



On board with Eaton.

Space-saving benefits of remote breaker resets in rail

EATON

Powering Business Worldwide



Author name

Alexandre Zint,
Product manager, Eaton

In today's competitive environment, train operators must use every opportunity to maximise the appeal and competitiveness of rail transportation. One way of achieving this is to reduce onboard equipment dimensions to increase passenger comfort and seating space.

In this paper Alexandre Zint, product manager at Eaton, explains how the correct choice of remote breaker reset devices makes this possible, while also improving equipment reliability and reducing maintenance cost.

Rail operators today find themselves in a highly competitive marketplace where the train is just one of the many transportation methods available. To meet this challenge, the industry is focusing on making the rail system the most appealing transportation choice on offer. Improvements to comfort, speed and affordability are seen as key components of this drive.

An important contribution towards success in this market can be made if some extra room can be released in passenger carriages. This can increase the number of seats, make room for wheelchairs or bikes and improve comfort by allowing passengers more room. Also, there is pressure to introduce double-deck trains, reduce underframe train gauges and reduce the size of the driver's cab. Accordingly, designers are seeking to delocalise and distribute functions to inaccessible places around the passenger car – in the roof, under the body or in hidden cabinets – to gain extra space. Eaton's Remote Breaker Reset (RBR) technology provides an opportunity to achieve this, while also guaranteeing circuit breaker reset without disrupting power.

Remote Breaker Reset – principle of operation

As its name suggests, an RBR allows a train driver or other rail operative to remotely reset a circuit breaker after it has been triggered. The assembly comprises electronics, connectors, a solenoid and piston as shown in Fig. 1. RBR devices are available in three sizes and four voltage ratings, and are designed to be compatible with and mounted onto the JS, AR, ADS, GH and GJ hydraulic-magnetic circuit breakers in the Eaton Heinemann series.



Fig1: Remote Breaker Reset key components

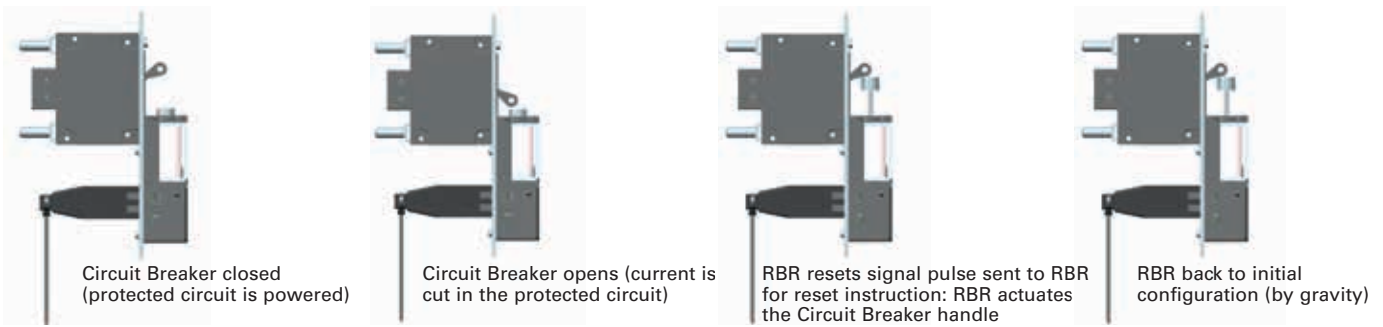


Fig 2: Remote Breaker Reset operating sequence

The sequence of events during a reset is shown in Fig. 2. During normal operation, the circuit breaker is closed, allowing current to flow within the protected circuit. The handle is in the up position, and the breaker can remain in this state indefinitely. The RBR solenoid is not energised, and the piston is held in a retracted position by gravity. If a short circuit or extended overload event occurs on the protected circuit, the breaker will trip to cut the current flow, and the handle will drop into the down position.

The RBR can then be activated by a signal pulse sent from the remote control location. This energises the solenoid, which pulls the piston upwards to strike the circuit breaker handle and reset it, allowing current to flow again in the protected circuit. As the pulse signal returns to zero, the solenoid de-energises and simply returns back to the retracted position by gravity.

Benefits of the remote circuit breaker

Offerings competitive to the RBR depend on a worm gear reset device, which is located in an extra breaker housing and occupies valuable horizontal space. This space can be saved by using an RBR, which locates directly under the breaker handle.

The RBR also resolves timing issues related to the worm gear approach, which takes several seconds to reset the circuit breaker. This can cause arcing during reset under overload or short circuit conditions, damaging contacts and eventually leading to failure. By contrast, the solenoid-based solution resets breakers in milliseconds, preventing arcing damage.

Additionally, the control circuit has been designed to draw low currents – typically around 200 mA – which avoids interfering with any associated computer systems. At the same time, a single RBR is powerful enough to reset up to four circuit breakers.

Reset on short circuit is also possible as the tripping mechanism of Eaton’s Hydraulic-magnetic circuit breakers will immediately trip even if the circuit breaker handle is blocked in the up position.

The RBR is ideally suited to a wide range of rail and other equally demanding remote environments within telecom, industrial and machinery, marine and defence applications. The devices can be guaranteed to provide electrical protection over time, with a high level of reliability throughout conditions of shock, vibration, humidity, salinity and temperature variation. As Fig. 3 shows, there are many options available to the designer in addition to the four voltage ratings (24-48-72 and 110 VDC) and three sizes. These allow each designer to find the best fit for their application.

Conclusions

Eaton’s hydraulic-magnetic circuit breakers offer significant advantages in train design because they allow precise circuit protection with improved safety: greatly reducing the incidence of nuisance tripping. They provide this level of protection while being particularly resilient to the extremes of mechanical, electrical and thermal shock experienced by equipment in rail environments.

The Remote Breaker Reset devices described above offer the same environmental resilience while bringing valuable extra functionality to the circuit breakers.

RBR advantageously allows the relocation of critical functions into inaccessible places such as in the roof or under the body of rail carriages – thereby improving seating space and passenger Comfort. In addition RBR allows an immediate reset of a triggered circuit breaker without human intervention on the breaker: a very desirable feature that reduces the total cost of ownership and allows continuity of functions without annoyance to passengers when the train is in operation.

Another key advantage is the RBR’s ability to reset a breaker in milliseconds rather than the few seconds required by the worm gear reset devices. This prevents arcing, protects the breaker contacts and prolongs the life of the breaker. When all functional and operational benefits are taken into account – the reduced weight, size and cost of the circuit breaker solution through the elimination of contactors, motorized switches and protection devices; the lower risk of nuisance tripping resulting from temperature variations, shock or vibration; the minimizing of downtime thanks to the reset capability on a powered circuit and risk-free resetting on a short circuit – then overall operating costs and total cost of ownership are both significantly reduced with this solution.

Designers wishing to implement remote breaker reset systems within their new or refurbishment rail car projects can benefit from working with a major international partner such as Eaton. Eaton not only designs and manufactures the RBR devices with the advantages described above, but also produces the hydraulic-magnetic circuit breakers that they operate with. They can assist with configuring or even customising integrated solutions optimised for specific applications. Support is available both from Eaton applications engineers and local distributors around the world.

If you would like more information about options for remote breaker reset, visit Eaton online at www.eaton.eu/rail, contact your nearest local distributor or contact Eaton via alexandrezint@eaton.com

RBR-AR-4-110-110-C1-V1-T3

Series	Breaker type to reset	# of poles it can reset	Nominal voltage Coil	Nominal voltage Control	Control	Push washer type	Version	Special corrosion Treatment
	ARJS		24	24				
RBR	AR	1 to 4	48	48	C	1	V1	T3
	GJ		72	72	N	2		
			110	110				

Fig 3: Remote Breaker Reset options

