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MicroVersaTrip Plus™ and MicroVersaTrip PM™ Trip Units

for WavePro™ Low-Voltage Power Circuit Breakers

User's Guide

Wave Pro™
Low Voltage
Power Circuit Breakers

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

Example

K 3 32 LSI GD Z1 PM R

Code	Description	Function
K	WavePro	Breaker Family
8 1 2 3 4 5	800 A 1600 A 2000 A 3200 A 4000 A 5000 A	Frame Size
01 04 08 16 20 32 40 50	150 A 400 A 800 A 1600 A 2000 A 3200 A 4000 A 5000 A	Installed CT
L S I	Long-time Short-time Instantaneous	Overcurrent Protection
G GD	Ground Fault Ground Fault (user defeatable)	Ground fault protection
Z1 Z2 X	GF Zone-Selective Interlock GF & ST Zone-Selective Interlock Switchable Inst, ST, and GF	Optional protection
P M	Protective Relays & Comm Metering & Comm	Optional features
R	Replacement unit	Ordered as Replacement

Example – a Trip Unit with catalog number K332LSIGDZ1PMR has the following features:

- WavePro circuit breaker
- 3200 A frame
- 3200 A installed CT
- Long-time, short-time, and instantaneous overcurrent protection
- Defeatable ground-fault protection
- Ground-fault zone-selective interlock
- Protective relays, metering, and communication
- Trip Unit was ordered as a replacement

DEH–178

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 exist 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 Electrical Distribution & Control assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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Chapter 1. Introduction

Chapter 2. Setup Mode

List of Figures

List of Tables

1-1 Product Desription

The MicroVersaTrip Plus™ and MicroVersaTrip PM™ Trip Units described in this publication are used on WavePro™ low-voltage power circuit breakers. A front view of the MicroVersaTrip Plus Trip Unit is shown in Figure 1.

The Trip Unit has a 50-pin rear connector that provides the Trip Unit's main connections to the circuit breaker frame and to the equipment control signals.

There is a recessed connector in the front panel to accept interchangeable current rating plugs.

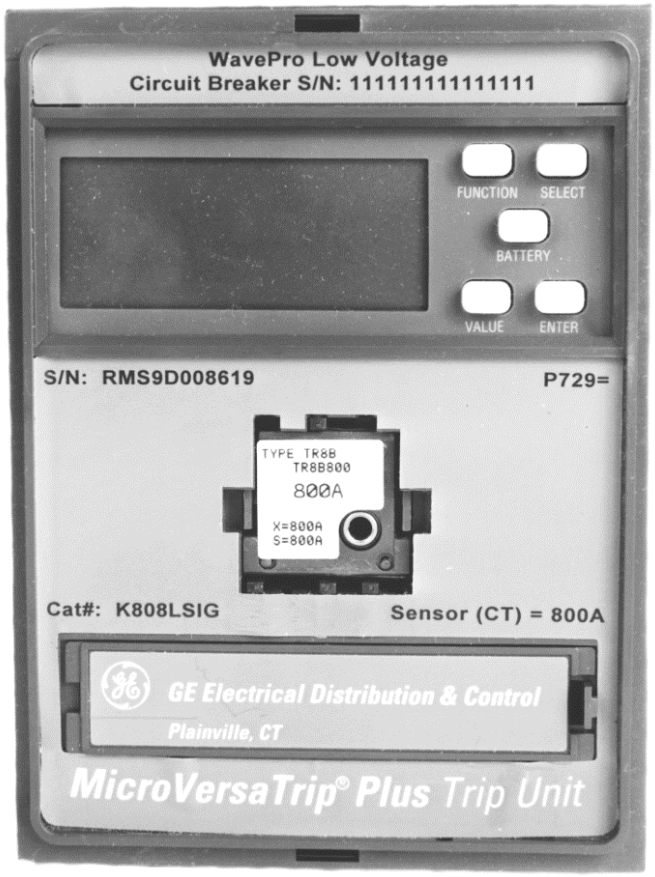

Figure 1. Front view of a MicroVersaTrip Plus Trip Unit.

CAUTION: Removal of a Trip Unit from its breaker must be performed with the breaker in the OPEN or TRIPPED position. Draw-out breakers should be racked out first.

ATTENTION: Pour retirer déclencheur, le disjoncteur doit être en position ouverte ou déclenchée. Les disjoncteurs débrochables doivent ètre en position débrochée.

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

ATTENTION: Ne pas utiliser le disjoncteur sans son déclencheur. Une mauvaise installation du déclencheur peut être dangereuse.

CAUTION: Removal of the rating plug while the breaker is carrying current reduces the breaker's current-carrying capacity to approximately 25% of the current sensor rating. This may result in undesired tripping.

ATTENTION: Si le calibreur est retiré alors que le disjoncteur est sous tension, le déclencheur se régle automatiquement à approximativement 25% du calibre du transformateur de courant. Ceci peut entrainer un déclenchement indésirable.

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.

1-2 Trip Unit Functions

MicroVersaTrip Plus and MicroVersaTrip PM Trip Units have specific standard and optional functions. All Trip Units share a series of interchangeable rating plugs. The standard functions for both types of Trip Unit are as follows:

- Protection
  - Long-time protection
  - Instantaneous protection
- Status
  - Trip target (trip type)
  - Trip information (magnitude and phase)
  - Trip operations counters
- Metering display
  - Phase current (selectable among phases)

The optional functions available on both types of Trip Unit are as follows:

- Short-time protection, with or without I^2T
- Ground-fault protection, with or without I^2T

- Defeatable ground fault, with or without I^2T
- Zone-selective interlock, with ground fault only or with both ground fault and short-time protection
- Switchable short time and instantaneous with ground fault

Additional optional functions available only with MicroVersaTrip PM Trip Units are as follows:

- Available configurations
  - Communication and metering
  - Communication, metering, and protective relaying
- Remote communication with POWER LEADER™ communications network (commnet)
- Metering functions
  - Voltage (V)
  - Energy (kWh / MWh / GWh)
  - Total real power (kW / MW)
  - Total apparent power (kVA / MVA)
  - Demand power (kW / MW)
  - Peak demand power (kW / MW)
  - Frequency (Hz)
- Protective relaying
  - Undervoltage
  - Overvoltage
  - Voltage unbalance
  - Current unbalance
  - Power reversal

NOTE: MicroVersaTrip PM style Trip Units require external +24 Vdc control power.

NOTE: Le déclencheur de type MicroVersaTrip PM necessite l'utilisation d'une alimentation extérieure 24 Vcc.

1-3 Trip Unit Catalog Numbers

A simple catalog-numbering system defines all of the standard and optional Trip Unit functions for each of the two series of Trip Units. K332LSIGDZ1R is an example of a valid catalog number.

The first character of the catalog number, K, defines the Trip Unit as configured for a WavePro circuit breaker.

The second character of the catalog number indicates the breaker frame size, as listed in Table 1.

Code	Breaker Frame Size
8	800 A
1	1600 A
2	2000 A
3	3200 A
4	4000 A
5	5000 A

Table 1. Breaker frame size referred to by the second character of the Trip Unit catalog number.

The third and fourth characters of the catalog number indicate the CT that is actually installed in the breaker, as listed in Table 2.

Code	CT Size
01	150 A
04	400 A
08	800 A
16	1600 A
20	2000 A
32	3200 A
40	4000 A
50	5000 A

Table 2. Installed breaker CT size referred to by third and fourth characters of Trip Unit catalog number.

The fifth character of the catalog number is the letter L, which indicates that all Trip Units come with long-time overcurrent protection. Additional letters are appended to the catalog number to indicate installed protective functions, as in Table 3. These suffixes are valid for both MicroVersaTrip Plus and MicroVersaTrip PM Trip Units. They are appended from left to right in the order given.

Suffix	Protective Function
S	Short-time overcurrent protection
I	Instantaneous overcurrent protection
G	Ground fault
GD	Defeatable ground fault (not UL listed)
Z1 or Z2	Zone-selective interlock: Z1 – ground fault only Z2 -– ground fault and short time
X	Switchable instantaneous/short time and ground fault (not UL listed)

Table 3. Trip Unit catalog number suffixes for optional functions.

MicroVersaTrip PM catalog numbers contain an additional one- or two-letter suffix to indicate the communication, metering, and relaying functions installed, as shown

in Table 4. MicroVersaTrip Plus catalog numbers do not have this final suffix.

Suffix	Function
(none)	MicroVersaTrip Plus Trip Unit
PM	Metering, relaying, and communication
M	Metering and communication

Table 4. MicroVersaTrip PM Trip Unit suffixes for communication, metering, and relaying.

Finally, if the Trip Unit is ordered as a replacement, an "R" suffix is appended to the catalog number.

For example, a Trip Unit with catalog number K332LSIGDZ1PMR has the following functions:

K -- Trip Unit for Wave Pro circuit breaker

3 – Frame size of 3200 A

32 – breaker current sensor (CT) of 3200 A

L -- long-time overcurrent protection

S -- short-time overcurrent protection

I -- adjustable instantaneous protection

GD -- defeatable ground-fault protection

Z1 – ground-fault zone-selective interlock

PM -- MicroVersaTrip PM with relaying, metering, and communication

R – Replacement Trip Unit

1-4 Rating Plugs

Interchangeable rating plugs are used to establish or change the current rating of the breaker. Rating plugs for MicroVersaTrip Plus or MicroVersaTrip PM Trip Units in WavePro breakers are interchangeable within the same sensor rating. A built-in rejection feature prevents the insertion of a rating plug with an incorrect sensor rating into a Trip Unit.

Rating plug catalog numbers are listed in Table 5.

Catalog Number	Sensor Rating, Amps	Plug Rating	Breaker Frame Size, Amps
TR1B60	150	60	800
TR1B80		80	
TR1B100		100	
TR1B125		125	
TR1B150		150	
TR4B150	400	150	800
TR4B200		200	
TR4B225		225	
TR4B250		250	
TR4B300		300	
TR4B400		400	
TR8B300	800	300	800 1600
TR8B400		400	
TR8B450		450	
TR8B500		500	
TR8B600		600	
TR8B700		700	
TR8B800		800	
TR16B600	1600	600	1600
TR16B800		800	
TR16B1000		1000	
TR16B1100		1100	
TR16B1200		1200	
TR16B1600		1600	
TR20B750	2000	750	2000
TR20B800		800	
TR20B1000		1000	
TR20B1200		1200	
TR20B1500		1500	
TR20B1600		1600	
TR20B2000		2000	
TR32B1200	3200	1200	3200
TR32B1600		1600	
TR32B2400		2400	
TR32B3200		3200	
TR40B1600	4000	1600	4000
TR40B2000		2000	
TR40B2500		2500	
TR40B3000		3000	
TR40B3600		3600	
TR40B4000		4000	
TR50B3200	5000	3200	5000
TR50B4000		4000	
TR50B5000		5000	

Table 5. Rating plug catalog numbers.

1-5 Equipment Interfaces

MicroVersaTrip Plus Trip Units

MicroVersaTrip Plus Trip Units do not usually require connections within the equipment, since all wiring is contained within the circuit breaker. The only two connections are for optional zone-selective interlock (Z1 and Z2) and the neutral sensor. Connections are made through the breaker's secondary disconnect A.

Zone-selective interlocking coordinates breakers, so that the downstream breaker is allowed the first opportunity to clear a disturbance. The two types of available zone-selective interlocking are Z1, which reacts only to ground faults, and Z2, which reacts to both ground faults and short-time overcurrent pickups. Separately mounted zone-selective interlock modules are required between upstream and downstream breakers.

Neutral Current Sensors

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 entrainer un mauvais fonctionnement du système électrique.

MicroVersaTrip PM Trip Units

In addition to the inputs received by MicroVersaTrip Plus Trip Units, MicroVersaTrip PM Trip Units also receive inputs from external voltage conditioners, a +24 Vdc auxiliary power supply, and communication connections. External +24 Vdc auxiliary power is required for operation.

POWER LEADER™ Communication Network

MicroVersaTrip PM Trip Units may be integrated into a Power Management Control System through the POWER LEADER™ Modbus Concentrator, which collects data from a MicroVersaTrip PM Trip Unit (a commnet device) and communicates across the RS485 network to a remote PC. Also, MicroVersaTrip PM Trip Units can be wired to a POWER LEADER Modbus Monitor through a Modbus Concentrator. The Modbus Monitor, which is mounted either in the equipment or independently, provides a central station for viewing metering and status information collected from multiple remote power management devices.

Commnet connections are made directly to wiring terminations on breaker frames. All commnet connections to the Trip Units are made through the 50-pin plug on the Trip Unit, which mates with a receptacle on the breaker frame. These additional connections are made to the equipment through the secondary disconnects of the breaker.

Voltage Inputs

Voltage inputs are sensed by conventional instrument potential transformers(PTs). PTs have 120 Vac secondaries and must always be used in groups of three; no open-delta connections are permitted. PT primaries are connected either line-to-line or line-to-neutral, as required.

PTs may be used for other monitoring functions, subject to reasonable burden limitations. Note that PTs must be connected in a specific sequence to ensure proper phase relations and power-flow sensing.

Each PT output feeds an individual voltage conditioner that scales the nominal voltage to approximately 1.76 Vac for use by the Trip Unit.

Power Requirements

A small amount of power is necessary to energize the liquid crystal display (LCD) during setup, for viewing breaker status, and for metering displays. MicroVersaTrip PM Trip Units require external +24 Vdc auxiliary power for proper operation. The four sources of such power are the following:

- *Flow of current* -- Breaker current sensors provide sufficient power to energize the LCD when at least 20% of the sensor's ampere rating is flowing.
- *+24 Vdc Auxilliary Power* – Breakers with MicroVersaTrip PM Trip Units are supplied with external +24 Vdc power that, whenever present, energizes the LCD.
- *Internal Battery Power* – The Trip Unit has an internal battery that powers the unit temporarily when the BATTERY key on the display is pressed. Battery power automatically turns off 30 seconds after the last keypad press. The battery power supply is disabled when any current is sensed through the current sensors.
- *MicroVersaTrip Portable Power Pack* -- The MicroVersaTrip Portable Power Pack contains a dc

power source and a cable. The LCD is energized when the cable is plugged into the rating plug test receptacle.

1-6 Trip Unit Information

Trip Unit Label Information

Following are descriptions of the various label information on the front of the Trip Unit, as illustrated in Figure 2.

- *Extreme top* -- circuit breaker series and serial number of the breaker, unless it is a replacement unit.
- *Upper-left center* – Trip Unit serial number, such as RMS9D008587.
- *Upper-right center* -- Trip Unit date of manufacture code, such as P729=.
- *Lower-left center* -- catalog number of the Trip Unit, such as K440LSGPM.
- *Lower-right center*-- sensor rating of the Trip Unit, such as SENSOR (CT) = 4000A.
- *Below battery cover* -- indicates whether the unit is MicroVersaTrip Plus or MicroVersaTrip PM.

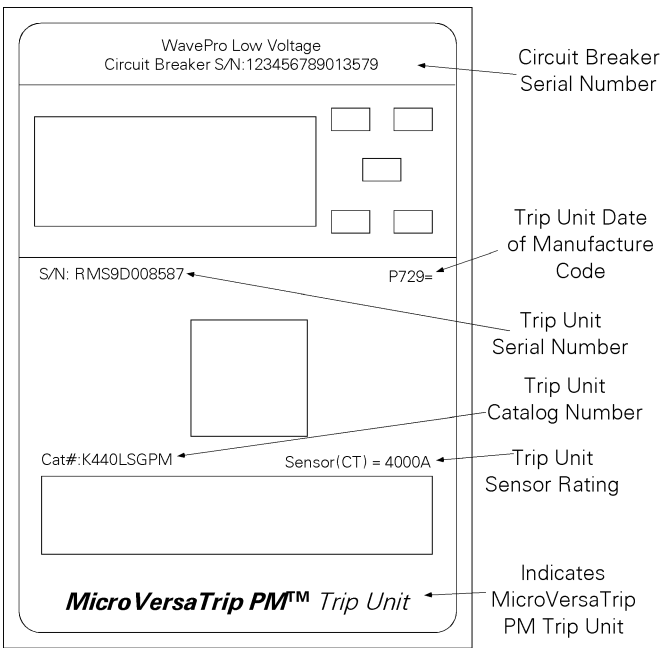

Figure 2. Label information on the front of the Trip Unit.

Function Keys

The Trip Unit has four programming keys and a battery enable key. These are marked FUNCTION, SELECT, VALUE, ENTER, and BATTERY, as illustrated in Figure 3. All setup, status, and metering functions and displays are accessed through these keys. As each set point is entered, it is stored in the Trip Unit's nonvolatile memory, so subsequent loss of power does not result in loss or change of any settings.

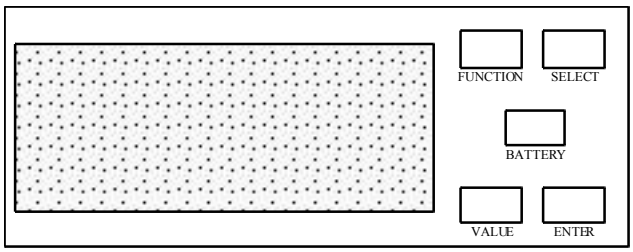

Figure 3. Function key placement on face of Trip Unit.

The functions of the five keys are

- FUNCTION -- selects the mode of display.
- SELECT -- chooses the next item for display.
- VALUE -- selects the phase-to-phase display or allows changing of set points.
- ENTER -- stores set points.
- BATTERY -- powers the Trip Unit from the internal battery.

Chapter 2 describes the operation of these keys in detail.

Battery Function

Pressing the BATTERY key on the face of the Trip Unit powers the unit from its internal battery. Battery power is maintained for 30 seconds after the last key is pressed. This self-powered mode allows setting up the Trip Unit or viewing trip targets when the breaker is de-energized and external control power is unavailable. All normal setup, meter, and status functions can be performed with battery power.

The battery is intended to power the Trip Unit when it is otherwise unpowered. At low line currents (less than 20% of the sensor rating) the Trip Unit display is not active. Pressing the BATTERY key under these conditions will not power the Trip Unit.

Note that at temperatures above 40° C, the BATTERY key may have to be held down for up to 5 seconds for the Trip Unit to be powered.

Batteries

The Trip Unit uses a lithium manganese dioxide battery with a typical life of two years in a normally energized breaker. Typical usage could include one half-hour of use for first-time cold setup, 10 Trip Unit status checks per year on a de-energized breaker, and one or two configuration changes per year.

The battery is *not* required for proper operation or protection of the breaker. It is not needed nor used to store setpoints, configurations, or trip target information. It provides a source of power to display setpoints and trip information only if no other source of power is available.

Battery Replacement

Replace the battery if it does not power up the Trip Unit or if the low-battery symbol appears in the display when the BATTERY key is pressed. Lift the right-side tab of the battery cover on the front of the Trip Unit to expose the 3.0 V lithium magnesium dioxide cell. A suitable replacement is the Duracell DL123A, which is available from industrial distributors.

WARNING: Replace the battery with Duracell DL123A only. Use of a different battery may present risk of fire, explosion, or damage to equipment. Observe proper battery polarity when installing in the Trip Unit battery compartment.

ATTENTION: Remplacer la batterie avec uniquement des Duracell DL123A. 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 battery 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.

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

Liquid Crystal Display

Figure 4 illustrates the LCD with all segments illuminated. The various segments are energized in response to conditions sensed by the Trip Unit.

1-7 MicroVersaTrip Plus and MicroVersaTrip PM Accuracies

The accuracy data in Table 6 represent the average expected performance of MicroVersaTrip Plus and MicroVersaTrip PM Trip Units. These data are valid for setup, metering, and status mode displays. They include the effects of Trip Unit ambient-temperature variation from 0° C to 70° C.

All percentages are based on full-scale values. Full-scale current is *xIn*, the rating of the breaker's rating plug. Full-scale voltage is the potential transformer primary voltage rating. These data do not include the accuracy rating of any measuring instrument.

For characteristics and accuracies of overcurrent protection, refer to DES–001 for long- time delay, short-time delay, and instantaneous time-current curves and DES–002 for ground-fault time-current curves.

Value	Full-Scale Accuracy	Resolution
Current (A, kA)	± 2%	± 0.5 digit
Voltage (V)	± 1.5%	± 0.5 digit
Energy (kWh, MWh, GWh)	± 3.5%	± 0.5 digit
Real power (kW, MW)	± 3.5%	± 0.5 digit
Total power (kVA, MVA)	± 3.5%	± 0.5 digit
Frequency (Hz)	± 1 Hz	± 1 Hz
Time delay (sec)	± 1 sec	± 1 sec

Table 6. Protective relay and metering accuracies and resolutions.

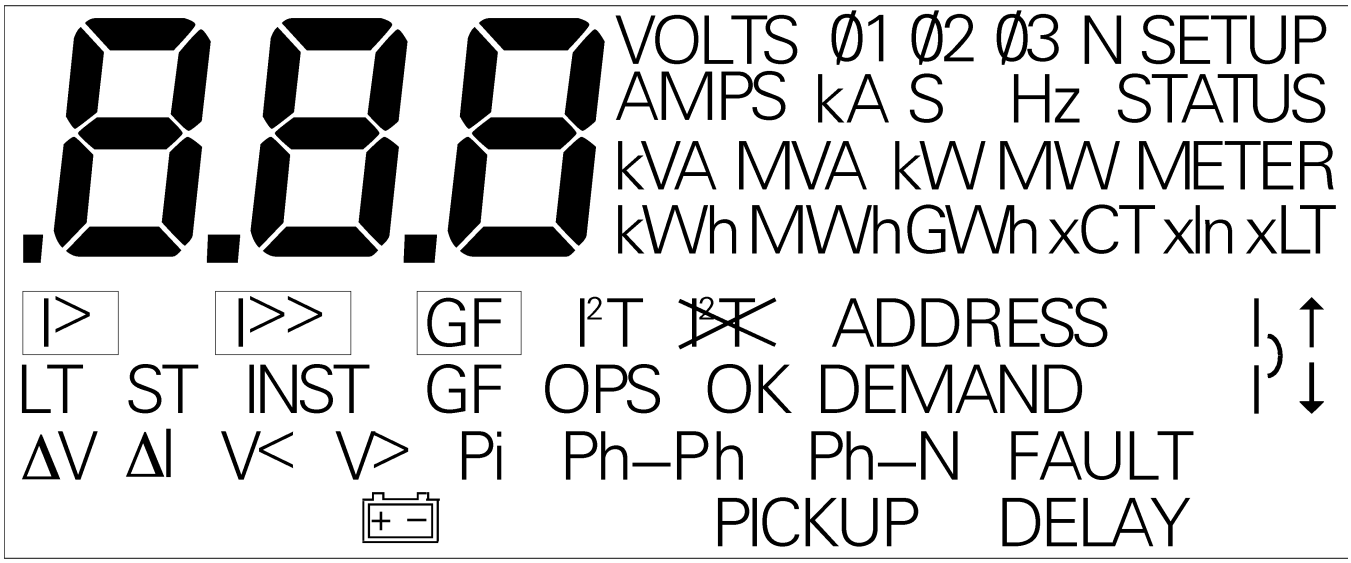

Figure 4. Liquid crystal display segments.

2-1 Overview

This chapter describes the operation of the four programming keys, set point and time-delay adjustments, and their accuracies. The setup procedures should only be repeated if the Trip Unit or the protection characteristics are changed, requiring different set points and time delays.

These procedures apply to MicroVersaTrip Plus and MicroVersaTrip PM Trip Units. Setup programming must be performed with the rating plug installed.

For Trip Units set up through the Power Management Control System, refer to instructions published for that system.

Table 7 contains a list of abbreviations used throughout the description of the setup procedures.

Abbr.	Description
xIn	Rating plug ampere rating.
xCT	Current sensor ampere rating.
xLT	Long–time (LT) current setting in amperes. Multiply LT set point by rating plug amperes. *xLT* = (LT setpoint multiplier) x (*xIn*)
F	FUNCTION key on face of Trip Unit.
S	SELECT key on face of Trip Unit.
V	VALUE key on face of Trip Unit.
E	ENTER key on face of Trip Unit.

Table 7. Abbreviations used in setup procedure descriptions.

WavePro circuit breakers are available with Power+™ as well as MicroVersaTrip Plus and MicroVersaTrip PM Trip Units. There are two different sets of abbreviations used to describe the same TripUnit settings in the documentation and on the Trip Unit labels. These abbreviations are listed in Table 8.

Trip Unit Setting	Abbreviations	
Rating Plug rating, A	xIn	X
Current Sensor rating, A	xCT	S
Current setting, A	xLT	C

Table 8. Comparison of Trip Unit settings abbreviations.

2-2 Operating Modes

MicroVersaTrip Plus and MicroVersaTrip PM Trip Units have three operating modes: Setup, Metering, and Status. The effects of each of the four programming keys in each mode are listed in Table 9.

All the programming keys, except for ENTER, automatically step the Trip Unit display to the next available option each time the key is pressed. Continued pressing of a key eventually loops the display back to the initial option for that function. This is illustrated in Figure 5 for the FUNCTION key, which shows that repeatedly pressing this key cycles the mode among Status, Metering, and Setup. Pressing the ENTER key more than once has no effect.

In Setup mode, depressing the VALUE key for about 5 seconds activates a fast scan that rapidly displays each of the available set points or time delays for some of the trip characteristics.

2-3 Setup Mode Operation

The following instructions describe setup procedures for all available Trip Unit functions. These are illustrated in Figure 6. All Trip Units provide long-time overcurrent protection, long-time delay, and some form of short-circuit protection. All other functions are optional.

If a specific set of Trip Unit functions, such as relaying or short-time overcurrent protection, has not been ordered, that function will not appear on the Trip Unit display. Ignore setup mode instructions for such functions.

The Trip Unit must be provided with auxiliary power during setup. This can come from internal battery power, from a MicroVersaTrip Portable Power Pack, or from an external +24 Vdc power supply.

To begin the process, press the FUNCTION key until SETUP appears in the upper-right corner of the Trip Unit display. Setup mode always begins with long-time pickup. After a choice has been made for this and each subsequent trip function, press SELECT to advance to the next function.

		Trip Unit Operating Mode		
Key	**Symbol**	**Setup**	**Metering**	**Status**
FUNCTION	F	Select one of three modes: Setup, Metering, Status		
SELECT	S	Select next programming display	Select next metering display	Select next status display
VALUE	V	Display next set point or time-delay value	Display next phase value	No effect
ENTER	E	Store set point or time-delay value into memory	No effect	No effect

Table 9. Actions of function keys in Trip Unit operating modes.

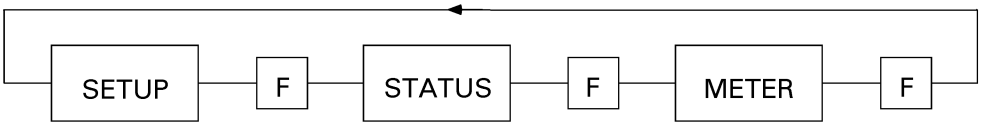

Figure 5. Operation of FUNCTION key, showing progression among Trip Unit operating modes.

Set points are entered into memory in three steps: display, select, and activate, as described below:

1. Press the VALUE key until the desired set point is displayed flashing on the LCD.
2. Press the ENTER key to select this set point. The displayed value stops flashing and the SETUP icon flashes on the LCD. This indicates that the value has been stored in memory but is not yet active. If a new set point is displayed but not selected by pressing the ENTER key (set point value still flashing), then the displayed set point is not entered into memory and the original value is maintained. Multiple set point changes can be made in this fashion without changing the active settings. For each of these changes, the SETUP icon continues to flash.
3. Press the FUNCTION key to activate these settings in the Trip Unit. The SETUP icon no longer flashes, which indicates that any selected settings are also currently active. The FUNCTION key should always be pressed following set point changes to ensure that the active settings match the stored settings.

The set point change steps are summarized as follows:

- Display set point – Press the VALUE key until the desired setting is flashing.
- Select set point – Press the ENTER key; the setting stops flashing and the SETUP icon starts flashing.
- Activate set points – Press the FUNCTION key to activate the settings; the SETUP icon stops flashing.

Always confirm settings on the Trip Unit after making changes by exiting and re-entering Setup mode and rechecking each changed setting.

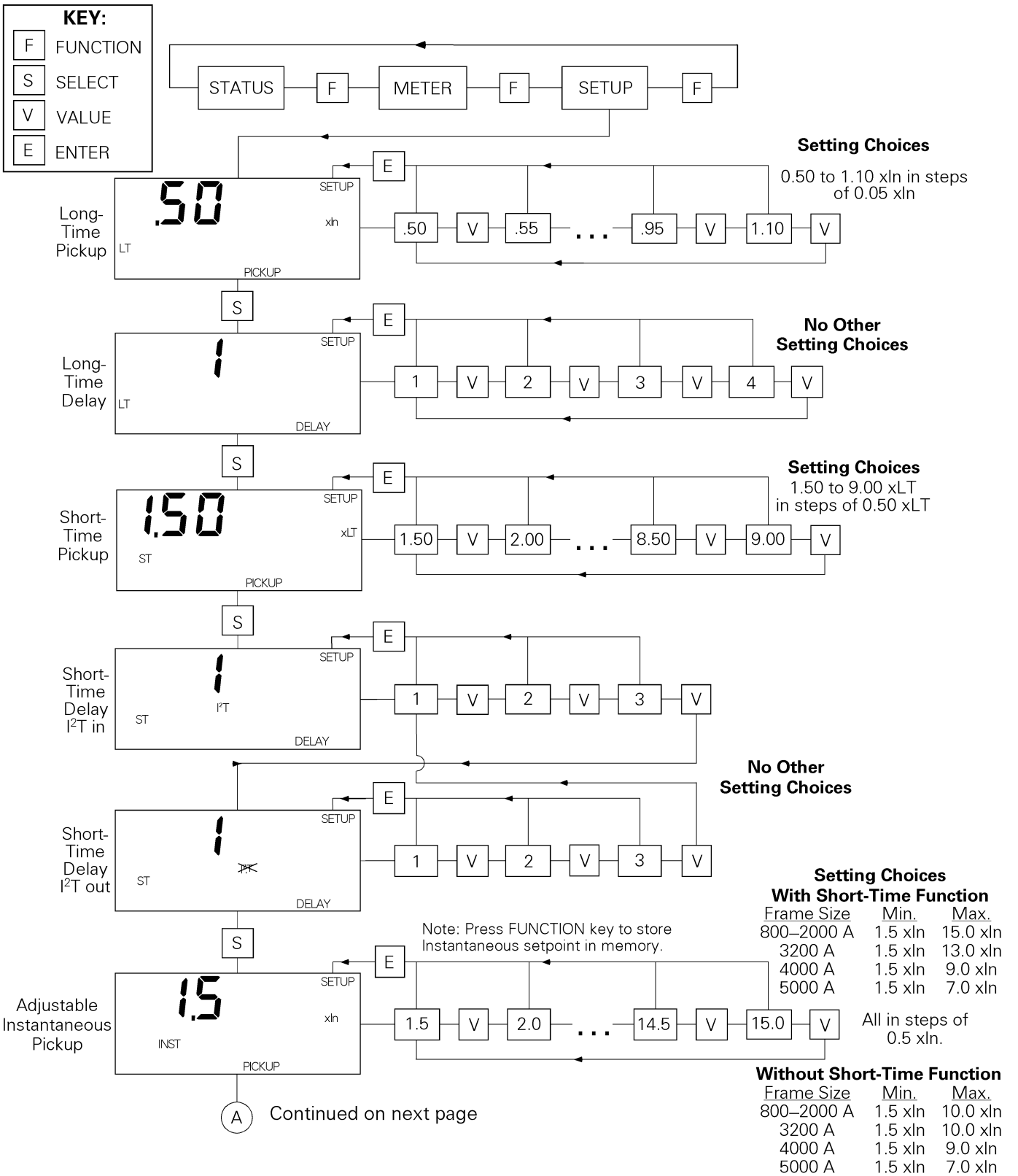

Figure 6. Trip Unit setup mode programming function flow.

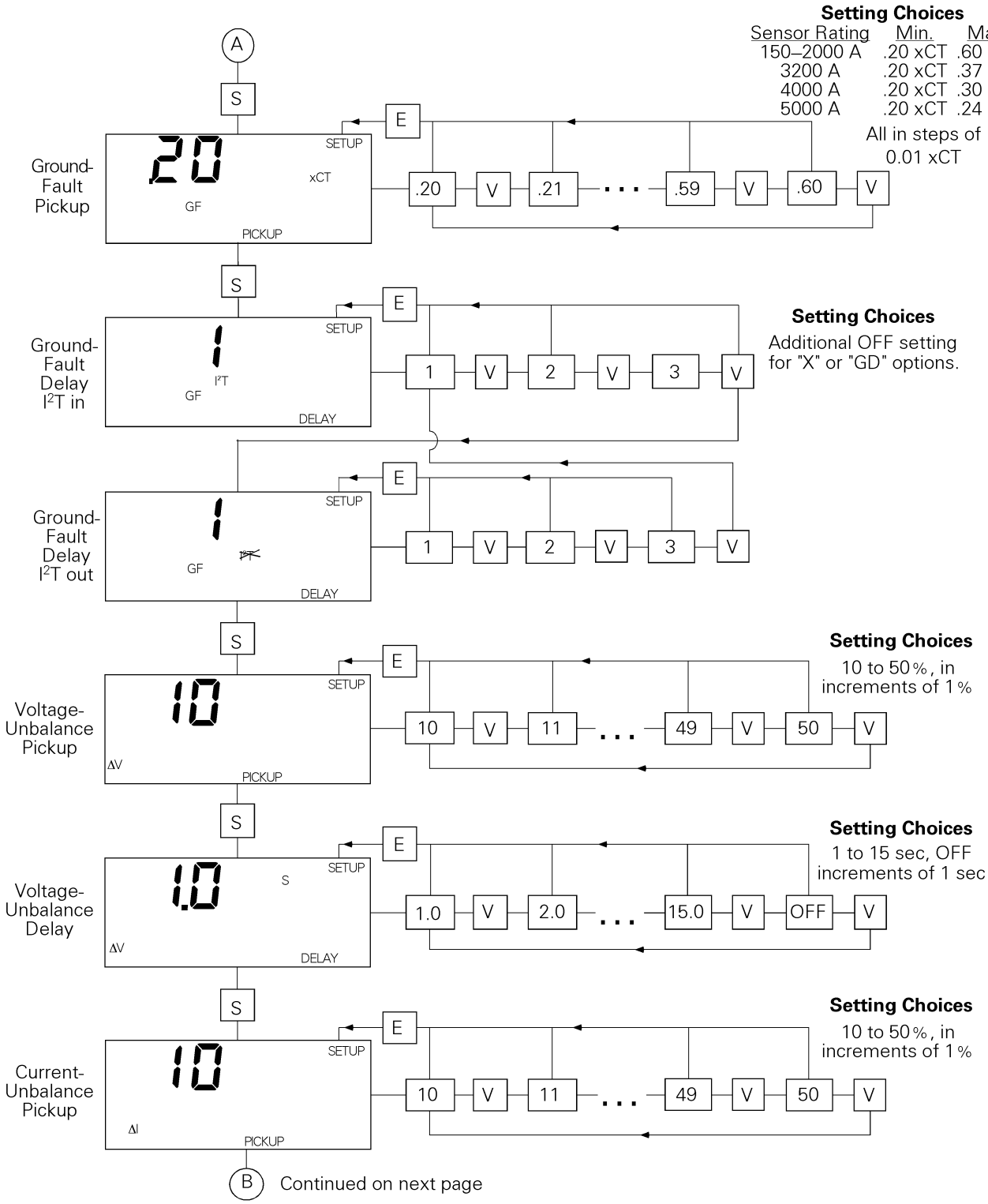

Figure 6. Trip Unit setup mode programming function flow (continued).

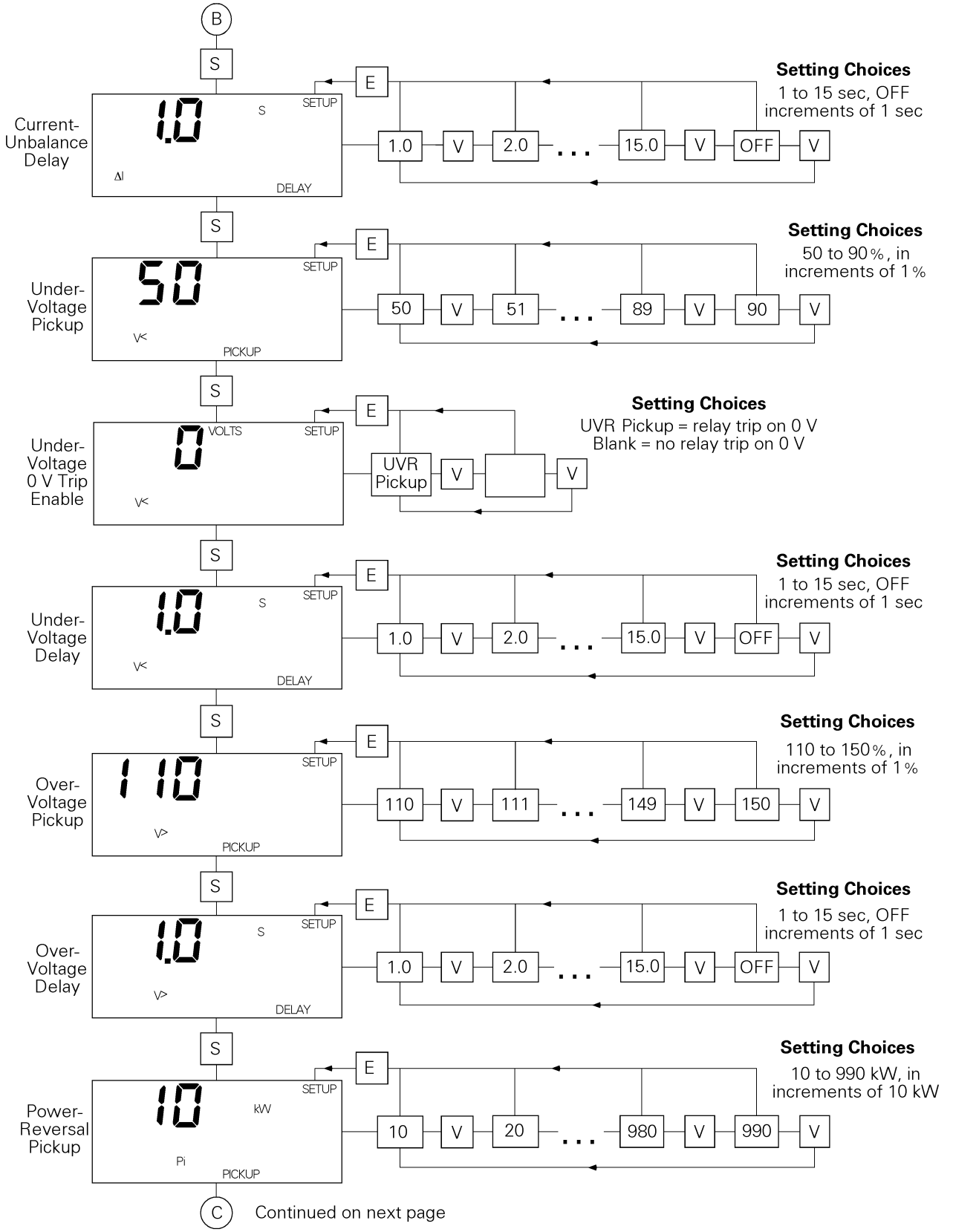

Figure 6. Trip Unit setup mode programming function flow (continued).

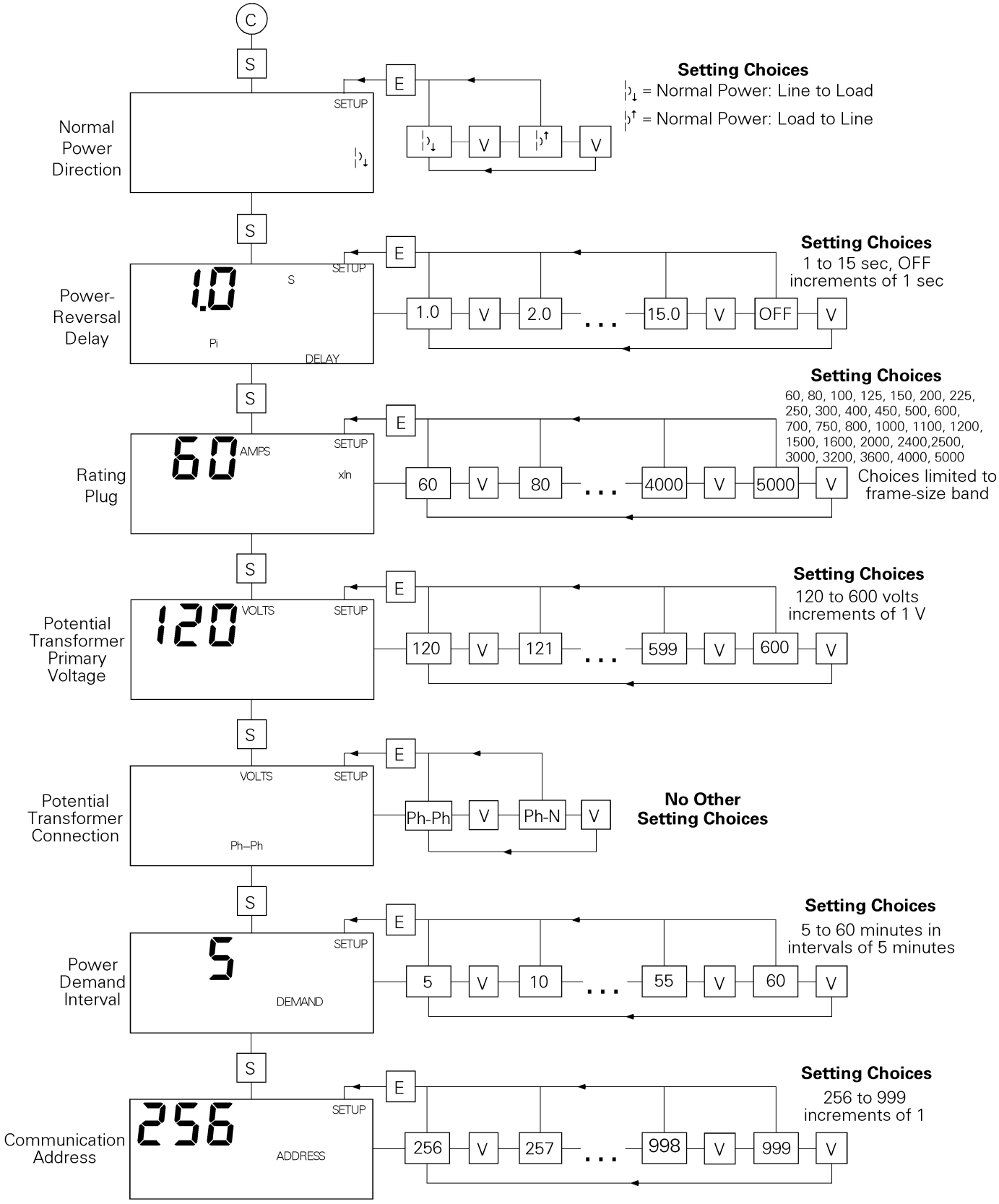

Figure 6. Trip Unit setup mode programming function flow (continued).

Long-Time Pickup

The first setup-mode display is always the long-time pickup setpoint, as illustrated in Figure 7. This set point establishes the breaker's nominal ampere rating, *xLT*, as a fraction of the rating plug value, *xIn* (*xLT* = LT multiplier x *xIn*). Press the VALUE key to scroll through the available choices. Press ENTER to store the desired set point.

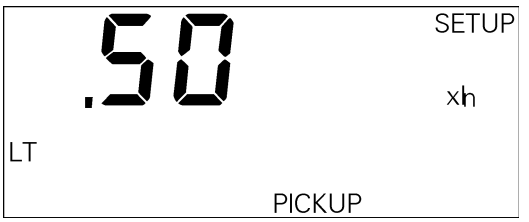

Figure 7. Trip Unit display for long-time pickup.

The choices are 0.50 to 1.10 times *xIn*, in steps of 0.05. The pickup value is defined for –10% to +10% of the set point.

Figure 8 illustrates the long-time pickup settings.

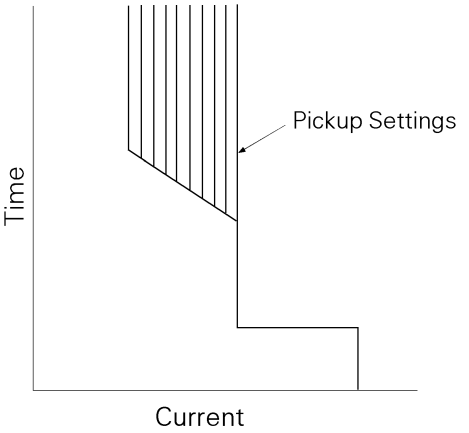

Figure 8. Time-current curve illustrating long-time pickup.

Long-Time Delay

The Trip Unit display for long-time delay is illustrated in Figure 9. This function allows normal momentary overloads without nuisance tripping. The time delays at the lower limit of the bands at 600% of the long-time current setting, *xLT*, are listed in Table 10. Figure 10 illustrates the effect of this delay on trip time. Press the VALUE key to cycle through the four choices of time-delay bands. Press ENTER to store the desired value.

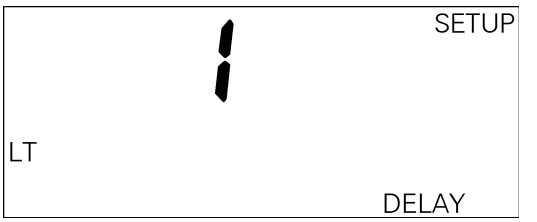

Figure 9. Trip Unit display for long-time delay.

Band	Delay, sec
1	2.4
2	4.9
3	9.8
4	20

Table 10. Lower-limit delays for long-time delay bands.

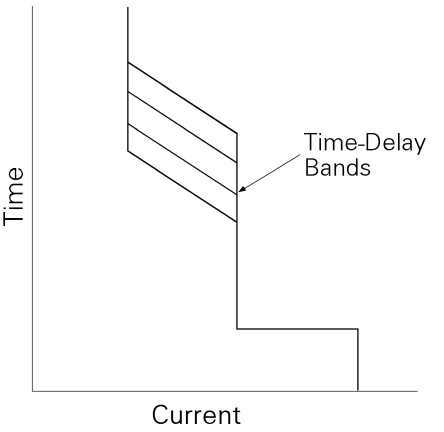

Figure 10. Time-current curve illustrating long-time delay.

Short-Time Pickup

The 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 from 1.5 to 9.0 times the long-time setting, *xLT*, in steps of 0.5 *xLT*. The Trip Unit display is illustrated in Figure 11. The time-current curve for short-time pickup is shown in Figure 12.

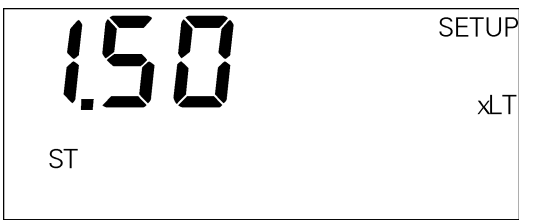

Figure 11. Trip Unit display for short-time pickup coupled with long-time pickup.

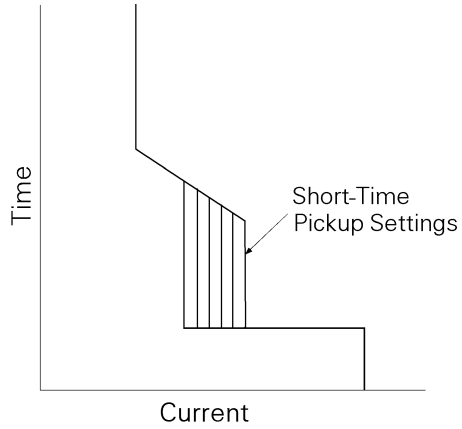

Figure 12. Time-current curve illustrating short-time pickup.

Short-Time Delay

The Trip Unit display for short-time delay is shown in Figure 13. This function delays the breaker trip on a short-time trip. The choices of time-delay bands are listed in Table 11. The delay with I^2T IN is for a current of 600% of *xLT* at the lower limit of the band. The delay with I^2T OUT is for the lower limit of each band.

On ANSI Trip Units ordered with the user-selectable, switchable instantaneous overcurrent and ground-fault option, "X," an additional value of OFF appears at the end of the delay band settings. Choosing OFF disables short-time protection. The short-time OFF band is interlocked with instantaneous pickup, so that only one function can be turned off at a time.

The I^2T OUT function, illustrated in Figure 14, establishes a constant time delay. I^2T IN biases the delay with a constant slope, as shown in Figure 15.

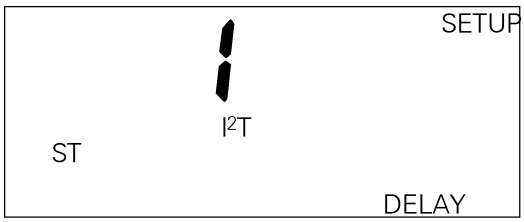

Figure 13. Trip Unit display for short-time delay.

Band	Time Delays, sec
1	0.10
2	0.21
3	0.35

Table 11. Lower-limit delays for I^2T OUT short-time delay bands.

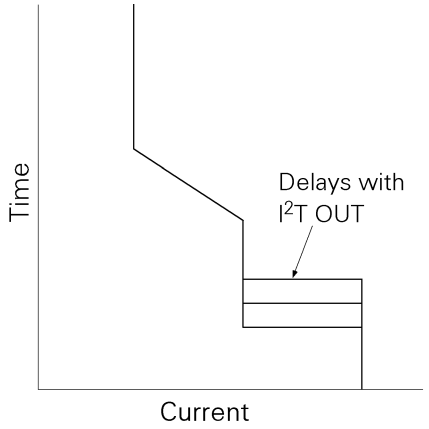

Figure 14. Time-current curve for short-time delay with I^2T OUT.

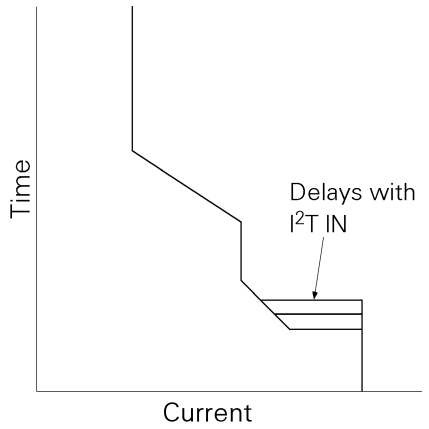

Figure 15. Time-current curve for short-time delay with I^2T IN.

Instantaneous Pickup

Instantaneous overcurrent protection, with Trip Unit display illustrated in Figure 16, causes an immediate breaker trip when the chosen current level is reached. The pickup value may be set in steps of 0.5 *xIn* from 1.5 *xIn* to a maximum dependent on the frame size and the presence of the short-time function, as listed in Table 12.

Note the difference from short-time pickup, which is based on a multiple of *xLT*. The time-current characteristic is shown in Figure 17.

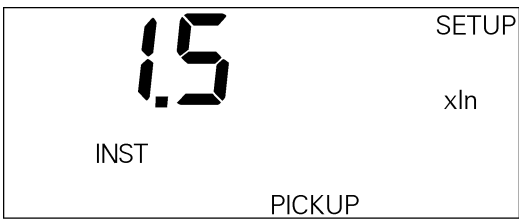

Figure 16. Trip Unit display for instantaneous pickup.

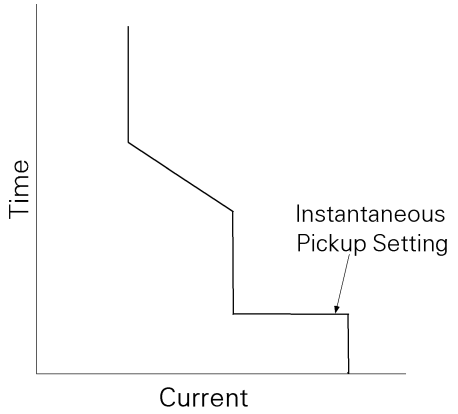

Figure 17. Instantaneous overcurrent protection set point.

Frame Max. Amp Rating	Setpoints Without ST	Setpoints With ST
2000	1.5–10.0 *xIn*	1.5–15.0 *xIn*
3200	1.5–10.0 *xIn*	1.5–13.0 *xIn*
4000	1.5–9.0 *xIn*	1.5–9.0 *xIn*
5000	1.5–7.0 *xIn*	1.5–7.0 *xIn*

Table 12. Instantaneous pickup settings for various frame sizes with and without the short-time function.

On Trip Units with the user-selectable switchable instantaneous overcurrent and ground-fault option, X, an additional value of OFF appears at the end of the listing of numerical values. Choose this setting to disable instantaneous protection. The instantaneous OFF selection is interlocked with short-time pickup, so that only one function can be turned off at a time.

Ground-Fault Pickup

The trip unit display for ground-fault pickup is shown in Figure 18. This function sets the pickup current for ground-fault protection. The available settings are listed in Table 13 as multiples of *xCT* the current sensor rating, in steps of 0.01 *xCT*. The maximum value is limited to 1200 A. Figure 19 illustrates the time-current curve for ground-fault pickup.

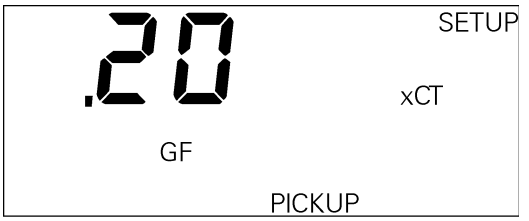

Figure 18. Trip Unit display for ground-fault pickup.

Sensor, A	Set Points
150–2000	0.20–0.60
3200	0.20–0.37
4000	0.20–0.30
5000	0.20–0.24

Table 13. Ground-fault pickup settings, as a function of sensor rating.

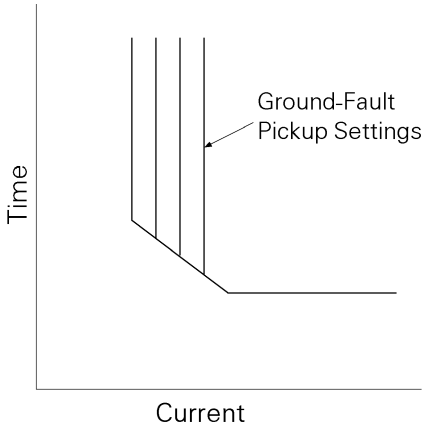

Figure 19. Time-current curve for ground-fault pickup.

Ground-Fault Delay

This function sets the delay before the breaker trips when the ground-fault pickup current has been detected. The Trip Unit display is shown in Figure 20. The choices are listed in Table 14. The delay for I^2T OUT is at the lower limit of each band. The delay for I^2T IN is at 200% of the pickup setting at the lower limit of the band.

The I^2T OUT function establishes a constant time delay, as shown in Figure 21. I^2T IN biases the delay with a constant slope, as shown in Figure 22.

With the X or GD options (switchable or defeatable ground fault), an OFF selection appears as an additional time-delay set point. Selecting OFF disables ground-fault protection.

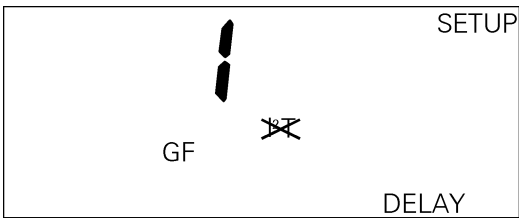

Figure 20. Trip Unit display for ground-fault delay, showing I^2T out.

Band	Time Delay, sec
OFF	Disabled
1	0.10
2	0.21
3	0.35

Table 14. Lower-limit delays for ground-fault delay bands.

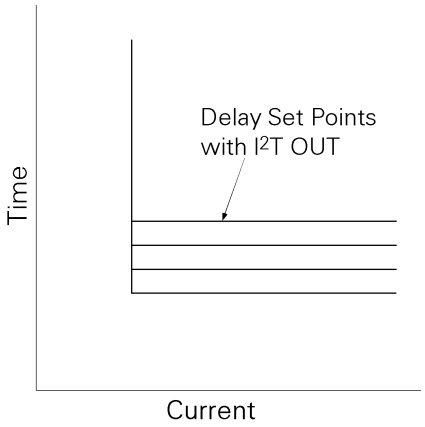

Figure 21. Time-current curve for ground-fault delay with I^2T OUT.

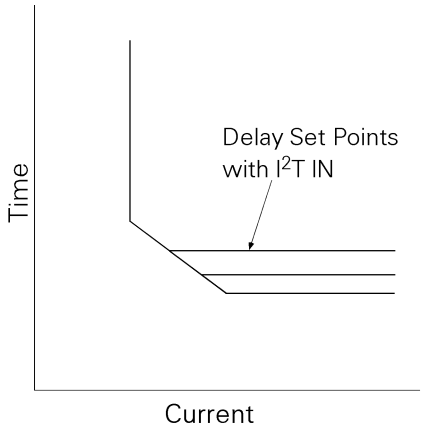

Figure 22. Time-current curve for ground-fault delay with I^2T IN.

Voltage-Unbalance Relay Pickup

This function compares the highest or lowest phase voltage with the average of all three phases and initiates a trip if the difference exceeds the set point. The true rms voltage is computed for each phase. The range of set points is from 10 to 50% of the unbalance, with an increment of 1%. The Trip Unit display is shown in Figure 23.

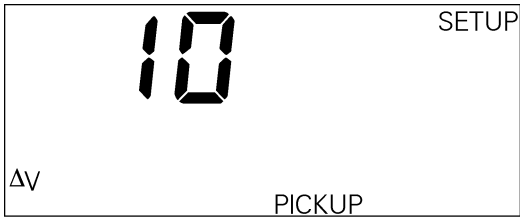

Figure 23. Trip Unit display for voltage-unbalance relay pickup.

Voltage-Unbalance Relay Delay

This function sets the delay time before a voltage-unbalance trip occurs. The range of delays is 1 to 15 seconds, in steps of 1 second. Choosing OFF disables voltage-unbalance protection. The Trip Unit display is shown in Figure 24.

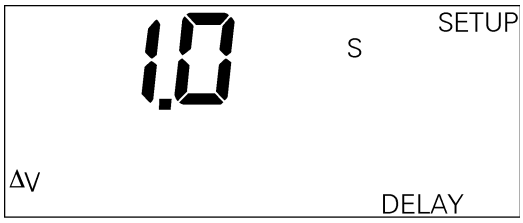

Figure 24. Trip Unit display for voltage-unbalance relay delay.

Current-Unbalance Relay Pickup

This function compares the true RMS current in the highest or lowest phase with the average of all three phases and initiates a trip if the difference exceeds the set point. The range of set points is 10 to 50% of the unbalance, with an increment of 1%. The Trip Unit display is shown in Figure 25.

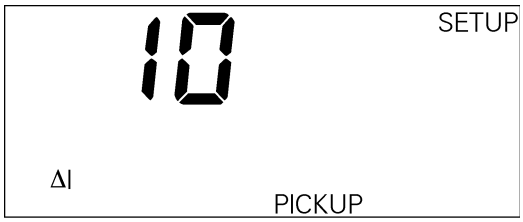

Figure 25. Trip Unit display for current-unbalance relay pickup.

Current-Unbalance Relay Delay

This function sets the delay time before a current-unbalance trip occurs. The range of delays is 1 to 15 seconds, in steps of 1 second. Choosing OFF disables current-unbalance protection. The Trip Unit display is shown in Figure 26.

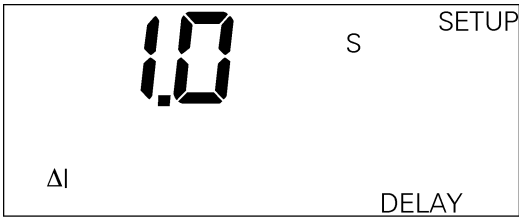

Figure 26. Trip Unit display for current-unbalance relay delay.

Undervoltage Relay Pickup

This function measures the true rms voltage in all phases and initiates a trip if any phase voltage drops below the set point. The range of set points is 50 to 90% of the nominal voltage, with an increment of 1%. The Trip Unit display is shown in Figure 27.

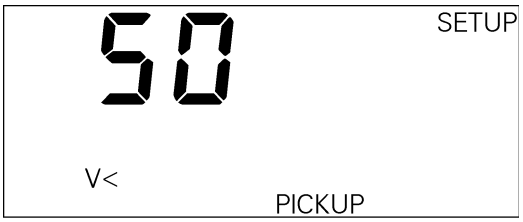

Figure 27. Trip Unit display for undervoltage relay pickup.

Undervoltage Relay Zero-Volt Trip Enable

This function determines if the relay trips when all three phase voltages drop to zero volts. The Trip Unit display for zero-volt trip disabled is shown in Figure 28. The Trip Unit display for zero-volt trip enabled is shown in Figure 29.

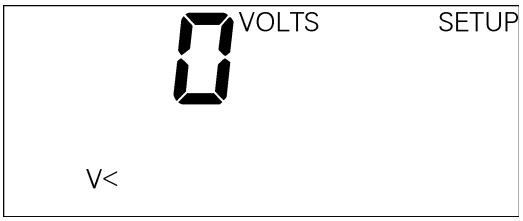

Figure 28. Trip Unit display for undervoltage relay zero-volt trip disabled.

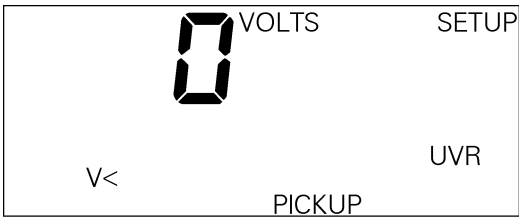

Figure 29. Trip Unit display for undervoltage relay zero-volt trip enabled.

Undervoltage Relay Delay

This function sets the delay time before an undervoltage trip occurs. The range of delays is 1 to 15 seconds, in steps of 1 second. Choosing OFF disables undervoltage protection. The Trip Unit display is shown in Figure 30.

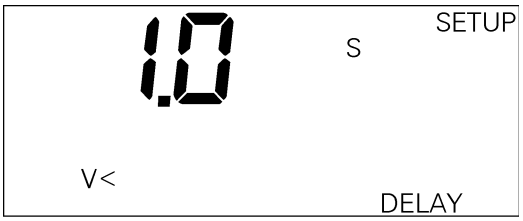

Figure 30. Trip Unit display for undervoltage relay delay.

Overvoltage Relay Pickup

This function measures the true rms voltage in all phases and initiates a trip if any phase voltage exceeds the set point. The range of set points is 110 to 150% of the nominal voltage, with an increment of 1%. The Trip Unit display is shown in Figure 31.

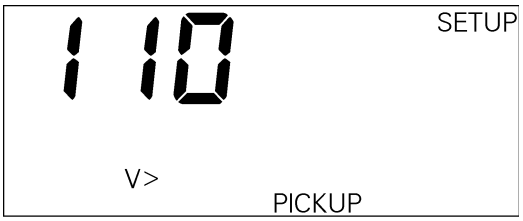

Figure 31. Trip Unit display for overvoltage relay pickup.

Overvoltage Relay Delay

This function sets the delay time before an overvoltage trip occurs. The range of delays is 1 to 15 seconds, in steps of 1 second. Choosing OFF disables overvoltage protection. The Trip Unit display is shown in Figure 32.

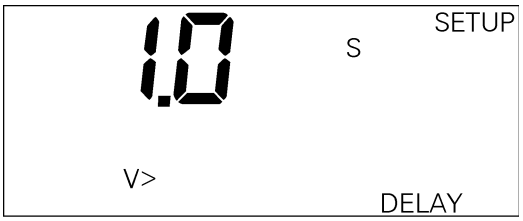

Figure 32. Trip Unit display for overvoltage relay delay.

Power-Reversal Relay Pickup

This function measures the direction of power flow through the breaker and initiates a trip if a sufficient magnitude of reverse power is detected. The range of set

points is 10 kW to 990 kW, in steps of 10 kW. The Trip Unit display is shown in Figure 33.

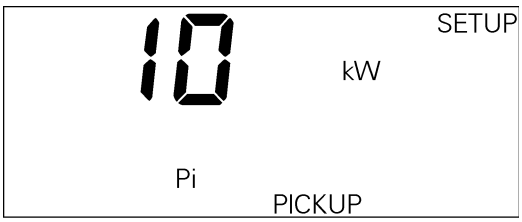

Figure 33. Trip Unit display for power-reversal relay pickup.

Power Direction Setup

This function selects the normal power flow direction for the breaker, either from line to load or from load to line. Figure 34 shows the setup display for normal power flow of line to load. This direction setup also affects the sign of the normal power metering displays.

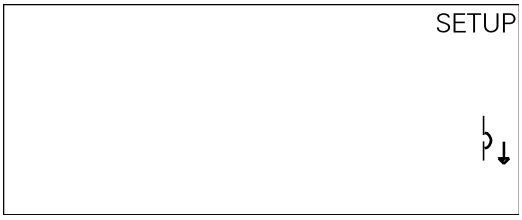

Figure 34. Trip Unit display for power direction setup, showing line to load.

Power-Reversal Relay Delay

This function sets the delay time before a power-reversal trip occurs. The range of delays is 1 to 15 seconds, in steps of 1 second. Choosing OFF disables power-reversal protection. The Trip Unit display is shown in Figure 35.

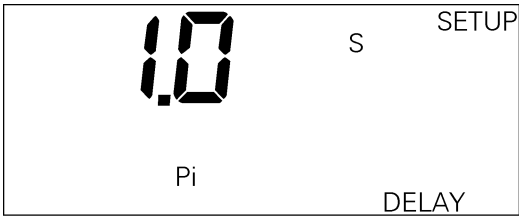

Figure 35. Trip Unit display for power-reversal relay delay.

Rating Plug Current Setting

The Trip Unit display for rating plug setting is shown in Figure 36. Enter the current setting of the rating plug by scrolling through the list with VALUE and pressing ENTER when the correct value is reached. Table 15 lists the available rating plugs for the various Trip Units.

CAUTION: Incorrect storage of this set point will result in incorrect metering values.

ATTENTION: Si une valeur incorrecte est enregistrée pour ce réglage, les mesures seront fausses.

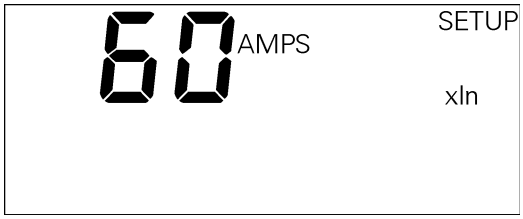

Figure 36. Trip Unit display for rating plug current set point.

Breaker Frame Size, A	Rating Plug Options, Amps
800–2000	60, 80, 100, 125, 150, 200, 225, 250, 300, 400, 450, 500, 600, 700, 750, 800, 1000, 1100, 1200, 1500, 1600, 2000
3200	1200, 1600, 2400, 3200
4000	1600, 2000, 2500, 3000, 3600, 4000
5000	3200, 4000, 5000

Table 15. Trip Unit rating plug options.

Potential Transformer Primary Voltage

Enter the primary voltage rating of the potential transformer, as illustrated in Figure 37. The range of values is 120 to 600 volts, with an increment of 1 volt.

CAUTION: Incorrect storage of this set point will result in incorrect metering values. Even if this setting is entered remotely, it must be entered again locally.

ATTENTION: Si une valeur incorrecte est enregistrée pour ce réglage, les mesures seront fausses. Cette valeur doit être enregistrée localement même dans le cas d'une utilisation à distance avec commnet.

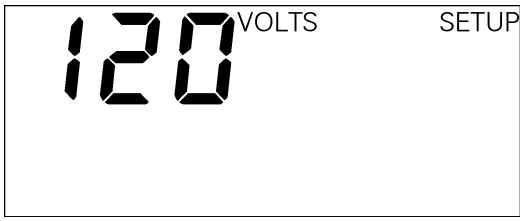

Figure 37. Trip Unit display for potential transformer primary voltage set point.

Potential Transformer Connection

Note that this step applies only to MicroVersaTrip PM Trip Units.

Select the appropriate potential transformer connection, either line-to-line (PH-PH) or line-to-neutral (PH-N), as illustrated in Figure 38.

CAUTION: Incorrect storage of this set point will result in incorrect metering values.

ATTENTION: Si une valeur incorrecte est enregistrée pour ce réglage, les mesures seront fausses.

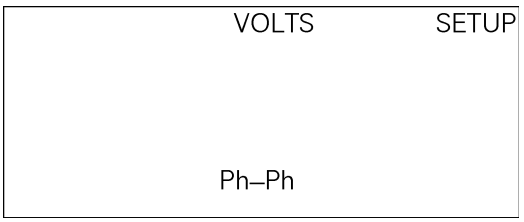

Figure 38. Trip Unit display for potential transformer connection choice.

Power Demand Intervals

This function sets the power demand interval, which can be in the range of 5 to 60 minutes, in steps of 5 minutes. This setpoint specifies the time interval for power demand averaging. The Trip Unit calculates a rolling average of breaker power over this time interval. The Trip Unit display is illustrated in Figure 39.

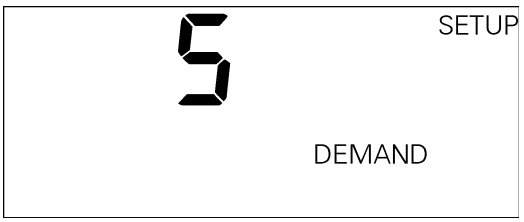

Figure 39. Trip Unit display for power demand interval.

Communication Address

Note that this step applies only to MicroVersaTrip PM Trip Units connected to the Power Management Control System.

With POWER LEADER systems, the address is assigned at the breaker. The address options are from 256 to 999, in steps of 1, as illustrated in Figure 40.

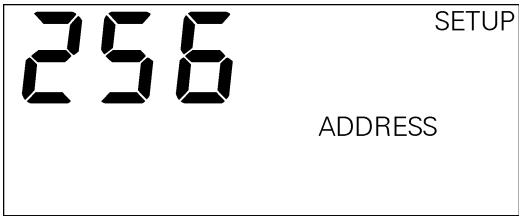

Figure 40. Trip Unit display for setting communication address.

3-1 Overview

The metering mode displays parameter values for that part of the electrical system controlled by the breaker's MicroVersaTrip Plus or MicroVersaTrip PM Trip Unit. Both currents and voltages are computed as true rms values. There is no loss of accuracy even in the presence of high levels of harmonics. All metering displays are updated once each second. Accuracies and resolutions are described in Section 1-8 and Table 6.

All values except frequency are displayed to three significant figures. For example, phase currents might be displayed as 60.7 AMPS, 492 AMPS, or 1.22 KA.

The Trip Unit metering displays are appropriate to the actual configuration ordered. All MicroVersaTrip Plus and MicroVersaTrip PM Trip Units include current metering. Two configurations of the MicroVersaTrip PM Trip Units (with PM and M suffixes in their catalog numbers) have the full complement of metering displays.

The Trip Unit must be provided with auxiliary power to display metered values. This can come from internal battery power, from a MicroVersaTrip Portable Power pack, from an external +24 Vdc power supply, or by energizing the breaker to at least 20% of its sensor load.

3-2 Metering Mode Operation

Metering mode is reached by pressing FUNCTION until METER appears in the upper-right corner of the display. Metering mode always begins with the phase currents. The sequence in which the metered values appear is illustrated in Figure 41.

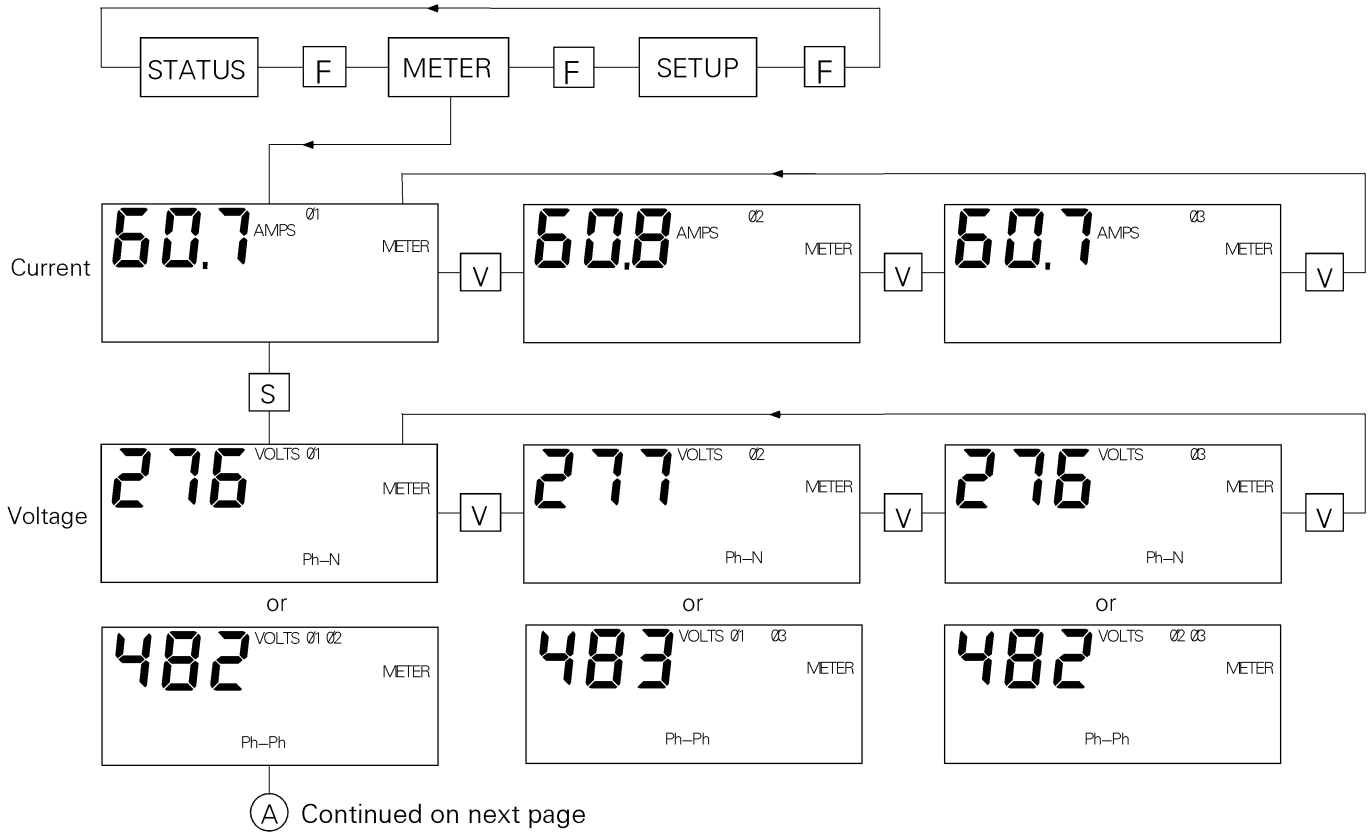

Figure 41. Trip Unit metering mode function flow.

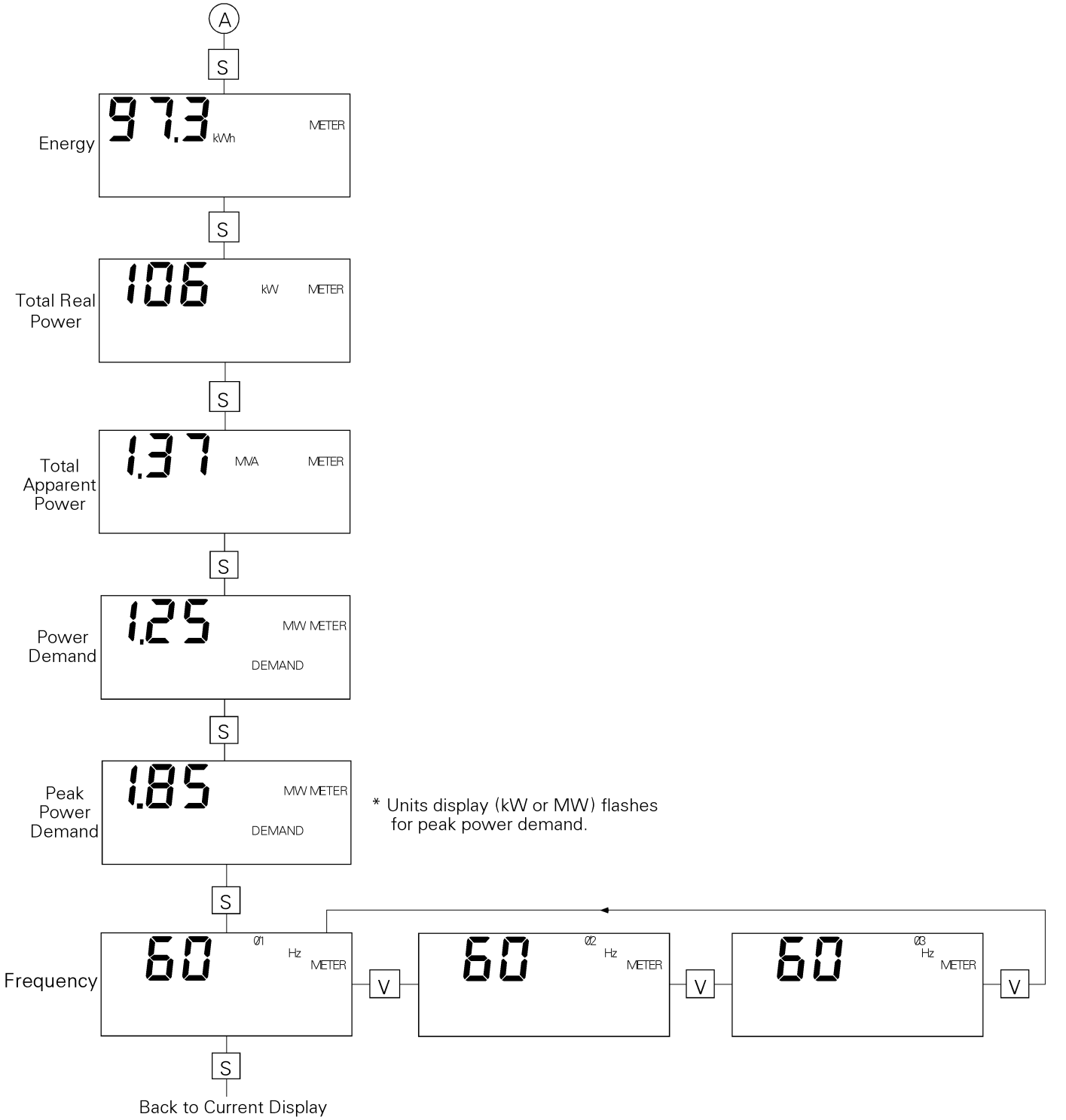

Figure 41. Trip Unit metering mode function flow (continued).

Current

The initial metering display is phase 1 line current, as illustrated in Figure 42. Press VALUE to cycle among the three phases. Current is displayed from 0 to 999 amperes and from 1.00 to a maximum of 999 kA. For current values less than 5% of the current sensor rating, the displayed value is zero.

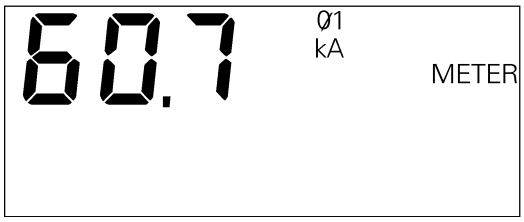

Figure 42. Trip Unit display for current metering.

Voltage

The voltage displayed by this function depends on how the Trip Unit was configured during Setup. If the breaker was configured with phase-to-neutral connections, the display shows individual phase voltages, as in Figure 43. If the breaker was configured with phase-to-phase connections, the display shows voltages between the phases, as in Figure 44. Press VALUE to cycle through the three phase voltages.

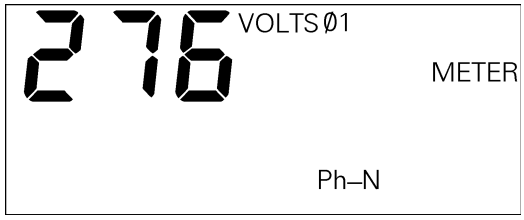

Figure 43. Trip Unit display for line-to-neutral voltages.

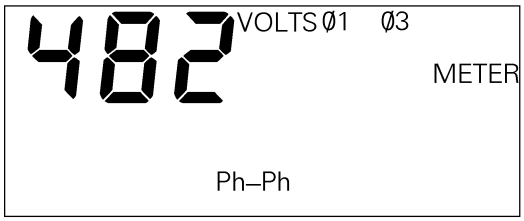

Figure 44. Trip Unit display for line-to-line voltages.

Energy

This display, illustrated in Figure 45, shows the aggregate energy flow through the breaker. The value is displayed from 0 to 999 kWh, then automatically switches units to display 1.00 to 999 MWh, and then again to display 1.00 to 999 GWh. When 999 GWh is exceeded, the display switches back to 0 kWh. The largest negative energy value displayed is –99 GWh.

Accumulated energy is stored in nonvolatile memory. The value in the display can be reset through the Trip Unit keypad. To reset the energy value, hold down the VALUE key and press the SELECT key. The displayed energy value will reset to zero.

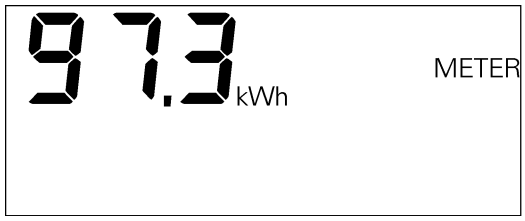

Figure 45. Trip Unit display for aggregate energy.

Total Real Power

The value displayed for total real power, illustrated in Figure 46, represents the aggregate real power in watts flowing through all three phases. The value is displayed from 0 to 999 kW, then automatically switches units to display 1.00 to 999 MW.

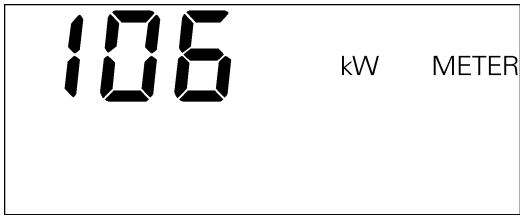

Figure 46. Trip Unit display for aggregate real power.

Total Apparent Power

The value displayed for total apparent power, as illustrated in Figure 47, represents the aggregate total apparent power in volt-amperes flowing through all three phases. The value is displayed from 0 to 999 kVA, then automatically switches units to display 1.00 to 999 MVA.

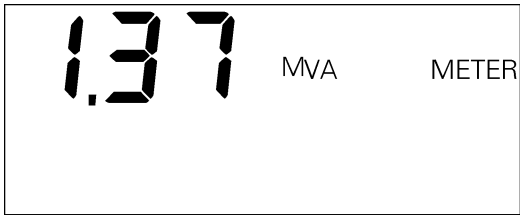

Figure 47. Trip Unit display for aggregate apparent power.

Power Demand

Power demand is the average of total power over the selected interval (5, 10, …, 55, 60 minutes). This display is updated every minute. The power demand display is illustrated in Figure 48.

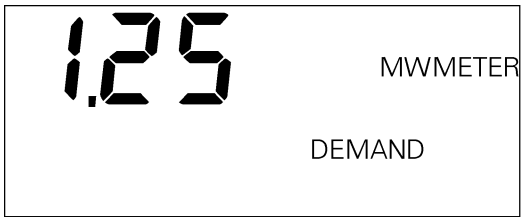

Figure 48. Trip Unit display for power demand.

Peak Power Demand

Peak power demand is stored in nonvolatile memory. Every minute, the power demand is calculated and compared against the stored peak power demand. If the new power demand is greater than the stored peak demand, the Trip Unit stores the new power demand as the peak value. The display of peak power demand is identical to the display illustrated in Figure 48, except that the units segment (in this case, MW) flashes.

Peak demand is stored in nonvolatile memory. The value in the display can be reset through the Trip Unit keypad. To reset the peak demand to the present demand, hold down the VALUE key and press the SELECT key.

Frequency

This display, illustrated in Figure 49, shows the frequency of the line current. Either line voltage or current must be present for this display to appear.

The frequency is calculated from the current and voltage signals. If both are present, the voltage frequency is displayed. If neither are present, this display does not appear.

The frequency is displayed in steps of 1 Hz.

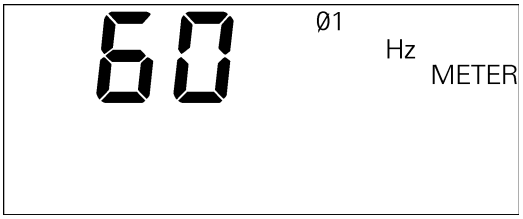

Figure 49. Trip Unit display for frequency.

4-1 Overview

Trip Unit Status mode is selected by pressing the FUNCTION key until STATUS appears on the display. Status mode indicates the present status of the Trip Unit and circuit breaker. It also displays information about trip conditions and the trip history of the breaker. Two categories of information can be displayed: trip information and trip operations counters.

Trip Information

Various trip information parameters are displayed when an overcurrent trip or protective relay trip occurs.

The Status display indicates when a long trip is imminent (breaker is in pickup). Following a trip, the Trip Unit displays a trip target to indicate the type of trip, the fault current magnitude at trip, and the phase of the fault (where appropriate). For adjustable-instantaneous trips, the Trip Unit displays the instantaneous function setpoint rather than the actual current.

Trip information is stored in the Trip Unit memory and displayed when Trip Unit power is returned or if internal battery power is enabled. Trip information is always available if Trip Unit power is maintained following a fault.

The Status display records trip information only for those options ordered with the Trip Unit. For example, only MicroVersaTrip PM Trip Units can be equipped with protective relays and thus display information about them.

Trip Operations Counters

Trip operations counters record the total number of overcurrent trips. Separate internal counters are provided for each of the following types of trips: long-time, short-time, adjustable-instantaneous, and ground-fault. The corresponding counter is incremented after any of these trips. A maximum of 256 trips can be counted for each type of fault, after which the counter rolls over to zero.

4-2 Status Mode Operation

This section describes each of the Status mode displays.

Normal Status Display

When the breaker is closed and its circuit energized, the normal status display appears, as illustrated in Figure 50. This display indicates that the Trip Unit is not in long-time pickup and that all trip targets are cleared.

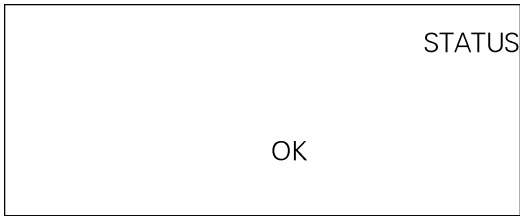

Figure 50. Trip Unit display for normal status.

Long-Time Overcurrent Pickup Display

When the long-time overcurrent function has reached 95% of the Trip Unit's long-time current rating, *xLT*, PICKUP begins to flash on the display, as illustrated in Figure 51. During the transition from 95% to 100% of the set point, the frequency of flashing increases. When the set point is reached, but before the time delay has expired, the flashing stops, indicating that tripping is imminent.

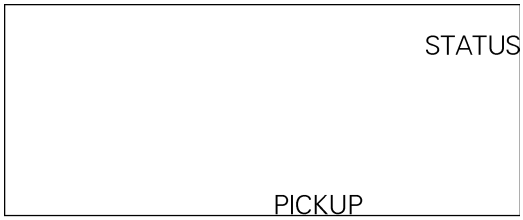

Figure 51. Trip Unit status display for long-time overcurrent pickup.

Trip Target and Fault Displays

When the breaker trips, information about the trip can be displayed in Status mode. Figure 52 illustrates a typical fault display following a trip.

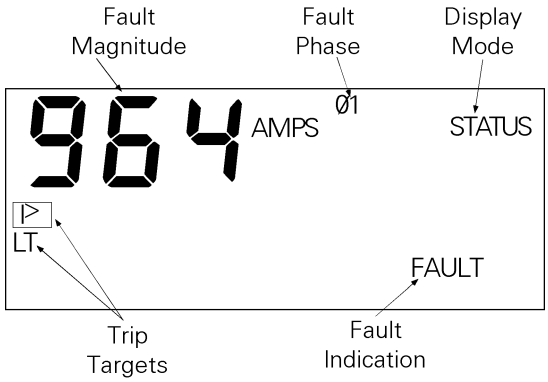

Figure 52. Typical fault display following a breaker trip.

The FAULT segment indicates that the breaker has tripped because of an overcurrent condition or a protective relay. This segment remains visible until it is cleared, including displays in Setup and Meter mode. This provides an indication that trip information is available, even if other screens are being displayed. If the trip was caused by a

protective relay, the FAULT segment flashes in Setup or Meter mode. After an overcurrent trip, the FAULT segment and the appropriate overcurrent target are displayed in all modes, without blinking, until cleared.

Long-Time Overcurrent Fault Display

After a long-time overcurrent trip, the trip information display contains the fault current magnitude at trip, the phase on which the fault occurred, and the overload (I>) and long-time (LT) trip targets. This display is illustrated in Figure 53.

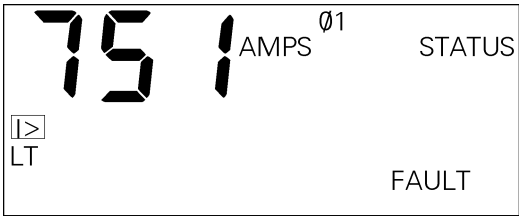

Figure 53. Trip Unit Status display for long-time overcurrent trip.

Short-Time Overcurrent Fault Display

After a short-time trip, the status display appears as in Figure 54. The information presented is similar to that in the long-time overcurrent display, with the short-circuit (I>>) and short-time (ST) targets.

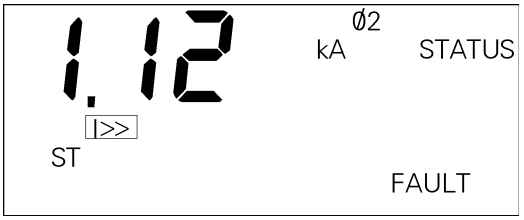

Figure 54. Trip Unit status display for short-time overcurrent trip.

Instantaneous Fault Display

The status display for an adjustable instantaneous trip is illustrated in Figure 55. Because of the fast response of this function, the Trip Unit displays only the threshold current for the fault, not the actual fault current nor the phase on which the fault occurred.

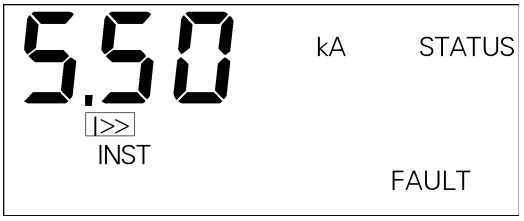

Figure 55. Trip Unit status display for instantaneous overcurrent trip.

Ground-Fault Display

When a ground-fault trip occurs, the display illustrated in Figure 56 appears. The fault current is displayed in units of *xCT*, the breaker CT sensor rating. Multiply the sensor rating of the breaker by the displayed fault current multiplier to obtain the ground-fault current at trip.

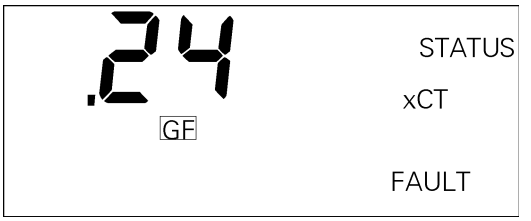

Figure 56. Trip Unit status display for ground-fault trip.

Protective-Relay Fault Display

After a protective-relay trip, the display indicates FAULT with a target for the type of relay that initiated the trip. This is illustrated in Figure 57 for an overvoltage trip. The targets for the five protective relays are listed in Table 16.

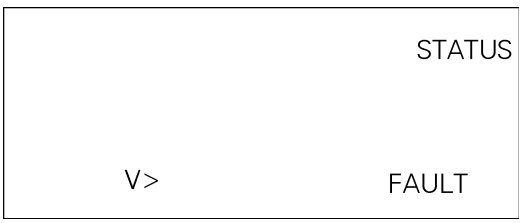

Figure 57. Trip Unit status display for protective-relay trip.

Code	Protective Relay
ΔV	Voltage unbalance
ΔI	Current unbalance
V<	Undervoltage
V>	Overvoltage
I↑	Power reversal

Table 16. Trip Unit display targets for protective relays.

Clearing the Trip Information

Since trip information is stored in nonvolatile memory, the Trip Unit continues displaying the trip information until it is manually cleared or a new trip occurs. After the trip information has been recorded or reviewed, it can be cleared with the keypad. With the Trip Unit in Status mode, hold down the VALUE key and press the SELECT key. The trip information is then cleared and the display reverts to STATUS OK, as in Figure 50.

Trip Operations Counter Display

Trip operations counters record the total number of overcurrent trips. To review any of the trip operations counters while in Status mode, press the SELECT key until the desired count appears. Figure 58 illustrates a typical trip operations counter display. This example indicates that there have been three long-time trips on this breaker since the counter was last reset.

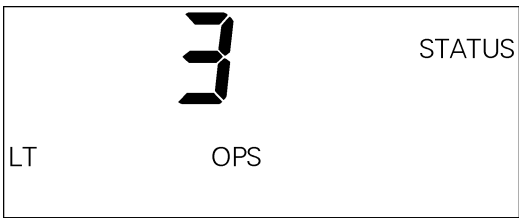

Figure 58. Trip Unit status display for long-time overcurrent trip counter.

Clearing the Trip Operations Counters

Since the trip operations counters are stored in nonvolatile memory, the Trip Unit maintains the information indefinitely. To clear a particular counter, first display the corresponding count, then hold down the VALUE key and press the SELECT key. The trip counter is reset to zero.

MicroVersaTrip Plus and MicroVersaTrip PM Trip Units and rating plugs are factory tested and normally shipped installed in their breaker frame assemblies or as part of a conversion kit. There is no requirement for periodic maintenance of the Trip Units. *There are no user-serviceable components within the Trip Units.*

5-1 Trip Unit Removal and Replacement

Rejection pins are installed on the rear of all Trip Units to prevent installation of an incorrect Trip Unit into a breaker. Do not use excessive force when installing a Trip Unit. Replacement of a Trip Unit always requires repeating the setup procedures, as described in Chapter 2.

WARNING: Before beginning this procedure, turn the breaker off, disconnect it from all voltage sources, and discharge the closing springs.

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

1. Open the breaker and remove it from the cubicle or substructure. Place it on a suitable work surface. Note that 3200–5000 A frame breakers must be suitably supported so that the spring discharge mechanism is not engaged.
2. Insert the Racking Handle (catalog number 568B731G1) and move the racking mechanism to the TEST position, as shown on the draw-out position indicator.
3. Remove the four screws securing the trim plate on the breaker, then remove the trim plate.
4. Remove the six screws securing the escutheon to the breaker. Pull the manual charging handle out partway, then slide off the escutcheon.
5. Pull out the locking slide on the right of the Trip Unit mounting plate, then pull the Trip Unit out, carefully disengaging the pins on the rear connector.

To reinstall the Trip Unit, perform the following procedure:

1. Pull out the locking slide on the right of the mounting plate. Push the Trip Unit into place, carefully engaging the 50-pin connector and lining up the rejection posts on the rear of the Trip Unit with the holes in the mounting plate. Release the locking slide.
2. Check that the breaker racking mechanism is still in the TEST position. Pull the manual charging handle out partway, then slide the handle through the slot in the escutcheon and move the escutcheon into place. Insert the six mounting screws and tighten to 14–20 in-lb.
3. Replace the trim ring around the escutcheon, with the narrow side at the bottom. Insert the four mounting screws and tighten to 14–20 in-lb.
4. Insert the Racking Handle and return the racking mechanism to the DISC position, as shown by the draw-out position indicator.
5. Reinstall the breaker into its cubicle or substructure.

5-2 Rating Plug Removal and Replacement

CAUTION: Removal of the rating plug while the breaker is carrying current reduces the breaker's current-carrying capacity to approximately 25% of the current sensor rating.

ATTENTION: Si le calibreur est retiré le disjoncteur et traversé par un courant, le niveau de protection s'ajuste à approximativement 25% du calibre du transformateur d'intensité.

Interchangeable rating plugs are removed with a Rating Plug Extractor, 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 59. Be sure to grab the tabs and not the front cover of the rating plug, or the plug may be damaged.

Rejection features are provided on all rating plugs to prevent application mismatches. Never force a rating plug into place. Refer to Chapter 1 to find the appropriate rating plugs for each sensor rating and breaker frame.

If a replacement rating plug has a different rating than the plug that was removed, follow the appropriate setup procedure in Chapter 2 to enter the new rating.

Figure 59. Removing the interchangeable rating plug.

5-3 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 Trip Unit display is blank.	Line current is below 20% of the breaker sensor rating (MicroVersaTrip Plus).	At least 20% of the current sensor rating, *xCT*, must be flowing through the breaker to activate the display. If not, power the Trip Unit with the internal battery or the Portable Power Pack. The battery power supply is disabled when any current is sensed through the current sensors.
	External +24 Vdc is absent (MicroVersaTrip PM).	Check that the auxiliary power supply is present and operational.
2. The Trip Unit display flashes.	Can occur on Plus-style Trip Units when the load current fluctuates near 20% of the breaker sensor rating.	Power the Trip Unit with the internal battery or the Portable Power Pack.
3. The Trip Unit display flashes ERR.	The built-in self test has detected an error.	Replace the Trip Unit.
4. The trip indication target will not clear.	Trip Unit is not in Status mode.	Press FUNCTION until STATUS is displayed. Hold down the VALUE key and press the SELECT key to clear the target.
5. Unit does not communicate with the Modbus Monitor or the Power Management Control System	The communication wires are shorted or improperly connected.	Locate and repair the short or the incorrect connection.
	The Trip Unit address is incorrect.	Check that the address assigned to the Trip Unit, as in Chapter 2, agrees with the address at the host.
6. Current readings are incorrect.	The rating plug value was defined incorrectly.	Read the *X* value from the rating plug name plate and enter this as the *xIn* value with the rating plug current set point procedure in Chapter 2. *Do not enter the sensor rating, S.*
7. Voltage readings are incorrect.	The potential transformer (PT) primary voltage was defined incorrectly.	Read the PT primary rating from the PT name plate and enter this value with the PT primary voltage procedure in Chapter 2.
	The PT connection was defined incorrectly.	Follow the PT connection procedure in Chapter 2 to enter Ph-N for a wye-connected PT primary or Ph-Ph for a delta-connected PT.
8. The display is blank or the Low Battery symbol appears when the BATTERY key is pressed.	The battery is discharged.	Replace the battery.

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