

Theory of Operation

The LWI30xx provides a wireless interface between a magnetic-stripe card-reader and a laundry machine within a laundry center. The system is designed to support up to 60 machines. Each Washer/Dryer within the laundry center is equipped with a LWI30xx. An additional LWI30xx is configured as a Bridge, and is attached to the Card-Reader using a 2-wire RS-485 bus. The LWI30xx Bridge performs the task of polling each LWI30xx's installed in a laundry machine.

Each LWI30xx uses a Chipcon (part number CC1100), single-chip RF transceiver from Texas Instruments Corporation. The data sheet and additional documentation can be viewed from the Texas Instruments website at <http://focus.ti.com/docs/prod/folders/print/cc1100.html>. The device provides the wireless communication link between the laundry machines and the module configured as the Bridge.

The RF transceiver is configured to operate using Gaussian Frequency Shift Keying (GFSK) modulation at 32Kbits/second. Channel selection is controlled by writing to an internal register in the RF transceiver. The spread spectrum method uses Frequency Hopping, where 127 channels are used with a channel spacing of approximately 200 KHz. The transmitted frequency range is 902.499 – 927.693 MHz. Frequency hopping is performed every 60 milliseconds, with the maximum transmission time less than 35 milliseconds within each hop period. This results in less than 100 milliseconds of transmission time on any channel within a 20 second period.

Each LWI30xx module installed in a laundry machine is assigned a Network ID and Machine ID. This information is stored in non-volatile memory within the module and the Card Reader. The LWI30xx Bridge uses the network ID and Machine ID to poll each LWI30xx module within the Laundry Center. The Bridge transmits a packet that includes a command byte; count byte, Network ID, Machine ID, data payload, and 2 bytes of CRC. Only the LWI30xx module with a matching Network ID and Machine ID will respond to the received packet.

This scheme is used to monitor the available state of each laundry machine as well as to send a command for issuing pulses to the laundry controller board to enable the machine.

The RF transceiver is controlled by a NXP microcontroller (LPC2138) through a 4-wire SPI interface. The microcontroller also controls and monitors the interface circuitry to the laundry machine control board. The interface circuitry uses opto-isolators to electrically isolate the LWI30xx from the laundry machine. Power to the LWI30xx is provided from the laundry machine controller board. The LWI30xx has a full-wave bridge rectifier and a switching regulator, which converts the input voltage to +5 Volts. Interface circuitry is powered from the +5

Volts. The microcontroller operates from +3.3V from a linear regulator. The RF transceiver operates from an independent +3.3V linear regulator off the +5 Volts. This partitioning provides electrical isolation of the power planes between both devices. A metal shield is soldered on the board which covers the RF transceiver and its associated circuitry.

The antenna for the RF transceiver consists of an 18 AWG insulated stranded wire. The wire is cut to approximately 3.2 inches in length to provide a $\frac{1}{4}$ wavelength antenna. It is soldered directly to the PWB.