Model Railroad System
A collection of utilities for Model Railroaders
Application Note 01: Switch Test Demo

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This document describes version 2 of the Model Railroad System package.

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Chapter 1

Introduction

This application note presents the hardware and software for a 2' by 8' H0 switching layout. This module is a table top module and features a central switch ladder with a number of dead end yard sidings. Also included is a "main line" track with a push-pull commuter train with a signaled interlocking plant where this main line goes through the central switch ladder. The layout will use an assortment of Azatrax devices to control turnouts, magnetic uncoupling ramps, and signals. It will also use Azatrax IR sensors to detect trains at critical places. It will be using a Lenz DCC system (XPressNet) to operate trains and will interface to a PI Engineering Rail Driver and use the Rail Driver as a throttle (for a switcher engine) and for turnout and magnetic uncoupling ramp control. All of these devices will be connected via USB to a computer which will manage all operations of the layout using software elements provided by the Model Railroad System. While the specific layout presented in this application note is somewhat contrived, many of the circuits and code fragments would be applicatical to a more typical model railroad layout.

Chapter 2

The Layout

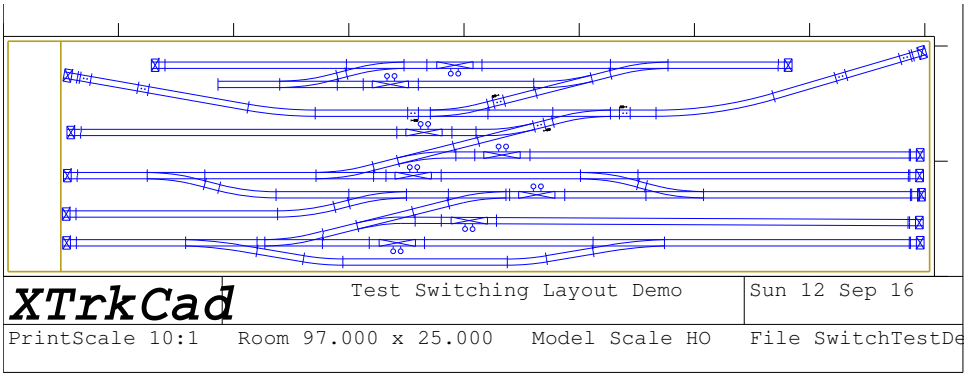


Figure 2.1: Switch Test Demo Layout

The complete layout is shown in Figure 2.1. This is a back and forth switching yard layout, with a "Main Line" going through the middle of the yard. The yard ladder goes up the middle of the layout and consists of a series of turnouts facing in different directions. There are three places where a run around move can be made and almost all of the tracks have a electro-magnetic uncompling ramp. The turnouts connecting the "Main Line" to the yard tracks are protected with signals and these turnouts are under CTC control[1]. The rest of the turnouts are in "yard" territory and are under local control and will be thrown by the switch "crew"[2].

[1]These turnouts require dispatcher (the computer) authority before they can be thrown and the switch "crew" needs dispatcher authority before entering onto the "Main Line" and shown by the signal aspects of the interlocking signals.

[2]They will be directly controled by buttons on the Rail Driver.

The sections that follow hightlight some of the main features of this layout.

2.1 Main line interlocking plant

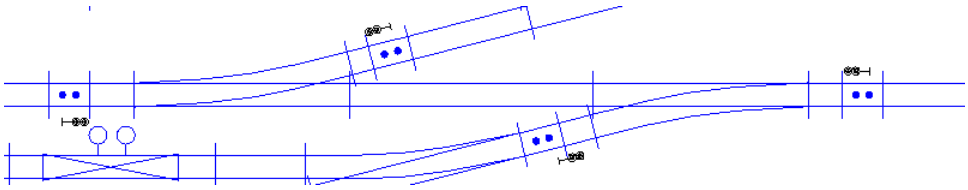
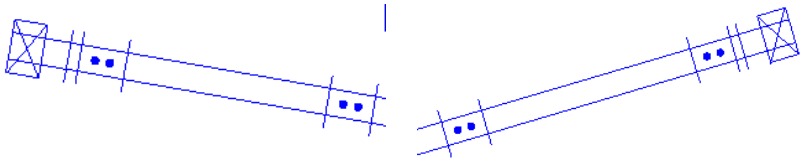


Figure 2.2: Main line interlocking plant

The main line interlocking plant, shown in Figure 2.2, consists of two opposed point turnouts and four two head (two over two) signals. There are IR sensors at each aproach[3]. The dispatcher, implemented as part of the software program running on the computer, controls these two turnouts and the signals that guard their aproaches. Because of the regularly scheduled commuter train, there are only limited windows when a switch job can cross over the main line. We will be using four Azatrak SR4-U units to operate the signals, two Azatrak MRD2-U units to sense the presense of trains at the aproaches to the interlocking plant, and an Azatrak SL2-U to operate the turnouts.

2.2 Commuter train stations at the ends of the main line.



(a) Downtown station (west) (b) Suburbia Station (east)

Figure 2.3: Commuter train stations

[3]Located at each of the four signals.

At each end of the main line is a commuter train station, as shown in Figure 2.3. We will use an Azatrak MRD2-U unit for each station to detect when the commuter train aproaches, arrives at, and leaves the station. When the commuter train aproaches, we will reduce its speed, when it arrives we will stop it and reverse its direction (changing the headlights, marker lights and rooftop flashers), and when it leaves the station we will increase its speed to its full operating speed.

2.3 Magnetic Uncoupling ramps

Figure 2.4: Magnetic Uncoupling ramp

There are eight Magnetic Uncoupling ramps, one of which is shown in Figure 2.4. The coils of these ramps will be activated using a NPN Darlington transistor circuit [4] controlled by one output of a SR4-U device. We will build 2 circuit boards that hold 4 transistor switch circuits each and use 2 SR4-Us to control these transistor switch circuits, thus handling all 8 of the uncoupling ramps.

[4] Using a TIP120 transistor.

Chapter 3

Turnout Control

Chapter 4

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Chapter 5

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Chapter 6

Rail Driver Interface

Chapter 7

XPressNet

Chapter 8

Simple Dispatcher

Bibliography