



Harvest ELECTRONICS

Level Crossing Monitor

System Overview

Originally developed for KiwiRail in New Zealand and currently in operation at 150 crossings with current orders for a further 200 units, the Harvest Rail Crossing Monitor (RXM) was designed to monitor the following functions at rail level crossings:

- Mains power
- Battery charge status (and presence—for theft)
- Track temperature
- Spare inputs for future equipment such as Dragging Equipment Detectors and Land Slip Detectors
- Current to each lamp (via electrically isolated Hall effect sensors)
- Bell current (Hall effect sensors)
- Logs all relay activity and auto-reports errors after programmable timeout

The system has been designed to work on GSM/GPRS and 3G networks with five day battery backup to report daily logs. Staff have online internet access to graphs of the past and present status.

Five levels of alarms can be programmed for different responses: from immediate reporting to cellular phone (or email) through to next-day scheduled maintenance. All alarms can automatically be sent as XML files to a train control centre via FTP.

The Terminal board provides a wiring interface to the rail crossing system and also monitors and controls connected devices such as lamps, bells, relays, digital inputs, battery voltage and temperature.

Provision has been made for the terminal board to communicate using an Iridium satellite modem for crossings which do not have cellular coverage.

Display and Indicators

Digital inputs 1 through 10 have green LEDs which will turn on when the input pin is connected to ground.

Each relay has a red LED which is turned on when the relay coil is energized.

Red LED – switched on when a condition has occurred with one or more of the monitored signals and this information cannot be transferred back via the attached SPE.

Yellow LED – switched on when data is being transmitted or received via the SPE.

Green LED – wired to the CHARGE pin of the PSU connector and will switch on when the power supply is producing +12V derived from the mains.

A two line by 16 character backlit LCD display module is used to provide various reports, diagnostic and menu messages. The backlight is yellow/green and is switched on whenever the CHARGE pin indicates the presence of mains voltage.

When the terminal board is powered only from the system battery, the backlight will be switched off after 30 seconds if no key button is pressed. The backlight will switch on again when a key button is pressed.

See the section below for more details regarding menus and data entry.

Key Buttons

There are five key buttons which allow the user to select menus & options or enter limited data parameters.

Test	In normal user mode causes a test call to be made. In test mode allows various tests to be carried out
Menu	Advances the display to the next menu or advances to the next field in data entry mode
Enter	Selects the option currently highlighted in a menu or enters the current data field in data entry mode
Up	Scrolls the display up through a series of sub-menu items or advances a number/letter in data entry mode
Down	Scrolls the display down through a series of sub-menu items or advances a number/letter in data entry mode

Interfaces

In order to measure current flow in a conductor without any galvanic connection, a hall effect sensor is used to measure the magnetic flux in a ferrite toroid that the conductor passes through. Due to varying current draw of different lamps and bells, there are several varieties of these sensors available. Battery voltages are measured by analog to digital converters in the microprocessor chips. Customer side voltages are measured and communicated to the main processor via a 2.5kV isolation barrier.

Specifications

- Sixteen general purpose analogue hall effect sensor inputs
 - Lamps and bells
- Ten general purpose digital inputs
 - Contact closure to monitor control relay activity
- Two relay contact outputs
 - 5A at 240VAC rated contacts
- Temperature sensor input
 - Dallas 'One-Wire'® temperature sensor
- Battery and Half Battery voltage measurement inputs

- 240VAC powered, with internal 7.2AH 12V backup battery

- Modem
 - Motorola Quad Band GSM modem
 - Motorola Quad Band 3G modem
 - Iridium Satellite communications interface

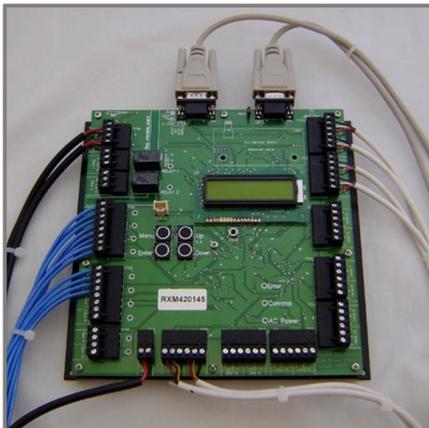


Figure 2 - Input Panel



Figure 1 - Track Temperature Sensor



Figure 3 - Hall Effect Sensor