



Incorporated in Delaware in 2016, CRSC (USA) Inc has opened its doors to the North America market to provide train control, rolling stock, and communication integrated solutions. CRSC (USA) Inc. specializes in system engineering services which includes systems design, systems integration, implementation, verification and validation. CRSC (USA) Inc will bring our parent company manufacturing capabilities to US soil for all those projects where Buy America is a requirement. Our parent company, CRSC LTD, initiated their services in 1953 as a Systems Integrator and has been become a global leader in transit control systems and rolling stock industry with their own OEM Products and Systems Solutions.

DS6-80 interlocking system Overview

The DS6-80 zone controller system is a fail-safe signaling device that complies with European railway safety standards. It is the core wayside equipment of the CBTC interoperability system. It connects to AWS, SSI, ATS, CC, adjacent ZC, and the Maintenance PC. It can generate train movement authority (MA) in real time based on the position of CBTC trains, track occupancy information, interlocking route information, temporary speed restriction command, etc. The ZC can transmit the MA to the CC through the radio communication system (RCS) or Data Communication System (DCS) to ensure the safe operation of all trains within its territory. The system is a microprocessor-based 2 times 2-out-of-2 (2x2oo2) Solid State interlocking signal control system. The system has been developed in accordance with the European Railway standards EN50126, EN50128 and EN50129, the safety integrity level has reached CENELEC SIL4, and it has obtained the safety certification from a third-party, an international evaluation company.

The DS6-80's ZC system has been implemented at several systems in China and in overseas urban rail transit, high-speed railway, general-speed railway and freight railway. The first system has been in service since 2008. The ZC can be utilized for acquiring IO, managing interlocking and/or just for controlling the zones within a train control system. Its versatility and customizability allow for different safe applications including interoperability requirements.

DS6-80 Interlocking system

CRSC has had successfully implemented the DS6-80 Zone controller in brownfield projects. The DS6-80 ZC logic unit is based on 2x2oo2 architecture, which is divided into two systems, system I and system II. The dual systems operate in a master / remote configuration. When a fault is detected in either system, that system will be actively switched to a safe status mode to ensure that the system functions can be performed safely and highly reliable.

SIL4 Certification



Railway Product Certificate

Certificate Number: RCR/PC/078-20171205

The following railway product as detailed below and in the attached schedule, has been assessed by Ricardo Rail in respect of compliance with the identified norm(s). The product has been shown to comply, subject to any restriction and limitations listed in the attached schedule, which form part of this certificate.

Product Under Certification	DS6-80 Zone Controller (ZC) System V1.2.0 as Generic Application
Applicant Name & Address	Beijing National Railway Research & Design Institute of Signal & Communication Group Co., Ltd.(CRSCD) 7 Floor Building B, 1 South Road of Auto Museum, Fengtai District, Beijing, China
Basis of Assessment	<ul style="list-style-type: none"> EN50129:2003, Railway applications - Communication, signalling and processing systems - Safety related electronic systems for signalling EN50128:2011, Railway applications - Communication, signalling and processing systems - Software for railway control and protection systems EN50126:1999, Railway applications - The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)
Certification Statement	Ricardo Rail has performed independent safety assessment on the product and certifies that: The product has been developed in compliance with EN50128 and EN50129 standards. The development lifecycle process meets EN50126 standard requirements where applicable. The safety related functions of the product as listed in Table 1 of the Assessment Report (*) have been designed and achieved Safety Integrity Level (SIL) 4 as defined in EN50129.
Annex of Certificate	Page 2 and onwards of this certificate.
Assessment Report (*)	CP00443-02-10-10 CRSCD DS6-80 Zone Controller (ZC) System Safety Assessment and Certification Report H, Issue 1, 05 th December 2017. Note: This certificate should be read in conjunction with the above Assessment Report (*) that is an integral part of this certificate.
Validity	Issue Date: 05 th December 2017 Issue No.: 1 The certificate is valid until such a time as changes or modifications are made to any part of the product design, rating or operational parameters as described in this certificate

Signature: 
Iain Carmichael
Ricardo Certification Signatory
On behalf of Ricardo Certification Limited
Edward Lloyd House, 8 Pinnacle Way, Pride Park, Derby, DE24 8ZS, UK

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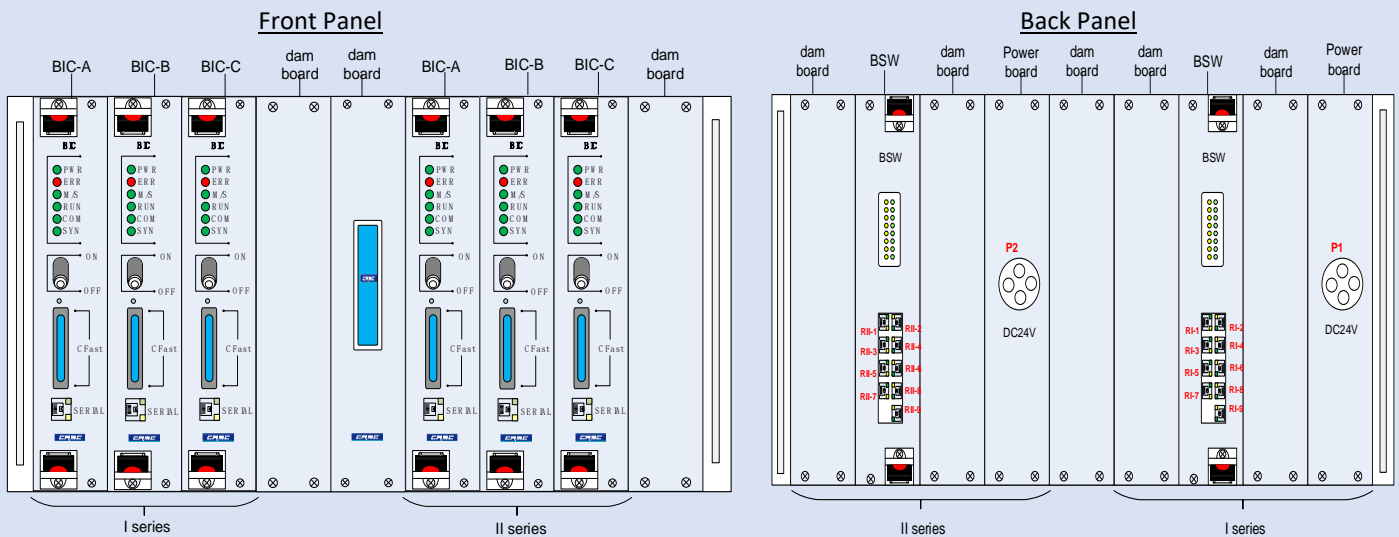


Each BIC board has a CPU based on Intel Core i7 Chipset. The entire system uses a dual-CPU with symmetric redundancy architecture. The BIC board is directly expanded with a multi-channel Ethernet interface. Communication between the CPUs of different BIC boards is done through Ethernet. BIC-A and BIC-B are mainly responsible for the logical processing and the vital logic comparisons. BIC-C is used to collect data from BIC-A and BIC-B and then packages and forwards the data directly to external devices.

The configuration instructions are as follows:

- 1) The ZC logic unit is divided into system I and system II, and which are both slotted in the same chassis. There are 8 slots in the 6U tall chassis.
- 2) Each system has 3 computing or processors boards on the front and 1 Ethernet board on the back.
- 3) The two empty slots (pictured below) can be installed with a BIC board and a BSW board.

The front view and rear view of ZC logic unit are shown below.



The system uses a flexible modular design that is easily configured according to the I/O needs of the system. Each pair of Solid-State I/O modules are designed in a 2x2oo2 architecture and connect to the ZC Logic Unit using a redundant Ethernet interface. The time sampling is 100 ms and has the ability to manage an interlocking or use in other applications including speed detection.

DS6-80 Cases Studies

	Project Name	Railway Type	Scope of Work	Project Completion Date	KM	Stations
1	Signaling System of Beijing Metro Line 8 Phase 1 & Phase 2 Project	Metro	Design, Supply, Testing and Commissioning of FZL300 CBTC SYSTEM (ATS, ATP, ATO, SSI, DCS, MMS, wayside Equipment)	2013.12	28.00	19

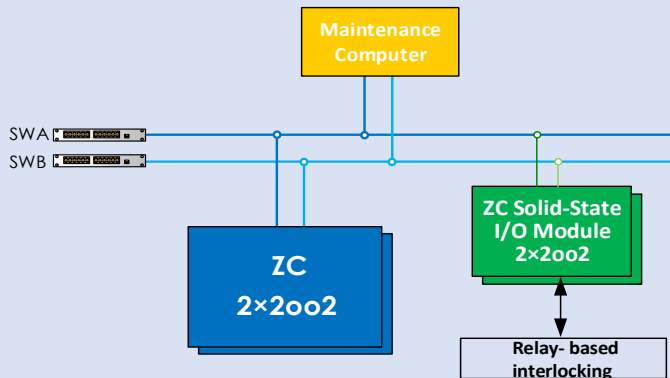
2	Signaling System Of Beijing Metro Line 8 Phase 3 Project	Metro	Design, Supply, Testing and Commissioning of FZL300 CBTC SYSTEM (ATS, ATP, ATO, SSI, DCS, MMS, wayside equipment)	2016.12	17.30	14
3	Signaling System of Chongqing Rail Transit Line 5 Phase 1 Project	Metro	Design, Supply, Testing and Commissioning of FZL300 CBTC SYSTEM (ATS, ATP, ATO, SSI, DCS, MMS, wayside equipment)	2017.12	39.70	25
4	Signaling System Of Beijing Maglev Line S1	Maglev Light Rail	Design, Supply, Testing and Commissioning of FZL300 CBTC SYSTEM (ATS, ATP, ATO, SSI, DCS, MMS, MMS, wayside equipment)	2017.12	10.00	8
5	Signaling System of Changchun Rapid Rail Transit Beihu Line Phase I Project	Metro	Design, Supply, Testing and Commissioning of FZL300 CBTC SYSTEM (ATS, ATP, ATO, SSI, DCS, MMS, MMS, wayside equipment)	2018.10	13.30	12
6	Signaling System of Xi'an North to Airport Intercity Rail Transit Project	Intercity Railway	Design, Supply, Testing and Commissioning of FZL300 CBTC SYSTEM (ATS, ATP, ATO, SSI, DCS, MMS, MMS, wayside equipment)	2018.12	29.30	10

Key Benefits

- **Fail Safe:** level of safety is SIL4.
- **Excellent Reliability and Availability:** designed with double 2oo2 redundant architecture.
- **System Reliability :** MTBF >2×10⁵ hours.
- **System Availability:** ≥99.999%.
- **System Maintainability:** MTTR < 30 minutes
- **High Maintainability and Lower Maintenance Costs:** due to reduced equipment types, spare parts, and repair times.

DS6-80 Zone Controller Solution

The structure of the zone controller is shown in the Figure below. The ZC system consists of the ZC logic unit, a maintenance computer, Solid-state I/O modules, network switches, and power modules. The structure of ZC system is shown below.



The ZC system supports different configurations such as:

- Using Solid-state I/O modules to interface with relay-based interlockings.
- Having the ZC directly communicate with an SSI through Ethernet by using secure and encrypted

protocols. In this scenario the Solid-state I/O modules are not needed.

- c. Connect to different ZC of other manufacturers through Ethernet using secure and encrypted protocols.

The Zone Controller is a fail-safe system based on 2x2oo2 architecture. It can communicate safely and reliably and is able to transmit information to signal control systems provided by different manufacturers. The Ethernet communication board supports UDP/IP and TCP/IP Ethernet communication, and supports 10/100/1000baseT, IEEE802.3i 802.3u, and 802.3ab. Each Ethernet port can communicate with multiple security nodes.

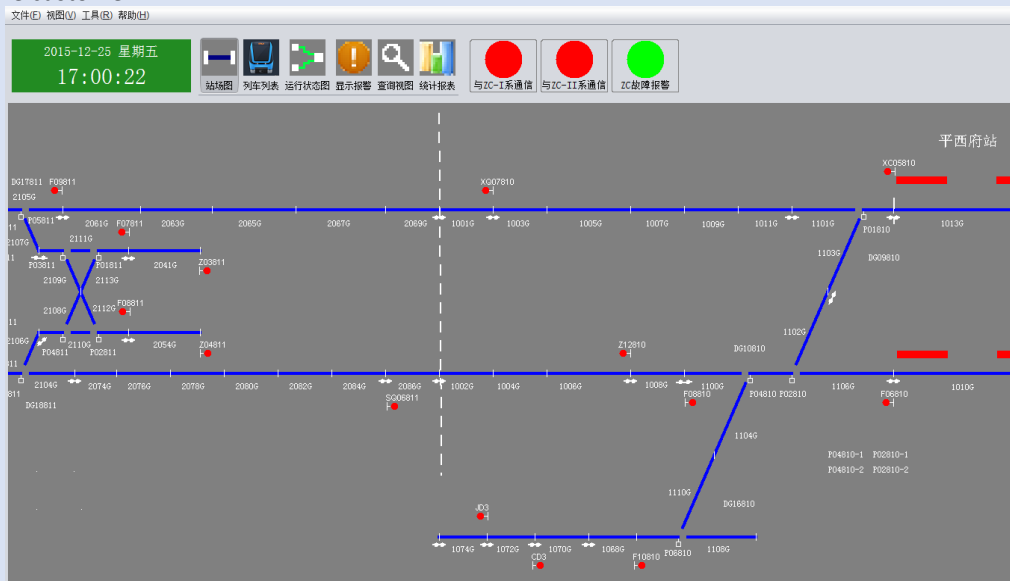
The ZC is provided with a highly reliable Maintenance industrial Computer that interacts with the Zone Controller, local SSI and adjacent ZC and SSIs via Ethernet to acquire real time data for statuses and processing of the field devices during operations. The functions are:

- Data Recording: Recording data from the ZC Logic Unit and I/O Modules, such as ZC state information, operation information, fault alarm information, etc.

- System Status Display: Display using a graphical interface (GUI) the status of the signal system in real time, including wayside devices, communication status, train position, track section status, and display the train status with the MA status in text form. Train status includes train ID, running direction, driving mode, train speed, the MA starting point and ending point, etc. The historical data (in text form) can be access locally.
- Alarms Display: Display the alarm status and records via GUI. Alarms are displayed in tabular form, including alarm time, recovery time, alarm device, alarm level, alarm type, alarm content, etc.
- Historical Playback: it can store historical data as a minimum of 30 days but it is customizable to higher size. The historical data can be playback any time and view the running status of ZC equipment, alarm information, fault information, etc.
- External Interface: The Maintenance computer can interface with any external monitoring system and send ZC system Maintenance data and system alarm information as required.

ZC Maintenance GUI

The typical GUI structure of the existing interlocking systems provided by CRSC is shown below but all features are customizable to the needs of the customer.



DS6-80 System configuration

The typical configuration of DS6-80 system based on 2 cabinets with optional solid state I/O modules, as shown in the figure below.

