GENERAL MONITORS

Model IR400

HART Field Device Specification for Point IR Gas Detector

Instruction Manual **12-10**

Part No. **MANIR400H**
Revision **C/12-10**

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1.0 Introduction

Scope

The IR400 Combustible Gas detector complies with HART Protocol Revision 6.0. This document specifies all of the device specific features and documents HART Protocol implementation details. The functionality of this Field Device is described sufficiently to allow its proper application in a process and its complete support in HART capable Host Applications.

Purpose

This specification is designed to complement the IR400 Instruction Manual by providing a complete description of this field device from a HART Communications perspective.

Who should use this document?

This specification is designed to be a technical reference for HART capable host application developers, system integrators, and knowledgeable end users.

References

DOCUMENT NAME	DOCUMENT RELATIONSHIP
HART Communications Protocol Specifications	This is used to insure compliance with the HART Communication Protocol.
IR400 Instruction Manual	This is the General Monitors, Inc. IR400 Product Instruction Manual.

2.0 Device Identification

The following Table 1 is the Field Device Identification Data for the instrument.

Manufacturer's Name	General Monitors, Inc.	Model Number	IR400
HART ID Code	223 (DF Hex)	Device Type Code:	131 (83 Hex)
HART Protocol Revision	6.0	Device Revision:	1
Number of Device Variables	0		
Physical Layers Supported	1		
Physical Device Category	FSK		

Table 1: Field Device Identification Data

3.0 Product Overview

The IR400 is an Infrared Combustible Gas Detector from General Monitors. The IR400 accurately measures combustible gas and reports the measurement as a percent of the Lower Explosive Limit (%LEL) of the gas.

4.0 Product Interfaces

Process Interface

This section describes all interfaces between the devices and the measured process.

Sensor Input Channels

Host Interface

The HART interface uses the 4 – 20mA current loop. Refer to the Installation Manual for connection details.

1.1.1 Analog Output: Percent of Lower Explosive Limit (LEL)

1.1.2 The primary variable is proportional to the percent lower explosive limit. 4.0mA output current corresponds to zero LEL. 20.0mA output current corresponds to 100% LEL.

Local Interfaces, Jumpers, and Switches

Refer to the Installation Manual for connection details.

1.1.3 Local Controls And Displays

1.1.4 There are neither local controls nor displays in the IR400 unit.

1.1.5 Internal Jumpers And Switches

1.1.6 There are no internal jumpers or switches in the IR400 unit.

5.0 Device Variables

There are no device variables exposed to the user.

6.0 Dynamic Variables

There is only one Dynamic Variable exposed to the user.

Primary Variable = Percent of Lower Explosive Limit

1.1.7 The primary variable is proportional to the percent lower explosive limit. 4.0mA output current corresponds to zero LEL. 20.0mA output current corresponds to 100% LEL. The device mode is the variable, which corresponds to the Modbus register 0x00.

Secondary, Tertiary, and Quaternary Variables: Not Applicable

There are none defined for the IR400 product.

7.0 Status Information

The error status, which is returned via Common Practice Command #48, is shown in Table 2 and corresponds to Modbus register 0x02.

Byte	Bit	Description	Class	Device Status Bits Set
LSB	0	IR Close to Low	Error	4,7
	1	Negative Drift	Error	4,7
	2	IR is Low	Error	4,7
	3	IR is High	Error	4,7
	4	Brown Wire Short	Error	4,7
	5	Low Line Voltage	Error	4,7
	6	Failed to Calibrate	Error	4,7
	7	Failed to Zero	Error	4,7
MSB	0	Gas Check Timeout	Error	4,7
	1	Active Lamp Fault	Error	4,7
	2	Reference Lamp Fault	Error	4,7
	3	Heater Failure	Error	4,7
	4	FLASH Checksum Error	Error	4,7
	5	RAM Checksum Error	Error	4,7
	6	Excess Negative Drift	Error	4,7
	7	EEPROM Checksum Error	Error	4,7

Table 2: Error Status Information

These bits may be set at power up to indicate an instrument failure. They may also be set by a failure detected during continuous background diagnostic testing.

8.0 Universal Commands

Command 3 returns the current loop variable and the primary variable for a total of 9 bytes returned. Command 9 returns the PV only.

9.0 Common Practice Commands

The following common practice commands are implemented.

Supported Commands

The following common-practice commands shown in Table 3 are implemented:

Command Number	Byte Number	Meaning
Command 38	N/A	Reset Configuration Changed Flag.
Command 48	0	Returns Priority Fault, High Byte
Command 48	1	Returns Priority Fault, Low Byte
Command 48	2	Returns error status (same as Modbus register x02), High Byte
Command 48	3	Returns error status (same as Modbus register x02), Low Byte
Command 48	4	Returns Power Cycled Flag
Command 48	5	Returns Event Happened Flag
Command 48	6	Value = 0: All OK; Bit 0: Maintenance Required; Bit 1: Critical Fault
Command 48	7	Returns 0

Table 3: IR400 – Common Practice Commands

Burst Mode

The IR400 does not support Burst Mode.

Catch Device Variable

This Field Device does not support Catch Device Variable.

10.0 Device Specific Commands

The Device Specific commands are used strictly for the unique features of the IR400 and at the discretion of General Monitors. They are described here in section 10.0 and are summarized in Table 4.

Command #131: Do Abort

This sends the unit to Run mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #136: Set Alarm Level

This sets the Alarm level.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm level, % of FS

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm level, % of FS

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 – 2	N/A	Undefined
3	Error	Passed Parameter Too Large
4	N/A	Undefined
5	Error	Too Few Data Bytes Received
6 – 15	N/A	Undefined
16	Error	Access Restricted
17 – 127	N/A	Undefined

Command #137: Set Warn Level

This sets the Warn level.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm Warn level, % of FS

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm Warn level, % of FS

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 – 2	N/A	Undefined
3	Error	Passed Parameter Too Large
4	N/A	Undefined
5	Error	Too Few Data Bytes Received
6 – 15	N/A	Undefined
16	Error	Access Restricted
17 – 127	N/A	Undefined

Command #142: Reset Event Happened Flag

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
None	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #143: Read Event Logging Counters

Reads the 5 event logging counters.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 1	Unsigned-16	Warning Event Counter
2 - 3	Unsigned-16	Alarm Event Counter
4 - 5	Unsigned-16	Fault Event Counter
6 - 7	Unsigned-16	Maintenance Event Counter
8 - 9	Unsigned-16	Calibrate Event Counter

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #144: Clear Event Logging Counters

This resets the 5 event logging counters to zero.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
None	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #145: Read Warning Event Log

This reads the Warning Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10-13	Unsigned-8	Reserved = 0

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #146: Read Alarm Event Log

This reads the Alarm Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10-13	Unsigned-8	Reserved = 0

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #147: Read Fault Event Log

This reads the Fault Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second

Byte	Format	Description
10-11	Unsigned-8	Priority Fault
12-13	Unsigned-16	Event Cause – See device specific table

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #148: Read Maintenance Event Log

This reads the Maintenance Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Event Log Number
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10-11	Unsigned-16	Reserved = 0
12-13	Unsigned-16	Code

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #149: Set Clock

This sets the internal real-time clock.

Request Data Bytes

Byte	Format	Description
0 – 2	Date	Date: Day, Month, Year-1900
3	Unsigned-8	Hours
4	Unsigned-8	Minutes
5	Unsigned-8	Seconds

Response Data Bytes

Byte	Format	Description
0 – 2	Date	Date: Day, Month, Year-1900
3	Unsigned-8	Hours
4	Unsigned-8	Minutes
5	Unsigned-8	Seconds

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #150: Read Clock

This reads the internal real-time clock setting.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 – 2	Date	Date: Day, Month, Year-1900
3	Unsigned-8	Hours

Byte	Format	Description
4	Unsigned-8	Minutes
5	Unsigned-8	Seconds

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #151: Set Run Time Meter

This sets the internal run time meter.

Request Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Run Time Meter Value

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Run Time Meter Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #152: Read Run Time Meter

This reads the internal run time meter.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Run Time Meter Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #154: Set Event Index

This sets the index of logged event to read. 0 – latest event

Request Data Bytes

Byte	Format	Description
0	Unsigned - 8	Sets index of logged event to read using commands 143 – 146. Range 0 – 9.

Response Data Bytes

Byte	Format	Description
0	Unsigned - 8	Event Index

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #155: Get Event Index

This reads event logged index.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned - 8	Event index

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #156: Read Calibration Event Log

This reads Calibration Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0-3	Unsigned-32	Event Running Time (in Seconds)
4-6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10 - 11	Unsigned-16	Reserved = 0
12 - 13	Unsigned-16	1 - Zero, 2 - Calibration

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #163: Get Fast Changing Information

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 1	Unsigned-16	Mode
2 - 3	Unsigned-16	Sub Mode
4 – 7	Float	AO
8 - 9	Unsigned-16	Priority fault
10 – 11	Bit map	Error status
12	Unsigned-8	Reserved = 0
13	Unsigned-8	Reserved = 0
14	Unsigned-8	Reserved = 0
15	Unsigned-8	Power cycled flag
16	Unsigned-8	Event happened flag
17	Integer-8	% of FS
18-21	Integer-32	Reserved = 0

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #164: Get Slow Changing Information

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 1	signed-16	Temperature
2 - 5	float	Voltage
6 - 7	unsigned-16	% Beam Blockage

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #165: Get Set Up Information

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Gas ID
1	Enumerated	Measured Units
2- 5	Unsigned-32	Full Scale
6	Unsigned-8	Alarm level, % of FS
7	Unsigned-8	Reserved = 0
8	Unsigned-8	Reserved = 0
9	Unsigned-8	Warn level, % of FS
10	Unsigned-8	Reserved = 0
11	Unsigned-8	Reserved = 0
12	Unsigned-8	Reserved = 0
13	Unsigned-8	Reserved = 0
14	Unsigned-8	Reserved = 0
15	Unsigned-8	Reserved = 0
16	Unsigned-8	Reserved = 0
17	Unsigned-8	Cal IO type: 0 – zero switch, 1 – manual solenoid, 2 – automatic solenoid
18-19	Unsigned-8	Reserved = 0
20	Unsigned-16	Reserved = 0
21	Unsigned-8	Reserved = 0
22	Unsigned-8	Cal level, % of FS.
23	Unsigned-8	Reserved = 0
24	Unsigned-8	Current Range: 0 = 3.5 – 20mA, 1 = 1.25 – 20mA

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Gas Selection Codes

Code to read / write	Gas Type
0	Methane
1	Propane
2	N Butane
3	Hexane
4	% by volume Methane
5	Special Order
6	Ethane
7	Pentane

Command #170: Set Current Range

This sets the current range to be either one of 2 possible selections.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0 – Range 3.5mA - 20mA, 1 -- Range 1.25 - 20mA

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0 – Range 3.5mA - 20mA, 1 -- Range 1.25 - 20mA

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #185: Set Gas ID or sensor type

Request Data Bytes

Byte	Format	Description
0	Unsigned 8	Gas ID or sensor type

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	Gas ID or sensor type

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Gas Selection Codes

Code to read / write	Gas Type
0	Methane
1	Propane
2	N Butane
3	Hexane
4	% by volume Methane
5	Special Order
6	Ethane
7	Pentane

Command #186: Set Cal IO type

Request Data Bytes

Byte	Format	Description
0	Unsigned 8	0 – zero switch, 1 – manual solenoid, 2 – automatic solenoid

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	0 – zero switch, 1 – manual solenoid, 2 – automatic solenoid

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #187: Set Solenoid State

Request Data Bytes

Byte	Format	Description
0	Bits	Solenoid State: 1 - off, 2 - on

Response Data Bytes

Byte	Format	Description
0	Bits	Solenoid State: 1 - off, 2 - on

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #188: Read Solenoid State

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned -8	Solenoid State: 0 = disabled, 1 - off, 2 - on

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 127		Undefined

Command #190: Set Calibration Level

Request Data Bytes

Byte	Format	Description
0	Unsigned 8	Cal level, % of FS

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	Cal level, % of FS

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #191: Do Zero

This sends the unit to Zero mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #192: Do Calibration

This sends the unit to Calibration mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #193: Do Zero/Calibration

This sends the unit to Zero/Calibration mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #195: Do Gas Check

This sends the unit to Gas Check mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

11.0 Tables

IR400 – Device Specific Commands Summary

The following Table 4 is a summary of the IR400 Device Specific Commands.

Command Number	Byte Number	Meaning
131		Do Abort
136		Set Alarm Level
137		Set Warn Level
142		Reset Event Happening Flag
143		Read Event Logging Counters
144		Clear Event Logging Counters
145		Read Warning Event Log
146		Read Alarm Event Log
147		Read Fault Event Log
148		Read Maintenance Log
149		Set Time Clock
150		Read Time Clock
151		Set Running Time
152		Read Running Time
154		Set Event Index
155		Read Event Index
156		Read Calibrate Event Log
163		Get Fast Changing Information
164		Get Slow Changing Information
165		Get setup Information
185		Set Gas ID
186		Set Cal_IO_Type
187		Set Solenoid State
188		Read Solenoid State
190		Set Calibration Level
191		Do Zero
192		Do Calibration
193		Do Zero/Calibration
195		Do Gas Check

Table 4: IR400 – Device Specific Commands

IR400 – Operating Mode Values

The following Table 5 is a summary of the IR400 Operating Mode Values:

Operating Mode	Value in Hex
Run Mode	0x0001
Calibration Mode	0x0002
Zero Mode	0x0004
Calibration Pending Mode	0x0008
Calibration Apply Gas Mode	0x0010
Calibration Complete Mode	0x0020
Startup Mode	0x0040
Temperature Correction “Slope” Mode	0x0080
Gas Check Mode	0x0200
Zero Cal Mode	0x0400
Lamp Adjust Mode	0x0800

Table 5: IR400 - Operating Mode Values

Fault Event Log – Cause Description

The following Table 6 describes the cause as reported by the read event log commands:

Bits	Cause
0x0000	No Fault
0x0001	IR Close to Low
0x0002	Negative Drift
0x0004	IR is Low
0x0008	IR is High
0x0010	Brown Wire Short
0x0020	Low Line Voltage
0x0040	Failed to Calibrate
0x0080	Failed to Zero
0x0100	Gas Check Timeout
0x0200	Active Lamp Fault
0x0400	Reference Lamp Fault
0x0800	Heater Failure
0x1000	FLASH Checksum Fault
0x2000	RAM Checksum Fault
0x4000	Excess Negative Drift
0x8000	EEPROM Checksum Fault

Table 6: Fault Event Log – Cause Description

12.0 Performance

Sampling Rates

The IR400 samples each detector at 1 msec intervals.

Power-up

On power up, the IR400 executes a self-test procedure, which requires approximately 15 seconds. During this time, the analog output is set to 3.5mA. After the self-test is satisfactorily completed, the unit sets the PV to a value representing the mode of the instrument.

Device Reset

The IR400 cannot be reset by any command. The unit only resets when power is cycled.

Self-Test

The IR400 goes through a self-test upon power cycle. Should any of the tests fail, the unit immediately reports a fault condition.

Command Response Delay

The IR400 responds as follows:

Response Type	Response Time
Minimum	20 ms
Typical	50 ms
Maximum	100 ms

Table 7: Command Response Times

Busy and Delayed-Response

The IR400 does not use delayed-response times.

Long Messages

The largest data field used by the IR400 is in response to Command 20 & 22 (Read/Write Long Tag): 34 bytes including the two status bytes.

Non-Volatile Memory

The IR400 uses EEPROM to hold the device's configuration parameters. New data is written to this memory immediately on execution of a write command.

Operating Modes

The IR400 reports percent of lower explosive limit detected while in RUN mode. Various other modes are used to support the calibration of the instrument.

Write Protection

The IR400 does not support any write protection mode.

Annex A. Capability Checklist

Manufacturer, model, and revision	General Monitors, Inc., IR400, Revision 1
Device type	Infrared Combustible Gas Detector
HART revision	6.0
Device Description available	Yes
Number and type of sensors	1 Internal Infrared
Number and type of actuators	0
Number and type of host side signals	1: 4 - 20mA analog
Number of Device Variables	0
Number of Dynamic Variables	1
Mappable Dynamic Variables?	No
Number of common-practice commands	2
Number of device-specific commands	30
Bits of additional device status	8
Alternative operating modes?	No
Burst mode?	No
Write-protection?	Mfg Only

Table 8: Capability Checklist

Annex B. Default Configuration

Parameter	Default value
Lower Range Value	0% LEL
Upper Range Value	100% LEL
PV Units	Percent Lower Explosive Limit
Sensor type	Infrared Detector
Number of wires	3
Damping time constant	N/A
Fault-indication jumper	N/A
Write-protect jumper	N/A
Number of response preambles	5

Table 9: Default Configuration