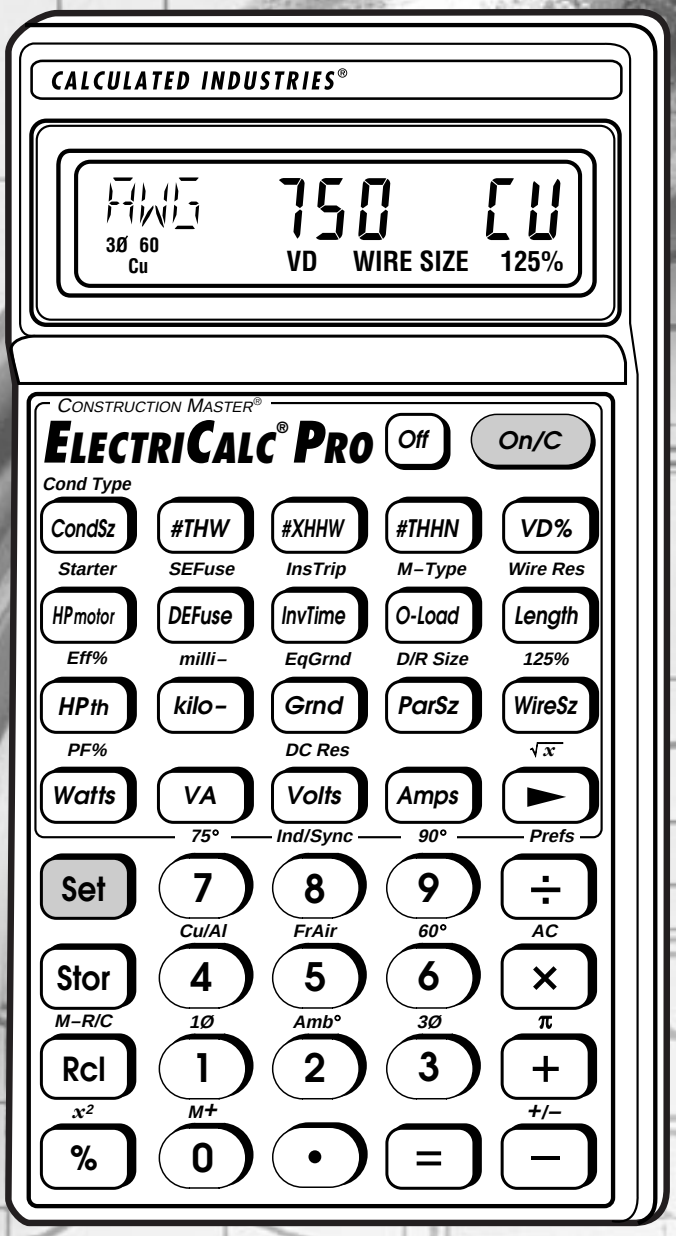
USER'S GUIDE

ELECTRICALC® PRO

MODEL 5060



CALCULATED INDUSTRIES®

Putting answers at your fingertips since 1978

Introducing the

ElectriCalc® Pro

Now NEC®-Updateable!

The *ElectriCalc® Pro* is an invaluable calculator for today's busy electrical professional. Unlike a regular calculator, it has intuitively labeled "electrical keys" and conforms to the 2002 and future *National Electrical Codes*, allowing you to solve Code-related problems quickly and accurately. The most common NEC tables are now at your fingertips!

An important new feature of the *ElectriCalc Pro* is that it is now programmed to accept future NEC changes, allowing you to conveniently install future Code editions in a few simple steps.

The *ElectriCalc Pro* instantly solves for the following:

- Volts, Amps, Volt-Amps, Watts, kVA, kW, PF%, EFF%, and DC Resistance
- Copper or Aluminum Wire Sizes
- Parallel & Derated Wire Sizes
- Voltage Drop Wire Sizes, % and Actual Voltage Drops, Voltage Drop Distances and Wire Resistances
- Grounding Conductors Sizes
- Motor Full-Load Amps
- Overload Protection Sizes
- NEMA Starter Sizes
- Conduit Sizes
- And much more!

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Installing NEC Updates

Your *ElectriCalc Pro* is now updateable for future National Electrical Code® editions that are updated every three (3) years (next Code update is 2005). To upgrade your unit, follow the instructions below:

1) Purchase the NEC Update from CI (see pricing & details from CI's Web site: www.calculated.com or call 1-800-854-8075). This Update is in the form of a chip that contains the new Code.
2) Once you receive the NEC Update chip, you need to install it in your ElectriCalc Pro:

   a) Turn calculator off.
   b) As a precaution, remove the battery (located back of calculator, top of unit) by sliding battery door out with your thumbnail. Set aside.
   c) Using a screwdriver, pop out the square tab located in the middle section on the back of your calculator.
   d) Replace it with the new Update tab by inserting it into the slot.
   e) Replace the battery door.
   f) Turn calculator on. Your calculator is now updated and ready to use.

Key Definitions

Standard Calculator Functions

[On/C] — On/Clear
Turns on power. Pressing once clears the last entry and the display. Pressing twice clears all non-permanent values.

[Off] — Off
Turns all power off. Clears the memory and most internal registers.

[+] [–] [x] [÷] [=]
Arithmetic operation keys.

[0] – [9] & [•]
Used for keying in numbers.

[%] — Percent
Four function percent key.

[►] Back Space Function
Used to delete entries one keystroke at a time (unlike the On/C function, which deletes the entire entry).

[Set] — Second Function
Accesses the secondary functions shown above the keys when pressed prior to selection.

[Stor] — Store
Used to store values when pressed just before a storage register (i.e., M+, AMPS, VOLTAGE, etc.).
Displays: STOR.

[Rcl] — Recall
Recalls a value stored in a register (e.g., to recall voltage drop % press [Rcl] [VD%]). **Displays: RCL.**

[Set] [+] — Pi (π)
Constant = 3.141593

[Set] [–] — Change Sign (+/–)
Toggles the sign of the displayed value (from positive to negative or from negative to positive).

[Set] [%] — x^2
Squares the displayed value.

[Set] [►] — Square Root ($\sqrt{x}$)
Square root function.

[Stor] [0] — Cumulative Memory
Adds displayed value to Memory (e.g., 10 [M+], 20 [M+], [Rcl] [M+] = 30). Clears when the calculator is shut off.

[Rcl] [0] — Memory Recall
Displays the value saved in (M+).

[Rcl] [Rcl] — Display/Clear Memory
Displays and clears the value saved in (M+).

[Set] [Rcl] — Clear Memory
Clears the value saved in (M+) without changing displayed value.

Mode Set-up Functions

[Set] [x] — All-Clear (AC)
Resets all settings and values to their default settings.

[Set] [÷] — Preferences
Use to set default settings or modes (see “Preference Settings” page 26)

[Set] [1] — Single-Phase (1Ø)
Sets calculator to single-phase mode. **Displays: 1Ø.**

[Set] [3] — Three-Phase (3Ø)
Sets calculator to three-phase mode. **Displays: 3Ø.**

[Set] [2]
— Ambient Temperature (Amb°)
Permanently enters ambient temperature for determining ampacity derived wire sizes. Ambient temperature will only change when entering a new value or by resetting the calculator (**[Set] [x]**). Defaults to 30°C (86°F). **Amb°** will display when the ambient temperature is other than 30°C (86°F). **Displays: Amb°.**

NOTE: *The temperature units can be displayed in Celsius (°C) or Fahrenheit (°F) by using the preference function (**[Set][÷]**).*

[Set] [4] — Copper/Aluminum
Used to toggle between copper (default) and aluminum wire types. When the wire type is revised, any calculated wire size will be re-calculated automatically. If a wire size is entered with the wrong wire type, pressing **[Set] [4]** will change the material type without changing the size.
Displays: Al or Cu.

[Set] [5] — Free Air (FrAir)
Sets calculator into Free Air mode, which refers to NEC Table 310-17 for wire size calculations. **Displays: FrAir.**

[Set] [6] — 60°C Wire Insulation
Sets calculator to 60°C wire insulation type for wire size calculations. This is the default setting. **Displays: 60.**

[Set] [7] — 75°C Wire Insulation
Sets calculator to 75°C insulation type for wire size calculations.
Displays: 75.

[Set] [9] — 90°C Wire Insulation
Sets calculator to 90°C insulation type for wire size calculations.
Displays: 90.

Electrical Functions

[kilo-] — Kilo-
This key is used with watts, amps, volts, and volt-amps to identify “kilo-” values.

[Set] [kilo-] — Milli-
This key sequence is used with other keys watts, amps, volts, and volt-amps to identify “milli-” values.

[Amps] — Amps
Enters or calculates amps (using volts and VA or watts). **Displays: AMPS, KAMP or mAMP.**

[Volts] — Volts
Enters or calculates volts (using amps, HPth, and VA or watts). Default value is 240 volts. **Displays: VOLT, KV, or mV.**

[Set] [Volts] — DC Resistance
Calculates and displays DC resistance. **Displays: OHMS.**

[VA] — Volt-Amps
Enters or calculates volt-amps (using amps, volts and horsepower or watts). **Displays: VA, KVA, or mVA.**

[Watts] — Watts
Enters or calculates watts (using amps, volts, and VA or horsepower).
Displays: WATT, KW, or mW.

[Set] [Watts] —Power Factor
Enters or calculates power factor percentage (based on watts and VA). Defaults to 100%. Entered or calculated power factors greater than 100% will result in an error. **Displays: PF%.**

[HPth] — Horsepower (Theoretical)
Enters or calculates theoretical horsepower (based on Amps, VA, watts, efficiency%, PF%, and/or volts). 1.0 HPth correlates to 746 watts at 100% efficiency. **Displays: HPth.**

[Set] [HPth] — Efficiency
Enters or calculates the percent ratio between real power (watts) and theoretical horsepower. Default: 100%. Entered or calculated efficiencies greater than 100% will result in an error. **Displays: EFF%.**

Motor Horsepower Functions

The *ElectriCalc Pro* can be used to determine motor full-load current (amps) based on entries for motor horsepower (HP), phase and voltage.

You can also find an equivalent motor horsepower if you have entered voltage and full load current values. Only HP and voltage entries as defined by NEC Tables 430-148 and 430-150 can be used to determine motor loads.

[Set] [8] — Induction/ Synchronous Motor Toggle
Toggles between induction and synchronous motor types. **Displays: SYNC** (synchronous) or **IND** (induction - default).

[HPmotor] — Motor Horsepower
Enters or calculates motor horsepower. **Displays: SYNC HP** (synchronous) or **HP IND** (induction - default).

Ampacity Tables

The *ElectriCalc Pro* uses NEC Table 310-16 (310-17 for Free Air) to find wire sizes and ampacity ratings of wires. The calculator uses the following data to calculate wire size: 1) insulation temperature rating (60°C, 75°C and 90°C); 2) wire material (copper or aluminum); and 3) ambient temperature. Only standard AWG wire sizes are used by the *ElectriCalc Pro*.

NOTE: *1/0, 2/0, 3/0 and 4/0 wires are entered using the [0] key (i.e., 0, 00, 000 and 0000).*

[WireSz] — Wire Size/Ampacity
Enters or calculates wire size based on ampacity and voltage drop, if a voltage drop length has been entered.

♦ *First Press*

If a wire length has been entered, the first press will show the larger of the ampacity or voltage drop derived wire size. The calculator will use the larger value when calculations require a wire size. If no voltage drop length has been entered, the calculator will display the calculated ampacity rated wire size.

♦ *Second Press*

If a wire length has been entered, the second press displays the smaller of the two wire sizes. If not solving for voltage drop wire size, then displays the maximum ampacity.

♦ *Third Press*

If a wire length has been entered, displays the minimum wire ampacity rating.

[Set] [WireSz] — 125% Ampacity

Used for motor wire sizing when the wire must not exceed 80% of its rated ampacity (125%A). This keystroke calculates wire size based on 125% of the entered or calculated amps value. **Displays: 125%.**

[ParSz] — Parallel Size
Used to find the size of parallel conductors using amperage and an entered quantity of wires. Parallel wire size computations smaller than 1/0 are displayed as "none" (display shows "**nonE**") as the NEC does not allow parallel wire runs smaller than 1/0.

♦ *First Press*
When preceded by a number, calculates the applicable wire size for that quantity of wires in parallel.
Displays: PAR WIRE SIZE.

♦ *Second Press*
Displays the maximum adjusted ampacity of the calculated parallel wire size. **Displays: WIRE A.**

NOTE: *No adjustments are made for deration.*

[Set] [ParSz] — Derated Wire Size
Used to calculate derated wire sizes and allowable ampacity based on the entered quantity of wires, NEC Table 310-16 and NEC Table 310-15(b)(2)(a). Derated wire sizes are not calculated when there are less than 4 wires, or when the unit is in Free Air mode.

♦ *First Press*

Calculates the derated wire size, if you have entered the number of wires, for example, 4 [Set] [ParSz]).
Displays: D/R WIRE SIZE.

♦ *Second Press*

Displays the maximum adjusted ampacity of the derated wire size.
Displays: D/R WIRE A.

♦ *Third Press*

Displays the derated adjustment factor per the NEC Table 310-15(b)(2)(a).
Displays: ADJ %.

Voltage Drop Solutions

The *ElectriCalc Pro* will calculate maximum lengths, minimum wire sizes or actual voltage drops given the other two values. Voltage drop solutions are based on the DC resistance values found in NEC Chapter 9, Table 8.

NOTE: *Voltage drop solutions may vary slightly from actual AC circuit values as the calculator does not incorporate factors such as inductive reactance, skin effect, raceway material, etc.*

[VD%] — Percent Voltage Drop
Used to enter or calculate voltage drop. The default voltage drop is 3%. If wire size or wire length values are not available, "**nonE**" will display since the voltage drop cannot be found.

♦ *First Press*
Enters a maximum allowable voltage drop percentage (**Displays: V DROP %**) or calculates actual voltage drop (**Displays: V DROP**).

♦ *Second Press*
Calculates actual percent voltage drop. **Displays: V DROP %.**

[Length] — Length
Enters or calculates the length of a run for voltage drop computation.
Displays: FEET or MET.

NOTE: *Units of length can be set to Feet or Meters by use of the Preference function (**[Set] [÷]**).*

[Set] [Length] — Wire Resistance
Displays the actual resistance per 1,000 feet of the wire size in [WireSz] based on NEC Chapter 9, Table 8. **Displays: OHMS WIRE.**

Ground Function Keys

[Grnd] — Ground
An output-only key used to find the grounding electrode conductor size for AC systems based on NEC Table 250-66 and an entered or calculated service-entrance conductor (largest size). Only actual wire sizes are considered valid entries.

♦ *First Press*
Calculates the copper grounding electrode conductor size if you have entered a valid wire size.
Displays: GRND CU WIRE SIZE.

♦ *Second Press*
Displays the aluminum grounding electrode conductor size.
Displays: GRND AL WIRE SIZE.

♦ *Third Press*
Displays the circular mil area used to calculate the grounding electrode conductor size. **Displays: CMIL WIRE.**

[Set] [Grnd]
— Equipment Ground (EqGrnd)
This function uses NEC Table 250-122 to compute the minimum equipment grounding conductor size, given an entered amperage rating or setting for a over-current device up line (i.e., 300 [Set] [Grnd]).

NOTE: *This function deviates from the NEC Table 250-122 in that 1250 MCM AL is used instead of 1200 as specified in NEC Table 250-122.*

♦ *First Press*
Displays the copper grounding conductor size for the entered amp rating.
Displays: EQPG WIRE SIZE CU.

♦ *Second Press*
Displays the aluminum grounding conductor size.
Displays: EQPG WIRE SIZE AL.

Fuse/Breaker Keys

The *ElectriCalc Pro* has special keys that automatically calculate the Amp ratings of the following over-current protection devices: Dual Element Fuses (Time Delay), Single Element Fuses (Non-Time Delay), Instantaneous Trip Breakers (Type 1), Inverse Time Breakers (Type 2), and Overload Protection Devices.

These fuse and circuit breaker sizes are derived using the "Percent of Full-Load Current" multipliers listed in NEC Table 430-152.

You can also calculate the full voltage starter size for non-plugging and non-jogging duty motors based on phase, voltage, motor HP and NEMA table specifications.

If a parameter is missing or invalid, the calculator will display "**nonE**."

[Set] [O-Load] — Motor Type
Based on NEC Table 430-152, this key selects the motor type used to define the percent factors for breakers/fuses. Once set, the motor type remains fixed until you change it or perform an all clear (**[Set] [x]**).

♦ *First Press*

Displays the current motor type. Note there is no motor type in single-phase mode.

♦ *Second Press*

In three-phase mode only, subsequent presses of [O-Load] will select and display the next motor type from this list: **SQ-C non-E** (Squirrel Cage, non-Design E), **SQ-C E** (Squirrel Cage, Design E), **SYNC no codE** (Synchronous), **WND no codE** (Wound Rotor).

[DEFuse] — Dual Element Fuse

♦ *First Press*

Calculates the minimum amp rating for a Dual Element Fuse.
Displays: AMPS dE.

♦ *Second Press*

Displays the full-load current percent multiplier used to determine fuse size. **Displays: %FLC.**

[Set] [DEFuse]
— Single Element Fuse (SEFuse)

♦ *First Press*

Displays the minimum amp rating based on phase, motor type, and amperage. **Displays: AMPS SE.**

♦ *Second Press*

Displays the full-load current percent multiplier value used to determine fuse size. Subsequent presses repeat this cycle. **Displays: %FLC.**

[Set] [InvTime] — Instantaneous Trip Circuit Breaker

♦ *First Press*

Displays the minimum amp rating for an Instantaneous Trip Circuit Breaker, based on the phase, motor type, and amperage. **Displays: AMPS b1.**

♦ *Second Press*

Displays the full-load current percent multiplier value used to determine breaker size. **Displays: %FLC.**

[InvTime] — Inverse Time Breaker

♦ *First Press*

Calculates the minimum amp rating for an Inverse Time Breaker, based on the phase, motor type, and amperage. **Displays: AMPS b2.**

♦ *Second Press*

Displays the full-load current percent multiplier value used to determine breaker size. **Displays: %FLC.**

[O-Load] — Overload Protection

♦ *First Press*

Displays the overload amperage requirement based on the full-load current shown on the motor nameplate. Multiplies the entered motor nameplate full-load current (stored in the [Amps] registers) by 115% or the value you enter. Conforms to NEC Section 430-32 (a)(1) value of 115% unless you enter another value. For example, entering 125 [O-Load] would calculate overload protection based on 125% of the entered amperage. **Displays: AMPS ol.**

♦ *Second Press*

Displays the full-load current percent multiplier value used to determine the overload current protection size. Subsequent presses of [O-Load] repeat the cycle. **Displays: %FLC.**

[Set] [HPmotor] — Starter Size

Displays the starter size (from NEMA publication ICS 2-1988 Tables 2-327-1 and 2-327-2) based on the phase, voltage, and motor horsepower settings. **Displays: STAR SIZE.**

NOTE: *Horsepower values not identified in NEMA tables will cause the calculator to round up to the next larger starter size in the table.*

Conduit Sizing Keys

The *ElectriCalc Pro* calculates conduit size using NEC Tables 1, 3, 4, and 5 of Chapter 9 (given insulation type, wire size, and quantity of wires). It will also calculate the number of wires of a specified insulation type and wire size that will fit in a defined conduit size. Acceptable conduit sizes (depending on the type of conduit used) are as follows: 1/2", 3/4", 1", 1-1/4", 1-1/2", 2", 2-1/2", 3", 3-1/2", 4" 5" and 6". Conduit sizes are entered using decimal equivalents (i.e., 1-1/2" is entered as 1.5, 3/4" is entered as .75, etc.).

[#THW], [#XHHW], [#THHN] — Number of Wires

Used to enter or calculate the number of wires in a raceway and calculate cross-sectional wire area.

♦ *First Press*

Enters number of wires or calculates maximum number of wires in conduit. **Displays: TTL WIRES** (calculated) or **WIRES** (entered).

♦ *Second Press*

Shows total cross-sectional area for all entered wires. **Displays: WIRE AREA** (entered) or **TTL WIRE AREA** (calculated).

♦ *Third Press*

Shows total cross-sectional area of all entered wires of the selected wire insulation. **Displays: TTL WIRE AREA.**

[CondSz] — Conduit Size

Used to find conduit sizes based on the total area of the entered wire types and sizes (up to 15 at one time). If the quantity and insulation type has not been entered, the calculator will assume 2 THHN wires for single-phase or 3 THHN wires for three-phase calculations.

♦ *First Press*

Enters or calculates conduit size.
Displays: COND SIZE.

NOTE: *If a wire size has not been entered or calculated, or an invalid conduit size is entered, the calculator will display "**nonE**."*

♦ *Second Press*

Shows total number of wires in the conduit for calculated conduit size. Shows the conduit internal area for an entered conduit. **Displays: TTL WIRES** (calculated) or **CONDAREA** (entered).

NOTE: *Third through fifth presses display only for calculated conduit sizes.*

♦ *Third Press*

Shows fill percentage for the calculated conduit size as determined by Table 1, Chapter 9. **Displays: COND FILL %.**

♦ *Fourth Press*

Shows the total wire area for all entered wires. **Displays: FILL TTL WIRE AREA.**

♦ *Fifth Press*

Shows remaining fill area. This value may be negative if all wires are the same size due to Note 7 in NEC Chapter 9, Table 1.
Displays: REM WIRE AREA.

[Set] [CondSz] — Conduit Type

♦ *First Press*

Displays the currently selected conduit type.

♦ *Second Press*

Subsequent presses will display and select the next conduit type from this list: 1) EMT 2) ENT 3) FMC 4) IMC 5) LFNB 6) LFNA 7) LFMC 8) RMC 9) P-80 10) P-40 11) P-A 12) P- EB. To select a specific conduit type, enter the corresponding number of the conduit and then press [Set] [CondSz]. If you press this keystroke without entering a number, the calculator will switch to the next conduit type on the list.

Preference Settings

Your calculator has the following Preference Settings that you can access and change at any time.

Reach the Preference Function by pressing **[Set] [÷]**. Then, to access each category, press the **[÷]** key until the desired setting is reached. *Within each category*, press the **[+]** or **[-]** keys to toggle between individual selections (note: the **[+]** will advance, the **[-]** will back-up).

You can change these settings at any time by repeating the above, and setting in a new preference. ***NOTE:*** *To clear preferences, you must either reset using keystrokes below, or perform an All-Clear (**[Set] [x]**).*

The Preference Settings are (default settings shown first):

To Set 1999 or 1996 NEC Code:	
[Set] [÷] *(1st press of [÷])*	**CODE 99**
[+]	**CODE 96**
To Set Ambient Temp. to °C or °F:	
[÷] *(2nd press of [÷])*	**AMB° 30 °C**
[+]	**AMB° 86 °F**
To Set Length to Feet or Meter:	
[÷] *(3rd press of [÷])*	**FEET 1.**
[+]	**MET 1.**

Default Settings

When you first receive your calculator, it is pre-set to the default settings listed below. You can always return your calculator to these default values with an All-Clear (**[Set] [x]**).

Ambient Temperature	**30°C**
Insulation Rating	**60°C**
Material	**Copper (Cu)**
Phase	**3Ø**
Volts	**240 V**
Efficiency	**100%**
Power Factor	**100%**
Length Units	**Feet**
Voltage Drop Percent	**3%**
Wire Environment (vs Free Air)	**Raceway**

Basic Math Operations

This calculator uses standard chaining logic, which simply means that you enter your first value, the operator (+, –, x, ÷), the second value and then the equals sign (=).

A.	3	[+]	2	[=]	5
B.	3	[–]	2	[=]	1
C.	3	[x]	2	[=]	6
D.	3	[÷]	2	[=]	1.5

Percent Calculations

The percent key **[%]** can be used for finding a given percentage of a number or for working add-on, discount or division percentage calculations.

355	[x]	15	[%]	53.25
250	[+]	6.5	[%]	266.25
25	[–]	5	[%]	23.75
100	[÷]	50	[%]	200.

The percent key also allows you to change percentages to decimals (e.g., 25 [%] 0.25).

Memory Functions

Whenever the **[Stor] [0] (M+)** keys are pressed, the displayed value will be added to memory. A list of memory keystrokes/functions is provided below:

Function	Keystrokes
Add to memory	**[Stor] [0]**
Display total in memory	**[Rcl] [0]**
Display & clear memory	**[Rcl] [Rcl]**
Clear memory, no display	**[Set] [Rcl]**
Replace memory with displayed value	**[Set] [Rcl] [Stor] [0]**

The memory is semi-permanent; it will be cleared when you:

1) turn off the calculator;
2) press **[Rcl] [Rcl]**;
3) press **[Set] [Rcl]**;
4) press **[Set] [x]** (all clear).

How To Use Memory Functions:

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Add to M+	355 [Stor] [0]	355. M
Add to M+	255 [Stor] [0]	255. M
Recall total M+	[Rcl] [0]	610. M
Sub. from M+	745 [Set] [Stor] [0]	745. M
Recall & clear	[Rcl] [Rcl]	– 135.

Kerchoff's Law

The *ElectriCalc Pro* utilizes Kerchoff's Law in finding volts, amps, volt-amps, watts, horsepower (theoretical), efficiency and power factor.

Finding Voltage

Find the voltage supply to a single-phase load drawing 14,605 volt-amps and 115 amps.

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Enter VA	14605 [VA]	14,605. VA
Enter amps	115 [Amps]	115. AMPS
Solve for volts	[Volts]	127. VOLT

Finding Amps

What is the current (amps) for a load drawing 8,250 volt-amps on a 240 volt, three-phase circuit?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 3-phase	[Set] [3]	3 PH
Enter VA	8250 [VA]	8,250. VA
Enter volts	240 [Volts]	240. VOLT
Solve for amps	[Amps]	19.846416 AMPS

Finding Current Load

A building with 120/240 volt 1Ø service has the following loads:

Range = 7,800 VA
Dryer = 5,100 VA
Lighting = 6,470 VA
Heating = 15,100 VA
Appliances = 8,900 VA

What is the service load (amps) of the circuit supplying this building?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Add VA loads:	7,800 + 15,100 + 5,100 + 8,900 + 6,470 [=]	43,370.
Enter as VA	[VA]	43,370. VA
Enter volts	240 [Volts]	240. VOLT
Solve for amps	[Amps]	180.70833 AMPS

Finding Amps from Kilowatts

What is the amperage for a 75 kW load connected in a 120/208 volt, 3Ø circuit?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 3-phase	[Set] [3]	3 PH
Enter kilowatts	75 [kilo-] [Watts]	75. KW
Enter volts	208 [Volts]	208. VOLT
Solve for amps	[Amps]	208.17918 AMPS

Finding Volt-Amps

What is the VA rating for a 120 volt, 22 amp, 1Ø circuit? What is the kVA rating?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Enter volts	120 [Volts]	120. VOLT
Enter amps	22 [Amps]	22. AMPS
Solve volt-amps	[VA]	2,640. VA
Solve for kVA	[kilo-] [VA]	2.64 KVA

Finding kVA Rating

What is the kVA rating for a 120/208 volt, three-phase 65 amp transformer?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Enter volts	208 [Volts]	208. VOLT
Enter amps	65 [Amps]	65. AMPS
Solve for kVA	[kilo-] [VA]	23.417327 KVA

Finding Wattage

A 120 volt single-phase 45 amp electrical motor has an 87% power factor. What is its wattage?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Enter volts	120 [Volts]	120. VOLT
Set power fact %	87 [Set] [Watts]	87. PF%
Enter amps	45 [Amps]	45. AMPS
Solve for watts	[Watts]	4,698. WATT

Finding kW Rating

What's the kW rating for a 90 amp, 208 volt, three-phase broiler with 100% power factor?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 3-phase	[Set] [3]	3 PH
Set power factor	100 [Set] [Watts]	100. PF%
Enter amps	90 [Amps]	90. AMPS
Enter volts	208 [Volts]	208. VOLT
Solve for kW	[kilo-] [Watts]	32.423991 KW

Motor Horsepower

The *ElectriCalc Pro* can calculate the full load current (amps) of a motor, based on phase, voltage and motor (synchronous or induction). It uses NEC Tables 430-148 and 430-150 to determine the motor full load current. (If you enter a value for HP or voltage that does not correspond to these tables, the unit will display Error 8).

The *ElectriCalc Pro* can also calculate an equivalent horsepower for either an induction or a synchronous motor based on a voltage, phase and full load current. When calculating motor HP from an entered amperage, a result not directly matching a value in NEC Table 430-148 or 430-150 will cause the calculator to choose the next higher table value for motor horsepower.

Finding Single-Phase Full Load Current

A 2 HP induction motor operates on 230 volt, single-phase power. What is the full load current for this motor?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Enter volts	230 [Volts]	230. VOLT
Enter HPind	2 [HPmotor]	2. HP IND
Find full load amps	[Amps]	12. FLC A

Finding Motor Wire Size and Ampacity

Find the wire size required to connect a continuous run, 3Ø, 3 HP induction motor into a 230V circuit.

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Enter volts	230 [Volts]	230. VOLT
Enter HPind	3 [HPmotor]	3. HP IND
Find load current	[Amps]	9.6 FLC A
Find 125% A size	[Set] [WireSz]	14 CU AWG WIRE SIZE 125%
Find max ampacity	[WireSz]	14 20.0 WIRE A125%

NOTE: *Display will show wire size in the upper left when displaying wire ampacity rating.*

Finding Synchronous Motor Horsepower

A synchronous motor is defined as having a 27 amp load on a 240 volt, 3Ø circuit. What is its horsepower?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Set to synch.	[Set] [8]	0. SYNC
Enter volts	240 [Volts]	240. VOLT
Enter amps	27 [Amps]	27. AMPS
Solve for Hp	[HPmotor]	25. HP SYNC

Ampacity Wire Sizing

The required wire size of a service conductor can be determined based on the specified electrical requirements and the [WireSz] key. The wire size is automatically recalculated whenever the wire insulation (temperature) ratings or wire material (copper or aluminum) types are revised. Wire sizing is based on the requirements defined in NEC Tables 310-16 and 310-17.

Wire Sizing Based on Insulation Rating

Wiring is being installed in a 240 volt, single-phase system rated at 30 kVA. What is the wire size needed if you use 60°C copper wire?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Set to 60˚C	[Set] [6]	1Ø 60 Cu 1 PH
Enter kVA	30 [kilo-] [VA]	30. KVA
Enter volts	240 [Volts]	240. VOLT
Find amps	[Amps]	125. AMPS
Find CU wire size	[WireSz]	0 CU
		AWG WIRE SIZE

Re-sizing Wire Based on Different Insulation Ratings

What wire size is required for a 75°C copper branch circuit carrying a load of 260 amps? What would the wire size be if 90°C copper is used?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 75°C	[Set] [7]	3Ø 75 Cu 0.
Enter amps	260 [Amps]	260. AMPS
Find wire size	[WireSz]	300 CU
		AWG WIRE SIZE
Change to 90˚	[Set] [9]	0000 CU
		AWG WIRE SIZE

Wire Sizing Based on Ambient Temperature

Find the 90°C aluminum wire size needed to connect a 47,700 volt-amp load to a 240 volt, single-phase source. What is the adjusted wire size, if the ambient temperature rating is changed from the default 30°C to 40°C?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Set to 90°C	[Set] [9]	1 Ø 90 Cu 1 PH
Set toAl	[Set] [4]	1 Ø 90 Al 1 PH
Enter VA	47700 [VA]	47,700. VA
Enter volts	240 [Volts]	240. VOLT
Find amps	[Amps]	198.75 AMPS
Find wire size	[WireSz]	0000 AL AWG WIRE SIZE
Change ambient temperature	40 [Set] [2]	AMB° 40.˚C
Find adjusted wire size	[WireSz]	250 AL AWG WIRE SIZE
Reset amb. temp	30 [Set] [2]	AMB° 30.˚C

***NOTE:** Ambient temperature will remain at 40°C unless you change it or perform an ALL CLEAR (**[Set] [x]**).*

Wire Sizing Based on Material Type

Find the wire size for a 75°C copper wire carrying a 3Ø load of 265 amps. What is the equivalent aluminum wire size?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 75°C	[Set] [7]	3Ø 75 Cu 0.
Enter amps	265 [Amps]	265. AMPS
Find wire size	[WireSz]	300 CU AWG WIRE SIZE
Change to alum.	[Set] [4]	400 AL AWG WIRE SIZE

Sizing Parallel Conductors

What size 60°C insulated copper wire is required for a single conductor carrying a 500 amp load in a Free Air environment (30°C amb. temp.)? What size for 2 parallel conductors? For 3 conductors?

(Cont'd)

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set free air mode	[Set] [5]	3Ø 60 FrAir Cu 0.
Enter amps	500 [Amps]	500. AMPS
Find 1 wire size	[WireSz]	500 CU AWG WIRE SIZE
Find 2 wire size	2 [ParSz]	000 CU PAR WIRE SIZE
Find 3 wire size	3 [ParSz]	0 CU PAR WIRE SIZE

NOTE: *Parallel wire sizes smaller than 1/0 will be displayed as nonE.*

Finding Derated Wire Size

What is the derated wire size required for nine 75°C copper wires, each carrying a maximum load of 65 amps?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 75°C	[Set] [7]	3Ø 75 Cu 0.
Enter amps	65 [Amps]	65. AMPS
Find normal wire size	[WireSz]	6 CU AWG WIRE SIZE
Find derated wire size	9 [Set] [ParSz]	3 CU D/R WIRE SIZE

Sizing Temperature-Adjusted Derated Wires

A circuit was built with 90°C aluminum wire connecting a 47,650 volt-amp load to a 240 volt, single-phase source. Ambient temperature is 50°C. What is the derated wire size required if eight current-carrying THHN wires were installed in the raceway?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Set to 90°C	[Set] [9]	1Ø 90 Cu 1 PH
Toggle to alum.	[Set] [4]	1Ø 90 Al 1 PH
Enter volt-amps	47650 [VA]	47,650. VA
Enter volts	240 [Volts]	240. VOLT
Set to 50°C amb	50 [Set] [2]	AMB° 50° C
Find adjst wire sz.	[WireSz]	300 AL AWG WIRE SIZE
Find derated wire size	8 [Set] [ParSz]	500 AL D/R WIRE SIZE

NOTE: *Ambient temperature should be changed back to 30°C to avoid conflicts in answers through out the rest of this manual.*

Reset to 30°C	30 [Set] [2]	AMB° 30° C

Voltage Drop

The reduction in voltage between the power source and the load can be determined by entering the phase, volts, amps, wire material, voltage drop wire size and length of run. The calculator determines resistance and then the voltage reduction. Voltage drop can be displayed as volts dropped, or as a percent reduction of potential load.

This calculator also finds voltage drop wire size once you have entered or calculated the phase, volts, amps, length, wire type, and allowable VD percentage. It will solve for the distance ([Length]) once you have entered or calculated the phase, volts, amps, wire type, voltage drop wire size, and allowable VD percentage. The *ElectriCalc Pro* uses resistance values found in NEC Table 8 to determine voltage drop.

NOTE: *Voltage drop solutions may vary slightly from actual AC circuit measurements as the calculator does not incorporate factors such as inductive reactance, skin effect, raceway material, etc. In most situations, the DC Voltage Drop calculation is sufficient to meet safety standards.*

IMPORTANT NOTE ON VOLTAGE DROP CALCULATIONS

The *ElectriCalc Pro* calculates voltage drop and wire size using DC resistance as defined by the 2002 NEC. To find the voltage drop for a *specific* wire size, you must *first enter amps and the one-way wire length* (and other required variables), entering the specific wire size *last*. Otherwise, for your safety the calculator will recalculate the wire sizes based on the '99 NEC Ampacity Tables and maximum allowable voltage drop.

Finding Single-Phase Voltage Drop

You are installing 175 feet of 75°C, #8 THW branch circuit copper conductors to supply an 11A load on a 208V 1Ø system. What is the source voltage drop at the load?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Set to 75°C	[Set] [7]	1Ø 75 Cu 1 PH
Enter amps	11 [Amps]	11. AMPS
Enter volts	208 [Volts]	208. VOLT
Enter length	175 [Length]	175. FEET
Enter wire size	8 [WireSz]	8 CU
		AWG WIRE SIZE
Solve volt. drop	[VD%]	3.0 DROP V
Solve % v.drop	[VD%]	1.4 DROP V %

Finding Three-Phase Voltage Drop

A 20-amp three-phase load is being fed by a 230-volt source located 150 feet away. The installation specifications require 75°C #10 THW stranded copper conduc-tor. What is the voltage drop on this branch circuit?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 75°C	[Set] [7]	3Ø 75 Cu 0.
Enter amps	20 [Amps]	20. AMPS
Enter volts	230 [Volts]	230. VOLT
Enter length(feet)	150 [Length]	150. FEET
Enter VD wire size10	[WireSz]	10 CU AWG WIRE SIZE
Solve volt. drop	[VD%]	6.4 DROP V
Solve % v.drop	[VD%]	2.8 DROP V %

Finding Voltage Drop Wire Size

A 20-amp single-phase 208-volt load will be located 175 feet away from the source. Assuming a 3% allowable voltage drop, what is the size of 75°C conductor re-quired for this branch circuit?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Set to 75°C	[Set] [7]	3Ø 75 Cu 0.
Set to 1-phase	[Set] [1]	1 PH
Enter amps	20 [Amps]	20. AMPS
Enter volts	208 [Volts]	208. VOLT
Enter distance	175 [Length]	175. FEET
Enter allow. VD%	3 [VD%]	3.0 DROP V %
Find wire size	[WireSz]	8 CU
		AWG VD WIRE SIZE
Find actual voltage drop	[VD%]	5.4 DROP V
Find % v.drop	[VD%]	2.6 DROP V %

Finding Voltage Drop Distance

How far from a single-phase 240-volt source can you install a 15 amp load using 60°C #10 Al branch circuit conductors? Assume a 3% allowable voltage drop.

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 1-phase	[Set] [1]	1 PH
Set to aluminum	[Set] [4]	1Ø 60 Al 1 PH
Enter amps	15 [Amps]	15. AMPS
Enter volts	240 [Volts]	240. VOLT
Enter wire size	10 [WireSz]	10 AL AWG WIRE SIZE
Enter 3% VD	3 [VD%]	3.0 DROP V %
Find distance	[Length]	123.77387 FEET
Find actual voltage drop	[VD%]	7.2 DROP AL V
Find % v.drop	[VD%]	3.0 DROP AL V %

NOTE: *The calculator automatically makes adjustments for resistance using NEC Chap 9, Table 8, if the insulation type is other than 75°C.*

Finding Voltage Drop Resistance

What is the resistance of 85 feet of #2 90°C copper conductor?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 90°C mode	[Set] [9]	3Ø 90 Cu 0.
Enter wire size	2 [WireSz]	2 CU AWG WIRE SIZE
Find resistance	[Set] [Length]	0.2033993 OHMS WIRE
Find 85 ft resist*	[÷] 1000 [x] 85 [=]	0.0172889

***NOTE:** Given resistance per 1000 feet, divide by 1000 to get a per foot resistance, then multiply by 85.*

Finding DC Resistance

What is the equivalent resistance of a 12 volt DC circuit pulling 5 amps?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Enter voltage	12 [Volts]	12. VOLT
Enter amps	5 [Amps]	5. AMPS
Find resistance	[Set] [Volts]	2.4 OHMS

Ground Conductor Wire Size

You can use single or multiple service entrance conductor(s) to find the grounding electrode conductor for AC systems. When using multiple conductors, the *ElectriCalc Pro* uses the equivalent circular mils to find the grounding electrode conductor (based on NEC Table 250-66).

Find the grounding electrode conductor wire size required when 2/0 is the largest 3-phase 75°C copper service-entrance conductor being used. What is the equivalent aluminum size? What is the equivalent circular mils?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Set cond. temp.	[Set] [7]	3Ø 75 Cu 0.
Enter wire size	00 [WireSz]	00 CU AWG WIRE SIZE
Find grnd wire sz	[Grnd]	4 CU GRND WIRE SIZE
Find alum size	[Grnd]	2 AL GRND WIRE SIZE
Find circular mils	[Grnd]	133,100. CMIL WIRE

Equip. Grounding Conductor Wire Size

The [Set] [Grnd] keystroke can be used to find the grounding conductor size for raceways and “over-current devices in circuit ahead” equipment. The calculator uses the displayed amperage value to solve for the equipment grounding conductor based on NEC Table 250-122.

Find the equipment grounding conductor size required when the circuit-breaker is rated at 45 amps and 90° copper is being used in the installation. What is the equivalent aluminum size?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Set cond. temp.	[Set] [9]	3Ø 90 Cu 0.
Enter amp rating	45 [Amps]	45. AMPS
Find equip. grnd. wire size	[Set] [Grnd]	10 CU EQPG WIRE SIZE
Find alum size	[Grnd]	8 AL EQPG WIRE SIZE

Fuse and Circuit Breaker Size

What is the computed dual element and single element fuse size for a 230 volt, 3-phase, 50 HP induction motor? What are the Instantaneous Trip and Inverse Time Circuit Breaker requirements?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Enter volts	230 [Volts]	230. VOLT
Enter hp	50 [HPmotor]	50. HP IND
Find full current	[Amps]	130. FLC A
Find DE fuse size	[DEFuse]	227.5 dE AMPS
Display % used	[DEFuse]	175. %FLC
Find SE fuse size	[Set] [DEFuse]	390. SE AMPS
Display % used	[DEFuse]	300. %FLC
Find inv. time brkr	[InvTime]	325. b2 AMPS
Display % used	[InvTime]	250. %FLC
Find ins. trip breaker sz.	[Set] [InvTime]	1,040. b1 AMPS
Display % used	[InvTime]	800. %FLC

Starter Size

What NEMA size starter is required for a 575 volt, 3Ø, 20 HP induction motor?

Steps	Keystrokes	Display
Reset calculator	[On/C]	0.
Enter volts	575 [Volts]	575. VOLT
Enter hp	20 [HPmotor]	20. HP IND
Solve for starter size	[Set] [HPmotor]	2 STAR SIZE

Overload Protection Size

What overload protection device size is required for a 460 volt, 3-phase, 15 HP induction motor with a nameplate current rating of 19.2 amps and a 1.0 service factor? What is the required overload rating at 125% (for a 1.15 service factor)?

Steps	Keystrokes	Display
Reset Calculator	[On/C]	0.
Enter volts	460 [Volts]	460. VOLT
Enter horsepower	15 [HPmotor]	15. HP IND
Enter nameplate current	19.2 [Amps]	19.2 AMPS
Find overload size	[O-Load]	22.08 ol AMPS
Display % used	[O-Load]	115. %FLC
Find 125% load	125 [O-Load]	24. ol AMPS
Display % used	[O-Load]	125 %FLC

Conduit Size

The *ElectriCalc Pro* can calculate the size of conduit required when running single or multiple wires using the [CondSz] key and the calculator's internal tables. The calculator uses NEC values for area of THW, THHN, and XHHW wires. When using the actual wire areas (and following the guidelines in NEC Chapter 9, Tables 1, 3, 4 and 5), the calculator can calculate a conduit size based on the conduit type and the same or different wire types and sizes.

To select a specific conduit type, enter the corresponding number of the conduit and then press [Set] [CondSz]. The numbers and types are:

1) EMT	**2) ENT**	**3) FMC**	**4) IMC**
5) LFNB	**6) LFNA**	**7) LFMC**	**8) RMC**
9) P-80	**10) P-40**	**11) P-A**	**12) P-EB**

When you enter a new conduit type or scroll through the types, you will see the updated conduit size (if you have entered the wire type and quantity).

Finding Motor Branch-Circuit Wire Size & Conduit Size — Same Wire Type & Size

What size THHN copper wire & RMC conduit are needed to connect a 10 HP 1Ø induction motor to a 115 volt source?

Steps	Keystrokes	Display
Reset calculator	[Set] [x] [On/C]	0.
Set to 1-phase	[Set] 1	1 PH
Enter volts	115 [Volts]	115. VOLT
Enter horsepower	10 [HPmotor]	10. HP IND
Enter cond. type	8 [Set] [CondSz]	nonE RMC
Display full load amps	[Amps]	100. FLC A
Find wire size	[Set] [WireSz]	0 CU AWG WIRE SIZE 125%
Find wire ampacity	[WireSz]	0 125.0* WIRE A125%
Find conduit size	[CondSz]	1.25 in RMC COND SIZE
Find total # wires	[CondSz]	2. TTL WIRES
Find conduit fill %	[CondSz]	24.3 FILL COND %
Find act. fill area	[CondSz]	0.3710 FILL TTL WIRE AREA
Find rem. area	[CondSz]	0.1021 REM WIRE AREA

NOTE: *Display will also show wire size in upper left when displaying maximum ampacity rating.*

NOTE: *If a wire size has been calculated or stored, and the wire type/quantity is not defined, the calculator will assume 2 THHN wires for 1Ø and 3 THHN wires for 3Ø when calculating conduit size.*

Finding Conduit Sizes for Multiple Conductors — Same Wire Type & Size

Find the minimum IMC conduit size for eleven #6 THHN copper wires.

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Enter cond. type	4 [Set] [CondSz]	nonE IMC
Enter wire size	6 [WireSz]	6 CU AWG WIRE SIZE
Enter # THHN	11 [#THHN]	11. THHN WIRES
Find conduit size	[CondSz]	1.25 in IMC COND SIZE

Finding Number of Wires in Existing Conduit — Same Size, Various Types

Find the maximum number of #10 THHN copper wires that can be pulled through an existing 3” EMT conduit. How many XHHW wires? How many THW wires?

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Enter cond. type	1 [Set] [CondSz]	EMT nonE COND
Enter wire size	10 [WireSz]	10 CU AWG WIRE SIZE
Enter conduit size	3 [CondSz]	3.00 in EMT COND SIZE
Find max THHN #	[#THHN]	167. THHN TTL WIRES
Find max XHHW#	[#XHHW]	145. XHHW TTL WIRES
Find max THW #	[#THW]	145. THW TTL WIRES

Finding Conduit Size - Multiple Conductors Different Wire Sizes & Types

Three 1/0 THWN 75°C conductors and one #2 XHHW 75°C copper conductor are to connect to a panel board using a single conduit. What is the cross-

sectional area of wires, conduit size and actual fill area? (Use [THHN] for THWN; the cross-sectional areas are the same.)

Steps	Keystrokes	Display
Clear calculator	[On/C] [On/C]	0.
Set to 75°	[Set] [7]	1Ø Cu 75 0.
Enter cond. type	3 [Set] [CondSz]	nonE FMC COND
Enter 1st wire sz	0 [WireSz]	0 CU AWG WIRE SIZE
Enter #, type wire	3 [#THHN]	3. THHN WIRES
Find cross-sect. wire area	[#THHN]	0.5565 THHN WIRE AREA
Enter 2nd wire sz	2 [WireSz]	2 CU AWG WIRE SIZE
Enter #, type wire	1 [#XHHW]	1. XHHW WIRE
Find cross-sect.	[#XHHW]	0.1146 XHHW WIRE AREA
Find conduit size	[CondSz]	1.50 in FMC COND SIZE
Find total # wires	[CondSz]	4. TTL WIRES
Find conduit fill %	[CondSz]	36.1 FILL COND %
Find act. fill area	[CondSz]	0.6711 FILL TTL WIRE AREA
Find rem. area	[CondSz]	0.0717 REM WIRE AREA

Error Codes

The error codes for the *ElectriCalc Pro* are listed below (Note: To clear an error, simply press any key):

Error	Description
1	Display register overflow *(Answer too large to fit display)*
2	Invalid or out-of-scale entry
3	PF or EFF calculated above 100%
4	Conduit Size beyond limits of table
5	Unable to calculate VDWire Size *(Amps/Length too high)*
8	Invalid HP entry per NEC table
9	Entered or calculated more than 15 different wires sizes
11	Temperature setting out of range for wire computation.

Battery Information

The calculator is powered by a single 3-Volt Lithium CR-2032 battery. This should last upwards of 800 hours of actual use (1 year plus for most people). If the display becomes very dim or erratic, replace the battery.

NOTE: *Please use caution when dispos-ing of your old batteries as they contain hazardous chemicals.*

2002 NEC References

Table 250-66
Table 250-122
Table 310-15(b)(2)(a)
Table 310-16
Table 310-17
Chapter 9, Table 1, 4, 5 and 8
Section 430-32
Table 430-148
Table 430-150
Table 430-152
Appendix C

Updating Future Code Revisions

This model is updateable for future NEC Editions. For information on 2005 and 2008 Codes, contact the dealer where this calculator was purchased or you may contact Calculated Industries, Inc. in the fall of the year prior.

Permanent Values/Settings

Values and settings maintained in permanent memory can only be changed (1) by pressing **[Set] [x]** (resets calculator to default settings), or (2) by changing each one or all of these settings. The following are permanent values:

(1) Selectable (60°C/75°C/90°C) insulation ratings and CU/AL wire type ratings
(2) Phase setting (1Ø/3Ø)
(3) The entered values for volts, voltage drop %, power factor % and efficiency %

Semi-Permanent Values

The following semi-permanent values are cleared to default settings when the calculator is shut off:

(1) Independent User Memory
(2) Free Air mode

Warranty

Warranty Repair Service – U.S.A.

Calculated Industries, Inc. (“CI”) warrants this product against defects in materials and workmanship for a period of one (1) year from the date of original consumer purchase in the U.S. If a defect exists during the warranty period, CI at its option will either repair (using new or remanufactured parts) or replace (with a new or remanufactured unit) the product at no charge.

THE WARRANTY WILL NOT APPLY TO THE PRODUCT IF IT HAS BEEN DAMAGED BY MISUSE, ALTERATION, ACCIDENT, IMPROPER HANDLING OR OPERATION, OR IF UNAUTHORIZED REPAIRS ARE ATTEMPTED OR MADE. SOME EXAMPLES OF DAMAGES NOT COVERED BY WARRANTY INCLUDE, BUT ARE NOT LIMITED TO, BATTERY LEAKAGE, BENDING, OR VISIBLE CRACKING OF THE LCD, WHICH ARE PRESUMED TO BE DAMAGES RESULTING FROM MISUSE OR ABUSE.

To obtain warranty service in the U.S., ship the product postage paid to the CI Authorized Service Provider listed on the back page of the User’s Guide.

Please provide an explanation of the service requirement, your name, address, day phone number and dated proof of purchase (typically a sales receipt). If the product is over 90 days old, include payment of $6.95 for return shipping and handling within the contiguous 48 states. (Outside the contiguous 48 states, please call CI for return shipping costs.)

A repaired or replacement product assumes the remaining warranty of the original product or 90 days, whichever is longer.

Non-Warranty Repair Service – U.S.A.

Non-warranty repair covers service beyond the warranty period or service requested due to damage resulting from misuse or abuse.

Contact the CI Authorized Service Provider listed on the back page of the User's Guide to obtain current product repair information and charges. Repairs are guaranteed for 90 days.

Repair Service – Outside the U.S.A.

Not all countries have CI Authorized Service Providers or the same warranty and service policies. To obtain warranty or non-warranty repair service for goods purchased outside the U.S., contact the dealer through which you initially purchased the product. If you cannot reasonably have the product repaired in your area, you may contact CI to obtain current product repair information and charges, including freight and duties.

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IN NO EVENT WILL CI BE LIABLE FOR DIRECT, INDIRECT, SPECIAL,

INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT IN THE PRODUCT OR ITS DOCUMENTATION.

The warranty, disclaimer, and remedies set forth above are exclusive and replace all others, oral or written, expressed or implied. No CI dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific rights, and you may also have other rights, which vary, from state to state.

FCC Class B

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC rules.

Legal Notices

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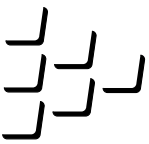
File: 5060-UG-B



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