

Technical Description of the ZTH100 Wireless Remote Control

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The ZTH100 is a wireless remote control that is designed to work with a series of residential lighting and appliance modules that are also manufactured by Advanced Control Technologies. At the present time, these products are either dimmers or relay-based switches.

The remote control uses a high-speed micro-controller to operate the LCD display, to read the keypad, to execute instructions, and to control communications with other devices. It also contains a device that functions as a time of day clock, and a flash memory IC to provide non-volatile retention of certain data. Additionally, the ZTH100 contains a transceiver that is electrically equivalent to the transceivers found in each of the modules that it controls.

The transceivers operate in half-duplex fashion to provide two-way communications. The communications, while varied, most often consist of a command from the ZTH100 followed by an acknowledgement by the addressed module(s) that a valid command was received.

The transceiver operates in the 900MHz ISM band at 908.42 MHz. The data, which is digital in nature, is Manchester encoded and sent using FSK modulation at a 9600 bit/sec rate. The deviation of the modulation is plus and minus 10 KHz.

A 7.3728 MHz crystal oscillator is used both as a clock for the micro-controller and also as a reference oscillator for the fractional PLL frequency synthesizer. This PLL is used to generate both the local oscillator for the receiver and the fundamental frequency of the transmitter. The output power of the transmitter portion of the transceiver is controlled by the micro-controller which causes the transmit power to be very low for some setup functions.

Modulation of the transmitter is accomplished in the PLL by having the micro-controller cause it to use one divisor when the modulating data is low and a slightly different one, when it is high.

The receiver is a single conversion type. The local oscillator runs at 908.22 MHz (200 KHz below the receive frequency).

A wireless transmission occurs briefly in response to one of two events: 1) A manually issued command initiated by the User, or 2) An automated command that is initiated when the internal time of day clock matches a previously User-programmed time.

The communications are done using a protocol called the Z-Wave protocol, which is a wireless network protocol that has been especially designed for home automation products. It defines how various types of information are to be formatted into frames. These frames not only include commands and data, but also source and destination

information, as well as checksums that are used for error detection. The ZTH100 and the modules that it controls make up a wireless local network, where each of the modules can function as wireless repeaters (also half duplex). There is provision within the protocol for intelligent and adaptive routing and also for handling collisions.

Except for a handful of discrete passive components, the entire transceiver is contained in one integrated circuit, the CC900 made by Chipcon. The transmitter and receiver share a common antenna. A SAW filter is used to help minimize receiver overload from strong signals on nearby frequencies. The antenna used in the ZTH100 is simply a trace on a printed circuit board. There are no external connections to the antenna. Since the device is a battery-powered handheld device, it neither uses or provides for a ground connection of any kind.