SIGNALLING DEVICE DRIVER DEMO

Requirements and Product Structure Specification

Initial Document

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Signalling Device Driver Demo

Project Description

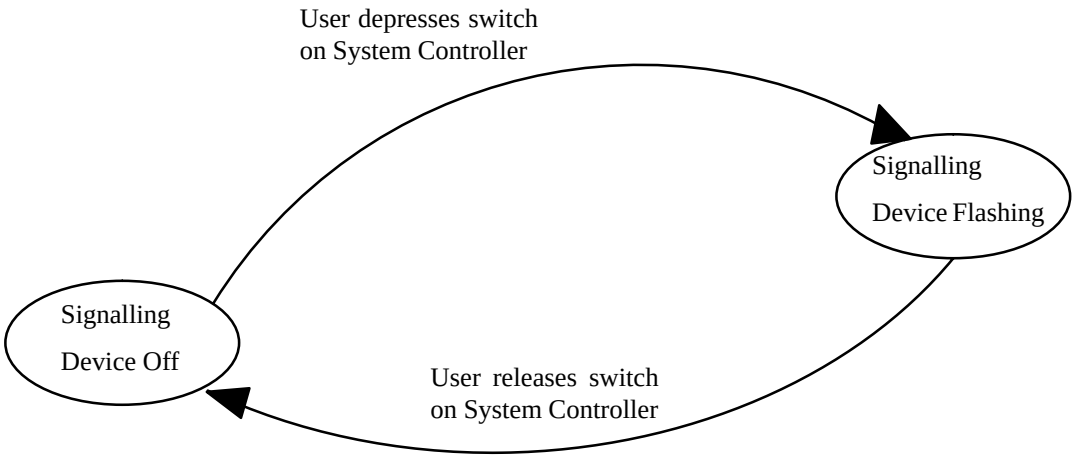
The Signalling Device Driver Demo (aka surface mount flasher) is a data set created to demonstrate the capabilities of STEP Part 210. This is an extension of the original flasher, circa 1990. The demo is a four level assembly (pcb, pca, module, LRU) that exists in a simulated external system.

Document Status:

Initial internal release: Feb 19, 2000

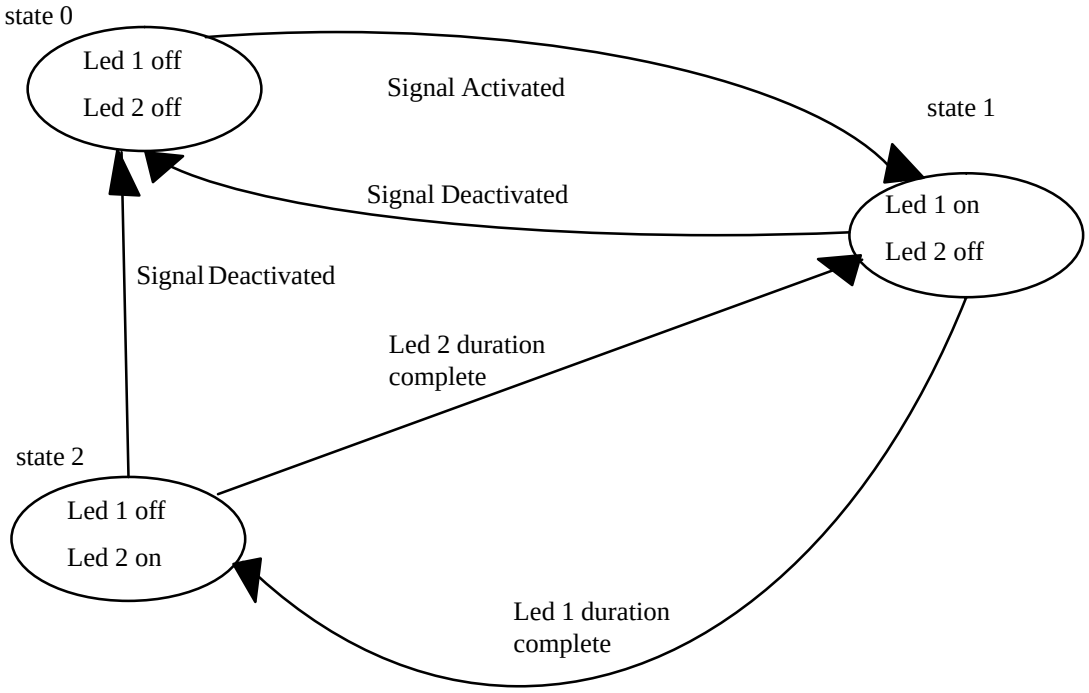
The first release establishes high level requirements, and interfaces necessary to support simulation, fabrication and assembly. The first release creates a product structure encompassing the lowest to highest level product covered in the current scope. It also identifies data items either available or planned.

The User Interaction Diagram



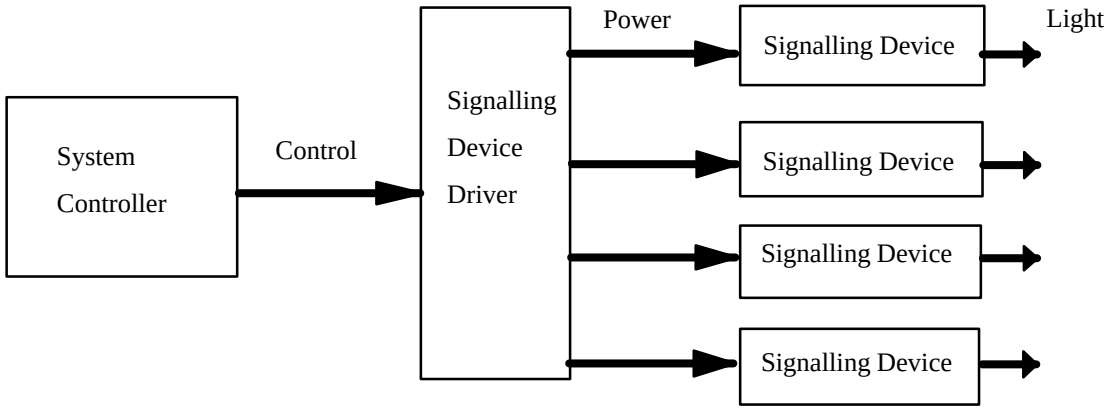
The Crossing guard signals flash in an on/off sequence as long as the operator depresses the appropriate switch on the System Controller.

The Signalling Device State Diagram



The Crossing guard signals flash as long as the operator depresses the System Controller switch. The signalling devices flash at the rate of 1 Hz with a duty cycle of 50% when actuated. Each led has a 50% duty cycle and the led 1 and 2 states are complementary.

The System Signal Flow Block Diagram



The system as synthesized separates the signal actuation decision and implementation functions. The actuation mechanism resides in the System Controller while the implementation mechanism resides in the Signalling Device Driver. This allows different signalling devices to be implemented without changing the controller implementation. The System Controller is self–powered. The System Controller sends discrete signals to the Signalling Device Driver. The Signalling Device Driver converts each discrete input into a low frequency power signal which is fed to the controlled Signalling Device.

System Controller Characteristics

A discrete signal greater than 5 Volts will result in a flashing light. A discrete signal less than 1 volt will not result in a flashing light.

Signalling Device Characteristics

Each led in the signalling device converts 2 V @ 20 mA into between 3 and 12 mcd. A voltage less than 50 mV will result in a dark led. Typical drop across the led at 20 mA is 2 V.

The Cable Harness Diagram

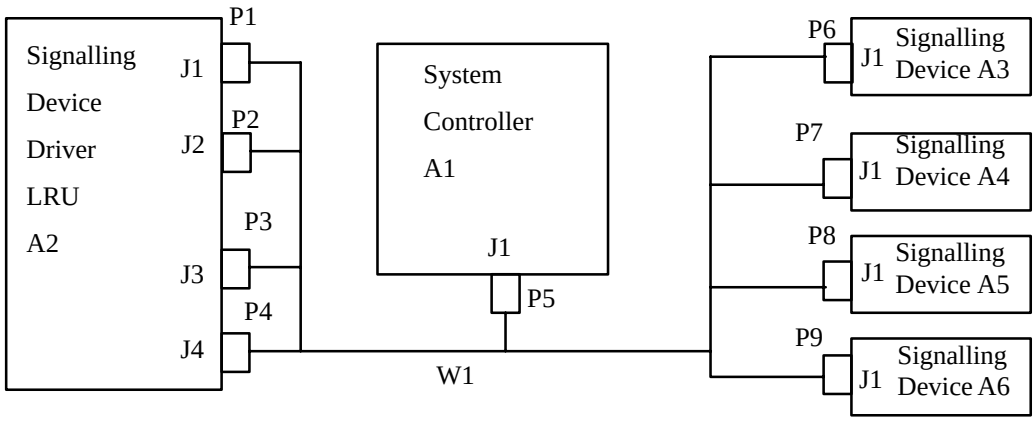
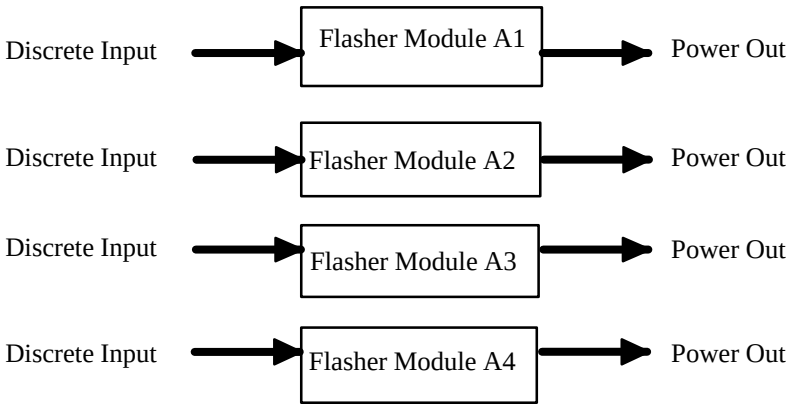


Figure 2 is the high level harness diagram for the system.

Signalling Device Driver Block Diagram



The block diagram of the Signalling Device Driver illustrates the four independent Flasher Modules contained in the LRU.

Pin definitions for the Signalling Device Driver

Signal assignment is shown only for J1. J2–J4 assignments are identical to J1.

pin	name
1	Bias_high_1
2	Bias_high_2
3	Power_output
4	Bias_low_1
5	Bias_low_2
6	Signal_Enable
7	Signal_Enable_return

Pin definitions for the Flasher Module

J1 pin	name
1	Bias_hi_1
2	Bias_hi_2
3	Power_out
4	Bias_lo_1
5	Bias_lo_2
6	Enable
7	Enable_return

Pin definitions for the Flasher PCA.

Terminal	name
E1	hi_1
E2	hi_2
E3	out
E4	lo_1
E5	lo_2
E6	dc
E7	gnd

Connection table for the discrete wires in the Flasher Module from the Flasher PCA A1 to the Connector J1.

From	To
J1–1	A1–E1
J1–2	A1–E2
J1–3	A1–E3
J1–4	A1–E4
J1–5	A1–E5
J1–6	A1–E6
J1–7	A1–E7

Product Structure

The Product Structure Description includes the following:

1. items being designed,
2. items being used in the design but not designed,
3. items in the next level of assembly.

The information about the items being designed is sufficient to manufacture and re–use the item. The information about the item being used is sufficient to use the component. The information about items in the next level of assembly (called the environment) is sufficient to validate and verify the design. The environment specifically excludes most items actually found in a real model railroad (e.g., the trains, tracks, ac power). No further product structure details will be provided for the following:

- The Environment
- The System Controller
- The Signalling Device
- The Cable Harness

The Environment	contains	
		1 System Controller, A1
		1 Signalling Device Driver LRU, A2
		4 Railway Crossing Signal Devices, A3–A6
		1 Cable Harness connecting: the Railway Crossing Signal Devices; the Flasher LRU; the System Controller, W1
The System Controller	contains	
		1 Battery
		4 Pushbutton N.O. Switches
		1 Connector

The Signalling Device Driver LRU, CPN 827–3762–001	contains	
		4 Flasher Modules, A1–A4, CPN 827–3762–002
		1 Module Mounting Plate, CPN 827–3762–006
		Hardware
The Cable Harness	contains	
		4 Railway Crossing Signal Device Mating Connectors
		1 System Controller Mating Connector
		4 Flasher LRU Mating Connectors
The Flasher Module, CPN 827–3762–002	contains	
		1 Flasher PCA, A1
		1 Interface Connector, J1, Cannon 9 pin male
		1 Connector Mounting Plate, CPN 827–3762–005
		7 wires
		Hardware
The Connector Mounting Plate, CPN 827–3762–005	contains	
		1 Fabricated Plate
		Hardware
The Flasher PCA, CPN 601–1794–001	contains	
		PWB1, CPN 600–2010–834
		LM555CMM, U1, CPN 826–3762–010
		0.72 uF, C1, ECPU1C724MA5, CPN TBD
		0.01 uF, C2, ECHU1C103JB5, CPN 827–3762–012
		1.0 uF, C3, ECPU1C105MA5, CPN 827–3762–011

		1 MegOhm, R1, ERJ3GEY105, CPN 826–3762–015
		1 kOhm, R2, ERJ3GEY102, CPN TBD
		220 Ohm, R3–R6, ERJ12Y221, CPN 827–3762–013
The Flasher PWB, CPN 600–2010–834	contains	
		1 Double–clad Laminate, 2 electrical layers
The LM555CMM	contains	
		function
		terminals
		package
		tolerances
		constraints
The ECPU1C105MA5	contains	
		function
		terminals
		package
		constraints

Data Being Created

The following data is being created. (Data from Mentor is requested from other Pilot participants).

The Environment	
	VHDL Testbench pushbutton —> light
	SABER Test pushbutton —> light

	block diagram (this document)
The Signalling Device Driver LRU, CPN 827–3762–001	
	VHDL Testbench
	AP 203 Assembly model
	SABER Test
	schematic?
The Flasher Module, CPN 827–3762–002	
	VHDL Testbench
	SABER Test
	AP 203 Assembly model
	drawings
	wiring chart (this document)
The Connector Mounting Plate, CPN 827–3762–005	
	Inseparable assembly AP 203 model
	Hardware AP 203 models
	drawings
The Flasher PCA, CPN 601–1794–001	
	AP 203 model
	AP 210 model (from IDF)
	AP 203 keepout model
	AP 210 board design (from Mentor)
	AP 210 physical netlist
	AP 210 Usage View

	schematic
	assy drawing
	VHDL Testbench
	SABER test
	SABER netlist
The Flasher PWB, CPN 600–2010–834	
	fab drawings
	AP 203 model
	AP 210 board outline (from IDF)
	AP 210 board design (from Mentor)
	AP 210 physical netlist
	AP 210 Usage View
LM555CMM	AP 203 model, including terminals as separate products
ECPU1C724MA5 0.72uF	AP 203 model, including terminals as separate products
ECHU1C103JB5 0.01 uF	AP 203 model, including terminals as separate products
ECPU1C105MA5 1 uF	AP 203 model, including terminals as separate products
ERJ3GEY105 1 Meg	AP 203 model, including terminals as separate products
ERJ3GEY102 1 k	AP 203 model, including terminals as separate products
ERJ12Y221 220 Ohm	AP 203 model, including terminals as separate products

Component Spec Sheet Data Provided by Logicon: U1, C1–C3, R1–R6 (thanks folks!)

More Ideas:

- Need EM pilot team input for document review
- Library data
- Mentor layout

- LKSoft layout
- Test procedures
- Models of Test fixtures
- Design a Bud Box chassis to finish the LRU design (no chassis was designed).
- Design a wire harness
- Design a System Controller
- Design a Crossing Signal Device
- Pick some analysis and do it and document it and include it in the structure.