

## Theory of Operation

The LWI30XX unit provides a wireless interface between a 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 an LWI30XX. An additional LWI30XX is attached to the Card-Reader using a 2-wire RS-485 bus. The LWI30XX attached to the Card-Reader performs the task of polling each LWI30XX unit within the laundry machine for its available state using the RF transceiver. It reports the status to the Card-reader. When a patron swipes their magnetic-stripe card, the Card-reader sends a command to the attached LWI30XX for the selected machine. The command is sent using the RF transceiver. The receiving LWI30XX within the machine interprets the command and generates a series of pulses to the coin-drop circuit on the laundry machine control board.

Messages transmitted by the RF transceiver consist of 16 bytes operating at 16Kbits/second. The information in the message consists of a command byte; count byte, packet number byte, and a 4-byte identification number (unique to each LWI30XX unit). These are followed by an additional 7 bytes of data followed by 2 bytes of CRC. The 4-byte identification number is used to distinguish a single LWI30XX unit. A response or command is not performed unless the 4-byte number within the message matches the id number of the LWI30XX. The command byte in the message determines what operation is to be performed. This scheme is used to ensure only one device is transmitting at a single point in time. A message is sent approximately every 50ms with approximately 10 ms the transmitter is on. Dead time exists between messages to ensure synchronization with the start of message.

The LWI30XX uses the 2.4-GHz DSSS Radio from Cypress Semiconductor Corporation (part number CYUSB6935-48LFXC). The CYWUSB6935 transceiver is a single-chip 2.4 GHz Direct Sequence Spread Spectrum Gaussian Frequency Shift Keying (GFSK) baseband modem radio. The data sheet and theory of operation documents can be viewed from the Cypress website ([www.cypress.com](http://www.cypress.com)). Copies of both have been included with this documentation.

The Cypress radio transceiver is controlled by a Texas Instruments microcontroller (MSP430) 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 transformer secondary in the laundry machine. 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 and the Cypress RF transceiver operate from two independent +3.3V linear regulators off the +5 Volts. This partitioning provides electrical isolation of the power planes between both devices.