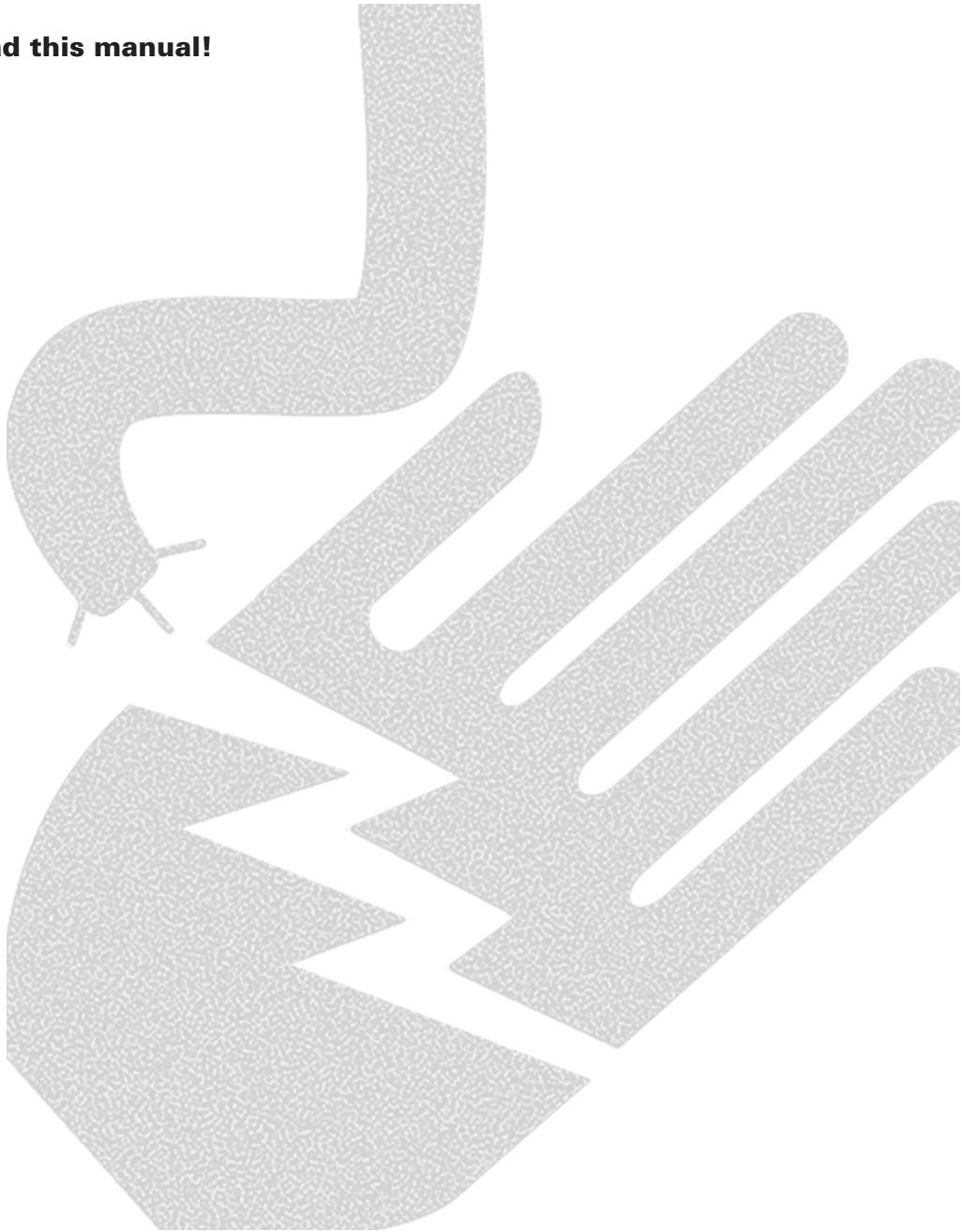
Information Manual **1C96944H02**

Effective April 2014
Supersedes March 2011

Panelboard and switchboards series rating information manual

Play it safe...read this manual!



Powering Business Worldwide

meet this standard. Series rated systems have be
effective method of meeting these requirements.

There are three protection systems used to protec
age power distribution conductors and equipmen

- Fully rated protection
- Fully rated, selectively coordinated protection
- Series rated protection

Fully Rated Protection: Where all overcurrent dev
rated for the full prospective short-circuit current a
side terminals throughout the system.

Selectively Coordinated Protection: Is a fully rate
where the overcurrent device closest to the fault w
first, thus isolating the faulty circuit.

Series Rated Protection: A short-circuit interrupti
assigned to a combination of two or more overcu
protective devices that are connected in series and
rating of the downstream device(s) in the combin
less than the series rating.

The short-circuit interrupting rating of the first de
series must be equal to or greater than the availa
current. Downstream breakers, however, are not t
for the system's available fault current.

Series ratings are also known in the industry as in
ratings, series combination ratings, and series co
ratings. The upstream overcurrent device in the s
be either internally or externally feeding downstre
devices.

are responsible for their own testing, labeling, and listing. Therefore, the *UL Recognized Components Directory* can not be used to interpret series-connected ratings in equipment.

Code Issues

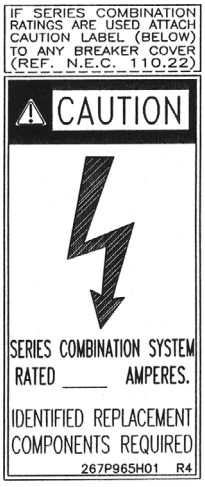
Requirements of NFPA 70—the National Electrical Code for series ratings may be met by equipment marked with ratings adequate for the available fault current at the point of application in the electrical system. Eaton's panelboards and switchboards are marked consistent with NEC Article 240.86 for tested combinations.

NEC 240.86 Motor Contribution. Series ratings shall not be used where:

1. Motors are connected on the load side of the higher-rated overcurrent device and on the line side of the lower-rated device.
2. The sum of the full-load currents exceeds 1% of the interrupting rating of the lower-rated breaker.

Note: NEC 240.86 is additive and both conditions must be met to apply.

Additionally, NEC Article 110.22 requires field marking on equipment where series ratings are used. This label is supplied with Eaton panelboards and switchboards using series combination ratings and reads "Caution—Series Combination System Rated _____ Amperes Available. Identified Replacement Component Required."



Note to Installing Electrician: NEC 110.22 requires the installer to properly apply and complete this label. Label(s) must be placed on all equipment where series ratings are used.

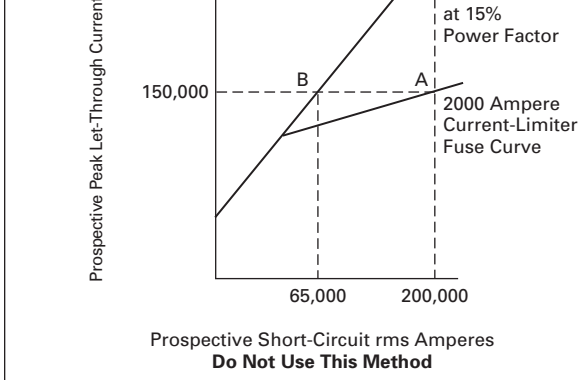


Figure 1.

Conclusion: This conclusion is wrong when the downs service has a blow-open contact assembly, as does a molded-case circuit breaker or similar device. It may b valid when the current-limiting fuse is sized to protect passive bus bar system.

The up-over-down method ignores dynamic impedanc (the inherent current-limiting of the downstream mold case circuit breaker). Such impedance is developed di by the forces of the let-through current created when t contacts are blown open.

Some breakers rated 15 to 50 amperes, 120/240 volt maximum have been investigated and found suitable use in panelboards from a different manufacturer. The identified as "Classified" breakers. DO NOT USE SERI RATINGS WITH "CLASSIFIED" BREAKERS! Series rati apply ONLY to those Eaton breakers listed and publish this booklet.

DANGER: Use of other devices can cause explosion, severe injury, or death!

in bold/shaded areas. Respective branch breakers are shown directly below their associated main device. **If a rating is not initially found in a column, first look to the columns to the right for higher "Series Equipment Ratings" within the same table. If still not found, use ratings from table of a higher system voltage (higher numbered table).**

Example 1:

208Y/120 volt, 3-phase, 4-wire, AC system with available fault current of 26,438 amperes. Main (upstream) device is a 3-pole, 225 ampere, EDS breaker. The branch (downstream) breakers are single- and 2-pole, 20, 30, and 60 amperes, 120 volt and 120/240 volt BAB breakers.

1. Go to the 120/240 volts table (**Table 1**).
2. Look down under the 22 kA column. This rating is not shown.
3. Look to the columns to the right. This combination rating is shown under the 42 kA column, and therefore is valid.

Example 2:

480Y/277 volt, 3-phase, 4-wire, AC system with available fault current of 62,097 amperes. Main (upstream) device is a 3-pole 250 ampere, HJD breaker. The branch (downstream) breakers are 2- and 3-pole, 60, 70, and 100 ampere EHD breakers.

1. Go to the 480Y/277 volts table (**Table 4**).
2. Look down under the 65 kA column. This rating is not shown.
3. Look to the columns to the right. This rating is not shown.
4. Look at the table with the next higher system voltage. (480 volts, **Table 5**).
5. This combination rating is shown under the 65 kA column, and therefore is valid.

3. Go to the 277 volts table (**Table 3**).
4. Look under the 25 kA column. This rating is n Look to the columns to the right. This rating i under the 35 kA column, and therefore is vali for combinations with the single-pole GHQ br

Other Applications of Series Ratings

Series ratings can also be applied under the follow guidelines:

- Any FULLY RATED breaker can be applied upst downstream, or in the middle of any of the seri stated in the tables
- Any series rating stated in the tables may have series rated branch breakers of the EXACT SAM further downstream in that rating

COMBINING SERIES RATINGS are allowed under conditions. Main and branch ratings may be comb

- Breakers A, B, and C are in series respectively f main to branch. Breakers A and B series rate to Breakers A and C series rate at the same interru (or higher). It is allowable to use A, B, and C tog the A-B series rating

It is improper to combine series ratings under the condition:

- Breakers A, B, and C are in series respectively f to branch. Breakers A and B series rate togethe B and C series rate at the Breaker B interrupting level. It is not allowable to use A, B, and C toge A-B series rating. However, combining multiple rent devices as in this example, can be accomp all devices in the series combination have been together and listed in triple rating **Table 13**

Note: The information contained in this manual also app specifying the upstream overcurrent protective device fo through-feed and sub-feed panelboards without an integ

	QBAF QBAG	QBAF QBAG		QPGF QBAF QBAG QBHW QPHW			QPGF QBAF QBAG QBHW QPHW EHD FD			QPGF QBAF QBAG QBHW QPHW GB, GHB GHQ EHD FD HFD	
125							**EGH** GHQ, GHB				
150	**FDB** BA, BAB HQP QBGF QBAF QBAG										
200							**LA-P** BA, BAB HQP QBHW QPHW EHD FD				
225		**EDB** BA, BAB BABRP BABRSP HQP QBGF QPGF QBHGF QPHGF QBHW QPHW QBAF QBAG	**EDS** BA, BAB BABRP BABRSP HQP QBGF QPGF QBHGF QPHGF QBHW QPHW QBAF QBAG	**ED, FD, FDE** BA, BAB BABRP BABRSP HQP QBGF QPGF QBAF QBAG QBHW QBHGF			**EDH, CHH** BA, BAB BABRP BABRSP HQP QBGF QPGF QBAF QBAG	**HFD, HFDE** BA, BAB HQP QBGF QBAF QBAG QBHW QPHW QBHGF GB, GHB GHQ, GHQRSP EHD FD, EGS	**FDC** BA, BAB HQP QBHW QPHW		

		KDB BA, BAB BABRP BABRSP HQP QBGF QPGF QBAF QBAG	**KDB, CKD** BA (15–70A) BAB (15–70A) BABRP BABRSP HQP (15–70A) QBHW QPHW	BA (15–70A) BAB (15–70A) BABRP BABRSP HQP (15–70A) QBHW QPHW	**KDB** **CKD** EHD	BA (15–70A) BAB (15–70A) HQP (15–70A)	**CHKD** GB, GHB EHD FD EGS ①	QBHW QPHW		GB, GH EHD FD HFD EGS EGH
600							**CHLD, HLD** EHD			
800							**HMDL** EHD			
1200							**HND, CHND** **NGH, NGH-C** EHD ②			

① Not valid with CHKD.
② Valid for single-pole only.

									FD, FDE FDB HFD, HFDE
125						**EGH** GHB			
150	**FDB** BAB_H HQP_H								
200						**LA-P** BAB_H HQP_H QBHW_H QPHW_H EHD FDB FD JD, JDB			
225		**EDB** HQP_H BAB_H QBHW QPHW	**EDS** HQP_H BAB_H QBHW QPHW **CHH** ① BAB_H	**ED** BAB_H HQP_H QBHW_H	**FD, FDE** BAB_H HQP_H QBHW_H QPHW_H EHD (15–70A) FDB	**EDH, EDC** BAB_H HQP_H	**HFD, HFDE** BAB_H HQP_H QBHW_H QPHW_H GB, GHB EHD FDB FD, FDE	**FDC** BAB_H HQP_H QBHW_H QPHW_H	**FDC** GB, GHB EHD FDB FD, FDE HFD, HFDE
250				**JD, JDB** BAB_H (15–70A) HQP_H (15–70A) QBHW_H QPHW_H EHD FDB	**HJD** BAB_H (15–70A) HQP_H (15–70A) QBHW_H QPHW_H	**HJD** GB, GHB EHD FD FDB ED JD, JDB EGS	**JDC** BAB_H HQP_H QBHW_H QPHW_H		**JDC** GB, GHB EHD FD, FDE FDB HFD, EDB, ED, HFDE EDH JD, JDB HJD, EGS,

① Valid with BAB_H only.

	FDB	ED JD, JDB DK, KD, KDB EGS ②		EDH JD, JDB HJD DK, KD, KDB HKD	FDB FD, HFD, EI ED, FDE, HI EDH JD, JDB HJD DK, KD, KD HKD
500		**NB-P** JD, JDB KD, KDB, DK CKD			
600		**HLD, HLDB, CHLD** GB ①, GHB ① FD, EDB, EDS ED, EHD JD, JDB KD, KDB, DK, CKD LD, LDB		**LDC** EDB, EDS, ED EDH	
800		**NB-P** KD, KDB, DK	**HMDL** EHD FD		
1200		**HND, CHND** EDB, EDS, ED EHD			**NDC** EDB, EDS, EDH
2500		**RD** EDB, EDS, ED			**RDC** EDB, EDS, EDH

① Valid on 2- and 3-pole breakers only. Not valid for single-pole.
② Not valid with CHKD.

125			**EGS** GHQ GHB	**EGH** GHQ GHB			
225			**FD, FDE** GHB GHQ GHQRSP GHBGFEP ①	**HFD, HFDE** GHB, GHQRSP GHQ EHD FD, GHBGFEP ②	**FDC** GHB EHD FD HFD		
250	**JD, JDB** GHB		**JD, JDB** GHB (15–50A) GHBGFEP	**HJD** GHB (15–50A) EHD FD GHBGFEP	**LCL** GHBS	**JDC** GHB EHD FD HFD	
400	**KD, KDB CKD** GHB	**HKD CHKD** GHB	**KD, KDB CKD** GHB (15–50A) EHD FD	**HKD, CHKD** GHB EHD FD	**KDC** GHB EHD FD HFD		**LCL** GHB EHD FD HFD

① Not valid with FDE.
② Not valid with HFDE.

Table 4. 480Y/277 Volts AC—Breaker/Breaker Series Ratings

Main devices shown in shaded area, centered at top. Respective branch devices shown directly below.
All ratings in this table apply to 2- and 3-pole branch breakers only. For single-pole branch breakers, see **Table 3**.

Main Breaker Maximum Amperes	**Series Equipment Rating—kA Symmetrical**					
	22	**25**	**35**	**65**	**100**	**150**
100						**FCL** GHB, GHQRS
125			**EGS** GHB	**EGH** GHB		
225			**FD, FDE** GHB, GHQRSP	**HFD, HFDE** GHB, GHQRSP	**FDC** GHB	
250	**JD, JDB** GHB		**JD, JDB** GHB (15–50A)	**HJD** GHB	**JDC** GHB	
400	**KD, KDB CKD** GHB	**HKD, CHKD** GHB	**KD, KDB CKD** GHB (15–50A)	**HKD, CHKD** GHB (15–50A)	**KDC** GHB	**LCL** GHB

				EHD FDB FD HFD JD, JDB HJD		
225		**FD, FDE** EHD FDB	**HFD, HFDE** EHD FDB FD, FDE EGS ①	**FDC** EHD, EGS, EGH FDB FD, FDE HFD, HFDE		
250	**JD, JDB** EHD FDB		**HJD** EHD FDB FD, FDE JD, JDB EGS	**JDC** EHD, EGS, EGH FDB FD, FDE HFD, HFDE JD, JDB HJD		FDE, HF
400		**KD, KDB** EHD FDB	**HKD** EHD FDB FD, FDE JD, JDB KD, KDB EGS	**KDC** EHD, EGS, EGH FDB FD, FDE HFD, HFDE JD, JDB HJD KD, KDB HKD	**LA-P** JD, JDB HJD KD, KDB HKD	EHD FDB FD, FDE HFD, HI FDC JD, JDE HJD KD, KDI HKD
500				**NB-P** JD, JDB HJD KD, KDB HKD		
600		**LD, LDB CLD** JD, JDB	**HLD, HLDB CHLD** FD, FDE JD, JDB KD, KDB LD, LDB			

① Not valid with HFDE.

		FD JD, JDB	FD HFD JD, JDB HJD			
400		**KD, KDB CKD** FDB FD JD, JDB	**HKD, CHKD** FDB FD, FDE HFD, HFDE JD, JDB HJD	**KDC** FDB FD, FDE HFD, HFDE	**KDC** JD, JDB HJD KD, KDB HKD	**LCL** FDB FD, FDE HFD, HFDE FDC JD, JDB HJD JDC KD, KDB HKD KDC
600		**LD, LDB CLD** FD JD, JDB	**HLD, HLDB CHLD** KD, KDB LD, LDB			

Table 7. 120/240 Volts AC—Fuse/Breaker Series Ratings

Main fuse class shown in shaded area, centered at top. Respective branch devices shown directly below.

Main Fuse Maximum Amperes	**Series Equipment Rating—kA Symmetrical**					
	100			**200**		
100						**R** BA, BAB HQP QBHW QPHW GB GHB
200			**R** GB GHB	**J** BA, BAB HQP QBHW QPHW	**T** BA, BAB HQP QBHW QPHW	
400	**J** BA, BAB HQP QBHW QPHW	**T** BA, BAB HQP QBHW QPHW		**J** GB GHB	**T** GB GHB	

200			**R** GB GHB	**J** BAB_H HQP_H QBHW_H QPHW_H	**T** BAB_H HQP_H QBHW_H QPHW_H	GB GHB
400	**J** BAB_H HQP_H QBHW_H QPHW_H	**T** BAB_H HQP_H QBHW_H QPHW_H		**J** GB GHB	**T** GB GHB	
4000			**L** EHD FDB FD, FDE ED JD, JDB DK, KD, KDB			

Table 9. 277 Volts AC Fuse/Breaker Series Ratings

Main fuse class shown in shaded area, centered at top. Respective branch devices shown directly below.
All ratings in this table apply to single-pole branch breakers only. For 2- and 3-pole branch breakers, consult other

Main Fuse Maximum Amperes	**Series Equipment Rating—kA Symmetrical**						
	65		**100**			**200**	
100			**J** GHBS GHQ GHQRSP	**T** GHBS GHQ GHQRSP		**R** GHB	
200	**J** GHBS GHQ GHQRSP	**T** GHBS GHQ GHQRSP	**J** EHD FD HFD	**T** EHD FD HFD	**R** GHB		
400						**J** GHB	GHB

400					J GHB	T GHB	
600			J EHD FD, FDE HFD, HFDE FDC	T GHB EHD FD, FDE HFD, HFDE FDC JD HJD JDC			

Table 11. 480 Volts AC—Fuse/Breaker Series Ratings

Main fuse class shown in shaded area, centered at top. Respective branch devices shown directly below. All ratings in this table apply to 2- and 3-pole branch breakers only. Not valid for single-pole branch breakers.

Main Fuse Maximum Amperes	Series Equipment Rating—kA Symmetrical	
	100	200

100			R EHD			
200	J EHD FD HFD FDC	T EHD FD HFD FDC				

200	J FD, FDE HFD, HFDE FDC	T FD, FDE HFD, HFDE FDC	R JD HJD JDC			
400	J JD HJD JDC	T JD HJD JDC	R KD HKD KDC			
600				J KD HKD KDC	T KD HKD KDC	

Table 13. Triple Series Ratings

Main Fuse Class and Maximum Amperes	Tenant Main Type	Branch Type	System Voltage	Sho Circ Seri Rati (kA,
L-6000	DK, KD, KDB	GB, GHB, EHD ①	240	100
L-6000	DK, KD, KDB	GB, GHB	120/240	100
L-6000	DK, KD, KDB	FD ①, FDB	240	100
L-6000	DK, KD, KDB	JD, JDB	240	100
L-6000	JD, JDB	GB, GHB	240	100
L-6000	JD, JDB	GB, GHB	120/240	100
L-6000	FD	GB, GHB	240	100
L-6000	FD	GB, GHB	120/240	100
L-6000	FD, FDB	BAB_H, HQP_H QBHW_H, QPHW_H	240	100
L-6000	FD, FDB	BA, BAB HQP (15–70A)	120/240	100
L-6000	EHD	BAB_H, HQP_H	240	100
L-6000	EHD	BA, BAB, HQP	120/240	100

① Valid on 2- and 3-pole breakers only. Not valid for single-pole.

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