

# VOLU-probe/SS

Stainless Steel Pitot Airflow Traverse Probes



# VOLU-probe/SS

## Product Description

The VOLU-probe/SS Stainless Steel Pitot Airflow Traverse Probe is ideally suited for new installations or retrofit applications requiring accurate airflow measurement in locations having limited straight duct runs. Multiple sets of total and static pressure sensing ports along the entire length of the VOLU-probe/SS traverse the airstream in a single line across the duct, and average the sensed pressures in separate manifolds. An array of VOLU-probe/SS probes are used to properly

sense the typically stratified flow to provide an equal area traverse of an entire duct cross-section. The VOLU-probe/SS is suited for clean or harsh and particulate laden applications, operating at temperatures ranging from  $-20$  to  $900^{\circ}\text{F}$ . As a primary flow sensing means, the VOLU-probe/SS can be used in industrial process applications ranging from power generation (combustion airflow), fiber quenching, process drying, emission monitoring, etc.

## How It Works

The VOLU-probe/SS operates on the Fechheimer Pitot derivative of the multi-point, self-averaging Pitot principle to measure the total and static pressure components of airflow. Total pressure sensing ports, with chamfered entrances to eliminate air direction effects, are located on the leading surface of the VOLU-probe/SS to sense the impact pressure ( $P_t$ ) of the approaching airstream (see Figure 1). Fechheimer pair of static pressure sensing ports, positioned at designated angles offset from the flow normal vector, minimize the error inducing effect of directionalized airflow. As the flow direction veers from the normal, one static sensor is exposed

to a higher pressure ( $P_s + \text{part of } P_t$ ), whereas the other static sensor experiences a lower pressure ( $P_s - \text{part of } P_t$ ) of the same magnitude, thereby canceling out the undesired effect of partial total pressure ( $P_t$ ) (see Figure 2). It is this unique design of offset static pressure and chamfered total pressure sensors that make the VOLU-probe/SS insensitive to approaching multi-directional, rotating airflow with yaw and pitch up to  $30^{\circ}$  from straight flow, thereby assuring the accurate measurement of the sensed airflow rate without the presence of an airflow straightener upstream. This unique design of the VOLU-probe/SS is covered by U.S. Patent No. 4,559,835.

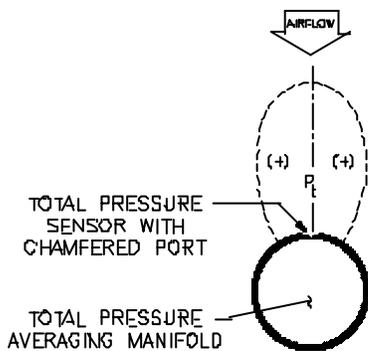


Figure 1

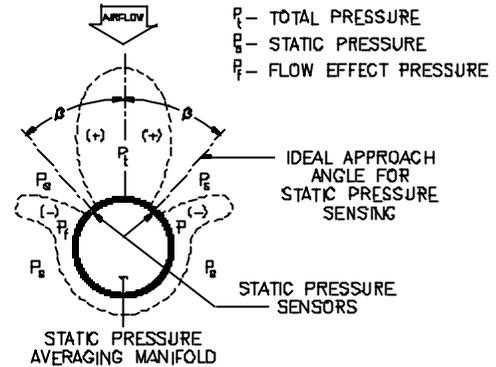
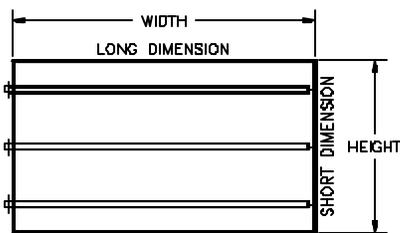


Figure 2

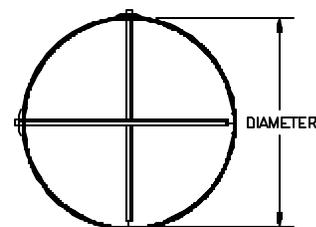
## Accuracy

All recognized flow measurement standards (ASHRAE Fundamentals, AMCA Publication 203, Industrial Ventilation Manual, 40CFR60, etc.) agree that accurate airflow measurement is highly dependent upon the quantity and pattern of sensing points in the airstream, and the relative position of the sensing points to upstream/downstream flow disturbances.

When installed per Air Monitor's Minimum Installation Requirements (see back page), the minimum quantity and placement of VOLU-probe/SS airflow traverse probes shown below will produce assured measuring accuracies of  $\pm 2-3\%$  of actual airflow.



FOR SQUARE AND RECTANGULAR DUCT



FOR CIRCULAR DUCT

HEIGHT DIMENSION	MINIMUM QTY. OF VOLU-probes RECOMMENDED	HEIGHT DIMENSION	MINIMUM QTY. OF VOLU-probes RECOMMENDED
8" TO 12"	1	>54" TO 84"	4
>12" TO 30"	2	>84" TO 120"	5
>30" TO 64"	3	>120" TO 180"	6

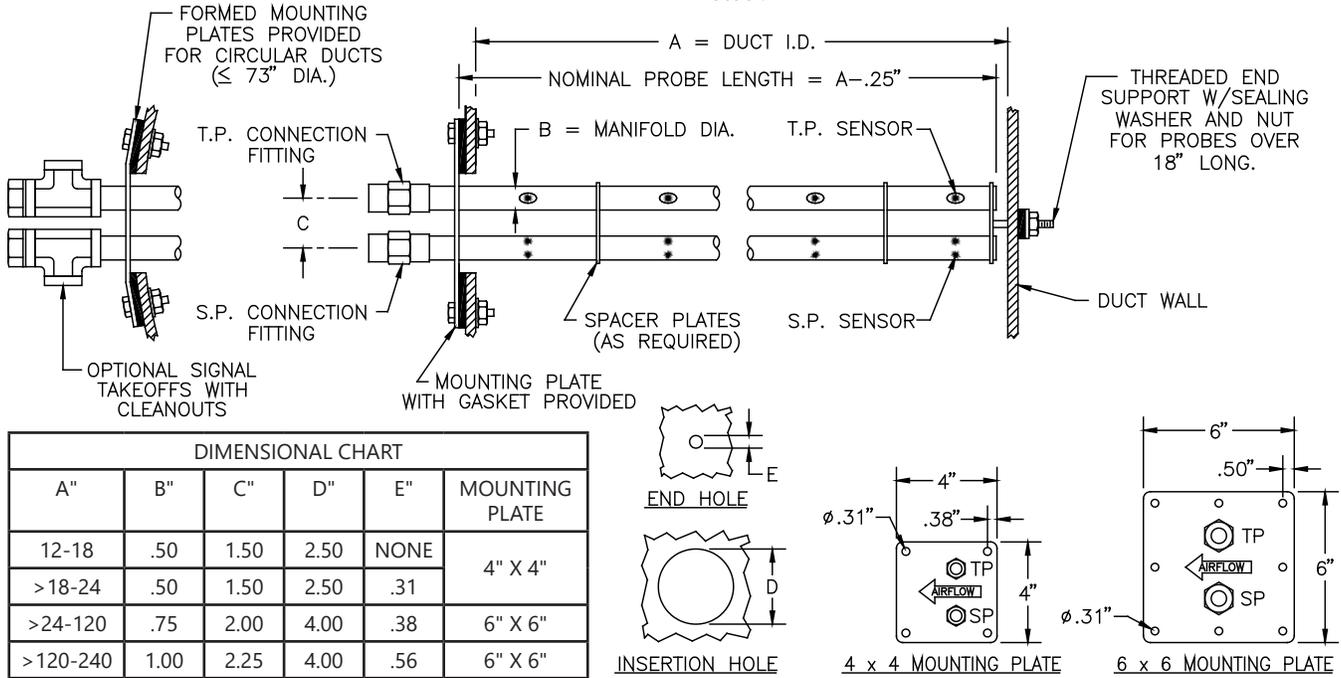
DIAMETER	MINIMUM QTY. OF VOLU-probes RECOMMENDED
6" TO 18"	1
>18" TO 72"	2
>72" +	3

# VOLU-probe/1SS & 2SS

## VOLU-probe/1SS – Externally Mounted

The VOLU-probe/1SS is designed for mounting in ducts or stacks by drilling two holes in opposing walls, without the need to enter those structures.

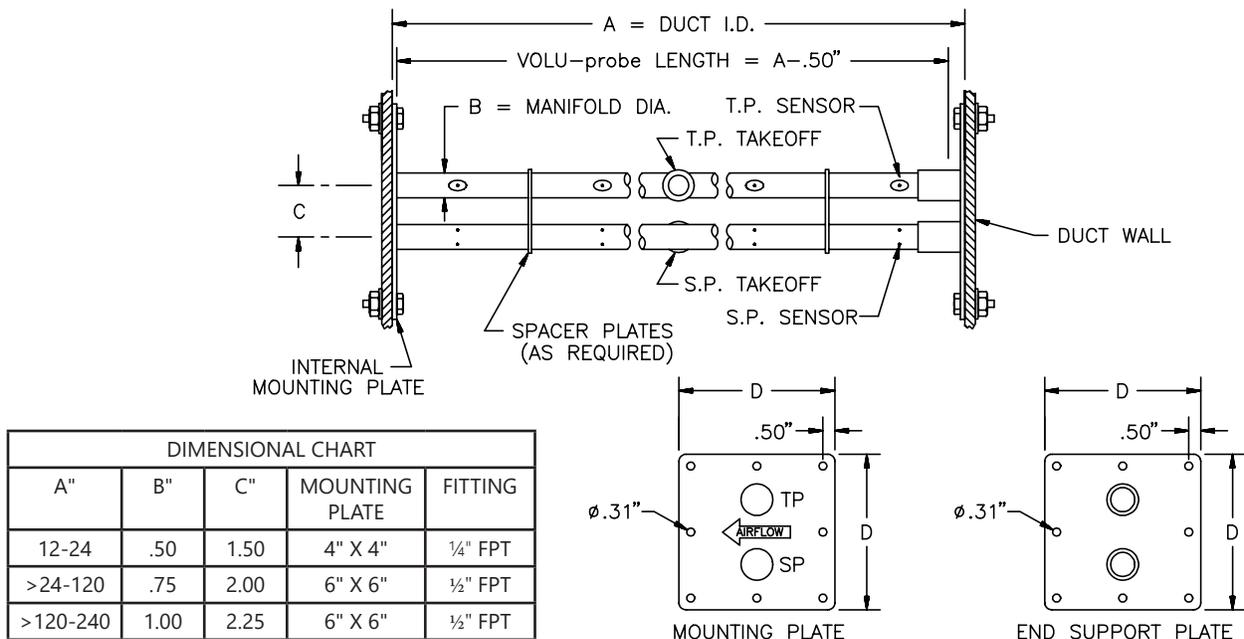
The VOLU-probe/1SS is furnished with a threaded end support, gasketed washer and nut, and a mounting plate with signal take-off FPT connections, all fabricated of type 316 stainless steel.



## VOLU-probe/2SS – Internally Mounted

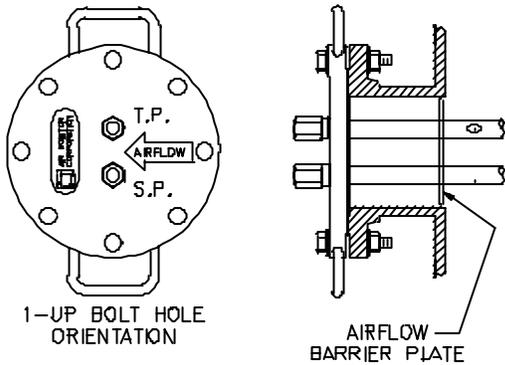
The VOLU-probe/2SS is designed for larger ducts or stacks where the size permits entry for installation, or where duct external accessibility or clearance is insufficient to permit probe mounting from outside the duct.

The VOLU-probe/2SS is furnished with interior mounting and end support plates, and midpoint signal take-off FPT connections, all fabricated of type 316 stainless steel.



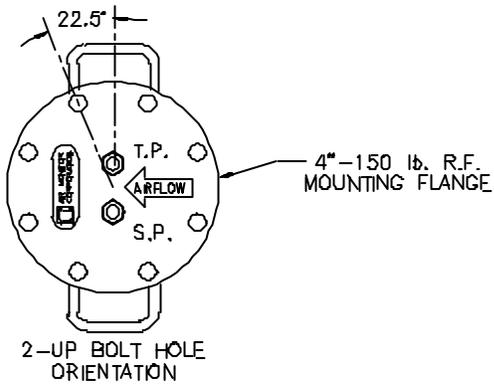
# VOLU-probe/SS Options

## VOLU-probe/SS – Construction Options



1-UP BOLT HOLE ORIENTATION

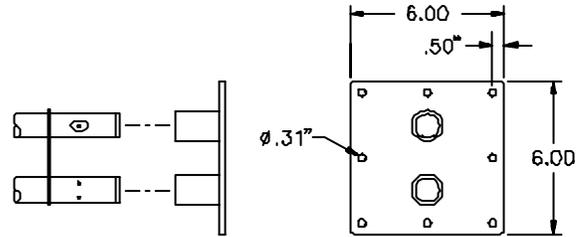
AIRFLOW BARRIER PLATE



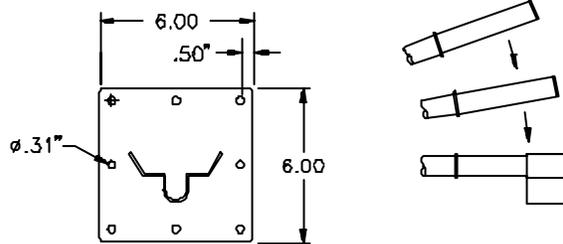
2-UP BOLT HOLE ORIENTATION

4"-150 lb. R.F. MOUNTING FLANGE

150 lb. Mounting Flange

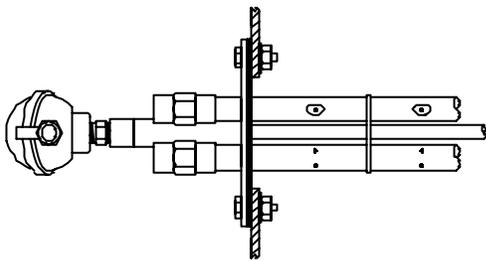


SOCKET

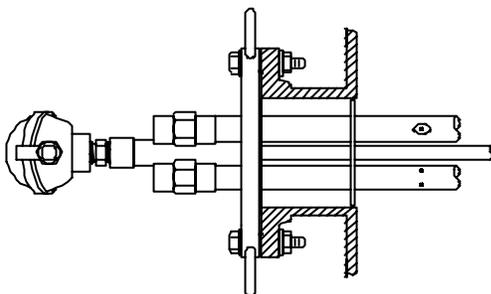


Y-SHAPED

Probe End Supports

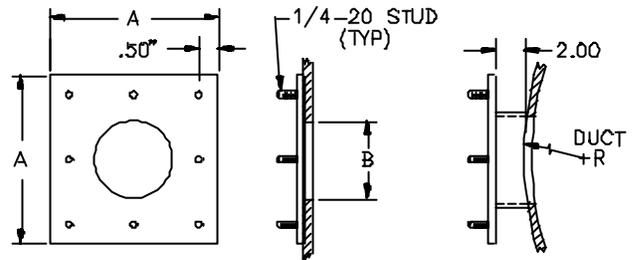


WITH STANDARD MOUNTING PLATE

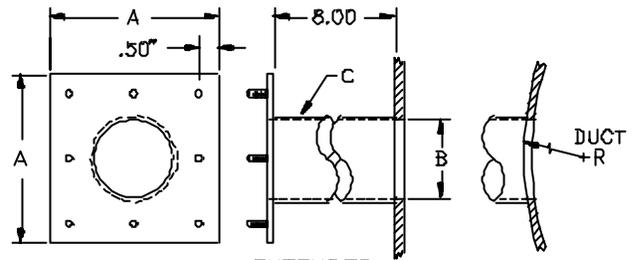


WITH 150lb MOUNTING FLANGE

Temperature Probe



STANDARD



EXTENDED

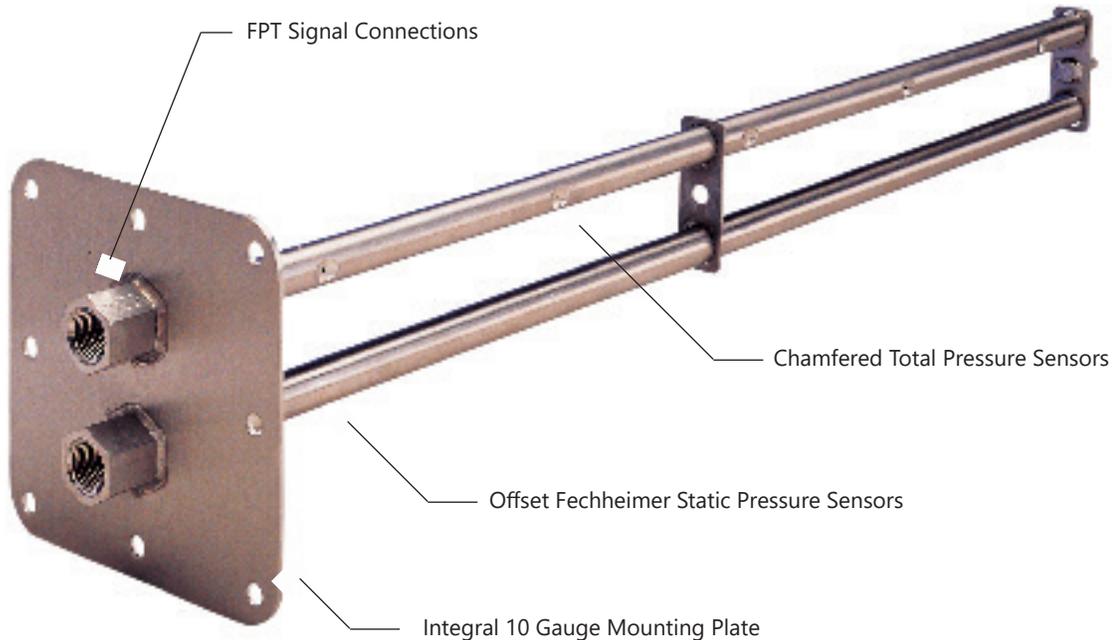
DIMENSIONAL CHART

PROBE LENGTH	A"	B"	C (PIPE)
12-24	4.00	$\phi 2.50$	2.5" SCH 40
25-240	6.00	$\phi 4.00$	4" SCH 40

Companion Mounting Plates

# Stainless Steel Airflow Traverse Probes

## Construction Features



## Features

**No Air Straighteners Required.** The VOLU-probe/SS unique dual offset static pressure sensor and patented chamfered total pressure sensor design permit the accurate measurement of the airflow rate in highly turbulent flow locations (with directional yaw and pitch varying up to 30° from the duct's longitudinal axis) without the need for upstream air straightening means.

**Offered in Two Models.** The VOLU-probe/SS is offered in two basic configurations to facilitate installation in new or existing ducts or stacks; the Model 1SS for external mounting, and the Model 2SS for internal mounting.

**Negligible Resistance to Airflow.** The VOLU-probe/SS cylindrical configuration and smooth surface free of external sensor protrusions permit the airstream to flow unrestricted around and between the installed traverse probes, creating a very minimal, if not negligible resistance to airflow (Ex: 0.046 IN w.c. at 2000 fpm air velocity).

**Performs Equal-Weighted Averaging of Flow Signals.** Through the use of separate averaging manifolds, the VOLU-probe/SS instantaneously averages, on an equal-weighted basis, the multiple pressures sensed along the length of the probe, producing separate "averaged" total pressure and static pressures at the probe's external signal connections.

**Provides for Equal Area Traverse.** Each VOLU-probe/SS contains multiple total and static pressure sensors specifically and precisely located along the length of the probe to provide an equal area traverse of ducted airflow. For rectangular duct configurations, the sensors are spaced at equal distances along the probe. For circular duct configurations, the sensors are located at the centers of the equivalent concentric area along the probe.

**True Velocity Pressure Measurement.** The total and static pressure components of airflow measured by the VOLU-probe/SS can be directly converted in velocity pressure (and velocity) without the use of correction factors, thereby facilitating flow verification with a 3D traverse probe or other hand held instrumentation.

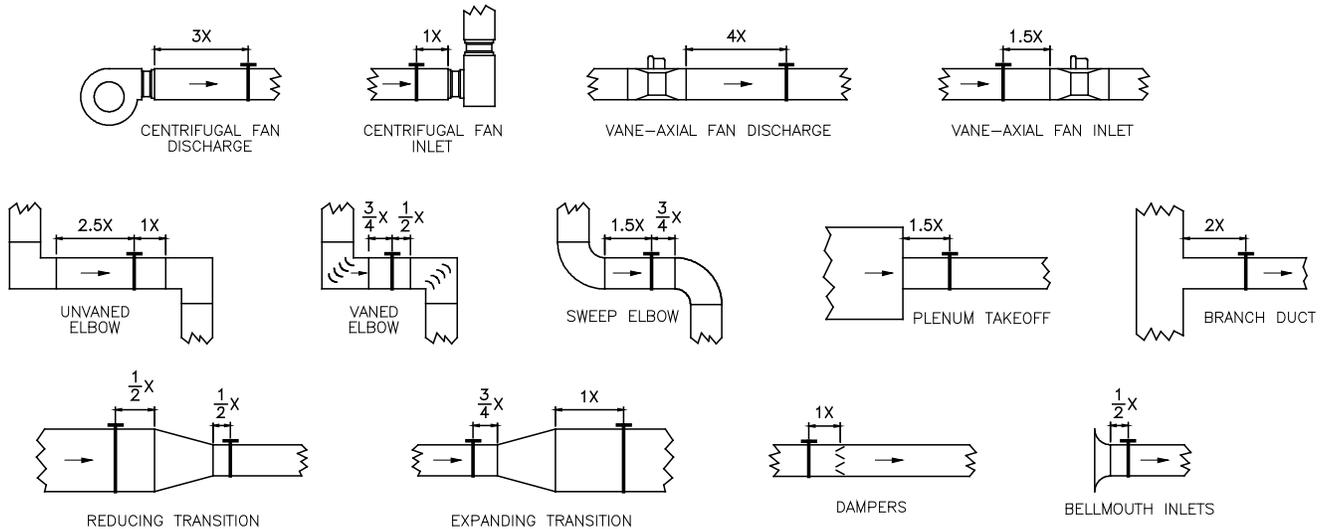
**Purgeable Design.** Individual two tube design permits high pressure, full volume purge for an effective cleaning for dirty air applications.

**Rugged Construction Assures Long Service Life.** The standard VOLU-probe/SS is fabricated from Type 316 stainless steel using all welded construction. See Page 4 for construction options, and contact Factory for alternate materials of construction such as Hastelloy, Inconel, Kynar, PVC, etc, and for special coatings such as erosion resistant tungsten carbide.

# VOLU-probe/SS

## Minimum Installation Requirements

**Note:** VOLU-probe/SS locations shown are **not** ideal. The locations indicate the **minimum** clearance required from air turbulence producing sources. Wherever possible, the VOLU-probe/SS should be installed where greater runs of straight duct (or clearances) than shown below exist.



Rectangular Duct  $x = \frac{z(H \times W)}{H + W}$

Circular Duct  $x = \text{Duct Diameter}$

Transition Angle  $\leq 15$ . This applies to both reducing and expanding transitions

## Suggested Specification

Provide where indicated an array of airflow traverse probes capable of continuously monitoring the stack or duct capacities (air volumes) it serves.

Each airflow traverse probe shall contain multiple total and static pressure sensors and internally connected to their respective averaging manifolds. The flow sensors shall not protrude beyond the surface of each probe, and shall be the offset (Fechheimer) type for static pressure and the chamfered impact type for total pressure measurement. The airflow sensing probe's measurement accuracy shall not be affected by directional flow having pitch and/or yaw angles up to 30°.

Each airflow traverse probe shall be fabricated of type 316 stainless steel, all welded construction, and shall be furnished with the flat or curved plate mounting means. In addition, access ports and accessory hardware shall be provided to facilitate external installation of the probe and end support (if required), yet permitting easy probe removal for inspection, etc.

The airflow traverse probe shall not induce a pressure drop in excess of 0.046 IN w.c. at 2000 FPM, nor measurably contribute to sound levels within the duct. Total and static pressure sensors shall be located at the centers of equal areas (for rectangular duct) or at equal concentric area centers (for circular ducts) along the probe length. The airflow traverse probe shall be capable of producing steady, non-pulsating signals of total and static pressure without need for flow corrections or factors, with an accuracy of 2-3% of actual flow. Overall velocity range is from 400 to 10,000 Actual feet per minute (Select 10:1 turndown within the range). Note: Consult factory for higher velocities.

The airflow traverse probe(s) shall be the VOLU-probe [1SS, 2SS] as manufactured by Air Monitor Corporation, Santa Rosa, California.