SPGS

Signals Power and Grounding Specialists, Inc.

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GEM 1/GEM 1E

Genius Environmental Monitor
Series 1

Reference Manual

Table of Contents

List of Illustrations

1   INTRODUCTION

1.1   The Genius Environment Monitor Series 1 is part of the electrical environment monitoring family manufactured by Signals Power and Grounding Specialists, Inc. The *GEMS1* units, which include the *GEM 1E*, are capable of continuously monitoring both AC and DC current on a single conductor. The units may be ordered with a standard 20 Amp configuration, or an optional 200 Amp configuration.

The *GEMS1* units provide a real-time display of current on the monitored conductor. The unit is capable of comparing current present with user-selected threshold settings. Thresholds may be set at both AC and DC, High and Low comparison points. When the monitored current exceeds a predetermined threshold point, the actual reading illuminates the LED, indicating an alarm condition. Optional alarm cables will allow a customer's external alarm or data collection system to also indicate the condition.

The *GEMS1* standard mounting configuration accommodates 19" equipment frames. Extension plates are available separately for 23" equipment frame mounting.

1.2   **Purpose** of this manual is to provide beneficial information for:

- Planning

- Engineering

- Installing *GEMS1* units

- Administration of *GEMS1* units

1.3   **Project Planning** for *GEMS1* equipment:

- Project planning and coordination

- Define site requirements

- Select conductors to monitor

- Install a *GEMS1*

- Configure a *GEMS1*

- Maintain a *GEMS1*

1.4   **Intended Audience:**

- Project engineers

- Equipment engineers

- Land and Building engineers

- Installers

- Maintenance technicians

- Administration personnel

- Management

2   INSTALLATION

2.1   General Information

Unpacking

- Handle parts with care.
- Verify items below are included:

        1 - *GEMS1* Unit
        1 - Current Sensor
        1 - Extension Cable
        4 - Screws, Philip (frame mounting)
        1 - RJ45 Calibration Plug
        2 - Frame Mount Brackets
        4 - Screws, Flat (bracket mounting)
        1 - Trimmer Adjustment Tool
        1 - Operations Manual
        1 - Spare 1/2 Amp GMT Fuse

    Note: Sensors available in 20 or 200 Amp

    Optional items:
        1 - Alarm Cable (GEM 1)
        1 - Set Extension Plates
              (23"mount)
        1 - Data Interface Cable (GEM 1E)

2.2   Electrical Requirement

- The unit requires a DC power source that will provide voltage within a range of 20-70 volts. Correct polarity must be observed. (The *GEMS1* units [front panel] are equipped with a 1/2 Amp fuse for internal circuit protection.)

2.3   Tool Requirements

- Flat Blade Screwdriver
- Phillips Blade Screwdriver
- AC/DC Hand-held Amp Probe

2.4   Material Requirements

- Insulated Copper Wire per customer specifications for:
    - Power (+) & (-)
    - Shield Ground
    - Chassis Ground

2.5   Mounting

- Attach the two (2) Equipment Frame Mounting Brackets **(Fig. 1, Item 20)**, supplied with the unit, to the *GEMS1* unit using the four (4) mounting screws provided.

    Note: The unit depth is adjustable by selecting desired depth and mounting brackets at that depth.

- Secure the *GEMS1* in the selected equipment frame with the four (4) mounting screws provided.

- Optional 23" extension plate kits must be ordered separately.

2.6   Power Connection

- Connect the (+) lead to terminal block TB-1 **(Fig. 2, Item 23)**, located on the rear panel.
- Connect the (-) lead to terminal block TB-2 **(Fig. 2, Item 24)**, located on the rear panel.

2.7   Ground Connections

- Connect an insulated grounding conductor for Shield Ground to terminal block TB-3 **(Fig. 2, Item 25)**, located on the rear panel.

- Connect an insulated grounding conductor for Chassis Ground to terminal block TB-4 **(Fig. 2, Item 26)**, located on the rear panel.

Note: **Separate grounding conductors MUST be used for Chassis Ground and Shield Ground.**

2.8   Fuse Alarm Connections

- Connect the Fuse Alarm Input leads, Common (COM) and Normally Open (N/O) to TB-5 and 6 **(Fig. 2, Items 27 and 28)**, located on the rear panel.

- Connect the Fuse Alarm Output leads, Common (COM) and Normally Open (N/O) to TB-7 and 8 **(Fig. 2, Items 29 and 30)**, located on the rear panel.

Note: **The input and output fuse alarm leads are internally connected for chaining of the alarm leads.**

2.9   *GEMS1* Calibration

Unit must have power on prior to calibration.

- Set the Power ON/OFF Switch to the ON position **(Fig. 2, Item 21)**, located on the rear panel.

- The Power LED Indicator will illuminate **(Fig. 1, Item 3)**, located on the front panel.

With the sensor <u>removed</u> from the *GEMS1,* calibration can be performed.

- Insert the RJ45 calibration plug into the Sensor Input Connector **(Fig. 2, Item 31)**, located on the rear panel.

- Set the AC/DC Select Switch to AC **(Fig. 1, Item 4)**, located on the front panel.

- While observing the Panel Meter Display **(Fig. 1, Item 2)**, located on the front panel, calibrate the AC Offset. Adjust the AC OFF adjustment pot **(Fig. 1, Item 12)**, located on the front panel, until the Panel Display Meter reads 00.00 ±.01.

- Set the AC/DC Select Switch to DC **(Fig. 1, Item 4)**, located on the front panel.

- While observing the Panel Meter Display **(Fig. 1, Item 2)**, located on the front panel, calibrate the DC Offset. Adjust the DC OFF adjustment pot **(Fig. 1, Item 15)**, located on the front panel, until Panel Meter Display reads 00.00 ±.01.

- Remove the RJ45 calibration plug.

- Disregard any changes in the reading on the Panel Meter Display at this time.

- The *GEMS1* unit is now calibrated.

2.10   Parameter Settings

Each alarm parameter is adjustable, although thresholds are preset for monitoring of safety conductors. They are shipped as follows:

DC High - .25 amps
DC Low + .25 amps
AC High + .25 amps
AC Low DISABLED

Note: See Section 3.1., Alarm Parameter Adjustment, for detailed information prior to making adjustments.

2.11   Alarm Reporting

- An alarm condition will exist when the sensor's current reading exceeds the high parameter setting, or falls below the low parameter setting on either the AC or DC current readings. This condition must exist for more than 250ms.

- When an alarm condition exists, it will be reported via its respective Alarm Indicator LED (**Fig. 1, Items 16-19**), located on the front panel, and the Alarm Contact Output Connector (**Fig. 2, Item 33**), located on the rear panel. (For pin-out configuration see **Fig. 3**)

- The Alarm Contact Output Connector (**Fig. 2, Item 33**) provides the user with a closed or open circuit (user selectable) for interfacing with an alarm reporting device. The *GEMS1* alarm outputs are designed to work with cross platforms in mind (e.g., Ground and/or Battery signals).

2.12   Alarm Latching Selection

Factory shipped in the OFF position

- When the Alarm Latch Switch (**Fig. 1, Item 7**), located on front panel, is set to the OFF position, the following applies:

Once an alarm condition exists, the respective LED, and contact output will remain activated only for the duration of the alarm condition.

- When the Alarm Latch Switch (**Fig. 1, Item 7**), located on front panel, is set to the ON position, the following applies:

Once an alarm condition exists, the *GEMS1* will latch the alarm in the active state. The alarm will remain active even if the alarm condition is cleared. The respective alarm LED and contact output will stay latched until both the alarm condition is cleared and the Alarm Latch Reset Button (**Fig. 1, Item 8**), located on the front panel, is depressed and released.

2.13   AC RMS/Peak Selection

Factory shipped with RMS selected

- When the AC RMS/Peak Select Switch (**Fig. 1, Item 9**), located on front panel, is set to the RMS position, the AC component of the sensor input signal will be represented by its True-RMS value.

- When the AC RMS/Peak Select Switch (**Fig. 1, Item 9**), located on front panel, is set to the Peak position, the AC component of the sensor input signal will be represented by its actual peak value.

2.14   Alarm Enabling & Disabling

Factory shipped with the AC Low alarm disabled and all other alarms enabled.

- The *GEMS1* is equipped with an Alarm Select Dip Switch **(Fig. 2, Item 32)**, located on the rear panel.

- The Alarm Select Dip Switch consists of four separate switches, each of which will enable/disable any of the four (4) alarm reporting output types (DC H/L, AC H/L). (For switch setting configuration see **Fig. 4**)

- While an alarm output is disabled, its respective Alarm Indicator LED **(Fig. 1, Items 16-19)**, located on the front panel, and respective Alarm Contact Output Connector contact set **(Fig. 2, Item 33)**, located on the rear panel, will be deactivated.

2.15 Sensor Installation

- Place the sensor assembly in the approximate location of the conductor to be monitored.

  Note: **Do not place a sensor around the conductor at this time.**

- Allow approximately five (5) minutes for the sensor to stabilize and adjust to room temperature.

- Route the extension cable from the *GEMS1* unit and attach to the sensor.

- Insert the extension cable into the Sensor Input Connector **(Fig. 2, Item 31)**, located on the rear panel of the *GEMS1* unit.

- Carefully place the sensor around the conductor to be monitored. Make sure the stenciling on the sensor is facing the ground bar, the sensor is fastened securely, and the conductor is in the center of the sensor core.
- The Panel Meter Display **(Fig. 1, Item 2)** reading now indicates actual current flow, if any, on the conductor monitored.

2.16 GEM 1E Option

The GEM 1E provides an interface to simulate a 50 MV shunt output for an existing Data Collection device. All previous installation instructions also apply.

2.16.1 Interface to Existing Data Collection Unit

The supplied interface cables (2 twisted pair) are attached in the following manner:

- Connect the DC+ lead to terminal block TB-9 **(Fig.2, Item 34)**. located on the rear panel.

- Connect the Common DC- lead to terminal block TB-10 **(Fig.2, Item 35)** located on the rear panel.

- Connect the Common AC+ lead to terminal block TB-12 **(Fig.2, Item 37)** located on the rear panel.

- Connect the AC- lead to terminal block TB-11 **(Fig.2, Item 36)** located on the rear panel.

3   ADMINISTRATION

3.1   Alarm Parameter Adjustment

3.1.1   Factory settings can be modified. Increasing parameter adjustments for safety conductors is not recommended except for a temporary period of time. For example, locating and correcting the source of an alarm condition. To adjust, see 3.1.3 for details.

3.1.2   If the monitored conductor is NOT a safety conductor, adjustments should be made. See 3.1.3 for details.

3.1.3   If a different predetermined alarm parameter is desired, use a hand-held AC/DC Amp Probe to obtain readings from the conductor to be monitored. These readings will be necessary to establish the parameter settings, which are adjusted as follows:

- Set the AC/DC Select Switch **(Fig. 1, Item 4)**, located on the front panel, to either AC or DC. This is determined by the desired parameter that will be adjusted.

- Set the Alarm Hi/Lo Select Switch **(Fig. 1, Item 6)**, located on the front panel, to either High or Low. This is determined by the desired parameter that will be adjusted.

- Press and hold the Alarm Set Button **(Fig. 1, Item 5)**, located on the front panel, while observing the Panel Meter Display **(Fig. 1, Item 2)**, located on the front panel. The display indicates the present alarm parameter setting.

- To change the displayed parameter setting, continue to hold the Alarm Set Button, and adjust the respective Parameter Adjustment Pot **(Fig. 1, Items 10, 11, 13, and 14)**, located on the front panel, until the Panel Meter Display shows the desired setting.

- Follow the above steps for the AC and DC, HIGH and LOW alarm parameter adjustment

settings.

Note: **On the DC reading of negative numbers, the more negative of the two numbers is said to be lower. (i.e. -100.0 amps is lower than 50.0 amps.)**

3.2   Extension Cable/Sensor Testing

It is recommended that all non-factory supplied extension cables and previously used cables or sensors be re-tested prior to installation. SPGS can provide this service. If customer would like to test these items, equipment required for testing includes:

- Remote Cable Tester capable of testing open/short RJ-45 cable connectors
- 70 Ohm Cable Tester (manufactured by SPGS)
- Volt Ohm Meter

3.2.1   Extension Cable - Test #1

- Insert one end of the extension cable into master's RJ-45 jack of the Remote Cable Tester.

- Insert the other end of the extension cable into remote RJ-45 jack of the Remote Cable Tester.

- Follow manufacturer's operation instructions for the cable tester.

- The extension cable must pass this test before installation of the *GEMS1* can continue.
  - If the extension cable does not pass the test, change both module plugs and retest or return to Signals Power and Grounding Specialists for repair.

3.2.2   Sensor Test

- Set the volt ohm meter to measure ohms.

- Insert the 70 Ohm Cable Tester: red lead to the VOLT OHM of the meter and black lead of the tester to the COM of the meter.

- Insert the sensor into the 70 ohm cable tester. (The reading on the volt ohm meter should be between 67 ohms and 73 ohms.)

- The sensor must pass the above test before continuing with installation of the *GEMS1*.

- If the sensor does not pass the test, return the sensor to Signals Power and Grounding Specialists for repair.

4   SPECIFICATIONS

4.1   Physical Characteristics

- Unit Size (HxWxD)   3.5" x 9" x 17"
  Weight   4.6 lbs.

- Maximum conductor size   2" Diameter

- Sensor size (HxWxD)   7" x 5" x 1"
  Weight   0.9 lb.

4.2   Electrical Characteristics

- Supply Voltage Requirement
    DC: 20VDC to 70VDC

- Supply Current Level
    DC: 250 mA max.

- Power Consumption
    DC: 5 W max.

- Input Fuse Alarm contact rating
    1 Amps at 60V

- Parameter Alarm contact rating
    1 Amps at 60V

- Monitoring range:
    20 Amp Sensor
    AC: 0.01 to 19.99 Amps
    DC: -19.99 to 19.99 Amps

    200 Amp Sensor
    AC: 0.1 to 199.9 Amps
    DC: -199.9 to 199.9 Amps

- Alarm settings:
    20 Amp Sensor
    AC: 0 to 19.99 Amps
    DC: -19.99 to 19.99 Amps

    200 Amp Sensor
    AC: 0 to 19.99 Amps
    DC: -199.9 to 199.9 Amps

- AC/DC readings:

Accurate to within ±1%

- Resolution:
    20 amp 0.01
    200 amp 0.10

- Frequency range
    AC: 5 Hz to 1 KHz
    DC: 0 to 1 Hz

- Minimum pulse detection
    250 ms

- ***GEM 1*** output
    L.E.D. Display
    Dry contact source
    Internal LCD meter

- ***GEM 1E*** output
    L.E.D. Display
    Dry contact source
    Internal LCD meter
    AC 50 MV shunt
    DC 50 MV shunt

4.3   Environmental Characteristics

- Operating Temperature
    Normal   59 F - 89 F (15 C - 30 C)
    Maximum   32 F - 120 F (0 C - 40 C)

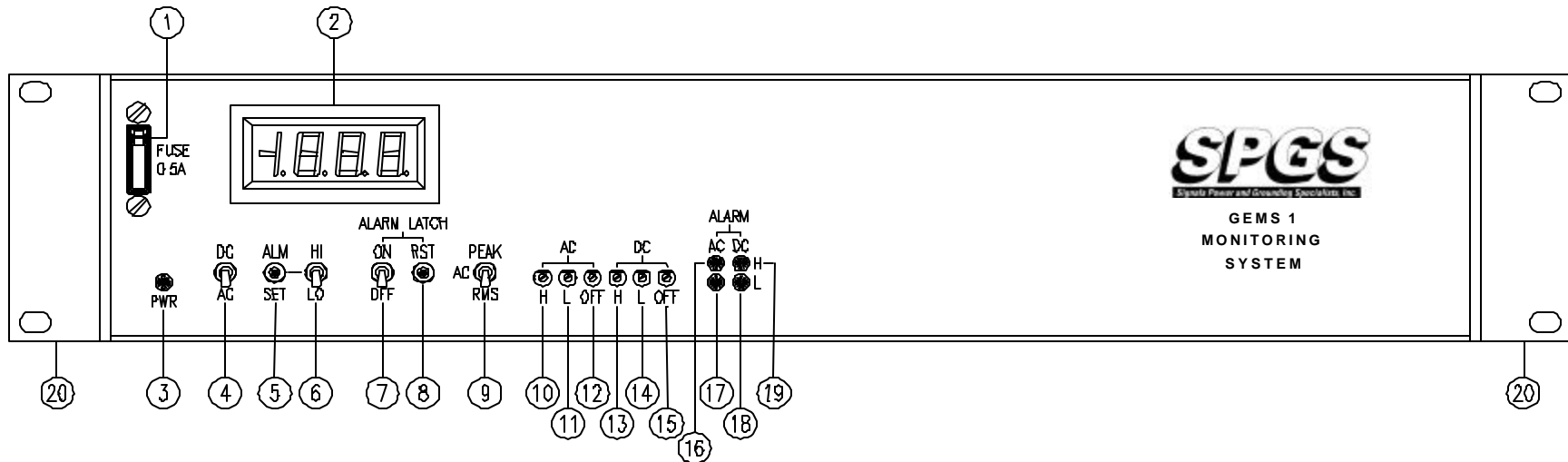- Relative Humidity
    30-80% non-condensing

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Figure 1, Front Panel

|		
1 Input Fuse 0.5A	8 Alarm Latch Reset Button	15 DC Offset Adjustment Pot
2 Panel Meter Display	9 AC Peak/RMS Select Switch	16 AC High Alarm Indicator LED
3 Power LED Indicator	10 AC High Parameter Adjustment Pot	17 AC Low Alarm Indicator LED
4 AC/DC Select Switch	11 AC Low Parameter Adjustment Pot	18 DC High Alarm Indicator LED
5 Alarm Set Button	12 AC Offset Adjustment Pot	19 DC Low Alarm Indicator LED
6 Alarm Hi/Lo Select Switch	13 DC High Parameter Adjustment Pot	20 19" Rack Mount Brackets
7 Alarm Latch Switch	14 DC Low Parameter Adjustment Pot	
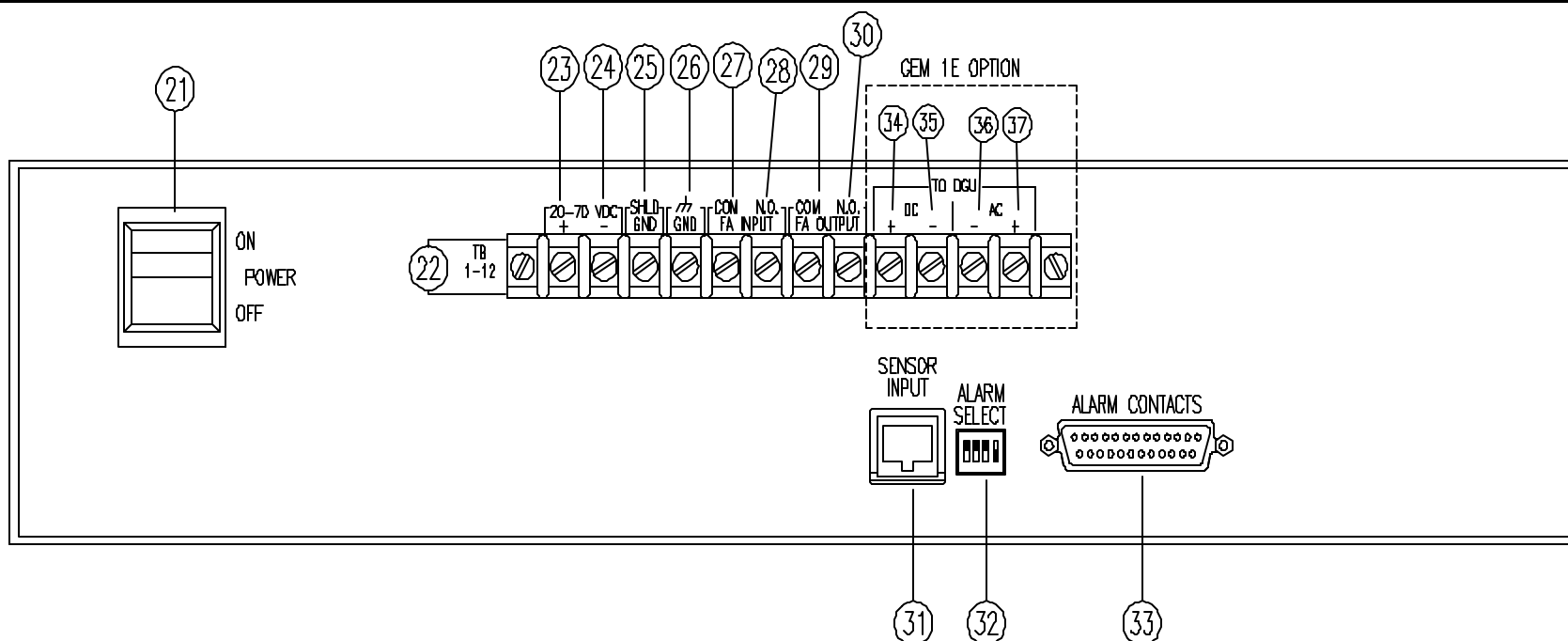
Figure 2, Rear Panel

|		
21 Power ON/OFF Switch	27 Fuse Alarm Input, Com. Conn (TB-5)	33 Alarm Contact Output Connector
22 Terminal Block	28 Fuse Alarm Input, N.O. Conn (TB-6)	34 DC + (TB-9) (GEM 1E Only)
23 (+) Return Connection (TB-1)	29 Fuse Alarm Output, Com. Conn (TB-7)	35 DC - (TB-10) (GEM 1E Only)
24 (-) Power Connection (TB-2)	30 Fuse Alarm Output, N.O. (TB-8)	36 AC - (TB-11) (GEM 1E Only)
25 Shield Ground Connection (TB-3)	31 Sensor Input Connector	37 AC + (TB-12) (GEM 1E Only)
26 Chassis Ground Connection (TB-4)	32 Alarm Select DIP Switch	
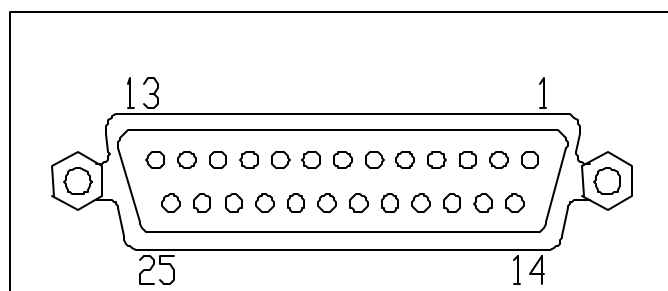
ALARM CONTACTS

Color	Pin #	Description	Color	Pin #	Description
WH-BL	1	DC High Norm Closed	WH-BN	7	AC High Norm Closed
4BL-WH	2	DC High Common	BN-WH	8	AC High Common
WH-OR	3	DC High Norm Open	WH-SL	9	AC High Norm Open
OR-WH	4	DC Low Norm Closed	SL-WH	10	AC Low Norm Closed
WH-GN	5	DC Low Common	RD-BL	11	AC Low Common
GN-WH	6	DC Low Norm Open	BL-RD	12	AC Low Norm Open

Note: The alarm interface cable is a single ended cable equipped with a standard DB-25 Male connector. This cable is normally provided by the customer, but may be purchased through SPGS upon request.

Figure 3, Alarm Contact Output Connector Configuration
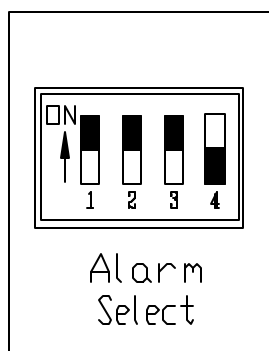
Pos #	Description
1	DC HIGH ALARM
2	DC LOW ALARM
3	AC HIGH ALARM
4	AC LOW ALARM

SWITCH POSITION

UP	ALARM ENABLE
DOWN	ALARM DISABLE

SWITCHES ARE DEFAULTED TO:

ENABLED	DC HIGH
ENABLED	DC LOW
ENABLED	AC HIGH
DISABLED	AC LOW

Figure 4, Alarm Select DIP Switch Configuration

INSTALLATION KIT

•	Cotton lacing cord	1 Roll
•	Ty-wrap with ID tag	20 Each
•	GMT type fuses for DC powering at customer fuse panel	2 Each
•	Extra fuses for *GEMS 1* DC fuse holders	2 Each
•	Vinyl labels (alphanumeric)	1 Sheet
•	DC power cable	15' Red and Black, 18 Gauge Solid
•	Plastic screwdriver for adjusting sensor offsets	1 Each
•	Ground conductor	40' Green, 18 Gauge, THHN stranded
•	Ground conductor crimp terminal (*GEMS 1* end)	2 Each
•	Ground conductor crimp terminal (Types Spade and Fork) (grounded end)	1 of Each Type
•	RJ 45 calibration plug	2 Each

INSTALLATION TOOLS

- Scissors
- Ty-rap with ID tag
- Unwrap and wire wrap tools
- Regular screwdriver
- 70 ohm cable tester
- Continuity tester
- Volt ohm meter (digital)
- RJ 45 crimp tool
- Crimp tool for ground terminals
- Needle nose pliers
- Black narrow point permanent magic marker
- Jeweler type regular screwdriver for sensor offsets
- Red pencil
- Yellow highlighter
- Spudger
- Alarm simulation tester (SPGS developed) to validate wiring to MDF block

GEMS1 SENSOR DATA FORM

Site:	Date:
GEMS1 Bay Location:	Employee:

	Core Size	Description	DC			AC		
			High	Low	Reading	High	Low	Reading
1								

Site:	Date:
GEMS1 Bay Location:	Employee:

	Core Size	Description	DC			AC		
			High	Low	Reading	High	Low	Reading
1								

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