



Northern States Power Company

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D. E. Gilberts  
Senior Vice President  
Power Supply

December 30, 1980

Mr. James G. Keppler  
Director, Region III  
Office of Inspection and Enforcement  
U. S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, IL 60137

Dear Mr. Keppler:

MONTICELLO NUCLEAR GENERATING PLANT

Docket No. 50-263 License No. DPR-22

This letter provides further information with respect to IE Bulletin No. 80-17, Supplement 4.

Enclosed is the schematic and instruction manual for the SDV water level monitoring system per our letter to your office dated December 23, 1980.

If additional information is required, please communicate directly with plant management.

Yours truly,

D. E. Gilberts  
Senior Vice President  
Power Supply

cc: Mr. C. H. Brown  
Mr. G. Charnoff  
Director, Office of Inspection and Enforcement  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Enclosures

DEG:nk

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UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT

Docket No. 50-263

LETTER DATED DECEMBER 30, 1980  
RESPONDING TO NRC REQUEST  
FOR INFORMATION IN IE BULLETIN NO. 80-17

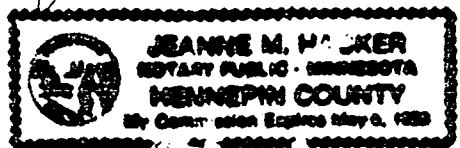
Northern States Power Company, a Minnesota corporation, by this letter dated December 30, 1980, hereby submits information in response to NRC request for information concerning IE Bulletin No. 80-17, Supplement 4.

This request contains no restricted or other defense information.

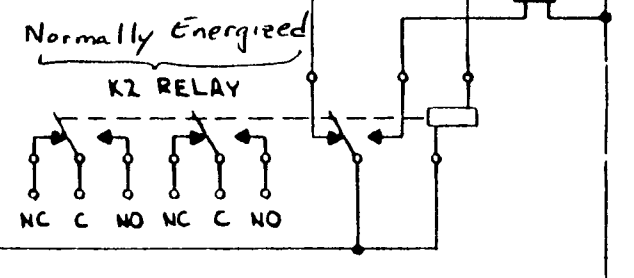
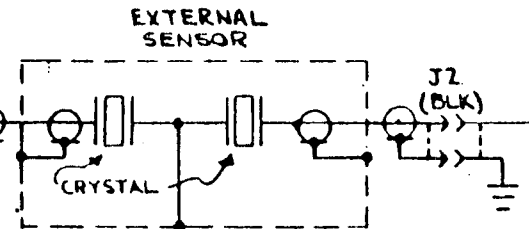
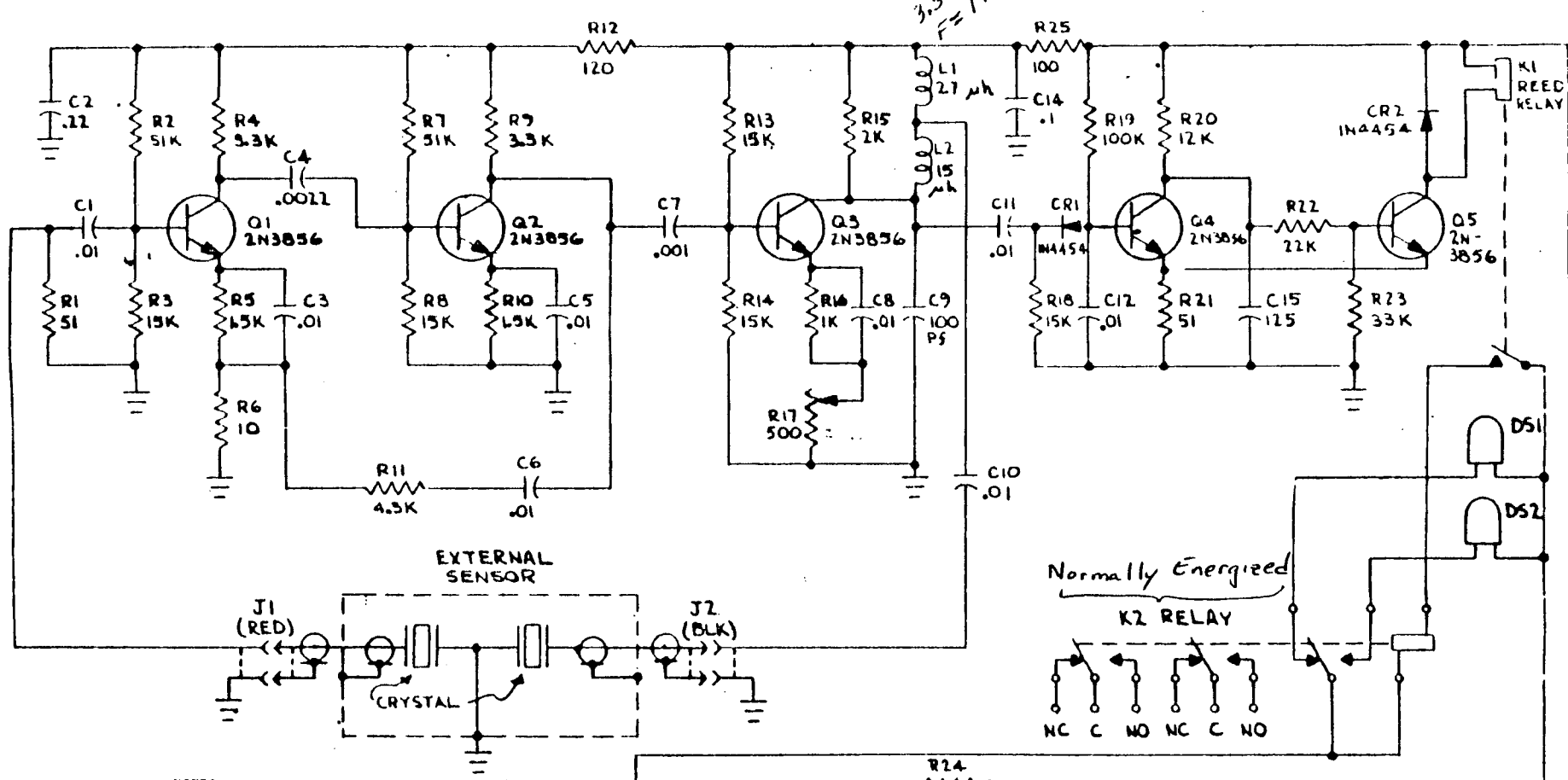
NORTHERN STATES POWER COMPANY

By: *D. E. Gilberts*  
D. E. Gilberts  
Senior Vice President  
Power Supply

On this 30 day of Dec, 19 80, before me a notary public in and for said County, personally appeared D. E. Gilberts, Senior Vice President, Power Supply, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Northern States Power Company, that he knows the contents thereof and that to the best of his knowledge, information and belief, the statements made in it are true and that it is not interposed for delay.

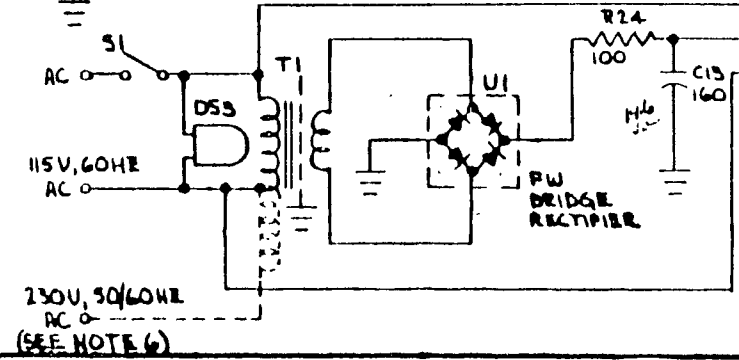
*Jeanne M. Hacker*  


3.5 VAC  
F = 1 Mc/yr HE



**NOTES**

1. Models of 440 and 460 series:  
R11 is 10K.
2. Models of 420 and 460 series:  
K1 is normally closed.
3. Models with numerals 3 or 5 following the letter C:  
R6 is 500 ohm pot.  
R7 is 10 ohms.  
C14 is .01 MFD.
4. Lamps DS1, 2, 3 and switch S1 are optional.
5. Unless otherwise indicated, resistors are in ohms, capacitors are in microfarads.
6. Special transformer used for 230 VAC input.



REVISIONS			SCHEMATIC DIAGRAM MODEL	
NO	DATE	BY	400C TO 499C CONTROL UNIT	
1	4/7/70	WJ	NATIONAL SONIC CORPORATION	
2	4/30/70	WJ	16000000 / 16000000 / 16000000	
DRAWN BY			SCALE	MATERIAL
ROLANDER			DATE	DRAWING NO.
CHECKED			5-15-68	B17578
TRACED			APP	

ENVIROTECH



# Sensai<sup>®</sup>

## INSTRUCTION MANUAL

SECTION 2000  
LIQUID CONTROLS

IDS-15A

MODELS 601S & 621S NON-PENETRATION  
ULTRASONIC LIQUID LEVEL SENSORS

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NATIONAL SONICS 250 Marcus Boulevard, Hauppauge, N.Y. 11787, (516) 273-6600  
Division of Envirotech Corporation

Telex 14-454

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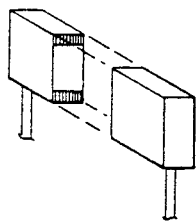
## SYSTEM DESCRIPTION

### INTRODUCTION

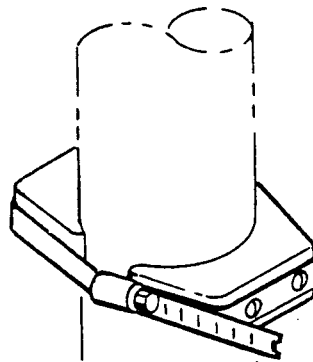
The Sensall Models 601S and 621S Non-Penetration Sensors provide liquid level detection at a predetermined point without contacting the process liquid. The sensors are light weight, small and install easily onto existing equipment. A Sensall system consists of an electronic control unit, the non-penetration sensor, and the interconnecting cables. The system operates on 117VAC, 60 Hz power and once adjusted does not require any further attention.

### SENSOR

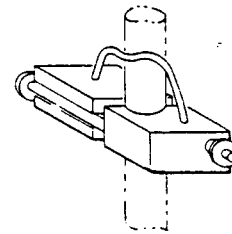
Model 601S consists of two identical transducers that comprise a sensor. The Model 601S is intended for sensing across two flat parallel surfaces, such as a flat glass sight gauge. Model 621S consists of two transducer units containing cast-in installation hardware. The Model 621S is intended for sensing across a cylindrical section, such as a tube or pipe.



MODEL 601S



MODEL 621S  
LARGE  
DIAMETER



MODEL 621S  
STANDARD  
DIAMETER

### CONTROL UNIT

The control unit enclosure houses the electronics and is supplied to conform to NEMA 12, 4 or 7 ratings.

The electronics is solid state except for a DPDT electromechanical relay.

All of the electronics is mounted on a glass-epoxy PC board. A terminal board provides for external connections as necessary for control of pumps, valves, etc. When ordered, control units are supplied interconnected to perform special sequences, such as automatic emptying or automatic filling.

The listed specifications are for a typical control unit that is commonly used in many applications.

SPECIFICATIONS

SENSOR	MODEL 601S	MODEL 621S
Repeatability	0.02 inch (0.51 mm)	
Measurement Technique	Ultrasonic	
Power Consumption	Less than 10 Milliwatts	
Pressure	Sight gauge rating	Vessel rating
Temperature	0°F to + 250° F (-18° C to + 121° C)	
Weight	6 oz. per pair	6 oz.
Housing Material	Glass reinforced epoxy	Epoxy Casting
Cable and Connector	Six feet *Teflon coaxial, 50 OHM cable terminated with shielded plug. (Longer lengths can be supplied)	Six feet *Teflon double coaxial, 50 OHM cable each terminated with shielded plug. (Longer lengths can be supplied)

CONTROL UNIT	MODEL 400C-1/300C-1
Input Voltage	Standard 117 volts A.C. 60 Hz (50 Hz supplied on special order) (Other voltages supplied on special order)
Power Consumption	Less than 6 watts
Standard Relay	DPDT - 10 amp, 28 VDC resistive or 240 VAC, 80% PF
Response Time	Standard 0.5 seconds. Shorter or longer response times supplied on special order.
Temperature	-30°F to +150°F (-34°C to +65°C)
Housing	JIC (NEMA 12) enclosure standard, NEMA 4 (watertight) and NEMA 7 (explosion proof) supplied on special order.
Size and Weight	6" X 6" X 4", 5 1/2 lbs.

\*Dupont Trademark

## SYSTEM INSTALLATION

### GENERAL

Installation of the Sensall System will require mounting of the control unit and the sensor and making the necessary electrical connections. Unpack the control unit, sensor and cable. Do not remove sensor from plastic bag until ready for installation.

### NOTE

Sensor model numbers that end with a  
-1 use the 300C control unit

### CONTROL UNIT INSTALLATION

The control unit, except for special applications, is supplied without holes in the enclosure. This allows for custom installation of power lines, sensor and control lines. The control unit can be mounted at any angle and can be remotely located from the sensor. It is recommended that the control unit be mounted in an area that is easily accessible and away from corrosive or damp atmospheres. Care should be exercised to insure that no foreign materials fall into the electronics when the cover is open.

The following is a typical installation procedure for the control unit.

- a. Select location for control unit within reach of cable supplied with sensor and suitable for the type of enclosure being installed.
- b. Open cover.
- c. Remove electronics assembly PC board from enclosure by unscrewing four mounting screws.

### CAUTION

*Do not drill enclosure before removing PC board. Damage to the electronics is possible if the drill goes through the enclosure into the PC board.*

- d. Drill necessary entrance holes in enclosure to accommodate sensor and power connections from line and controlled equipment.
- e. Install enclosure at selected location using holes provided in external mounting feet.
- f. Attach entrance fittings to enclosure.
- g. Clean box thoroughly, insure that all metal particles are removed.
- h. Route line cord and coaxial cable through separate entrance fittings. Attach conduit to entrance fittings if necessary.
- i. Strip 1/2" of insulation from ends of power and relay wires and attach suitable solderless lugs.
- j. Dress wires aside and remount electronics assembly PC board.



## SYSTEM INSTALLATION

### CONTROL UNIT INSTALLATION (Continued)

- k. Connect all lugs to terminal strip in accordance with desired function, refer to Wiring Diagrams.
- l. Make ground connection to control unit using electronics assembly mounting screw specified "GRD" or "GND".
- m. Replace cover and tighten securely.
- n. Apply power.

#### CAUTION

*Standard Sensall models are provided with a relay rated at 10 amps. (Resistive load or 80% PF). Damage to the contacts can result if the relay is subjected to an overload.*

### SENSOR INSTALLATION

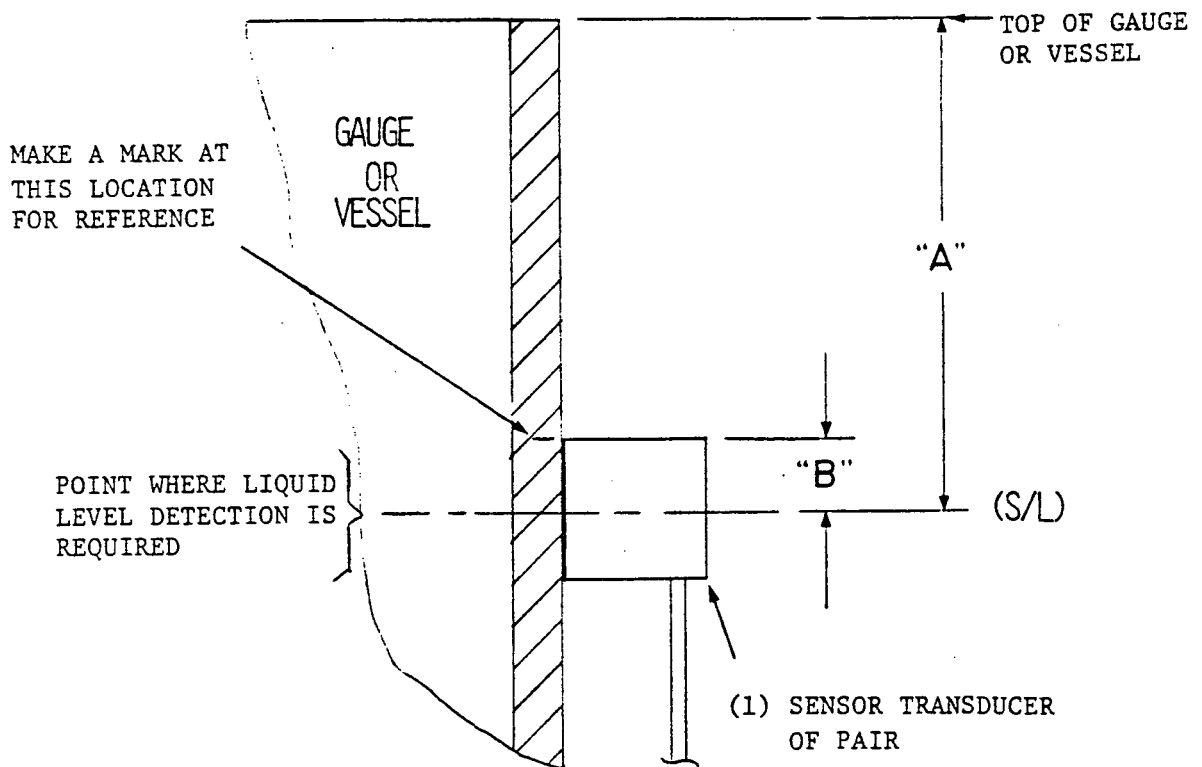
The sensors are shipped in a plastic bag to insure cleanliness. Once the sensors are removed from the protective plastic bag, contact with the sensor faces, (area between tapes for the 601S or circular molded area for the 621S) should be avoided. The faces are specially prepared and if contaminated with oil, a satisfactory epoxy bond would be difficult to obtain. Before an installation is made, refer to the following alignment, surface preparation and epoxy mixing procedures. Trouble free performance is insured if these procedures are followed carefully.

## SYSTEM INSTALLATION

### SENSOR ALIGNMENT

The alignment of the sensor is important; misalignment of the sensor transducers will cause ultrasonic signal loss and possibly poor system performance. The following procedure applies to the 601S and the 621S sensors.

1. Measure from top of gauge tube or vessel on both sides and mark dimension "A" where detection is required. Measure one-half the distance of the sensor height and mark dimension "B" onto the gauge or vessel.
2. When the sensor is affixed onto the surface the "B" dimension will then be passing directly through the sensor sensing level (S/L), as shown.



Sensor Transducer Alignment Diagram

### SURFACE PREPARATION

The surface area (gauge glass, tube, vessel, etc.) that the sensor will be affixed to MUST be thoroughly clean (this includes removing paint on prepainted surfaces). Use a non-petroleum base solvent such as alcohol, Trichloroethane, Methyl Ethyl Keyton (MEK), etc. and a clean cloth. Remove surface irregularities that would prevent proper seating of sensor. Slight pitting of the gauge glass or vessel will not affect sensor performance.

### MIXING OF EPOXY (Used when permanent bond is desired.)

Mix epoxy NSC No. A-2492 in accordance with directions on package. Use the plastic separator bar or wooden stick to work resin and epoxy together for a few minutes. Insure that the epoxy resin and hardener are kneaded to a uniform black before opening package. Thorough mixing is crucial for a good permanent bond.

## SYSTEM INSTALLATION

### PERMANENT INSTALLATION

If the sensor has been used in a temporary installation and permanent installation is required, it will be necessary to remove the adhesive tapes, clean the sensor faces with a non-petroleum base solvent such as alcohol, Trichloroethane, Methyl Ethyl Keytone (MEK) etc. and replace the tape strips with the supplied strips. (Removal and replacement of tape strips applies to Model 601S only.)

### MODEL 601S

Permanent installation of the Model 601S sensor onto a flat type sight gauge or other flat surface requires no tools and is as follows:

#### NOTE

Do not touch pre-cleaned prepared sensor faces. Contamination would affect bond. If contamination occurs re-clean sensor faces with a non-petroleum base solvent.

- a. Spread THIN film of epoxy using wooden spreader (supplied) onto prepared surface of sensor (between tapes).
- b. Lift tabs from each end of sensor to expose adhesive side of tape.
- c. Align top edge of sensor against line marked on gauge (dimension "B") and use a rolling action to affix sensor onto the prepared surface of the gauge glass. Press sensor firmly against glass to squeeze out excess epoxy and to achieve a firm bond of the adhesive strips. Support the sensor cables to relieve tension on the transducers, during the epoxy curing process. Wipe away excess epoxy.
- d. Allow the epoxy to cure for a minimum of 12 hours at room temperature. Higher temperatures will result in a faster cure time. (Example: 3 Hrs. @ 150 °F)

### MODEL 621S

Permanent installation of the Model 621S onto a round tube, vessel, etc. requires no tools. Check that the sensor ordered matches the diameter of the tube that it will be used on. Installation is as follows:

- a. Set both sensor sides face up with nuts and spring washers on screw attachments.
- b. Spread THIN film of epoxy using wooden spreader (supplied) onto prepared surfaces of sensor (circular area).

## SYSTEM INSTALLATION

### MODEL 621S (Continued)

- c. Attach sensor onto tube or vessel being sure to align top edge of sensor with dimension "B". Screw down nuts to lightly compress the spring washers under the nuts and to squeeze out epoxy adhesive (do not over tighten). When the sensor is properly installed, both sides of the sensor should have equal gaps as shown on the diagram. (For clamp-on type sensors, the number of spaces in clamp should be equal on both sides.)
- d. Allow the epoxy to cure for a minimum of 12 hours at room temperature. Higher temperatures will result in a faster cure time. After the epoxy is cured, loosen or remove the two nuts.

### TEMPORARY INSTALLATION

Temporary installation is recommended in areas where it might be necessary to periodically move the sensing point. The alignment and surface preparation procedures will apply. Temporary installation will require a grease that will not flow when the vessel, gauge, etc., is at its normal operating temperature. A silicone grease such as Halocarbon 25-5S is recommended. When the Model 601S sensor is moved from a temporary installation to another, replacement of the tape strips (extra supplied) is recommended.

### MODEL 601S

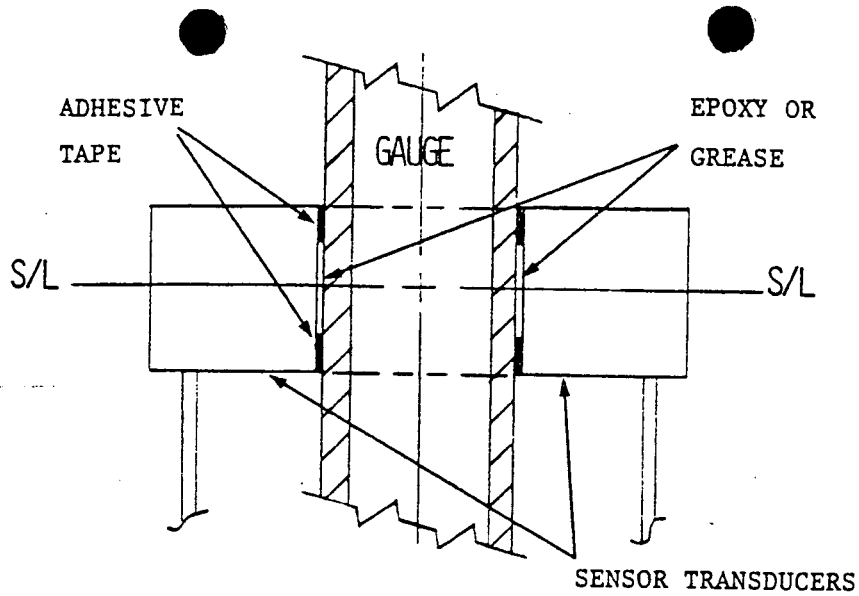
Temporary installation of the Model 601S sensor onto a flat type sight gauge or other flat surface requires no tools and is as follows:

- a. Spread THIN film of grease onto prepared surface of sensor (between tapes).
- b. Lift tabs from each end of sensor to expose adhesive side of tape.
- c. Align top edge of sensor against line marked on gauge (dimension "B") and use a rolling action to affix sensor onto gauge glass. Press sensor firmly against glass to squeeze out excess grease and to achieve a firm bond of the adhesive strips. Support the sensor cable to relieve any tension on the sensor.

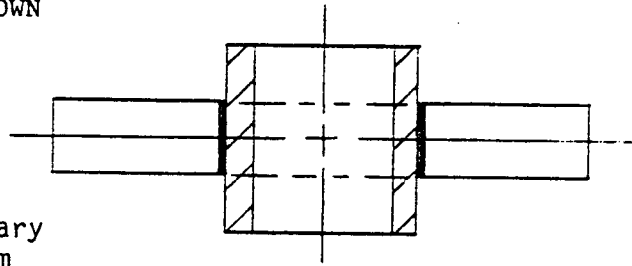
### MODEL 621S

Temporary installation of the Model 621S sensor onto a round vessel, tube, etc., requires no tools. Check that the sensor ordered matches the diameter of the tube that it will be used on. Installation is as follows:

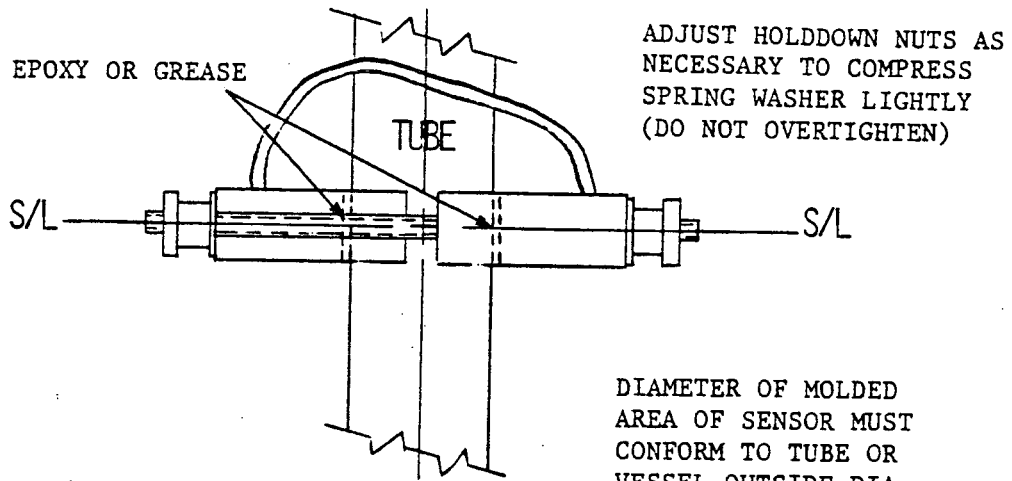
- a. Set both sensor sides face up with nuts and spring washers on screw attachments.
- b. Spread THIN film of grease onto the prepared surfaces of the sensor (circular area).
- c. Attach sensor onto tube or vessel being sure to align top edge of sensor with dimension "B", screw down nuts to lightly compress the spring washers under the nuts to squeeze out excess grease (do not over tighten). When the sensor is properly attached, both sides of the sensor should have equal gaps as shown in the diagram. (For clamp-on type sensors, the number of spaces in clamp should be equal on both sides.)



TRANSDUCERS MUST BE  
CENTERED AND ALIGNED  
AS SHOWN



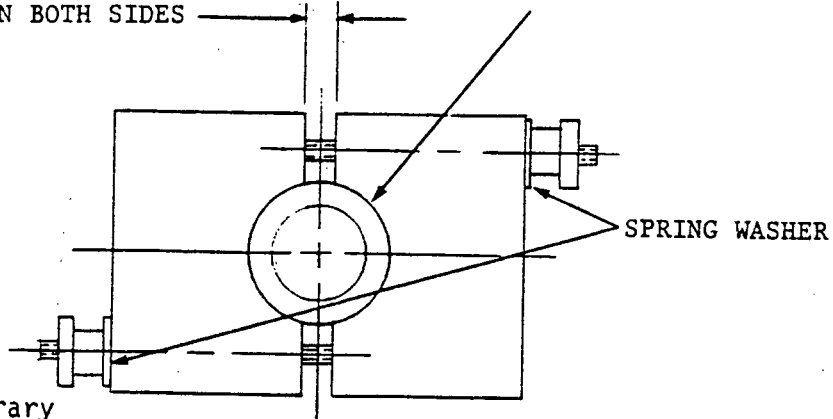
Model 601S  
Permanent Or Temporary  
Installation Diagram



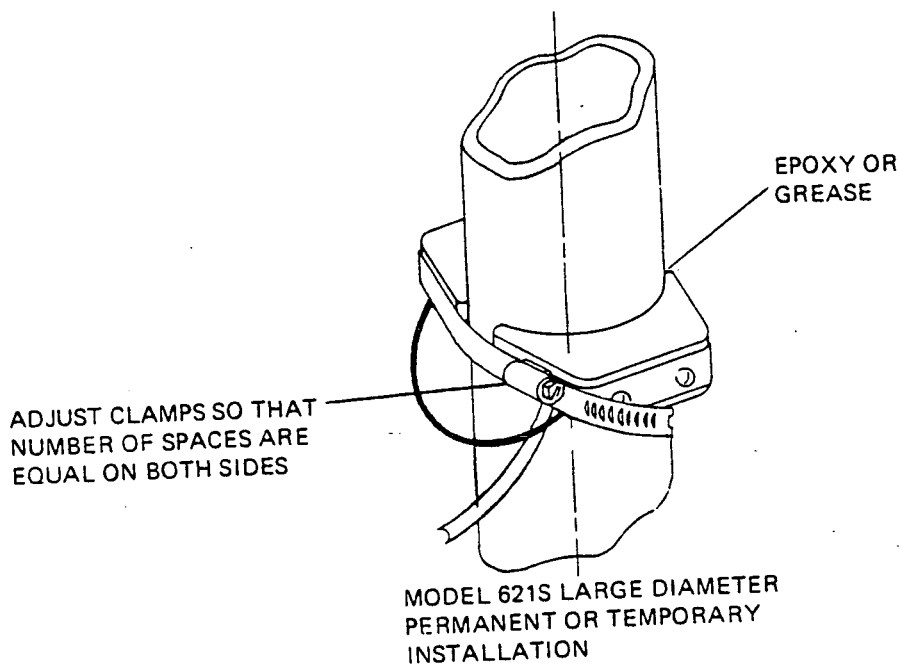
ADJUST HOLDDOWN NUTS AS  
NECESSARY TO COMPRESS  
SPRING WASHER LIGHTLY  
(DO NOT OVERTIGHTEN)

DIAMETER OF MOLDED  
AREA OF SENSOR MUST  
CONFORM TO TUBE OR  
VESSEL OUTSIDE DIA-  
METER

GAP EQUAL SPACING  
ON BOTH SIDES



Model 621S  
Permanent Or Temporary  
Installation Diagram



#### ADJUSTMENT

After the installation is complete the system must be adjusted. This procedure applies to the 601S and the 621S for liquid/gas interface detection (refer to theory and PC Board Diagram).

- a. Allow the liquid to rise above the sensor sensing level (S/L). Find the minimum gain position of the potentiometer that still permits the power relay to be energized. Note position of the shaft.
- b. Lower liquid level below the sensor body. Continue to increase the gain until either the relay energizes or the maximum position of the potentiometer is reached (whichever occurs first). Note position of the shaft.
- c. Turn potentiometer approximately 1/3 the distance toward the potentiometer setting noted in Step (a).
- d. Allow the liquid to rise to the level of the sensor sensing level (S/L). The relay should energize. Lower the liquid level below the S/L. The relay should de-energize. Slight increase or decrease in control unit gain adjustment may be required to energize relay exactly at the S/L.

In the cases where the system can be used for liquid interface detection, follow the above procedure with these exceptions:

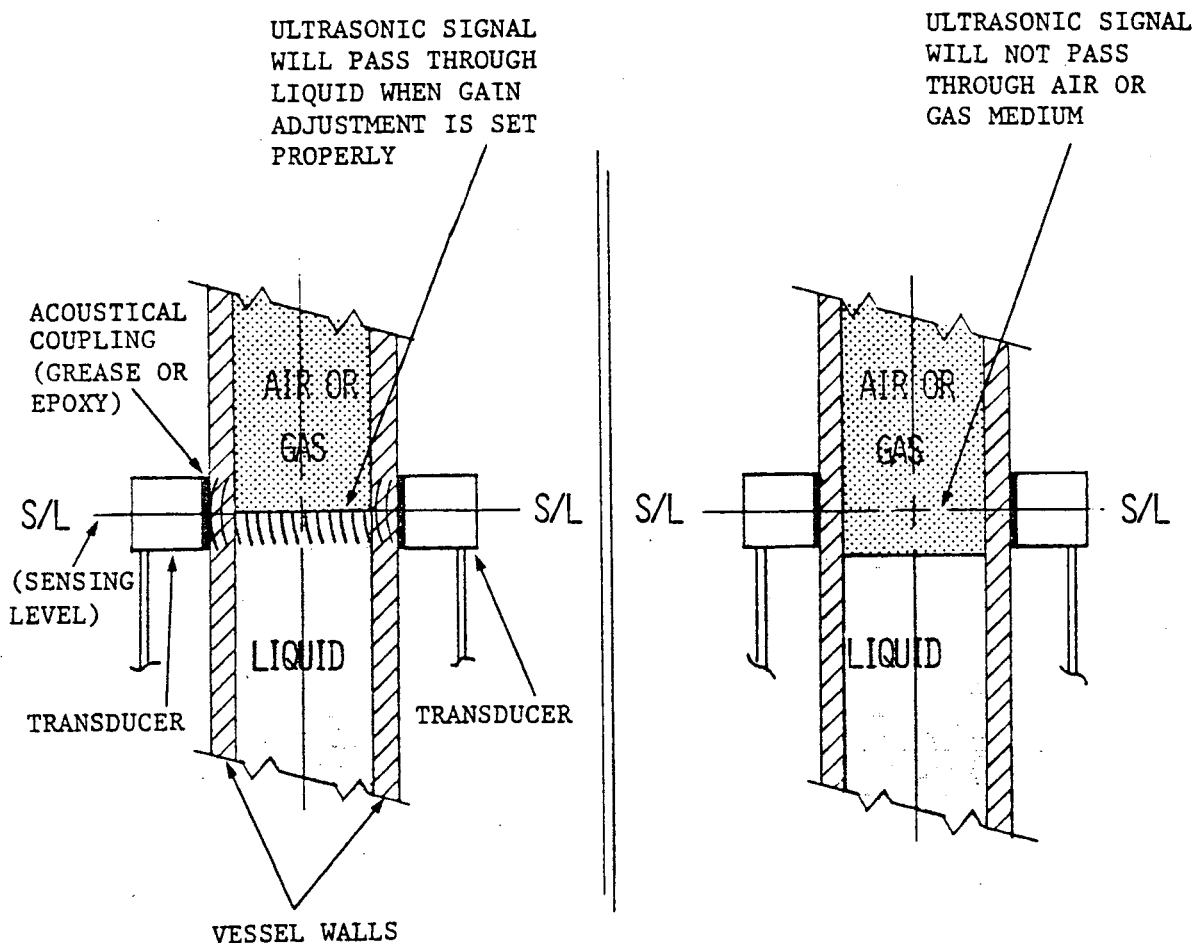
- a. In step a., above, allow the less attenuative liquid to fill the sensor gap.
- b. In step b., above, allow the more attenuative liquid to fill the sensor gap.

## THEORY

In operation, the control unit generates an electrical signal that is converted to an ultrasonic signal at the transmitter transducer. When the gauge or vessel is filled with liquid this signal is transmitted through the front section, through the liquid, through the rear section, to the receiver transducer and reconverted to an electrical signal. The signal is amplified in the control unit and a relay is energized. When liquid falls below the sensor gap level the signal is attenuated (the electrical signal is greatly reduced) and the relay becomes de-energized.

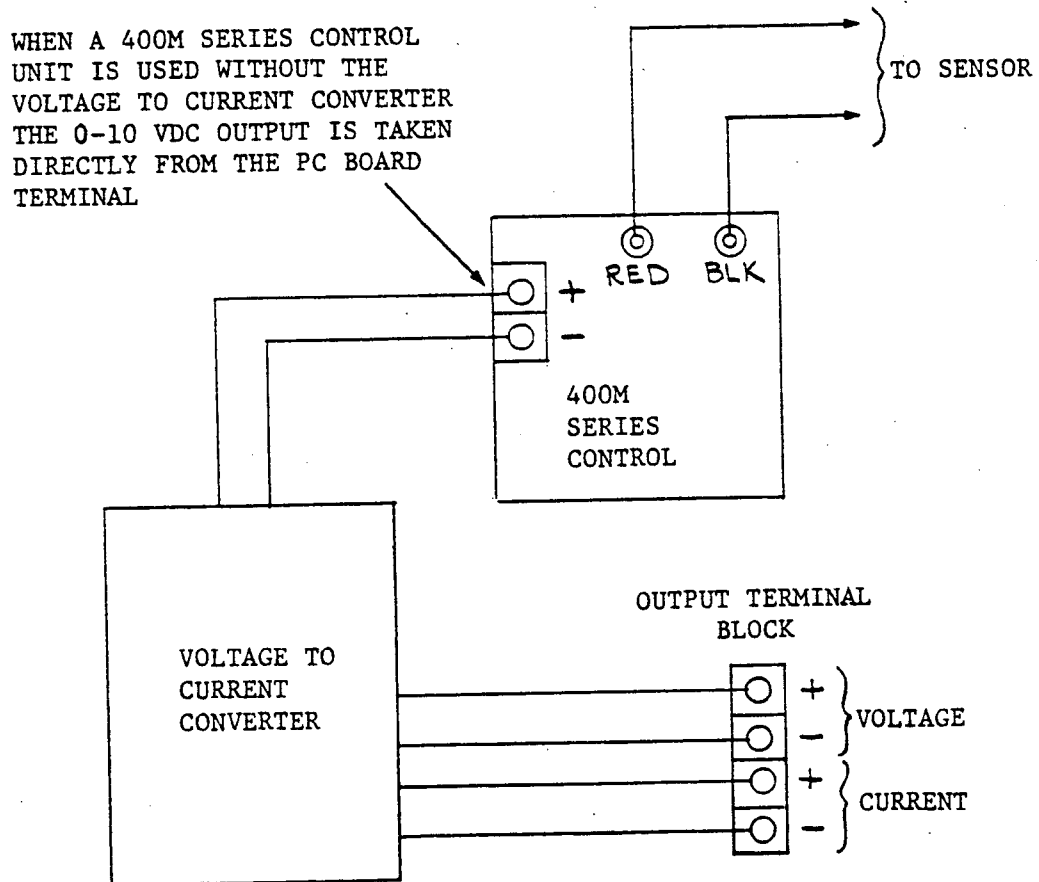
The ultrasonic signal will transmit through the sections of a sight gauge or vessel when filled with liquid. This signal will not pass through when the vessel is filled with a gas.

Different liquids exhibit different acoustical attenuation properties. Detection of a liquid interface of two immiscible liquids is possible if the acoustical attenuation difference is great enough. Differences increase with gap spacing, so that better interface detection can generally be achieved when the vessel is at least several inches across.



## SPECIAL SYSTEMS

When a proportional output or proportional output with HI-LO trip action is required a Model 400M series control electronics is used. Connections for a proportional voltage output or a proportional current output (in units supplied with a voltage to current converter) are as shown. Connections for relay action (if unit is so equipped) are shown in the Wiring Section.





## MAINTENANCE

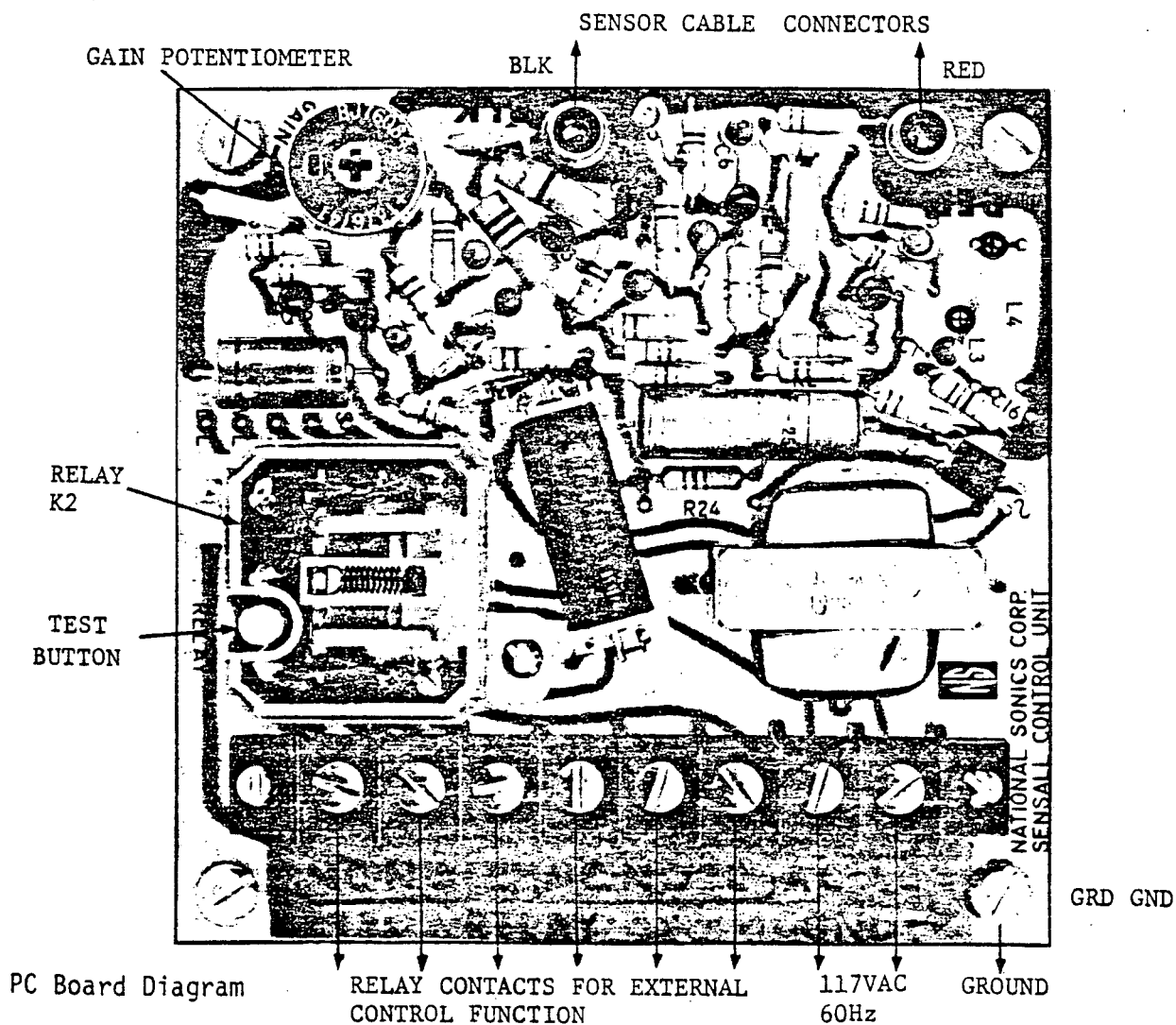
The Sensall System does not require any maintenance. The control unit incorporates rugged solid state electronics for maximum reliability. Periodic inspection of the relay contacts can be made. If the plug-in relay contacts are burned or pitted, replacement is recommended.

The sensor is hermetically sealed, does not contain any moving parts and does not require any maintenance.

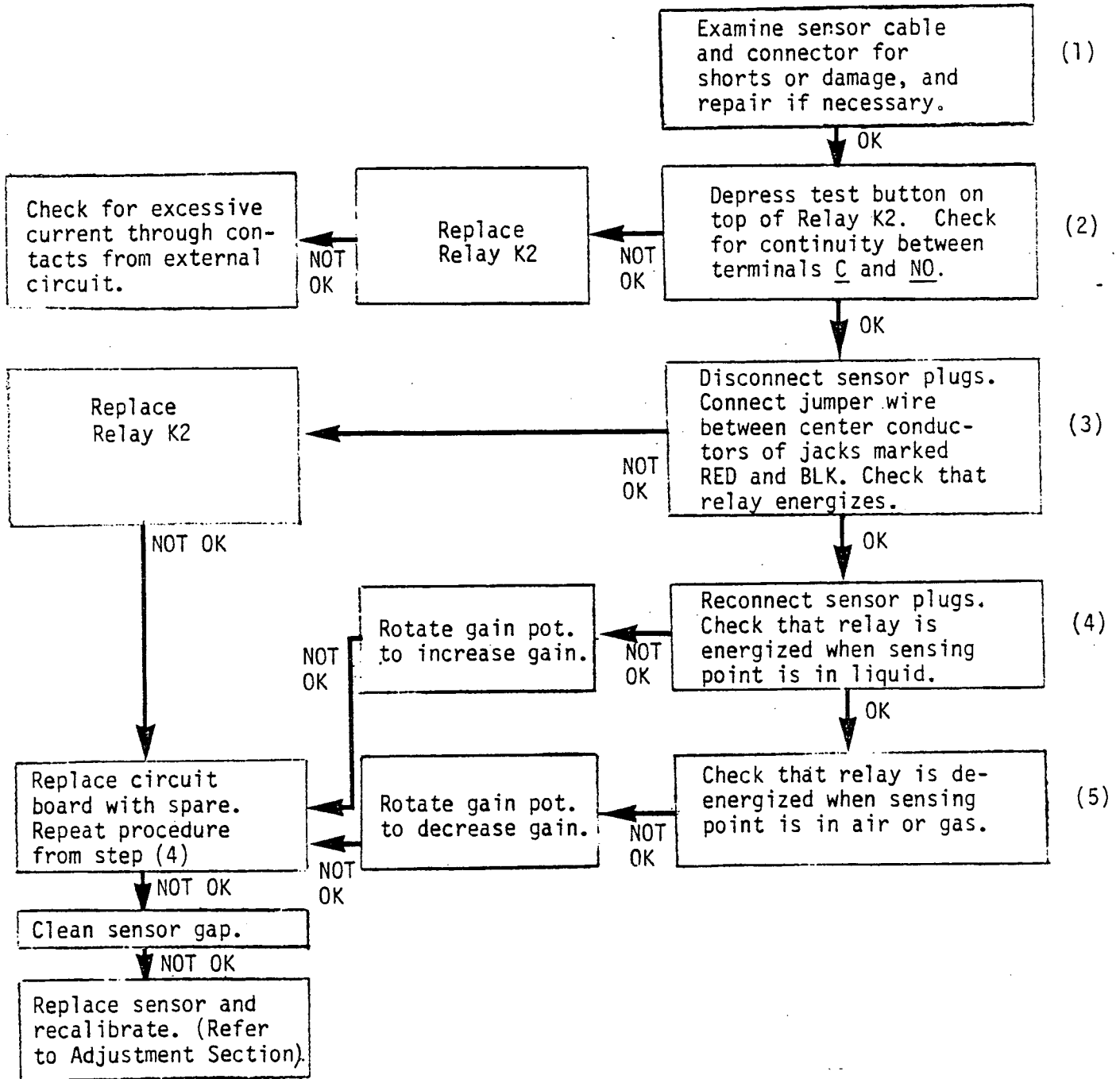
### TROUBLE SHOOTING

In the event that operating problems develop, check for proper installation of the system. Air bubbles in epoxy bond will cause acoustical interference. Check that the system is receiving correct input line power. If problem is not located within these areas, follow the trouble shooting procedure outlined in the diagram. Refer to the PC Board Diagram for potentiometer and connector location information. Proceed with step 1 and continue with each step in sequence until the problem is found and corrected.

If the sensor or circuit board is defective, return to National Sonics for repair or replacement.



MAINTENANCE



Trouble Shooting Diagram

## WIRING

### GENERAL

The electrical connections necessary to put a Sensall System into operation are power (usually 117 VAC, 50/60 Hz, special applications can have AC at various frequencies and voltage potentials or DC), sensor crystal leads (black lead and red lead) relay connections and in special applications the recorder connections. Typical wiring diagrams are shown for different modes of operation. Wire the unit to match the selected wiring configuration.

### ELECTRICAL CONNECTIONS

All wiring shown within the control unit is factory supplied. The actual layout for the terminal strips may vary, use terminal markings as shown in figures to make the proper connections. All other wiring shown including connections made to the terminal strip is made at installation site.

Wiring diagrams are shown with 3 wire 3 phase motor controllers. Other power distribution systems can be substituted for the one shown. Consult wiring diagrams supplied with (respective) motor controller.

The contact positions shown inside the control unit for the various applications correspond to the tank liquid level condition shown in each case.

Model 300/400C Control Unit - For liquid level sensing - normally supplied with an DPDT - 10 amp, NI relay.

Model 300/400D Control Unit - Two control units, each with an DPDT-10 amp, NI relay, for independent sensor operation.

Model 300/400E Control Unit - Two control units, with one DPDT-10 amp, NI relay wired for automatic discharge operation. (DPDT contacts available for control function.)

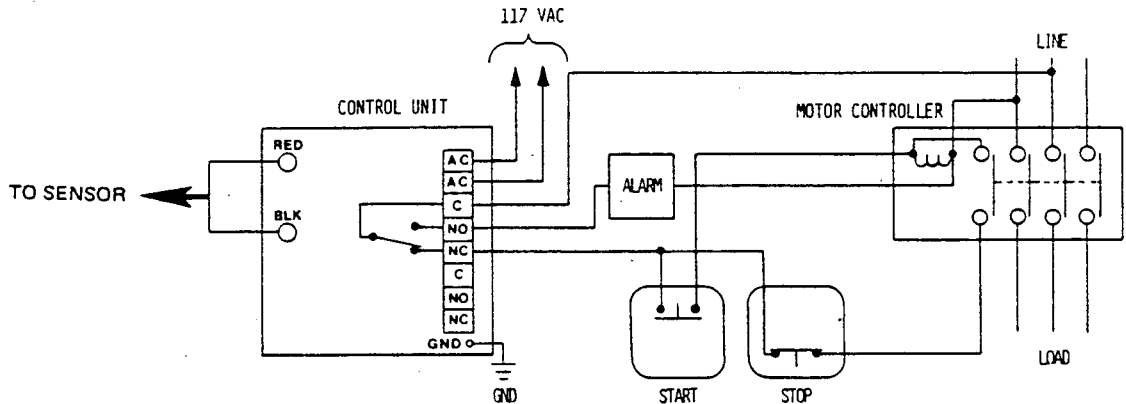
Model 300/400F Control Unit - Two controls units with one DPDT-10 amp, NI relay wired for automatic filling operation. (DPDT contacts available for control function.)

Model 300/400CU Control Unit - UL approved control unit supplied with a DPDT relay.

## WIRING

### AUTOMATIC HIGH LEVEL ALARM AND SHUT-OFF

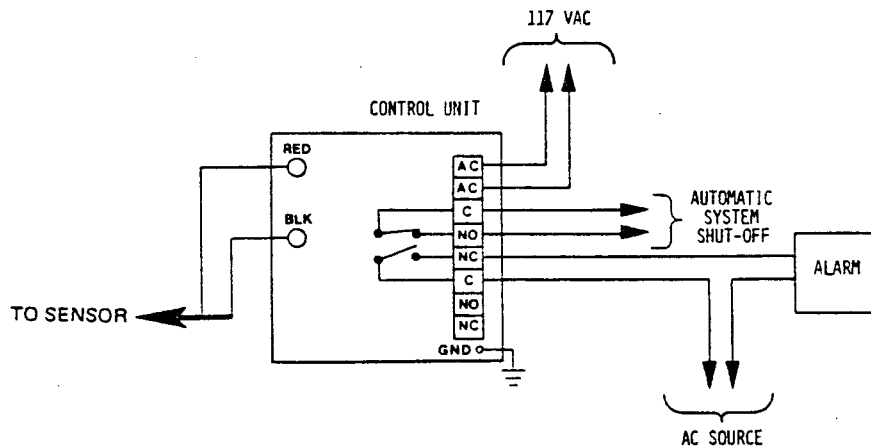
The push button starts the pump. When the liquid level reaches the sensor the alarm is turned on and the pump is shut-off. If power to control unit fails, the alarm goes on and pump operation is disabled.



Automatic High Level Alarm & Shut-Off

### AUTOMATIC LOW LEVEL ALARM AND SHUT-OFF

When the level falls to the sensor, the alarm goes on and the circuit breaker shuts off the remainder of the system. If power to control unit fails, the alarm goes on and pump operation is disabled.

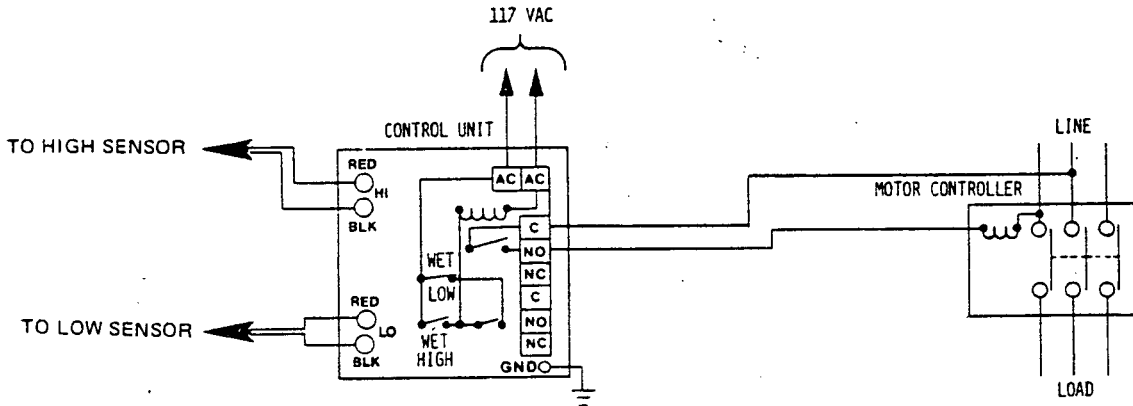


Automatic Low Level Alarm and Shut-Off

## WIRING

### AUTOMATIC TANK DISCHARGE (WITH MODEL 300/400E CONTROL UNIT)

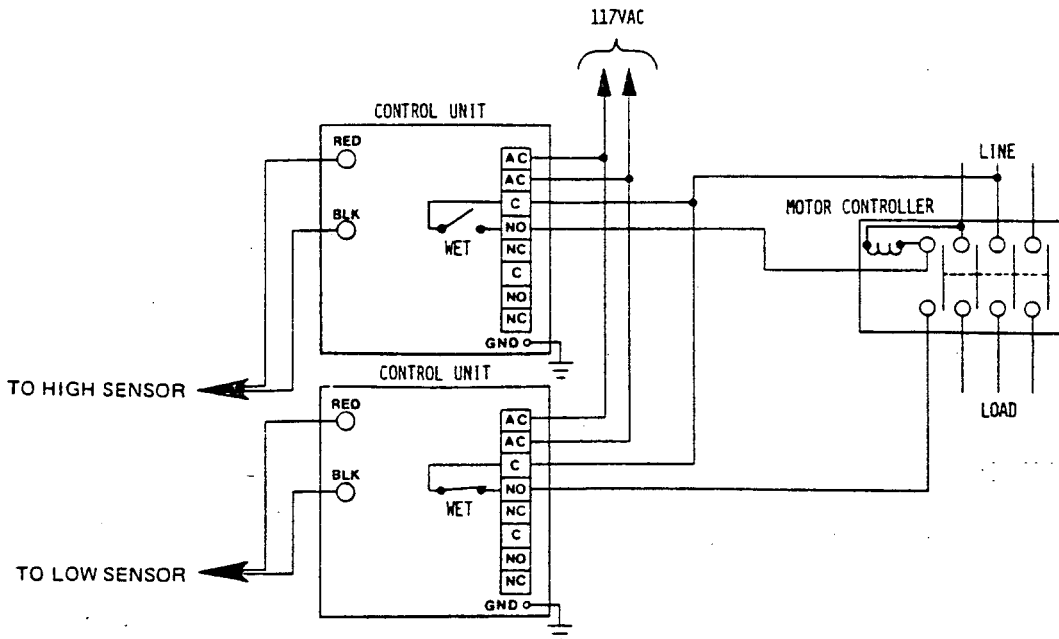
When the level rises to the high sensor, the pump (or valve) discharges the liquid until the level falls to the low sensor and the pump is shut-off. The cycle is repeated again when the level rises to the high sensor. If power to the control unit fails, pump operation is disabled.



Automatic Tank Discharge

### AUTOMATIC TANK DISCHARGE (WITH TWO MODEL 300/400C CONTROL UNITS)

When the level rises to the high sensor the pump (or valve) discharges the liquid until the level falls to the low sensor and the pump is shut off. The cycle is repeated again when the level rises to the high sensor. If power to control unit fail, pump operation is disabled.

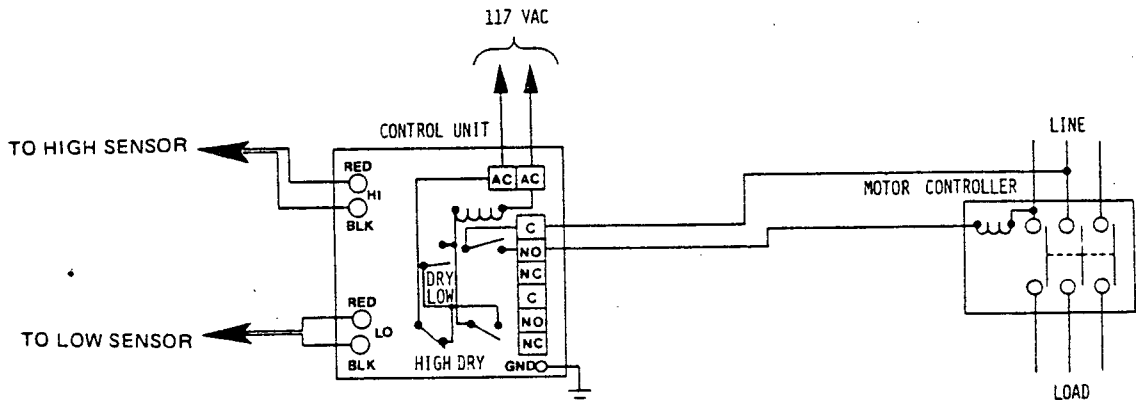


Automatic Tank Discharges (with Two Control Units)

## WIRING

### AUTOMATIC TANK FILLING (WITH MODEL 300/400F CONTROL UNIT)

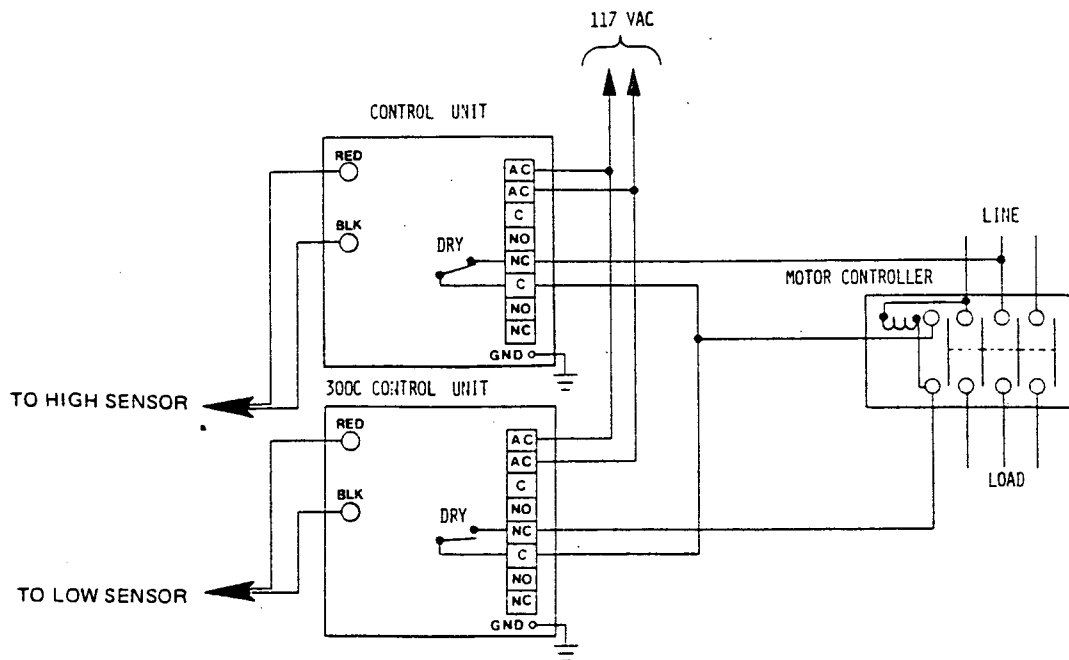
When the level falls to the low sensor, the pump operates until the level rises to the high sensor and the pump is shut-off. The cycle is repeated again when the level falls to the low sensor. If power to control unit fails, pump operation is disabled.



Automatic Tank Filling with Model 300/400F Control Unit

### AUTOMATIC TANK FILLING (WITH TWO MODEL 300/400C CONTROL UNITS)

When the level falls to the low sensor, the pump operates until the level rises to the high sensor and the pump is shut-off. The cycle is repeated again when the level falls to the low sensor. If power to the control unit fails, pump operation is disabled.



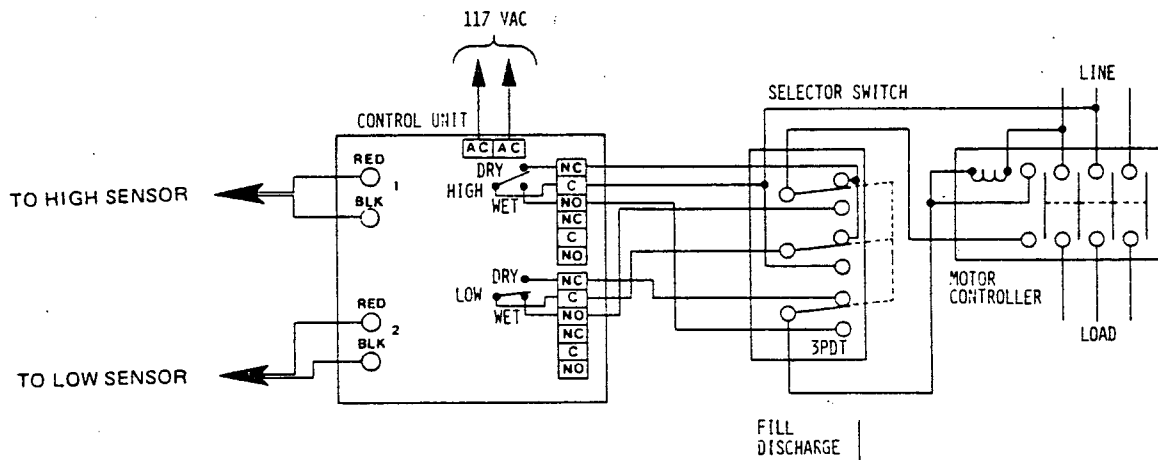
Automatic Tank Filling (with two Control Units)

## WIRING

### COMBINATION AUTOMATIC TANK FILL OR DISCHARGE (WITH MODEL 300/400D CONTROL UNIT)

When the manual switch is set for automatic filling, and the level falls to the low sensor, the pump operates until the level rises to the high sensor and pump operation is disabled.

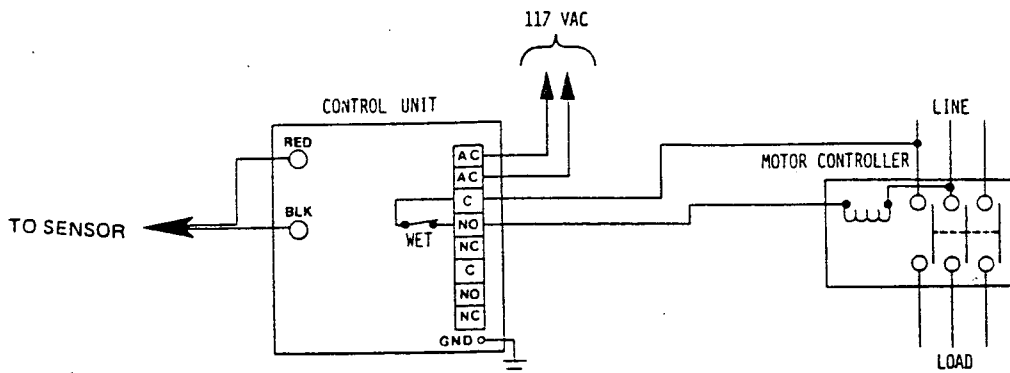
When the manual switch is set for automatic discharge and the level in the tank rises to the high sensor, the pump (or valve) discharges the liquid from the tank until the level falls to the low sensor and the pump is shut-off. If the power to control unit fails, pump operation is disabled.



Combination Automatic Tank Fill or Discharge

### SINGLE SENSOR AUTOMATIC LEVEL CONTROL

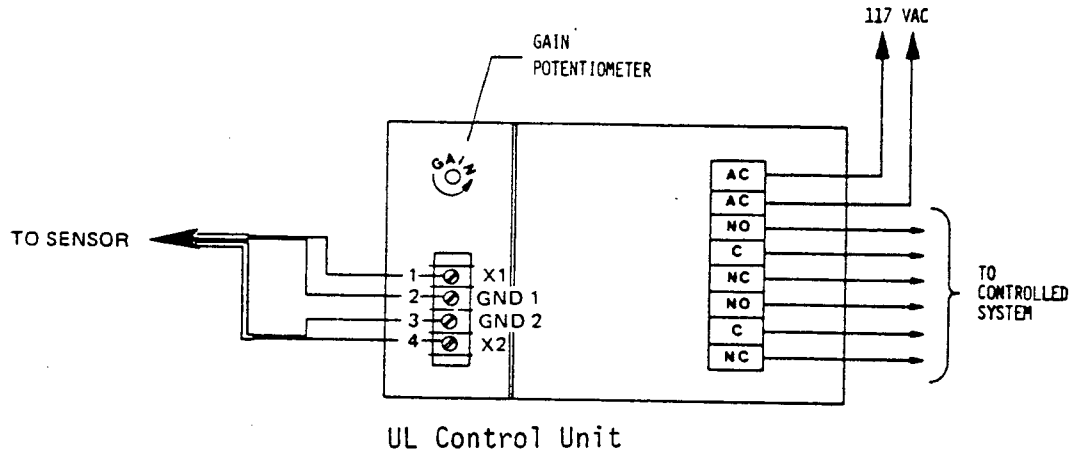
This arrangement is only recommended for small tanks. For most applications it is more desirable to use a two sensor arrangement. When the level falls below the sensor, the pump operates until the level rises above the sensor and the pump is shut-off. This arrangement is suitable when the control unit contains a built in delay to increase the recycle period. When power to control unit fails, pump operation is disabled.



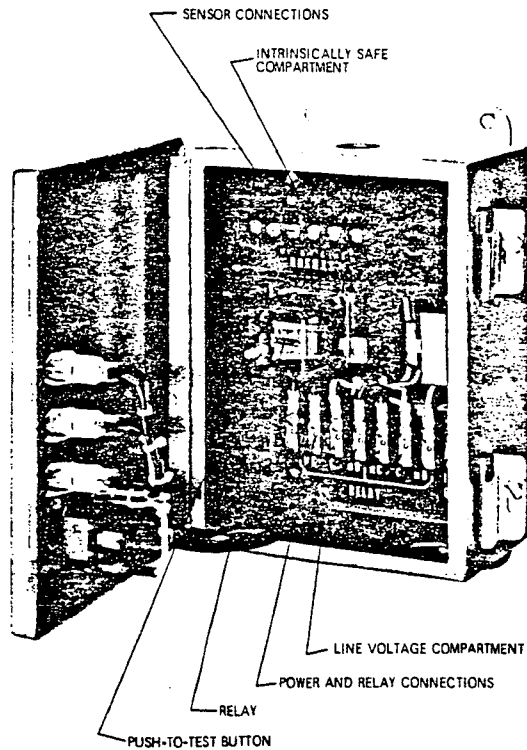
Single Sensor Automatic Level Control

UL CONTROL UNIT

Wiring of the system is the same for the Sensall UL Control Unit as with a standard Sensall control unit (refer to previous wiring diagrams). The sensor is connected to the control unit at the sensor terminal block by using the 4 spade lugs. Check that the proper lugs are going to the grounding terminals. Refer to Figure 17 for UL control unit layout.



UL Control Unit



Control Unit Layout



REPLACEABLE PARTS LIST

DESCRIPTION	*MANUFACTURER	PART NUMBER
PC Board Model 300C-1	National Sonics	B-1174 (300C)
PC Board Model 400C-1	National Sonics	B-1174 (400C)
Relay, 3PDT, 120V, 10A	Potter & Brumfield	KUP14A25-120V
Phono Jack	National Teltronics	340
Sensor Model 601S	National Sonics	B-2398
Sensor Model 621S	National Sonics	C-2478
Epoxy	National Sonics	A-2492
Silicon Grease	Halo Carbon Products 82 Burlews Court Hankensack, NJ 07601	25-5S

\*Or equivalent

For reordering of system or for replacement of parts refer to the control unit model number and serial number and the sensor model number and serial number or refer to the original purchase order number for this equipment.

ENVIROTECH



NATIONAL SONICS

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Hauppauge, N.Y. 11787  
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Telex: 14-4545

- NATIONAL SONICS PRODUCTS
- DELTA SCIENTIFIC PRODUCTS

## WARRANTY

For the benefit of the original Purchaser, National Sonics warrants all products of its manufacture to be free from defects in material and workmanship when installed, serviced and operated according to National Sonics instructions. National Sonics will repair or replace, F. O. B. its plant or other location designated by it, any part(s) which examination shall show to be defective under normal use within one year from date of installation or eighteen months from date of shipment to the original Purchaser, whichever comes first. For component equipment not of National Sonics manufacture, National Sonics assumes no obligation for design or construction, but shall, upon notification by Purchaser either arrange for on-site repair by the manufacturer's authorized service facility or return to our plant for repair or replacement as required. National Sonics obligation under this Warranty is based upon its receiving prompt notice of claimed defects which shall in no event be later than 30 days after the end of the warranty period.

Any special test or requirement placed upon National Sonics products must be mutually agreed upon in writing between National Sonics and the Purchaser at the time of contract acceptance. If National Sonics sells any equipment not of its manufacture but as part of a system sale and necessary for the operation of the system, National Sonics warrants such equipment to be free from defects in material and workmanship for 90 days from date of installation at original Purchaser's site.

This Warranty shall not apply to products or parts which have been altered or repaired outside National Sonics plant or with other than National Sonics replacement parts, without its prior written consent, or damaged by improper installation, application, erosion or corrosion, or subject to misuse, abuse, neglect or accident. Any labor or material backcharges or product returned for refund must receive National Sonics prior written authorization.

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