Model DT210

Multi-Channel Hydrogen Sulfide Gas
Readout/Relay Module

Instruction Manual **07/06**

Part No. MANDT210

Revision A/07-06

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Warranty Statement

General Monitors warrants the Model DT210 to be free from defects in workmanship or material under normal use and service within two (2) years from the date of shipment. General Monitors will repair or replace without charge any such equipment found to be defective during the warranty period. Full determination of the nature of, and responsibility for, defective or damaged equipment will be made by General Monitors' personnel.

Defective or damaged equipment must be shipped prepaid to the General Monitors' plant or the representative from which the shipment was made. In all cases, this warranty is limited to the cost of the equipment supplied by General Monitors. The customer will assume all liability for the misuse of this equipment by its employees or other personnel.

All warranties are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without General Monitors' approval or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered.

Except for the express warranty stated above, General Monitors disclaims all warranties with regard to the products sold, including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of General Monitors for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.

System Integrity Verification

General Monitors' mission is to benefit society by providing solutions through industry-leading safety products, services and systems that save lives and protect capital resources from the dangers of hazardous flames, gases and vapors.

The safety products you have purchased should be handled carefully and installed, calibrated, and maintained in accordance with the respective product instruction manual. Remember, these products are for your safety.

To ensure operation at optimum performance, General Monitors recommends that certain maintenance items are performed.

Commissioning Safety Systems

Before power up, verify wiring, terminal connections and stability of mounting for all integral safety equipment including, but not limited to:

- Power supplies
- Control modules
- Field detection devices
- Signaling / output devices
- Accessories connected to field and signaling devices

After the initial application of power (and any factory specified warm-up period) to the safety system, verify that all signal outputs, to and from devices and modules, are within the manufacturers' specifications. Initial calibration / calibration checking / testing should be performed per the manufacturers' recommendations and instructions.

Proper system operation should be verified by performing a full, functional test of all component devices of the safety system, ensuring that the proper levels of alarming occur.

Fault/Malfunction circuit operation should be verified.

Periodic Testing/Calibration of Field Devices

Periodic testing/calibrating should be performed per the manufacturers' recommendations and instructions. Testing/Calibrating procedures should include, but not be limited to:

- Verify zero reading
- Apply a known concentration of gas, or a simulated test device provided by the manufacturer
- Verify integrity of all optical surfaces and devices.

When testing produces results outside of the manufacturers' specifications, re-calibration or repair/replacement of the suspect device(s) should be performed as necessary. Calibration intervals should be independently established through a documented procedure, including a calibration log maintained by plant personnel, or third party testing services.

1.0 Introduction

1.1 Notice

All information contained in this instruction manual may be used only to install and operate the Model DT210 provided by General Monitors, Inc. (GM). 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 DT210 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 DT210 is an eight channel readout/relay module designed to be used with the S4000T Smart Sensor. This system will continuously monitor hydrogen sulfide gas within any of the following ranges: 0-20ppm, 0-50ppm, and 0-100ppm. Normally, only a periodic system calibration check is needed to assure dependable performance.

The microprocessor based DT210 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.

NOTE: Weatherproof and explosion proof enclosures are not included in the factory mutual performance approval of these systems.

The DT210 has a digital display (0-99ppm) and visual status indicators as follows:

CONDITION	INDICATOR
Normal condition	Digital display indicates "0"
Low gas alarm	WARN (flashing amber).
High gas alarm	ALARM (flashing red).
Malfunction	MAL (flashing amber).
Calibration	CAL (steady amber)
Channel being indicated	PEAK CH (steady green).
Reset of latching alarm	RESET (steady red).
Alarm inhibit	AL (red indication appears to right of digital display).

Table 1: Visual Status Indicators

Eight LED indications numbered from 1 to 8 are also included around each of the status indicators to identify the channel or channels associated with the condition being

displayed. Output from the DT210 is in the form of open collectors which will “sink” a maximum of 100mA when active. These open collector outputs are referenced to system ground (common).

Three relay outputs are also provided. The alarm and warn relays are DPDT (double pole, double throw) and the malfunction relay is SPDT (single pole, double throw). Various options for the operation of the alarm and warn relays are switch selectable and will be described later in this manual.

1.3 Operation

The Model DT210 furnishes the 24 VDC power to the S4000T Smart Sensors as well as receiving the 4 to 20mA output signal from the S4000Ts. The digital display of the DT210 shows the gas concentration level up to 99ppm. Higher concentration levels will cause the display to blink the 99 reading. The same will be true for a 0-50ppm, or 0-20 ppm system. The display will blink a “50” or “20” respectively for over-range conditions. Should a malfunction occur in the S4000T, the DT210 will display a flashing “MAL” on the front panel. During calibration, the DT210 will display the word “CAL” on the front panel. The channel LED will also be illuminated to identify which channel has been affected.

The DT210 is designed to provide operational status of any and all active channels. For example, if a malfunction status indicator illuminates and the associated channel LED indicator “2” is shown, the remaining active channels will continue to indicate their normal functions.

If fewer than eight channels are connected to the DT210, the unused channels will cause a malfunction indication to appear on the front panel. To prevent this, a Channel Disable switch is provided on the main P.C. board. This switch, (S1) consists of 8 two-position switches (Figure 1). Each is associated with the individual channels (1 to 8) to permit disabling those not currently in use. The disable switches may also be used if a channel is to be taken out of service for any reason.

In normal operation either an “O” or a ppm reading will appear on the digital display. If any channel detects a gas buildup above the 2ppm level, the value will be displayed on the digital display and a PEAK CH indication along with the associated channel number will appear on the front panel.

The standard configuration provides for latching alarm and non-latching warn relays; however, any combination of latching or non-latching alarms may be selected by the customer through the use of switch S8.

If a gas concentration exceeding the “warn” or “alarm” set point is detected, its value will be indicated by the DT210. When latching alarms are used and the gas concentration has dropped below the present alarm, the alarm may be reset. The reset switch, (S2), is located adjacent to the illuminated RESET. The warn indication will remain on until the gas concentration falls below the “warn” preset level and then RESET will again illuminate to indicate to the operator that the warn set point may be reset. The alarms may be remotely reset by using a momentary contact pushbutton connected to the terminals labeled P3Z-28 and P3Z-30 on the rear terminal connector (Figure 3).

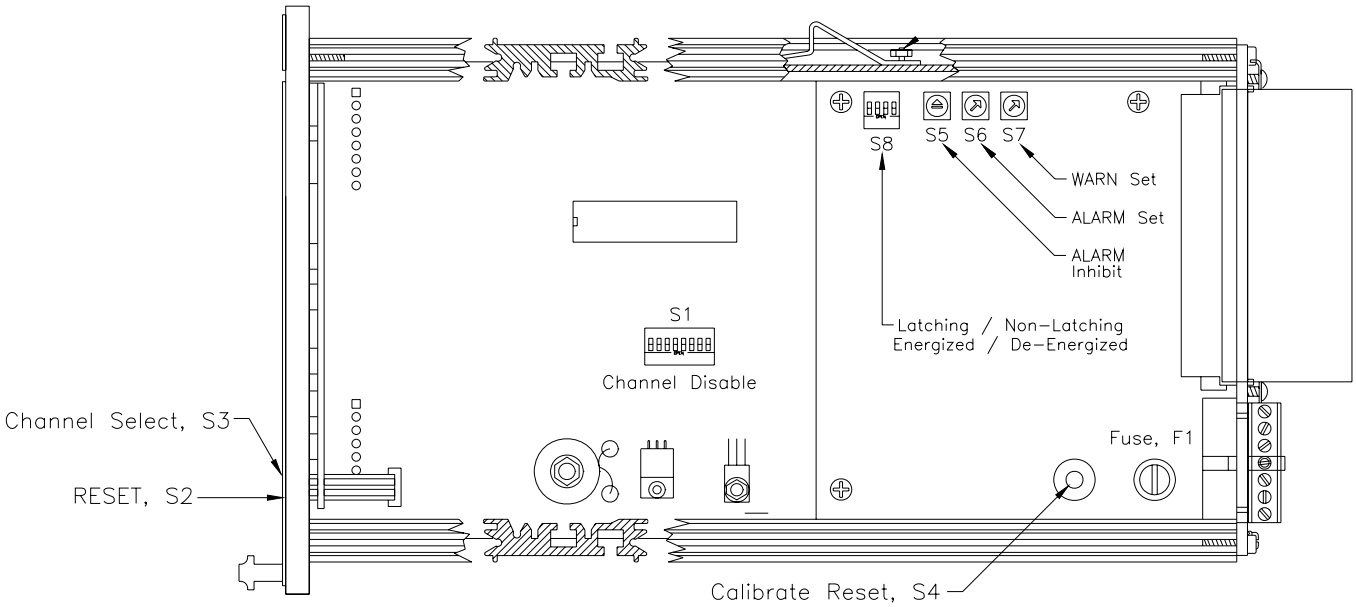


Figure 1: DT210 Sectional View

1.4 Voting Option

The DT210 can be configured with a special voting option when specified on the original order for equipment. A system supplied with this option will require that two channels reach the alarm set point before the alarm relay will actuate. All other functions of the Model DT210 systems will be the same as for the non-voting system.

Since all others outputs from the DT210 are the same in the voting versions, a special open collector output is provided for the customer who wishes to use the open collectors in a voting mode. Terminal P3Z2 (ALARM VOTING OUT) and P3D2 (COMMON) are used for this purpose (Figure 3).

NOTE: The voting option is not included in the factory mutual approval of this equipment.

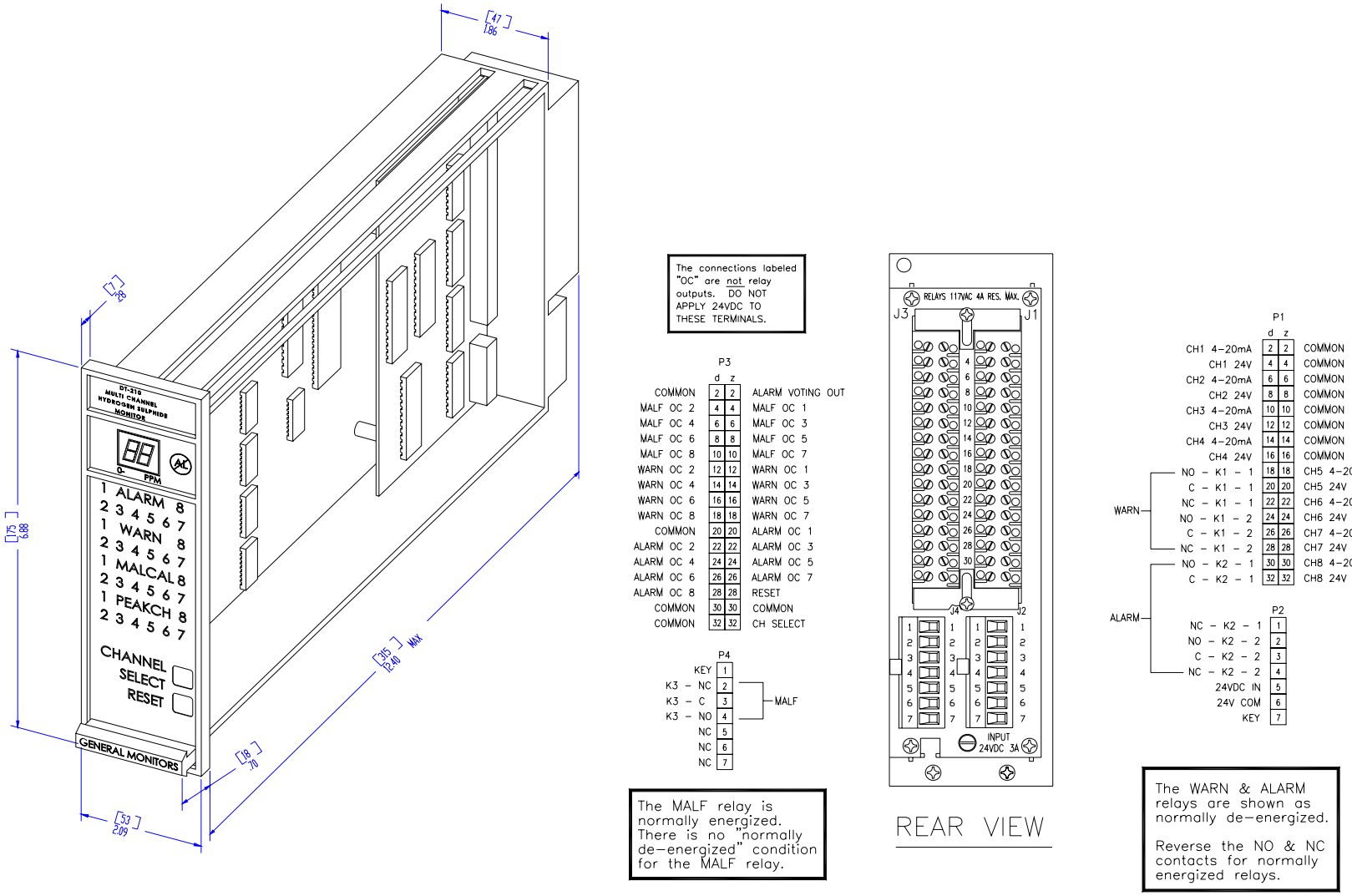


Figure 2: Outline and Rear Terminal Connections (Ref 32036)

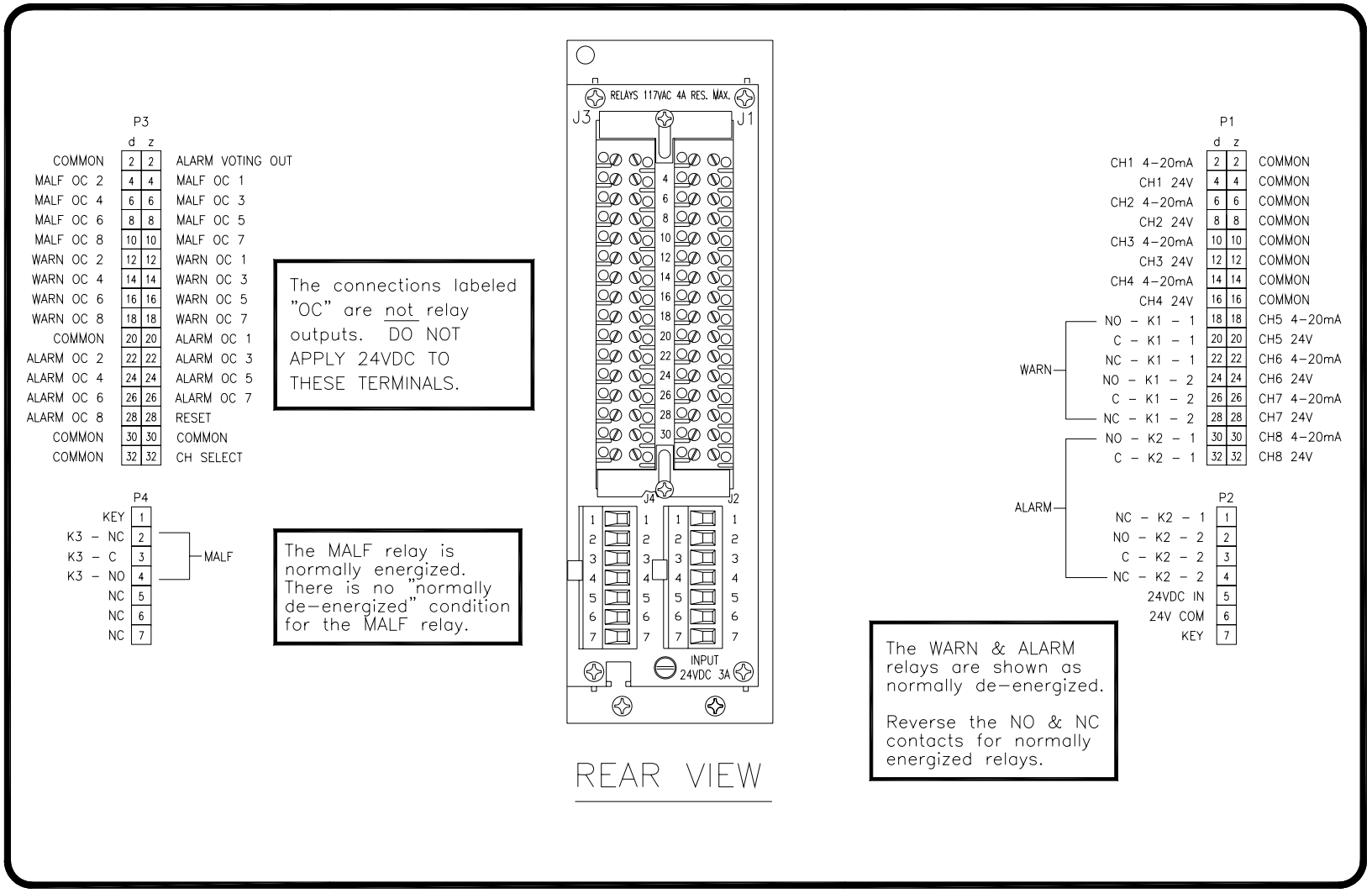


Figure 3: Rear Terminal Connections

1.5 Rear Connector Identification

Please refer to Figure 2 and Figure 3 regarding the following information. Figure 2 is the outline dimensional drawing, which is silk-screened on the rear panel and associated with the Jacks: J1, J2, J3, and J4. Figure 3 gives a detailed description of the 78 connections on the rear panel.

The plugs associated with the connections are identified as P1, P2, P3, and P4. P1 and P3 contain two vertical rows of sixteen terminations each and each row is identified as row “d” or row “z”. Additionally the rows are identified in pairs using even numbers from 2 through 32. For example: termination P1Z-2 is the top right hand terminal of plug P1.

P2 and P4 each contain a single row of seven terminations. By similar example, termination P2-1 is the top terminal of plug P2 and P2-7 is the bottom.

All 4 of the plugs are keyed to only fit their proper locations.

With reference to Figure 3, the location of specific terminations is as follows:

Plug P1

- Row d, terminals 2 through 16 and row z terminals 18 through 32 are the +24 VDC power to the eight ST200 Smart Sensors and the 4-20mA signals from the S4000Ts. The common terminations associated with these connections are located on Row z terminals 2 through 16
- Row d terminals 18 through 28 are the output connections from the Warning relay contacts
- Row d terminals 30 and 32 are two of the contacts of the ALARM relay (See Plug P2)

Plug P2

- Terminals 1 through 4 are the remaining four connections for the ALARM relay contacts (See Plug P1)
- Terminals 5 through 6 are the +24 VDC input and 24 VDC common input respectively to the Model DT210
- Terminal 7 serves as the key

Plug P3

- Plug 23 primarily provides the open collector output signals for the malfunction, warning and alarm conditions. Terminals d4 through 10 and z4 through 10 are the malfunction output signals from eight Smart Sensors
- Terminals d12 through 18 and z12 through 18 are the eight warning output signals. Terminals d22 through 28 and z20 through 26 are eight alarm output signals
- Terminals d2, d20, d32, and z30 are common terminals
- Terminals z2 is the open collector output signal to be used when in the alarm voting mode

- Terminal z28 will permit a remote reset switch to be used to reset the alarms when the latching mode is in use
- Terminal z32 permits a remote channel select switch to be used

Plug P4

- Terminal 1 serves as the key
- Terminals 2,3, and 4 are the output connections from the malfunction relay contacts
- Terminals 5,6, and 7 are not used

2.0 Installation

2.1 Location of the Readout/Relay Module

The DT210 should be mounted in a non-hazardous area. It should also be mounted in a weather-protected location unless installed in a weatherproof enclosure. The following mounting hardware is available to facilitate installations.

Panel Mount Frame (one unit), 49 mm (2") wide	P/N 10201-1
Panel Mount Frame (two Units), 98 mm (4") wide	P/N 10199-1
Rack Frame (up to 8 units), 483 mm (19") wide	P/N 10200-1
Blank Panel (for used position)	P/N 10187
Wall Mount Bracket (one unit)	P/N 10195-1
Wall Mount Bracket (two Units)	P/N 10202-1
Weatherproof Enclosure (one or two units)	P/N 10259-1
NEMA 7 Explosion Proof Enclosure (one or two units)	P/N 10099-1
Desk Top Cabinet (up to 8 units)	P/N 914-006

NOTE: The mounting hardware is not included in the Factory Mutual performance approval.

- The mounting should be as free from shock and vibration as possible.
- Care should be taken to mount the module away from radio transmitters or similar equipment, even though it is RFI/EMI resistant.
- Provide a wiring service loop (module to field wiring) to facilitate access to the adjustments located on the PC Board. This service loop will also provide easy removal and disconnect from the front of the panel.
- Care should be taken to assure adequate ventilation. Do not mount the DT210 in a manner which will restrict the natural convection air flow from normal ambient air.
- The operating range is 0°C to 60°C (32°F to 140°F).

2.2 Power Connections

The DT210 will operate on nominal line power of 22-30 VDC. 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 hydrogen sulfide gas buildup. Primary DC power may be provided by any nominal 24V direct

current supply. Appropriate cables should be used to prevent excessive voltage drop, and the cable run should be as short as possible. Connect the positive supply to +24V In (connector P2-5) and the common to 24V COM-In (connector P2-6). An internal diode protects the system in the event of inadvertent supply reversal.

2.3 Power Interconnection to the S4000T

The DT210 is designed to supply the 24VDC power required by the General Monitors' S4000T Smart Sensor.

To power the S4000T:

- The DT210 must be located within a maximum distance of 700 meters (1200 feet) from the S4000T and the maximum permissible loop resistance of 8 ohms at 24VDC.
- The interconnection is made from the P1 rear connector block terminations of Model DT210 identified as CH "(X)" + 24V ("X" stands for the appropriate channel number 1 to 8), and common.
- The +24V terminal should be connected to the TB2 connection point 9 identified as +24V VDC RED in the Model S4000T.
- The common terminal point is ground to the TB2 connection point 8 in the S4000T. Each of the P1 terminations also identifies the S4000T that it is associated. For instance, the connections to the S4000T number 1 are P1d4 and P1z2.

Function	S4000T	DT210
Ground	TB2-8	P1z2
+24V	TB2-9	P1d4

2.4 Analog Interconnection to the S4000T

The 4-20mA output signal from the S4000T is interconnected with the DT210 to provide the following:

- Indication in a control room or other location remote to the Model S4000T of the operation and alarm conditions of the S4000T
- Alarm relays for audible or visual indications or other relay type of functions desired by user
- The open collector output signals

To interconnect the DT210 with the S4000T, make the following interconnections:

Function	S4000T	DT210
4-20mA output	TB21	P1d2

NOTE: ("X" stands for the appropriate channel number, 1 to 8).

2.5 ALARM WIRING CONNECTIONS

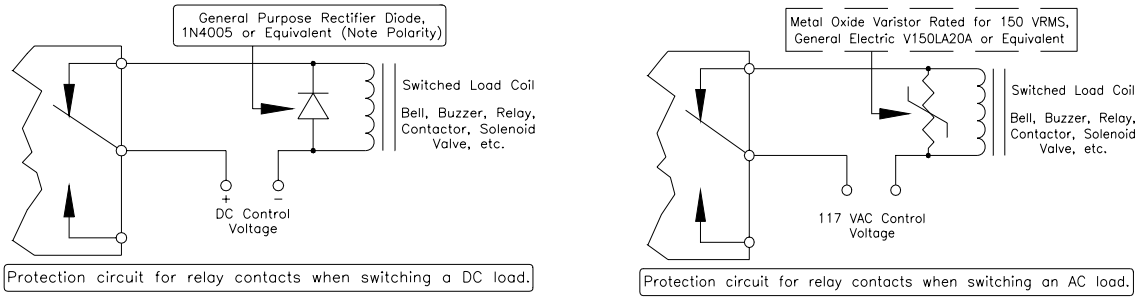
Alarm wiring connections are also made at designated connectors located on the rear panel of the DT210. The alarm and warn gas alarm relay contacts (dry) are DPDT and rated 4 amps at 117 VAC, resistive. They may be latching (manual reset) or non-latching (automatic reset), and normally de-energized (with power applied to the controller). Each of these operations can be selected by DIP switches in the DT210. The malfunction alarm relay contacts (dry) are SPDT and rated 4 amps at 117 VAC resistive. The malfunction relay is always provided as non-latching and normally energized (with power applied to the controller).

The number designations on the alarm connection terminals (rear panel) are in accordance with the following (Figure 3).

Malfunction alarm (with power applied)	P4-3 = Common P4-4 = Open P4-2 = Closed
Warn alarms normally energized (with power applied)	P1d-20, P1d-26 = Common P1d-22, P1d-28 = Open P1d-18, P1d-24 = Closed
Warn alarms normally de-energized (with power applied)	P1d-20, P1d-26 = Common P1d-18, P1d-24 = Open P1d-22, P1d-28 = Closed
Alarm alarms normally energized (with power applied)	P1d-32-P2-3 = Common P2-1, P2-4 = Open P1d-30, P2-2 = Closed
ALARM alarms normally de-energized (with power applied)	P1d-32, P2-3 = Common P1d-30, P2-2 = Open P2-1, P2-4 = Closed

NOTE: Corresponding terminations for one set of contacts are identified vertically for each pole of the relays for warn and alarm.

CAUTION: Inductive loads (bells, buzzers, relays, contactors, 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.

Figure 4: Relay Protection for AC and DC Loads

2.6 Open Collector Outputs

An open collector output can simply be thought of as a SPST switch connected such that one terminal is connected to the system common, and the other terminal is the output. The load to be driven is connected between the open collector output and a supply voltage that is positive with respect to the systems common. When the output is not activated, like a normally de-energized relay, there is no current flow (the switch is open). For an active output, the switch is closed permitting current to flow. It is very important that the load is selected such that the maximum current flow is less than the rated value. This is especially true for loads with high surge currents such as incandescent lamps.

The alarm and warning open collector can be normally energized (sink current) or normally de-energized (not sinking current). They can also be latching or non-latching. These settings are DIP switch selectable. The malfunction open collector is always normally energized (sinking current) and non-latching.

The open collectors are rated at 100mA at 30 VDC max. The maximum output leakage current is 50uA. To connect to an open collector see Figure 5.

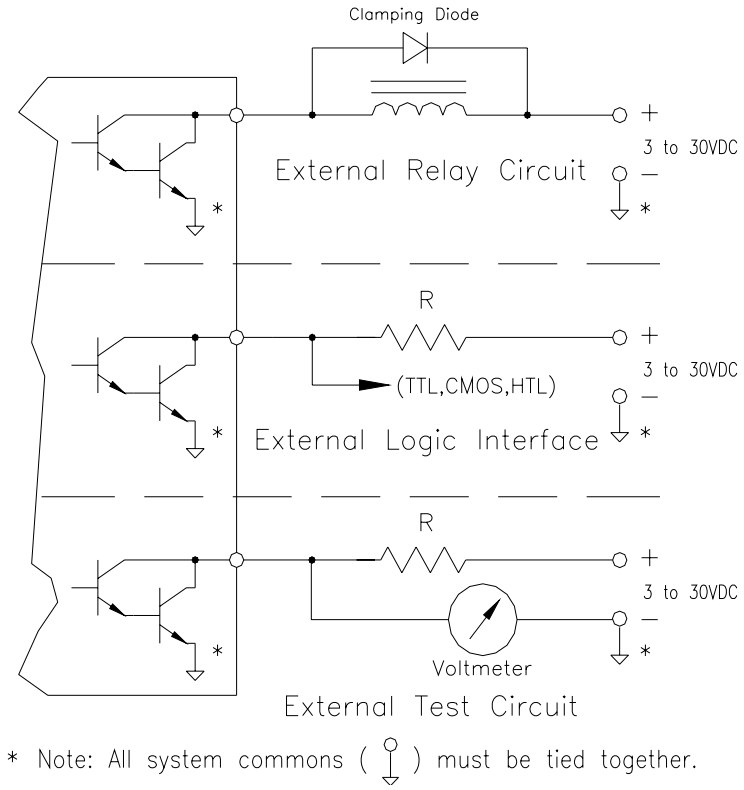


Figure 5: Open Collector Outputs

CAUTION: If any open collector output is connected to an external device which is not powered by the same power supply that is powering the Model DT210. jumper W2 must be removed.

2.7 Applying Power

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

The S4000T has a time delay (during which time a constant 4mA signal is supplied by the unit) for approximately 6 seconds after DC power is applied. 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 S4000T returns to normal operation from the malfunction mode.

IMPORTANT: During the time out period for a Smart Sensor, no indication will be given of this condition by the DT210.All other channels will function normally.

2.8 Alarm Point Adjustments

2.8.1 Warning Setting

The warning set point level may be adjusted in discrete percentage values. These adjustments values change depending upon the range of the instrument and are as follows:

Range	Adjustment Steps
0-100ppm	5ppm between 10 and 85ppm
0- 50ppm	2ppm between 10 and 40ppm
0- 20ppm	1ppm between 3 and 18ppm

Table 2: Warning Adjustment Values

The adjustments are accomplished by rotary switch S7 (Figure 3). Switch S7 is a 16 position switch with the position marked from 0 through 9 and A through F. Position 0 corresponds with the low value (10ppm or 3ppm depending on instrument range) and position F with the high value (85, 40, or 18ppm depending on instrument range).

2.8.2 Alarm Setting

The alarm set point level adjustments are identical to that for the warn signal given above. Use rotary switch S6 (Figure 1) for the alarm setting.

2.9 Alarm Set Point Adjustments

To check that the desired values have been set for the warn and alarm signals, depress the reset switch on the front panel and hold it in. The digital display will show the ppm level at which the warn relay and open collector signals will actuate.

Release the reset switch and immediately depress it and hold it in again. The ppm level on the digital display will switch to show the set point for the alarm level.

When the reset switch is released, the DT210 will return to its normal function and the peak channel will again be indicated.

3.0 Indicators, Switches and Functions

3.1 PPM Display

The digital display is scaled from 0 to 99ppm and will show the concentration of H_2S gas present within this range. Over-range readings will be indicated by the flashing of the digital display.

For a system having a range of 0-99ppm, the display will be flashing “99” for off-scale readings.

For systems having the range of 0 to 50 or 0 to 20ppm, the off-scale values will also flash, but the display will show a flashing “50” for a 0-50ppm range system and a flashing “20” for a 0-20ppm system.

CAUTION: Any flashing digital display indicates that a high gas concentration is present and immediate action should be taken.

3.2 Peak Channel Display

The DT210 will continuously display the value of the highest reading channel on the digital readout. Simultaneously the PEAK CH LED will be illuminated along with the channel number (1 through 8).

A special feature allows the user to view the level of each of the other active channels by depressing the channel select switch (3) on the front panel and holding it in for approximately 2 seconds. When it is released, the display will cycle through all channels that have not been disabled, beginning with channel 8 and ending with channel 1, after which it will return to the PEAK CH indication. During the cycle, each channel will be displayed approximately 2 seconds.

A slower cycle may be obtained by holding the channel select switch in rather than releasing it after 2 seconds. This allows the user to view channel 8 for as long as the switch is held depressed. To move to channel 7, release the switch and immediately depress and hold it in again. Continue releasing and depressing the switch to cycle through the remaining channels.

3.3 Gas Alarm Indicators

The red “ALARM” LED and amber “WARN” LED indicators illuminate whenever the gas concentration at any sensor 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 associated relay contacts and the open collector output signals.

3.4 Malfunction Indicator

Normally off, this amber indicator flashes any time there is a fault in the system. Gas alarm indications by relays, open collector output signals, and the front panel indicators for that channel are by-passed during a malfunction. The malfunction relay de-energizes and the green flashing “MAL” alarm LED accompanied by flashing amber channel indicator (1 through 8) illuminate on the front panel, telling the operator which

channel is in malfunction. If more than one channel is in malfunction, all channel numbers that are in malfunction will be displayed.

3.5 Calibration Indicator

When any channel is placed into calibration mode, an amber “CAL” indicator will appear on the front panel accompanied by the channel indicator number (1 through 8). Both of these indications will be steady. When a channel is in “CAL” mode the alarm and warn relays and open collector output associated with that particular channel will not operate. The malfunction outputs will be operative in “CAL” mode, however.

3.6 Reset Switch

Any alarm relay and open collector output, which is set for latching operation, and its associated alarm indicator, will stay in the alarm condition even if the gas concentration at the sensor drops below the set point. When the “reset” indication appears on the front panel of the Model DT210, the alarm condition can be cancelled by depressing the momentary-action reset switch, S2, located on the front panel adjacent to the “reset” indication (Figure 1). Depressing the switch has no effect if the gas concentration is still above the set point levels.

The reset switch serves the additional function of an LED check and the set point level check for warn and alarm signals.

By depressing the switch and holding it for 2 to 3 seconds, the warn indicator will begin to flash and its associated channel indicators (1 through 8) will be illuminated (steady). The digital display will show the set point for the warn alarm. After 4 or 5 seconds, the indication will switch to the alarm indicator, where the information for the alarm condition will be shown in a similar manner. After displaying the alarm condition for approximately 4 seconds the system will automatically return to its operating condition.

3.7 Alarm Inhibit

Alarm circuits can be disabled to prevent activation of the relay contacts when testing the complete S4000T – DT210 system. To do so, slide the DT210 forward and activate the internal alarm inhibit rotary switch (S5) located on the printed circuit board (Figure 1). When in this mode, the symbol “AL” will appear just to the right of the digital display on the front panel. Switch S5 has 10 positions. Positions 0 and 9 are not active and the switch should be in one of these positions for all channel alarms to be active. Positions 1 through 8 will disable each of the associated channels.

NOTE: Inhibiting a channel will have no effect on any other channel.

3.8 Channel Disable

The function and use of this switch (S1) was described in Section 1.3 C. It has no secondary functions.

3.9 Relay Operation Selection

The Model DT210 provides optional relay operation for the warn and alarm relays. These various operations are switch selectable through the use of S8 (Figure 1). S8 is a four section, two-position DIP switch, mounted on the main P.C. board. Sections 1 and 2 control whether the relays will be energized or de-energized during normal operation and sections 3 and 4 determine if they will be latching or non-latching. Switch settings are shown in the table below. To simplify the instructions the terms IN and OUT are used for the switch positions. These terms have reference to the top of each switch section when looking into the P.C. board from the right side. The sections of the switch are numbered 1 through 4 from left to right. “IN” is the top section of the switch depressed. “OUT” is accomplished by depressing the bottom of the switch to move the top of the switch “OUT”.

	SECTION	RELAY	SWITCH POSITION
DE-ENERGIZED	1	ALARM	IN
	2	WARN	IN

Table 3: De-Energized Switch Position

In this position, the relays will be de-energized during normal operation of the system with power applied.

	SECTION	RELAY	SWITCH POSITION
ENERGIZED	1	ALARM	OUT
	2	WARN	OUT

Table 4: Energized Switch Position

In this position, the relays will be energized during normal operation of the system with power applied and will drop out upon loss of primary system power.

	SECTION	RELAY	SWITCH POSITION
LATCHING	3	WARN	IN
	4	ALARM	IN

Table 5: Latching Switch Position

In this position, the relays will latch upon reaching an alarm condition and will require manual reset when the alarm condition is removed.

	SECTION	RELAY	SWITCH POSITION
NON-LATCHING	3	WARN	OUT
	4	ALARM	OUT

Table 6: Non-Latching Switch Position

In this position, the relays will automatically reset after an alarm condition when the gas concentration falls below the pre-set alarm set point.

3.10 Channel Select Switch Functions

As mentioned earlier, the DT210 will show the condition of all active channels. This is accomplished through use of the channel select switch (S3), as described in Section 3.2 and by watching the digital display reading for each channel. The following indications may be observed.

Condition	Observation
All channels operational and functioning normally.	During the cycle from channel to channel any gas concentration above 2ppm will be shown on the digital display.
One or more channels disabled; others functioning normally.	The LED channel number indicators associated with the disabled channels will not appear during the scan cycle and the digital display will function as above for all active channels.
One or more channels in malfunction; others functioning normally.	The digital display will show an “ER” for any channel in malfunction. All other indications will show the gas concentration (above 2ppm) for operating channels.
One or more channels in calibrate, others functioning normally.	The digital display will show a “CA” for any channel in calibration. All other indications will show the gas concentration (above 2ppm) for operating channels.

3.11 Other Diagnostic Information

Additional diagnostic capabilities have been incorporated into the DT210 that does not require the use of any of the switches. This information will be displayed by the front panel LED’s and the digital display when it occurs.

Condition	Observation
All active channels (those not disabled) in malfunction.	The digital display will show an “Er”. The MAL LED and associated channel number LEDs will flash. Numbers for the disabled channels will be missing.
All active channels (those not disabled) in calibrate.	The digital will show a “CA”. The CAL LED and associated channel number LEDs will be on steady. Numbers for the disabled channels will be missing.

If all active channels are in the CAL mode and a malfunction occurs on one channel, the MAL LED will begin to flash. The associated channel number LED will also change from steady to flashing and the malfunction circuit will actuate. The digital display however, will continue to display a “CA” until the calibration of the sensor is completed and it is returned to service. At this time the display will switch to read the gas concentration of that channel.

4.0 Operational Adjustments and Procedures

4.1 Initial Start-Up

Each Model DT210 is completely checked at the factory for proper operation. However a complete checkout is a necessity upon placing the system in operation, to assure system integrity. This includes: verify the digital indicator zero, checking and adjusting alarm set points, and performing a complete calibration procedure for each associated Model S4000T.

4.2 Model S4000T/DT210 Calibration

The DT210 provides an alternative method for returning a S4000T to operation without performing a calibration by reapplying the magnet screwdriver to the calibration switch as described in the S4000T instruction manual.

To assist in a situation where the wrong channel is inadvertently placed into calibration, momentary contact switch S4 at the rear of the P.C. board (Figure 1) may be pressed to cancel the calibration mode.

CAUTION: It should be remembered that removing the 24VDC power to a S4000T will automatically cause it to go into a time out mode for 6 seconds when power is restored. This will also be true for all other channels associated with this particular DT210, since actuation of switch S4 will remove power from all the model S4000T units.

During a normal calibration of a smart sensor the output current is held at a constant 1.5mA so that it is not necessary to inhibit the channel under calibration to prevent relay operation.

If other tests are to be conducted with gas applied to the smart sensor, the alarm circuits can be disabled to prevent activation of the relay contacts. To do so, rotate switch S5 (Figure 1) to the channel number (1 through 8) to be tested.

The red “AL” indication will appear on the front panel next to the digital display to remind the operator that a channel alarm has been inhibited.

Be sure to return the channel to operation when testing is complete.

4.3 Alarm Set Point Check

To check the alarm set points, depress the reset switch, S2 and hold it in to check the warn set point. Release and immediately depress S2 again and hold it in to check the alarm set point.

4.4 Sample Calibration Schedule

Establishing a periodic calibration schedule is critical to maintaining optimal product performance. Below is a sample schedule for the TS4000:

Detector Serial Number: _____ Location: _____

1) Installation and preliminary calibration. Record date after preliminary calibration is performed:
Date: _____

2) 24-hour calibration. Record date after 24-hour calibration is performed:
Date: _____

3) 7 day calibration check (Record date and reading of calibration check. Repeat after 7 days if reading deviates more than ±20%. Otherwise go to step 4).

Date	Reading	Date	Reading	Date	Reading
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

4) 14 day calibration check (Record date and reading of calibration check. Repeat after 14 days if reading deviates more than ±20%. Otherwise go to step 5).

Date	Reading	Date	Reading	Date	Reading
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

5) 30-day calibration check (Record date and reading of calibration check. Repeat after 30 days if reading deviates more than ±20%. Otherwise go to step 6).

Date	Reading	Date	Reading	Date	Reading
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

6) 60-day calibration check (Record date and reading of calibration check. Repeat after 60 days if reading deviates more than ±20%. Otherwise go to step 7).

Date	Reading	Date	Reading	Date	Reading
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

7) 90-day calibration check:

Date	Reading	Date	Reading	Date	Reading
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

5.0 System Problems and Troubleshooting

5.1 Maintenance

Once installed, the S4000T/DT210 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 log book be kept showing calibration dates and dates of sensor replacement.

5.2 Troubleshooting Table

The information presented in the following table is designed to correct the more common problems which appear during system startup and operations. 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 module be returned to the factory for repair.

Problem	Possible Cause	Corrective Action
1. ppm display does not turn on after application of DC power.	• No input power. • 3 amp DC fuse (F1) is defective • Input power leads reversed	• Insure proper power supply to controller • Replace F1 • Verify connections to +24VDC-IN and 24V COM IN are correct
2. The MAL LED is flashing	The S4000T is in malfunction mode	Check the S4000T unit for proper operation
3. The MAL LED is on steady but appears to be dim	Low input voltage	Insure proper voltage (22-30 VDC) to the Readout/Relay Module
4. The MAL LED is flashing alternately bright and dim.	• 3 amp DC fuse (F1) is defective • Input power leads reversed	Check for proper operation of S4000T and insure proper voltage to the DT210
5. Warn and/or Alarm LEDS do not turn on when ppm readout exceeds set point.	Alarm set points not properly adjusted	Perform alarm and warn alarm set point adjustment

Table 7: Troubleshooting Table

This section is intended to be a guide in correcting problems which may arise in the field. This section is not all-inclusive, and General Monitors should be contacted for assistance if the corrective actions listed do not eliminate the problem. 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.

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

6.0 Customer Support

6.1 General Monitors' Offices

Area	Phone/Fax/Email
UNITED STATES	
	Toll Free: +1-800-446-4872
Corporate Office: 26776 Simpatica Circle Lake Forest, CA 92630	Phone: +1-949-581-4464 Fax: +1-949-581-1151 Email: info@generalmonitors.com
9776 Whithorn Drive Houston, TX 77095	Phone: +1-281-855-6000 Fax: +1-281-855-3290 Email: gmhou@generalmonitors.com
UNITED KINGDOM	
Heather Close Lyme Green Business Park Macclesfield, Cheshire, United Kingdom, SK11 0LR	Phone: +44-1625-619-583 Fax: +44-1625-619-098 Email: info@generalmonitors.co.uk
IRELAND	
Ballybrit Business Park Galway, Republic of Ireland	Phone: +353-91-751175 Fax: +353-91-751317 Email: info@gmil.ie
SINGAPORE	
No. 2 Kallang Pudding Rd. #09-16 Mactech Building Singapore 349307	Phone: +65-6-748-3488 Fax: +65-6-748-1911 Email: genmon@gmpacifica.com.sg
MIDDLE EAST	
LOB12, #G20 P.O. Box 61209 Jebel Ali, Dubai United Arab Emirates	Phone: +971-4-8815751 Fax: +971-4-8817927 Email: gmme@emirates.net.ae

Table 8: GM Locations

7.0 Specifications

7.1 Mechanical Specifications

Dimension:	53mm x 175mm x 294mm (Approx. 2.1" x 6.9" H x 11.5"D)
Weight:	1.8kg (Approx. 3.8 lbs)

7.2 Environmental Specifications

Temperature Range:	O°C to 60°C (32°F to 140°F)
Storage Temperature:	-28°F to +130°F
Humidity:	15 to 95% Non-condensing

7.3 Electrical Specifications

Electrical Clarification:	General purpose for mounting in a non-hazardous area
Power:	22-30 VDC, 8 Watts DT210 plus 6 watts for each Model S4000T
Channel Input Resistance:	125 ohms maximum
Input:	0-20mA from the S4000T Smart Sensor
Output Power to the Smart Sensor:	24 VDC nominal at 0.25 AMP to the S4000T

7.4 System Specifications

Display Range:	0 to 99ppm, Flashing '99' for Over-range Indication for 0-100ppm range. Flashing "50" for 0-50ppm range and flashing "20" For 0-20ppm range.
Mounting Configurations:	Rack. Panel, Wall, Weatherproof Enclosure
Accuracy:	+2ppm or +10% of applied gas, whichever is greater
Warranty:	Two Years
Approvals	CSA and FM
Status Indicators:	Alarm, Warming, Malfunction, Calibrate, Peak Channel, Reset, AL
Channel Indicators	1 through 8 associated with status indicators ALARM, WARN. MAL. CAL, PEAK CH
Front Panel Switches:	Channel Select, Reset

Alarm and Warn LED Test:	Incorporated with reset switch (hold for over one second)
Alarm Disable:	9 position rotary switch
ALARM setting:	16 position rotary switch (5ppm steps between 10 and 85ppm for 0-100ppm range) (2ppm steps between 10 and 40ppm for 0-50ppm range) (1ppm steps between 3 and 18ppm for 0-20 range)
Warning Setting:	16 position rotary switch (5ppm steps between 10 and 85ppm for 0-100ppm range) (2ppm steps between 10 and 40ppm for 0-50ppm range) (1ppm steps between 3 and 18ppm for 0-20ppm range)
Energized-De-energized Option:	Alarm and Warn set by Dip Switch
Latching-Non Latching Option:	Alarm and Warn set by Dip Switch
Channel enable:	Set by DIP Switch for each channel
Voting	Jumper selectable – one or two channels alarm only
Calibration Reset:	One momentary pushbutton switch PC board mounted
Outputs:	Open collector: one alarm per channel, one warning per channel, one malfunction per channel Relay: Alarm – DPDT contacts at 4 AMP 117 VAC resistive Warning – DPDT contacts at 4 AMP 117 VAC resistive Malfunction – SPDT contacts at 4 AMP 117 VAC resistive
Remote Reset:	Yes

7.5 Cable Requirements

3 wire shielded maximum cable length allowable between display module and sensor assembly with one way resistance of 4 ohms (total 8 ohm loop)

AWG	METERS	FEET
18	150	500
16	300	1000
14	700	1500

Table 9: Cable Lengths

7.6 Recommended Spare Parts

One Model DT210 for up to two years of operation

DESCRIPTION	PART NUMBER	QTY
Fuse, 3 amp, 250 VAC, Slo-Blo	951-208	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

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