Product Brief

PinKit

A modular building system for pinball machines

Highlights

PinKit is a pinball machine architecture based on modular, distributed functions that defines a standard bus and command set for pinball machines. An initial set of boards provide all functions needed to create a complete pinball machine control system.

Overview

PinKit defines a standard connection and set of messages that support the functions needed in a pinball machine. It also provides an initial set of building elements (boards and software) to build a pinball machine from scratch, or to replace the EM or SS controllers in an existing machine. PinKit does not use (or adapt to) any existing machine boards or board sets.

PinCAN Bus

PinKit uses a Controller Area Network (CAN) bus; a proven, industry standard, reliable bus. CAN is a two-wire differential signaling bus highly used in automobiles and industrial controllers since the late 1980s. Connections are provided by low-cost CAT-5e network cables. Power is provided over the cable allowing low-power nodes to operate with a single connection. Bus communication speed is 250Kbs. Messaging latency is less than 1 ms.

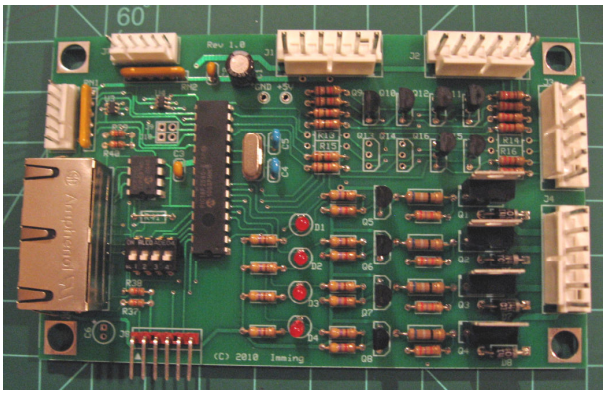
Messaging

PinKit messages are two-bytes long, typically one command byte and one data byte. Devices such as lamps, coils, and switches are addressed using an 8-bit ID. Messages are used to fire coils, control lamps, and report switch events.

Advantages

Modularity
Boards can be added to system to add function in small increments as needed. Multiple instances of the same board make spare parts more practical.

Serviceability
Removing playfield or backbox involves just two connectors: Power, a 6 pin Molex and PinCAN bus, a standard Cat5 network cable. Small boards make it easy to replace or remove a board for service.



Reliability
Differential signaling eliminates grounding issues between boards. CAN bus handles shorts to ±40V and transients to ±250V. Switch inputs are ESD protected.

Power Efficient
Prototype system reduced power from 250W to 30W. Sub-second power-on to game start.

PinKit API

The PinKit Application Programming Interface (API) provides the functions needed to implement a pinball machine. Functions are provided to monitor and control playfield objects as well as scheduling commands and functions. A game state machine provides a template that can be customized for game-specific behavior while providing the basic functions common to most machines.

Board	Description	Status
Mini Controller	Drive up to 4 coils and up to 12 switches and LED lamps	Complete
Flipper Driver	Optimized for flipper control	Complete
Matrix Lamp Driver	Up to 32 lamps in a 4x8 matrix	Complete
Display Board	Up to seven 1" digits	Complete
Audio Board	4-bit ADPCM file playback from SD card	Complete

Boards/Controllers

The table above shows the set of available boards.

System

A pinball system is created by interconnecting controller boards. Boards are typically placed near the playfield devices to minimize wiring. Up to 15 boards can be connected, providing control to up to 240 coils, lamps, and switches. The diagram below shows a typical system.

Hardware

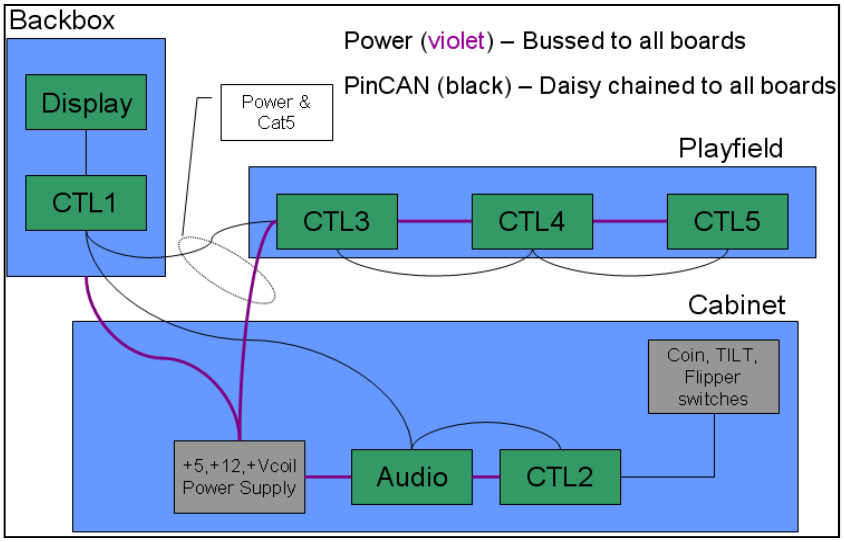
PinKit controllers are based on the Microchip PIC 18F2580 microcontroller running at 20 MHz (5 MIPs). The 2580 provides 16K word instruction memory, 1536 bytes of data SRAM, and on-chip EEPROM for storage of setting adjustments and accounting data. The on-chip Enhanced CAN (ECAN) protocol engine offloads message transmit and receive functions. A Microchip MCP2551 CAN transceiver provides physical bus interface.

Power Supplies

Designed to use standard ATX12V personal computer power supply. Coils are driven with 24-27V DC supply.

Electrical Specs.

Lamp Voltage, 12V typical, supports up to 24V
Coil Voltage, 27V typical, supports up to 80V



Development Support

PinKit software is written in standard C for the Microchip MCC18 compiler, available as a free Lite version. An In-Circuit Serial Programming (ICSP) connector is provided on the board so they can be programming in-system using the low-cost PicKit2 programmer.

The PinCAN bus can be monitored using the Microchip MCP2515 demo board and included software as a bus monitor.

Pinball may be a lifestyle, but PinKit controllers are not supported for life-support applications.

Contact Information

PinKit development has been done in cooperation with Whiz-Bang Pinball. http://whizbangpinball.blogspot.com/

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