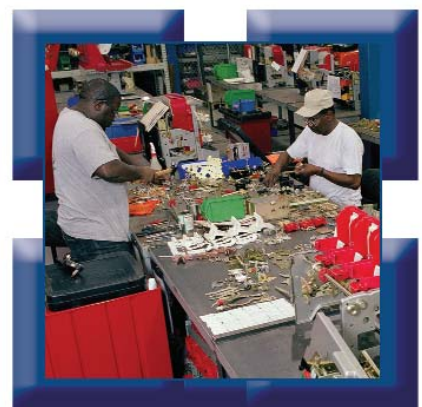
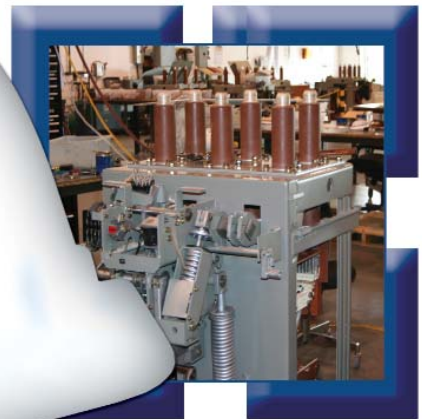
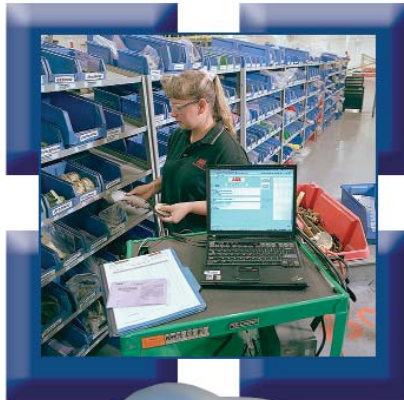


Service & Aftermarket Solutions

For Low & Medium Voltage Switchgear & Circuit Breakers



Customers Choose ABB

Outstanding aftermarket support is one of the many reasons customers choose ABB.

Over the years, ABB brands have included ITE, Gould, Brown Boveri and ultimately ABB. ABB is strongly committed to providing aftermarket service and support for all of these brands. ABB's customers have come to expect extraordinary responsiveness in providing direct replacement circuit breakers, authentic breaker and switchgear components for maintenance, upgrades, life extension projects, and field services.

ABB Medium Voltage Service (MV Service) recognizes that circuit breakers and switchgear have different service needs depending on factors such as age, maintenance, application, and duty cycle. That's why ABB has a variety of aftermarket solutions that extend the life of, and in many cases reduce the maintenance requirements of, switchgear. Plus, ABB has qualified personnel to perform the aftermarket field services required to keep electrical equipment operating properly and safely.



ABB's legacy dates back to 1927

ABB's worldwide leadership and manufacturing excellence in low and medium voltage circuit breakers, switchgear, and related products allows ABB to provide a variety of aftermarket solutions and services for nuclear safety related and conventional applications.

Parts & Components

- ABB and legacy brand name low and medium voltage switchgear and circuit breakers

System Solutions

- Roll-in replacement circuit breakers
- Circuit breaker refurbishments

Service & Support

- Power service and support
- Protective relaying and control service and support
- Engineered solutions
- Training

Parts & Components

MV Service provides quality parts and components for the entire family of ABB low and medium voltage switchgear types: K-Line®, K-Line® Plus, LK, MB, FBK, HK, HK-II, SafeGear® and Advance®. As the original equipment manufacturer (OEM) for these product lines, parts supplied by ABB are “authentic” and produced with the right material to controlled specifications and tolerances for an exact fit.

Circuit breaker renewal parts include common components such as trip devices, primary contacts, and complete interrupter pole assemblies, as well as discrete parts and complete refurbishment kits.

The ABB Family of Switchgear Products

ABB Brand Names

- ITE
- Gould
- Gould-Brown Boveri
- Brown Boveri
- ABB

Low Voltage

- K-Line®
- K-Line® Plus
- K-Don
- FBK
- MB
- LK

Medium Voltage

- HK
- HK-II
- HKV
- GHK
- VHK
- VHK-X
- ADVAC®
- AMVAC™
- SafeGear®
- Advance®



MV Service supplies replacement components for the full line of ABB switchgear products

Parts & Components Benefits

- Extensive inventory of new switchgear and circuit breaker components to meet normal and emergency needs for both nuclear safety related and conventional applications
- Same day shipments available on most parts
- Only authorized supplier for original ABB factory manufactured components
- Components experts are on-call 24 hours a day, 365 days a year (+1-800-929-SWGR)
- Aftermarket support team with over 200 years of combined switchgear and circuit breaker experience
- OEM - parts are manufactured to controlled prints and specifications providing the right product, with the right material, for an exact fit
- Extensive database of switchgear and circuit breaker drawings and details on customer orders dating back over 40 years
- All parts are newly manufactured and backed by a full one-year warranty

System Solutions

Roll-in Replacement Circuit Breakers

MV Service is a leading producer of aftermarket low and medium voltage roll-in replacement circuit breakers that are designed to directly replace existing circuit breaker types. A comprehensive portfolio positions MV Service to provide new aftermarket roll-in replacement circuit breakers for most major manufacturers' switchgear brands.

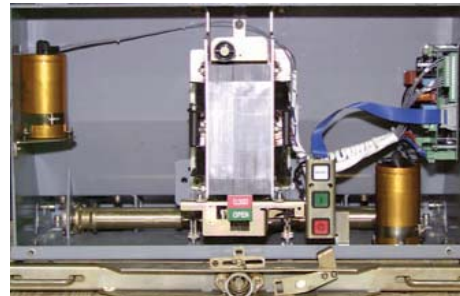
Manufacturer	Models
ABB / ITE	HV, HK, HKV, GHK, LK, LKE, MB, MBE, K-Line
Siemens / Allis-Chalmers	AM, MA, FC, MC, MSV, FSV
Federal Pacific	DST, DST-2, FP, FM, DMB
General Electric	AM, AMH, AK, AKR
McGraw-Edison	WS, WSA, PSD
Westinghouse	DH, DHP

ABB provides new low and medium voltage aftermarket roll-in replacement circuit breakers for most major brands.

ABB has extensive global manufacturing and technology resources to provide new replacement circuit breakers that are built to the latest standards and utilize the latest electric power technologies to provide improved reliability, enhanced performance, and increased safety. This translates into extended switchgear life, increased personnel and property safety, and reduced ownership costs.

Medium Voltage Roll-in Replacement Circuit Breakers

- Uses AMVAC magnetic operating mechanism
 - An electromagnetic flux shifting device that exceeds the retaining force of permanent magnets to change the position of the operating shaft
 - Capable of performing 100,000 mechanical operations at 25 kAIC
 - Minimal lubrication and maintenance required
 - Specifically designed to operate with vacuum interrupters
- Uses ABB vacuum interrupters
 - Incorporates the latest technology in rotating spiral contact designs to maximize contact life and are rated for 30,000 full load operations and over 100 full short circuit operations
 - Vacuum interrupter and current carrying assemblies are fully encapsulated in epoxy, for most frame sizes, to provide maximum protection from dirt and humidity, greatly reducing the potential for tracking and partial discharge
- Built with all new parts
- Modification of the existing circuit breaker switchgear compartment is usually not necessary
- Switchgear interlocking safeguards are incorporated
- Circuit breaker frame is constructed of rugged steel and counter weighted to easily and safely connect during the racking process



AMVAC magnetic actuator operating mechanism



Medium voltage roll-in replacement for GE Type AM

Low Voltage Roll-in Replacement Circuit Breakers

Low voltage replacement breakers use state-of-the-art EMAX circuit breakers. This modular and compact circuit breaker is extremely reliable with over 250,000 global installations, making it a perfect fit for replacement applications.

The EMAX circuit breaker:

- Self-contained air magnetic breaker with stored energy operating mechanism
- Safe breaker with double insulated live parts and total phase segregation
- Built with sturdy components, including a metal frame structure
- Rated at 20,000 mechanical operations and 10,000 electrical operations at 800 amperes
- Various levels of circuit breaker microprocessor trip unit intelligence:
 - Complete set of protection and control functions
 - Measurements signaling and data storage
 - Communication capabilities for use in automation and control systems
 - Bluetooth capabilities providing safe remote circuit breaker interrogation



Low voltage cradle-in-cradle replacement with the EMAX circuit breaker

Cradle-in-Cradle

Low voltage replacement breakers are typically either direct replacements, where the EMAX breaker is mounted directly into the switchgear cubicle, or a cradle-in-cradle replacement. The cradle-in-cradle replacement is an increasingly popular option, because it provides the ability to standardize on the ABB EMAX circuit breaker for all low voltage replacements regardless of the switchgear manufacturer. The cradle-in-cradle is a double interface frame with inner and outer interfaces. The outer interface mounts physically and electrically in the switchgear cubicle. The inner interface matches up with the EMAX draw out breaker, allowing for quick and easy installation and removal.

Cradle-in-Cradle Benefits

- Easy to standardize on EMAX and reduce inventory across different switchgear types
- Simplifies personnel training and increases personnel safety through standardization
- Fits into and strengthens breaker cubicles that may have settled or shifted over time
- Allows for the replacement EMAX breaker to easily rack into and out of the cubicle
- Avoids misalignments of circuit breaker connections

Standards & Testing of Roll-in Replacement Circuit Breakers

- Designed, built, and tested according to latest applicable ANSI standards
- Circuit breakers are "type tested" and each breaker undergoes full production testing
- Tested in a switchgear cell to ensure integrity and fit
- Nuclear certification available

Orientation & Training

ABB knows that orienting customers on the technology, operation and maintenance of aftermarket roll-in replacement circuit breakers saves time and money. That is why MV Service provides one day of technical supervision and training for customers with the purchase of a new roll-in replacement circuit breaker type.

Circuit Breaker Refurbishments

Refurbishments are for circuit breakers with readily available parts. ABB's factory trained technicians provide refurbishment services for both nuclear and non-nuclear low and medium voltage circuit breakers. ABB refurbishes circuit breakers to a "like new operating condition" and provides a full one year warranty that covers parts and labor.

"One Price" Refurbishment Program

ABB offers an exclusive refurbishment program for ABB lineage circuit breakers. ABB will provide a complete circuit breaker refurbishment price up front that includes all standard parts normally replaced during breaker refurbishment, plus any additional components that do not meet ABB acceptance standards. Some exceptions apply.



ABB has dedicated resources to professionally repair and refurbish all low and medium voltage circuit breakers to like new operating condition, in a controlled factory environment.

"One Price" Highlights:

- Complete circuit breaker refurbishment price upfront
- Includes all standard parts normally replaced during breaker refurbishment, plus additional components that do not meet ABB acceptance standards
- Conditional on the circuit breaker being received in working condition with no apparent damage found during the "as received" inspection
- Includes a one year warranty

Refurbishment Process

1. "As received" inspection of major assemblies and testing to verify breaker operation
2. Circuit breaker is completely disassembled for inspection and cleaning
 - Non-current parts are cleaned by methods that remove all foreign material, but don't compromise the material's dielectric or structural properties
 - Current carrying components are cleaned by methods that do not deteriorate original plating
3. Parts are inspected for cracks and deterioration utilizing approved acceptance criteria
4. Parts are replaced, re-painted and/or re-plated as required to meet the original design life of the breaker
 - If more than 50% of the main contact surface is damaged, worn, or cracked, the main contact will be replaced
5. All old lubricants are removed, the mechanism and all non-current carrying pivot points are re-lubricated with Mobil 28 or Anderol 757 lubricant per customer specification
6. Circuit breaker is reassembled per assembly drawings
7. Circuit breaker is "final" tested as a new breaker in accordance with applicable ANSI standards
8. Each refurbished circuit breaker is labeled for traceability
9. Test report is supplied that includes results obtained from "as received" and "final" testing along with a list of replaced parts.

Other Manufacturers' Circuit Breakers

ABB has expertise to refurbish other manufacturers' circuit breakers to "like new operating conditions." The refurbishment process is the same as with ABB circuit breakers. Base prices quoted cover typical refurbishment components and labor from qualified technicians. Other parts and repairs are performed based on additional quotations and customer approval.

ABB Customer Service Solutions

In addition to providing excellent circuit breaker refurbishments, ABB works with customers to create refurbishment programs to meet specific needs and time-frames. Examples of customer service solutions include:

- Loaner / spare breakers for refurbishment rotation and minimized down time
- On-site refurbishments
- Reusable shipping crates to protect the breakers during transit



In-house factory plating operation enhances the customer service level provided

Refurbishment Benefits

- Ability to refurbish ABB lineage and other manufacturers' low and medium voltage circuit breakers
- Refurbish nuclear safety related and conventional circuit breakers
- Extends the service life of the circuit breaker to like new operating condition
- Turnkey refurbishments free customer resources for other assignments
- Combination of service-oriented personnel and factory capabilities assures the most cost-effective and timely breaker refurbishments
- Work performed by professional technicians in a controlled environment and supported by design and product engineers
- OEM for ABB lineage low and medium voltage circuit breakers
- Nuclear safety related refurbishments comply with 10 CFR 50 Appendix B, 10 CFR Part 21 and NQA1 requirements
- Properly equipped facilities for safe handling, diagnostics, parts cleaning, plating, and testing
- Refurbishments validated by full production testing to original specifications and industry standards
- One-year factory warranty provided on refurbished circuit breakers

Service & Support

Power Service & Support

MV Service factory-trained technicians offer comprehensive field maintenance and repair services for planned and emergency work, 24 hours a day, 365 days a year. Service personnel have direct contact with the factory for authentic parts, original equipment drawings, and technical support. Services include switchgear and circuit breaker commissioning, inspection, testing and refurbishment, replacement of breakers, relays and control components, primary bus upgrades, and related switchgear services. ABB also offers maintenance and repair training from product orientation for new equipment to advanced repairs and life extension programs.



Field services are available for low and medium voltage switchgear and circuit breakers.

Field Services for Low & Medium Voltage Switchgear & Circuit Breakers

- Emergency Repairs
- Installation/Maintenance
- Supervision
- Start-Up and Commissioning
- Bus Modifications
- Maintenance Agreements
- Specific Turnkey Installation/Maintenance
- Spare/Obsolete Parts Support
- Breaker Upgrades
- Retrofit Solutions
- Retrofit/Upgrade
- Reliability Assessment
- Engineered Solutions

Emergency Repairs

Factory-trained technicians are available 24 hours a day, 365 days a year to support emergency repairs. Technicians also have the support of the MV Service factories to provide necessary parts, drawings, and engineering guidance.

Asset Management

The primary benefits of an asset management program are increased asset availability and performance, along with maximized operations and maintenance effectiveness. That is, extend the asset's life, reduce its operational costs, and ensure its availability.

MV Service has the experience and knowledge to provide asset management programs for low and medium voltage switchgear and circuit breakers. The program starts with an evaluation of the existing equipment. The evaluation process uses a numerical analysis to determine the condition of the equipment from a service perspective. Factors such as age, application criticality, new and used parts availability, ability to be refurbished, technology employed, maintainability, and safety are all evaluated. A simple visual inspection of each breaker can also be performed, providing valuable additional evaluation data.

Once each switchgear and circuit breaker is evaluated, it is divided into four categories:

- Resolve - High Critical Application - High Evaluation Score
- Manage - High Critical Application - Low Evaluation Score
- Monitor - Low Critical Application - High Evaluation Score
- Accept - Low Critical Application - Low Evaluation Score

After the equipment is categorized, MV Service works with customers to determine the corrective actions and timelines for each of the categories. As with service projects, ABB provides flexible work scopes to meet customer needs.

Arc Flash - REA Safety Protection

Personnel safety and equipment protection from arc flash is important to everyone. ABB offers the state-of-the-art REA Arc Protection System, a proven relay system with thousands of global installations, to minimize arc flash energy in case of a system fault.

The ABB REA Arc Protection System utilizes a patented fiber-optic sensor technology that instantaneously detects light from an arc. A tough unshielded fiber optic cable runs throughout the switchgear compartments and detects the intense light from a developing arc. If an arc occurs, it is seen by the REA relay that signals a "trip" to the designated circuit breaker in less than 2.5 ms.

The ABB REA Arc Protection System is ideal for aftermarket installations because of the increased personnel and property protection and the easy switchgear installation. MV Service field service technicians are trained to properly install, test, and commission the REA system.



The REA Arc Protection System quickly mitigates arc faults, increasing safety.

Match-in-Line

Expanding an existing switchgear line-up by adding one or more feeder frames is commonly referred to as "match-in-line." MV Service provides match-in-line for ABB legacy switchgear types HK, HKII, K-line, and other switchgear types.

As the OEM of switchgear products, MV Service has the reference drawings and manufacturing capabilities to easily produce "exact match" expansion frames for ABB lineage designs. MV Service designs and manufactures all interfaces and extensions, including bus work and protection and control panels. MV Service technicians assemble and wire up the frames. Field service technicians work with customers to install, connect, test, and commission the switchgear match-in-line expansion.

Retrofit Solutions

Retrofit solutions or upgrades are available for low and medium voltage switchgear and circuit breakers. Retrofits aim at extending the life of equipment and reducing operating costs.

- **Low voltage circuit breakers** - retrofits involve the replacement of electromechanical controls with new solid state control units that incorporate the current standards of overcurrent and ground fault protection.
- **Medium voltage circuit breakers** - retrofits involve upgrading the operating and interrupting mechanisms to current technologies and possible higher interrupting capabilities.
- **Switchgear** - retrofits include upgrading to a higher operating and interrupting rating, which includes bus upgrades. Retrofits also include a retrofit offering where a new switchgear cell and circuit breaker is inserted into an existing switchgear cell.

Since 1927, ABB customers have been assured of continued, responsive support - - long after the equipment has been energized.

Protective Relay & Control Service & Support

The reliability threat posed by aging electric power systems and the need to reduce operating costs increases the importance of protective relays in existing substations and power plants. With the legacy Westinghouse electromechanical, solid state, and microprocessor-based protective relay systems, ABB is uniquely positioned to provide expert relay solutions due to a large installed base, application diversity, access to engineering designs, and global development capabilities. MV Service provides customers with engineering and technical support in every aspect of system protection, from testing to managing complete turnkey projects.

Turnkey

MV Service supplies complete protective relay system turnkey services. Commercial services include development of the bid proposal and contract negotiation assistance. Engineering finalizes the system design, develops electronic drawings, and provides technical support throughout the project. Once the relay system arrives, ABB installs the system, and performs the commissioning and testing on the system. System documentation and training of operating personnel is provided. A project manager oversees the complete turnkey project.



ABB Relay Retrofit for GE electromechanical relay

Relay System Maintenance

MV Service offers maintenance on relays and relay systems used for the protection of generation, transmission, transformer, and distribution systems. The ABB field service technicians are factory trained to maintain all manufacturers' relays and all types of relays including electromechanical, solid state, and microprocessor. Typical maintenance packages include an initial inspection of the relays, "as found" testing, cleaning, recalibration, and "as left" testing. All of the findings and test results are documented and reported.

Testing & Commissioning Services

MV Service has the expertise to test and commission relays and relay systems at a customer's location to ensure that the relays are properly operating and wired correctly. Specific job scopes are developed based on customer requirements. Factory trained engineers and technicians verify that the relay settings are correct and perform system functional tests to verify the integrity of the system. The relays are run through trip checks to make sure they pass acceptance testing. In-service tests can also be performed. System wiring is verified against as built drawings. Documentation on findings, including test reports, is provided.

Relay Commissioning:

- Settings installed
- Computerized acceptance tests
- Test reports

System Commissioning:

- System functional test
- Trip checks
- In-service tests
- As installed drawings

Retrofit

Existing relay and control panels are modified and retrofitted at the customer's location. ABB replaces old, troublesome relays with new microprocessor relays in the existing panels. ABB furnishes the necessary engineering, documentation, relay settings, and commissioning per customer requirements.

Modular Control Buildings

ABB delivers to the customer's site: fully tested, modular control buildings with protection, control and automation systems installed. MV Service supplies a complete customized design, including engineering and drawings per the customer's specifications.



Modular control building

Engineering Solutions

Short Circuit

Short circuit studies are usually performed when changes are made to an existing system, including the installation of new power equipment or the reconfiguration of existing equipment. MV Service has the expertise to provide these studies to ensure the proper coordination and protection settings related to the electrical equipment and system.

Arc Flash

Arc flash studies reveal the potential arc flash temperature at a particular piece of equipment in the event of a fault. These studies are performed to determine the necessary level of protective equipment or clothing to be worn by workers in close proximity to these potential arcs. These studies also help determine the proper application of any arc flash mitigation equipment to be installed.

Integration

Integration studies find the most efficient and economical approach to the integration and application of ABB and other manufacturer's equipment into a site installation. This includes identifying system protection requirements and the proper devices to provide system protection.

System Reliability

System reliability improvement studies involve the general analysis of an electrical power system to determine the cause of power system failures or reduced reliability. ABB will recommend configuration changes and additional equipment necessary to correct system failures and improve overall system reliability.

Training

MV Service' "hands-on" training programs educate customers on the proper maintenance and service of ABB electrical power equipment. These training programs are offered at both ABB and customer facilities. MV Service has a large selection of specialized training programs available and training programs can be tailored to meet the specific needs of customers.

The training programs are developed for operators, engineers, and technicians to become proficient in the application, installation, operation, maintenance, testing, and commissioning of ABB switchgear, circuit breakers, relays, and relay systems.

Power Service Training

Power service training focuses on switchgear and circuit breakers and is available for both nuclear and non-nuclear applications. Circuit breaker and switchgear training covers all product aspects. Training can also include tearing down breakers, identifying components that need to be replaced, and rebuilding.

Relay Service Training

ABB has comprehensive relay training programs for all relay types including electromechanical, solid state, and microprocessor relays. Class participants learn everything about relays from calibration to troubleshooting techniques. ABB also has relay training programs that teach detailed protective relaying such as symmetrical components and fault analysis, distribution and transmission protection, along with protection for many electric power component applications.



ABB instructors are engineers and technicians with years of experience.

Training programs cover

- Product orientation
- Application
- Installation
- Calibration
- Operation
- Inspection
- Maintenance
- Testing
- Commissioning
- Troubleshooting
- Safety

Flexible Solutions for All Your Aftermarket Needs

Product	Solution	Description	When to Choose	Benefits
Switchgear & Circuit Breakers	Replacement Parts & Components	OEM of renewal parts for Gould, ITE, Brown Boveri, & ABB	Parts needed for properly maintained switchgear	Quick ship program OEM: manufactured with proper material to controlled specs
		Service	Repair	Emergency situations & unexpected & planned outages
	Installation & commissioning		Need qualified personnel	Train inexperienced personnel Ensure integrity of the installation
	Preventive maintenance		Need qualified maintenance personnel	Scheduled program maximizes reliability
Switchgear System Solutions	Refurbishment	Customer site	Extend the life of the circuit breaker	Breakers remain on customer premises
		Qualified service centers		Fully trained personnel
		Factory		Facility resources available - engineering & production
	Roll-in- Replacement Breakers	Replacement breakers for ABB & other manufacturers	New breaker requirements for existing switchgear	Provides new vacuum circuit breaker for greater reliability
				Latest operating technology minimizes maintenance Potential short circuit capability upgrade for safety margins
	Breaker Retrofit	Retrofit of LV breaker trip units	Extend the life of the circuit breaker & update controls	Increase communication capabilities Improve accuracy of trip settings Improve breaker protection coordination with other devices
Switchgear Retrofill				Overhaul existing switchgear cubicles to accept a new circuit breaker
Protection & Control	Replacement Parts & Components	OEM parts for ABB & Westinghouse	Parts needed for relay repair	OEM of parts & components Manufactured to controlled prints & specifications
				Service Solutions
	Retrofit	Update older equipment to provide increased operating capabilities	Updates & replaces older technology	
	Modular protection & control buildings	Replacement of complete protection & control system & building to meet new operational requirements	Turnkey replacement protection & control facility for new equipment Shortened outage time for installation & change over	
Technical Support	Engineering Studies	Short circuit	Calculates short circuit capabilities to verify proper product application & accuracy of protection & control settings	Ensure accurate product application & reliable coordination of protective devices
		Arc flash	Determine arc fault energy to properly protect personnel & to ensure compliance with applicable standards	Increased safety of personnel, property, and equipment
		System reliability improvement	Maximize system reliability	Improved coordination of installed equipment
				Increased reliability & reduced down time
	System integration	Coordination of new equipment	Safe interaction of applied equipment	
			Increased safety & reliability	
Training	Protection & control	Provide maintenance personnel training on protection & control products	Teaches maintenance personnel the latest protection & control technologies & maintenance requirements	
	Switchgear & circuit breaker	Provide maintenance personnel training on switchgear and circuit breakers	Teaches maintenance personnel breaker maintenance requirements, refurbishment practices, and appropriate repair and parts replacement techniques	



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