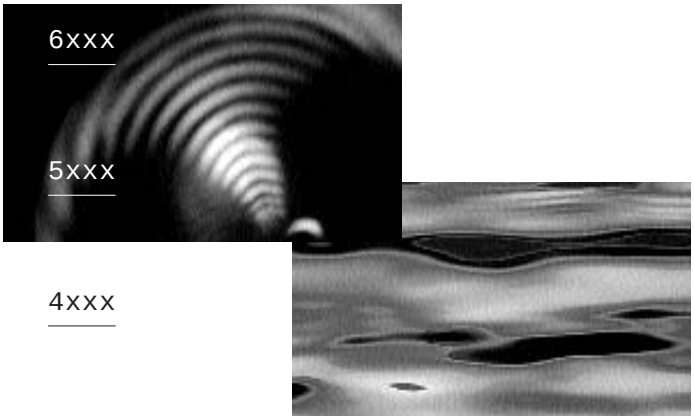
Model R95

Installation and Operating Manual

Through-Air

Radar Level Transmitter

7xxx



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STI

Read this Manual Before Installing
This manual provides information on the Through-Air Radar transmitter. It is important that all instructions are read carefully and followed in sequence. The *QuickStart Installation* instructions are a brief guide to the sequence of steps for experienced technicians to follow when installing the equipment. Detailed instructions are included in the *Complete 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
The Through-Air Radar system is designed for use in Category II, Pollution Degree 2 installations. Follow all standard industry procedures for servicing electrical and computer equipment when working with or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

Electrical components are sensitive to electrostatic discharge. To prevent equipment damage, observe safety procedures when working with electrostatic sensitive components.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

FCC ID: LPN R95
Any unauthorized changes or modifications not expressly approved by the party responsible for compliance could void user's authority to operate this equipment.

WARNING! Explosion hazard. Do not connect or disconnect designs rated Explosion-proof or Non-incendive unless power has been switched off and/or the area is known to be non-hazardous

Magnetrol reserves the right to make changes to the product described in this manual at any time 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 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.

1.0 Complete Installation

This section provides detailed procedures for properly installing, configuring, and, as needed, troubleshooting the Through-Air Radar Level Transmitter.

1.1 Unpacking

Unpack the instrument carefully. Make sure all components have been removed from the packing material. Check all the contents against the packing slip and report any discrepancies to the factory.

Before proceeding with the installation, do the following:

- Inspect all components for damage. Report any damage to the carrier within 24 hours.
- Make sure the nameplate model number on the probe and transmitter agree with the packing slip and purchase order.
- Record the model and serial numbers for future reference when ordering parts.

1.2 Electrostatic Discharge (ESD) Handling Procedure

Magnetrol's electronic instruments are manufactured to the highest quality standards. These instruments use electronic components that 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.

- Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap the board in aluminum foil. Do not place boards on foam packing materials.
- Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is recommended.
- Handle circuit boards only by the edges. Do not touch components or connector pins.
- Make sure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.

1.3 Before You Begin

1.3.1 Site Preparation

Each Through-Air Radar transmitter is built to match the specific physical specifications of the required installation. Make sure the antenna connection is correct for the threaded or flanged mounting on the vessel or tank where the transmitter will be placed. See Mounting, Section 1.4.

Make sure that the wiring between the power supply and Through-Air Radar transmitter are complete and correct for the type of installation.

When installing the Through-Air Radar transmitter in a general purpose or hazardous area, all local, state, and federal regulations and guidelines must be observed. See Wiring, Section 1.5.

1.3.2 Equipment and Tools

No special equipment or tools are required to install the Through-Air Radar transmitter. The following items are recommended:

- Open-end wrenches or adjustable wrench to fit the process connection size and type. Threaded antenna and transmitter 2"(51 mm), transmitter adjustment 1¼" (32 mm). A torque wrench is highly desirable.
- Flat-blade screwdriver
- Digital multimeter or digital volt/ammeter
- 24 VDC power supply, 23 mA

1.3.3 Operational Considerations

Operating specifications vary based on antenna type.

1.4 Mounting

The Through-Air Radar transmitter can be mounted to a tank using a variety of process connections. Generally, either a threaded or flanged connection is used.

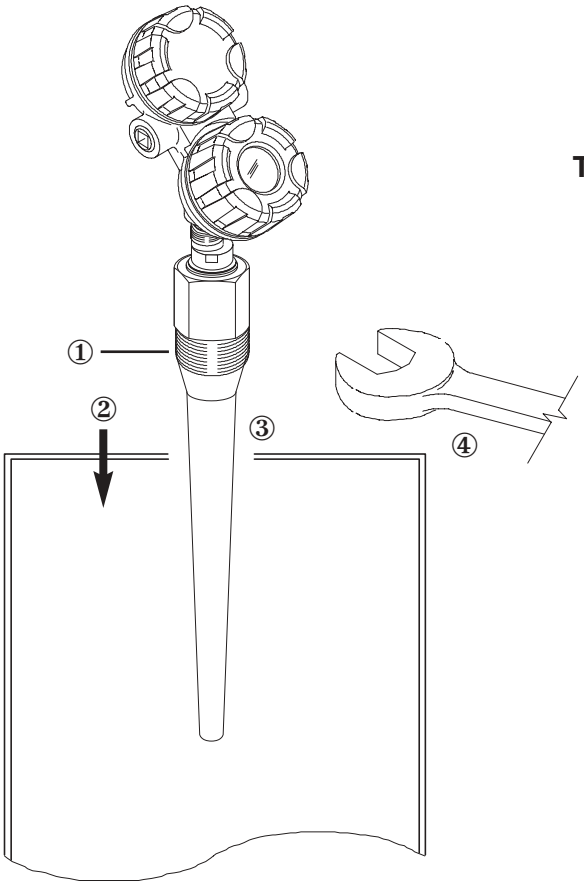
Note: Do not place insulating material around any part of the Through-Air Radar transmitter including the probe flange.

Make sure all mounting connections are properly in place on the tank before installing the transmitter. Compare the nameplate on the antenna and transmitter with the product information; make sure the antenna type and mount are correct for the intended installation.

1.4.1 Installing the Transmitter

Before installing, make sure the:

- Model and serial numbers on the nameplates of the antenna and transmitter are identical.
- Antenna has adequate room for installation.
- Process temperature, pressure, dielectric, and viscosity are within the probe specifications for the installation.



To install the transmitter:

① Make sure the process connection is at least 1½" NPT or a flanged mounting.

② Carefully place the antenna into the vessel. Align the gasket on flanged installations.

③ Align the antenna process connection with the threaded or flanged mounting on the vessel.

④ For threaded connections, tighten the nut of the antenna process connection. For flanged connections, tighten flange bolts.

⑤ Rotate the transmitter to face the most convenient direction for wiring, configuration, and viewing.

1.5 Wiring

Caution **The Through-Air Radar transmitter operates at voltages of 20-36 VDC (GP), 20-28.6 VDC (IS) and 20-36 VDC (XP). Higher voltage will damage the transmitter.**

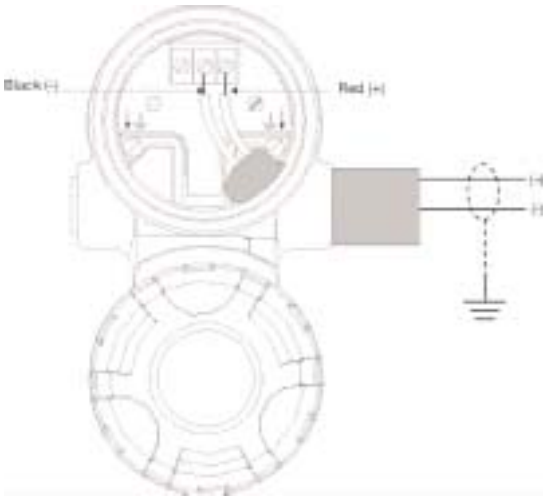
Wiring between the power supply and the Through-Air Radar transmitter should be made using 18-22 AWG shielded twisted pair instrument cable. Within the transmitter enclosure, connections are made to the terminal strip and the ground connections. The directions for wiring the Through-Air Radar transmitter depend on the application:

- General Purpose or Non-incendive (Cl I, Div. 2)
- Intrinsically Safe
- Explosion Proof

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

1.5.1 General Purpose or Non-incendive (Cl I, Div. 2)

A general purpose installation does not have flammable media present. Areas rated non-incendive (Cl I, Div. 2) have flammable media present only under abnormal conditions. No special electrical connections are required. If flammable media is contained in the vessel, the transmitter must be installed per Cl I, Div. 1 standards of area classification.



To install General Purpose or Non-incendive wiring:

1. Remove the cover to the wiring compartment of the transmitter. Install the conduit plug in the unused opening.
2. Install a conduit fitting and pull the supply wires.
3. Connect shield to an earth ground at power supply and leave floating at the transmitter.
4. Connect an earth ground wire to the nearest green ground screw. (Not shown in illustration.)
5. Connect the positive supply wire to the (+) terminal and the negative supply wire to the (-) terminal.
6. Replace the cover to the wiring compartment of the transmitter.

1.5.2 Intrinsically Safe

An intrinsically safe (IS) installation potentially has flammable media present. An approved IS barrier must be installed in the non-hazardous (safe) area.

To install Intrinsically Safe wiring:

1. Make sure the IS barrier is properly installed in the safe area (refer to local plant or facility procedures). Complete the wiring from the barrier to the Through-Air Radar transmitter.
2. Remove the cover to the wiring compartment of the transmitter. Install the conduit plug in the unused opening.
3. Install a conduit fitting and pull the supply wires.
4. Connect shield to an earth ground at power supply and leave floating at the transmitter.
5. Connect an earth ground wire to the nearest green ground screw. (Not shown in illustration.)
6. Connect the positive supply wire to the (+) terminal and the negative supply wire to the (-) terminal.
7. Replace the cover to the wiring compartment of the transmitter.

1.5.3 Explosion Proof

Explosion Proof (XP) is a method of designing equipment for installation in hazardous areas. A hazardous location is an area in which flammable gases or vapors are, or may be, present in the air in quantities sufficient to produce explosive or ignitable mixtures. The wiring for the transmitter must be contained in Explosion Proof conduit extending into the safe area. Due to the specialized design of the Through-Air Radar transmitter, no Explosion Proof conduit fitting (EY seal) is required within 18" of the transmitter. An Explosion Proof conduit fitting (EY seal) is required between the hazardous and safe areas.

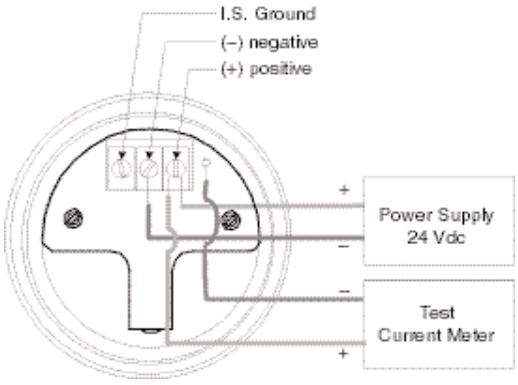
To install Explosion Proof wiring:

1. Install Explosion Proof conduit from the safe area to the conduit connection of the Through-Air Radar transmitter (refer to local plant or facility procedures).
2. Remove the cover to the wiring compartment of the transmitter.
3. Connect shield to an earth ground at the power supply and leave floating at the transmitter.
4. Connect an earth ground wire ⏚ to the nearest green ground screw. (Not shown in illustration.)
5. Connect the Intrinsic Safety (IS) terminal to ground per NFPA 70, the CeC, or the local inspector.
6. Connect the positive supply wire to the (+) terminal and the negative supply wire to the (-) terminal.
7. Replace the cover to the wiring compartment of the transmitter.

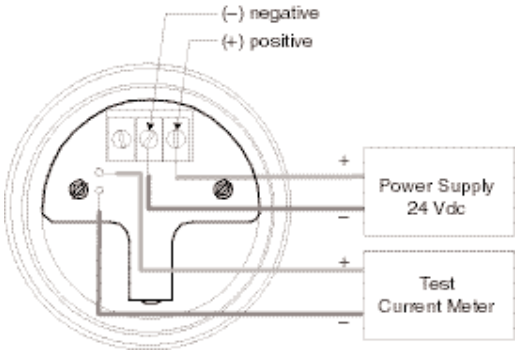
1.6 Configuring the Transmitter

The Through-Air Radar transmitter comes configured from the factory and can be reconfigured in the shop. Bench configuration provides a convenient and efficient way to set up the transmitter before going to the tank site to complete the installation.

Before configuring the transmitter, collect the operating parameters information. Then, power-up the transmitter on the bench and follow through the step-by-step procedures for the menu-driven transmitter display. Information on configuring the transmitter using a HART communicator is given in Configuration Using HART.



Explosion Proof Model



General Purpose/Intrinsically Safe Model

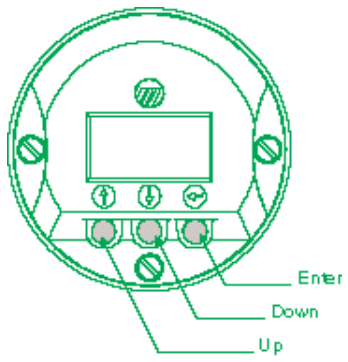
1.6.1 Operating Parameters

Some key information is needed to calibrate the Through-Air Radar transmitter. Complete the configuration information table.

1.6.2 Setting Up for Shop Configuration

The Through-Air Radar transmitter can be configured at a test bench by connecting a 24 VDC power supply directly to the transmitter terminals. The connections are illustrated in the accompanying diagrams. An optional digital multimeter is shown if current measurements are desired.

1. When using a HART communicator for configuration, a minimum 250 Ω line load resistance is required. See the HART communicator manual for more information.
2. The transmitter can be configured without the antenna, but disregard error messages due to the unattached antenna.
3. Through-Air Radar transmitter may indicate a LEVEL value >0 when disconnected from antenna.
4. After entering the last value, allow 10 seconds before removing power from the transmitter. This allows the transmitter to store values.



1.6.3 Transmitter Display and Keypad

The Through-Air Radar transmitter has a liquid-crystal display (LCD) capable of showing two lines of 8 characters each. Transmitter measurements and configuration menu screens are shown on the LCD.

The transmitter default display is the measurement screen. It cycles every 5 seconds to display LEVEL, %OUTPUT, Quality, and LOOP information. The transmitter defaults to this display after 5 minutes if no keystrokes are sensed.

The keypad has three arrows used to scroll through the displays and to calibrate the transmitter – the Up and Down Arrow (⇧ ⇩) keys and the Enter (↵) key.

Arrows	Function in Display Mode	Function in Configuration Mode
Up and Down ⇧ ⇩	Moves forward and backward in the configuration program from one display to another.	Increases or decreases the value displayed or moves to another choice. *Note: Hold arrow key for rapid scrolling.*
Enter ↵	Enters the configuration mode (noted by an exclamation point as the last character in the top display line).	Accepts a value and moves to the next step of the configuration program.

1.6.4 Password Protection (Default = 1)

The Through-Air Radar transmitter is password protected to restrict access to certain portions of the menu structure that affect the operation of the system. When the proper password is entered, an exclamation point (!) appears as the last character of the first line of the display. The password can be changed to any numerical value up to 255. The password is required whenever configuration values are changed.

The default password installed in the transmitter at the factory is 1. The last step in the configuration menu provides the option to enter a new password. If 0 is entered as a password, the transmitter is no longer password protected and any value in the menu can be altered without entering a confirming password, except diagnostic values.

Note: If the password is not known, the menu item New Password displays an encrypted value representing the present password. Call the factory with this encrypted value to determine the present password.

1.6.5 Menu: Step-By-Step Procedure

The following table provides a complete explanation of the software menus displayed by the Through-Air Radar transmitter. Use this table as a step-by-step guide to configure the transmitter.

The first column presents the menus shown on the transmitter display. The displays are in the order they would appear if the arrow keys were used to scroll through the menu. The numbers are not shown on the display. They are provided as a reference.

The second column provides the actions to take when configuring the transmitter. Additional information or an explanation of an action is given in the third column.