Inter-player Line-of-sight Communication (IPLoS) Protocol

Last Revised: 2011/06/09

Section 1: Infrared Physical Specifications

The IPLOS protocol is implemented using infrared communication. All IPLOS devices in the MAGE system must comply with the following IR specifications:

1. IR transmitter and receiver must operate with 940nm waves
2. All IR signals are frequency modulated with a 56kHz square wave signal
3. An **on** signal is defined by 56kHz square wave
4. An **off** signal is defined by the lack of 56kHz pulses succeeding a start-of-data marker and before the end-of-data marker
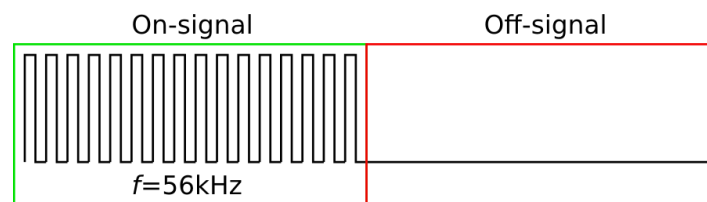

Figure 1: **On** *and* **Off** *signals*

Section 2: Timing and Packet Structure

Additionally, the packet structure of the communication is defined as follows (similar to the protocol used by RCA IR remote controls):

1. Each IR packet is preceded with a start-of-data marker
2. The start-of-data marker is a burst of 4ms **on** signal (blue burst in fig. 3), followed by 4ms **off** signal
3. **Logic-0** is defined by a 0.5ms pulse of **on** signal followed by 1ms of **off** signal
4. **Logic-1** is defined by a 0.5ms pulse of **on** signal followed by 2ms of **off** signal
5. The end-of-data marker is a burst of 0.5ms **on** signal (red burst in fig. 3); the receiver should conclude its receiving operation after encountering this pulse which determines whether the last bit was a logic-1 or logic-0.
6. Each non-variable length IR packet contains 12-bit of data **plus** 12-bit of inverted data bits for error detection. This 12-bit packet is further partitioned into two fields: 4-bit and 8-bit fields henceforth called fields *A* and *B*. Bit-order is LSB-first from the transmitting side.
7. Non-header packets that make up a variable length packet are only 8-bit long as defined in section 3
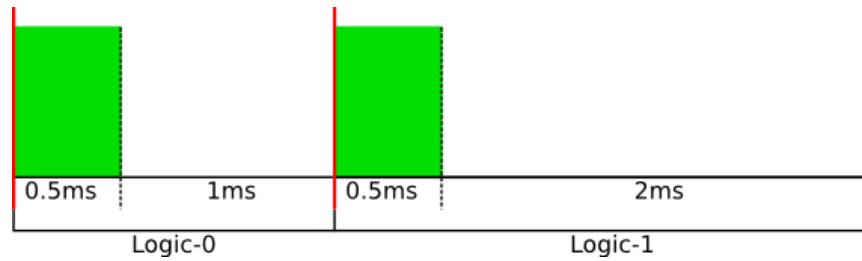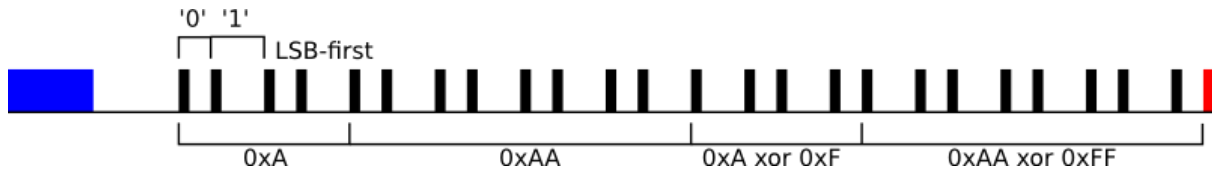
Figure 2: Logic-0 and Logic-1 bits

Figure 3: An example packet '`0xA 0xAA`'

Section 3: Variable Length Packet Structure

MAGE IPLOS packets can be 'chained' together to create data packets that are longer than 12-bits. This is achieved by sending 0 in field *A* and the length of the data packet in field *B*. Subsequent packets will only be 8-bit long. Receiver units that caught 8-bit packets without encountering a 12-bit header packet should ignore these 8-bit sub-packets.