INSTRUCTION MANUAL

Level Tek
Model 318A

Robertshaw
Industrial Products

Robertshaw Industrial Products Division
1602 Mustang Drive
Maryville, TN 37801
Telephone: (865) 981-3100 Fax: (865) 981-3168

NUMBER

909GF252F

P-2389

SECTION I - DESCRIPTION

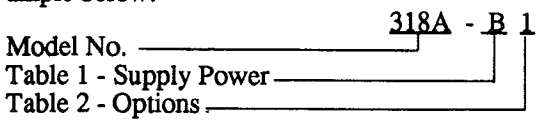
1.1.GENERAL

The Model 318A Level Tek is an all electronic, capacitance-actuated, On-Off control instrument for detecting predetermined product level changes in tanks, sumps, silos, and other vessels or containers. It is capable of detecting a variety of products such as liquids, powders and granular, lump, or flake materials. The product can be conductive or non-conductive.

The Model 318A is self contained and uses integrated circuits to ensure long term stability, reliability and reduced maintenance. Control signals are provided through the contacts of a DPDT relay. The instrument features adjustable time-delay which is selective for time-delay on the relay "energizing," "de-energizing," or both.

1.2 MODEL IDENTIFICATION

Identify instrument models in accordance with the description and variations listed in each table. Dashes are used in the model number only in those spaces as indicated in the example below.



Key Model No.

Model No.	Description
318A	On-Off control unit mounted in a combination explosion-proof/weathertight enclosure. Unit includes a single DPDT control relay, fixed differential (deadband) and adjustable time delay. CSA approved for non-shortstop version.

Table 1 - Supply Power

Desig.	Description
A	18 to 30 VDC
B	120 VAC, ±10%
C	240 VAC, ±10%

Table 2 - Options

Desig.	Description
1	None
2*	Short-Stop

* Requires shortstop probe.

SECTION II - SPECIFICATIONS

2.1 ENVIRONMENTAL

Operating Temperature Range .....-40 to +140°F
Storage Temperature .....-55 to +180°F.
Operating Humidity Range .....0 to 95% RH (non-condensing)
Vibration Limits .....2 g's to 100 Hz
Weight .....3.5 lbs.

Enclosure: Explosion Proof

Model 318A-B1-CSA certified for Class I, Div. 1, Groups C & D; Class II, Div. 1, Groups E, F, G; and CSA enclosure 5. Also meets NEMA 4, 12. All models have same enclosure.

Intrinsic Safety:

Model 318A-B1-CSA certified intrinsically safe probe input circuit for Class I, Div. 1, Groups C & D; Class II, Div. 1, Groups E, F, G (when used with probes 702A, 728B, 729A, 736A, 738A, 739A, 740A or 741A). No safety barrier required.

2.2 ELECTRICAL

Supply Voltages. ..... 18 to 30 VDC, ± 10%
120 VAC, 50/60 Hz, ± 10%
240 VAC, 50/60 Hz, ± 10%
Supply Power ..... 8 Watts, 8 VA Maximum

2.3 PERFORMANCE

Control Range (zero adjustment) ..... 260 pF Maximum
Sensitivity (deadband)
Fixed differential ..... 0.2 pF
Time Delay
Adjustible..... 0.5 to 30 seconds
Temperature Coefficient ..... Control Point 0.01 pF/Deg. C
Control Relay
Form..... DPDT
Contact Rating DPDT..... 5A @ 28 VDC
120/240 VAC
Non-inductive

SECTION III - INSTALLATION

3.1 GENERAL

Examine the instrument for possible shipping damages. **IMPORTANT:** If for any reason it is determined that parts should be returned to the factory, please notify the nearest Robertshaw Controls Company sales representative prior to shipment. Each unit must be properly packaged to prevent damage. Robertshaw assumes no responsibility for equipment damaged in shipment due to improper packaging.

Choose the location in accordance with good instrument practice, avoiding extremes of temperature, humidity and vibration. (See "Specifications," Section II.)

3.2 PROBE MOUNTING

Robertshaw probes are purchased separately from the instruments and are available in a variety of sizes and types with numerous options for the materials of construction. Each probe should be selected for the specific application in order to ensure the best and most reliable operation of the system.

Probes are available with or without insulation. Insulated probes may be used for liquid, solid or interface detection and can also be used on conductive materials. Bare probes are normally used on non-conductive materials only.

Standard type probes are installed so that the face of the packing gland is flush (or nearly so) with the vessel wall. When installing the probe in a nozzle, recess or open end well, a sheathed probe should be used, with the sheath length equal to the nozzle, recess, or well length. This ensures that the "active" portion of the probe is extended into the process area and eliminates potential problems due to build-up in the nozzle, recess or well.

The Short-Stop option and probe should be used when detecting levels of viscous, sticky materials that tend to cling and build-up on sensing probe. By addition of the Short-Stop circuitry and probe, the effects of this type build-up can be

eliminated and reliable, accurate level detection will occur.

When installing the Short-Stop probe, the Short-Stop element of the probe must extend at least four (4) inches into the process. Therefore, if the probe is installed in a nozzle, recess, or well, the probe must be specified with length dimensions that will ensure that this condition is met.

CAUTION

When installing an insulated probe, care should be taken to prevent accidental puncture of the probe insulation.

3.2.1 Horizontal Mounting

Horizontally mounted rod-type probes must be installed in the vessel at the desired point of level detection. Horizontally mounted probes provide the closest control (smallest deadband) in that a small level change at or near the probe will produce a large capacitance change.

On applications involving viscous liquids or materials that have a tendency to "cling" or "build-up," it is recommended that the probe be mounted on slight downward angle to permit draining of the material from the probe.

3.2.2 VERTICAL MOUNTING

Vertically mounted rod-type probes should be installed in either the top or bottom of the vessel with the midpoint on the probe corresponding to approximately the desired level detection point. Vertically installed probes allow a variation in the level detection point up and down the length of the probe by means of the instrument zero adjustment.

3.3 INSTRUMENT MOUNTING

The Model 318A Level-Tek is designed for mounting directly on the installed probe assembly as shown in Figure 3-1 and may be mounted or oriented in any position.

Prior to installing the instrument onto the probe, the probe electrical connections pin (included with the instrument) must be installed in the end of the probe as shown in Figure 3-2 to provide the electrical connection between the probe and the instrument. Do not overtighten the pin. On Short-Stop probe installations, remove the printed circuit assembly (PCA) from the instrument condulet prior to installing the condulet onto the probe. Re-install the PCA after the condulet has been handtightened onto the installed probe.

THREAD SIZE (PROBE ENTRANCE)	MODEL NO.
½ NPT	318-( )1
¾ NPT	318-( )2

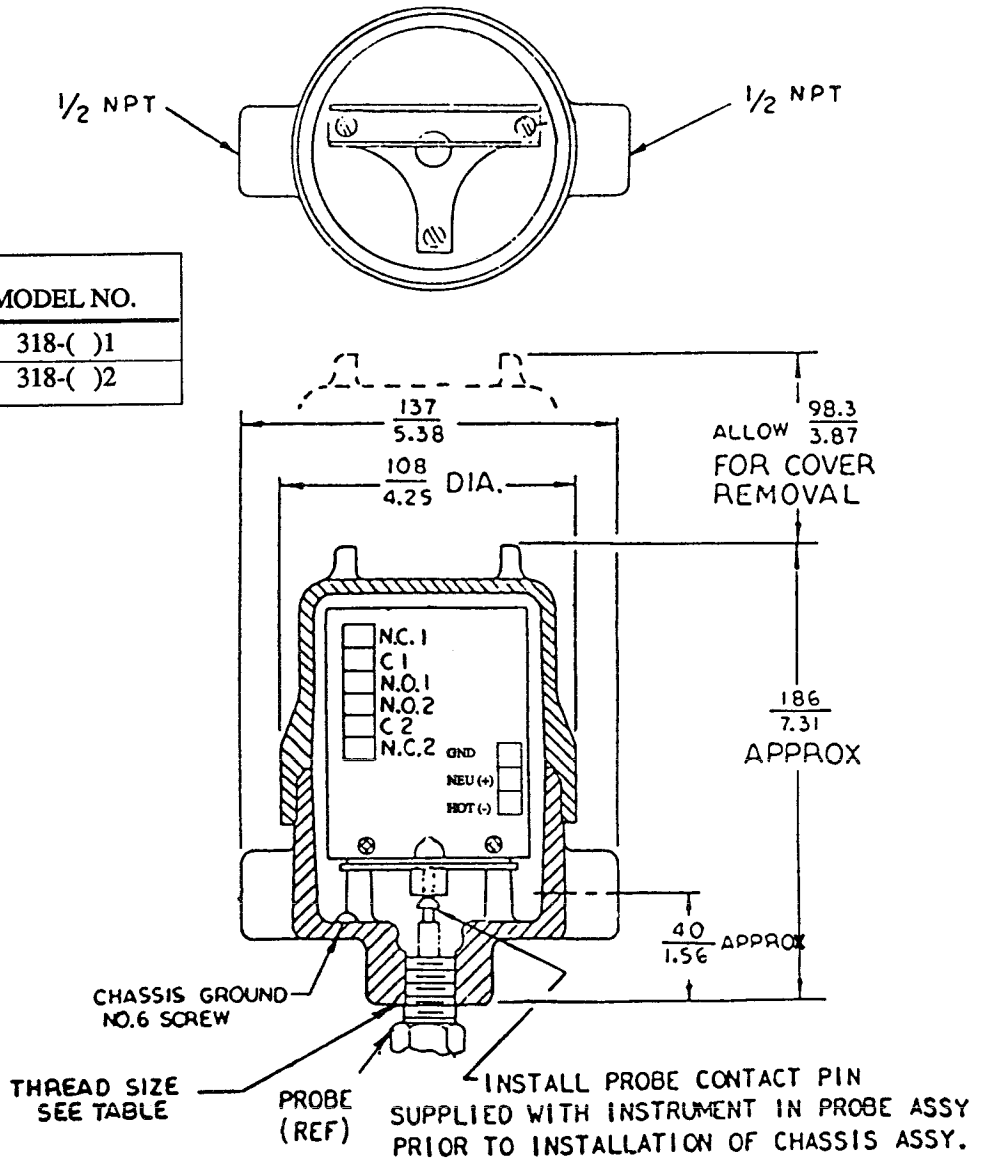


Figure 3-1. Mounting Dimensions for Model 318.

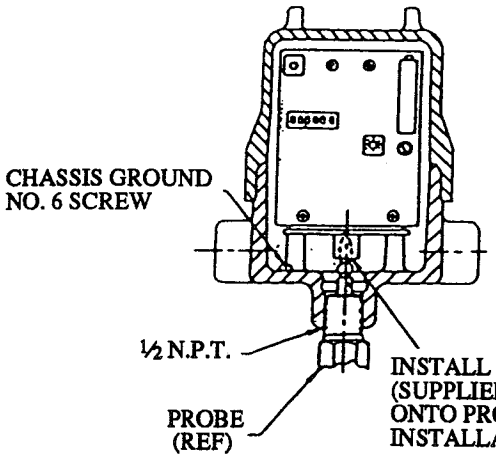
3.4 ELECTRICAL CONNECTIONS

The instrument chassis assembly may be removed from the housing for wiring installation by loosening the three captive chassis mounting screws and withdrawing the chassis straight out. In re-installing the chassis assembly, make certain that the probe connection pin is engaged in the chassis receptacle.

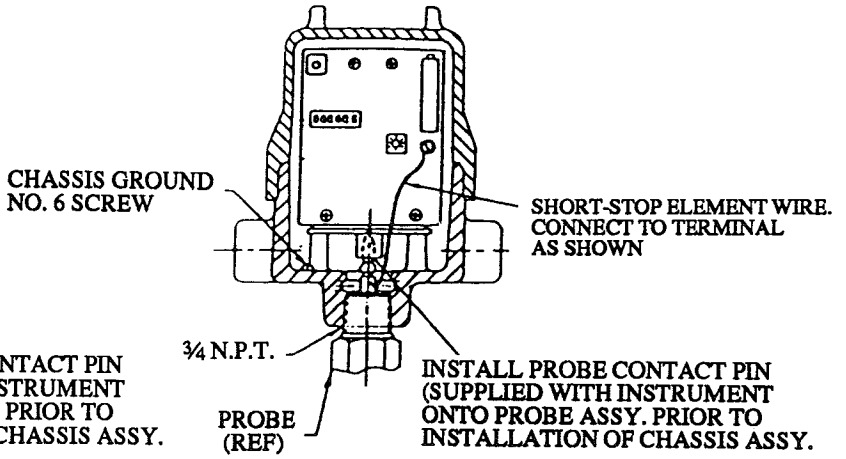
All electrical connections should be made in accordance with Figure 3-2. See Specifications (Section II) for control relay contact ratings.

PROBE WIRING

MODEL NO. 318-( )1



MODEL NO. 318-( )2
SHORT-STOP



ELECTRICAL CONNECTIONS

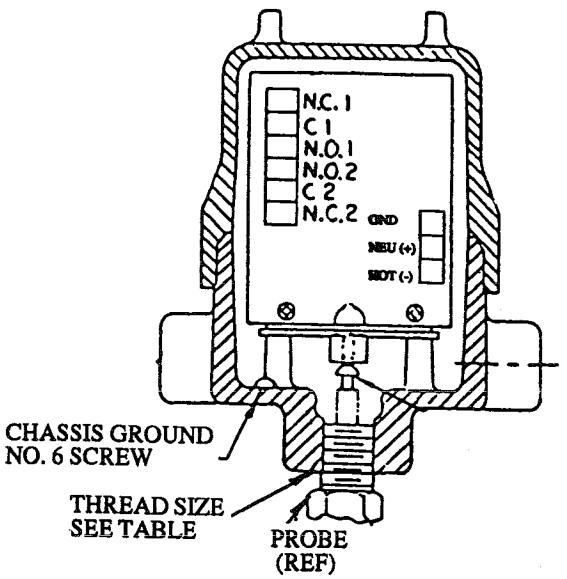
TERMINAL NO.	DESCRIPTION
GND	GROUND
NEU (+)	POWER INPUT
HOT (-)	SEE RATING PLATE

N.C. 1	NORMALLY CLOSED	NO. 1
C 1	COMMON	NO. 1
N.O. 1	NORMALLY OPEN	NO. 1
N.O. 2	NORMALLY OPEN	NO. 2
C 2	COMMON	NO. 2
N.C. 2	NORMALLY CLOSED	NO. 2

[1]

THREAD SIZE (PROBE ENTRANCE)	MODEL NO.
½ NPT	318-(11
¾ NPT	318-(12

PROBE AND RELAY WIRING
(ALL MODELS)



[1] CONTROL RELAY CONTACT DESIGNATIONS ARE SHOWN WITH RELAY IN THE DE-ENERGIZED CONDITION. THE RELAY IS NORMALLY ENERGIZED AND BECOMES DE-ENERGIZED WHEN LEVEL OR PROCESS REACHES THE CONTROL POINT.

Figure 3-2. Electrical Connections for Model 318A.

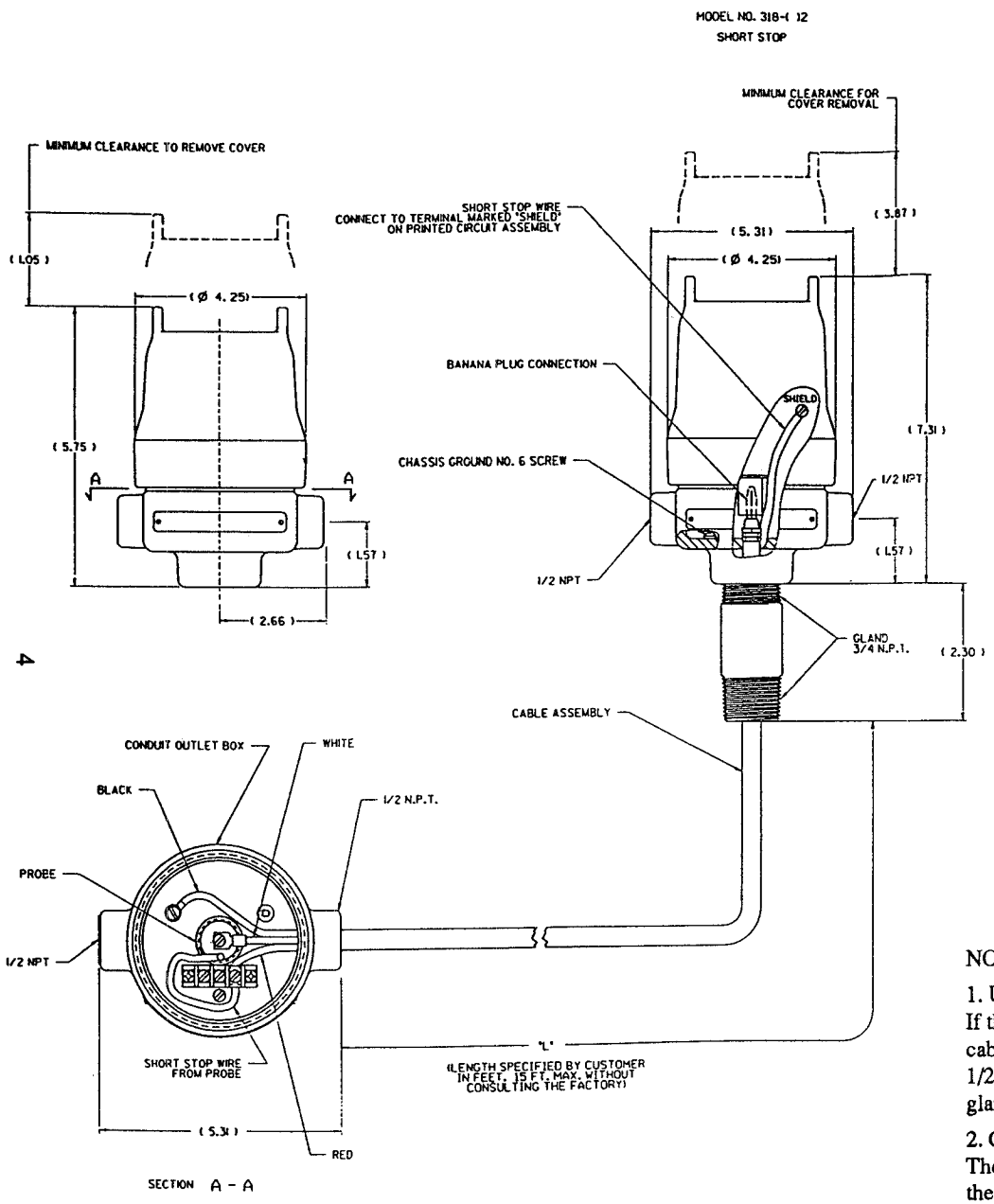


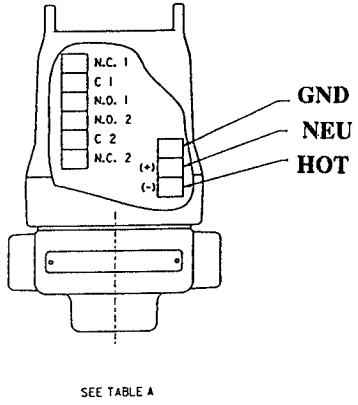
TABLE A ELECTRICAL CONNECTIONS	
TERMINAL NO.	DESCRIPTION
GND	GROUND
NEU (+)	SEE RATING PLATE
HOT (-)	SEE RATING PLATE

NO MANUAL REVISIONS PERMITTED 909SK762

REV.		DESCRIPTION	
A	87015	RELEASED FOR PRODUCTION	
B	87290	ADDED VIEW; TABLE A; & DIMS.	
C	87585	REV. TABLE A. ADD: GRD.NEU & HOT	

N.C.	1	NORMALLY CLOSED	NO. 1
C	1	COMMON	NO. 1
N.O.	1	NORMALLY OPEN	NO. 1
N.O.	2	NORMALLY OPEN	NO. 2
C	2	COMMON	NO. 2
N.C.	2	NORMALLY CLOSED	NO. 2

SEE NOTE 2



SEE TABLE A

909GF252F

NOTES:

1. Use of this cable assembly violates the explosion-proof rating of the instrument housing. If the instrument is to be mounted in a hazardous area, the installer must insure that the cable is contained within an explosion proof conduit from the 3/4 NPT of the gland to the 1/2 NPT of the conduit outlet box. Also, the conduit must be sealed within 18 inches of the gland.

2. Control relay contact designations are shown with relay in the de-energized condition. The relay is normally energized and becomes de-energized when level or process reaches the control point.

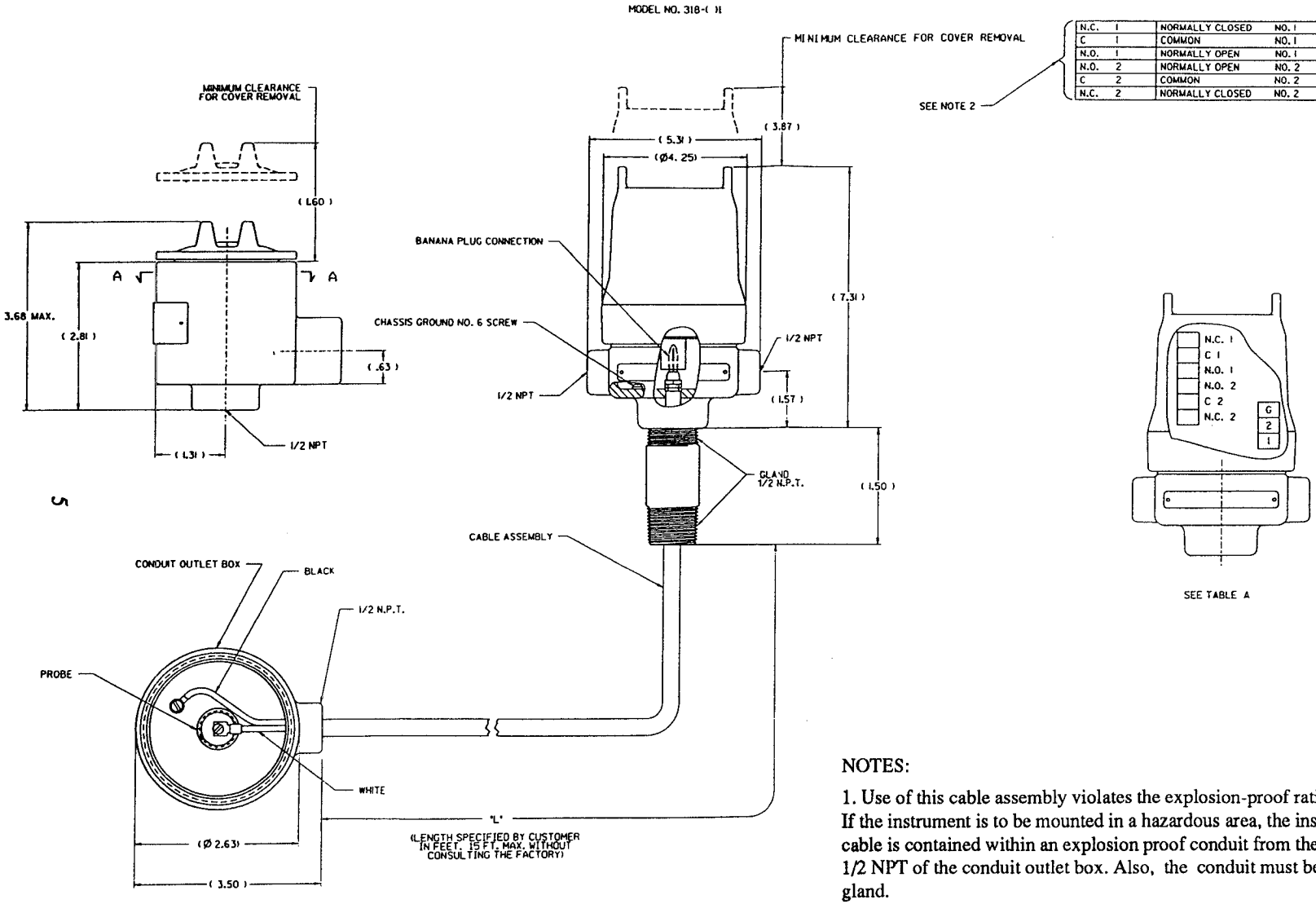
Installation Drawing of Remote Mounted 318A Short Stop

TABLE A	
ELECTRICAL CONNECTIONS	
TERMINAL NO.	DESCRIPTION
1 (H) -	SEE RATING PLATE
2 (H) +	SEE RATING PLATE
G	GROUND

NO MANUAL REVISIONS PERMITTED

909SK763

REV.	CHANGE NO.	DESCRIPTION	REVISED DATE	BY
A	87015	RELEASED FOR PRODUCTION	8-27-96	BH
B	87298	ADDED VIEW; TABLE; & DIMS.	1-14-97	BH



NOTES:

1. Use of this cable assembly violates the explosion-proof rating of the instrument housing. If the instrument is to be mounted in a hazardous area, the installer must insure that the cable is contained within an explosion proof conduit from the 1/2 NPT of the gland to the 1/2 NPT of the conduit outlet box. Also, the conduit must be sealed within 18 inches of the gland.

2. Control relay contact designations are shown with relay in the de-energized condition. The relay is normally energized and becomes de-energized when level or process reaches the control point.

909GF252F

Installation Drawing of Remote Mounted Standard 318A

SECTION IV - OPERATION

4.1 SELECTING THE OPERATIONAL MODE

The Model 318A Level-Tek is provided with a field-changeable operation mode switch (see Figure 4-1) to allow for fail-safe operation of the control relay contacts upon loss of electrical power.

Applications for HIGH LEVEL detection should use the High Level Fail-Safe (HLFS) mode. In this mode, an increasing level (or capacitance) causes the control relay to de-energize when the HIGH LEVEL control point of the instrument is reached. Thus, the loss of electrical power or other system failures would also cause the control relay to de-energize and indicate a HIGH LEVEL or UNSAFE condition. For example, this mode would be used to prevent overfilling a vessel.

Applications for LOW LEVEL detection should use the Low Level Fail-Safe (LLFS) mode. In this mode, a decreasing level (or capacitance) causes the control relay to de-energize when the LOW LEVEL control point of the instrument is reached. Thus, the loss of electrical power or other system failures would also cause the control relay to de-energize and indicate a LOW LEVEL or UNSAFE condition. For example, this mode would be used if emptying the vessel below the control point cannot be tolerated.

4.2 CALIBRATION ADJUSTMENTS

All of the adjustments for calibrating the Model 318A Level-Tek are located on the side of the electronic chassis assembly as shown in Figure 4-1.

NOTE

A solid state light (LED) is included on the Printed Circuit Assembly to make calibration easier. The light is "ON" when the control relay is de-energized.

4.2.1 INITIAL ADJUSTMENTS

Before performing the calibration procedure, place the following adjustments in the positions indicated below:

a. **MODE SWITCH:** Turn all positions "ON".
b. **COARSE ZERO:** Turn to position 0 (zero).
c. **FINE ZERO:** Using a small screwdriver, turn this adjustment to the full counterclockwise position. This is a 30-turn glass trimming capacitor. **It is fragile and will be damaged if forced past the stops.**
d. **TIME DELAY:** Turn to the full counterclockwise position.

4.3 CALIBRATION PROCEDURE

4.3.1 CALIBRATION FOR HIGH LEVEL FAIL-SAFE OPERATION

a. Make the initial adjustments per paragraph 4.2.1.
b. Set the MODE Switch for High Level Fail-Safe operation by moving positions 2 and 4 to "off". At this point, the MODE SWITCH positions should be as follows:

POSITION:	1	2	3	4	5	6
STATE:	ON	OFF	ON	OFF	ON	ON

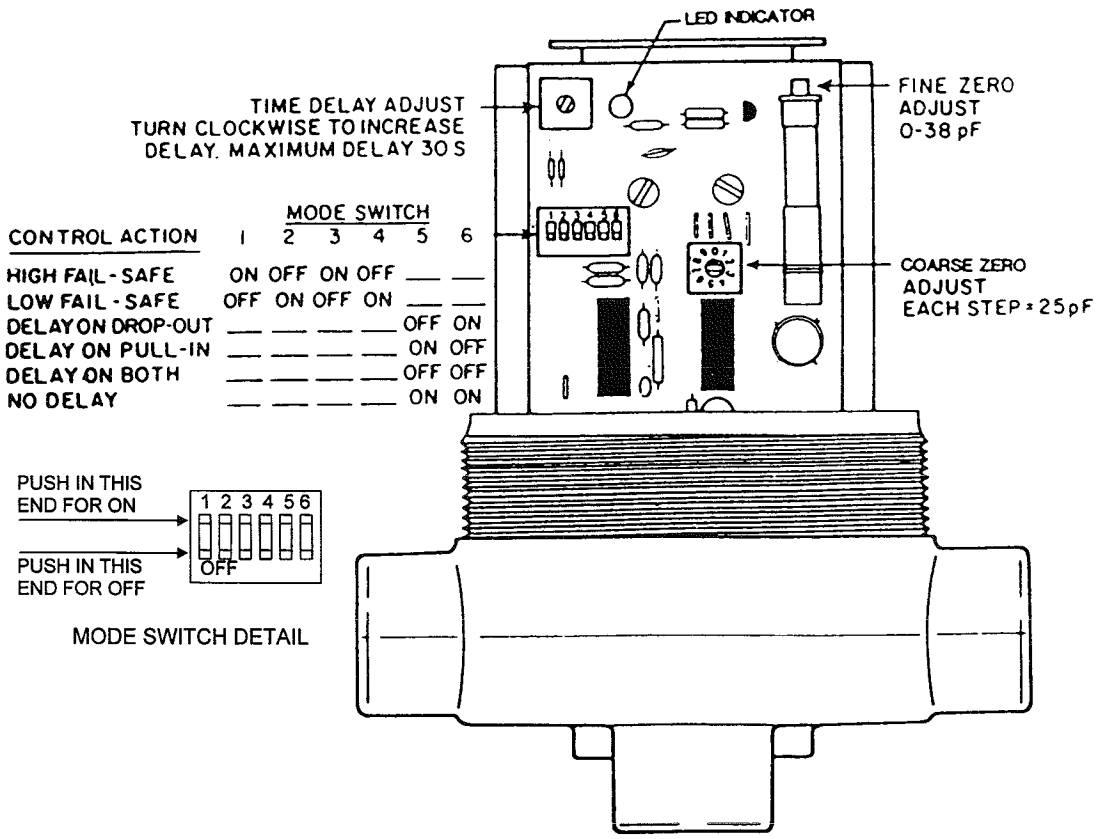


Figure 4-1.
Calibration and Operational Mode Adjustments.

c. Procedure for Vertical Probe with Desired Trip Point Above the Tip of the Probe
   1. Apply power to the unit and allow at least 30 minutes for warm-up.
   2. Bring the product to the desired "trip point" level.
   3. Observe that the LED is "ON". If it is not, conduct checks of all connections, etc.
   4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "OFF". Then, turn the COARSE ZERO adjustment back one step counterclockwise. The LED should come "ON".
   5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "OFF". The calibration adjustment for the proper trip point is now complete.

d. Procedure for Vertical Probe with Desired Trip Point at the Tip of the Probe
   1. Apply power to the unit and allow at least 30 minutes for warm-up.
   2. Ensure that the product level is well below the tip of the probe.
   3. Observe that the LED is "ON". If it is not, conduct checks of all connections, etc.
   4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "OFF". Then turn the COARSE ZERO adjustment back one step counterclockwise. The LED should come "ON".
   5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "OFF".
   6. Turn the FINE ZERO adjustment clockwise one additional turn. The calibration adjustment for the proper trip point is now complete.

e. Procedure for Non-Contacting (Proximity) Probe
   1. Apply power to the unit and allow at least 30 minutes for warm-up.
   2. Bring the product to the desired "trip point" level which is below the probe but close to it.
   3. Observe that the LED is "ON". If it is not, conduct checks of all connections, etc.
   4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "OFF". Then turn the COARSE ZERO adjustment back one step counterclockwise. The LED should come "ON".
   5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "OFF". The calibration adjustment for the proper trip point is now complete.

f. Procedure for Horizontal Probe
   1. Apply power to the unit and allow at least 30 minutes for warm-up.
   2. Ensure that the product level is well below the probe.
   3. Observe that the LED is "ON". If it is not, conduct checks of all connections, etc.
   4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "OFF". Then, turn the COARSE ZERO adjustment back one step counterclockwise. The LED should come "ON".
   5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "OFF".
   6. Turn the FINE ZERO adjustment clockwise one additional turn. The calibration adjustment for the proper trip point is now complete.

g. Procedure for Short-Stop Probe
   1. Apply Power to the unit and allow at least 30 minutes for warm-up.
   2. Ensure that the product level is well below the probe.
   3. Observe that the LED is "ON". If it is not, conduct checks of all connections, etc.
   4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "OFF". Then, turn the COARSE ZERO adjustment back one step counterclockwise. The LED should come "ON".
   5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "OFF".
   6. If the material is conductive, turn the FINE ZERO adjustment five (5) additional turns clockwise.
      If the material is nonconductive, turn the FINE ZERO adjustment two (2) additional turns clockwise.
      The calibration adjustment for the proper trip point is now complete.

4.3.2 Calibration for Low Level Fail-Safe Operation

a. Make the initial adjustments per paragraph 4.2.1.
b. Set the MODE Switch for Low Level Fail-Safe operation by moving positions 1 and 3 to "OFF". At this point, the MODE SWITCH positions should be as follows:

POSITION:	1	2	3	4	5	6
STATE:	OFF	ON	OFF	ON	ON	ON

c. Procedure for Vertical Probe with Desired Trip Point Above the Tip of the Probe
   1. Apply power to the unit and allow at least 30 minutes for warm-up.
   2. Bring the product to the desired "trip point" level.
   3. Observe that the LED is "OFF". If it is not, conduct checks of all connections, etc.
   4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "ON". Then, turn the COARSE ZERO adjustment back one step counterclockwise. The LED should turn "OFF".
   5. Slowly turn the FINE ZERO adjustment clockwise until the LED is "ON". The calibration adjustment for the proper trip point is now complete.

d. Procedure for Vertical Probe with Desired Trip Point at the Tip of the Probe.
   1. Apply power to the unit and allow at least 30 minutes for warm-up.
   2. Ensure that the product level is well below the tip of the probe.
   3. Observe that the LED is "OFF". If it is not, conduct checks of all connections, etc.
   4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "ON". Then turn the COARSE ZERO adjustment back one step counterclockwise. The LED should turn "OFF".
   5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "ON".
   6. Turn the FINE ZERO adjustment clockwise one additional turn. The calibration adjustment for the proper trip point is now complete.

e. Procedure for Non-Contacting (Proximity) Probe
   1. Apply power to the unit and allow at least 30 minutes for warm-up.
   2. Bring the product to the desired "trip point" level which is below the probe but close to it.
   3. Observe that the LED is "OFF". If it is not, conduct checks of all connections, etc.

4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "ON". Then turn the COARSE ZERO adjustment back one step counterclockwise. The LED should turn "OFF".
5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "ON". The calibration adjustment for proper trip point is now complete.

f. Procedure for Horizontal Probe

1. Apply power to the unit and allow at least 30 minutes for warm-up.
2. Ensure that the product level is well below the probe.
3. Observe that the LED is "OFF". If it is not, conduct checks of all connections, etc.
4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "ON". Then, turn the COARSE ZERO adjustment back one step counterclockwise. The LED should turn "OFF".
5. Slowly turn the FINE ZERO adjustment clockwise until the LED just turns "ON".
6. Turn the FINE ZERO adjustment clockwise one additional turn. The calibration adjustment for the proper trip point is now complete.

g. Procedure for Short-Stop Probe

1. Apply power to the unit and allow at least 30 minutes for warm-up.
2. Ensure that the product level is well below the probe.
3. Observe that the LED is "OFF". If it is not, conduct checks of all connections, etc.
4. Turn the COARSE ZERO adjustment clockwise, one step at a time, until the LED turns "ON". Then, turn the COARSE ZERO adjustment back one step counterclockwise. The LED should turn "OFF".
5. Slowly turn the FINE ZERO adjustment clockwise until the LED is "ON".
6. If the material is conductive, turn the FINE ZERO adjustment five (5) additional turns clockwise.
   If the material is nonconductive, turn the FINE ZERO adjustment two (2) additional turns clockwise.
   The calibration adjustment for the proper trip point is now complete.

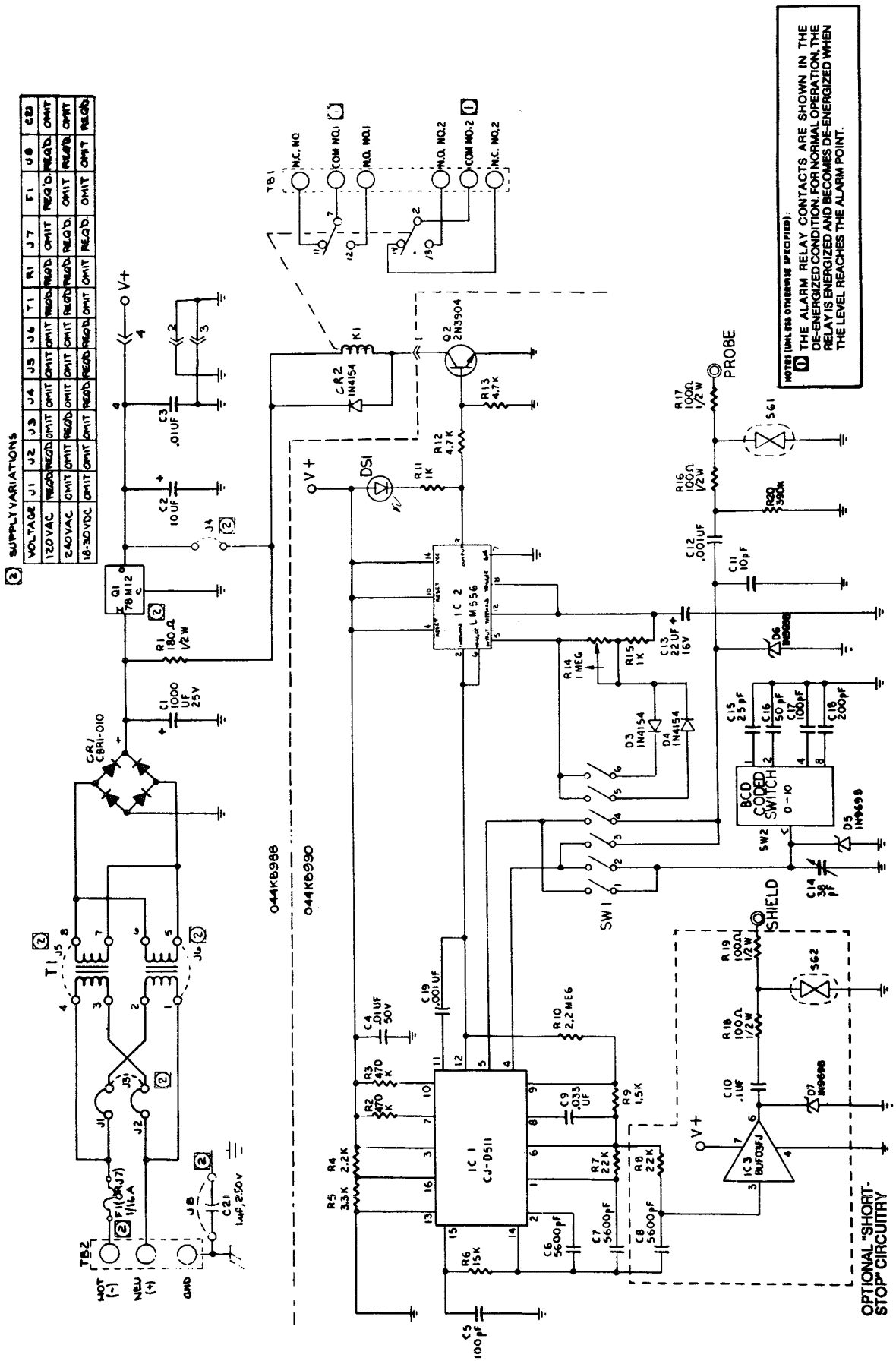
4.3.3 Adjustable Time Delay

Time delay action is used to enable the unit to ignore turbulence or splashing in the vessel. This adjustment can cause a delay of up to thirty seconds and is set for the desired action as follows:

a. Set positions 5 and 6 of the MODE SWITCH as shown below to obtain the desired time delay effect.

TIME DELAY	MODE SWITCH	
	5	6
Relay Energizing	ON	OFF
Relay De-energizing	OFF	ON
Both	OFF	OFF
None	ON	ON

b. To obtain the desired time delay, adjust the TIME DELAY ADJUST clockwise to increase and counterclockwise to decrease. Maximum delay is thirty seconds.


SUPPLY VARIATIONS
VOLTAGE J1 J2 J3 J4 J5 J6 T1 R1 J7 F1 J8 C21
120 VAC READ READ OMIT OMIT OMIT OMIT READ READ READ READ OMIT
240 VAC OMIT OMIT READ OMIT OMIT OMIT READ READ READ OMIT OMIT
18-30 VDC OMIT OMIT OMIT READ READ READ OMIT OMIT OMIT OMIT READ
NOTES (UNLESS OTHERWISE SPECIFIED):
1. THE ALARM RELAY CONTACTS ARE SHOWN IN THE DE-ENERGIZED CONDITION. FOR NORMAL OPERATION, THE RELAY IS ENERGIZED AND BECOMES DE-ENERGIZED WHEN THE LEVEL REACHES THE ALARM POINT.
044K6988
044K6990
OPTIONAL "SHORT-STOP" CIRCUITRY
PROBE
SHIELD
BCD CODED SWITCH 0-10
IC 1 CJ-D511
IC 2 LM556
IC 3 BUF03FJ
Q1 78M12
Q2 2N3904
CR1 CBRI-010
CR2 IN4154
K1
TB1
TB2
T1
SW1
SW2
HOT (+)
NEU (-)
GND
V+
DS1
S61
S62
D3 IN4154
D4 IN4154
D5 IN9698
D6 IN9698
D7 IN9698
C1 1000 UF 25V
C2 10 UF
C3 .01UF
C4 .01 UF 50V
C5 100pF
C6 5600pF
C7 5600pF
C8 5600pF
C9 .033 UF
C10 .1UF
C11 10pF
C12 .001UF
C13 22UF 16V
C14 30 pF
C15 25 pF
C16 50 pF
C17 100pF
C18 200pF
C19 .001UF
C21 1uF, 250V
R1 180Ω 1/2W
R2 470 K
R3 470 K
R4 2.2K
R5 3.3K
R6 15K
R7 22K
R8 22K
R9 1.5K
R10 2.2 MEG
R11 1K
R12 4.7K
R13 4.7K
R14 1 MEG
R15 1K
R16 100Ω 1/2W
R17 100Ω 1/2W
R18 100Ω 1/2W
R19 100Ω 1/2W
R20 390K
F1 (3AG) 1/16A

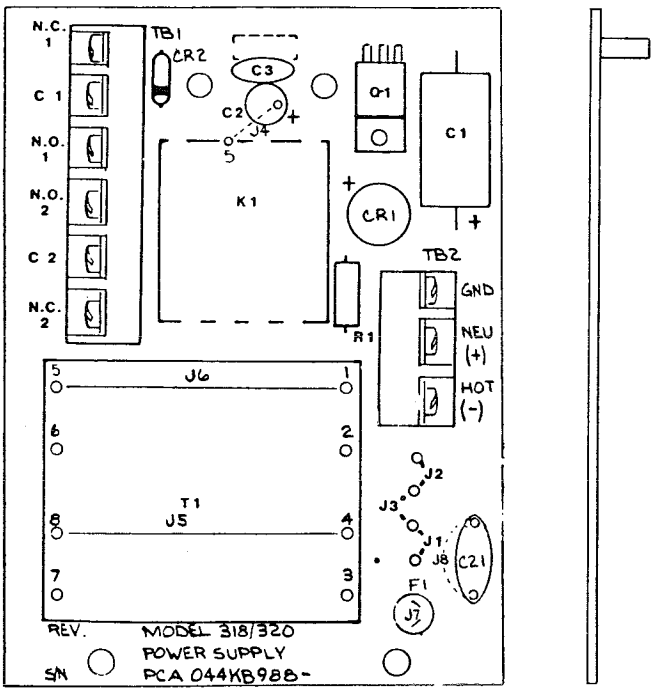
SECTION V - PARTS LIST

PARTS LIST FOR MODEL 318A

Description	Part Number
PCA Assembly 318A-A1	044 KX 001-17
PCA Assembly 318A-B1	044 KX 001-13
PCA Assembly 318A-C1	044 KX 001-15
PCA Assembly 318A-A2	044 KX 001-18
PCA Assembly 318A-B2	044 KX 001-13
PCA Assembly 318A-C2	044 KX 001-16
PCA RF Assembly 318A-( )1	044 KB 990-01
PCA RF Assembly 318A-( )2	044 KB 990-02
PCA Power Supply 318A-A( )	044 KB 988-06
PCA Power Supply 318A-B( )	044 KB 988-04
PCA Power Supply 318A-C( )	044 KB 988-05
PC Board Cover, 318A	018 KB 029
Bracket Assembly, 318A	020 KB 581-03
Relay DPDT, 318A	250 KB 070
Kit, Probe Pin & Adjusting Tool	909 GM 168
Suppression Kit, Inductive Loads	909 GM 170
Condulet, Lower, 318A-( )2	040 KB 229-01
Condulet, Lower, 318A-( )1	040 KB 229
Condulet, Upper, 318A	040 KB 387
O-Ring, 318A	560 GD 238

PARTS LIST for Power Supply Assembly 044 KB 988

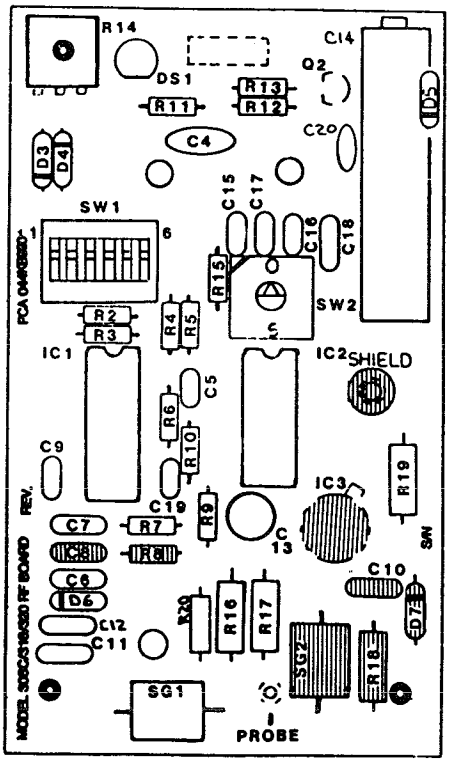
Item	Description	Part Number
T1	Transformer	904 GC 339-01
TB1	Terminal Strip, 6 Contact	325 KB 157-06
TB2	Terminal Strip, 3 Contact	325 KB 157-03
R1	Resistor 180Ω ½ watt	260 GE 207
CR1	Bridge Rectifier	270 KB 663
CR2	Diode IN4154	270 KB 662
Q1	Regulator 78M12	270 KB 306-12
C1	Capacitor 1000µf 25V	035 KB 193-12
C2	Capacitor 10µf 25V	035 KB 194-06
C3	Capacitor .01µf 50V	035 KB 058-02
C21	Capacitor 1µf 250V	035 KB 207-25
S1	Socket, 4 pin	055 KB 151-04
K1	Relay	250 KB 070
F1	Fuse ⅛A	130 KB 034-09
FH	Fuse Holder	130 KB 134-50

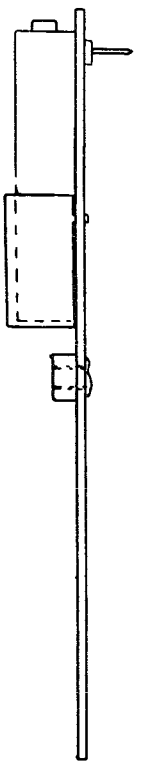


PARTS LIST FOR MODEL 318A RF Amplifier 044 KB 990

Item	Description	Part Number
IC1	Integrated Circuit CJ-D511	270 KB 736
IC2	Integrated Circuit LM-556	270 KB 737
IC3	Integrated Circuit BUF03FJ	270 KB 738
Q2	Transistor 2N3904	270 KB 317
DS1	LED, Red	190 KB 086
D3	Diode IN4154	270 KB 662
D4	Diode IN4154	270 KB 662
D5	Diode IN969B	270 KB 168
D6	Diode IN969B	270 KB 168
D7	Diode IN969B	270 KB 168
R2	Resistor 470K ¼ watt	260 GD 517
R3	Resistor 470K ¼ watt	260 GD 517
R4	Resistor 2.2K ¼ watt	260 GD 309
R5	Resistor 2.2K ¼ watt	260 GD 313
R6	Resistor 15K ¼ watt	260 GD 405
R7	Resistor 22K ¼ watt	260 GD 409
R8	Resistor 22K ¼ watt	260 GD 409
R9	Resistor 1.5K ¼ watt	260 GD 305
R10	Resistor 2.2 meg ¼ watt	260 GD 609
R11	Resistor 1K ¼ watt	260 GD 301
R12	Resistor 4.7K ¼ watt	260 GD 317
R13	Resistor 4.7K ¼ watt	260 GD 317
R15	Resistor 1K ¼ watt	260 GD 301
R16	Resistor 100Ω ½ watt	260 GE 201
R17	Resistor 100Ω ½ watt	260 GE 201

Item	Description	Part Number
R18	Resistor	260 GE 201
R19	Resistor	260 GE 201
R20	Resistor 390K ¼ watt	260 GD 515
R14	Var. resistor 1 meg	260 KB 203-01
C4	Capacitor .01μf 50V	035 KB 058-02
C5	Capacitor 100pf	035 KB 197-01
C6	Capacitor 5600pf	035 KB 197-02
C7	Capacitor 5600pf	035 KB 197-02
C8	Capacitor 5600pf	035 KB 197
C9	Capacitor .033μf	035 KB 197-03
C10	Capacitor	035 KB 197-04
C11	Capacitor 10pf	035 KB 197-05
C12	Capacitor .001μf	035 KB 197-06
C13	Capacitor 22μf 16V	035 KB 196-01
C14	Var. Capacitor 38pf	035 KB 195
C15	Capacitor 25pf	035 KB 197-07
C16	Capacitor 50pf	035 KB 197-08
C17	Capacitor 100pf	035 KB 197-01
C18	Capacitor 200pf	035 KB 197-10
C19	Capacitor .001μf	035 KB 197-06
C20	Capacitor 75pf	035 KB 197-14
SG1	Spark Gap	270 KB 365
SG2	Spark Gap	270 KB 365
SW1	Switch 6 position DIP	300 KB 198-06
SW2	Switch 10 Pos. Rotary BCD	300 KB 153





SHADED PARTS ARE OMITTED FROM NON-SHORTSTOP VERSION

Robertshaw
Industrial Products

U.S.A. and Canada
Robertshaw Industrial Products Division
1602 Mustang Drive
Maryville, TN 37801
Telephone: (865) 981-3100 Fax: (865) 981-3168
http://www.robertshawindustrial.com

Exports
Invensys Appliance Controls
1701 Byrd Avenue
P.O. Box 26544
Richmond, Virginia 23261-6544
Telephone: (804) 756-6500 Fax: (804) 756-6561

invensys.

Q-4016 (12/04) Printed in U.S.A.