BM100/120
Single and Dual Level Trip Amplifiers

Lee-Dickens Ltd

GENERAL
The BM100 and BM120 are 8 to 30 Volt DC powered Trip Amplifiers. The BM100 being a single level trip amplifier and the BM120 a dual level trip amplifier.

TRIP ACTION
Trip amplifiers are supplied with relays that operate in a specified manner with regard to the analogue input signal. The terminology used, such as HIGH and LOW trip and FAIL-SAFE and NON-FAIL-SAFE operation, refer to the set-up for the relay.

HIGH TRIP and LOW TRIP refer to the section of the analogue input signal which represents the alarm condition. HIGH TRIP means that the alarm condition is above the set-point and LOW TRIP means that the alarm condition is below the set-point.

FAIL-SAFE OPERATION means that the relays are normally energised and will de-energise in the alarm condition, i.e. the relays FAIL to the alarm condition in the event of a power failure. Furthermore, if the input signal is a 4 to 20mA current loop, by default the LOW-TRIP(s) will Fail Safe on Loss of Input Signal. Alternatively, the Trip Amplifier can be ordered with an Upscale Drive on Loss of Input, whereby the HIGH-TRIP(s) with Fail Safe on Loss of Input Signal.

NON-FAIL-SAFE OPERATION means that the relays are normally de-energised and will energise in the alarm condition.

In all cases, the state of each relay is indicated by a bi-colour RED/GREEN LED, which is visible through the fascia of the instrument.

RED = ALARM Condition and GREEN = NORMAL or SAFE Condition

The instruments, unless otherwise stated on the customer order, are factory set to:

BM100 – HIGH FAIL-SAFE BM120 – HIGH-LOW-FAIL-SAFE

These trip settings can be changed by relocating soldered links on the jumper pads located on the printed circuit board (pcb) within the instrument as shown later in this document.

WARNING – MAKE SURE THAT THE POWER SUPPLY IS SWITCHED OFF BEFORE EXTRACTING THE PCB FROM THE OUTER CASING.

In order to extract the pcb from the outer casing first remove the front panel (place a small screw-driver under the top or bottom lip of the front panel and lever out). The terminal blocks are secured by two lugs, which fit into recesses in the outer casing. To remove the pcb gently ease the sides of the outer casing away from the terminal blocks and pull the terminal blocks forward.

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INSTALLATION
The BM range instruments are housed in enclosures with mouldings for mounting the instruments onto a Top Hat DIN rail. The instrument simply clips onto the rail by placing the lower edge of the moulding under the lower edge of the DIN rail and levering upwards. The instrument may be removed just as simply by placing a small screw-driver into the slot on the top of the instrument and levering downwards.

Care should be taken when wiring the instrument to apply the correct supply voltage. Further care should also be taken to ensure that any other components already located in the terminals are not damaged or misplaced.

Please note that the terminals in these enclosures should be subjected to a tightening force of no greater than 0.4Nm.

CALIBRATION
Each instrument is supplied factory calibrated and no further adjustment should be necessary. If it does become necessary to trim the calibration then please carry out the following procedure:

Refer to next page for location of Span and Zero Potentiometers.

First you will need the remove the instrument from its casing as detailed above.

1) Apply the specified power supply and inject an input signal equal to 0% of span.
2) Rotate RV3 (the Upper Setpoint Potentiometer) fully anticlockwise
3) Use RV1 (the Zero Potentiometer) to set the point where LE1 just turns Red
4) Set the input to 100% of span
5) Rotate RV3 fully clockwise
6) Use RV2 (the Span Potentiometer) to set the point where LE1 just turns Red
7) Repeat operations 1 to 6 until both points are as close as possible
8) Set the input to 50% of span
9) Check that LE1 changes to red when RV3 is at the 50% point

For BM120s only

10) Rotate RV4 (the Lower Setpoint Potentiometer) fully anticlockwise
11) Check that LE2 changes to Red at an input signal of 0% of input span ±1%
12) Rotate RV4 fully clockwise
13) Check that LE2 changes to Red at an input signal of 100% of input span ±1%
14) Set the input to 50% of the input span
15) Check that LE2 changes to Red when RV4 is at the 50% point.

Having reset the potentiometers, we recommend that the pots are sealed using liquid paper.

Finally replace the instrument in its casing and re-insert the fascia window.

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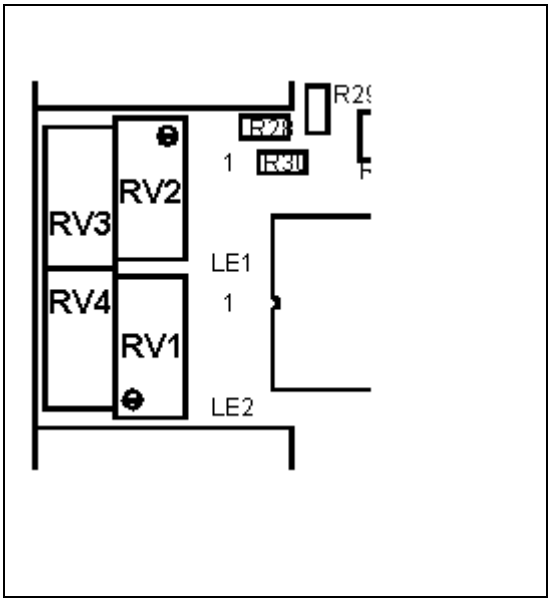
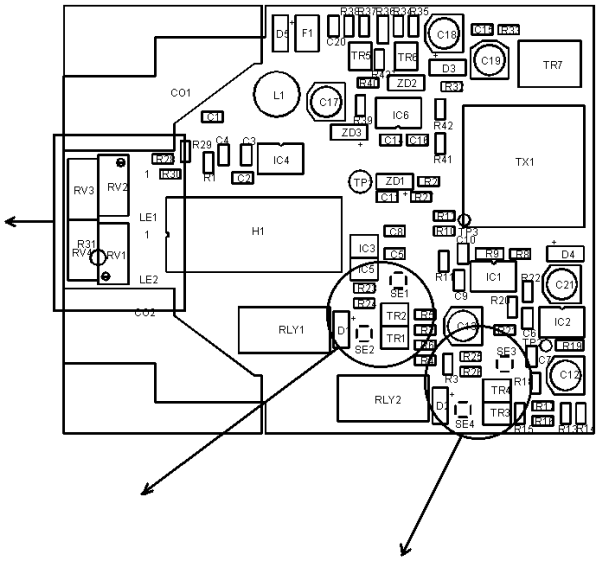
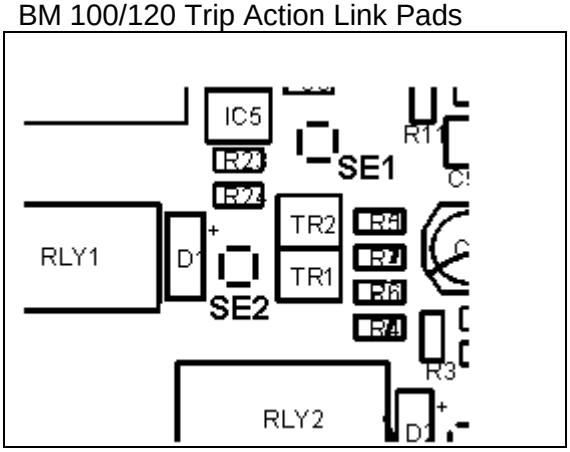
Position of LEDs and Potentiometers RV3 and RV4

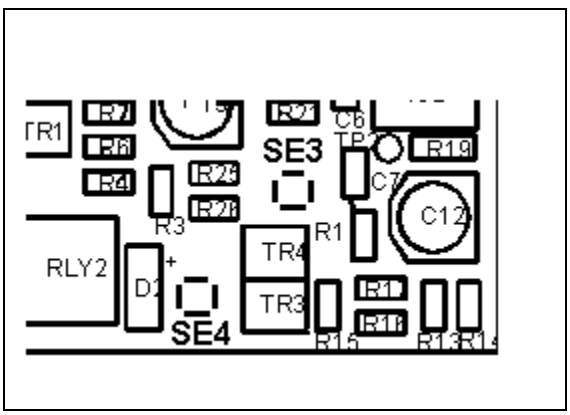


BM120 Component Side Layout
(BM100 is a sub-set of the BM120)



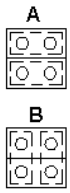
BM 100/120 Trip Action Link Pads





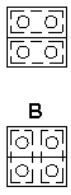
BM100 Trip Links

Type	SE1	SE2
HFS	B	B
LFS	A	A
HNF	B	A
LNF	A	B



BM120 Trip Links

Type	SE1	SE2	SE3	SE4
HHFS	B	B	B	B
HLFS	B	B	A	A
LLFS	A	A	A	A
HHNF	B	A	B	A
HLNF	B	A	A	B
LLNF	A	B	A	B



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Installation and Calibration
Issue 3.0 September 2017

SPECIFICATIONS
Please note that the following are typical standard ranges.

INPUTS:
D C Current
Standard Ranges
0 to 10mA into 100 ohms
4 to 20mA into 62 ohms
Optional Ranges
0 to 1mA into 100 ohms
0 to 10mA into 10 ohms
4 to 20mA into 10 ohms
Drive on Loss of Input:
Default – Downscale
Option - Upscale
Other current inputs as required:
Minimum current 10µA
Maximum current 100mA

D C Voltage
Between -250 to +250 Volt DC
Minimum voltage span 5mV
Maximum voltage span 500V
Input Impedance
1M ohms or greater

AC Current
0 to 1 Amp

AC Voltage
0 to 250 Volt maximum

Resistance (2 wire)
Between 0 and 20K ohms
Minimum span 5 ohms
Maximum span 20K ohms

Potentiometers (3 wire)
Between 0 and 10K ohms
Minimum span 10 ohms
Maximum span 10K ohms

Resistance Thermometers
2 or 3 wire, 100 or 130 ohms at 0°C
Measurable Range: -200 to +800°C
Calibrated Temperature span:
Minimum 10°C Maximum 600°C
Input is linearised

Thermocouples
Type B, E, J, K, N, R, S & T
Temperatures covered:

Type	Range	Min Temp Change
B	600 to 1800°C	400°C
E	-260 to 1000°C	65°C
J	-200 to 1200°C	80°C
K	-260 to 1370°C	100°C
N	0 to 1300°C	150°C
R	50 to 1760°C	400°C
S	80 to 1760°C	400°C
T	-260 to 400°C	100°C

Automatic cold junction compensation
O/C thermocouple monitoring upscale or downscale drive

OUTPUTS:

Relay - Contacts
BM100 - One SPCO contact with the option of a second relay to make the output into DPCO

BM120 - One SPCO relay contact per level

Contact Ratings
Maximum current 2A
Maximum voltage 220V dc/250V ac
Maximum load 60W 62.5VA

Switching Differential
0.5% of span approx

Switching Mode
Relay energises or de-energises on rising or falling signal as required

Set Point
270° screw driver operated potentiometer through front panel

Relay State Indication
Bi-colour red/green LED
Green = Stable State
Red = Alarm State

SUPPLY:

Power Supplies
8 to 30 Volt DC

Power Required
1.5W Maximum

GENERAL:

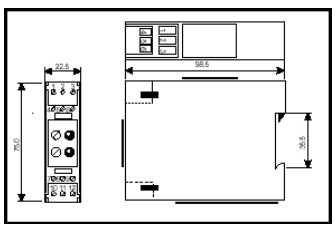
Temperature Coefficient
±0.1% of span/Δ10°C
(for inputs > 100mV)
+ Cold junction error, for thermocouple inputs

Operating/Storage Temperature Range
0 to +45°C / -20 to +60°C

Operating/Storage Humidity Range
0 to 95% RH non-condensing

Weights
BM100 139 gms
BM120 145 gms

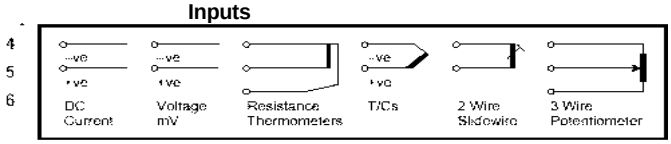
MECHANICAL DETAILS



TERMINAL DETAILS

Terminal
1 Power Supply -ve
2 Power Supply +ve
3 Power Supply Earth

Inputs



Terminal
7 Relay N/O
8 Common — Higher Trip and BM100
9 Relay N/C
10 Relay N/O
11 Common — Lower Trip for BM120 or DPCO relay for BM100
12 Relay N/C

ORDERING DETAILS
a) Give identification code, i.e. BM120
b) Give power supply voltage, i.e. 24 Volt DC
c) Give details of input signal, i.e. Chromel/Alumel thermocouple, span 0 to 250°C. (If thermocouple input please specify upscale or downscale burnout drive)
d) Give details of trip action required, i.e.

For BM100
- HNF = High Non Fail Safe - LFS = Low Fail Safe
- HFS = High Fail Safe - LNF = Low Non Fail Safe

For BM120
- HHNF = High High Non Fail Safe - LLFS = Low Low Fail Safe
- HLNF = High Low Non Fail Safe - HLFS = High Low Fail Safe
- HHFS = High High Fail Safe - LLNF = Low Low Non Fail Safe

H = High Trip = Alarm condition above the set point
L = Low Trip = Alarm condition below the set point
FS = Fail Safe = Relay normally energised to de-energise in the alarm condition
NF = Non Fail Safe = Relay normally de-energised to energise in the alarm condition

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