

# Nuclear Power Capabilities

Magnetrol International, Incorporated  
Orion Instruments, Inc.

## Overview

History in the Nuclear &  
Fossil Power Industry

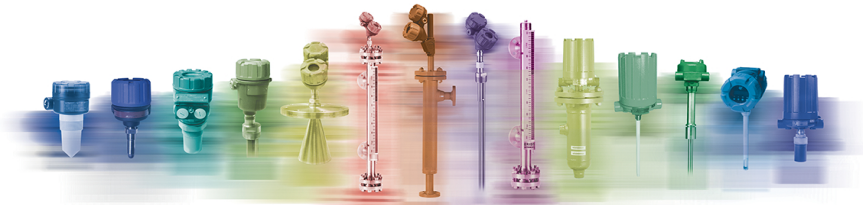
## Quality Program

10 CFR Part 50, Appendix B

10 CFR Part 21

IEEE 323 – 1974

IEEE 344 – 1975



## Magnetrol & Orion Instruments

Magnetrol, a global company, pioneered the mechanical switch in 1932 for boiler applications. Over time our expertise in this arena gave access to the power industry where today it is a rare case that one cannot find our transmitters or switches monitoring a critical level in nuclear & fossil plants around the world.

This entrepreneurial and innovative spirit continues today. As the need for improved instrumentation and control increased, so

did our product offering. It has evolved to include a range of level and flow technologies to satisfy the most complex applications.

A key development was the Eclipse Guided Wave Radar (GWR). Magnetrol introduced this technology to the process world and was the first to leverage its unique capabilities in the Power Industry.

In 2001 we started Orion Instruments, a subsidiary of Magnetrol International, after noting stagnation in

the advancement of Magnetic Level Indicators (MLI). In this short period of time Orion Instruments revolutionized the MLI industry with the release of the Aurora integrated MLI/GWR – an instrument widely accepted in the Power Industry.

While today we provide level solutions to all major market segments, our roots are in the Power Industry and it continues to be the mainstay of Magnetrol and Orion Instruments and a focus for ongoing R&D.

## Instrumentation Highlights (Nuclear Power Industry)

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Magnetrol has been supporting the Nuclear Power Industry with safety and non-safety related level switches since the early 1970s. Our installed base includes Pressurized Water Reactors (PWR), Boiling Water Reactors (BWR) and CANDU reactors around the world.

We maintain a Quality Program in compliance with the criteria set forth by 10 CFR Part 50, Appendix B, adhere to the reporting of noncompliance and

defects consistent with 10 CFR Part 21 and offer testing to IEEE 323 and IEEE 344 standards. This attention to quality allows us to meet the ongoing needs of our customers.

Although Magnetrol's inauguration into the Nuclear Power Industry came by way of our mechanical switches, we supported long-term testing of the Eclipse Guided Wave Radar at plants undergoing modernization. Tests confirmed the performance benefits,

reliability and cost savings of this advanced level technology. As a result, we have installations on feedwater heaters, hotwells, drain tanks, etc. at Oconee, V.C. Summer and Ginna Nuclear Stations.





*"A fully redundant system integrating the Eclipse Guided Wave Radar with conventional float-based Magnetic Level Indication"*



## Aurora

After nearly four years of extensive testing of the Eclipse Guided Wave Radar platform including its Foundation Fieldbus communication protocol, Oconee Nuclear Station was the first NPP to retrofit aging torque tubes on their feedwater heaters with the Aurora.

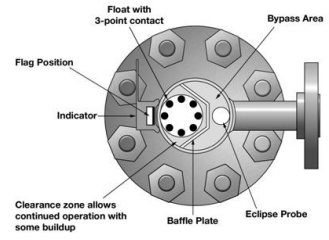
The patented combination of conventional float-based magnetic level indication and the

performance benefits of the Eclipse Guided Wave Radar address the need for a fully redundant system in a single chamber design.

The Aurora allows simultaneous, independent measurements of the liquid using two distinct and proven technologies.

Its unique perforated baffle plate in a 3 or 4 inch chamber isolates the two measurements ensuring the

unfortunate failure in one does not compromise the performance of the other.



## Eclipse Guided Wave Radar

Unsurpassed in its ability to accurately and reliably monitor level in feedwater heaters, deaerators, condenser hotwells, etc. without requiring calibration or various corrections in the Distributive Control System (DCS), the Eclipse Guided Wave Radar has found a home in the Power Industry.

Designed to operate under high temperatures and pressures, the Eclipse employs time domain reflectometry (TDR) to

precisely monitor the level in critical plant applications.

Unlike traditional level technologies affected by process variations (e.g., specific gravity, pressure and temperature), the Eclipse is unaffected by these conditions allowing it to provide accurate level measurement from startup to operational temperatures.

In addition to these performance benefits, the Eclipse has no moving parts to

eliminate instrument induced errors as well as routine calibration. Our proprietary algorithm to compensate for dielectric shift in the vapor space and process isolation seal ensure accuracy and reliability in high temperature saturated steam applications.



## Pulsar Non-Contact Radar

A Through-Air Radar utilizing Pulse Burst technology for high performance and reliability in measuring liquid levels.

The non-contacting nature of the measurement eliminates issues associated

with contact technologies on key applications such as spent fuel pool and boric acid storage level monitoring.

In balance of plant level applications, the Pulsar excels where other technologies fall short.



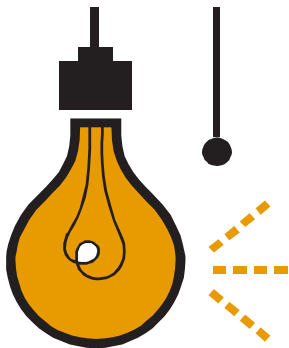
# Mechanical Switches

Noted for their quality, reliability and longevity, Magnetrol's mechanical switches have long been a fixture in safety and non-safety related applications. They are utilized throughout the nuclear and turbine islands as well as a host of balance of plant applications.

Magnetrol presently maintains 13 different switch configurations under our Quality Program. These range from single, dual and three stage displacer type switches with narrow or wide differential to external flanged/sealed caged float and flood level switches.

Our switches provide high/low level protection and safety shutdown services for an extensive range of applications. Some of the more common being core cooling water surge tanks, feedwater heaters, fuel transfer canal, condensate storage, turbine building drain pot, leak detection (various), reactor coolant pumps and emergency diesel generator fuel storage and day tanks.

The current installed base for Magnetrol switches on safety and non-safety related applications encompass 85 percent of domestic nuclear power plants. International installations include plants in Argentina, Brazil, Mexico, Taiwan, Korea, China, Canada, and Romania to name a few.



## The Next Generation in Power

As the nuclear renaissance unfolds and existing plants push to modernize critical instrumentation and control systems, Magnetrol will continue to work closely with individual plants, EPC contractors, manufacturers and consortiums to further the enhancement and adoption of advanced level technologies.

The next generation in nuclear power presents new challenges and exciting opportunities for Magnetrol and Orion Instruments, our partners and the industry. Whether

leveraging the diversity of our proven mechanical capabilities; optimizing the process through tighter level control with the Eclipse Guide Wave Radar; or the marriage of multiple technologies to provide true redundancy in an integrated package, we are steadfast in our resolve to meet the needs of our customers.

It is an unwavering commitment to quality, safety and continuous improvement that has lead to our past and present success and will be foremost in our mission to support the Nuclear Power Industry in the future.

### Magnetrol's product groups by Technology:

- Buoyancy
- Non-Contact Ultrasonic
- Contact Ultrasonic
- Guided Wave Radar
- Pulse Burst Radar
- RF Capacitance
- Magnetic Level
- Thermal Dispersion
- Vibration

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# Instrumentation from Magnetrol



## Guided Wave Radar

Eclipse and Horizon transmitters are two-wire, loop-powered, 24 VDC level transmitters based on Guided Wave Radar (GWR) technology. Available in coaxial, twin rod and single rod probes, these leading-edge transmitters provide measurement performance well beyond that of many traditional technologies. Available with HART®, FOUNDATION fieldbus™ and PROFIBUS® outputs



## Thru-Air Radar

Pulsar Pulse Burst Radar level transmitters are the latest generation of loop-powered, 24 VDC, liquid level transmitters. They offer lower power consumption, faster response time and are easier to use than most loop-powered radar transmitters. Pulsar is available in a dielectric rod or horn antenna style.



## Float & Displacer

Float-actuated switches are available in top-mount and side-mount styles for high or low level alarm, interface, and pump control applications. Top-mounting displacer type level switches offer the industrial user a wide choice of alarm and control configurations. Displacer based electronic and pneumatic transmitters offer 4-20 mA or HART output.



## Ultrasound

Echotel contact and non-contact ultrasonic level transmitters and switches are available in a range of models to provide users with the features and options suitable for their specific application. The Models 961 single point and 962 dual point switches are available with relay or current shift electronics.



## Thermal Dispersion

Thermatel Models TA1 and TA2 Mass Flow Transmitters provide reliable mass measurement for air and gas flow applications. Thermatel switches provide a high level of performance in flow, level and interface applications for air, gas and liquids. A sanitary version of the TD2 switch is available for sterile, Clean-In-Place applications.



## Visual Indication

Atlas™, Aurora and Gemini are magnetically coupled liquid level indicators precision engineered and manufactured to provide accurate, reliable, and continuous visual level indication. Aurora provides redundant control with both a float and an Eclipse Guided Wave Radar transmitter.



## RF Capacitance

Kotron RF Capacitance level switches and transmitters are available in nine different models to provide a wide range of features to suit a large array of applications and process media.



## Vibrating Rod

Solitel Vibrating Rod Level Switches provide reliable level detection of powders and bulk solids. This compact, integral switch is suitable for high or low level detection in hoppers or silos.



## Magnetostriction

The Enhanced Jupiter magnetostrictive transmitter provides a 4-20 mA output proportional to the level being measured or Foundation fieldbus™ output. May be externally mounted to a MLI or inserted directly into the process vessel.



**PLEASE NOTE:** The instruments recommended in this guide are based on field experience with similar applications and are included as a general guide to flow control selection. However, because all applications differ, customers should determine suitability for their own purposes.



Worldwide Level and Flow Solutions<sup>SM</sup>

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