITH, TURNING ON THE CALIBRATION GAS, OR THE MERIDIAN COULD GO INTO ALARM. CALIBRATION MODE INHIBITS THE ALARMS.

YOU MUST WAIT FOR THE 30-180 SECOND TIMER TO COUNT DOWN BEFORE A SUCCESSFUL CALIBRATION. THIS TIMER ALLOWS THE GAS LEVEL TO STABILIZE BEFORE THE CALIBRATION IS COMPLETE FOR BEST ACCURACY. FAILURE TO DO SO COULD RESULT IN AN INCORRECT CALIBRATION OF THE SENSOR WHICH COULD RESULT IN INJURY OR DEATH.

5. After a successful span calibration:
   A. Press **ENT/MENU** to accept.
   B. Screen displays ***SPAN SET***.
   C. Remove calibration gas.

D. Screen displays ***SENSOR X CALIBRATION***.

E. Press **ESC** twice to return to the text and numerical display.

NOTE: If 5 minutes elapses before zeroing the device, the device times out and returns to the text and numerical display. If this happens, reselect **CALIBRATION**. To keep the time out from occurring, press either **UP** or **DN**. The 5 minute time out starts over after a key is activated. If more time is required for specific gases, adjust the span time parameter.

7.3. Maintaining the Device

Table 7-6: Recommended Maintenance Matrix details the recommend maintenance item for the device.

Table 7-6: Recommended Maintenance Matrix

Item	Activity	Frequency	Details
Sensor	Replace	Periodic	See Section 7.3.1 Replacing a Sensor
E-Chem Sensor	Change	As needed	See Section 7.3.2 Changing the E-Chem Sensor's Range
Combustible IR Sensor	Change	As needed	See Section 7.3.3 Selecting the Combustible IR Sensor's Target Gas
Intrinsically Safe (IS) Barrier PCB	Replace	As needed	See Section 7.3.4 Replacing the Intrinsically Safe (IS) Barrier PCB
Power Supply PCB (3-4 Wire)	Replace	As needed	See Section 7.3.5 Replacing the Power Supply PCB (3 or 4-Wire)
Power Supply PCB (2 Wire)	Replace	As needed	See Section 7.3.6 Replacing the Power Supply PCB (2-Wire)
4-20mA Loop Trimming	Adjustment	Initial installation & As needed	See Section 7.3.7 Trimming the 4-20mA Loop
LCD PCB/CPU PCB	Replace	As needed	See Section 7.3.8 Replacing the LCD PCB/CPU PCB
Terminal/Relay/ MODBUS RS-485 PCB	Replace	As needed	See Section 7.3.9 Replacing the Terminal/Relay/MODBUS RS-485 PCB
Meridian NPT Ex Seal	Replace	As needed	See Section 7.3.10 Replacing the Meridian NPT Ex Seal
Meridian Detector Body Assembly	Replace	As needed	See Section 7.3.11 Replacing the Meridian Detector Body Assembly
Sensor Mapping	As needed	As needed	See Section 7.3.12 Re-mapping the Sensors
Sensor Fault	As needed	As needed	See Section 7.3.13 Clearing a Sensor Fault

7.3.1 Replacing a Sensor

NOTE: The device ships without the sensor installed. The procedure to install a sensor is the same as to replace a sensor.

1. To replace a sensor, see Section 4.1.26 Installing/Replacing a Sensor.
2. Perform zero and span calibrations on the device (see Section 7.2.1 Zero Calibration and Section 7.2.2 Span Calibration.

7.3.2 Changing the E-Chem Sensor's Range

WARNING: ONLY CHANGE THE SENSOR'S RANGE IN CLEAN AIR. CHANGING THE SENOR'S GAS RANGE AUTOMATICALLY CHANGES ITS SET AND RESET ALARM SETTINGS. EACH GAS RANGE HAS ITS OWN UNIQUE CORRESPONDING SET AND RESET VALUES. ALWAYS VERIFY THESE SETTINGS AFTER CHANGING THE SENSOR'S GAS RANGE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

Gas range varies based on the installed sensor. For example, a CO sensor has a default range of 50, but you may select either 100 or 1000 as its range.

NOTE: System manager access level is required to perform this operation.

1. Change the access level to system manager (refer to Section 5.1.7 Configuring the User Access Menu):
2. Change the gas range via the main menu (refer to Section 5.1.3 Configuring the Setup Menu):
   A. From the main menu, select **SETUP**
   B. Select **SENSOR X SETUP**
   C. Select **GENERAL**
   D. Select **GAS RANGE**
   E. Press **ENT/MENU**
   F. Select desired range
   G. Press **ENT/MENU**
   H. Press **ESC**
   I. Save changes and back out of menu.

7.3.3 Selecting the Combustible IR Sensor's Target Gas

The combustible IR sensor allows the selection of different target gases. To select the sensor's target gas range (096-3473-56):

NOTE: System manager access level is required to perform this operation.

1. Change the access level to system manager (refer to Section 5.1.7 Configuring the User Access Menu):
2. Select the IR sensor's target gas via the main menu (refer to Section 5.1.3 Configuring the Setup Menu):
   A. From the main menu, select **SETUP**
   B. Select **SENSOR X SETUP**
   C. Select **GENERAL**
   D. Select **GAS RANGE**
   E. Press **ENT/MENU**
   F. Select desired target gas
   G. Press **ENT/MENU**
   H. Press **ESCS**
   I. Save changes and back out of menu.
3. The ***CAL REQUIRED*** message appears after detecting a new combustible gas being loaded. Perform a span calibration at this point, since no changes can take effect until this is done.

NOTE: These selections only appear when the combustible IR sensor is present in the system.

7.3.4 Replacing the Intrinsically Safe (IS) Barrier PCB

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING PCB INTO THE DEVICE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

The devise has two (2) intrinsically safe (IS) barrier PCBs: one for 3 or 4-wire; and one for 2-wire transmitters. To replace the IS barrier PCBs:

1. Unscrew the setscrew and the housing cover
2. Pull on the LCD PCB/CPU PCB set from the four (4) standoffs.
3. Remove the two (2) wires from TB1.

NOTE: It is not necessary to remove the wire ribbon cable from the upper and lower PCB stack.

4. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
5. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
6. Unscrew the two (2) retention screws on the light blue IS terminal block on the IS PCB and remove the top of the plug.
7. Unscrew the two (2) screws and remove the IS terminal block cover.
8. Unscrew the two (2) remaining screws from the PCB stack.

NOTE: For 3 or 4-wire only, retain both the aluminum heat sink plate and the thermal conductive pad underneath it. Both are located between the IS PCB and the bottom of the housing.

9. Pull the IS PCB from the power supply PCB while retaining the thermal isolation barrier pad located between them. The thermal isolation barrier pad is present in 3 or 4-wire devices only.

10. Push the new IS PCB into the power supply PCB.
11. Screw the two (2) top screws into the PCB stack.
12. Replace IS terminal block cover with the two (2) screws, onto the bottom of the PCB stack.
13. Screw the two (2) retention screws on the light blue IS terminal block on the IS PCB and replace the top of the plug.
14. Replace the entire PCB stack into the housing and screw the four (4) standoffs into place.
15. Reconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
16. Replace the two (2) wires into TB1.
17. Replace the LCD PCB/CPU PCB set.
18. Replace the housing cover, tighten and secure the setscrew.

7.3.5 Replacing the Power Supply PCB (3 or 4-Wire)

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the two (2) wires from TB1.
3. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
4. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
5. Unscrew the two (2) screws and remove the IS terminal block cover.
6. Unscrew the two (2) remaining screws from the PCB stack.
7. Pull the terminal/relay/MODBUS RS-485 PCB from the power supply PCB.

NOTE: For 3 or 4-wire only, retain both the aluminum heat sink plate and the thermal conductive pad underneath it. Both are located between the IS PCB and the bottom of the housing.

8. Pull the IS PCB from the power supply PCB while retaining the thermal isolation barrier pad located between the IS PCB and the power supply PCB, to be re-installed. The thermal isolation barrier pad is present in 3 or 4-wire devices only.
9. Remove the wire ribbon cable from the power supply PCB.
10. Replace the power supply PCB and repeat the above steps in reverse.
11. Replace the housing cover, tighten and secure the setscrew.

7.3.6 Replacing the Power Supply PCB (2-Wire)

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the two (2) wires from the TB1.
3. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
4. Unscrew the two (2) screws and remove the IS terminal block cover.
5. Unscrew the two (2) remaining screws from the PCB stack.
6. Pull the IS PCB from the power supply PCB.
7. Remove the wire ribbon cable from the power supply PCB.
8. Replace the power supply PCB and repeat the above steps in reverse.
9. Replace the housing cover, tighten and secure the setscrew.

7.3.7 Trimming the 4-20mA Loop

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

NOTE: System manager access level is required to perform this operation.

1. Change the access level to system manager (refer to Section 5.1.7 Configuring the User Access Menu).
2. From the text and numerical display, enter the main menu by pressing **ENT/MENU**.
3. Select **SETUP**.
4. Select **MERIDIAN SETUP**.
5. Select **CURRENT LOOPS**.

NOTE: One (1) is the default sensor. To change: select **ENTER/MENU**; press **UP** or **DN** to select **Sensor 2** (to adjust loop 2) or **Sensor 3** (to adjust loop3); select **ENTER/MENU**.

6. Select **4MA OFFSET**.
7. Select **ENTER/MENU**.
8. Connect a precision current measuring device to the corresponding loop being trimmed.

NOTE: Ensure current measurement device is properly calibrated.

9. Press **UP** or **DN** to increase or decrease the current on the loop until you have 4mA at your point of measurement.
10. Press **ENTER/MENU**.
11. Select **20MA OFFSET**
12. Press **ENTER/MENU**.

13. Press **UP** or **DN** to increase or decrease the current on the loop until you have 20mA at your point of measurement.
14. Select **ENTER/MENU**.
15. Press **ESC**. Screen displays ***SAVE CHANGES?***.
16. Press **ENT/MENU**. Screen displays ***SAVING***, and then returns to ***MERIDIAN SETUP***.
17. Press **ESC** three times to return to the main menu.

7.3.8 Replacing the LCD PCB/CPU PCB

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the wire ribbon cable from the LCD PCB/CPU PCB.
3. Replace the LCD PCB/CPU PCB and repeat the above steps in reverse.
4. Replace the housing cover, tighten and secure the setscrew.

7.3.9 Replacing the Terminal/Relay/MODBUS RS-485 PCB

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the two (2) wires from TB1.
3. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
4. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
5. Unscrew the two (2) screws and remove the IS terminal block cover.
6. Unscrew the two (2) remaining screws from the PCB stack.
7. Pull the terminal/relay/MODBUS RS-485 PCB from the Power Supply PCB.
8. Replace the terminal/relay/MODBUS RS-485 PCB and repeat the above steps in reverse.
9. Replace the housing cover, tighten and secure the setscrew.

7.3.10 Replacing the Meridian NPT Ex Seal

The Meridian NPT Ex seal is located between the device and the Meridian Junction Box Assembly.

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the two (2) wires from TB1.

NOTE: Do not remove the wire ribbon cable from the upper and lower PCB stack.

3. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
4. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
5. Unscrew the two (2) screws and remove the IS terminal block cover.
6. Unscrew the six (6) screws on the light blue IS terminal block and remove the six (6) wires from the TB.
7. Unscrew the Meridian NPT Ex seal from the device.
8. Unscrew the Meridian junction box assembly cover.
9. Unscrew the six (6) screws on the light blue TB4 and remove the six (6) wires from the TB4 inside the Meridian junction box assembly.
10. Unscrew the Meridian NPT Ex seal from the Meridian junction box assembly.
11. Pull the six (6) wires on top of the Meridian NPT Ex seal into the device's ¾" NPT hole.
12. Screw the Meridian NPT Ex seal into the device.

NOTE: When installing the Meridian NPT Ex seal, thread into the ¾" NPT hole, hand tighten, then tighten an additional ¼ to ¾ turns.

WARNING: TO MAINTAIN EXPLOSION PROOF/FLAME PROOF A MINIMUM OF 5 THREADS OF ENGAGEMENT IS REQUIRED. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

13. Insert the six (6) wires into the light blue IS terminal block and screw them down. See Section 4.1.25 Connecting a Sensor Head.
14. Screw the two (2) retention screws on the light blue IS terminal block on the IS PCB and replace the top of the plug.
15. Ensure the top of all your applicable plugs with feeding wires are easily accessible prior to replacing the PCB stack to ease re-plugging.
16. Replace the PCB stack into the housing.
17. Replace the four (4) standoffs.
18. Replace the IS terminal block cover and tighten the two (2) screws.
19. Re-connect the tops of the plugs for any other terminal blocks in use (VDC, MODBUS, Alarms, Fault, and Remote Acknowledge).
20. Replace the two (2) wires to TB1.
21. Replace the LCD PCB/CPU PCB set into t he four (4) standoffs.
22. Replace the housing cover, tighten and secure the setscrew.
23. Unscrew the Meridian junction box assembly cover.
24. Pull the six (6) wires on bottom of the proof/flame proof seal into the Meridian junction box assembly's ¾" NPT hole.
25. Screw the Meridian junction box assembly onto the Meridian NPT Ex seal.

NOTE: When installing the Meridian NPT Ex seal, thread into the ¾" NPT hole, hand tighten, then tighten an additional ¼ to ¾ turns.

WARNING: TO MAINTAIN EXPLOSION PROOF/FLAME PROOF A MINIMUM OF 5 THREADS OF ENGAGEMENT IS REQUIRED. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

26. Insert the six (6) wires into the light blue TB4 and screw them down. See Section 4.1.14 Mounting & Wiring the Junction Box Assembly (AL or SS).
27. Replace the Meridian junction box assembly cover and secure the setscrew.

7.3.11 Replacing the Meridian Detector Body Assembly

WARNING: ENSURE RECEIVERS AND POWER SUPPLIES ARE NOT POWERED WHEN INSTALLING WIRE TO THE DEVICE.

WARNING: ENSURE THE ATMOSPHERE IS FREE FROM COMBUSTIBLE AND/OR TOXIC GASES PRIOR TO STARTING THIS PROCEDURE. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

1. Unscrew the setscrew and housing cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the two (2) wires from TB1.

NOTE: Do not remove the wire ribbon cable from the upper and lower PCB stack.

3. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
4. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
5. Unscrew the two (2) screws and remove the IS terminal block cover.
6. Unscrew the six (6) screws on the light blue IS terminal block and remove the six (6) wires from the TB.
7. Remove the Meridian end cap and sensor.
8. Unscrew the Meridian detector body assembly from the device.
9. Select the replacement Meridian detector body assembly.
10. Pull the six (6) wires on top of the Meridian detector body assembly into the device's ¾"NPT hole.
11. Screw the Meridian detector body assembly into the device.

NOTE: When installing the Meridian NPT Ex seal, thread into the ¾" NPT hole, hand tighten, then tighten an additional ¼ to ¾ turns.

WARNING: TO MAINTAIN EXPLOSION PROOF/FLAME PROOF A MINIMUM OF 5 THREADS OF ENGAGEMENT IS REQUIRED. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

12. Insert the six (6) wires into the light blue IS terminal block and screw them down (see Section 4.1.25 Connecting a Sensor Head).
13. Replace the IS terminal block cover and tighten the two (2) screws.
14. Ensure the top of all your applicable plugs with feeding wires are easily accessible prior to replacing the PCB stack to ease re-plugging.
15. Replace the PCB stack into the housing.
16. Replace the four (4) standoffs.
17. Re-connect the tops of the plugs for any other terminal blocks in use (VDC, MODBUS, Alarms, Fault, and Remote Acknowledge).
18. Replace the LCD PCB/CPU PCB set into t he four (4) standoffs.
19. Replace the housing cover, tighten and secure the setscrew.
20. Replace the Meridian end cap and secure the setscrew.

CAUTION: Meridian end cap must be attached to protect the device from ingress from water or dust. Ensure all sensor(s) are installed prior to operation. Ensure Meridian end cap is installed prior to operation. Only use Meridian end cap P/N 096-3437-1 or 096-3437-2.

7.3.12 Re-mapping the Sensors

When the sensor mapping is changed from its initial mapping, the LCD displays an error message and the Fault LED flashes. The sensors need to be changed back to their initial mapping. For example, Sensor1 was initially a Cat-Bead, Sensor2 was an O_2, and Sensor3 was a E-Chem. Later the sensors were changed by mistake, and you want to change them back. Sensor1 is a O_2, Sensor2 is a E-Chem and Sensor3 is a Cat-Bead.

NOTE: You do not need to remove power to install/replace sensors. Follow local procedures and safety regulations.

WARNING: ALARM SETTINGS ARE STORED IN THE SENSOR. CHANGING SENSOR MAPPING CHANGES ALARM SETTINGS. VERIFY PRIOR TO PROCEEDING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

NOTE: Removing a sensor creates a fault condition (FLT LED blinks, error message alternates between SYSTEM FAULT and SENSOR OFFLINE on the LCD). To avoid this fault condition:

- from the main menu, enter **ACCESS**;
- take sensor offline;
- save the change;
- remove the sensor.

This is temporary, as the device automatically reverts to the sensor being online.

WARNING: THE ORDER OF SENSOR INSTALLATION DEFINES THE CORRESPONDING LOOP. FOR EXAMPLE, THE DEVICE ASSIGNS THE 1st SENSOR INSTALLED TO LOOP1, THE 2nd SENSOR TO LOOP2, THE 3rd TO LOOP3. YOU MUST CONFORM TO THE SENSOR TYPE RULES PER SENSOR POSITION IN THE SYSTEM CONFIGURATION AS OUTLINED IN Table 4-4: Hard Wired Configurations – Sensor Types Supported for 3 or 4-Wire. VIOLATING, OR ARE ATTEMPTING TO VIOLATE, SENSOR CONFIGURATION RULES AUTOMATICALLY PLACES THE DEVICE INTO AN IMMEDIATE FAULT MODE. THIS IS AN ILLEGAL CONFIGURATION (NOT INTRINSICALLY SAFE). FAILURE TO ADHERE TO THE CORRECT SENSOR MAPPING COULD RESULT IN INJURY OR DEATH.

NOTE: System manager access level is required to perform this operation.

1. Change the access level to system manager (refer to Section 5.1.7 Configuring the User Access Menu).
2. Set **Sensors Enable** to **0** and save.

3. Sensor Enable automatically resets to 1.
4. Set **Sensor Enable** to either **2** or **3** as applicable and save.
5. Remove all three (3) Sensors.
6. Re-insert each sensor one (1) at a time in the proper order and acknowledge via LCD.

7.3.13 Clearing a Sensor Fault

1. When a sensor is exposed to a high concentration of the target gas, a sensor fault message appears on the LCD and the FLT LED blinks.

NOTE: The high concentration shortens the life of the sensor. This applies to E-Chem and Cat-Bead sensors.

2. To clear the fault, activate the **ENTER/MENU** key.

7.4. Troubleshooting the Device

WARNING: IF THE DEVICE DOES NOT FUNCTION PROPERLY, REMOVE FROM SERVICE AND MARK FOR MAINTENANCE. ALL PCBS ARE FIELD REPLACEABLE. ONLY USE TELEDYNE GAS AND FLAME DETECTION REPLACEMENT PARTS. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

Table 7-7: Troubleshooting Matrix

Symptom	Cause	Solution
Sensor not read by gas detector.	Intrinsically safe (IS) barrier PCB circuit is open.	Replace intrinsically safe (IS) barrier PCB (refer to Section 7.3.4 Replacing the Intrinsically Safe (IS) Barrier PCB).
Gas detector does not operate.	No power applied to gas detector.	• Verify proper VDC input is applied to gas detector. • If voltage is verified, then replace power supply PCB (refer to Section 7.3.5 Replacing the Power Supply PCB (3 or 4-Wire)).
Loss of 4-20mA signal.	Damaged to 4-20mA circuit.	Replace power supply PCB (refer to Section 7.3.5 Replacing the Power Supply PCB (3 or 4-Wire)).
Relay(s) do not function.	Alarm set points incorrect.	Verify alarm settings.
	Low power to transmitter.	Verify transmitter supply voltage is within the proper VDC range.
	Bad Terminal/Relay/ MODBUS RS-485 PCB	Replace terminal/relay/MODBUS RS-485 PCB (refer to Section 7.3.8 Replacing the LCD PCB/CPU PCB).
Gas detector (CPU) appears hung, or it continues to reboot.	Firmware malfunction.	• Remove power for 10 to 15seconds, then reapply power. • If no change, then replace CPU PCB (refer to Section 7.3.10 Replacing the Meridian NPT Ex Seal).
Device zero drifts.	Needs calibration.	Zero calibrate the device.
	Interfering gas present.	Place zero air on sensor to determine if outside gas is present.
	Rapid temperature changes.	If possible, shield sensor from source of temperature changes.
Device's output is continuously negative.	It was probably zero calibrated with background gas present.	Apply a source of clean air to sensor and zero calibrate.

Table 7-7: Troubleshooting Matrix (Continued)

Symptom	Cause	Solution
Device does not respond to calibration gas.	Bad or weak calibration gas.	Test the device with the sensor simulator. Replace calibration gas source.
	Poor gas delivery.	• Verify proper regulator, tubing (Tygon, Teflon), calibration fitting are used. • Check tubing for cuts. • For Cl_2 applications, confirm regulator/tubing was not used with H_2S. Also confirm that other reducing gases were not used, like ammonia, hydrides etc. • For sticky gases (HF, HCl Cl_2, SO_2, BCl_3 etc.), confirm that stainless steel regulator (PN 077-1430) and Teflon tubing is being used. • Check calibration adapter is not plugged. • Windy environment.
	Poor calibration technique.	Follow proper calibration procedure (refer to Section 7.2. Calibration Methods).
	Incorrect calibration gas.	• Replace calibration gas source. • Verify sensor range is ≥ calibration gas concentration.
	Incorrect calibration gas concentration.	Follow proper calibration procedure (refer to Section 7.2. Calibration Methods).
	Bad sensor.	Replace sensor (refer to Section 7.3.1 Replacing a Sensor).
	Open circuit on the intrinsically safe (IS) barrier PCB.	Replace the intrinsically safe (IS) barrier PCB (refer to Section 7.3.4 Replacing the Intrinsically Safe (IS) Barrier PCB).
Device does not respond to calibration gas.	K-Factor not applied.	Enter the K-factor into its parameter field after applicable calculations (refer to Appendix B.3. Combustible Cat-Bead Sensor K-Factors).
LCD is blank although the device is producing an output signal.	LCD contrast too low.	Adjust LCD contrast.
	24VDC power not wired correctly, or no power supplied, or <24VDC applied.	Ensure proper VDC power is supplied, or wires properly landed.
Loss segments in LCD.	Failed LCD segments.	Replace LCD PCB (refer to Section 7.3.10 Replacing the Meridian NPT Ex Seal).

Table 7-7: Troubleshooting Matrix (Continued)

Symptom	Cause	Solution
LCD displays CAL REQUIRED	• Bad or weak calibration gas. • Poor calibration technique.	• Replace gas source. • Follow proper calibration procedure (refer to Section 7.2. Calibration Methods).
LCD displays UNDER RANGE	• Gas reading is below zero. • Interference gas present and gives negative reading. • Sensor drifted.	• Re-zero in clean air. • Check for possible interference gas. • Re-zero and calibrate.
LCD displays OVER RANGE	• Exposed to gas concentration higher than its range. • Sensor exposed to interference gas higher than sensor range. • Sensor is not settled yet, or sensor is out of balance.	• Check test gas verses sensor range. • Apply clean air. • Wait for sensor to settle. Re-balance the sensor (zero for IR and Cat Bead sensors).
LCD displays sensor X is OFFLINE and fault LED flashes OR LCD displays SYSTEM FAULT	• Sensor is removed from device. • Sensor connection not fully engaged.	• Replace sensor (refer to Section 7.3.1 Replacing a Sensor). • Verify Sensor is pushed firmly into detector head.
LCD displays I.S. VIOLATION and fault LED Flashes	Sensor mapping has changed from initial configuration.	Re-map the sensors (refer to Section 7.3.12 Re-mapping the Sensors).
LCD displays SENSOR FAULT	Exposed to gas concentration higher than its range.	Clear the Sensor Fault (refer to Section 7.3.13 Clearing a Sensor Fault).

Appendix A. Specifications

A.1. Device Specifications

Table A-1: Device Specifications

Category	Specifications	
Power Requirements	3-4 wire PCB (All relays energized, with LCD heater, up to three sensors based on Table 4-4: Hard Wired Configurations – Sensor Types Supported for 3 or 4-Wire configurations and with one optional communications PCB)	10 to 30VDC 8.5Watts 24VDC @ 355mA Max. Note: Voltages as measured at the device.
	3-4 wire PCB (All relays energized, without LCD heater, up to three sensors based on Table 4-4: Hard Wired Configurations – Sensor Types Supported for 3 or 4-Wire configurations and with one optional communications PCB)	10 to 30VDC 6.0Watts 24VDC @ 250mA Max. Note: Voltages as measured at the device.
	2-Wire PCB	18 to 30VDC, 21.6mA Max. Note: Voltages as measured at the device.
	4-Wire loop power supply	10-30VDC, 24mA Max. Note: Voltages as measured at the device.
Relays	Four configurable form C (SPDT) relays rated for 5A @ 30VDC or 250VAC resistive	
	Relay1, Relay2 and Relay3 level alarms are configurable for high or low trip, for normally energized (failsafe) or normally de-energized and for latching or non-latching	
	Relay4 is always normally energized for failsafe operation so loss of power to the device indicates a fault condition.	
Loop Load Resistance at nominal 24VDC	3-Wire non-isolated (source) for HARTWired	840Ω Max. 230 to 600Ω
	3-wire non-isolated (sink) for HARTWired	680Ω Max. 230 to 600Ω
	4-wire isolated (sink and source)	680Ω Max.

Table A-1: Device Specifications (Continued)

Category	Specifications	
4 to 20mA Current Loop	1 loop per sensor, normal signaling connection types inhibit current fault current	4 to 21.6mA sink, source, non-isolated, & isolated configurable 3.6mA
Communications – Standard	MODBUS RTU (RS-485) RTU legal address range is 1 to 247 Up to 32 RTUs per loop 1,200 meters maximum distance.	
Communications Expansion Cards (CEC) – Optional PCB	WiredHART PCB HART Version 7.2 or higher Interface – Emerson Model 375 or 475 Handheld Field Communicator, AMS-HART Version 5-7, Custom HART AMS (DCS, SCADA, PLC) Rx (controller) to Tx (fixed gas device) theoretical maximum cable distance is 10,000Ft (3,000meters). For details refer to the HART Communication Application Guide. Fault loop current – 3.2mA	
Memory	Non-volatile memory (NV-EEPROM) Ensures configuration parameters retained during power loss.	
Number of Sensors	3 sensors maximum	
Duct Mount Adapters	Flow velocities	350 to 1000CFM
	Compatibility	Flat Round: for 6" to 8" Diameter Ducts
Calibration	Both zero and span supported	
LED	3 alarms and 1 fault	
Heater Actuation (for LCD with Heater only)	Heater ON: when <-10°C Heater OFF: at 0°C Parameter is not configurable.	
Transmitter Housing	Material	Aluminum or stainless steel with (2) 3/4"NPT conduit connections
	Dimensions (both Al and SS)	5.79Hx6.57Wx5.69"D (147.07Hx166.88Wx144.53Dmm)
	Mounting flanges holes (both Al and SS)	ID 0.30" on 5.85" centers (ID 7.62mm on 148.59mm centers)

Table A-1: Device Specifications (Continued)

Category	Specifications	
Transmitter Housing	Weight (includes housing, PCB stack, detector assembly, sensor and Meridian end cap)	6.52Lbs. (2.96Kg) Aluminum Device 11.0Lbs. (4.98Kg) Stainless Steel Device
Remote sensor junction housing with (4) ¾" NPT conduit connections – aluminium	Dimension	4.70Hx4.70Wx3.55"D (119.38Hx119.38Wx190.17Dmm)
	Mounting flanges holes	ID 0.30" on 4.41" centers (ID 7.62mm on 112.01mm centers)
	Weight	1.7Lbs. (0.77Kg)
Remote sensor junction housing with (4) ¾" NPT conduit connections – stainless steel	Dimension	4.86Hx4.86Wx3.86"D (123.5Hx123.5Wx98.0Dmm)
	Mounting flanges holes	ID 0.33" on 5.59" centers (ID 8.5mm on 142mm centers)
	Weight	5.2Lbs. (2.35Kg)
Field wiring	Plug-in connectors: 28AWG to 16AWG (0.2mm^2 to 1.5mm^2) Input power and relays connector: 18AWG to 10AWG (1.0mm^2 to 4mm^2) Wiring temperature: 105°C minimum	
Remote intrinsically safe cable	The cable between remote sensor and Meridian junction box assembly must be a 6 conductor, 18AWG (approximately 0.82mm^2) minimum size, shielded, insulation thickness 0.4mm minimum appropriate for intrinsically safe applications. It should meet IEC 60079-14 standard or its equivalent. 100 Ft. (30.48m) maximum distance from a transmitter to any sensor. Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.	
Operating temperature	-40.0 to +167°F (-40 to +75°C)	
Storage temperature	-67.0 to +167°F (-55 to +75°C)	
Operating humidity	5 to 95% RH, non-condensing	

A.2. Combustible (LEL), IR, Cat-bead Sensor Specifications

Table A-2: Combustible (LEL), IR, Cat-bead Sensor Specifications

Category	Specifications	
IR - Combustible (LEL) Sensor		
Default Range	0 to 100% LEL	
Accuracy	50%LEL and below:	+3%LEL
	>50%LEL:	±5%LEL
Warm Up Time	30 Mins.	
Response Time	T90 <20Sec	
Operating Temp.	-40.0 to +167°F (-40 to +75°C)	
Storage Temp.	-67.0 to +167°F (-55 to +75°C)	
Humidity	0 to 95% RH, Non-Condensing	
Default Cal Gas	CH_4	
IR - Carbon Dioxide (CO_2) Sensor		
Default Range	0-5% V/V	
Accuracy	± 0.25%V/V	
Warm Up Time	30 Mins.	
Response Time (w/optional deluge guard)	T90 <30Sec	
Operating Temp.	-40.0 to +167°F (-40 to +75°C)	
Storage Temp.	-4.0 to +122°F (-55 to +75°C)	
Humidity	0 to 95% RH, Non-Condensing	
Default Cal Gas	CO_2	
Cat-Bead - Combustible (LEL) Sensor		
Default Range	0-100%LEL	
Accuracy	≤50%LEL:	+3%LEL
	>50%LEL:	±5%LEL
Warm Up Time	5 Mins.	
Response Time	T90 <20Sec	

Table A-2: Combustible (LEL), IR, Cat-bead Sensor Specifications (Continued)

Category	Specifications
Operating Temp.	-40 to +167°F (-40°C to +75°C)
Storage Temp.	-67 to +167°F (-55 to +75°C)
Humidity	0 to 95% RH, Non-Condensing
Default Cal Gas	CH_4

A.3. Toxic (E-Chem) Sensor Specifications

The Company offers two (2) types of E-Chem Sensors: Standard and Rock Solid.

- Standard E-Chem Sensors – Capable of detecting higher concentrations than the Rock Solid E-Chem Sensors.
- Rock Solid E-Chem Sensors – Baseline is more stable and accurate. Allows lower range and lower alarm settings. Less susceptible to interference gases. Faster response and recovery time then Standard E-Chem Sensors.

Table A-3: Toxic (E-Chem) Sensor Specifications

096-3473-XX	Gas	Symbol	Type **	RH Rating ***	Operating Temp Range (°C)	Default Range (PPM) ****	Range (Min. to Max.) (PPM) ****	Default Cal Gas
03	Ammonia	NH_3	Std.	G	-5 to 50 (-40 to 50)#	100	50 to 500	NH_3
24	Bromine	Br_2	RS	H	-40 to 50	10	1 to 10	Cl_2
01	Carbon Monoxide	CO	Std.	G	-40 to 50	100	50 to 1000	CO
20	Chlorine	Cl_2	RS	H	-40 to 50	5	1 to 30	Cl_2
21	Chlorine	Cl_2	RS*	L	-40 to 50	5	1 to 30	Cl_2
37	Chlorine Dioxide	ClO_2	RS*	H	-40 to 50	5	1 to 5	Cl_2
38	Chlorine Dioxide	ClO_2	RS	L	-40 to 50	5	1 to 5	Cl_2
22	Fluorine	F_2	RS	H	-40 to 50	5	1 to 5	Cl_2
23	Fluorine	F_2	RS*	L	-40 to 50	1	1 to 5	Cl_2
12	Hydrogen	H_2	Std.	H	-40 to 50	4%	1 to 4%	H_2
25	Hydrogen Chloride	HCl	RS*	H	-25 to 50	10	1 to 25	SO_2
26	Hydrogen Chloride	HCl	RS	L	-25 to 50	10	1 to 25	SO_2
11	Hydrogen Cyanide	HCN	Std. *	G	-20 to 50	25	25 to 100	HCN
27	Hydrogen Fluoride	HF	RS*	H	-25 to 50	10	1 to 30	SO_2
28	Hydrogen Fluoride	HF	RS	L	-25 to 50	10	1 to 30	SO_2

Table A-3: Toxic (E-Chem) Sensor Specifications (Continued)

096-3473-XX	Gas	Symbol	Type**	RH Rating***	Operating Temp Range (°C)	Default Range (PPM)****	Range (Min. to Max.) (PPM)*****	Default Cal Gas
02	Hydrogen Sulfide (Low Methanol cross sensitivity)	H_2S	Std.	G	-40 to 50	50	10 to 100	H_2S
14	Nitric Oxide	NO	Std.	G	-40 to 50	50	50	NO
54	Nitrogen Dioxide	NO_2	Std.	G	-40 to 50	10	10 to 20	NO_2
19	Oxygen	O_2	Std.	G	-30 to 50	25%	10 to 25%	N_2
39	Ozone	O_3	RS*	H	-40 to 50	1	1 to 3	Cl_2
09	Silane	SiH_4	Std.	G	-40 to 50	10	1ppm, 10ppm	PH_3
31	Sulfur Dioxide	SO_2	RS*	H	-25 to 50	10	1 to 25	SO_2
32	Sulfur Dioxide	SO_2	RS	L	-25 to 50	10	1 to 25	SO_2
05	Sulfur Dioxide	SO_2	Std.	H	-40 to 50	50	10 to 500	SO_2

* Denotes the most common sensor used to monitor the gas when several options are available.
**Sensor Type – Standard or Rock Solid. Sensor Type - Rock Solid sensors have extremely low noise allowing for lower alarm set points with less false alarms.
*** The typical Humidity Range the sensor will be exposed to. (G) denotes General indoor or outdoor use, (H) denotes High humidity (70%RH, +/- 15%RH) areas or outdoor use, (L) Low humidity (50%RH, +/- 15%RH) for indoor use.
**** Default Range – This is the most popular range for each Teledyne Gas & Flame Detection sensor.
***** Range – All are PPM except where denoted.
# NH_3 sensors operate down to -40°C if the environment is kept frost-free. In these conditions, a sampling line with gas dryer may be used. Please contact your Technical Support. See Appendix E.. Technical Support
Note: Toxic (E-Chem) Sensor specifications vary from sensor to sensor. This list is not all-inclusive. For specific Part Numbers, please contact the Company. See Appendix E.. Technical Support

This page is intentionally left blank.

Appendix B. Gas Sensor Information

B.1. Sensor Technology Overview

Table B-1: Sensor Technology Overview

Technology	Description	Advantages	Limitations
Cat-Bead	Beads consist of a wrapped coil of platinum wire covered with a ceramic base coated with a precious metal to act as the catalyst. The active, or sensing, bead is heated up to 600°C, allowing the oxidation of combustible. The reference, or nonsensitive, bead remains at a lower temperature and is separated from the active bead by a thermal barrier. A Wheatstone bridge measures and compares the resistance of the two beads. Wheatstone bridge circuit: When gas burns on the active bead causing the temperature to increase, the resistance of the bead changes. As the bridge becomes unbalanced, the offset voltage is used determines the measured value. The combustion that occurs across the active bead leads to an unbalanced output of the circuit. This value is then used to determine the concentration of combustible gas present.	• Low cost • Can detect wide range of combustible gases • Proven technology for the detection of hydrogen	• High power • Chlorine, silicones and acid gases can poison them • Unusable in oxygen deficient atmospheres • Cannot discern between different types of combustible gases
Infrared (IR)	Infrared light is a part of the electromagnetic spectrum that is comprised of invisible light that can be felt as heat. The wavelength profile of infrared is expressed in microns between 0.7µm and 300µm. Combustible hydrocarbon gas molecules absorb certain wavelengths of IR - called absorption bands - while allowing others to pass through. Each gas has a specific set of IR wavelengths it will absorb, called the absorption spectrum. This provides a unique identifier to monitor and detect target gases. Infrared sensors detect specific types of gases using filters that only allow narrow bands of wavelengths to pass through to a detector. This works like a pair of sunglasses that filter out some of the sun's UV rays and visible light from your eyes.	• Long life • Resistant to contamination	• Unable to detect hydrogen • Unable to discern between different types of hydrocarbons

Table B-1: Sensor Technology Overview (Continued)

Technology	Description	Advantages	Limitations
Electrical Chemical (E-Chem)	Electrochemical sensors provide monitoring for a wide variety of toxic gases. An aqueous electrolyte solution provides a conductive path for ions to travel between electrodes. The working electrode either reduces or oxidizes target gases, resulting in a current flow between the working and the counter electrode. The reference electrode provides a zero reference point from which the resulting difference in potential between the counter and working electrodes can be compared. Target gas levels can be measured in parts per million (ppm). • Rule of thumb: If you can't put your head into the monitored environment, do not use an E-Chem sensor to monitor it. • No liquid environments • No extreme temperatures or pressures • No high velocity duct mounts Note: We offer Standard and RockSolid E-Chem Sensors. Refer to Appendix A.3. Toxic (E-Chem) Sensor Specifications	• Low power • Can detect wide range of gases • Low cost	• Highly humid or arid conditions shorten life span • Some require oxygen

B.2. Sensor Performance Factors

Table B-2: Sensor Performance Factors

Factor	Description	Sensor Type
Target Gas	Identify target gases that have a potential for providing a hazard in the process. Most sensors are applicable to mostly toxic or mostly combustible gas monitoring. However, some sensor types are capable of monitoring for either. Situations where several gases may pose a threat may be monitored for a presence.	Generally Toxic • Electrochemical Generally Combustible • Infrared • Catalytic Bead
Sensor Placement	Sensor placement directly impacts sensor effectiveness. No sensor can detect a hazard if placed too far from release or receptor points. Use zoned or voting coverage areas, where multiple sensor points effectively provide a maximum, redundant coverage area (to minimize false alarms) and account for barriers, air currents, and all potential gas release points.	Application specific
Temperature/ Humidity	Severe environments can affect certain sensor types. All sensor types are rated for specific temperature ranges. High humidity environments, where water vapors can interfere with readings, can affect some sensors.	Varies
Oxygen Content	In applications where oxygen may be displaced or not present in a gas sample, the sensor type should be considered.	Cat bead and most E-Chem sensors will not perform as designed without oxygen present.
Power Consumption	Some sensor types consume much more power than others. This is important when considering if a technology is appropriate for a fixed or portable detection device. Fixed detection systems need appropriate power supplies to maintain the current necessary for sensor operation.	Varies
Cross Interference	Gases other than target gases can interfere with nearly all sensor types. Sensor manufacturers employ different methods to counter the effects using filters, sensor construction materials, and preprogrammed expected response functions based on target gas characteristics. In some technologies, a sensor is calibrated with an appropriate cross interference gas, if the target gas is unobtainable or difficult to apply in field conditions. In this case, apply a K-factor to the calibration values.	Varies

B.3. Combustible Cat-Bead Sensor K-Factors

Cat-Bead sensors can be used to accurately detect most combustible gases, especially hydrocarbons. The default calibration gas for these sensors is mostly methane, since almost 90% of the combustible gas detection applications are for this gas. The other most popular gas used is propane. Cat-Bead sensors respond differently based on different combustible gases. Thus, the following examples for each gas.

Although the target gas is always preferred in order to achieve maximum accuracy, these gases may not always be available in a form convenient for use in the field. Surrogate test gases are convenient substitutes, and have been selected for their stability and availability.

B.3.1 Using Target Gas Other than Methane

This section covers calibration to a target gas other than methane, using that same target gas. For example:

1. User desires to measure propane (C_3H_8) using a Cat-Bead sensor.
2. User has a propane bottle of gas and the label reads 50%LEL.
3. Adjust K-FACTOR field in the sensor setup menu to match the value for the target gas. In this example, Propane (C_3H_8) is 0.51. See Section 5.1.3 Configuring the Setup Menu.
4. Ensure the CALGASCONC value matches the gas label, in this example, 50%LEL.

After calibrated, the device should read 50%LEL in propane scale when 50%LEL propane bottle gas is applied.

B.3.2 Using Methane as a Surrogate Gas

Table B-3: K-Factors for Combustible Cat-Bead Sensors - Methane provides the K-Factors referenced to methane calibration. The factors are the typical ratios of the response to the listed gases relative to the response to methane. The values are typical, but will vary from sensor to sensor and over the lifetime of a given sensor. When a gas other than the calibration gas is detected, divide the reading by the corresponding factor to estimate the actual gas concentration. For example, propane may be detected by the device calibrated with methane.

Note that the concentration in %LEL on the label of the methane tank. Apply gas to the device and span to value derived by dividing this number with the given K-Factor. For example:

1. User desires to measure Isobutylene (C_4H_8) using a Cat-Bead sensor.
2. User has a methane bottle of gas and the label reads 50%LEL.
   A. Adjust K-Factor field in the sensor setup menu to match the value for the target gas. In this example, Isobutylene (C_4H_8) is 0.58. See Section 5.1.3 Configuring the Setup Menu.
3. User determines the CALGASCONC value.
   A. The K-Factor (methane ratio) for Isobutylene (C_4H8) is 0.58 (from Table B-3: K-Factors for Combustible Cat-Bead Sensors - Methane).

B. Divide 50%LEL by 0.58 K-Factor. This equals 86.2%LEL.

C. Thus, the device's CALGASCONC parameter should be set to 86%LEL when exposed to 50%LEL methane. See Section 5.1.3 Configuring the Setup Menu.

4. After calibrated, the device should read 86%LEL in Isobutylene scale when 50%LEL methane bottle gas is applied.

Table B-3: K-Factors for Combustible Cat-Bead Sensors - Methane

Gas/Vapor*	K-Factor (Parameter Field)	K-Factor (Methane Ratio)
Acetaldehyde (C_2H_4O)	0.64	0.64
Acetone (C_3H_6O)	0.60	0.60
Acetylene (C_2H_2)	0.63	0.63
Ammonia (NH_3)	1.43	1.43
Benzene (C_6H_6)	0.45	0.45
1,3-Butadiene (C_4H_6)	0.45	0.45
n-Butane (C_4H_{10})	0.52	0.52
Isobutane (C_4H_{10})	0.45	0.45
Isobutylene (C_4H_8)	0.58	0.58
Butyl Acetate ($C_6H_{12}O_2$)	0.40	0.40
n-Butyl Alcohol ($C_4H_{10}O$)	0.45	0.45
Chlorobenzene (C_6H_5Cl)	0.38	0.38
Cyclohexane (C_6H_{12})	0.46	0.46
Diethyl ether ($C_4H_{10}O$)	0.50	0.50
n-Decane ($C_{10}H_{22}$)	0.29	0.29
Ethane (C_2H_6)	0.68	0.68
Ethyl Acetate ($C_4H_8O_2$)	0.46	0.46
Ethyl Alcohol (C_2H_6O)	0.63	0.63
Ethylbenzene (C_8H_{10})	0.41	0.41
Ethylene (C_2H_4)	0.63	0.63
Ethylene Oxide (C_2H_4O)	0.49	0.49

Table B-3: K-Factors for Combustible Cat-Bead Sensors - Methane (Continued)

Gas/Vapor*	K-Factor (Parameter Field)	K-Factor (Methane Ratio)
Heptane (C_7H_{16})	0.42	0.42
n-Hexane (C_6H_{14})	0.40	0.40
Hydrogen (H_2)	0.81	0.81
Isopropyl Alcohol (C_3H_8O)	0.44	0.44
Methane (CH_4)	1.00	1.00
Methanol (CH_4O)	0.78	0.78
Methylene Chloride (CH_2Cl_2)	1.11	1.11
Methyl Chloride (CH_3Cl)	0.88	0.88
Methyl Ethyl Ketone (C_4H_8O)	0.43	0.43
n-Otane (C_8H_{18})	0.32	0.32
Pentane (C_5H_{12})	0.51	0.51
Isopentane (C_5H_{12})	0.46	0.46
Propane (C_3H_8)	0.51	0.51
Propylene (C_3H_6)	0.62	0.62
Propylene Oxide (C_3H_6O)	0.44	0.44
Styrene (C_8H_8)	0.43	0.43
Tetrahydrofuran (C_4H_8O)	0.47	0.47
Toluene (C_7H_8)	0.42	0.42
Vinyl Chloride (C_2H_3Cl)	0.56	0.56
O-Xylene (C_8H_{10})	0.38	0.38

Note: K-Factors based on methane.

B.3.3 Using Propane as a Surrogate Gas

Table B-4: K-Factors for Combustible Cat-Bead Sensors - Propane provides the K-Factors referenced to propane calibration. The factors are typical ratios of the response to the listed gases relative to the response to propane. The values are typical, but will vary from sensor to sensor and over the lifetime of a given sensor. When a gas other than the calibration gas is detected, divide the reading by the corresponding factor to estimate the actual gas concentration. For example, a device calibrated with propane can detect methane.

Note the concentration in %LEL on the label of the propane tank. Apply gas to the device and span to value derived by dividing this number with the given K-Factor. For example:

1. User desires to measure Isobutylene (C_4H_8) using a Cat-Bead sensor.
2. User has a propane bottle of gas and the label reads 50%LEL.
   A. Adjust K-Factor (propane ratio) field in the sensor setup menu to match the value for the target gas. In this example, Isobutylene (C_4H_8) is 0.58. See Section 5.1.3 Configuring the Setup Menu.
3. Determines the CALGASCONC value.
   A. The K-Factor for Isobutylene (C_4H_8) is 1.14 (from Table 69 below).
   B. Divide 50%LEL by 1.14 K-Factor. This equals 43.8%LEL.
   C. Thus, the device's CALGASCONC parameter should be set to 43.8%LEL when exposed to 50%LEL propane. See Section 5.1.3 Configuring the Setup Menu.
4. After calibrated, the device should read 44%LEL in Isobutylene scale when 50%LEL propane bottle gas is applied.

Table B-4: K-Factors for Combustible Cat-Bead Sensors - Propane

Gas/Vapor*	K-Factor (Parameter Field)	K-Factor (Propane Ratio)
Acetaldehyde (C_2H_4O)	0.64	1.25
Acetone (C_3H_6O)	0.60	1.18
Acetylene (C_2H_2)	0.63	1.23
Ammonia (NH_3)	1.43	2.80
Benzene (C_6H_6)	0.45	0.88
1,3-Butadiene (C_4H_6)	0.45	0.88
n-Butane (C_4H_{10})	0.52	1.01
Isobutane (C_4H_{10})	0.45	0.88

Table B-4: K-Factors for Combustible Cat-Bead Sensors - Propane (Continued)

Gas/Vapor*	K-Factor (Parameter Field)	K-Factor (Propane Ratio)
Isobutylene (C_4H_8)	0.58	1.13
Butyl Acetate ($C_6H_{12}O_2$)	0.40	0.78
n-Butyl Alcohol ($C_4H_{10}O$)	0.45	0.88
Chlorobenzene (C_6H_5Cl)	0.38	0.74
Cyclohexane (C_6H_{12})	0.46	0.90
Diethyl ether ($C_4H_{10}O$)	0.50	0.98
n-Decane ($C_{10}H_{22}$)	0.29	0.56
Ethane (C_2H_6)	0.68	1.33
Ethyl Acetate ($C_4H_8O_2$)	0.46	0.90
Ethyl Alcohol (C_2H_6O)	0.63	1.23
Ethylbenzene (C_8H_{10})	0.41	0.80
Ethylene (C_2H_4)	0.63	1.23
Ethylene Oxide (C_2H_4O)	0.49	0.96
Heptane (C_7H_{16})	0.42	0.82
n-Hexane (C_6H_{14})	0.40	0.78
Hydrogen (H_2)	0.81	1.58
Isopropyl Alcohol (C_3H_8O)	0.44	0.86
Methane (CH_4)	1.00	1.96
Methanol (CH_4O)	0.78	1.52
Methylene Chloride (CH_2Cl_2)	1.11	2.17
Methyl Chloride (CH_3Cl)	0.88	1.72
Methyl Ethyl Ketone (C_4H_8O)	0.43	0.84
n-Otane (C_8H_{18})	0.32	0.62
Pentane (C_5H_{12})	0.51	1.00
Isopentane (C_5H_{12})	0.46	0.90

Table B-4: K-Factors for Combustible Cat-Bead Sensors - Propane (Continued)

Gas/Vapor*	K-Factor (Parameter Field)	K-Factor (Propane Ratio)
Propane (C_3H_8)	0.51	1.00
Propylene (C_3H_6)	0.62	1.21
Propylene Oxide (C_3H_6O)	0.44	0.86
Styrene (C_8H_8)	0.43	0.84
Tetrahydrofuran (C_4H_8O)	0.47	0.92
Toluene (C_7H_8)	0.42	0.82
Vinyl Chloride (C_2H_3Cl)	0.56	1.09
O-Xylene (C_8H_{10})	0.38	0.74

Note: K-Factors based on propane.

B.4. Combustible IR Sensor Surrogate Test Gas

NOTE: Some gas types are available pre-calibrated by the factory. The Combustible IR Sensors ship with an individual correction factor (to propane or propylene) on the certificate. Ensure these values on the certificate are used.

CAUTION: The device prompts "CAL REQUIRED when new IR gas curve is selected. Ensure calibration is performed, otherwise device gas detection ability is compromised.

Although the target gas is always preferred in order to achieve maximum accuracy, these gases may not always be available in a form convenient for use in the field. Surrogate test gases are convenient substitutes, and have been selected for their stability and availability.

When using a surrogate gas to test the device's combustible IR sensor (096-3473-56):

- Find the target gas in the "selected curve/target gas" column.
- Use only the test gas and concentration indicated. IR sensors do not have the same ratio of response between two gases throughout the entire detection range. These values are only valid for the indicated concentrations.
- For a bump test, apply the indicated surrogate test gas - the sensor should respond with a reading as indicated in the "sensor reading" column, with a tolerance of approximately ±2% LEL.
- If calibrating, set the span gas concentration to the value shown in the "sensor reading" column. Calibrate (zero and span) the sensor by following the instrument prompts, per the user guide.

Example: to span for toluene, apply 25%LEL propylene and span to 57% LEL (toluene).

WARNING: THE MERIDIAN INFRARED (IR) SENSOR SURROGATE GAS TABLE HAS BEEN UPDATED. DEPENDING ON THE SERIAL NUMBER OF THE IR SENSOR, THE FACTORS TO USE MAY HAVE CHANGED. PLEASE REFER TO THE SEPARATE "MERIDIAN IR SURROGATE TABLE" DOCUMENT FOR THE MOST UP TO DATE INFORMATION (DOCUMENT 062-0093). FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

B.5. Toxic (E-Chem) Gas Interferences

There are known gas interferences to a limited number of chemical compounds. The Company attempts to identify possible gas interferences to which gas sensors may be exposed. However, not all chemical compounds that presently exist have been tested.

NOTE: The Toxic (E-Chem) Gas Interferences tables (062-0064) are included on the CD that ships with the product. You can check our web site to compare your version to those posted. Updates to the tables are typically posted to our web site.

NOTE: These specific tables apply to the Meridian device only.

This page is intentionally left blank.

Appendix C. Safety Integration Level (SIL-2) Information

C.1. SIL-2 Parameters

Table C-1: SIL-2 Parameters

SIL Parameters	
Safe Failure Fraction (SFF)	90.45%
Average Probability of Failure on Demand (PFD_{avg})	8.81×10^{-4}
Probability of Failure per Hour (PFH)	1.99×10^{-7}
Process Time	24Hrs.
Proof Test Interval (PTI)	8760Hrs.

NOTE: For the device's installation, operation, configuration, maintenance and specifications refer to the applicable sections of this guide.

C.2. Proof Test Procedure

The SIL safety parameters presented in this manual assume an annual safety function proof test of the device to detect failure modes not detectable by built in diagnostic functions. Failure to perform an annual proof test invalidates the safety performance parameters presented herein.

WARNING: THIS TEST DISABLES HAZARDOUS CONDITION MONITORING. PERFORM THIS TEST ONLY WHEN YOU KNOW CONDITIONS ARE SAFE (I.E. UNIT SHUTDOWN/ TURN AROUND). USE ALTERNATIVE MONITORING FOR HAZARDOUS CONDITIONS THROUGHOUT THIS TESTING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.

NOTE: Verification of the safety function requires adjustment of the fault current to something other than 4mA for proper verification.

Tools Required:

- 3mm (TBR) hex wrench
- Standard calibration gas
- Calibration gas (sufficient concentration to activate highest alarm level)
- Calibration adapter
- DVM multi-meter

Procedure:

1. Bypass final element safety function to prevent inadvertent activation of safety shutdown systems (i.e. deluge/ suppression/evacuation systems).
2. Using the hex wrench, loosen the setscrew securing the Meridian end cap assembly to the sensor housing.
3. Remove the Meridian end cap assembly.
4. Remove the sensor assembly from the sensor housing.
   A. Verify the fault relay (K4) deactivates (normally open)
   B. Verify the fault 4-20mA signal is transmitted to the receiving element of the safety system.
5. Reinstall the sensor.
6. Install the Meridian end cap and secure it with the setscrew.

CAUTION: The Meridian end cap protects the device from ingress from water or dust. Always install the Meridian end cap prior to operation. Use only Meridian end cap P/N 096-3437-1 or 096-3437-2 with mesh screen or 096-3437-3 or 096-3437-4 without mesh screen.

7. Cycle the power or perform a power on reset of the transmitter and wait for the sensor warm up time to expire

8. Perform zero and span calibrations of sensor as described in Section 7.1. Calibrating the Device and wait for inhibit time to expire
9. Challenge the sensor with an upscale calibration gas and ensure that:
   A. Alarms activate (K1, K2, & K3)
   B. 4-20mA signal reflects the proper gas concentration reading
10. Restore the safety system by disabling the safety bypass systems.
11. Table C-2: SIL Proof Test Results shows the expected results.

Table C-2: SIL Proof Test Results

Section	Test	Element	Criteria
4.1	Fault - Sensor communication	Relay	Impedance NO to Com >1MOhm
4.2	Fault - 4-20mA signal	Current loop	Programmed fault current (<> 4mA)
8.1	Alarm activation	Relay	K1-K3 NC to Com >1MOhm
8.2	Gas reading	Current loop	± 0.1mA

This page is intentionally left blank.

Appendix D. Parts List

Table D-1: Parts List

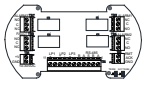
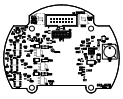
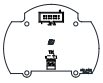
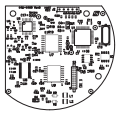
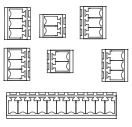
Category	Item	Description	Part Number
Accessories		Terminal/Relay/MODBUS RS-485 PCB	096-3404
		3 or 4-Wire Power Supply PCB	096-3401
		2-Wire Power Supply PCB	096-3407
		3 or 4-Wire Intrinsically Safe (IS) Barrier PCB	096-3448
		2-Wire Intrinsically Safe (IS) Barrier PCB	096-3449
		Optional Communication Expansion Card (CEC) PCB	For Optional CEC PCBs, contact the Company.
		LCD PCB and CPU PCB	096-3447-xx: • 01 = includes LCD (no LCD Heater) • 02 = includes LCD (LCD Heater) • 03 = No LCD (Blind)
		Connector/Jumper Replacement Kit: (1) 11-position connector, (1) 2-position connector, (1) 3-position connector, (1) 6-position connector and (1) 2-position jumper	096-3495

Table D-1: Parts List

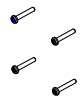
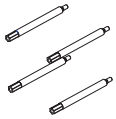
Category	Item	Description	Part Number
Accessories, cont.		Screw Replacement Kit: (4) 6-32 x $^{7}/_{8}$ Phillips pan head screws	096-3496
		Standoff Replacement Kit: (4) M4 x 82 standoffs	096-3497
		Intrinsically safe (IS) terminal block cover isolates the IS wires.	074-0528-01
		Ribbon cable (between J2-A on the power supply PCB (for 3 or 4-Wire Isolated) and J2-B on the CPU PCB)	096-3456
		Meridian Detector Body Assembly	096-3484-xx • 01 = 3-4 Wire & Plastic Meridian End Cap • 02 = 3-4 Wire & SS Meridian End Cap • 03 = 2 Wire & Plastic Meridian End Cap • 04 = 2 Wire & SS Meridian End Cap • 05 = 3-4 Wire & Plastic Meridian End Cap, for INMETRO • 06 = 3-4 Wire & SS Meridian End Cap, for INMETRO • 07 = 2 Wire & Plastic Meridian End Cap, for INMETRO • 08 = 2 Wire & SS Meridian End Cap, for INMETRO

Table D-1: Parts List

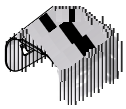
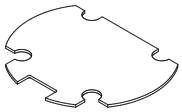
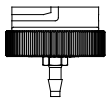
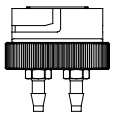
Category	Item	Description	Part Number
Accessories, cont.		Meridian NPT Ex Seal Provides explosive proof seal between transmitter and remote junction box.	096-3483
		Sun Shield Deflects sun off of the device, complete with mounting holes and rain drip ridge.	073-0373
		¼-Turn Deluge Guard Provides protection from wet weather and hose-downs.	096-3441
		Thermal Isolation Barrier Pad (only applicable for 3 or 4-wire)	077-1418
		Aluminum Heat Sink Plate (only applicable for 3 or 4-wire)	073-0381
		Thermal Conductive Pad (only applicable for 3 or 4-wire)	077-1419
		¼-Turn Calibration Fitting Delivers calibration gas directly to the sensor face without dilution from environmental interferences such as wind. Barb fitting provided for tube connection to the calibration gas source (gas cylinder, permeation device or generator).	096-3438
		¼-Turn Flow Cell Fitting Used in sample draw configurations. The baffle prolongs life by reducing air velocity past the sensor face.	096-3439
		¼-Turn Dust Filter Fitting	096-3537

Table D-1: Parts List

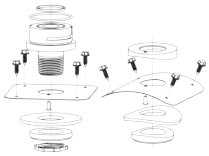
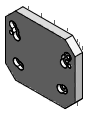
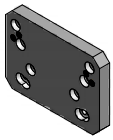
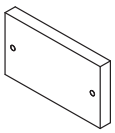
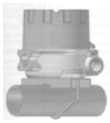
Category	Item	Description	Part Number
Accessories, cont.		Meridian End Cap Assembly	096-3437-x: • 1= Plastic • 2= Stainless Steel • 3= Plastic w/o Screen • 4= Stainless Steel w/o Screen
		Detector Head Sump Value Used when mounting device in low areas where water may accumulate to protect sensor	096-3539
		¼-Turn Flat/Round Duct Mount Fitting Kit Used for either flat or round 6" to 8" Ø ventilation ducts without drying out the sensor.	096-3440
		Aluminum ½" thick Retrofit Mounting Plate with hardware Used to mount the device where a previously mounted Teledyne Gas and Flame Detection transmitter was located; provides clearance to access Meridian end cap.	073-0374
		High Density Polyethylene (HDPE) ¾" thick Retrofit Mounting Plate with hardware Used to mount the device where a previous mounted Teledyne Gas and Flame Detection transmitter was located and provides clearance to access Meridian end cap.	093-0607
		High Density Polyethylene (HDPE) Mounting Spacer Plate Used to add additional space between the device and the mounting surface.	074-0584
		Pipe Mounting Bracket for Gas Detector (Al & SS)	076-0377

Table D-1: Parts List

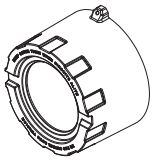
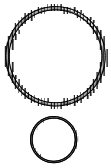
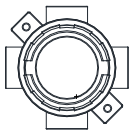
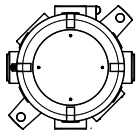
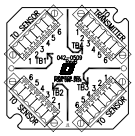
Category	Item	Description	Part Number
Accessories, cont.		Pipe Mounting Bracket for Meridian Junction Box Assembly (Al)	076-0376
		¾" NPT to 20mm Metric Thread Adapter	077-1402
		Enclosure Stop Plug Used to seal unused conduit entries.	077-1404
		Enclosure Replacement Cap	• 093-0603 (Al) • 093-0604 (SS)
		Magnet Tool Used to access menus via the four (4) navigation keys	096-3482
		O-Ring Replacement Kit (1) 4.53" Ø rubber o-ring for enclosure cap seal and (1) rubber o-ring for Meridian detector body assembly	096-3498
		Meridian Junction Box Assembly (Aluminum)	096-3475
		Meridian Junction Box Assembly (Stainless Steel)	096-3520
		Meridian Junction Box PCB	096-3434

Table D-1: Parts List

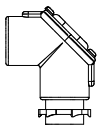
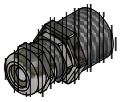
Category	Item	Description	Part Number
Accessories, cont.		Meridian Junction Box Mounting Spacer Kit (2) $^{5}/_{8}$" OD x .250" spacers and (2) $^{5}/_{8}$" OD x 0.750" spacers Recommended for integral installation and in environments with high vibration.	096-3532
		90° Elbow male-female, ¾" NPT threads (2.08"H x 2.23"W), Zinc die cast Used for multi-sensor integral installations.	048-0089
		Remote Cable Gland Fitting Used in the Meridian junction box assembly and IS cable.	048-0091
		Remote Intrinsically Safe (IS) Cable	069-0097-10 = 10' 069-0097-25 = 25' 069-0097-50 = 50' 069-0097-75 = 75' 069-0097-100 = 100'
		Sensor Simulator with Knob Note: Simulator is for temporary use only.	096-3395
Manual		Meridian Transmitter CD	096-3487
Sensors – Toxic (E-Chem)		CO	096-3473-01
		H_2S Low Methanol	096-3473-02
		NH_3	096-3473-03
		SO_2 Hi RH	096-3473-05
		SiH_4	096-3473-09
		HCN	096-3473-11
		H_2 Hi RH	096-3473-12
		NO	096-3473-14

Table D-1: Parts List

Category	Item	Description	Part Number
Sensors – Toxic (E-Chem), cont.		O_2	096-3473-19
		Cl_2 RS Hi RH	096-3473-20
		Cl_2 RS Lo RH	096-3473-21
		F_2 RS Hi RH	096-3473-22
		F_2 RS Lo RH	096-3473-23
		HCl RS Hi RH	096-3473-25
		HCl RS Lo RH	096-3473-26
		HF RS Hi RH	096-3473-27
		HF RS Lo RH	096-3473-28
		SO_2 RS Hi RH	096-3473-31
		SO_2 RS Lo RH	096-3473-32
		ClO_2 RS Hi RH	096-3473-37
		ClO_2 RS Lo RH	096-3473-38
		O_3 RS Hi RH	096-3473-39
		NO_2	096-3473-54
Sensors – Other Technology		Combustible (LEL) Cat-Bead Methane (CH_4)	096-3473-55
		Combustible (LEL) IR Methane (CH_4)	096-3473-56
		CO_2 IR	096-3473-58

Table D-1: Parts List

Category	Item	Description	Part Number
Accessories Calibration		0.5LPM Regulator 1.0LPM High Flow Regulator 0.3LPM Low Flow Regulator 0.5LPM Stainless Steel Regulator (for use with sticky gases)	077-0018 077-0254 077-1416 077-1430
		Teflon PFA Tubing, ¼"OD x 10' Teflon PFA Tubing, ¼"OD x 25' $^1/_8$ ID x ¼ OD, Tygon Tubing x 10' $^1/_8$ ID x ¼ OD, Tygon Tubing x 25' $^1/_8$ ID x ¼ OD, Tygon Tubing x 50' $^1/_8$ ID x ¼ OD, Tygon Tubing x 75'	068-0005-010 068-0005-025 068-0007-010 068-0007-025 068-0007-050 068-0007-075
		Remote Calibration Fitting - Plastic, use with $^1/_8$" ID Tubing	077-1385
		Remote Calibration Fitting – Stainless Steel, use with ¼" OD Tube	077-1386
Calibration Kits* (The specific calibration kit depends on the sensors in your device)		Standard Calibration Kit For non-reactive gases, such as O_2, CO or CH_4. Includes carrying case, 0.5LPM male regulator, and Tygon tubing.	096-3500
		Reactive Calibration Kit for reactive gases, such as NH_3, Cl_2 or HCl. Includes carrying case, 0.5LPM male stainless steel regulator, and Teflon tubing.	096-3501
		High Flow Calibration Kit for non-reactive, high-flow (or remote) applications. Includes carrying case, 1.0LPM male regulator, and Tygon tubing.	096-3502

* Calibration Kits do not include any Gas Cylinders. That must be determined at time of order. Calibration Cap sold separately.
Note: For calibration equipment, contact your sales representative.
Note: When placing an order for Toxic (E-Chem) Sensors, please specify Part Number to ensure compatibility.

Appendix E. Technical Support

This product is designed to provide you with reliable, trouble-free service. Contact your regional Technical Support if you have technical questions, need support, or if you need to return a product. Details can be found at:

www.Detcon-Service@Teledyne.com

NOTE: When returning a product, contact Technical Support to obtain a Return Material Authorization (RMA) number prior to shipping.

TELEDYNE
GAS AND FLAME DETECTION

AMERICAS

14880 Skinner Rd
Cypress, TX, USA
Tel: 1-626-934-1672

EMEA

Zl Est, rue Mathieu Orfila
CS 20417
62027 Aras, France
Tel.: 03 21 60 80 80

ASIA PACIFIC

290 Guigiao Road
Pudang, Shanghai 201206
People's Republic of China
Tel.: +86-21-3127-6373

www.teledynegasandflamedetection.com

P/N 087-0049, Rev. G.1 / January 2024