

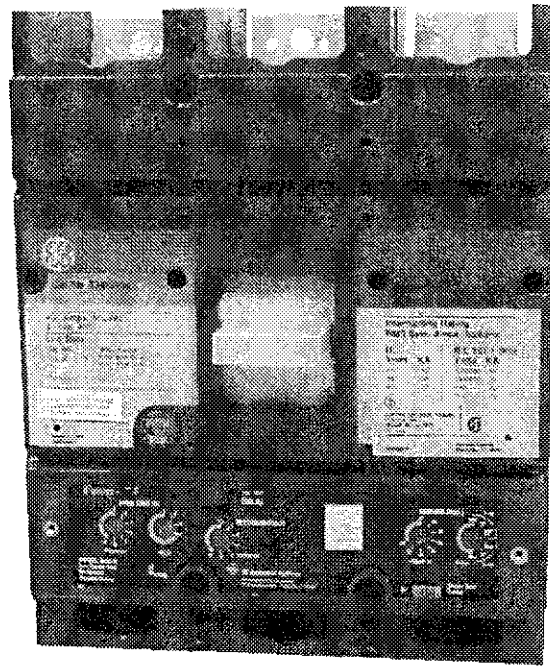
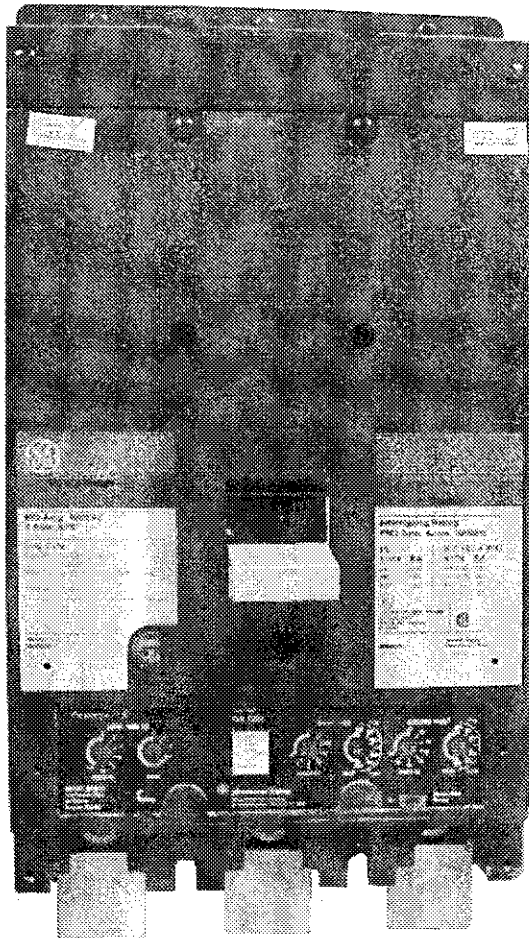


DEH-40060

J & K Frame Molded-Case Replacement Breakers

with Power+™ 4 Trip Units

User's Guide



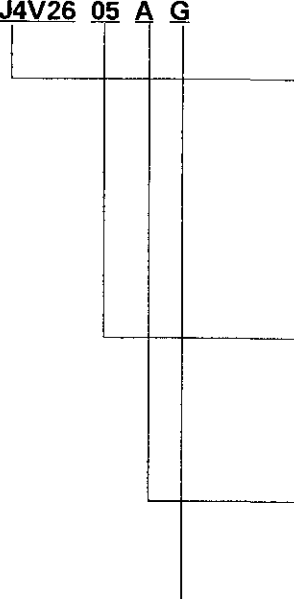
J & K Frame Molded-Case Replacement Circuit Breakers

Getting Started

Please take a moment to compare the catalog number of your replacement circuit breaker with the following catalog number key to ensure that you have received the desired breaker and trip unit configuration. Note that this table is for use in interpreting existing catalog numbers, rather than for creating a catalog number for placing an order.

While J and K frame circuit breakers with Power+™ 4 trip units are direct replacements for breakers with MicroVersaTrip® 4 trip units, there are differences in settings for the various functions. Be sure to note the settings and functions available with Power+ 4 trip units as described in this manual.

Example
THJ4V26 05 A G



Code	Description	Function
TJ4V26	J600 Standard	J Frame Breakers
THJ4V26	J600 Hi-Break®	
TJL4V26	J600 65 kA IC (@ 480 Vac)	
TK4V46	K1200 Standard	K Frame breakers
TKL4V46	K1200 65 kA IC (@ 480 Vac)	
01	150 A	J Frame Current Sensor Rating
02	200 A	
03	300 A	
04	400 A	
05	500 A	
06	600 A	
08	800 A	K Frame Current Sensor Rating
10	1000 A	
12	1200 A	
A	Power+™ 4 trip unit	Trip Unit type
none	Long-time, instantaneous	Protection Functions
N	Long-time, short-time, fixed instantaneous	
G	Long-time, instantaneous, ground fault	
NG	Long-time, short-time, fixed instantaneous, ground fault	

Example: A circuit breaker with catalog number THJ4V2605AG has the following functions:

THJ4V26 – J600 Hi-Break frame, rated for 35 kA IC at 480 Vac

05 – Breaker current sensor (CT) rated at 500 A

A – Power+ 4 trip unit

G – Long-time, adjustable instantaneous, and adjustable ground-fault protection

For problems with these circuit breakers and trip units, contact the GE Customer Support Center at 1-800-GE RESOLve (1-800-437-3765).

DEH-40060

WARNINGS, CAUTIONS, AND NOTES AS USED IN THIS PUBLICATION

WARNINGS

Warning notices are used in this publication to emphasize that hazardous voltages, currents, or other conditions that could cause personal injury or death are present in this equipment or may be associated with its use.

Warning notices are also used for situations in which inattention or lack of equipment knowledge could cause either personal injury or damage to equipment.

CAUTIONS

Caution notices are used for situations in which equipment might be damaged if care is not taken.

NOTES

Notes call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance. Features may be described herein that are not present in all hardware and software systems. GE Industrial Systems assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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J & K Frame Molded-Case Replacement Circuit Breakers

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1-1 Introduction

The J and K Frame circuit breakers with Power+™ 4 trip units described in this guide are intended solely as replacements for J and K frame breakers with MicroVersaTrip® 4 trip units.

1-2 Outline Drawings

Figure 1 contains the outline drawing of J Frame breakers for use in providing appropriate provision for mounting. Figure 2 contains the outline drawing of K Frame breakers.

1-3 Lug Selection

These breakers are sold without lugs. Table 1 lists the lugs available, with corresponding wire size ranges, for the different frame sizes of J and K Frame breakers.

1-4 Accessories

Internal Accessories

Internally mounted accessories are UL listed and field installable, except for the bell alarm, which is only available factory installed. Available accessories are listed in Table 2.

The total number of accessories that may be installed in a circuit breaker is any one plus a bell alarm. All are available with lead exit through the side or back of the breaker.

Accessory	J Frame Pole Mounting	K Frame Pole Mounting
Auxiliary Switches	Right	Right
Shunt Trip	Right	Right
Bell Alarm Switch	Left	Center
Undervoltage Release	Right	Right
Combination Shunt Trip with Auxiliary Switch	Right	Right
Combination Undervoltage Release with Auxiliary Switch	Right	Right

Table 2. Internally mounted accessories for J and K Frame breakers.

External Accessories

The following are available as externally mounted accessories:

- Motor-operated mechanisms
- Back-connected studs, plug-in bases
- Mechanical interlocks
- Padlocking devices
- Handle operator
 - STDA flange-mounted, variable-depth
 - TDM door-mounted, variable-depth
 - TDR integral mechanism, fixed-depth

Accessory Application

For detailed information on accessories and their applications, see the GE BuyLog, GEP-1100, and GET-2779.

Breaker Type	Frame Size, A	Sensor Rating, A	Standard Lugs, Cu/Al		Optional Lugs, Cu Only	
			Catalog Number	Wire Size	Catalog Number	Wire Size
J Frame	400	150 200 300 400	TCAL43	(1) 6–600 kcmil or (2) 2/0–250 kcmil	TCO43	(1) 6–600 kcmil or (2) 2/0–250 kcmil
	600	500 600	TCAL63	(2) 4/0–350 kcmil Cu or (2) 300–500 kcmil Al	TCO63	(2) 250–350 kcmil
K Frame	800	800	TCAL81 ¹ TCAL91 ²	(3) 3/0–500 kcmil	TCO81A ¹ TCO91 ²	(3) 3/0–500 kcmil
	1200	1000 1200	TCAL121 ¹ TCAL131 ²	(4) 250–350 ³ kcmil Cu or (4) 250–500 kcmil Al	TCO121 ¹ TCO131 ²	(4) 250–400 kcmil

¹ For upper (line) terminals.

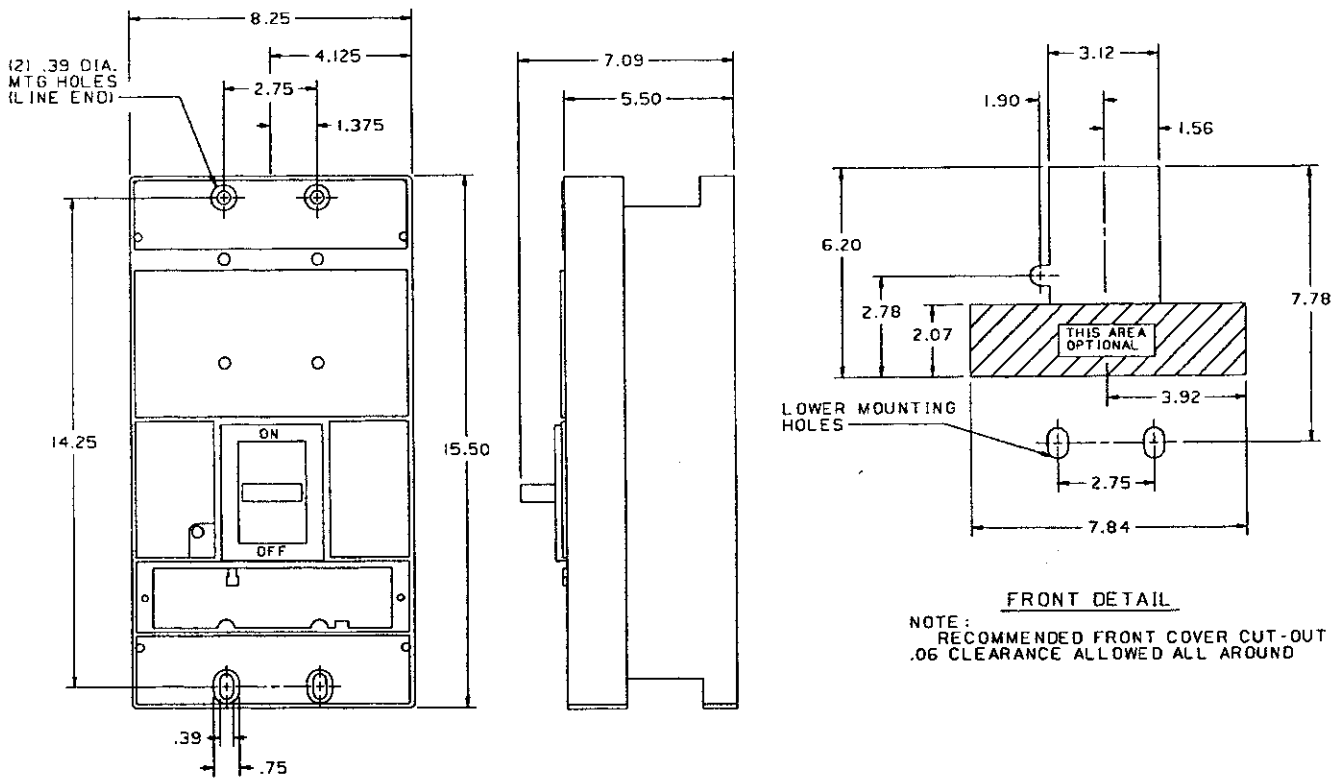
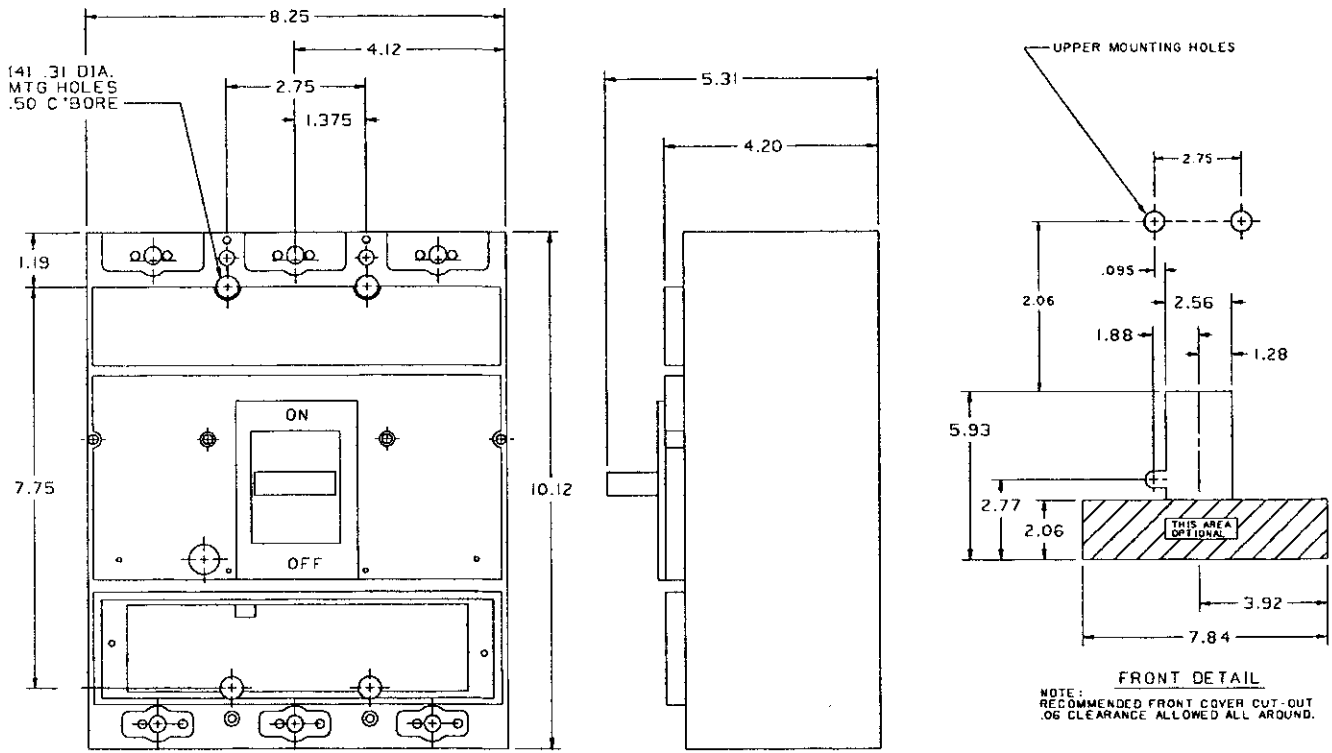
² For lower (load) terminals.

³ Suitable for 500 kcmil copper for voltage-drop considerations.

Table 1. Lugs and wire sizes for J and K frame breakers.

J & K Frame Molded-Case Replacement Circuit Breakers

Chapter 1. Circuit Breakers



1-5 Catalog Numbers

A simple catalog-numbering system defines all of the circuit breaker and trip unit ratings and functions. A complete catalog numbering key is found inside the front cover. Each of the segments of the catalog number is described below.

The base catalog numbers for the various sensor and interrupting ratings are listed in Table 3.

For example, a circuit breaker with catalog number THJ4V2605AG has the following functions:

THJ4V26 – Hi-Break® J600 frame

05 – Breaker current sensor (CT) rated at 500 A

A – Power+™ 4 trip unit

G – Long-time, adjustable instantaneous, and adjustable ground-fault protection

Frame Type	Sensor Rating, A	Standard	Hi-Break®	65 kA IC
J600	150	TJ4V2601A	THJ4V2601A	TJL4V2601A
	200	TJ4V2602A	THJ4V2602A	TJL4V2602A
	300	TJ4V2603A	THJ4V2603A	TJL4V2603A
	400	TJ4V2604A	THJ4V2604A	TJL4V2604A
	500	TJ4V2605A	THJ4V2605A	TJL4V2605A*
	600	TJ4V2606A	THJ4V2606A	TJL4V2606A*
K1200	800	TK4V4608A	—	TKL4V4608A
	1000	TK4V4610A	—	TKL4V4610A
	1200	TK4V4612A	—	TKL4V4612A

* TJL4V with 500 and 600 A sensors are available with adjustable instantaneous only (no suffix or G suffix only).

Table 3. Base catalog numbers for the various breaker load ratings.

The alphabetic suffix characters indicate the protection functions provided by the trip unit, as listed in Table 4.

Function	Suffix			
	none	N	G	NG
Long-Time Setting	X	X	X	X
Adjustable Long-Time Delay	X	X	X	X
Long-Time Pickup Light	X	X	X	X
Adjustable Short-Time Pickup	—	X	—	X
Adjustable Short-Time Delay	—	X	—	X
Adjustable Instantaneous Pickup	X	—	X	—
Fixed Instantaneous Pickup, 15X	—	X*	—	X*
Adjustable Ground-Fault Pickup	—	—	X	X
Adjustable Ground-Fault Delay	—	—	X	X
Function Code	LI	LSN	LIG	LSNG

* TJL4V with 500 and 600 A sensors are available with adjustable instantaneous only (no suffix or G suffix only).

Table 4. Protection functions provided in the trip unit, as indicated by the catalog number suffix.

J & K Frame Molded-Case Replacement Circuit Breakers

Chapter 2. Power+™ 4 Trip Unit

2-1 Trip Unit Applications

The Power+™ 4 trip units described in this publication are an integral part of J and K frame molded-case circuit breakers. These breakers are intended as replacements for J and K frame breakers equipped with MicroVersaTrip® 4 trip units. Figure 3 shows the front panel of the Power+ 4 trip unit.



Figure 3. Front view of the Power+ 4 trip unit.

Power+ 4 trip units are ordered with the circuit breaker and are not available separately. The breaker chapters describe the catalog number structure, including trip unit options.

NOTE: Trip units as received may have settings that are undesirable for the specific application. Ensure that settings are appropriately adjusted before energizing.

NOTE: Les disjoncteurs sont livrés avec des réglages standards qui peuvent être inadéquates pour certaines applications. Vérifier ces réglages avant de mettre le disjoncteur sous tension.

Differences in Trip Unit Functions

MicroVersaTrip 4 trip units installed in older J and K frame breakers have only one (fixed) long-time delay band, while Power+ trip units have four customer-selectable bands. Band 3 is directly below and band 4 is directly above the old fixed band.

Also, MicroVersaTrip 4 trip units have only a fixed I²t short-time delay band, while Power+ 4 provides that same band plus three constant delay bands with I²t out.

See Appendix 3 for a complete cross-reference listing of settings for the two trip unit types.

2-2 Trip Unit Functions

Power+ 4 trip units have specific standard and optional functions, with the maximum current rating determined by the sensor installed in the breaker. The standard functions of the trip unit are as follows:

- Long-time protection
- Instantaneous protection

The optional functions available are as follows:

- Short-time protection
- Ground-fault protection

2-3 Equipment Interfaces

Power+ 4 trip units do not require connections within the equipment, since all wiring is contained within the circuit breaker. When ground-fault protection is provided, the external neutral sensor secondary output, if required, is connected to the breaker.

An external neutral current sensor is required for single-phase, three-wire and for three-phase, four-wire power systems.

CAUTION: Neutral current sensors are required for single-phase, three-wire and three-phase, four-wire systems. When the trip unit is connected to a three-phase, three-wire system, the neutral sensor terminals of the breaker are left open. Do not short any neutral current sensor terminals in a three-phase, three-wire system, as this could result in damage to, or malfunction of, the electrical system.

ATTENTION: Un transformateur de courant de neutre est nécessaire pour les réseaux 3 phases + neutre. Si le neutre n'est pas distribué, les bornes de neutre du déclencheur doivent être laissées ouvertes. Ne pas les court-circuiter (ceci peut endommager le déclencheur et entraîner un mauvais fonctionnement du système électrique).

For breakers requiring external ground fault connections, attach the leads between the terminals on the current sensor and the breaker terminals shown in Figure 4. Use twisted-pair wire, #14 AWG minimum. Be sure to maintain the proper polarity, with the white and black leads connected as indicated on the breaker. File break-out locations in the bottom cover of the breaker with a circular file. Route the ground leads out of the bottom cover, being careful not to pinch the leads.

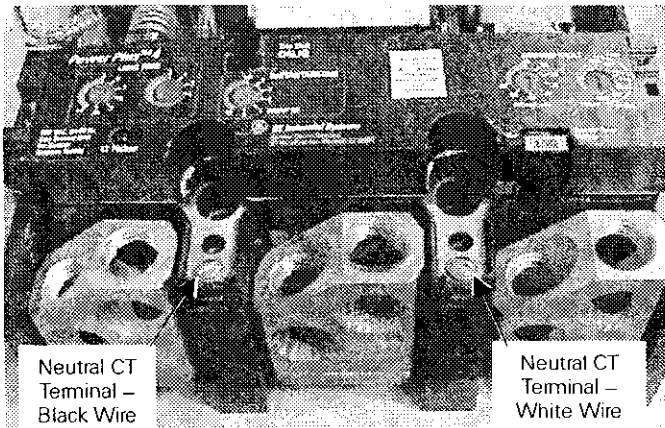


Figure 4. Terminals for connecting neutral CT leads.

sensor rating, X. The choices for C are .5, .6, .7, .8, .9, .95, 1.0 times X. Figure 5 illustrates the long-time pickup settings.

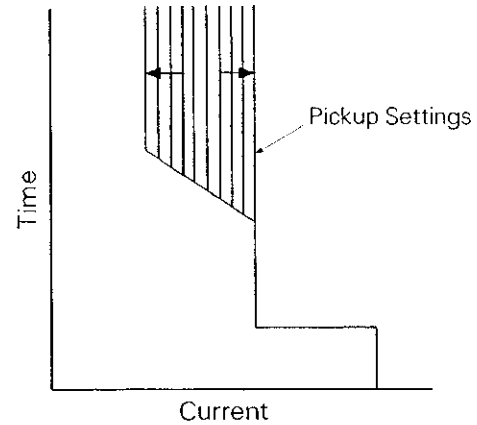


Figure 5. Time-current curve illustrating long-time pickup.

2-4 Trip Unit Settings

Selector Switches

The following selector switches are present on the front of the trip unit. Each function is described in detail below.

- Long-time pickup (standard)
- Long-time delay (standard)
- Instantaneous pickup (standard)
- Short-time pickup (optional)
- Short-time delay (optional)
- Ground-fault pickup (optional)
- Ground-fault delay (optional)

Trip unit protective functions are set with the rotary selector switches on the front of the unit. Table 5 contains a summary of the functions and the available settings.

Refer to the Appendix for detailed setting information.

Long-Time Pickup

The long-time pickup set point establishes the breaker's nominal ampere rating, C, as a multiple of the current

Long-Time Delay

The long-time delay function allows normal momentary overloads without nuisance tripping. The nominal time delays at the midpoints of the bands for 600% of the long-time current set point, C, for the four selectable bands are listed in Table 6. Figure 6 illustrates the effect of this delay on the trip time.

Band	Delay, sec
1	3
2	6
3	12
4	25

Table 6. Nominal delays for the long-time delay bands.

Protective Function	Pickup Settings	Nominal Midpoint Delay Settings	Delay Curve
Long-Time, (C)	.5, .6, .7, .8, .9, .95, 1.0 multiple of Sensor Rating (X)	3, 6, 12, 25 seconds (Bands 1, 2, 3, 4)	Fixed
Short-Time	1.5, 2, 2.5, 3, 4, 5, 7, 9 multiple of Long-Time Setting (C)	.13, .26, .42 second (Min, Int, Max)	I^2t In, I^2t Out
Adjustable Instantaneous *	1.5, 2, 3, 5, 7, 9, 10 multiple of Sensor Rating (X)	No delay	N/A
Ground-Fault	.2, .25, .3, .35, .4, .45, .5, .6 multiple of Sensor Rating (X)	.13, .26, .42 seconds (Min, Int, Max)	I^2t In, I^2t Out

* When short-time protection is provided, instantaneous is fixed at 15X.

Table 5. Summary of protective functions and setting values for each.

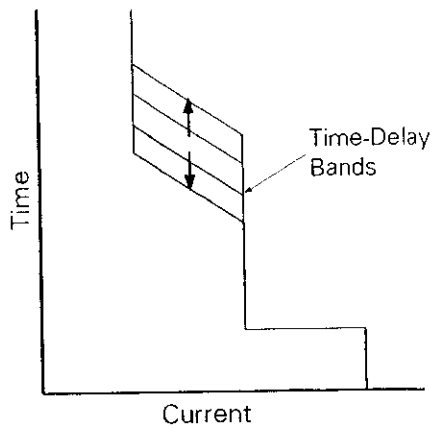


Figure 6. Time-current curve illustrating long-time delay.

Short-Time Pickup

The optional short-time pickup function establishes the current at which short-time trip is activated. Short-time pickup is coupled with long-time pickup and the choices of pickup settings are 1.5, 2, 2.5, 3, 4, 5, 7, and 9 times the long-time setting. The time-current curves for short-time pickup are illustrated in Figure 7.

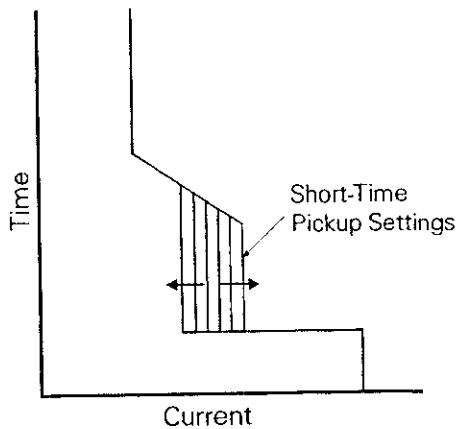


Figure 7. Time-current curve illustrating short-time pickup.

Short-Time Delay

This function delays the breaker trip when the short-time pickup function is provided. The switch settings MIN, INT, and MAX correspond to nominal midpoint time delays of .13, .26, and .42 second, respectively. The delay with I^2t IN for a current of 600% of C is 0.40 second at the lower limit of the band.

The I^2t OUT function, illustrated in Figure 8, establishes a constant time delay. I^2t IN biases the delay with a constant slope, as shown in Figure 9.

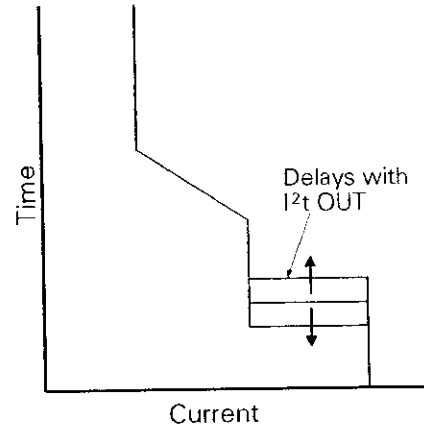


Figure 8 Time current curve illustrating short-time delay with I^2t OUT.

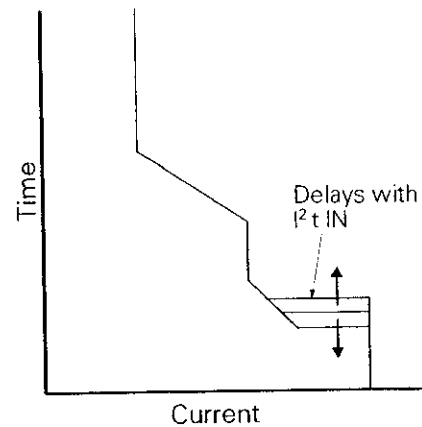


Figure 9. Time current curve illustrating short-time delay with I^2t IN.

Instantaneous Pickup

Instantaneous overcurrent protection causes the breaker to trip without any intentional delay when the chosen current setting is reached. When short-time protection is provided, instantaneous protection is fixed at 15 X. When adjustable instantaneous protection is provided (no short-time), the pickup current may be set to 1.5, 2, 3, 5, 7, 9, and 10 times the sensor rating, X.

Note the difference from short-time pickup, which is based on a multiple of the long-time pickup setting, C , while instantaneous pickup is based on the current sensor rating, X. The time-current characteristic is illustrated in Figure 10.

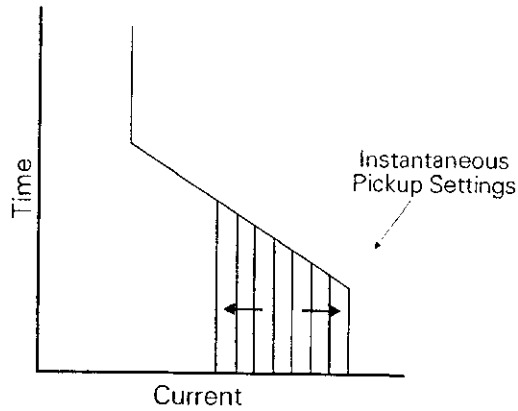


Figure 10. Time-current curve illustrating instantaneous pickup.

Ground-Fault Pickup

This function sets the pickup current for ground-fault protection. The available settings are .2, .25, .3, .35, .4, .45, .5, and .6 times the current sensor rating, X. Figure 11 illustrates the time-current curve for ground-fault pickup.

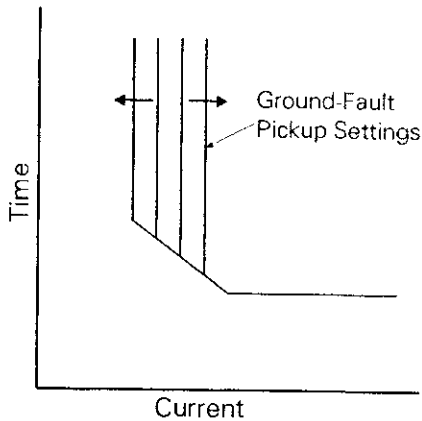


Figure 11. Time-current curve illustrating ground-fault pickup.

Ground-Fault Delay

This function sets the delay before the breaker trips when the ground-fault pickup current is detected. The switch settings MIN, INT, and MAX correspond to nominal time delays at the midpoints of the bands of .13, .26, and .42 second, respectively, at 600% of the pickup setting. The delay with I²t IN at 200% of the pickup setting is 0.40 second at the lower limit of the band.

The I²t OUT function, illustrated in Figure 12, establishes a constant time delay. I²t IN biases the delay with a constant slope, as shown in Figure 13.

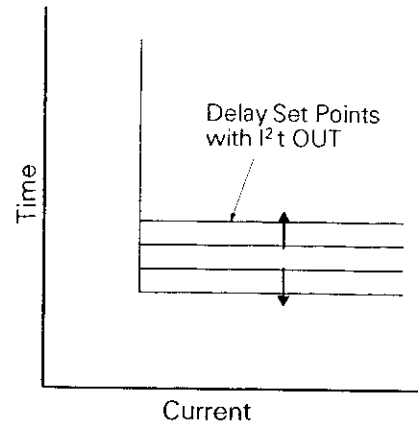


Figure 12. Time-current curve illustrating ground-fault delay with I²t OUT.

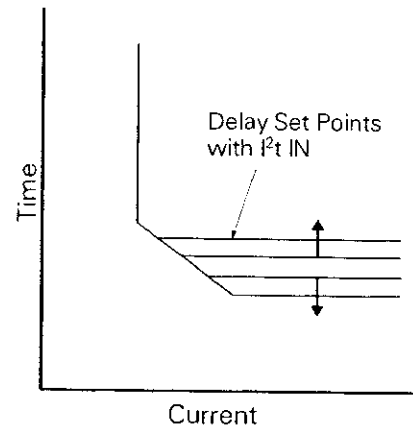


Figure 13. Time-current curve illustrating ground-fault delay with I²t IN.

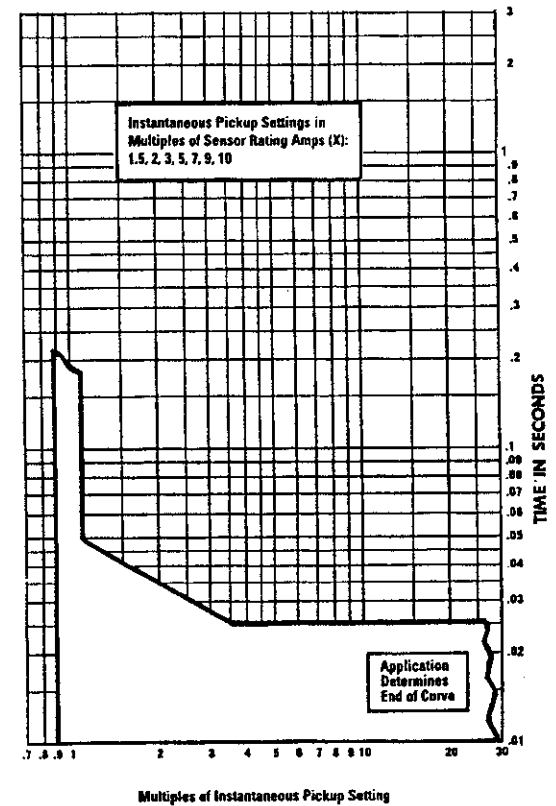
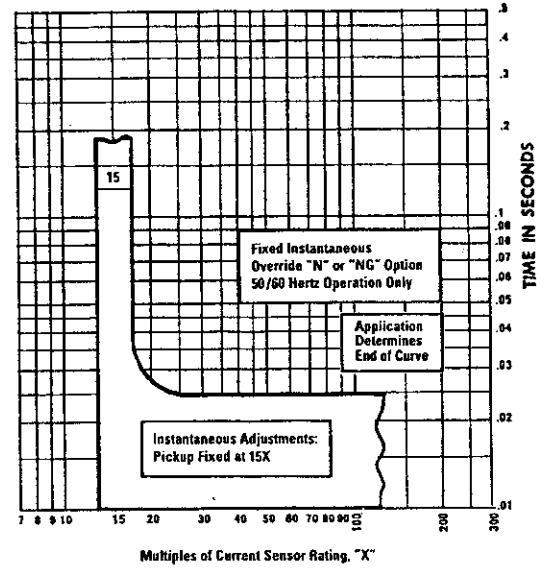
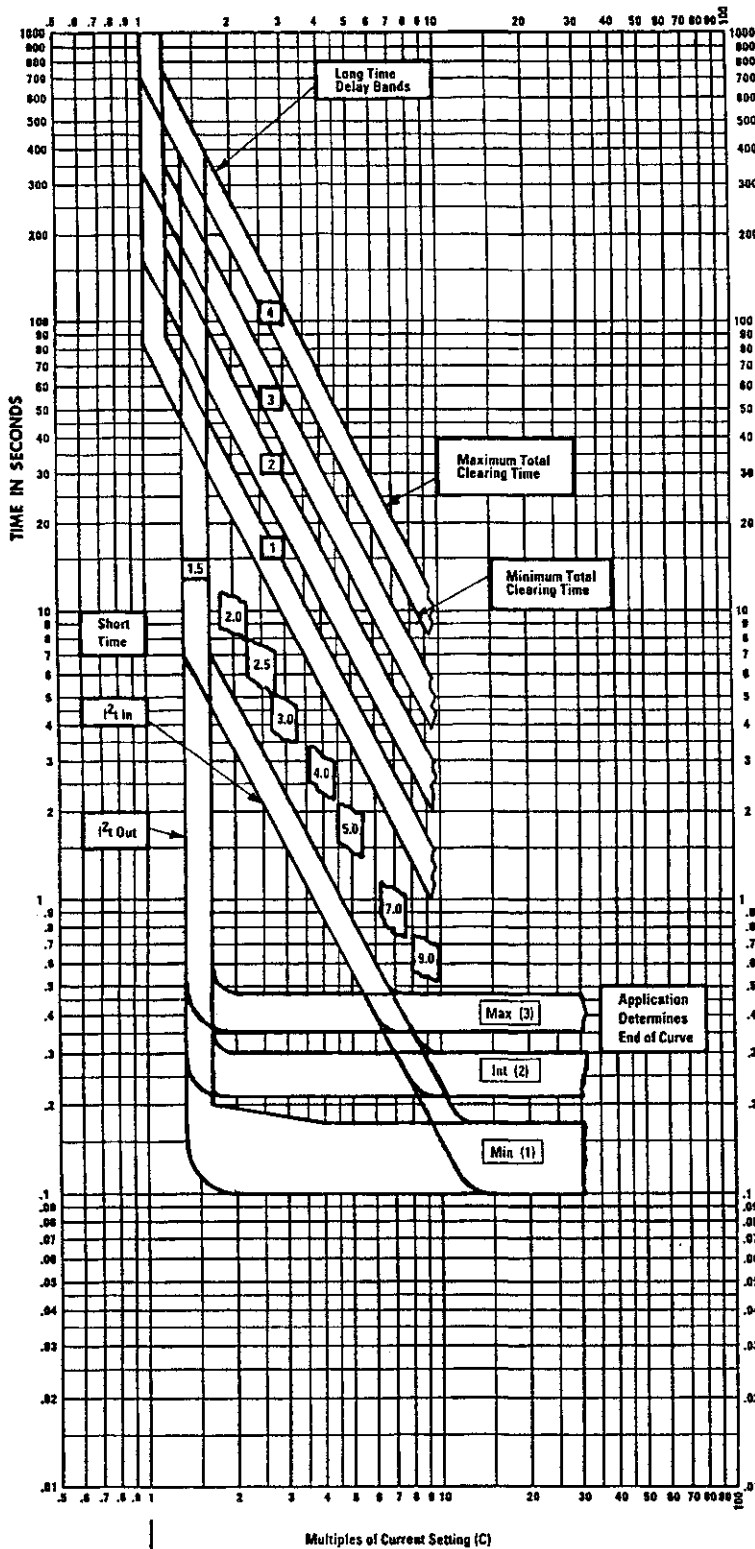
2-5 Long-Time Pickup Status

Whenever the circuit breaker is carrying at least 95% of the long-time pickup current (C), the long-time pickup light begins to blink. Above 100% of the long-time pickup current, the LED is lit continuously, indicating an imminent overload trip.

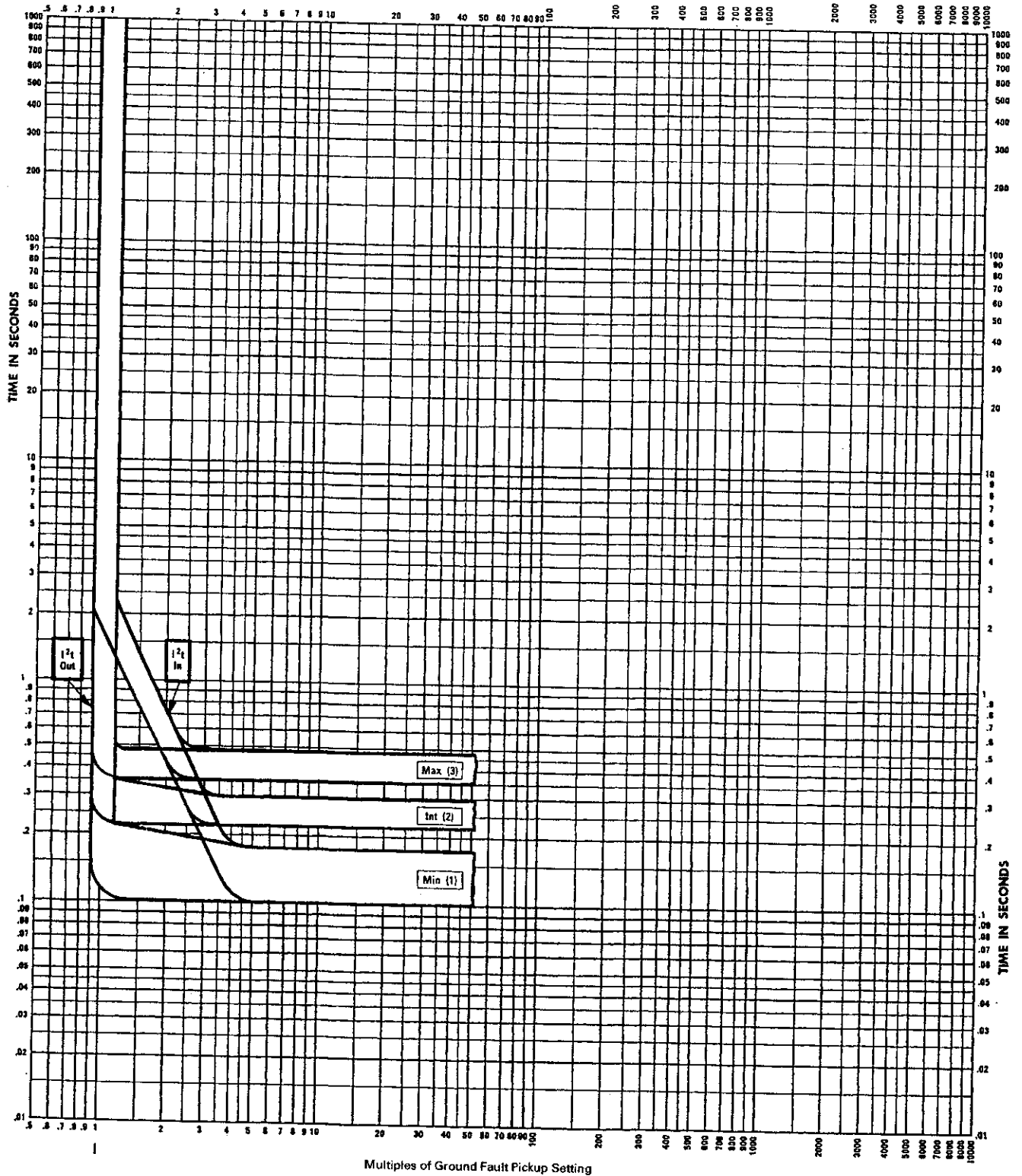
J & K Frame Molded-Case Replacement Circuit Breakers

Appendices

Appendix 1. Time-Current Curves for Long-Time, Short-Time, and Instantaneous Functions



Appendix 2. Time-Current Curve for Ground-Fault Function



Appendix 3. MicroVersaTrip® 4 and Power+™ 4 Trip Unit Settings Cross-Reference Listing

Function / dial	If MicroVersaTrip 4 was set at	Then set Power+ 4 to	Comments
Long-Time Current (C)	0.50	0.50	Depending on application
	0.60	0.60	
	0.70	0.70	
	0.80	0.80	
	0.85	0.80 or 0.90	
	0.90	0.90	
	1.00	1.00	
Long-Time Delay	Fixed Delay Band (I ² t = K = 600)	Set to 3 or 4 band (Band 3: I ² t = K = 432) (Band 4: I ² t = K = 900)	Band 3 plots immediately below the Fixed band. Band 4 plots immediately above the Fixed band.
Short-Time Pickup	1.50	1.50	
	2.00	2.00	
	2.50	2.50	
	3.00	3.00	
	4.00	4.00	
	5.00	5.00	
	7.00	7.00	
9.00	9.00		
Short-Time Delay	Fixed I ² t band (I ² t = K = 18)	Set to Min Delay band with I ² t IN (I ² t = K = 18)	
Instantaneous Pickup	1.50	1.50	* Application may dictate which setting to use
	2.00	2.00	
	2.50	2.00 or 3.00*	
	3.00	3.00	
	4.00	3.00 or 5.00*	
	6.00	5.00 or 7.00*	
	8.00	7.00 or 9.00*	
10.00	10.00		
Ground Fault Pickup	0.20	0.20	
	0.25	0.25	
	0.30	0.30	
	0.35	0.35	
	0.40	0.40	
	0.45	0.45	
	0.50	0.50	
0.60	0.60		
Ground Fault Delay	Min (1) Int (2) Max (3) with I ² t slope (I ² t = K = 2)	Min (1), I ² t IN Int (2), I ² t IN Max (3), I ² t IN (I ² t = K = 2)	



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General Electric Company
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