WAYSIDE EQUIPMENT

OCS 950
Object Controller System

An Object Controller System (OCS) is a central unit of a Computer-Based Interlocking (CBI) system. It provides the two-way interface between the Central Interlocking System (CIS) and wayside equipment.

Bombardier’s OCS 950 is part of the latest-generation EBI Lock 950 CBI system and offers a flexible interface to control and monitor wayside objects or other typical elements (indoor or outdoor) found in signalling applications.

With its input and output (I/O) functionality, the OCS 950 receives commands from the CIS and transmits these to the wayside objects accordingly. Also, it monitors the equipment and sends status information back to the CIS. The controlled and monitored objects in the site can be vital or non-vital nature or a mixture of both.

The most common objects supervised include: optical signals (filament or LED-based); point machines (maximum 16 in a turnout); track circuits (AC, DC, frequency or coded), axle counters and Automatic Train Protection (ATP) equipment such as balises. The system can also monitor and control level crossings, line blocks, relay interlocking systems and generic I/O interfaces.
OCS 950 v5 platform

- Compatible to previous versions of OCS 950
- Design life of minimum 25 years.
- Based on plug-in units
- All plug-in units are hot swappable, i.e., live insertions and ejection could be made with power turned on
- Up to 16 plug-in units for I/O in a subrack, and up to four subracks in a cabinet
- MMI on each I/O plug-in unit displays the mode of operation (e.g., normal operation, reduced operation and maintenance) and the state of each I/O
- Design based on diversified HW platform and diversified real time operating systems
- Advanced diagnostic for preventive, corrective and predictive maintenance
- Remote asset management with inventory reports (e.g., serial numbers, version numbers of SW/HW/FW) to keep track of installed base
- Remote download of SW, FW and configuration data
- Inputs and outputs could be configured in a redundant mode
- Support interlocking cycle time down to 100 ms

Enclosures/Cabinets

- Indoor and outdoor cabinets available
- Various sizes of cabinets available
- IP00, IP21, IP55 and IP66 available
- Metal sheet, aluminum or stainless steel

Environmental Aspects

Besides complying with the tough Bombardier internal ECO requirements, the following are valid as well for our products:

- REACH (Registration, Evaluation, Authorisation and restriction of Chemicals)
- RoHS Directive (Restriction of Hazardous Substances)
- WEEE Directive (Waste Electrical and Electronic Equipment)

Standards

In addition to relevant design standards and standards defined as best practice, the OCS950 v5 meets the following specific standards:

- Railway safety standards (SIL 4 compliant) EN 50126, EN 50128, EN50129
- EMC:
  - Railway: EN 50121-4
  - Industrial environments, Emission: EN 61000-6-4
  - Industrial environments, Immunity: EN 61000-6-2
- Insulation coordination: EN 50124-1
- Environmental conditions: EN 50125-3 and ETSI EN 300019 (Storage, Transportation and Operation)
## Technical Data

**Temperature**
-40°C to + 70°C (-40°F to +158°F)

**Power supply**

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>General AC</td>
<td>Single-phase: 115/230V AC or Three-phase: 3 x 205/400</td>
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<tr>
<td>DC</td>
<td>+24 V DC</td>
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</tbody>
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Detailed I/O specification

**Vital Power Outputs (VPO)**
- Located on VPO plug-in unit
- Eight outputs (double switch-over) per VPO plug-in unit
- Up to 125 V AC @ 3A
- DC currents up to 2.0 A for voltages up to 48 V
- DC currents up to 1.0 A for voltages up to 60 V
- DC currents up to 0.5 A for voltages up to 120 V

**Vital Low Power Outputs (VLPO)**
- Located on VLPO plug-in unit
- Control of safety relays
- 24-60 V DC coils
- Eight outputs (low power) per VLPO plug-in unit

**Vital Voltage Monitoring Inputs (VVMI)**
- Located on VVMI plug-in unit
- 16 inputs per VVMI plug-in unit
- Nominal 24 and 48 V AC (@ 40-400 Hz)/DC
- Inactive is less than 8 V
- Active more than 18 V
- Detection of both static and flashing states

**Signal Outputs**
- Located on SIG plug-in unit
- Types of optical units supported:
  - LED based
  - Single filament
  - Double filament
  - External filament switches
- Eight outputs per SIG plug-in unit
- Nominal: 12 – 230 V AC (@ 50, 60 or 75 Hz) /DC @ 4 W-80 W per output
- Day/night modes
- Cold filament checks
- True RMS measurement of currents and voltages
- Lamp proving
- Earth leakage detector
- Insulation measurement
- Control and monitor of signals using up to 24 outputs
- Static and flashing aspects, 20-120 flashes/minute
- Signal aspect degradation

**Vital Contact Monitoring Inputs**
- Located on MIO plug-in unit
- Eight Vital Contact Monitoring per MIO plug-in unit
- Supports following connection types: antivalent, double switch, double switch phase shift and non-vital contact single switch
- Each input delivers at least 20 mA, wetting current at the monitored contact
- Each input configurable with de-bounce filter and hold time
- Typical application is for conventional AC and DC track circuits

### Non Vital Outputs
- Located on MIO plug-in unit
- Four single-pole single-throw (SPST)
- Four single-pole double-throw (SPDT)
- Up to 115 V AC @ 0.5 A or 72 V DC @ 2.0 A
- Switch rate up to 2 switches per second

### Non Vital Inputs
- Located on MIO plug-in unit
- Eight Non Vital Inputs
- Up to 115 V AC or DC
- Inactive is less than 4 V
- Active more than 8 V
- Each input configurable with de-bounce filter

### Motor Control for Turnouts (Point Machines), Derailing Devices and Level Crossings (Barrier Machines)
- Located on MAC or MDC plug-in units
- Two independent motors/machines per plug-in unit
- Up to 16 machines
- AC motor, 1 or 3 phase (MAC): 115 – 400 VAC
- DC motor (MDC): 24 – 230 VDC
- 4 to 9 wire solutions
- Earth leakage detector
- Position monitoring (normal, reversed, mid, etc.)
- Max reversal time of operation
- Coupled machines
- Synchronous reversal of machines
- Local control panels
- Trail detection
- Misc functions/applications: point lock, clamp lock, electro magnets, external detectors, movable point frogs, point heating, machine heating, cranks to machines

### Axle Counters Interface
- Located on AXE plug-in unit
- Control of up to 32 track sections per AXE plug-in unit
- Control of up to 64 axle counter heads per AXE plug-in unit
- Bus and star topology supported for axle counter heads
- Copper or fibre media for communication to axle counter heads
- Axle counter heads immune to Eddy current brakes

### Transparent Eurobalise Driver Outputs
- Located on the TRE plug-in unit
- Eight Eurobalise driver outputs per TRE plug-in unit
- EBI Cab 2000 interface
- Both short and long telegrams
- Compliant with UNISIG SUBSET–036

### Transparent Serial Balise Driver Outputs
- Located on the TBIS plug-in unit
- Eight driver outputs per TBIS plug-in unit
- EBI Cab 700/900 interface

### Track Section Interface
- Located on the TSC plug-in unit
- Control of coded/frequency track circuits
- Joints and jointless
- Train vacancy detection and domestic ATP (up to 20 kHz carrier using customer specific codes)
- Integrated EBI Track 200/300/400
- EBI Cab 800 interface
OCS 950 OBJECT CONTROLLER SYSTEM

Transmission Interface
The role of the communication network is to enable continuous and safe and secure communication between parts of the railway signalling system. The protocol is based on IP and carry all vital, non-vital and alarm messages, but also diagnostic data.

Transmission media
• Both copper cable (cat6 shielded) and optical fibres (single mode or multi mode) can be used as transmission media. Fibres are preferably used at long distances or when galvanic insulation is needed.
• Connectors used are RJ-45 and LC-connectors respectively. But, also more reliable connectors like Sofix are used.

Topology
• The network is typically built with a bus topology.
• If dedicated transmission media (e.g. dark fibre) is available for the communication between the interlocking and the object controllers it is also possible to build this network as a ring in order to reduce the equipment need and installation costs.

Redundancy
For availability reasons the networks are duplicated, i.e. the core network and the local area networks, and all vital communication is using the duplicated network to ensure continuous operation.

Protocols
• The OCS950 supports our proprietary signalling safety protocol tailored to minimise needed bandwidth.
• The standard interfaces defined by EULYNX will be supported once the relevant specs are released, like SCI-XX, SDI-XX, SMI-XX.

Cyber security
Full Cyber security implemented to protect networks, software and data from attack, damage or unauthorised access.

Standards
In addition to fulfilling relevant telecommunication and data communication standards the communication network also meets the railway standard EN 50159.