Kotron™ II
Series 801
RF Capacitance
Transmitter For
Level/Flow/Volume

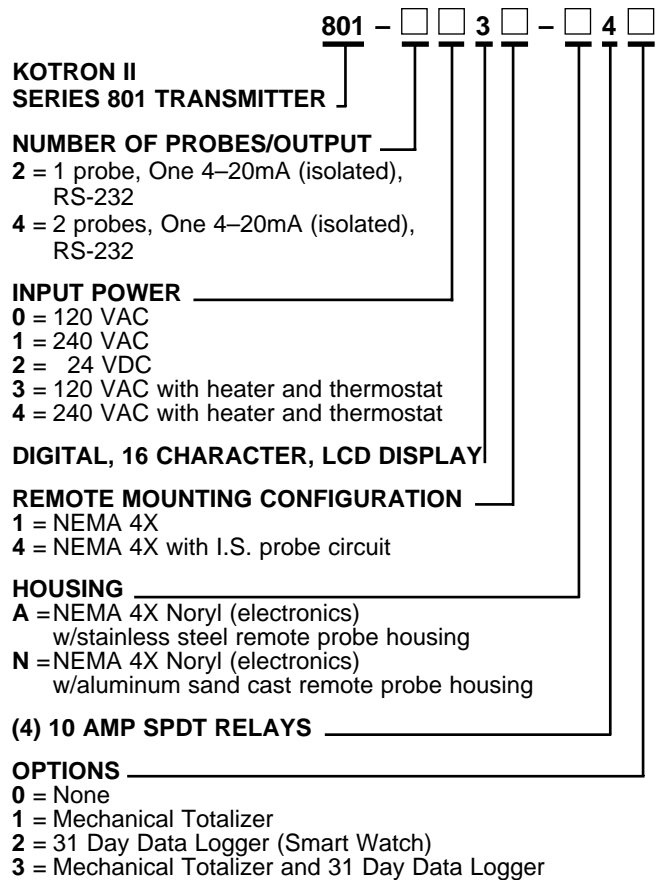## Instruction Manual and Parts List

TABLE OF CONTENTS

DESCRIPTION

The Kotron II Series 801 Transmitter is a new generation RF Capacitance transmitter that offers the user unparalleled power. The Series 801 can interface with two separate vessels, essentially making it a mini-multiplexer, while software mathematics allows for the *Sum* or *Difference* of the two signals.

MODEL IDENTIFICATION

Each Series 801 capacitance transmitter has a nameplate on which the model number of the unit is shown. The model number is coded to identify the options of that specific unit.

801 – ☐ ☐ 3 ☐ – ☐ 4 ☐

**KOTRON II
SERIES 801 TRANSMITTER**

NUMBER OF PROBES/OUTPUT
2 = 1 probe, One 4–20mA (isolated), RS-232
4 = 2 probes, One 4–20mA (isolated), RS-232

INPUT POWER
0 = 120 VAC
1 = 240 VAC
2 = 24 VDC
3 = 120 VAC with heater and thermostat
4 = 240 VAC with heater and thermostat

DIGITAL, 16 CHARACTER, LCD DISPLAY

REMOTE MOUNTING CONFIGURATION
1 = NEMA 4X
4 = NEMA 4X with I.S. probe circuit

HOUSING
A = NEMA 4X Noryl (electronics) w/stainless steel remote probe housing
N = NEMA 4X Noryl (electronics) w/aluminum sand cast remote probe housing

(4) 10 AMP SPDT RELAYS

OPTIONS
0 = None
1 = Mechanical Totalizer
2 = 31 Day Data Logger (Smart Watch)
3 = Mechanical Totalizer and 31 Day Data Logger

PRINCIPLE OF OPERATION

The amount of capacitance developed in any application is determined by the size (surface area) of the probe, the distance from the probe to its ground reference, and the dielectric constant of the medium being measured.

Considering that the probe's mounting position is fixed, and the dielectric value of the medium is constant, the amount of capacitance developed in any vessel becomes dependent upon the probe's diameter and length.

As a medium rises and falls in the tank, the amount of capacitance developed between the sensing probe and the ground reference also rises and falls. The Pulsatel circuit, mounted on the probe, changes the capacitance signal to a digital signal which can then be sent to the main electronics located up to 2500 feet (760 M) away.

INSTALLATION

CAUTION: Please read the entire installation section carefully prior to starting installation.

UNPACKING

Unpack the instrument carefully, making sure all components are removed from the packing material. Inspect the components for damage, and report any concealed damage to the carrier within 24 hours. Check the contents of the carton/crate against the packing slip and report any discrepancies to the factory. Check the nameplate model number, making sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

INSTALLATION LOCATION

Kotron II Series 801 transmitters should be located with easy access for service, calibration and monitoring. The electronics should not be exposed to ambient temperatures as follows: below -20° F (-29° C) without heater option; -40° F (-40° C) with heater option; or above +160° F (+71° C). Special precaution should be made to prevent exposure to corrosive atmosphere, excessive vibration, shock, or physical damage.

> *CAUTION: This unit contains CMOS electronics which may be damaged by static electricity. Do not touch any semi-conductor device unless you are properly grounded.*

It is common practice to use the metal tank wall as the ground reference. In such cases, it is required that the probe housing makes a good electrical connection to the tank wall. If there is any doubt about this connection or the use of PTFE thread tape, gaskets, paint, or rust impede this connection, a separate metal strap should be installed between the probe housing and the tank.

In non-conductive media, sensing probes should be located close to the tank wall for greatest sensitivity. Probes should be isolated from severe motion in the tank, because surface turbulence may cause signal deviation.

> *CAUTION: When an insulated probe is used in a hazardous and/or abrasive medium, the probe should be inspected annually for nicks, cuts or abrasions which may degrade the integrity of the insulation. In the event that wear is found, replace the probe or consult the factory for further instructions. This procedure is critical in vessels containing hazardous media unless an I.S. probe circuit is used.*

Metal Walled Tanks

On water based liquids, a problem should not be encountered with sensitivity or linearity. With non-conductive, low dielectric media, sensitivity can be enhanced by locating the probe close to and parallel with the tank wall. If this is not practical, a concentric ground tube surrounding the probe, (stilling well), may be a solution.

INSTALLATION LOCATION cont.

Tanks/Silos with Non-Conductive Materials of Construction

With plastic, concrete, wood, or any other non-conductive walled vessel, the reference electrode mentioned above needs clarification. Most commonly, this electrode will be in the form of a concentric ground tube (i.e. stilling well). In questionable circumstances, consult the factory. In all cases, a good electrical connection must be made between the ground surface and the probe housing.

NOTE: These comments also apply to glass-lined metal walled tanks.

Vertical Mounting

Vertically mounted probes should be installed so that the end of the probe rod is at least 2.00 inches (51 mm) below the lowest desired level control point with conductive materials, or 4.00 inches (102 mm) below the lowest desired level control point with non-conductive materials. Refer to Figure 1.
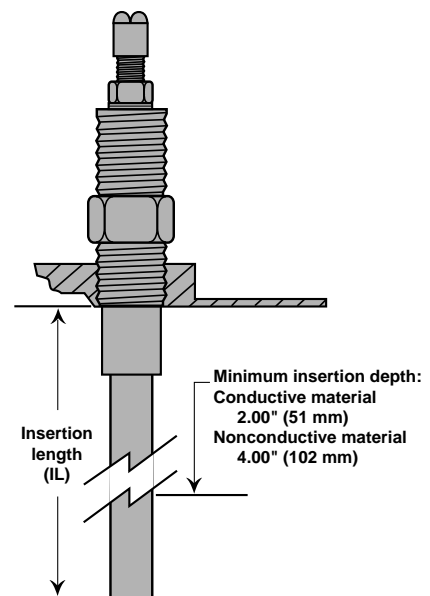

Minimum insertion depth:
Conductive material
2.00" (51 mm)
Nonconductive material
4.00" (102 mm)

Insertion length (IL)

Figure 1

Transmitter Mounting Location

The transmitter enclosure should be securely fastened to an appropriate supporting structure in a location that permits easy access for maintenance. Avoid locations that are exposed to direct sunlight, flooding, high levels of radiated electromagnetic interference, and excessive vibration or shock.

INSTALLATION cont.

MOUNTING PROCEDURE

Transmitter Mounting Procedure

There are two predrilled holes in the enclosure for connecting 3/4" NEMA 4X conduit; one for power and one for the remote probe wiring. Two additional holes may be drilled in the base as shown in Figure 2.
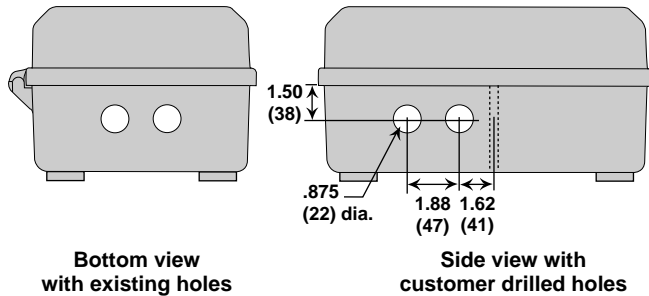

1.50 (38)

.875 (22) dia.

1.88 (47) **1.62 (41)**

Bottom view with existing holes

Side view with customer drilled holes

Figure 2

Transmitter Mounting Holes

1. Open the door of the unit.

2. Drill holes in the enclosure as required for additional wiring. Be careful not to damage the printed circuit boards. Be sure that the PC boards are not damaged or contaminated when removing filings and/or debris from the housing.

3. Provide watertight seals for all wiring entrances into the enclosure.

4. Mount the enclosure to a wall or flat surface using the appropriate screws or bolts. The mounting tabs on the back of the enclosure can be rotated to the sides, or top and bottom to facilitate mounting. Refer to Figure 3.
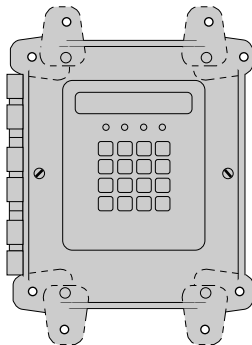

Figure 3

Transmitter Mounting Tabs

5. Install conduit for power and control wiring. Be sure all connections to the enclosure maintain a NEMA 4X rating

6. Close the transmitter door until it is time to wire the transmitter. Proceed to the Probe Mounting Procedure.

MOUNTING PROCEDURE cont.

Standard Rigid Probe

1. Thread probe into mounting bushing on tank.

2. Tighten securely being certain that the wrench is applied **ONLY** to the lower probe nut. Refer to Figure 4

3. Screw the preamplifier housing onto the probe. Refer to Figure 4.

4. Screw housing on probe until hand tight. Housing can be wrench tightened to align conduit connection with conduit.

5. Locate the white wire assembly on the printed circuit board. Connect the free end of this wire to the probe connection screw. Refer to Figure 4.

> *CAUTION:* Check probe terminal connection carefully to be certain lug will not short to packing gland or interfere with assembly of remote housing to probe.
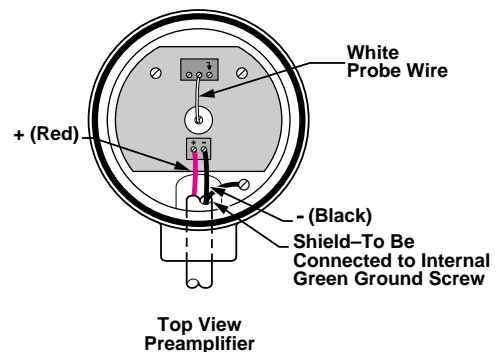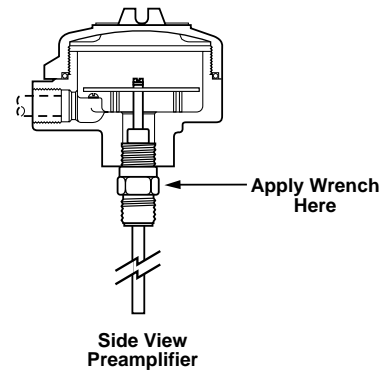
6. Proceed to Wiring Procedure on Page 5.

Apply Wrench Here

Side View Preamplifier

White Probe Wire

+ (Red)

– (Black)

Shield–To Be Connected to Internal Green Ground Screw

Top View Preamplifier

Figure 4

Standard Rigid Probe Mounting

INSTALLATION cont.

MOUNTING PROCEDURE cont.
Flexible Probe

*CAUTION: Flexible probes are shipped with the cable clamp and the probe nut hand tightened. The end of a flexible probe **MUST** be secured to the bottom of the tank by either attachment to a bracket or to a heavy weight in order to keep the probe taut. Follow the mounting instructions listed below.*

1. Remove mylar housing insulator located over the clamp.
2. Attach weight (if used) to probe end.

CAUTION: Do not discard the mylar housing insulator.

3. Insert probe end through tank mounting bushing and feed cable into the tank. Do not allow probe insulation to be damaged by scraping against the bushing threads.
4. Secure lower end of probe (or optional weight) to tank bracket if one is used.

CAUTION: Probe cable must not be in contact with anything metallic in its final installation position.

5. Apply thread sealant to mounting nut.
6. Screw mounting nut into tank bushing until tight.

NOTE: Do not allow the probe to fall in the tank while following steps 7 through 18.

*CAUTION: Apply wrench to lower probe nut only.*

7. Loosen both socket clamp screws.
8. Pull clamp and teflon retaining bushing off probe.
9. While holding probe cable, loosen upper probe nut.
10. Pull excess cable up through probe nuts until cable is taut.
11. Tighten the probe nuts.
12. Cut off cable 1.35 inches (34 mm) above top of upper probe nut and strip off 1.25 inches (32 mm) of insulation.
13. Slide teflon retaining bushing onto cable and seat it into the upper probe nut.
14. Slide clamp onto cable and seat it in the teflon retaining bushing.
15. Tighten both socket head clamp screws to approximately 35 in./lbs. torque.
16. Slip mylar housing insulator over clamp.

NOTE: Do not allow the probe to fall in the tank while following steps 7 through 18.

MOUNTING PROCEDURE cont.
Flexible Probe cont.

CAUTION: Check probe terminal connection carefully to be certain lug will not short to packing gland or interfere with assembly of remote housing to probe.

17. Screw housing onto probe and tighten. Make sure conduit connection is properly aligned for wire entry. Refer to Figure 5.
18. Locate the white wire on the upper printed circuit board. Connect the free end of this wire to the probe connection screw. Refer to Figure 5.
19. Proceed to Wiring Procedure on Page 5.

Side View Preamplifier

Top View Preamplifier
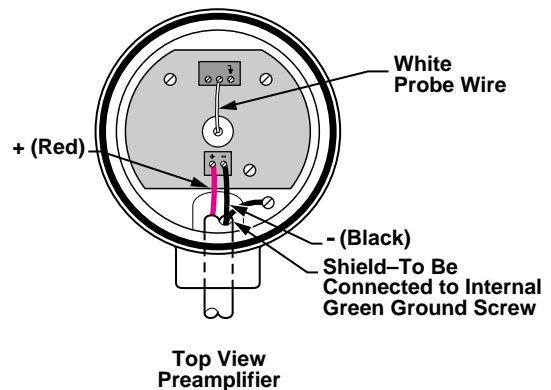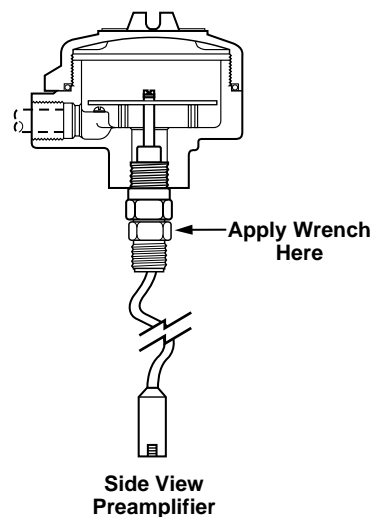
Figure 5
Flexible Probe Mounting

ELECTROSTATIC DISCHARGE (ESD) HANDLING PROCEDURE

Magnetrol's electronic instruments are manufactured to the highest quality standards. These instruments utilize electronic components which may be damaged by static electricity present in most work environments. The following steps are recommended to reduce the risk of component failure due to electrostatic discharge:

1. Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap board in aluminum foil. Do not place boards on foam packing materials.

2. Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is also recommended.

3. Handle printed circuit boards only by the edges. Do not touch components or connector pins.

4. Ensure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.
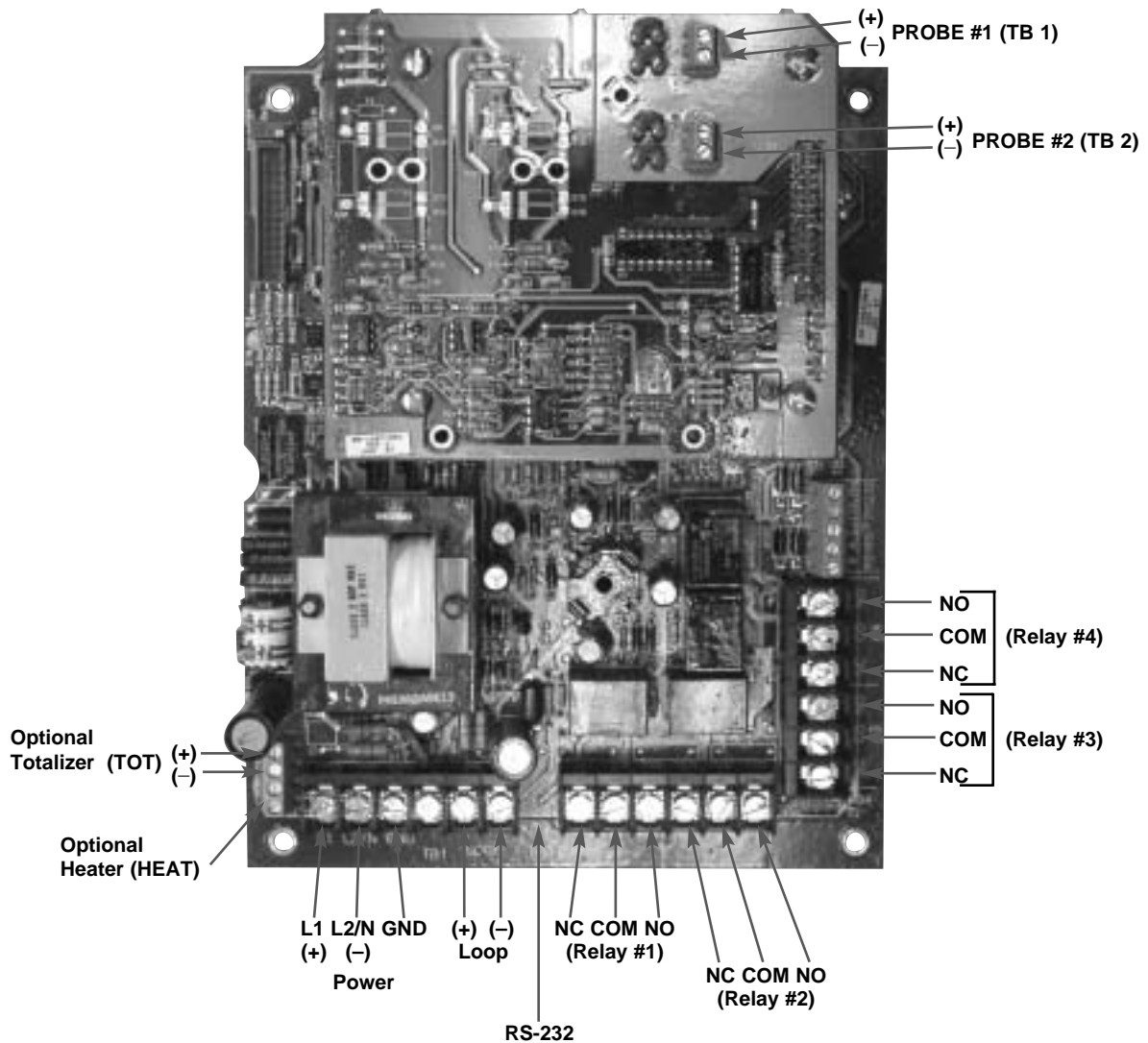
WIRING

**Figure 6
Mother/Daughter Board Assembly**

5

WIRING PROCEDURE

NOTE: Do NOT attempt to operate this unit at voltages other than as shown in the Model Identification as it may damage the unit.

> **CAUTION:** *This instrument is grounded through the grounding connector of terminal block TB1 of the mother board. The power input must include a ground wire connected to a good earth ground. Failure to ground the instrument may allow a shock hazard to exist!*

Transmitter Power Wiring

1. Open the cover of the transmitter enclosure by loosening the six screws.

2. The main PC board (mother) is marked for 120/240 VAC (L1, L2/N, GND) and 24 VDC (±) power connections. Ensure proper connections are made on these three terminals. Refer to Figure 6. Spade lugs should be used. For optimum operator safety, observe the wiring colors listed in Table 1.

	U.S.	**Europe**	**U.K.**
Line 1 (HI)	Black	Blue	Brown
Line 2 Neutral	White	Black	Blue
Ground	Green/Yellow	Green/Yellow	Green/Yellow

Wiring Colors By Country/Continent
Table 1

3. 16 AWG or 18 AWG stranded wire is recommended for connection of power and control circuits.

4. Proceed to the Probe Preamplifier Wiring Section.

Power Wiring

1. Make sure power source is turned off.

2. Pull power supply wires through transmitter conduit connection.

3. Connect the positive supply wire to the (L1) terminal, the negative (neutral) supply wire to the (L2/N) terminal on the transmitter, and the ground wire to the (GND) terminal. Refer to Figure 6 on page 5.

4. Dress the wires together neatly and securely with cable ties.

OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES.

Relay Wiring

Refer to Figure 6 on page 5 for terminal locations.

NOTES:

1. Relay 3 can be dedicated as a diagnostic alarm. (See calibration section of the manual for the proper use of this relay).

2. Equipment controlled by the Kotron relays is assumed to be powered from one source, while the Kotron unit itself is assumed to be powered from a different source.

3. "Fail" means a loss of power to the Kotron unit.

4. a. When the relay coil is de-energized, a connection is made between the terminals CM (common) and NC (normally closed), and there is no connection between CM and NO (normally open).

   b. When the relay coil is energized, a connection is made between the terminals CM and NO, and there is no connection between CM and NC.

Probe Preamplifier Wiring

To connect the preamplifier to the transmitter, use a shielded twisted pair of 22 gauge stranded conductors (Magnetrol P/N 009-7146-001).

Transmitter Wiring

Output Wiring

Connect 4–20 mA output wiring to (+) and (−) terminals of TB1 on the main printed circuit board. Refer to Figure 6. Ensure proper polarity by connecting red wire to (+) terminal and black wire to (−) terminal. The shield should be connected to earth ground to ensure proper noise immunity.

UNIT CONFIGURATION

GENERAL CONFIGURATION INSTRUCTIONS

The Kotron II Series 801 capacitance transmitter contains a microprocessor-based operator interface which allows for easy configuration of level, flow or volume control applications. These features are built into the transmitter and are entered via a keypad located on the front of the unit.

This operator interface and the instructions for the Unit Configuration are broken down into six main groups of menus, as follows:

MEASURED VALUES   To view measured values

SYSTEM CONFIG   First time configuration (Essential programming information for measurements)

I/O CONFIG   Configure input/output functions

ADVANCED CONFIGURATION   Values that affect the units performance

DIAGNOSTICS   Test functions

LAPTOP   Download data log to Lap Top computer. (With optional Data Logger only)

Passwords

The Series 801 transmitter has two types of passwords that can be used to protect configuration parameters. They are as follows:

GENERAL PASSWORD – The General Password is used for the **I/O Config** portion of the Menu Structure (except for probe lo/probe hi). Any time a change is made to parameters in this menu, ie. 4–20 mA, relays, etc., the Series 801 will prompt the operator to enter a password. This password can be any one to six character numeric combination that is easy for the operator to remember.

SUPERVISORY PASSWORD – The Supervisory Password is used for the **System Config** and the **Calibration** portion of the Menu Structure (and probe lo/probe hi). This password is used to protect values that can affect the performance and/or accuracy of the device.

NOTE: Although the Supervisory Password is normally used in the System Config and the Calibration menus, this password can also be used in any portion of the menus. The Supervisory Password overrides the General Password.

The Passwords can be changed at any time via the Calibration mode.

If an invalid password is entered into the 801, the display will read **PASSWORD INVALID**. By pressing the DEL key three times, the unit will return to the normal run mode and continue to operate with the previous programmed parameters. **Please enter the programmed password below for future reference.**

> *CAUTION: The Series 801 is shipped from the factory with the password 0801. If the programmed password is misplaced or forgotten, please consult the factory for assistance.*

Password   ☐ ☐ ☐ ☐ ☐ ☐

GENERAL CONFIGURATION INSTRUCTIONS cont.

Operator keypad

All Unit Configuration instructions in this manual will show the local transmitter display exactly as it will appear to the operator on the Series 801.

The operator interface to the 801 is via a keypad consisting of the following keys:

Key	Function
$\boxed{0}$ – $\boxed{9}$	For numeric entry of parameters
$\boxed{.}$	For decimal numeric entries
$\boxed{\text{DEL}}$	To exit any programming area and return to the measurement mode
$\boxed{\text{ENT}}$	For storing new parameter values into memory. Also used to exit the parameter entry mode, if pressed prior to entering numeric parameter values
$\boxed{\uparrow}$ $\boxed{\downarrow}$	To sequentially access other parameter procedures. In addition, parameters may be skipped over without affecting their stored values
$\boxed{\text{2ND}}$	To change the display scrolling speed when entering text

All values for Parameter Entry procedures follow the trans action flow below:

FIRST LEVEL PROGRAMMING MENUS
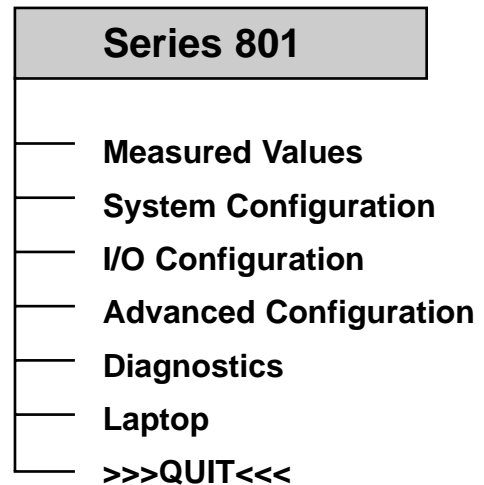
Series 801

- **Measured Values**
- **System Configuration**
- **I/O Configuration**
- **Advanced Configuration**
- **Diagnostics**
- **Laptop**
- **>>>QUIT<<<**

UNIT CONFIGURATION cont.

NOTE: Prior to programming, it is suggested that the installation is reviewed and all data such as **probe lo** and **probe hi** points, desired **units of measurement, 4–20 mA settings,** and **relay set points** are written down to aid in the programming.

SERIES 801 MAIN MENU STRUCTURE
SINGLE PROBE OPERATION

Series 801

Measured Values
Level
Volume (Volume mode only)
Flow (Flow mode only)
Totalizer (Flow mode only)
Loop
Calculation
View Data Log
Previous Menu

System Configuration
Unit Operation
Level Units
Mode Setup
    Level Only
        Level Limit
        Probe Lo Point
        Probe Hi Point
        Previous Menu
    Volume & Level
        Vessel Type
        Volume Units
        Level Limit
        Probe Lo Point
        Probe Hi Point
        Previous Menu
    Flow & Level
        Flow Element
        Flow Units
        Low Flow Cutoff
        Level Limit
        Probe Lo Point
        Probe Hi Point
        Previous Menu

I/O Configuration
Relay Settings
4–20 mA Settings
Totalizer (Flow mode only)
Comm Port Setup
Previous Menu

Advanced Configuration
Damping
Set Clock
Enter Tag
Default Display
Calculation
Change Password
Change Sup Password
Previous Menu

Diagnostics
Test Relays
Test 4–20 mA Loop
Signal Values
View Version #
Extended Errors
Init Probes
Previous Menu

Laptop
STRT
END

>>>QUIT<<<

UNIT CONFIGURATION cont.

NOTE: Prior to programming, it is suggested that the installation is reviewed and all data such as **probe lo** and **probe hi** points, desired **units of measurement, 4–20 mA settings,** and **relay set points** are written down to aid in the programming.

SERIES 801 MAIN MENU STRUCTURE
DUAL PROBE OPERATION

Series 801

Measured Values

Probe 1 Select
       P1 Level
       P1 Volume (Volume mode only)
       P1 Flow (Flow mode only)
       Previous Menu
Probe 2 Select
       P2 Level
       P2 Volume (Volume mode only)
       P2 Flow (Flow mode only)
       Previous Menu
Totalizer (Flow mode only)
Loop
Calculation
View Data Log
Previous Menu

System Configuration

Unit Operation
Probe 1 Select
       Level Only
       Level Units
       Mode Setup
       Level Limit
       Probe Lo Point
       Probe Hi Point
       Previous Menu
       Volume & Level
       Level Units
       Mode Setup
       Vessel Type
       Volume Units
       Level Limit
       Probe Lo Point
       Probe Hi Point
       Previous Menu
       Flow & Level
       Level Units
       Mode Setup
       Flow Element
       Flow Units
       Low Flow Cutoff

System Configuration cont.

Probe 1 Select cont.
       Flow & Level cont.
       Level Limit
       Probe Lo Point
       Probe Hi Point
       Previous Menu
Probe 2 Select — Same as Probe 1 Select

I/O Configuration

Relay Settings
4–20 mA Settings
Totalizer (Flow mode only)
Comm Port Setup
Previous Menu

Advanced Configuration

Damping
Set Clock
Enter Tag
Default Display
Calculation
Change Password
Change Sup Password
Previous Menu

Diagnostics

Test Relays
Test 4–20 mA Loop
Signal Values
View Version #
Extended Errors
Init Probes
Previous Menu

Laptop

STRT
END

>>>QUIT<<<

UNIT CONFIGURATION cont.

NOTE: Prior to programming, it is suggested that the installation is reviewed and all data such as **probe lo** and **probe hi** points, desired **units of measurement, 4–20 mA settings,** and **relay set points** are written down to aid in the programming.

SERIES 801 MAIN MENU STRUCTURE
DIFFERENCE OR SUM OPERATION

Series 801

Measured Values
Probe 1 Select
  P1 Level
  P1 Volume (Volume mode only)
  P1 Flow (Flow mode only)
  Previous Menu
Probe 2 Select
  P2 Level
  P2 Volume (Volume mode only)
  P2 Flow (Flow mode only)
  Previous Menu
Comb. Level
Comb. Volume (Volume mode only)
Comb. Flow (Flow mode only)
Totalizer (Flow mode only)
Loop
Calculation
View Data Log
Previous Menu

System Configuration
Unit Operation
Level Units
Mode Setup
Volume Units (Volume mode only)
Flow Units (Flow mode only)
Probe 1 Select
  Level Only
  Level Limit
  Probe Lo Point
  Probe Hi Point
  Previous Menu
  Volume & Level
  Vessel Type
  Level Limit
  Probe Lo Point
  Probe Hi Point
  Previous Menu
  Flow & Level
  Flow Element
  Low Flow Cutoff

System Configuration cont.
Probe 1 Select cont.
  Flow & Level cont.
  Level Limit
  Probe Lo Point
  Probe Hi Point
  Previous Menu
Probe 2 Select — Same as Probe 1 Select

I/O Configuration
Relay Settings
4–20 mA Settings
Totalizer (Flow mode only)
Comm Port Setup
Previous Menu

Advanced Configuration
Damping
Set Clock
Enter Tag
Default Display
Calculation
Change Password
Change Sup Password
Previous Menu

Diagnostics
Test Relays
Test 4–20 mA Loop
Signal Values
View Version #
Extended Errors
Init Probes
Previous Menu

Laptop
STRT
END

>>>QUIT<<<

UNIT CONFIGURATION cont.

MEASURED VALUES MENU

This menu is used to view present values being measured in the Series 801. The menu layout is shown below.

> ## Series 801

Measured Values

    Level
            Present measurement
    Volume (Volume mode only)
            Present measurement
    Flow (Flow mode only)
            Present measurement
    Totalizer (Flow mode only)
            Present measurement
    Loop
            Present measurement
    Calculation
            Present measurement
    View Data Log
            Present measurement
    Previous Menu

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to view the *Measured Values* menu. **Measured Values** and the **UP/DOWN** arrows will be displayed.

To view the Measured Values - Press ENT at the **Measured Values** display. **Level** will be displayed if level mode has been selected. (**Level or Volume** can be displayed if volume mode has been selected. **Level, Flow or Totalizer** can be displayed if flow mode has been selected).

To view the Present Measurement - Press ENT. After reviewing, press ENT to return to **Level, Volume** (Volume Mode Only) or **Flow** (Flow Mode Only).

To scroll down to the next Measured Value - Press the DOWN arrow. Pressing the UP arrow scrolls up the menu. Press ENT at any measured value that you wish to review.

If you do not wish to view the measured values at this time, press DEL up to three times from anywhere in the display and the unit will return to the default display. Pressing ENT at **Previous Menu** display, will cause the unit to return to **Measured Values**.

UNIT CONFIGURATION cont.

Level Measurement

This menu is used to configure the main control parameters of the Series 801 for level measurement.

For the purposes of this manual, and to become familiar with the configuration parameters of this unit, all instructions will be shown. It is important to note that once in the System Config menu, you may scroll through the selections by using the UP or DOWN arrows. Once the desired selection is displayed, press ENT. The unit is capable of being configured in three different modes of operation.

- **Level Only**
- **Volume & Level**
- **Flow & Level**

The menu layout for **Level Measurement** is shown below.

> ## Series 801

Measured Values

System Config - Level Measurement

> **Unit Operation**
> **Level Units**
> **Mode Setup**
> **Level Limit**
> **Probe Lo Point**
> **Probe Hi Point**
> **Previous Menu**

> ### *Unit Operation*
> **Single Probe**
> **Dual Probe**
> **Difference (1-2)**
> **Summing (1+2)**

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to display **Measured Values**. Press the DOWN arrow to display **System Config**.

Press ENT once again to enter the System Config Menu and to display **Unit Operation**. Press ENT to display the present configuration. Use the UP or DOWN arrow to scroll through the options. When the desired selection is displayed, press ENT to store the value. If the mode selection has been changed, a warning will appear:

WARNING This mode change WILL erase ALL settings! Confirm change by pressing <9> will be displayed if the selection has been changed. Press <9> to confirm.

Supr Password? will be displayed and your chosen password must be entered at this time. The unit will display the next menu item.

> ### *Level Units*
> **Inches**
> **Feet**
> **Centimeters**
> **Meters**

Press ENT once again to enter System Config and to display **Level Units**. Press ENT to display the present units of measurement. Use the UP or DOWN arrow to scroll through units of measurement. When the desired selection is displayed, press ENT to store the value. **Password?** will be displayed if the selection has been changed and your chosen password must be entered at this time. Press ENT to display the next menu item - **Mode Setup.**

Refer to Page 7 on selection of a General or Supervisory Password.

> ### *Mode Set Up*
> **Level Only**
> **Volume & Level**
> **Flow & Level**

With **Mode Set Up** displayed, press ENT to display the present mode. Scroll UP or DOWN until the desired mode is displayed. Press ENT. If the mode selection has changed, a warning will appear:

WARNING This mode change WILL erase ALL settings! Confirm change by pressing <9> will be displayed if the selection has been changed. Press <9> to confirm.

Supr Password? will be displayed and your chosen password must be entered at this time. The unit will display the next menu item – **Level Limit**.

Press ENT to display the maximum level possible in the present units of measurement. Press ENT to display the next menu item – **Probe Lo Point.**

NOTES:
1. The Probe Lo and Probe Hi points are the most critical in the calibration procedure. Be sure of the values before they are entered.
2. The media level must be moved to accomplish this procedure. The Probe Lo and Probe Hi points can be entered in any order and can be easily changed in the future when the process level is at a much higher or lower point.
3. A minimum level change of two percent (2%) of tank height (or 5pF, whichever is greater) will yield a valid calibration. However, a large change yields better accuracy..
4. The unit will automatically "time out" and revert back to the Default Display after four minutes if without a keystroke. Any information already entered will remain in memory. Simply reenter the System Config section and enter any remaining data.

UNIT CONFIGURATION cont.
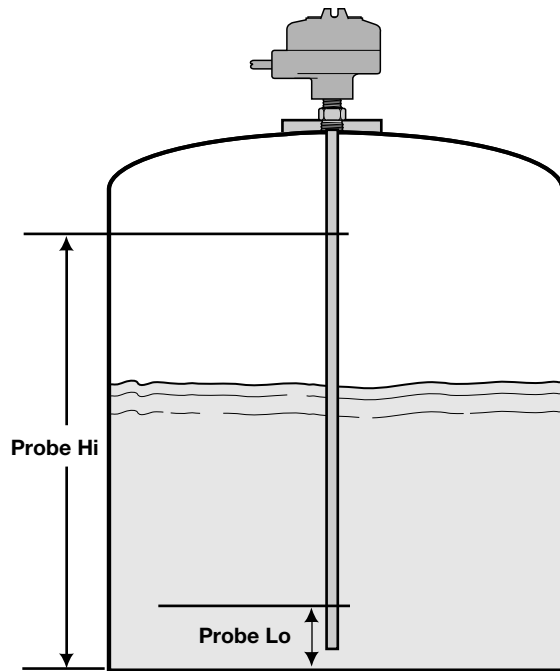
SYSTEM CONFIG MENU cont.

Level Measurement cont.

Press ENT to display current **Probe Lo** value. Enter the exact low level of the process medium. Use proper level units (inches, centimeters, etc.) previously selected. When the desired value is displayed, press ENT to store the value. **Supr Password?** will be displayed if the selection is changed. Enter your **Supr Password** at this time. Press ENT to accept the password and to display **Probe Hi Point.**

Move medium to a high point in the tank or simulate the level change by moving the probe. Press ENT to display current **Probe Hi** value. Enter the exact level of the process medium. Use proper level units (inches, centimeters, etc.) previously selected. When the desired value is displayed, press ENT to store the value. **Supr Password?** will be displayed if the selection is changed. Enter your **Supr Password** at this time. Press ENT to accept the password and to display **Previous Menu.**

If the application utilizes two probes (dual probe, difference, or summing) continue to the calibration of **Probe 2**. Press ENT to display **Probe 2 Select.** Press ENT to display **Level Units** and begin calibration of Probe 2. Enter all values for Level Units, Mode Setup, Probe Lo, and Probe Hi points.

System Configuration is now complete. Proceed to I/O Configuration on Page 20 to continue Unit Configuration.
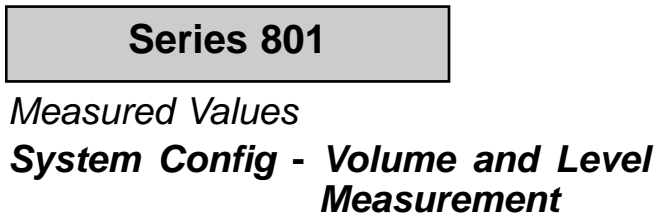
UNIT CONFIGURATION cont.

Volume and Level Measurement

This menu is used to configure the main control parameters of the Series 801 for volume and level measurements.

For the purposes of this manual and to become familiar with the configuration parameters of this unit, all instructions will be shown. It is important to note that once in the System Config menu, you may scroll through the selections by using the UP or DOWN arrow. Once the desired selection is displayed, press ENT. The unit is capable of being configured in three different modes of operation.

- **Level Only**
- **Volume & Level**
- **Flow & Level**

The menu layout for **Volume and Level Measurement** is shown below.

Series 801

Measured Values

System Config - Volume and Level Measurement

| Unit Operation |
| Level Units |
| Mode Setup |
| Vessel Type |
| Volume Units |
| Level Limit |
| Probe Lo Point |
| Probe Hi Point |
| Previous Menu |

Unit Operation

| Single Probe |
| Dual Probe |
| Difference (1-2) |
| Summing (1+2) |

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to display **Measured Values**. Press the DOWN arrow to display **System Config**.

Press ENT once again to enter System Config and to display **Unit Operation**. Press ENT to display the present configuration. Use the UP or DOWN arrow to scroll through the options. When the desired selection is displayed, press ENT to store the value. If the mode selection has changed, a warning will appear:

WARNING This mode change WILL erase ALL settings! Confirm change by pressing <9> will be displayed if the selection has been changed. **Press <9> to confirm.**

Supr Password? will be displayed and your chosen password must be entered at this time. The unit will display the next menu item - **Level Units**.

Level Units

| Inches |
| Feet |
| Centimeters |
| Meters |

Press ENT once again to enter System Config and to display **Level Units**. Press ENT to display the present units of measurement. Use the UP or DOWN arrow to scroll through units of measurement. When the desired selection is displayed, press ENT to store the value. **Password?** will be displayed if the selection has been changed and your chosen password must be entered at this time. The unit will display the next menu item – **Mode Setup**.

Refer to Page 7 on selection of a General or Supervisory Password.

Mode Set Up

| Level Only |
| Volume & Level |
| Flow & Level |

With **Mode Set Up** displayed, press ENT to display the present mode. Scroll UP or DOWN until the desired mode is displayed. Press ENT. If the mode selection is changed, a warning will appear:

WARNING This mode change WILL erase ALL settings! Confirm change by pressing <9> will be displayed if the selection has been changed. **Press <9> to confirm.**

Supr Password? will be displayed and your chosen password must be entered at this time. The unit will display the next menu item - **Vessel Type**.

Volume and Level

| Vessel Type |
| Horiz/Flat |
| Horiz/Elipp. |
| Horiz/Sphere |
| Verti/Flat |
| Verti/Conical |
| Spherical |
| Custom Table |

With **Vessel Type** displayed, press ENT to display the present selection. Use the UP or DOWN arrow to scroll through the **Vessel Type** selections. When the desired vessel is displayed, press ENT.

Enter the values needed to define the vessel parameters (ie. length, height, radius, end radius, cone, etc.). Refer to detailed vessel drawings on Page 15 for definitions.

NOTE: For Horiz/Elipp tanks, when **END** is displayed, enter the value for one end of vessel only.

When the necessary parameters are entered, the unit will display the next menu item - **Volume Units**.

UNIT CONFIGURATION cont.

Volume and Level Measurement - Vessel Drawings

Len

Side View

Horizontal/Spherical

Ht

Rad

Top View

Vertical/Flat

Rad

Side View

Len

Horizontal/Flat

Ht

Con

Rad

Top View

Vertical/Conical

Len

End

Horizontal/Elliptical

Rad

Side View

Rad

Spherical

15
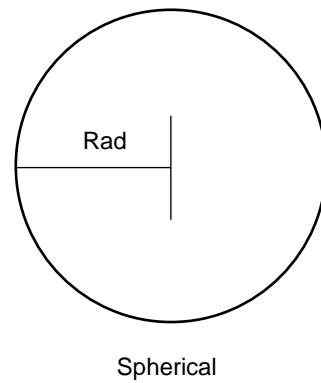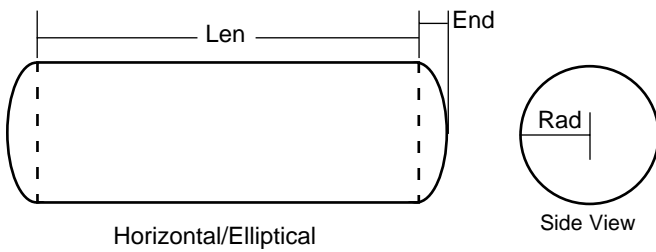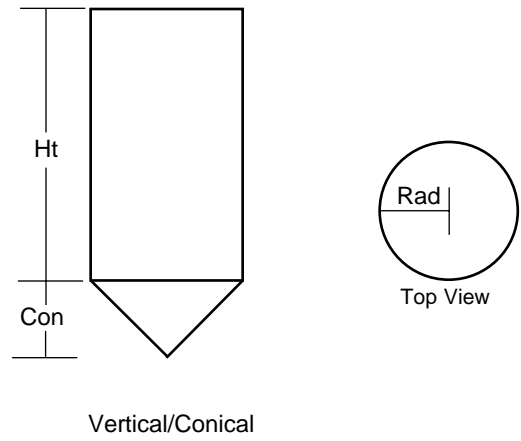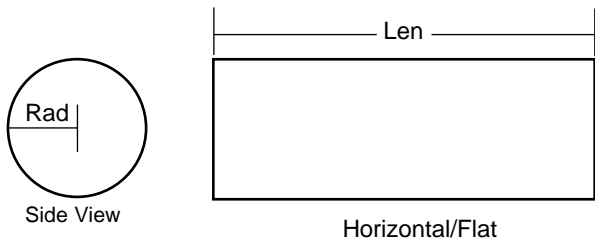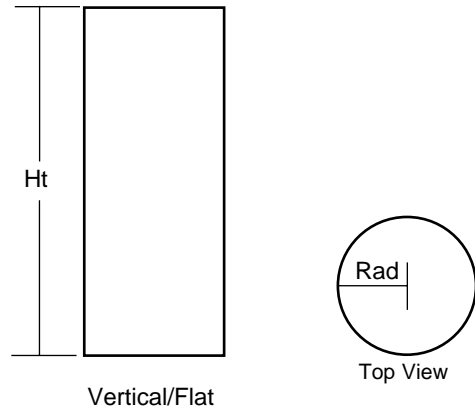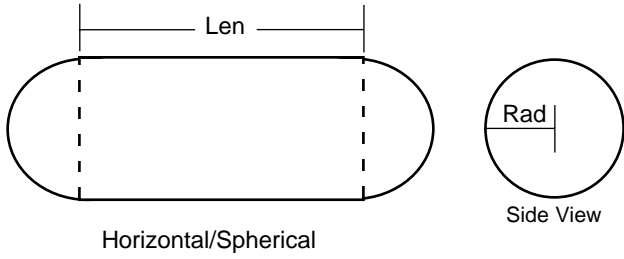
SYSTEM CONFIG MENU cont.

Custom Table

If a custom table is selected, **Password?** will be displayed. Enter password and **Table Name** will be displayed. Press ENT and the present name will appear on the display. Press the 2nd key to start the left value/letter scrolling. If a faster scrolling speed is desired, press 2nd again. Make the selection by pressing ENT to lock in the first letter/value designation of the Table name. Press ENT once again to proceed to the next character. Perform the same steps as stated above. When completed, press ENT and the display will read **Max. Table Span**. Enter the maximum span in the units of measurement selected. **Max. Table Value** will then be displayed. Enter the maximum value in the customer conversion/strapping table. **Table Units** will be displayed. Enter via the 2nd key in any units. Press ENT and display reads **ENTER TABLE PTS**. Press ENT again to read **00%**: Begin entering percent of volume for each % of height displayed in 2% steps. Table is complete after all 51 points are entered. After entering the points in the table, **Previous Menu** is displayed. Press ENT to continue to **Volume Units**.

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item – **Volume Units.**

Volume Units

Cubic Feet
Gallons
Million Gallons
Cubic Meters
Liters
Million Liters
Petroleum Barrel

With **Volume Units** displayed, press ENT to display the selected units. Scroll to the desired **Volume Units** and press ENT. If the mode selection has changed, a warning will appear:

WARNING This mode change WILL erase ALL settings! Confirm change by pressing <9> will be displayed if the selection has been changed. Press <9> to confirm.

Supr Password? will be displayed and your chosen password must be entered at this time. The unit will display the next menu item – **Level Limit**.

Press ENT to display the maximum level possible in the present units of measurement. Press ENT to display the next menu item – **Probe Lo.**

Refer to Page 7 on selection of a General or Supervisory Password.

SYSTEM CONFIG MENU cont.

NOTES:

1. The Probe Lo and Probe Hi points are the most critical entries in the calibration procedure. Be sure of the values before they are entered.
2. The media level must be moved to accomplish this procedure. The Probe Lo and Probe Hi points can be entered in any order and can be easily changed in the future when the process level is at a much higher or lower point.
3. A minimum level change of two percent (2%) of tank height (or 5pF, whichever is greater) will yield a valid calibration. However, a large change yields better accuracy.
4. The unit will automatically "time out" and revert back to the Default Display after four minutes if without a keystroke. Any information already entered will remain in memory. Simply reenter the System Config. section and enter any remaining data.

Press ENT to display current **Probe Lo** value. Enter the exact low level of the process medium. Use proper level units (inches, centimeters, etc.) previously selected. When the desired value is displayed, press ENT to store the value. **Supr Password?** will be displayed if the selection is changed. Enter your **Supr Password** at this time. Press ENT to accept the password and to display **Probe Hi.**

Move medium to a high point in the tank or simulate the level change by moving the probe. Press ENT to display current **Probe Hi** value. Enter the exact level of the process medium. Use proper level units (inches, centimeters, etc.) previously selected. When the desired value is displayed, press ENT to store the value. **Supr Password?** will be displayed if the selection is changed. Enter your **Supr Password** at this time. Press ENT to accept the password and to display **Previous Menu.**

If the application utilizes two probes (dual probe, difference, or summing) continue to the calibration of **Probe 2**. Press ENT to display **Probe 2 Select.** Press ENT to display **Level Units** and begin calibration of Probe 2. Enter all values for Level Units, Mode Setup, Probe Lo, and Probe Hi points.

System Configuration is now complete. Proceed to I/O Configuration on Page 20 to continue Unit Configuration.

UNIT CONFIGURATION cont.

Flow and Level Measurement

This menu is used to configure the main control parameters of the Series 801 for flow and level measurements.

For the purposes of this manual and to become familiar with the configuration parameters of this unit, all instructions will be shown. It is important to note that once in the System Config menu, you may scroll through the selections by using the UP or DOWN arrow. Once the desired selection is displayed, press ENT. The unit is capable of being configured in three different modes of operation.

- **Level Only**
- **Volume & Level**
- **Flow & Level**

The menu layout for **Flow and Level Measurement** is shown below.

Series 801

Measured Values
System Config - Flow and Level Measurement

Unit Operation
Level Units
Mode Setup
Flow Element
Flow Units
Low Flow Cutoff
Level Limit
Probe Lo Point
Probe Hi Point
Previous Menu

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to view the **Measured Values** menu. Press DOWN arrow to display **System Config.**

Press ENT once again to enter the System Config menu and to display **Unit Operation**. Press ENT to display the present configuration. Use the UP or DOWN arrow to scroll through the options. When the desired selection is displayed, press ENT to store the value. If the mode selection has changed, a warning will appear:

WARNING This mode change WILL erase ALL settings! Confirm change by pressing <9> will be displayed if the selection has been changed. Press <9> to confirm.

Supr Password? will be displayed and your chosen password must be entered at this time. The unit will display the next menu item

---

Level Units

Inches
Feet
Centimeters
Meters

Please refer to the above menu layout for the configuration instructions below.

Press ENT once again to enter System Config and to display **Level Units**. Press ENT to display the present units of measurement. Use the UP or DOWN arrow to scroll through units of measurement. When the desired selection is displayed, press ENT to store the value. **Password?** will be displayed if the selection has been changed and your chosen password must be entered at this time. The unit will display the next menu item – **Mode Setup.**

Mode Set Up

Level Only
Volume & Level
Flow & Level

With **Mode Set Up** displayed, press ENT to display the present mode. Scroll UP or DOWN until the desired mode is displayed. Press ENT. If the mode selection has been changed, a warning will appear:

WARNING This mode change WILL erase ALL settings! Confirm change by pressing <9> will be displayed if the selection has been changed. Press <9> to confirm.

Supr Password? will be displayed and your chosen password must be entered at this time. The unit will display the next menu item - **Flow Element**.

Flow and Level

Flow Element		
	V-notch	22.5°
		30°
		45°
		60°
		90°
		120°
	Parshall	1"
		2"
		3"
		6"
		9"
		12"
		18"
		24"
		36"
		48"
		60"
		72"
		96"
		120"
		144"

UNIT CONFIGURATION cont.

Flow and Level

Flow Element cont.

Rectangular/End Contractions (Rct/Cntr)

Rectangular

Cipolletti

Palmer Bowlus 4"

6"

8"

10"

12"

15"

18"

21"

24"

27"

30"

H-Flume   6"

9"

12"

18"

24"

30"

36"

54"

Custom Table

With **Flow Element** displayed, press ENT to display the selection. Use the UP or DOWN arrow to scroll through the **Flow Element** selections. When the desired flow element is displayed, press ENT.

If the flow element is changed, **Password?** will be displayed and your chosen password must be entered at this time. The unit will display the next menu item - **Flow Units**.

NOTE: If the Rectangular/End Contractions, Rectangular or Cipolletti is selected, the unit will prompt the user for the width of the flow element.

If the flow element for your application is not in the menu. select the custom table to configure a 51 point strapping table. Press ENT on display of Custom Table. Your password will be required, then **Table Name** will be displayed. Press ENT and input the table name via 2nd key. Refer to Page 16 for volume custom table configuration. Press ENT and read **Max. Table Span**. Press ENT and key in maximum span level. Press ENT once again and read **Max Table Value** and press ENT. Key in desired Max. table value (usually equal to the 100% value) and press ENT. **Table Units** will appear. Key in any appropriate units and press ENT. Input 51 points in the strapping table and press ENT. Refer to Page 16, Custom Table Entry for volume mode, for more information about the Custom Table Entry.

Flow Units

Cubic Feet/Sec

Cubic Feet/Min

Cubic Feet /Hr

Gallons/Min

Gallons/Hr

Million Gals/Day

Cubic Meters/Sec

Cubic Meters/Min

Cubic Meters/Hr

Liters/Min

Liters/Hour

MegaLiters/Day

With Flow Units displayed, press ENT to display the selections. Use the UP or DOWN arrow to scroll through the Flow Units. When the desired flow unit is displayed, press ENT. The unit will display the next menu item - **Low Flow Cutoff.**

Flow and Level

Low Flow Cutoff

Cut __

With **Low Flow Cutoff** displayed, press ENT to display Cut.

Low Flow Cutoff is the low level cutoff value in the chosen units of level. This will force a zero flow value when the level is at or below this **Low Cutoff Value**. Enter the value and press ENT. **Password?** will be displayed and your chosen password must be entered at this time. The unit will display the next menu item – **Level Limit.**

Press ENT to display the maximum level possible in the present units of measurement. Press ENT to display the next menu item – **Probe Lo.**

NOTES:
1. The Probe Lo and Probe Hi points are the most critical entries in the calibration procedure. Be sure of the values before they are entered.
2. The media level must be moved to accomplish this procedure. The Probe Lo and Probe Hi points can be entered in any order and can be easily changed in the future when the process level is at a much higher or lower point.
3. A minimum level change of two percent (2%) of flume flow (or 5pF, whichever is greater) will yield a valid calibration, however, a large change yields better accuracy.
4. The unit will automatically "time out" and revert back to the Default Display after four minutes if without a keystroke. Any information already entered will remain in memory. Simply reenter the System Config. section and enter any remaining data.

SYSTEM CONFIG MENU cont.

Flow and Level Measurement cont.

Press ENT to display current **Probe Lo** value. Enter the exact low level of the process medium. Use proper level units (inches, centimeters, etc.) previously selected. When the desired value is displayed, press ENT to store the value. **Supr Password?** will be displayed if the selection is changed. Enter your **Supr Password** at this time. Press ENT to accept the password and to display **Probe Hi.**

Move medium to a high point in the tank or simulate level change by moving the probe. Press ENT to display current **Probe Hi** value. Enter the exact level of the process medium. Use proper level units (inches, centimeters, etc.) previously selected. When the desired value is displayed, press ENT to store the value. **Supr Password?** will be displayed if the selection is changed. Enter your **Supr Password** at this time. Press ENT to accept the password and to display **Previous Menu.**

If the application utilizes two probes (dual probe, difference, or summing) continue to the calibration of **Probe 2**. Press ENT to display **Probe 2 Select.** Press ENT to display **Level Units** and begin calibration of Probe 2. Enter all values for Level Units, Mode Setup, Level Limit, Probe Lo, and Probe Hi points.

System Configuration is now complete. Proceed to I/O Configuration on Page 20 to continue Unit Configuration.
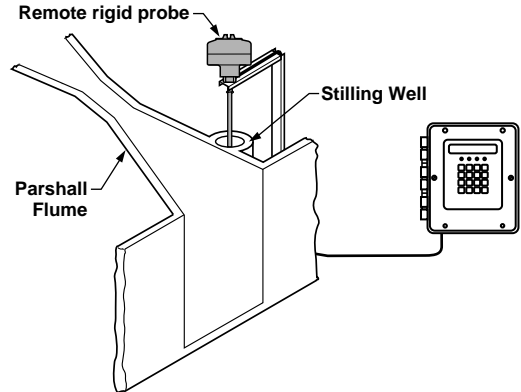
UNIT CONFIGURATION cont.

I/O CONFIGURATION MENU

This menu is used to configure relay settings, 4–20 mA current output, totalization, and communications parameters of the Series 801. The relays and 4–20 mA output can be set to control from Probe 1 (single probe), Probe 1 or Probe 2 (dual probes), or the combined signals of Probe 1 and 2 (difference or summing).

All relays can be configured for normal mode of action. (ie. high or low alarm). However the unit can be configured for dedicated relay use as follows:

Relay 1	Normal
Relay 2	Normal or Lead/Lag Pump Alternation (Used with Relay 1)
Relay 3	Normal or Dedicated Fault
Relay 4	Normal or Sampler Contact

Series 801

Measured Values

System Config

I/O Config

> **Relay Settings**
> **4–20 mA Settings**
> **Totalizer (Flow Mode Only)**
> **Comm Port Set up**
> **Previous Menu**

> ### *Relay Settings – Relays*
>
> **Control w/Probe 1**
> **(Dual Probes, Difference, and Summing Modes Only)**
>
> **Control w/Probe 2**
> **(Dual Probes, Difference, and Summing Modes Only)**
>
> **Control w/Probe 1 & 2**
> **(Difference and Summing Modes Only)**
>
> **Disabled**
>
> **Enabled**
>
> **SetPoint**   **LEVEL**
>   **VOLUME (Volume Mode Only)**
>   **FLOW (Flow Mode Only)**
>   **ON Setpoint**
>   **OFF Setpoint**
>   **ON Delay**
>   **OFF Delay**
>   **Fail-safe OFF**
>   **Fail-safe ON**
>   **Fail-safe Hold**

I/O CONFIGURATION MENU cont.

Please refer to the Relay Settings menu layout at bottom left for the configuration instructions below.

From the Default Display, press ENT to display **Measured Values**. Press the DOWN arrow to display **System Config**. Press the DOWN arrow once again to display **I/O Config**.

Press ENT once again to enter I/O Config and to display **Relay Settings**. Press ENT to display **Relay #**. Enter the relay number to be configured and press ENT.

If utilizing a **Single Probe,** press ENT to proceed to operating status.

If utilizing a **Dual Probe**, choose **Probe 1** or **Probe 2**. Press ENT to proceed to operating status.

If utilizing **Difference** or **Summing**, choose **Probe 1, Probe 2**, or **Probe 1 and 2**. Press ENT to proceed to operating status.

Use the UP or DOWN arrow to toggle between **Disabled** and **Enabled**. If enabled is chosen, **ON** will be displayed. Enter the **ON** setpoint value for that relay and press ENT. Enter the value at which the relay setpoint should turn off at the **OFF** display. Press ENT. If the 801 is in the flow or volume modes, the unit will prompt the user to set the relays in a level mode, volume mode, or flow mode.

If the ON and OFF setpoint values entered are identical, the display will read **ON>=Setpoint**. Use the UP or DOWN arrow to toggle between **"greater than or equal to"** and **"less than or equal to"** setpoint. Press ENT to display **ON Delay**. This is the number of seconds before activating or deactivating the relay contact closure. This delay is adjustable from 1 to 120 seconds. Press ENT after the value is entered. Follow the same procedure for the **OFF Delay**. Press ENT and **Fail-safe: OFF** will be displayed. OFF means the relay is released. In the event a failure occurs, ON means the relay is energized and HOLD means the relay is left in its present state. Use the UP or DOWN arrow to scroll through selections. Press ENT and **Relay Settings** will be displayed.

If **Lead/Lag** is chosen under Relay 2, Relays 1 and 2 will be utilized in the Lead/Lag sequence.

If **Fault** is selected for Relay 3, the user will be prompted to select the faults that control Relay 3. Select between Enable and Disable for the displayed Fault by using the UP or DOWN arrow. Press ENT to continue to next item.

With **Fault Action** in the display, press ENT. Choose the operation of Relay 3 on the faults; **Energize** or **De-Energize**. With **Previous Menu** on the display, press ENT.

Relay #3

Normal
> **Fault**
>   **Preamp 1**
>   **Preamp 2**
>   **Loop Flt**
>   **Params**
>   **System**
>   **Fault Action**
>   **Energized**
>   **De-Energized**
> **Previous Menu**

I/O CONFIGURATION MENU cont.

Password? will be displayed if any of the selections have been changed. Your chosen password must be entered at this time. The unit will display the current menu item - **Relay Settings.**

Refer to Page 7 on selection of a General or Supervisory Password.

Press the DOWN arrow to proceed to **4–20 mA Settings**.

4–20 mA Settings

> **Control w/Probe 1**
> > **(Dual Probes, Difference, and Summing Modes Only)**
>
> **Control w/Probe 2**
> > **(Dual Probes, Difference, and Summing Modes Only)**
>
> **Control w/Probe 1 & 2**
> > **(Difference and Summing Modes Only)**
>
> **4:**
>
> **20:**
>
> **Fail-safe: 4 mA**
> > **20 mA**
> > **Hold**

With **4–20 mA Settings** displayed, press ENT to display **Setpoint LEVEL, Setpoint FLOW** or **Setpoint VOLUME**, depending on the mode that the unit is in.

If utilizing a **Single Probe,** press ENT to proceed to 4–20 mA settings.

If utilizing a **Dual Probe**, choose **Probe 1** or **Probe 2**. Press ENT to proceed to 4–20 mA settings.

If utilizing **Difference** or **Summing**, choose **Probe 1, Probe 2**, or **Probe 1 and 2**. Press ENT to proceed to 4–20 mA settings.

If level only is selected as the mode of operation, the display will read **4:___** and **20: ___**. In addition, if the Volume or Flow modes are selected, the 4 and 20 points can be entered as volume or flow units. Enter the value desired for 4 mA and press ENT. **20:0** will be displayed. Enter the value desired for the 20 mA. The 4–20 mA scale may be set anywhere up to the Level Limit value. **Failsafe**: and the current condition is displayed: **4 mA, 20 mA,** or **Hold**. The fail-safe is the output loop current in the event any fault condition. **Hold:** Current loop remains at last value, **4mA**: Current loop goes to 4 mA, or **20 mA**: Current loop goes to 20 mA. Use the UP/DOWN arrows to scroll to the desired fail-safe condition and press ENT.

Password? will be displayed and your chosen password must be entered at this time. Press ENT, the unit will display the current menu item - **4–20 mA Settings**.

I/O CONFIGURATION MENU cont.

Totalizer (Flow Mode Only)

> **Control w/Probe 1**
> > **(Dual Probes, Difference, and Summing Modes Only)**
>
> **Control w/Probe 2**
> > **(Dual Probes, Difference, and Summing Modes Only)**
>
> **Control w/Probe 1 & 2**
> > **(Difference and Summing Modes Only)**
>
> **Hardware**
> > **Tot___**
>
> **Software**
> > **Tot___**

This is the weight of each count of flow increment shown on the mechanical totalizer.

If utilizing a **Single Probe,** press ENT to proceed to Totalizer settings.

If utilizing a **Dual Probe**, choose **Probe 1** or **Probe 2**. Press ENT to proceed to Totalizer settings.

If utilizing **Differential** or **Summing**, choose **Probe 1, Probe 2**, or **Probe 1 and 2**. Press ENT to proceed to Totalizer settings.

With **Totalizer** displayed, press ENT to display **Hardware**. Press ENT and **Tot 0 cuft** is displayed. Enter the value at which each digit changes based on the chosen units of flow and press ENT: the unit will display **Password?** and your chosen password must be entered at this time. Press ENT and **Tot 0 cuft** will be displayed. Enter the value desired at which the software totalizer changes each increment and press ENT.

The unit will display **Software**. Press the DOWN arrow to scroll to display **Comm Port Set Up**.

Comm Port Set Up

> **Laptop Rate**
>
> **MagNet Rate**
>
> **MagNet Addr**
>
> **Previous Menu**

With **Comm Port Set Up** displayed, press ENT to display **Laptop Rate 300**. Use the UP/DOWN arrow to scroll to the desired rate and press ENT.

NOTE: The baud rate selected must match the baud rate setting from the communications program of the laptop being used in the downloading scheme.

The unit will display **MagNet Rate 300**. Use the UP/DOWN arrow to scroll to the desired rate. Press ENT at the desired rate and **MagNet Address** will be displayed. Enter the number assigned to the unit in the field at which the MagNet software is to use as the address location and press ENT.

Password? will be displayed and your chosen password must be entered at this time. Press ENT, and the unit will display **Comm Port Set Up**. Use the DOWN arrow to scroll to **Previous Menu** and press ENT. Press the DOWN arrow to scroll to the next menu section - **Calibration.**

UNIT CONFIGURATION cont.

CALIBRATION MENU

This menu is used to calibrate non-control parameters of the Series 801. Each menu item will prompt for **Sup Pswd?** as a protection against unauthorized changes.

```
┌─────────────────────────────────┐
│                                 │
│        Series 801               │
│                                 │
└─────────────────────────────────┘
```

Measured Values
System Config
I/O Config
Advanced Configuration
> **Damping**
> **Set Clock**
> **Enter Tag**
> **Default Display**
> **Calculation**
> **Change Password**
> **Change Sup Pass**
> **Previous Menu**

Damping

This allows for smoothing of the 4–20 mA output signal to achieve a stable display and output under turbulent level conditions. Values of 0 to 50 are available. Increasing the value will increase the damping and slow the response. The factory setting of 10 should be utilized until an unstable display or output is observed.

Set Clock

This allows for changing of the date and time on the smartwatch option. Unit prompts for:

> **Month?**
> **Date?**
> **Year?**
> **Hour?**
> **Minute?**

After entering these values, in military format, the unit prompts **ENTer to set** and then asks for the supervisory password.

Enter Tag

This menu shows the present tag - **Magnetrol 801**. (If utilizing multiple probes, Probe 1 Select will be displayed. A tag may be entered for each probe).

If desired, this tag can be changed by using the UP or DOWN arrows to scan through characters and press ENT to change the character at that location in the tag. Pressing the 2nd key will start the scrolling of the available characters. Press ENT when the desired character is shown.

CALIBRATION MENU cont.

Default Display

This menu allows for a choice of items displayed during normal operation. The following items may be toggled **ENABLED/DISABLED** using the UP and DOWN arrow:

> **Probe 1 Tag**
> **P1 Level**
> **P1 Vol/Flow**
> **Probe 2 Tag**
> **P2 Level**
> **P2 Vol/Flow**
> **Comb. Level**
> **Comb. Vol/Flow**
> **Loop**
> **Clock**
> **Calculation**
> **Totalizer**
> **Previous Menu**

The last menu item is **Previous Menu**. If any change was made in the default display, ENT at this point will cause the unit to prompt for the **Sup Pswd**.

Calculation

Press ENT to display **Existing Test Is**. Press ENT again to display **Text: ___** . Enter text by using UP or DOWN arrow keys, pressing the 2nd key and pressing ENT at each entry. The display will then read **MULT:**. This is the multiplier used in the calculation. Your level, flow or volume reading is multiplied by this value.

NOTE: The calculation is only for display purposes, not control of relays or loop current.

Change Password

Allows for a change of password. Requires the Sup Pswd.

Change Sup Password

Allows for a change of Sup Pswd. Requires the Sup Pswd.

Previous Menu

Returns to the current menu, **Calibration**.

Press DOWN arrow to proceed to **Diagnostics**.

DIAGNOSTICS MENU

This menu is used to provide the user with testing the functionality and providing useful information for troubleshooting of the unit.

Series 801

Measured Values

System Config.

I/O Config

Advanced Configuration

Diagnostics

Test Relays

Test 4–20 mA Loop

Signal Values

View Version#

Extended Errors

Previous Menu

Test Relays

This menu provides a controlled contact closure for each relay to test its integrity. A password is required.

Test 4–20 mA Loop

Once the desired output loop current value is entered on the display, the Series 801 will drive the given loop current to an external device for calibration purposes. A password is required.

Signal Values

Used for advanced factory troubleshooting.

View Version

This is the version number of the software installed in the 801.
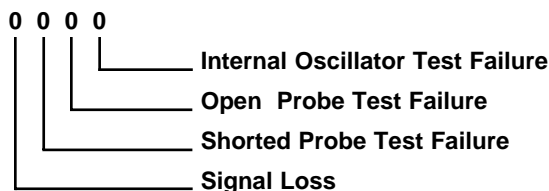
Extended Errors

Provides further information for the factory personnel in troubleshooting.

An eight digit code will be displayed by pressing ENT at the Extended Errors prompt. By reading this code from right to left, information on both probe circuits can be obtained. The first four bits (starting at the right) are associated with probe circuit 1, and the second set of four bits is associated with probe circuit 2, as shown below.

0 0 0 0	0 0 0 0
Probe 2	**Probe 1**

All zeros will appear on a properly functioning Series 801. A one (1) will appear when an error is detected.

BIT   4 3 2 1

```
        0 0 0 0
              |_____ Internal Oscillator Test Failure
            |_____ Open  Probe Test Failure
          |_____ Shorted Probe Test Failure
        |_____ Signal Loss
```

DIAGNOSTICS MENU cont.

Extended Errors cont.

BIT 1: A one (1) will appear if the Series 801 fails the internal oscillator test. The remote probe electronics may be defective. Consult factory.

BIT 2: A one (1) will appear if the Series 801 fails the open probe test. Ensure proper connection of the white wire between terminal block TB1 and the probe screw terminal in the probe housing. Consult factory if unsuccessful.

BIT 3: A one (1) will appear in this position if the Series 801 fails the shorted probe test. Remove the white wire from the probe screw and measure resistance between probe screw and ground.

BIT 4: A one (1) will appear in this position if the signal between the probe electronics and transmitter is out of range. A direct "short" across the probe will also trigger Bit 4. Ensure proper connection and polarity of wiring between probe housing and transmitter.

Press ENT. **Extended Errors** will be displayed. Press the DOWN arrow to display Previous Menu. Ent will display the current menu, Diagnostics. Press the DOWN arrow to display LapTop.

LAPTOP MENU

This menu is used to enter the start and end day range for downloading of stored data log for the Series 801.

Series 801

Measured Values

System Config.

I/O Config

Calibration

Diagnostics

Laptop

STRT

END

With **LapTop** displayed, press ENT to display **STRT ___** . Enter a number of the day of data to be downloaded. Press ENT and **END** will appear. Enter an ending day. Press ENT and **Laptop** will be displayed. If the laptop is connected for RS-232 and the baud rate is compatible as set in the **I/O Config**, the unit will begin to download the start /end day range. Please note: this is an updating 30 day format. It will download the minimum, maximum (at times of occurrence), and total flow data for selected days.

Refer to Page 5 for Wiring information. Any P.C. communication program may be used to capture this data. Start the communications program. Start an ASCII download and follow the above procedure. Refer to your communications program documentation if needed.

TROUBLESHOOTING

These are troubleshooting displays which may appear on the Series 801.

SYMPTOM	PROBLEM	SOLUTION
CAP TOO LO	The probe high point being entered has a lower capacitance than the present lo point.	Raise the probe high point being entered.
CAP TOO HI	The probe low point being entered has a higher capacitance than the present hi point.	Lower the probe low point being entered.
COMM PARAM FAIL!	The configuration parameters for the communications port are corrupt.	Press **ENT** to continue. This will load default values for the communication parameters The communication parameters should be checked to see that they match your configuration. This is accomplished through the I/O Config menu.
MAIN PARAM FAIL!	The main parameters which store probe lo/probe hi are corrupt.	Press **ENT** to continue. This will load default values for the main parameters. All of the items in the System Config menu need to be verified.
STRAP TBL FAIL!	There is an error in the custom strapping table entry.	Press **ENT** to continue. The table is cleared. If a custom table is not being used then this error can be ignored. If you are using a custom table, the table has to be re-entered.
RLY 1 PARAM FAIL!	The parameters for Relay 1 are corrupt.	Press **ENT** to continue. The relay is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
RLY 2 PARAM FAIL!	The parameters for Relay 2 are corrupt.	Press **ENT** to continue. The relay is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
RLY 3 PARAM FAIL!	The parameters for Relay 3 are corrupt.	Press **ENT** to continue. The relay is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
RLY 4 PARAM FAIL!	The parameters for Relay 4 are corrupt.	Press **ENT** to continue. The relay is disabled. and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
LOOP PARAM FAIL!	The parameters for the 4–20 mA loop are corrupt.	Press **ENT** to continue. The loop is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
CALC PARAM FAIL!	The calculation parameters are corrupt.	Press **ENT** to continue. New values need to be entered for the calculation. This is accomplished from the Calibration menu.
PASSWORD LOST!	The passwords are corrupt.	Press **ENT** to continue. Enter new passwords from the Calibration menu.
DATA LOG LOST!	The data log is corrupt.	Press **ENT** to continue. The data log is cleared.
P.O.S.T. FAILED!	Power on self test failed. Microprocessor internal register was not set correctly on power up. The software will attempt to set the register to the proper value.	Turn unit off and apply power again. If the error disappears, it was able to set the register to the proper value and will function properly.
OPERATION DENIED	Manual operation of relays or current loop is not allowed because the proper password was not entered.	Retry with the proper password.
OUT OF RANGE	The value that was entered was not in an acceptable range.	Re-enter a value within the proper limits.
CANNOT BE EQUAL!	The value for the 4 mA point and the 20 mA point cannot be equal.	Choose the values that are not the same and re-enter.
INVALID LEAD/LAG	Setting any relays other than relay 1 and 2 for lead/lag operation is not allowed.	Check that both relays 1 and 2 are enabled and that the setpoints are proper for lead/lag operation.
PASSWORD INVALID	The password entered is not valid.	Retry the previous operation and enter the proper password.

TROUBLESHOOTING cont.

SYMPTOM	PROBLEM	SOLUTION
CCO/PROBE (1) or (2) FAIL	Various	Consult Extended Errors section on page 23 of this manual.
NO CLOCK PRESENT	The real time clock was not found on the board. No data logging or time sampling is allowed.	If you need the real time functions, contact the factory to determine if your unit was ordered with the data logging option.
LOOP > 20 mA	The calculated value for the loop output is greater than 20 mA. The loop output will be in its fail-safe mode.	If the level is within a normal operating range, adjust the loop parameters to allow proper tracking of the level. If the level is out of the normal 4–20 mA range, then correct the problem with the level.
LOOP < 4 mA	The calculated value for the loop output is less than 4 mA. The loop output will be in its fail-safe mode.	If the level is within a normal operating range, adjust the loop parameters to allow proper tracking of the level. If the level is out of the normal 4–20 mA range, then correct the problem with the level.
DISPLAY IS TOO DIM OR TOO LIGHT		Turn R11(contrast adjustment) clockwise to darken the display or counterclockwise to lighten the display until the desired contrast is obtained.

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

Description		Specification
Supply Voltage		120 VAC, 50-60 Hz 240 VAC, 50-60 Hz 24 VDC
Output	Analog	4–20 mA (Isolated), reversible 1000 ohms max. loop resistance
	Digital	RS-232
	Range	5 pF minimum 50,000 pF maximum
Accuracy		Better than 1.0% of span
Repeatability		± .1%
Linearity		± .5%
Data	Entry	Full numeric keypad
	Indication	16 character alphanumeric LCD display
Relays 4 SPDT	AC	10A @ 120/240 VAC resistive
	DC	10A @ 30 VDC resistive
		0.5A @ 125 VDC resistive
	Set Point Range	0-50,000 pF
	Differential Range	0.50 pF minimum, 50,000 pF maximum
	Time Delay	0-120 Seconds Level Rising, Falling, Both

Description	Specification
Power Consumption	15 VA maximum
Humidity	99% Non-condensing (electronics)
Operating Pressure and Temperature	Dependent upon probe selection See Bulletin 50-125.
Electrostatic Discharge Protection	Per IEC specification 801-2.
Response Time	0.5 to approx. 2 seconds, depending upon probe capacitance and damping value
Ambient Temperature (Electronics)	-20° F to +160° F without heater (-29° C to +71° C) and thermostat
	-40° F to +160° F with heater and (-40° C to +71° C) thermostat
Temperature Coefficient of Set Point -20° F to +160° F (-29° C to +71° C)	± .01%/degree F (± .018%/degree C)
Maximum Remote Mount Distance	Standard: 2500 Feet (760 M)
	Intrinsically Safe: 800 Feet (240 M)

SPECIFICATIONS cont.

AGENCY APPROVALS

Agency	Model No.	Approval
FM*	801-XX31-N4X	Non-hazardous indoor/outdoor NEMA 4X IP65
	801-XX34-N4X	Intrinsically Safe Remote (indoor/outdoor, NEMA 4X IP65 when installed per Magnetrol drawing 99-5043-001 Class I, II & III, Div. 1 Groups A, B, C, D, E, F, & G NEMA 4X housing mounted in non-hazardous areas

CAUTION: Agency ratings are based partially on the proper probe selection. Refer to the chart at the right for approved combinations.

Agency	Model No.	Approval
CSA*	801-XX31-N4X	Non-hazardous indoor/outdoor TYPE 4X
	801-XX34-N4X	Intrinsically Safe Remote indoor/outdoor TYPE 4X when installed per Magnetrol drawing 99-5043-001 Class I, II & III Groups A, B, C, D, E, F, & G Enclosure TYPE 4X mounted in non-hazardous areas **NOTE**: For Groups E & F - insulated probes must be used.

* Approvals pending

7th Digit in Elect. Model No.	Approved Probes
1,4	All probes

INTRINSIC SAFETY

INTRINSIC SAFETY

Models 801-XX34-N4X are pending FM and CSA agency approval for use as an intrinsically safe circuit.

HAZARDOUS LOCATION
Intrinsically Safe
Class I, II, III, Div. 1,
Groups A, B, C, D, E, F, G

NON-HAZARDOUS LOCATION
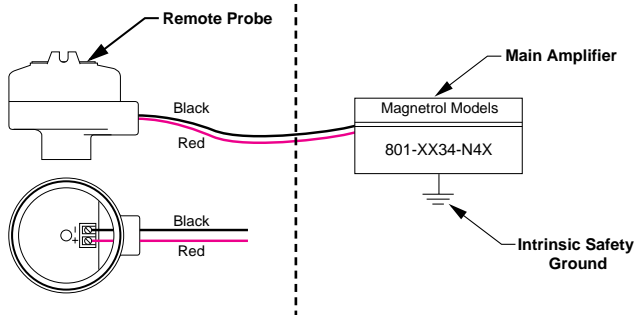
Intrinsically Safe/Sécurité Intrinsèque

WARNING: Substitution of components may impair intrinsic safety.

**AVERTISSEMENT:** La substitution de composants peut compomettre la sécurité intrinsèque.

NOTES:
1. The NEC must be followed when installing this equipment.
2. For installation guidance, see ANSI/ISA RP 12.6.
3. The resistance between the associated apparatus intrinsic safety ground terminal and earth must be less than one ohm.
4. Non-hazardous area equipment connected to the associated apparatus should not use or generate more than 250 volts.
5. The total cable series inductance and shunt capacitance between the associated apparatus and the remote probe must not exceed the indicated values for applicable groups:
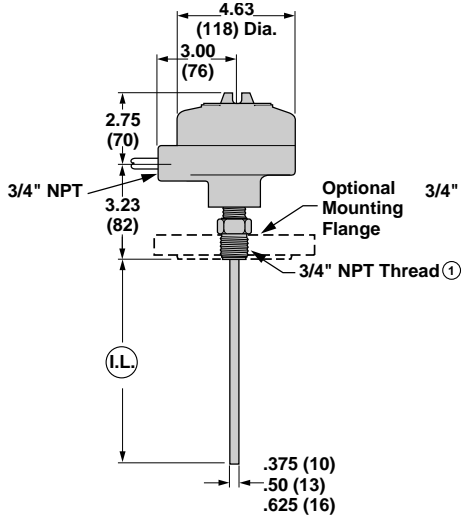
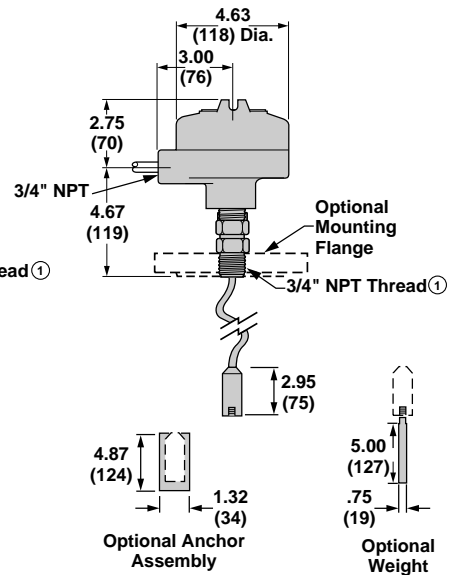| Group	Max. Capacitance	Max. Inductance
AB	0.13 µF	0.47 mH
CE	0.92 µF	1.97 mH
DFG	2.89 µF	3.53 mH

SPECIFICATIONS cont.

DIMENSIONAL SPECIFICATIONS   inches (mm)
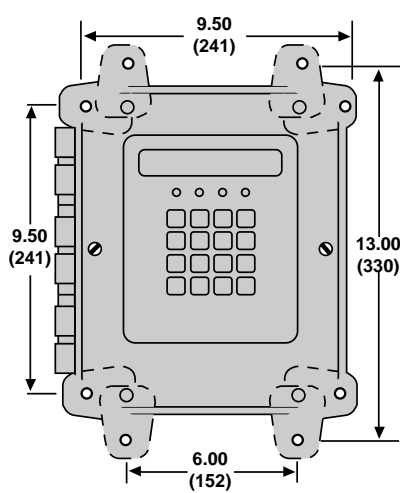
**Electronics Housing**   **Remote Mount/Standard Rigid Probe**   **Remote Mount/Flexible Probe**

NOTE: ① Standard process connection is $^3/_4$" NPT. Consult probe brochure (50-125) for flange and other probe connections.

REPLACEMENT PARTS

Item	Description		Part Number
1	NEMA 4X Door, LCD Display, and Keypad		Consult Factory
2*	Main P.C. Board	120 VAC	030-3564-004
		120 VAC with Heater	Consult Factory
		240 VAC	030-3564-002
		240 VAC with Heater	Consult Factory
		24 VDC	Consult Factory
3*	Daughter P.C. Board	Standard	Consult Factory
		Intrinsically Safe	Consult Factory
4*	Display P.C. Board		Z30-3539-002
5	Enclosure Gasket		012-1606-001
6	Remote Probe Base NEMA 4X/7/9	316 SS	004-9140-001
		Cast Aluminum	004-9104-001
7	Remote Probe Cover NEMA 4X/7/9	316 SS	004-9142-001
		Cast Aluminum	004-9105-001
8	O-ring		012-2101-345
9*	Preamplifier Assembly	Standard	030-2411-002
		Intrinsically Safe	030-9005-001
10	Shielded Twisted Pair (Up to 2500 feet [760 meters])		009-7146-001
Enclosure Accessories Kit (Includes Mounting feet, hardware and hinges)			089-5210-001

*   See ESD Handling Procedure on Page 5.
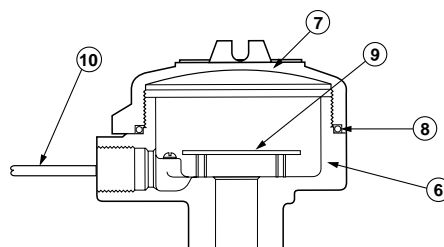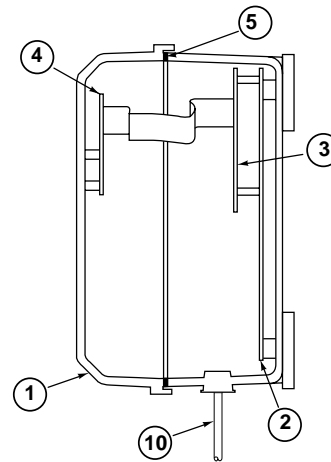
IMPORTANT

PRODUCT WARRANTY

All Magnetrol/STI electronic and ultrasonic level and flow controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol/STI shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol/STI products.

QUALITY ASSURANCE

The quality assurance system in place at Magnetrol/STI guarantees the highest level of quality throughout the company. Magnetrol/STI is committed to providing full customer satisfaction both in quality products and quality service.

Magnetrol's quality assurance system is registered to ISO 9001 and Z299.1 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

ASSURED QUALITY & SERVICE COST LESS

SERVICE POLICY

Owners of Magnetrol/STI controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

a. Returned within the warranty period; and
b. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

RETURN MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol/STI's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

Note: See ESD Handling Procedure on page 5.

///Magnetrol

5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4000 • Fax 630-969-9489 • www.magnetrol.c
145 Jardin Drive, Units 1 & 2 • Concord, Ontario Canada L4K 1X7 • 905-738-9600 • Fax 905-738-1306
Heikensstraat 6 • B 9240 Zele, Belgium • 052 45.11.11 • Fax 052 45.09.93
Regent Business Ctr., Jubilee Rd. • Burgess Hill, Sussex RH15 9TL U.K. • 01444-871313 • Fax 01444-871317

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5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4028 • Fax 630-969-9489 • www.sticontrols.