1.2 Loadcenters and Circuit Breakers

**Type BR Loadcenters and Circuit Breakers**

---

**Overview**

**General Product Description**

Loadcenters are enclosures specifically designed to house the branch circuit breakers and wiring required to distribute power to individual circuits. They contain either a main breaker when used at the service entrance point or a main lug when used as a sub-panel to add circuits to existing service. The main breaker protects the main entire panel and can be used as a service disconnect. The branch breakers protect the wires leading to individual electrical loads such as fixtures and outlets.

**Plug-on Neutral Loadcenters**

The BR Plug-on Neutral portfolio from Eaton offers a unique design that offers improved safety, ease of installation and leaves the end result with a clean and professional look and feel.

---

**Features, Benefits and Functions**

**Plug-on Neutral Style Loadcenters**

- The short-body BR electronic circuit breakers are optimized to save gutter space and installation time with an easier, more succinct installation process
- Unique self-leveling tabs to allow for quick drywall offset
- Added keyhole hanging feature on cover for ease of installation
- Common drive types on screw connections for added simplicity and convenience
- Inboard neutral to increase the gutter space for easier installation of conductors
- Backed-out neutral screws to allow for a quick connection of ground and neutral conductors
- Upgraded to embossed circuit numbers for a more clean and professional look

**Loadcenter Construction**

Eaton’s Type BR loadcenters have standard tin-plated aluminum bus with a limited availability of copper bus.

---

The sum of the handle ratings connected to any stab is limited to 150 A maximum on the 100 and 125 A loadcenters, and 200 A on loadcenters with 150 A or higher main bus. NEMA Type 1 boxes or enclosures are manufactured from galvanized steel. Raintight boxes are manufactured from galvanized steel, then finished using an electrostatic powder coat, baked urethane paint process.

**Neutrals**

Eaton BR loadcenters feature three types of neutrals:

**Inboard Plug-on Neutral**

Code changes and higher safety standards are leading to more arc fault circuit interrupter (AFCI) installations. With the electrical contractor in mind, Eaton has revolutionized the way Combination AFCIs are installed with the Plug-on Neutral line of loadcenters and breakers.

**Insulated/Bondable Split Neutral**

Panels are supplied with split insulated neutrals with an insulated cross strap. For service entrance applications, the neutral must be bonded by using the bonding strap supplied with the panel. For non-service entrance (sub-panel) applications, the panel may be installed with the bonding strap not connected to the neutral. Separate ground bars must be used on non-service entrance panels.

---

**Contents**

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td></td>
</tr>
<tr>
<td>Standards and Certifications</td>
<td>V1-T1-47</td>
</tr>
<tr>
<td>Catalog Number Selection</td>
<td>V1-T1-49</td>
</tr>
<tr>
<td>Product Selection</td>
<td>V1-T1-51</td>
</tr>
<tr>
<td>BR Plug-on Neutral Loadcenters</td>
<td>V1-T1-58</td>
</tr>
<tr>
<td>Spa Panels</td>
<td>V1-T1-61</td>
</tr>
<tr>
<td>Riser Panel</td>
<td>V1-T1-62</td>
</tr>
<tr>
<td>Type BR Renovation Loadcenter</td>
<td>V1-T1-63</td>
</tr>
<tr>
<td>BR Loadcenter Options and Accessories</td>
<td>V1-T1-66</td>
</tr>
<tr>
<td>BR Circuit Breakers</td>
<td>V1-T1-83</td>
</tr>
</tbody>
</table>
1.2 Loadcenters and Circuit Breakers

Type BR Loadcenters and Circuit Breakers

Grounds

In service entrance applications where the neutral is bonded, unused neutral holes may be used for terminating ground conductors. In sub-feed panels, the neutral must be isolated (non-bonded), and ground wires must be terminated on a separate ground bar.

The insulated/bondable single/split neutral panels have sufficient terminations for both ground and neutral conductors. The insulated/bondable single split neutral panels are supplied with a separate factory-installed ground bar if the catalog number contains a “G.” If not, a separate ground bar should be installed. Insulated/Bondable Single Neutral panels are supplied without a ground bar (unless otherwise noted), and ground bar kits if needed must be purchased separately.

Neutral and Ground Terminals

The standard terminals on grounds and neutrals are rated to accept (3) #14–#10 Cu/Al or (1) #14–4, provided the cables terminated are of the same material. For larger cables, add-on neutral lugs may be ordered from the accessories on Page V1-T1-72.

Note: NEC allows only one current-carrying conductor per hole on neutrals unless otherwise noted.

Bottom Fed Loadcenters

For single-phase 225 A and below loadcenters that are bottom fed, a standard panel can be rotated 180 degrees to allow straight-in wiring of power cables to the main terminals. Because the main circuit breaker handle operates horizontally, the orientation of the main circuit breaker handle is consistent with the requirements of NEC 2008 Article 240.81.

Gutter Splicing

Loadcenters are not UL listed as wiring troughs. Therefore, gutter splicing of riser cables to tap off to the main device is not permitted. Refer to NEC 2008 Article 312.8.

Fire Rating

Due to the numerous openings in both loadcenter boxes and trims, they should not be mounted in firewalls. There is no approved method for sealing the enclosures for this application.

Date Code

The date of manufacture of each loadcenter is printed on the outside of the carton as well as inside the loadcenter. On the carton, the date code is printed on the end carton label. In the loadcenter, the date code is located on the small white label located on the right side wall (with the main device on top).

The date code is in the following format: F # # # &. The “F” is the numeric code for the Lincoln, IL plant, and the three numbers are the year and week of manufacturing, e.g., 023. The “!” sign at the end signifies the decade of the 2010. Therefore, the date code F023& would indicate that the product was manufactured in the 23rd week of 2010. The 1980s are represented by the “+” sign and the 1990s are represented by a “=” at the end of the code.

Surge Protectors

Complete home surge protection is available in multiple options, including a factory-installed option that provides the highest level of surge protection in a residential design. See Tab 3 for more details.

Circuit Breaker Case Interrupting Capacity

- 10 kAIC
- 22 kAIC
- 25 kAIC

Warranty Information

- 10-year limited loadcenter warranty
- 10-year limited branch breaker warranty

Standards and Certifications

UL Listings

All Eaton Type BR loadcenters are listed under UL File E52977 except the 2–8 circuit loadcenters, up through and including 125 A, which are listed under UL File E8741.
1.2 Loadcenters and Circuit Breakers

Type BR Loadcenters and Circuit Breakers

**Warranty**
10-year warranty on all Type BR loadcenters and circuit breakers.

**Optimized Knockouts**
- Knockout locations for additional access
- Easier to remove

**Smooth Case Edges**
- Provides a more professional look and feel

**Top or Bottom Feed**
- Straight-in wiring saves labor and material
- One panel for either top or bottom applications

**Plug-On Neutral**
- Eliminates the pigtail connection providing time and labor savings
- Provides a professional installation

**2/0 Lug**
- Easily removable and can be installed in any location on the neutral bar

**Type BR AFCI Breakers**
- Compact design for easier wiring
- Improved wireway access
- Optional LED indicates one of six trip codes for circuit diagnostics
- Provides a clean gutter space

**Inboard Neutral**
- Increases gutter space to allow for the professional installation of conductors

**Standard Tin-Plated Aluminum Bus**
- Excellent conductivity and corrosion resistance
- Copper bus options available for select catalog numbers

**Drywall Offset on Both Sides of the Enclosure**
- Allow for faster installation using predetermined self-leveling tabs

**Commercial Grade Main Breaker**
- 25 kAIC series rated main breaker for superior protection

**Common Drive Types**
- Minimizes number of tools required for installation as the neutral bar and breaker screws will share a common drive type

**Grounding Screw**
- Provides a quick and easy means of bonding the neutral and ground

**Twin Neutral Bars**
- Minimum 150% neutral capacity

**Backed Out Neutral Screws**
- Allows for quick connection of neutral and ground conductors

**Cover Features not Shown:**
- Cover Keyhole Hanging Feature
- Ease of cover installation
- Rigid Center Cover Spine
- Provides strength when twistouts are removed
- Improved Cover Twist-Outs
- Easier to remove twistouts
- Embossed Cover Circuit Numbers
- Durable circuit numbering with added marking for twin breakers

**Single Keyhole Mounting**
- One keyhole at the top and bottom provides easier mounting and leveling

"Tangential" Center Knockout
- Easier installation for conduit applications
Catalog Number Selection

Single-Phase Plug-on Neutral Loadcenters

**Type Designation**
- BR = 1 inch (25.4 mm) breaker loadcenter

**Feature**
- P = Plug-on neutral design

**Number of Spaces**
- 8 10 12 16 20
- 24 30 40 42 60

① The number of circuits is equal to double the number of spaces.

**Bus Amperage**
- 100 = 100 A
- 125 = 125 A
- 150 = 150 A
- 200 = 200 A
- 225 = 225 A

**Bus Material**
- Blank = Aluminum
- C = Copper

**Main Device**
- L = Main lug only
- B = Main breaker
- E = Convertible with main lugs installed
- N = Convertible (main device purchased separately)
- H = 22 kAIC

**Packaging**
- Blank = Individually packed with cover attached
- P1 = Loadcenters palletized (no box), covers 4 per carton

**Trim Color**
- Blank = ANSI 61 Gray
- W = White (Indoor Only)

**Accessories Installed**
- Blank = None installed
- DG = Double ground bar (for panels under 20 spaces)
- F = Feed-through lugs
- G = Ground bar

**Enclosure**
- Blank = NEMA Type 1 indoor with combination trim
- R = NEMA Type 3R rainproof
- S = NEMA Type 1 indoor with surface trim

**Single- and Three-Phase Legacy Loadcenters**

**Phase**
- Blank = Single-phase
- 3 = Three-phase

**Eaton’s Type BR Loadcenter**

**Factory Options**
- SUR = Factory integrated surge

**Number of 1-Inch (25.4 mm) Spaces**

**Maximum Number of Circuits**

**Main Device**
- B = Main breaker
- L = Main lug
- N = Convertible main
- H = Main breaker high AIC

**Construction**
- Blank = No feed thru lugs
- F = Feed-through lugs
- G = Ground bar
- NY = NY City gutter space

**Enclosure**
- R = NEMA Type 3R rainproof
- S = NEMA Type 1 indoor with surface trim
- F = NEMA Type 1 indoor with flush trim
- RIS = Riser panel

**Amperes**
- 50 = 50 A
- 70 = 70 A
- 100 = 100 A
- 125 = 125 A
- 150 = 150 A
- 200 = 200 A
- 225 = 225 A
- 300 = 300 A
- 400 = 400 A
- 600 = 600 A

**Note**
- ① No character space used.
### BR Electronic Circuit Breakers

**Type Designation**
- **BR** = 1 inch (25.4 mm) breaker loadcenter

**High kAIC Rating**
- **H** = 42 kAIC

**Neutral Design**
- **N** = Pigtail neutral wire
- **P** = Plug-on neutral

**Number of Poles**
- **1** = Single-pole

**Options**
- **Blank = UL**
- **C** = Canada (CSA® only)

**Amperes**
- **15** = 15 A
- **20** = 20 A
- **25** = 25 A (GFI)
- **30** = 30 A (GFI)

**Breaker Function**
- **DF** = Dual function
- **AF** = Combination arc fault
- **GF** = Ground fault
- **EP** = Equipment protection (30 mA)
1.2 Loadcenters and Circuit Breakers

Type BR Loadcenters and Circuit Breakers

Technical Data and Specifications

General
A. The Contractor shall furnish and install deadfront loadcenters incorporating circuit breakers of the number, rating and type as specified herein and as shown on the contract drawings.
B. The loadcenter and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL, NEMA and NEC including:
1. UL 67—Standards for Panelboards.
C. UL 50—Standards for Cabinets and Boxes.
D. UL 489—Standards for Molded Case Circuit Breakers.
E. UL 869—Standards for Service Equipment.

Qualifications
A. The manufacturer of the loadcenter shall be the manufacturer of the circuit breaker within the loadcenter.
B. For the equipment specified herein, the manufacturer shall be ISO 9000 certified.
C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of seven (7) years.

Manufacturers
A. Eaton.

Ratings
A. Loadcenters shall be rated for 120/240 Vac and shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 10,000 amperes rms symmetrical.
B. Circuit breakers shall be a minimum of 125 A frame. Circuit breakers 15 through 125 A trip size shall take up the same pole spacing.
C. Loadcenters shall be labeled with a UL short-circuit rating. When series combination ratings are applied with integral or remote upstream devices, a label shall be provided. Series combination ratings shall cover all trip ratings of installed frames. It shall state the conditions of the UL series ratings including:
1. Size and type of upstream device.
2. Branch devices that can be used.
3. UL series short circuit rating.

Construction
A. All loadcenters, with the exception of the branch circuit breakers, shall be completely factory assembled with main breakers, main lugs, or no main device.
B. Interiors shall be designed so that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be designed so that circuits may be changed without machining, drilling, or tapping.
C. Physical means shall be provided to prevent the installation of more overcurrent devices than that number for which the enclosure was designed, rated and approved. Half-size breakers shall have a UL listed rejection tab over the line terminals. Loadcenter interiors must have notched stabs to accept these rejection tab class CTL breakers, if required and approved.

Bus
A. Busbars for the main and cross connectors shall be [tin-plated aluminum] [copper] in accordance with Underwriters Laboratories standards. Busing shall be braced throughout to conform to industry standard practice governing short-circuit stresses in loadcenters.

Note: Note to spec writer—select one (copper available in limited ratings).

B. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection of same ampacity as branch.

Wiring/Termination
A. All wire connectors and terminals shall be of the anti-turn solderless type and shall be suitable for copper or aluminum wire of the sizes indicated. All connectors must meet the “Requirements for Wire Connectors and Soldering Lugs” as stated in UL 486B.
B. All loadcenters where marked shall be suitable for use with 60 °C or 75 °C rated wire.
A. Circuit breakers shall be molded case type. Circuit breakers shall have four-rivet construction (GFI Type—5 rivets). Multipole circuit breakers shall be of a stack pole design to provide electrical phase isolation.

B. Each pole of the circuit breaker will provide inverse time delay overload and instantaneous short-circuit protection by means of both thermal and magnetic sensors.

C. The circuit breaker calibration shall not be affected by environmental changes in relative humidity. The thermal bimetal element shall be welded to the steel frame and calibration shall be set independent of the molded case by computer controlled equipment.

D. All circuit breakers shall be operated by a toggle-type handle and multipole circuit breakers shall have an internal common trip mechanism. The circuit breakers shall incorporate trip mechanisms that are mechanically trip-free from the handle. The handle position shall provide visual trip indication.

E. Contacts shall be of non-welding silver alloy.

F. All circuit breakers shall have the trip rating inscribed on the handle on each circuit breaker pole. Also, unique color-coded cases that indicate the UL listed 10 kA or 22 kA interrupting ratings. Breakers shall be able to be used as main or branch disconnect devices.

G. Branch circuit breakers may also be used in the 1/2-inch (12.7 mm) per pole ratings that include two-pole 1-inch (25.4 mm) wide modules and four-pole 2-inch (50.8 mm) wide modules. Two-pole circuit breakers must incorporate a common trip mechanism.

H. Circuit breakers shall be completely enclosed in a molded case of thermoset material. No internal aluminum parts shall be used. All internal ferrous parts shall be plated to prevent corrosion.

I. All terminals shall be listed for use with copper or Galvanized sheet steel having multiple knockouts. Rainproof boxes shall use galvanized steel or an approved coating system which meets or exceeds standards for outdoor NEMA Type 3R enclosures. Boxes shall be of sufficient size to provide at least a minimum code gutter space on all sides.

J. The calibrated bimetal assembly shall be mechanically isolated from the load terminal using a flexible braided copper shunt wire, such that movement of the terminals due to twisting and overtorquing does not affect breaker calibration.

K. Breakers shall be SWD rated and/or HACR rated as required.

L. Arc Fault Interrupting circuit breakers, (AFI), shall be provided on all 15 and 20 A single-phase 120/240 Vac circuits except those indicated as remote controlled breakers. AFI breakers shall be “Classified for mitigating the effects of arcing faults,” or conforming to UL Standard 1699 and as defined by Article 210.12 Section A of the 1999 NEC Code.

Surge Protection Devices
See Volume 1, Tab 2 for complete details on surge protection.

Enclosures
A. Loadcenter shall have NEMA Type 1 general purpose or NEMA Type 3R rainproof enclosures as indicated on the drawings and shall be surface or combination flush/surface mounted except where noted.

B. Boxes shall be made from galvanized sheet steel having multiple knockouts. Rainproof boxes shall use galvanized steel or an approved coating system which meets or exceeds standards for outdoor NEMA Type 3R enclosures. Boxes shall be of sufficient size to provide at least a minimum code gutter space on all sides.

C. The deadfront shall have an easy adjustment feature for flush applications.

D. Boxes shall be factory assembled into a single rigid structure.

E. Unless otherwise noted on drawings, hinged doors covering all circuit breaker handles shall be included in all trims. Trim doors shall not uncover any live parts in making the circuit breaker handles accessible. If key locks are required, all locks shall be keyed alike.

F. Combination trims for flush and surface panels shall be flat and shall overlap the box by at least 5/8-inch (15.9 mm) all around. Trims shall be mounted by a screwdriver without the need for special tools.

Finish
A. Trims shall be bonderized and finished with a light gray ANSI-61 enamel. The paint finish shall be of a type to which field applied paint will adhere.

Factory Testing
A. The standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA.