Application Note

Remote Asset Shutdown

with SignalFire Telemetry Remote ShutDown System (RSD)

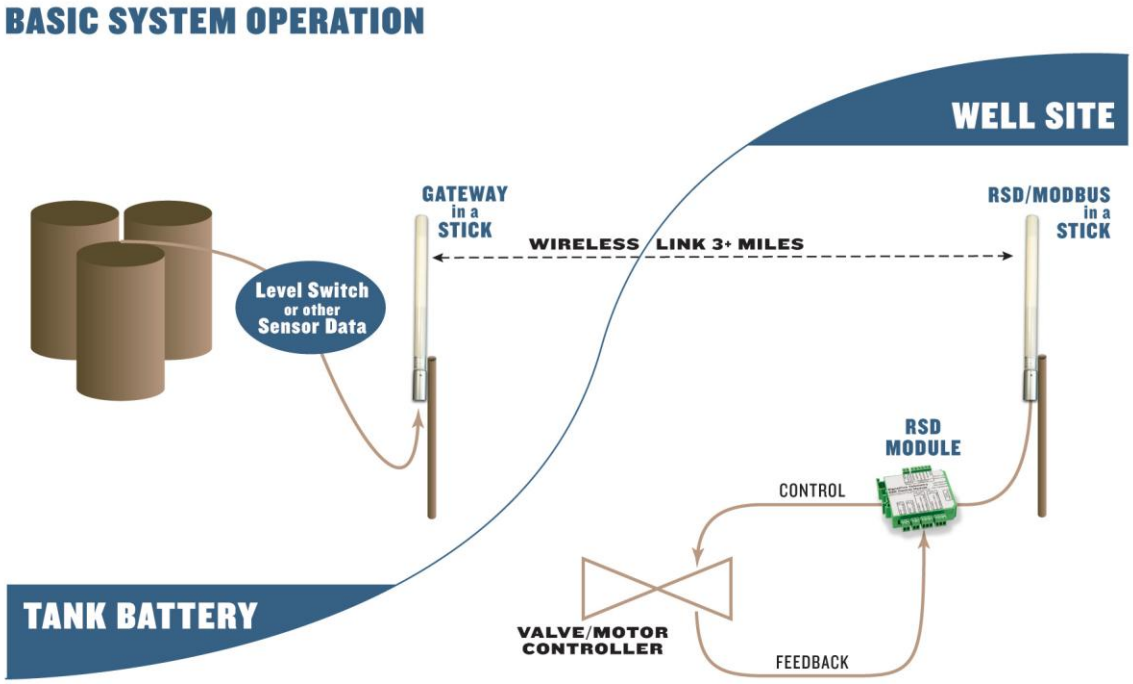
OVERVIEW

Shutting down (or starting up) an operation from a remote location is commonly needed in various industries.

An oil field, for example, may have a tank that collects oil and/or water from several wells that may be several hundred yards to several miles away from the tank battery. If the tank fills up, the wells must be shut down (turned off or a valve closed) to prevent overflow — the "decision" to shut down the wells is best made and implemented from the remote tank site.

SignalFire's Wireless Telemetry Remote ShutDown (RSD) system implements this type of monitoring and control with ***failsafe logic,*** which is necessary for wireless operation of critical systems.

The figure below diagrams the remote monitoring and control operation (while it shows one well site, actual systems often have multiple well sites for each tank battery).



SignalFire's Wireless Telemetry System used for remote shutdown monitoring and control

TOPOLOGIES

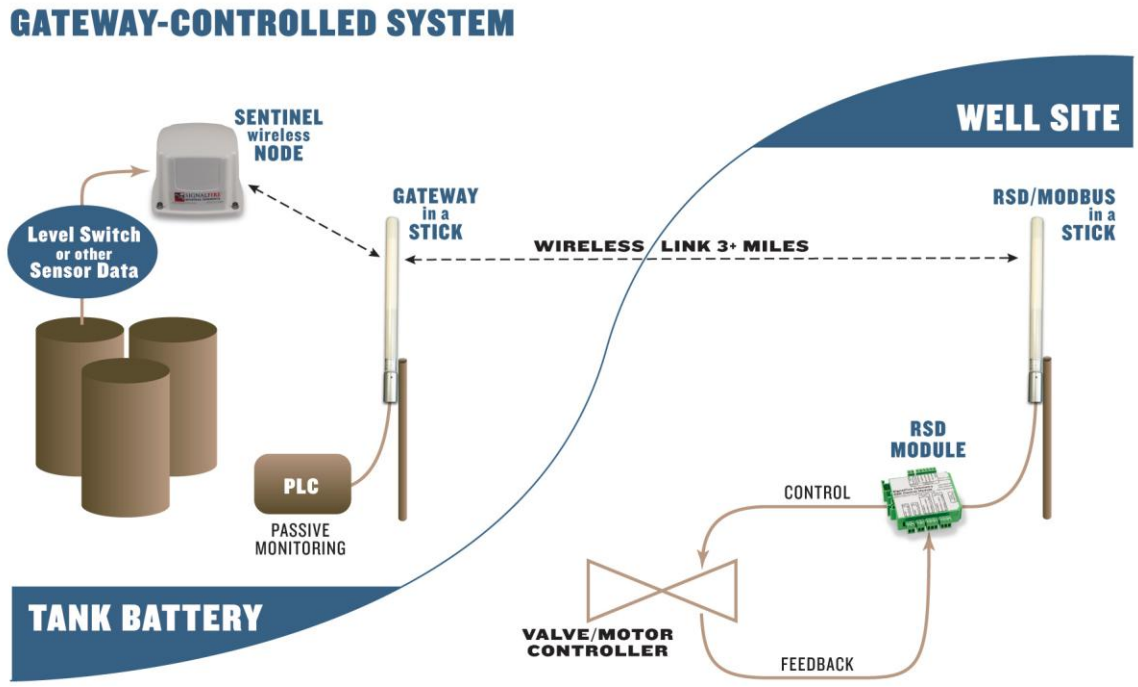
The Remote ShutDown (RSD) system can be implemented in either of two ways:

1. SignalFire Gateway-controlled (stand-alone) system
2. Programmable Logic Controller (PLC) controlled system

The systems refer to the place or device where the decision to shut down the remote wells is made. Both have similar hardware and software in place, and both contain SignalFire's ***CommSafe*** failsafe software (see below), which guards against system failure in the event that communication is interrupted.

1. SignalFire Gateway-Controlled System

The SignalFire Gateway may be configured to monitor ***and*** control the remote well sites as a stand-alone system. A PLC may be used to off-load sensor data.

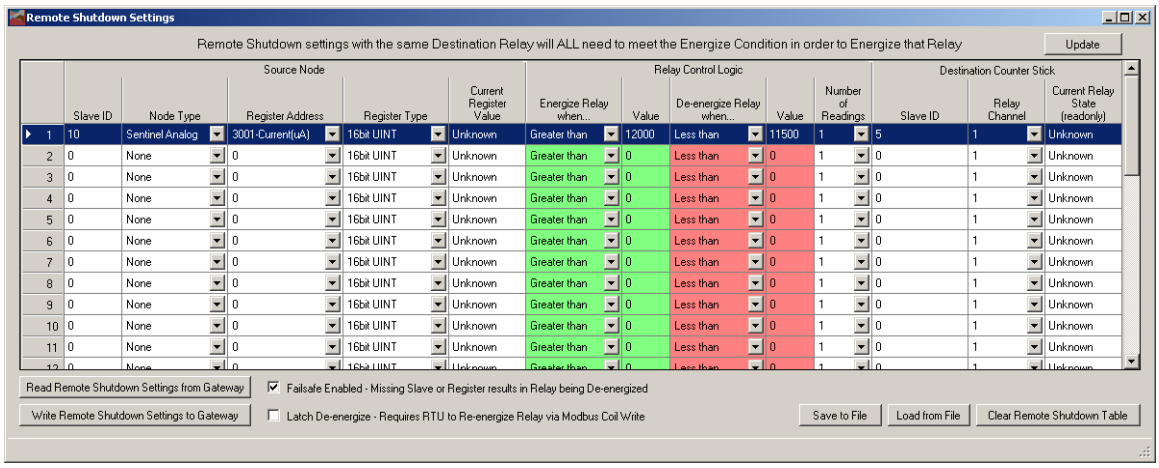


SignalFire Gateway monitoring and control with PLC to off-load sensor data

In this case, the SignalFire Gateway is configured to update the remote RSS nodes based on the status of received (from the tank sensors) register(s).

Let's say, for example, the tank has a radar level sensor. This sensor would send its data wirelessly to the gateway, and the gateway would be configured to update the remote nodes appropriately. Here is an example of the logic:

If Tank-level from sensor A is greater than X.X feet,
set relay B on remote node C to be de-energized.



SignalFire Gateway ToolKit's RSD setup screen

The system has been set up as follows:

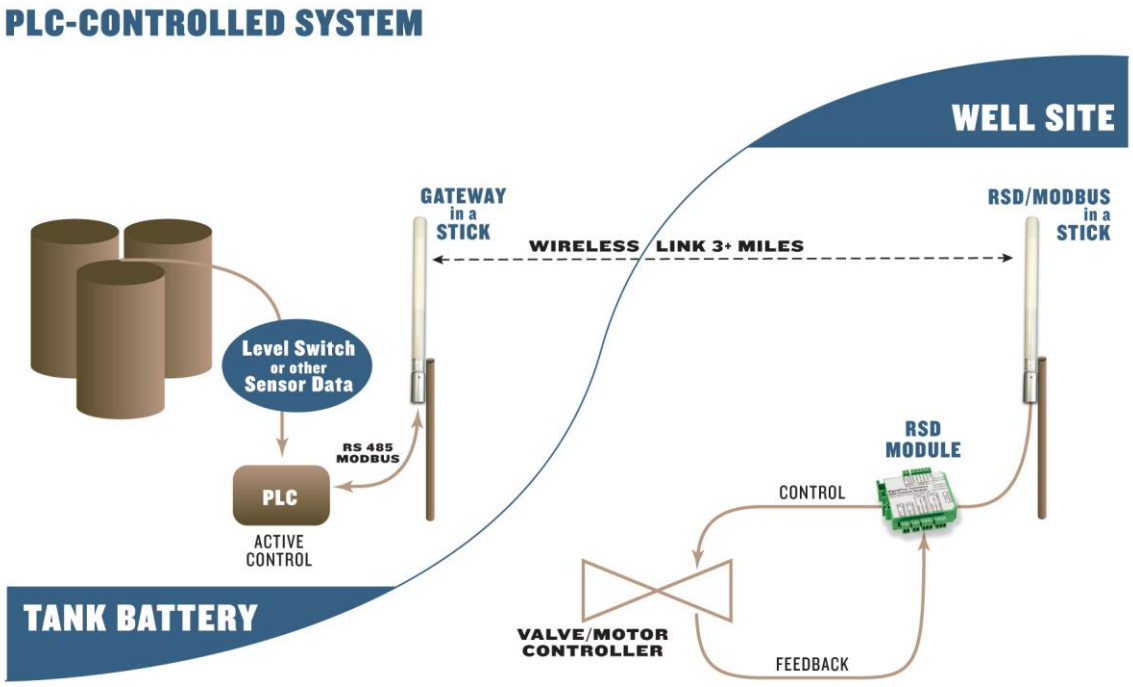
- Slave ID (SID) 10 is a Sentinel Analog connected to a sensor reading tank level.
- When SID 10's analog reading is greater than 12 mA, relay #1 will be energized.
- When SID 10's analog reading is less than 11.5 mA, relay #1 will be de-energized.
- The relay is connected to SID 5 (RSD Stick).

The RSD Stick has two dedicated relay outputs and two dedicated digital inputs. The inputs can be used to monitor the status of the system that the RSD Stick is controlling.

SignalFire RSD Stick and Relay I/O Module

PLC-Controlled System

In this system, a local PLC at the tank battery makes the decision to shut down the remote well sites.



SignalFire PLC-controlled monitoring and control

The diagram above shows the tank level information (switch, level sensors, pressure sensors…) connected to a local PLC. The tank sensors may be directly connected to the PLC or via the SignalFire Wireless system. The PLC monitors the data and determines whether or not the tank is in an alarmed state. This state information is sent to the SignalFire Gateway via a Modbus RS485 connection for transmission to the remote nodes at the well sites.

In this scenario, the Gateway does not make any decisions. It simply ensures reliable communications to the remote nodes.

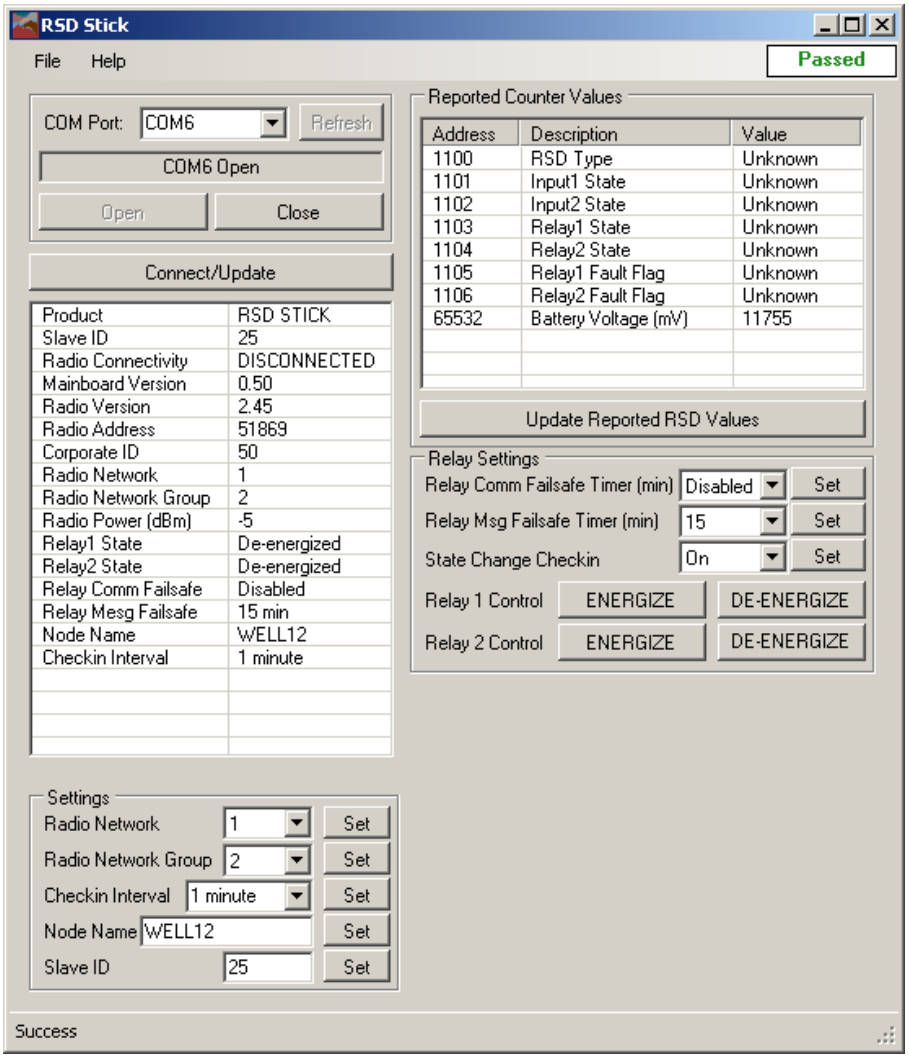
Additionally, the remote node's two digital input channels can monitor the well site's state (on or off) and transmit this data back to the Gateway, so the PLC can monitor the well site's remote state.

SIGNALFIRE COMMSAFE – FAILSAFE FEATURE

CommSafe is a configurable safety system built into each of the remote RSD nodes. It monitors the communication status of the node-to-gateway link and sets its outputs to a safe state if it detects a problem with the communication state.

CommSafe allows users to have confidence that interruption in wireless communications — such as that caused by a worker removing the gateway or powering it down — will not result in system safety failure. CommSafe monitors both message timing from the gateway and the node's ability to communicate back to the gateway, and the safe state may be set in response to a failure of either test. This logic is user configurable.

In the figure below, the remote RSD node is configured with the communication timeout disabled and the gateway message timeout set to 15 minutes. If these timeouts are violated, the output relay will be set to the de-energized state.



Remote RSD node configuration screen