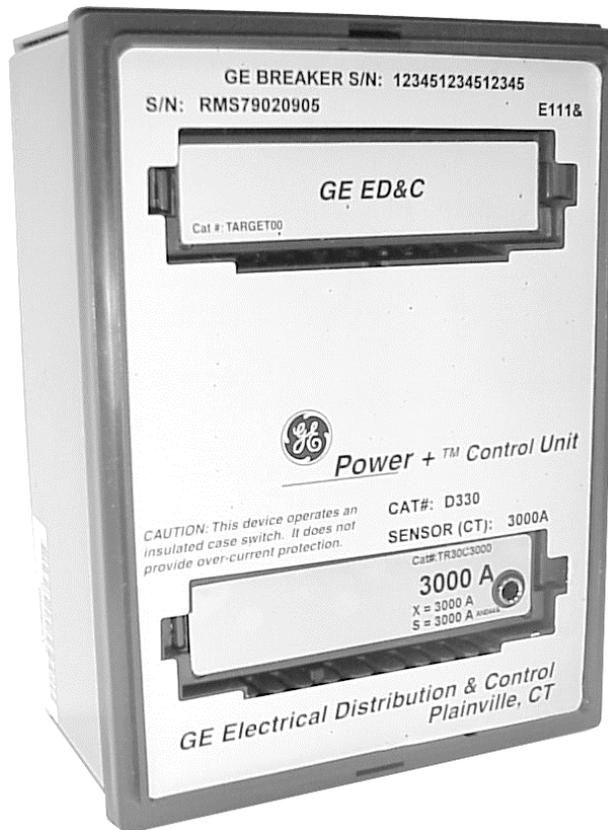




# Power+™ Control Units

for Power Break® II Insulated-Case Switches

## User's Guide



# Power+™ Control Units

## Getting Started

Since this Control Unit is available in a variety of configurations, please take a moment to compare the catalog number of your purchased Control Unit with the catalog number key below.

**Example**

**D 2 20 T2 R**

Code	Description	Function
D	Power Break II	Switch Family
2	2000 A	Maximum CT
3	3000 A	
4	4000 A	
08	800 A	Installed CT
16	1600 A	
20	2000 A	
25	2500 A	
30	3000 A	
40	4000 A	
(none)	TARGET00 (blank insert)	Target Module Installed
T2	TARGET02 (with ground fault)	
R	Replacement unit	Ordered as Replacement

Example – a Control Unit with catalog number D220T1R has the following features:

- Power Break II switch (D)
- 2000 A maximum CT (2)
- 2000 A CT installed (20)
- Target module with ground fault indication (T2)
- Control Unit was ordered as a replacement (R)

## DEH40381

### ***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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# ***Power+™ Control Units***

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## 1-1 Applications

The Power+™ Control Units described in this publication are used on Power Break® II insulated-case switches.

### 1-2 General

Power+ Control Units are the same size and have the same connectors as the Power+ trip units and the RMS9D series of MicroVersaTrip Plus™ and MicroVersaTrip PM™ trip units.

Power+ Control Units may be tested with the Control Unit installed in the switch, the rating plug installed in the Control Unit, and the switch carrying current. The Test Kit plugs into the test socket of the rating plug. The Test Kit catalog number is TVRMS2 and its operation is described in GEK-97367.

Power+ Control Units are removable from the switch. For instructions on installing and removing the Control Unit, see Chapter 4 of this guide or the appropriate switch user's guide.

**CAUTION:** Removal of a Control Unit from its switch must be performed with the switch in the OPEN or TRIPPED position. Draw-out switches should be racked out first.

**ATTENTION:** Pour retirer unité de contrôle, l'interrupteur doit être en position ouverte ou déclenchée. Les interrupteurs débrochables doivent être en position débrochée.

**CAUTION:** Do not attempt to operate the switch without its assigned Control Unit. Installation of an incorrect Control Unit may result in unsafe operation of the switch.

**ATTENTION:** Ne pas tenter d'opérer l'interrupteur sans son unité de contrôle assignée. L'installation d'une unité de contrôle incorrecte peut avoir comme conséquence une opération non sécuritaire de l'interrupteur.

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

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

## 1-3 Control Unit Functions

Power+ Control Units have specific standard and optional functions. The standard function of the Control Unit is to operate switch accessories.

The optional functions available are as follows:

- Protection
  - Ground-fault protection, with or without I<sup>2</sup>T
- Status
  - Ground-fault trip targets
  - Health monitor

## 1-4 Control Unit Catalog Numbers

A simple catalog-numbering system defines all of the standard and optional Control Unit functions. A complete catalog numbering key is found inside the front cover. Each of the segments of the catalog number is described below.

The first character indicates the switch type for which the Control Unit is configured, as listed in Table 1.

Character	Switch Type
D	Power Break II

Table 1. Switch type referred to by the first character of the Control Unit catalog number.

The second character of the catalog number indicates the highest-rated current transformer (CT) sensor allowed for that switch frame, as listed in Table 2.

Character	Maximum CT
2	2000 A
3	3000 A
4	4000 A

Table 2. Highest-rated CT allowed in the switch frame, given by the second character of the Control Unit catalog number.

The third and fourth characters of the catalog number indicate the CT that is actually installed in the switch, as listed in Table 3.

Characters	Installed CT
08	800 A
16	1600 A
20	2000 A
25	2500 A
30	3000 A
40	4000 A

Table 3. Installed CT, as indicated by the third and fourth characters of the Control Unit catalog number.

# Power+™ Control Units

## Chapter 1. Introduction

Following the protective function letters is a two-character code indicating the type of target module installed (if any), as listed in Table 4.

Suffix	Target Module Cat. No.
(none)	TARGET00 (blank)
T2	TARGET02 (with GF)

Table 4. Control Unit catalog number code indicating the Target Module installed.

Finally, if the Control Unit was ordered as a replacement, the letter “R” is appended to the catalog number.

For example, a Control Unit with catalog number D220T2R has the following functions:

- D – Control Unit for Power Break II switch
- 2 – Maximum CT rating of 2000 A
- 20 – Switch current sensor (CT) of 2000 A
- T2 – Target module with ground-fault trip indication
- R – Control Unit was ordered as a replacement

### 1–5 Rating Plugs

A rating plug, shown in Figure 1, is supplied in the switch with a rating coordinated to that of the current sensor. A rating plug must be replaced only with a unit with the identical rating.

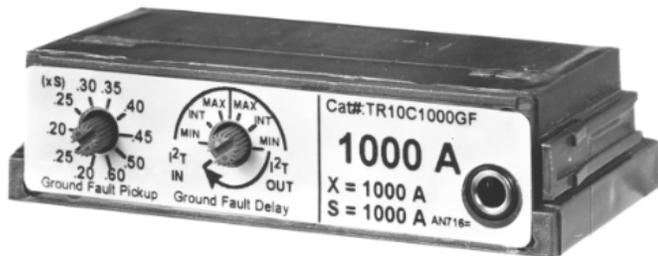


Figure 1. Power+ rating plug shown with ground-fault protection function.

### Ground-Fault Protection

Ground-fault protection with Power+ Control Units is provided as an option in the rating plug. Ground-fault protection is activated by installing a rating plug with the ground-fault option into the Control Unit. The pickup and delay settings available with the switches on the rating plug are described in Chapter 2, *Control Unit Setup*.

To order a rating plug with the ground-fault protection function, append “GF” to the catalog number of the rating plug with the desired sensor and plug rating.

**WARNING:** Rating plugs equipped with ground fault must be replaced only with other ground-fault-equipped rating plugs. Failure to do so could result in personal injury or death, as well as damage to equipment.

**AVERTISSEMENT:** Les calibreurs munis d’un détecteur de défaut de mise à la terre ne doivent être remplacés que par des calibreurs munis d’un détecteur de défaut de mise à la terre. La non application de cette directive peut entraîner des blessures ou même provoquer la mort ainsi qu’endommager l’équipement.

### 1–6 Equipment Interfaces

Power+ Control Units do not usually require connections within the equipment, since all wiring is contained within the switch. The only connection is for the neutral sensor, which uses a special dedicated disconnect.

**CAUTION:** Neutral current sensors are required for single-phase, three-wire and three-phase, four-wire systems. When the Control Unit is connected to a three-phase, three-wire system, the neutral sensor terminals of the switch 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:** Des capteurs de courant de neutre sont nécessaires pour les systèmes à phase simple, trois câbles et trois phases, quatre câbles. Lorsque l’unité de contrôle est branchée à un système trois phases, trois câbles, les terminaux de capteur de neutre de l’interrupteur sont laissés ouverts. Ne court circuiter aucun des terminaux de capteur de courant de neutre dans un système trois phases, trois câbles, car il pourrait résulter en des dommages ou un mauvais fonctionnement du système électrique.

## **1–7 Control Unit Information**

### **Control Unit Label Information**

Following are descriptions of the various numbers on the front of the Control Unit, as shown in the cover picture.

- *Top center* – Serial number of the switch in which the Control Unit is installed, such as 175033115700302.
- *Top-left corner* – Serial number of the unit, such as RMS71234567.
- *Top-right corner* – Date of manufacture code, such as E715=.
- *Right center above rating plug* – Catalog number of the Control Unit, such as D220.
- *Right center, below catalog number* – Current sensor rating in amperes.

There are two more labels on the Control Unit that are not generally visible when it is plugged into a switch.

- *Side of unit* – Bar code giving the catalog number of the Control Unit.
- *Rear of unit* – Yellow caution label.

### **Selector Switches**

The following selector switches are present on the front of the Control Unit. See Chapter 2, *Setup Mode*, for a complete description of each function.

- Ground-fault pickup (optional, on rating plug)
- Ground-fault delay (optional, on rating plug)

**2-1 Overview**

Both of the Control Unit protective functions are set with the rotary selector switches on the front of the rating plug. Table 5 contains a summary of the functions and the available settings.

**2-2 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, *S*. The maximum setting may be less than .6, depending on the switch frame size. Figure 2 illustrates the time-current curve for ground-fault pickup.

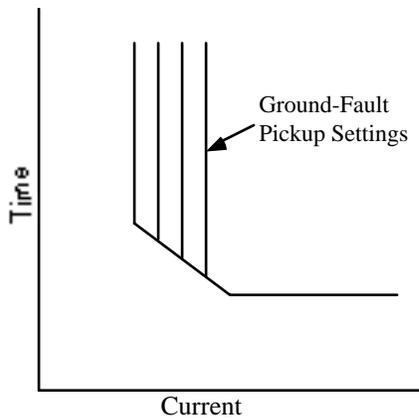


Figure 2. Time-current curve illustrating ground-fault pickup.

**2-3 Ground-Fault Delay**

This function sets the delay before the switch opens when the ground-fault pickup current is detected. The switch settings MIN, INT, and MAX correspond to nominal time delays of .10, .21, and .35 second, respectively. The delay with I<sup>2</sup>T OUT is for the lower limit of each band. The delay with I<sup>2</sup>T IN is at 200% of the pickup setting at the lower limit of the band.

The I<sup>2</sup>T OUT function, illustrated in Figure 3, establishes a constant time delay. I<sup>2</sup>T IN biases the delay with a constant slope, as shown in Figure 4.

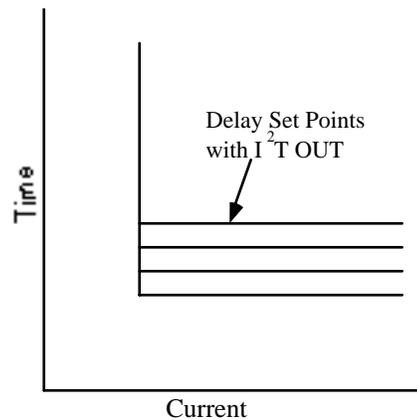


Figure 3. Time-current curve illustrating ground-fault delay with I<sup>2</sup>T OUT.

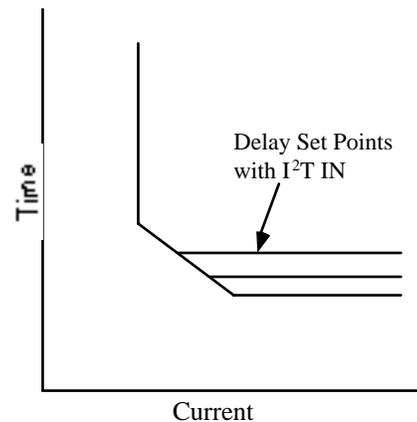


Figure 4. Time-current curve illustrating ground-fault delay with I<sup>2</sup>T IN.

Parameter	Pickup Settings	Delay Settings	Delay Curve
Ground-Fault Trip	.2, .25, .3, .35, .4, .45, .5, .6* multiple of Sensor rating (S)	.10, .21, .35 seconds (Min, Int, Max)	I <sup>2</sup> T In, I <sup>2</sup> T Out

\* Maximum setting is limited by the frame size.

Table 5. Summary of ground-fault trip settings.

### 3-1 Target Module

Control Unit status information is provided by the optional target module. This module indicates when a switch opening was caused by a ground fault, as well as whether the Control Unit is functioning properly. The target module is shown in Figure 5.

If a Control Unit is ordered without a target module, a blank insert is installed in the Control Unit slot. Catalog numbers are listed in Table 6.

**NOTE:** The target modules that include ground-fault trip indication do not provide the ground-fault protection function. If ground-fault protection is required, a ground-fault-equipped rating plug must be installed in the Control Unit.

**NOTE:** Les modules à voyants lumineux (target) qui incluent une indication de déclenchement d'un défaut de mise à la terre ne sont pas équipés d'un fonction de protection d'un défaut de mise à la terre. Si une telle fonction est requise, un calibreur mini d'une fonction de protection d'un défaut de mise à la terre doit être installé dans l'unité de contrôle.



Figure 5. Target module.

Catalog No.	Description
TARGET00	Blank insert
TARGET02	With ground fault target

Table 6. Target Module catalog numbers.

### 3-2 Functions

The front of the target module contains two push buttons and either four or five LEDs. The following functions are provided by the target module.

#### Trip Targets

To verify the condition causing a switch trip, press the VIEW button. The GF LED will light. The RESET button clears the trip target indication.

#### Battery Test

If the switch has not tripped or if the trip target has been cleared, pressing the VIEW button performs a battery test. The BAT LED will light if the batteries are okay. If the BAT LED is dim or does not light, replace the Control Unit batteries as described in Chapter 4, *Maintenance and Trouble-Shooting*. Note that the only function of the Target Module batteries is to power the LEDs; they have no effect on Control Unit operation and are not required to store targets or for ground fault functions.

#### Health Monitor

The Control Unit can be tested for proper functioning if the Control Unit is powered by one of the following sources:

- A Test Kit (catalog number TVRMS2) is plugged into the jack on the front of the Rating Plug.
- The switch is carrying a load current of at least 20% of its current sensor rating.
- External +24 Vdc control power is connected.

Press and hold the VIEW button for at least five seconds. If the Control Unit is operating properly, the LTPU LED will blink slowly. Note that if the Control Unit is not powered by one of the above sources, this test will not give a true indication of Control Unit functioning.

## Power+™ Control Units

### Chapter 4. Maintenance and Trouble-Shooting

#### 4-1 Control Unit Removal and Replacement

Rejection pins are installed on the rear of all Control Units to prevent installation of an incorrect Control Unit into a switch. Do not use excessive force when installing a Control Unit.

#### Power Break II Insulated-Case Switches

Power Break II switches are shipped from the factory with their Control Units installed. Removal is only necessary for replacement.

To remove the Control Unit, perform the following procedure:

**WARNING:** Before beginning this procedure, turn the switch OFF, disconnect it from all voltage sources, and discharge the closing springs, if they are charged, by closing and then opening the switch.

**AVERTISSEMENT:** Avant de commencer cette procédure, mettre l'interrupteur en position OFF, le déconnecter de toute tension d'alimentation, et décharger les ressorts de fermeture.

1. Loosen the four #8-32 screws on the switch trim-plate assembly, if present, and remove the trim plate.
2. Loosen the four #10-32 screws at the corner of the switch cover. Remove the cover from the switch face.
3. Pull the Control Unit locking lever to the right, then hold the Control Unit near the rating plug and lift it straight out of the switch.

To reinstall the Control Unit, perform the following procedure:

1. Pull the Control Unit locking lever to the right. While holding the lever, carefully align the connector on the rear of the Control Unit with the connector in the switch. Press down on the Control Unit while holding it near the rating plug. When the Control Unit is fully seated, slide the locking lever back to the left.
2. Reinstall the switch top cover and tighten the four #10-32 screws to 32 in-lbs.
3. Replace the trim plate, if present, and tighten the four #8-32 screws to 20 in-lbs.

#### 4-2 Rating Plug Removal and Replacement

Rating plugs are removed with a rating plug removal tool, Catalog No. TRTOOL. (Suitable equivalents are commercially available as “integrated circuit (DIP) extractors.”) Grasp the rating plug tabs with the extractor and pull the plug out as illustrated in Figure 6. Be sure to grab the tabs and not the front cover of the rating plug, or the plug may be damaged.



Figure 6. Removing the interchangeable rating plug (a Power+ Trip Unit is shown).

To install a rating plug, hold the plug between the thumb and forefinger, then push it into the Control Unit. Proper engagement is verified by a click. Rejection features are provided on all rating plugs to prevent application mismatches. Never force a rating plug into place. A rating plug must only be replaced with a unit with the identical rating.

Do not attempt to use a rating plug from a different type of Control Unit or Trip Unit in a Power+ Control Unit.

### 4-3 Target Module Removal and Replacement

A target module is removed with the rating plug removal tool, catalog number TRTOOL, also known as an integrated circuit (DIP) extractor, is required to remove the Target Module. Grasp the tabs of the module with the tool, as shown in Figure 7. Be careful to hold the tabs and not the front cover, as the Target Module could be damaged otherwise. Gently pry the Target Module out by pulling away from the Control Unit. A gentle left-right wriggling motion assists the removal. Insure that the tabs are held securely until the Target Module is completely removed.



Figure 7. Removing the target module (a Power+ Trip Unit is shown).

To install a target module, hold the module between the thumb and forefinger, then push it into the Control Unit. Proper engagement is verified by a click.

#### Target Module Battery Replacement

To replace the two batteries in the Target Module, remove the module from the Control Unit as described above. Slide the old batteries out from the battery compartment at the rear of the Target Module. It may help to pry them out with a small screwdriver blade in the cutout on top of the module. Slide the new batteries into the battery compartment. Be careful not to short out the batteries during removal or installation. Recommended replacement batteries are Panasonic CR1616, Eveready E-CR1616BP, and Duracell DC1616B.

**WARNING:** Replace the batteries with Panasonic CR1616, Eveready E-CR1616BP, or Duracell DC1616B only. Use of a different battery may present risk of fire, explosion, or damage to equipment. Observe proper battery polarity when installing in the battery compartment.

**AVERTISSEMENT:** Remplacer la batterie avec uniquement des Panasonic CR1616, Eveready E-CR1616BP, ou Duracell DC1616B. L'utilisation d'autres batteries peut présenter un risque de feu, d'explosion ou d'endommagement du matériel. Respecter la polarité de la batterie en l'installant dans son logement.

**WARNING:** The batteries may explode if mistreated. Do not recharge, disassemble, or dispose of in fire. Keep the battery away from children and dispose of the used battery promptly.

**AVERTISSEMENT:** La batterie peut exploser en cas de mauvaise utilisation. Ne pas la recharger, l'ouvrir ou la jeter dans un feu. Doit être gardé hors de portée des enfants. Une fois usée, la batterie doit être jeté rapidement.

### 4-4 Trouble-Shooting Guide

The following guide is provided for trouble-shooting and isolating common problems. It does not cover every possible condition. Contact the Customer Support Center at 800-843-3742 if the problem is not resolved by these procedures.

Symptom	Possible Cause	Corrective Action
1. The health monitor function of the optional target module does not operate.	Line current is below 20% of the switch sensor rating.	At least 20% of the current sensor rating, <i>X</i> , must be flowing through the switch to activate this function. If the load current is below this level, power the Control Unit with the Test Kit or the Portable Power Pack.
	The target module is not seated properly.	Verify that the target module is fully seated in its slot.
2. The trip indication target will not clear.	The target module batteries are low.	Replace the batteries in the target module.
3. The battery check (BAT) LED on the target module does not light.	The target module batteries are low.	Replace the batteries in the target module





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