Functional description of TMCCII remote controller

The Train Master Command Control II remote controller or TMCCII remote controller is a wireless device used to operate and control model trains. It works in conjunction with a TMCCII command base. It most basic operation consists of receiving input from the operator of the model train and converting this information into digital information packets which are transmitted via a wireless 2.4GHz band link to a TMCCII base transceiver unit. The TMCCII remote controller is also capable of receiving information packets from the TMCCII base transceiver or other TMCCII remote control units.

The TMCCII remote controller consists of a series of subsystems used in combination perform the functions necessary to operate the model train. The central core of the remote controller consists of a microprocessor that functions using a crystal operating at a frequency of 8.00MHz. This single microprocessor controller connects to a series of sub systems by either a parallel or serial interfacing techniques.

The remote controller is powered using 3 AA rechargeable Nickel Metal Hydride batteries. The remote controller connects or fits into the TMCCII base transceiver for recharging. A low voltage power control circuit is used to connect the power during operation and disconnects the batteries from the remote when the battery voltage is insufficient for operation.

The TMCCII remote controller uses a CHIPCON based subsystem which gives the remote controller bi-directional transceiver capability. It operates between the 2.404GHz and 2.480 GHz range using approximately 150 individual channels. Each channel is spaced 500 KHz apart. These channels are broken into 15 groups of 10 channels each. Each of the 15 groups allows a different train control system to be operated within the same transmission range of each other. The 10 channels within a group allow for the channel selection to provide clear channel selection and reduced interference with other 2.4GHz band devices. Information packets are transmitted and received using an MSK encoding method at a data rate of 250Kbs. CRC error detection is provided to insure data integrity. If an error is detected during transmission it is corrected by using a proprietary protocol that uses retransmission techniques for correction. The CHIPCON controller interfaces to the microprocessor using a SPI serial interface. Information packets are sent and received to and from the CHIPCON module and microprocessor as necessary. These packets contain both data and status information on the operation of the CHIPCON controller.

Other TMCCII remote controller interfaces include dual LCD interfaces. The main LCD screen displays the current information and status of the train being operated. The second screen includes a touch screen overlay that is used to select different operations. Three analog to digital inputs are used to select the braking action, the operation of the bell and intensity of the whistle on the train,

the boost and braking action of the train being operated. A low frequency 300Hz backlighting converter is used to improve the visibility of the LCD screens. In addition to the touch screen input, a set of mechanical keys are used to give the operator additional input for train operation. An optical speed control knob is used to change the speed in which the train operates based in how fast or slow it is operated. A vibrating motor gives the operator the sensation of operating a real train. A memory module interface is provided to allow the operator to save and recall information about the operation of the train. Finally a speaker and LED output are used to indicate the operation of the remote controller.