

# Wireless Joypad for Sony PlayStation

## Theory of Operation

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### 1. Station Side Radio

The radio system is mainly composed of three parts: radio modem, frequency synthesizer and baseband microprocessor. The radio is interfaced with Sony PlayStation via a 9-pin connector. Sony PlayStation sends a command to the radio every 16 milliseconds. The radio takes the data from PlayStation, packetize the data by adding preambles, frame information, and error checking bytes. The packetized frame is transmitted to the wireless joystick. When joystick replies, this radio receives the data, un-packetize it, and sends to Sony PlayStation. The radio modem is a FSK modem running at 76.8 kbps with Manchester encoding to avoid frequency drifting. Frequency is controlled by a frequency synthesizer which adjusts a voltage-controlled RF oscillator dynamically for accurate frequency management. Channel is set by selecting an 8-position slide switch. A total of 8 channels can be selected conversing the frequency range of 903.8 – 925.9 MHz. The antenna is an embedded PCB antenna matching is done by using lumped inductors and capacitors. The radio is a half-duplex system and is powered by a 3.3V power source provided by Sony PlayStation. The total average power consumption of the radio system is about 20 mA at 3.3V.

### 2. Joypad Side Radio

Joypad side radio operates in similar way to Station Side Radio as described in previous section. However, this radio works as a slave compared to the Station Side Radio. When powered on, this radio is in receiving mode and waits until a command from Station Side Radio is received. It scans keystrokes on the joypad and replies the command with the keystroke data to the Station Side Radio. Similarly, the data is packetized in the same way as Station Side Radio. The controller transmits once every 720 mS when the controller is not touched. When the controller is being played, it returns to normal mode, at which the transmitter transmits every 16 mS. The joypad radio is powered by 4-AAA side batteries and down regulated to 3.3V.