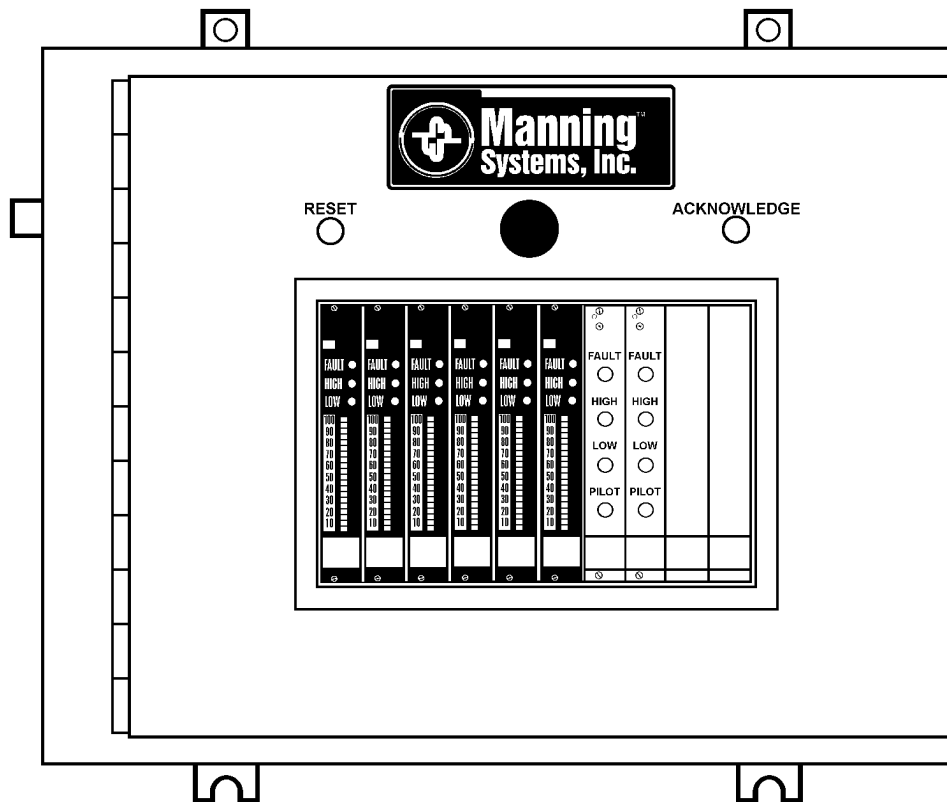


INSTRUCTION AND INSTALLATION MANUAL

MODEL 20 GAS MONITORING ALARM SYSTEM



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1 SYSTEM DESCRIPTION



A Introduction

This manual has been prepared to help in the use and installation of the Manning Systems Model 20 Gas Monitoring Alarm System. This manual will convey the operating details of the alarm system, ensure proper installation, and demonstrate power-up and routine maintenance procedures.

This manual must be carefully followed by all individuals who have or will have the responsibility for using or servicing the Model 20 alarm system.

Warranties made by Manning Systems, Inc. with respect to this equipment will be voided if the equipment is not used and serviced in accordance with the instructions in this manual. If in doubt about a procedure, please contact Manning Systems, Inc. before proceeding.

Manning Systems has contracted with the buyer to have technical personnel on site for system start-up supervision. Please call Manning Systems (913-894-1185) for a start-up appointment and for help or advice with any questions that may arise during the installation.

Other manuals will be provided to cover details of sensors, auxiliary items, etc.

B System Description

The Manning Systems Model 20 is designed to accept up to 10 4/20 mA current input signals, plus provide a regulated 17 VDC supply to operate all sensors manufactured by Manning Systems.

When specified, the Model 20 can also accept voltage input signals.

The base Model 20 unit is provided with 10 empty slots for plug-in channel cards. A channel card is required for each sensor connected to the Model 20. The Model 20 may be equipped with standard channel cards, bargraph channel cards or any combination thereof (see Figure 3).

Standard Channel Cards provide a Low Alarm LED, High Alarm LED, sensor Fault LED, and Pilot LED that indicates normal operation. The Standard Channel Card also provides control of its base unit mounted individual Low Alarm Relay and the common High Alarm Relay. Alarm setpoints are field adjustable.

The Model 20 base unit has one common high relay which operates in conjunction with the horn and will trip if any channel detects a high gas concentration or a sensor fault. The "Acknowledge" switch will silence the horn and clear the common high alarm relay until the next event. If a high alarm condition initiates the horn, the horn and common high relay will clear automatically when the gas concentration clears. The common high relay is normally energized so it will trip in the event of a power failure.

Bargraph Channel Cards provide a 20-segment LED that indicates gas concentration (the bottom segment lighted indicates power on), an individual high alarm relay, and an individual fault relay in addition to the standard features.

The Model 20 will support all of Manning Systems' sensors, including oxygen, which requires a down-scale alarm.

All components that are in contact with voltages above 40 volts are UL listed, including the enclosure.

Note: The Model 20 is for use in non-classified areas only.

Base Unit Specifications:

Electrical Power: 120 VAC, 50/60 Hz at 1.5 amp.

Mother Board:

Signal input: 4/20 mA.

DC Power available for sensors: Heavy-duty internal 17 VDC, 5 amp maximum regulated supply.

Base Unit Relay Ratings (10 - Individual LO, 1 - Common HI): 3 amp at 24 VDC or 120 VAC, Form C contacts providing NO (normally open) or NC (normally closed) operation.

Enclosure: 16 gauge steel, gasketed, plexiglass window, 20" high x 16" wide x 6" deep, Nema 1 rated enclosure.

Weight: 45 pounds

Operating Ambient Temperature range: 32° F to 105° F.

Operating Humidity: 5-95% Relative Humidity, non-condensing.

Push-button Controls:

Acknowledge - Silences horn and clears common HI Relay.

Reset - Clears signal and latched functions. If warning, alarm, or fault condition exists, indications will not clear or will return after a short time delay.

Capacity: 10 slots for use with standard channel cards or bargraph channel cards.

Standard Channel Card Specifications:

Light Outputs and Relays:

LO Alarm:

- Setpoint field adjustable
- LED latching by board mounted DIP switch
- Relay non-latching 10 seconds on delay, 60 seconds off delay

**HI Alarm:**

- Setpoint field adjustable
- LED latchable by board mounted

DIP switch

- Common HI Relay non-latching 10 seconds on delay, 10 seconds off delay

Fault:

- LED non-latchable
- Fault trips common high relay, 10 seconds on delay, latched

Bargraph Channel Card Specifications:**Light Outputs and Relays:****LO Alarm:**

- Setpoint user adjustable
 - LED latchable by board mounted
- DIP switch

- Relay 10 seconds on delay, 60 seconds off delay, latched if LED latched

HI Alarm:

- Setpoint user adjustable
 - LED latchable by board mounted
- DIP switch

- On board individual high relay never latches

- Common high relay does not latch on an alarm condition

Fault:

- Fault below 1.5 mA signal
 - LED latchable by board-mounted
- DIP switch

- On board individual fault relay latched if the LED is latched

- Common high relay latches if DIP switch is selected to trip on a fault condition.

On Board Relay Ratings:

- (Individual HI, individual Fault)
- 0.5 amp at 120 VAC or 24 VDC
 - Form C contacts providing NO (normally open) or NC (normally closed) operation

Options:

Down scale alarm (for oxygen monitoring)

Note: The Model 20 is for use only in non-classified areas.



A Locating Model 20

Normally the main control unit will be shipped in one container and the sensor enclosures in a second container. Inspect all boxes and their contents for shipping damage. If any screws or other metal parts are missing, these must be found to ensure that the printed circuits will not be damaged when power is applied.

It is absolutely essential that the proper sensors be connected to their corresponding channels. The channels are numbered one through ten on the terminal strips in the main control unit.

It is also important that the installer identify on a plant floor plan where each sensor is located, and the channel number to which each sensor reports.

The control unit is designed to be mounted on a solid (non-vibrating) wall through holes in the four mounting flanges. While the physical location must be determined in part by local conditions, it is important to consider the following:

- Protect the Model 20 from rain, snow, water sprays, cleaning crews, and physical damage.
- Mount the unit on a solid wall (non-vibrating) at eye level for convenience in taking readings, servicing, etc.

- The Model 20 is **NOT** explosion proof. **DO NOT MOUNT** in a hazardous atmosphere.

- Operating temperature for the Model 20 is +32°F to +105°F.

- **DO NOT drill holes in the top of the cabinet as this will void the warranty.**

- If hole drilling is required, be sure to remove all metal filings.

- Mounting dimensions are included in Figure 1.

B Wiring

Electrical wiring must comply with all applicable codes. Plant equipment

that may be involved and operating conditions should be discussed with local operating personnel to determine if any special needs should be considered.

Nearly all start-up problems are due to improper wiring or monitor configuration. Please follow these guidelines carefully. Figure 2 (page 5) presents a wiring diagram for the Model 20.

AC Power Wiring:

- Use only stranded cable for both AC power, relay outputs, and sensor input cables.

- The units must have a proper third wire ground for safety and sensor shielding. Be sure to follow local codes.

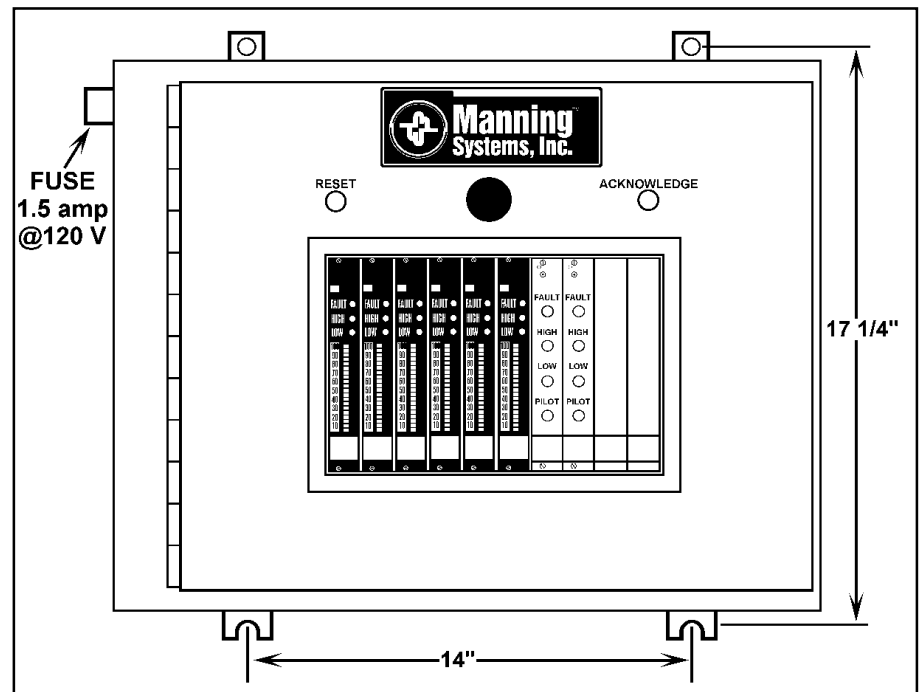


Figure 1: Mounting dimensions for the Model 20 Gas Monitoring Alarm System



- All AC cables must be kept away from the incoming sensor cables, i.e., **do not** put AC cables inside conduit containing sensor cables.
- Keep all wiring away from variable speed drives and SCR control units to minimize electrical noise exposure.
- Electrical Power: 120 VAC, 50/60 Hz, 1.5 amps.
- Manning Systems recommends the use of an uninterruptible power supply for protection against power disturbances, outages, etc.
- Electrical power ground: The unit must be properly grounded.

- Relays on the bargraph channel card (green plug in terminal blocks) are rated for 0.5 amp at 120 VAC or 24 VDC
- Relay wiring must be run in separate conduit from the sensor cable if the relay circuit is AC.

Sensor Wiring:

- See sensor manual for proper sensor cable.
- Usually 3 conductor, 18 AWG stranded, shielded cable (Belden #8770 or equivalent). In some cases 16 AWG may be required (Belden #8618 or equivalent). Review individual sensor manuals for details.
- See sensor manual for proper sensor location.
- Never run AC circuits in the same conduit as the sensor cable.

Note: The common HI relay is energized in a non-alarmed condition so that a power loss in the Model 20 will result in an alarm. All other relays are de-energized in a normal condition.

Relay Wiring:

All relays have Form C, dry contacts. Any required power source must be within the rating and fused or current limited to keep from damaging the contacts.

- Relays on the main unit (barrier block terminal strips) are rated for 3 amps at 120 VAC or 24 VDC

Sensor Wiring Detail

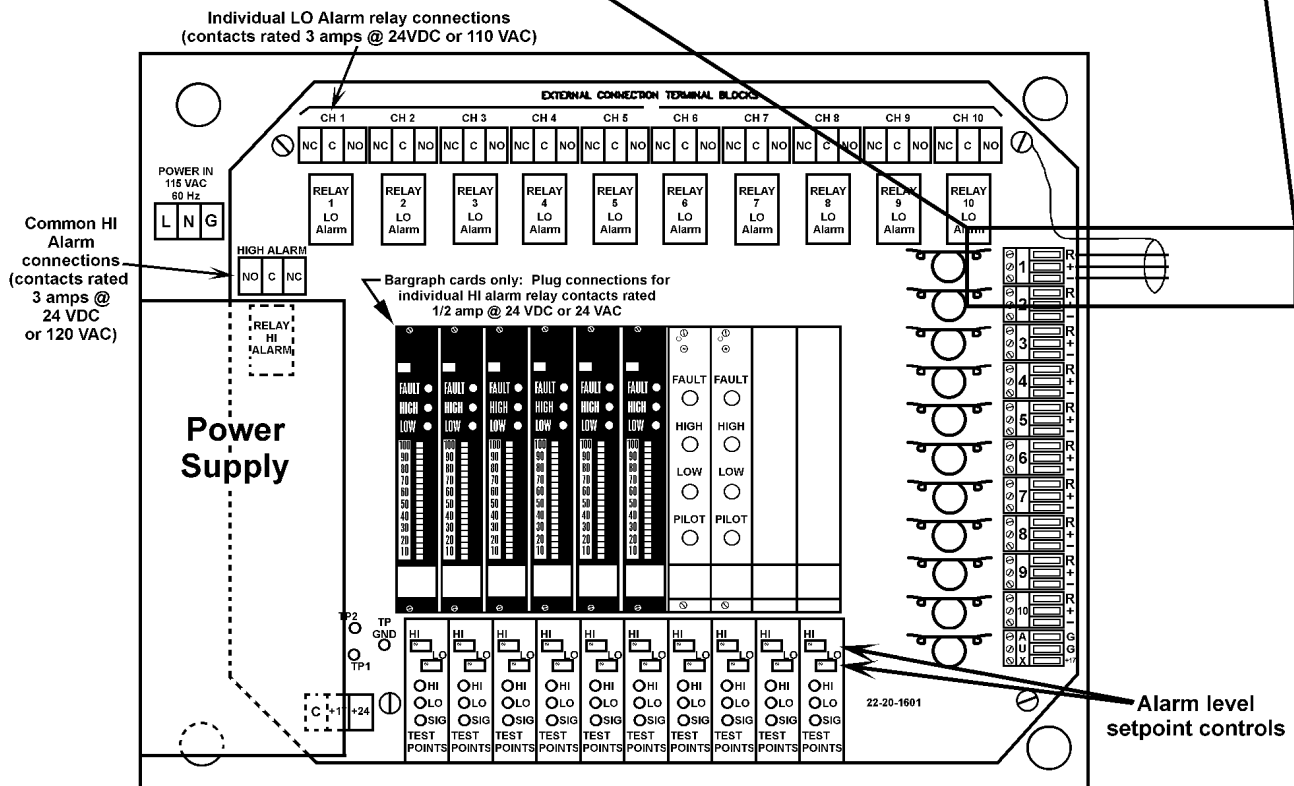
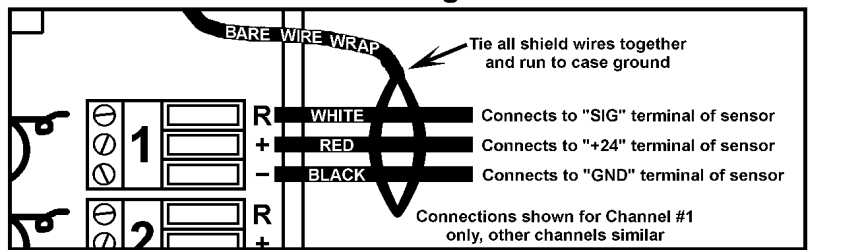


Figure 2: Wiring diagram for the Model 20 Gas Monitoring Alarm System



A Display Panel

Figure 3 shows the face panel of the Model 20 with the two types of cards available for the Model 20.

Standard Channel Card:

The *LO* LED indicates the low alarm level has been exceeded as determined by the low setpoint. The *LO* LED is latching as determined by the channel card mounted DIP switch (#1).

The *HI* LED indicates the high alarm level has been exceeded as determined by the high setpoint. The *HI* LED is latching as determined by the channel board mounted DIP switch (#2).

When lighted, the *PILOT* LED indicates the unit has power, and that the signal is currently below the low and high alarm levels.

The *FAULT* LED indicates a sensor or wiring fault has been detected. The *FAULT* LED does not latch.

Bargraph Channel Cards:

A 20-segment *Bargraph Display* indicates the gas concentration level. The bottom LED is always lighted to indicate power to the display.

The *LO* LED indicates the low alarm level has been exceeded as determined by the low setpoint. The *LO* LED and base unit mounted individual *LO* Relay operate together and are latching as determined by the channel card mounted DIP switch (#1).

The *HI* LED indicates the high alarm level has been exceeded as determined by the high setpoint. It is latching as determined by the channel card mounted DIP switch (#3). The individual channel card mounted *HI* Relay and the base unit mounted common *HI* Relay never latch.

The *FAULT* LED indicates a sensor or wiring problem has occurred and the sensor is inoperable. The *FAULT* LED and channel card mounted individual

FAULT Relay operate together and are latching as determined by the channel card mounted DIP switch (#2). A fault condition will either trip or not trip the base unit mounted common *HI* Relay depending on the position of the channel card mounted DIP switch (#4).

B Reset and Acknowledge Buttons

Pushing the *Reset* button will attempt to clear any latched LEDs or relays. If the channel is still in alarm, the corresponding LED and relay will not clear or will return to their alarm state shortly after the reset button is released.

Pushing the *Acknowledge* button will silence the Model 20 horn and clear the common high alarm relay until the next event occurs. The horn is triggered by a fault or high alarm condition.

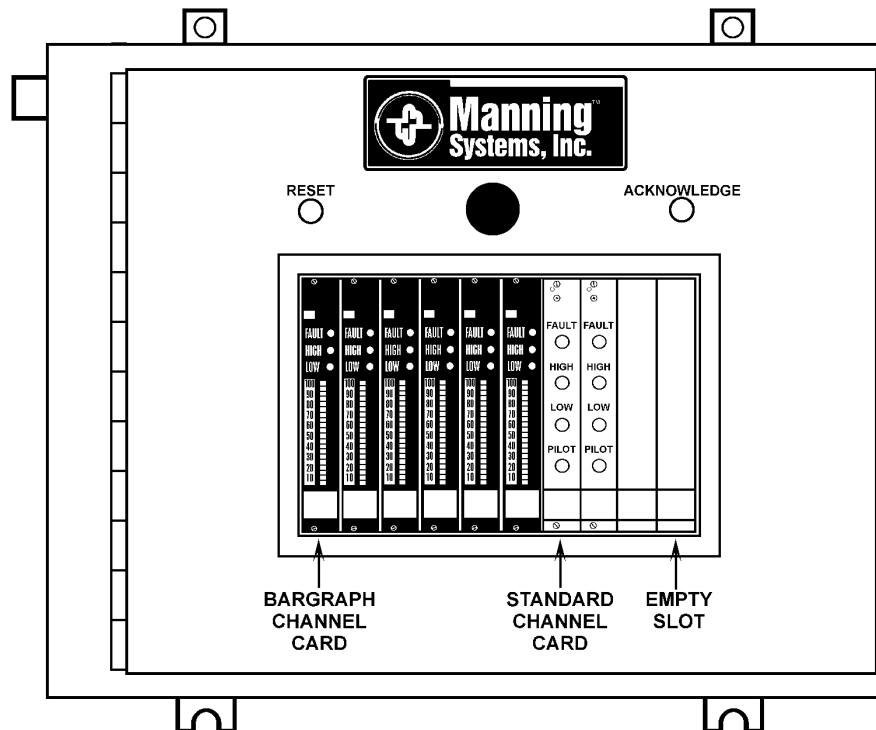


Figure 3: Display panel showing cards available for the Model 20



C DIP Switch Settings

DIP switch settings on standard and bargraph channel cards are presented in Figures 4 and 5.

Note: Normal factory settings are bold underlined.

Standard Channel Card (Figure 4):

- Switch #1: **Open** - *LO* LED non latching
Closed - *LO* LED latching
- Switch #2: Open - *HI* LED non latching
Closed - *HI* LED latching

Bargraph Channel Card (Figure 5):

- Switch #1: ON - *LO* alarm light and relay latch
OFF - *LO* alarm light and relay non-latched
- Switch #2: **ON** - Fault light and channel card fault relay (green plug) latched
OFF - Fault light and channel card fault relay (green plug) non-latched

Note: The master relay on the mother board latches on a fault if selected by switch #4, regardless of this switch position.

- Switch #3: **ON** - *HI* LED latched
OFF - *HI* LED non-latched
- Note:** The master relay on the mother board and the channel card mounted *HI* Relay (green plug) are both non-latching on a high alarm regardless of this switch position

- Switch #4: **ON** - Allows fault to throw master relay on mother board
OFF - Fault will not affect master relay on mother board
- Note:** The channel board fault relay (green plug) is not affected by this switch

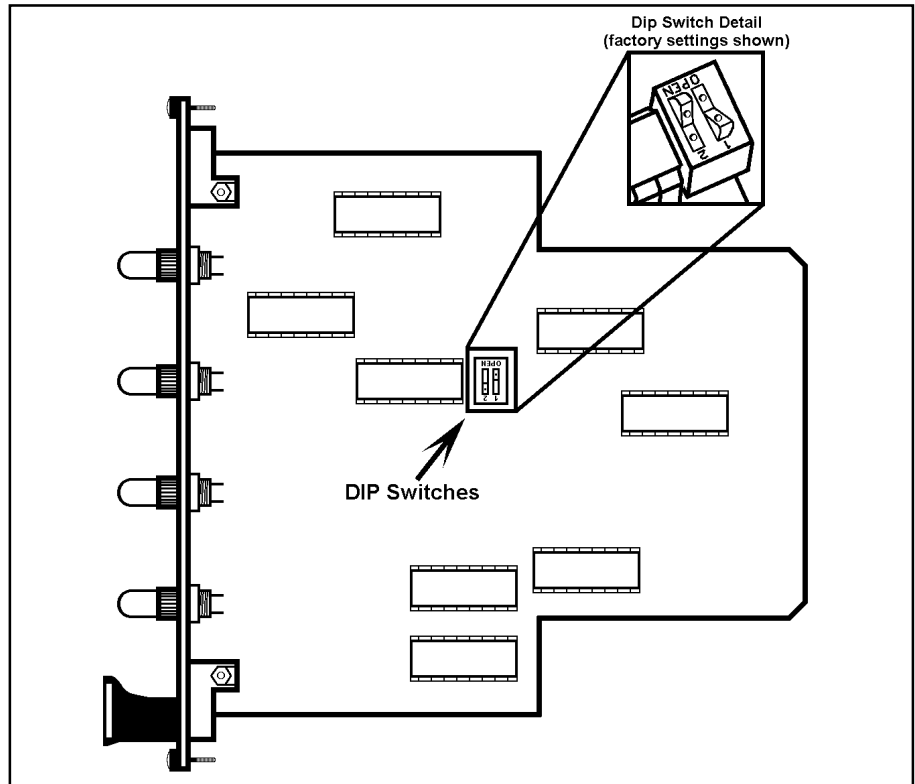


Figure 4: DIP switch settings on a standard channel card on the Model 20

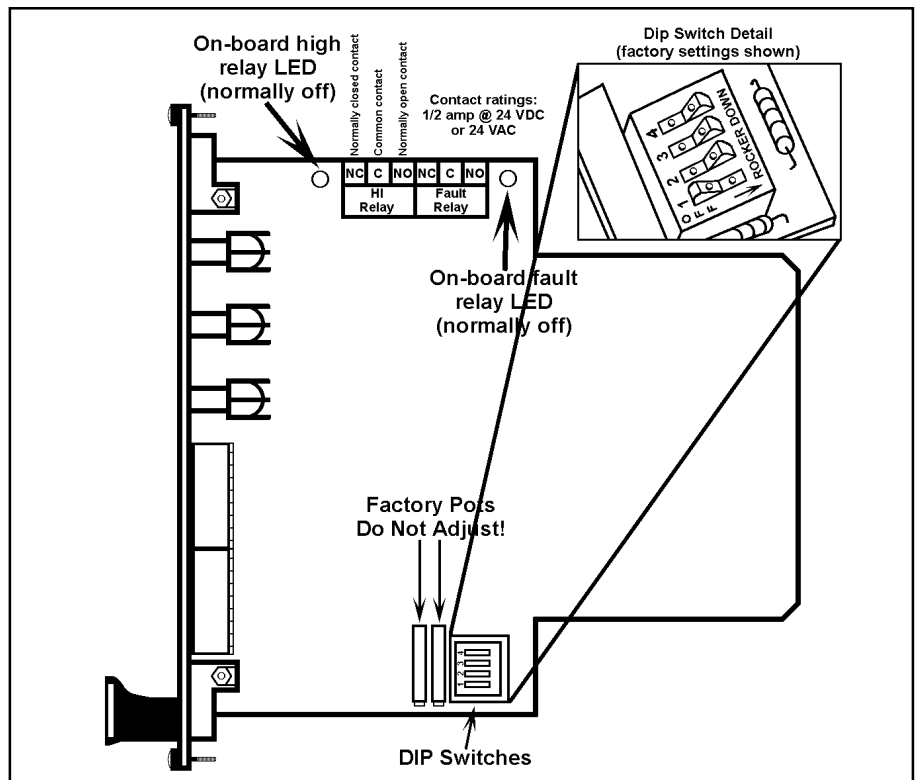


Figure 5: Bargraph channel card DIP switch settings and relay wiring



D Signal and Setpoints

The voltage between *TP Gnd* and *TP Sig* indicates the current signal received from the sensor. The normal range is 0.4 volts to 2.0 volts, which corresponds with 4 to 20 mA. This manual will use the voltage at *TP Sig* to describe the input signal. When this signal exceeds the voltage at *TP LO* or *TP HI*, the low alarm or high alarm function will take place. Figure 6 presents signal and setpoint adjustments on the Model 20. The low setpoint is user adjustable by measuring the voltage on *TP LO* and adjusting the *LO* adjust pot until the desired setpoint is reached. The *HI* pot and *HI* testpoint function the same way.

The LO and HI alarm setpoints are factory adjusted as indicated on the data sheet included with your Model 20. Never adjust these setpoints outside the range of 0.4 to 2.0 volts. Contact Manning Systems if you have any questions or want help in determining setpoints for your particular sensor and application.

After setpoint adjustment, always expose sensor to the gas being monitored and verify that the warning and alarm lights trigger at the desired concentration.

E Power-Up Procedures

Before applying power, make a final check of all wiring for continuity, shorts, grounds, etc. It is usually best to disconnect external alarms and other equipment

from the unit until the initial power-up procedures are completed.

After power-up, allow 24 hours for the system to stabilize before testing the sensors. Because sensors are normally located at a distance from the monitoring unit, the test time required and accuracy of the response checks will be improved if two people perform the start-up procedures and use radio contact.

Start-Up Test: One person exposes each sensor to a small amount of the gas that is being monitored. The second person stays at the Model 20 unit to determine that the sensor, when exposed to the gas fumes, is connected to the proper input, responds, and causes appropriate alarm functions.

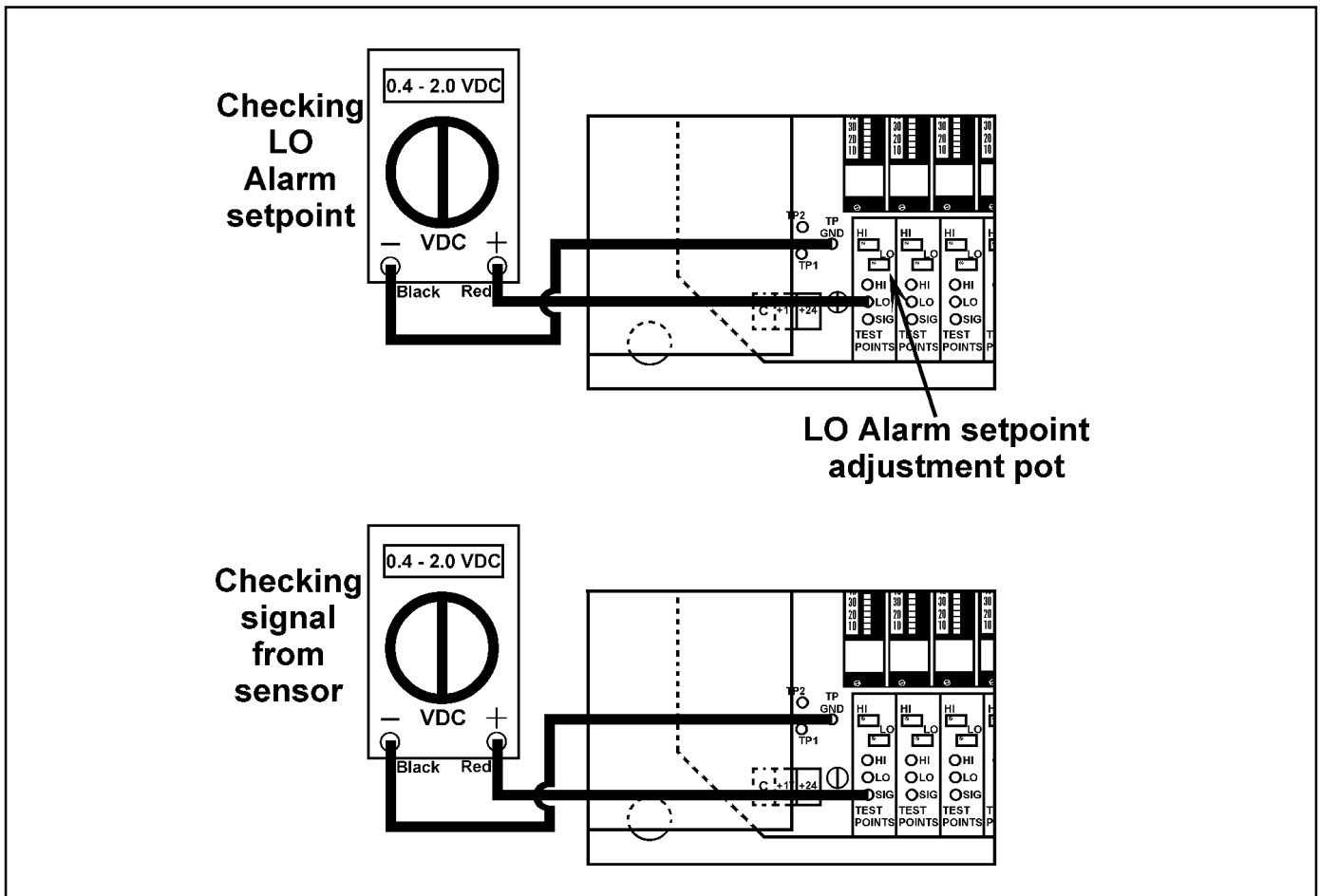


Figure 6: Signal and setpoint adjustment on the Model 20



F Troubleshooting

The unit will indicate a fault if the signal is less than 0.14 volts at *TP Sig*.

Some Manning Systems sensors are configured to send a signal of 0.05 volts at *TP Sig* if a sensor fault exists. If *TP Sig* = 0.05 volts, this indicates a properly wired sensor is in a fault condition. Proceed to investigate the sensor.

If *TP Sig* = 0.00 volts, this indicates no signal from the sensor. Check for correct wiring or loose connections between the sensor and monitoring unit.

Figure 7 presents details on troubleshooting the Model 20. Power supply voltages should be checked at *TP1* (+17.5 VDC) and at *TP2* (+12 VDC). Both

points should be DC Volts as labeled. The power supply to each sensor should be checked at each sensor terminal block. It should be 17.5 VDC or for voltage pre amp sensors 9.0 VDC.

If false signals or no signals are received from one or more sensors, check wiring and refer to the sensor manual's troubleshooting section.

If questions arise, call Manning Systems.

G Maintenance

The Model 20 is designed for long life and high reliability. Manning Systems recommends checking signal voltages monthly and logging them on the

data sheet included with your Model 20. Additionally, the sensors being monitored should be exposed to the target gas on a monthly basis while all alarm functions are verified at the Model 20. This will test the sensor and any equipment connected to the relays in addition to the Model 20. Be sure to review the test requirements of individual sensors as more stringent testing may be required.

H Replacement Parts

For replacement parts, contact Manning Systems, Inc. Be sure to give serial number and model number of unit.

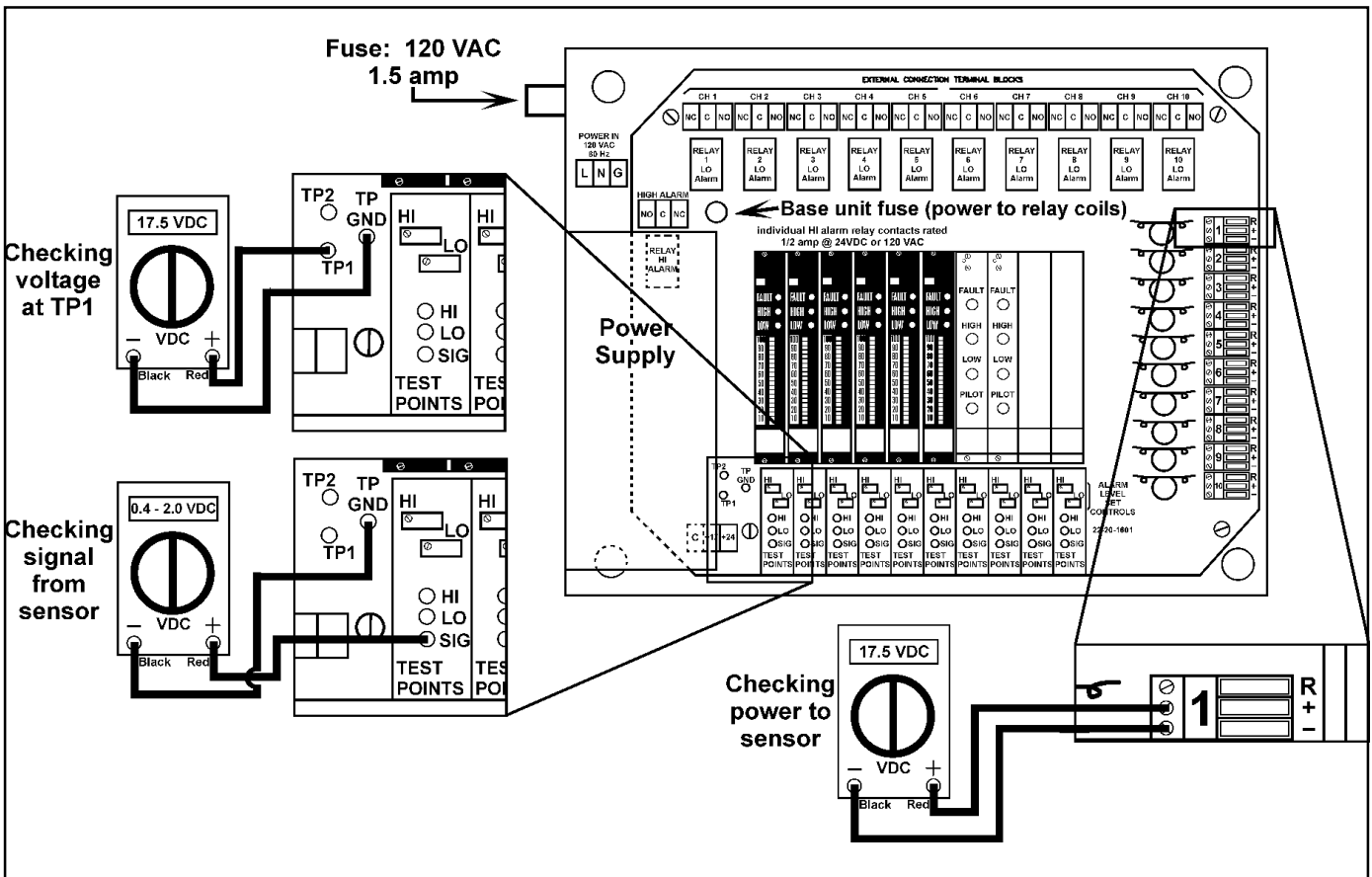


Figure 7: Troubleshooting the Model 20



Limited Warranty

1. Limited Warranty. Manning Systems, Inc. (“Manning”) warrants to the original purchaser and/or ultimate customer (“Purchaser”) of Manning’s Products (“Product”) that if any part thereof proves to be defective in material or workmanship within eighteen (18) months of the date of shipment by Manning or twelve (12) months from the date of first use by the purchaser, whichever comes first, such defective part will be repaired or replaced, free of charge, at Manning’s discretion if shipped prepaid to Manning at 11511 W. 83rd Terrace, Lenexa, Kansas 66214, in a package equal to or in the original container. The Product will be returned freight prepaid and repaired or replaced if it is determined by Manning that the part failed due to defective materials or workmanship. The repair or replacement of any such defective part shall be Manning’s sole and exclusive responsibility and liability under this limited warranty.

2. Exclusions.

A. If gas sensors are part of the Product, the gas sensor is covered by a twelve (12) month limited warranty of the manufacturer.

B. If gas sensors are covered by this limited warranty, the gas sensor is subject to inspection by Manning for extended

exposure to excessive gas concentrations if a claim by the Purchaser is made under this limited warranty. Should such inspection indicate that the gas sensor has been expended rather than failed prematurely, this limited warranty shall not apply to the Product.

C. This limited warranty does not cover consumable items, such as batteries, or items subject to wear or periodic replacement, including lamps, fuses, valves, vanes, sensor elements, cartridges, or filter elements.

3. Warranty Limitation and Exclusion.

Manning will have no further obligation under this limited warranty. All warranty obligations of Manning are extinguishable if the Product has been subject to abuse, misuse, negligence, or accident or if the Purchaser fails to perform any of the duties set forth in this limited warranty or if the Product has not been operated in accordance with instructions, or if the Product serial number has been removed or altered.

4. Disclaimer of Unstated Warranties.

THE WARRANTY PRINTED ABOVE IS THE ONLY WARRANTY APPLICABLE TO THIS PURCHASE. ALL OTHER WARRANTIES, EX-

PRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

5. Limitation of Liability.

IT IS UNDERSTOOD AND AGREED THAT MANNING’S LIABILITY, WHETHER IN CONTRACT, IN TORT, UNDER ANY WARRANTY, IN NEGLIGENCE OR OTHERWISE SHALL NOT EXCEED THE AMOUNT OF THE PURCHASE PRICE PAID BY THE PURCHASER FOR THE PRODUCT AND UNDER NO CIRCUMSTANCES SHALL MANNING BE LIABLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES. THE PRICE STATED FOR THE PRODUCT IS A CONSIDERATION LIMITING MANNING’S LIABILITY. NO ACTION, REGARDLESS OF FORM, ARISING OUT OF THE TRANSACTIONS UNDER THIS WARRANTY MAY BE BROUGHT BY THE PURCHASER MORE THAN ONE YEAR AFTER THE CAUSE OF ACTION HAS OCCURRED.

