



# Model DC130

Hydrocarbon Gas Dual/Single  
Channel Readout/Relay Module



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**Instruction Manual** **12-05**

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**MANDC130**

**Part No.**  
**Revision**

**MANDC130**  
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# 1.0 Introduction

## 1.1 Notice

All information contained in this instruction manual may be used only to install and operate the Model DC130 system provided by General Monitors, INC. (GMI). The sale of the instrument does not license the user to reproduce General Monitors' drawings or to utilize proprietary circuitry or information without prior written permission.

The DC130 system is easy to install and operate. However, this manual should be read in full, and the information contained herein understood before attempting to install or operate the system.

## 1.2 General

The Model DC130 is a dual/single channel readout/relay module to be used with the Model S4000C Smart Sensor. This system is designed to continuously monitor hydrocarbon gas in the 0-100% LEL range. Normally only a periodic system calibration check is needed to assure dependable performance.

The microprocessor based DC130 may be rack, panel, or wall mounted in a non-hazardous area. Weatherproof enclosures are available for outdoor installations and explosion proof enclosures for hazardous installations.

The DC130 has two digital displays (0-99% LEL), one for each channel, and visual status indicators for normal operation (READY), gas alarms (ALRM and WARN), calibration (CALIB), malfunction (MALF), and reset (RESET). Three relay alarm circuits are provided, two for the gas alarm circuits, ALARM and WARN, and one for the Malfunction alarm circuit. The alarm relays are common to both channels.

## 1.3 Operation

The Model DC130 furnishes 24 VDC power to the S4000C Smart Sensor and in return receives a 4 to 20 mA output signal. The digital displays of the DC130 show the gas concentration levels up to 99% LEL. Higher concentration levels will cause the display to blink the "99" reading. Should a malfunction occur in the S4000C smart sensor, the DC130 will display an "Er" on the appropriate readout display and the letters "MALF" will be illuminated on the front panel. During calibration, the DC130 will display a "CA" on the appropriate readout display and the word "CALIB" will illuminate on the front panel.

In normal operation, the word READY appears on the front panel. When latching alarm relays are used, and the gas concentration has dropped below the preset alarm level, the word "RESET" is illuminated. An alarm RESET switch is located adjacent to the illuminated "RESET". The relays may be remotely reset by momentarily connecting the RESET terminal on the rear panel to the DC common.

## 2.0 Installation

### 2.1 Location of the Readout/Relay Module

The DC130 readout/relay unit should be mounted in a non-hazardous area. It should also be mounted in a weather-protected location unless installed in a weatherproof enclosure. Mounting hardware is available from GMI for indoor wall, rack, or panel mounting, as well as weatherproof and explosion proof housings.

The mounting should be as free from shock and vibration as possible. Caution must also be taken to allow convention air-cooling. Although the readout/relay unit is RFI resistant, it should be mounted in close proximity to radio transmitters or similar equipment. GMI recommends a wiring service loop be provided to facilitate front panel hook up or removal.

### 2.2 Power Connections

The DC130 operates on nominal line power of 117 VAC, 50/60HZ, or 24VDC. There is no power on-off switch, so power must remain disconnected until all other wiring connections are made. A power on-off switch is not included to prevent accidental systems shut down, since the system is designed for continuous use to maximize protection from combustible gases.

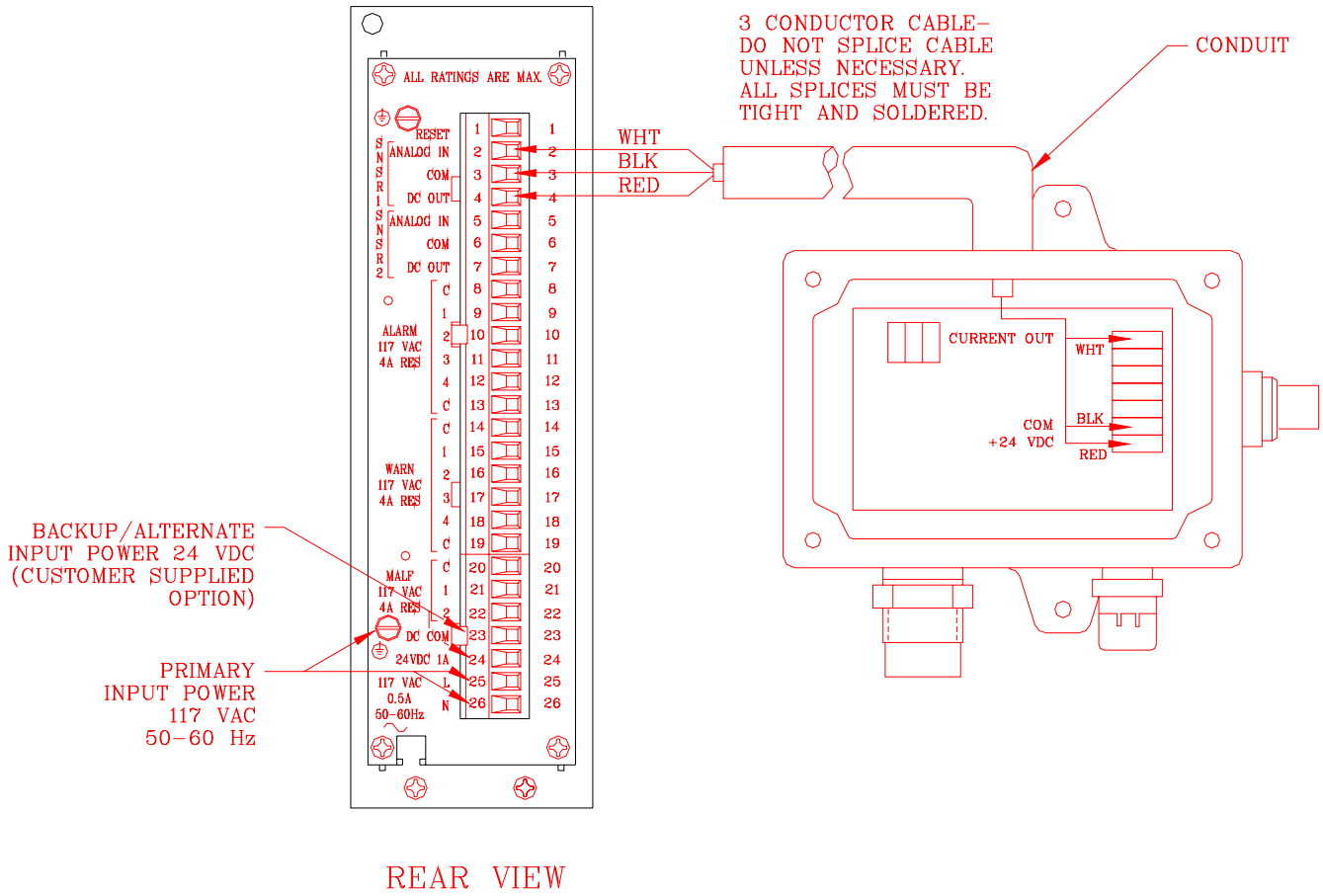
If AC is to power the system, connect the AC power terminals LINE, NEUTRAL and GROUND (L, N, and O) on the rear of the controller (Figure 1).

Primary DC power may be provided by any nominal 24V direct current supply. Heavy-duty cables should be used to prevent excessive voltage drop and the cable run should be as short as possible. Connect the positive supply to the 24VDC (+) and the negative supply to DC COM (-). An internal diode protects the system in the event of inadvertent supply reversal.

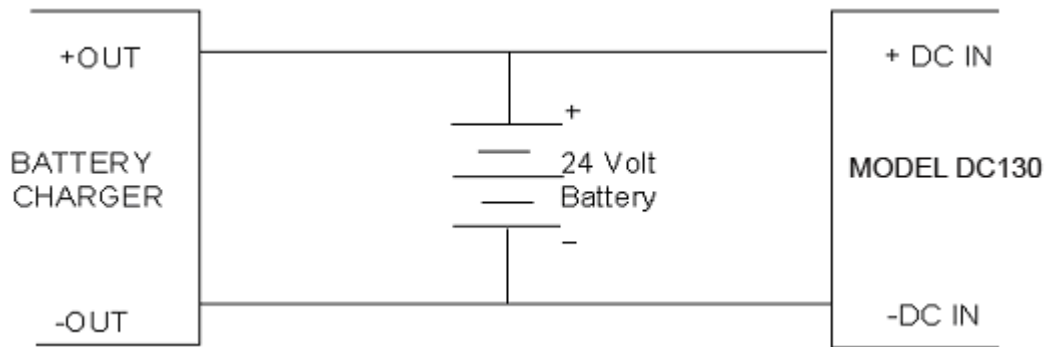
### 2.3 Battery Backup

Battery backup of an AC powered unit may be employed if desired. The customer furnished battery may be connected as shown in Figure 2. No manual or relay switching is required. A customer furnished battery charger should be used to keep the battery charged to the battery manufacturer's recommended level. The cable length (battery to DC130) should be as short as possible. Should an AC power failure occur, the 24-volt battery supplies current through the diode to the DC130 circuitry. **DO NOT USE MORE THAN A 24-VOLT BATTERY.**

The battery rating (ampere-hour capacity) is dictated by the length of time you expect power outages to last. A Model DC130 requires approximately ½ ampere (peak) at 24 Volts DC. General Monitors recommends that a Lead-Acid type battery be used. This type battery can be expected to last for several years with minimum maintenance.



**Figure 1: Outline Rear Terminal Connections**



**Figure 2: Schematic Battery Back-Up System**

## 2.4 Power Interconnections to the Model S4000C Smart Sensor

The Model DC130 is designed to supply the 24VDC power required by the General Monitors' Model S4000C Smart Sensor. To power the S4000C, the DC130 must be located within a maximum distance of 2000 meters (6000 feet) from the S4000C Smart Sensor; maximum permissible loop resistance is 30 ohms at 24VDC. The interconnection is made from the rear terminal block connections of the Model DC130 identified as "DC OUT" and "COM" (Figure 1). The "DC OUT" terminal should be connected with a red wire to the TB1 connection point 7 identified as +24VDC RED in the Model S4000C. The "COM" terminal point is connected with a black wire to the TB1 connection point 6 in the S4000C identified as "COM-BLK" (TB1-6). These interconnections are the same for both Smart Sensor 1 and 2.

## 2.5 Analog Interconnection to S4000C Smart Sensor

The 4-20 mA output signal from the S4000C is interconnected with the DC130 to provide the following:

- Local indication in a control room or other location remote to the Model S4000C
- Alarm relays for audible or visual indications or other relay type or functions desired by user

To interconnect the DC130 with the S4000C, make the following interconnections:

<b>DC130</b>		<b>S4000C</b>
ANALOG IN	to	CURRENT OUT (wht.)
COM	to	COM (blk.)

**NOTE:** If the DC130 is supplying the 24VDC power to the S4000C, the only interconnection is the ANALOG IN on the DC130 and CURRENT OUT on the S4000C. This single interconnection is possible through an internal jumper, which connects DC COMMON and ANALOG COMMON terminals within the Model DC130.

## 2.6 Setting Relay Operation

The Model DC130 has been provided with alarm and warn relays that can be set by the user to provide either latching or non-latching operation, and energized or de-energized operation. Mini-Dip Switch S3, located on the circuit board, is used to make these settings. To gain access to this switch, slide the controller forward a few inches from its mounted position. Unless otherwise specified when equipment was ordered, these relays will have the following settings when shipped from the factory:

- Alarm Relay – Latching, De-Energized
- Warn Relay - Non-Latching, De Energized

To change the relay operation, refer to Table 1. The two positions of switch S3 are identified as "open" and the numbers 1 through 8. Depressing a switch to the "open" position corresponds to the open position of the option table. Likewise, depressing a switch to the numbered position will enable the closed position shown in the option table. Note that the switch sections 6 through 8 are not used.

Switch	Open	Closed
1	Alarm Relay De-Energized	Alarm Relay Energized
2	Warn Relay De-Energized	Warn Relay De-Energized
3	Latched Alarm	Non-Latched Alarm
4	Latched Alarm & Warn	Non-Latched Warn
5	Dual Channel	Single Channel
6 to 8	Spares	

**Table 1: Option Table SW3**

## 2.7 Alarm Wiring Connection

Alarm wiring connections are made at designated terminals located on the rear panel of the DC130. The Alarm and Warn gas alarm relay contacts (dry) are DPDT and rated 4 amps at 117VAC, resistive. The Malfunction relay is always provided as non-latching, normally energized (with power applied to the controller) and is not field adjustable.

The number designations on the alarm connection terminals (rear panel) are in accordance with the following:

Malfunction alarm (with power applied)	C=Common 1=Open 2=Closed
ALARM, WARN alarms normally energize (with power applied)	C = Common 1,4 = Open 2,3 = Closed
ALARM, WARN alarms normally de-energized (with power applied)	C = Closed 2,3 = Open 1,4 = Closed



**CAUTION:** Inductive loads (bells, buzzers, relays, contractors, solenoid valves, etc.) connected to the high alarm, low alarm, and malfunction alarm relays must be clamped as shown in one of the following diagrams. Unclamped inductive loads can generate voltage spikes in excess of 1000 volts. Spikes of this magnitude will cause false alarms and possible damage.

## 2.8 Applying Power

Before applying power to the system for the first time, all wiring connections should be double-checked for correctness.

The system has a time feature. For approximately 45 seconds after power is applied, the alarm relays remain deactivated and front panel indicators, except READY, cannot light. The purpose of this feature is to eliminate false alarms, which might otherwise result while the system is stabilizing. The time delay is also initiated when the S4000C returns to normal operation from the Malfunction mode.

## 2.9 Alarm Set Point Adjustments

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**NOTE:** Alarm circuits can be disabled to prevent activation of the relay contacts when testing the complete S4000C – DC130 System. To do so, slide the DC130 forward and activate the internal RELAY INHIBIT SWITCH (S4) located on the printed circuit board. When in this mode, the letters “AL” will appear on the right hand side of the front panel just below the digital display for channel 2 to advise the operator that the relays are not active.

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Both alarm set potentiometers are located on the right hand side of the printed circuit board when facing the DC130.

### 2.9.1 Warn Setting

When the level set pushbutton (S2) is pressed, the value of the warn level will appear on the digital display associated with channel 2. The warn level may be changed by adjusting the warn potentiometer (R24) until desired value appears on the digital display.

### 2.9.2 Alarm Setting

When the level set pushbutton (S2) is pressed, the value of the alarm level will appear on the digital display associated with channel 1. The alarm level may be changed by adjusting the ALARM (R26) potentiometer until the desired new value appears on the digital display,

**IMPORTANT:** When alarm adjustments are complete, be sure to return the RELAY INHIBIT SWITCH (S4) to its operating (OFF) position.

## 3.0 Indicators, Switches and Functions

### 3.1 %LeI Display

The digital displays are scaled from 0-99% LEL. Should a malfunction occur, the affected channel display will indicate an “Er” reading.



**CAUTION:** A reading of 99% LEL, or high off-scale readings, indicate a dangerous gas concentration is present.

### 3.2 Ready Indicator

This light-emitting diode (LED) glows a steady green and the word “READY” appears whenever the channels are operating normally (i.e. when power is on and there is no malfunction alarm condition).

### 3.3 Gas Alarm Indicators

The red high alarm LED and amber warn alarm LED indicators illuminate whenever the gas concentration at one of the sensors exceeds the concentration at which the respective alarm circuits were pre-set. The activating of the LED’s will be accompanied by the activation of the gas alarm relays.

### 3.4 Malfunction Indicator

Normally off, this amber indicator flashes any time there is fault in one of the systems. Gas alarm relays and indicators are by-passed during a malfunction, and the malfunction relay de-energizes. When one of the sensors is in “CAL” mode the CALIB indicator illuminates to alert the user that the gas alarm relays are not operating and the letters “CA” appear on the digital display for the associated channel. The malfunction relay does activate in “CAL” mode, however.

### 3.5 Reset Switch

Any alarm relay, which is wired for latching operation and its associated alarm indicator, will stay in alarm condition even if the gas concentration at the sensor drops below the set point. The alarm condition of the relay and indicator can be cancelled when the “RESET” indication appears on the front panel of the DC130 by depressing the momentary-action reset switch located on the front panel adjacent to the “RESET” indication. Depressing the switch has no effect if the gas concentration is still above the set point levels.

## 4.0 Operational Adjustments and Procedures

### 4.1 Initial Start-Up

Each Model DC130 is completely checked at the factory for proper operation. However, a complete checkout is necessary upon placing the system in operation to assure system integrity. This includes verifying the digital indicator zero, checking and adjusting alarm set points, and performing a complete calibration procedure.

### 4.2 Model S4000C/DC130

Alarm circuits can be disabled to prevent activation of the relay contacts when preparing to calibrate. To do so, move switch S4 located on the P.C. board to the "RELAY INHIBIT" position.

### 4.3 Alarm Set Point Check

To check the alarm set points, depress the LEVEL SET pushbutton (S2). The alarm set point will be on the channel1 digital display and the warn set point will be on the channel 2 digital display.

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**NOTE:** Up to 5% hysteresis is normal around alarm set points. This is required to prevent relay chatter. If the relays are latching, the RESET will have to be depressed to de-activate the alarm circuits. After alarm points have been set or checked, return the RELAY INHIBIT SWITCH S4 to the off position to restore normal operation.

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## 5.0 System Problems and Troubleshooting

### 5.1 General

It is highly recommended that a spare sensor be on hand at all times. While GMI sensors are a most reliable, long life sensor available, sensor failure tends to be the largest potential cause of real down time. A full complement of other GMI recommended spare parts should also be on hand. GMI's warranty will be voided if damage results from repair efforts involving replacement of P.C. boards or their components other than routine replacement of recommended spare parts. It is recommended that defective controllers be returned to the factory for repair even if the warranty has expired.

### 5.2 Maintenance

Once installed, the Model S4000C/DC130 systems require little or no routine maintenance other than periodic calibration checks. GMI recommends that a calibration schedule be established and adhered to. GMI also recommends that a logbook be kept showing calibration dates and dates of sensor replacement.

The removal of particulate matter from accessory sensor covers may be facilitated by the use of an appropriate halogen-free solvent. Water and/or ethanol are examples of suitable solvents. The sensor cover should be thoroughly dried with compressed air if necessary, before refitting to the sensor body. A calibration check should be made after the cleaned cover has been re-installed because the cleaning process may have increased sensor response.

### 5.3 Troubleshooting

This section is intended to be a guide in correcting problems, which may arise in the field. The information presented in the following table is designed to correct the more common problems, which appear during system start-up and operation. This section is not all-inclusive, and General Monitors should be contacted for assistance if the corrective actions listed do not eliminate the problem. Should the various actions suggested in the table fail to restore normal operation, we recommend that the factory be consulted, and if necessary, that the system be returned to the factory for repair.

If equipment or qualified personnel required for various tests is not available it is recommended that the defective unit be returned to General Monitors for repair. A complete written description of the problem should be included.

Be sure to place instrument in Alarm Inhibit mode or disconnect external alarm wiring before making any check, which might send the unit into alarm, if an alarm condition will create problems.

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**NOTE:** If the equipment is under warranty, any repairs performed by persons other than General Monitors' authorized personnel may void the warranty. Please read the warranty statement carefully.

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<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
% LEL display does not turn on after application of power (AC or DC).	<ol style="list-style-type: none"> <li>1. No input power</li> <li>2. 0.5 amp AC fuse (F1) is defective.</li> <li>3. 2 amp DC fuse (F2) is defective.</li> </ol>	<ol style="list-style-type: none"> <li>1. Insurer proper power supply to controller.</li> <li>2. Replace F1.</li> <li>3. Replace F2.</li> </ol>
Module, the MALF LED is flashing.	<ol style="list-style-type: none"> <li>1. Low input power</li> <li>2. The S4000C is in malfunction mode.</li> </ol>	<ol style="list-style-type: none"> <li>1. Insure proper power supply to controller.</li> <li>2. Check the S4000C Unit for proper operation.</li> </ol>
WARN and /or Alarm LED's do not turn "ON" when % LEL readout exceeds Alarm point.	Alarm pots not properly adjusted	Perform ALARM and WARN alarm set point adjustment.

**Table 2: Troubleshooting Table**

## 6.0 Specifications

<b>Dimensions:</b>	2.1"W x 6.9"H x 11.5"L (53mm x 175mm x 294mm)
<b>Weight:</b>	Approximately 3.8 lbs. (1.8kg)
<b>Mounting Configurations:</b>	Rack, panel, wall, weatherproof and explosion proof enclosures
<b>Temperature Range:</b>	32°F to 140°F (0°C to 60°C)
<b>Input Power:</b>	105-130 vac/50-60 Hz 205-2525 vac/50-60 Hz 22-30 VDC
<b>Output Power:</b>	8 watts maximum for DC130 and 6 watts maximum for each Smart Sensor.
<b>Signal Input (each channel):</b>	24VDC nominal at 0.25A to each Smart Sensor
<b>Display Range:</b>	4-20ma from the model S4000C Smart Sensor DC130, 0-99% LEL. A two-digit display for each channel blinking 99 for over-range indication.
<b>Status Indicator:</b>	ALARM, WARN, CALIB, MALF, READY, and RESET
<b>Alarm and Warn Relays: (common to channels 1 and 2)</b>	DPDT 4 amp relay at 117 VAC resistive, energized/de-energized relay and latching/non-latching relay or both alarm and warn set by dipswitch
<b>Malfunction Relay:</b>	SPDT 4 amp at 117 VAC resistive, normally energized and non-latching
<b>Relay Inhibit:</b>	Disables alarm and warn relays with indicating LED on front panel, set by toggle switch on P.C. board
<b>Channel Disable:</b>	Disables channel 1, set by dipswitch on P.C. Board
<b>Warranty:</b>	2 years

**Cable:** 3 wire shielded maximum cable length allowable between readout/relay module and sensor assembly with one-way resistance of 15 ohms (total 30 ohm loop).

AWG	FEET	METER
18	1,200	400
16	2,400	800
14	6,000	2,000

**Table 3: Maximum Cable Lengths**

**Recommended Spare Parts:**

Description	Part Number	Quantity
Fuse, 5 amp 250 VAC	951-200	2
Fuse, .2 amp 250 VAC	951-015	2



**ADDENDUM**  
**Product Disposal Considerations**

This product may contain hazardous and/or toxic substances.

EU Member states shall dispose according to WEEE regulations. For further General Monitors' product WEEE disposal information please visit:

[www.generalmonitors.com/customer\\_support/faq\\_general.html](http://www.generalmonitors.com/customer_support/faq_general.html)

All other countries or states: please dispose of in accordance with existing federal, state and local environmental control regulations.