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Selective Coordination Breaker Application Chart

For Molded Case Circuit Breakers fed by Distribution Transformers

Application Note

New Information
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What is it?

Selective Coordination, as described in the 2005 National Electric Code® (NEC®) Article 100, states "Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the choice of overcurrent protective devices and their ratings or settings." Essentially in a selectively coordinated system **only** the breaker directly supplying the overloaded/faulted part of the system will open, thus allowing the rest of the system to operate. Selective coordination is required by NEC Article 620.62 for Elevators, Article 700.27 for Emergency system(s) and Article 701.18 for Legally required standby system(s) and by default Article 517.26 Application of Other Articles that did not change, thus, selective coordination is also required for essential electrical systems in health care facilities. When designing for selective coordination in these systems, if a three-phase dry type distribution transformer is utilized to step down the primary voltage to secondary voltage of 208Y/120 volt level, the following chart can be utilized to insure selective coordination.

Who benefits and why?

Designing a selectively coordinated system requires knowledge about the application, product standards, installation codes and the time current curves of the breakers being used. Testing must be completed and certified in order to identify a panel as selectively coordinated. The following chart is designed to assist application and design engineers in creating a system that meets 2005 NEC requirements for selective coordination.

How will this chart help in designing a selectively coordinated system?

Achieving selective coordination is straightforward when using the following selection table. Follow these steps to ensure that selective coordination is in place:

Step 1: Determine the load requirements on the secondary side of the dry type transformer.

Step 2: Select the required KVA rating and insure that the selected transformer has impedance greater than or equal to that shown in the chart.[1]

Step 3: Select the Cutler-Hammer recommended secondary **main** circuit breaker. Frame size, trip unit, and recommended settings are shown based on 125% of full load current (FLA) per NEC code.

Step 4: Select the **branch** circuit breaker, based on required amperage. Those branch circuit breakers listed in the rows corresponding to the main breaker will provide selective coordination with the chosen secondary main circuit breaker. Selective coordination is based on utilizing selected breakers with appropriate adjustable trip settings.

Note: For some transformer kVA ratings, different types of Cutler-Hammer secondary Main Breakers are shown. The most cost effective secondary main breaker is shown first. Some larger secondary main breaker frame sizes are also shown for the same kVA rating for those applications requiring a wider range of branch breakers. In addition where applicable the existing Series C frame and the new physically smaller Series G frame breakers are shown.

[1] Typical Cutler-Hammer transformer impedance data can be found in the Consulting Applications Guide (CAG) for General Purpose Transformers, TP-1 & K-Factor transformers. **For Harmonic Mitigating and specialty transformers refer to Eaton Corp**.

Example: Required kVA to serve the 208Y/120 volt load is 112.5 kVA and the largest branch breaker that will be required is 250 amperes. The least expensive recommended secondary main circuit breaker is the 400Ampere KD frame with a 400A/Trip setting. If a 100% rated secondary main breaker was desired, then a CKD would be selected. If a 400 ampere branch breaker was required, then either the series C type LD or the Series G type LG breaker could be selected with a 600 ampere trip unit set at 400 amperes.

Table 1.1 PowR-Line 1A, 3A, 4B Panelboard Selective Coordination
(Secondary Side of Distribution Transformers) @ 208Y / 120 Volt

Transformer					Secondary Main MCCB				Branch Breaker		
KVA	Secondary Voltage	Secondary Full Load Current (FLA)	Transformer % Z (Min.) Note: (3)	Let-through AIC (RMS)	MCCB Type / Frame	Trip Unit	125% FLA	MCCB Trip Rating (NEC 450.3(B))	Branch Type that would be Selective [IT-Interchangeable Trip, NIT-Non Interchangeable Trip]	Max. Frame Rating	Max Trip Rating
15	208Y/120	42	≥3.8	1096	Series C [FDB or FD-600V] (225A Frame)	Thermal / Magnetic (1)	52	60A	BAB	100A	≤60A
30	208Y/120	83	≥7.5	1110	Series C JD (250A Frame)	Thermal / Magnetic (1)	104	125A	BAB	100A	<60A
									[FDB (NIT) & FD (IT) - 600V]	225A	<100A
30	208Y/120	83	≥3.7	2251	Series C KD-80% CKD-100% (400A Frame)	Electronic (KES Digitrip RMS 310) (2)	104	125A	BAB	100A	<60A
									[FDB (NIT) & FD (IT) - 600V]	225A	<100A
45	208Y/120	125	≥5.55	2251	Series C KD-80% CKD-100% (400A Frame)	Electronic (KES Digitrip RMS 310) (2)	156	250A T.U. Set @ 175A	BAB	100A	<60A
									[FDB (NIT) & FD (IT) - 600V]	225A	<100A
75	208Y/120	208	≥6.15	3385	Series C KD-80% CKD-100% (400A Frame)	Electronic (KES Digitrip RMS 310) (2)	260	400A T.U. Set @ 300A	BAB	100A	≤100A
									ED-240V, [FDB (NIT) & FD (IT) - 600V]	225A	≤225A
									Series C JD	250A	<250A
112.5	208Y/120	312	≥9.2	3394	Series C KD-80% CKD-100% (400A Frame)	Electronic (KES Digitrip RMS 310) (2)	390	400A T.U. Set @ 400A	BAB	100A	≤100A
									ED-240V, [FDB (NIT) & FD (IT) - 600V]	225A	≤225A
									Series C JD	250A	≤250A
112.5	208Y/120	312	≥3.15	9913	Series C LD -80% CLD-100% (600A Frame)	Electronic (LES Digitrip RMS 310) (2)	390	600A T.U. Set @ 400A	ED-240V, [FDB (NIT) & FD (IT) - 600V]	225A	≤225A
									Series C JD	250A	≤250A
					Series G LG-80%	Electronic (LT trip unit)			Series C DK, KD-80% CKD-100%	400A	<400A

(Table 1.1 continued)

150	208Y/120	416	≥4.2	9913	Series C LD -80% CLD-100% (600A Frame) Series G LG-80%	Electronic (LES Digitrip RMS 310) (2) Electronic (LT trip unit)	520	600A T.U. Set @ 600A	ED-240V, [FDB (NIT) & FD (IT) - 600V]	225A	≤225A
									Series C JD	250A	≤250A
									Series C DK, KD-80% CKD-100%	400A	<400A
150	208Y/120	416	≥2.4	17348	Series C ND-80% CND-100% Series G NGS-80% (1200A Frame)	Electronic (Digitrip RMS 310) (2)	520	1200A T.U. Set @ 600A	ED-240V, [FDB (NIT) & FD (IT) - 600V]	225A	≤225A
									Series C JD	250A	≤250A
									Series C DK, KD-80% CKD-100%	400A	≤400A
									Series C LD-80% CLD-100%	600A	≤600A
									Series G L630E-80%	600A	≤600A
225	208Y/120	625	≥3.5	17844	Series C ND-80% CND-100% Series G NGS-80% (1200A Frame)	Electronic (Digitrip RMS 310) (2)	781	1200A T.U. Set @ 800A	ED-240V, [FDB (NIT) & FD (IT) - 600V]	225A	≤225A
									Series C JD	250A	≤250A
									Series C DK, KD-80% CKD-100%	400A	≤400A
									Series C LD-80% CLD-100%	600A	≤600A
									Series G L630E-80%	600A	≤600A
300	208Y/120	833	>4.7	17717	Series C ND-80% CND-100% Series G NGS-80% (1200A Frame)	Electronic (Digitrip RMS 310) (2)	1041	1200A T.U. Set @ 1200A	ED-240V, [FDB (NIT) & FD (IT) - 600V]	225A	≤225A
									Series C JD	250A	≤250A
									Series C DK, KD-80% CKD-100%	400A	≤400A
									Series C LD-80% CLD-100%	600A	≤600A
									Series G L630E-80%	600A	≤600A

(Table 1.1 continued)

500	208Y/120	1388	≥6.3	22030	Series C RD-80% CRD-100% Series G RGU-80%	Electronic (Digitrip RMS 310) (2)	1735	2000A T.U. Set @ 2000A	QPHW, QBHW	100A	≤100A
500	208Y/120	1388	≥1.3	106759	Series C RD-80% CRD-100% Series G RGU-80%	Electronic (Digitrip RMS 310) (2)	1735	2000A T.U. Set @ 2000A	EDC-240V FDC-600V (2 & 3 Pole only)	225A	≤225A
500	208Y/120	1388	≥2.4	57828	Series C RD-80% CRD-100% Series G RGU-80%	Electronic (Digitrip RMS 310) (2)	1735	2000A T.U. Set @ 2000A	JD	250A	≤250A
									DK, KD-80%	400A	≤250A
									Series C LD-80% CLD-100%	600A	≤600A
									Series G L630E-80%	600A	≤600A

Notes: (1) Magnetic trip set to 10x
(2) Digitrip OPTIM 550 electronic trip unit available
(3) Typical Cutler-Hammer transformer impedance data can be found in the Consulting Applications Guide (CAG) for General Purpose Transformers, TP-1 & K-Factor transformers. For Harmonic Mitigating and specialty transformers refer to Eaton Corp.

IMPORTANT: Additional testing at 480Y/277 Vac and using other branch circuit breakers is in progress. Please contact Eaton Corporation for results.

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