Jewell Instruments

LCA-165 Chosen for CBTC System

- **Objectives:** Modernizing and upgrading BART systems
- **Solution:** Jewell Instruments **LCA-165**
- **Benefits:** High-precision and ruggedness
- **Results:** Modern system and precise measurements

Overview

The Bay Area Rapid Transit (BART) system is continuing to upgrade its nearly 50-year-old legacy signaling equipment to a modern Communications-Based Train Control (CBTC) system. This multi-phase modernization project replaces 125 miles of fixed-block tracks across 47 stations to increase system capacity, reduce delays, and allow trains to run closer together safely.

Jewell Instruments LCA-165

Background Of Issue

BART is a heavy-rail public transit system that connects the San Francisco Peninsula with communities in the East Bay and South Bay. BART service currently extends as far as Millbrae, Richmond, Antioch, Dublin/Pleasanton, and Berryessa/North San José. BART operates in five counties (San Francisco, San Mateo, Alameda, Contra Costa, and Santa Clara) with 131 miles of track and 50 stations.

From the opening of service in 1972 to the present day, BART has enhanced the quality of life in the Bay Area by providing rapid and reliable transportation. Today, the BART system is essential to the health of the region's economy—connecting workers and businesses and relieving regional traffic congestion. At the same time, BART is the backbone of the region's public transit system, accommodating people of all income levels as well as youth, seniors, and people with disabilities. By reducing the need to drive, BART reduces emissions and air pollution, supporting a healthier environment.

BART is upgrading due to a number of reasons:

- Equipment is older: Legacy fixed-block hardware causes roughly 10% of systemwide delays.
- Increased capacity: Transbay capacity will jump from 24 to 30 trains per hour per direction.
- Closer headways: Train spacing reduces from thousands of feet apart to just two-minute headways.
- Better reliability: Real-time radio and digital tracking improve overall punctuality and reduce crowding.

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Project

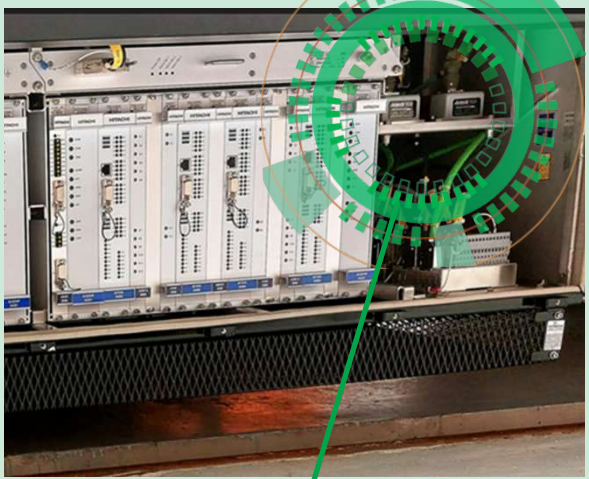
In a Communications Based Train Control Systems, moving blocks replaces the rigid physical track circuits with continuous radio communication that tracks exact train locations. New onboard tech such as Carborne controllers, roof antennas, and axle speed sensors feed real-time movement data to central computers. Streamlined transponders and wireless track antennas replace heavy physical trackside components, improving worker safety.

The BART expansion is designed to operate up to 30 ten-car trains per hour (300 cars) in each direction through the existing Transbay Tube between San Francisco and Oakland, maximizing throughput in the most heavily used part of its system. The program includes 306 additional railcars to provide the additional trains needed.

BART's network topology, which mixes densely-packed urban stations served at high frequencies by multiple interlined services along a central trunk (West Oakland to Daly City, served by all lines but the Orange) with branching suburban lines with widely-spaced stations and lower frequencies, is similar to European S-Bahn systems. Trains on each primary service run every 20 minutes, except the busy Yellow Line, which operates every 10 minutes on weekdays. However, many stations are served by multiple lines; the trunk between West Oakland and Daly City receives 15 trains per hour (average four-minute

headways) in peak hours. The Oakland Airport Connector runs "on demand", typically on headways of 10 minutes or less.

Hitachi Rail previously selected the Jewell LSBC Series Accelerometer which is a general-purpose ±0.5G to ±20G linear device designed for rail and other applications. More recently, Hitachi has selected the LCA-165 for use in worldwide rapid transit and people mover systems as crucial components in safety and control systems providing a safe, controlled ride by providing train acceleration, deceleration, and position information in their Communications Based Train Control (CBTC) systems. The LCA-165 accelerometers are configured specifically to yield a combination of high accuracy and ruggedness in railway applications. The Jewell LCA-165-R Series is the highest repeatability sensor of its class in the world today and meet or exceed CENELEC and AREMA standards for Rail applications



Two LCA-165 High-Performance Accelerometers mounted in the electronics rack

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