

**GENERAL MONITORS**

**MODEL ST200**

**Smart Sensor  
Hydrogen Sulfide Gas**

**1289**

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## **GENERAL MONITORS**

The information and technical data disclosed by this document may be used and disseminated only for the purposes and to the extent specifically authorized by General Monitors in writing. Such information and technical data are proprietary to General Monitors and may not be used or disseminated except as provided in the foregoing sentence.

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### **WARNING**

The Model ST200 contains components which can be damaged by static electricity. Special care should be taken when wiring the system to ensure that only the connection points are touched.



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## GENERAL MONITORS

### MODEL ST200

### HYDROGEN SULFIDE SMART SENSOR

#### I. INTRODUCTION

##### A. NOTICE

All information contained in this instruction manual may be used only to install and operate the Model ST200 System provided by GENERAL MONITORS, INC. (GMI). The sale of the instrument does not license the user to reproduce GMI drawings, or to utilize any information in this manual without prior written permission.

The Model ST200 System is easy to install and operate. However, this manual should be read in full, and the information contained herein understood, before attempting to place the system in service.

##### B. GENERAL

The General Monitors' Model ST200 is a microprocessor based hydrogen sulfide sensor which has all of its electronics located in the sensor housing. Sensor data and status information may be transmitted up to 3,000 meters (9,000 feet) using a 4-20 milliamp signal. The unit will indicate a malfunction (zero output signal) if the black or white heater leads are open or if the DC power to the unit is below a lower limit. This malfunction status is also indicated at the sensor by means of blinking daylight type LED which is an integral part of the CALIBRATE switch.

During the calibration procedure, the output signal is set to 1.5mA and remains there until the calibration gas is removed and the sensor detects less than a 10 percent full scale concentration. There are no potentiometers to adjust either in the field or at the factory. If the "zero" and "span" parameters are not within prescribed limits, the unit will revert to the malfunction mode until there is a proper calibration.

The unit operates from an unregulated 24 VDC supply which may be located up to 500 meters (1500 feet) from the sensor electronics. The 4-20 milliamp signal output may be applied directly to one of the General Monitors' Smart Sensor readout/relay modules; or it may be fed to industrial analog to digital converters for use in multipoint computer based monitoring systems.

Note: Factory Mutual approval covers systems that use only General Monitors "FM Approved" sensor assemblies and readout/relay modules.

##### C. SENSOR OPERATING PRINCIPLE

GMI's sensor is a solid state, continuous, diffusion type element. The sensor utilizes hydrogen sulfide's ability to strongly and significantly adsorb onto certain materials as the basis for the measurement. Specifically,  $H_2S$  will adsorb onto many different metals (as will many other materials, includ-

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### C. SENSOR OPERATING PRINCIPLE (cont'd)

ing numerous hydrocarbons, sulphur dioxide and other sulphur compounds). GMI has developed a proprietary metal oxide semiconductor which is extremely selective in "permitting"  $H_2S$  to adsorb onto it. That is, very few other compounds found in practical applications will affect this metal oxide. The semiconductor material is therefore, for all practical purposes, specific to  $H_2S$ .

The semiconductor is located in the system circuit, acting as a resistor. When air which contains  $H_2S$  diffuses into the sensor through the outer flame arrestor, the adsorption of the  $H_2S$  onto the semiconductor causes its electrical resistance to decrease. The sensor is temperature controlled to prevent adsorption rate variations from ambient temperature changes. The decrease in resistance is extremely repeatable over a range of 0 to 100 ppm  $H_2S$ , thus the change produces an analog signal approximately proportional to the logarithm of the  $H_2S$  concentration. This signal is amplified and converted to a digital signal which is processed by the microcomputer. The output is a 4-20 milliamperes current linearly proportional to the  $H_2S$  gas concentration. The adsorption process is reversible, so that when air containing no  $H_2S$  subsequently diffuses into the sensor, the  $H_2S$  gas desorbs. The semiconductor then resumes its original "clean air" resistance value.



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### II. SYSTEM COMPONENTS

#### A. SENSOR ASSEMBLY

Several types of sensors are available to monitor 0-20ppm, 0-50ppm or 0-100 ppm H<sub>2</sub>S. The proper sensor will have been provided with the system if GMI was made aware of the gas concentration to monitor.

The SENSOR ASSEMBLY (See Figure 1) consists of the sensor plus sensor housing. The sensor assembly is designed for NEC Class I, Division 1, Group B, C and D hazardous areas.

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### III. INSTALLATION INSTRUCTIONS

To make the input and output connections to the Model ST200, remove the four (4) bolts holding the cover and remove the cover to gain access to the terminals.

#### PARTICULAR CARE SHOULD BE TAKEN TO AVOID CONTACT WITH CIRCUIT BOARD COMPARTMENTS

##### A. POWER CONNECTIONS

The system operates on nominal power of 24 Volts DC. Power must remain disconnected until all other wiring connections are made. (NOTE: To eliminate accidental system shutdown, GMI does not provide a power on-off switch.) Use any 24VDC nominal supply with a minimum rating of 0.25 amperes. Adequate wire size should be used to prevent excessive voltage drop, and the run should be less than 2100 feet. The total loop resistance must be 10 ohms or less. Connect the positive supply lead to +24VDC RED (TB1-7) and the negative supply lead to COM-BLK (TB1-6) on the terminal block TB1 inside the sensor housing (see figure 1). This information is also contained on an information plate on the inside of the housing cover.

##### B. SENSOR OUTPUT CURRENT CONNECTION (SEE FIG. 1)

To connect the 4-20mA output signal, connect the positive lead to the terminal labeled CURRENT OUT and the negative lead to the terminal labeled COM on TB1 inside the sensor housing.

##### C. CHOOSING SENSOR LOCATIONS

There are no hard and fast rules governing the selection of optimum sensor locations. The customer must evaluate conditions at his own facility to make this determination. The following are the major factors to be considered.

###### 1. LIKELY SOURCES OF ESCAPING H<sub>2</sub>S

In general at least one sensor should be located in close proximity to each point where H<sub>2</sub>S is most likely to escape into the air. Consideration should also be given to placing sensors at locations where the H<sub>2</sub>S may be carried by local air currents, ventilation equipment, etc.

###### 2. ENVIRONMENTAL FACTORS

Avoid installing sensors where they will be unnecessarily exposed to wind, dust, water, shock, or vibration. Observe the temperature range limitations of sensors, covered in the Specification section of this manual.

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### C. CHOOSING SENSOR LOCATIONS (Cont'd)

#### 3. "POISONS" and "CONTAMINANTS"

Sensors may be adversely affected by prolonged exposure to certain materials. Loss of sensitivity or corrosion may be gradual if such materials are present in low concentrations, or it may be rapid at high concentrations. The more important materials adversely affecting sensors are:

- Halides (compounds containing chlorine, fluorine, bromine, or iodine).
- Silicones (often contained in greases and aerosols). Silicones do not chemically attack the sensor, they instead coat it and therefore reduce or stop its response to  $H_2S$ .
- Acid vapors.
- Caustic liquids or vapors.

The presence of such materials in an area does not necessarily preclude the use of a metal oxide semiconductor sensor. The feasibility of using a sensor in such areas must be determined by an analysis of the specific factors in each application. However, sensors used in such areas usually require calibration checks on a more frequent basis than normal, and typically have a shorter life than normal. In many such applications the normal two year warranty would not apply.

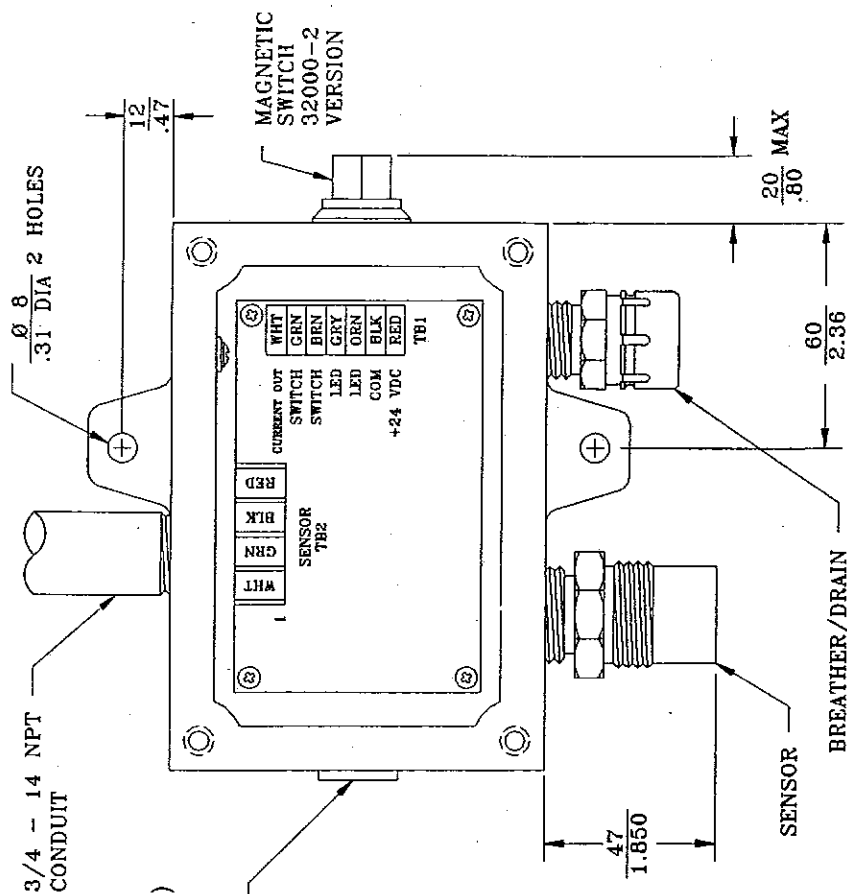
### D. MODEL ST200 INSTALLATION

#### CAUTION - VERY IMPORTANT

You will note that each sensor is shipped from the factory with a red plastic cap fitted over the sensing head. Inside the cap is a desiccant. DO NOT remove this cap until you are ready to power the system. SAVE the cap and RECAP the sensor at any time in the future when the system's power is off for an extended period of time. The desiccant pack may be discarded.

#### CAUTION

GMI discourages the painting of sensor assemblies. If the sensor head is painted over, gas will not be able to diffuse into the sensor.

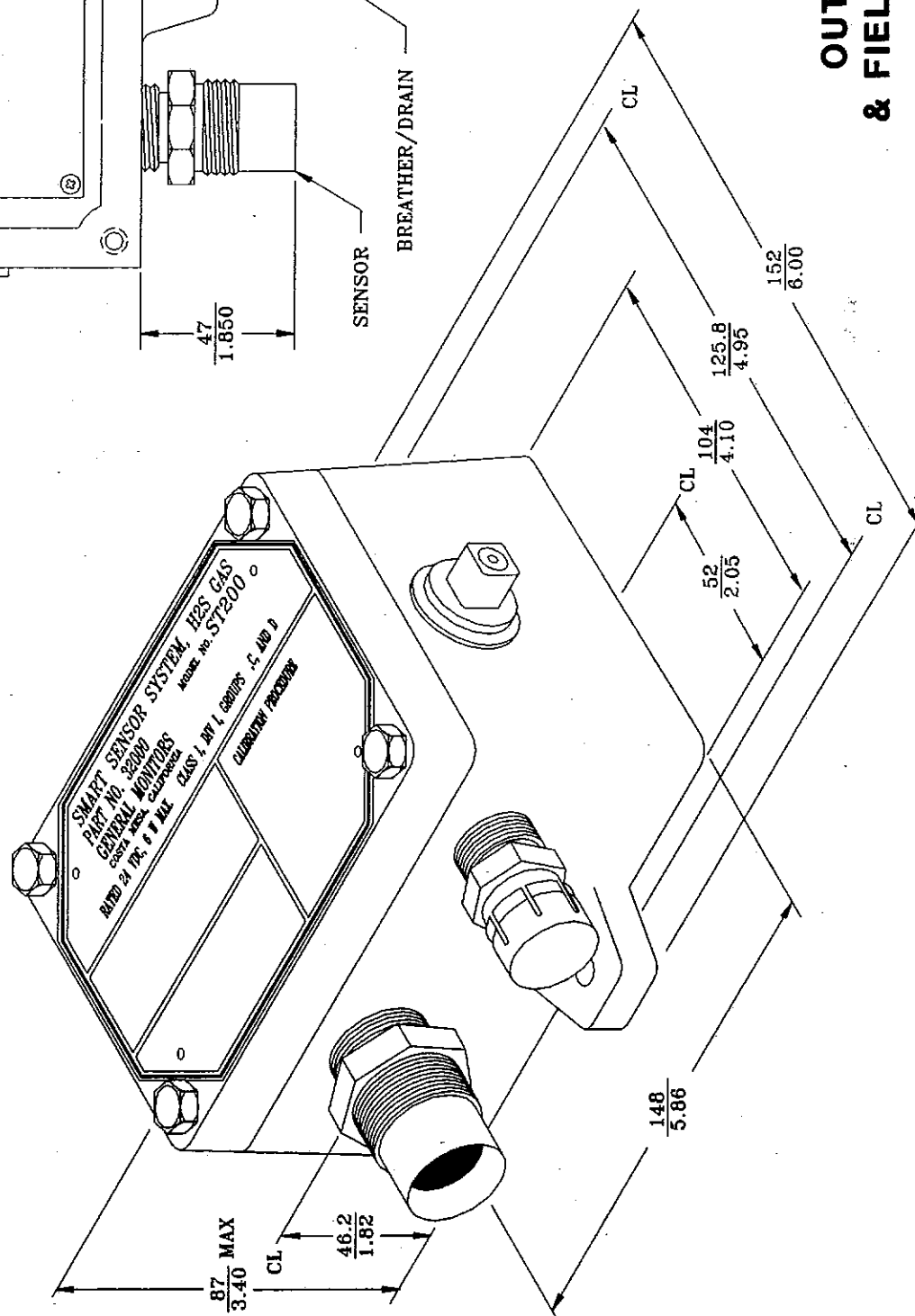


FRONT VIEW

(COVER REMOVED FOR CLARITY)

SPARE ENTRY -  
3/4 - 14 NPT

**DIMENSIONS**



**FIG. 1**

# OUTLINE DRAWING & FIELD TERMINATIONS

(REF 32001E)

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### D. MODEL ST200 INSTALLATION (Cont'd)

Various types (P/N's) of sensors can be provided with the Model ST200. However, the installation method is identical in most cases.

The Model ST200, installation as shown in Figure 1, consists of a sensor plus GMI P/N 10280 sensor housing. This assembly is designed for use in NEC Class I, Division 1, Groups B, C, and D hazardous areas.

#### CAUTION

Sensors should always be mounted pointing downward so that water will not accumulate on the sensor head. Mounting should be as free from shock and vibration as possible, and should be convenient for calibration checks in place. The sensor housing must never be opened when power is on, otherwise the explosion-proof integrity of the Model ST200 is violated. The four bolts on the housing lid of the ST200 must be fully engaged.

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### IV. START-UP AND OPERATION

#### A. INITIAL APPLICATION OF POWER

Before applying power for the first time double-check all wiring components, and ensure the ST200 has been on power for at least 24 hours to let the sensor stabilize before it is calibrated.

#### B. CALIBRATION

Calibration to customer specified gas concentration is initially done at the factory. We recommend that the Model ST200 system be re-calibrated upon start-up, and that calibration be checked at least every 90 days thereafter.

This statement is not intended to discourage the customer from checking calibration more frequently. Local environmental problems (such as mud collecting on the sensor head, or sensors accidentally being painted over) are distinct possibilities in many applications. By recommending "frequent" calibration checks, GMI is not implying that the customer should expect problems with sensor life or stability. The opposite is true. In fact, our typical sensor life and stability are probably unmatched by competitive H<sub>2</sub>S sensors. "Frequent" calibration checks merely assure the integrity of this life-protecting equipment.

A sample calibration schedule and checklist have been provided in the appendix of the manual. Please refer to it in establishing the required calibration program.

The calibration procedure is as follows:

1. Be sure the Model ST200 has been in operation for 24 hours prior to calibration to assure stability.
2. Before actuating the CALIBRATION switch, ensure that the sensor is in clean air. If the atmosphere at the sensor contains a low background of H<sub>2</sub>S, observe the following procedure:
  - a) Obtain a GMI field calibrator plastic bottle (P/N 50020). Assure that it contains no H<sub>2</sub>S by flushing it with clean air. Place your hand or a cover over the bottle's open end and take it to the sensor.
  - b) Place bottle over the sensor.
  - c) Wait a few minutes for the sensor to become permeated with clean air.
  - d) Actuate the CALIBRATION switch for at least 3 seconds. The LED in the center of the switch will come on steady. The Model ST200 has been supplied with two types of calibration switches. The older type is a pushbutton which must be depressed and held for at least 3 seconds to put the Smart Sensor into the calibrate mode. The latest type is a magnetic switch which requires the application of a magnetic actuator to the end of the switch for at least 3 seconds. Actuation of the switch will cause the LED inside the switch to turn on.

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B. CALIBRATION (Cont'd)

If it is desired to return the Model ST200 to normal operation without performing a calibration, and it has been in the calibration mode for at least 90 seconds, reapply the magnetic end of the screwdriver to the CALIBRATION switch.

NOTE:

The following may apply when a sensor is replaced. If the clean air baseline value of the sensor being calibrated is substantially different from the value of the previous sensor, the pushbutton will have to be held in for a longer period of time before the ST200 will go into the calibration mode. This time may be as long as 10 to 15 seconds.

3. Select two calibration ampoules, one that represents 20% of the full scale of the sensor and the other that represents 50% of the full scale value. Check date code on the ampoules. Ampoules may start to lose concentration after a specified period. The ampoule label will state: "EXP (date \_\_\_\_\_)". Please adhere to this cut-off date. Place the ampoules in their corresponding holders inside a field calibration plastic bottle (GMI P/N 50020). Place the bottle over the sensor and make sure there is a tight seal. Crush the 20% full scale ampoule by turning the associated screw assembly, which serves as a vise. After a period of approximately 5 minutes the LED will blink slowly indicating that the 20% calibration has been stored. Without removing the calibration bottle from the sensor, immediately crush the 50% full scale ampoule. The LED will return to a steady indication. After an additional time of approximately 5 minutes, the LED will again blink slowly indicating that the calibration level has again been stored. Remove the calibration bottle and when the gas concentration level falls below 10% of the full scale value, the LED will go out. The output current will then respond proportionally to the gas concentration. If the calibration parameters were not within proper limits, the unit will go into the malfunction mode, indicated by a rapid blinking of the LED. Then the calibration procedure must be repeated from the beginning.

NOTE: If a true malfunction occurs while in the CALIBrate mode, the ST200 will shift to the MALFunction mode until the cause of the malfunction is corrected.

After each use of the field calibrator plastic bottle, it is necessary to clear the bottle of residual H<sub>2</sub>S gas. This may be done by flushing the plastic bottle with clean air or by human breath.

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### V. SYSTEM PROBLEMS AND TROUBLE-SHOOTING

#### A. GENERAL

It is highly recommended that a spare sensor be on hand at all times. GMI sensors are the most reliable, longest life hydrogen sulfide sensors available. Sensor failure tends to be one of the potential causes of real downtime. A full complement of other GMI recommended spare parts should also be on hand. It is recommended that defective ST200 systems be returned to the factory for repair even if the warranty has expired.

#### B. TROUBLE-SHOOTING TABLE

As with all General Monitors' products, the Model ST 200 has been designed to provide many years of trouble free operation, as evidenced by its two year warranty. However, the system has not been designed to permit repairs to be made to the printed circuit boards. If the various actions suggested in the Troubleshooting 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 checkout.

As an additional aid in locating the source of trouble in a Model ST200, the system has been designed to provide diagnostic flashing of the LED to indicate several abnormal conditions in addition to the normal operation and calibration sequences already described. Refer to (Fig. 6) for the identification of the malfunction LED flashing sequence.

#### C. MAINTENANCE

Once installed, the Model ST200 system requires little or no routine maintenance other than periodic calibration checks. GMI recommends that calibration schedule be established and adhered to. GMI also recommends that a log book 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 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 increase response due to removal of dirt, etc.

After the warranty period has expired, or if it is not possible to return the ST200 to the factory, replacement sets of printed circuit boards may be ordered and replaced in the field.

#### CAUTION

Again observe caution not to touch components on the printed circuit boards to prevent possible static electricity from damaging the unit.



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### V. MODEL ST200 TROUBLE-SHOOTING

#### INTRODUCTION

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.

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

<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>	<u>CORRECTIVE ACTION</u>
No output signal and LED is off.	No DC power to the unit.	Be sure the +24VDC is applied with the correct polarity.
No output signal, LED blinking rapidly with an even duty cycle.	Improper calibration.	Re-calibrate the unit.
	Sensor out of tolerance.	Replace the sensor and re-calibrate
No output signal LED blinking rapidly with the LED mostly on.	The internal heater to the H <sub>2</sub> S sensor is not working.	1. Check that white & black sensor leads are connected properly.  2. Replace sensor.
No output signal, LED blinking rapidly with the LED mostly off.	Low DC input voltage at the sensor electronics.	Be sure DC supply is operating properly and the current carrying capacity and supply wiring are adequate.
4ma output signal - normal (READY) can't enter CAL mode when actuating CAL switch for 1 minute.	Switch contacts bad.	Replace switch.

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### C. MAINTENANCE (Cont'd)

The two circuit boards should only be replaced as a set and should not be separated from each other except under static free laboratory conditions. General Monitors strongly recommends that this set of boards be returned to the factory where they will be checked out and the faulty board replaced.

The following steps should be used when replacing the set of printed circuit boards:

1. Transport and keep the replacement set of boards in their static proof plastic bags until ready to install.
2. Area must be declassified before removing the sensor housing cover.
3. Remove power from the sensor preferably at a central distribution station or if powered from a Model DT200 or DT230 from terminals "DC OUT" and "DC-COM" on the rear of the DT200 or DT230.
4. Remove the four (4) bolts holding the sensor cover and remove the cover.
5. Remove the four (4) sensor leads from terminal block TB2.
6. Remove all leads from terminal block TB1.
7. Remove the four (4) phillips head screws in each of the four corners of the P.C. board assembly and carefully remove the set of boards.
8. Replace with the new set of boards from the static proof plastic bag and place the old set in the bag for protection.
9. To re-assemble, reverse steps 3 through 7.

#### Sensor replacement

When a sensor requires replacement, steps 2,3,4 & 5 above should be followed. The old sensor should be removed from the sensor housing and new one installed in its place.

DO NOT USE A WRENCH TO INSTALL NEW SENSOR. INSTALL ONLY HAND TIGHT.

Observe the proper color designations in re-connecting the new sensor leads and tighten the terminal screws securely to ensure proper operation.

#### Switch replacement

Replacing the calibration switch follows a similar sequence as the sensor. Follow steps 2,3 & 4 above. Then remove the four (4) leads on TB1 identified as "SWITCH GRN", "SWITCH BRN", "LED GRY" and "LED ORG". Remove the switch and install the replacement. Again it is only necessary to install the switch HAND TIGHT.

Ensure the new switch leads are securely held in their terminal block before replacing sensor housing cover.

## GENERAL MONITORS

### VI. SPECIAL WARNING

Through engineering design testing, manufacturing techniques, and rigid quality control, General Monitors supplies the finest gas detection systems available. The user must recognize his responsibility for maintaining the gas detection system in operational condition.

- (1) GENERAL MONITORS recommends a calibration check on a regular schedule. The calibration check should be conducted at least every ninety (90) days. This is the only method of insuring proper system operation and response to combustible gases. More frequent calibration checks are encouraged to spot problems such as mud collecting on the sensor heads, accidental painting over of sensors, etc. A calibration check is defined as the procedure of applying a known concentration of gas to the system sensors while observing the display unit or output signal level. The visual display will indicate the gas concentration, and alarm indicators/circuits will activate in direct relationship to gas concentration.
- (2) GENERAL MONITORS cautions, as with all equipment of this type, that high levels or long exposure to certain atmospheres will "poison" the sensor and eventually affect sensitivity. See Section III C. (3) for specific information. Use in such atmospheres requires calibration checks on a more frequent schedule than normal. General Monitors should be consulted for application feasibility determination before installing a system in such atmospheres.
- (3) GENERAL MONITORS' sensors and sensor housings are designed and tested for use in certain classes of hazardous atmospheres. Explosion-proof integrity cannot be maintained if sensors and sensor housings are operated in other than the "as designed" condition. Terminal access covers of sensor housings must be on. Sensor housing must be installed in accordance with National Electrical Code acceptable practices for the class of hazardous atmosphere.
- (4) Sensors are designed with sintered metal or screen covers which act as flame arrestors. Do not operate sensors without screen or sintered metal parts in place.
- (5) GENERAL MONITORS' gas detection systems are primarily SAFETY devices for the protection of personnel and facilities, and must be "always ready". With proper installation, calibration and maintenance, the system will provide continuous monitoring of hazardous areas. The user must assume all liability for misuse of GENERAL MONITORS' gas detection systems.
- (6) The system's full two year warranty will be voided if customer personnel or third parties damage the system during repair attempts.

**GENERAL MONITORS****VII. WARRANTY**

GMI warrants all of its products to be free from defects in workmanship or material under normal use and service within two (2) years (Hydrocarbon, H<sub>2</sub>S and CO gas) and (1) year (Flame Detection) from date of shipment. CO sensors carry a six-month warranty. GMI will repair or replace without charge, any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by GMI personnel. Gas detection elements which have been poisoned by contaminants are not included in this warranty. In all cases this warranty is limited to the cost of the equipment. All warranties hereunder 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 GMI 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. GMI's responsibility under the above warranty shall be limited to the repair or replacement at GMI's option at no cost to the purchaser for parts or labor, of any component which fails during the warranty period provided that the purchaser has promptly reported such failure to GMI in writing and GMI, upon inspection, found such component to be defective. The purchaser must obtain shipping instructions for the return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

EXCEPT FOR THE EXPRESS WARRANTY STATED ABOVE, GMI DISCLAIMS ALL WARRANTIES WITH REGARD TO THE PRODUCTS SOLD HEREUNDER 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 GMI FOR DAMAGES INCLUDING, BUT NOT LIMITED TO, CONSEQUENTIAL DAMAGES ARISING OUT OF/OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT.

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VIII. SPECIFICATIONSSystem Specifications

Sensor Type: Continuous, diffusion, adsorption type.

Specificity: H<sub>2</sub>S specific.

Warranty: Two years

Built to conform to the requirements of: CSA ) where applicable  
FM )  
ISA SP12.15 Pt. I ISA Performance Standards for  
H<sub>2</sub>S Detection Instruments

Measuring Range: 0-20 ppm or 0-50 ppm or 0-100 ppm

Accuracy:  $\pm 2$ ppm or  $\pm 10\%$  of applied gas, whichever is greater.

Temperature Variation:  $\pm 4$  ppm or 10% of applied gas, whichever is greater  
over -10°C to +50°C temperature range

Long Term Stability:  $\pm 4$  ppm or 10% of applied gas, whichever is greater  
over a 21 day time period

Response Time: Wire screen flame arrestor version:  
  
T50  $\leq$  1 min of full scale with full scale  
concentration applied  
  
Sintered stainless steel arrestor version:  
  
T50  $\leq$  2 min of full scale with full scale  
concentration applied.

Humidity Variation:  $\pm 4$  ppm or 10% of applied gas, whichever is greater  
over 15 to 90% RH at ambient temperature

Environmental Specifications

Operating Temperature: -40°C to +75°C (-40°F to +167°F)

Humidity Range: 0-99% RH (non-condensing)

Storage Temperature: -55°C to 85°C

**GENERAL MONITORS**Electrical Specifications

Supply Voltage: 22-30 VDC

Power Consumption: 24VDC nominal, 0.25 amp. maximum

Analog Output: 0-22 mA (4-20 ma FSD)

Analog Output Load: 4 to 20 mA for 0 to 100% Full scale. 0 mA for malfunction operating into 300 ohms maximum, 1.5 mA for calibration (0 mA optional).

LED Status Indicator: On steady during calibration mode.  
Blinking rapidly for a malfunction.  
Blinking slowly during time-out and when calibration is complete and accepted by the sensor electronics.

Malfunctions monitored: Low supply voltage.  
Open sensor lead.  
Sensor out of range.

Lead Length: Output Signal:  
9000 feet (3000 meters) maximum  
Total Loop Resistance - 300 ohms

Remote Power Supply:  
1500 feet (500 meters) maximum  
10 ohm loop resistance using 16 AWG cable and 24VDC minimum.

Electrical Classification: Class I, Division 1, Groups B, C and D.

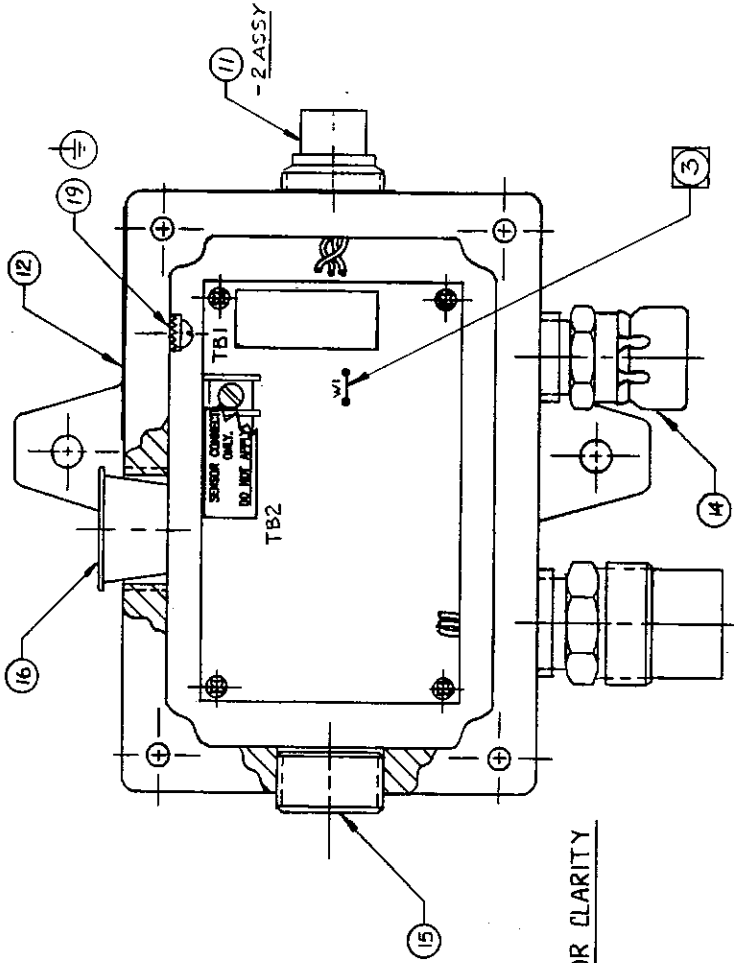
Mechanical Specifications

Dimensions: 150 mm (6 inches) long  
100 mm (4 inches) high  
75 mm (3 inches) deep

Weight: Approximately 4.5lb (2.1 kg)

IX. RECOMMENDED SPARE PARTSOne Model ST200For up to Two Years Operation

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>QTY.</u>
1.	Switch, calibration	30021-1	1
2.	Sensor	per original order	1

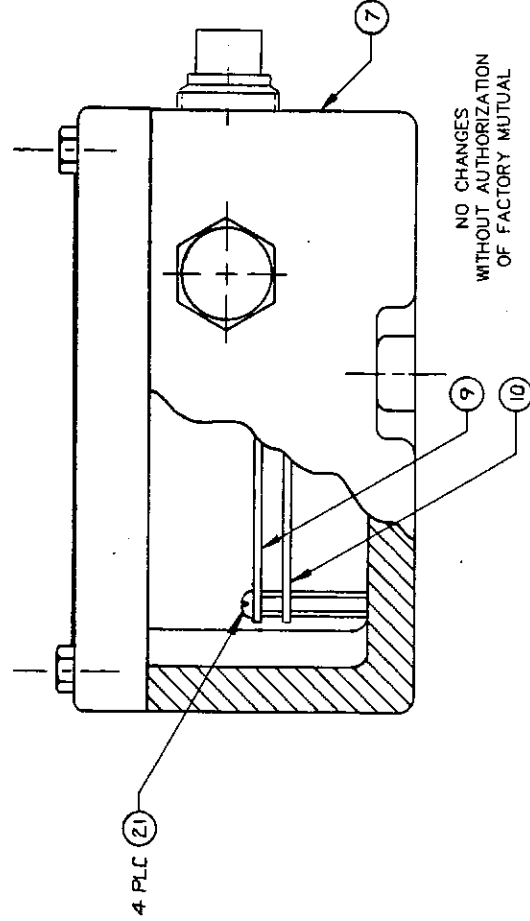


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PART NUMBER	QTY	REF PART NUMBER	DESCRIPTION	ITEM REFERENCE DESIGNATOR
014-060	1	PDB-1	BREATHING/DEATH EXPL. PROOF	14
014-065	1	CUP-2	PLUS 3/4" IN CLOSE UP	15
028-315	1	3040	SCREW GULLOCHING M6-32 X 3/8	19
32021-1	1		SWITCH CALIBRATION ASSY	11
9487	1		CAPLUG TAPERED 3/4" 12-K	16
9053	4		SCW 6-3209/16 PHIL PH NO 55T	21
32014-1	1		LABEL LED FLASHING SEQUENCE	17
32002	INFO		SCHEMATIC DIAGRAM	
32001	INFO		OUTLINE DIM & FIELD TERM SHRT 2KSR	7
10280-2	1		ENCLOSURE ASSY EXPL H2S	9
32005-1	1		CCA CONTROL ELECTRONICS ST200P	10
32008-1	1		CCA CONVERTER ELECTRONICS ST200P	

NO CHANGES WITHOUT AUTHORIZATION OF FACTORY MUTUAL

(32000-2 G)



FINAL ASSEMBLY - H2S GAS  
MODEL ST200

FIG.2

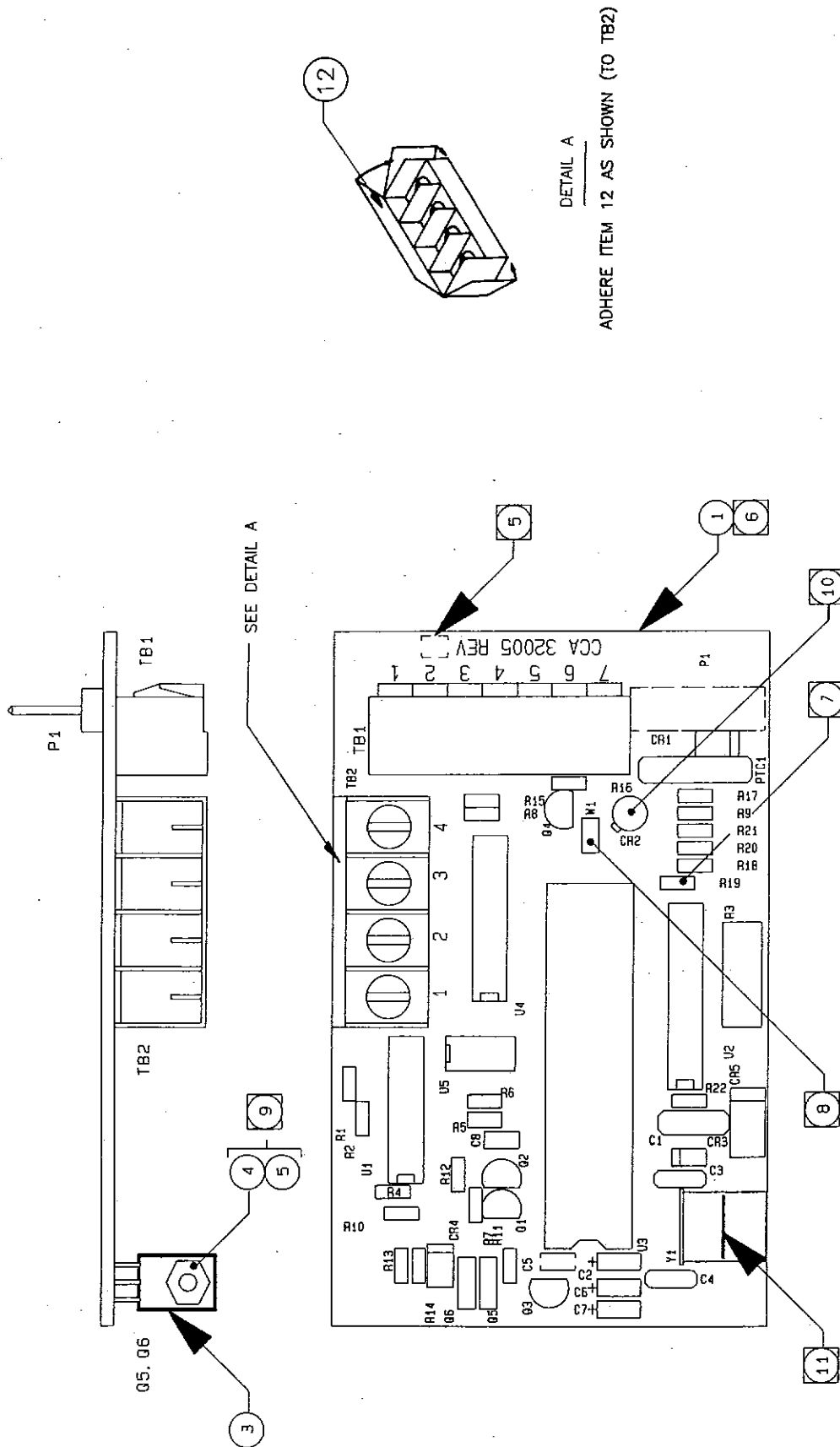
(REF 32000-2G)

# CCA, CONTROL ELECTRONICS MODEL ST200

NO CHANGES  
WITHOUT AUTHORIZATION  
OF FACTORY MUTUAL

FIG.3 SHT 1

(REF 32005F)





# CCA, CONTROL ELECTRONICS MODEL ST200

FIG.3 SHT2

PART NUMBER	QTY	DESCRIPTION	ITEM	REFERENCE DESIGNATOR	PART NUMBER	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
32005	INFO	CCA CONTROL ELECTRONICS DUB			948-250	1	MPS145	TRANS MPS145 SIL 1W 40V NPN		Q3
32002	INFO	SCHEMATIC DIAGRAM			947-315	1		RES 2.21K 1% RN55D METAL FILM		R16
32006-1	1	CCD CONTROL ELECTRONICS ST200XP	1		947-323	1	20900	RES 20K 1% RN55D METAL FILM		R6
915-027	1	CAP 150PF 100V DIPPED MICA	C1		947-329	2		RES 4.75K 1% RN55D METAL FILM		R7,10
915-026	2	CAP 20PF 100V DIPPED MICA	C3,4		947-369	3		RES 47.5K 1% RN55D METAL FILM		R8,9,11
915-129	3	CAP 22UF 6V TANT	C2,6,7		948-245	3	MPS 8099	TRANS MPS 8099 NPN		Q1,2,4
915-033	1	CAP .1UF 50V CER	C5		921-362	1	A102204NL	TERM BLOCK 4 POS .325 CTR PC MT		T82
915-040	1	CAP 150PF 100V CER	C8		921-373	1	1790364	TERM BLOCK SIL POS END PC MT		T81A
923-001	1	CRYSTAL 3.000MHZ TE	Y1		921-372	6	1790319	TERM BLOCK SINGLE POS PC MT		T81B
948-102	2	DIODE 1N4002 100V 1A	CR1,4		921-723	1	09-80-1053	CONN 5 POS .156 SD WAFER GLD PLT		P1
948-040	1	DIODE 200V 3.9V 5.0A	CR5		30015-1	2	2N5194	TRANSISTOR MATCHING PROCEDURE		8 Q5,6
948-104	1	DIODE 1N4148 SIGNAL	CR3		10284-8	1		MICROCOMPUTER PROGRAMMED ST200		U3
948-043	1	DIODE REF VOLTAGE 2.5V	CR2		947-618	1		RES 402 OHM 1% RN55D METAL FILM		R13
931-500	1	IC ANA MUX/DEMUX DIFF 4 CHANNEL	U1		947-308	1		RES 10.7K 1% RN55D METAL FILM		R1
931-438	1	IC 8 BIT MICROPRO A/D CONVERTER	U2		932-002	AR	5780	COATING CONFORMAL		
931-384	1	IC RAM NONVOLATILE STATIC 64 X 4 5V	U4		948-503	1	75K .1% RN55D MET FILM	RES 75K .1% RN55D MET FILM		R4
931-390	1	IC OP AMP 8 PIN MINI DIP	U5		948-504	1	150K 1%	RES 150K .1% RN55D MET FILM		R5
947-328	1	RES 1K 1% RN55D METAL FILM	R2		0C-SELECT	1		0C SELECT PROCEDURE		R19
947-224	1	RES 22 OHM 1.5W 5% CARBON	R3		931-001	1	7403-09-FR50	INSULATOR SIL-PAD		3
947-314	2	RES 49.9 OHM 1% RN55D METAL FILM	R15,17		12517	1		MUT M3X0.5 NYLON HEX		4
947-301	1	RES 10K 1% RN55D METAL FILM	R22		12515	1		SCR M3X0.5X8 SLOT PAN HD NYL		5
947-393	5	RES 200 OHMS 1% RN55D	R12,14,18,20,21		32016-1	1		LABEL, SENSOR WARNING		12
947-700	1	RES 40A 50V PTC DEVICE	PTC1							

NO CHANGES WITHOUT AUTHORIZATION OF FACTORY MUTUAL

(32005-1 G)

NO CHANGES  
WITHOUT AUTHORIZATION  
OF FACTORY MUTUAL

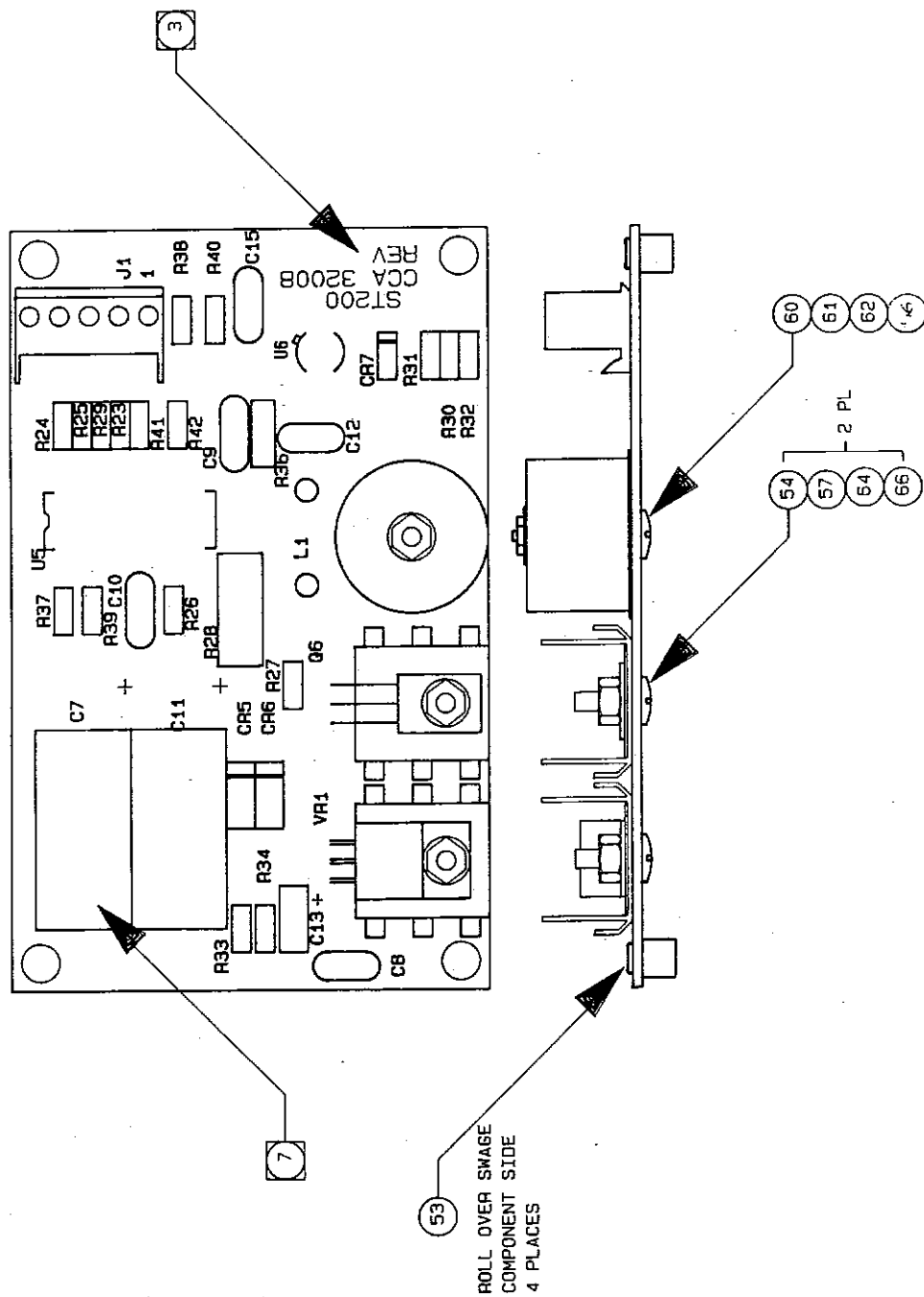
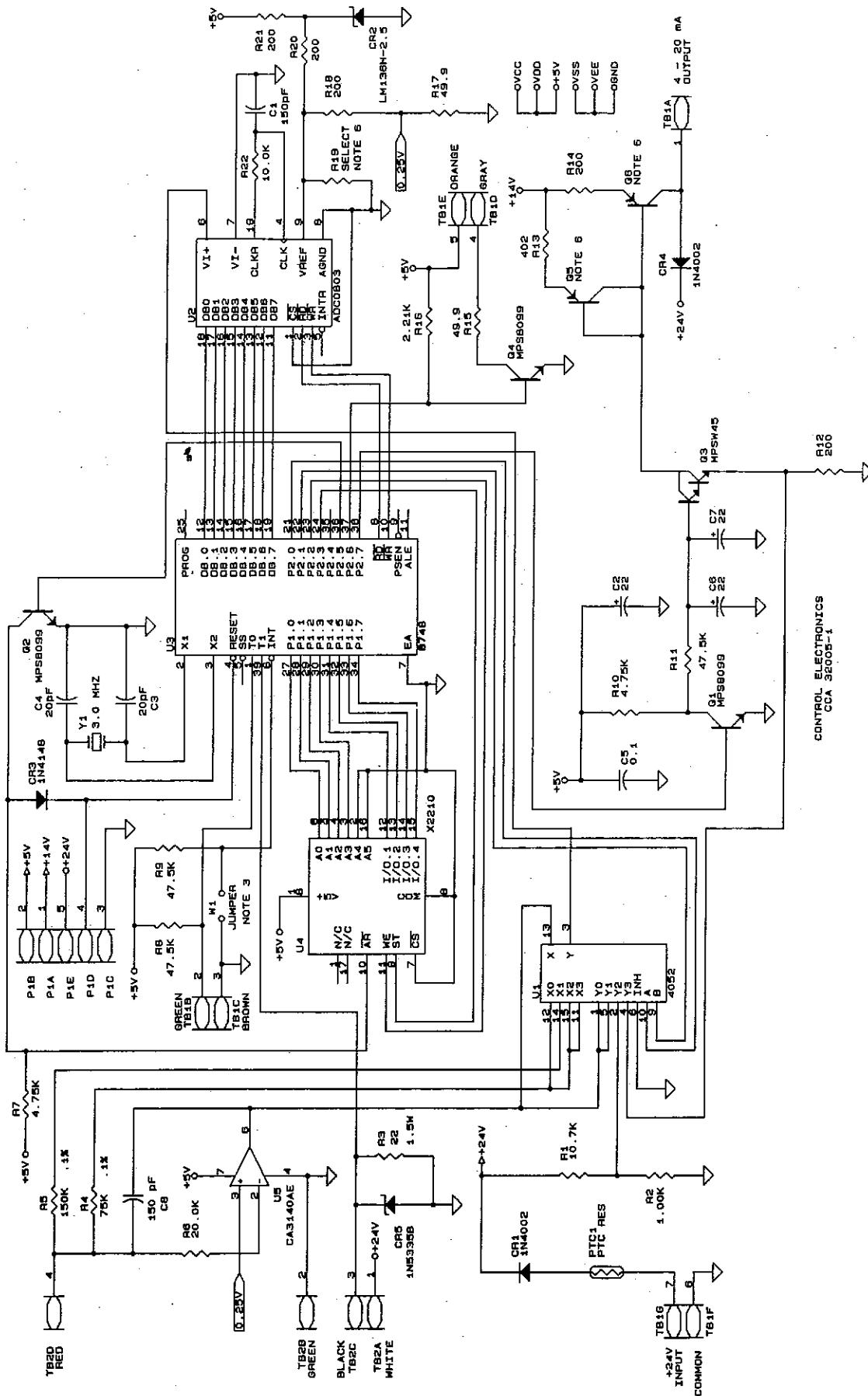


FIG.4  
SHT1

CCA, CONVERTER ELECTRONICS  
MODEL ST200



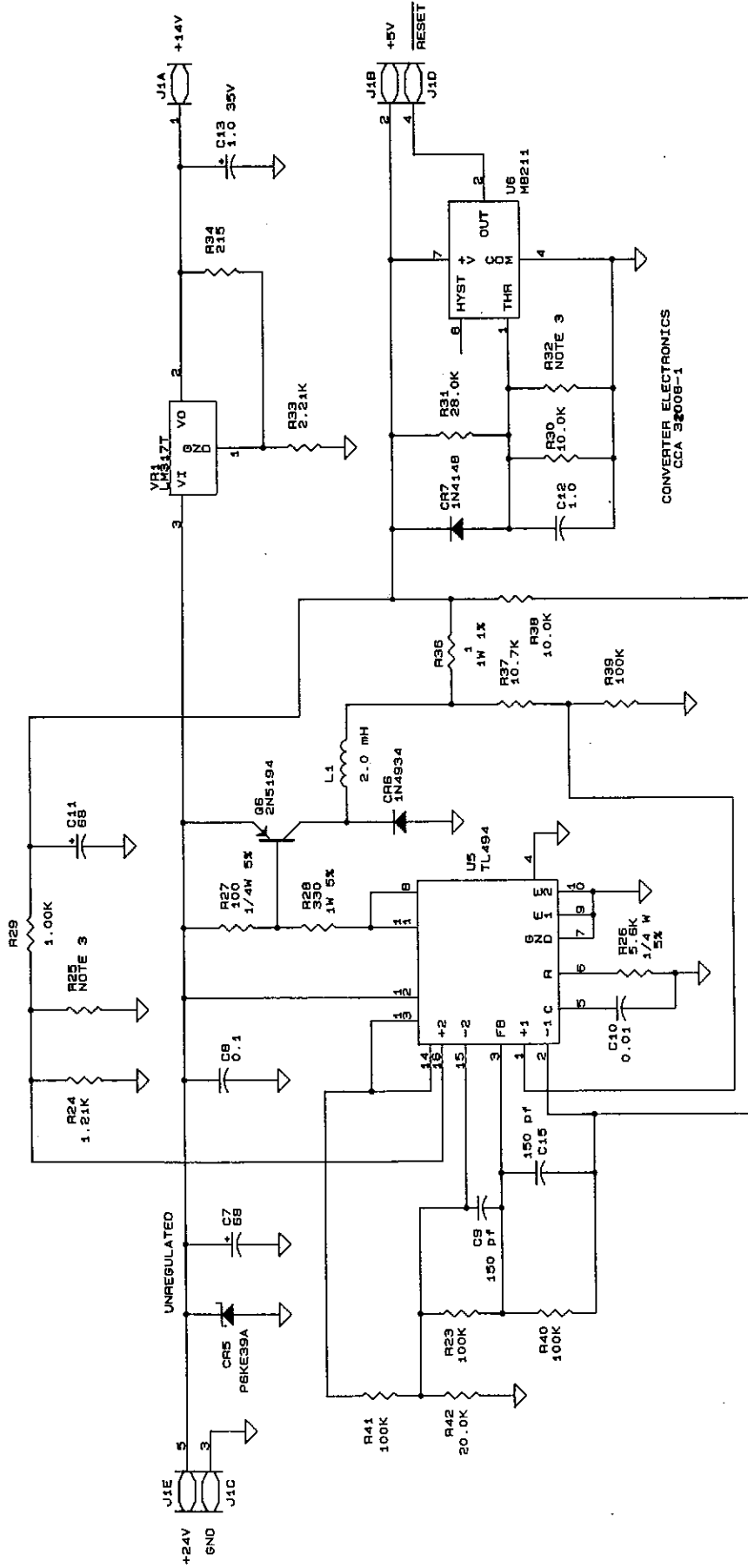


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**SCHEMATIC  
CONTROL ELECTRONICS  
MODEL ST200**

**FIG. 5 SHT 1**

(REF 32002G)



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**SCHEMATIC**  
**CONVERTER ELECTRONICS**  
**MODEL ST200**

**FIG. 5 SHT 2**

# MALFUNCTION LED FLASHING SEQUENCE

Model ST 200

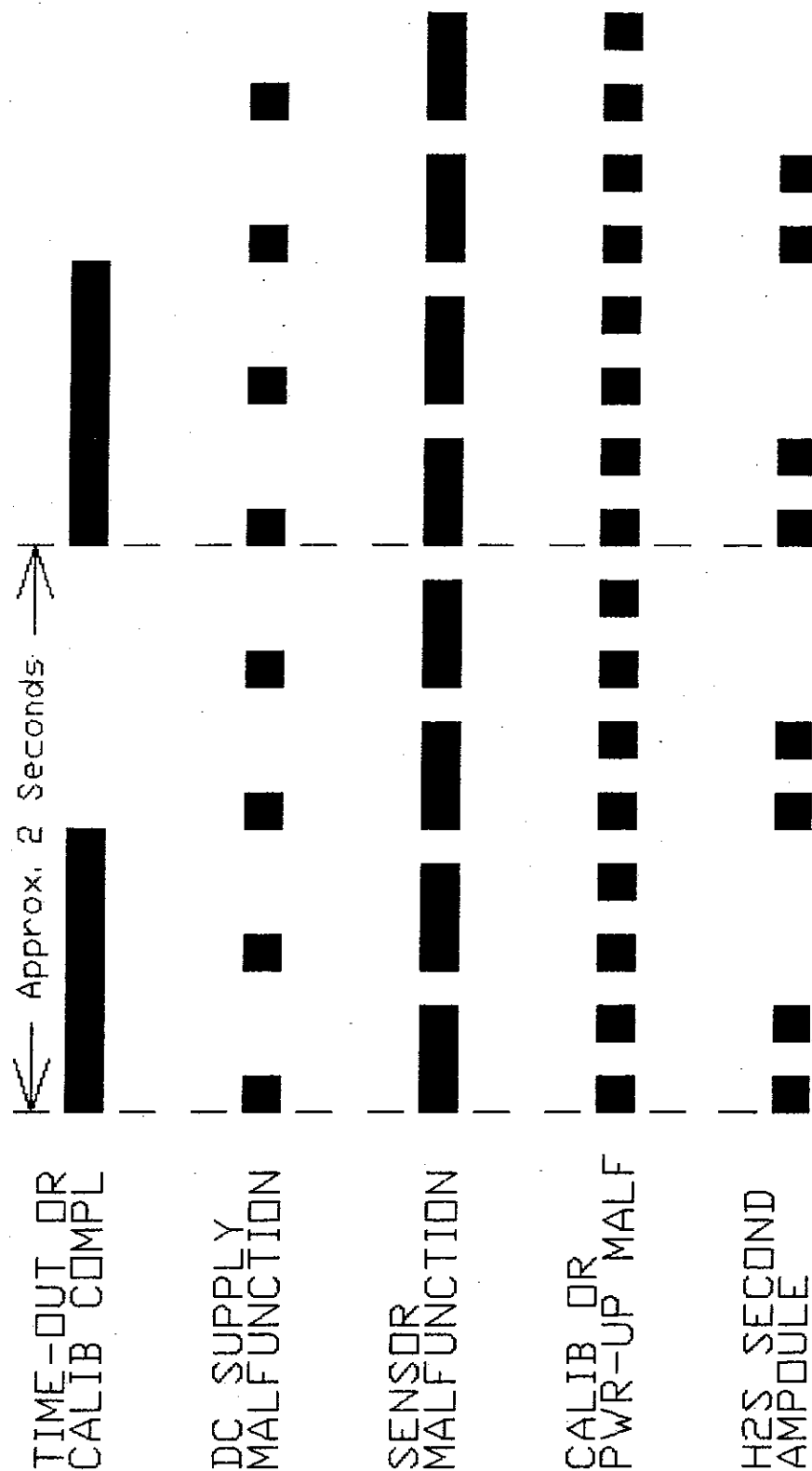


FIG. 6