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Track more with less.

Application Solution | US

CBTC Secondary Train Detection Systems

Communications Based Train Control (CBTC) uses telecommunications to continuously determine the position of a train with greater accuracy compared to conventional signaling systems. When operating as designed, a CBTC system helps transits keep their lines running smoothly and efficiently. However, there are certain situations in which proper CBTC system function may be interrupted, requiring a secondary system. A secondary system provides backup operation when needed, and may also be required per CBTC design to handle non-equipped cars that enter an equipped area.

What are the general benefits of a CBTC Secondary System?

- **Automatic protection for trains not equipped with CBTC equipment**
  A CBTC secondary train detection system will detect trains and other vehicles to determine if a track section is occupied or clear, including those not equipped with CBTC equipment such as maintenance vehicles or non-CBTC equipped trains that use the same tracks. The CBTC secondary system allows for a safe distance between vehicles.
- **Protection for CBTC equipped trains when communication is disrupted**
  There are several scenarios that can cause safety concerns or system delays with a CBTC system. If a system is partially down, such as an equipment failure on even a single train, the system will go into fail-safe mode. Train movement is eventually resumed under manual operating procedures, but a CBTC secondary system allows automatic train tracking and movement to continue, albeit with longer headways, in a vital, safe manner.
- **Protecting entry and exit points of CBTC & non-CBTC territory**
  Trains frequently move between CBTC protected and non-CBTC areas. An example is when trains move across the boundary from an unmonitored rail yard or maintenance facility to a CBTC protected area. A CBTC secondary system will monitor the entry and exit of vehicles at the boundaries of CBTC territory.
- **Red signal overrun detection systems**
  A secondary detection system may be used to augment the function of a CBTC system by detecting when a train operator overruns a red aspect signal.
- **Grade crossing warning systems**
  The secondary train detection system may be used to activate and deactivate grade crossing warning systems along the right of way.
- **CBTC sieving operation**
  Some technologies used for secondary systems can provide clear/occupied status or real-time axle count within each track block, which can be utilized for CBTC sieving function by the zone controller.

Why use axle counters for secondary train detection?

The installation of Communication Based Train Control Systems has increased exponentially over the past 20 years. For the hundreds of mass transit systems worldwide, CBTC is now the norm for greenfield projects, as well as for brownfield projects aimed at upgrading communication systems. When designing a CBTC secondary system, there are choices available as to the type of technology that is utilized for train detection.

Up until the early 2000's, conventional technology such as track circuits was primarily used when implementing a CBTC secondary system. In the years since, a clear shift in the industry has occurred to instead favor the utilization of vital axle counting systems for this application. There are several reasons for this switch, as summarized below:

Drawbacks of conventional technology

- Installation time & cost (greenfield projects)
- Required upgrades to aging components (brownfield projects)
- Ongoing maintenance costs
- Effects from harsh environmental conditions
- Changing/deteriorating track and ballast
- Trash and metallic debris interference
- Limited functional scope
- Limited track section length
- Issues related to traction return current, radiated emissions and electromagnetic interference (EMI)

Improvements provided by axle counters

- Quick and low-cost installation without modification of track layout
- Ability to easily integrate with existing technology
- High availability regardless of environmental, track, or ballast conditions
- Built in functionalities that maintain uptime by increasing system fault tolerance of metallic objects
- The ability to provide additional information such as train speed and direction
- Longer track section lengths to save on equipment and installation time and cost
- High resistance to traction return current, radiated emissions and EMI

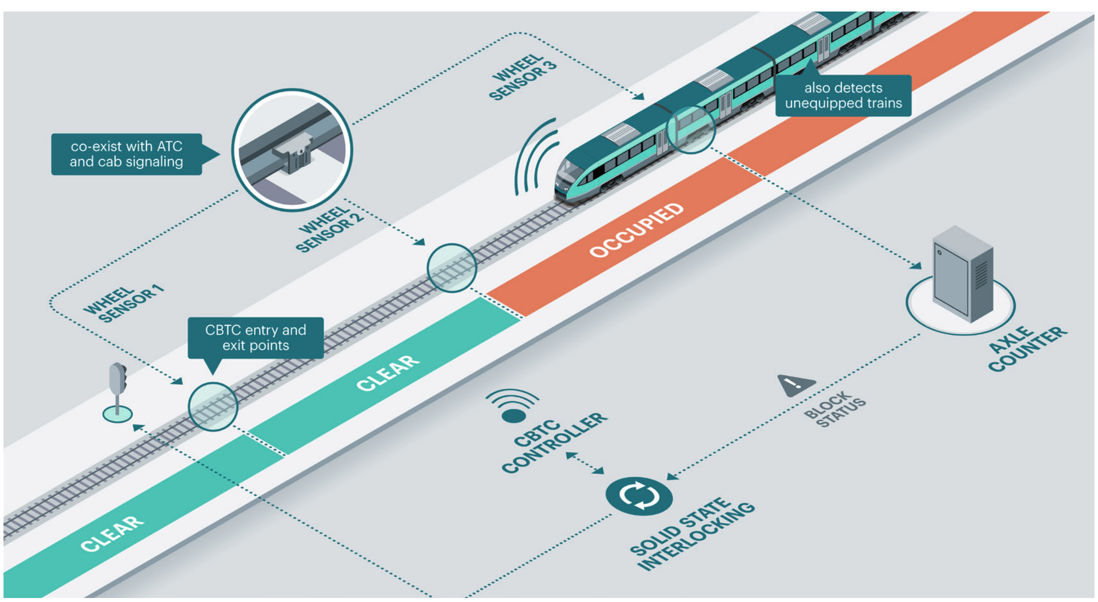

Figure 1 shows a typical CBTC secondary system layout using axle counters

Solution

Frauscher axle counting systems provide the functionality, reliability, and minimal maintenance requirements that are ideal for CBTC secondary systems. They also provide ease of installation and the unique capability to seamlessly integrate with existing technology.
Our inductive wheel sensors are easily installed — clamped to the rail within five minutes utilizing our rail claw, without drilling or changing the integrity of the rail. Wheel sensors are highly resistant to common harsh environmental conditions, traction return current, radiated emissions and EMI, which are all frequently present in transit systems.
The Frauscher Advanced Counter FAdC easily integrates with existing technology, provides information on track vacancy, train speed and direction, has built in capabilities to maintain uptime by increasing fault tolerance of metallic objects, and allows for unlimited track section lengths for flexibility and lower equipment costs.

In addition, the installation versatility of axle counters can simplify testing and commissioning of brownfield CBTC projects. Less system downtime and a reduced number of worker hours required for completion significantly reduce project costs and service interruptions.

Finally, the shorter headways and increased capacity enabled by CBTC often lead to a need for further substations to provide traction power. The use of axle counters helps to alleviate this need by decoupling the signal system from the traction return currents through the rails. It is possible to use both rails for traction return current, which reduces the need for additional substations as well as the associated costs.

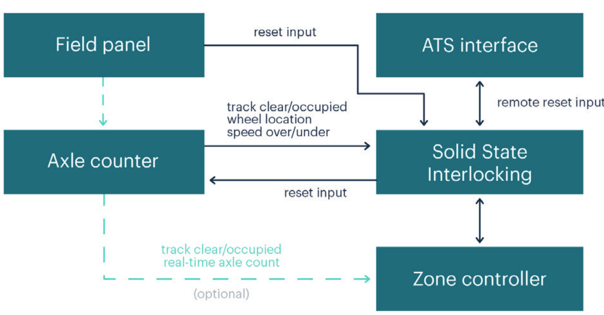

Figure 2 provides an example of an axle counter integration with a typical CBTC system

Equipment

Wheel Sensor RSR180

Frauscher Advanced Counter FAdC

Further information

More detailed product descriptions and information is available on our website:
www.frauscher.us

Datasheet RSR180
Datasheet FAdC
Solutions: CBTC Secondary Systems
Axle Counters
Wheel Sensors