



PAC in Railway Signaling

A Railway Signaling system is made up of a series of chain control systems. If one device in the series has failed, that usually means a series of back-end devices have also failed. This causes difficulty for maintenance teams to troubleshoot, as they have to check each device, step by step, to verify which one caused the failure.

An effective railway signaling monitoring and control system simplifies troubleshooting while allowing for easier failure prevention. The system centralizes management and monitoring, and tracks the causes of failure so that problems can be quickly traced to their source. Furthermore, any device failure is detected in real time, streamlining any troubleshooting operation while maximizing safety and efficiency.

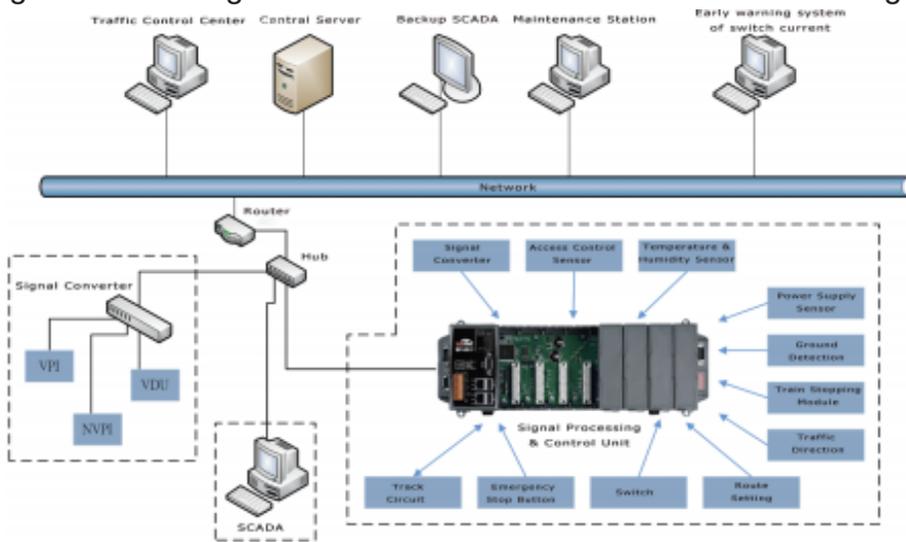
By using network transmission and user-friendly graphic interfaces, the monitoring and control system makes data collection, analysis, and signaling management easy and efficient.

System Architecture:

The railway signaling monitoring & control system consist of three parts: the signal converter, SCADA system, and signal processing control unit.

Signal Converter: the signal converter connects to VPI, NVPI, and VDU modules over RS-422/RS-232 to send and receive information, as well as to send information to SCADA, traffic control, or a central server. The types of information sent and received include: CTC, VDU, PIDS, station information, and similar. SCADA then decodes, displays, and records that information

Signal Processing and Control Unit: WinPAC-8XX7 series Programmable Automation Controllers (PAC)



▲ System Architecture

are used for signal processing and control. This unit features a high performance CPU, large capacity memory and storage, a wide range of I/O interfaces (e.g. USB, VGA, Ethernet, RS-232, RS-485, etc.), and built-in real time operating system & firmware that meet IEC-61121-3 standards. It also enables several programming options, such as: functional block diagram (FBD), ladder diagram (LAD), Sequential Function Chart (SFC), and Structured Text (STL), among others listed in the product cut sheet.



With the addition of remote data acquisition modules (e.g. I-8014W, I-87053W or I-87057W), or, with RS-485/RS-232 (I-8144iW), the signal processing and control unit is able to send and receive data. After processing data, it will then send the data to SCADA, traffic control, or a central server via the internet. The type of information it sends and receives include: AF track circuit communications, PF track circuit communications, emergency stop button status signal, switch information both digital and analog, route setting communications, traffic direction digital communications, analog information from the train stopping module, ground detection status, power supply information, temperature and humidity information, access control status, signal converters, and more.

SCADA System: SCADA presents to the end user a graphic version signal converter or signal processing and control information, displayed hierarchically on different pages. The main page includes real time data, accumulated data, and data analysis with charts. The sub-pages present various interfaces: alarm management (real time and historical data), statistics and analysis reports, parameter settings for critical values, database management, settings or modification for system operation parameters and replay of track operations. All relevant information can be accessed by operators in the control room or over a remote network.

The real time information page displays the route in a graphical diagram and displays station connection status in real time. The monitoring page presents real time information from each monitoring point in the station, shows the speed code for each track circuit, working current of the track circuit, and the reverse current value of the switch on the route map.

The accumulated data page houses error message logs, the time chart for working current on each track circuit, and a replay of track operations. If there's an abnormality in track operation, after troubleshooting, track operation replay will help verify the root problem of the abnormality, and then the system can be improved in relation to the specific problem. The replay function of Track operations is designed to monitor the entire system. Troubleshooting teams can play it back at full, half, and double speed to make finding problems easier.

The data analysis chart page is used to perform a warning analysis and avoid failure during operations. A warning analysis can be performed by comparing, for example, manufacturer provided data on a railroad switch motor to with the real-time detected motor data. Based on thread hold criteria provided the customer, when the criteria of the thread hold are exceeded, the system sends a warning message to remind the relevant personnel to repair or replace the affected parts.

Summary

A track signal monitoring and control system is a comprehensive and necessary system that, over time, will improve efficiency, reduce cost, and enhance safety. Investing in such a system costs both time and money at the outset, but the long-term rewards are substantial. ICP DAS USA and its

partnered



integrators are experienced in this field and developing more and more efficient methods and systems to further increase cost-efficiency.

Want to learn more? Visit our website www.icpdas-usa.com or give us a call at 1-310-517-9888. You can also reach us through email at sales@icpdas-usa.com. We are available from 8:00 a.m. to 5:00 p.m. PST.

Model	WP-8137	WP-8437	WP-8837	WP-8147	WP-8447	WP-8847
OS	Windows CE 5.0					
ISaGRAF Software	ISaGRAF Ver. 3	IEC 61131-3 standard, LD, ST, FBD, SFC, IL & FC				
	Scan Time	3 to 15 ms for general program 15 to 50 ms for complex or large program				
CPU / SDRAM	520 MHz / 128 MB					
Flash	128 MB			96 MB		
Memory Expansion	microSD socket with one microSD card (support up to 32 GB)					
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year					
Dual Watchdog Timers	Yes					
VGA	Yes 640 x 480, 800 x 600, 1024 x 768			Yes 640 x 480, 800 x 600		
Ethernet	RJ-45 x 2, 10/100 Base-TX (Auto-negotiating, LED indicators)					
Slot Number	1	4	8	1	4	8
	Note: For High Profile I-8K and I-87K Modules Only					
Operating Temperature	-25 to +75 °C					
Input Power Range	+10 to +30 VDC					
Redundant Power Inputs	Yes, with one power relay (1 A @ 24 VDC) for alarm					