

Kotron® Sentinel II Model 804 RF Level Transmitter

Installation and Operating Manual



RF

Capacitance

Level

Measurement

Read this Manual Before Installing

This manual provides information on the Kotron Model 804 Sentinel II RF Level Transmitter. It is important that all instructions are read carefully and followed in sequence. Detailed instructions are included in the *Installation* section of this manual.

Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

Notes

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Warnings

Warnings identify potentially dangerous situations or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.

Safety Messages

Follow all standard industry procedures for servicing electrical equipment when working with or around high voltage. Always shut off the power supply before touching any components.

Low Voltage Directive

For use in Category II installations. If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired.

WARNING! Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Notice of Trademark, Copyright, and Limitations

Magnetrol & Magnetrol logotype, STI & STI logotype, Kotron, and Sentinel are registered trademarks of Magnetrol International, Incorporated. Kotron Model 804 Sentinel II RF Level Transmitter is a tradename of Magnetrol International, Incorporated.

Copyright © 2007 Magnetrol International, Incorporated.

Performance specifications are effective with date of issue and are subject to change without notice. Magnetrol makes no warranty with respect to the accuracy of the information in this manual.

Warranty

All Magnetrol/STI electronic 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 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.



Kotron Model 804 Sentinel II

RF Level Transmitter

Table of Contents

1.0 Description	
1.1 Principle of Operation	1
1.2 Unpacking	1
1.3 Connecting Cable	2
2.0 Installation	
2.1 Installation Location	2
2.2 Mounting.....	3
2.2.1 Mounting Procedure	3
2.2.2 Integral Mount with Standard Rigid Probe	3
2.2.3 Integral Mount with Flexible Probe.....	4
2.2.4 Remote Mount with Standard Rigid Probe	5
2.2.4.1 Remote Mount with Standard Rigid Probe	5
2.2.4.2 Preamplifier.....	6
2.2.5 Remote Mount with Flexible Probe.....	7
2.2.5.1 Main amplifier	7
2.2.5.2 Preamplifier.....	7
2.3 Electrostatic Discharge (ESD) Handling Procedure..	9
2.4 Wiring	9
2.4.1 Wiring Power Supply Board	9
2.4.1.1 Power wiring	9
2.4.1.2 Discrete output wiring	9
2.4.2 Wiring Operation	10
2.4.2.1 4–20 mA output wiring	10
2.4.2.2 Active or passive selection	10
2.4.2.3 RS-485 output	10
2.4.2.4 Manual self-test.....	11
2.5 Unit Configuration	11
2.5.1 General Configuration Instructions.....	11
2.5.2 Password.....	11
2.5.3 Operator Keypad.....	11
2.5.4 QuickCal.....	12
2.5.5 General Programming Menus.....	13
2.5.6 Measured Value Menu.....	14
2.5.7 System Configuration Menu	14
2.5.8 I/O Configuration Menu	16
2.5.8.1 Discrete output settings.....	16
2.5.8.2 Setting 4–20 mA and communications output	17
2.5.9 Advanced Configuration Menu	18
2.5.10 Diagnostics Menu	19
3.0 Reference Information	
3.1 Troubleshooting	20
3.1.1 Test Relays.....	20
3.1.2 Test 4–20 Output.....	20
3.1.3 Signal Values	20
3.1.3.1 CCO int. cap	20
3.1.3.2 Open probe.....	20
3.1.3.3 CCO probe.....	20
3.1.4 View Version #	21
3.1.5 Factory Presets.....	21
3.1.6 Troubleshooting Procedures	21
3.2 Agency Approvals.....	22
3.2.1 Agency Specifications – Intrinsically Safe Installation (FM/CSA).....	23
3.3 Specifications	24
3.3.1 Electrical	24
3.3.2 Dimensional.....	25
3.4 Replacement Parts.....	27
3.4.1 Replacement Parts	27
3.5 Model Numbers.....	28
3.5.1 Transmitter	28

1.0 Description

The Sentinel II is a unique, powerful level transmitter. The leading-edge microprocessor-based circuitry has non-volatile memory that requires no battery backup. To simplify troubleshooting, powerful diagnostics not only check all aspects of the system, but will actually indicate the faulty section of the system. MagneCal™ offers the user the greatest improvement in RF Capacitance—*one small level change (2% of span) is needed to calibrate.*

1.1 Principle of Operation

The amount of capacitance developed in any vessel 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.

Assuming that the probe's mounting position and the dielectric of the medium are fixed, the amount of capacitance developed in any vessel becomes dependent upon the probe's diameter and length. Adjusting the combination of the probe's diameter and length (and its proximity to a ground reference) can generate the necessary capacitance required by the electronic circuitry.

As the media rises and falls in the tank, the amount of capacitance developed between the probe and the ground reference also rises and falls. The capacitance-controlled oscillator circuit mounted on the probe changes the capacitance signal to a digital wave form—proportional to the change in level. The Series 804 amplifier then converts this digital pulse signal into an isolated 4–20 mA analog output signal.

1.2 Unpacking

Unpack the instrument carefully making sure all components have been removed from the packing material. Inspect all components for damage and report any concealed damage to the carrier within 24 hours.

Check the contents of the carton making sure it agrees with the packing slip and the purchase order. Verify that the model number imprinted on the nameplate matches the number on the packing slip and the purchase order. Report any discrepancies to the factory. Check and record the serial number for future reference when ordering parts.

1.3 Connecting Cable

Remote mount connecting cable should be shielded, twisted pair, 22-gauge stranded conductors and may be ordered as Magnetrol part number 009-7146-001. Cable length in feet must be specified at time of order; 2500 feet (760 m) maximum; 800 feet (240 m) maximum for intrinsically safe models.

2.0 Installation

Caution: Carefully read this entire section prior to installation.

2.1 Installation Location

Kotron Sentinel II Transmitters should be placed in a location which allows easy access for service, calibration, and monitoring. Electronics should not be exposed to ambient temperatures below -40°F (-40°C) nor above $+160^{\circ}\text{F}$ ($+70^{\circ}\text{C}$). Special precaution should be taken to prevent exposure to corrosive atmosphere, excessive vibration, shock, or physical damage.

It is common practice to use the metal tank wall as the ground reference. When doing this, it is required that the probe housing make a good electrical connection to the tank wall. If there is any doubt about this connection (rust or using PTFE thread tape, gaskets, or paint may impede this connection), then a separate strap should be installed between the probe housing and the tank.

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

Caution: This unit contains CMOS electronics that could be damaged by static electricity. Do not touch any semiconductor devices unless you are properly grounded.

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 (a stilling well) may be a solution.

Tanks/Silos with Non-Conductive Materials of Construction

With plastic, concrete, wood, or any other non-conductive walled vessel, the reference electrode (mentioned in the *Principle of Operation* section on page 1) needs clarification. Most commonly, this electrode will be in the form of a concentric ground tube (for example, a 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.

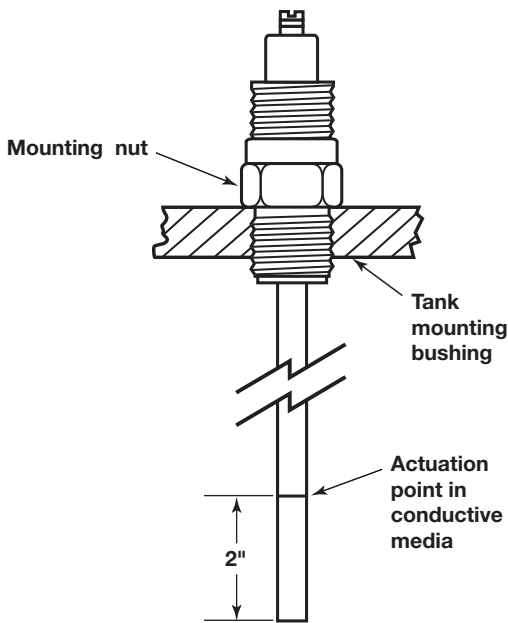


Figure 1

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

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 ruin 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.

2.2 Mounting

Probes should be mounted vertically and such that the probe rod is at least 2" (50 mm) below the lowest desired level control point with conductive materials; or, 4" (100 mm) below the lowest desired level control point in non-conductive materials. Refer to Figure 1.

2.2.1 Mounting Procedure

Kotron Sentinel II Transmitters with standard probes up to and including 12" (305 mm) in length are shipped pre-assembled. Units with standard probes over 12" (305 mm) in length are shipped unassembled to avoid damage during transit; and must be assembled before mounting. Follow the proper mounting procedure for specific unit.

NOTE: Before beginning mounting procedures, ensure that the power source to the unit is off. After installing the probe on the tank, and before wiring the electronics to the probe, it is beneficial to perform a probe resistance check to verify the integrity of the probe.

The resistance of an insulated probe in conductive liquid (or a bare probe in non-conductive media), when measured between the probe screw terminal and the probe mounting nut with an ohmmeter set to its 20 megohm scale, should be INFINITE.

2.2.2 Integral Mount with 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.

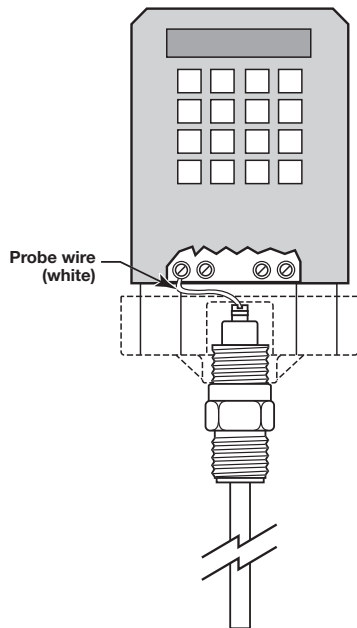


Figure 2
Integral Mount with
Standard Rigid Probe

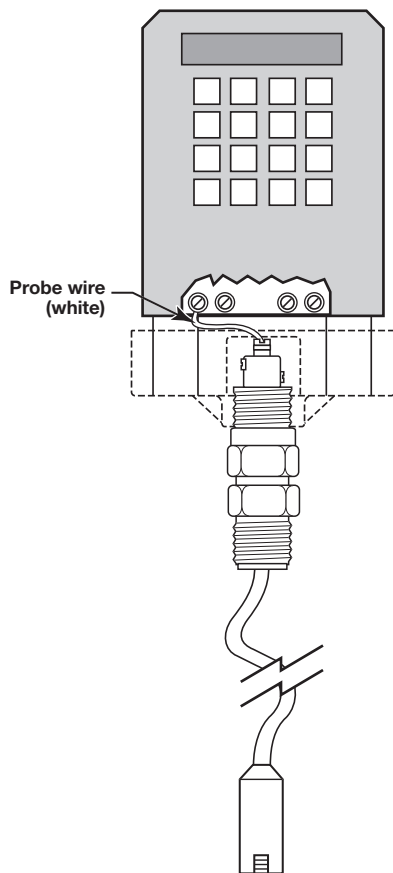


Figure 3
Integral Mount with
Flexible Probe

3. Screw the amplifier housing onto the probe. Refer to Figure 2.
4. Screw housing onto the probe unit until hand tight. Housing may be wrench tightened to align conduit connection with conduit.
5. Remove housing cover.

NOTE: Refer to Electrostatic Discharge Handling Procedure on page 9.

6. Remove the electronics assembly from the housing base by loosening the four mounting screws.
7. Locate the white wire that is fastened to the probe screw on the circuit board. Connect the free end of this wire to the probe connection screw.
8. Reinstall the electronics assembly into the housing.

Caution: Check probe terminal connection carefully to ensure that the lug will not short packing gland or interfere with assembly of amplifier housing to probe.

9. Proceed to *Wiring* section on page 9.

2.2.3 Integral Mount with 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 below.

1. Remove mylar housing insulator located over the clamp. Refer to Figure 3.

Caution: Do not discard the mylar housing insulator.

2. Attach weight, if used, to probe end. Refer to Figure 3.
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.

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

4. Apply thread sealant to mounting nut.
5. Screw mounting nut into tank bushing until tight.
6. Secure lower end of probe (or optional weight) to tank bracket if one is used.

Caution: Apply wrench to lower probe nut only.

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

7. Loosen both socket head clamp screws.
8. Pull clamp and Teflon® retaining bushing off probe.
9. While holding the probe cable, loosen upper probe nut.
10. Pull excess cable up, through the probe nuts, until cable is taut.
11. Tighten the probe nuts.
12. Cut off cable 1.35" (34 mm) above top of upper probe nut, and strip off 1.25" (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 inches/pound torque.
16. Slip mylar housing insulator over clamp.
17. Screw housing onto probe and tighten. Make sure conduit connection is properly aligned for wire entry.
18. Remove housing cover.

NOTE: Refer to *Electrostatic Discharge Handling Procedure* on page 9.

19. Remove the electronics assembly from the housing by loosening the four mounting screws.
20. Locate the white wire, which is connected to the probe terminal (P) on the circuit board, and connect its free end to the probe connection screw.
21. Reinstall the electronics assembly into the housing.

Caution: Check probe terminal connection carefully to ensure that the lug will not short packing gland or interfere with assembly of amplifier housing to probe.

22. Proceed to *Wiring* section on page 9.

2.2.4 Remote Mount with Standard Rigid Probe

2.2.4.1 Main amplifier

Remote amplifier assemblies are normally shipped from the factory assembled into an "L" mounting bracket. To install amplifier assembly, proceed as follows. Refer to Figure 4.

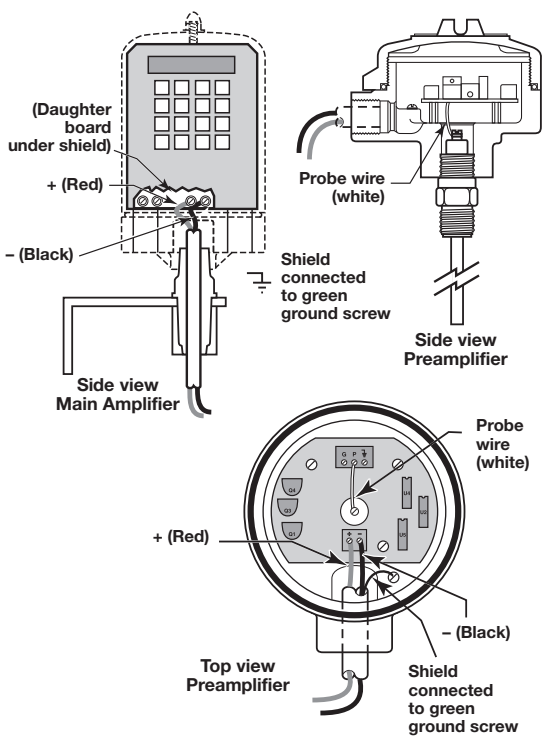


Figure 4
Remote Mount with
Rigid Probe Wiring

1. Remove amplifier from mounting bracket.
2. Install bracket in a location that is isolated from temperatures below -40°F (-40°C) and above $+160^{\circ}\text{F}$ ($+70^{\circ}\text{C}$) and vibration which could cause mechanical damage.
The unit may be mounted up to 2500 feet (760 m) from the probe assembly. Location should also offer easy access for wiring, calibration, and maintenance.
3. Re-install amplifier onto mounting bracket.
4. Remove the electronics assembly from the housing by loosening the four mounting screws.
5. Route the twisted shielded pair cable up through the housing base as shown in Figure 4 on page 5.
6. Remove the shield from the electronics assembly by removing the top mounting screw and snapping the shield off of the bracket.
7. Attach the twisted pair to the connection screws on the daughter board (refer to Figure 4 on page 5) as follows:
 - Red wire to the + (positive) screw terminal;
 - Black wire to the – (negative) terminal;
 - Shield to the shield terminal.
8. Dress wires and reassemble shield to the bracket. Reinstall the electronics assembly into the housing base.
9. Replace the housing cover and proceed with the wiring of the preamplifier.

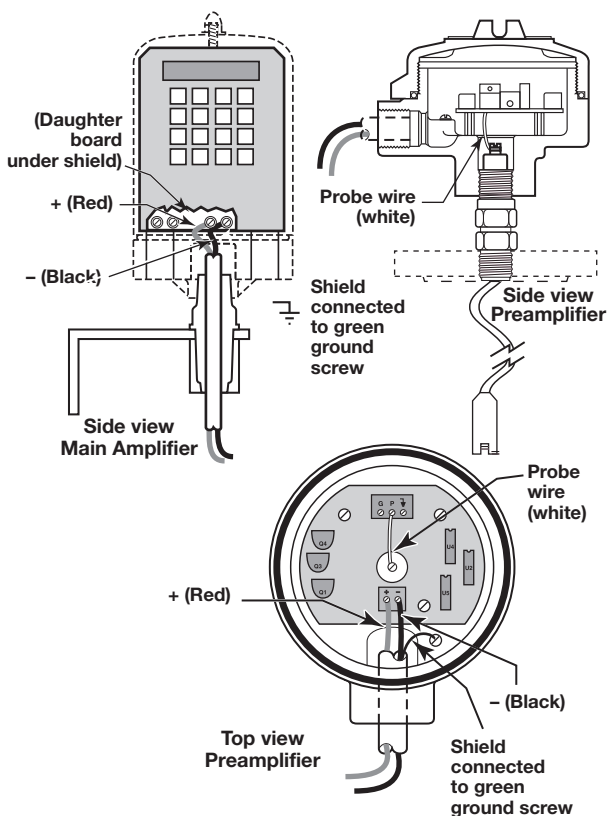


Figure 5
Remount Mount with Flexible Probe Wiring

2.2.4.2 Preamplifier

1. Thread probe into mounting bushing on tank.
2. Tighten securely, making certain that the wrench is applied only to the lower probe nut. Refer to Figure 4 on page 5.
3. Screw housing on probe until hand tight. Housing may be wrench tightened to align conduit connection with conduit.
4. Connect the white wire from the remote KISO board to the probe connection screw.
5. Attach the twisted pair to the remote KISO board (refer to Figure 4 on page 5) as follows:
 - Red wire to the + (positive) terminal of TB2;
 - Black wire to the – (negative) terminal of TB2;
 - Shield to the green ground screw, inside of the housing base.
6. Proceed to *Wiring* section on page 9.

2.2.5 Remote Mount with Flexible Probe

2.2.5.1 Main amplifier

Remote amplifier assemblies are normally shipped from the factory assembled into an “L” mounting bracket. To install amplifier assembly, proceed as follows. Refer to Figure 5.

1. Remove amplifier from mounting bracket.
2. Install bracket in a location that is isolated from temperatures below -40°F (-40°C) and above $+160^{\circ}\text{F}$ ($+70^{\circ}\text{C}$) and vibration which could cause mechanical damage.

The unit may be mounted up to 2500 feet (760 m) from the probe assembly. Location should also offer easy access for wiring, calibration, and maintenance.

3. Re-install amplifier onto mounting bracket.
4. Remove the electronics assembly from the housing by loosening the four mounting screws.
5. Route the twisted shielded pair cable up through the housing base as shown in Figure 5 on page 6.
6. Remove the shield from the electronics assembly by removing the top mounting screw and snapping the shield off of the bracket.
7. Attach the twisted pair to the daughter board (refer to Figure 5) as follows:
 - ◆ Red wire to the + (positive) screw terminal;
 - ◆ Black wire to the – (negative) terminal;
 - ◆ Shield to the shield terminal.
8. Dress wires and reassemble shield to the bracket. Reinstall the electronics assembly into the housing base.
9. Replace the housing cover and proceed with the wiring of the preamplifier.

2.2.5.2 Preamplifier

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 below.

1. Remove mylar housing insulator located over the clamp. Refer to Figure 3 on page 4.

Caution: Do not discard the mylar housing insulator.

-
2. Attach weight, if used, to the probe end.
 3. Insert probe end through tank mounting bushing and feed cable into the tank. Do not allow probe insulation to become damaged by scraping against the bushing.

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

4. Apply thread sealant to mounting nut.
5. Screw mounting nut into tank bushing until tight.
6. Secure lower end of probe (or optional weight) to tank bracket if one is used.

Caution: Apply wrench to lower probe nut only.

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

7. Loosen both socket clamp screws.
8. Pull clamp and Teflon retaining bushing off of 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" (34 mm) above top of upper probe nut and strip off 1.25" (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 inches/pounds torque.
16. Slip mylar housing insulator over clamp.
17. Screw housing onto probe and tighten. Ensure that conduit connection is properly aligned for wire entry.
18. Locate the white wire, which is fastened to the probe terminal (P) on the circuit board, and connect the free end to the probe connection screw.

Caution: Check probe terminal connection carefully to ensure that the lug will not short packing gland or interfere with assembly of amplifier housing to probe.

19. Proceed to *Wiring* section on page 9.

NOTE: Read the *Electrostatic Discharge Handling Procedure* which follows prior to proceeding to the *Wiring* section.

2.3 Electrostatic Discharge (ESD) Handling Procedure

Magnetrol/STIs 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.

2.4 Wiring

2.4.1 Wiring Power Supply Board

For connection of power and control circuit, 16–22 AWG stranded wire is acceptable. Refer to Figures 6 and 7 for power supply board layout and terminal locations.

2.4.1.1 Power wiring

1. Ensure that power source is turned off from unit.
2. Pull the power supply wires through the conduit connection.
3. Connect the positive (hot) supply wire to the L1 on terminal block TB1.
4. Connect the negative (neutral) supply wire to the L2/N on terminal block TB1.
5. Connect the ground wire to the green screw in the housing base.

2.4.1.2 Discrete output wiring

NOTES: Output #1 may be used as a dedicated diagnostic alarm.

Any or all outputs can be used for LEAD/LAG pump sequencing.

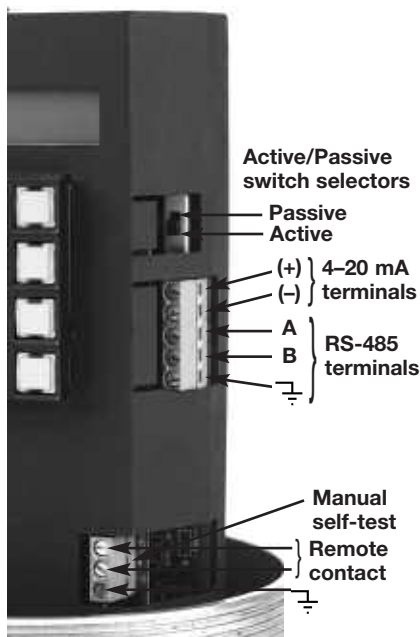


Figure 6
Logic Board Terminal Connections

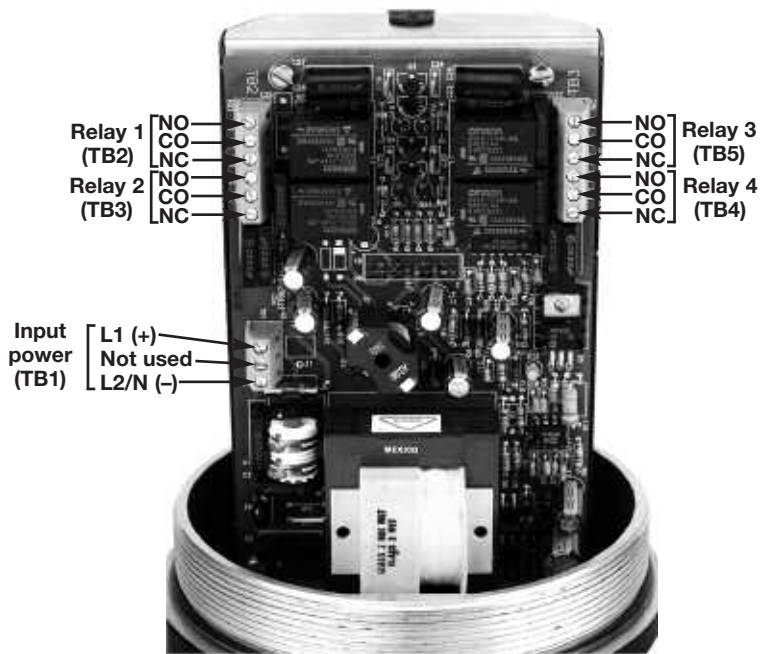


Figure 7
Power Supply Board
Terminal Connections

2.4.2 Wiring Operation

2.4.2.1 4–20 mA output wiring

Connect the positive wire to the + terminal; connect the negative wire to the – terminal.

2.4.2.2 Active or passive selection

The 4–20 mA output can be configured for active or passive operation. Active mode allows the Sentinel II to drive the loop (for example, the Sentinel II is the 24 VDC power supply). The passive mode allows the Sentinel II to react like a loop-powered transmitter (the loop power is supplied elsewhere). Switch S1 changes the mode. See Figure 6 on page 9.

Cable should be shielded, twisted pair, 22 gauge stranded conductors. In the active mode of operation the shield should be grounded at the model 804. In the passive mode the shield should be grounded at the power source.

Caution: Applying power to the 4–20 mA output, while in the active mode, will seriously damage the instrument.

2.4.2.3 RS-485 output

RS-485 communication is achieved by means of a 2-wire, twisted pair connected to terminal block.

1. Connect the A wire from the control room converter to terminal A.
2. Connect the control room converter wire B to terminal B.

NOTE: Polarity among units in loop must be observed.

3. If connecting multiple 804 units in a daisy chain configuration, be sure to connect the wiring in parallel and have the ending 804 unit with the termination resistor jumpered. The termination jumper pins are located under the shield, below the RS-485 terminal block. The jumper (JP1) should be in positions 2 and 3, removed on all units except the last one in the chain. The last unit should have the jumper in positions 1 and 2.
4. Proceed to *Unit Configuration* section on page 11.

NOTE: If connecting several units, note the color wire used for A and B; ensure that the same designated color is used for each of the units.

2.4.2.4 Manual self-test

A manual self-test can be performed on the 804 electronics. A remote contact should be wired across terminals 1 and 2 with terminal 3 used for shield if needed.

Performing a manual self-test will cause the 804 to go into alarm mode. The relays and mA output will change to the mode selected in the Unit Configuration.

2.5 Unit Configuration

2.5.1 General Configuration Instructions

The Kotron Sentinel II RF Capacitance Level Transmitter contains a microprocessor-based operator interface, which allows easy configuration of level measurement or control applications. These simple-to-use features are accessed through the 16-digit keypad, located on the front of the unit's shield.

The operator interface and instructions for the unit configuration are broken down into five main groups of menus:

MEASURED VALUES:

For viewing the measured values

SYSTEM CONFIG: Probe calibration

I/O CONFIG: Configure the input/output functions (such as 4–20 mA and relays)

ADV CONFIG: Set the unit's advanced features (such as password and display options)

DIAGNOSTICS: Enhanced troubleshooting features.


2.5.2 Password

The Sentinel II has a built-in password system to restrict access to portions of the menu that affect the unit's operation. The password is required whenever programming values are being changed. The password can be changed to any four digit number desired. This procedure is described under the **ADV CONFIG** menu page 13.

Caution: The Sentinel II is shipped from the factory with the password 0804. If the programmed password is misplaced or forgotten, consult the factory for assistance.

2.5.3 Operator Keypad

All unit configuration instructions in this manual will show the local transmitter display exactly as it will appear to the operator. The operator interface is via a keypad consisting of the following keys:

Key	Function
0 – 9	For numeric entry of parameters
.	Decimal point
DEL	To delete an incorrectly entered character
ENT	For storing new values into memory
↕ (up/down arrow keys)	Used to step through the menu and/or option choices
	Quick calibration menu

2.5.4 QuickCal

The Sentinel II Level Transmitter has a special QuickCal menu for quick and easy calibration. With this menu, entry of a low calibration point and a high calibration point, which correspond to the 4–20 mA span, is possible.


The advantage of QuickCal is that it is not necessary to enter the general programming menu to perform basic setup of the unit. Following is the QuickCal menu structure:

Run Mode:

- Warning
- Password
- Set LO Point
- Set HI Point

NOTE: If the QuickCal menu is accidentally pressed, depress the ENT key (no other keys) three times when the “warning” message appears.

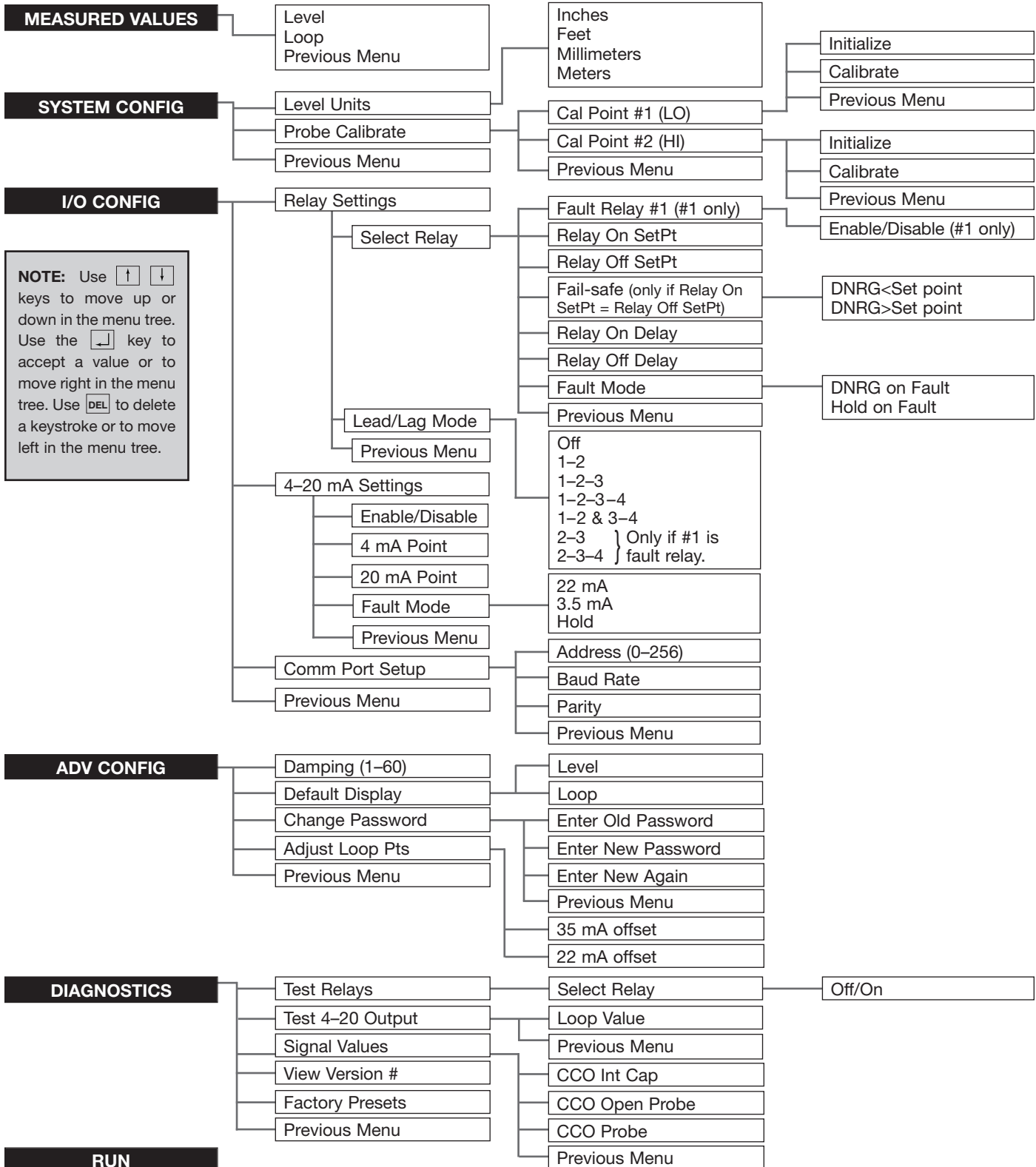
Following is a step-by-step procedure for using the QuickCal menu. Before beginning, ensure that level in the tank is at the low level (4 mA). Begin at the RUN mode:





Key	Current Menu Location	Display	Comments
None	Run	Magnetrol Intl 0.0 level units	This is RUN mode.
	<i>QuickCal</i>	WARNING SETTINGS WILL BE LOST	
ENT	<i>QuickCal</i>	Enter Password	Enter the system password (factory default is 0804)
ENT	<i>QuickCal</i>	Set LO Point – 0	Move the level in the vessel to desired 4 mA output point. Enter the actual level (default units are in inches)
ENT	<i>QuickCal</i>	Set HI Point – 0	Move the level in the vessel to desired 20 mA output point. Enter the actual level.
ENT	Run	Magnetrol Intl x.x inches	x.x will correspond to level in vessel.

2.5.5 General Programming Menus

Following is an outline of the general menu structure used in the Sentinel II. Even though all features are shown, certain features will only affect specific modes. For example, the 4–20 mA output menu can be accessed in all models, but

changes will affect only the models with 4–20 mA output. Use the UP and DOWN arrow keys to scroll through any portion of the menu; use the ENT key to make a selection.



NOTE: Use   keys to move up or down in the menu tree. Use the  key to accept a value or to move right in the menu tree. Use  to delete a keystroke or to move left in the menu tree.

2.5.6 Measured Value Menu

(In the charts that follow, this symbol, >, refers to .)

The Measured Value menu is used to display current values being measured by the Sentinel II (refer to page 15 for the overall menu layout).

Follow this step-by-step procedure to use this menu. It is assumed that you are starting from the RUN mode.

Current Menu Location	Display	Action	Comments
Run	Magnetrol Int'l x.x level units	Normal operation	This is the RUN MODE
Run/Measured Values	Measured Values > to select	Access "Measured Values" menu	
Run/Measured Values/ Level	Level x.x level units	Display the process level	<i>Level units</i> is the unit of measure selected under SYSTEM CONFIG.
Run/Measured Values/ Loop	Loop x.x mA	Display the loop current	If the 4–20 mA output has not been programmed, this display will be 4.0 mA.
Run/Measured Values/ Previous Menu	Previous menu > to select		Press ENT to move up one level in the program to <i>Measured Values</i> ; or press DEL twice to return to the RUN MODE.
Run	Magnetrol Int'l level/level units	This is the RUN mode.	

2.5.7 System Configuration Menu

This System Configuration menu is used to select the measurement units and to calibrate the probe for a particular application. Follow this

step-by-step procedure to use this menu. It is assumed that you are starting from the RUN mode.

Current Menu Location	Display	Action	Comments
Run	Magnetrol Int'l x.x level units	Normal operation	This is the RUN MODE
Run/System Config	Run/System Config/ >to select	Access the System Config menu	Use the arrow keys to scroll down until the display reads "System Config".
Run/System Config/ Level Units	Level Units	Select the unit of measure for calibration and display.	Use the arrow keys to select your option.
Run/System Config/ Level units	Enter password	Accept the data entered	The "Enter Password" display will not appear if you have entered the password anywhere else in the general program menu. Use the numeric keys to type in your password.
Run/System Config/ Probe Calibrate	Probe Calibrate >to select	Access the "Probe Calibrate"	Read the following section before continuing.

NOTE: A minimum level change (2% of span) is required; however, a greater differential will improve accuracy. Two calibration points will be entered: Cal Pt. #1 (LO) is the lower point; Cal Pt. #2 (HI) is the upper point. They may be entered in any order.

If it is easier to raise the level in your vessel, set "Cal Pt. #1 (LO)" first; raise the level a minimum of 2%, then set Cal Pt.

#2 (HI)". If it is easier to lower the level in your vessel, then set "Cal Pt. #2 (HI)" first; lower the level a minimum of 2%, then set "Cal Pt. #1 (LO)".

These calibration points do not have to correspond with the 4–20 mA output settings or any discrete output set point; they are two arbitrary points along the length of the probe.

2.5.7 System Configuration Menu (cont.)

Current Menu Location	Display	Action	Comments
Run/System Config/ Probe Calibrate	Probe Calibrate > to select	Access the Probe calibration menu	This is the start of the PROBE CALIBRATE menu.
Run/System Config/ Probe Calibrate	Cal Pt. #1 (LO) > to select	Access the lower calibration point menu	
Run/System Config/ Probe Calibrate/ Cal Point #1 (LO)	Initialize > to select	Reset the Cal Pt. #1 (LO) to zero	The first time the unit is calibrated and when changing "Cal Pt. #1 (LO)", press ENT. Otherwise press the DOWN arrow.
Run/System Config/ Probe Calibrate	Enter Password	Accept the data entered	The "Enter Password" display will not appear if the password has been entered anywhere else in the general program menu. Use the numeric keys to enter your password.
Run/System Config/ Probe Calibrate/ Cal Point #1 (LO)	Calibrate	Calibrate the lower probe reference point	Calibrate with the level as low on the probe as possible. There must be at least 1" of level on any insulated probe. The level entered may be the actual level in the vessel or the number of inches of probe coverage.
Run/System Config/ Probe Calibrate	Previous Menu > to select		Press ENT.
Run/System Config/ Probe Calibrate	Cal Pt. #2 (HI) > to select	Access the upper calibration point menu	Set up for the upper calibration reference point.
Run/System Config/ Probe Calibrate/ Cal Point #2 (HI)	Initialize > to select	Reset the Cal Pt. #2 (HI) to zero	The first time the unit is calibrated and when changing "Cal Pt. #2 (HI)", press ENT. Otherwise press the DOWN arrow.
Run/System Config/ Probe Calibrate/ Cal Point #2 (HI)	Enter Password Probe Calibrate	Accept the data entered	The "Enter Password" display will not appear if the password has been entered anywhere else in the general program menu. Use the numeric keys to enter your password.
Run/System Config/ Probe Calibrate/ Cal Point #2 (HI)	Calibrate	Calibrate the upper probe reference point	Calibrate with the level as high on the probe as possible. There must, however, be at minimum 2% (of span) differential between the calibration points. A greater differential will improve accuracy. The level entered may be the actual level in the vessel or the number of inches of probe coverage.
Run/System Config/ Probe Calibrate	Previous Menu > to select		Press ENT.
Run System Config	Probe Calibrate > to select		Press DEL twice to return to the RUN mode.
Run	Magnetrol Int'l x.x level units	Normal operation	The RUN mode.

2.5.8 I/O Configuration Menu

The I/O Configuration menu is used to configure the discrete relay output, 4–20 mA output, and communication parameters of the Sentinel II.

The menu is divided into two tables: Discrete output settings; and 4–20 mA/communications settings.

2.5.8.1 Discrete output settings

Follow the step-by-step procedure for setting the discrete output. It is assumed that you are starting from the RUN mode.

Current Menu Location	Display	Action	Comments
Run	Magnetrol Int'l x.x level units	Normal operation	This is the RUN mode.
Run/I/O CONFIG	I/O Config > to select	Access the I/O Config menu	Use the arrow keys to scroll down until the display reads I/O Config.
Run/I/O Config/ Relay Settings	Relay Settings > to select	Access the Relay Settings menu	This menu allows you to set all discrete output parameters (Relay).
Run/I/O Config/ Relay Settings	Select Relay > to select	Select the relay to configure	This menu allows you to set specific parameters concerning individual set points. Enter the discrete output number (1–4). NOTE: If you enabled Relay #1 as the fault relay, control output options are (2–4).
Run/I/O Config/ Relay Settings Select Relay	Fault Relay (#1) Disable	Select relay #1 as the fault relay	This display will only appear if Relay #1 is selected in the preceding step. Select Relay #1 as the fault relay (enable) or as a standard discrete output (disable)
Run/I/O Config/ Relay Settings Select Relay	Enable/disable disable	Activate the relay	Select to use (enable) or bypass (disable) this output.
Run/I/O Config/ Relay Settings Select Relay	Relay On point X.XX in	Set the relay energize point	Enter the level at which you want the output to energize.
Run/I/O Config/ Relay Settings Select Relay	Relay Off point X.XX in	Set the relay de-energize point	Enter the level at which you want the output to de-energize.
Run/I/O Config/ Relay Settings Select Relay	Fail-safe DNRG>Set point	Select the fail-safe condition	This step will only appear if the Relay On and Relay Off points are the same. Select either DNRG<Set point (low level fail-safe) or DNRG>Set point (high level fail-safe).
Run/I/O Config/ Relay Settings Select Relay	Relay On Delay 1 sec	Set the relay energize delay	Enter the desired delay period before the relay energizes.
Run/I/O Config/ Relay Settings Select Relay	Relay Off Delay 1 sec	Set the relay de-energize delay	Enter the desired delay period before the relay de-energizes.
Run/I/O Config/ Relay Settings Select Relay	Fault Mode DNRG on fault	Select the output state on fault	Select whether the control output will de-energize on a system fault or hold the latest output.
Run/I/O Config/ Relay Settings	Previous Menu > to select		
Run/I/O Config/ Relay Settings	Select Relay > to select		
Run/I/O Config/ Relay Settings Lead Lag Mode	Lead Lag Mode DNRG>Set point	Set the Lead/Lag relay combinations	This menu allows you to select various options concerning multiple pump sequencing. Use the arrow keys to select the various pump sequencing options (1-2, 1-2-3, 1-2-3-4, etc.). If relay #1 was selected as the fault relay, options containing 1 will not be available.
Run/I/O Config/ Relay Settings	Previous Menu > to select		
Run/I/O Config/ Relay Settings	Relay Settings > to select		Press the down arrow to setup the 4–20 mA output or communications options (the next table) or press DEL two times to return to the RUN mode.
Run	Magnetrol Int'l x.x level units	Normal operation	The RUN mode.

2.5.8 I/O Configuration Menu (cont.)

The I/O Configuration menu is used to configure the discrete relay output, 4–20 mA output, and communication parameters of the Sentinel II.

The menu is divided into two tables: Discrete output settings; and 4–20 mA/communications settings.

2.5.8.2 Setting 4–20 mA and communications output

Following is a step-by-step procedure for setting the 4–20 mA and communications output. It is assumed that you are beginning at the RUN mode.

Current Menu Location	Display	Action	Comments
Run	Magnetrol Int'l x.x level units	Normal operation	This is the RUN mode.
Run/I/O CONFIG	I/O Config > to select	Access the I/O Config menu	Press the down arrow until the display reads I/O Config.
Run/I/O Config/ 4–20 mA Settings	4–20 mA Settings > to select	Access the 4–20 mA Settings menu	
Run/I/O Config/ 4–20 mA Settings	Enable/Disable Disable	Activate the 4–20 mA Output menu	Select to use (enable) or bypass (disable) the 4–20 mA output.
Run/I/O Config/ 4–20 mA Settings	4 mA Point x.xx in	Set the 4 mA level	Enter the level of the desired 4 mA output.
Run/I/O Config/ 4–20 mA Settings	20 mA Point x.xx in	Set the 20 mA level	Enter the level of the desired 20 mA output.
Run/I/O Config/ 4–20 mA Settings	Fault Mode off	Set the output state on fault	Select the state of the 4–20 mA Output in the event of a unit fault. Use the arrow keys to select the fault option (3.5 mA, 22 mA, or HOLD).
Run/I/O Config/ 4–20 mA Settings	Previous Menu x.xx in		Press ENT.
Run/I/O Config/ Comm Port Setup	Comm Port Setup > to select	Access the Comm Port Setup menu	Set a specific address for this device when used with a digital communications protocol.
Run/I/O Config/ Comm Port Settings	Address (0–256) > to select	Set the unit's communication 0	This is the I.D. byte used to select this particular unit during polling.
Run/I/O Config/ Comm Port Settings	Baud rate 9600	Set the unit's communication speed	The selection options are 300, 1200, 4800, 9600.
Run/I/O Config/ Comm Port Settings	Parity Odd	Set the condition of the parity bit	The selection options are Odd, Even, or None.
Run/I/O Config/ Comm Port Settings	Previous Menu > to select		Press ENT. Press DEL twice to return to the RUN mode.
Run	Magnetrol Int'l x.x level units	Normal operation	The RUN mode.

2.5.9 Advanced Configuration Menu

This menu is used to set the non-control parameters of the Sentinel II.

Follow this step-by-step procedure to use this menu. It is assumed that you are starting from the RUN mode.

Current Menu Location	Display	Action	Comments
Run	Magnetrol Int'l x.x level units	Normal operation	This is the RUN mode.
Run/Adv Config	Adv Config > to select	Access the Adv Config menu	Use the arrow keys to scroll down until the display reads Adv Config.
Run/Adv Config/ Damping	Damping (1–60) 6	Set the output damping	Set a damping factor to the 4–20 mA output to decrease the effect of turbulence. Enter the number of seconds.
Run/Adv Config/ Damping	Enter password	Accept the data entered	The Enter password display will not appear if a password has been entered anywhere else in the general program menu. Use the numeric keys to enter your password.
Run/Adv Config/ Default Display	Default Display Level	Set the display for the run mode	Set the display variable for the RUN mode.
Run/Adv Config/ Change Password	Change Password > to select	Change the unit's password	Press ENT only if you want to change the password; press the down arrow to skip. Enter the current system password; press ENT. Then enter the new password; press ENT. Enter the new password again; press ENT.
Run/Adv Config/ Adjust Loop Pts.	Adjust loop pts.	Calibrate the 4–20 mA output	Allows matching of the actual 4–20 mA output with the displayed value from the measuring circuit. Adjustment is factory set and typically will not need to be readjusted.
Run/Adv Config/ Adjust Loop Pts.	3.5 mA Offset xxx	Set the 3.5 mA end point	Use a DMM to measure the actual output current, increase or decrease the xxx value until DMM reads 3.5 mA. Press ENT.
Run/Adv Config/ Adjust Loop Pts.	22 mA Offset xxx	Set the 22 mA end point	Use a DMM to measure the actual output current, increase or decrease the xxx value until DMM reads 22 mA. Press ENT. Press DOWN arrow.
Run/Adv Config	Previous Menu > to select		Press DEL two times to return to the RUN mode.
Run	Magnetrol Int'l x.x level units	Normal operation	This is the RUN mode.

2.5.10 Diagnostics Menu

This menu is used to offer the technician a method of testing the unit's functionality. It also provides useful information for troubleshooting purposes.

Follow this step-by-step procedure to use this menu. It is assumed that you are starting from the RUN mode.

Current Menu Location	Display	Action	Comments
Run	Magnetrol Int'l x.x level units	Normal operation	This is the RUN mode.
Run/Diagnostics	Diagnostics > to select	Access the Diagnostics menu	Press the arrow keys to scroll down until the display reads Diagnostics.
Run/Diagnostics/ Test Relay	Test Relays > to select	Test the relay outputs menu	This menu allows you to energize/de-energize each output individually.
Run/Diagnostics/ Test Relay	Enter Password	Accept the data entered	Enter a number between 1 and 4. Use the arrow keys to toggle between Energize and De-energize.
Run/Diagnostics/ Test Relay	Select Relay ~	Set the relay to test	Set the display variable for the RUN mode.
Run/Diagnostics/ Test 4–20 mA Loop	Test 4–20 mA Loop > to select	Test the 4–20 mA output	Press ENT twice. Enter the value of the desired output current. Press ENT. The 4–20 mA output is now at the desired loop current. Press ENT when finished.
Run/Diagnostics/ Signal Values	Signal Values > to select	Access the Signal Values menu	View actual signal readings from the electronics, probe, and preamplifier.
Run/Diagnostics/ Signal Values	CCO Int Cap x.xx uS	Check the function of the internal oscillator	This test compares the probe's capacitance on the probe and displaying it as a function of the oscillator.
Run/Diagnostics/ Signal Values	CCO Open Probe x.xx uS	Check the connection between the preamplifier and the probe	This test compares the probe's capacitance on the probe and displaying it as a function of the oscillator.
Run/Diagnostics/ Signal Values	CCO Probe x.xx uS	Measure the probe's capacitance in the application	This test is measuring the actual capacitance on the probe and displaying it as a function of the oscillator.
Run/Diagnostics/ Signal Values	Previous Menu > to select		Press ENT.
Run/Diagnostics/ View Version #	View Version # x.xx	View the software revision #	Displays the version number of Sentinel II software which is installed.
Run/Diagnostics	Previous Menu > to select		Press DEL two times to return to the RUN mode.
Run	Magnetrol Int'l x.x level units	Normal operation	The RUN mode.

3.0 Reference Information

3.1 Troubleshooting

Caution: In hazardous areas, do not remove housing until power is disconnected and atmosphere is determined to be safe. The Sentinel II contains a comprehensive diagnostics system that can assist in locating the cause of a specific fault. This system also allows the user to test the 4–20 mA and discrete (relay) outputs to ensure satisfactory operation of the system. The following section defines each function of the diagnostics system:

3.1.1 Test Relays

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

3.1.2 Test 4–20 Output

The 4–20 Loop Output menu provides a means for testing the 4–20 mA output. Once the desired loop current is entered, the Model 804 will drive the output loop to this current value.

3.1.3 Signal Values

The Signal Values menu provides a means of examining the signals between the probe and the CCO (Capacitance Controlled Oscillator). The three signals are:

3.1.3.1 CCO int. cap.

This signal represents the time period of the oscillator using the internal test capacitor. This fixed capacitor is switched into the circuit to test the oscillator. A value of approximately 475 and 525 μsec . is acceptable.

3.1.3.2 Open probe

This signal represents the time period of the oscillator with no capacitor attached (the probe and the fixed capacitor are switched out of the circuit). A value between 150 μsec . and 250 μsec . is acceptable.

3.1.3.3 CCO probe

This signal represents the time period of the oscillator using the probe's capacitance. The minimum should be equal to or greater than the open probe value; the maximum should not exceed 70,000 μsec .

3.1.4 View Version

The View Version # menu enables the user to verify the version number of the software of the unit.

3.1.5 Factory Presets



The Factory Presets menu allows setting of special factory functions. This menu should only be used with guidance from factory personnel. Contact the factory for assistance.

3.1.6 Troubleshooting Procedures

The chart below describes error messages that can appear on the Sentinel II display.

Display	Cause	Solution
Open probe	The capacitance being measured by the unit is too low. Possible causes include missing probe; missing/broken probe wire; or a poorly connected probe wire.	Check the interconnection wire between the probe and the preamplifier.
Shorted probe	Probe resistance between the center connection and mounting nut is less than 1 megohm. Possible causes include a bare probe in conductive media or a damaged insulated probe in a conductive media.	Check the probe resistance by connecting an ohmmeter between the center connection and the mounting nut. If the resistance is less than infinity, contact the factory.
Probe error	Probe capacitance exceeds 50,000 pF.	Contact the factory for application assistance.
No return signal	Occurs when the oscillator is not receiving a signal. Possible causes include a shorted probe; missing/broken interconnection cable between the preamplifier and the main electronics (remote only); or a defective circuit board.	If the probe is a shorted probe, follow the instructions above for shorted probe.

3.2 Agency Approvals

AGENCY	MODEL APPROVED	APPROVAL CATEGORY	APPROVAL CLASSES	
FM  APPROVED	804-XXXX-23X	Explosion proof	Class I, Div. 1; Groups B, C, & D	
	804-XXXX-33X	Insulated probes only	Class II, Div. 1; Groups E, F, & G Class III, NEMA 4X IP66	
	804-XXXX-53X	Integral units	Class I, Div. 1; Groups B, C, & D	
		Explosion proof with I.S. probe	Class II, Div. 1; Groups E, F & G Class III, NEMA 4X IP65	
	804-XXXX-63X	Remote units	Class I, Div. 1; Groups B, C, & D	
		Explosion proof	Class II, Div. 1; Groups E, F & G Class III, NEMA 4X IP65	
	Remote probe Intrinsically Safe	Class I, Div. 1; Groups A, B, C, & D		
		Class II, Div. 1; Groups E, F & G Class III, NEMA 4X IP65		
	CSA 	804-XXXX-23X	Explosion proof	Class I, Div. 1; Groups C, & D
		804-XXXX-33X	Insulated probes only*	Class II, Div. 1; Groups E, F, & G Class III, Type 4X
804-XXXX-53X		Integral units	Class I, Div. 1; Groups C, & D	
		Explosion proof with I.S. probe	Class II, Div. 1; Groups E, F & G Class III, Type 4X	
804-XXXX-63X		Remote units	Class I, Div. 1; Groups B, C, & D	
		Explosion proof	Class II, Div. 1; Groups E, F & G Class III, Type 4X	
Remote probe Intrinsically Safe		Class I, Div. 1; Groups A, B, C, & D		
		Class II, Div. 1; Groups E, F & G Class III, Type 4X		

*For Class II, Groups E & F, insulated probes must be used.



These units have been tested to EN 50081-2 and EN 50082-2 and are in compliance with the EMC Directive 89/336/EEC.

3.2.1 Agency Specifications – Intrinsically Safe Installation (FM/CSA)

INTRINSIC SAFETY

Model 804-XXXX-53X and 804-XXXX-63X are FM and CSA agency approved for use as an intrinsically safe circuit per the instructions on Drawing 99-5053-001 (Figure 8) shown below.

Intrinsically Safe/Sécurité Intrinsèque

WARNING: Substitution of components may impair intrinsic safety.

AVERTISSEMENT: La substitution de composants peut compromettre la sécurité intrinsèque.

Intrinsically Safe for: Hazardous Location Class I, Div. 1, Groups A, B, C, and D; Class II, Div. 1, Groups E, F, and G; Class III, NEMA 4X IP65.

Hazardous Location
Explosion proof for: Class I, Div. 1, Groups B, C, and D;
Dust ignition proof for: Class II, Div. 1, Groups E, F, and G; Class III, NEMA 4X IP65

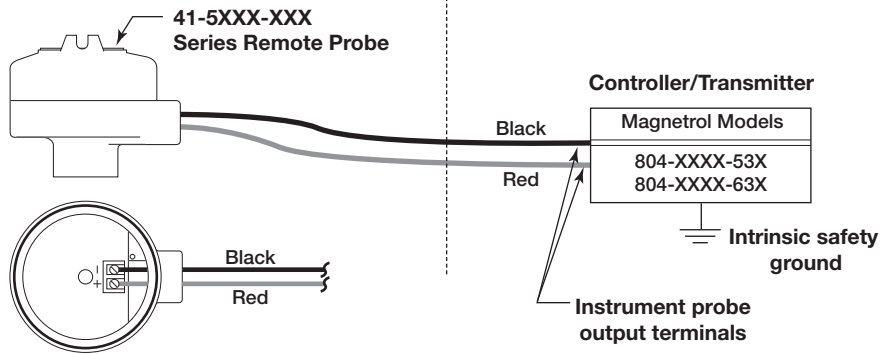


Figure 8
Drawing 99-5053-001

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. For FM intrinsically safe remote probes:
 - For Class I, Groups A & B locations, maximum cable length 800 feet;
 - For Class I, Groups C & D locations, maximum cable length 2500 feet.
6. No revisions shall be made to this drawing without FM or CSA authorization.
7. For CSA certification, installation shall be as specified by Canadian electric code.

3.3 Specifications

3.3.1 Electrical

Power supply		120 VAC, 50/60 Hz (+10%, -15%)
		240 VAC, 50/60 Hz (+10%, -15%)
		24 VDC, ($\pm 10\%$)
Power consumption		15 VA nominal
Supply voltage effect		Less than 1 pF over full range
Ambient temperature range		-40° to +160° F (-40° to +71° C)
Humidity		99% non-condensing (electronics)
Accuracy		Better than $\pm 1.0\%$
Repeatability		$\pm 0.1\%$
Linearity		$\pm 0.5\%$
Temperature effect		$\pm 0.01\%/^{\circ}\text{F}$ $\pm 0.018\%/^{\circ}\text{C}$
Operator interface		
		Data entry 16-button keypad
		Display 2-line \times 16-character LCD display
Continuous output	Signal	Active 4–20 mA (isolated reversible max. 1000 ohms loop resistance)
		Passive 4–20 mA (isolated reversible max. 1000 ohms loop resistance)
		Dependent on power supply)
		Range 5 pF minimum; 50,000 pF maximum
		Damping 0–90 seconds
Discrete output	Set point range 0–50,000 pF	
	Adjustable differential range 0.5 pF minimum	
		50,000 pF maximum
		Time delay 0–90 seconds level rising, level falling, both
Relay output		AC 10 amp @ 120/240 VAC resistive
		DC 10 amp @ 30 VDC resistive
		0.5 amp @ 125 VDC resistive
Maximum remote cable length		Standard: 2500 feet (762 m)
		Intrinsically safe: 800 feet (240 m)

3.3 Specifications

3.3.2 Dimensional inches (mm)

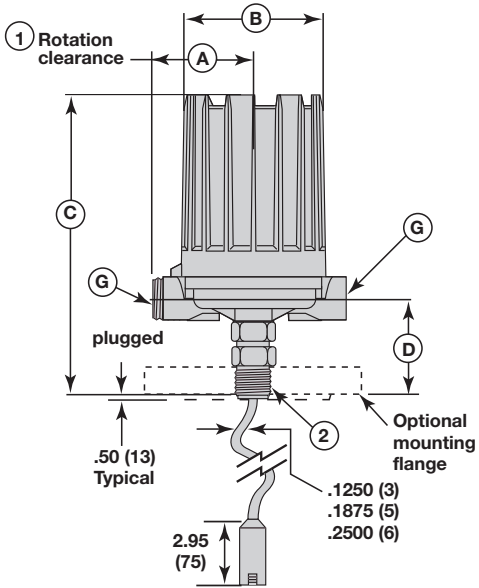


Figure 9
Integral Mount with Flexible Probe

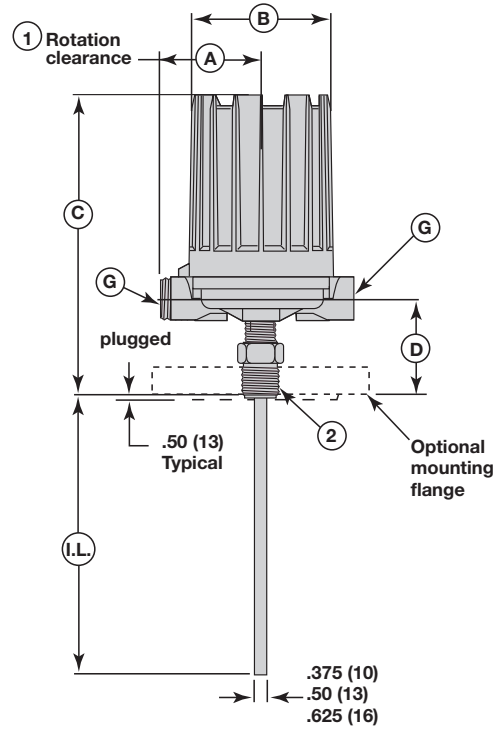


Figure 10
Integral Mount with Standard Rigid Probe

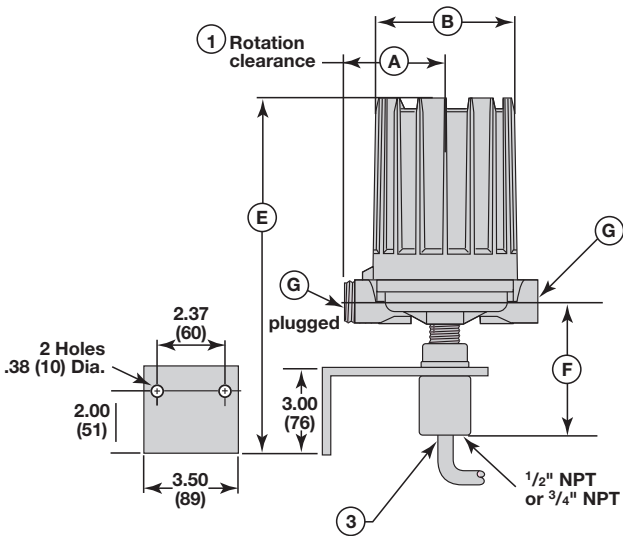


Figure 11
Remote Mount with Flexible Probe

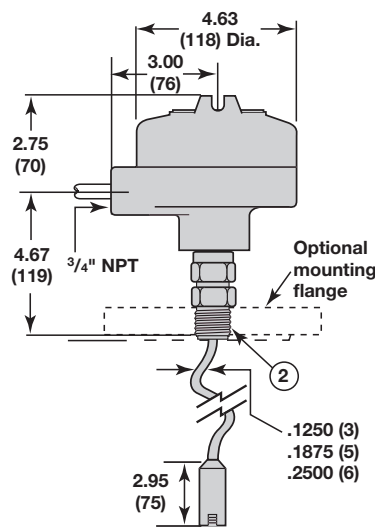


Figure 12
Optional Anchor Assembly
P/N 032-8814-001

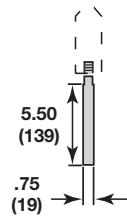


Figure 13
Optional Weight
P/N 004-4355-001

3.3 Specifications

3.3.2 Dimensional (cont.)

inches (mm)

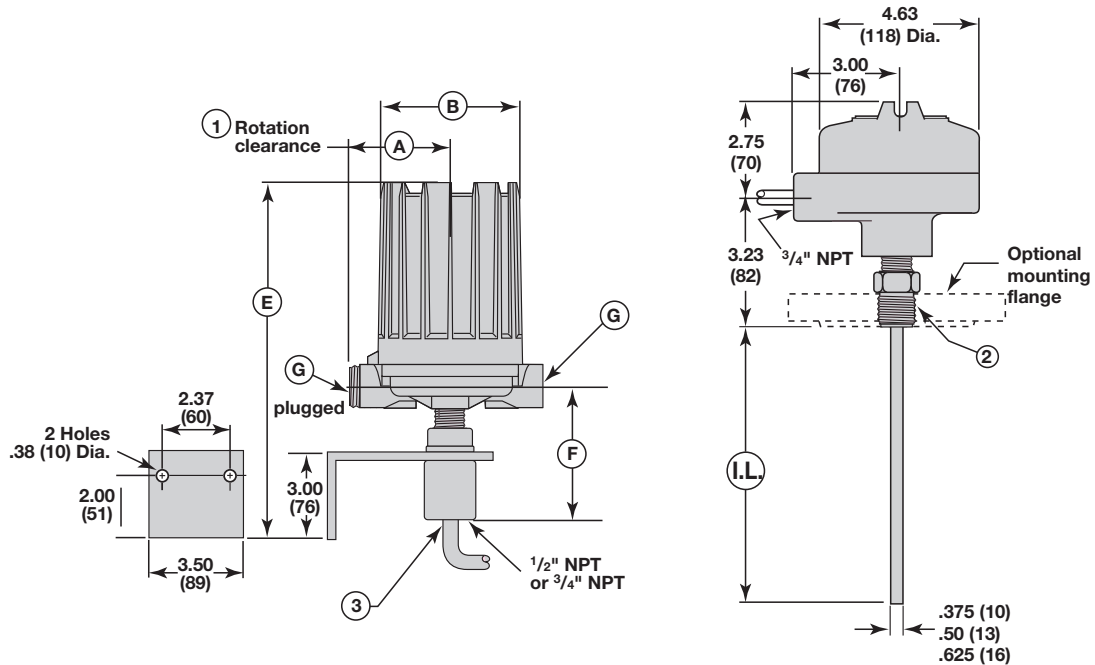


Figure 14
Remote Mount with Standard Rigid Probe

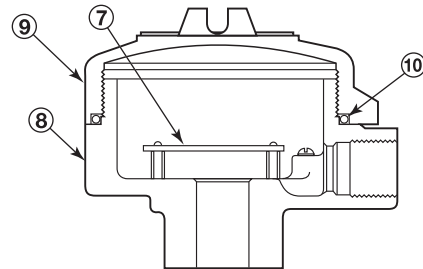
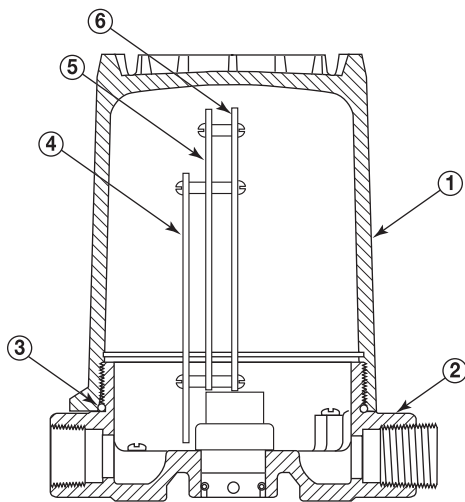
Outline Dimensions										
Housing	A	B	Standard Rigid Probe				Flexible Probe			
			C	D	E	F	C	D	E	F
NEMA 4X/7/9 Die-cast alum.	3.87 (98)	5.93 (151)	10.89 (276)	2.44 (61)	13.44 (341)	4.11 (104)	12.33 (313)	4.71 (119)	13.44 (341)	4.11 (104)

Conduit Connections	G
NEMA 4X/7/9 (remote probe housing) Single conduit	¾" NPT
NEMA 4X/7/9 Dual conduit	1" NPT

NOTES:

- ① Allow 8 inches (203 mm) overhead clearance for cover removal.
- ② Standard process connection is ¾" NPT. Consult probe brochure (Magnetrol 50-125/STI 95-133) for flange and other probe connections.
- ③ Probe/amplifier connecting cable to be shielded twisted pair 22-gauge stranded conductors; Magnetrol/STI part number 009-7146-001, 2500 feet (760 m) maximum; 800 feet (240 m) maximum for intrinsically safe models.

3.4 Replacement Parts



Item	Description			Part Number
1	Cover			004-9174-007
2	Base			004-9188-004
3	O-Ring			012-2201-253
4	Daughterboard	Integral		Z30-2213-001
		Integral I.S.		Z30-2213-002
		Remote		Z30-2213-003
		Remote I.S.		Z30-2213-004
5	Logic board	4-20		Z30-2211-001
		RS-485		Z30-2211-002
		4-20/RS-485		Z30-2211-003
6	Power supply board	120 VAC	0 relays	Z30-2212-003
			2 relays	Z30-2212-002
			4 relays	Z30-2212-001
		240 VAC	0 relays	Z30-2212-006
			2 relays	Z30-2212-005
			4 relays	Z30-2212-004
		24 VDC	0 relays	Z30-2212-009
			2 relays	Z30-2212-008
			4 relays	Z30-2212-007
7	KISO board	Explosion proof		Z30-2411-002
		Intrinsically safe		Z30-9005-001
8	Remote housing base	Aluminum		004-9104-001
		316 SS		004-9140-001
9	Remote housing cover	Aluminum		004-9105-001
		316 SS		004-9142-001
10	Remote housing O-ring			012-2101-345

3.5 Model Numbers

3.5.1 Transmitter

BASIC MODEL NUMBER:

804	Kotron Sentinel II RF Level Transmitter
-----	---

ELECTRONIC HOUSING:

R	NEMA 4X7/9 aluminum die-cast, 1" NPT
Y	NEMA 4X7/9 aluminum die-cast, 1" NPT w/316 SS, CCO housing (remote only)

INPUT POWER:

0	120 VAC
1	240 VAC
2	24 VDC

ANALOG OUTPUT/COMMUNICATIONS:

1	4–20 mA
5	4–20 mA w/RS-485 (Modbus)

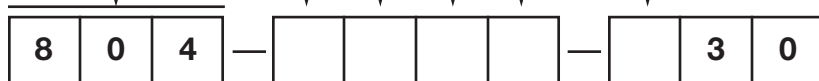
ALARM/CONTROL OUTPUT:

0	Transmitter only
C	(2) 10 amp SPDT relays w/gold flash contacts
D	(4) 10 amp SPDT relays w/gold flash contacts

MOUNTING:

2	Integral explosion proof
3	Remote explosion proof
5	Integral explosion proof w/intrinsically safe probe
6	Remote explosion proof w/intrinsically safe probe

Complete details on the available probes can be found in Bulletin 50-125, Kotron RF Sensing Probes



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:

1. Returned within the warranty period; and
2. 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'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 Electrostatic Discharge Handling Procedure on page 9.



5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4000 • Fax 630-969-9489 • www.magnetrol.com
 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



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

Copyright © 2007 Magnetrol International, Incorporated. All rights reserved. Printed in the USA.

Teflon® is a registered trademark of DuPont.

BULLETIN: 50-604.3
EFFECTIVE: May 2004
SUPERSEDES: March 1999