

# Reagent-Based Chlorine System

The Model SCS921A is intended for the determination of the sum of monochloramine and free chlorine in water. It can also be used to determine certain other halogen oxidants. It is ideal for the measurement of chlorine in seawater. The system consists of the SCS921A sample conditioning unit, a 499ACL-02 sensor, and either a 1055-24 or a 54eA chlorine analyzer.

## Model SCS921A Sample Conditioning System

- **CORROSION RESISTANT ALL PLASTIC CONSTRUCTION.** Ideal for seawater.
- **LOW REAGENT USAGE** means unattended operation for two weeks at a time.
- **AMPEROMETRIC MEASUREMENT** permits analysis of turbid samples.

## Model 1055-24 Chlorine Analyzer (shown)

- **TWO LINE, BACK-LIT DISPLAY** with easy to use interface.
- **TWO INDEPENDENT OUTPUTS**
- **THREE FULLY PROGRAMMABLE ALARMS**
- **INPUT FILTER** improves stability at low concentrations.

## Model 54eA Analyzer

- **THREE LINE BACK-LIT DISPLAY** with easy to use interface
- **TWO INDEPENDENT OUTPUTS**
- **THREE FULLY PROGRAMMABLE ALARMS**, plus one dedicated fault alarm
- **OPTIONAL HART DIGITAL COMMUNICATIONS**
- **OPTIONAL PID AND TPC CONTROL**

## Model 499A CL Sensor

- **RUGGED** molded Noryl<sup>1</sup> (PPO) construction.
- **NO TOOLS REQUIRED** to change membrane.
- **MAINTENANCE TAKES ONLY A FEW MINUTES** a month.
- **AUTOMATIC CORRECTION** for changes in membrane permeability with temperature.

<sup>1</sup> Noryl is a registered trademark of General Electric.



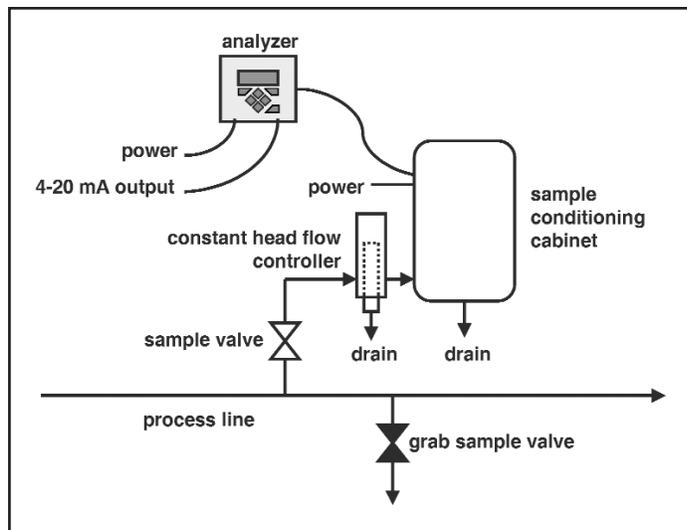
# MODEL SCS921A SAMPLE CONDITIONING SYSTEM

The model SCS921A is a sample conditioning system that permits a single sensor to measure a variety of halogen oxidants in water. The SCS921A can be used to measure

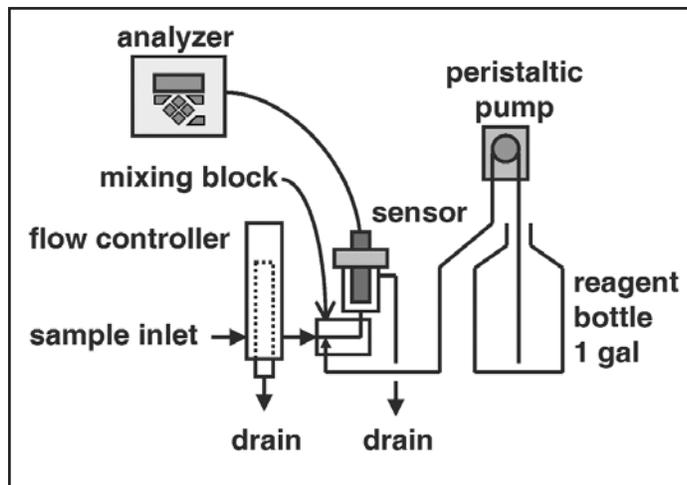
- the sum of free chlorine and monochloramine
- chlorinated seawater
- bromine oxidants

Chlorinated seawater is really a mixture of bromine oxidants. Seawater contains about 50 ppm of bromide ( $\text{Br}^-$ ). When chlorine as sodium hypochlorite or chlorine gas is mixed with seawater, the chlorine reacts with bromide to form a mixture of bromine oxidants, which the SCS921A measures.

The SCS921A should not be used for water and wastewater in which dichloramine, nitrogen trichloride, or organic or inorganic chloramines constitute a major portion of the total chlorine.



The figure to the right is a schematic diagram of the instrument. The sample enters the constant head flow controller, which provides a constant flow of about 100 mL/min to the sensor. Excess sample leaves the flow controller through the inner drain tube. From the outlet of the flow controller, the sample enters the mixing block where the reagent is injected. The reagent, a mixture of potassium iodide in an acetic acid/acetate buffer, converts free chlorine, monochloramine, and bromine into an equivalent amount of iodine. The treated sample then flows through a static mixer and into the flow cell. A membrane-covered amperometric sensor in the flow cell measures the concentration of iodine. The analyzer, mounted outside the cabinet holding the sample conditioning system, receives the signal from the sensor and displays the concentration in ppm (mg/L) as  $\text{Cl}_2$ . The sample leaves the flow cell and drains to waste.



## MODEL 1055-24 SOLU COMP II CHLORINE ANALYZER

The Model 1055-24 Solu Comp II chlorine analyzer is designed for the continuous determination of chlorine in water. It is used with the Model 499ACL-02 sensor and the SCS921A sample conditioning system.

The Solu Comp II analyzer is housed in a weatherproof, corrosion-resistant, ABS, NEMA 4X enclosure. It is suitable for wall, panel, or pipe mounting. Operation of the analyzer is through a membrane keypad. A back lit, two-line display shows the total chlorine level as well as temperature. User-customized displays are available.

Menu screens for calibrating and programming are simple and intuitive. Plain language prompts in English, German, Italian, Portuguese, French, or Spanish guide the user through procedures. There are no service codes to enter. Information and diagnostic screens are available at the push of a button.

The Solu Comp II has two isolated, continuously variable 4-20 mA outputs. Outputs can be assigned to total chlorine concentration or to temperature. Output dampening and linear or logarithmic output are also available.

The Solu Comp II has three programmable alarm relays. Alarms can be assigned to total chlorine concentration or temperature. The third alarm can be configured as a fault alarm. The fault alarm activates when an analyzer or sensor fault occurs.

The analyzer fully compensates chlorine readings for changes in membrane permeability caused by temperature changes.

Solu Comp II Model 1055-24 for the determination of total chlorine is a single input instrument. The Solu Comp II is also available with dual input, for example, chlorine and pH. For additional information concerning the dual input option see Product Data Sheet (PDS 71-1055).

## MODEL 54eA ANALYZER

The Model 54eA analyzer can be used with the SCS921A sample conditioning system and 499ACL-02 sensor for the continuous determination of chlorine in water.

The Model 54eA analyzer is housed in a rugged NEMA 4X weatherproof, corrosion resistant enclosure of epoxy-painted aluminum. It is suitable for panel, pipe, or wall mounting. Operation of the analyzer is through a front panel membrane keypad. The large back-lit dot matrix display continuously indicates chlorine concentration in large numerals along with temperature, current output, and two programmable process parameters, such as alarms or diagnostic variables. Menu screens for calibrating and programming the analyzer are simple and intuitive. Plain language prompts in English, Spanish, Italian, German, and French guide the user through instrument configuration and sensor calibration.

The Model 54eA is a member of the Rosemount SMART FAMILY<sup>®</sup> of instruments. It is designed to communicate with the Model 375 HART<sup>®</sup> communicator or any host that supports the HART communication protocol.

Two independent isolated outputs provide either a 0-20 mA or 4-20 mA output and can be assigned to chlorine or temperature. The controller option allows PID control acting on chlorine or temperature.

Three, fully programmable process alarms are standard. One relay can be configured as an interval timer. An over-fee timer is available for any one process relay, and one relay can also be used as an interval timer. The TPC option allows any alarm relay to be used for Time Proportional Control.

The analyzer fully compensates chlorine readings for changes in membrane permeability caused by temperature changes.

For additional information, see Product Data Sheet 71-54e.

## MODEL 499A CL-02 SENSOR

The Model 499ACL-02 total chlorine sensor is used in the SCS921A sample conditioning system. Although the sensor is called a chlorine sensor, it really measures iodine. The iodine comes from the reaction between halogen oxidants in the sample and the buffered potassium iodide reagent added by the sample conditioning system.

The sensor consists of a gold cathode and a silver anode in an electrolyte solution. A silicone membrane, permeable to iodine, is stretched over the cathode. The analyzer applies a voltage to the cathode sufficiently negative to reduce all the iodine reaching it. Because the concentration of iodine in the sensor is zero, a concentration gradient continuously forces iodine from the sample through the membrane into the sensor.

The reduction of iodine in the sensor generates a current directly proportional to the concentration of iodine in the sample. Because the iodine depends on the amount of chlorine and bromine oxidants in the sample, the sensor current is ultimately proportional to the oxidant concentration.

The permeability of the membrane to iodine is a function of temperature. A Pt100 RTD in the sensor measures the temperature, and the analyzer uses the temperature to compensate the total chlorine reading for changes in membrane permeability.

Sensor maintenance is fast and easy. Replacing the membrane requires no special tools or fixtures. Simply place the membrane assembly on the cathode and screw the retainer in place. Installing a new membrane and replenishing the electrolyte takes only a few minutes.

# SPECIFICATIONS — SAMPLE CONDITIONING SYSTEM

## GENERAL

**Enclosure:** Fiberglass reinforced polyester, designed to NEMA 12 standards

**Dimensions:** H 20.6 in. W 13.3 in. D 6.9 in.  
(H 52.3 cm W 33.7 cm D 17.5 cm)

**Mounting:** Wall

**Ambient Temperature:** 32° - 122°F (0 - 50°C)

**Ambient Humidity:** 0 - 90% (non-condensing)

**Power:** 115 Vac, 64 mA, 60 Hz;  
or 230 Vac, 31 mA, 50 Hz

**Hazardous Location:** The SCS921A sample conditioning system has no agency approvals.

**EMI/RFI:** EN61326

**LVD:** EN61010-1



**Weight/Shipping Weight:** 13 lb/16/lb (6.0 kg/7.5 kg)

## SAMPLE REQUIREMENTS

**Inlet Connection:** compression fitting, accepts 1/4 in. tubing

**Flow Cell Drain Connection:** compression fitting, accepts 1/4 in. tubing

**Flow Controller Drain Connection:** 3/4 in. barbed fitting

**Inlet Pressure:** <100 psig (791 kPa abs)

**Flow:** at least 100 mL/min

**Temperature:** 32 - 122°F (0 - 50°C)

**Total Alkalinity:** <125 mg/L as CaCO<sub>3</sub>

## SAMPLE CONDITIONING SYSTEM

**Reagent:** Potassium iodide, acetic acid, and sodium acetate solution, 1 gallon (3.785 L).

**Reagent Usage:** 1 gallon lasts approximately 14 days.

**Reagent Pump:** Fixed speed peristaltic pump, 10-11 mL/hr.

# SPECIFICATIONS — MODEL 1055-24 ANALYZER

**Case:** ABS. Pipe, surface, and panel mount versions are NEMA 4X/CSA 4 (IP65).

## Dimensions

**Panel (code -10):** 6.10 x 6.10 x 3.72 in. (155 x 155 x 94.5 mm)

**Surface/Pipe (code -11):** 6.23 x 6.23 x 3.23 in. (158 x 158 x 82 mm); see page 8 for dimensions of pipe mounting bracket.

**Conduit openings:** Accepts PG13.5 or 1/2 in. conduit fittings

**Display:** Two line, 16-character, back-lit display. Character height: 4.8 mm. Display can be customized to meet individual requirements.

**Ambient temperature and humidity:** 0 to 50°C, (32 to 122°F) RH 5 to 95% (non-condensing)

Note: The analyzer is operable from -20 to 60°C (-4 to 140°F) with some degradation in display performance.

## Power:

Code -01: 115/230 Vac ±15%, 50/60 Hz ±6%, 8.0W Installation Category II

Equipment protected throughout by double insulation.

**Hazardous Location:** Applies to analyzer only, not to system



Class I, Division 2,  
Groups A, B, C, & D



**POLLUTION DEGREE 4:** Extended Environment  
Outdoor use where conductive contamination such as rain, snow, or dust may be present. (Hazardous Location only)

**RFI/EMI:** EN-61326

**LVD:** EN-61010-1



**Outputs:** Two 4-20 mA or 0-20 mA isolated outputs. Continuously adjustable. Linear or logarithmic. Maximum load 600 ohms. Output dampening with time constant of 5 sec is user-selectable.

**Alarms:** Three (3) alarm relays for process measurement(s) or temperature. Alarm 3 can be configured as a fault alarm, instead of a process alarm. Each relay can be configured independently. Alarm logic (high or low activation) and deadband are user-programmable.



**Relays:** Form C, single pole double throw, epoxy sealed



	Resistive	Inductive
28 Vdc	5.0 A	3.0 A
115 Vac	5.0 A	3.0 A
230 Vac	5.0 A	1.5 A

**Terminal Connections Rating:** 26-14 AWG wire size

**Weight/Shipping weight** (rounded up to nearest lb or nearest 0.5 kg): 3 lb (1.5 kg)/4 lb (2.0 kg)

## SPECIFICATIONS — MODEL 54eA ANALYZER

**Case:** Epoxy-painted (light gray) cast aluminum, NEMA4X (IP65).

**Dimensions:** 144 x 144 x 132 mm (5.7 x 5.7 x 5.2 in.), DIN size panel cut-out.

**Front Panel:** Membrane keypad with tactile feedback. Three green LEDs indicate alarm status. Red LED indicates fault condition.

**Conduit Openings:** Accepts PG 13.5 or 1/2 inch conduit fittings

**Display:** Three-line, back-lit, dot matrix LCD, 70 x 35 mm. First line is measurement reading. Second line is temperature and current output. Third line is user-selectable. Character heights: 1st line - 16 mm (0.6 in.), 2nd and 3rd lines - 7 mm (0.3 in.).

**Ambient Temperature and Humidity:** 0 to 50°C (32 to 122°F). 95% (maximum) non-condensing.

Analyzer can be operated between -20 and 60°C (-4 to 140°F) with some degradation in display quality.

**Power:** 115 VAC ± 10%, 50/60 Hz ± 6%, 8 W  
230 VAC ± 10%, 50/60 Hz ± 6%, 8 W

**Hazardous Location:** Applies to analyzer only, not to system Class I, Division 2, Groups A, B, C, & D. T5 Ta=50°C. Dust ignition proof: Class II, Division 1, Groups E, F, & G; Class III.

FM: Max. relay contact rating: 28 Vdc resistive

150 mA - Groups A & B;  
400 mA - Group C;  
540 mA - Group D

CSA:



Max. relay contact rating:  
28 Vdc; 110 Vac; 230 Vac;  
6 amps resistive. Enclosure Type 4.



RFI/EMI: EN-61326



LVD: EN-61010-1

**Outputs:** Two 4-20 mA or 0-20 mA isolated outputs. Continuously adjustable. Outputs can be assigned to chlorine or temperature. Output dampening is user-selectable. Maximum load at 115/230 Vac is 600Ω. Maximum load at 100/200 Vac is 550Ω. Output 1 has superimposed HART signal (options -261 and -263). Outputs can be programmed for PID control (options -262 and -263).

### Alarms:



Relay 1 - Process, Interval, or Time Proportional Control (TPC requires code -262 or -263)

Relay 2 - Process, Interval, or Time Proportional Control (TPC requires code -262 or -263)

Relay 3 - Process, Interval, or Time Proportional Control (TPC requires code -262 or -263)

Relay 4 - Sensor/analyzer and process fault alarm

Each relay has a dedicated LED on the front panel.

**Relay Contacts:** Relays 1-3: Epoxy sealed form A contacts, SPST, normally open



Relay 4: Epoxy sealed form C, SPDT

	<u>Resistive</u>	<u>Inductive</u>
28 Vdc	5.0 Amps	3.0 Amps
115 Vac	5.0 Amps	3.0 Amps
230 Vac	5.0 Amps	1.5 Amps

**Weight/Shipping Weight:** 5 lb/6 lb (2 kg/2.5 kg)

## SPECIFICATIONS — MODEL 499ACL-02 SENSOR

**Wetted Parts:** Gold, Noryl<sup>1</sup> (PPO), Viton, EPDM, Silicone

**Dimensions:** 25.4 x 143 mm (1.0 x 5.6 in.)

**Cable:** 25 ft. (7.6m) standard

**Pressure Rating:** 0 to 65 psig (101 to 549 kPa)

**Temperature Rating:** 32 to 122°F (0 to 50°C)

**Electrolyte Capacity:** Approximately 25 mL

**Electrolyte Life:** Approximately 4 to 6 months

**Weight/Shipping Weight:** 1 lb/3 lb (0.5 kg/1.5 kg)

<sup>1</sup> Noryl is a registered trademark of General Electric.

## PERFORMANCE SPECIFICATIONS — COMPLETE SYSTEM

**Operating Range:** 0 to 20 ppm (mg/L) as Cl<sub>2</sub>.

**Linear Range:** 0 to 6 ppm (mg/L) as Cl<sub>2</sub>.

**Linearity:** For six samples at constant temperature more or less evenly distributed between 0 and 6 ppm, the maximum deviation of a point from the least squares fit to the data is less than ±2% of range.

**Response Time:** Following a step change in concentration, the reading reaches 95% of final value within 3 minutes at 25°C.

**Drift:** At about 2 ppm and constant temperature, drift is typically less 0.1 ppm over two weeks.

## ORDERING INFORMATION AND ACCESSORIES

**Model SCS921A Reagent-Based Chlorine System.** The SCS921A is used for the continuous determination of chlorine in seawater. It can also be used to measure the sum of monochloramine and free chlorine in water. The SCS921A consists of a sample conditioning system, a sensor, and an analyzer. Reagents must be ordered separately. See **ACCESSORIES - Sample Conditioning System**.

MODEL SCS921A REAGENT-BASED CHLORINE SYSTEM	
CODE	POWER (required selection)
11	115 V 60 Hz
12	230 V 50 Hz
CODE	ANALYZER (optional selection)
250	1055-01-10-24 analyzer, panel mount
251	1055-01-11-24 analyzer, pipe/wall mount
260	54eA-01 analyzer
261	54eA-01-09 analyzer with HART communications
262	54eA-01-20 controller with PID and TPC control
263	54eA-01-09-20 controller with PID and TPC control and HART communications
CODE	SENSOR (optional selection)
30	499ACL-02-54 sensor with standard cable
31	499ACL-02-54-60 sensor with optimum EMI/RFI cable

### ACCESSORIES - Sample Conditioning System

PN	DESCRIPTION	WEIGHT*	SHIP WEIGHT*
9380080	Peristaltic pump for reagent, 115 Vac	2 lb (1.0 kg)	2 lb (1.0 kg)
9380086	Peristaltic pump for reagent, 230 Vac	2 lb (1.0 kg)	2 lb (1.0 kg)
23868-00	Replacement tubing for peristaltic pump, 6 ft	1 lb (0.5 kg)	2 lb (1.0 kg)
9380087	Retainer disk for peristaltic pump tubing	1 lb (0.5 kg)	2 lb (1.0 kg)
9100132	Fuse, 1/8 A, Slo-blo, 3AG250V, for 115 Vac version	1 lb (0.5 kg)	2 lb (1.0 kg)
9100191	Fuse, 1/16 A, Slo-blo, 3AG250V, for 230 Vac version	1 lb (0.5 kg)	2 lb (1.0 kg)
R459-4GAL	Reagent, acetic acid/acetate buffer with potassium iodide, 4 x 1-gal bottles/case	38 lb (17.5 kg)	40 lb (18.5 kg)

### ACCESSORIES - 1055-24 Analyzer

PN	DESCRIPTION	WEIGHT*	SHIP WEIGHT*
9240048-00	Tag, stainless steel, specify marking	1 lb (0.5 kg)	1 lb (0.5 kg)
23820-00	Pipe mounting kit	2 lb (1.0 kg)	3 lb (1.5 kg)
23554-00	Gland fitting PG 13.5, 5 per package	1 lb (0.5 kg)	1 lb (0.5 kg)

### ACCESSORIES - 54eA Analyzer

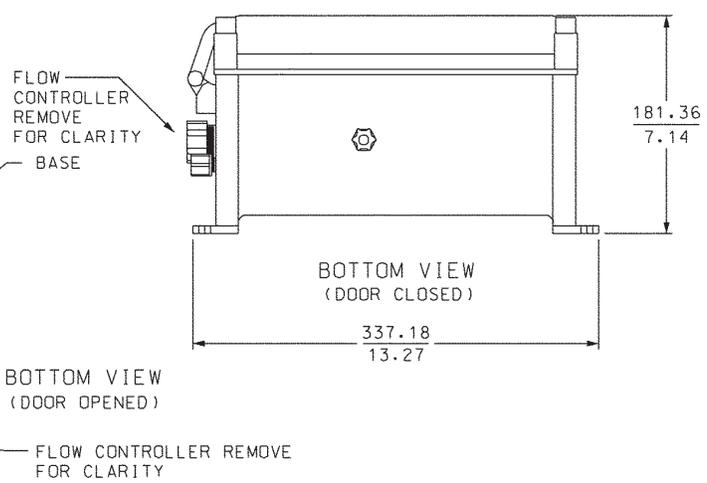
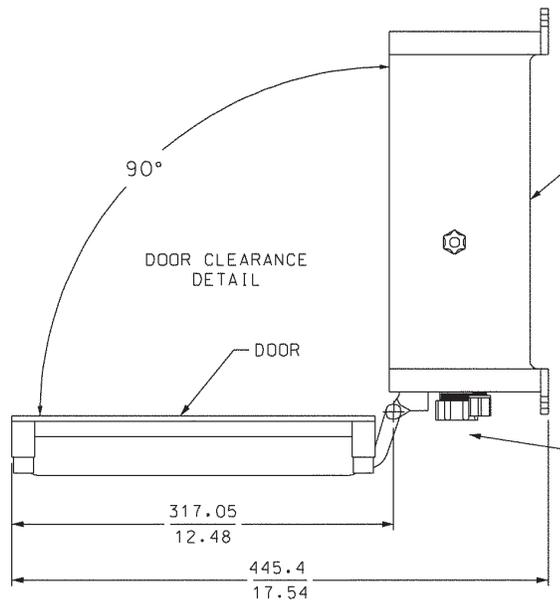
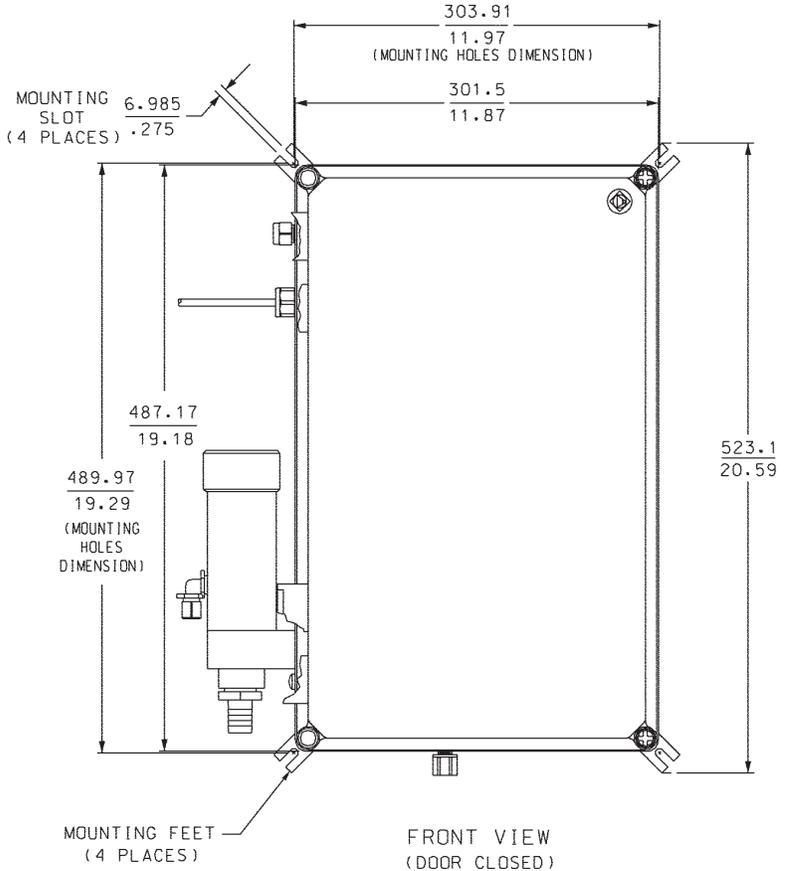
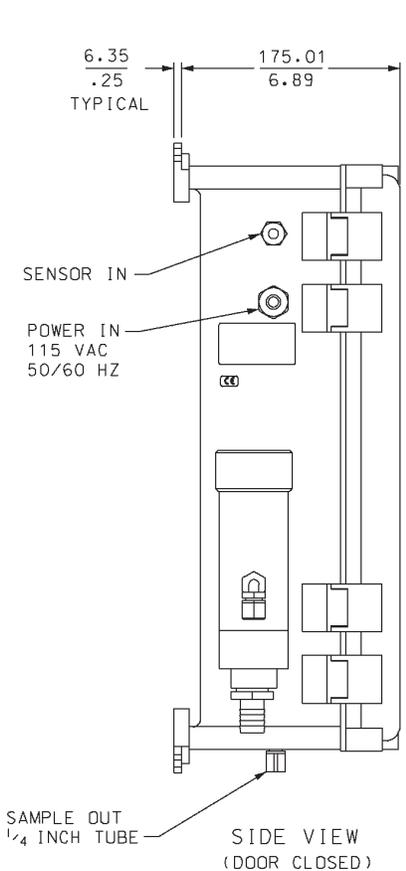
PN	DESCRIPTION	WEIGHT*	SHIP WEIGHT*
2002577	Wall and two inch pipe mounting kit	2 lb (1.0 kg)	3 lb (1.5 kg)
23545-00	Panel mounting kit	2 lb (1.0 kg)	3 lb (1.5 kg)
23554-00	Cable glands, kit (Qty 5 of PG 13.5)	1 lb (0.5 kg)	1 lb (0.5 kg)
9240048-00	Stainless steel tag (specify marking)	1 lb (0.5 kg)	1 lb (0.5 kg)

### ACCESSORIES - Sensor

PN	DESCRIPTION	WEIGHT*	SHIP WEIGHT*
23501-02	Total Chlorine Membrane, includes one membrane assembly and one O-ring	1 lb (0.5 kg)	1 lb (0.5 kg)
23502-02	Total Chlorine Membrane Kit, includes 3 membrane assemblies and three O-rings	1 lb (0.5 kg)	1 lb (0.5 kg)
R434-4OZ	Total Chlorine Sensor Fill Solution, includes electrolyte and KI crystals to be mixed before use (discard excess after use)	1 lb (0.5 kg)	2 lb (1.0 kg)

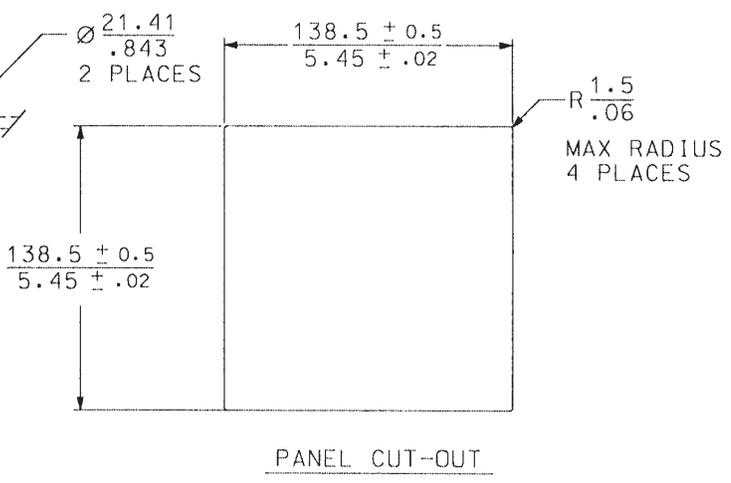
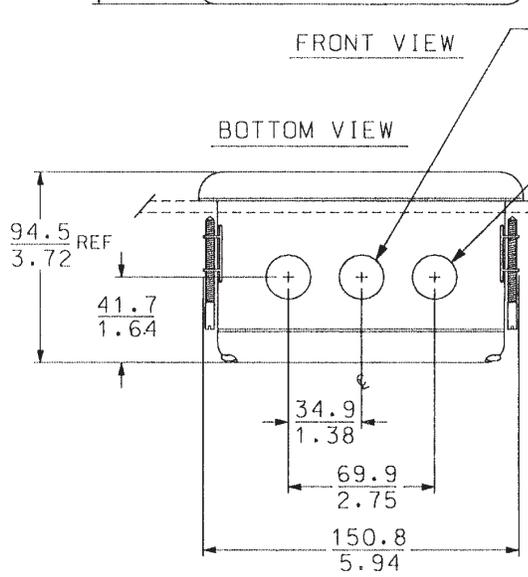
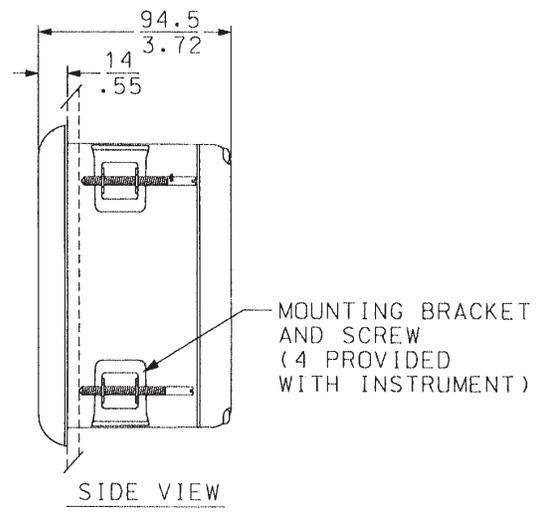
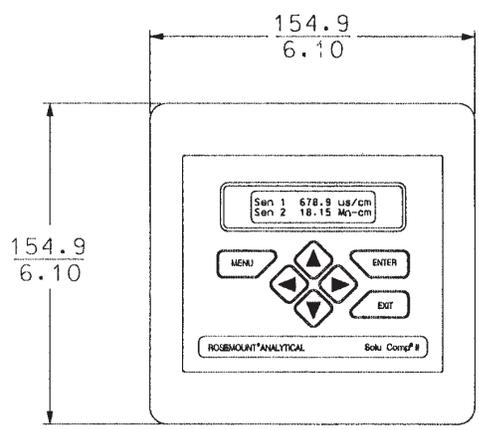
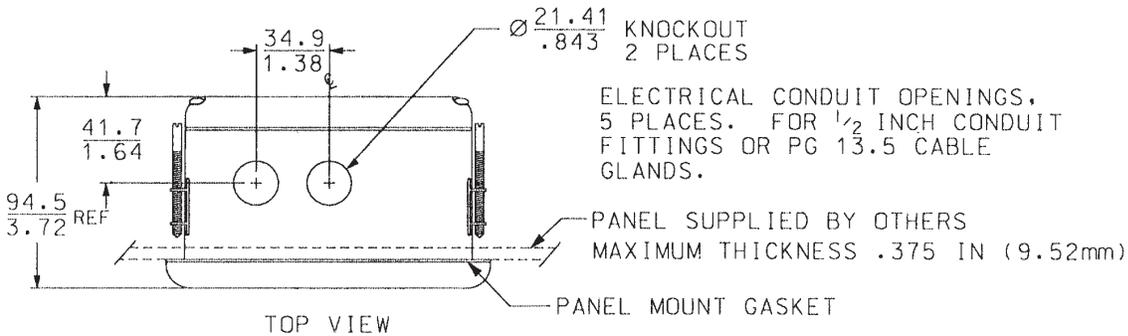
\*Weights are rounded up to the nearest whole pound or 0.5 kg.

MILLIMETER  
INCH



**DIMENSIONS OF SCS921A CASE**

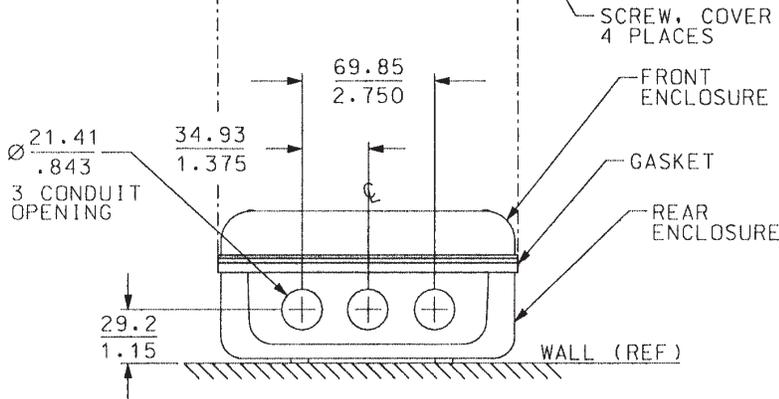
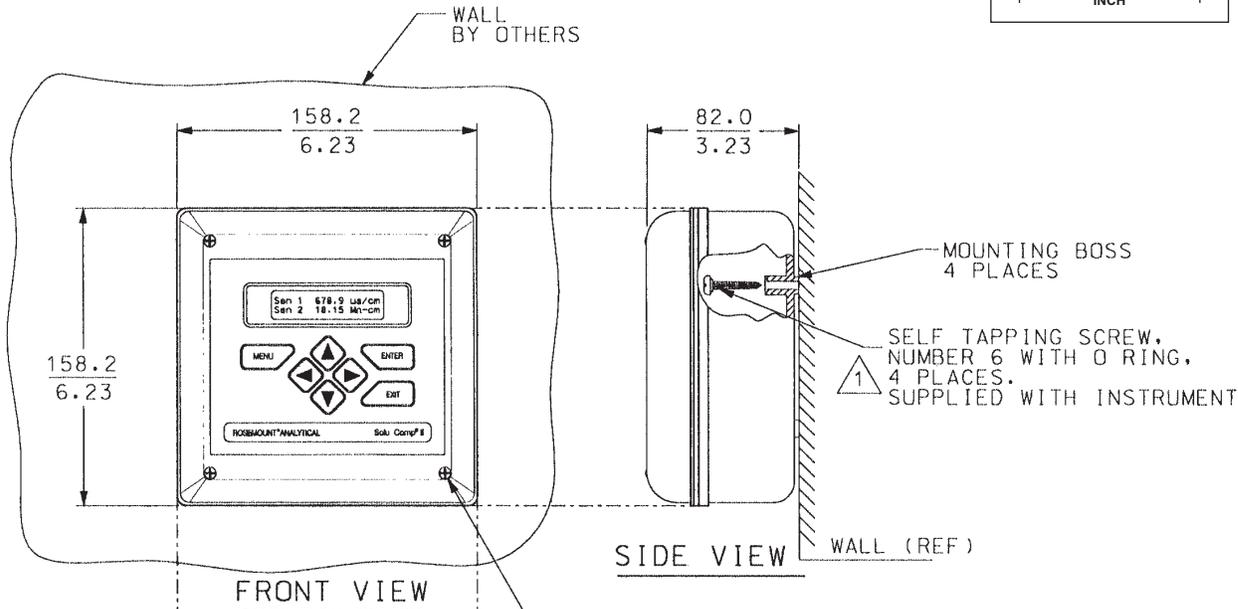
← MILLIMETER INCH →



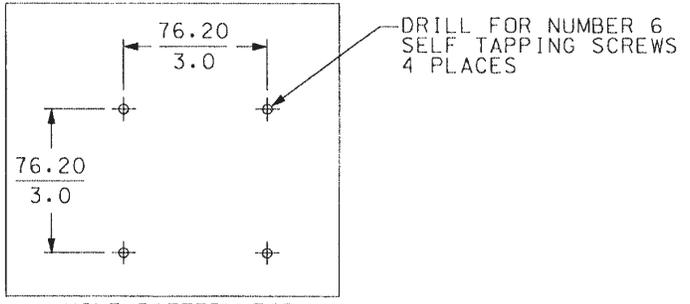
⚡ DO NOT OPERATE OR ENERGIZE INSTRUMENT WITH CASE OPEN.

**1055-24 PANEL MOUNT INSTALLATION**

*Access to the wiring terminals is through the rear cover. Four screws hold the cover in place.*



**BOTTOM VIEW**



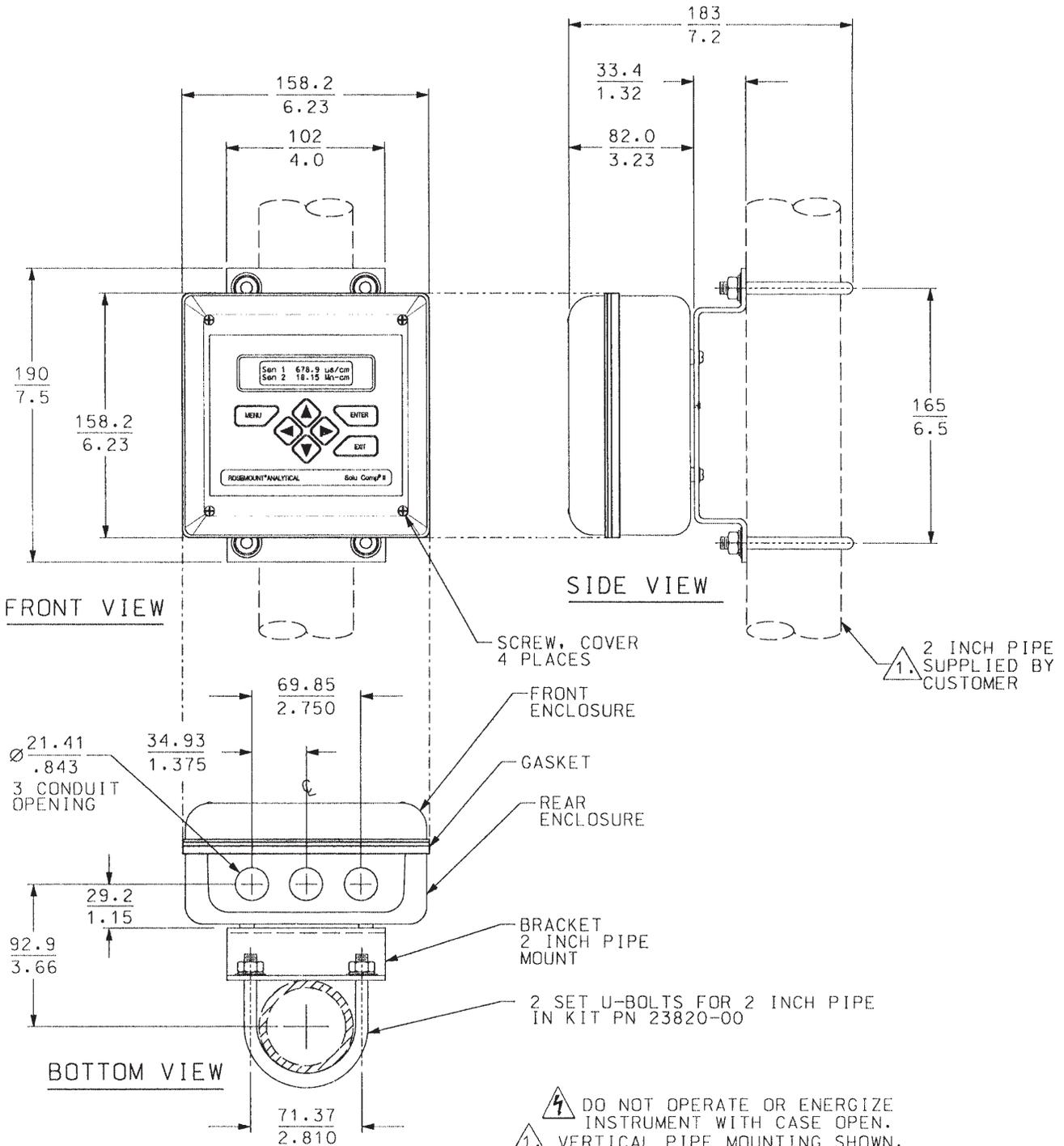
**HOLE PATTERN FOR REAR SURFACE MOUNT ENCLOSURE**

- DO NOT OPERATE OR ENERGIZE INSTRUMENT WITH CASE OPEN.
- PIERCE MEMBRANE WITH SELF TAPPING SCREW

**1055-24 SURFACE MOUNT INSTALLATION**

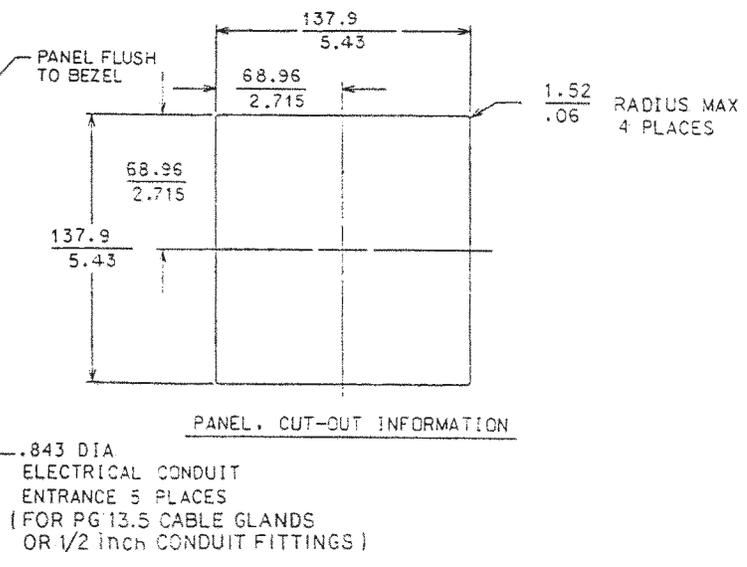
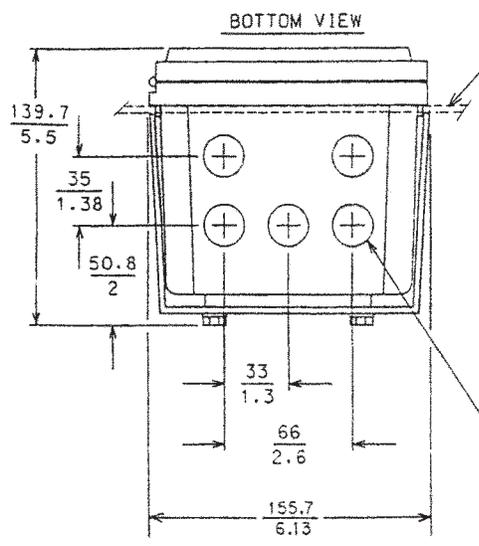
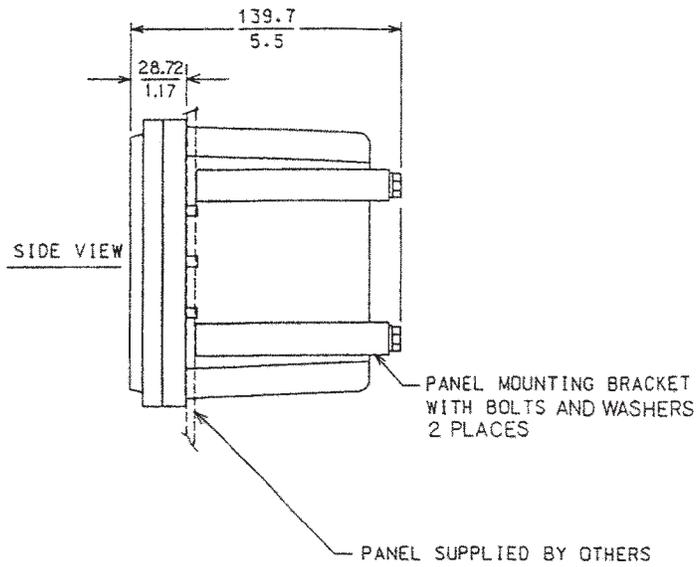
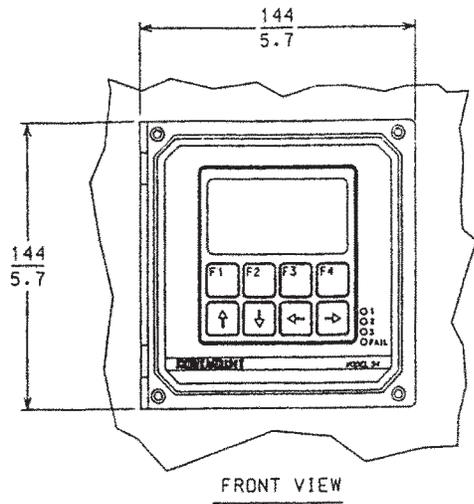
*The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.*

MILLIMETER  
INCH

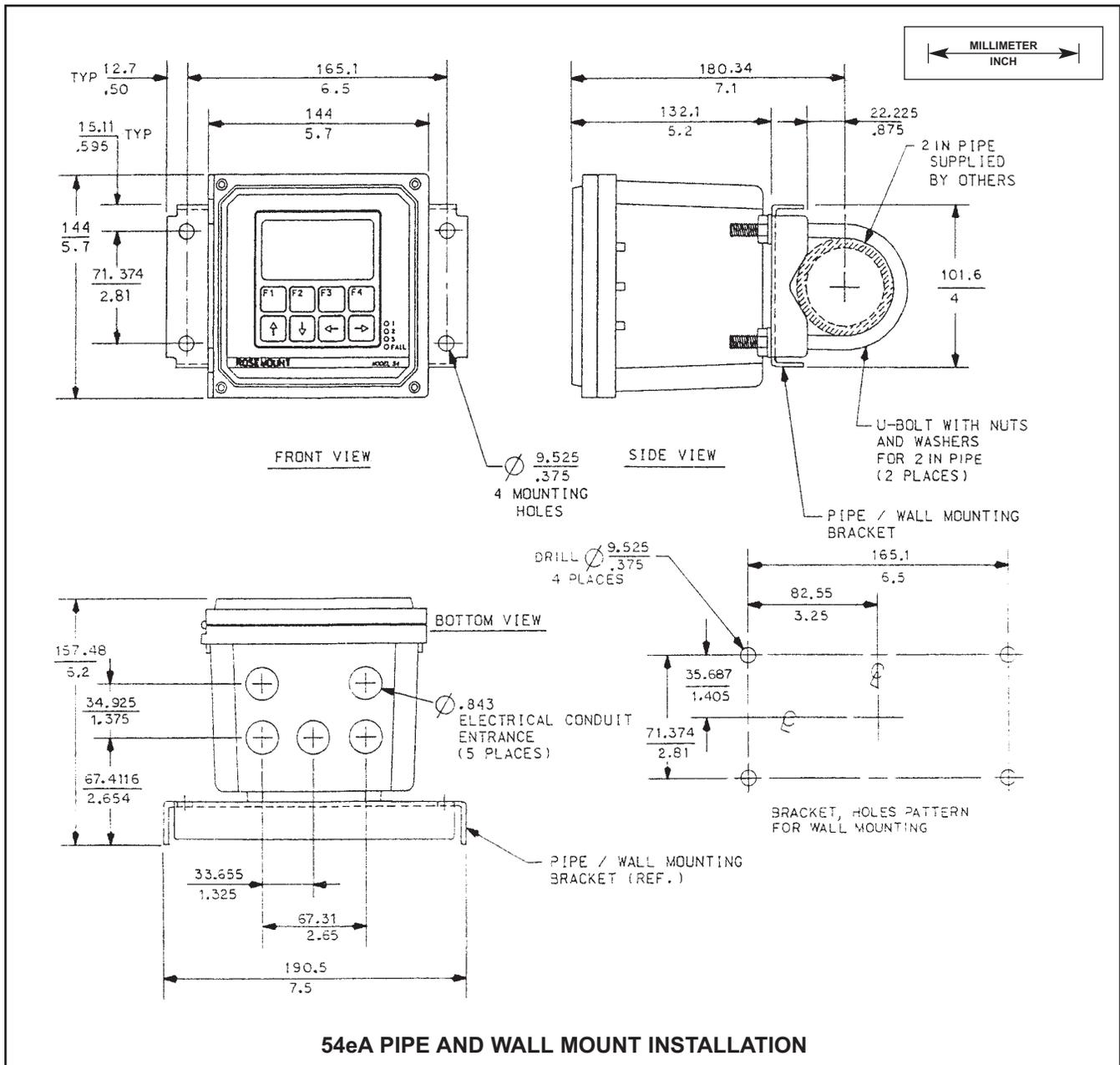


### 1055-24 PIPE MOUNT INSTALLATION

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.



**54eA PANEL MOUNT INSTALLATION**



*The right people,  
the right answers,  
right now.*

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*Specifications subject to change without notice.*



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**Emerson Process Management**

**Liquid Division**  
2400 Barranca Parkway  
Irvine, CA 92606 USA  
Tel: (949) 757-8500  
Fax: (949) 474-7250  
<http://www.raihome.com>

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