Cutler-Hammer
Westinghouse &
Cutler-Hammer Products
Five Parkway Center
Pittsburgh, Pennsylvania, U.S.A. 15220

October 2006
Mailed to: E/29-100A

Time/Current Characteristic Curves for Westinghouse Series C® N-Frame Circuit Breakers with Type NES Digitrip RMS 310 Trip Units

Westinghouse AB DE-ION® Circuit Breakers

Breaker Description	Curve No.	Page
Series C Types ND, CND, HND, CHND, NDC, CNDC Circuit Breakers Equipped With Type NES Digitrip RMS 310 Trip Units With		
I^2t Ramp Short Time Delay (Phase Protection)	SC-5375-92A	2
Adjustable Short Time Delay (Phase Protection)	SC-5376-92A	3
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Series C Types ND, HND and NDC Circuit Breakers Equipped With Digitrip OPTIM Trip Units		
Long Delay I^2t, Short Delay I^2t	SC-6331-96	5
Long Delay I^2t, Short Delay Flat	SC-6332-96	6
Long Delay I^4t, Short Delay Flat	SC-6333-96	7
Instantaneous and Override	SC-6334-96	8
Ground Fault Protection	SC-6335-96	9

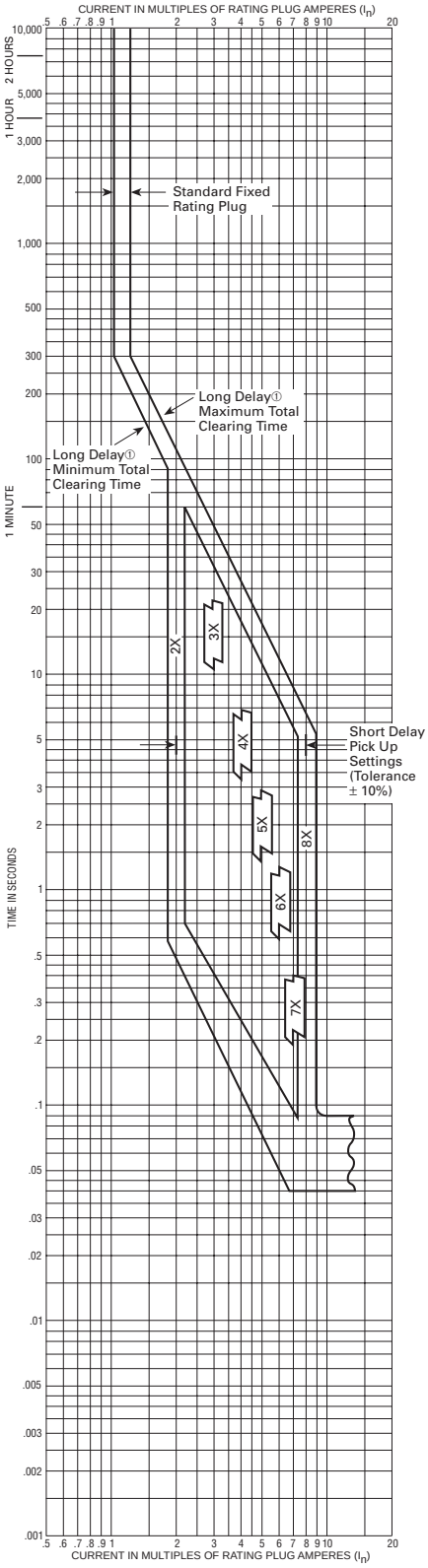
Individual oversize copies of curves listed above printed on onion-skin paper are available in limited quantity from:
Cutler-Hammer
Westinghouse &
Cutler-Hammer Products
Five Parkway Center
Pittsburgh, PA 15220

When ordering onion-skin curves, use number at bottom of page where curve appears, i.e., SC-5375-92A. **Requests for full sets of curves will not be honored.**

① Use in conjunction with SC-5375-92A or SC-5376-92A.

AB DE-ION Circuit Breakers

Types ND, CND, HND, CHND, NDC, CNDC, NDU, NGU Equipped With Type NES Digitrip RMS 310 Trip Units With I²t Ramp Short Time Delay (Phase Protection)



Circuit Breaker Time/Current Curves (Phase Current)
Series C® N-Frame Circuit Breakers
Equipped With Type NES Digitrip RMS 310 Trip Units

The NES Digitrip RMS 310 Trip Units are AC only devices that employ microprocessor based technology that provides true RMS current sensing means for proper correlation with thermal characteristics of conductors and equipment. They are used with Circuit Breaker Types ND, CND, HND, CHND, NDC, and CNDC.

I²t Ramp Short Time Delay **Typical Trip Unit Nameplate**

Frame Rating Amperes (Max.)	**Available Rating Plugs** Ampere Rating (I_n)	Type	Catalog Number	Short Delay Pickup Range Amperes
800	800	Fixed	8NES800T	1600-6400
	700	Fixed	8NES700T	1400-5600
	630	Fixed	8NES630T④	1260-5040
	600	Fixed	8NES600T	1200-4800
	550	Fixed	8NES550T	1100-4400
	500	Fixed	8NES500T	1000-4000
	450	Fixed	8NES450T	900-3600
	400	Fixed	8NES400T	800-3200
	400, 500, 600, 800	Adj.	A8NES800T1	800-6400
	400, 500, 630, 800	Adj.	A8NES800T2④	800-6400
1200	1200	Fixed	12NES1200T	2400-9600
	1000	Fixed	12NES1000T	2000-8000
	900	Fixed	12NES900T④	1800-7200
	800	Fixed	12NES800T	1600-6400
	700	Fixed	12NES700T	1400-5600
	630	Fixed	12NES630T④	1260-5040
	600	Fixed	12NES600T	1200-4800
	600, 800, 1000, 1200	Adj.	A12NES1200T1	1200-9600

Interrupting Ratings – 50/60 Hz
RMS Sym. Amperes (kA)

Breaker Type	UL/CSA 240V	UL/CSA 480V	UL/CSA 600V	IEC 947-2 220-240V	IEC 947-2 380-415V
ND, CND	65	50	25	65	50
HND, CHND	100	65	35	100	65
NDC, CNDC	200	100	50	200	100

I_{CS} = .25 I_{CU}
I_{CW} = 15 kA @ .5S
U_{imp} = 8kV

Notes

Curve accuracy applies from -20°C to +55°C ambient. For possible ampere derating for ambient above 40°C, refer to Cutler-Hammer.

Digitrip RMS 300 trip units are suitable for functional field testing with test kit Cat. No. STK2. For field testing using primary injection methods, follow NEMA publication AB-4-1991.

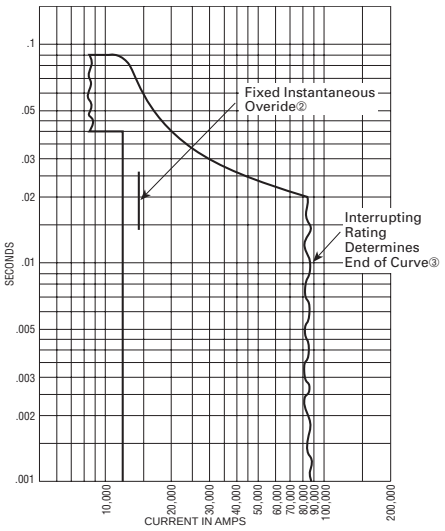
For ground fault time-current curves see SC-5377-92A.

① There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pick up value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.

② For high fault current levels a fixed instantaneous override is provided at 14000A (Tolerance ±15%).

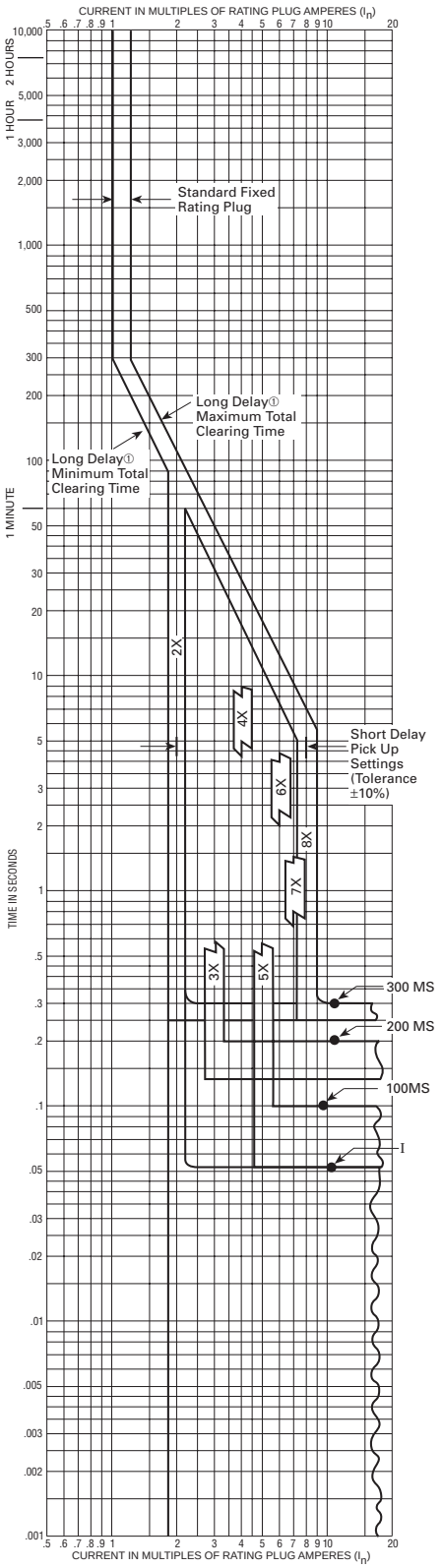
③ The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.

④ Not UL/CSA Listed.



AB DE-ION Circuit Breakers

Types ND, CND, HND, CHND, NDC, CNDC, NDU, NGU Equipped With Type NES Digitrip RMS 310 Trip Units With Adjustable Short Time Delay (Phase Protection)



Circuit Breaker Time/Current Curves (Phase Current)
Series C® N-Frame Circuit Breakers
Equipped With Type NES Digitrip RMS 310 Trip Units

The NES Digitrip RMS 310 Trip Units are AC only devices that employ microprocessor based technology that provides true RMS current sensing means for proper correlation with thermal characteristics of conductors and equipment. They are used with Circuit Breaker Types ND, CND, HND, CHND, NDC, and CNDC.

Adjustable Short Time Delay **Typical Trip Unit Nameplate**

Available Rating Plugs

Frame Rating Amperes (Max.)	Ampere Rating (I_n)	Type	Catalog Number	Short Delay Pickup Range Amperes
800	800	Fixed	8NES800T	1600-6400
	700	Fixed	8NES700T	1400-5600
	630	Fixed	8NES630T④	1260-5040
	600	Fixed	8NES600T	1200-4800
	550	Fixed	8NES550T	1100-4400
	500	Fixed	8NES500T	1000-4000
	450	Fixed	8NES450T	900-3600
	400	Fixed	8NES400T	800-3200
	400, 500, 600, 800	Adj.	A8NES800T1	800-6400
	400, 500, 630, 800	Adj.	A8NES800T2④	800-6400
1200	1200	Fixed	12NES1200T	2400-9600
	1000	Fixed	12NES1000T	2000-8000
	900	Fixed	12NES900T④	1800-7200
	800	Fixed	12NES800T	1600-6400
	700	Fixed	12NES700T	1400-5600
	630	Fixed	12NES630T④	1260-5040
	600	Fixed	12NES600T	1200-4800
	600, 800, 1000, 1200	Adj.	A12NES1200T1	1200-9600

Interrupting Ratings – 50/60 Hz
RMS Sym. Amperes (kA)

Breaker Type	UL/CSA 240V	UL/CSA 480V	UL/CSA 600V	IEC 947-2 220-240V	IEC 947-2 380-415V
ND, CND	65	50	25	65	50
HND, CHND	100	65	35	100	65
NDC, CNDC	200	100	50	200	100

I_{CS} = .25 I_{CU}
I_{CW} = 15 kA @ .5S
U_{imp} = 8kV

Notes

Curve accuracy applies from -20°C to +55°C ambient. For possible ampere derating for ambient above 40°C, refer to Cutler-Hammer.

Digitrip RMS 300 trip units are suitable for functional field testing with test kit Cat. No. STK2. For field testing using primary injection methods, follow NEMA publication AB-4-1991.

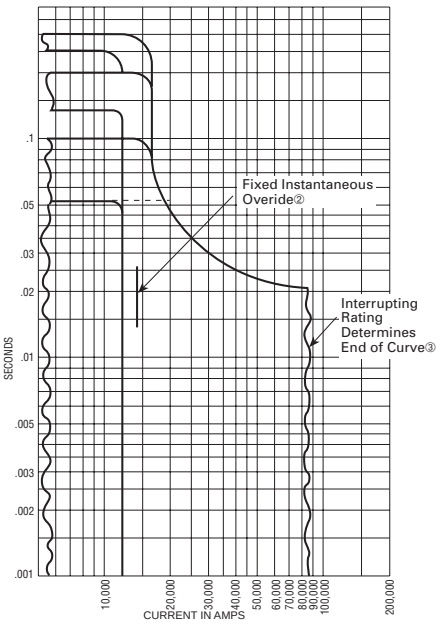
For ground fault time-current curves see SC-5377-92A.

① There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pick up value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.

② For high fault current levels a fixed instantaneous override is provided at 14000A (Tolerance ±15%).

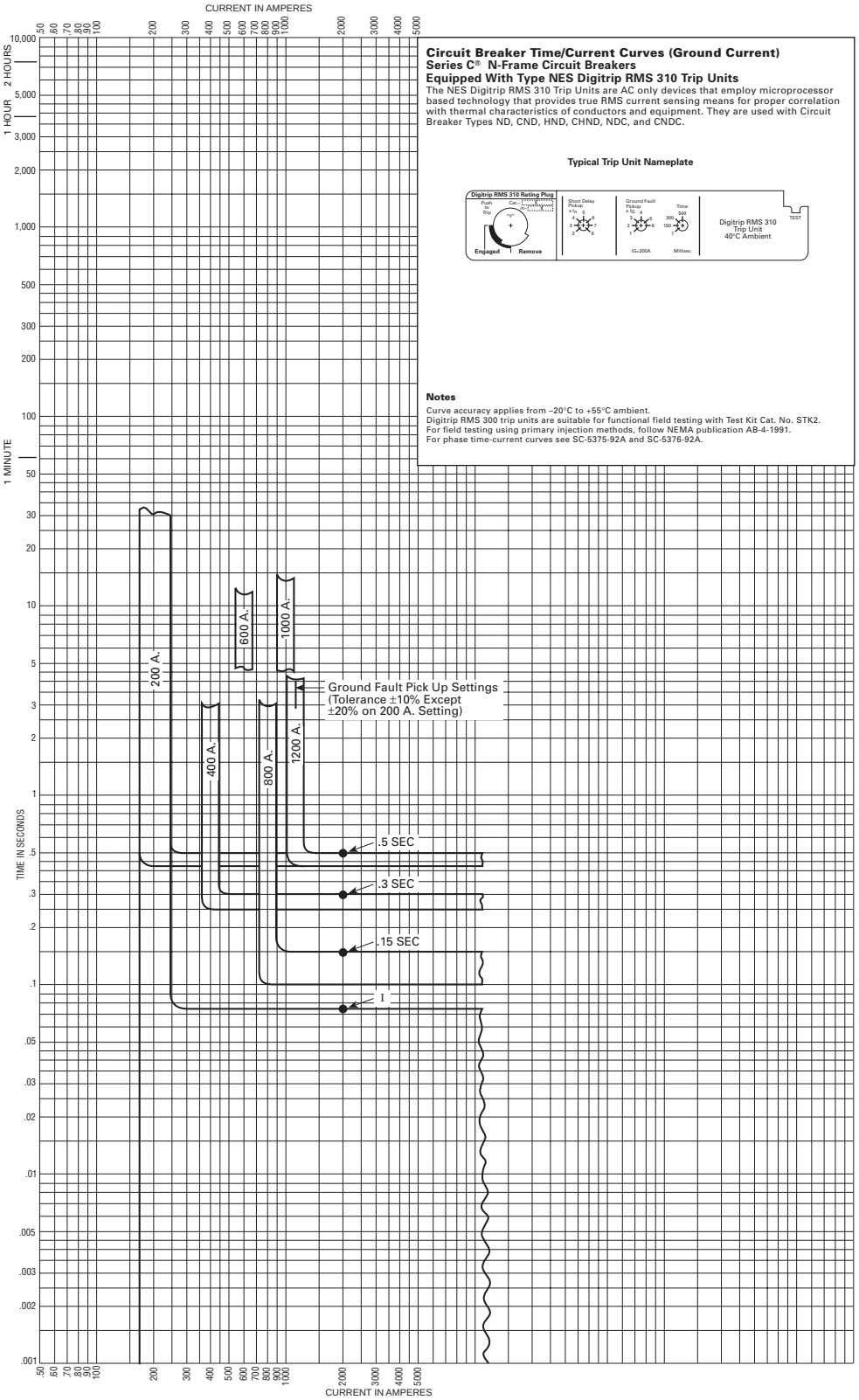
③ The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.

④ Not UL/CSA Listed.



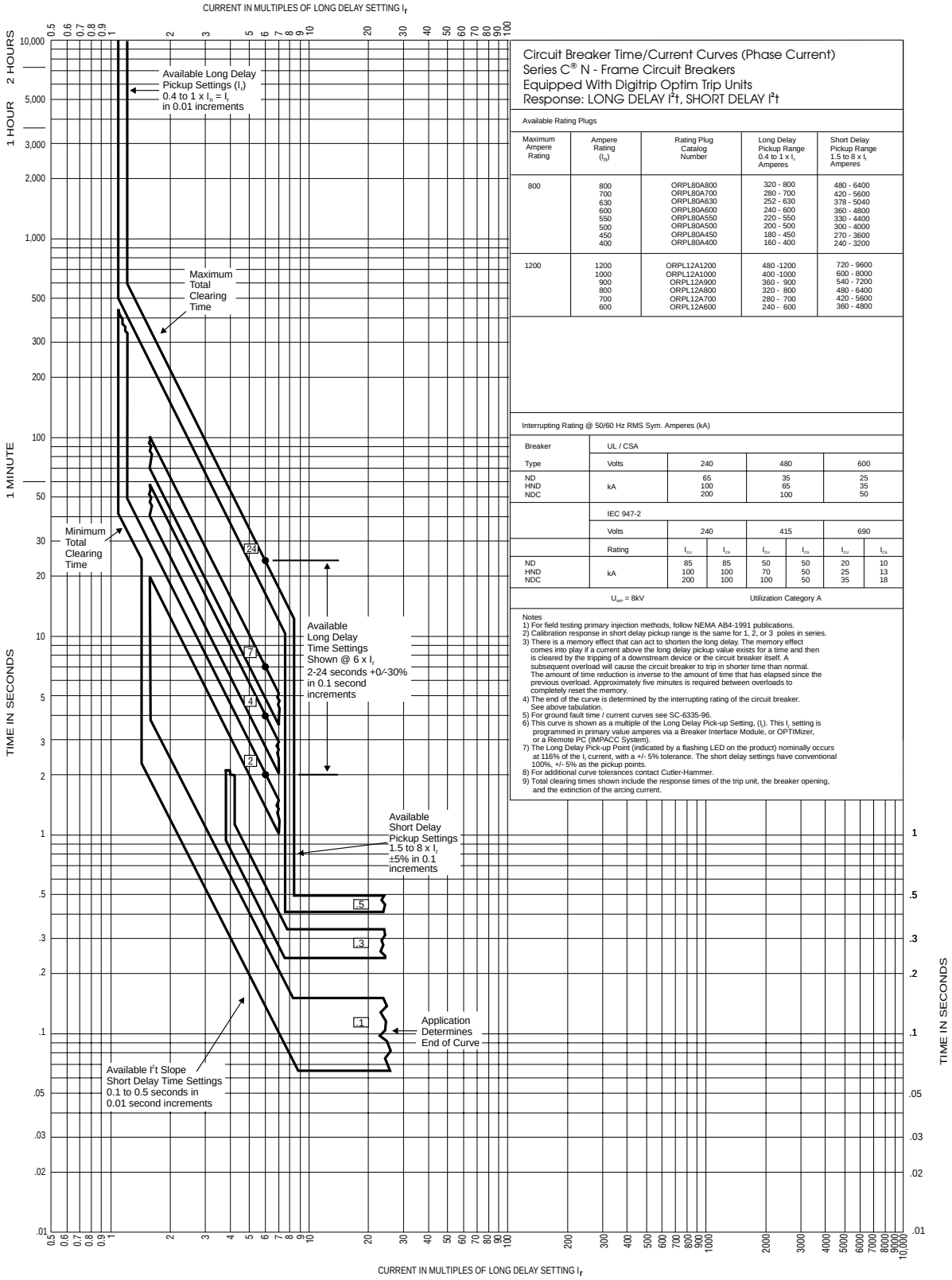
AB DE-ION Circuit Breakers

Types ND, CND, HND, CHND, NDC, CNDC, NDU, NGU Equipped With Type NES Digitrip RMS 310 Trip Units With Ground Fault Protection



AB DE-ION Circuit Breakers

N-Frame Circuit Breakers Equipped with Digitrip OPTIM Trip Units; Long Delay I²t, Short Delay I²t



Circuit Breaker Time/Current Curves (Phase Current)
Series C® N - Frame Circuit Breakers
Equipped With Digitrip Optim Trip Units
Response: LONG DELAY I²t, SHORT DELAY I²t

Available Rating Plugs

Maximum Ampere Rating	Ampere Rating (I_n)	Rating Plug Catalog Number	Long Delay Pickup Range 0.4 to 1 x I_n Amperes	Short Delay Pickup Range 1.5 to 8 x I_r Amperes
800	800	ORPL80A800	320 - 800	480 - 6400
	700	ORPL80A700	280 - 700	420 - 5600
	630	ORPL80A630	252 - 630	378 - 5040
	600	ORPL80A600	240 - 600	360 - 4800
	550	ORPL80A550	220 - 550	330 - 4400
	500	ORPL80A500	200 - 500	300 - 4000
	450	ORPL80A450	180 - 450	270 - 3600
	400	ORPL80A400	160 - 400	240 - 3200
1200	1200	ORPL12A1200	480 -1200	720 - 9600
	1000	ORPL12A1000	400 -1000	600 - 8000
	900	ORPL12A900	360 - 900	540 - 7200
	800	ORPL12A800	320 - 800	480 - 6400
	700	ORPL12A700	280 - 700	420 - 5600
	600	ORPL12A600	240 - 600	360 - 4800

Interrupting Rating @ 50/60 Hz RMS Sym. Amperes (kA)

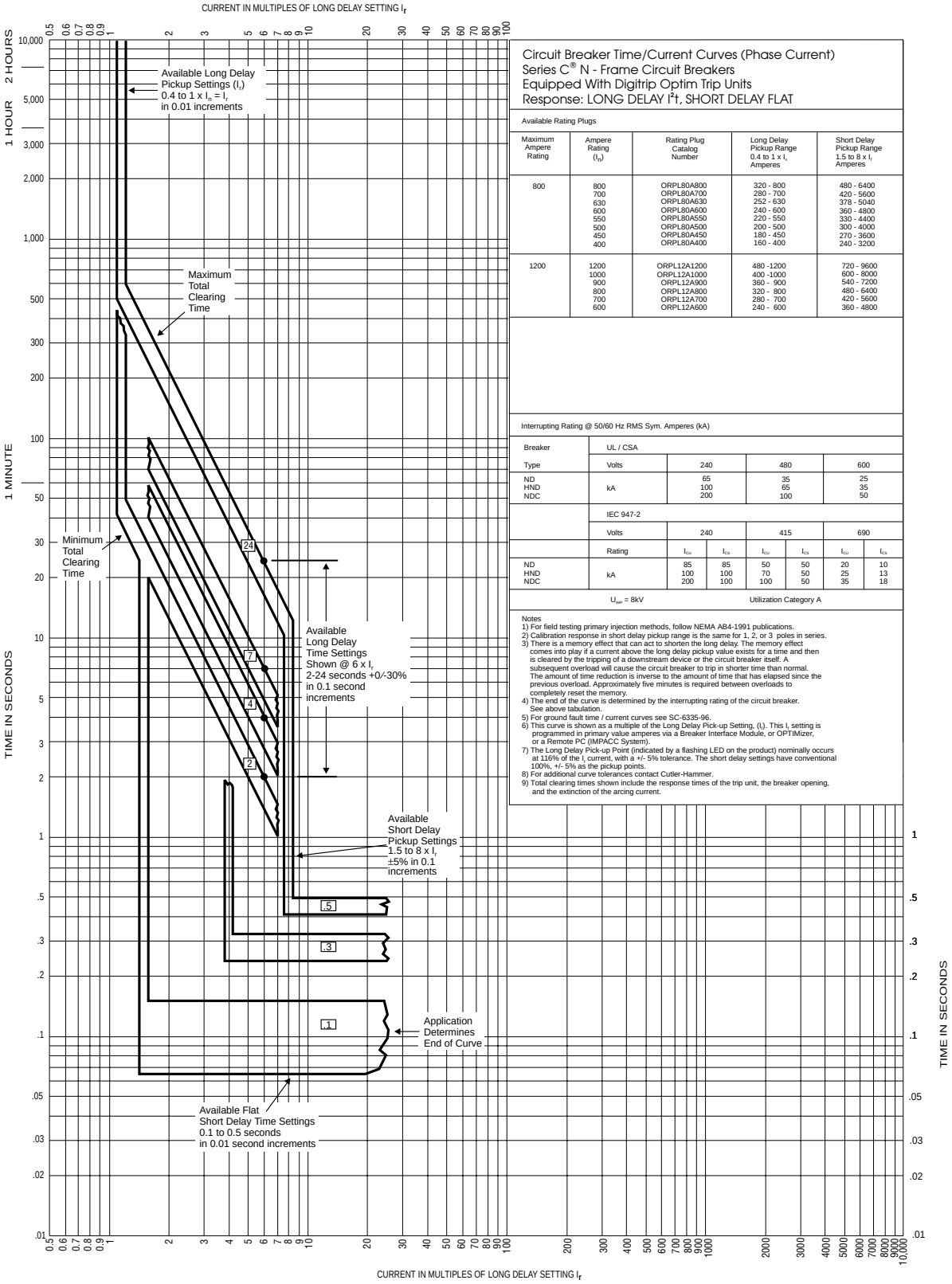
Breaker	UL / CSA						
Type	Volts	240		480		600	
ND HND NDC	kA	65 100 200		35 65 100		25 35 50	
	IEC 947-2						
	Volts	240		415		690	
	Rating	I_{cu}	I_{cs}	I_{cu}	I_{cs}	I_{cu}	I_{cs}
ND HND NDC	kA	85 100 200	85 100 100	50 70 100	50 50 50	20 25 35	10 13 18
U_{imp} = 8kV				Utilization Category A			

Notes
1) For field testing primary injection methods, follow NEMA AB4-1991 publications.
2) Calibration response in short delay pickup range is the same for 1, 2, or 3 poles in series.
3) There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.
4) The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.
5) For ground fault time / current curves see SC-6335-96.
6) This curve is shown as a multiple of the Long Delay Pick-up Setting, (I_r). This I_r setting is programmed in primary value amperes via a Breaker Interface Module, or OPTIMizer, or a Remote PC (IMPACC System).
7) The Long Delay Pick-up Point (indicated by a flashing LED on the product) nominally occurs at 116% of the I_r current, with a +/- 5% tolerance. The short delay settings have conventional 100%, +/- 5% as the pickup points.
8) For additional curve tolerances contact Cutler-Hammer.
9) Total clearing times shown include the response times of the trip unit, the breaker opening, and the extinction of the arcing current.

Curve No. SC-6331-96

AB DE-ION Circuit Breakers

N-Frame Circuit Breakers Equipped with Digitrip OPTIM Trip Units; Long Delay I²t, Short Delay Flat



Circuit Breaker Time/Current Curves (Phase Current)
Series C® N - Frame Circuit Breakers
Equipped With Digitrip Optim Trip Units
Response: LONG DELAY I²t, SHORT DELAY FLAT

Available Rating Plugs

Maximum Ampere Rating	Ampere Rating (I_n)	Rating Plug Catalog Number	Long Delay Pickup Range 0.4 to 1 x I_n Amperes	Short Delay Pickup Range 1.5 to 8 x I_r Amperes
800	800	ORPL80A800	320 - 800	480 - 6400
	700	ORPL80A700	280 - 700	420 - 5600
	630	ORPL80A630	252 - 630	378 - 5040
	600	ORPL80A600	240 - 600	360 - 4800
	550	ORPL80A550	220 - 550	330 - 4400
	500	ORPL80A500	200 - 500	300 - 4000
	450	ORPL80A450	180 - 450	270 - 3600
	400	ORPL80A400	160 - 400	240 - 3200
1200	1200	ORPL12A1200	480 -1200	720 - 9600
	1000	ORPL12A1000	400 -1000	600 - 8000
	900	ORPL12A900	360 - 900	540 - 7200
	800	ORPL12A800	320 - 800	480 - 6400
	700	ORPL12A700	280 - 700	420 - 5600
	600	ORPL12A600	240 - 600	360 - 4800

Interrupting Rating @ 50/60 Hz RMS Sym. Amperes (kA)

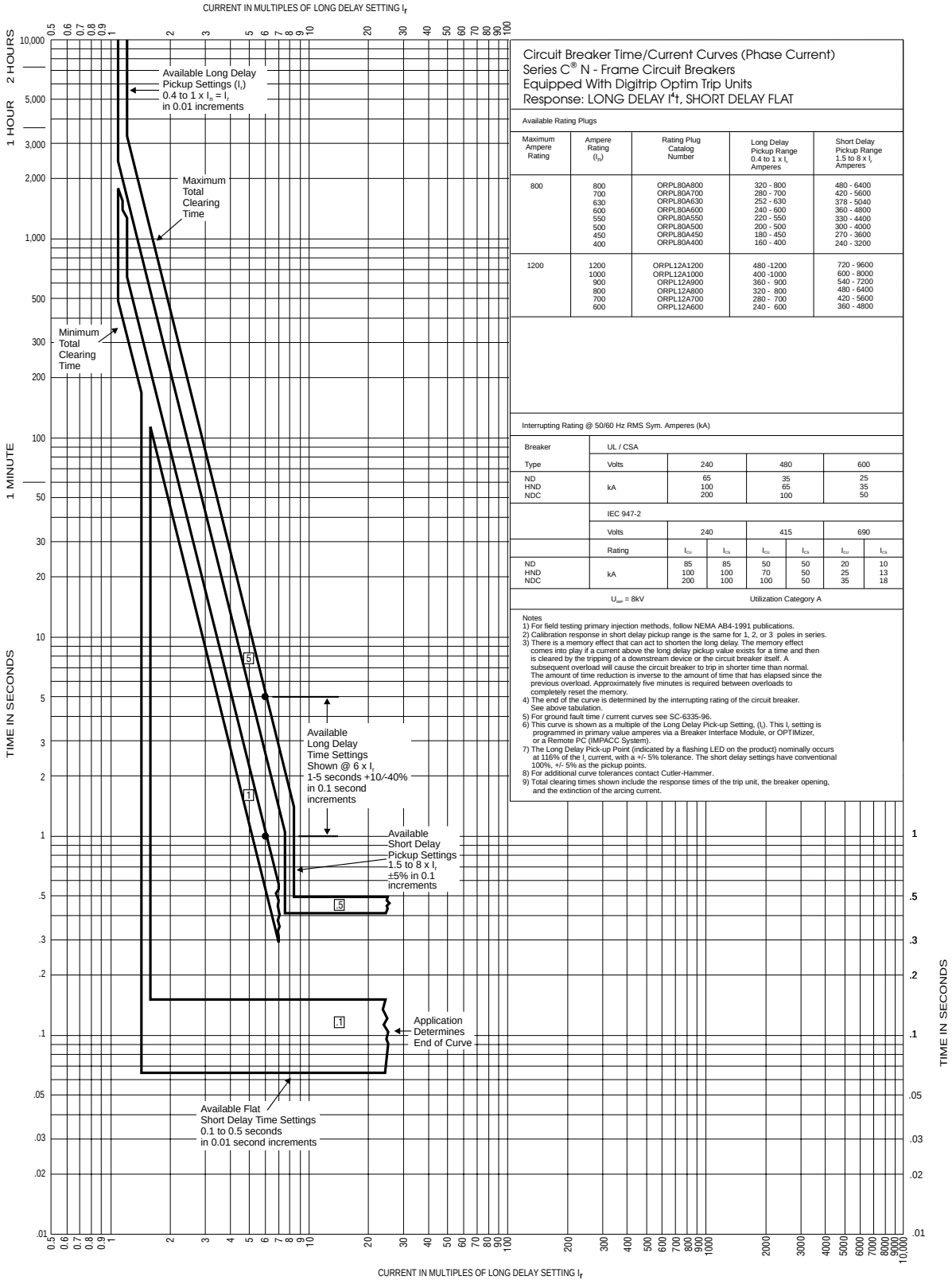
Breaker	UL / CSA			
Type	Volts	240	480	600
ND HND NDC	kA	65 100 200	35 65 100	25 35 50

	IEC 947-2						
	Volts	240		415		690	
	Rating	I_{cu}	I_{cs}	I_{cu}	I_{cs}	I_{cu}	I_{cs}
ND HND NDC	kA	85 100 200	85 100 100	50 70 100	50 50 50	20 25 35	10 13 18
	U_{imp} = 8kV			Utilization Category A			

Notes
1) For field testing primary injection methods, follow NEMA AB4-1991 publications.
2) Calibration response in short delay pickup range is the same for 1, 2, or 3 poles in series.
3) There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.
4) The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.
5) For ground fault time / current curves see SC-6335-96.
6) This curve is shown as a multiple of the Long Delay Pick-up Setting, (I_r). This I_r setting is programmed in primary value amperes via a Breaker Interface Module, or OPTIMizer, or a Remote PC (IMPACC System).
7) The Long Delay Pick-up Point (indicated by a flashing LED on the product) nominally occurs at 116% of the I_r current, with a +/- 5% tolerance. The short delay settings have conventional 100%, +/- 5% as the pickup points.
8) For additional curve tolerances contact Cutler-Hammer.
9) Total clearing times shown include the response times of the trip unit, the breaker opening, and the extinction of the arcing current.

AB DE-ION Circuit Breakers

N-Frame Circuit Breakers Equipped with Digitrip OPTIM Trip Units; Long Delay I^4t, Short Delay Flat



Circuit Breaker Time/Current Curves (Phase Current)
Series C® N - Frame Circuit Breakers
Equipped With Digitrip Optim Trip Units
Response: LONG DELAY I^4t, SHORT DELAY FLAT

Available Rating Plugs

Maximum Ampere Rating	Ampere Rating (I_n)	Rating Plug Catalog Number	Long Delay Pickup Range 0.4 to 1 x I_n Amperes	Short Delay Pickup Range 1.5 to 8 x I_r Amperes
800	800	ORPL80A800	320 - 800	480 - 6400
	700	ORPL80A700	280 - 700	420 - 5600
	630	ORPL80A630	252 - 630	378 - 5040
	600	ORPL80A600	240 - 600	360 - 4800
	550	ORPL80A550	220 - 550	330 - 4400
	500	ORPL80A500	200 - 500	300 - 4000
	450	ORPL80A450	180 - 450	270 - 3600
	400	ORPL80A400	160 - 400	240 - 3200
1200	1200	ORPL12A1200	480 -1200	720 - 9600
	1000	ORPL12A1000	400 -1000	600 - 8000
	900	ORPL12A900	360 - 900	540 - 7200
	800	ORPL12A800	320 - 800	480 - 6400
	700	ORPL12A700	280 - 700	420 - 5600
	600	ORPL12A600	240 - 600	360 - 4800

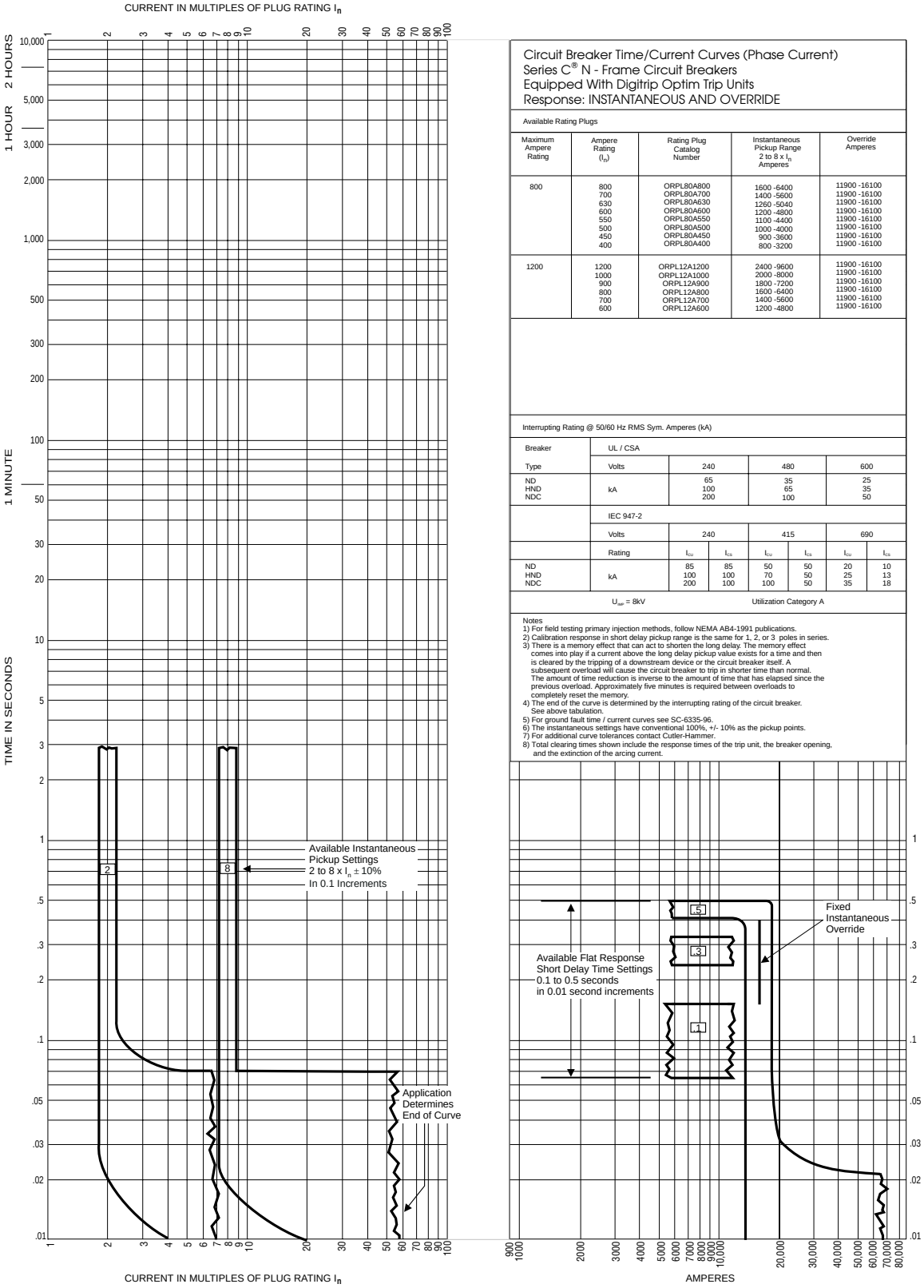
Interrupting Rating @ 50/60 Hz RMS Sym. Amperes (kA)

Breaker	UL / CSA					
Type	Volts	240		480		600
ND HND NDC	kA	65 100 200		35 65 100		25 35 50
	IEC 947-2					
	Volts	240		415		690
	Rating	I_{cu}	I_{cs}	I_{cu}	I_{cs}	I_{cu}	I_{cs}
ND HND NDC	kA	85 100 200	85 100 100	50 70 100	50 50 50	20 25 35	10 13 18
	U_{imp} = 8kV			Utilization Category A			

Notes
1) For field testing primary injection methods, follow NEMA AB4-1991 publications.
2) Calibration response in short delay pickup range is the same for 1, 2, or 3 poles in series.
3) There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.
4) The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.
5) For ground fault time / current curves see SC-6335-96.
6) This curve is shown as a multiple of the Long Delay Pick-up Setting, (I_r). This I_r setting is programmed in primary value amperes via a Breaker Interface Module, or OPTIMizer, or a Remote PC (IMPACC System).
7) The Long Delay Pick-up Point (indicated by a flashing LED on the product) nominally occurs at 116% of the I_r current, with a +/- 5% tolerance. The short delay settings have conventional 100%, +/- 5% as the pickup points.
8) For additional curve tolerances contact Cutler-Hammer.
9) Total clearing times shown include the response times of the trip unit, the breaker opening, and the extinction of the arcing current.

AB DE-ION Circuit Breakers

N-Frame Circuit Breakers Equipped with Digitrip OPTIM Trip Units; Instantaneous and Override



Circuit Breaker Time/Current Curves (Phase Current)
Series C® N - Frame Circuit Breakers
Equipped With Digitrip Optim Trip Units
Response: INSTANTANEOUS AND OVERRIDE

Available Rating Plugs

Maximum Ampere Rating	Ampere Rating (I_n)	Rating Plug Catalog Number	Instantaneous Pickup Range 2 to 8 x I_n Amperes	Override Amperes
800	800	ORPL80A800	1600 -6400	11900 -16100
	700	ORPL80A700	1400 -5600	11900 -16100
	630	ORPL80A630	1260 -5040	11900 -16100
	600	ORPL80A600	1200 -4800	11900 -16100
	550	ORPL80A550	1100 -4400	11900 -16100
	500	ORPL80A500	1000 -4000	11900 -16100
	450	ORPL80A450	900 -3600	11900 -16100
	400	ORPL80A400	800 -3200	11900 -16100
1200	1200	ORPL12A1200	2400 -9600	11900 -16100
	1000	ORPL12A1000	2000 -8000	11900 -16100
	900	ORPL12A900	1800 -7200	11900 -16100
	800	ORPL12A800	1600 -6400	11900 -16100
	700	ORPL12A700	1400 -5600	11900 -16100
	600	ORPL12A600	1200 -4800	11900 -16100

Interrupting Rating @ 50/60 Hz RMS Sym. Amperes (kA)

Breaker Type	UL / CSA Volts	240	480	600
ND	kA	65	35	25
HND		100	65	35
NDC		200	100	50

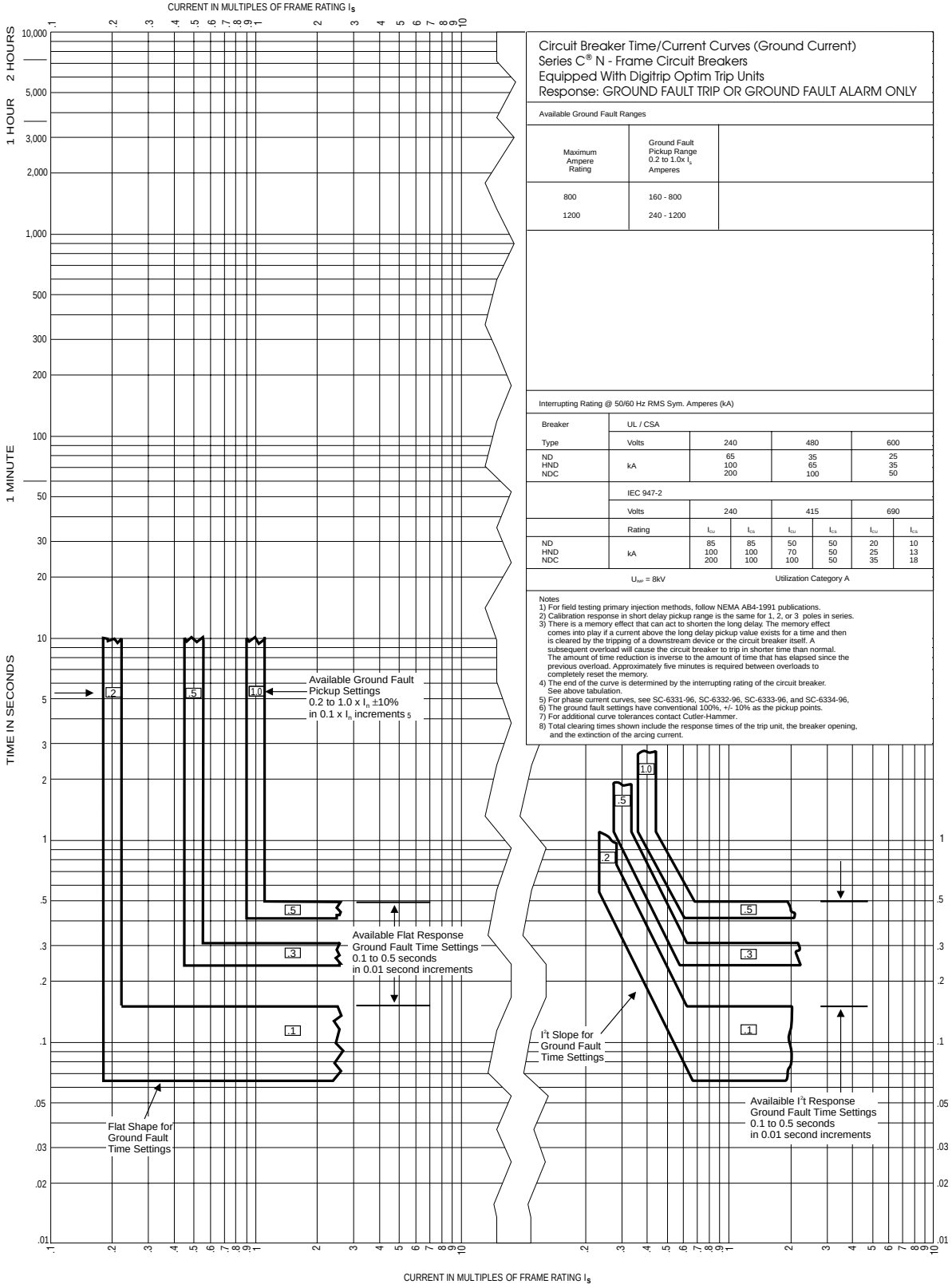
	IEC 947-2 Volts	240		415		690	
	Rating	I_{cu}	I_{cs}	I_{cu}	I_{cs}	I_{cu}	I_{cs}
ND	kA	85	85	50	50	20	10
HND		100	100	70	50	25	13
NDC		200	100	100	50	35	18

U_{imp} = 8kV Utilization Category A

Notes
1) For field testing primary injection methods, follow NEMA AB4-1991 publications.
2) Calibration response in short delay pickup range is the same for 1, 2, or 3 poles in series.
3) There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.
4) The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.
5) For ground fault time / current curves see SC-6335-96.
6) The instantaneous settings have conventional 100%, +/- 10% as the pickup points.
7) For additional curve tolerances contact Cutler-Hammer.
8) Total clearing times shown include the response times of the trip unit, the breaker opening, and the extinction of the arcing current.

AB DE-ION Circuit Breakers

N-Frame Circuit Breakers Equipped with Digitrip OPTIM Trip Units; Ground Fault or Ground Fault Alarm Only



Circuit Breaker Time/Current Curves (Ground Current)
Series C® N - Frame Circuit Breakers
Equipped With Digitrip Optim Trip Units
Response: GROUND FAULT TRIP OR GROUND FAULT ALARM ONLY

Available Ground Fault Ranges

Maximum Ampere Rating	Ground Fault Pickup Range 0.2 to 1.0x I_n Amperes
800	160 - 800
1200	240 - 1200

Interrupting Rating @ 50/60 Hz RMS Sym. Amperes (kA)

Breaker Type	UL / CSA Volts	240	480	600
ND HND NDC	kA	65 100 200	35 65 100	25 35 50

	IEC 947-2 Volts	240		415		690	
	Rating	I_{cu}	I_{cs}	I_{cu}	I_{cs}	I_{cu}	I_{cs}
ND HND NDC	kA	85 100 200	85 100 100	50 70 100	50 50 50	20 25 35	10 13 18

U_{imp} = 8kV Utilization Category A

Notes
1) For field testing primary injection methods, follow NEMA AB4-1991 publications.
2) Calibration response in short delay pickup range is the same for 1, 2, or 3 poles in series.
3) There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.
4) The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.
5) For phase current curves, see SC-6331-96, SC-6332-96, SC-6333-96, and SC-6334-96,
6) The ground fault settings have conventional 100%, +/- 10% as the pickup points.
7) For additional curve tolerances contact Cutler-Hammer.
8) Total clearing times shown include the response times of the trip unit, the breaker opening, and the extinction of the arcing current.

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