EXP-EXTRM-20FT-PKG-V8

C1D1 Explosion Proof Extraction Room Equipment Package Designed for 20' Container Extraction Rooms

20FT CONTAINER EXTRACTION ROOM KIT



EXPLOSION PROOF EXIT SIGN - CLASS I, DIVISION 1 & 2 - IP65 - 120V/277VAC - EMERGENCY BATTERY BACK-UP	X1



24" EXPLOSION PROOF FAN - 7820 CFM - 1 HP - 115-230V - CLASS 1 GROUP D & CLASS 2 GROUPS F & G RATED	X2



EXPLOSION PROOF LED PAINT SPRAY BOOTH LIGHT - CLASS 1 DIV 1 - CLASS 1 DIV 2 - T6 - 7,000 LUMENS	X2



EXPLOSION PROOF HYDROCARBON GAS SENSOR	X1



EXPLOSION PROOF SWITCH - CLASS 1 DIV 1 AND CLASS 2 DIV 1	X1

*Pictures may differ from actual product received.

Explosion Proof Bug Eye Emergency LED Fixture Instruction Manual for the EXP-EMG-EXT Product Line



*Pictures not the same on every model

Congratulations on the purchase of your new Explosion Proof Bug Eye Emergency LED Exit Fixture. Please read these instructions carefully to familiarize yourself with the safe operation and maintenance of your new emergency fixture. Following these instructions will insure many years of safe and dependable service.

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***Please visit our website for all warranty/return related questions.*

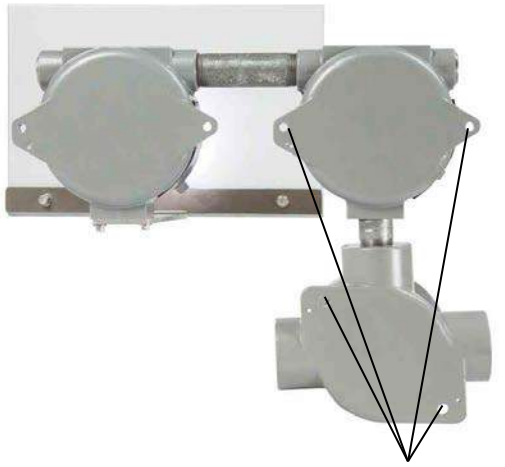
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I. Installation & Operation

NOTE: *The EXP-EMG-EXT* line *is designed to be surface mounted to flat surfaces such as walls.*

I. Installation

Mounting for this fixture is achieved via mounting tabs located on the back side of the light.

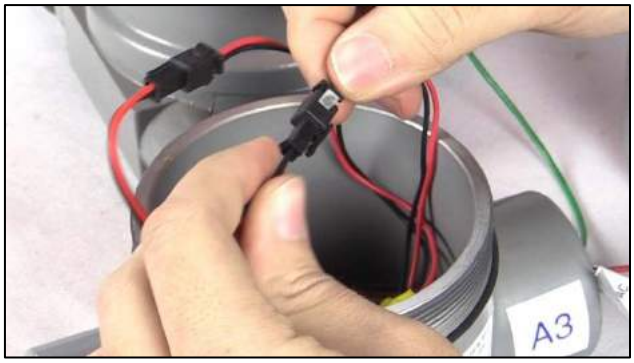

Mounting Tabs

The EXP-EMG-EXT explosion proof emergency self-testing LED fixture is **NOT** a factory sealed fixture. Operators will bring their own rigid conduit to a junction box and complete their connects. Cap off any hubs that are not in use.

Both battery legs *must be* connected together. This prevents the battery from draining during storage and transit. **DO NOT CONNECT HIGH VOLTAGE TO BATTERY LEGS.**

II. Operation

1. Apply AC power to the light. The LED indicator should turn RED.
2. In the event of power loss, the fixture will illuminate all lights automatically. Once power is restored, the lights will turn off and the batteries will charge.



AC LIVE (120V)	BLACK
AC LIVE (277V)	RED
AC NEUTRAL	WHITE
GROUND	GREEN

II. Self-Diagnostic Test

Once the emergency fixture is properly installed and AC power supplied, the dual color LED indicator will come ON and the self-diagnostic test function will automatically initiate. The LED indicates the unit's status. A STEADY GREEN LED indicates normal service, a FLASHING GREEN LED indicates the unit is testing, a FLASHING GREEN/RED LED indicates the battery is charging and a RED LED (in different combinations) indicates a service alert. Refer to the service indication chart for more details. The LED will be OFF when the unit is in emergency mode.

I. Self-Diagnostic Service

The self-diagnostic function is factory preset and performs the following:

1. Monitoring of battery, battery charger and lamps.

2. Self-testing and a 30-second or longer discharge once every 30 days, after AC power has been supplied for a minimum of 24 hours.

3. Self-testing and a 30-minute or longer discharge once every 180 days, after AC power has been supplied for a minimum of 24 hours.

4. Self-testing and a 90-minute discharge once every 365 days, after AC power has been supplied for a minimum of 24 hours.

II. Service Indication

LED Indicator	Status
One Flash Red	Replace Electronics
Two Flashes Red	Replace Battery
Four Flashes Red	Replace Lamp Head Board
Five Flashes Red	Replace Remote Lamp Head or Remote Lamp Head is Disconnected
Steady Red	Power Is Connected
Solid Green	Trickle Charge
Flashing Green	In Test
Red/Green Flashing	High Charge

III. Trouble-Shooting and Maintenance

CAUTION: *Always turn AC power to the equipment OFF before servicing. Servicing should be performed only by a qualified service technician.*

I. Trouble-Shooting

1. Problem: Emergency lights do not operate.

If the charge indicator light is OFF, check that the circuit breaker for AC supply is ON.

If the charge indicator light is OFF, check that they battery is properly connected. If the problem persists, replace the battery.

2. Problem: Emergency lights are dim.

The battery might not be fully charged. Allow battery to recharge for 24 hours and then retest. If the lights are still dim, replace the battery.



Charger/Battery Fault LED

II. Maintenance

1. Battery: The battery supplied in the fixture requires no maintenance. However, it should be tested periodically and replaced when it no longer operates the connected fixtures for the duration of a 30-second or 90-minute test.

2. Other: Clean lenses and replace lamps as and when required.

Self-Testing: The circuit continuously monitors the operating condition of the AC power, battery supply voltage, emergency lamp continuity and charging circuit. The purpose of this option is to provide visual signaling in response to a fault at the EXIT sign battery and/or battery charger. If a failure is detected, visual status will occur immediately via the CHARGER LED and/or the BATTERY FAULT LED. The LEDs will stay illuminated until the fault is corrected. The circuit also monitors the transfer circuit as well as performing automatic code compliant testing. The circuit will perform a 30 second discharge and self-test every 28-30 days. A 90 minute discharge and self-test is performed every 6 months.

IV. Safety Warnings and Ratings

I. Warnings

WARNING: Risk of electric shock - never connect to, disconnect from or service while equipment is energized.

WARNING: Risk of fire - Lamps are hot. Keep combustible material away from the hot parts. Observe lamp manufacturer's warnings, recommendations and restrictions on lamp operation and maintenance. Make sure lamps are correctly installed.

The battery in this emergency fixture may not be fully charged. After electricity is connected, let the battery charge for at *least* 24 hours.

Consult local building code for approved wiring and installation.

Disconnect AC power before servicing and installation.

DO NOT use this electrical equipment for anything other than its intended use.

The use of accessory equipment is not recommended by the manufacturer and will void product listing and warranty and may cause unsafe conditions.

Any service on this equipment should be performed by qualified personnel only.

Cap unused wires with enclosed wire nuts or other approved method.

Make sure wire terminations are secure and leads are properly tucked in appropriate wire channels.

II. Ratings/Approvals

Class I, Divisions 1 & 2 Groups A, B, C, D
Class I, Zones 1 & 2 Groups IIB + H2
Class II, Divisions 1 & 2 Groups E, F, G
Class III, Divisions 1 & 2
90 Minute Emergency Runtime
24 Hour Battery Recharge Time
Self-Testing Unit
Horizontal and Vertical Adjustable

24" Explosion Proof Exhaust Fan - 7820 CFM - 1HP, 115-230V AC Single Phase - Roof Mounted

This fan is completely assembled, tested and ready for installation when shipped from the factory. It is for general ventilation use only. Do not use to exhaust dirt, dust, grease or lint-laden air.

Vibration or jarring in transit may cause loosening of bolts, nuts and set-screws or misalignment of the propeller. Check these items before installing the fans.

Mount fan only for upward discharge (up to vertical). Downward discharge requires addition of a propeller retainer for completely safe operation.

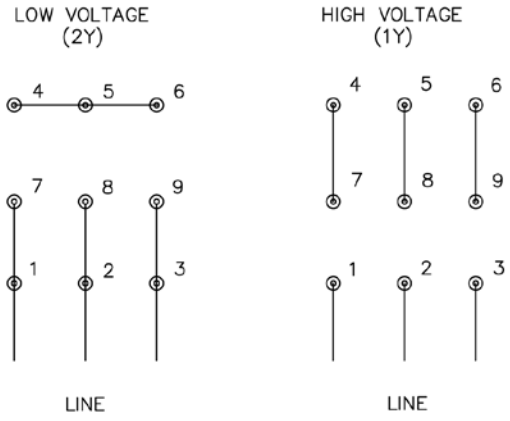
Propeller blades must be cleaned periodically to prevent accumulated dirt from causing unbalance.

LUBRICATION:- Motors are equipped with pre-lubricated ball bearings. The original supply of grease is kept free from dirt, grit or outside contamination by the bearing seals and, under normal operating conditions, does not require replenishment for the life of the bearing.

WARNING: We strongly recommend that only a licensed electrician install this product.

LINE CONNECTIONS:- Connect the motors of all fans according to the diagrams inside the terminal box cover or on the nameplate. **BE SURE TO CONNECT FOR THE VOLTAGE, FREQUENCY AND PHASE TO BE USED.**

Dual-voltage single phase motors are factory-connected for 115 volt lines. Dual-voltage single-phase motors are factory-connected for 230 volt lines. Provide U.L. recognized electrical overload protection not to exceed 125% of the marked input rating of the fan motor.



SAFE INSTALLATION:- The Occupational Safety and Health Act stipulates that when a fan is mounted less than seven(7) feet above the floor or working level, the blades shall be guarded and the guards shall have openings no larger than one-half (½) inch. These fans require supplementary guards when this requirement must be met.

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4ft, 2 Lamp Explosion Proof Light Fixture

WARNING: Do not attempt installation until you are familiar with all warnings, precautions, and procedures outlined within this instruction sheet.

INSTALLATION PRECAUTIONS

- Do not install fixture in any classified location where the marked operating temperature exceeds the ignition temperature of the hazardous atmospheres.
- Consult fixture nameplate for the suitability ambient temperature shown on the nameplate.
- Refer to fixture nameplate for minimum supply wire temperature rating.
- Verify that the supply voltage agrees with fixture rating as indicated on nameplate.
- All local and national electrical/building codes must be followed when installing this lighting fixture. For code interpretation, consult your local authority.
- Product must be used only with glass tubes intact and all cap threads fully engaged. Do not use if glass tubes are cracked or damaged.

Caution: Only use lamp size, type and /or wattage as shown on fixture nameplate.

INSTRUCTIONS FOR INSTALLING

We strongly recommend that only a licensed electrician install this product.

WARNING: Make sure that the power is disconnected before installing. This fixture is extremely heavy and must be mounted to a surface that can structurally support the load.

NOTE: This fixture requires a minimum of 50 inches of clearance from re-lamp end for lamp replacement. An optional drop mounting kit that will allow for end to end row mounting is available, please consult factory.

WARNING: Do not let fixture hang on one bracket at any time. Failing to comply can result in breakage of end casting or mounting bracket, allowing the fixture to fall, which can cause serious injury or death.

- The mounting brackets are shipped installed on the fixture.
- Install the brackets to wall or ceiling with two 3/8" bolts (not supplied) at center measurements.
- Fixture is now ready for mounting.

It is strongly suggested to use two licensed electricians to proceed with the final mounting of the fixture to avoid any possible personnel injury or damage to the fixture as the unit weights up to 46lbs (21.0 kg) and will be slightly awkward to hold in position and attach to brackets mounted on wall or ceiling. Depending on mounting height and scaffolding, a hydraulic man–lift or two good quality ladders should be used.

INSTRUCTIONS FOR WIRING LAMP

- Remove the upper center screw cap on the re-lamp end (field wiring compartment).
- Install approved cable connector or conduit fitting into ½" NPT hub on field wiring compartment.
- Install a three conductor cable into the connector, allowing 3 inches of wire inside compartment for connection.
- Using approved wire connectors, splice wires as per color codes: black to black (line) white to white (common) and green to green (ground).
- Replace end-cap, making sure there are no wires protruding that may be pinched causing a possible short circuit.

WARNING: Fixture must be grounded as required per paragraph 410-21 and article 250 of the National Electric Code and/or rule 30-500. Failure to properly ground this fixture will create an electrical shock, which can cause serious injury or death.

INSTRUCTIONS FOR RELAMP

⚠WARNING

- To avoid risk of fire, explosion or electric shock, this product should be maintained by a qualified electrician only, in accordance with all applicable codes and regulations.
- To avoid electric shock: Be certain electrical power is OFF before and during maintenance.

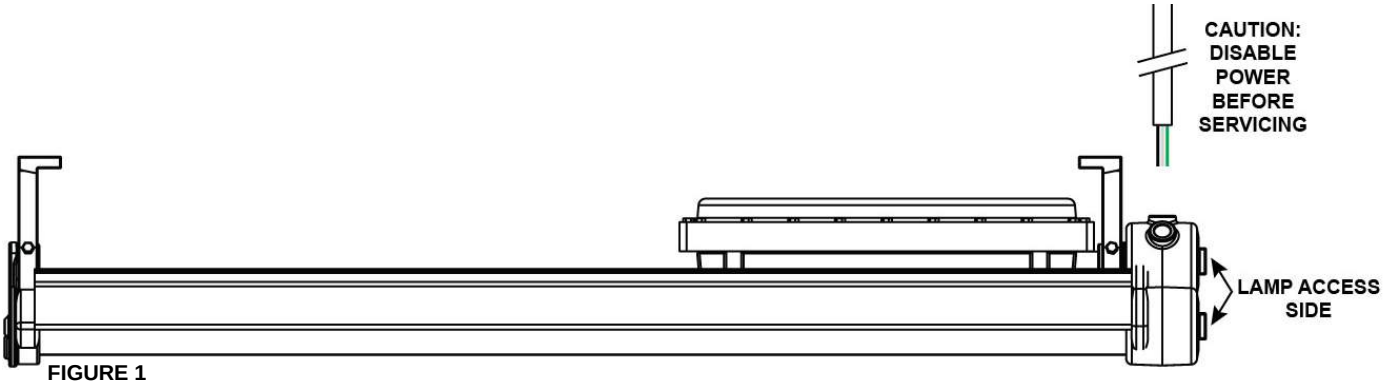


FIGURE 1

Caution: Only use lamp size, type and/or wattage as shown on fixture nameplate.

1. Disconnect power to the fixture prior to servicing. **FIGURE 1**

2. With a wrench, remove end-cap (lamp access cover) for the lamp you wish to replace. Rotate counter-clockwise. **FIGURE 2**



FIGURE 2

3. Loosen the two lamp holder bracket screws holding the old lamp. **FIGURE 3** Twist and remove the lamp holder bracket. **FIGURE 4**

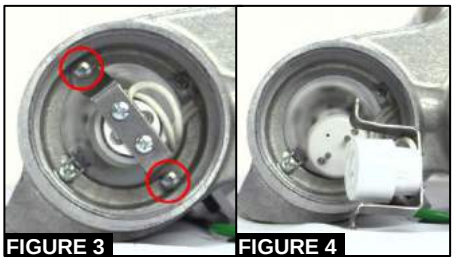
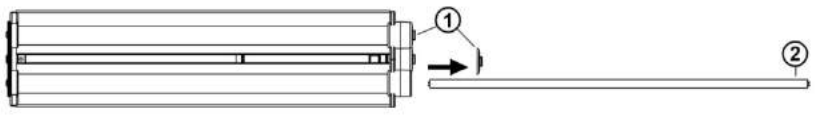


FIGURE 3 FIGURE 4

4. Remove the old lamp and install the new lamp, seating lamp in opposite lamp holder. **FIGURE 5**



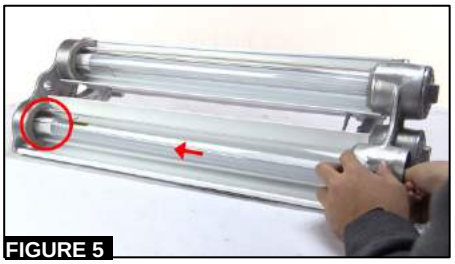


FIGURE 5

5. Replace lamp holder into position on the lamp. Twist slightly to place the lamp holder bracket under screw heads and tighten the screws. **FIGURE 3**

6. Reattach end-cap. Rotate clockwise. **FIGURE 6**



FIGURE 6



Series EXP-SNR-TG-EC-ITS-ALG-ALCH200

Explosion Proof Alcohol Sensor

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INTRODUCTION

COMPONENTS

ALCH200 Toxic Transmitter

The ALCH200 Toxic Transmitter is used to monitor for gas leaks near storage cylinders, process piping, or gas feed equipment in virtually any type of industrial plant environment. The transmitter housing is explosion proof, and is rated for use in hazardous locations (see specifications). The transmitter features an Smart Sensor, a non-intrusive four button user interface with a back-lighted graphics display, three level alarm system with three (optional) alarm relays, high-resolution 4-20mA current loop output, real-time clock, data-logger, and optional HART™ or Modbus™ communication interface. In addition, the transmitter offers several optional gas generators for automatic, timed testing of sensors.

Smart Sensor and Gas Generator

Smart Sensors and generators contain non-volatile memory to store information about the target gas they were designed to monitor, or generate. They contain general information about the target gas, such as the name, range, units, alarm settings, along with specific calibration information, such as response to gas, mA-Hr of usage, and calibration history. Information is transferred into the transmitter at startup, and whenever one of the components is inserted into a live transmitter. Because all calibration data is stored in the memory, sensor modules may be calibrated using a spare transmitter in the shop, and subsequently installed into a field transmitter, eliminating the need for field calibration.

Sensors and generators plug into the external housing at the base of the transmitter. They are easily removed, and installation is simplified by way of molded carrier that aligns each connector for a perfect fit. Once installed, a ¼ turn locking ring secures the carrier in place. Simply install the sensor and generator into the carrier (1), slide it onto the alignment pins (2), and twist the ring ¼ turn counter clockwise (3).

Sensors and generators are designed for use in ambient air at temperatures of -30° to +60° C, at a relative humidity between 20 and 98 %RH (some sensors are rated to -40° C, oxygen sensors are rated to -10° C).

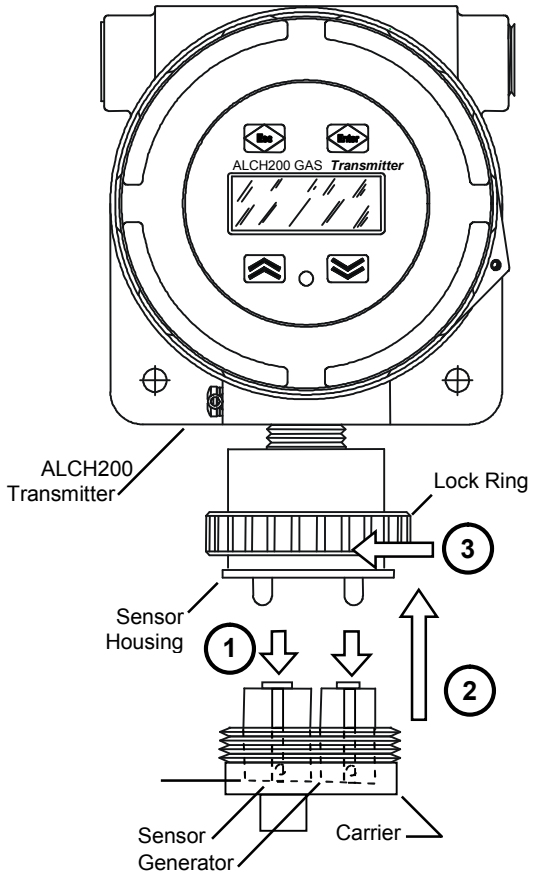


Figure 1. Transmitter, sensor, generator (carrier shown rotated 90° for clarity).

	Operating sensors in extremely dry air or in condensing gas streams is not recommended.

Table 1. Smart Sensors

Gas	Part No.	Standard Range	Minimum Range	Maximum Range
GENERAL GASES				
Acetylene		0-200 PPM	0-50 PPM	0-500 PPM
Alcohol		0-200 PPM	0-50 PPM	0-500 PPM
Alcohol		0-500 PPM	0-500 PPM	0-2000 PPM
Ammonia		0-100 PPM	0-50 PPM	0-500 PPM
Ammonia		0-1000 PPM	0-500 PPM	0-2000 PPM
Carbon Monoxide		0-100 PPM	0-50 PPM	0-1000 PPM
Dimethylamine (DMA)		0-100 PPM	0-100 PPM	0-200 PPM
Ethylene Oxide		0-20 PPM	0-20 PPM	0-200 PPM
Formaldehyde		0-20 PPM	0-20 PPM	0-200 PPM
Formaldehyde		0-1000 PPM	0-500 PPM	0-2000 PPM
Hydrogen		0-2000	0-500 PPM	0-2000 PPM
Hydrogen		0-4 %	0-1%	0-10 %
Nitric Oxide		0-100 PPM	0-50 PPM	0-500 PPM
NOx		0-200 PPM	0-50 PPM	0-500 PPM
Oxygen		0-25%	0-10%	0-25%
Phosgene		0-1 PPM	0-1 PPM	0-5 PPM
Phosgene		0-100 PPM	0-5 PPM	0-100 PPM
OXIDANT GASES				
Bromine		0-1 PPM	0-1 PPM	0-5 PPM
Bromine		0-10 PPM	0-5 PPM	0-200 PPM
Chlorine		0-1 PPM	0-1 PPM	0-5 PPM
Chlorine		0-10 PPM	0-5 PPM	0-200 PPM
Chlorine Dioxide		0-1 PPM	0-1 PPM	0-5 PPM
Chlorine Dioxide		0-10 PPM	0-5 PPM	0-200 PPM
Chlorine Dioxide		0-1000 PPM	0-200 PPM	0-1000 PPM
Chlorine Dioxide		0-1 PPM	0-1 PPM	0-5 PPM
Fluorine		0-1 PPM	0-1 PPM	0-5 PPM
Fluorine		0-10 PPM	0-5 PPM	0-200 PPM
Hydrogen Peroxide		0-10 PPM	0-10 PPM	0-200 PPM
Hydrogen Peroxide		0-1000 PPM	0-200 PPM	0-2000 PPM
Iodine		0-1 PPM	0-1 PPM	0-5 PPM
Iodine		0-10 PPM	0-5 PPM	0-200 PPM
Ozone		0-1 PPM	0-1 PPM	0-5 PPM
Ozone		0-10 PPM	0-5 PPM	0-200 PPM
Ozone		0-1000 PPM	0-200 PPM	0-1000 PPM

(continued on next page)

ACID GASES				
Hydrogen Bromide		0-20 PPM	0-10 PPM	0-200 PPM
Hydrogen Chloride		0-10 PPM	0-10 PPM	0-200 PPM
Hydrogen Cyanide		0-10 PPM	0-10 PPM	0-200 PPM
Hydrogen Fluoride		0-10 PPM	0-10 PPM	0-200 PPM
Hydrogen Sulfide		0-50 PPM	0-10 PPM	0-500 PPM
Hydrogen Sulfide		0-500 PPM	0-200 PPM	0-1000 PPM
Nitrogen Dioxide		0-10 PPM	0-10 PPM	0-200 PPM
Sulfur Dioxide		0-10 PPM	0-10 PPM	0-200 PPM
General Acid Gases		0-10 PPM	0-10 PPM	0-200 PPM
HYDRIDE GASES				
Arsine		0-1000 PPB	0-500 PPB	0-2000 PPB
Arsine		0-10 PPM	0-10 PPM	0-200 PPM
Diborane		0-1000 PPB	0-500 PPB	0-2000 PPB
Diborane		0-10 PPM	0-10 PPM	0-200 PPM
Germane		0-1000 PPB	0-500 PPB	0-2000 PPB
Germane		0-10 PPM	0-10 PPM	0-200 PPM
Hydrogen Selenide		0-1000 PPB	0-500 PPB	0-2000 PPB
Hydrogen Selenide		0-10 PPM	0-10 PPM	0-200 PPM
Phosphine		0-1000 PPB	0-500 PPB	0-2000 PPB
Phosphine		0-10 PPM	0-10 PPM	0-200 PPM
Phosphine		0-1000 PPM	0-200 PPM	0-2000 PPM
Silane		0-10 PPM	0-10 PPM	0-200 PPM
Silane		0-1000 PPB	0-500 PPB	0-2000 PPB

*Corresponding gas generator available for standard range of sensor, and lower.

SPECIFICATIONS

Table 2. Specifications

Sensor Type	Electrochemical cell
Gas Type	Select from list (see Table 1)
Range	User adjustable within limits of selected sensor (see Table 1)
Response Time	Sensor dependent
Accuracy	Generally ±10% of value, but limited by available calibration gas accuracy.
Repeatability	±1% (Electronic)
Linearity	±0.5% (Electronic)
Zero Drift	Less than 2% full scale per month
Span Drift	Dependent on operating environment but generally less than 3% per month
Analog Output	4-20 mA, 600 ohms max. at 24 VDC
Serial Interface	HART® (1200 baud modem interface), Modbus®1200-9600,14.4k, 28.8k – RS232 or RS485, user configurable)
Power	Class 2 power source as follows: Regulated 12 - 30 VDC; 25 mA maximum in loop-powered mode, 250 mA maximum in 3-wire mode.
Alarm Relays	Three SPDT relays: 5A @ 230 VAC resistive; 5A @ 30 VDC resistive
Relay Coil	Programmable either normally energized or normally de-energized
Enclosure	Explosion-proof, Class 1, Div. 1, Groups B, C, & D.
Auto-Test Option	Dependent on sensor gas type and programmed range (see Table 1)
Display	Graphics LCD, 96w x 32h, back-lighted in 3-wire mode
Controls	Four button, non-intrusive (magnetic switches); remote alarm reset input
Operating Temp.	-30° to +60° C (Min. temp. for O_2 sensor is –10° C)
Weight	4 Lbs (1.8 Kg.)

INSTALLATION

MECHANICAL MOUNTING

Transmitter

Figure 2 shows the dimensions of the transmitter enclosure and the location and size of the electrical conduit connection. In locations classified as hazardous, the transmitter housing must be earth grounded, and an explosion-proof seal must be installed as required by the local electrical code. The conduit or cable gland entry into the enclosure must be sealed. If conduit is used, it must also be sealed internally at the housing entry. This is required to prevent condensation from draining into the enclosure.

HAZARDOUS LOCATIONS

Connect housing to earth ground. Use explosion proof conduit, and seal it inside and out. Follow national, state, and local, electrical codes.

Seal conduit inside and out to keep out water.
Follow national, state, and local, electrical codes.

Secure the transmitter to a wall or flat surface through two mounting holes in the enclosure, as shown in Figure 2. If appropriate fasteners are used, the transmitter may be supported by conduit alone.

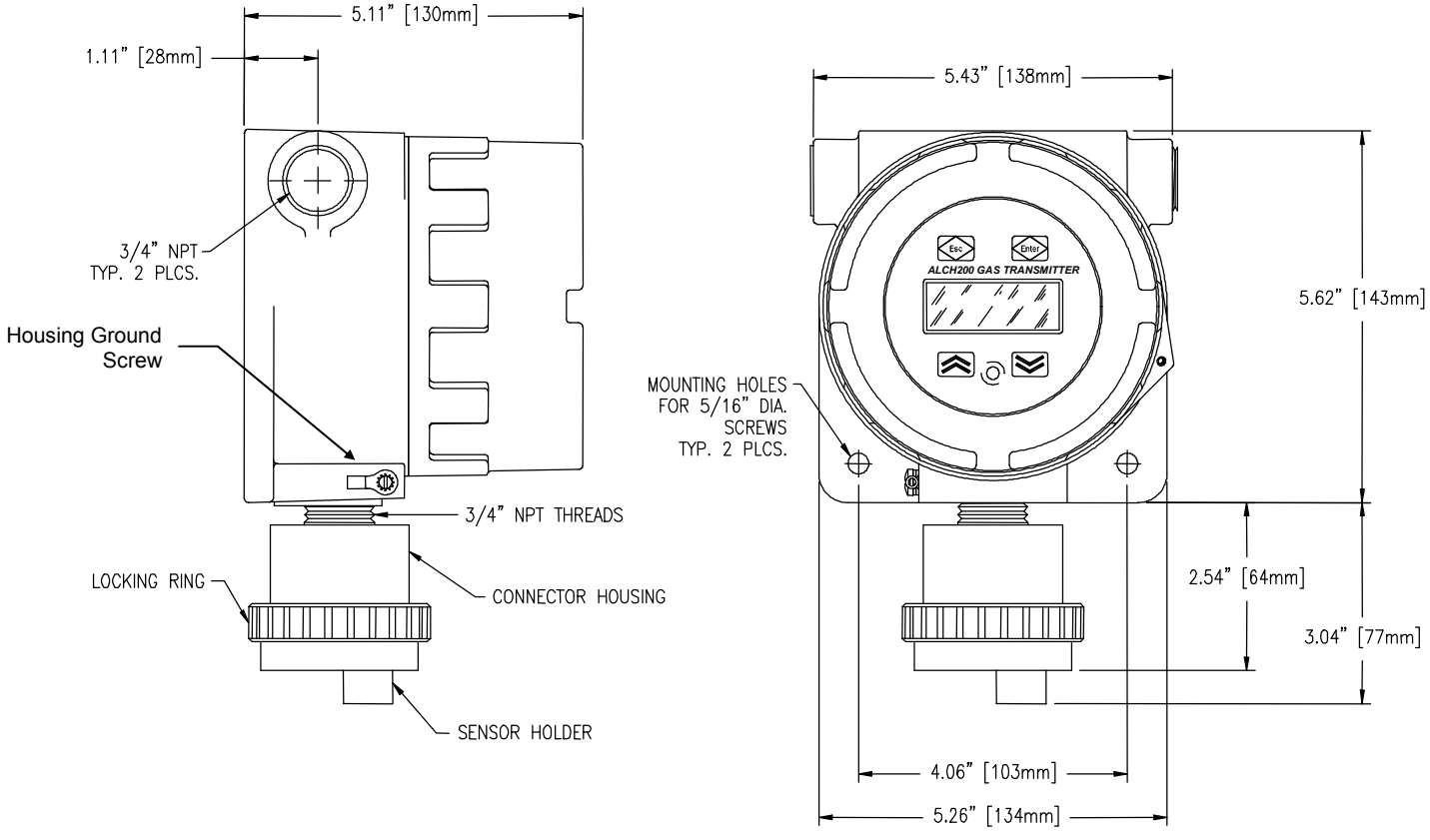


Figure 2. Overall dimensions

Sensor Duct-Mount Option

The sensor duct mount option allows Smart Sensors to be installed in a duct or pipe, and provides easy access to the sensor for service.

The assembly is comprised of a special sensor holder (Figure 3) that slides into the hollow duct mount adapter (Figure 4). The adapter has 1-1/2" MNPT threads on the insertion end, for securing it to the duct or pipe, and a barb fitting for supplying calibration gas to the sensor. An interface cable is provided to connect the sensor holder to the transmitter. Note that a mating flange for securing the adapter is not provided.

As shown in Figure 5, screw the adapter to the duct or pipe so the barb fitting is accessible to connect gas tubing. Once the adapter is in place, slide in the sensor holder, lock it in place, and connect the interface cable. It is recommended that the sensor not be installed in the holder until you are ready to start the transmitter. This is especially true during construction when excessive dust and dirt may be blowing through the duct system, and otherwise foul the sensor.

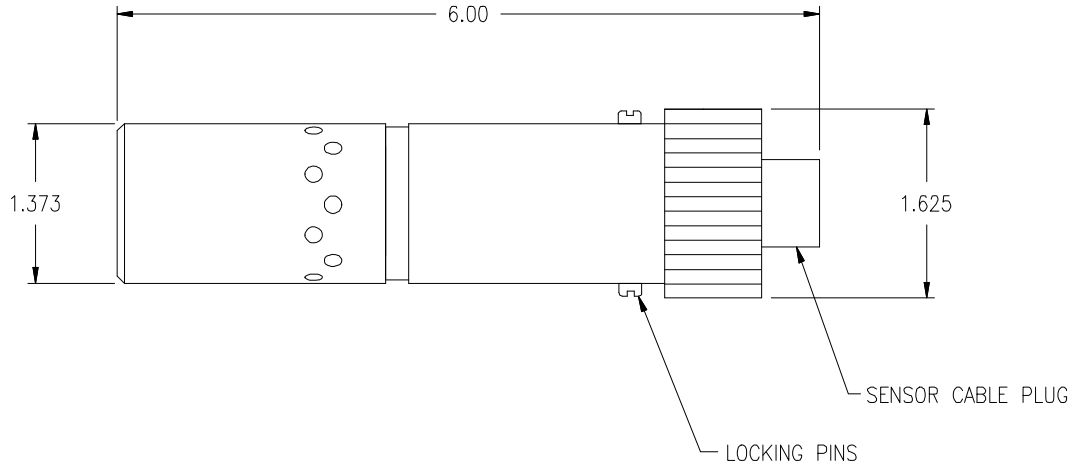


Figure 3. Duct-mount sensor holder

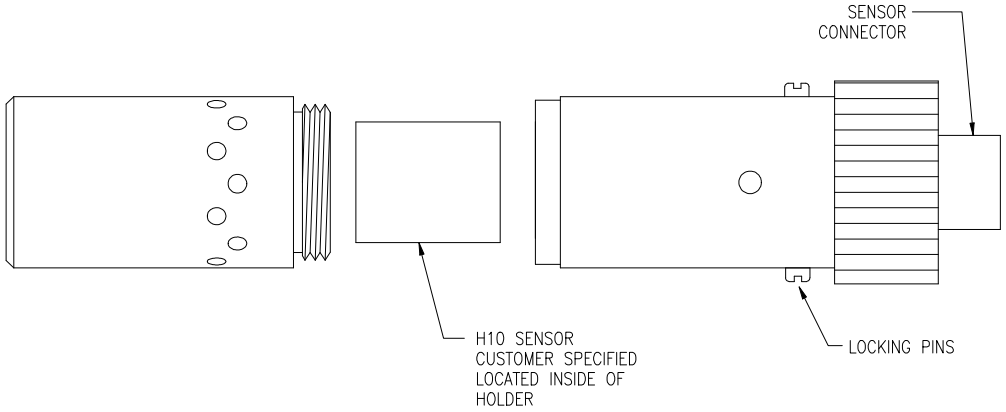


Figure 4 Duct Mount Sensor Exploded View

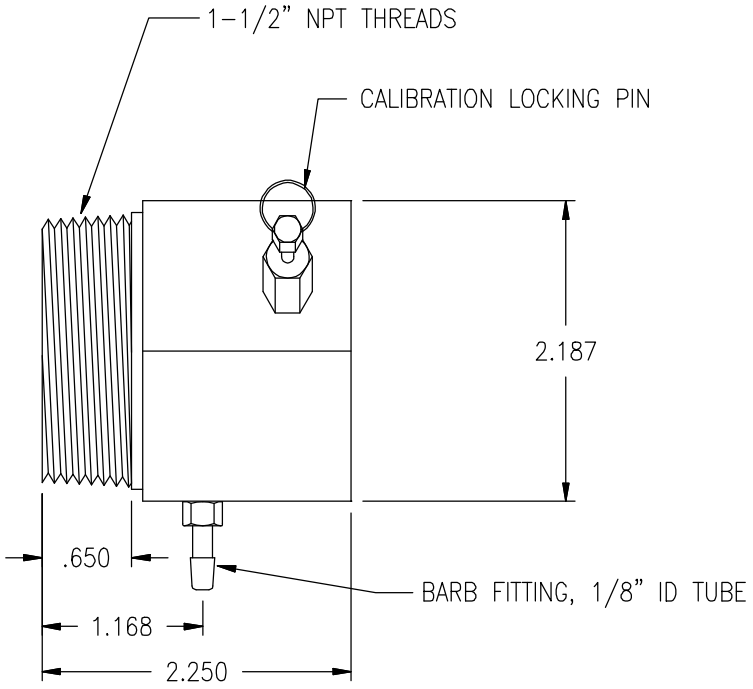


Figure 5. Duct-mount adapter

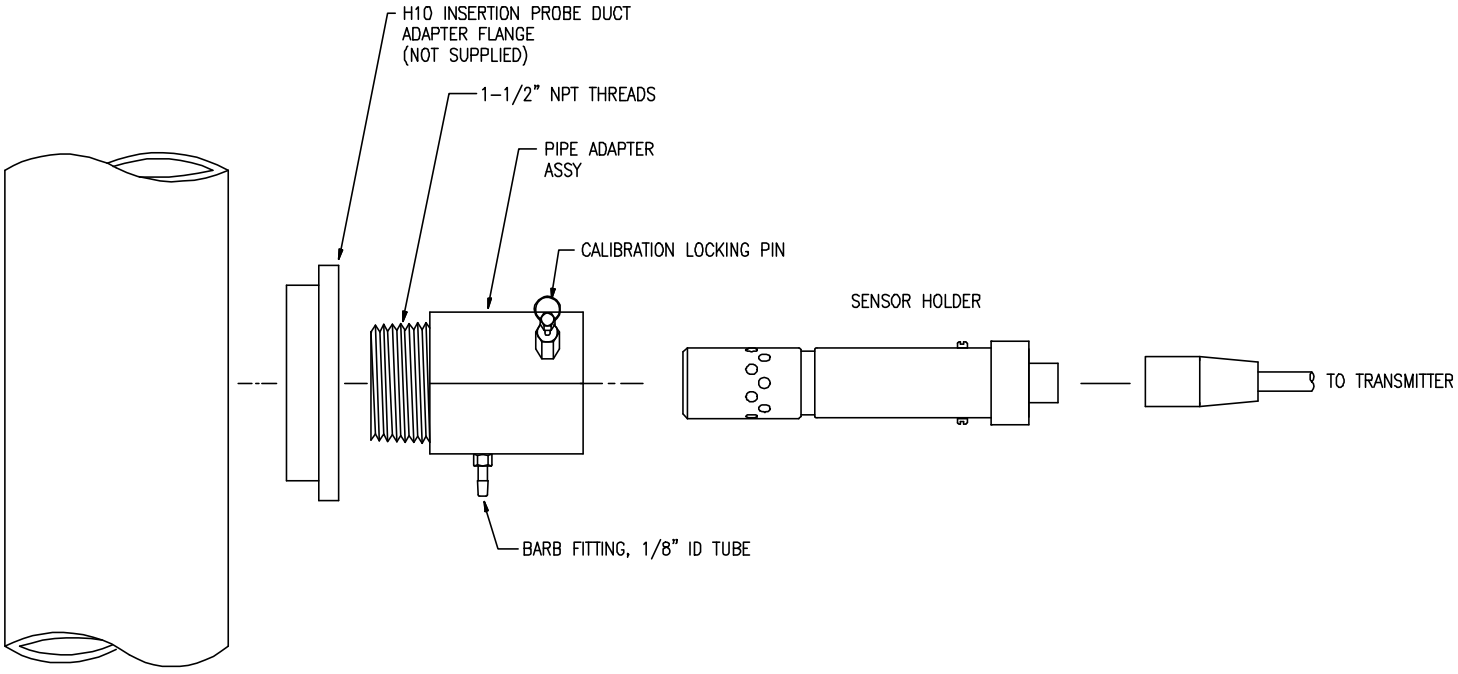


Figure 6. Duct-mount assembly

ELECTRICAL CONNECTIONS

Board Stack

The transmitter consists of four circuit boards, known collectively as the "stack". From top to bottom, they are the, Display, CPU, Isolation, and Power Supply boards. The top three boards, Display, CPU, and Isolation, are fastened together with metal standoffs, and plug into the Power Supply board, which is fastened to the lower housing with similar metal standoffs. Since most external wiring connections are made to terminals on the Power Supply board, it will be necessary to remove the top three boards.

	Please be aware of the hidden ribbon cable that connects the top three boards to the sensor. This cable is just long enough to permit the top boards to come free from the housing, but no further.	

To remove the top boards, unscrew the transmitter housing cover and turn off the power switch, SW5, located at the 12 o'clock position on the CPU board. Grasp the outer edge of the metal faceplate covering the Display board and gently rock it side to side, while pulling it up, and away from the housing. Once the top boards come free, lift them out and disconnect the sensor ribbon cable (note: this connector is keyed for ease of reconnecting later).

	Set switch SW5 to OFF before removing the upper board stack from the transmitter. Since SW5 does not disconnect power at the terminals of the Power Supply Board, declassify hazardous areas prior to opening the transmitter housing.	

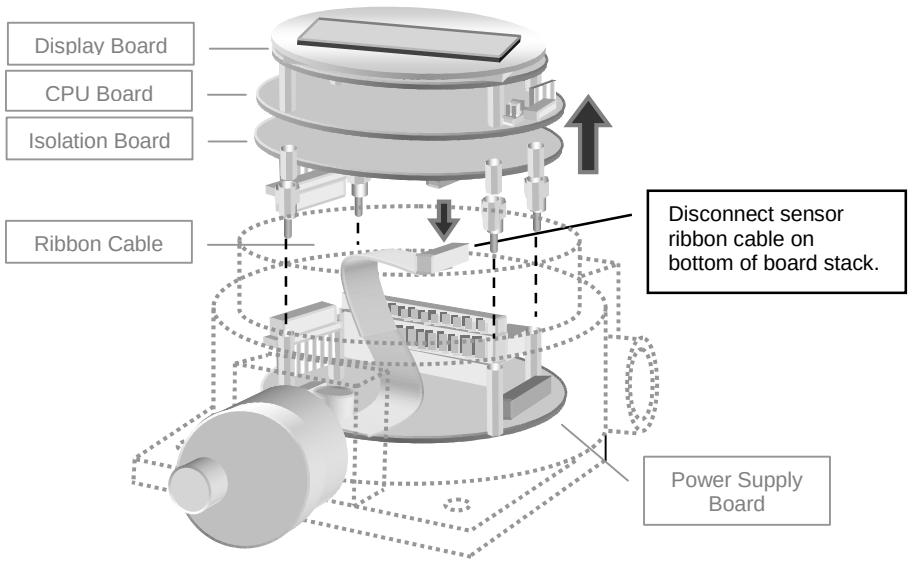


Figure 7. Separating the board stack

Power Supply Board Connections

Electrical connections are made to terminal blocks on the Power Supply board. Power, current loop, (optional) digital communications, and remote alarm reset, are connected at TB1. Connections to the three (optional) relays are made at TB2.

Current loop operation requires 12-30 VDC power supplied on the mA(+) terminal, from which the transmitter sources a 4-20mA current loop output signal on the mA(-) terminal. The transmitter can operate from current loop power alone, but without relays, LCD backlighting, and RS232/RS485 communications.

Loop-powered operation requires a maximum current of 25 mA, while transmitters wired in 3-wire mode will require a maximum of 250 mA, with all relays active. Power supplies operating multiple units should be sized for twice the calculated current requirement to allow for start-up inrush current requirements.

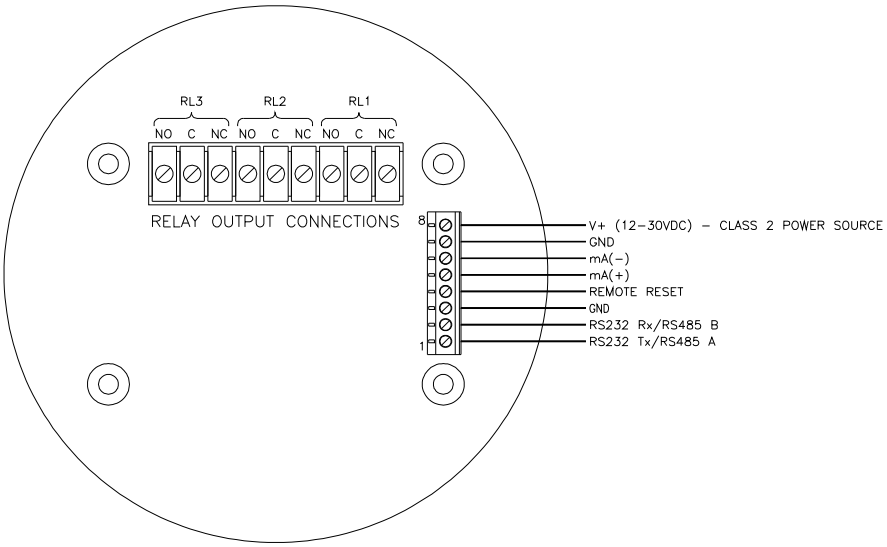


Figure 8. Power Supply Board Connections

The transmitter has limited space for wire; therefore, use the smallest gauge wire available that is compatible with electrical code and current requirements. When powering a group of transmitters in 3-wire mode from the same power supply, 12 AWG wire is recommended for long runs, with drops of higher gauge wire to each transmitter.

Internal relays are best used as pilot relays if heavy load switching is desired. Use suitable arc suppression devices across loads switched through internal relays.

The transmitter housing is normally grounded through explosion proof conduit. In the absence of such conduit, use a suitable grounding strap to bond the transmitter's housing to earth ground.

Always follow wiring practices governed by local, state, and national electrical codes.

External Connections

A17/B14 Monitor(s), 2-Wire Mode

ALCH200 (toxic gas) transmitters may be connected in 2-wire mode to an A17/B14 receiver system. In 2-wire mode, transmitters will not include alarm relays, LCD backlighting, or RS232/RS485 communication options. Consult the Power Supply and Receiver Module O&M manuals to properly size power supply requirements.

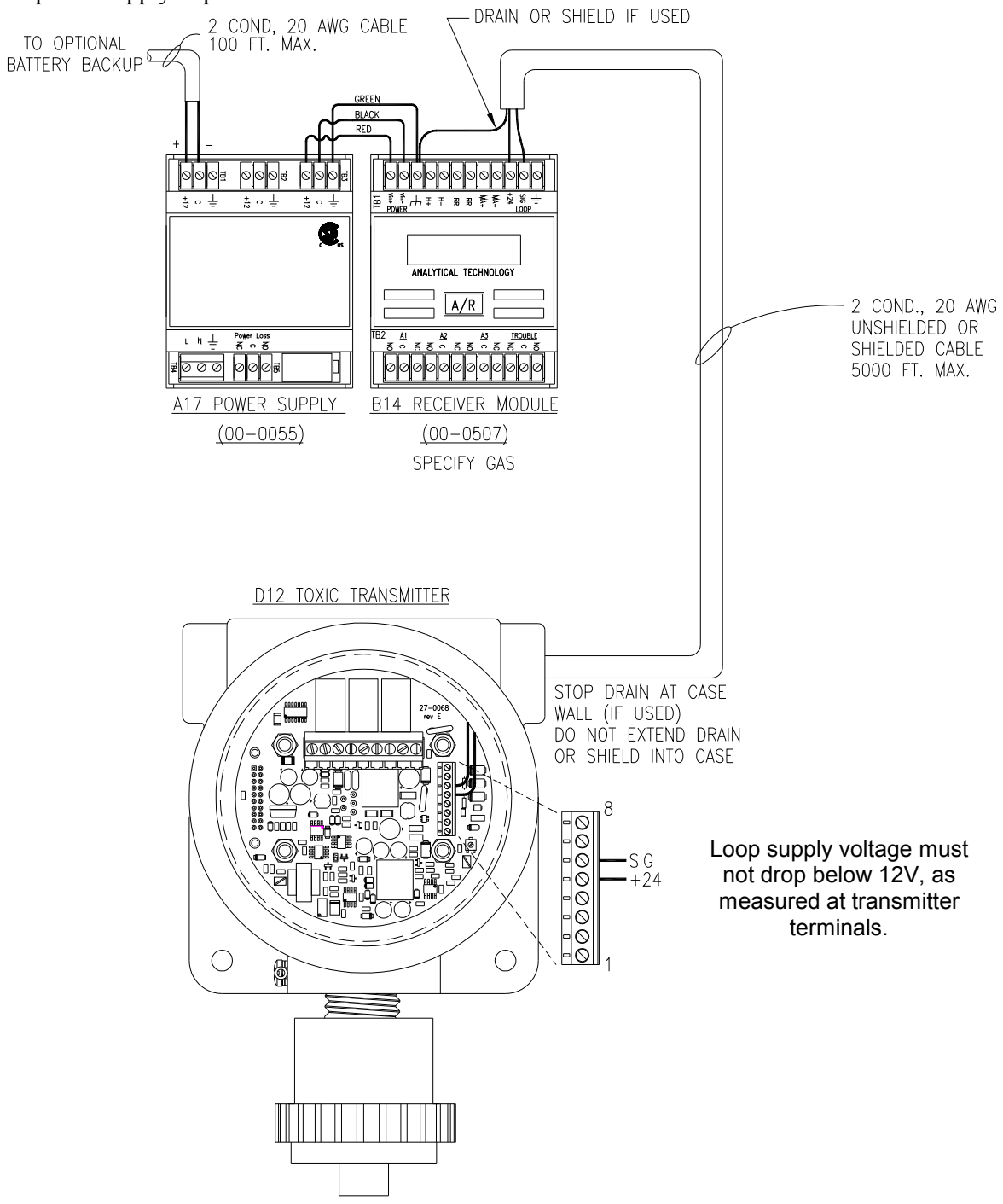


Figure 9. A17/B14 Monitors, 2-wire

A17/B14 Monitor(s), 3-Wire Mode

ALCH200 transmitters may be connected in 3-wire mode to an A17/B14 receiver system. In 3-wire mode, transmitters will include alarm relays, LCD backlighting, and RS232/RS485 communication options. Consult the Power Supply and Receiver Module O&M manuals to properly size the system power requirements.

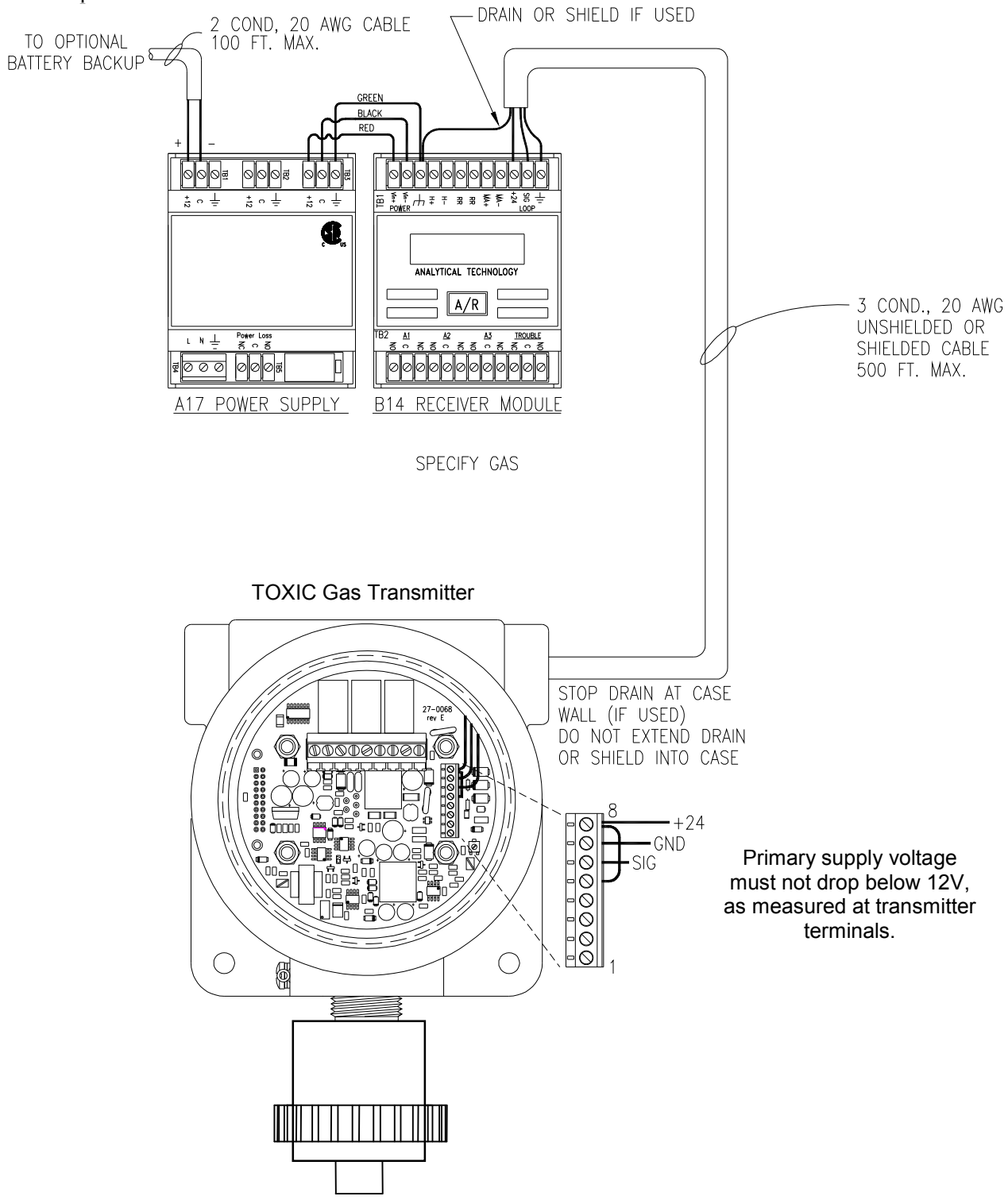


Figure 10. A17/B14 Monitor(s), 3-Wire Mode

Power Only, No Output Options

If there are no output options, transmitters may be powered from a single, primary supply as shown. Size each power supply according to the number of transmitters, the current demand of each (see specifications), and the wire resistance. The wire resistance must not be allowed to drop the primary supply voltage below 12V at the primary supply terminals of any transmitter. Hint: If possible, use 12-14 AWG wire on primary supply connections (shown in bold), keep the number of transmitters low, and verify the voltage on the on the transmitter furthest from the supply.

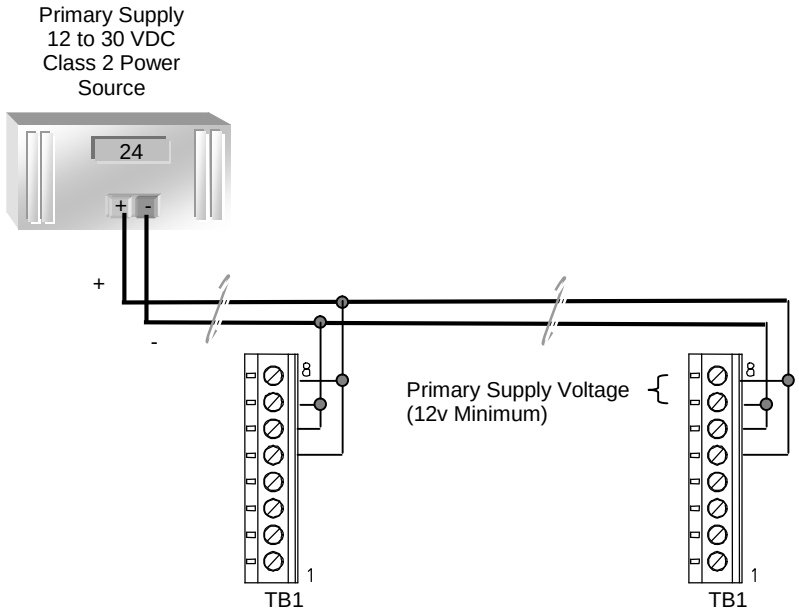


Figure 11. Power Only, No Output Options

Current Loop Receiver, Single Supply (2-Wire Mode)

The transmitter will source current to a loop receiver in 2-wire mode, as shown. A single power supply provides loop power, which is sufficient to power the transmitter, but without relays, LCD backlighting, and RS232/RS485 communications. Size each power supply according to the number of transmitters, the loop powered current demand of each (see specifications), and the wire resistance. The wire resistance must not be allowed to drop the Loop Supply Voltage below 12V at the terminals of any transmitter.

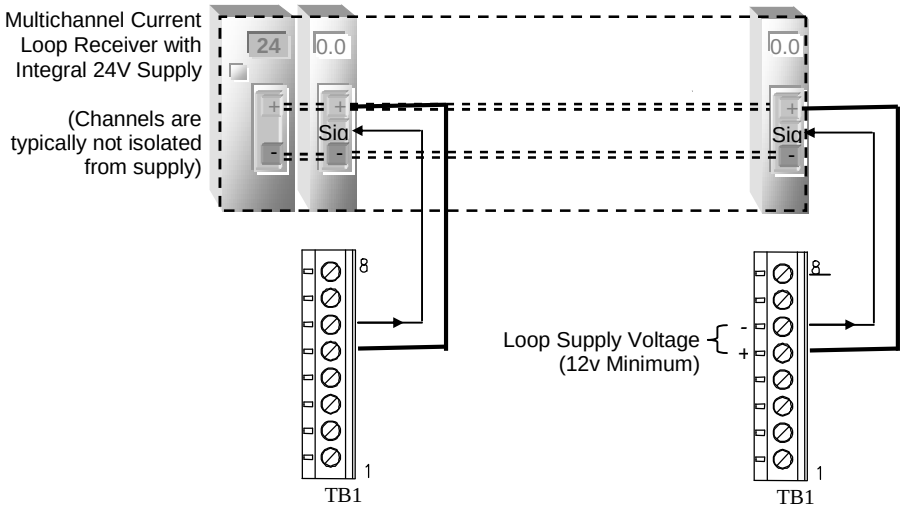


Figure 12. Current Loop Receiver, Single Supply (2-Wire Mode)

Current Loop Receiver, Single Supply (3-Wire Mode)

The transmitter will source current to a loop receiver as shown. A single power supply provides both primary and loop power to the transmitter. Size each power supply according to the number of transmitters, the current demand of each (see specifications), and the wire resistance. The wire resistance must not be allowed to drop the Primary Supply Voltage below 12V at the terminals of any transmitter. Hint: if possible, use 12-14 AWG wire on supply connections (shown in bold).

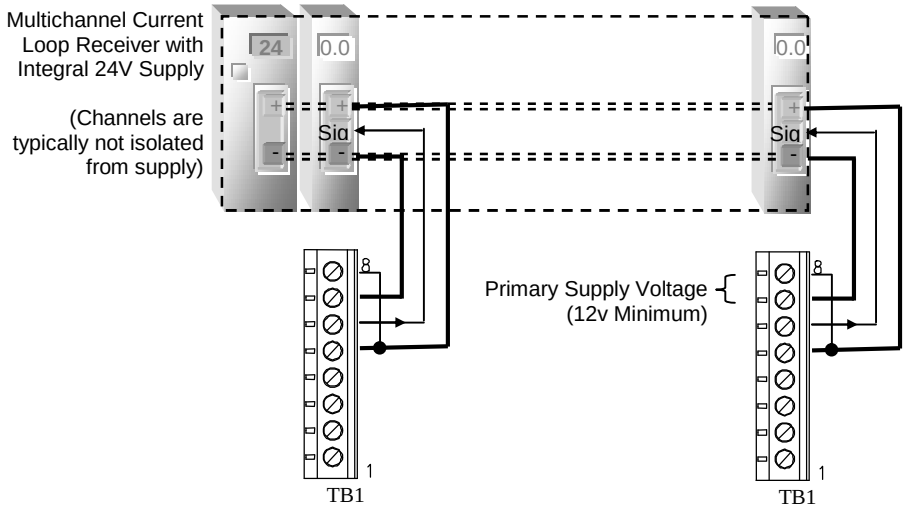


Figure 13. Current Loop Receiver, Single Supply (3-Wire Mode)

Current Loop Receiver, Dual Supplies (4-Wire Mode)

To reduce the power requirement of a single current loop supply, the transmitter may be powered from both a primary and loop supply, providing the following conditions are met.

1. Supply grounds are directly connected to minimize ground loops, and,
2. The Primary Supply Voltage is at least 12V, and must be equal to, or exceed, the Loop Supply Voltage, as measured at instrument terminals.

Size each power supply according to the number of transmitters, the current demand of each (see specifications), and the wire resistance. The wire resistance must not be allowed to drop the Primary Supply Voltage below the Loop Supply Voltage, which must be at least 12V, as measured at the terminals of any transmitter. Hint: select a Primary Supply with a higher voltage output than the Loop Supply, and use 12-14 AWG wire, if possible. Keep the number of transmitters supplied by the Primary Supply low, and verify the voltages at the terminals of the transmitter furthest from the Primary Supply.

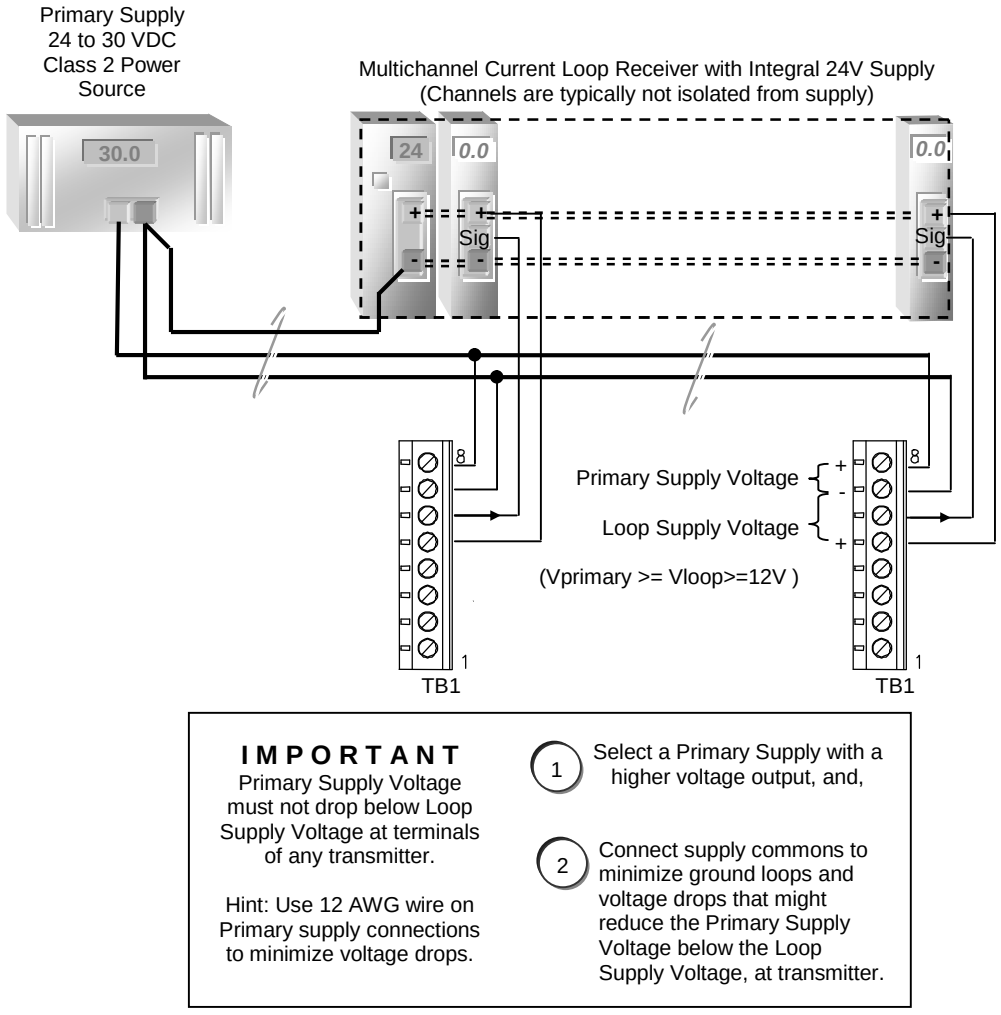


Figure 14. Current Loop Receiver, Dual Supplies (4-Wire Mode)

HART Transmitter, Point-to-Point (2-Wire)

The HART "Point-to-Point" connection permits the transmitter to communicate digitally, while retaining the functionality of its 4-20mA current loop. Setting the transmitter's polling address to 0 permits the current loop to function normally. According to HART specifications, the current loop must be terminated with a load resistor between 230 and 1100 ohms; however, transmitter specifications restrict the maximum analog output resistance to a lower value (see Specifications). The term, "active source", refers to a transmitter that is not loop powered, and sources current from power applied to it on separate terminals. Size the power supply according to the number of transmitters, the current demand of each transmitter (see specifications), and wire resistance. Wire resistance must not be allowed to drop the Primary Supply Voltage below 12V at the terminals of any transmitter. Hint: use at least 14 AWG wire on supply connections (shown in bold).

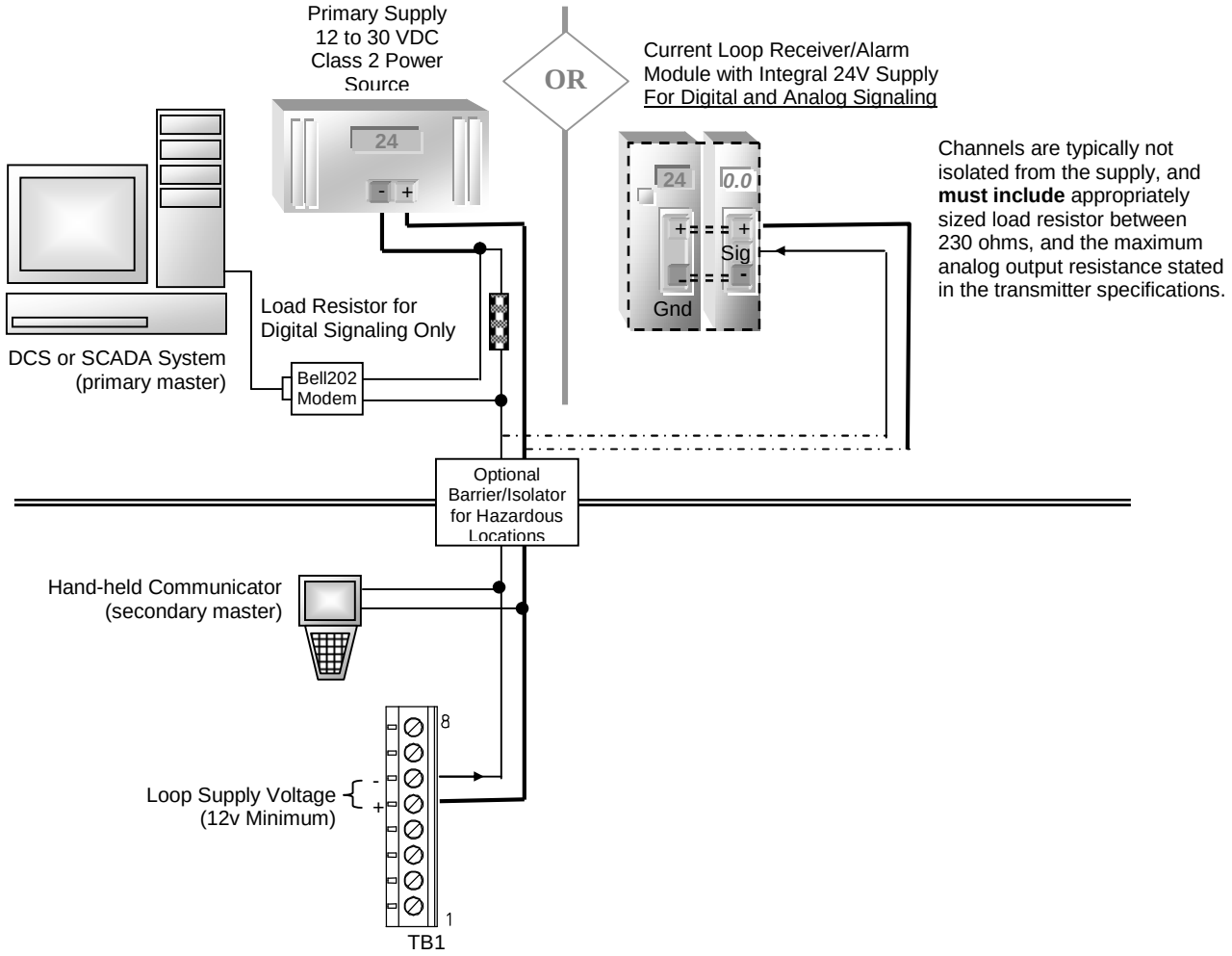


Figure 15. HART Transmitter Operation, Point-to-Point (2-Wire)

HART Transmitter, Point-to-Point, Active Source (3-Wire)

The HART "Point-to-Point" connection permits the transmitter to communicate digitally, while retaining the functionality of its 4-20mA current loop. Setting the transmitter's polling address to 0 permits the current loop to function normally. According to HART specifications, the current loop must be terminated with a load resistor between 230 and 1100 ohms; however, transmitter specifications restrict the maximum analog output resistance to a lower value (see Specifications). The term, "active source", refers to a transmitter that is not loop powered, and sources current from power applied to it on separate terminals. Size the power supply according to the number of transmitters, the current demand of each transmitter (see specifications), and wire resistance. Wire resistance must not be allowed to drop the Primary Supply Voltage below 12V at the terminals of any transmitter. Hint: use at least 14 AWG wire on supply connections (shown in bold).

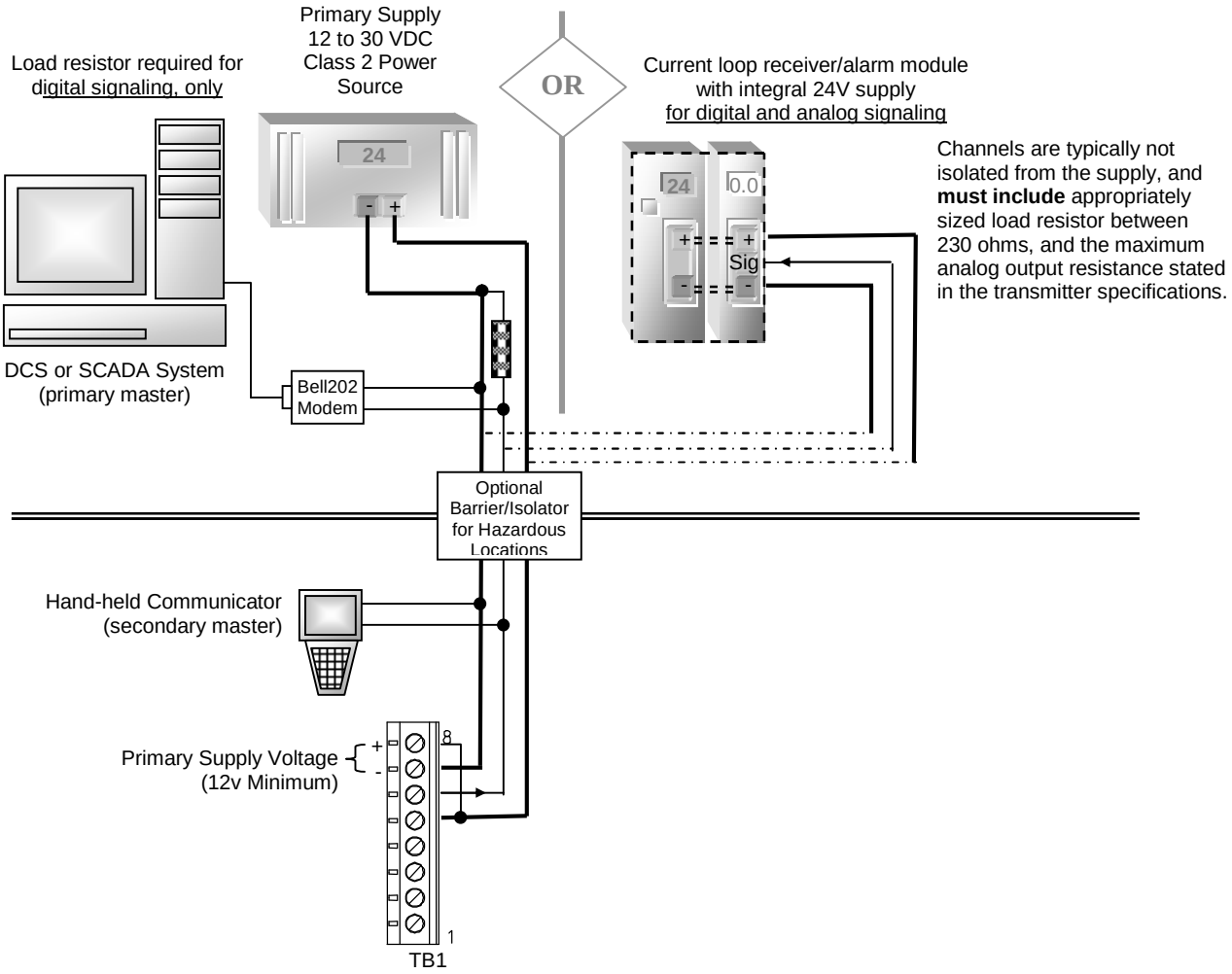


Figure 16. HART Transmitter Operation, Point-to-Point (3-Wire)

The HART multi-drop connection permits up to 15 transmitters to communicate digitally on the same bus, but at the cost of analog current signaling. Setting the transmitter's polling address from 1 to 15 fixes the current loop output at 4mA. According to HART specifications, the current loop must be terminated with a load resistor between 230 and 1100 ohms; however, transmitter specifications restrict the maximum analog output resistance to a lower value (see Specifications). The term, "active source", refers to a transmitter that is not loop powered, and sources current from power applied to it on separate terminals. Size the power supply according to the number of transmitters, the current demand of each transmitter (see specifications), and wire resistance. Wire resistance must not be allowed to drop the Primary Supply Voltage below 12V at the terminals of any transmitter. Hint: use at least 14 AWG wire on supply connections (shown in bold).

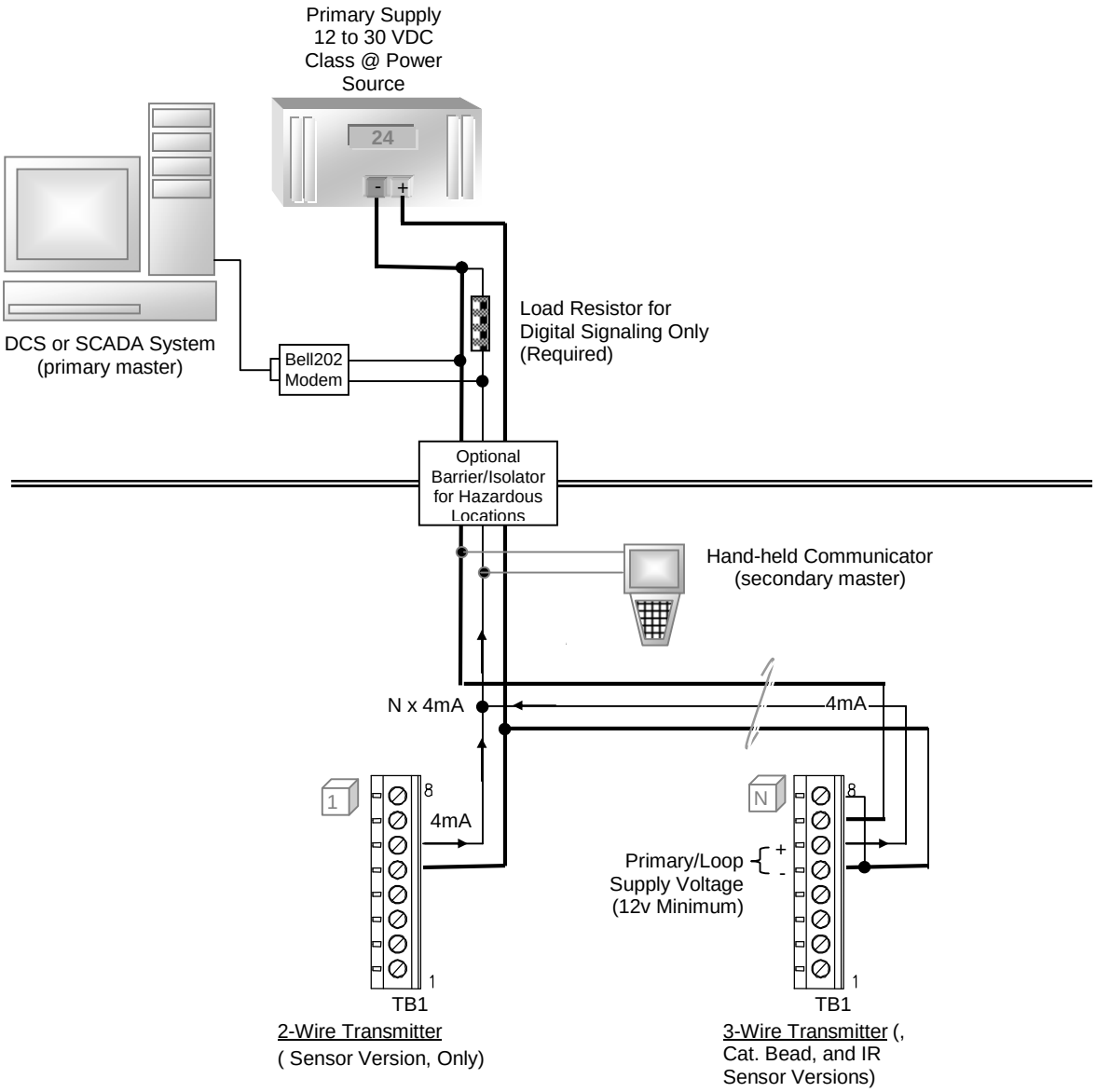


Figure 17. HART Transmitter Operation, Multi-drop Loop Powered (2-Wire) and Active Source (3-Wire)

Modbus RS485 Multi-drop

RS485 operation requires the transmitter to be wired in 3- or 4- wire mode. Modbus permits up to 247 devices to communicate digitally on the same bus; however, RS485 limits this to 32. Request the ALCH200 Transmitter Modbus Interface Manual for complete details on the Modbus interface.

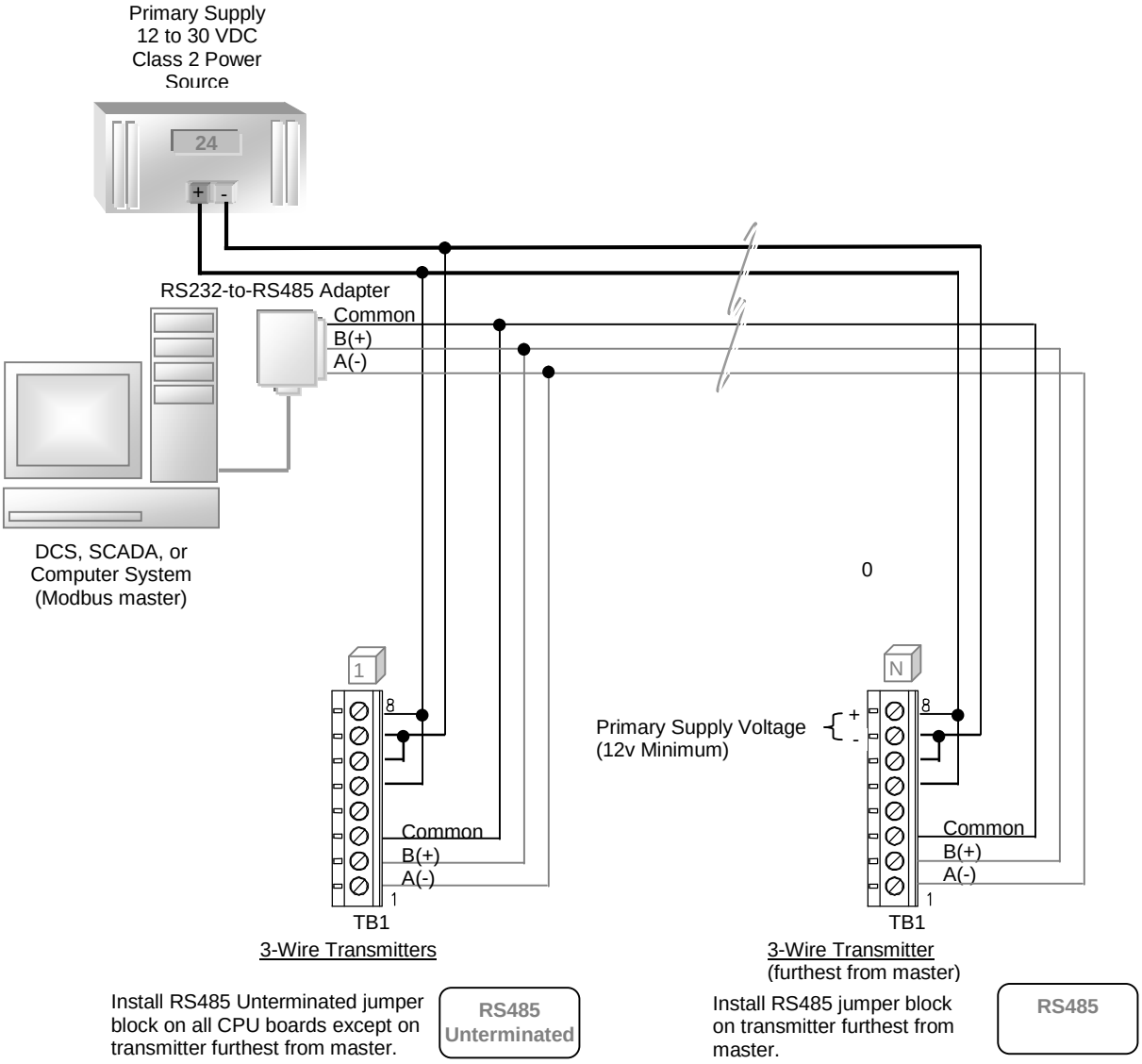


Figure 18. Modbus RS485 multi-drop connections

Computer RS232

RS232 operation requires the transmitter to be wired in 3- or 4- wire mode. See Printing Data Log Reports in Appendix A.for details on sending the data log to a printer or computer. Request ALCH200 Transmitter Modbus Interface Manual for complete details on the Modbus interface.

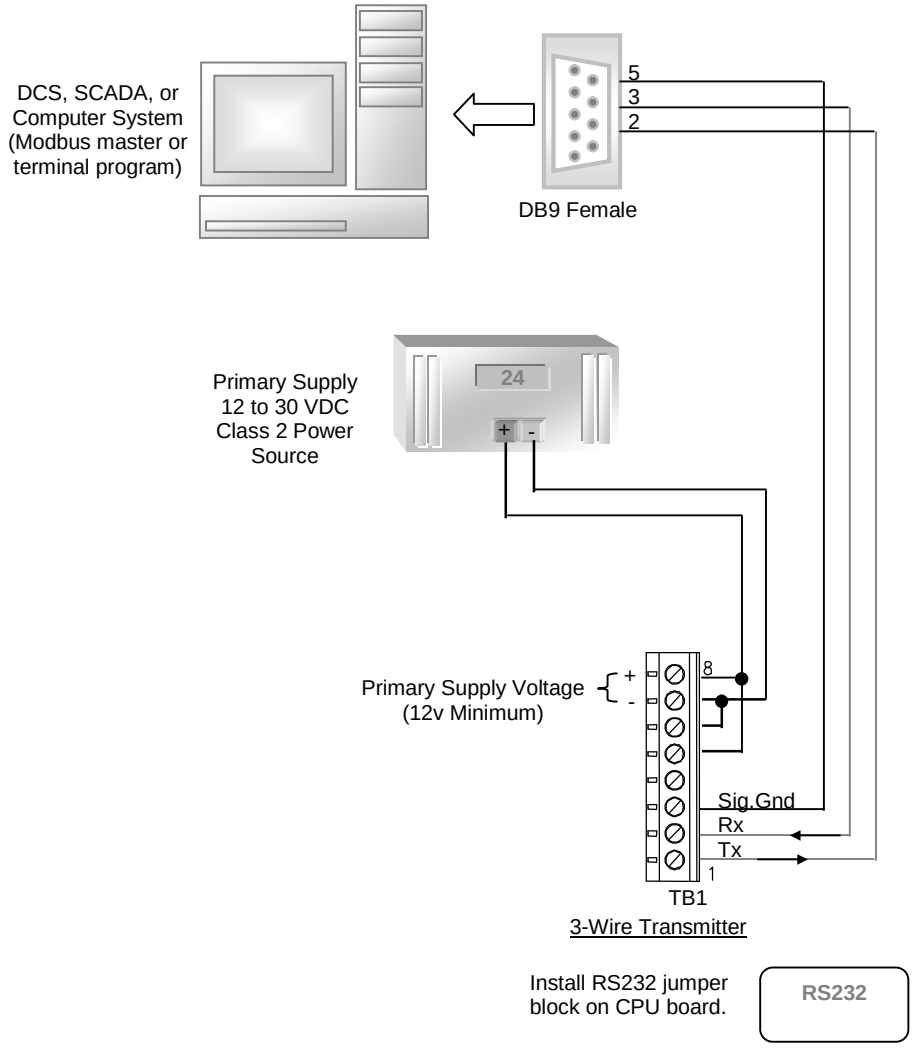
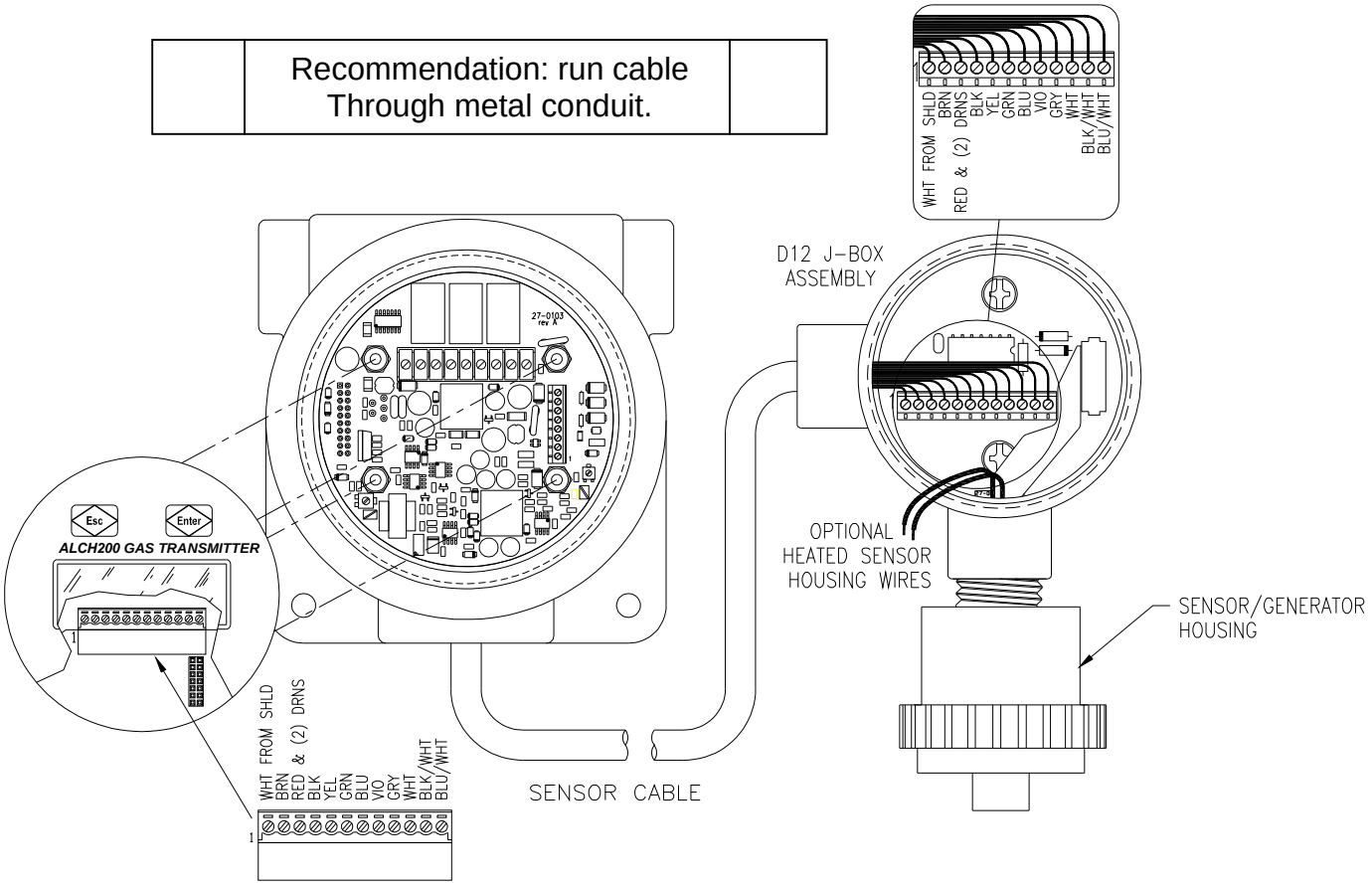


Figure 19. Computer RS232

Remote Sensor Wiring

The figure below shows the wiring of the remote sensor option, which allows separation of the transmitter and sensor by up to 50 feet. Interconnect cable is sold separately. Connections are made to terminal blocks in the transmitter and J-box (junction box) assembly. The sensor/generator housing is threaded into the J-box, and connected to a 14-position header. Do not allow exposed wires contact each other, the printed circuit boards, or any components.



NOTE: When Optional Heated Sensor housing is ordered, 2 Cond. Wire must be used to Connect from Junction Box to Transmitter or External 24V power Source. can supply 2 Cond. 20 Awg wire our part # (31-0008) sold as /ft. if requested. If connected as a 2-wire device an customer supplied 24V power source must be used to supply voltage required to make heater circuit functional. A 3 or 4-wire device can be hooked to the transmitter as shown in Fig 22 on page 27.

Figure 20 - Remote Sensor Wiring

Duct-Mount Sensor Wiring

The figure below shows the wiring of the sensor duct-mount option, which allows the sensor to be installed inside of a duct or pipe. The cable plugs into the rear of the sensor holder, and connects to a terminal block in the transmitter. Do not allow exposed wires contact each other, the printed circuit boards, or any components.

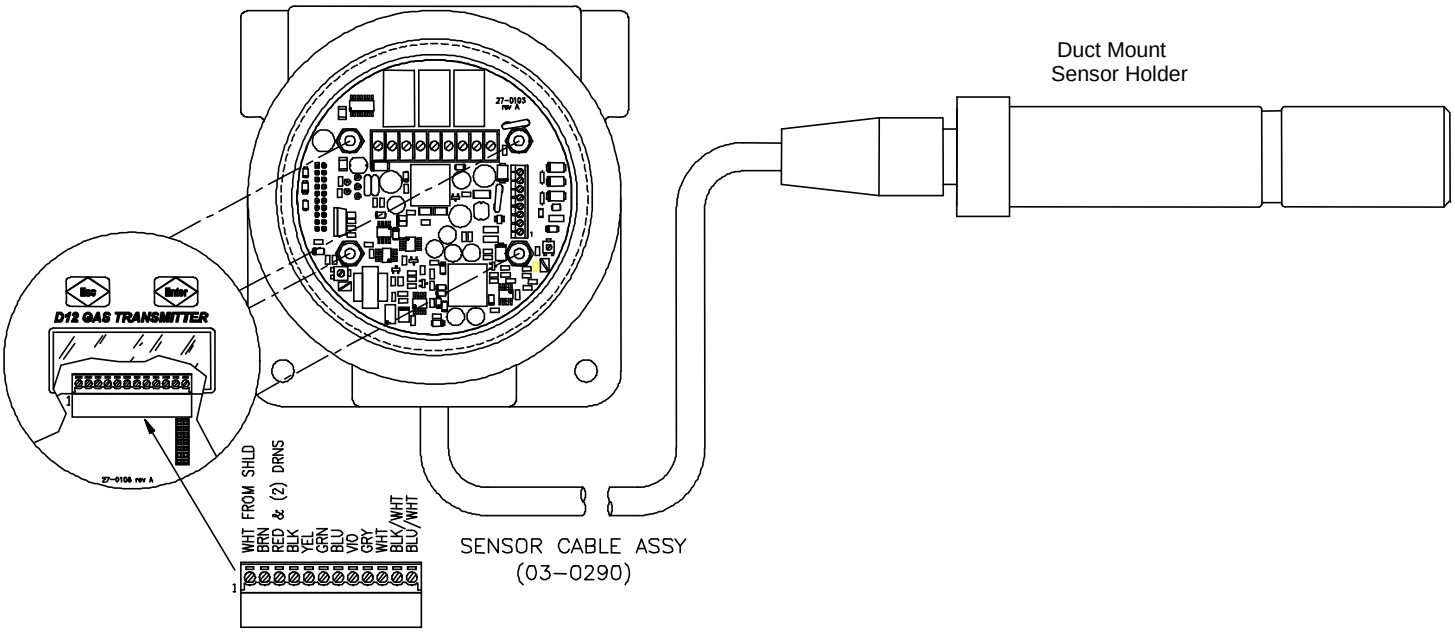


Figure 21 - Duct Mount Wiring

Heater Option for Sensor/Generator Housing

The heater should be supplied with 24VDC to provide approximately 5.8W to the housing. This may be derived from the transmitter supply in 3-wire mode, as shown below, or from a separate power supply. Heater leads are polarity insensitive.

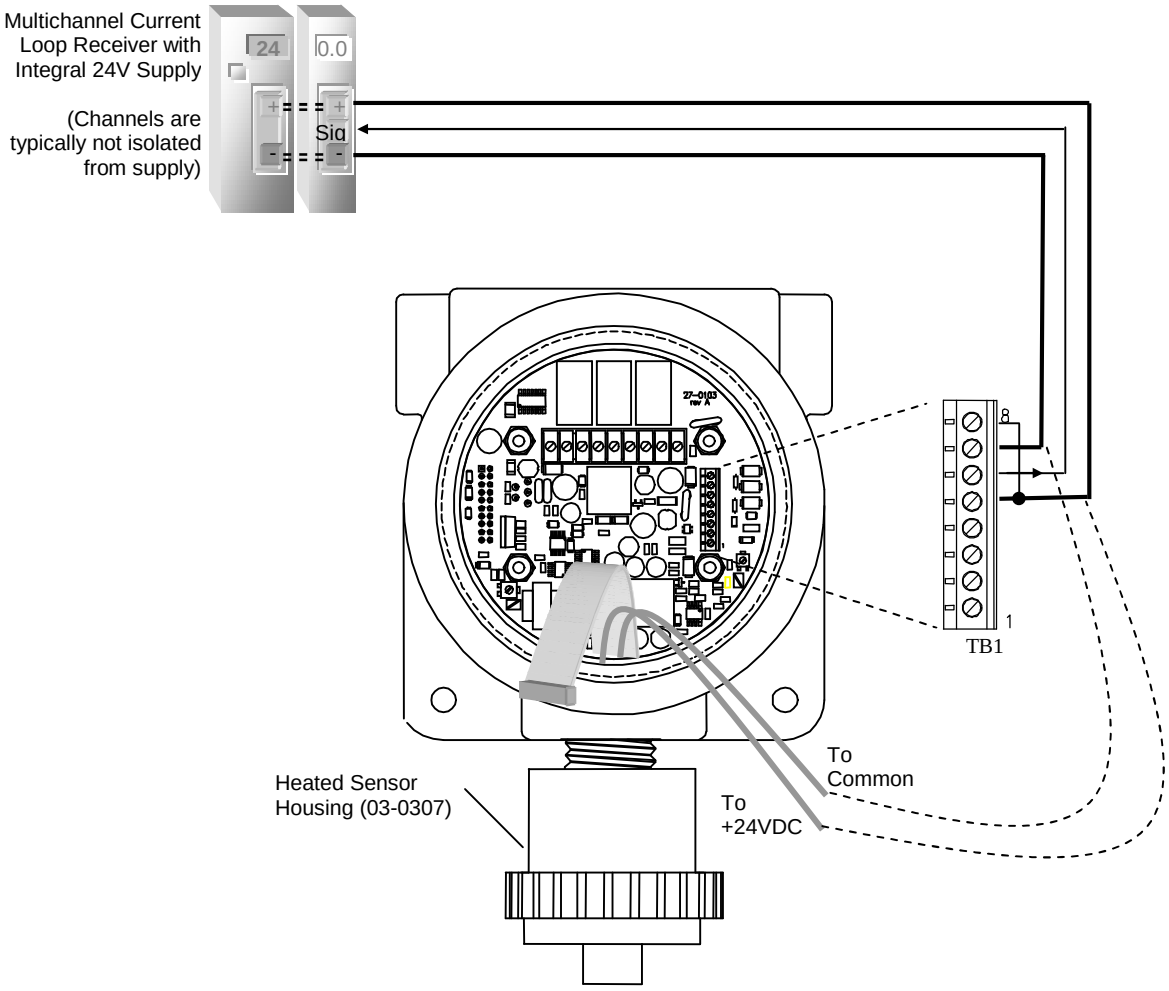


Figure 22 - Optional Heated Sensor Wiring

CPU Board Configuration

Install one jumper plug on JP4 as prescribed by communication interface.

If equipped with relays, install the relay option jumper on pins 3-4 of JP1.

Set switch SW5 to ON before replacing the housing cov

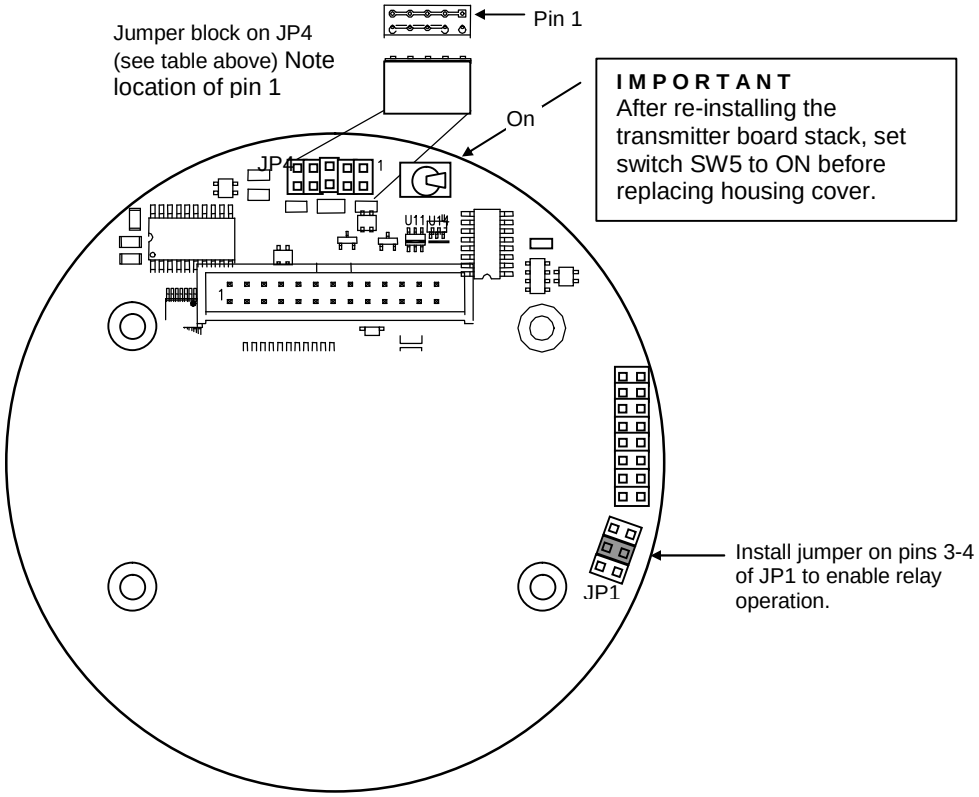


Figure 23. CPU Board configuration

Table 3. Communication option jumpers

Protocol	Interface	Jumper Plug Label	Comments
HART	Bell 202	N/A	No plug required (okay to install any)
Modbus	RS232	"RS232"	Use to connect one transmitter to a master device in a "point-to-point" configuration. See "ALCH200 Modbus Manual" for details.
Modbus	RS485	"RS485"	Use to connect up to 4 transmitters to a master device in a "multi-drop" configuration. Each transmitter connection biases and terminates the transmission line, as shown below. See "ALCH200 Modbus Manual" for details.
Modbus	RS485	"RS485 Unterminated"	Use to connect more than 4 transmitters to a master device in a "multi-drop" configuration. Transmitters are connected without adding bias or termination. Install one (terminating) "RS485" jumper plug on transmitter at furthest end of transmission line. See "ALCH200 Modbus Manual" for details.
ASCII	RS232	"RS232"	Use to connect one transmitter to a printer, or system terminal (see Data logging section).

OPERATION

OPERATOR INTERFACE

Interface Panel

The ALCH200 operator interface is non-intrusive, so you do not have to remove the housing cover to view the display, configure the transmitter, or calibrate the sensor. It features a backlighted*, 96x32 dot LCD display, and four "keys". The keys are implemented as four magnetic switches, each centered below a graphic icon, and activated when a magnet is held approximately ¼" above the icon. The transmitter is provided with a powerful, magnetic-screwdriver, designed specifically for activating the switches through the housing's thick, glass window. Throughout this manual, activating keys in this manner is referred to as, "touching" the keys, even though it is not necessary to make physical contact.

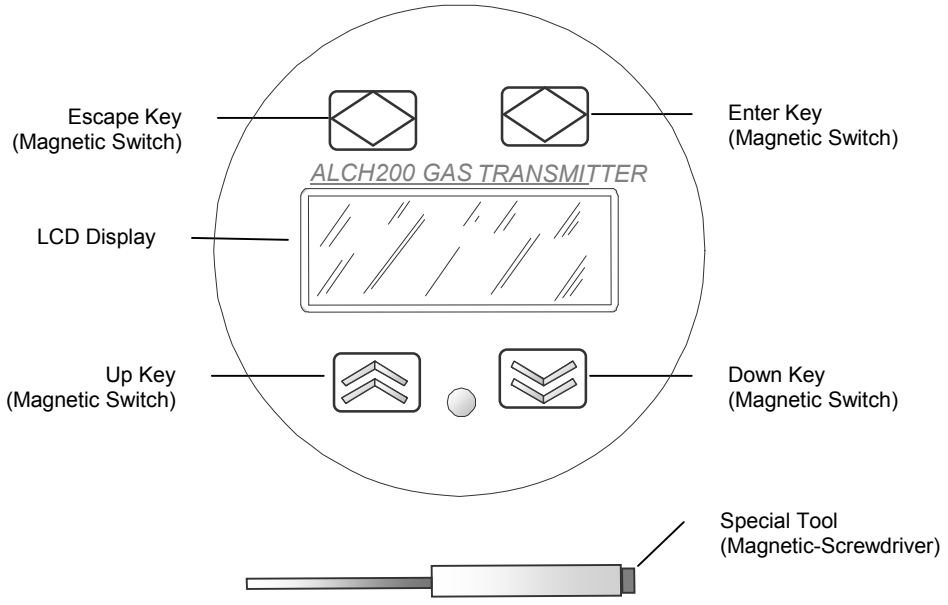


Figure 24. Operator interface panel

The operator interface is organized into pages that consist mostly of text objects representing readings, indicators, variables, functions, and links to other pages. Navigating the pages of objects is simplified through the use of a "point-and-click" interface, using an arrow cursor that may be moved from one object to the next by "touching" the up or down key. While the cursor is "pointing" at an object, touching the magnet to the Enter key is said to "select" the object, and the action performed depends on the type of object. If the object is a function, the Enter key executes the function. If a variable is selected for editing, the Up and Down keys change its value, and the Enter key saves it. Touching the Esc key aborts the edit and restores the previous value. If not executing a function, or editing a variable, touching the Esc key returns to the previous page.

(* back-lighting available in 3- or 4-wire mode, only)

Startup Review Sequence

When the transmitter starts, the display cycles through a series of pages to review the configuration of the transmitter, sensor, and generator. Alarms are inhibited, and the output of the transmitter is held at 4.0 mA (17.4mA for Oxygen sensors). This state is maintained for 5 minutes to provide time for the sensor readings to stabilize.

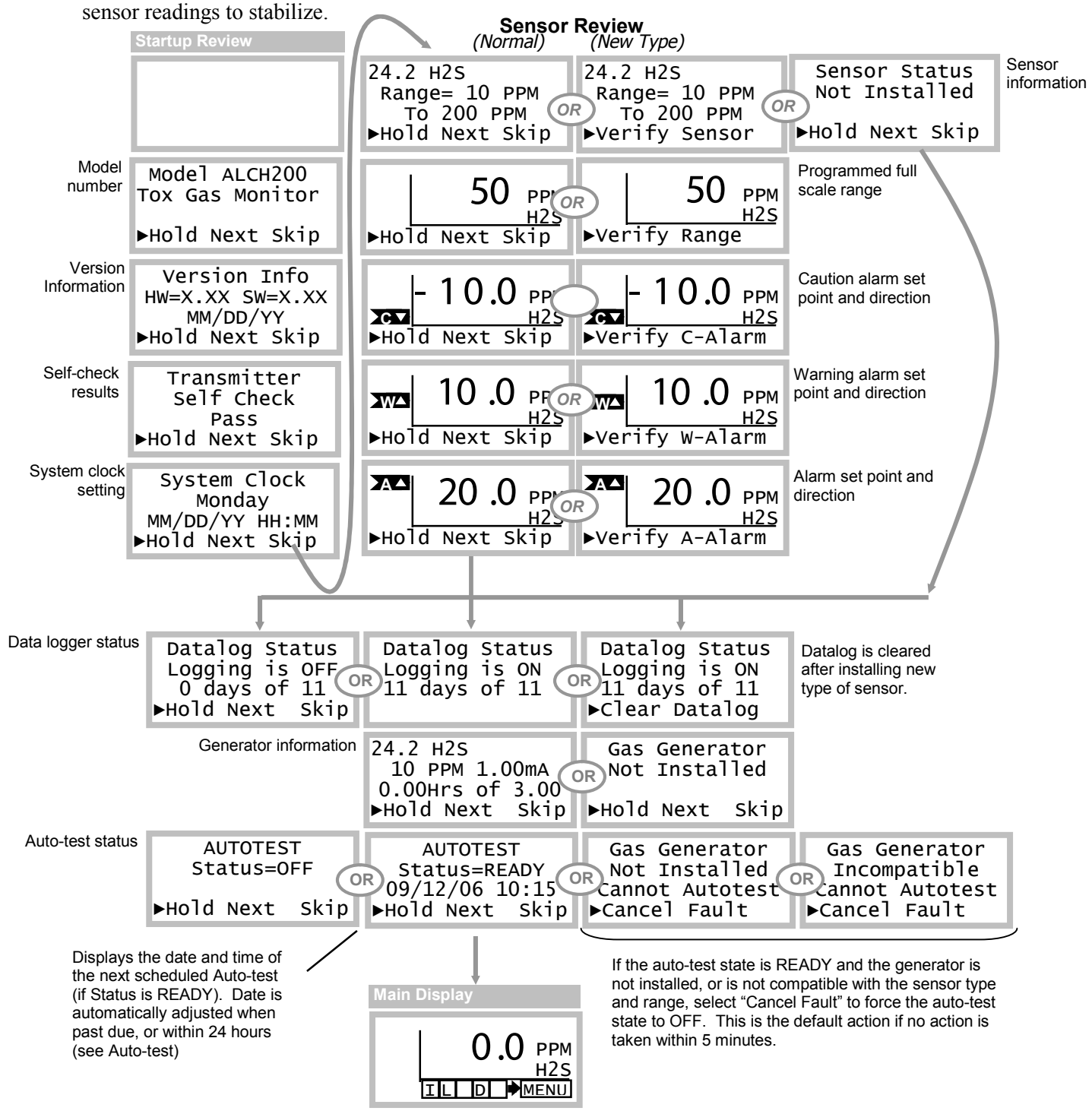


Figure 25. Startup review sequence

Main Display Page

The Main Display Page shows the name and concentration of the target gas, and units of measurement (PPM, PPB, %, etc). Indicators on the left and below show alarm and operating status.

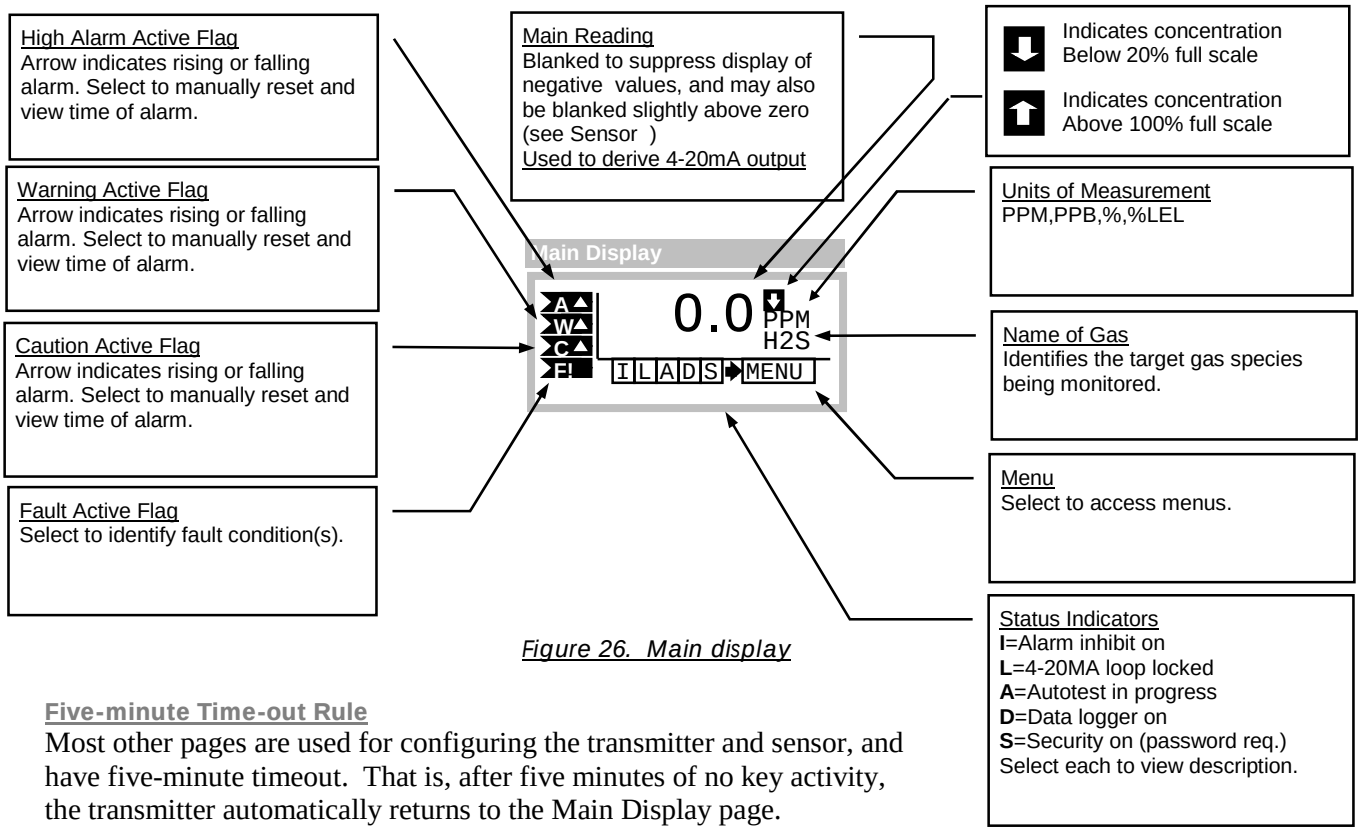
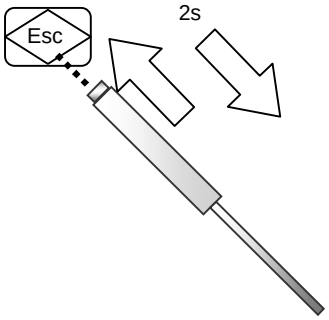


Figure 26. Main display

Five-minute Time-out Rule

Most other pages are used for configuring the transmitter and sensor, and have five-minute timeout. That is, after five minutes of no key activity, the transmitter automatically returns to the Main Display page. Exceptions to this rule include the zero and span calibration pages.



Esc Key Operation (Main Display Page)

Holding the magnet over the ESC key for 2 seconds, then removing, toggles alarm inhibit mode on and off. If the alarm inhibit mode was off, it is turned on for 15 minutes (default value). If alarm inhibit was on, it is turned off immediately. Alarm inhibit mode is on when the "I" status indicator is visible.

Fault Indication (Main Display Page)

Faults are indicated on the Main Display Page as shown in Figure 27.

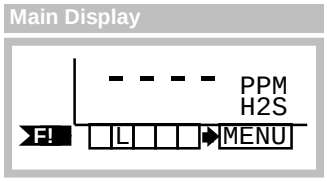
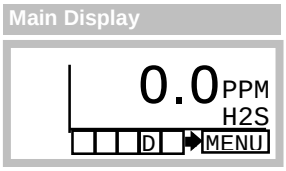


Figure 27. Standard fault indication

Main Reading

The main reading represents the gas concentration value and appears on the Main Display, along with the gas name, and units of concentration. It is reported on the 4-20mA output[1], and is the PV (Primary Variable) reported on the optional HART™ interface. It also appears at register 40043 (ALCH200_SYS_CONCBL) on the optional Modbus interface.



By default, the main reading is blanked to suppress the display of negative values. That is, the reading is reported as zero if the concentration should dip below zero, which can occur over time as a result of sensor aging. If the concentration falls to –20% of the full-scale range, a fault alarm is generated. Blanking is typically extended slightly above zero, as a means of stabilizing the main reading in the presence of excessive external noise, or other environmental factors (see Sensor Setup Page).

During zero and span calibration, the "un-blanked" gas concentration value is displayed, primarily to assess the amount of positive or negative drift. The "un-blanked" reading is also available on the Modbus interface (request "ALCH200 Transmitter Modbus Interface Manual", for more information).

[1] The 4-20mA may not match the reading when the "L" status indicator is visible on the Main Display, or when the output is in a physical limit.

Variable Editing

When a variable is selected, the edit cursor appears. The shape of the cursor symbolizes the up-down scroll nature of the value being edited. To provide feedback about which key is being activated, the cursor changes to a solid up-arrow when the magnet is touching the Up key, and to a solid down-arrow when the magnet is touching the Down key. When the variable has been adjusted to the desired value, touching the magnet to the Enter key changes the cursor to an hourglass shape while the program is saving the new value (recalculating associated variables and updating non-volatile memories). Touching the magnet to the Esc key discards the edited value and restores the original value.



Figure 28. Variable editing

SENSORS and GENERATORS

Sensor Setup

As mentioned, the ALCH200 transmitter accepts a wide variety of Smart Sensors, which configure the transmitter with the name of the gas, the full-scale range, units of concentration, blanking, damping, alarm settings, and data to assist the transmitter with transforming the sensor's output signal into a representation of gas concentration. For this reason, it is imperative to make certain the sensor and transmitter are properly configured for your particular application.

Sensor Setup Page

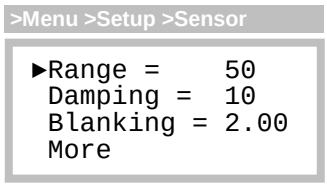


Figure 29. Sensor setup page

Table 4. Sensor variables

Variables	Description
Range	The Range variable sets the 100% full-scale value of the transmitter, which corresponds to the 20mA output value. Changing the range value also changes the Blanking value, which is computed as a fraction of the range. In this version of the transmitter, Range limits vary from sensor to sensor.
Damping	The Damping variable allows minor adjustment of the transmitter's auto-damping feature, used to stabilize readings. It is a unit-less value from 1 to 100, where a value of 1 corresponds to a T90[2] response of approximately 20s, and 100 is a T90 of approximately 30s.
Blanking	The Blanking variable is used to force the main reading to zero, whenever the gas concentration is below the programmed value. In this version of the transmitter, Blanking limits vary from sensor to sensor, but are typically 0 to 5% of the full scale range. Note that the transmitter always performs negative blanking, even when Blanking is set to 0. The variable is recomputed when the Range variable changes, so that same fraction of range is maintained. Doubling, or halving the Range variable, doubles or halves the Blanking variable, respectively.
More	More is a link to an additional sensor information page (below).

The data-logger records readings as a fraction of the sensor range. If data-logging is turned on (indicated by "D" status indicator on the Main Display), changing the Range variable causes a warning message to appear prior to saving the value. Select "Save" to save the new Range variable, or "Abort" to leave it unchanged.

Data-log Warning Page

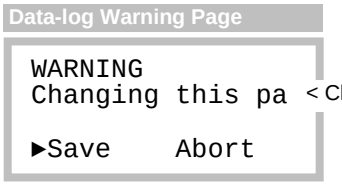


Figure 30. Data-log warning page

[2] T90 is the time required for the transmitter to reach 90% of its final value, after a step change in gas concentration.

Sensor More Page

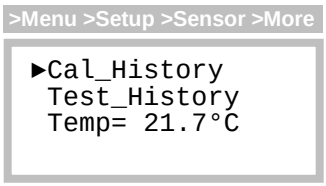


Figure 31. Sensor "more" page

Table 5. Sensor "more" variables

Variables	Description
Cal_History	Cal_History is a link to the Calibration History page (see Sensor Calibration Records).
Test_History	Test_History is a link to the Auto-test History page (see Auto-test History)
Temp	The Temp variable is the sensor temperature reading in degrees Celsius, which may be adjusted up or down to achieve a temperature offset calibration.

Changing Sensors and Generators

sensors and generators may be "hot-swapped", that is, removed and replaced with power applied. To remove, rotate the sensor housing lock-ring ¼ turn clockwise (bottom view), slide the molded carrier down, and carefully pull down on the sensor and/or generator body. To install, reload the carrier, push it into the housing, and rotate the ring ¼ turn counter-clockwise (bottom view).

Removing Sensors

Removing the sensor with powered applied starts a 60 second count down timer, during which alarms are inhibited, and the current loop output is fixed at 4.0mA (17.4mA for Oxygen sensors). This "immunity" period should be long enough to reinstall the sensor, or install a replacement sensor. If more time is needed, the count may be stopped indefinitely by selecting "Hold", which causes it to blink. A "Sensor Removed" fault will occur if a sensor is not installed before the timer expires. Figure 32 illustrates the display sequence associated with removing the sensor.

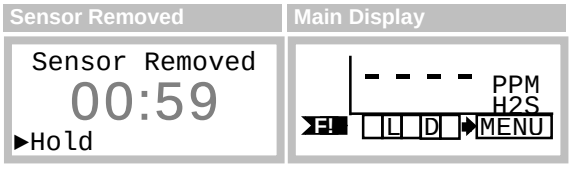


Figure 32. Sensor removal

Installing Sensors

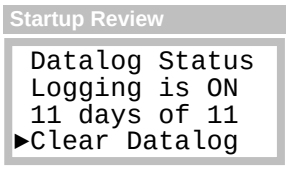
The transmitter maintains a copy of the previously installed sensor and compares the part numbers of the new sensor with the old. If the part numbers match, the transmitter sequences the startup review as normal, beginning with the sensor information[3]. If they do not match, review halts and waits for the

[3] As a convenience during field replacement, the transmitter sets the new sensor's full-scale range, blanking, damping, and alarms to match the previously installed sensor. This could cause confusion when transferring sensors from field transmitters to shop transmitters for calibration. During review, the shop transmitter will display the settings of the previously installed sensor, which might not match the field transmitter. Fortunately, this is not a real problem. The sensor may be calibrated as

operator to verify the new sensor, full-scale range, and alarm settings[4]. The startup review is illustrated in Figure 25.

	Warning: **Changing sensor types will clear the data log.**	

If data logging is turned on (indicated by the "D" status indicator appearing on the Main Display), and the sensor is replaced by one with a different part number, you will be prompted to clear the data log during review.



Once the sensor is installed, the transmitter executes a 5-minute (typical value) warm-up period, during which alarms are inhibited, the 4-20mA output is held at 4mA (17.4mA for Oxygen sensors), and Zero and Span calibration are not permitted.

NOTE: **Sensors can take as long as 12 hours to stabilize (bias) if not previously stored in the sensor keeper.**

Removing Generators

When a gas generator is removed, and the auto-test control is "READY", the transmitter displays a count down page similar to that for the sensor. Although the generator is not critical to the normal operation of the transmitter, attempting to auto-test without a generator would certainly fail. Selecting "Cancel Fault" forces the auto-test control to "OFF", which occurs by default on expiration of the timer. The auto-test control must be changed back to "READY" when a new generator is eventually installed. The display sequence associated with removing the gas generator is illustrated in Figure 33.

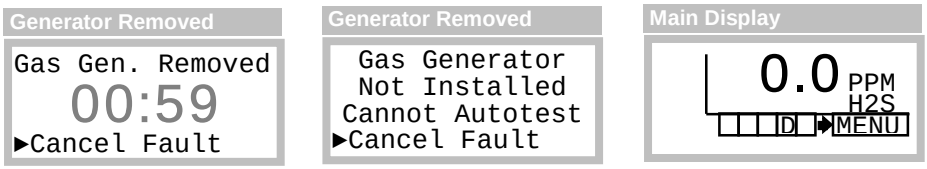


Figure 33. Generator removal

Installing Generators

When a generator is installed, the transmitter sequences the startup review, beginning with the generator information, as depicted in Figure 25. If problems with the gas type[5] or range[6] are detected, they are announced during review, and the auto-test control is set to OFF.

normal, and when it is eventually returned to the field, the field transmitter will restore its original settings. Always verify settings of field transmitters.

[4] After verifying the sensor, the transmitter copies the sensor settings to its local memory.

[5] Some generators produce a surrogate gas, instead of the sensor's target gas (see Auto-test)

[6] Some generators may not produce enough gas to pass Auto-test on higher sensor ranges (see Auto-test.

Bump-Testing

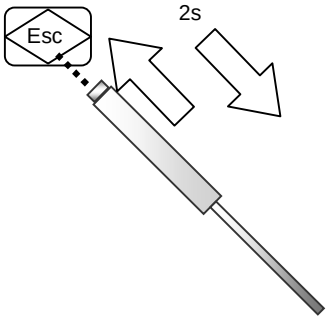
"Bump-testing" refers to a test whereby the sensor is briefly exposed to gas in order to verify the reading moves upscale from zero. It is recommended that it be performed at least once a month, using a small amount of bottled span gas.



Reminder:
Inhibit alarms before bump-testing.

Exposing the sensor to any reactive gas could cause false alarms, and can be avoided by temporarily inhibiting them. The most convenient method for doing so is from the Main Display, using the Esc key. This also allows you to view the transmitter reading to verify the sensor's response.

To quickly inhibit alarms…



Hold the magnet over the ESC key for 2 seconds, and remove it. This will toggle the alarm inhibit mode on for 15 minutes (default value), hold the current loop at 4mA (17.4mA for Oxygen sensors[7]), and cause the "I" and "L" status indicators to appear. Repeat the procedure when finished with the bump-test, and verify the flags disappear. See "Inhibiting Alarms" for more details.

[7] Oxygen sensors are usually exposed to air continuously, and do not require bump-testing.

Calibration

Calibration Frequency

While the transmitter itself requires no periodic calibration, sensors should be "zero" and "span" calibrated every 3-6 months, based upon environmental factors. Sensors frequently exposed to dirt, oil mist, vapors, or very dry air, may require more frequent calibration.

Zero Calibration

As the name implies, zero calibration corrects the transmitter reading to zero in the absence of any reactive gas. During zero calibration, the transmitter offset error is stored, and subsequently subtracted from future readings. recommends bottled zero gas as a source, which should be selected based on the type of sensor. For example, bottled "Zero" Air may be used to zero Chlorine sensors, but Oxygen sensors require bottled Nitrogen gas.

Span Calibration

The role of span calibration is to correct the transmitter reading to a known concentration of target gas (the gas for which the sensor was designed to monitor). During span calibration, the transmitter effectively stores the slope of the error, and divides it out of subsequent readings. Sensors for most gases, such as Ammonia, require a bottled "span gas" source. This applies even to Oxygen sensors, where the span gas source is bottled zero air.

Calibration Terminology

The zero calibration is referred to as, "zero", "zeroing", and "zeroed". Likewise for the span calibration, which appears as, "span", "spanning", and "spanned". As with most instruments, zero calibration should be performed before span.

Calibration Kits

Calibration kits, containing zero and span bottle gas sources, are available from for many toxic gases. Contact , or your local representative, if you have questions about calibration gas kits or gas sources.

Indications During Sensor Calibration

The "un-blanked" gas concentration value is displayed during zero and span calibration, primarily to observe any slight amount of positive or negative drift. In addition, alarms are cleared and inhibited, and the 4-20mA output of the ALCH200 transmitter is locked at 4.0mA (transmitters equipped with Oxygen sensors are locked at 17.4mA, representing normal, 20.9% atmospheric Oxygen). The 4-20mA output will not change when gas is applied and removed, and for 15 minutes thereafter (the default value). While viewing the calibration pages, the LCD display will indicate the changing gas concentration.

Calibration Exceptions

Zero and span calibration are not allowed during the following conditions:

- Sensor removed, or in 5-minute[8] warm-up period
- Transmitter fault is active
- Auto-test is active ("A" status indicator appears on Main Display page)

To help prevent errors, zero and span are not allowed if the sensor output, or span value entered, is too high or too low. Memory errors are reported if detected while updating the sensor or transmitter memory.

[8] Typical value, may vary by sensor gas type.

Zero Calibration Procedure

Performing a zero calibration requires a bottled "Zero-gas" with a 500 cc/min regulator, calibration adapter, and a convenient length of ¼" tubing. The gas used depends on the type of sensor installed. For example, an H_2S sensor may be zeroed with Zero-air, while Oxygen sensors must be zeroed with Nitrogen. In some cases, a sensor may be zeroed directly to the atmosphere, but only when it is known to be free of reactive gasses. Check with the factory if you are uncertain about which gas to use.

Referring to Figure 34, push the calibration adapter onto the exposed end of the sensor and connect one end of the tubing (1), connect the other end of tubing to the cylinder's regulator (2). Do not open the gas valve until instructed below.

From the Main Display, select Menu, then Zero_Sensor, as shown in Figure 35. This will clear and inhibit alarms at the transmitter, and hold the current loop output at 4mA (17.4mA for Oxygen sensors).

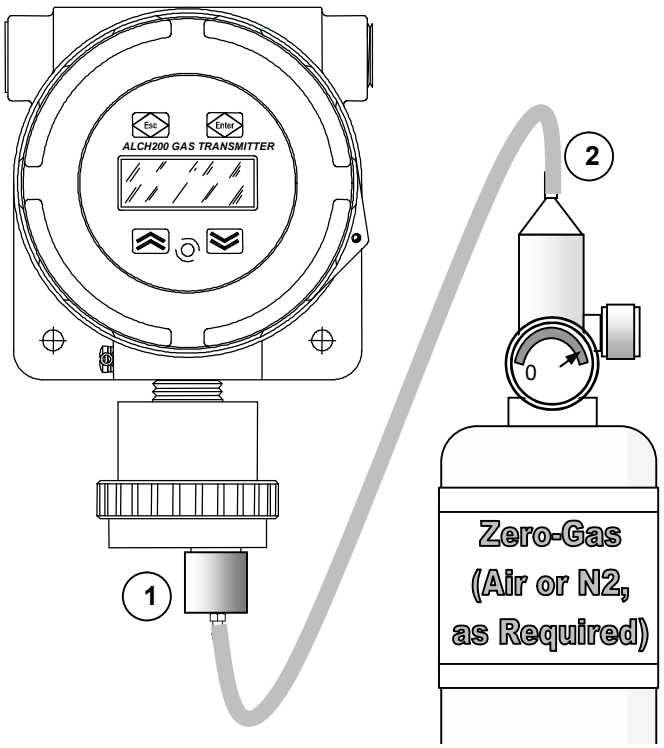


Figure 34. Zero calibration

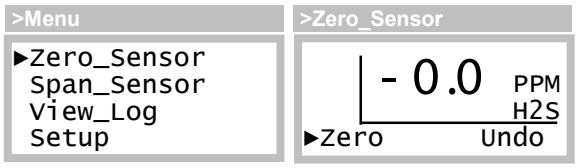


Figure 35. Zero Sensor page

Open the regulator to flow Zero-gas to the sensor. After approximately four minutes, select Zero. The "Cal" message will appear briefly at the bottom of the page and the reading will be forced to 0, 0.0, or 0.00. Since the reading is not blanked, it may show a negative sign, like "-0.0", which is normal. The procedure may be cancelled by selecting Undo. The Undo function is only possible while remaining on the Zero_Sensor page. Leaving the page will disable the possibility of canceling the calibration.

Touch the Escape key twice to leave the Zero_Sensor page and return to the Main page. By default, alarms will remain inhibited, and the current loop fixed for 15 more minutes (the default value).

Span Calibration Procedure

Span calibration* requires a bottled "span-gas" with a 500 cc/min regulator, calibration adapter, and a convenient length of ¼" tubing. The gas type and concentration used depends on the type of sensor installed. Check with the factory if you are uncertain about which gas to use.

Referring to Figure 36, slip the calibration adapter onto the exposed end of the sensor and connect one end of the tubing (1), connect the other end of tubing to the cylinder's regulator (2). Do not open the gas valve until instructed below.

* Perform the Zero calibration prior to the Span calibration.

From the Main Display, select Menu, then Span_Sensor, as shown in Figure 37. This will clear and inhibit alarms at the transmitter, and hold the current loop output at 4mA (17.4mA for Oxygen sensors).

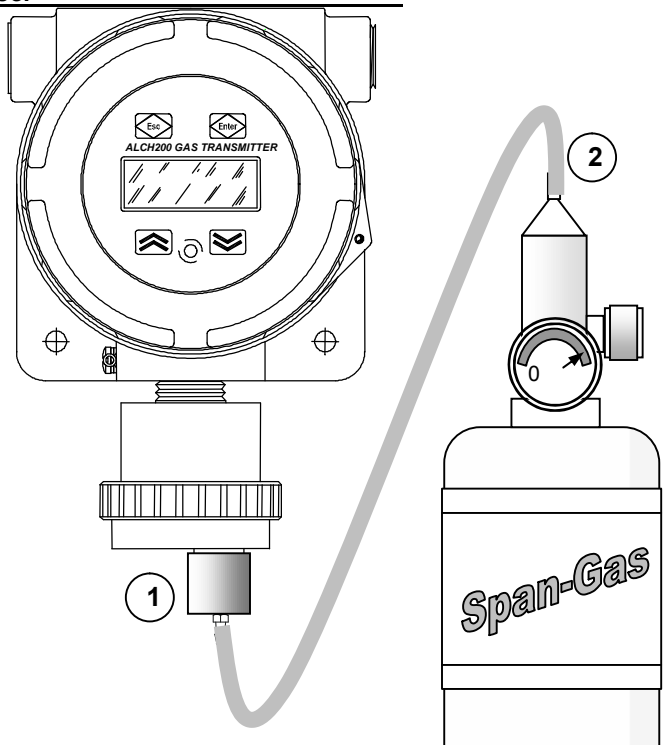


Figure 36 Span calibration

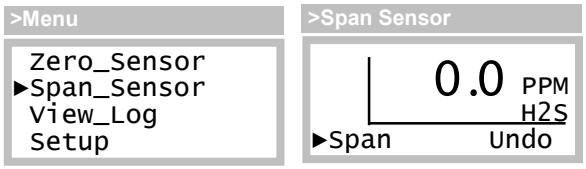
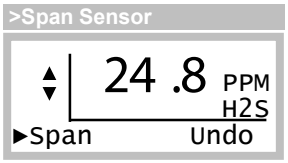
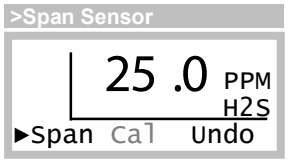


Figure 37. Span Sensor page

Open the regulator and allow span gas to flow to the sensor. The displayed reading should begin to increase, and stabilize after 5 to 10 minutes, depending on the gas type and range of the sensor.



Select Span, the concentration reading will become fixed, and the blinking Up/Dn edit cursor will appear just to the left of the reading. Touch the Up or Down key to correct the reading to match the known concentration of gas, then touch Enter.



The 'Cal' message will appear briefly at the bottom of the page. The procedure may be cancelled by selecting Undo. The Undo function is only possible while remaining on the Span_Sensor page. Leaving the page will disable the possibility of canceling the span calibration.

Touch the Escape key twice to leave the Span_Sensor page and return to the Main page. Disconnect the calibration adapter from the sensor and permit the readings to return to zero. By default, alarms will remain inhibited and the current loop fixed for 15 more minutes (the default value). Once the reading is below any of the alarm set points, you may terminate the alarm inhibit (and fixed loop output) using the Esc key on the Main Display, see Esc Key Operation (Main Display Page).

Calibration of Duct-Mount Sensors

To Zero and Span calibrate a duct-mounted sensor; pull the sensor out of the duct until the calibration locking pin clicks into the retaining slot. By pulling back slowly, the retaining pin will drop into place and automatically locate the sensor just behind the gas inlet port. Connect a length of tubing from the gas regulator to the barb fitting, and then follow the zero and span calibration procedures detailed earlier.

	For best results, pressure in the pipe or duct should be neutral, or slightly negative. Positive pressure may restrict the flow of calibration gas to the sensor, resulting in an inaccurate calibration.	

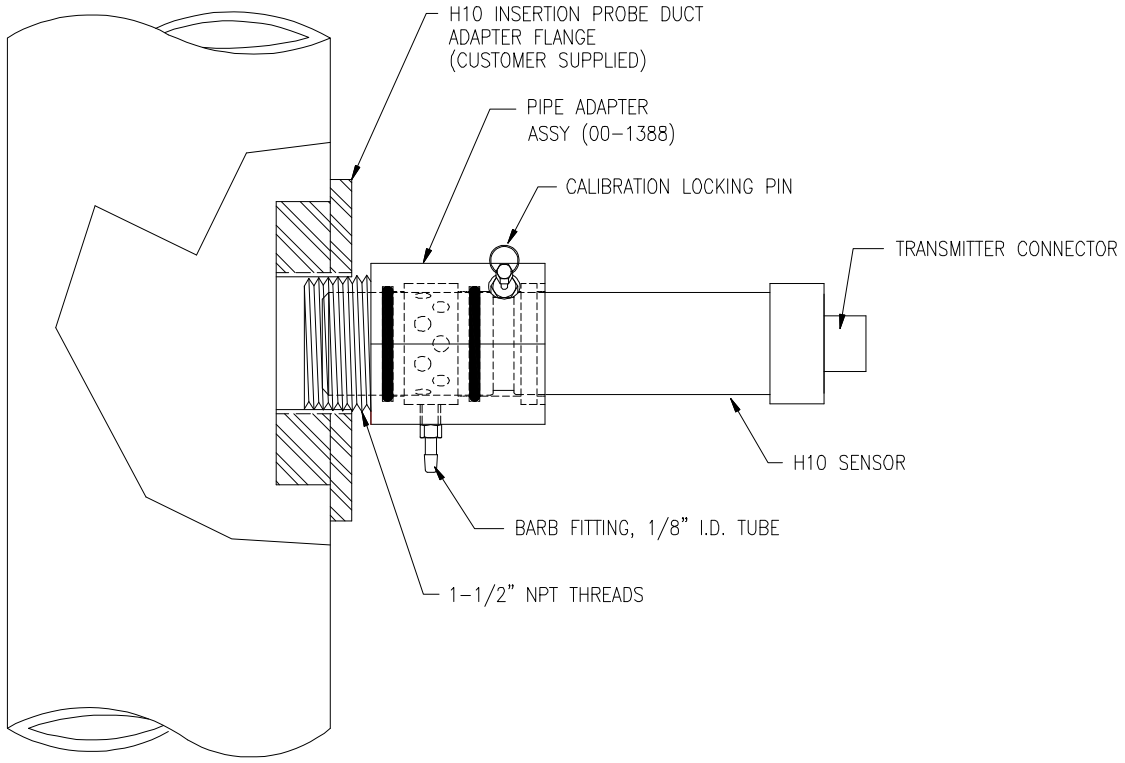


Figure 38. Calibration of duct-mount sensors (-0664)

Sensor Calibration Records

A calibration record is written into the sensor memory each time a zero or span calibration is performed, and when a calibration Undo is performed. Enough memory is reserved for 63 zero calibrations and 63 span calibrations. Zero and span calibration records are accessed on the Cal_History page.

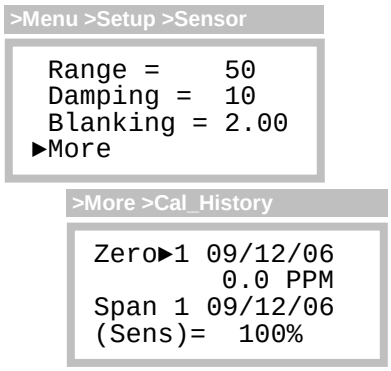


Figure 39. Sensor calibration history page

Zero calibration records are accessed on line 1, and are composed of an index number, date, and the concentration reading just prior to performing the calibration. The concentration reading can be thought of as the sensor "drift" from the previous zero calibration. Upon entry, the index number is set to the most recent calibration and may be scrolled down to view earlier calibration records.

Span calibration records are accessed on line 3, and include an index number, date, and the relative sensitivity of the sensor, in percent. Like the zero records, the index number is set to index the most recent calibration and may be scrolled down to view earlier calibration records. Span calibrations record the deviation from the reference sensitivity and display it in units of percent. Sensitivity is a measure of the sensor output for a given exposure to gas. More specifically, it is defined as the ratio of the signal output to the gas concentration and is often measured in µA/PPM. During manufacture, the sensitivity of the sensor is recorded and used as a reference. A value of 100% signifies that the sensitivity has not changed from the reference e.g., the sensor calibration is the same at it was when the system was calibrated at the factory. Lower values indicate a decreased sensitivity and, although not typical, higher values indicate increased sensitivity.

Auto-test

The Auto-test option verifies the serviceability of the transmitter on a prescribed schedule by exposing the sensor to a small amount of gas, and verifying a minimum response. Three attempts per test are made, and if the sensor does not respond on the third attempt, a fault alarm is triggered (may be optionally disabled). A summary of pass, fail, and retry counts are maintained in the sensor memory, and may be viewed on the Auto-test History page.

The test is performed at a specific time of day, and may be scheduled to repeat every 1 to 14 days. The date and time of the next test is available for editing, and the test may be triggered manually at any time, without affecting the preset schedule.

During startup, the transmitter examines the date and time of the next scheduled Auto-test. If the scheduled time and date has past, or if it is scheduled to occur within the next 24 hours, the transmitter moves the date by one day to provide a minimum of 24 hours before the first (or next) test is performed. This is done to allow sensors an additional "settling time", and to avoid confusion to installers during the commissioning period. Set the system clock to local time before scheduling the Auto-test time of day.

The Auto-test option requires a gas generator, which must be compatible with the installed sensor's gas type, and full-scale range.
lists gas compatible generators and sensors. Contact factory for a complete list.

Table 6. Compatible generators and sensors

Generator Part No.	***Generator Type***	***Compatible Sensors***			
		Sensor Type	***Part No.***	***Min. Range***	***Max. Range***
00-1239	Cl_2	Br_2	00-1000 00-1001	1 PPM 5 PPM	5 PPM 20 PPM
		Cl_2	00-1002 00-1003	1 PPM 5 PPM	5 PPM 20 PPM
		ClO_2	00-1004 00-1005	1 PPM 5 PPM	5 PPM 20 PPM
		F_2	00-1006 00-1007	1 PPM 5 PPM	5 PPM 20 PPM
		O_3	00-1008 00-1009	1 PPM 5 PPM	5 PPM 20 PPM
		HF	00-1019	10 PPM	20 PPM
		NO_2	00-1022	10 PPM	20 PPM
		I_2	00-1036 00-1037	1 PPM 5 PPM	5 PPM 20 PPM
		Acid Gas	00-1038	10 PPM	20 PPM
00-1240	NH_3	NH_3	00-1010	50 PPM	100 PPM
		DMA*	00-1450	100 PPM	100 PPM
00-1241	CO	CO	00-1012	50 PPM	100 PPM
		ETO	00-1039	20 PPM	50 PPM
		HCOH	00-1040	20 PPM	50 PPM
00-1243	H_2S	H_2S	00-1020	10 PPM	100 PPM
		HCl	00-1017	10 PPM	100 PPM
00-1244	SO_2	SO_2	00-1023	10 PPM	20 PPM
		HCN	00-1018	10 PPM	20 PPM

* DMA (Dimethylamine) compatible on one range only.

Auto-test Controls

Auto-test is controlled by the Status variable, which appears on the Auto-test page shown below.

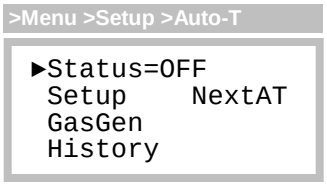


Figure 40. Auto-test control page

Table 7. Auto-test control variables

Variables	Description
Status	The variable Status may be set to one of three values: OFF – Auto-test will not begin automatically READY – Auto-test will occur on a regularly scheduled basis START – Auto-test will run once after returning to the Main Display page, and does not affect the preset schedule. If a generator is not installed, Status will be forced to OFF, and may not be changed to READY or START until one is installed. Setting the Status variable to START will not begin a manual Auto-test until you return to the Main Display page. This is designed to permit changes to the setting, or other settings, before launching the Auto-test sequence.

Auto-test Setup

The Auto-test setup page configures the Auto-test schedule pass threshold, and options for various transmitter indications.

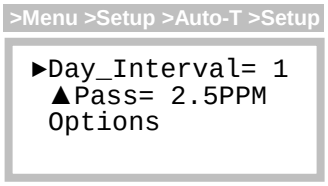


Figure 41. Auto-test setup page

Table 8. Auto-test setup variables

Variables	Description
Day_Interval	The Day_Interval variable specifies the number of days between automatic tests. The default is 1, and the limit is 1 to 14 (the exact time of day for testing may be set on the NextAT page, see below).
▲Pass	The delta-Pass variable specifies the amount by which the gas concentration must increase, in order to pass. Prior to starting the test, this amount is added to the "un-blanked" gas concentration reading to compute the pass threshold value that appears on the display (see Auto-test Sequence). This value is limited between 5%(default value), and 10% of the full-scale range (see Range in Table 4)
Options	Options is a link to the Auto-test Options page (below).

Auto-test Setup Options

>Menu>Setup>Auto-T>NextAT

```
►Log_Data=YES
 Cause_Fault=YES
 Override_mA=YES
```

The Auto-test Setup Options page variables control the behavior of the transmitter during Auto-test.

Variables	Description
Log_Data	The Log_Data variable controls values logged during Auto-test. When set to YES (default), the gas concentration (main reading) is logged as usual, including any increase caused by the gas generator. When set to NO, a code is logged that will display as, "TEST", on graphic and tabular report pages, and printouts.
Cause_Fault	The Cause_Fault variable determines if Auto-test failures cause transmitter fault alarms. When set to YES (default), a failure to pass Auto-test after the third attempt will cause a fault alarm, and force the 4-20mA output to the Fault_mA value, regardless of how the test was initiated (automatic or manual). When set to NO, Auto-test failures do not cause fault alarms (not recommended).
Override_mA	The Override_mA variable controls the 4-20mA output during Auto-test. When set to YES (default), the 4-20mA output will be forced to the Autotst_mA value to prevent receiver alarms (see 4-20mA Setup). When set to NO, the output will increase as the gas concentration rises, and may cause receiver alarms (not recommended).

Next Auto-test

>Menu>Setup>Auto-T>NextAT

```
Next Auto Test
►09/14/06 09:00
```

The date and time of the next scheduled Auto-test appears on the NextAT page. The time appearing on this page establishes the time of day for all future Auto-tests. After each Auto-test, the date will be incremented by the Day_Interval variable on the Auto-test Setup page (above). Note that if the Auto-test Status variable is set to READY, and the next auto-test setting is deliberately (or unintentionally) scheduled in the past, an Auto-test is immediately scheduled. This is apparent upon returning to the Auto-test control page (above), and seeing the Status variable blinking START. At this point, you may change the control to OFF, change the system clock, then change the control back to READY.

During startup, the transmitter examines the date and time of the next scheduled Auto-test. If the scheduled time and date has past, or if it is scheduled to occur within the next 24 hours, the transmitter moves the date by one day to provide a minimum of 24 hours before the first (or next) test is performed. Set the system clock to local time before scheduling the Auto-test time of day.

Auto-test History

>Menu>Setup>Auto-T>History

```
 Passes=    267
 Failures=    1
 Retries=     2
►Reset(Y/N)=NO
```

The Auto-test History page provides a summary of passes, failures, and retries, which are maintained in the sensor memory. Since three attempts are made, there are always two retries before a failure is recorded. The total number of tests is the sum of the passes and failures, and the number of gas generations is the sum of all three values.

The Reset function permits all counts to be zeroed. This is done by selecting Reset, and scrolling the value to YES. Clearing the counts is not recommended, since this information can prove useful over the lifetime of the sensor.

Gas Generator Information

>Menu>Setup>Auto-T>GasGen

```
11.1 Cl2
0.25PPM  0.26mA
0.07mAH Used
►Exit
```

The Gas Generator page lists information about the gas generator. The top line contains the generator gas code and the chemical abbreviation of the gas. The second line shows the delta-Pass value (described on the Auto-test Setup), and the amount of current required generate that particular concentration. The third line displays the mAH consumption of the generator. Selecting the Exit function returns the display to the previous page.

Auto-test Sequence

When the Auto-test starts (automatically or manually), alarms are inhibited and by default, the loop is fixed at 4mA (see Auto-test Setup Options and 4-20mA Setup). The transmitter will then step through a series of displays representing the test sequence.

Alarm relays are inhibited during Auto-test, and for up to 10 minutes afterwards during the recovery period. If a gas leak occurs during the recover period, will cancel the alarm inhibit and revert to normal operation. A gas leak is presumed when the concentration rises to 50% of the full-scale range, or higher.

While the alarms are inhibited during Auto-test, the 4-20mA output will usually be at a fixed level (Override_mA=YES). The output override may be disabled by setting Override_mA=NO, however, steps should be taken to disable receiver alarms in the control room.

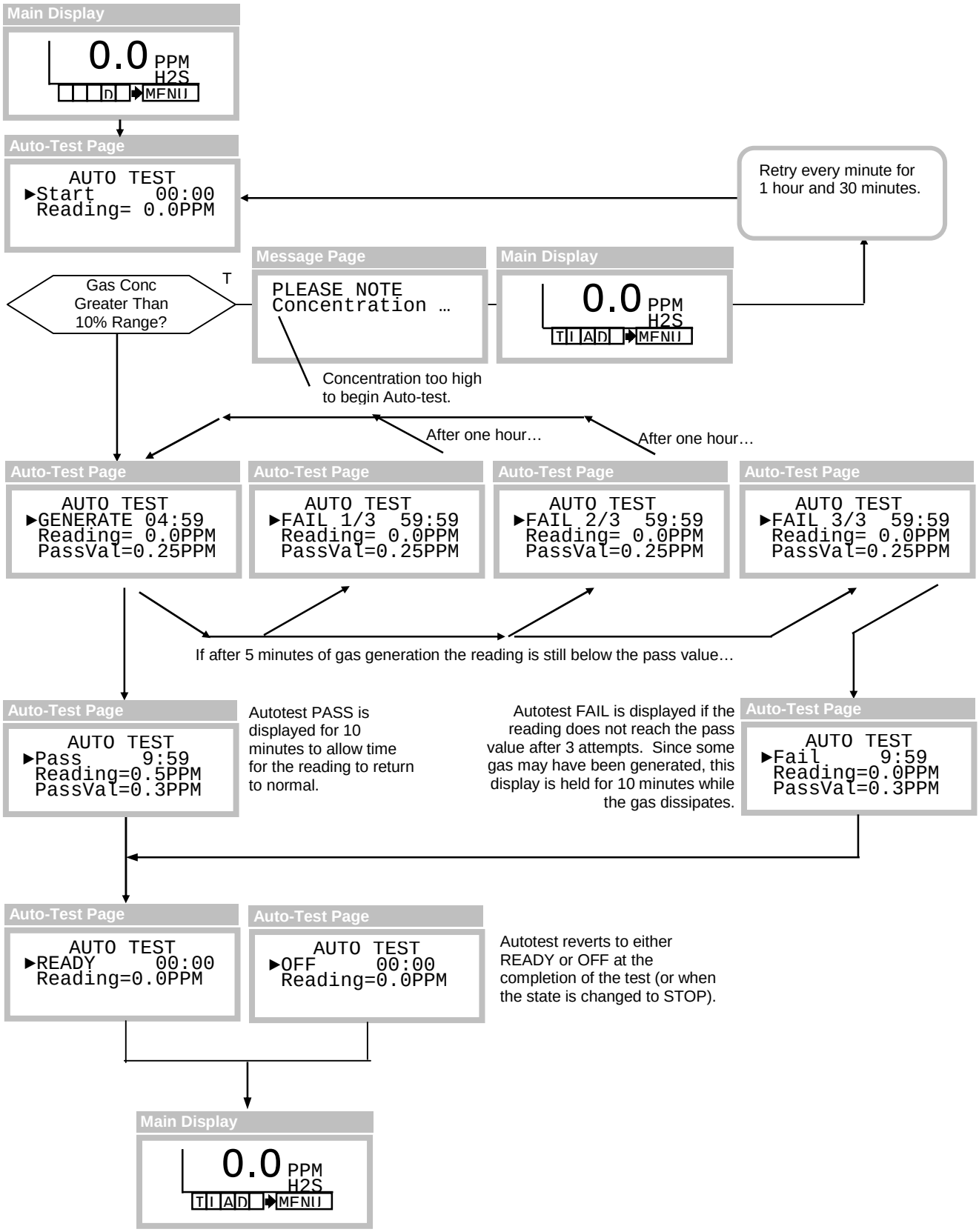


Figure 42. Auto-test sequence

ALARMS and RELAYS

Three gas concentration alarms and one fault alarm are standard in the ALCH200 transmitter. Alarm status flags appear on the Main Display, and status is available over the optional serial interface. Alarms may be assigned to activate one or more of three optional relays (see Alarm Relays).

Gas Concentration Alarms

The gas alarms are labeled, Caution, Warning, and Alarm, and although not strictly enforced, Alarm usually has the highest priority, followed by Warning and Caution. Figure 43 depicts the default relationship between each alarm.

For toxic gas sensors, the typical default setting for the Warning alarm is the TLV (threshold limit value) of the target gas. Alarm is usually set to 2 or 3 times higher than the TLV, and Caution is typically used to alarm on negative drift of –10% range or more (a fault alarm occurs if the reading drifts to –20% range, or below).

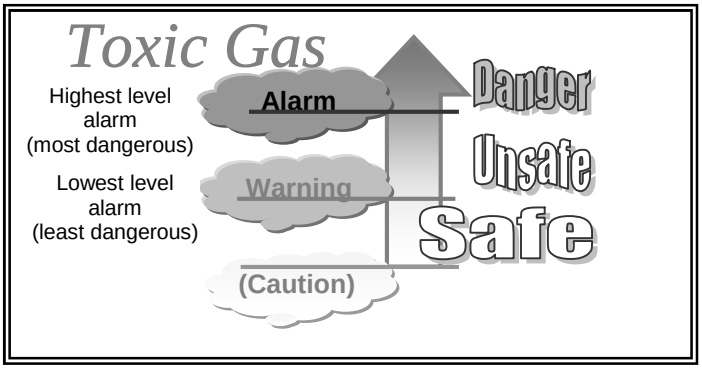


Figure 43. Default alarm relationships for toxic gas sensors.

Normal atmospheric oxygen is 20.9%. Oxygen sensor alarms default to: Warning 19.5%, Alarm 16%, and Caution 23%. Note that Caution is used to trap positive sensor drift.

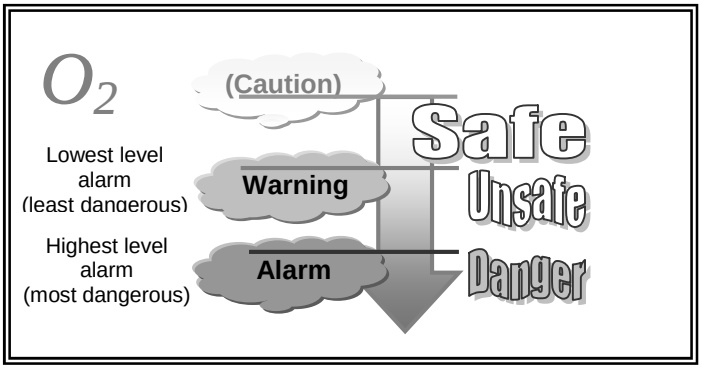


Figure 44. Default alarm relationships for oxygen sensors

Manual Alarm Reset

Alarms programmed for manual reset (see below) are held active, or latched, even after alarm conditions have subsided, and are reset by selecting the respective flag (A,W, or C) on the Main Display page. The Alarm Reset page appears and displays the date and time of the alarm. If alarm conditions have subsided, you may reset just the selected alarm (Reset), or all alarms (ResetAll). A link to the Alarm Inhibit page is provided for convenience.

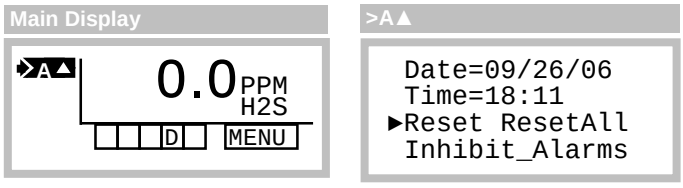


Figure 45. Manual alarm reset

Remote Reset

Grounding the "Remote Reset" input (see Figure 8) resets all latched alarms, if the respective alarm conditions have subsided.

Gas Alarm Operation

Figure 46 depicts relationships between variables associated with a rising gas alarm, and how they function in the presence of a gas leak, and recovery.

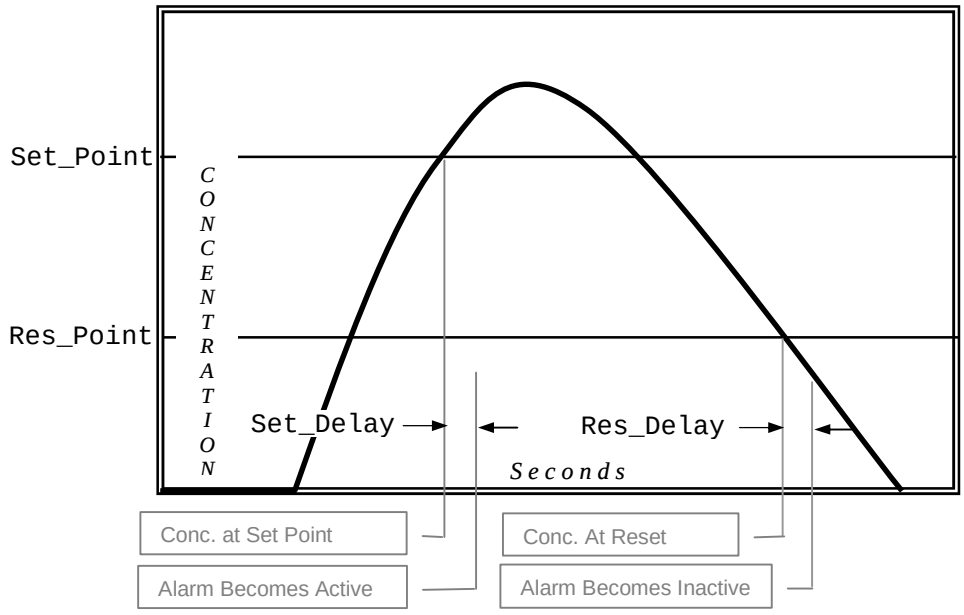


Figure 46. Rising alarm (Active=ABOVE_SP, Reset=AUTO)

Figure 47 depicts relationships between variables associated with a falling gas alarm (such as for Oxygen deficiency), and how they function in the presence of a gas displacement, and recovery.

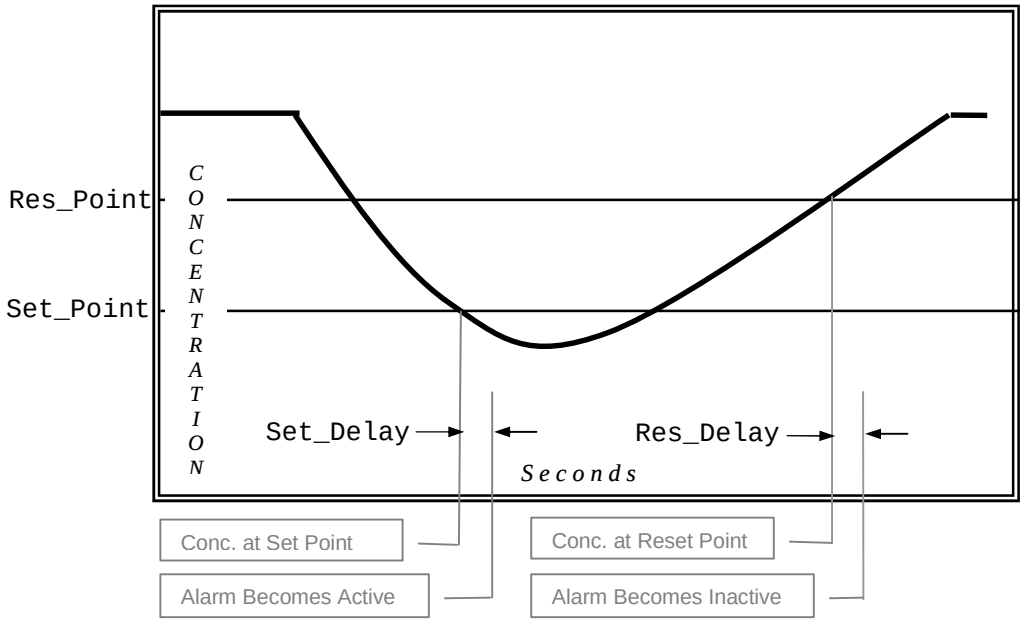


Figure 47. Falling alarm (Active=BELOW_SP, Reset=AUTO)

Gas Alarm Setup

Variables for the gas alarms are configured on the respective setup pages, as shown in Figure 48, and described in Table 9.

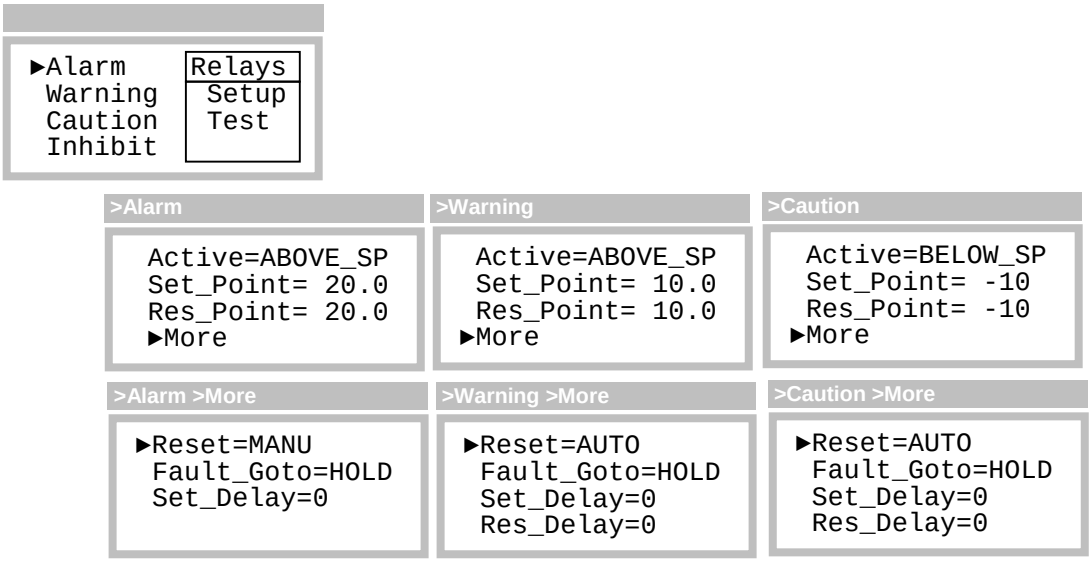


Figure 48. Alarm setup pages

Table 9. Alarm variables

Variable	Description
Active	The Active variable is used to specify the region of concentration where the alarm is active. When set to ABOVE_SP, the alarm becomes active at and above the set point (referred to as a rising alarm). When set to BELOW_SP, the alarm becomes active at and below the set point (referred to a falling alarm). Setting the value to DISABLED permanently deactivates the alarm. The variable setting is stored in the sensor memory.
Set_Point	The Set_Point variable defines the concentration level that the alarm becomes active. The alarm becomes active immediately if the set delay variable is 0, otherwise, it becomes active at the expiration of the set delay period. When the set point is reprogrammed, the reset point value is also reprogrammed to the same value.
Res_Point	The Res_Point variable defines the concentration level that the alarm becomes inactive. Once the alarm is active, it will remain active until the concentration level reaches the reset point. The alarm then becomes inactive immediately if the set delay variable is 0, otherwise, the alarm becomes inactive at the expiration of the reset delay period (only if the reset variable is programmed as AUTO – see below). The limits for the reset point are defined below.

Active=ABOVE_SP
Upper limit = current set point value
Lower limit = lowest set point value

Active=BELOW_SP
Upper limit = highest set point value
Lower limit = current set point value

When the set point is reprogrammed, the reset point value is reprogrammed to the same value.

`Reset` The Reset variable defines how the alarm is permitted to transition from active, to inactive. When the variable is set to AUTO, the alarm will transition without operator intervention, as soon as conditions permit (concentration reaches the reset point, and the reset delay period expires). When the variable is set to MANU, the alarm conditions must have subsided, and an operator must acknowledge the alarm manually, through the operator interface, the serial interface, or through the remote reset (see Electrical Connections, page 12).

Note: Res_Delay is operational for AUTO only. Setting the Reset variable to MANU suppresses display of the Res_Delay variable.

`Fault_Goto` The Fault_Goto variable specifies alarm behavior during transmitter faults, and overrides all other alarm settings. If the fault alarm should become active, you may program the concentration alarm to behave in one of three ways:
HOLD - the transmitter will attempt to hold the alarm in its current state. If the alarm is active, it will remain active. If the alarm is inactive, it will be inhibited from becoming active until after the fault is cleared.
SET - activates the alarm immediately, the set delay period is ignored. This feature permits the alarm to signal both concentration and fault conditions.
RESET – deactivates the alarm immediately, the reset delay period is ignored.

`Set_Delay` The set delay variable is used to configure the amount of time in seconds that the concentration must be in the alarm active region before becoming active. It may be used to avoid triggering alarms on relatively short gas exposures. Also, it may be used to help prevent alarm relay chattering when the concentration level is varying between the set point and reset point. The variable may be programmed between 0 (its default) and 10 seconds.

`Res_Delay` The reset delay variable is only displayed when the Reset variable is set to AUTO. It is used to configure the amount of time in seconds that the concentration must be in the alarm inactive region before becoming inactive. Like the set delay variable, it may be used to help prevent alarm relay chattering and is preferred over using set delay. The variable may be programmed between 0 (its default) and two hours (7200 seconds).

Fault Alarms

When a fault alarm occurs, the Main Display appears as shown below. By default, new alarms are inhibited, and active alarms are held so that relays controlling lights, sirens, and fans may continue to operate (this behavior may be modified on the Alarms Setup pages). Faults are permitted to clear automatically, without operator intervention, if they do not persist.

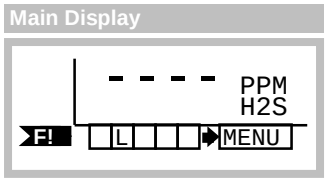


Figure 49. Fault alarm (Main Display)

Selecting the fault alarm flag causes the transmitter to display the fault code on line 1, and a description of the problem(s) on line 2. Selecting the Next function causes line 2 to display the next fault, if any.

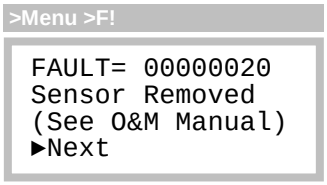


Figure 50. Fault page

Corrective Actions

Transmitter faults may be caused by improper wiring, ground loops, power supply sizing, current loop receivers, and other external factors.

1. At power on, transmitters can demand 2 or 3 times the normal amount of supply current. If the supply is not sized properly, transmitters may not power on, or may produce a fault in the external power supply. If this is suspected, try starting transmitters one at a time using switch SW5 on the CPU Board.

2. Check that each transmitter has the proper supply voltage at TB1 on its Power Supply Board. The ALCH200 Toxic Gas Transmitter requires at least 12v in all wiring modes.

3. When troubleshooting, it is permissible to temporarily swap sensors, generators, and board stacks with other transmitters. When finished, you MUST RE-VERIFY all transmitter settings, especially sensor, alarm, and 4-20mA settings. Also note that swapping components may result in losing data log records, since the log is dependent on sensor part numbers, and the full-scale range.

Table 10 lists transmitter faults and corrective actions.

Table 10. Fault descriptions

Fault	Description	Corrective Action(s)
ADC0 Read Error	The analog-to-digital converter channel assigned to the sensor's gas concentration output signal has failed, or is out of range.	1. Cycle power off and on 2. Replace sensor 3. Replace upper stack 4. Replace full stack
LCD Busy Error	The LCD driver chip cannot recover from an internal error.	1. Cycle power off and on 2. Replace upper stack 3. Replace full stack

SPI Bus Error	Serial peripheral interface bus has faulted.	1. Cycle power off and on 2. Replace upper stack 3. Replace full stack
ADC1 Read Error	The analog-to-digital converter channel assigned to the sensor's temperature output signal has failed, or is out of range.	1. Cycle power off and on 2. Replace sensor 3. Replace upper stack 4. Replace full stack
Sensor (-)Range	The sensor has drifted -20% range (below zero).	1. Zero sensor 2. Replace sensor
Sensor Removed	The sensor cannot be detected.	1. Reinstall sensor 2. Cycle power off and on 3. Replace sensor 4. Replace upper stack 5. Replace full stack
Sensor Mem Error	One or more configuration variables in the sensor memory do not pass checksum test.	1. Cycle power off and on 2. Replace sensor 3. Replace upper stack 4. Replace full stack
Sensor Cfg Error	One or more sensor configuration variables are outside of expected range.	1. Cycle power off and on 2. Replace sensor 3. Replace upper stack 4. Replace full stack
Gas Gen Removed	The generator cannot be detected.	1. Install generator 2. Cycle power off and on 3. Replace generator 4. Replace sensor 5. Replace upper stack 6. Replace full stack
Gen Incompatible	The gas generator is not compatible with the installed sensor type or range.	1. Replace generator 2. Change sensor range 3. Replace sensor 4. Replace upper stack 5. Replace full stack
System Mem Error	A checksum error has been detected in the system setup memory.	1. Cycle power off and on 2. Replace upper stack 3. Replace full stack
Alarm Mem Error	A checksum error has been detected in the alarm setup memory.	1. Cycle power off and on 2. Replace upper stack 3. Replace full stack
Operator Mem Err	A checksum error has been detected in the operator setup memory.	1. Cycle power off and on 2. Replace upper stack 3. Replace full stack
HART Mem Error	A checksum error has been detected in the HART setup memory.	1. Cycle power off and on 2. Replace upper stack 3. Replace full stack

Autotest Failed	Auto-test failed after 3 attempts.	1. Replace generator 2. Replace sensor 3. Replace upper stack 4. Replace full stack
Use 3-Wire Power	Relay option jumper is installed, but transmitter is powered from loop (2-wire).	1. If relays are not used, remove jumper. 2. Re-wire transmitter in 3- or 4-wire mode. 3. Replace upper stack 4. Replace full stack
Stack Overflow	An internal error occurred in the CPU.	1. Cycle power off and on 2. Replace upper stack 3. Replace the full stack
Factory Cal Err	An error has been detected in the factory calibration memory.	1. Cycle power off and on 2. Replace upper stack
UNCALIBRATED	This appears on the Main Display, in place of the gas name, when the transmitter has not been factory calibrated, or the calibration memory has become corrupted.	1. Cycle power off and on 2. Replace upper stack 3. Replace the full stack
Fault Alarm Test	This is not a real fault. This occurs when the fault alarm is being tested locally, or remotely.	

Alarm Relays

The EXP-SNR transmitter provides three optional SPDT mechanical relays rated for 5 amps, non-inductive loads at 250VAC. These relays are suitable for switching small loads, such as horns and warning lights, but should not be used to switch motors or other high current, inductive loads.

Each relay is assigned to one of the four alarms, and may be programmed as normally energized (failsafe), or normally de-energized. A normally energized relay will have electrical continuity between its C and NO contacts (while the transmitter is powered on), and will be open between its C and NC contacts. Conversely, a normally de-energized relay will have continuity between its C and NC contacts, and will be open between its C and NO contacts. Figure 42 illustrates the function of alarm and relay variables on the operation of the relays.

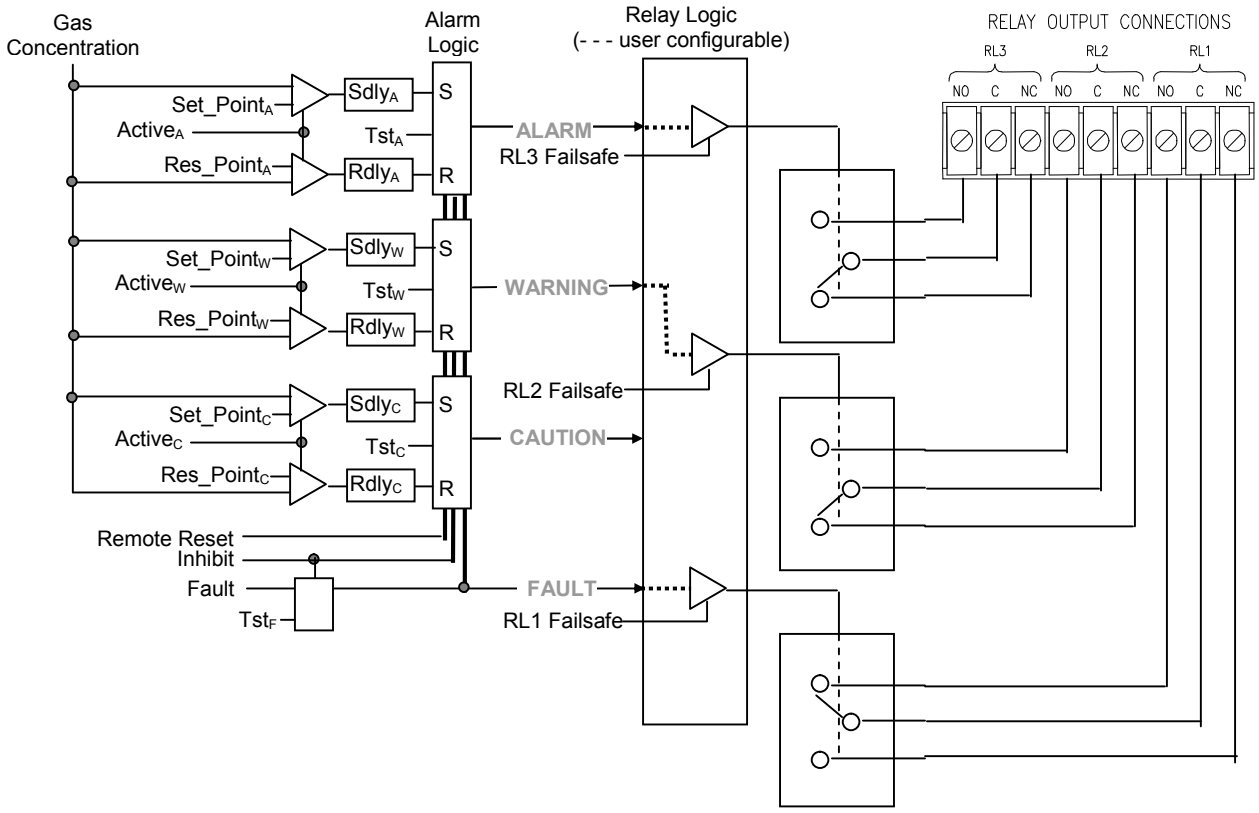


Figure 42 Alarm relay schematic

(default configuration – no alarms active)

Relay Setup Page

Relays are configured in the Relays Setup page, which is accessed by selecting Menu, Setup, Alarms, and (Relays) Setup. Select the alarm trigger source (Alarm, Warning, Caution, Fault), and failsafe property (Normal-On or Normal-Off).

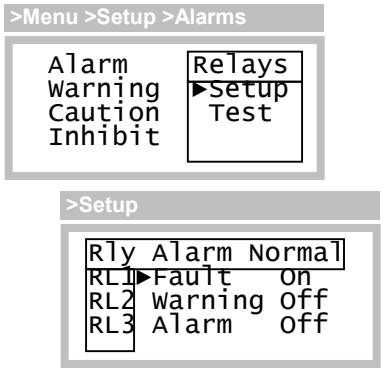


Figure 43. Relay setup page (example)

Testing Alarm Relays

Relays are tested by triggering (simulating) their assigned alarms on the Relay Test page. To trigger an alarm, scroll the "Select" variable up and down until an X appears below the letter representing the alarm. Save the selection by touching the Enter key, and move the cursor to the function labeled "Start".

	Caution: devices wired to the relays may activate when "Start" is selected. Be sure to inform proper personnel before performing the test.	

When ready, select "Start" to begin the test. "Start" will be replaced by, "Any key to Stop", and touching any key will end the test.

Relay Test Page

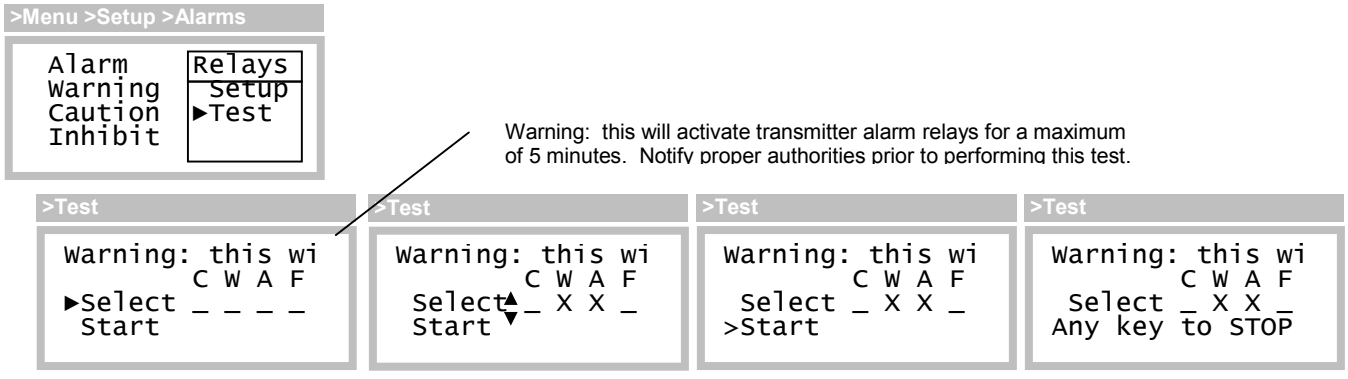


Figure 44. Relay test page example

Inhibiting Alarms

Alarms should be inhibited to prevent false activation, such as done just prior to "bump-testing" the sensor.

The most convenient method for temporarily inhibiting alarms is from the Main Display. Hold the magnet over the ESC key for 2 seconds, and remove it. This will toggle the alarm inhibit mode on for 15 minutes, which will clear and inhibit alarms, hold the current loop at 4mA, and cause the "I" and "L" status indicators to appear. Repeating the procedure toggles alarm inhibit mode off immediately, restores the current loop to normal operation, and clears the "I" and "L" status indicators. Both the inhibit duration, and loop output, are programmable and may be accessed on the Alarm Inhibit setup page (see below).

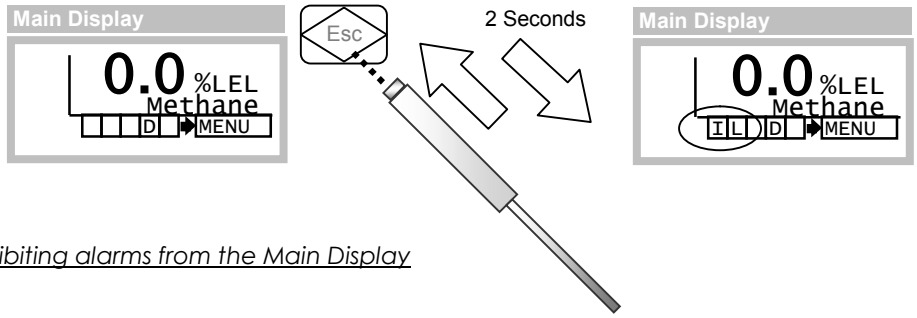


Figure 45. Inhibiting alarms from the Main Display

Alarm Inhibit Setup page

Variables and controls associated with the alarm inhibit mode are accessible on the Alarm Inhibit setup page (below), and are detailed in Table 15.

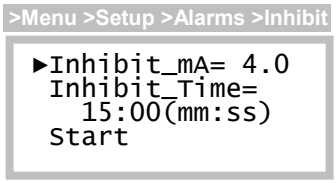


Figure 46. Alarm inhibit setup page

Table 15. Alarm inhibit variables and controls

Variables	Description
Inhibit_mA	The Inhibit_mA variable is output on the current loop during alarm inhibit. It ranges from 3.5 to 22.0 mA (this is the same value that appears on the 4-20mA Setup page).
Inhibit_Time	Alarm Inhibit Off The Inhibit_Time variable is the duration of the alarm inhibit mode, and is programmable from 00:00 to 99:59 (mm:ss). Alarm Inhibit On: The variable counts down from its programmed duration. Selecting it temporarily freezes the count and permits it to be scrolled up and down. If Enter is touched, counting resumes from the new value. If Esc is touched, counting resumes at the previous value. These changes are temporary, and are not saved as the programmed value.
Start (Stop)	The Start function turns on alarm inhibit, which clears and inhibits alarms, holds the current loop at 4mA, causes the "I" and "L" status indicators to appear, and starts the Inhibit_Time variable to begin ticking down. The label then changes to "Stop", and selecting it again turns off alarm inhibit, restore the current loop to normal operation, clears the "I" and "L" status indicators, and restores the Inhibit_Time variable to its programmed value.

4-20mA Analog Output

The 4-20mA output normally sources positive current to a receiver, proportional to the main reading. The output is 4 mA at zero, and rises to 20mA at the full-scale range (see "Range" variable in Sensor Target Gas, Range, Units, LEL Variables), and may go as high as 24mA (125%LEL) in case of gas flooding. Since reading is blanked below zero, the output should never go below 4mA in the course of normal operation.

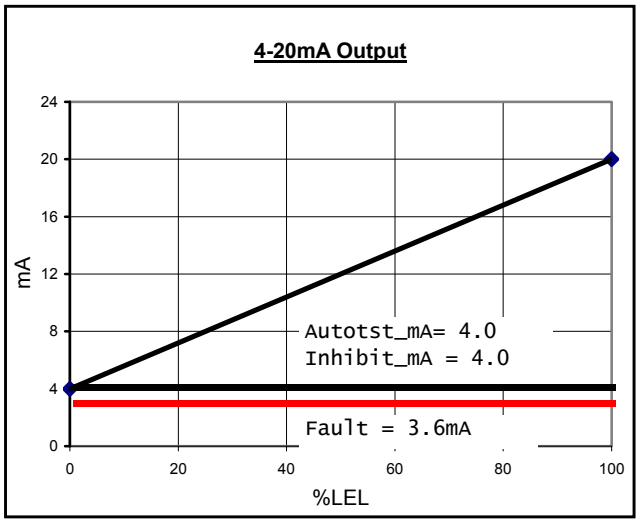


Figure 47. Current loop output plot

Output Overrides

By default, the output is forced to 3.6mA to signal fault alarms to the receiver. During alarm inhibit and auto-test modes, the loop is fixed at 4.0mA to prevent false alarms at the receiver. These are the default values, which may be changed on the 4-20mA Setup page.

4-20mA Setup Page

Variables listed on this page are described below.

```
>Menu >Setup >4-20mA
▶Autotst_mA= 4.0
 Inhibit_mA= 4.0
 Fault_mA=   3.6
 More
```

Figure 48. 4-20mA setup page

Table 16. 4-20mA variables

Variables	Description
Autotst_mA	The Autotst_mA variable is the mA value output during Auto-test mode – to prevent false alarms at the receiver. The default is 4.0mA, and is limited between 3.5[5] and 22.0 mA.
Inhibit_mA	The Inhibit_mA variable is the mA value output during the Alarm Inhibit mode – to prevent false alarms at the receiver. The default is 4.0, and is limited between 3.5[2] and 22.0 mA.
Fault_mA	The Fault_mA variable is the mA value output during Fault alarms. The default is 3.6mA, and is limited between 3.5mA[2] and 22.0mA. The value should be recognized as a fault by the loop receiver.
More	More is a link to the 4-20mA control page.

[5] Since the transmitter may be powered from the current loop, 3.5mA is the lower limit for all settings.

4-20mA Control Page

The 4-20mA Control page permits adjustment of the analog output, and provides a method for manually forcing it to a fixed value to overcome leakages, verify linearity, or test receiver alarms.

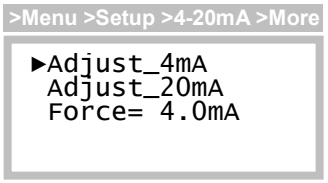


Figure 49. 4-20mA control page

Table 17. 4-20mA control variables

Variables	Description
Adjust_4mA	The Adjust_4mA variable is used to adjust the 4mA level on the 4-20mA output.
Adjust_20mA	The Adjust_20mA variable is used to adjust the 20mA level on the 4-20mA output.
Force	The Force variable is used to force the 4-20mA output to a fixed value. While the variable is not selected, the displayed value is updated to show the real-time output level. The loop is fixed at the instant the variable is selected, and the value may be scrolled up and down as desired, between 3.5 and 22.0 mA.

Loop Adjustment

Loop adjustment consists of adjusting the 4 and 20 mA levels (order does not matter) by scrolling the corresponding DAC[6] value. This may be accomplished by reading a current meter connected across the mA(+) and mA(-) terminals of TB1 on the transmitter's Power Supply Board, or reading the display of a calibrated, current loop receiver.

	Warning: **Disable current loop receiver alarms before proceeding.**	

Select Adjust_4mA or Adjust_20mA and observe the following displays. Select DAC_Value and scroll the displayed value up and down to achieve the desired output level, and touch Enter to save, or Esc to exit without saving.

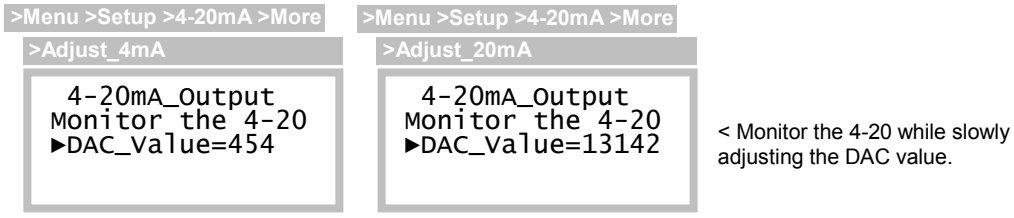


Figure 50. Loop adjustment pages

(DAC values shown may not match)

[6] Digital-to-Analog-Converter value ranging 0 to 16383 (14-bits). Adjustment is performed at factory, values will vary from transmitter to transmitter. This range may increase on future versions.

Data-log

The ALCH200 transmitter data log records gas concentrations in one of 12 discrete intervals ranging from 1 to 60 minutes, providing data from 11 to 474 days. Table 14 details sampling intervals and the associated metrics.

Table 14. Data-log sampling metrics

Sampling (Minutes)	Samples/Day	Days
1	1440	11
2	720	22
3	480	32
4	360	43
5	288	54
6	240	64
10	144	104
12	120	124
15	96	152
20	72	196
30	48	278
60	24	474

Gas concentration (see Main Reading) is recorded as an instantaneous value, and is not averaged or filtered in any way. When the data log memory is filled, new records will overwrite older ones.

Data-log Access

The Data Log Access page provides links to the setup, review, and print pages, which are described below.

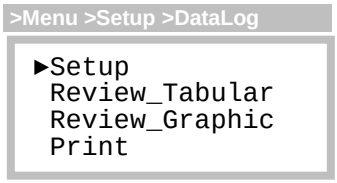
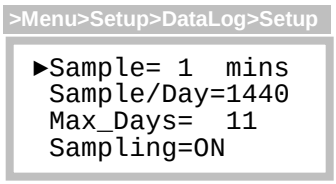


Figure 60. Data log access page

Data-log Setup



Variables on the Data Log Setup page select one of the 12 discrete sampling intervals listed in Table 14, and control starting, stopping and clearing of the data-log.

Figure 61. Data log setup page

Table 15. Data-log setup variables

Variables	Description
Sample, Sample/Day, Max_Days	These variables are used to select one of the 12 sampling intervals listed in Table 14. Each variable functions identically, and scrolling any one of the variables updates the other two. Warning: changing the sampling interval will clear the data-log.
Sampling	The Sampling variable is used to control data recording, which starts when set to ON, and stops when set to OFF. The data-log is cleared when set to CLR, after which the control is returned to its previous value (ON or OFF).

Data may be displayed on the LCD graphically, or in a tabular report format. Data may also be output to a terminal, terminal program, or serial printer. Dates formats are configurable as MM/DD or DDMMM (see System Clock), and samples are displayed in the concentration units shown on the Main Display Page.

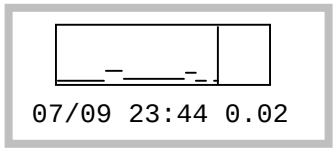
In place of numeric data samples, a report may display special text to indicate samples were unavailable, not yet sampled, or some condition prevented sampling.

Table 16. Data log special text

Special Text	Description
`----`	Sample unavailable (transmitter powered off, or sample not yet recorded)
FFFF	Fault alarm active at time of sample
TEST	Auto-test active at time of sample (if Log_Data=NO, see Auto-test Setup Options)
`****`	Data is corrupted, or unreliable

Data-log Graphic Report

>Menu >Setup >DataLog
>Review_Graphic
(short-cut) >Menu >View_Log



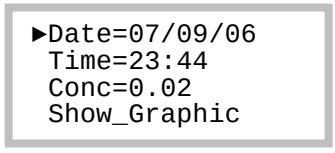
The Graphic Report page plots samples on the LCD from left to right, where older samples are on the left, and newer samples are to the right. Touching the Up and Down keys moves the vertical cursor line right and left, respectively, while updating the date, time, and sample data text on the bottom line.

Figure 62. Data log graphic report page

Upon entry, the cursor is parked at the most recent sample. Moving the cursor left displays the date, time, and values of earlier samples (moving it right will show "- - - -", not sampled yet). Touching the Enter key switches to the Tabular Report page, shown below, and touching the Esc key returns to the Menu page. Data is not plotted while viewing the page.

Data-log Tabular Report

>Menu >Setup >DataLog
>Review_Tabular



The Tabular Report page displays samples in the text field labeled "Conc"(gas concentration) and provides direct access to data by scrolling to an exact date and time.

Figure 63. Data log tabular report page

Upon entry, the Date, Time, and Conc variables are set to the most recent sample. Scrolling the Time variable up increments it by the sampling interval, and causes the next, successive sample to be displayed at Conc. Scrolling Time down displays the previous sample time, and value. Scrolling Time up and down will cause a date rollover at midnight. Scrolling the Date variable up increments it by one day, while holding the Time variable fixed. This is an expedient method to access specific data, and is useful for examining samples recorded at the time of day.

Once the date and time are set, select the Show_Graphic link to switch to the Graphic Report page. Data is not updated while viewing the page.

Data-log Printout

Data-log reports may be sent to serial printer, terminal, or terminal emulation program, such as Microsoft Hyperterminal®. See Appendix A. details on how to setup and print reports.

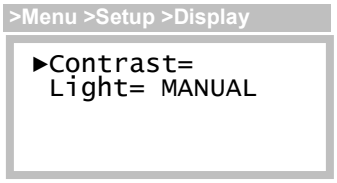
Figure 55. Data-log printout

Date	Time	S0	S1	S2	S3
07/09/06	22:40	1	0	0	1
07/09/06	22:44	-0	0	0	-0
07/09/06	22:48	1	TEST	TEST	TEST
07/09/06	22:52	TEST	TEST	TEST	TEST
07/09/06	22:56	TEST	TEST	TEST	TEST
07/09/06	23:00	1	0	0	1
07/09/06	23:04	1	0	0	1
07/09/06	23:08	1	0	0	1
07/09/06	23:12	1	0	0	1
07/09/06	23:16	1	1	1	0
07/09/06	23:20	0	0	0	-0
07/09/06	23:24	-0	0	0	0
07/09/06	23:28	----	----	----	----
07/09/06	23:32	----	----	----	----
07/09/06	23:36	----	----	----	----
07/09/06	23:40	FFFF	FFFF	0	0

Display

The EXP-SNR Transmitter features a back-lighted, 96w x 32h graphics

LCD. **Display Setup Page**



The Display Setup page variables are used to control the display contrast, and manage the backlight.

Table 21. Display page variables

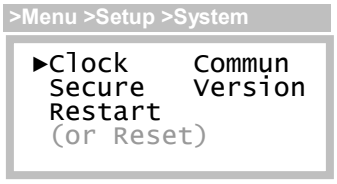
Variables	Description
Contrast	The Contrast variable is used to adjust the LCD contrast. Scroll the variable up to increase contrast (darker text), or down to decrease it (lighter text). The default value is 68%, and is adjustable between 0 and 100%.
Light	The Light variable is used to control when the LCD backlighting is turned on and off.

Setting	Backlight is …
MANUAL	On when any key is touched Off when no key touched for 5 minutes
AUTO	On when any key is touched or alarm is active Off when no key touched for 5 minutes, and no alarms active
NEVER_ON	Off permanently
ALWAYS_ON	On permanently (not recommended)

System

System pages provide version information and configure the internal clock, security access, communication protocols, and to reset various memory defaults.

System Access Page

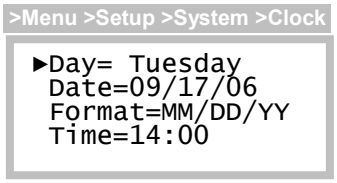


The System Access page provides links to the clock, security, communications, and version pages (the Reset link has been replaced with the Restart function on transmitters beginning with version 2.23).

Figure 56. System access page

Real-time Clock

Clock Setup Page



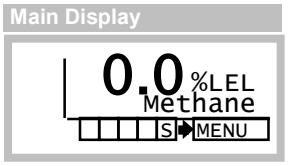
The Clock Setup page is used to set the transmitters real-time clock, which is referenced during sensor calibrations and data logging, and used to trigger Auto-test.

Figure 57. Clock setup page

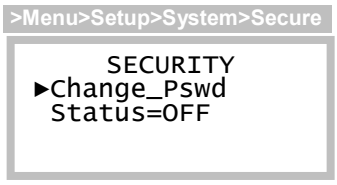
Variables	Description
Day	Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday
Date	Used to configure the month, date, and year, in the format specified by the Format variable (below). Built-in support for leap year.
Format	Selects the date format: MM/DD/YY, example: 09/19/06 DDMMMYY, example: 09Sep06
Time	24-hour format, 00:00 to 23:59

Security

The transmitter protects its configuration using a 4-digit, numeric password, from 0000 to 9999. When security is active, the "S" status indicator appears on the Main Display, variables may be read, but not modified, and functions will not execute, including the sensor verification function during startup review.



Security Control Page



Security is off by default, and may be toggled on and off by entering the 4-digit password.

Figure 58. Security control page

Activating Security

Select the Status variable on the Security Control page, which doubles as a link to the Password Entry page. When the page appears, select Enter Pswd, scroll to the password value (0 by default), and touch Enter. If successful, "PASS" appears briefly and you are returned to the Security Control page where the Status variable is set to ON. If not successful, "FAIL" appears and Status remains OFF.

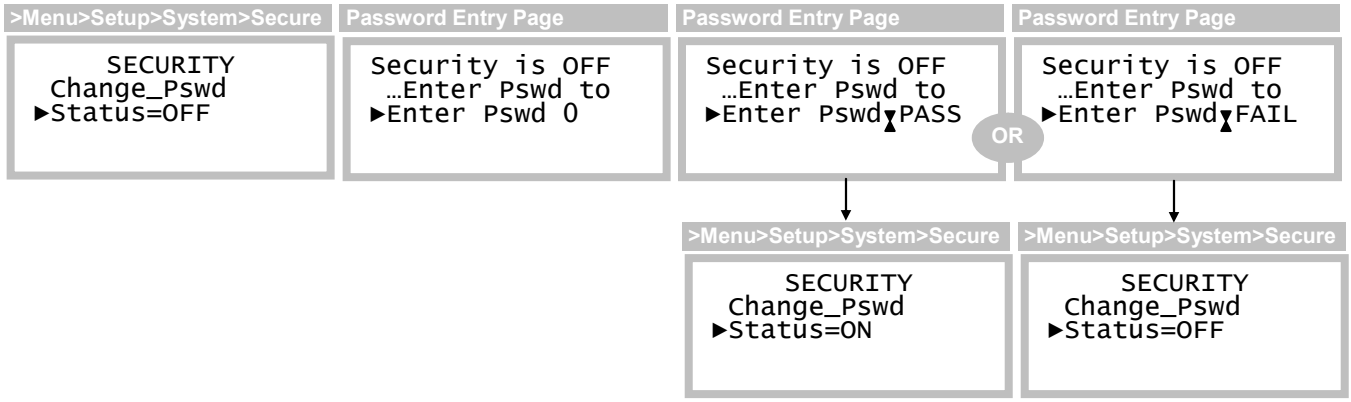


Figure 59. Activating security

Deactivating Security

The procedure to deactivate security is identical to that used for activating it, and if successful, the transmitter presents an option to automatically reactivate it after a timed interval.

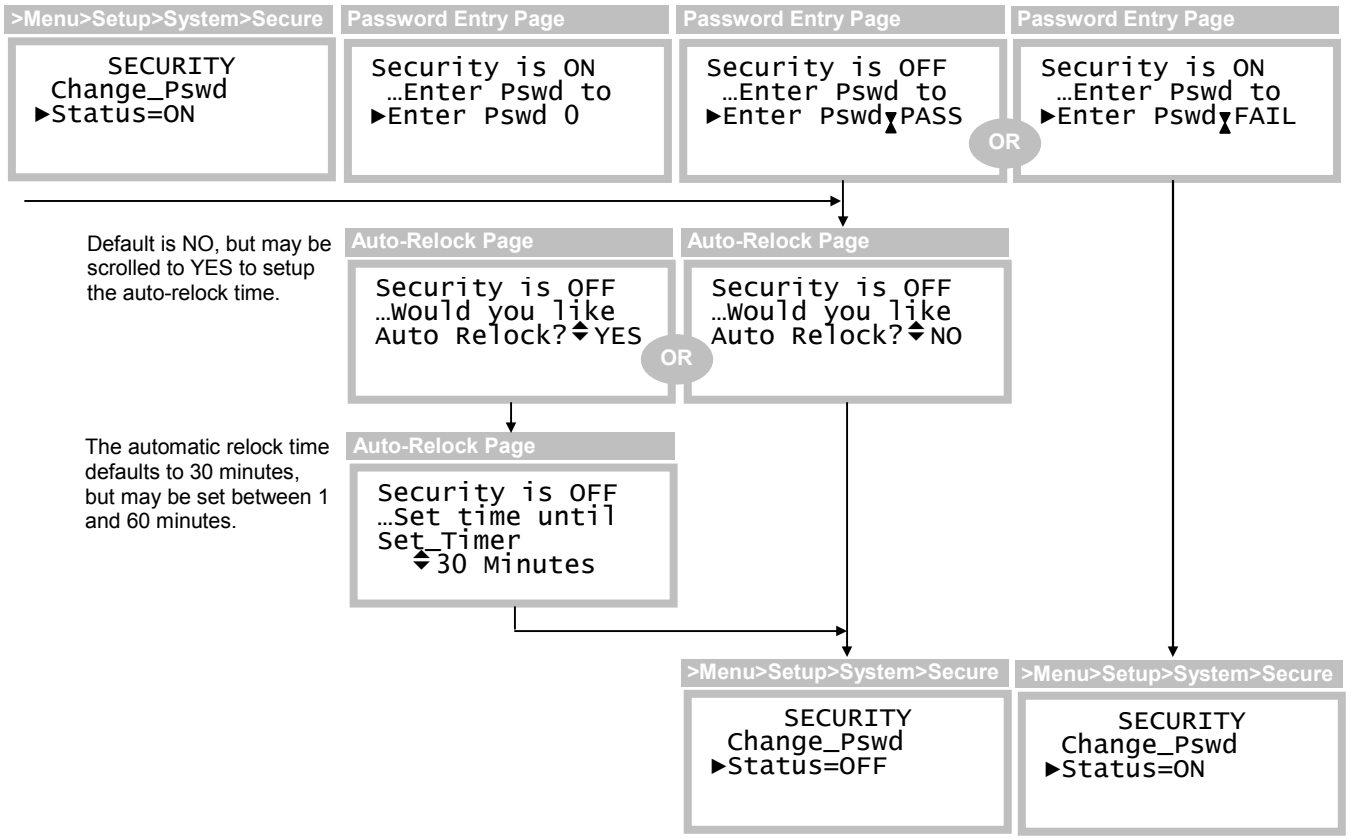


Figure 60. Deactivating security

Changing the Password

The security password is changed by selecting Change_Pswd from the Security Control page. Start by entering the old password, the enter the new one, and repeat it.

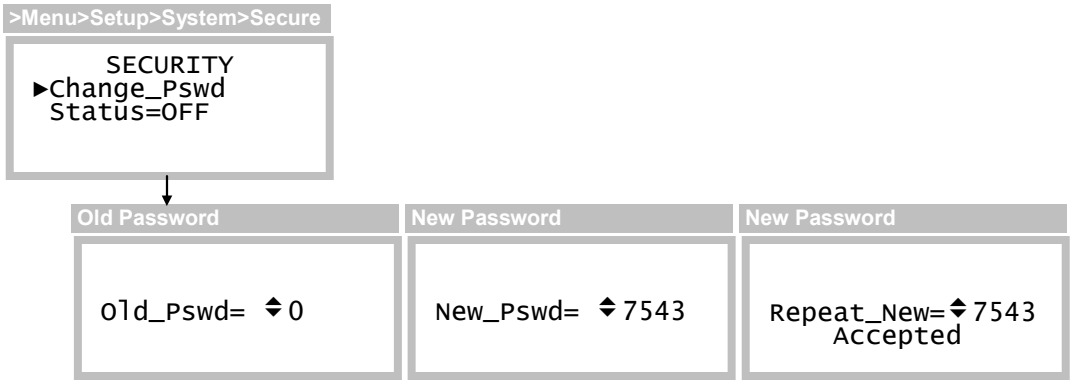
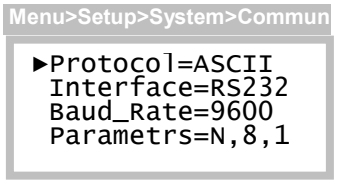


Figure 61. Changing the password

Communications

The EXP-SNR Transmitter supports ASCII, HART 5, and Modbus communications. ASCII is the default protocol if the HART or Modbus option is not ordered.

Communication Setup Page



Communication Setup page variables are used to configure the protocol and settings of the physical communication interface. The protocol selection is performed at the factory, and may not be changed. Settings for the physical communication interface may be changed for ASCII and Modbus protocols, however, they are restricted for the HART protocol).

Figure 62. Communication setup page

Table 22. Communication setup variables

Variables	Description
Protocol	The Protocol variable identifies the installed protocol driver: • None • ASCII (default) • Modbus (option) • HART (option)
Interface	The Interface variable selects the physical communication interface that the transmitter will control during transmit and receive functions: • RS232 (available for ASCII or Modbus, not for HART) • RS485 (available for ASCII or Modbus, not for HART) • MODEM (available for HART only) The transmitter must be wired in accordance with this selection (see ELECTRICAL CONNECTIONS starting on page 16).
Baud_Rate	The Baud_Rate variable is used to configure the baud rate of the transmitter's UART, and may be set to: 300,600,1200,2400,4800,9600,14.4k, or 28.8k The value is fixed at 1200 for HART protocol, and defaults to 9600 for Modbus and ASCII.
Parametrs	The Parametrs variable is used to configure parity, the number of data bits, and number of stop bits of the transmitter's UART: • N,8,1 …no parity, 8 data bits, 1 stop bits • N,8,2 …no parity, 8 data bits, 2 stop bits • E,8,1 …even parity, 8 data bits, 1 stop bit • O,8,1 …odd parity, 8 data bits, 1 stop bit The value is fixed at O,8,1 for HART protocol, and defaults to N,8,1 for Modbus and ASCII.

Protocol specific settings are configured on separate pages that are accessible from links on the Setup page, and are discussed below.

ASCII

ASCII is used for sending the data log to a serial printer, terminal, or terminal program, using RS232 (RS485 might be used under certain conditions). Handshaking is XON/XOFF only, and the Communication Setup page may be used to configure the interface, baud rate, and communication variables. See RS232 Modbus, PC Capture, or Printer for connection details. There are no additional pages for protocol variables.

HART

HART is a master/slave protocol that supports 1 or 2 masters, and up to 15 slave devices. Devices communicate digitally at an effective rate of 1200 baud by modulating the 4-20mA loop. Modulation is performed by a modem that conforms to the BELL 202 standard, which uses FSK (frequency shift keying), where 1200Hz represents a logic 1, and 2200Hz represents logic 0, and does not affect the loop's DC level. Connections are typically point-to-point, which enables bi-directional digital communication and preserves the transmitter's analog output signal. Up to 15 devices may be connected in a multi-drop configuration for digital communication, but requires each device to fix its output at 4mA. See HART Transmitter connection examples in ELECTRICAL CONNECTIONS on page 16, or consult the HART Foundation for additional details on connecting a HART transmitter.

When the HART protocol driver is installed, a link to the HART Setup page appears on the main Setup page.

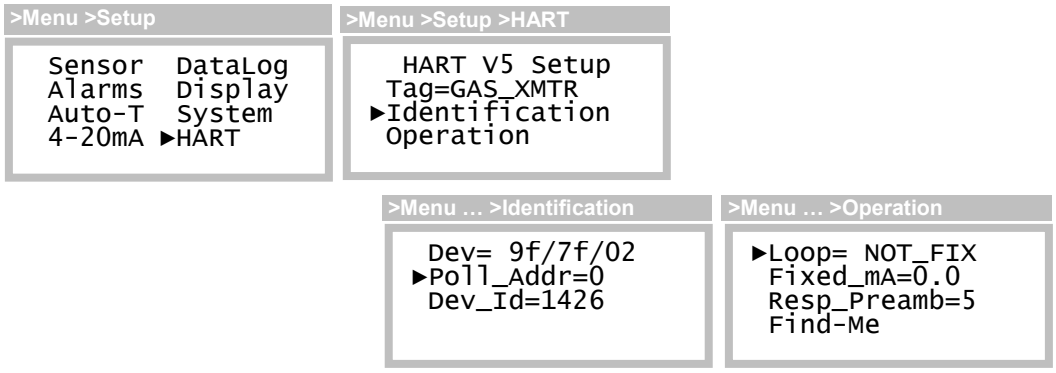


Figure 63. Hart setup pages

Table 23. HART setup variables

Variables	Description
Tag	The Tag variable can be used as a unique identifier for communicating to the transmitter. The variable is read only at the operator interface, but may be modified using HART network management commands.
Dev	The Dev variable displays read-only device information used in long-frame address commands, and by devices capable of utilizing the transmitter's DDL (device description language) file. The format of the information is, MFG_ID/DEV/REV. The MFG_ID is 9f, and identifies Analytical Technology, Inc as the manufacturer. DEV is 7f, and identifies the device as a EXP-SNR transmitter. REV is the revision level of the transmitter, currently set at 2 (may increment in the future).

Poll_Addr	The Poll_Addr variable sets the polling address of the transmitter. The default value is 0, which allows the transmitter to communicate digitally, while preserving the function of the 4-20mA output. The value may be set from 1 to 15, which fixes the output at 4mA, and disables analog signaling.
Dev_Id	The Dev_Id variable is used to form a unique identifier in the HART long frame address. This value is set at the factory, and appears on a label attached to the transmitter. Changing this setting is not recommended.
Loop	The Loop variable specifies the operation of the 4-20mA output. When the HART polling address is 0, the value is NOT_FIX and loop functions as normal. When the address is set to 1 or higher, the value is FIXED and the output is fixed at 4mA. The ability to alter this behavior is reserved for future use, and changing this setting is not recommended.
Fixed_mA	The Fixed_mA variable provides direct access the associated HART network management variable. The value is adjustable only when the Loop variable is FIXED, and may be adjusted between 3.5 and 22 mA.
Resp_Preamb	The Resp_Pream variable provides direct access to the associated HART network management variable, which determines the number of preamble characters (FF hex) transmitted at the beginning of each message. The default value is 5, and may be set from 3 to 20. Changing this setting is not recommended.
Find-Me	The Find-Me function places the transmitter into the Find-Me mode, where a master device can issue a command to positively identify the physical location of the transmitter.

Selecting the Find-Me function presents the special page that remains until the master device issues a "Find-Me" command to the transmitter, at which point the display changes to the "Device Found" page.

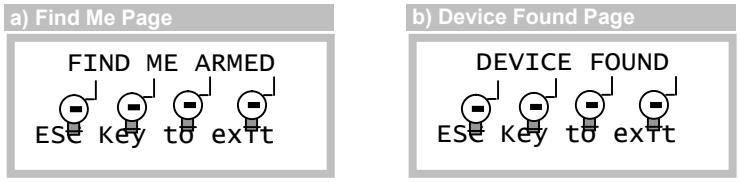


Figure 64. Hart a) Find-me and b) Device found pages

Modbus

Modbus is a master/slave protocol that supports a single master, and up to 247 slave devices on a common bus. The RS485 interface physically limits this number to 32 (1 master, 31 slaves), and RS232 restricts communication to a master and a single slave. The Communication Setup page may be used to configure the interface, baud rate, and communication variables. See RS485 Modbus Multidrop and RS232 Modbus, PC Capture, or Printer for connection details.

When the Modbus protocol driver is installed, a link to the Modbus Setup page appears on the main Setup page.

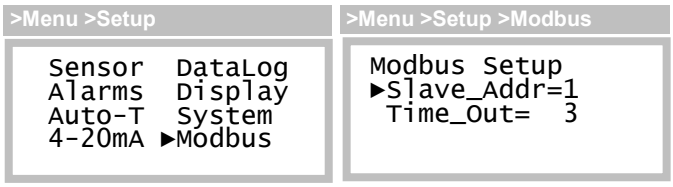


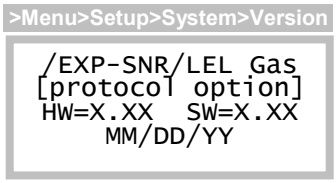
Figure 65. Modbus setup page

Table 24. Modbus setup variables

Variables	Description
Slave_Addr	The Slave_Addr variable is the transmitter's slave address, which may set from 1 (default) to 247.
Time_Out	The Time_Out variable belongs to the data-link layer of the protocol and defines the number of 1.5 character timeouts used to frame messages. This variable is reserved for future use and changing it is not recommended.

Transmitter Version

The Transmitter Version page displays transmitter information:



Line 1: model and version name
Line 2: protocol option (ASCII,HART,or Modbus)
Line 3: hardware and software version numbers
Line 4: software build date

Figure 66. Transmitter version page

Restart

The Restart function will cause the transmitter to start up, just as it does during a power-on-reset. This function replaces the Reset page beginning with version 2.23 of the EXP-SNR Combustible Gas Transmitter with Catalytic Bead sensor.

Resets

Note: the Reset page has been removed on software versions 2.23, and higher.

The Reset page provides functions for resetting configuration memories, and restarting the transmitter, which may prove useful for correcting specific faults. These functions should **not be used** unless they are specified in troubleshooting procedures, or directed by authorized factory personnel.

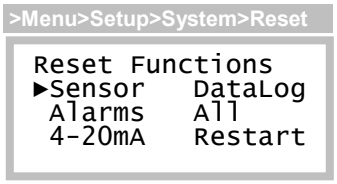


Table 25. Reset functions (do not use except for troubleshooting).

Function	Description
Sensor	Resets zero and span calibration, restarts transmitter. Sensor must be completely recalibrated. On LEL transmitters, calibration and Auto-test history are cleared.
Alarms	Resets alarm set/reset points, options, delays, and inhibit_mA, restarts transmitter.
4-20mA	Resets 4-20mA calibration, loop must be recalibrated, restarts transmitter.
DataLog	Clears the data log history, restarts transmitter.
All	Resets entire transmitter to factory defaults, excluding sensor, restarts transmitter. Requires full transmitter setup.
Restart	Restarts the transmitter.

SPARE PARTS

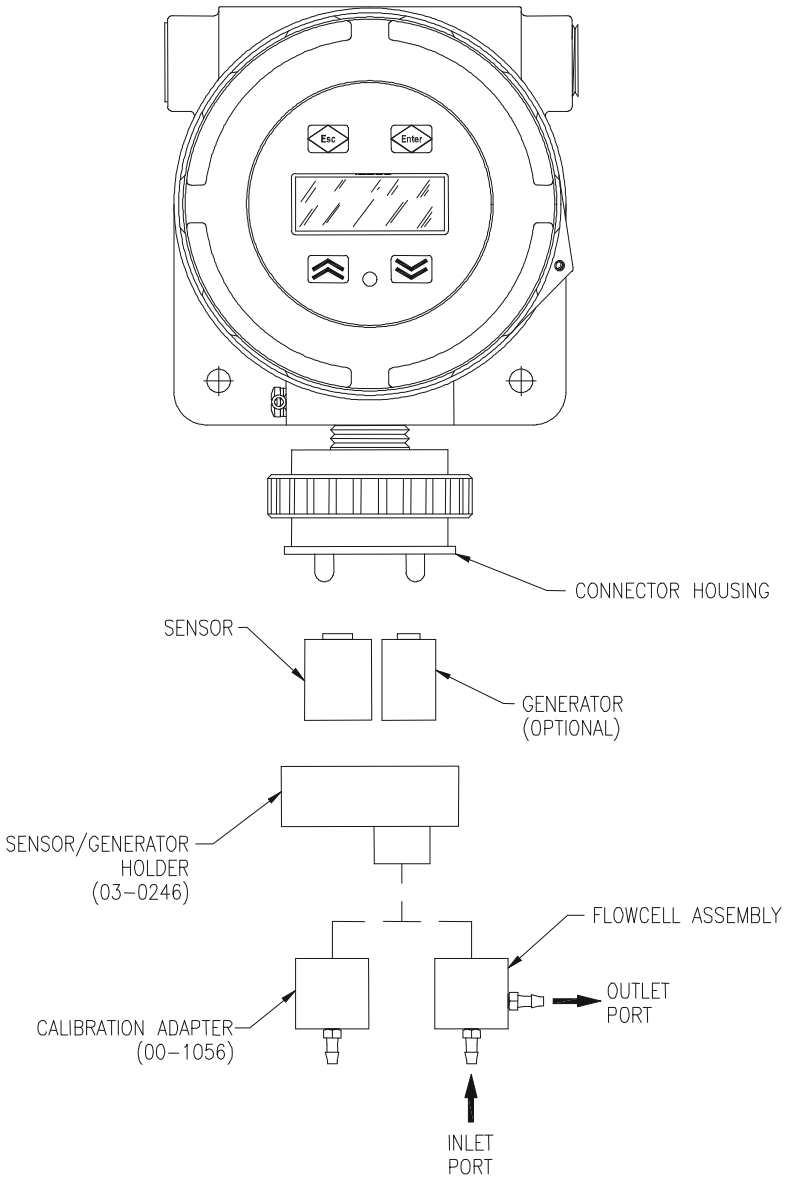

Esc
Enter
CONNECTOR HOUSING
SENSOR
GENERATOR
(OPTIONAL)
SENSOR/GENERATOR
HOLDER
(03-0246)
FLOWCELL ASSEMBLY
OUTLET
PORT
CALIBRATION ADAPTER
(00-1056)
INLET
PORT

Table 22. Transmitter

Description
PCB Stack Assembly w/o Relays
PCB Stack Assembly with Relays
Remote PCB Stack Assembly w/o Relays
Remote PCB Stack Assembly with Relays
Connector Housing Assembly
Connector Housing Assembly w/Heater
Sensor/Generator holder
Remote Interconnect Cable (25' Standard)
PCB Stack Assembly w/Rlys
Transmitter explosion-proof housing
Sensor gasket (non auto-test version)
Sensor/generator gasket (auto-test version)
Calibration adapter
Flowcell Assembly
Battery
Magnetic Screwdriver

Table 23. sensor modules

Description
Bromine, 0-1/5 PPM (2 PPM Standard)
Bromine, 0-5/200 (20 PPM Standard)
Chlorine, 0-1/5 PPM (2 PPM Standard)
Chlorine, 0-5/200 (20 PPM Standard)
Chlorine dioxide, 0-1/5 PPM (2 PPM Standard)
Chlorine dioxide, 0-5/200 (20 PPM Standard)
Fluorine, 0-1/5 PPM (2 PPM Standard)
Fluorine, 0-5/200 (20 PPM Standard)
Ozone, 0-1/5 PPM (2 PPM Standard)
Ozone, 0-5/200 PPM (20 PPM Standard)
Ammonia, 0-50/500 PPM (200 PPM Standard)
Ammonia, 0-500/2000 PPM (1000 PPM Standard)
Carbon monoxide, 0-50/1000 PPM (200 PPM Standard)
Hydrogen, 0-1/10% (4% Standard)
Oxygen, 0-5/25% (25% Standard)
Phosgene, 0-1/5 PPM (2 PPM Standard)
Phosgene, 0-5/100 PPM (100 PPM Standard)
Hydrogen chloride, 0-10/200 PPM (20 PPM Standard)
Hydrogen cyanide, 0-10/200 PPM (20 PPM Standard)
Hydrogen fluoride, 0-10/200 PPM (20 PPM Standard)
Hydrogen sulfide, 0-10/200 PPM (50 PPM Standard)
Nitric oxide, 0-50/500 PPM (200 PPM Standard)
Nitrogen dioxide, 0-10/200 PPM (20 PPM Standard)
Sulfur dioxide, 0-10/500 PPM (20 PPM Standard)
Arsine, 0-500/2000 PPB (1000 PPB Standard)
Arsine, 0-10/200 PPM (10 PPM Standard)
Diborane, 0-500/2000 PPB (1000 PPB Standard)
Diborane, 0-10/200 PPM (10 PPM Standard)
Germane, 0-500/2000 PPB (1000 PPB Standard)
Germane, 0-10/200 PPM (10 PPM Standard)
Hydrogen selenide, 0-500/2000 PPB (1000 PPB Standard)
Hydrogen selenide, 0-10/200 PPM (10 PPM Standard)
Phosphine, 0-500/2000 PPB (1000 PPB Standard)

Phosphine, 0-10/200 PPM (10 PPM Standard)
Phosphine, 0-200/2000 PPM (1000 PPM Standard)
Silane, 0-10/200 PPM (10 PPM Standard)
Iodine, 0-1/5 PPM (2 PPM Standard)
Iodine, 0-5/200 PPM (20 PPM Standard)
Acid gases, 0-10/200 PPM (20 PPM Standard)
Ethylene oxide, 0-20/200 PPM (20 PPM Standard)
Formaldehyde, 0-20/200 PPM (20 PPM Standard)
Hydrogen, 0-500/2000 PPM (2000 PPM Standard)
Hydrogen peroxide, 0-10/100 PPM (20 PPM Standard)
Alcohol, 0-50/500 PPM (200 PPM Standard)
Alcohol, 0-500/2000 PPM (2000 PPM Standard)
Acetylene, 0-50/500 PPM (0-200 PPM Standard)
Hydrogen peroxide, 200/2000 PPM (500 PPM Standard)
NOx, 50/500 PPM (200 PPM Standard)
Silane, 500/2000 PPB (1000 PPB Standard)
Formaldehyde, 500/2000 PPM (1000 PPM Standard)
Ozone, 200/1000 PPM (1000 PPM Standard)
Chlorine dioxide, 200/1000 PPM (1000 PPM Standard)
Chlorine dioxide, 1/5 PPM (low Cl2 response)
Dimethylamine (DMA), 100/200 PPM (100 PPM Standard)
Hydrogen bromide, 10/200 PPM (20 PPM Standard)
Hydrogen sulfide, 200/1000 PPM (500 PPM Standard)

Table 24. gas generators

Description
Chlorine
Ammonia
Carbon Monoxide
Hydrogen Sulfide
Sulfur Dioxide

Table 25. Duct mount sensor accessories

Description
Duct Mount Adapter
Duct Mount Sensor Holder
Sensor Gasket for (00-1389)
Duct Mount Cable Assembly

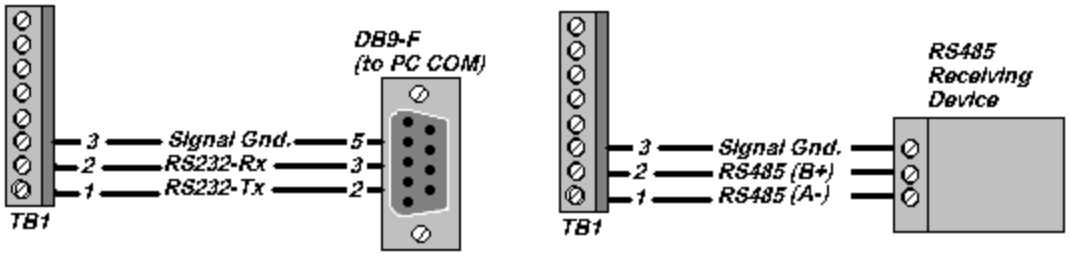
Appendix A.

Printing Data Log Reports

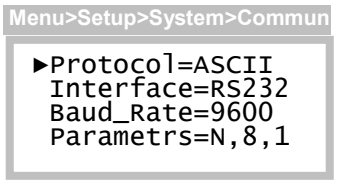
The following pages describe how to send a data-log report to a printer or computer, over a serial RS232 connection, and to import that data into Microsoft Excel for plotting.

Serial Connection

The data log report may be sent to a printer or a computer over an RS232 connection, or in some cases, an RS485 connection.



Communication Setup Page



The communication interface, baud rate, parity, number of data bits, and number of stop bits are configured on the Communication Setup page.

Flow Control

The transmitter uses XON/XOFF flow control while sending a report. That is, once the data stream has begun, it will continue until the XOFF character (19) is received. After sitting idle, the report stream will begin again upon reception of the XON character (17).

An RS232 connection can support full duplex communication and is perfectly suited for XON/XOFF flow control. However, an RS485 connection is only half duplex. It cannot receive while it is transmitting and might miss the XOFF character, resulting in a buffer overflow at the receiving device.

A receiving device will send the XOFF character when its buffer is nearly full. Some older dot-matrix printers will send an XOFF because they have a small receive buffers and cannot process characters while the head is returning to start a new line. On the other hand, most computers have comparatively large buffers and can easily accept the report stream without sending an XOFF. Therefore, an RS485 connection may work for sending reports to a computer.

The EXP-SNR features an additional method to help avoid losing data due to buffer overflow problems on receiving devices that lack XON/XOFF capability (or have the capability but are using an RS485 connection). A programmable time delay of up to 10s may be inserted at the end of each report line. This permits the receiver time to process more characters in its buffer and avoid an overflow. However, this may be a method of trial and error until the proper delay setting is determined so that no characters are missing from the report.

Report Format

The format of the report is suitable for import into most spreadsheet programs and consists of a date column, a time column, and 1-30 columns for sample values. Each line of the report shows the date and time of the first sample. Samples appearing in subsequent columns (left to right) were recorded at equal sampling intervals.

In the top line of the example below, the first sample (S0) occurred at 22:40. The next sample to the right (S1) occurred at 22:41, followed by the next (S2) at 22:42, and so on. This pattern is repeated throughout the report.

```
Date     Time     S0     S1     S2     S3

07/09/06 22:40 0.01 0.00 0.02 0.01
07/09/06 22:44 -0.0 0.00 0.00 -0.0
07/09/06 22:48 0.01 TEST TEST TEST
07/09/06 22:52 TEST TEST TEST TEST
07/09/06 22:56 TEST TEST TEST TEST
07/09/06 23:00 0.07 0.06 0.07 0.06
07/09/06 23:04 0.06 0.05 0.06 0.06
07/09/06 23:08 0.05 0.05 0.04 0.05
07/09/06 23:12 0.06 0.05 0.05 0.04
07/09/06 23:16 0.01 0.01 0.01 0.00
07/09/06 23:20 0.00 0.00 0.00 -0.1
07/09/06 23:24 -0.0 0.00 0.00 0.00
07/09/06 23:28 ---- ---- ---- ----
07/09/06 23:32 ---- ---- ---- ----
07/09/06 23:36 ---- ---- ---- ----
07/09/06 23:40 FFFF FFFF 0.02 0.02
```

The transmitter permits selection of either a CR (carriage return) or CR/LF (carriage return/line feed) as the EOL (end-of-line) characters. If the lines of the report appear to be printing over each other, choose the CR/LF option. If the lines appear to be double spaced, choose the CR option.

The number of sample columns appearing across the page is programmable from 1 to 30. This is designed so that a report may be directed to either a small carriage printer, or to a wider format device. A wider report will take less time to print because the date and time fields will be printed less frequently.

Samples reported are assumed to be in units of PPM, PPB, %, or %LEL, as determined by the gas concentration units appearing on the main display of the transmitter. Sample values outside of printing limits are forced to the following values.

Samples …	Are forced to…
Less than –999	*-999*
Greater than 9999	*9999*

Symbols may appear in place of sample values, and are defined as follows.

Symbol	Description	
----	No sample recorded. The transmitter was not on to record the sample, or has not yet recorded the sample.	
FFFF	The transmitter was in fault during the sample.	
TEST	The transmitter was in auto-test during the sample. This symbol appears only if the Log_Data variable in the Menu/Setup/Auto-T/Setup menu is set to “NO”.	
****	Data in the log is corrupted or unreliable.	

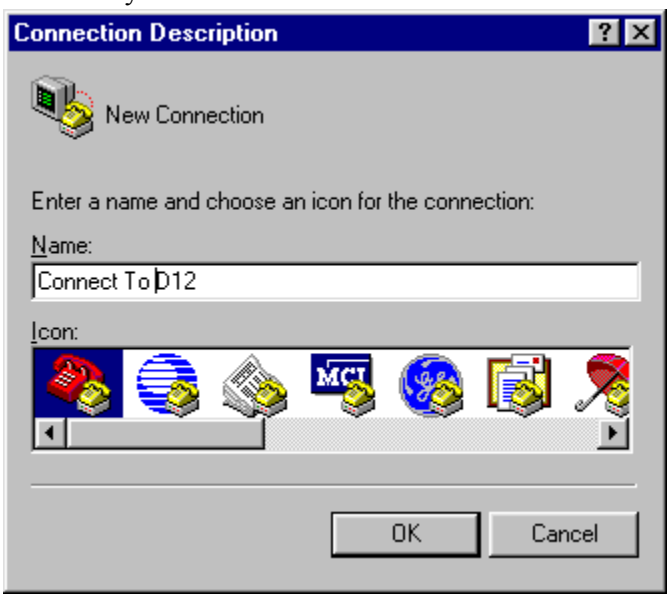
Report Control

The start date and length of the report may be controlled from the operator interface. The length of the report is limited to the number of days actually stored in the log. The report always begins at 00:00 on the start date, and continues forward for the number of days specified. If no data has yet been logged, the report will show four dashes (----) in place of samples.

Example: Charting a Data Log Report

Start HyperTerminal by clicking **Start**, pointing to **Programs**, pointing to **Accessories**, pointing to **Communications**, clicking **HyperTerminal,** and then double-clicking **Hypertrm.exe**.

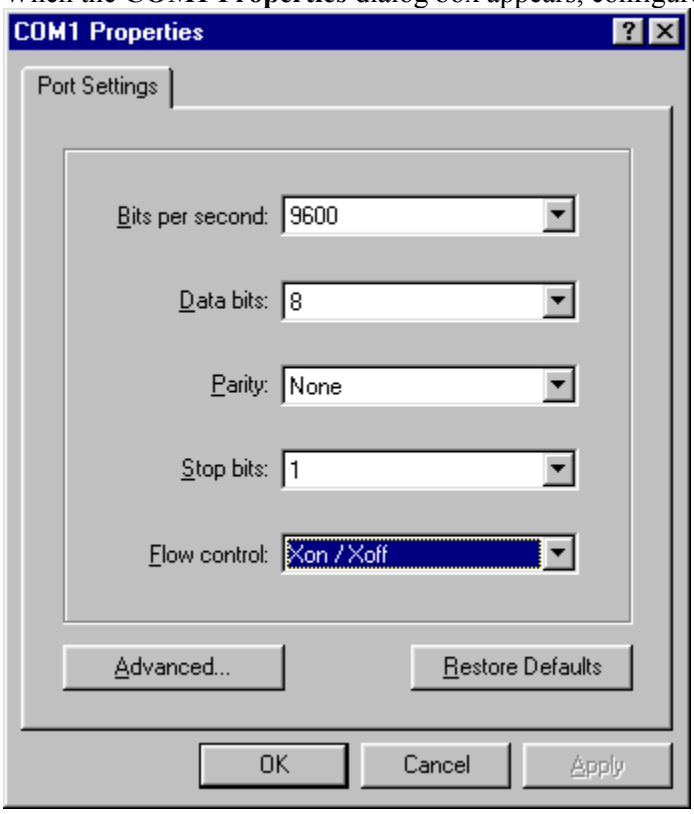
When the **Connection Description** dialog box appears, type in **Connect To ALCH200**. If you wish, choose an icon by sliding the horizontal scroll bar over and clicking one of the selections. Click **OK** when ready.



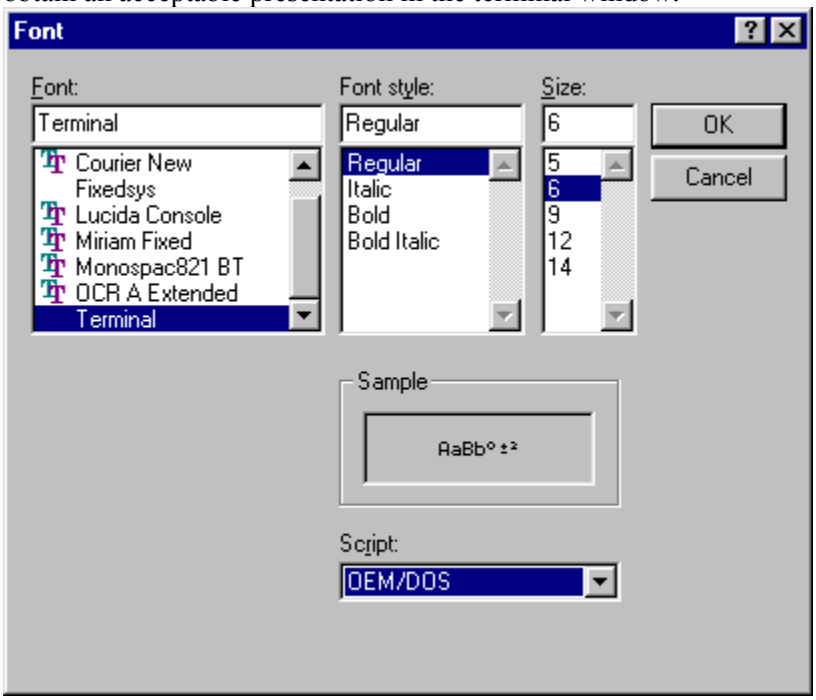
When the **Connect To** dialog appears, set **Connect using:** to **Direct to Com1** (or Direct to Com2 if you are using COM2) and click **OK**.



When the **COM1 Properties** dialog box appears, configure the Port Settings as shown below and click **OK**.

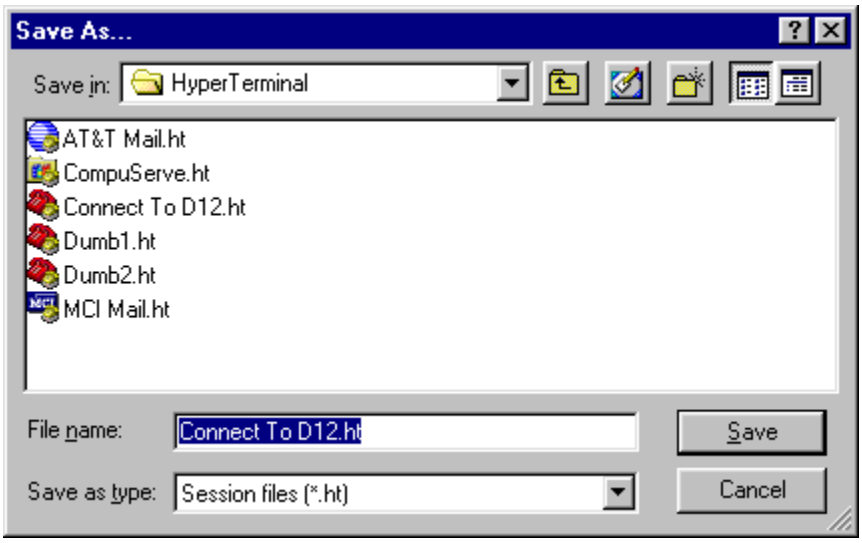


Click **View**, then click **Font** and configure the font settings as shown. This will insure that the data is presented in the terminal window without wrapping from line to line. You may need to experiment with these settings to obtain an acceptable presentation in the terminal window.

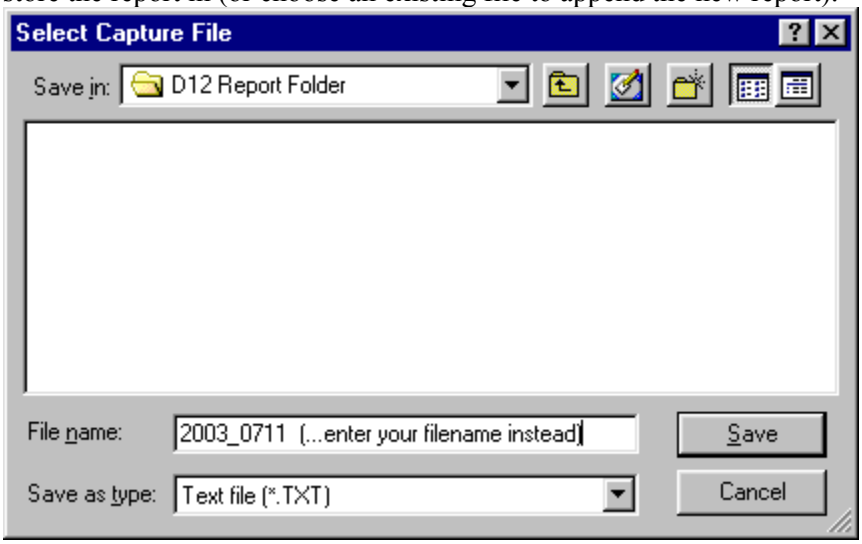


Click **OK** when finished.

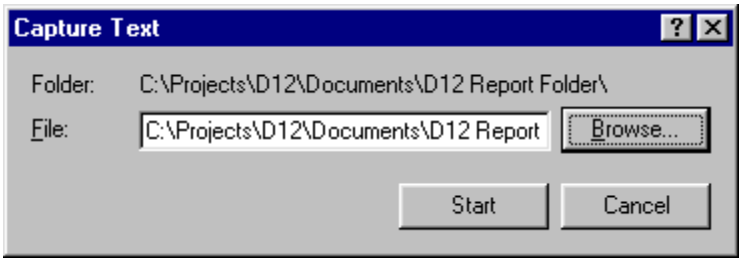
Click **File**, then click **Save As**, and click the **Save** button to store the settings as a HyperTerminal session file named Connect To ALCH200.ht (the filename should automatically appear). You may later place this file on your desktop and simply click it to get this point automatically.



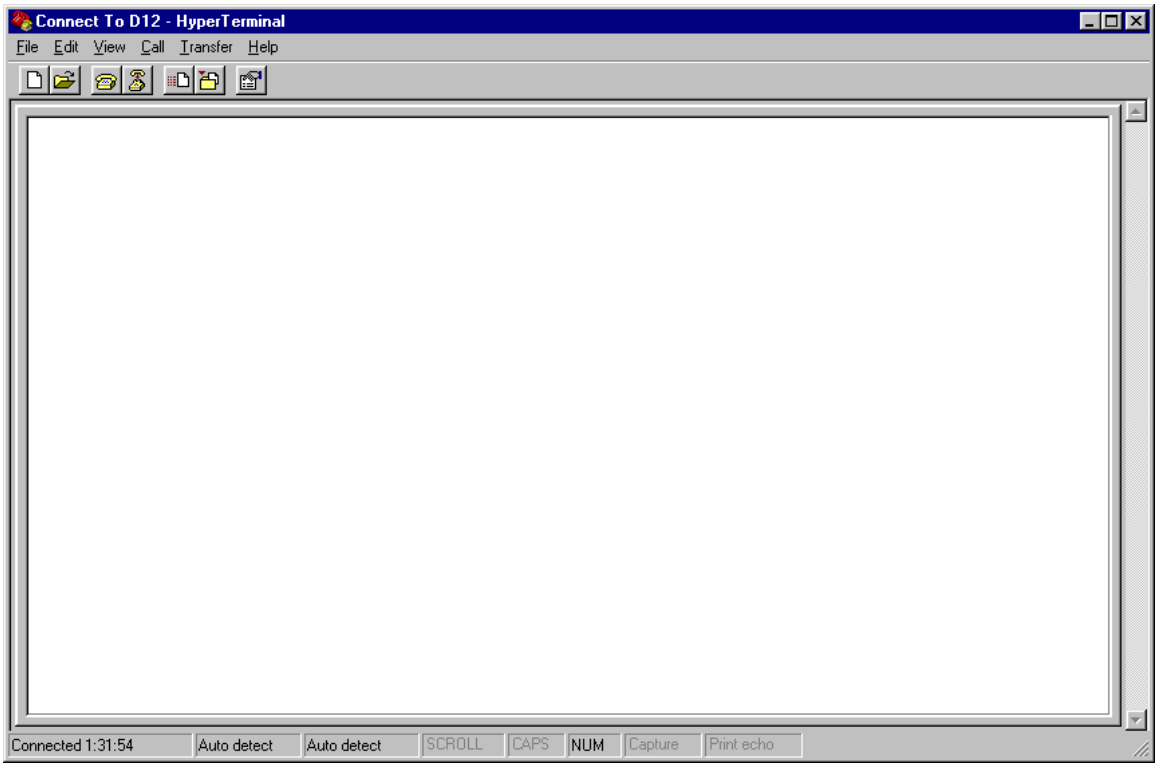
In order to chart the report data, it must be "captured" in a file and given a name. Click **Transfer** on the menu bar, click **Capture Text,** and then click the **Browse** button. Navigate to a folder and type the name of a file to store the report in (or choose an existing file to append the new report).



Click the **Save** button to return to the **Capture Text** dialog box.When the **Capture Text** dialog box reappears, click the **Start** button.



HyperTerminal is now ready to accept a report from the transmitter and save it in a file. Note that data may appear in the terminal window (shown below) if the Connect To ALCH200 session has been run previously, but this data will not appear in the file just opened.



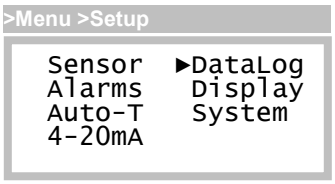
Starting the Report

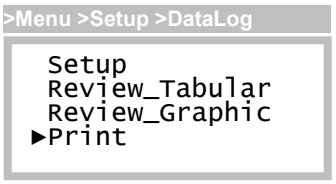
Prior to sending a report to the computer, the system clock should be set and the data logger turned on to record at least one sample. In addition, the Log_Data variable (in the Menu/Setup/Auto-T/Setup menu) should be set to NO if you prefer to see the symbol TEST and not gas concentration values during auto-test.

Configure the communication variables as shown below. Note that 9600 is the highest baud rate common to the EXP-SNR transmitter and the Hyperterminal program.

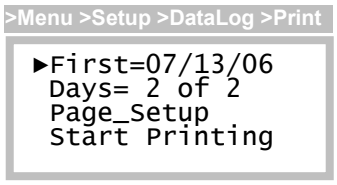
```
Menu>Setup>System>Commun
▶Protocol=ASCII
 Interface=RS232
 Baud_Rate=9600
 Parametrs=N,8,1
```

Navigate to the DataLog page and select Print. You will not be allowed access if there are no samples in the log.

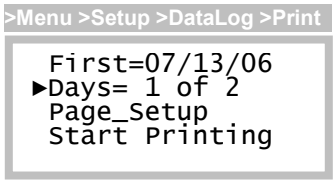




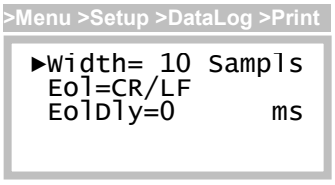
Select the first (starting) date. This will automatically re-compute the maximum number of days shown of the report (variable values will most likely differ from yours).



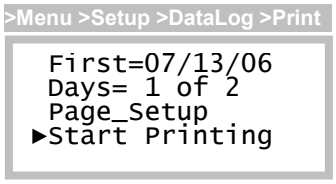
Edit the Days variable if you prefer to reduce the length of the report, otherwise the entire report will be printed.

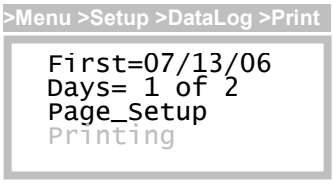


Select Page_Setup and configure the Width, Eol, and EolDly variables as shown. The Width variable controls the number of sample columns printed and is settable from 1 to 30. Since the Hyperterminal display is 80 characters wide, set this to 10 columns so that data does not wrap around to the next line. Set Eol for CR/LF, and EolDly to 0.

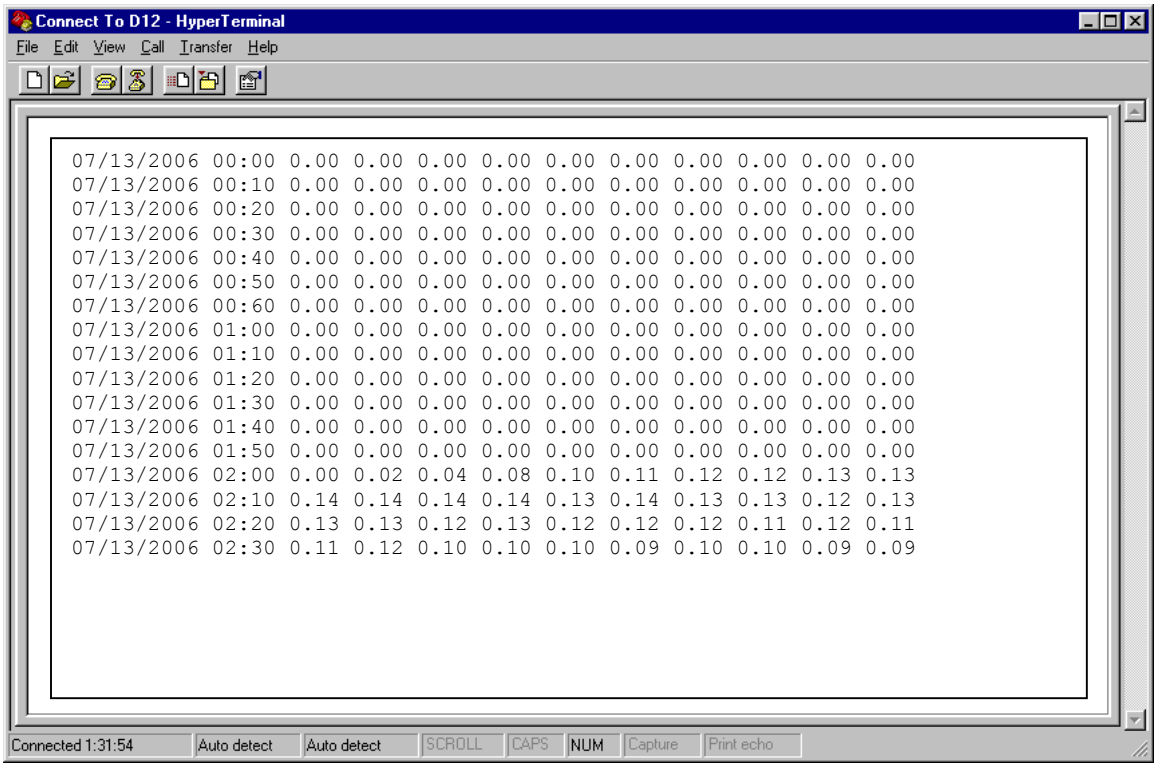


Escape from Page_Setup and select Start_Printing. "Printing" will begin flashing, and you may stop at any time by touching the Esc key.





The HyperTerminal terminal window should now begin to fill with lines from the report.



When the transmitter has stopped printing (displays Start_Printing), click **Transfer**, move down to **Capture Text** and click **Stop**. This will close the report file so that it may be opened by another program.

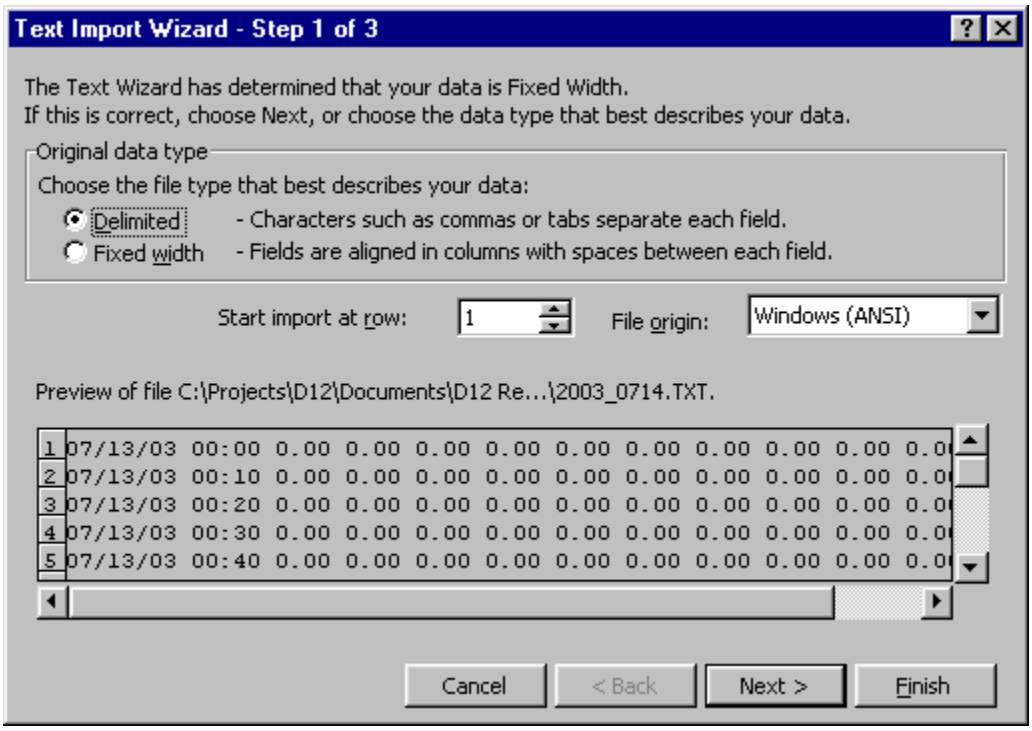
Charting with Microsoft Excel

Microsoft Excel can be used to import data log reports and create useful and informative charts.

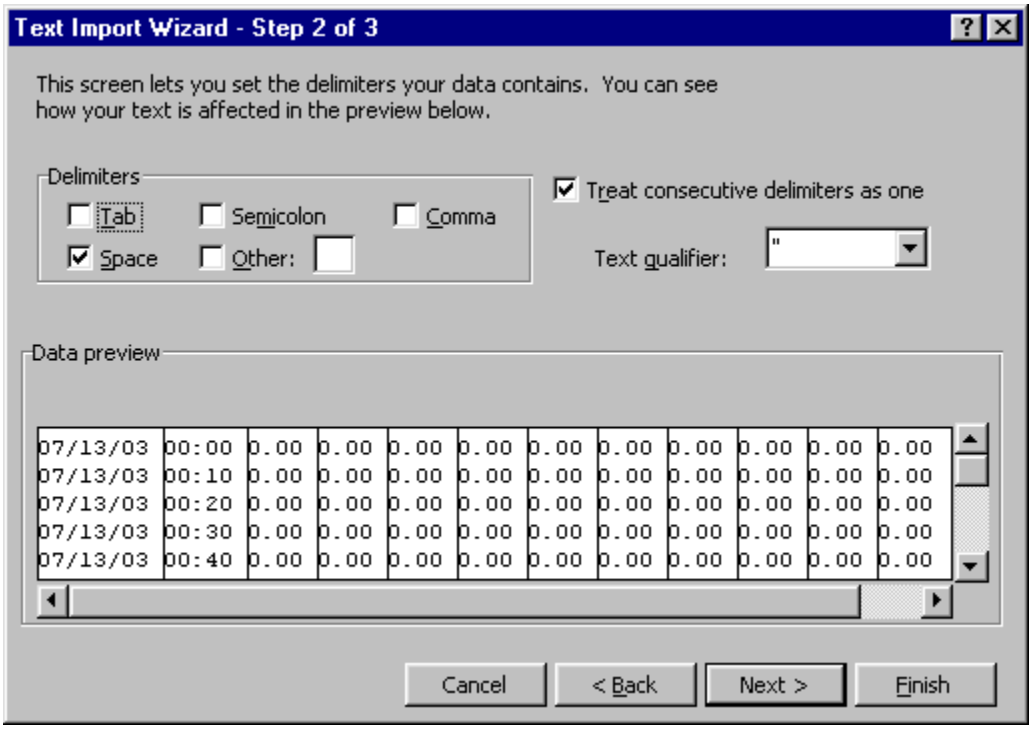
Start Excel by clicking **Start**, pointing to **Programs**, and clicking **Microsoft Excel.**

When Excel opens, click **File** and then click **Open.** Navigate to the data log report file you wish to chart and click **Open**. Excel will recognize the report as a text file and offer some configuration options.

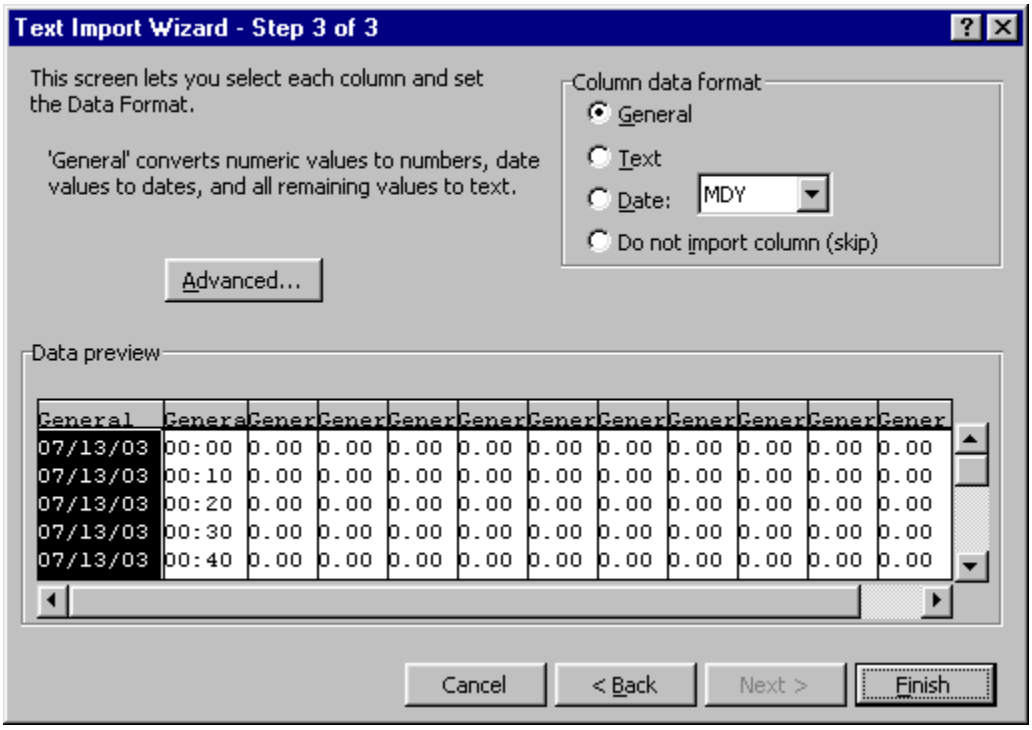
When the **Text Import Wizard – Step 1 of 3** appears, configure the settings as shown below and click **Next**. (Note that the values in your report file will be different than those shown below.)



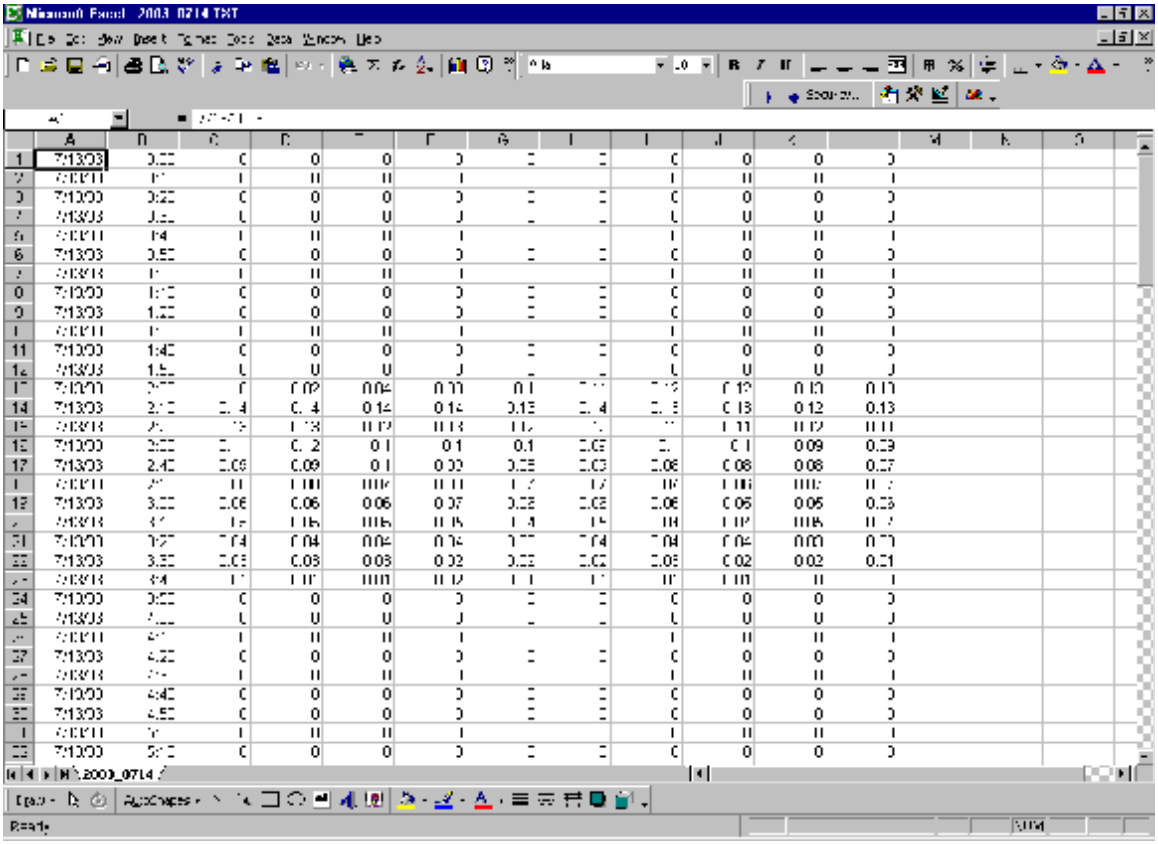
When the **Text Import Wizard – Step 2 of 3** appears, configure the settings as shown below and click **Next**.



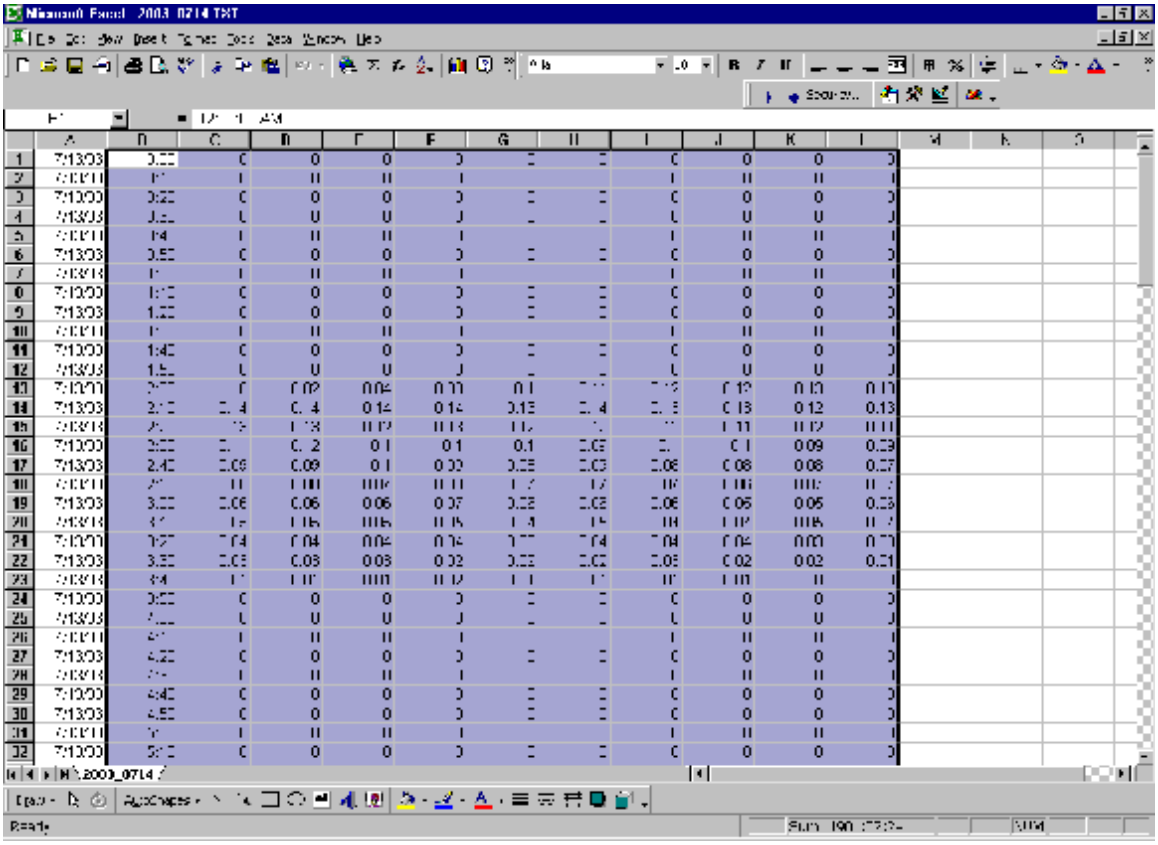
When the **Text Import Wizard – Step 3 of 3** appears, click **Finish**.



The report should appear as a spreadsheet resembling the format shown below. Of course the dates, times, and values will be different.

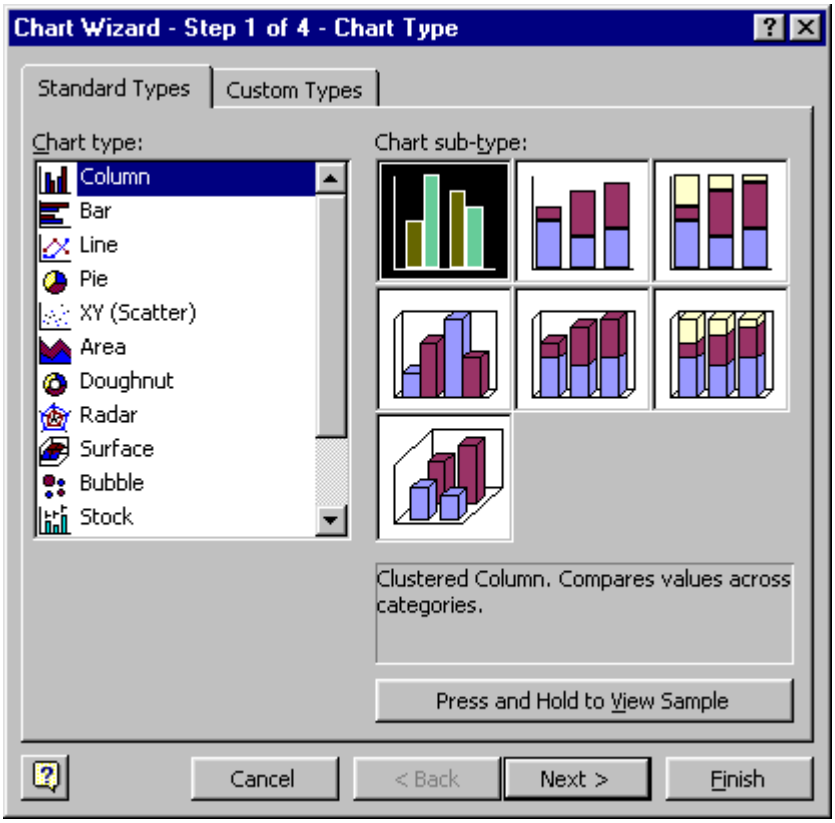


To chart the report, select one full day of data by dragging the mouse cursor over the region to be charted. Notice that this region begins in the time of day column and extends across each of the sample columns.

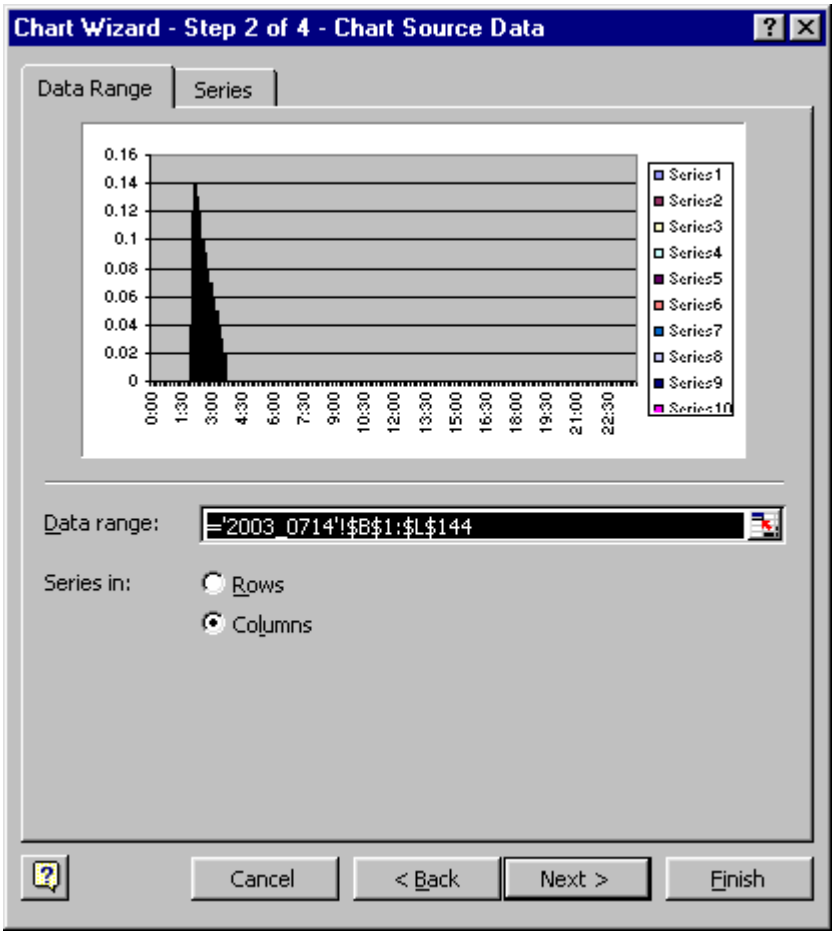


After selecting the region, click Insert and then Chart (or click the Chart icon directly from the toolbar).

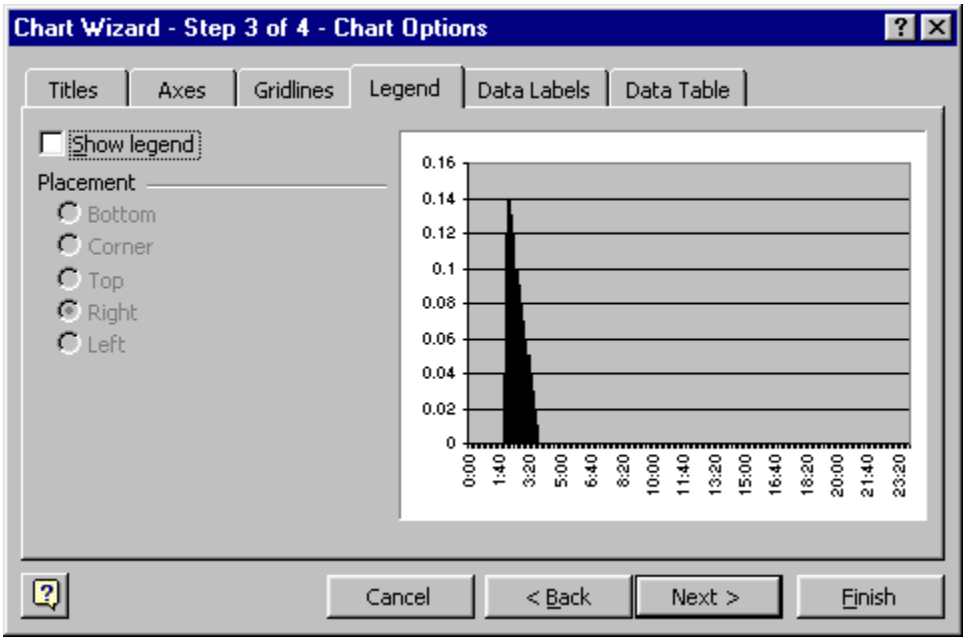
When the **Chart Type** dialog appears, click on **Column,** and click **Next.**



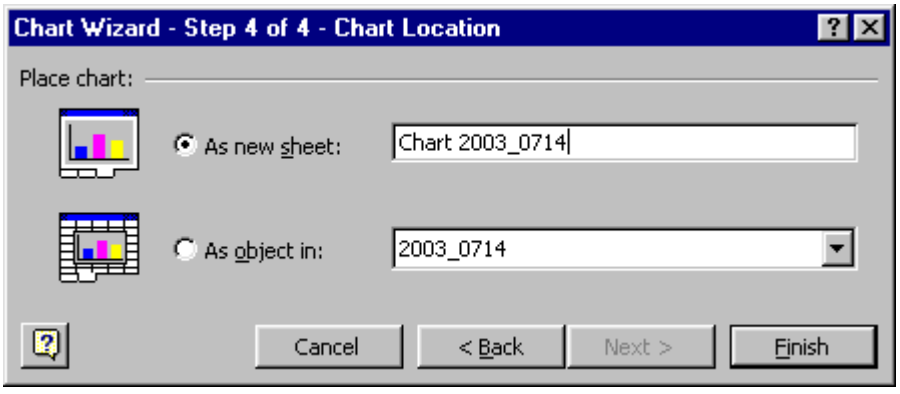
When the **Chart Source Data** dialog appears, click **Next**.



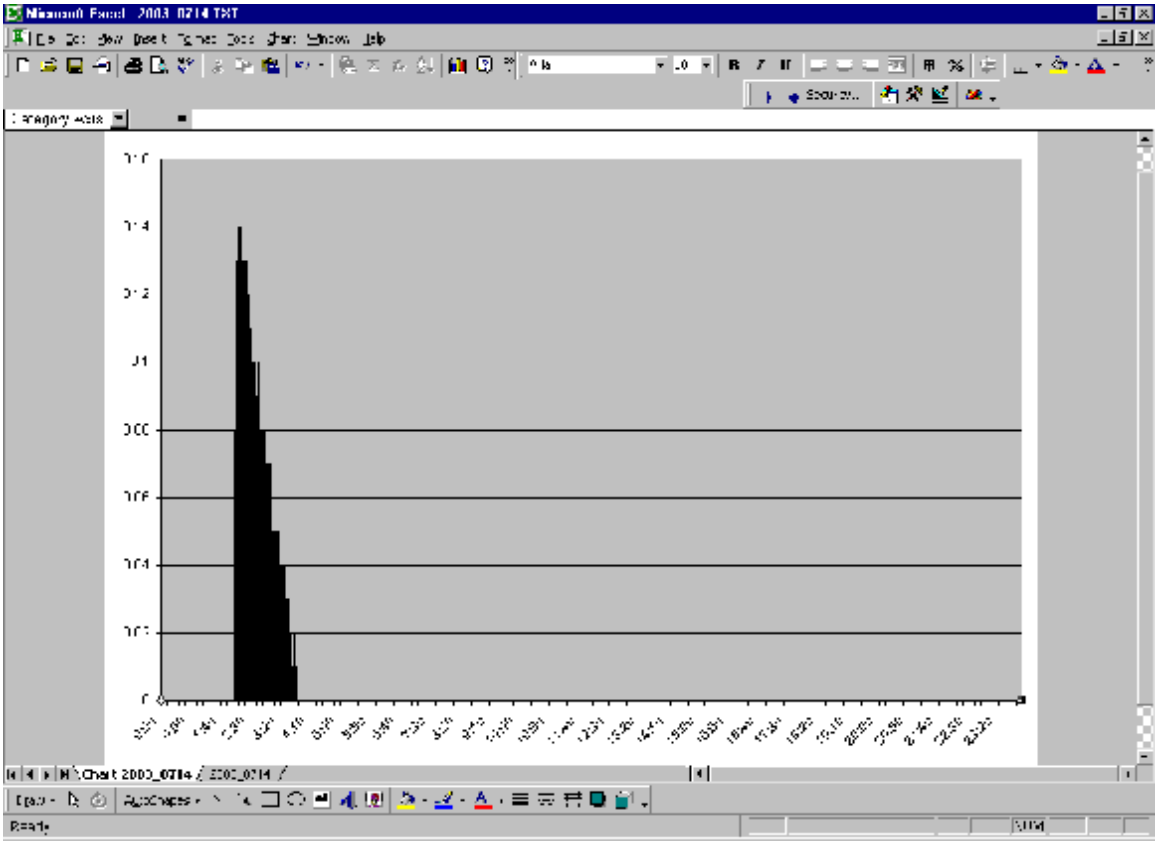
When the **Chart Options** dialog appears, click off the **Show legend** option, and click **Next**.



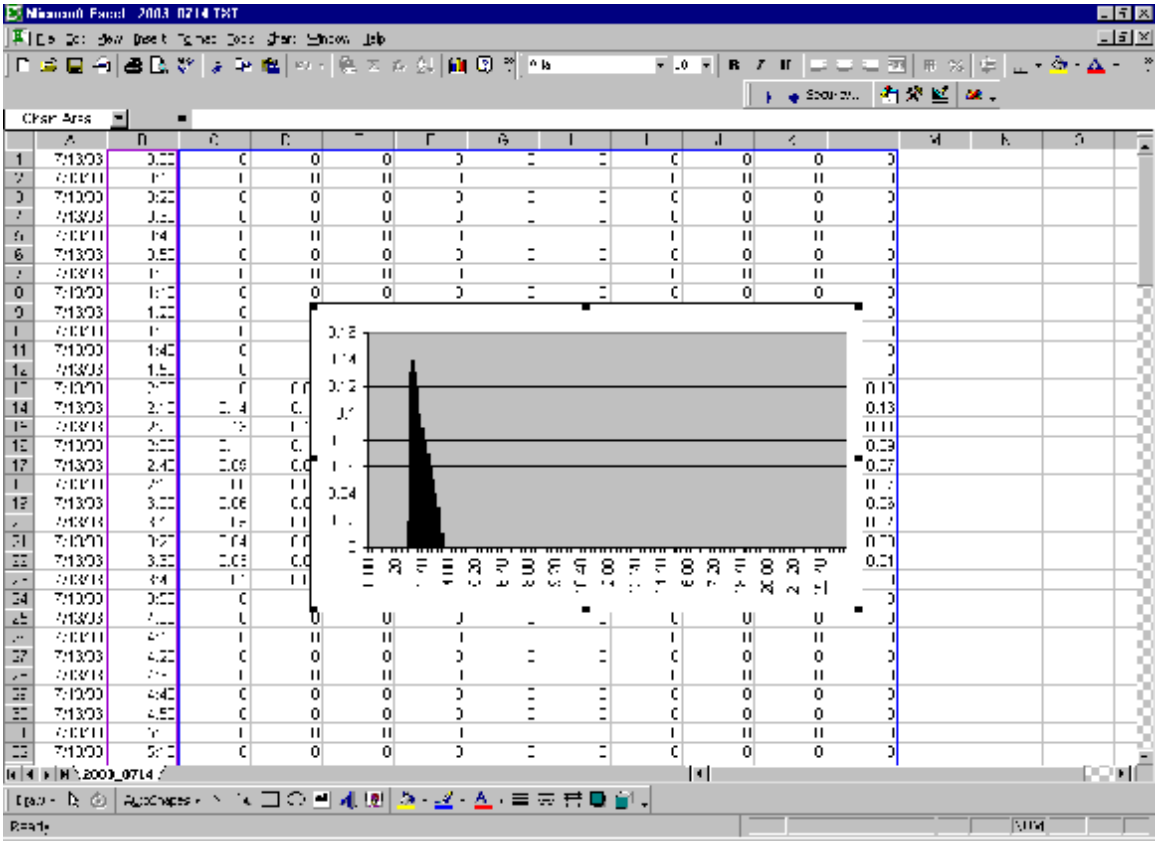
When the **Chart Location** dialog appears, click the **As new sheet** radio button and enter the name of a new sheet to store the chart in. Alternately, you may click the **As object in** radio button to place the chart onto the sheet you have just created.



If you have previously clicked the **As new sheet** radio button, the chart will appear on the new sheet named above. You may now move between the new sheet and the old sheet by clicking the sheet tabs that appear just below the chart display.



If you have previously clicked the **As object in:** radio button, the chart will appear on the existing sheet.



Finally, click **File**, then **Save** to store the chart.

Once the chart has been created, you may wish to rescale it, title it, and print it. These features are detailed in Microsoft Excel Help and are beyond the scope of this document.

Explosion Proof On/Off Switch

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

This device complies with requirements of Underwriters Laboratories, Inc. for use in hazardous locations, as listed on the device when used with suitable enclosures.

WARNING: To avoid risk of explosion, all flat machined surfaces must be kept clean and free from scratches, dents, debris, paint, and corrosion. The flat machined surfaces are explosion proof joints, and must be clean and undamaged on both the enclosure and cover.

INSTALLATION

1. The surfaces of the flat ground joint are precision machined to insure an explosion proof joint and must be protected from scratches or damage during installation.
2. When switch is mounted in the enclosure, it must be mounted to agree with cover indication of operation. That is, when the cover indicates ON, the switch must be in the ON condition.
3. Before the cover is installed, the flat ground joint surface must be thoroughly wiped clean of any dirt, grit, or other foreign substances and a light thin coating of lubricant placed on the joint to prevent possible corrosion.
   The joint between the box and the cover has been made accurately to .0015" to prevent the passage of this accuracy is destroyed.
4. ALL cover screws must be installed with at least five full threads engaged and must be securely tightened. All cover openings must be closed with a suitable cover.
5. Gaskets must not be added to these devices. Only gaskets designed for and permanently installed in these devices may be used.
6. In accordance with the hazardous location information specifying Class and Group listing marked on the device, sealing fittings must be added that will comply with requirements in the latest issue of the Canadian Electrical Code or National Electrical Code and any special requirements that are stated in the instruction sheet with the enclosure.

MAINTENANCE

Before removing the cover from any such device for inspection or maintenance, the power supply circuit must be OFF.

WARNING: To prevent risk of explosion, hammers and prying tools must not be used to remove covers off enclosures. Damage to the explosion proof flat machined surfaces on cover and enclosure may result. Handle covers carefully. Do not place them on surfaces that might damage or scratch the flat machined surfaces.

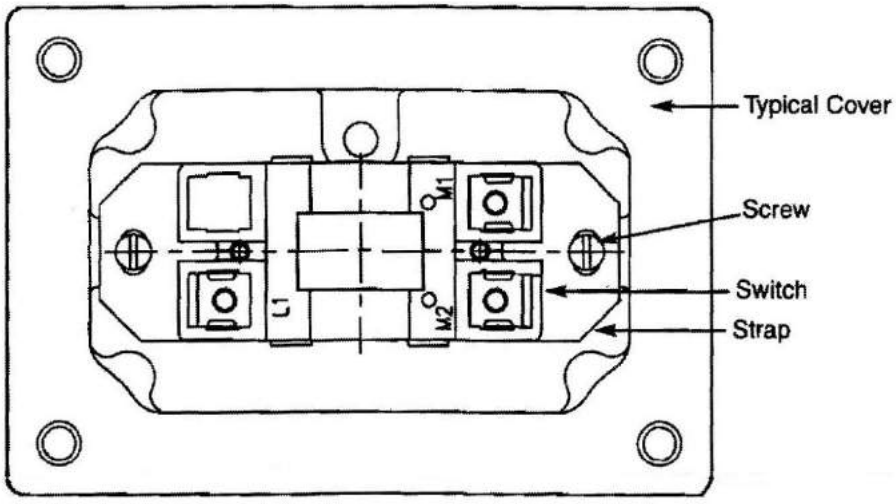
Before replacing the cover, after it has once been removed, the flat ground joint surfaces must be cleaned as described in step 3 under installation.

WARNING: To prevent risk of explosion, replace devices if the flat machined surface is damaged, scratched, dented, or corroded. Field rework of flat machined surfaces is not possible.

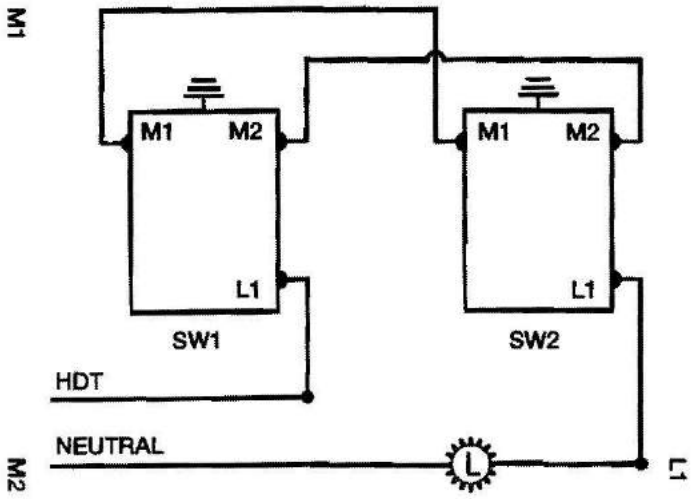
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Align the holes of the strap with the holes of the cover.

Use two screws to mount the switch onto the cover.



For the 3-Way switch, see figure below for wiring details.



CAUTION: Use 12 AWG copper conductors only. Insert the bare wire conductor(s) under the terminal clamp and securely tighten the screw(s). Note: Do not exceed 35 in-lbs. of torque.

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Explosion Proof Outlet

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

INSTALLATION

1. Mount back box in desired position following methods that comply with NEC and any local codes.
   CAUTION: Conduit sealing fittings MUST BE installed in Class 1, Group B locations to comply with the requirements in the latest edition of the NEC, Section 501-5 and/or 502-5 plus any other applicable standards. Sealing fittings must be close-nippled to the enclosure.
2. Pull all power source wiring into back box. Be sure wires are long enough to make proper connections.
   CAUTION: Use only copper or copper-clad wire with this receptacle.
3. Attach power source conductors to receptacle terminals in an approved manner. Black conductor is attached to bronze screw; white conductor is attached to silver cadmium screw; and green grounding conductor is attached to the green screw.
4. Push wiring into back box and attach receptacle using the four screws provided. The preferred arrangement for the receptacle is with the door hinge on top. Tighten screws to 30 inch-pounds torque.

OPERATION

1. Insert plug into receptacle as far as it will go.
2. Turn clockwise as far as it can go. Internal contacts of the receptacle are closed by this action and complete the electrical circuit.
3. Release plug allowing it to move outwardly slightly, into a locking detent position. Check by trying to turn and/or pull out without any inward pressure. Plug should not pull out.
4. To remove plug, press inward, turn counterclockwise and pull straight out.

MAINTENANCE

Perform visual, electrical and mechanical checks of all components on a regular schedule. This should be determined by the environment and frequency of use, but it is recommended that it should be at least once a year.

1. Make sure screws holding receptacle to back box are tight.
2. Clean receptacle face thoroughly
3. Make sure screws holding insulator in plug body are tight.
4. Clean all exterior parts of plug thoroughly.

WARNING: If any part of the receptacle appear to be broken or shows signs of any damage – DISCONTINUE ISE IMMEDIATELY. Replace, or properly repair the item before continuing service.

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