



*Testng of Microcabmatic III (ATC/PTC) at the Rochester Site © 2010 Alstom Transport*

# Carborne

## SIGNALING AHEAD FOR UTAH'S FRONTRUNNER SOUTH

### CENTRALIZED CONTROL OF UTAH'S ENTIRE FRONTRUNNER SYSTEM

Due to extreme traffic congestion and with population steadily growing, the UTA decided to expand its FrontRunner commuter route by opening up a 45-mile high-capacity extension. Eight new stations will be part of the new line, which will run adjacent to existing Union Pacific railroad track.

Alstom was awarded this subcontract from Rail Systems Solutions. The Alstom FrontRunner South project will provide expansion to the existing control office, which allows centralized control of the entire Utah FrontRunner system.

The scope of work covers the supply of the wayside signaling system, the carborne signaling electronics, central office modifications (to an office it supplied previously under a UTA Ogden, Utah project as well as 20 Micro Cabmatics™ III.

The new Micro Cabmatic™ III includes speed control protection via the Automatic Train protection (ATP) system, which ensures safety and is a strategic component in a system that is providing PTC compliance for its customers.

This configuration offered by Alstom allows the commuter line to operate at higher speeds, reduce latency, and allow maintenance and operations personnel to access information from remote locations.

Alstom's engineers have both defined the system requirements, and designed the signaling system, allowing for a streamlined and cost-effective project.

**Note:** The complete FrontRunner South line is scheduled to be finished in 2015. The Alstom Carborne equipment is currently in service.

### In This Section:

■ Micro Cabmatic™ III

■ ATC System Components

# > Micro Cabmatic™ III Vital Microprocessor Based Automatic Train Control System

**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 automatic controlled train movement, enforced 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, and opening car doors.

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, Utah, Philadelphia Taipei, Korea, and Shanghai.

## ATC FEATURES

- > **Easy to Install – 1/4 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

Data	Value
<b>Operating Conditions</b>	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
<b>Storage Conditions</b>	Temperature Range -55° C to +85° C Relative Humidity 0 to 100% non-condensing

# > Micro Cabmatic™ III Vital Microprocessor Based Automatic Train Control System

## 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



Micro Cabmatic III (Full ATC/ASCES Functionality)

### 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 G capable of providing ATP, ATO, and ATS

# > ATC - Automatic Train Control System Components



Aspect Display Unit (ADU)

## 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)

### 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

# > ATC - Automatic Train Control System Components

## PERIPHERAL EQUIPMENT

### 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



ATC - Displayed at the 2010 RSSI Show

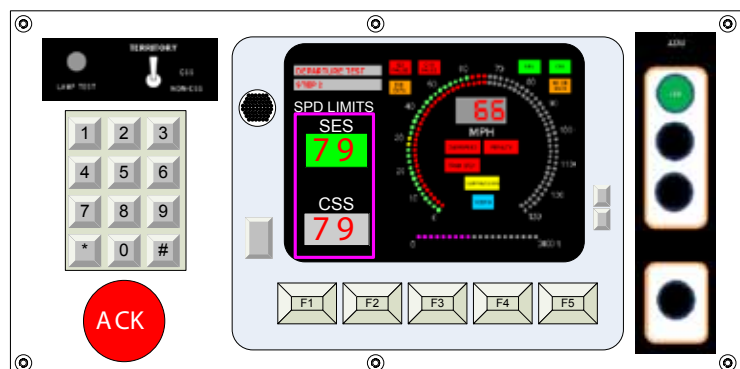


Illustration - Aspect Display Unit (ADU)