DynAmp

# BRP Series

# Basic Rectifier Protection System

## Installation, Operation and Service Manual

### Manual Item No. 044423

### Rev. M

DynAmp, LLC
3735 Gantz Road
Grove City, Ohio 43123 USA
Phone +1 614.871.6900
Fax +1 614.871.6910
www.dynamp.com
help@dynamp.com

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# DynAmp, LLC WARRANTY

Items and components manufactured by DynAmp, LLC for permanent installation are warranted to be free from defects in material and workmanship for a period ofr two (2) years from the date of shipment.

Items and components manufactured by DynAmp, LLC for portable and temporary use in more than one location, are warranted to be free from defects in material and workmanship for a period of eighteen (18) months from the date of shipment.

Extended warranties may be available for purchase for some products. Extended warranties are provided on a serial number by serial number basis as noted on DynAmp's original invoice and/or packing list.

Items and components not manufactured and resold by DynAmp, LLC, are warranted by their manufacturer.

Warranty repair shall be, at DynAmp's option, in the form of repair or replacement of the defective items or components. Concerning warranty repairs, DynAmp, LLC will be responsible for DynAmp provided time, material and transportation costs (shipping or travel). Actual method of warranty repair / correction will be determined by DynAmp, LLC at DynAmp's sole option. Such warranty repair shall constitute a fulfillment of all DynAmp, LLC liabilities in respect to said items and components. In no event shall DynAmp, LLC be liable for consequential damages.

Information in this document is subject to change without notice.

© 2005, 2007, 2008, 2009, 2011, 2013, 2016, 2018, 2020 DynAmp, LLC. All rights reserved.

Reproduction in any manner whatsoever for purposes other than installation, operation pr service by the purchaser or end user without written permission of DynAmp, LLC is strictly forbidden.

This manual is part of the complete set of product documentation that includes installation, operation, and service instruction, drawings and test results. Users should evaluate the information in the context of the complete set of product documentation and their particular applications. DynAmp, LLC assumes no liability for any incidental, indirect, or consequential damages arising from the use of this documentation.

While all information presented is believed to be reliable and in accordance with accepted engineering practices, DynAmp, LLC makes no warranties as to the completeness of the information.

All trademarks used in association with BRP are trademarks of DynAmp, LLC.

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# Hazard Warning!

**GENERAL**

All installation, maintenance and service must be performed by qualified technicians who are familiar with the warnings and instructions of this manual.

Use of the equipment in a manner not specified by the manufacturer can impair the protection provided within.

DynAmp does not assume liability for the customer's failure to comply with the rules and requirements provided in this manual.

**HAZARDOUS VOLTAGE**

This equipment is mounted on current-carrying busbars that may be energized at hazardous electric voltages during normal operation. **DynAmp recommends installation of BRP sensors on de-energized busbar(s).** The associated power rectifier should also be locked out. If it is not possible to de-energize the busbar(s) during installation, the user assumes all responsibility to ensure that adequate procedures are followed to assure safety of personnel.

Ignoring the installation precautions and warnings can result in severe personal injury or equipment damage.

To avoid the risk of electrical shock or fire, the safety instructions and guidelines in this manual must be followed. The electrical specifications must not be exceeded and the unit must be installed according to directions provided.

**SENSOR INSTALLATION/ REPLACEMENT**

Make sure sensors are installed with arrows pointing in the direction of conventional current flow in the bus. If sensors must be replaced, they should be replaced as a matched set.

**Symbol Identification:**

General definitions of safety symbols used on equipment and manual.

Caution/Warning: Refer to accompanying documents for instructions.

© 2020 DynAmp, LLC

**This Page is intentional Blank**

© 2020 DynAmp, LLC

# DynAmp, LLC Customer Support & Service Assistance

For further assistance, contact DynAmp, LLC Customer Support at:

Americas:

Telephone: +1 614.871.6900 Fax: +1 614.871.6910

8:00 AM to 5:00 PM USA Eastern Time

From first Sunday in November to second Sunday in March – 13:00 GMT to 22:00 GMT

From second Sunday in March to first Sunday in November – 12:00 GMT to 21:00 GMT

After Hours Critical Service Emergency:

Telephone: +1 614.871.6906

5:00 PM to 8:00 AM USA Eastern Time

From first Sunday in November to second Sunday in March – 22:00 GMT to 13:00 GMT

From second Sunday in March to first Sunday in November – 21:00 GMT to 12:00 GMT

Central e-mail:

help@dynamp.com

DynAmp web:

www.dynamp.com

© 2020 DynAmp, LLC

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# REVISION PAGE

| Page | Revision | Reason For Revision | Date |
|---|---|---|---|
| All | NEW | | 04/05 |
| All | A | Updated Manual per ECR 1256 adding option information | 11/05 |
| 16 | B | Updated table 5-2. | 01/07 |
| All | C | Updated per ECO 3177 | 04/07 |
| 7, 15, 17 | D | Updated per ECO 3178 | 01/08 |
| 15, 17 | D1 | Updated per additional findings – Trip Module terminals to 7 & 8 and update dwgs 05B108865D / 83B108876C | 05/08 |
| 7, 13, 17-18, 21 | E | Update per ECR 1437 – Specifications, Delete: 90° Connector Orientation (5-2), Instructions for Customer Adjustment of Forward Trip setpoints (5-6), and delete dwg 64A044455 from list. | 03/09 |
| 3-5, 7-8 13-19, 23 all | F | ECO 3217 - Removed 3.5 and included in 3.2, Table 4.1 Specifications, Section 6 Theory of Operation, Drawing List, PAR 10245 add Handling & Storage section | 09/09 |
| 23 | G | ECR 1440 – Insert Calibration Intervals | 08/11 |
| 9 | H | ECR 1652 – Change isolation voltage | 09/11 |
| 10,11,15, 16, 18-22 | I | CAR 10150 – Revise Forward Trip Setpoint information and add table for customer use. | 7/13 |
| 10,11,15, 16, 18-22 | J | ECO-3292 eliminate BRP-PE option. | 11/13 |
| 6, 8, 19 | K | ECR 2104 – Update Power handling in specifications, updated Figure 3.2 and drawing 84B108987, added 02A109534 | 11/16 |
| 19 | L | ECR 2190 – Add drawing 02B109594- | 01/18 |
| 19, iii, vii, | M | ECO 3369 - Update drawing 83B108876 to Rev F. ECO 3347 - Update general verbiage. | 08/20 |

© 2020 DynAmp, LLC

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# TABLE OF CONTENTS



© 2020 DynAmp, LLC

# FIGURES & TABLES



© 2020 DynAmp, LLC

# 1. SAFETY

## 1.1 OVERVIEW

This equipment is mounted on current carrying busbars that are energized at hazardous electric voltages during normal operation. Ignoring the installation precautions and warnings can result in severe personal injury or equipment damage. The following are general guidelines that should be followed when installing, operating and servicing the BRP.

Busbar should be de-energized with power locked out during installation of Sensor Pair.

Qualified technicians must perform all installation, maintenance, and service of this product. Personnel performing the installation must be familiar with the warnings and instructions of this manual.

Always follow all local and plant safety procedures.

Units are not intrinsically safe. Do not place in explosive atmospheres.

The sensors and cable assembly are rated IP67. This provides total protection of persons from touching voltage-carrying conductors or internal parts and protection from access of dust. IP67 also indicates that if the Sensor Pair and cable assembly are dipped into water (0.15 to 1 meter) under defined conditions of pressure and time, water will not enter in any harmful quantity. The sensors and cable assembly are NOT to be permanently submerged or used underwater.

Use of the equipment in a manner not specified by the manufacturer can impair the protection provided.

DynAmp does not assume liability for the customer's failure to comply with the rules and requirements provided in this manual.

© 2020 DynAmp, LLC

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# 2. HANDLING AND STORAGE

DynAmp products are engineered and manufactured for use in industrial environments. However, they contain sensitive electronic and mechanical components which may be damaged and fail if not handled and stored properly. All products must be handled and stored with the same care as any precision measurement instrument. Severe bumps or jolts may damage internal parts and cause malfunction or premature failure. DynAmp products are designed and assembled with conformal coating, shock mounting, and environmental seals, when appropriate or when specified. However, this protection requires that the product must be properly installed and operational before the protection is fully functional. Therefore, adequate protection from humidity, shock, and temperature must be provided during handling and storage prior to installation.

The handling and storage of equipment must be sufficient to meet the storage temperature and humidity specifications of the product and to prevent any condensation or contact with water or any other liquid. The storage location and container or crate must provide adequate protection from precipitation (rain, snow, ice) and direct water contact. Adequate shelter must be provided to prevent the accumulation of precipitation (rain, snow, ice) and water which can lead to the deterioration or failure of shipping containers or crates and cause water ingress. Storage in coastal or industrial areas subject to salt-laden or corrosive air or areas of wind-driven sand or other abrasive dust must be adequate to prevent the deterioration or failure of shipping containers or crates and cause ingress. Frequent inspection of storage areas and storage containers or crates is required to ensure proper storage conditions are being maintained.

If the shipping container or crate is opened and/or the equipment is removed for inspection prior to installation, the equipment must be repackaged in the original undamaged container or crate in the same manner as it was shipped to prevent environmental damage or placed in a storage location that meets the required environmental and storage conditions.

General product storage temperature and humidity requirements:

Storage Temperature: -40 to 70°C

-40 to 158°F

Storage Humidity: Maximum 85%, non-condensing

DynAmp, LLC does not assume liability for the customer’s failure to comply with handling and storage requirements.

For further assistance, contact DynAmp customer support.

© 2020 DynAmp, LLC

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# 3. DESCRIPTION

## 3.1 APPLICATION

The Basic Rectifier Protection system (BRP) protects high-power DC rectifiers and their related circuitry against reverse current conditions. For most applications, one BRP Sensor Pair is used on each rectifier bus that feeds a common load.

## 3.2 SYSTEM COMPONENTS

The BRP consists of:

- One pair of open-loop Hall effect current sensors permanently wired together.
- Interconnection Cable assembly
- Hardware for mounting sensors directly on busbar


**Figure 3.1**
**Basic Sensor Pair**

The BRP provides one Status Output for reverse current. This fail-safe output indicates normal rectifier condition (reverse current not present) with a binary “1” (+24V). In the event of reverse current, the Status Output signal level changes instantaneously to a binary “0” (0V). The minimum duration of a 0V reverse trip indication is 200 milliseconds. The Status Output will change state when reverse current exceeds approximately 7.5kA. The Status Output may be directly connected to a relay coil or to the signal input of a PLC or other electronics. The Status Output is short-circuit/overcurrent protected and will source or sink up to 100mA at +24V.

The BRP requires an external, regulated +24Vdc power supply. Connection to the Input Power and Status Output are made via the Interconnection Cable assembly included with the BRP Sensor Pair.

© 2020 DynAmp, LLC

## 3.3 ENHANCED VERSION OF THE BRP

An enhanced version of the BRP is available:

BRP-L consists of:

- One pair of open-loop Hall effect current sensors permanently wired together
- Interconnection Cable assembly
- Hardware for mounting sensors directly on busbar
- Trip Module for latching reverse current alarm (latches the Status Output signal from the Sensor Pair)

## 3.4 OPTIONAL COMPONENTS

The following components may be ordered with any BRP system :

- Mechanical relay with two “Form C” contacts, rated 3 Amps @ 150Vdc
- Power supply: 85-264 Vac, 90-350Vdc input range / +24Vdc @ 1A output
- IP67 enclosure with DIN rail, cable glands and wiring for trip module, relays and power supply.

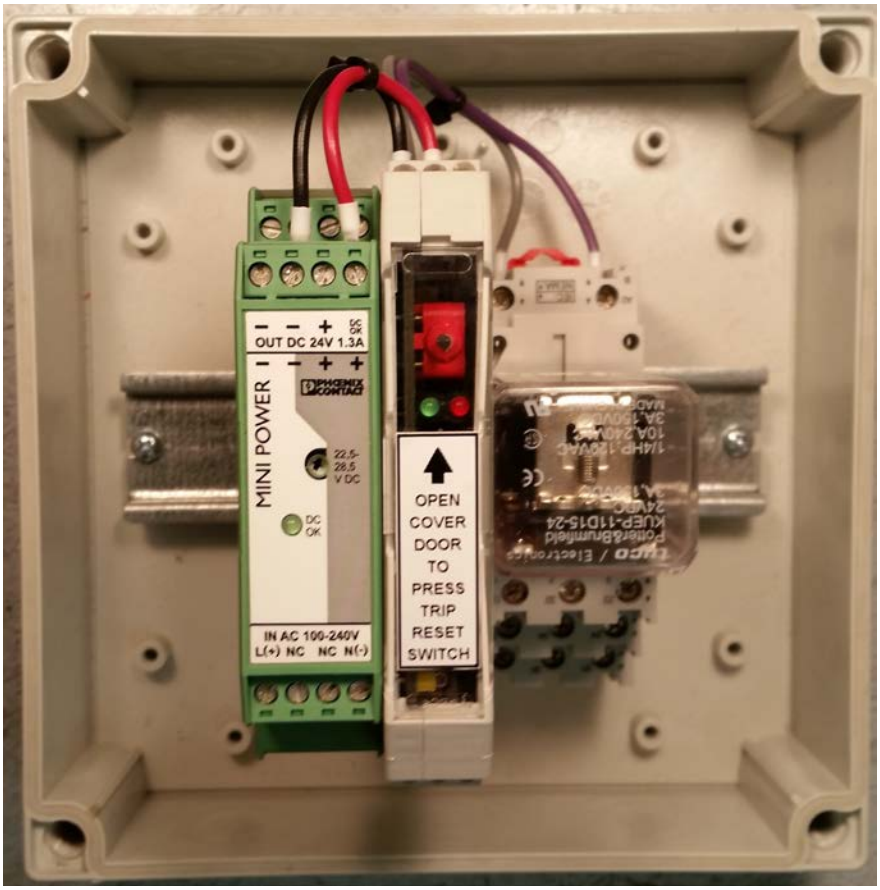


**Figure 3.2**
**IP67 Enclosure with +24V Power Supply, Trip Module & Mechanical Relay**

© 2020 DynAmp, LLC

# 4. PRODUCT SPECIFICATIONS

**Table 4.1**
**BRP Specifications**

| | |
|---|---|
| **BRP : Basic Rectifier Protection** | |
| Reverse Trip point | -7.5kA ±2.5kA |
| Response time | < 1mS |
| Signal Output | Fail-safe Logic +24VDC 100mA max. drops to 0 VDC upon reverse alarm returns to +24VDC 200mS after reverse current event ends |
| Mains Power | 22…26Vdc, 25mA, <1.0W nominal |
| Protection | *Output* : over-current, short circuit |
| | *Power Input* : reverse polarity, over-voltage, ESD |
| Isolation | 5kV bus bar to output |
| Protection Class | IP67 |
| Operating Temperature | -20º to +95ºC ( -4ºF to 203ºF) ( higher temperature operation possible via stand-off' Sensor Pair mounting) |
| Storage Temperature | -40º to +95ºC (-40ºF to 203ºF) |
| Humidity | 0-95% non-condensing (max) |
| Sensor Pair Input / Output Connection | M12 Receptacle on Master Sensor |
| Interconnection Cable Assembly | Right-angle M12 plug (one end) un-terminated (other end) 18AWG,<br>foil shield, FEP Jacket, 30m (98.4 ft) (May be cut to length during installation) |
| Sensor Size | 140mm x 82mm x 53mm x 2 sensors (5.5"H x 3.2"W x 2.1"D ) |
| Weight | 2.3kg (5 lbs) total ( Sensor Pair ) |
| Sensor Mounting | Screw mount directly to bus |
| | |
| **BRP L : Basic Rectifier Protection <u>with Latching Reverse Current Alarm Trip Module</u>** | |
| *Adds the following features and specifications to Basic Rectifier Protection Sensor Pair.<br>The list below applies to the BRP-L Trip Module electronics / enclosure.* | |
| Signal Output | LED indication and reverse alarm |
| Mains Power | 22…26Vdc, 25mA, (excluding load) <1.0W ( same as Sensor Pair ) |
| Signal Input | Interconnection Cable from Sensor Pair to screw terminals on Trip Module |
| Signal Output | Via screw terminals on Trip Module |
| Environmental | IP21 |
| Module Size | 42 x 99 x 115mm |
| Mounting | Standard DIN rail |

© 2020 DynAmp, LLC

## Table 4.1
## BRP Specifications Continued

| **OPTION SPECIFICATIONS** | |
|---|---|
| **Optional Power Relay for Reverse or Over Current Alarms** | |
| *( specially designed for reliable operation with higher power AC and DC loads )* | |
| Response time : | <1mS |
| Power handling : | 3A at up to 150VDC / 300VAC |
| Environmental : | IP21 |
| Relay Size | 44 x 44 x 77mm high including socket |
| | |
| **Optional Universal Power Supply** | |
| *( provides 24VDC to BRP if not available on-site )* | |
| Input : | 90…350 VDC and 85…264 VAC 47…440Hz |
| Output : | 24VDC |
| Environmental : | IP21 |
| Module Size | 23 x 99 x 115mm |
| | |
| **Optional IP 67 Enclosure** | |
| ( *improves IP rating of IP21 rated components )* | |
| Size | 254mm H x 175mm W x 112mm D |
| Environmental | IP67 |
| Mounting | Screw mount directly to wall or panel |

© 2020 DynAmp, LLC

# 5. INSTALLATION

The BRP Sensor Pair is mounted on current-carrying busbar(s) that may be energized at hazardous electric voltages during normal operation. DynAmp recommends that installation and maintenance of BRP sensors be performed only when associated busbar(s) are de-energized. The associated power rectifier should also be locked out during installation or maintenance. The user assumes all responsibility for implementation of adequate procedures and practices to ensure safety of installation and maintenance personnel.

## 5.1 HANDLING PRECAUTIONS

Review plant safety regulations before installation.

The BRP Sensor Pair and Interconnection Cable assembly should be inspected for shipping damage at the earliest opportunity. Visible damage must be reported to the carrier immediately. Concealed damage (not evident until the system is operated) must be reported to DynAmp, LLC immediately.

## 5.2 INSTALLATION CONSIDERATIONS

The BRP uses a pair of open-loop Hall effect sensors. One sensor is installed on each side of the busbar. Along with proprietary magnetic shielding, the two-sensor configuration helps to reduce the effect of external magnetic fields upon current sensing. While the BRP Sensor Pair is calibrated at the factory, on-site adjustment or calibration of the BRP Sensor Pair electronics is required to assure that forward trip setpoints are set properly.

- Whenever possible, the sensors should be installed on a straight section of the rectifier bus, away from sharp bends in the bus and the main bus, especially if other rectifiers are feeding the bus.
- The sensors should be mounted on, or close to the centerline of the two longer sides of a rectangular bus cross-section.
- The 90° angled connector and cable must exit downward from the master BRP sensor enclosure. This helps prevent ingress of fluids.

## 5.3 INSTALLATION OF SENSOR PAIR

Refer to drawings “Mounting Instructions BRP Sensor Pair - Horizontal Bus” and “Mounting Instructions BRP Sensor Pair - Vertical Bus” included at the end of this manual. Select the mounting location, observing the considerations given in the previous section. Be sure the arrow on each sensor enclosure points in the direction of plus to minus (conventional) current flow. The 90° angled connector and cable from the sensors must exit downward from each enclosure. Excess cable length between the master and slave sensors may be coiled and secured with cable ties. The minimum recommended bend radius for the cable is 1.6 inches [41mm].

Drill the busbar as indicated. Check hole alignment of the two sensor enclosures. Use extra care when installing the self-tapping mounting screws. The screws must be threaded into the

© 2020 DynAmp, LLC

hole at exactly 90° to the busbar, or the screw head may twist off. Extra mounting screws and washers are included with BRP in the event screws are broken, or misplaced.

Refer to drawing “Interconnection / Wiring BRP Sensor Pair” included at the end of this manual. Run the unterminated end of the Interconnection Cable to its intended destination. The Interconnection Cable may be cut to length during installation. The circuitry at the destination must include a regulated +24Vdc power supply and a relay, PLC input or other signal input.

## 5.4 TESTING THE STATUS OUTPUT

The following steps describe how to test the Status Output using a simulated reverse trip event. Refer to drawing included in back of manual “Interconnection / Wiring BRP Sensor Pair”:

1. De-energize and lockout the power rectifier.
2. Temporarily disconnect the Status Output from the power rectifier protective circuitry. Be sure to follow all local regulations for this operation.
3. Temporarily orient the Sensor Pair with reverse polarity. This may be accomplished in two ways: place the master sensor in the slave’s mounting position and vice-versa, or rotate each sensor on the bus so the arrow points in the opposite direction from conventional current flow. If each sensor is rotated it must occupy the same relative position on the busbar.
4. Energize the BRP Sensor Pair.
5. Monitor the Status Output.
6. Remove lockout from power rectifier.
7. Energize the busbar(s) and gradually increase forward current.
8. Record the kA level where the Status Output changes from +23.5V to 0V. This level should be -7.5kA ±2.5kA.

Once the Status Output has been tested and proper operation is confirmed:

1. Monitor the Status Output.
2. De-energize the busbar(s).
3. Status Output should change from 0V to 23.5V.
4. De-energize and lockout the power rectifier.
5. Mount the sensors in the orientation and position for proper polarity.
6. Connect the Status Output to power rectifier protective circuitry.
7. Remove lockout from power rectifier.

## 5.5 INSTALLING OPTIONAL SYSTEM COMPONENTS

There are several BRP options available. Refer to “Schematic BRP Systems” and “Wiring Diagram BRP System” drawings at the end of this manual. Connect the components ordered with system as shown in the Schematic and Wiring diagram.

© 2020 DynAmp, LLC

When the IP67 enclosure option is selected, access hole “knockouts” must be removed allowing cable assemblies (BRP Sensor Pair, input power, and signal output) to enter or exit the IP67 enclosure. Two cable glands are supplied with the IP67 enclosure. Use size M16 cable gland for the Sensor Pair output cable. Use M20 cable gland for input power/relay contact power connections.

**NOTE :**

If necessary, additional cable glands may be used. There are twelve knockouts on the enclosure.

Mounting feet and wing screw heads are supplied with the IP67 enclosure. The mounting feet are fixed to the back of the enclosure with screws. The enclosure may be mounted with or without the mounting feet. When the mounting feet are used, they may be rotated as needed. Refer to “Outline & Mounting: BRP IP67 Enclosure” drawing for dimensions of hole centers. The wing screw heads may or may not be used. They can be snapped in place on the cover screws. This allows the user to open the cover without tools.

© 2020 DynAmp, LLC

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# 6. THEORY OF OPERATION

## 6.1 CHARACTERISTICS OF A REVERSE TRIP EVENT

There is no existing data from an actual reverse current event in high power rectifiers. Instruments capable of measuring such an event are not installed in high power rectifiers.

In theory, the rise time of a reverse current event will vary depending on the type of rectifier circuit, the semiconductor, the frequency of the AC power, the voltage of the AC wave shape at the instant failure occurs, the number and locations of paralleled high power rectifiers, and the collectors cross section and spacing relative to the location of the failed rectifier. Due to the number of variables, it is difficult to calculate the minimum rise time of the initial reverse current. However, the following equation can be used to calculate a rough approximation of the SLOWEST rise time.

- Rise Time = Current / 1/4 cycle time

For 100kA with 50Hz AC this would equal: 100kA / 5mS or 20kA/mS.

This reverse current rise will inversely follow the AC sine wave and will therefore not be linear. Based on this, there is very little time between a reverse current rise of -5kA, -7.5kA, -10kA, etc.

DynAmp has fixed the BRP reverse trip setpoint at -7.5kA because it provides adequate reverse current protection while minimizing the possibility of false trips at lower setpoint values.

## 6.2 HOW THE SENSOR PAIR WORKS

The BRP Sensor Pair does not directly measure electrical current flow. Instead, the Sensor Pair measures magnetic flux density.

With the BRP Sensor Pair the detection of the magnetic field, density occurs at two points in space. By definition, each BRP sensor is a Gauss/ Tesla meter. The total measurement value is the average of the magnetic field density measured at both points. There is no proportionality between the average magnetic field density and the current unless the measurement integrates the continuous magnetic path around the busbar.

© 2020 DynAmp, LLC

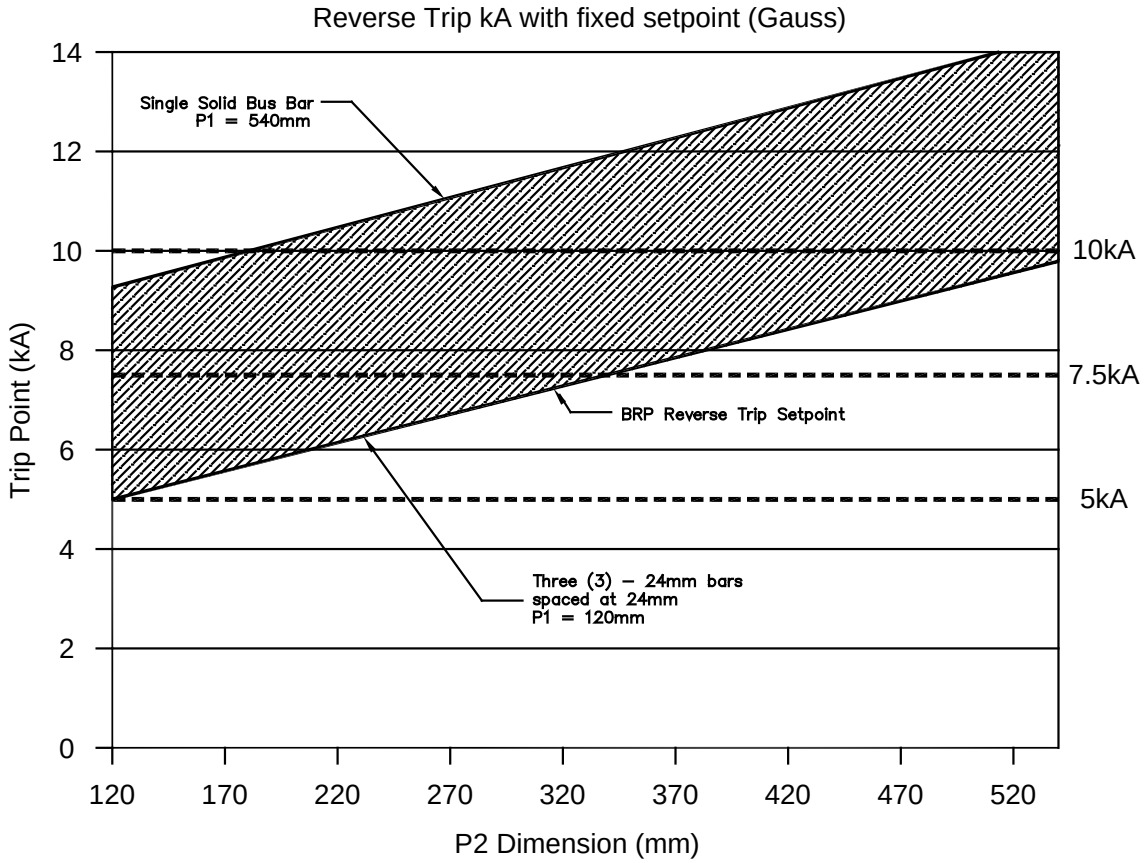


**Figure 6.2**
**Reverse Trip kA with Fixed Setpoint (Gauss)**

## 6.3 NORMAL OPERATION – BASIC SENSOR PAIR

The BRP Sensor Pair requires no maintenance. The sensors are permanently sealed. In the event that one or both of the sensors are damaged, both sensors must be replaced. When replacing sensors, make sure the replacement sensors are installed with proper polarity.

## 6.4 OUTPUT LATCHING TRIP MODULE ( OPTIONAL )

Latching Reverse Current Alarm is supplied with the BRP-L system.

## 6.5 BRP-L NORMAL OPERATION

The BRP-L consists of a Basic Sensor Pair, an Output/Power Cable Assembly (3-conductor version), and a Trip Module (Reverse Latching). All BRP systems require a regulated +24Vdc power supply. The power supply may be purchased from DynAmp, or provided by the user. The reverse trip setpoint is factory configured for a level of -7.5kA (±2.5kA). The circuit controlling the reverse trip setpoint is located inside the BRP Sensor Pair.

Once installed and connected, the BRP-L should be tested, but does not require adjustment. Testing the BRP-L is identical to testing the Basic Sensor Pair, except that the Sensor Pair

© 2020 DynAmp, LLC

output connects to the Trip Module, whose functions are described below. Read the remaining part of this section, and then refer to the “Testing the Status Output” section of this manual for functional test instructions.

Refer to drawing “Schematic BRP Systems” at the end of this manual. The BRP-L output is fail-safe; it is normally energized to high state (nominal +24Vdc). If a reverse trip event occurs, the output changes to low state (0 to +0.7Vdc). The output signal is present at terminals 14(+) and 15(-) of the Trip Module. The Trip Module output is typically connected to the control coil of a power relay or PLC input used to actuate protective circuitry in the power rectifier(s).

In addition to the output described above, the reverse current status that is monitored by the BRP-L is also indicated by status LEDs located on front of the Trip Module. The status LED and Trip Module output conditions are shown in table 6.1 below.

| Bus Current Condition | Trip Module Output | Green LED | Red LED |
|---|---|---|---|
| Normal Operation | High (+24V) | ON | OFF |
| Reverse Trip (actively occurring) | Low (0.7V) | OFF | ON |
| Normal Operation (Reverse Trip has occurred) | Low (0.7V) | ON | ON |

**Table 6.1**
**BRP-L Output and LED Status**

The latching function is associated with the reverse trip alarm only. The reverse trip output and status LEDs may be reset using the push-button reset switch on the Trip Module, or via an external normally open, momentary switch. The external reset switch is connected to Trip Module terminals 7 and 8. Actuating either reset switch will have no effect during normal operation. If a reverse current event is in progress, actuating the reset switch will momentarily change the state of the relay and LEDs. The output and LED status immediately returns to fault indication condition when released. If either reset switch is actuated when a reverse current event has occurred (but is no longer occurring), the output and LEDs will return to normal state.

© 2020 DynAmp, LLC

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# 7. SERVICE, PARTS, AND DOCUMENTATION

## 7.1 CALIBRATION INTERVALS

DynAmp does not specify required intervals of calibration for its products.

The end user of the product is responsible for identifying the appropriate interval between calibrations. The intervals should be determined based on the following factors:

- Requirements of a Quality Management System
- Accuracy and permissible limits of errors
- Purpose and usage
- Experience with similar products
- Manufacturer's recommendations
- Stability of the product
- Past history
- Other characteristics of the product

Reference: "ISO/IEC 17025:2017, General requirements for the competence of testing and calibration laboratories" and Laboratory Accreditation Bureau "Guidance for Documenting and Implementing ISO/IEC 17025:2005 and Laboratory Guidance."

As a guideline, DynAmp recommends a 24-month interval of calibration for all permanently installed products and a 12-month interval of calibration for all products used in portable applications.

© 2020 DynAmp, LLC

**This Page is Intentionally Blank**

© 2020 DynAmp, LLC

# 8. DRAWINGS

The drawings listed in table 8.1 have been included in the last part of this manual.

**Table 8.1**
**Drawing List**

| DRAWING TITLE | NUMBER | REVISION |
|---|---|---|
| Cable Assembly, BRP Sensor Pair Output / Power | 63A044325 | C |
| Block Diagram, BRP Basic Sensor Pair | 02A109534 | - |
| Outline: BRP Sensor Pair | 02A108834 | A |
| Interconnection / Wiring: BRP Sensor Pair | 02A108835 | B |
| Mounting Instructions: BRP Sensor Pair – Horizontal Busbar | 02B108815 | A |
| Mounting Instructions: BRP Sensor Pair – Vertical Busbar | 02B108841 | A |
| Outline & Mounting: BRP Mounting Channel Option | 02B109594 | - |
| Outline & Mounting: BRP IP67 Enclosure | 02B108870 | A |
| Schematic: BRP Systems | 05B108865 | E |
| Wiring Diagram: BRP System | 83B108876 | F |

© 2020 DynAmp, LLC