Installation and Operating Instructions

for

INSTALLATION & OPERATING INSTRUCTIONS

408-1000 TRANSMITTER & PROPORTIONAL CONTROLLER

For factory service, call toll free
1-800-527-6297
INSTALLATION & OPERATING INSTRUCTIONS

408-1000 TRANSMITTER &
PROPORTIONAL CONTROLLER

408-1000-001
CHASSIS ONLY

408-1000-2
WEATHER PROOF CASE

408-1000-E
EXPLOSION PROOF CASE
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1.0 INTRODUCTION

1.1 PURPOSE AND USE

The instructions in this manual pertain to the DREXELBROOK 408-1000 series transmitter and proportional control.

Basically, this instrument is a precision electronic capacitance to current transducer with a wide range of input capacitances (greater than 20,000:1) and three selectable output current ranges. The 408-1000 series instruments were designed to perform either of two distinct functions: The first is that of a transmitter and the other a proportional control. The method of calibration is different in each case.

When the instrument is used to transmit a current proportional to a level to an indicating or recording device it is calibrated as a transmitter. It is calibrated as a proportional control when used to control the load directly, for example when the output is used to control a valve through an I to P transducer.

The necessary change of input capacitance is provided by the "Probe" (DREXELBROOK Series 700) which is mounted in or near the material being measured. DREXELBROOK 380 series cable transmits the change of capacity from the probe to the instrument. Instrument output current is transmitted through standard wiring to the load device. For example: a recorder, recorder controller, I to P transducer, etc. The standard unit will supply any one of the three standard ISA ranges:

1. 1-5 milliamperes into (0-6000 ohms)
2. 4-20 milliamperes into (0-1500 ohms)
3. 10-50 milliamperes into (0-600 ohms)

The instrument is supplied preadjusted to the output range and fail safe direction specified on the purchase order. However, it may be field changed to either of the other ranges and/or the other fail safe direction.

1.2 MODELS AVAILABLE

Model No. 408-1000-2

General Purpose meets the following NEMA classifications:

I. General Purpose
II. Drip Tight
III. Weather Resistant
IV. Water Tight
V. Dust Tight (nonhazardous dusts only)
XII. Dust Tight-Drip Tight

Case dimensions 9-1/2 X 6-1/4 X 3-1/2 (See Drawing 418-2-1 CD Sheet 2 attached).

Model 408-1000-E

Explosion Proof for hazardous areas classified as:

Class I Groups C & D Div. 1 or 2

Dimensions 8-7/8 X 7" X 5" (See Drawing 418-2-1 CD Sheet 2 attached).

1.3 ELECTRICAL SPECIFICATIONS

The following specifications describe both Models 408-1000 and 408-1000-E.

1. Power Requirement 115 VAC 50/60 HZ 120 VAC (12 watts)
2. Line Voltage Effect ±0.2% for ±10 volts
3. Ambient Temperature -40 to +140 F Recommended
4. Temperature Effect ±3/4% per 30 F or 0.15 pf (mmf) whichever is larger
5. Linearity ±1/4% to approximately 2000 pf then ±1% to 4000 pf.
6. Input Range .25 to 4500 pf (mmf)
7. Output Ranges ***Switchable:
   1 to 5 milliamperes into 0 to 6000 ohms
   4 to 20 milliamperes into 0 to 1500 ohms
   or
   **10 to 50 milliamperes into 0 to 600 ohms

* The units will operate above 140 F but with reduced component life.

** If external load is above 300 ohms on this range, internal resistors must be shorted. Note that output leads will no longer be intrinsically safe. Consult factory.

***Output load circuit must not be grounded unless output modifier is added.
See 3.26
9. Fail Safe
Switchable Either
Low Level Fail Safe (LLFS)
Standard
or
High Level Fail Safe (HLFS)

10. Effect of Load Resistance
0.15% or less for full resistance range.

2.0 INSTALLATION

2.1 UNPACKING

Normally the instrument and cable(s) are packed in the same shipping carton; the probe is packed separately.

Carefully remove the contents of the carton and check each item against the packing list before destroying any packing materials. If there is any shortage or damage report it immediately to the factory.

2.2 LOCATION

The instrument was designed for field mounting but it is desirable that it be mounted in a location as free as possible from vibration, corrosive atmospheres and any possibility of mechanical damage. Ambient temperatures should be between 40° and 140° F. For convenience at start up it is best to locate the instrument in a reasonably accessible location.

2.3 WIRING

All connections are made to the barrier strip on the chassis. Due to the low power consumption of the instrument (less than 12 watts) the wiring need only be of a light gauge. Consult the wiring connection diagram 418-2-1-CD sheet 1 for proper connections.

2.4 CABLES

Only coaxial cables supplied by the DREX-ELBROOK ENGINEERING COMPANY should be used to connect the transmitter unit to the measuring probe. (Use of other cables can result in calibration instability).

The best installation technique is to use a compensating cable (i.e. a second coaxial cable identical in type and length to the cable connecting the measuring probe to the transmitter unit). See drawing 418-2-1-CD sheet 1 for connections. If cable terminations are modified in the field care must be taken to prevent shorting to ground of the center wire at the far end of the compensating cable.

The compensating cable need not be used when the change in capacitance is large compared with the cable capacitance. The error which can result is approximately 0.5 pf (mmf) per 10' of uncompensate cable per 10° F.

When more than 20 feet of uncompensated cable is used, capacitance equivalent to the excess must be connected between terminals 5 and 7. This capacitance is 19 pf (mmf) per foot of high stability cable and 13.7 pf (mmf) per foot of general purpose cable.

2.5 NOTES ON PROBES

The sensor element that transmits the capacity change of the level being measured to the instrument is called a probe. Probes take many forms depending chiefly on the parameters of temperature, pressure and length and the characteristics of the product being measured such as viscosity, coating, corrosion and dielectric constant. When these parameters are known the factory will select the correct probe for the applications.

Probes are of two general types - proximity or immersion. The latter may be divided into two categories "insulated" and "uninsulated".

Proximity type probes are used where it is necessary or desirable that the material being measured does not come in contact with the probe.

Uninsulated or "bare immersion probes" have a bare metallic sensing element to sense the product. These are usually used when the product being measured is a non-conducting material.

Insulated immersion probes have the sensing element sheathed in an insulating material such as Teflon (™) Du Pont Company or ceramic. Insulated probes may be used in applications measuring conductive or non-conductive products.

1- In applications requiring an insulated probe, use care during installation to prevent accidental punctures of the insulating sheath. This is particularly true with the thin wall, high sensitivity probes such as the 700-1-7 and 700-5-14.

2- Probes should be mounted in such a manner that they are not in the direct stream of a filling nozzle or chute. If this is not possible, deflecting baffles may be installed between the probe and the fill.

3- Do not take a probe apart or loosen the packing glands.

4- Tighten probe with wrench flats nearest the mounting threads.

5- If waves caused by agitation or agitator blades cause output to be unsteady consult the factory for correct solution of problem.

6- If probes are mounted in such a way that product may build-up around the
mounting threads as can happen in a nozzle, an inactive section should be added to the probe.

3.0 OPERATION

3.1 GENERAL

This section contains the calibration and operating information for level systems using the 408-1000 series instruments. Calibration instructions are divided into ten categories:

**IMMERSION APPLICATIONS**

1. Transmitter, Low Level Fail Safe
2. Transmitter, High Level Fail Safe
3. Proportional Control, Low Level Fail Safe
4. Proportional Control, High Level Fail Safe

**PROXIMITY APPLICATIONS**

5. Proximity Application, Low Level Fail Safe
6. Proximity Application, High Level Fail Safe

**INTERFACE APPLICATIONS**

7. Normal Interface, Low Level Fail Safe
8. Normal Interface, High Level Fail Safe
9. Inverted Interface, Low Level Fail Safe
10. Inverted Interface, High Level Fail Safe

3.2 CONTROLS/ADJUSTMENTS

There are four main adjustments or controls on the chassis front panel:

1. Step Zero
2. Fine Zero
3. Step Span
4. Fine Span

3.21 ZERO CONTROLS

The Step Zero Control and the Fine Zero Control work together to provide continuous adjustability of the minimum current point. (1 ma, 4 ma, or 10 ma depending upon the output range). Each Step Zero position advances the minimum current point approximately 60 pf while the Fine Zero provides continuous adjustment between each step.

3.22 SPAN CONTROLS

The Step Span Control and Fine Span Control work together to provide continuous adjustability of the change in capacitance required for full scale current change (i.e. 1 to 5 ma, 4 to 20 ma, or 10 to 50 ma). Each Step Span advances the span range approximately 3 times the previous range.

The Fine Span provides continuous adjustment between step span positions.

3.23 BELOW CHASSIS ADJUSTMENTS

There are three adjustments below the chassis that are normally set by the factory and need not be changed. They may, however, be reset by field personnel if desired.

1. The fail safe selector either high or low level.
2. A fine adjustment of the independent minimum current point.
3. The output current range selector allows the unit to be changed to either of the other two standard ISA ranges.

3.24 FAIL SAFE SELECTOR

The fail safe selector determines whether increasing or decreasing level will cause the output current to increase. (This is more fully explained below).

It is a metal link mounted on two of three screws on the circuit board on the right side of the chassis. To select low level fail safe action, the selector link is connected from the middle screw to the lowest of the three (marked LL). For high level fail safe action, it is connected from the middle screw to the highest of the three (marked HL).

**THE MEANING OF FAIL SAFE**

There are no devices that are absolutely "Fail Safe". By "Fail Safe" we mean that in the event of any of the most probable failures the instrument will fail safely. By "most probable failures" we mean such things as loss of power and most transistor and component failures. If your application requires absolute fail safe, a backup instrument should be installed so that it would take two simultaneous failures to cause the installation not to fail safely.

**LOW LEVEL FAIL SAFE**

Also called Direct Acting, this is the most commonly used fail safe position for continuous instruments. Output current increases as the level increases. (Exception being Inverted Interface, see General Interface Application). In the event of the most probable failures the output current will drop and indicate Low Level.

**HIGH LEVEL FAIL SAFE**

Also called Reverse Acting, output current increases as the level decreases. In the event of most probable failures output current will drop indicating High Level.

Note: Meters used in high level fail safe should have reverse calibration as minimum current is now maximum level.
3.25 INDEPENDENT MINIMUM CURRENT POINT
(NORMALLY FACTORY ADJUSTED)

The independent minimum current point adjustment establishes the point at which the zero and span adjustments do not interact. It is a screwdriver adjusted potentiometer which is reached through a hole on the left circuit board. To adjust the independent minimum current point:

a. Set the instrument on step span 2, fine span full clockwise.

b. Adjust the step and fine zero to obtain the desired minimum current point (1 ma on 1-5 ma range, 4 ma on 4-20 ma range).

c. Rotate the fine span control to full counter-clockwise.

d. If the current moves off the desired minimum current point, adjust the independent current potentiometer to change the current past the point desired by 1/4 the distance that the current moved on the previous step.

e. Repeat the adjustment procedure to verify the independent minimum current point.

3.26 OUTPUT CIRCUIT (PLEASE NOTE)

The standard instrument will only drive output circuits that are not grounded. If output circuit is negative grounded, an output modifier must be added to the 408-1000 output. See drawing 418-2-16-CD in this manual.

3.27 OUTPUT CURRENT RANGE SELECTOR

The output current range link changes the output range from 1-5 ma, to 4-20 ma, or 10-50 ma. It is a bare wire jumper on the top surface of the left printed circuit board. It is, unless otherwise specified, installed in the 4-20 ma position.

3.28 INSTRUCTIONS FOR FIELD CONVERTING
OUTPUT-SPAN MODEL 408-1000

I. As shown on drawing above, solder connections on printed circuit board to give desired output.

II. To establish independence of zero and span, refer to 3.25, independent minimum current point.

3.29 ADJUSTABLE TIME DELAY OPTION

If the instrument is equipped with adjustable time delay, see figure below, the speed of response of the output signal may be delayed up to 30 seconds. With the time delay switch in the off position the response time is approximately 150 micro-seconds. In the on position, the minimum delay is approximately 5 seconds, and may be increased to 30 seconds to reach 90% of a step change in input signal.

To calibrate, follow the appropriate calibration instructions leaving the Time Delay Switch in the Off position. When calibration is complete switch to ON position and turn Time Delay Adjust clockwise until enough delay is achieved.

3.3 START UP

Before applying power to the instrument be sure that the input power will be 115 VAC 50/60 Hz. Check all wiring connections observing polarity of the output and if a compensating cable is used, be sure the cables are not reversed.

WARNING- EXPLOSION PROOF UNITS

Before the explosion proof case lid is removed to calibrate the unit, the area must be checked and known to be nonhazardous.
When calibration is complete, the cover must be replaced and all bolts tightened.

Each conduit from the explosion proof case must be equipped with an approved seal fitting.

4.0 CALIBRATION

IMMERSION APPLICATION

4.1 TRANSMITTER - LOW LEVEL FAIL SAFE

a. Set Fine Span to extreme clockwise position.

b. Set Step Span to position #2.

c. With the vessel empty, set the Step and Fine Zero controls until the output is minimum. (i.e. 1 ma, 4 ma, or 10 ma depending upon the output current range).

d. Fill the vessel. (Output current will now normally exceed full scale current).

e. Turn the Step Span control until the output is less than full scale, then back off Step Span one position (if current did not exceed full scale in step d, then set Step Span to position #1).

f. Turn the Fine Span control until the output is full scale or reading the actual level of the vessel.

Calibration is now complete.

4.2 TRANSMITTER - HIGH LEVEL FAIL SAFE

a. Set Fine Span to extreme clockwise position.

b. Set Step Span to position #2.

c. With vessel full, set the Step and Fine Zero until output is minimum. (i.e. 1 ma, 4 ma, or 10 ma depending upon output current range). A compensation capacitor may be required and will be added by the factory when the application is known.

d. Empty the vessel. (Output current will now normally exceed full scale current).

e. Turn the Step Span until the output is less than full scale. Then back off Step Span one position. (If output current did not exceed full scale in step 2, then set Step Span to position #1).

f. Turn the Fine Span control until the output is full scale, or reading actual level in vessel. (i.e. 5 ma, 20 ma, or 50 ma).

Calibration is now complete.

4.3 PROPORTIONAL CONTROL - LOW LEVEL FAIL SAFE

a. Set the Fine Span to the extreme counterclockwise position.

b. Set the Step Span to position #1.

c. Bring the level in the vessel to the desired control point.

d. Set the Step and Fine Zero controls until the output is minimum (i.e. 1 ma, 4 ma, or 10 ma depending upon the output range).

e. Let the instrument control the level at this point.

f1. If the level begins to "hunt" or oscillate, increase the span by turning the Step Span control clockwise one step at a time until hunting ceases. Then turn the Fine Span Control clockwise until system begins to hunt again, then back off slightly until the level is again stable.

f2. If the system did not hunt in step e, tighter control of the operate point is possible by turning the Fine Span control clockwise until system begins to hunt then backing off until the system is again stable.

g. After the desired control action is realized, the exact control point may be moved up or down with the zero controls as desired.

4.4 PROPORTIONAL CONTROL - HIGH LEVEL FAIL SAFE

a. Set up as in part 4.3 for Low Level Fail Safe but with the instrument set for High Level Fail Safe.

4.5 PROXIMITY APPLICATIONS - GENERAL

Capacitance in a proximity application follows the following formula:

\[
C = \frac{L \cdot A}{D}
\]

Where C is the capacitance in pf, A is the area in sq. in. of plate size, D is the distance in inches, L is approximately equal to 0.23. It can be readily seen that the smaller the D or the larger the A, the greater the capacitance. The above formula
assumes a conductive material being measured. For a dielectric material the C will be smaller.

The change in capacitance (AC) seen by the instrument would be C of closest position minus C of furthest position.

In applications where the product being measured is a dielectric, that is a nonconductor, AC may be increased if necessary by installing a ground plate just below the product lower level. This ground plate should be at least as large as the sensing plate and electrically bonded to ground. The ground plate need not be a solid plate. It could be a series of leads spaced apart enclosing the same area as a plate.

4.51 PROXIMITY APPLICATION - LOW LEVEL

FAIL SAFE

Be sure link is in LLFS position.

a. Set fine span to extreme clockwise position.

b. Set Step Span to position #1.

c. With the material being measured at the lower operating level adjust the step and fine zero controls until the output is minimum, i.e. 1 ma, 4 ma, or 10 ma depending on the output current range.

d. Raise the material to the upper operating level but not touching the probe plate. Adjust the fine span until the output is full scale. If wider span is required use step span 3, 4 or 5.

e. Calibration is now complete.

4.52 PROXIMITY APPLICATION - HIGH LEVEL

FAIL SAFE

Be sure link is in HLFS position.

a. Set fine span to extreme clockwise position.

b. Set step span to position #1.

c. With the material at the upper operating level but lower than the probe plate adjust the Step and Fine Zero controls until output is minimum, i.e. 1 ma, 4 ma, or 10 ma depending on the output range.

d. Lower the level to the lower operating level and adjust the Fine Span until the output is full scale. If wider span is required use step span 3, 4 or 5.

e. Calibration is now complete.

4.6 INTERFACE APPLICATIONS - GENERAL

Notes on interface applications:

All level control applications are actually interface measurements. The most common being the interface of air and product. When the term interface is used it generally refers to the interface of two immiscible liquids.

For the purpose of level control we consider two types of interface. The first and more common we call Normal Interface which is classified by having the lower product phase the higher dielectric constant (K) or conductivity (G). The other type of interface we call inverted or upside down interface in which the upper phase has the higher (K) or (G).

In order to control properly the sensor probe should be permitted to "see" only the interface to be controlled. In other words if there is a second interface, for example air on the top of the upper liquid phase the probe must be shielded through the air/upper liquid phase interface so the probe only measures the upper/lower liquid phase interface. These shields are called inactive sections.

4.61 CALIBRATION OF NORMAL INTERFACE IN LOW LEVEL FAIL SAFE CONDITION

a. Set Fine Span to extreme clockwise position.

b. Set Step Span to position #2.

c. With the interface at the lowest desired operating point, set the Step and Fine Zero controls until the output is minimum, i.e. 1 ma, 4 ma, or 10 ma depending on the output current range.

d. Raise the interface to the highest desired operating point. (Output current will now normally exceed full scale current).

e. Turn the Step Span control until the output is less than full scale. (If current did not exceed full scale in Step d then leave Step Span in position #2.

f. Turn the Fine Span control until the output is full scale, i.e. 5 ma, 20 ma, or 50 ma depending upon output current range) or reading the actual interface level.
4.62 CALIBRATION OF NORMAL INTERFACE IN HIGH LEVEL FAIL SAFE CONDITION

a. Set Fine Span to extreme counter clockwise position.

b. Set Step Span to position #2.

c. With interface at the highest desired operating point, set the Step and Fine Zero until output is minimum. (i.e. 1 ma, 4 ma, or 10 ma depending upon output current range). A compensation capacitor may be required and will be added by the factory when the application is known.

d. Lower the interface to the lowest desired operating point. (Output current will now normally exceed full scale current).

e. Turn the Step Span until the output is less than full scale. (If output current did not exceed full scale in Step d, then leave Step Span in position #2).

f. Turn the Fine Span control until the output is full scale. (i.e. 5 ma, 20 ma, or 50 ma).

4.64 CALIBRATION OF INVERTED INTERFACE IN HIGH LEVEL FAIL SAFE CONDITION

a. Connect probe cable to compensate terminals and compensate cable to probe terminals. Add a padding capacitor equal to or greater than the full scale capacity of the probe in the lower phase. This capacitor will be added by the factory to terminals 8 and 9 when the application is known. If not supplied contact the factory for the proper value capacitors.

b. Set the Step Span to position #2 and Fine Span full counterclockwise position.

c. With the interface at the desired upper level, set the Step and Fine Span controls until output is zero percent (i.e. 1 ma, 4 ma, or 10 ma depending on output current range).

d. Lower the interface to the desired lower level. (Output current will now normally exceed full scale current).

e. Turn the Step Span until the output is less than full scale. (If output current did not exceed full scale in Step d, then leave Step Span in position #2).

f. Turn the Fine Span control until the output is full scale. (i.e. 5 ma, 20 ma, or 50 ma).

5.0 RECALIBRATION

1. In some applications it is difficult or even impossible to completely fill or empty a vessel. In such a case it is desirable to have a secondary calibration standard such as the DEKELBOOK Model 401-6-1, which can be used to simulate the capacitance of any empty and full vessel. The following procedure permits recalibration of an instrument without the necessity of changing the level.

2. In order to re-establish vessel calibration, start by setting up the instrument as described under calibration. After initial calibration, do the following:

a. Disconnect the coax center wire from the probe rod in the probe conduit. (Be sure that it does not short to anything).
b. Connect calibration capacitor to the instrument in parallel with existing probe cable (shield to #8, center wire to #9).

c. Adjust calibration capacitor until the instrument indicates minimum current. (i.e. 1 ma, 4 ma, or 10 ma, depending upon output current range).

d. Record value read on calibration capacitor and its serial number for later use. We suggest recording value also on the inside of the instrument door.

e. Adjust calibration capacitor until the instrument indicates maximum current. (i.e. 5 ma, 20 ma, or 50 ma).

f. Record capacity value as step d.

g. Disconnect calibration capacitor from instrument terminals.

h. Reconnect probe.

3. Whenever it is subsequently desired to check or reset the calibration, or replace the instrument, the calibration capacitor set to the value recorded above may be substituted for the probe. This is done as follows:

a. Disconnect the coax center wire from the probe in the probe conduit.

b. Connect the calibration capacitor in parallel with existing cable.

c. Set calibration capacitor to above recorded values.

d. Adjust the zero controls for the minimum current calibration and the span controls for the maximum current calibration.

e. Disconnect calibration capacitor.

f. Reconnect coax center lead to probe.

Unit is again ready for operation.

6.0 MAINTENANCE & TROUBLE SHOOTING

The 408-1000 series instruments are designed to give years of unattended service. No periodic or scheduled maintenance is required.

There are no specific spare parts that we would recommend be stocked by the user, however, if the application is critical, it is best to have a spare chassis available in the event of a component failure. In most cases, the chassis should be returned to the factory for repairs.

Do not return equipment without first contacting the factory. Anything being returned should include as much information as possible. The reason for return, original P.O. #, Drexelbrook order No., person to contact at your location, and "Ship To" address.

Spare instruments are generally in factory stock, for loan while the instrument is being repaired.

To keep paperwork straight please include a purchase order with return of equipment even though the equipment may be coming back for warranty repair.

FIELD SERVICE AND START UP ASSISTANCE

Trained field service men are available on a time plus expenses basis to assist in start ups, diagnosing difficult application problems or in-plant training of personnel.

Periodical instrument training seminars for customers are held at the factory. Contact the Service Manager for details on any of the above.

The following procedures should make trouble shooting Drexelbrook equipment as easy as possible using a minimum of equipment and time.

Each component in a system may be checked individually for proper operation or function.

The problem may usually be found in a matter of minutes by following the instructions on the following pages.

FACTORY ASSISTANCE

If attempts to locate the difficulty fail, notify your local factory representative or call the factory direct and ask for the service department. To help us solve your problem quickly please have as much of the following information as possible when you call:

<table>
<thead>
<tr>
<th>Instrument Model No.</th>
<th>Probe Model No.</th>
<th>Purchase Order No.</th>
<th>Date</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Cable length</td>
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<td>Application</td>
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<td></td>
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<td>Material being measured</td>
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<td></td>
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<td>Temperature</td>
<td>Pressure</td>
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<td>Brief description of the problem</td>
<td></td>
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Which part of the checkout procedures that did not work out properly
1. Remove measure & compensate cables from terminals 6, 7, 8 and 9.

2. Remove output wires from terminals 4 and 5 and connect a suitable milliammeter to these terminals. Observe Polarity. Instrument in the Low Level Fail Safe Connection.


4. Adjust Step Zero and Fine Zero until the meter reads minimum current (e.g.) 4 ma on a 4-20 ma range. The step zero switch will probably be on step 2 but may on some instruments be on 1 or 3.

5. With the meter reading minimum current turn the Fine Zero control 1/2 turn clockwise meter should read full scale or greater. If so the instrument is probably working correctly.

6. With Fine Zero control bring output meter reading on scale to approximately full scale.

Disconnect test meter and re-connect normal output circuit. The normal output circuit should read the same as the test meter did within the accuracy of the devices used to measure the current. If so, the output circuit is OK, if not consult "Output Circuit Checkout for Continuous Instruments".

7. If difficulty has not been located to this point proceed to "Probe Checkout" and "Cable Checkout Sections".

440-115-71
2 WIRE COAXIAL CABLE CHECK

(MEASURE CABLE)

1. DISCONNECT CABLES AT BOTH ENDS. BE SURE ALL TERMINALS ARE STANDING CLEAR.

2. MEASURE RESISTANCE FROM CENTER WIRE TO SHIELD RESISTANCE SHOULD BE INFINITY (OPEN CIRCUIT)

3. SHORT TERMINALS TOGETHER AT ONE END.

4. MEASURE RESISTANCE FROM CENTER WIRE TO SHIELD RESISTANCE SHOULD BE NEAR 0 OHMS (SHORT CIRCUIT)

(COMMENATE CABLE WHEN SUPPLIED)

5. REPEAT STEP 2 ABOVE
2 TERMINAL PROBE CHECK
FOR CONTINUOUS LEVEL INDICATING/CONTROLLING
APPLICATIONS

STEP 1. CHECK RESISTANCE PROBE TO GROUND WITH LEVEL BELOW PROBE.
RESISTANCE SHOULD BE INFINITE.
RESISTANCE LESS THAN 1 MEGOHM INDICATES EXCESSIVE LEAKAGE
PROBABLY DUE TO PRODUCT OR CONDENSATION IN GLAND/PACKING NUT
AREA.
IT MAY BE POSSIBLE TO DRY OUT IN OVEN AT 200°F. AFTER DRYING
OUT LOOSEN SET SCREW AND RE-TORQUE. CONSULT FACTORY FOR
PROPER TORQUE VALUE.

STEP 2. CHECK RESISTANCE PROBE TO GROUND WITH LEVEL ABOVE PROBE.
RESISTANCE SHOULD BE INFINITE.
RESISTANCE LESS THAN 1 MEGOHM INDICATES A DEFECT IN THE PROBE
INSULATION OR IF IT IS A BARE PROBE, MATERIAL MAY BE TOO CON-
DUCTIVE FOR THAT PROBE. CONSULT FACTORY.
If the instrument checkout procedure indicated that the problem was in the output circuit, perform the following steps.

1. Measure resistance from (+) to (-) leads with leads disconnected from instrument.
   Resistance May be:
   
<table>
<thead>
<tr>
<th>Resistance (ohms)</th>
<th>Current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6000 ohms</td>
<td>1-5ma output</td>
</tr>
<tr>
<td>0-1000 ohms</td>
<td>4-20 ma output</td>
</tr>
<tr>
<td>0-400 ohms</td>
<td>10-50 ma output</td>
</tr>
</tbody>
</table>

2. Measure resistance from (+) lead to chassis or earth ground. (+) & (-) leads still disconnected from instrument.
   Resistances should be greater than 10K ohms. If less than 10K ohms there is leakage from output circuit to ground, unless a special grounded output circuit is provided with instrument. Consult factory,
7.0 DRAWINGS & ILLUSTRATIONS
Note:

1. All devices shown in output circuit are optional extras. They are shown here as examples of typical devices and how they are wired.

2. All devices must be wired in series. Voltage driven devices require a series voltage dropping resistor.

3. Devices having a grounded input require a special output modifier to be added to the transmitter. Consult factory if needed.

4. Output wiring less than 500 ft. usually do not require shielding.

DREXELBROOK ENGINEERING CO.  ●  HORSHAM, PA. 19044

WIRING DIAGRAM
808-5 and 808-15 SERIES
LEVEL SYSTEMS

<table>
<thead>
<tr>
<th>TOLERANCE</th>
<th>DR. JER. SUN</th>
<th>APPD. 7-25-75</th>
<th>EDD 7/15/75</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE</td>
<td>NO. 418-2-1-CD</td>
<td>SHEET 1</td>
<td>7</td>
</tr>
</tbody>
</table>

CERTIFIED by ___
PO: ___  ENG: ___  USER: ___  DE: ___

CONDUIT NOT REQUIRED.
EXCESS CABLE MAY BE COILED IN CONVENIENT LOCATION

OUTPUT CIRCUIT (SEE NOTES 1, 2, 3 & 4)

GROUND
115 VAC 50/60 HZ

METER
METE BACK VIEW
RANGE SHUNT

ELECTRO PNEUMATIC TRANSMITTER
SETCON
SETCON

WIRING BARRIER
BLACK WIRE
GRAY WIRE
COMP CABLE
MEAS CABLE
FITTING CONDUIT
### Standard Dimensions

<table>
<thead>
<tr>
<th>Probe</th>
<th>A (NPT)</th>
<th>B (IN.)</th>
<th>C (Material)</th>
<th>E (IN.)</th>
<th>F (Material)</th>
</tr>
</thead>
<tbody>
<tr>
<td>700-1-7</td>
<td>3/4</td>
<td>.40</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-1-12</td>
<td>3/4</td>
<td>3/8</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-1-13</td>
<td>1 1/2</td>
<td>3/8</td>
<td>Teflon</td>
<td>+ 1.66</td>
<td>303 S.S.</td>
</tr>
<tr>
<td>700-1-14</td>
<td>1 1/2</td>
<td>3/8</td>
<td>Teflon</td>
<td>+ 1.66</td>
<td>C.S.</td>
</tr>
<tr>
<td>700-1-22</td>
<td>3/4</td>
<td>3/8</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-1-23</td>
<td>1 1/2</td>
<td>3/8</td>
<td>Teflon</td>
<td>+ 1.66</td>
<td>303 S.S.</td>
</tr>
<tr>
<td>700-1-24</td>
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<td>3/8</td>
<td>Teflon</td>
<td>+ 1.66</td>
<td>C.S.</td>
</tr>
<tr>
<td>700-1-37</td>
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<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-2-12</td>
<td>3/4</td>
<td>3/4</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-2-22</td>
<td>3/4</td>
<td>3/4</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-2-27</td>
<td>1 1/2</td>
<td>.54</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-2-37</td>
<td>3/4</td>
<td>.54</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-2-57</td>
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<td>.84</td>
<td>Teflon</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>700-4-30</td>
<td>1 1/2</td>
<td>1/4</td>
<td>S.S.</td>
<td>+ 1.66</td>
<td>C.S.</td>
</tr>
<tr>
<td>700-4-31</td>
<td>1 1/2</td>
<td>1/4</td>
<td>S.S.</td>
<td>+ 1.66</td>
<td>303 S.S.</td>
</tr>
</tbody>
</table>

**Notes:**

*1. Continuous 'Cote Shield' Probes*
*2. Nozzle Clearance - 1.75*
*3. Other Mat', Shield O.D., etc. Consult Factory*

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**Drexelbrook Engineering Co.**

**Horsham, PA. 19044**

**Continuous Level Probe**
WITH OLD CABLE CUT CLOSE TO SLEEVE, MOUNT SLEEVE IN VISE ON HEX AND DRIVE OUT REMAINING CABLE AND PLUG WITH A SUITABLY SIZED PUNCH. NOTE: OMIT THIS STEP IF NOT REQUIRED.

CUT CABLE TO DESIRED LENGTH AND STRIP PLASTIC COATING TO DIMENSION "A".

DO NOT UNLAY WIRE OF CENTER STRAND. INSERT HOLLOW PLUG OVER CENTER STRAND, FAN OUTER STRANDS AND DRIVE PLUG TO A SOLID SEAT.

BEND WIRES INWARD, ATTACH SOCKET TO SLEEVE AND TIGHTEN SECURELY.

STRAND CAN BE SEEN IN THE INSPECTION HOLE IF APPLIED PROPERLY. SEVERAL SLEEVE THREADS WILL BE EXPOSED AFTER TIGHTENING.

<table>
<thead>
<tr>
<th>WIRE ROPE SIZE</th>
<th>DIM &quot;A&quot;</th>
<th>DIM &quot;B&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/16</td>
<td>1 31/32</td>
<td>3/4</td>
</tr>
<tr>
<td>3/8</td>
<td>3 1/8</td>
<td>1 1/8</td>
</tr>
</tbody>
</table>

NOTE: DEPENDING ON THEIR CONDITION, REUSE OF THE PLUG AND SOCKET MAY SOMEWHAT DECREASE THE ULTIMATE LOAD-CARRYING ABILITY OF THE ASSY. IF REUSE IS DESIRED, INSPECT THE CONDITION OF THE THREADS ON THE SOCKET. IF THEY ARE DAMAGED, CHASE THE THREADS OR REPLACE THE SOCKET TO ENSURE FULL ENGAGEMENT OF THE SOCKET AND SLEEVE.
NOTES:
1. FLANGE WELDED TO GLAND. MAT'L & SIZE AS SPECIFIED.
   TEFON FACING IF SPECIFIED.
2. PROBE HOUSING NOT INTEGRAL WITH PROBE.
3. ANY WEIGHT MAY BE USED. 7/8" O.D. FITS THRU 3/4" NPT.
4. S.S. WEIGHT COMPLETELY TEFON ENCLOSED.
5. WEIGHT DRILLED & TAPPED 10-32 ONE SIDE/1/2-20 OTHERSIDE.
6. ALL TEFON TFE UNLESS OTHERWISE NOTED.
7. SEE 700-5-14-CD1 FOR SHORTENING INSTRUCTIONS.
LENGTH ADJUSTMENT FOR 700-5-14, 700-5-24 & 700-5-34 S.E.

A. INSTALL SENSING ELEMENT IN VESSEL.
B. DETERMINE DESIRED LENGTH AS FOLLOWS:
   A. LOOSEN SET SCREWS IN CLAMPING BLOCK 1 AND COMPRESSION GLAND 3, AND UNSCREW COMPRESSION GLAND 2 FROM 3 (TWO TURNS).
   B. CAREFULLY PUSH TEFLOM WIRE(S) THROUGH CLAMPING BLOCK 1, LEAVING SLIGHT SLACK. IF THE SENSING ELEMENT HAS WEIGHTED END, ALLOW WEIGHT TO SIT ON BOTTOM AND LEAVE SLIGHT SLACK.
   C. MARK POSITIONS (X) AND (Y) ON THE TEFLOM WIRE.
   D. SLIDE CLAMPING BLOCK OUT OF WAY AND REMOVE INSULATION FROM (X) TO (Y) (APPROXIMATELY 1 1/2`).
   E. TIGHTEN COMPRESSION PLUGS 2 AND 3 TO 30 FT-LBS.
   F. SLIDE CLAMPING BLOCK BACK INTO POSITION.
   G. RETORQUE AFTER 12 OR MORE HOURS.
   H. TIGHTEN BOTH SET SCREWS.
   I. CUT AWAY EXCESS CABLE ABOVE (X).
   J. TIGHTEN SET SCREW IN 3.