ROYCE TECHNOLOGIES

DATA Sheet

Interface Level And Point Level Analyzers & Sensors

Model 2511
Analyzer

Model 2505
System

Model 2120
System

Royce now offers a complete line of Interface Level and Point Level Analyzers that make it possible to reliably monitor and control the solid/liquid interfaces in settling tanks and clarifiers; regardless of the size of the plant, process or budgetary constraints and now all analyzers measure and output Clatity as well.

The Royce series of Interface Level Analyzers use an ultrasonic ranging technique to measure the depth of interfaces within the tank. The 25 series sensors are available in polyurethane for standard applications and Kynar for high temperature or chemical applications. A Stainless Steel sensor is available for explosion proof applications. The sensor is mounted just below the surface of the water. Royce offers a hinged bracket sensor mounting option that accommodates surface skimmer passage automatically with the rotation of the rake.

The **Model 2501A** is a low-priced instrument designed for interface monitoring applications which does not require Speed of Sound Correction.

The **Model 2511A** is capable of having the ultrasonic speed of sound signal from its transducers changed by the user in applications where liquid mediums other than water are in use. It also has four setpoint relays which can each be used as either a “high” or “low” setpoint. A serial output is available on both Models for the purpose of tying a number of the units to a central process control computer.

The **Model 2505** system incorporates all the features of the Model 2511A allowing individual monitoring and control on every primary, secondary, and Thickening clarifier in the plant - economically.

The economical **Series 2100** Point Level Detectors consist of the **Model 2110** Single Channel Detector for single point optical interface detection where control setpoints allow the user the keep the interface in a single location. The **Model 2120** Dual Level Detector allows for the user to control the interface between two levels in the clarifier.

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Sanitaire
ITT Industries

Applications

- Waste Treatment Clarifiers; Primaries, Secondaries, Gravity Thickeners
- Petroleum/Asphalt Separation Tanks
- Pulp & Paper Liquor Tanks
- Potable Water Clarifiers
- Raw Water Clarifiers
- Lamella Clarifiers
- Precious Metal Separators
- Any Tank with a Liquid/Solid Interface
- Mining Clarifiers
- Brine Tanks
- Slurry Tanks
- Settling Tanks

Features

- Measures both interface and Clarity
- No Moving parts, no maintenance, no recalibration required
- Surface skimmer friendly
- Microprocessor based electronics
- Back-Lit LCD displays
- Full featured set point relays Available
- Simple user friendly menu driven programming
- Numerical and graphical displays

2501A/2511A

The graphical displays on the Models 2501A & 2511A provide at least three very useful functions: (1) During start up, the customer is instructed, step by step, through the programming parameters which make the analyzer operable; (2) Profiles the entire liquid column of the tank, showing ALL solids interfaces. This will continually update stored information as sounding data is revised; (3) A trend of the interface level of interest, covering up to the last 24 hours, will continually be updated and available to the graphical display with the press of a button.

The microprocessor in both instruments is also used to provide a flexible, convenient customer interface with simplified setup, calibration, and troubleshooting procedures. The displays, setpoint relays, and remote outputs are all under direct microprocessor control. As a result, data is scaled easily to suit the specific needs of the customer.

Separate back lit, digital and graphical displays provide the numerical location of the desired solids interface, as well as a profile of the entire clarifier in real time. This profile visually depicts each interface in the clarifier and labels their individual levels. The amount of ultrasonic energy required for the reading is also shown on the graphical display; this informs the user of the relative signal absorption present in the clarifier at the time of the reading.

The fiberglass NEMA 4X instrument enclosure can be mounted on a vertical or horizontal handrail, or a wall.

The ultrasonic sensor with 25 feet of cable mounts on either a fixed support or a swing out bracket. A number of different sensor designs are available for applications in harsh environment clarifiers and washers.

Series 2500 Specifications

Models 2501A & 2511A

Tank Level Ranges:
1 to 99 feet, in feet, meters, % depth

Dead Zones:
1 foot from sensor and 2 inches above tank bottom

Level Resolution:
0.1 feet to 25' depth
0.2 feet to 50' depth
0.3 feet to 75' depth
0.4 Feet to 100' depth

Stability:
0.1% per degree centigrade

Sensor Ambient Conditions:
Temperature, -30 to 80°C
High Temperature Sensor, -30 to 105°C

Instrument Ambient Conditions:
Temperature, -10 to 50°C
with heater, -40 to 50°C
Relative Humidity, 5 to 100%, non-condensing

Power Requirements:
115/230 VAC ±15%, 50/60 HZ

Enclosures:
NEMA 4X

Cabling Limitations:
Sensor to Transceiver distance, 75 feet, maximum (ALL MODELS)
Transceiver to instrument distance, 750 feet, shielded cable (MODELS 2501A & 2511A ONLY)

Outputs:
4 - 20 mA isolated, can be scaled to any range
4 - 20 mA isolated, relative clarity of top four feet of tank
Digital Serial Interface either RS 232 or RS 485.

Relays:
Up to 4 Standard setpoint relays with programmable hysteresis
Form C rated 250 VAC at 6 Amps resistive

Additional Features:
Microprocessor controlled
Programmable digital display
Self test and automatic calibration
Help Screens and graphic display (MODELS 2501A & 2511A)
Compensation for nonstandard speed of sound (MODEL 2511A ONLY)

The Series 25 Sensor is mounted so that it is suspended just below the surface of the tank liquid. (See SENSOR AND TRANSCEIVER MOUNTING)

The dual crystal sensor, **Model 25DN,** uses one transducer to send and one transducer to receive. This gives the highest resolution and minimum dead band. All the single crystal sensors operate by both transmitting and receiving. In both cases, the crystal(s) operate under the analyzer's control emitting a directional burst of ultrasonic energy towards the bottom of the tank.

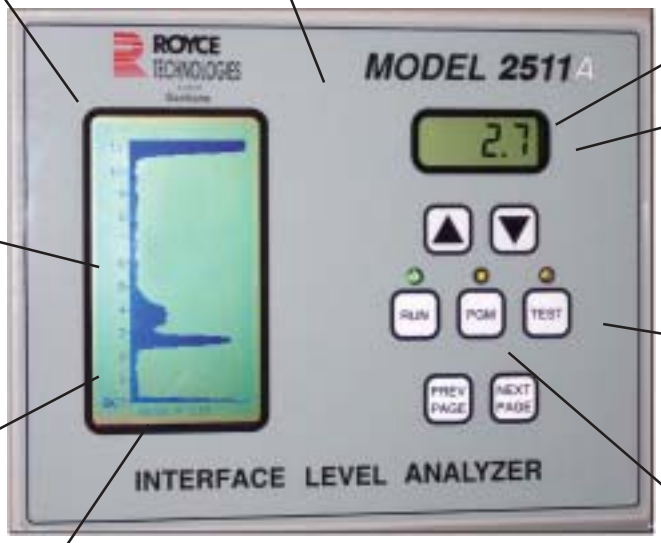
Energy reflected back and captured by the sensor is amplified by the receiver circuitry and digitized by the analyzer. In this way, the system builds a complete "tank profile" in the processor's memory which contains the magnitude of the reflected signal for every 1/10th foot increment in depth.

This profile is created on an averaging basis so that the incidental reflections from passing debris or a passing skimmer will not cause false readings. The analyzer interprets these arithmetic profiles to determine the position of all the layers in the tank. Once the instrument's software identifies the interface of interest (programmed by the operator during setup) the depth of that interface is digitally displayed on the numerical LCD display. At the same time, the graphical display is updated to show the profile of the entire tank depth. In these profiles, a peak in the reflected energy indicates the position of an interface, between density layers. The size of each peak is a function of the relative density of the layers. Thus the lighter "fluff" layers, which might be suspended above the main blanket, will appear as smaller (shorter), often broader peaks on the profile. In any case, the position of all the interfaces in the tank are detectable.

Backlit LCD Profile Display showing ALL interfaces. The most prominent being the most dense. The profile is updated with each numerical display update

Automatic, continuous, self-diagnostics with a dedicated set of alarm contacts

Backlit LCD Display of Desirable Interface in feet, meters or % of tank depth



Clarity to indicate process performance

Can be switched to view up to a 24 hour trend graph of the displayed level

Operation simple and straight forward

Profile is automatically scaled to the tank being measured

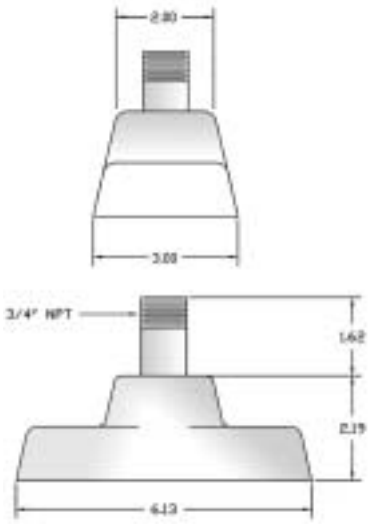
Sensor energy required for each reading is displayed

Programming the analyzer for your specific requirements is a simple matter of reading questions on the Profile display and responding with a single push of a button

Ultrasonic Sensors For The 2500 Series Interface Level Analyzers

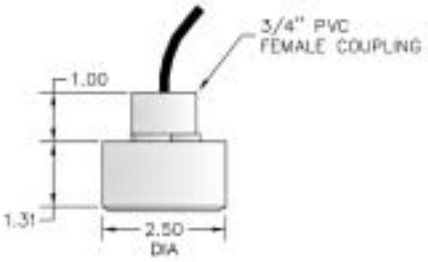
Model 25DN

The standard ultrasonic, dual crystal sensor used with the 2501A and 2511A Interface Level Analyzers for all normal aqueous non-chemical conditions, where maximum temperatures do not exceed 175° F (80° C). It incorporates a 3/4" 316 Stainless Steel nipple for customer supplied pipe mounting.



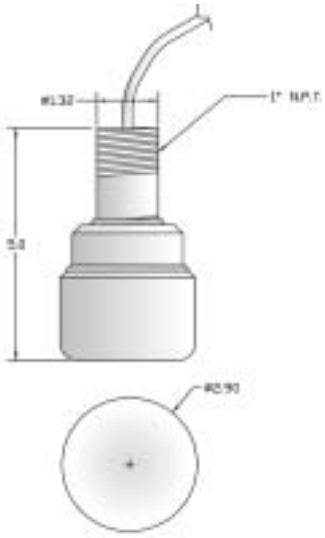
Model 25SN

Designed specifically for the Model 2505 analyzer, this economical sensor uses a single crystal to both transmit and receive. Constructed of the same material as the 25DN; it is used in non-chemical applications where the maximum temperatures do not exceed 175° F (80° C). Its physical size allows the sensor to be inserted into a pipe with an I.D. of 3 inches. It incorporates a 3/4" 316 Stainless Steel nipple for customer supplied pipe mounting.



Model 25SHE

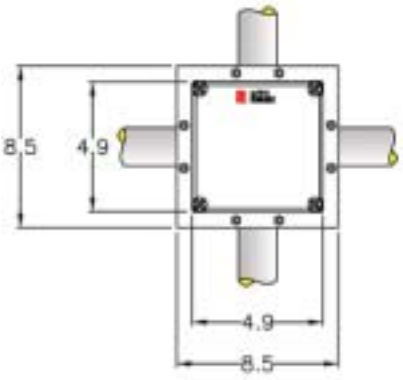
For generally harsh environment applications, this solid, Kynar sensor is made of chemically inert epoxy. It incorporates a 3/4" Kynar pipe nipple for customer supplied pipe mounting. All cables are high temperature Teflon jacketed. It can be used in chemical solutions of temperatures to 220° F (105° C).

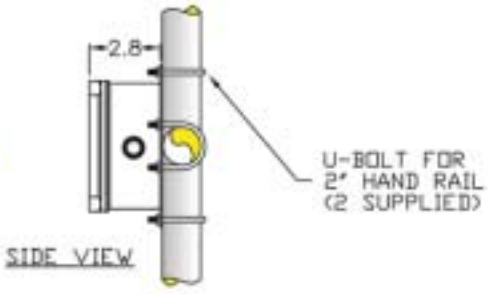


TR-25 & Rear Rail Mount

Mounted on Horizontal or Vertical Rail

TR-25 Transceiver
Required for 2501A/2511A Only





Economical Model 2505

In the late 1980's Royce introduced the first ultrasonic Interface Level Analyzer (ILA) which was capable of, not only identifying every interface in a liquid tank, but also allowed the user to see all the interfaces, as well as control or alarm on the interface of his choice. This breakthrough in electronic process control technology is now accepted to the point that the user now has a desire to mount an ultrasonic ILA on every primary, secondary, and thickening clarifier in the plant. Many larger operations now use Distributive Control Systems which can communicate continually with all their clarifiers through the individual ILA's.

The need for these large numbers of ILA's is not easily addressed. The common method of utilizing multiple sensors to one set of electronics is not convenient because of the separation of the individual clarifiers. Also, this same separation causes the already sophisticated electronics to become even more complex.

Royce has answered this dilemma with the **Model 2505** Interface Level System. With the Model 2505 each clarifier has its own set of interface level electronics and sensor, so the operator can view the contents of the clarifier as he monitors and/or programs the analyzer. There are no long, complex cable runs and the analyzer is where it belongs - on the clarifier.

The Model 2505 is a dedicated analyzer that is programmed with a Royce hand held terminal (Model 2) which allows for three important functions; (1) a step by step menu driven set up, (2) profiles (a Royce trademark) of the entire liquid column of the tank, including all interfaces, and (3) a 24 hour trend of the interface of interest. All of this information is simple to retrieve and view - whenever it is needed on top of the clarifier, where the operator can visually observe the process being monitored.

And the best news is that the Model 2505 System reduces the cost per tank for those operations where large numbers of clarifiers need to be monitored and/or controlled. Yes, controlled, because each Model 2505 has two setpoint relays which can be used for alarming, or sludge pump or weir control. The analyzer also has a harsh environment LCD display which continuously displays the numerical level of the interface of choice. Analog and digital communication outputs are also standard equipment on each system.

Every feature that is available on all other Royce 2500 Series Interface Level Analyzers is standard on the Model 2505. Royce was the company that brought this technology to your industry, and it is Royce that will bring you the most user friendly and reliable answer to your future interface level requirements.

A Windows compatible program is available for a customer computer, if the Royce hand held terminal is not desired.

Model 2 Hand Held Terminal Model 2505 (ONLY)

Ambient Conditions

Storage Temperature: - 20 to 70^{O} C
Operating Temperature: 0 - 50^{O} C
Humidity 90% non-condensing

Features

Graphical display of tank profile and 24 hour trend data
User Friendly help screens for analyzer setup
Eight hour rechargeable memory free battery

Model 2110

Model 2120

The Royce answer to accurate point level detection can be found in the **Model 2110** and **Model 2120** Point Level Systems. An optical system, these instruments are the first point level detectors available in the industry with self cleaning capabilities built into the sensor.

Simplicity in design with field proven technology makes the Royce Point Level Systems the best choice for static detection applications. The microprocessor based electronics of the Detector are programmed for high and low setpoints, relay time delays, and self cleaning optics by adjusting the setup switches on the printed circuit board.

Features

- Programmable Cleaning Intervals for Sensor Optics
- Push Button Sensor Calibration
- Back-Lit LCD displays
- Setpoint Control Relays
  Two on Model 2110
  Four on Model 2120
- NEMA 4X - IP66 - UL Listed Enclosure

Applications

- Potable Water Clarifiers
- Filter Backwash Holding Tanks
- Moving Bridge Clarifiers
- Wastewater Sump Blanket Levels
- Any tank with a Liquid/Solids Interface where stationary mounting of the sensors is possible

Sensor Calibration

- Place Sensor in Clean Water
- Push the “zero button”
- Repeat Procedure on a Yearly Basis (If sensor self cleaning is used
- Set Relay Trip Point

It’s that simple.
The system can be used to simply alarm an indicated level or it can be configured to fully control the interface level by supplying direct pump control.

As with all Royce instrumentation, we had the operator in mind at the design stage.

Sensor Self Cleaning

The sensor may be cleaned with customer supplied air or water, or with the compact Royce self contained air compressor assembly.

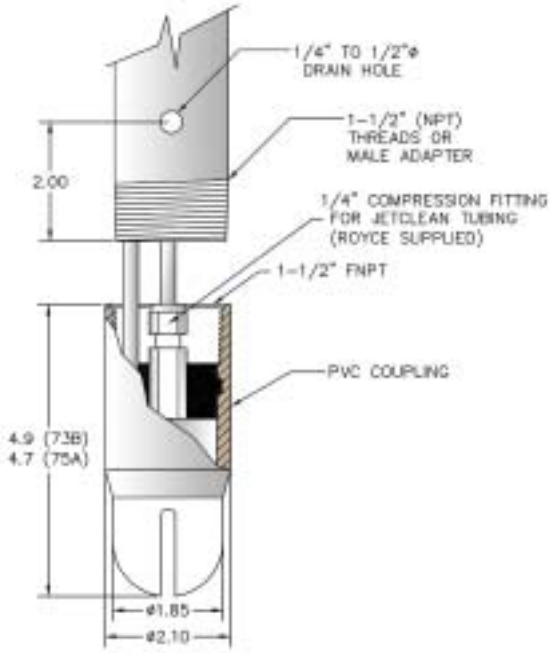
Model 2110 Specifications

The **Model 2110** Has a single optical **Model 21A** sensor for interface detection.

Setpont Range:
500 - 35,000 mg/l
Standard Outputs:
Two programmable setpoint relays, Form C rated 250 VAC at 7 Amps resistive
Self Cleaning:
Air or Water Jet (For use with house air or water or Royce Compressor system.)
Cleaning Interval:
Every 0.25 - 2 hrs
Input Power:
Switch selectable 115/230 VAC, 50/60 Hz.
Enclosure:
NEMA 4X (IP66) polycarbonate UL Listed

Model 21A Sensor Specifications

Type:
Single gap optical light absorption sensor
Setpoint Range:
500 - 35,000 mg/l
Repeatability:
± 1% of reading or ± 30 mg/l, whichever is greater
Temperature Limit:
0 - 50° C
Pressure:
0 - 50 PSIG
Self Cleaning:
Air or Water Jet (For use with house air or water or Royce Compressor system.)
Cable Termination:
Tinned leads
Mounting:
1 - 1/2" PVC Schedule 40
Construction:
Molded polymer body Chemically Resistant polyurethane optics

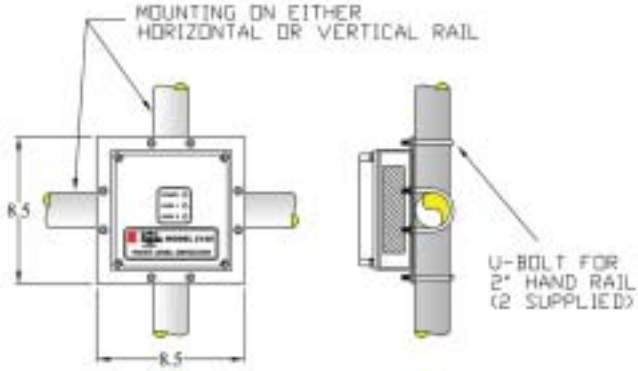


Model 2120 Specifications

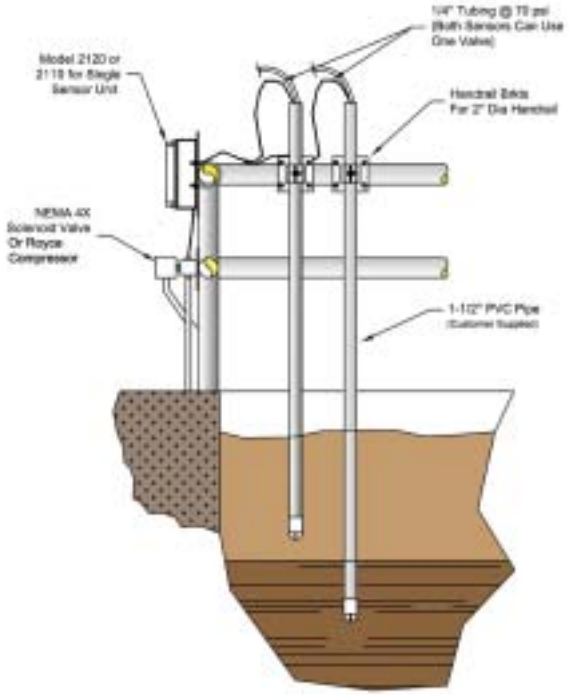
The **Models 2120** has two **Model 21A** sensors for the detection of two different interface levels. It can be used to control a blanket between two desired levels by direct operation of the extraction pump.

Setpont Range:
500 - 35,000 mg/l
Standard Outputs:
Four programmable setpoint relays, Form C rated 250 VAC at 7 Amps resistive
Self Cleaning:
Air or Water Jet (For use with house air or water or Royce Compressor system.)
Cleaning Interval:
Every 0.25 - 2 hrs
Input Power:
Switch selectable 115/230 VAC, 50/60 Hz.
Enclosure:
NEMA 4X (IP66) polycarbonate UL Listed

Detector Outline & Mounting

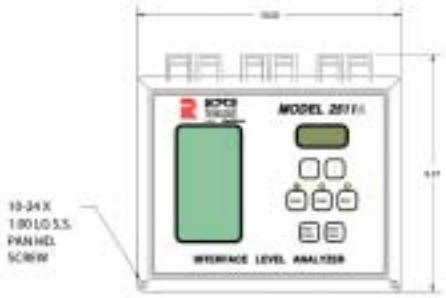


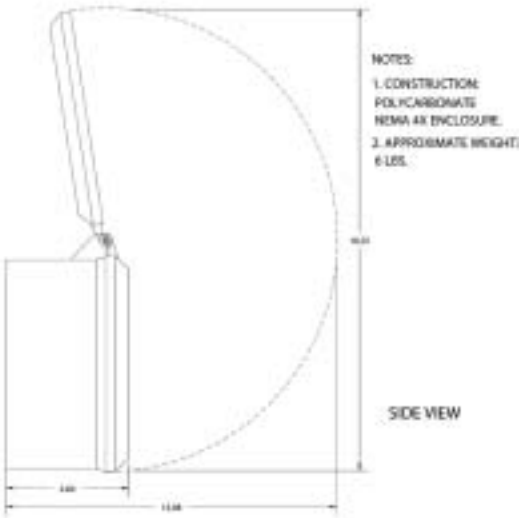
Sensor Outline & Mounting

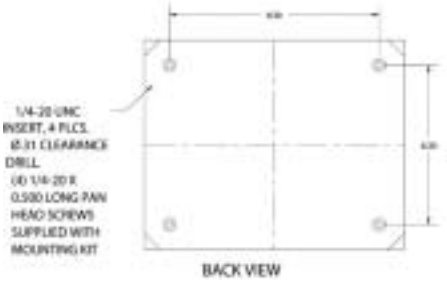


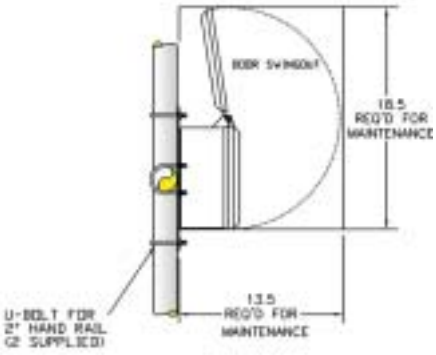
SERIES 2500 ANALYZER & SENSOR DIMENSIONS AND MOUNTING

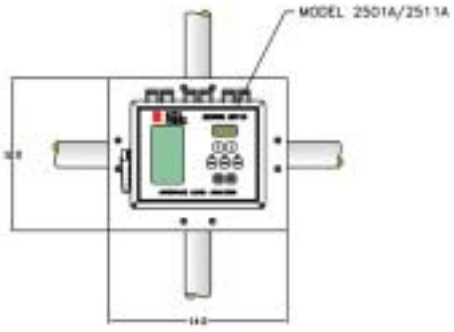
Analyzer Dimensions And Mounting



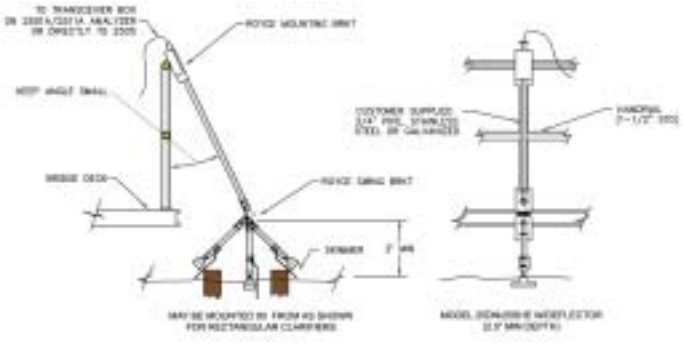




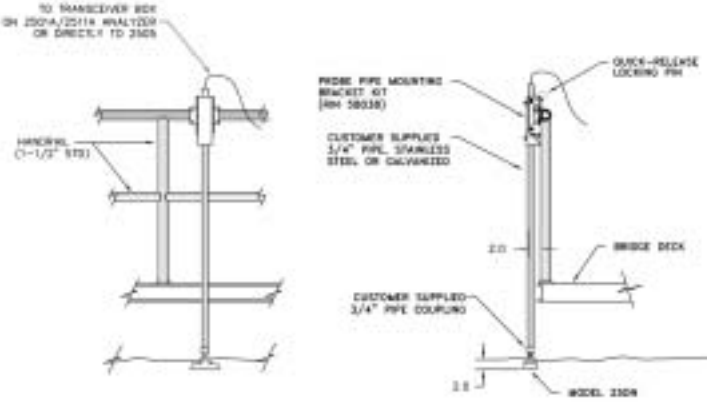




Swing Out Mounting



Stationary Mounting



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