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Workstation Display
Train Control/Management
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Alstom’s Centralized Traffic Control Systems are state of the art solutions to Train Control system requirements for both Transit and Mainline Rail Systems. The design is based upon a network distributed architecture and applies industry standard approaches in both hardware and software. This open architecture results in systems that are flexible, modular and cost-effective. The products apply Train Control application software design concepts that have been proven for over 40 years and feature Redundancy, Automatic Failover and High System Availability.

These systems evolved from Supervisory Control Systems beginning with single CPU minicomputers in the 1960’s. They address the needs of both transit and mainline rail systems, with specialized modules for advance scheduling functions in transit and dark territory control in railroads. Through the use of flexible building block approaches and open systems software and hardware technology, they cover a broad range of both system size and capabilities. The building block approach and the distributed design also allow for easy system growth and functional expansion, as well as integration of MIS, AVI, and future communication based signaling information.

Operations
- Centralized/Remote Train Control Management
- Increased Dispatcher Productivity
- Improved Efficiency via Automated Processing
- Faster Scheduling, Routing and Event Response
- Real-Time Alarm Notification
- Remote Diagnostics
- High System Availability

Open Systems
- Industry Standard Hardware Platforms
- Modular Scalable Software
- Distributed Client/Server Architecture
- Redundant Fail-Safe Processing Configuration
- Portable/Expandable/Upgradeable Components
- Transit or Mainline Railroad

Costs
- Lower Initial Investment
- Reduced Upgrade/Expansion Outlays
- Minimum Maintenance and Training Costs

Alstom Systems provide advanced supervisory solutions for train control requirements, including specialized modules for advanced scheduling functions, dark territory control, conflict detection/resolution, Time-Distance Graph, simulation, playback, and asset planning.

The modularity of the system promotes distributed hardware control where any workstation may be used for supervisory control functions at any time. Operating over wide and local-area networks, customers can distribute control functionality to improve resource utilization.

Ease of use and maintainability tools allow users to efficiently operate and maintain their system. This includes the ability to add, remove or modify territory on their own, using a suite of user-friendly software tools.
Centralized Traffic Control

TRANSIT FEATURES

Train Control System
- Color graphic displays for train occupancy/train location, wayside equipment status and alarms/warnings
- Operation for mainline, local and interlocking control
- Display and/or Printing of Train Graphs
- Simulation and Playback
- Alarm Management
- High availability with Warm Standby auto - failure

Automatic Train Supervision
- Signaling supervision
- Route setting
- Train tracking and identification
- Timetable management
- Traffic regulation
- Driver information

Auxiliaries Management
- Supervision and control of equipment for traffic station infrastructures such as escalators, fans, pumps, lights, ventilation, fire detection, gates, etc.

Traction and Energy Control
Supervision and control of:
- Power supply network
- Traction sub-stations
- Third rail/catenary sections
- Energy equipment such as feeders, circuit breakers, switches, transformers, rectifiers, battery systems, etc.

Passenger Information
- Inform passengers with voice and visual message displays about train arrival, train destination, incidents, public address, etc.

Telecommunications and Security
- Systems Supervision and control over communication systems such as radio closed circuit television (CCTV), etc.

RAILROAD FEATURES

Train Control
- Control of Territory with Train Describer, Train Tracking, and enhanced Signal Control Function
- Automated Schedule Regulation, with Computer Aided Dispatching and Routing
- Display and/or Printing of Train Graphs
- Simulation and Playback
- Dark Territory Control
- Alarm Management
- Track Management via Blocking and MOW Authorities (DTC & TWC: GCOR, CROR, NORAC)

System Integration
- Communication Equipment
- Video, Voice Integration
- System Staging
- Project Management

Operations Reporting System
- Display Collected Operations Data
- Generate User Defined Reports
- Commercial Relational Database
- System Interfaces For
  - Management Information Systems
  - Passenger Information Systems
  - AVI

VISIT!
www.alstomsignalingsolutions.com for all your traffic control needs.
An open architecture utilizes standard hardware, software and communications. This PC-based solution enables the use of a large range of hardware and software modules for data acquisition. It allows implementation of a large range of scalable systems, from single standalone station, up to a full wide-spread client-server configuration involving hundreds of PC's.
Traffic Control Tools
Time Distance Graph and Simulator

FEATURES

- Train Representation in a space-time graph
- Infrastructure Provision Representation
- Abnormalities Representation
- Conflict Representation
- Modifications – all displayed objects can be modified

**Time Distance Graph (TDG)** helps users monitor and regulate train traffic. TDG gives a clear graphical view of the train circulation, infrastructure state, abnormalities and detected conflicts.

TDG can be used either in online mode or in standalone offline mode to plan in advance train traffic taking into account infrastructure and temporary modifications to the timetable.

TDG is easy to use and highly configurable. It allows the operator to see in advance traffic problems in a clear and intuitive way and then to act quickly and to efficiently resolve the problem.

**FEATURES**

- **Simulates the Signaling System Devices**
- **Simulates the Train Movement**
- **Simulates the Trackside ATC**

Alstom’s **Simulator** is a complete simulation system devoted to Mass Transit, Suburban Railways and Railroad applications. It is able to simulate the whole set of Signaling System Devices and the Train Control System (ATC).

The Simulator performs three distinct functions:
- Simulates the operation of field devices in response to control requests
- Simulated trains accelerate, decelerate and stop just like real trains
- Manual point-to-point test of field indications and controls

The Simulator is ideal for operator training and also supports testing of schedules before they are used in service.
Alstom’s Centralized Traffic Control Systems utilize industry-standard databases, providing standard and efficient management of operational data. Users can easily access desired data and create their own ad-hoc reports.

**DATABASE FEATURES**

- Industry standard relational databases (Oracle, SQL-server, etc.)
- Easy access to all data via SQL
- Data is remotely accessible to external system (subject to security constraints)
- Data is backed up using replication

**REPORTS FEATURES**

- Standard set of reports
  - Train Sheet
  - Train Performance
  - Blocking Summaries, etc
- Ad-hoc reports can be easily generated by the user
- Individual reports can be added or customized using an easy to use report writer
- Reports may be viewed, printed, archived
FEATURES

- Ability to graphically view all previous events

- User can control the playback speed via an intuitive control panel
  - Fast Forward
  - Normal Speed
  - Slower than Normal Speed
  - Single-step to next event/time
  - Rewind

- User can select any location(s) to display and can change them at will as playback continues. This allows the user to see what is happening anywhere on the rail system

Playback allows users to review operational situations to determine what happened in past incidents. Much more than a simple video playback, the user can examine any location on the system under full playback control, allowing an easy yet comprehensive analysis of the sequence of events.

FEATURES

- Displayed data are the same as the running system, no new graphics to learn

- Available at any workstation

- No special equipment required
The Micro Cabmatic™ III Automatic Train Control (ATC) system is a modular product line encompassing functional hardware and firmware modules, which are combined to meet the operating requirements of a transit, commuter or railroad property. The ATC system employs solid-state microprocessor technology to provide for automatically controlling train movement, enforcing train safety, and directing train operations. The solid-state microprocessor based technology is a more versatile, reliable, economical, and compact system than the discrete component and mechanical based relay logic system it replaces.

The Alstom Signaling Carborne ATC product may consist of any combination of the following three subsystems. These subsystems are Automatic Train Protection (ATP), Automatic Train Operation (ATO) and Automatic Train Supervision (ATS). The ATP subsystem is designed to provide the highest level of safety achievable within the limits imposed by available technology. The ATP subsystem provides vital control functions such as proper train separation and overspeed detection and assures that train doors are called to open automatically only at a station. Functions normally performed by the train operator are provided by the ATO subsystem. These include smooth acceleration to the commanded running speed, regulation to maintain the commanded speed, and stopping the train smoothly at the proper position at station platforms and terminal zones.

The vehicle ATS subsystem is a two way communications link between the train and wayside. The ATS subsystem communicates with the wayside to select train routes automatically, dispatch trains automatically, provide train and crew reporting, and furnish the means to make trains responsive to supervisory commands (ex. schedule adherence) from Central Control.

Micro Cabmatic III equipment is configurable to operate on transit, commuter, and railroad systems. It has been proven on systems across the U.S. and abroad. The latest generation of this equipment is already being supplied in Washington, New York City, Atlanta, Philidelphia Taipei, Korea, and Shanghai.

**ATC FEATURES**

- Easy to Install – Half the space of relay-based systems
- Reliable solid-state design
- More economical – Microprocessor-based
- Easily expandable – “Building block” approach
- Easier to maintain – Removable modules, Eurocard-standard PC boards, board-edge status LEDs, test points, diagnostic menus, and serial ports for diagnostic tool connections
- Available in custom configurations to meet any operating requirement, including unmanned operation for transit, commuter or railroad environment

**Specifications**

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<th>Data</th>
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| Operating Conditions | Temperature Range -40° C to +70° C  
Relative Humidity 0 to 95%  
Vibration 5-20 Hz, 0.070” p-p  
Vibration 20-100 Hz, 1.4 g  
Mechanical Shock 4 g |
| Storage Conditions | Temperature Range -55° C to +85° C  
Relative Humidity 0 to 100% non-condensing |
FEATURES

ATP Subsystem
- Cab Signal Reception and Decoding
- Speed Sensing
- Overspeed Detection
- Digital Brake Assurance
- Zero Speed Detection
- Berthing Verification/Door Control
- Unintentional Movement Detection
- Rollback Detection
- Data Logging
- Aspect Display Unit

ATS Subsystem
- Train to Wayside Communication (TWC)
- Wayside to Train Communication (WTC)
- Redundancy (To Provide Greater Availability)

ATO Subsystem
- Automatic Speed Regulation
- Programmed Station Stopping
- Data Logging
- Pre-Revenue ATC System Testing
- Redundancy

Micro Cabmatic III (Full ATC/ASCES Functionality)

Micro Cabmatic III G (ATP Functionality Only)
ATP/TWC Receiver Coils
- Receives wayside ATP speed and door commands as well as wayside TWC messages sent through the running rails
  - ATP speed and door command signals sent to High Speed VCFD board
  - TWC message signal sent to TWC Modem/PA board
- Integrated into the coil assembly is a test coil used to verify cab signal operation during diagnostic testing
- Mounted under the vehicle, ahead of the first axle of the lead cab

TWC Transmit Coil
- Transmits TWC information from the car via the running rails to the wayside
  - Antenna is a 10-turn loop, which is housed in PVC pipe
  - Mounted under the vehicle, ahead of the first axle of the lead cab

Speed Sensors
- The ATP and ATO subsystems use outputs from the speed sensors to determine:
  - Actual speed
  - Distance traveled
  - Direction

Marker Antenna
- Detects passive wayside markers, located between the running rails at fixed distances from the station platforms
  - Passive wayside markers initiate and provide ‘distance to go’ information for programmed station stopping
- Consists of two overlapping coils encapsulated into a single unit
  - Marker Detector board generates a composite signal of all marker frequencies which it sends into one coil in the antenna
  - The interaction of the composite signal coil and passive wayside marker when they are in close proximity to each other allows the wayside marker frequency to pass through to the second coil in the antenna
  - The received signal is sent to the Marker Detector board
- A nulling plate located on the antenna is used to adjust the coupling between the two coils

Aspect Display Unit (ADU)
- Console display device in the train operator’s cab
- Interface between the ATC system and train operator
- Operates in real time
  - Typical ATP subsystem displays include:
    - Current speed limit
    - Actual train speed
    - Overspeed warning indication/audible alarm
  - Configurable for displaying non-ATP related displays and controls
    - ATO related information (station stop and skip stop indications)
    - ATS related information (train ID and route ID)
Peripheral Equipment

Aspect Display Unit (ADU)

- Console display device in the train operator’s cab
- Interface between the ATC system and train operator
- Operates in real time
- Typical ATP subsystem displays include:
  - Current speed limit
  - Actual train speed
  - Overspeed warning indication/audible alarm

- Configurable for displaying non-ATP related displays and controls
- ATO related information (station stop and skip stop indications)
- ATS related information (train ID and route ID)
Alstom’s Advanced Civil Speed Enforcement System (ACSES) is a proven Positive Train Control (PTC) platform. It is a continuous speed control system with intermittent transmission of data from transponders fixed on the track enhanced with a radio and communications system for dynamic updates of data. ACSES core functionality is based on Alstom’s existing transponder based technology installed worldwide and operating in revenue service since the early 90s with over 5000 vehicles equipped, including high-speed trains (TGV). Alstom has installed ACSES on the Northeast Corridor (NEC), one of the busiest railroads in North America, allowing high-speed train travel up to 150 mph.

**Modularity**
- The technology is adaptable to meet the customer needs
- ACSES can be a cost-effective upgrade of signaled territories to include enforcement and is suitable for dark territories
- ACSES can be a vital overlay to a separate and independent cab signal system, success fully merging two railroad safety technologies or it can be a stand alone system
- ACSES can use passive “fixed data” or “switchable data” transponders
- ACSES can be implemented with or without a data radio system

**Ordering Information**
*For assistance in ordering an ACSES system, please contact the Alstom Customer Service Center at 1-800-717-4477.*
Subsystems

Transponder to Train Transmission Subsystem
- Location, speed control and auxiliary data sent to train at regular intervals along the track
- Simple, safe and accurate location determination system with no on-board track map required
- Passive transponders powered by the antenna located under an oncoming train
- Straightforward railroad and line changes
- Data from transponders stays available in case of radio unavailability

Vital On-Board Subsystem
- Acts upon the data received from the Transponders, Encoders and Safety TSR Server
- Determines precise location of train
- Builds and enforces maximum speed envelope
- Manages interfaces with ACSES Display Unit, Cab Signaling system and other vehicle equipment
- Manages other miscellaneous functions (ex: tilting authorization, voltage breaks, etc.)
- **Embedded in Micro Cabmatic III**

Encoders
- Used where an interface to signaling logic is required
- Interfaces with signaling and safely encode and transmit to train signal status and route data

Communications System
- An Onboard to Wayside Radio system used to transmit TSR, Signaling, and Maintenance data to/from the train
- Redundant Communications equipment at a central location to control message routing and delivery between equipment
- ATCS radios and communications system used for the NEC application. ACSES application messages are self-protecting and ACSES can use different types of communication subsystems depending on the communications services required by each application

Safety Server
- One Server safely managing all Temporary Speed Restriction data to/from train and to/from dispatchers
- The Safety Server is a standard Alstom product designed for use in the rail industry than can be utilized for various vital server applications