



**Detecting Leaks
and Reverse Flow
with 60 Series
Endpoints**

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Introduction

As demand on water distribution systems continues to grow, more and more utilities are striving to improve the quality of service they provide, reduce water loss, prevent theft or misuse, and educate customers on conservation strategies. Utilities seek to proactively create a smarter, more satisfied consumer, and ensure that Earth's most precious natural resource is used as efficiently as possible.

Itron's 60 Series water endpoints feature robust leak and reverse flow detection capabilities to help utilities realize these goals.

About 60 Series Water Endpoints

The intent of this white paper is to discuss the leak and reverse flow detection capabilities of Itron 60 Series endpoints (60W, 60W-R, 60WP and 60WP-R).

Designed for the water market, 60 Series endpoints are part of Itron's ChoiceConnect™ suite of data collection solutions. Created with simplicity and reliability in mind, these compact endpoints provide superior performance in harsh pit environments and all manner of remote applications.



60WP Endpoint



60W-R Endpoint

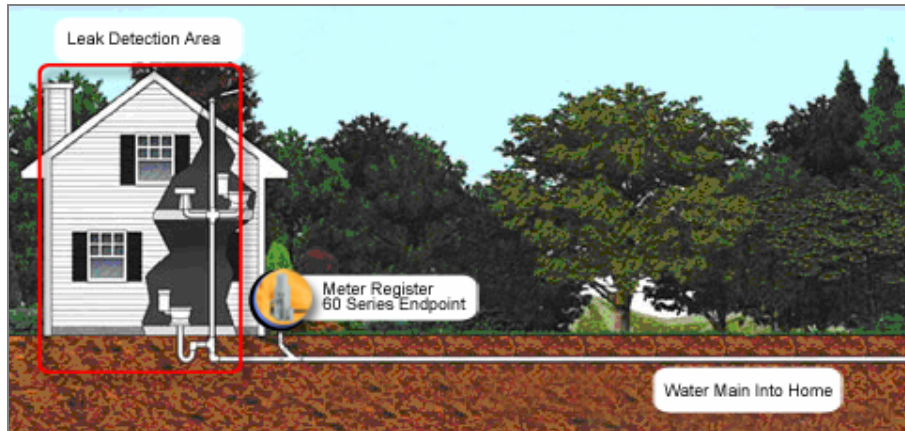
With features such as advanced leak, reverse flow and cut-cable tamper detection, as well as a 20-year battery life, utilities can deploy these endpoints to reduce operations and maintenance (O&M) expenses and improve customer satisfaction.

The 60 Series water endpoints utilize 50 radio channels randomly, selecting one channel for each data message. This multi-channel approach delivers improved reading performance over competing products by reducing the effect of interfering radio signals. Itron has also increased the 60 Series water endpoint's radio frequency (RF) output power and employed an advanced antenna to further improve meter reading performance.

These water endpoints work with Itron ChoiceConnect radio-based handheld computers and mobile collection systems.

Detecting Leaks with 60 Series Endpoints

The 60 Series endpoint provides system leak detection for any leaks occurring *after* the meter register.



The specific leak detection operating range is controlled by three parameters . These parameters determine:

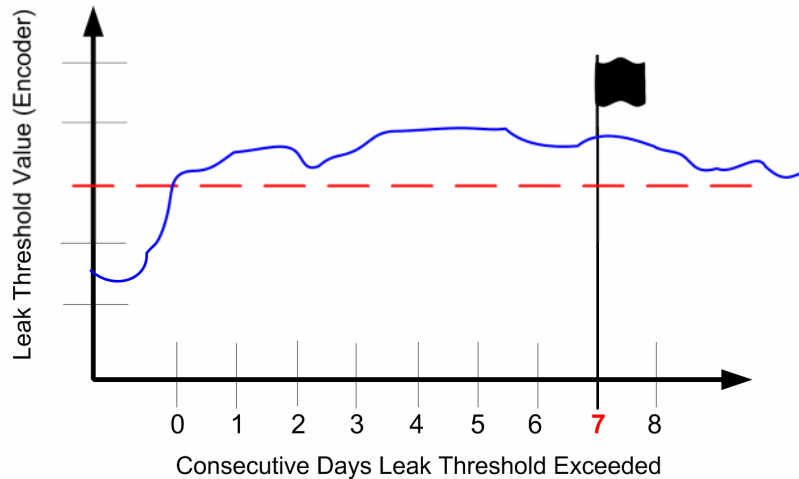
- 1) **Frequency** How often the endpoint checks for a leak.
- 2) **Time Period** How many consecutive non-zero flow periods have occurred and been reported by the endpoint.
- 3) **Threshold** How much water must flow during a presumed quiet period (period of time when little to no flow is typically registered) to be considered a leak.

Detection Methodology for Encoder-Style Registers

For encoder-style meters, the least significant digit reported by the register determines the smallest amount of water loss that can be considered a leak. Itron sets the value for this parameter during the initial endpoint programming phase of the manufacturing process.

Detecting Leaks and Reverse Flow with 60 Series Endpoints

Once the lowest metered amount is repeatedly detected every hour over a monitoring period of seven (7) days, these defined parameters trigger the leak detection flag in the endpoint to activate.



The leak detection flag is then passed to the ChoiceConnect collection application so that system administrators or service representatives can alert customers to a potential leak.

The screenshot shows the 'Mobile Interface - [Tamper Change Reads]' window. It features a menu bar (File, View, Tools, Help) and a toolbar with icons for Dashboard, Route Summary, Segment Summary, Routing, List of Route, Tamper Change, Remaining, and Mapping. Below the toolbar is a table with the following data:

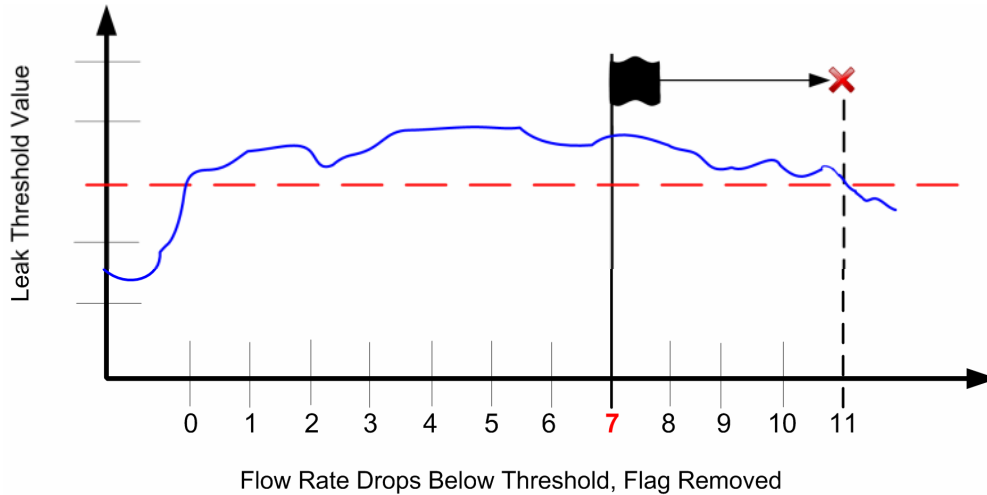
Endpoint ID	Market	Reading	Tamper	Address
0203045	W		Leak	23 E. Main Street, Anytown, WA USA
0205626	W		Leak	26 E. First Avenue, Anytown, WA USA
0206942	W			39 E. Lincoln Blvd, Anytown, WA USA
0306213	W		Reverse	307 S. Brown, Anytown, WA USA

Below the table is a 'Tamper Change Properties' form with fields for Route ID, Segment ID, Endpoint ID, Meter ID, Reading, and Address. At the bottom of the window, there are status indicators: PWR: On (green), RCVR: On (green), and XMITTER: Off (red).

Tamper flag indicator in the MC3 Mobile Interface software application (part of ChoiceConnect)

Since this leak occurs after the meter register, utilities receive compensation for any lost water. To help educate customers and be proactive on stemming the tide of lost water, utilities can utilize the 60 Series endpoints to monitor for leaks and notify customers in a timely fashion. Potential issues can be addressed and action taken to correct the problem and prevent the customer from receiving a higher-than-normal bill—and the utility from receiving a potential bill complaint—during the next cycle.

The leak detection flag remains set until the metered flow drops below the least significant encoder register value. Once this occurs, the leak detection flag will be removed and the seven day period will reset.

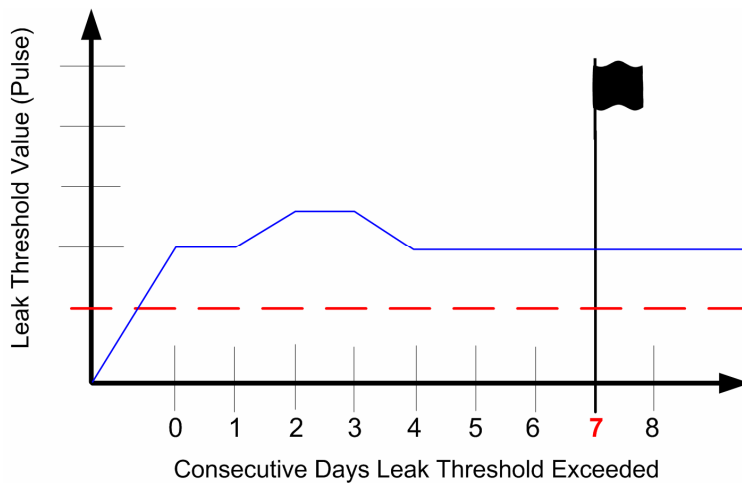


The ChoiceConnect collection system reflects the cleared tamper flag once a data packet is transmitted indicating the leak threshold is no longer being exceeded.

Detection Methodology for Pulsar-Style Registers

The detection methodology for pulser-style registers is very similar to that for encoder registers. The metered flow that generates one pulse determines the smallest amount of water loss that can be considered a leak. Itron sets the value for this parameter during the endpoint programming phase of the manufacturing process.

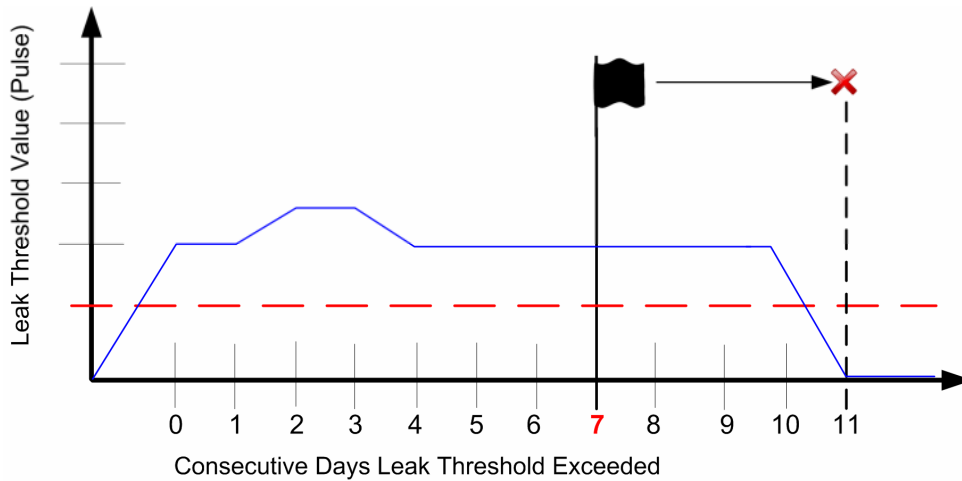
The leak detection flag in the endpoint is activated once the minimum pulse value is repeatedly detected every hour over a monitoring period of seven (7) days.



Detecting Leaks and Reverse Flow with 60 Series Endpoints

Similar to encoder registers, this flag is then passed to the ChoiceConnect collection application so that system administrators or service representatives can alert customers to a potential leak.

The leak detection flag remains set until the metered flow no longer produces a single pulse from the register. Once this occurs, the leak detection flag is cleared and the seven day period is reset. The ChoiceConnect collection system reflects the cleared tamper flag once a data packet is transmitted indicating the leak threshold is no longer being exceeded.



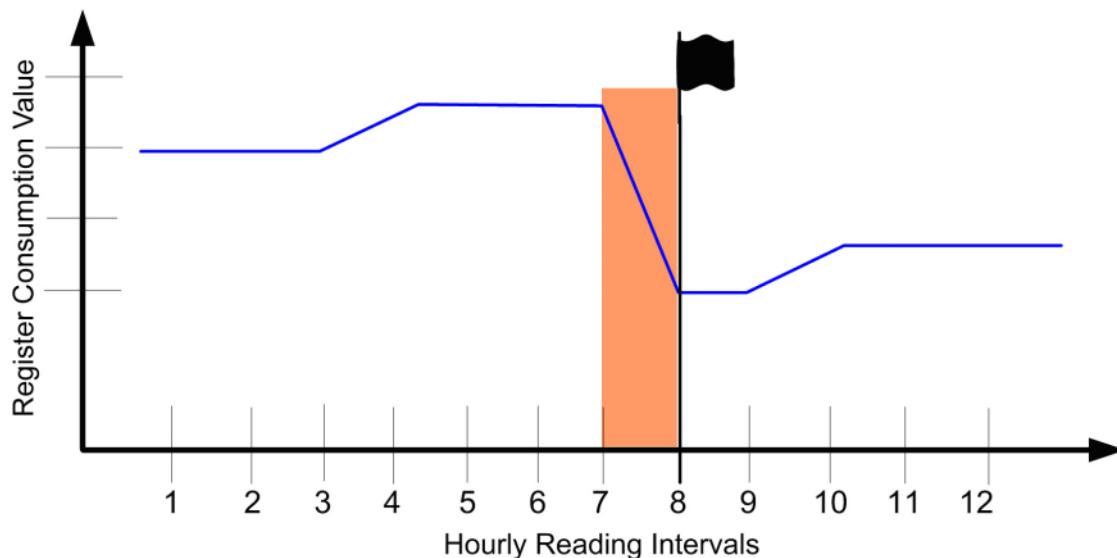
Detecting Reverse Water Flow with Encoder-Style Endpoints

Reverse flow (also referred to as backflow) can occur for a variety of reasons:

- Water main breaks can produce a significant loss of system pressure down stream and cause water to flow in the opposite direction to equalize pressure.
- In order to reduce their bills and “outsmart” the utility, unscrupulous customers may tamper with or invert a meter.
- During new construction, an untrained or inattentive contractor may inadvertently install the water meter incorrectly.
- Water pumps (for both residential and large-scale commercial and industrial customers, as well as water utility pumping stations) may malfunction and lose the ability to distribute water through the system in the proper direction.
- A meter register may report an inaccurate consumption value. The register wheels may record accurate consumption but electronics in the register may not read those properly and return a lower consumption value than the previous reading. Even though a reverse flow event has not occurred, this error in the data indicates a problem with the meter or endpoint that may need to be addressed.

The 60 Series encoder-style endpoints (60W and 60W-R) feature reverse flow detection that is based upon a simplified approach to determine revenue loss as a result of meter reversal.

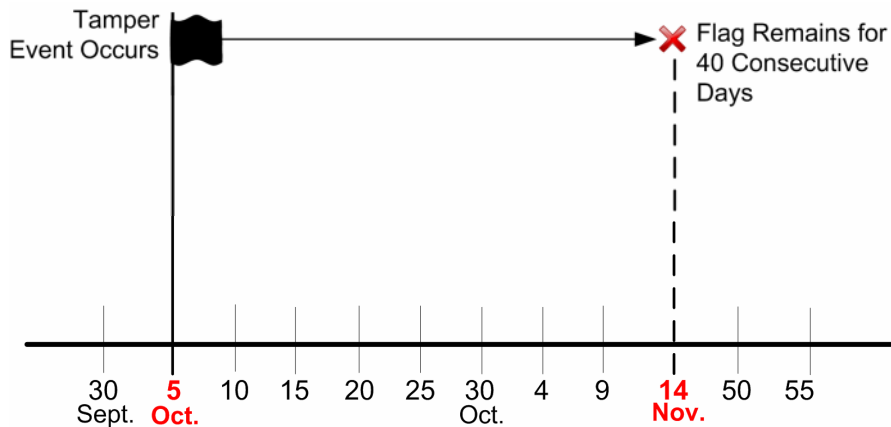
Reverse flow and theft detection are achieved by comparing differences in the register consumption value recorded by the endpoint. If the current register reading is less than the previous reading, then it is assumed that either some external pressure source caused water to flow backward through the meter or the meter was reversed in an attempt to lower the future reported consumption value, or the register reported an incorrect consumption value.



When the endpoint detects a reversal condition, an alarm flag is set, which is then reported to the utility by means of the meter reading equipment and associated ChoiceConnect collection software.

Detecting Leaks and Reverse Flow with 60 Series Endpoints

The alarm remains set for a period of 40 days to ensure it is reported within a typical monthly reading cycle. The alarm is disabled at the conclusion of the required 40 day period—provided no additional reverse flow events occur in that timeframe. Each reversal event will immediately initialize a new 40 day period.



Summary

In addition to their low-cost of ownership, ease of installation, superior performance and reliability, 60 Series water endpoints provide robust leak and reverse flow detection capabilities. By utilizing these devices in their system, utilities can help reduce the number of high bill customers receive; help educate customers on conservation efforts and potential problems within their residence; and more effectively identify and address potential theft or service quality issues.



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