

## Sugar Mill - Rotating Oven Temperature Monitoring

**Keywords:** Rotating plant, temperature monitoring, D2 W SIO, Battery-only supply, D2 W GMD Modbus

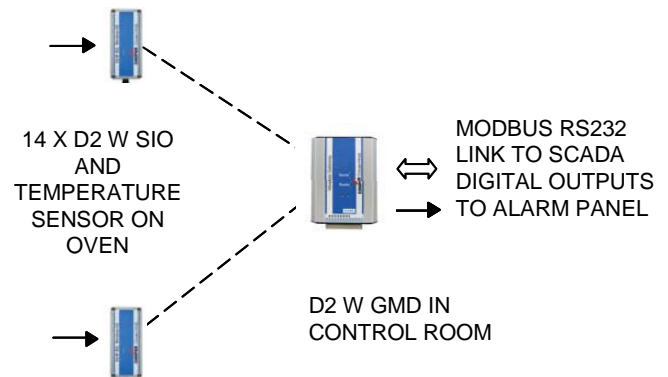
### Introduction

A rotating oven in a sugar mill heats the “process melt”. It is very important that the temperature is maintained at a constant level - if the temperature is too low solids build up; too high will burn the sugar content.

Once the oven has started rotating it normally runs continuously for five months. The cost of stopping the process is normally too high to plan for more than two stops a year.

The traditional method of temperature control was manual. Operators read 14 temperature gauges on the outside of the oven and adjusted the fuel valves to the oven. Reading the gauges was cumbersome, and relied on regular operator action. Temperature sensors connected to the control room via rotating slip rings had been implemented successfully, however the reliable life of the slip rings proved to be short.

The problem was solved by connecting the temperature sensors to D2 W SIO wireless transmitters. Each D2 W SIO is powered by a battery pack to avoid using slip rings to bring external power.

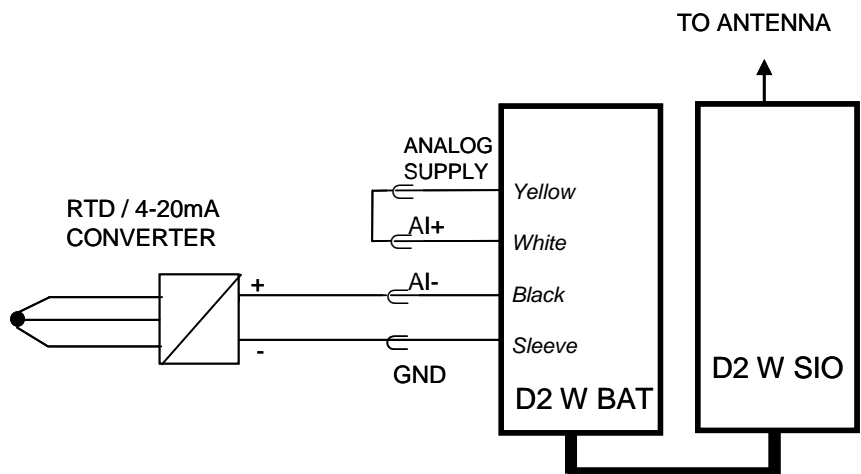


### Temperature Monitoring Unit

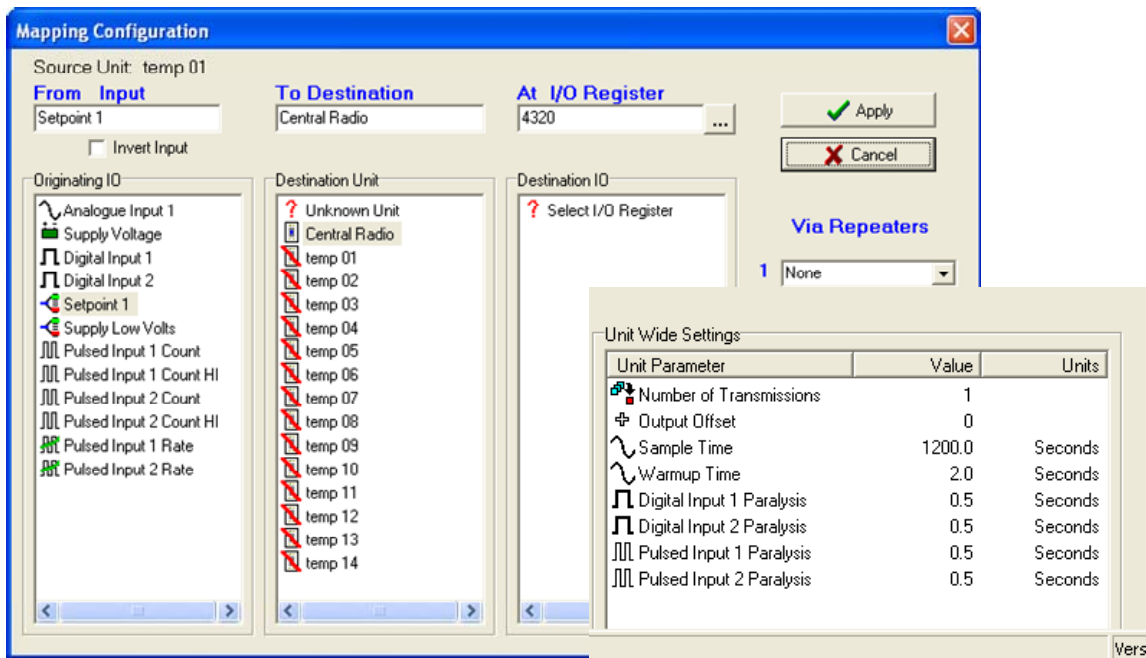
Each temperature monitoring unit consists of an RTD probe, a signal converter, a D2 W SIO wireless transmitter, a D2 W BAT battery pack and a CFD890 dipole antenna. Each unit transmits four signals - temperature measurement, battery voltage, alarm level on the temperature measurement and low battery alarm.

Design features are:

- To save energy, the sleep mode of the D2 W SIO is used. The D2 W SIO is configured to “sleep” for 20 minutes, then



apply loop power to the temperature converter and sensor for a warm up period of 2 seconds, take the



temperature measurement, and if the measurement has changed, transmit the new value. In this way, the 4-20mA temperature signal is only using power for a small fraction of the time.

- ❑ If there has been no temperature change, the D2 W SIO sends an update every hour to confirm good radio communications.
- ❑ The temperature alarm status is transmitted once per day normally, but if the alarm is “on” (temperature is low), then it is transmitted every 1 minute.
- ❑ Battery voltage and the alarm status is transmitted once per day.

The distance from the oven to the control room is approx 1000 feet, and the radio path is heavily obstructed by steelwork. Tests showed that a reliable radio path existed with dipole antennas, provided the antennas are mounted parallel to the axis of the oven. Even when the antenna rotates to the far side of the oven, away from the control room, there is enough radio reflection from steelwork for the radio path to work. When the antennas were tested perpendicular to the oven, the results were not as good.

## Control Room

The wireless unit used in the control room is a D2 W GMD with a Modbus interface to the plant SCADA system.

The D2 W GMD, as well as being able to output a wide range of protocols, can also output direct digital signals. The low battery levels of all 14 temperature units is mapped to a common output DIO1 (register 4320), and the temperature alarms are mapped to the second output DIO2 (register 4321). These outputs are connected directly to a backup alarm annunciator panel such that alarm notification occurs independently of the SCADA system.