Neptune Introduces
Integrated RF/E-Coder Technology

Neptune's use of integrated technology to enhance the efficiency of its products is on full display with the E-Coder)R900*i*. By combining the functionality of two of its best-received products, Neptune has given utilities a meter reading solution that offers value-added data, is easy to install and is consistently reliable.

In 1998 Neptune introduced the R900™ radio frequency meter interface unit. The R900 utilizes frequency hopping spread spectrum (FHSS) technology for maximum transmission range and read success rate. Since that time, Neptune has continued to improve the performance of the R900 by increasing output power and extending battery life. The waterworks industry has embraced the R900 due to its simplicity of design (no FCC license or programming required) and exceptional field performance, making Neptune a leader in the AMR market.

In 2003 Neptune introduced the E-Coder®, a solid-state absolute encoder register

Like all absolute encoders, the E-Coder shares several common characteristics:

- Local and remote readings are not dependent on a battery to power the encoding circuit;
- Remote communications via ASCII serial communications occur only when interrogated by a remote device (ex. probe / receptacle or MIU);
- Local visual reading and remote reading come from the same single source;
- Local odometer reading and remote readings are guaranteed to match.

With the growing acceptance of Automatic Meter Reading, the market was requesting more information than a basic encoder could provide. Neptune's engineers determined that the resolution provided by merely encoding the odometer wheels severely limited the possibility of offering enhanced features being requested by the market. This led to a totally new concept wherein the encoded data source directly related to the meter's measuring element. In the E-Coder the encoded data source is the register magnet, which is the register's only moving part and is linked directly to the measuring element. With this new encoding technique the E-Coder is capable of providing the features most requested by the market: high resolution meter reading, leak indication, reverse flow notification (backflow), rate-of-flow, tamper detection and improved reliability (the E-Coder has only one moving part).

All electrical energy needed for the basic functionality of the E-Coder is internally generated and no batteries are required. When connected to the R900, the E-Coder utilizes the R900 to power the integrated circuit to perform the advanced leak, backflow, rate-of-flow and tamper detection functions on a 15-minute basis. This advanced data is retained in the E-Coder's non-volatile memory for a rolling 35-day period and is communicated remotely to Neptune data collection devices via the R900 radio MIU.

Realizing that utilities purchasing Neptune's E-Coder would also purchase an R900 to take full advantage of the advanced functionality of E-Coder, Neptune determined the E-Coder could be further enhanced if it were integrated with the R900 in a single enclosure. This integration of two field-proven technologies would provide further benefits to utilities, including the reduction of installation time, installation errors and overall reliability.

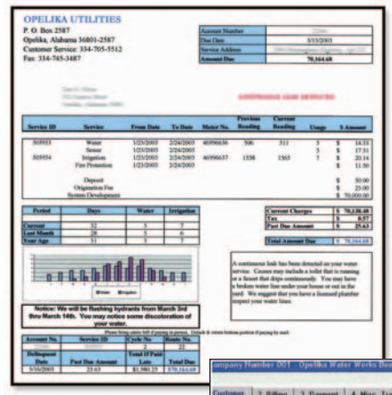
The E-Coder)R900*i* wireless design improves reliability and reduces the potential for tampering

The E-Coder)R900*i* is available in two versions. One is for submerged and harsh service environments found in meter pits, and the other is for inside set applications such as basements or hot water heater closets. The pit version features an integral antenna and an optional through-the-pit-lid antenna design providing application flexibility to ensure maximum performance in even the worst environments. The E-Coder)R900i also features a field replaceable battery for extended product life. Both designs feature an E-Coder and an R900 RF module combined in a single register enclosure. This unitized design offers increased value over separate units that must be installed using cables, connectors, and special tools. The E-Coder)R900*i* is merely mounted on the meter just like a standard register.

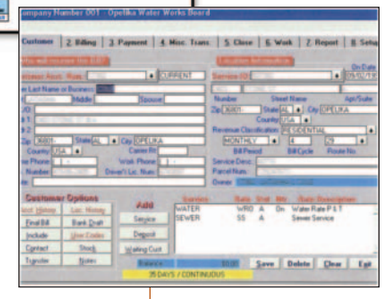
The E-Coder)R900*i* offers the "lowest cost of ownership" of any AMR endpoint solution on the market

This rich feature set of the E-Coder)R900*i* allows water utilities to be much more efficient by providing the means and data for improved customer service and proactive problem solving. Examples include but are not limited to the following:

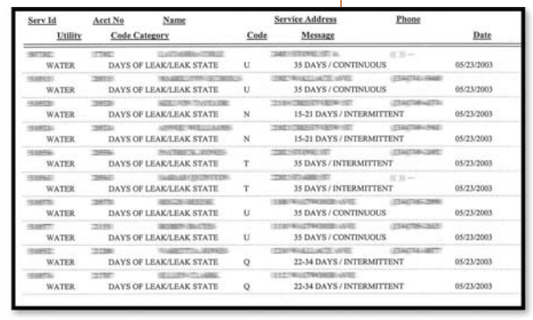
- The E-Coder)R900*i* leak data allows the utility to notify customers of leakage problems to avoid complaints and billing issues.
- The E-Coder)R900*i* can assist with Homeland Security as it will detect a reverse flow event that would occur if a contaminant were pumped into the water system at an elevated pressure.
- The E-Coder)R900*i* identifies a "no flow" or possible tamper problem whenever the meter is read rather than waiting until after the billing cycle to identify unusual consumption.



These proactive, value-added features available with the E-Coder)R900*i* offer utilities the unique opportunity to maximize the return on their AMR investment by improving operating efficiency, customer service, water loss management, drought management, as well as addressing homeland security related concerns.



This value-added data provided by the E-Coder)R900*i* is communicated seamlessly to Neptune's meter reading software and through to the utility's Customer Information System (CIS) - billing software, management reports and customer service screens.



Serv Id / Utility	Acct No / Code Category	Name	Code	Service Address / Message	Phone / Date
WATER	DAYS OF LEAK/LEAK STATE		U	35 DAYS / CONTINUOUS	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		U	35 DAYS / CONTINUOUS	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		N	15-21 DAYS / INTERMITTENT	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		N	15-21 DAYS / INTERMITTENT	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		T	35 DAYS / INTERMITTENT	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		T	35 DAYS / INTERMITTENT	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		U	35 DAYS / CONTINUOUS	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		U	35 DAYS / CONTINUOUS	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		Q	22-34 DAYS / INTERMITTENT	05/23/2003
WATER	DAYS OF LEAK/LEAK STATE		Q	22-34 DAYS / INTERMITTENT	05/23/2003

Water utilities can proactively notify customers of water leaks before they become problematic by printing leak detection information on their customer billing statements. Customers with more serious continuous leak conditions can be notified via e-mail, fax, or telephone immediately following the reading of the route, which often occurs weeks before billing statements are mailed.

Meter diagnostic and tamper detection reports can be generated every time a route is read to support proactive water meter maintenance and water loss management initiatives. These types of reports are invaluable for water utilities located in regions faced with drought and water supply concerns.

Neptune's introduction of the integrated solid state absolute encoder and R900 radio transmitter, E-Coder)R900*i*, has opened a new era of opportunity for any utility striving to improve operational efficiency and customer service.

E-Coder Icons and Displays

FLOW INDICATOR shows the direction of flow through the meter:

ON	Water in use.
OFF	Water not in use.
Flashing	Water is running slowly.
(–)	Reverse flow.
(+)	Forward flow.

LEAK INDICATOR displays a possible leak:

OFF	No leak indicated.
Flashing	Intermittent leak indicates that water has been used for at least 50 of the 96 15-minute intervals during a 24-hour period.
Continuous ON	Continuous leak indicates water use for all 96 15-minute intervals during a 24-hour period.

RATE OF FLOW - Average flow rate is displayed every 6 seconds on LCD display.

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