Residential 1-Line 2017

Multifamily Instructions

User's Manual

Using Residential 1-Line 2017 with Excel

Excel 1997-2003

This product was designed with Excel 1997 and runs fine with all versions of Excel through 2003.

Excel 1997-2003 creates files with a **.xls** file extension. This **.xls** file extension is the most common file extension for the Excel spreadsheets.

Excel 2007 and Later

Excel 2007 and later creates files with a new file extension **.xlsx.** This file extension in not reverse compatible with previous versions of Excel. Thus if you create files with Excel 2007 other users may not be able to use them.

Having said that we have created a version of Residential 1-Line 2017 that uses the new Excel 2007 **.xlsx** file extension. We have tested this **.xlsx** version and found the following:

1. The new Excel 2007 takes longer to load files and the recalculation time is a little slow.
2. The menus in Excel 2007 and later are not the same and some commands no longer exist.
3. The new **.xlsx** files we created seem to run properly (and slow) with Excel 2007 and later.

NOTE

We have both Excel 2000 and Excel 2007 installed on our machines. You may also wish to installed both version of Excel on your machines.

RESIDENTIAL 1-LINE 2017

The **Residential 1-Line 2017** software is a spreadsheet template software program for calculating main service switchboard, sub panels, feeder sizes and Residential 1-Line drawings. This program may be used for single and multifamily dwelling loads. The **Residential 1-Line 2017** software is for reference purposes only, and Durand & Associates cannot assume any responsibility for the accuracy of the program contents. In using this program the user agrees to hold harmless and wave all claims against Durand & Associates.

SOFTWARE REQUIREMENTS

Residential 1-Line 2017 was created with Microsoft Excel 97. To use these templates you must have Microsoft Excel, Version 97 or later, installed on your computer.

If you have Excel 2003 or earlier close these instructions and use the users manual in the C:\Residential 1-Line 2017 folder.

INTRODUCTION

The **Residential 1-Line 2017** software is a spreadsheet template program. The program was designed for use in conjunction with Microsoft Excel on the Windows platform. The program should also work on other platforms that can read and write Microsoft Excel 97 file formats.

LOADING THE PROGRAM

Insert the CD in your drive and follow the setup instructions.

The installation of Residential 1-Line will create the following folders on your C drive.

C:\Residential 1-Line 2017

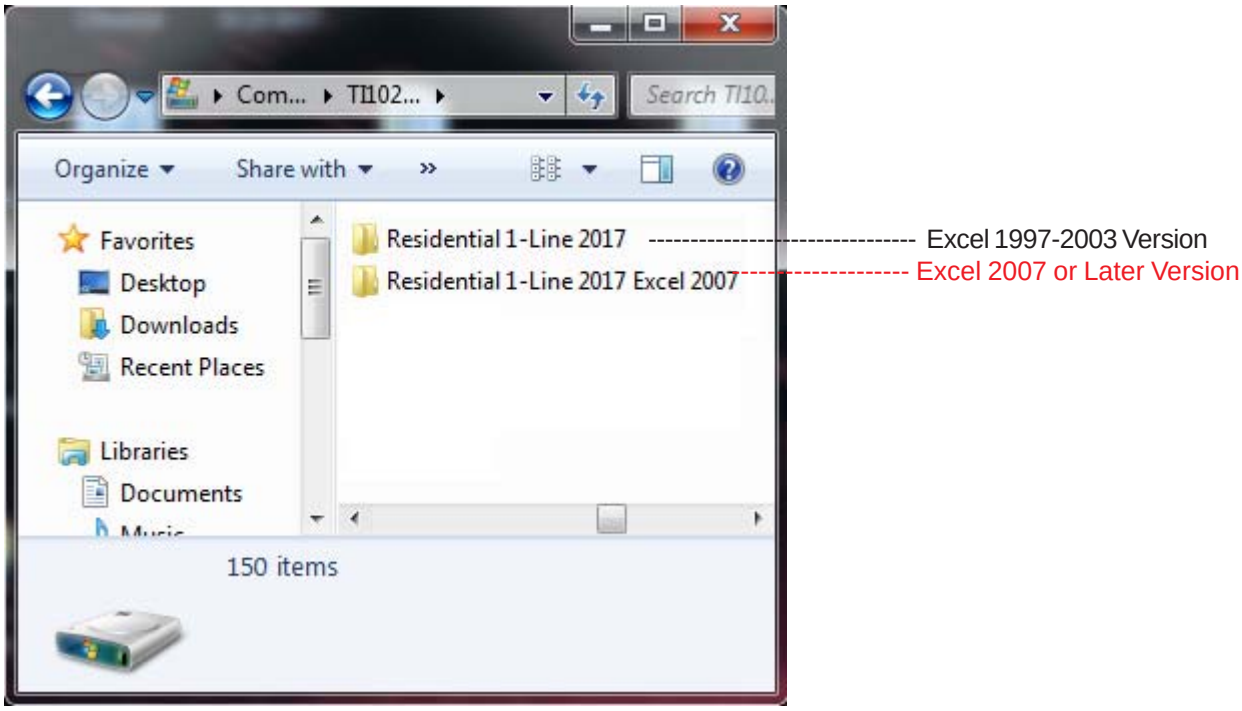
C:\Residential 1-Line 2017 Excel 2007

EXPLORING THE PROGRAM

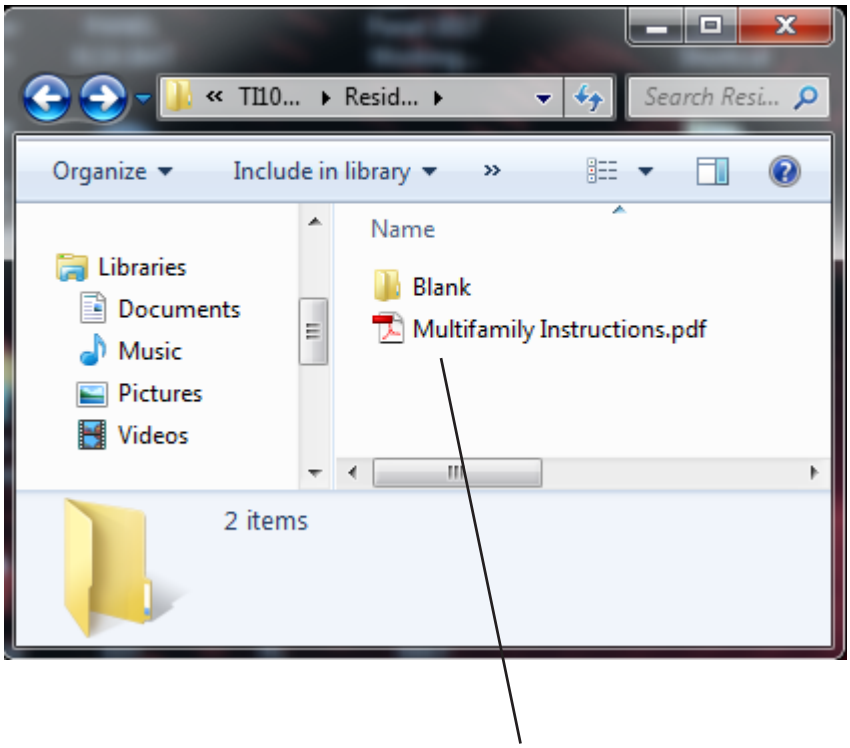
Residential 1-Line software is a complex spreadsheet template program. The program uses 32 files which link to one another. DO NOT CHANGE THE FILE NAMES. If a file name is changed the template can become corrupt.

LOCATING THE PROGRAM FILES

The Residential 1-Line templates are located on your C: drive.



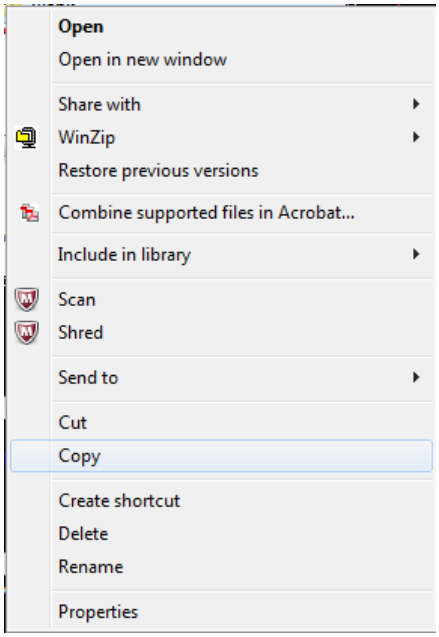
If you double click on the Residential 1-Line Excel 2007 folder, you will find 1-file & 1-folder.



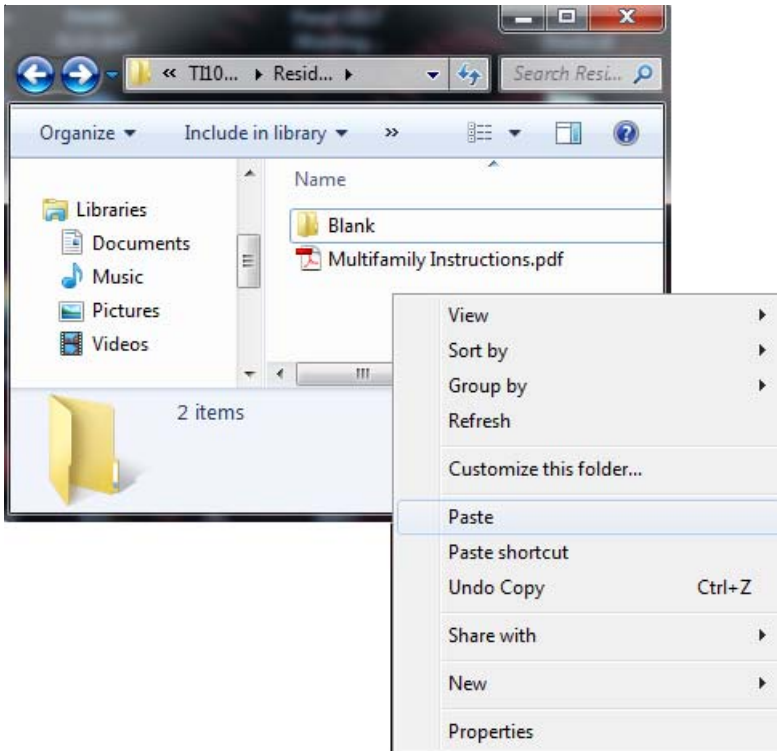
NOTE: Please double click on the "Multifamily Instructions" file and print the instructions.

STARTING A NEW PROJECT

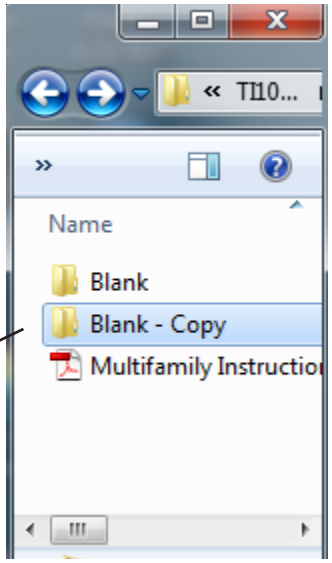
If you want to start a new project, RIGHT CLICK on the blank folder and select COPY.



Then RIGHT CLICK on the white area of the window and select PASTE.

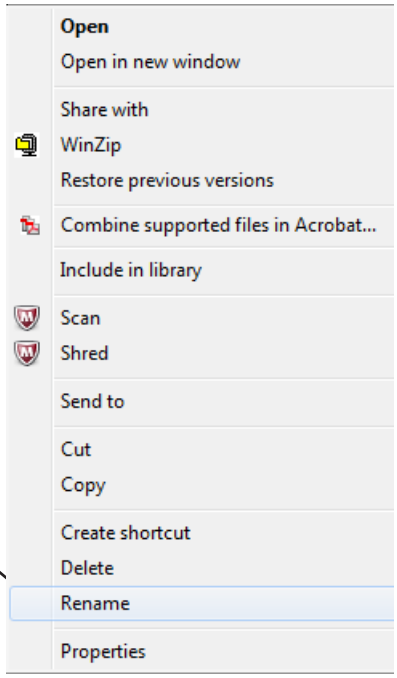


This will created a new folder titled “Blank Copy”.

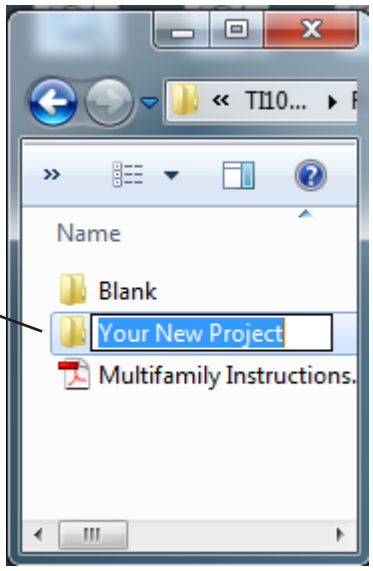


RENAME THE FOLDER

You can RIGHT CLICK on the new folder and select the RENAME command.



Type in your new project name.

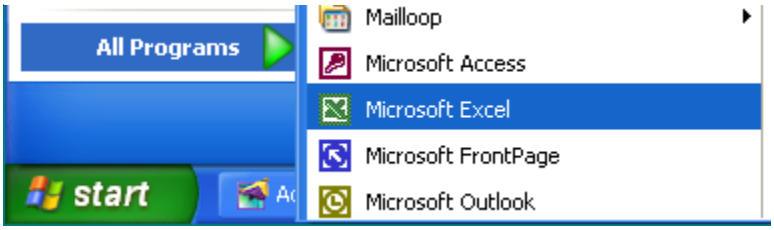


Use this method to create a new project each time you start a new Multifamily 1-Line.

Now that you have created a new folder close all windows.

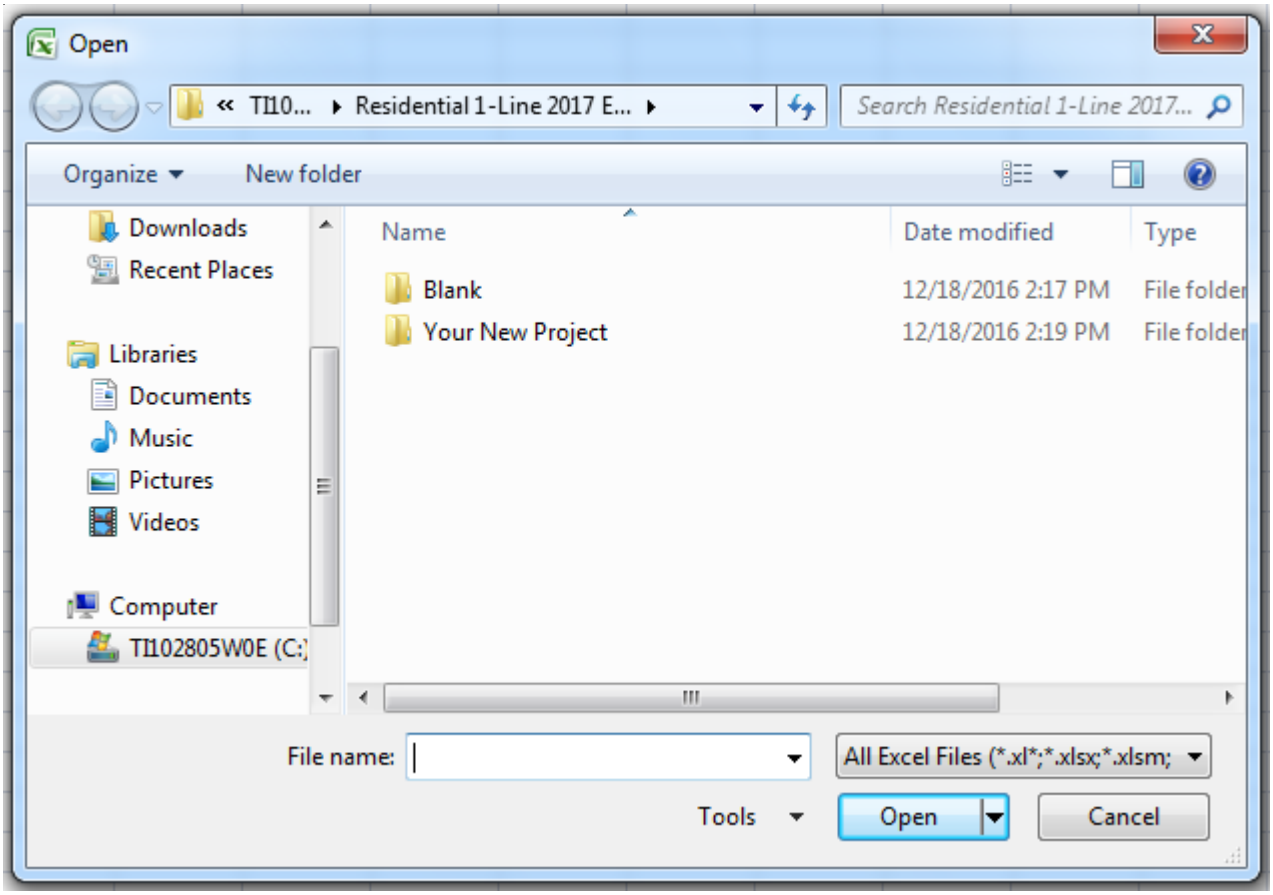
USING THE PROGRAM

Go to your START MENU, select ALL PROGRAMS, and select EXCEL.



This will start your Excel spreadsheet program.

Select the FILE OPEN command and locate the Residential 1-Line 2017 folder on your C: drive. Double click the Residential 1-Line 2017 folder to display the contents.

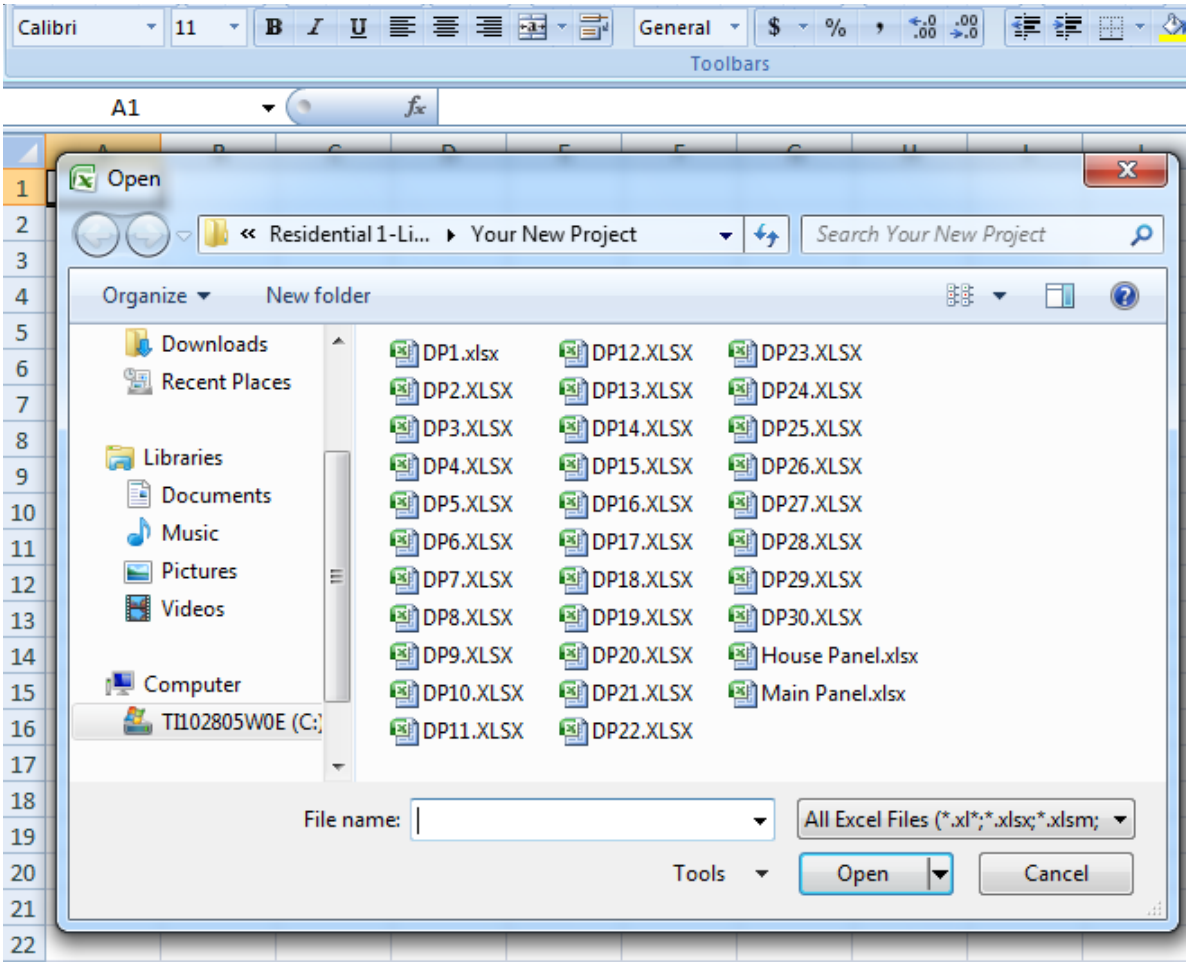


Now displayed are two (2) folders.

1. Blank
2. Your New Project (This is the folder you just created.)

Double click on “Your New Folder”.

EXPLORING THE SAMPLE PROJECT



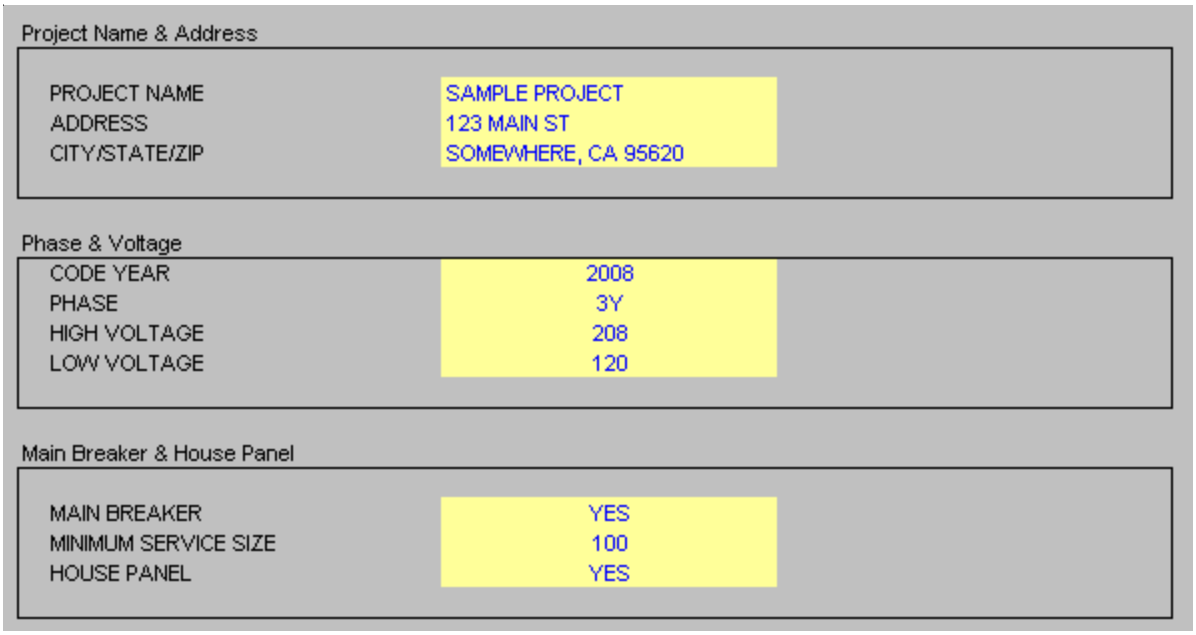
The files in this folder are MAIN PANEL, HOUSE PANEL, and DP1-DP30.

DO NOT RENAME THESE FILES (This will corrupt the files).

WORKING WITH THE MAIN PANEL

Double click on the MAIN PANEL file to display the Main Panel Template

This may take a few seconds to open as Excel updates the links to the other files.

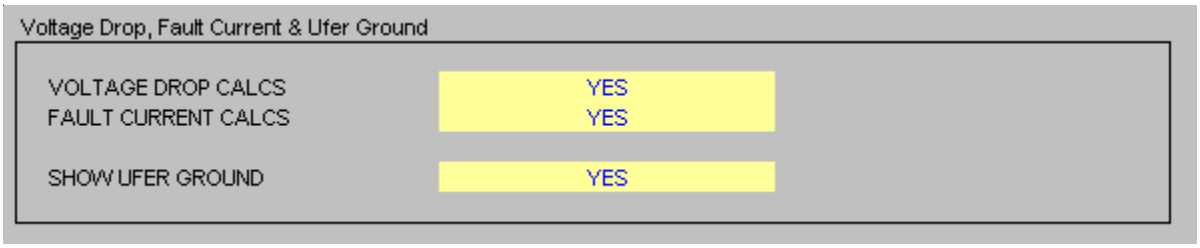


GENERAL INFORMATION

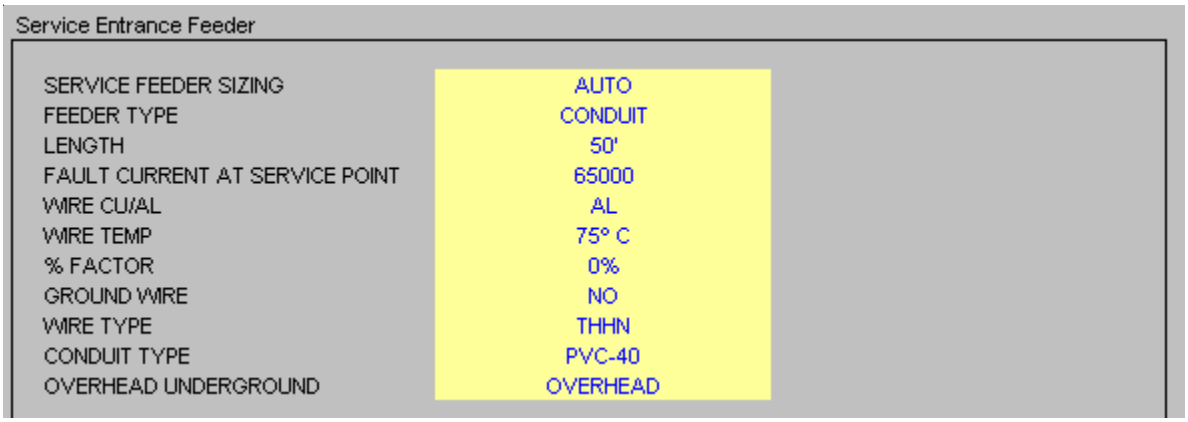
- **Project Name** (Enter the project name)
- **Address** (Enter the address)
- **City/State/Zip** (Enter the city, state, and zip code)

- **Code Year** (Select the Code Year from the pulldown menu)
- **Phase** (Select the phase from the pulldown menu)
  1 = 1-Phase
  3Y = 3-Phase Wye)
- **High Voltage** (Enter high voltage)
- **Low Voltage** (Enter low voltage)
- **Main Breaker** (Select YES or NO)
  You must have a main breaker when your have seven (7) or more meters.
- **Minimum Service Size** (Enter the minimum amps)
  The minimum amps is the smallest size allowed for the service. If the load exceeds the minimum amps, the program will automatically size the service to the correct size.
- **House Panel** (Select YES or NO)

GENERAL INFORMATION (continued)



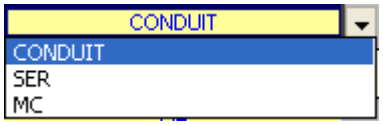
- **Voltage Drop Calcs** (Select YES or NO)
- **Fault Current Calcs** (Select YES or NO)
- **Show Ufer Ground** (Select YES or NO)



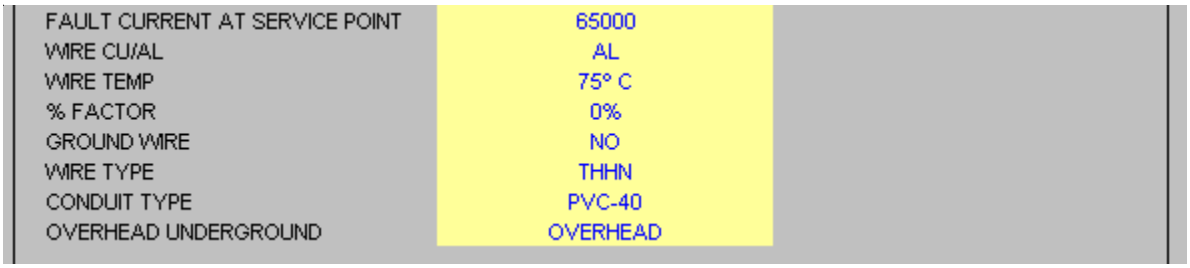
SERVICE FEED IN AUTO MODE

When auto mode is selected, the program will automatically calculate the feeder size. If the design load exceeds 1,200 amps, you will have to use the manual mode.

- **Service Feeder Sizing** (Select AUTO or MANUAL)
- **Feeder Type** (Select CONDUIT, SER, or MC)



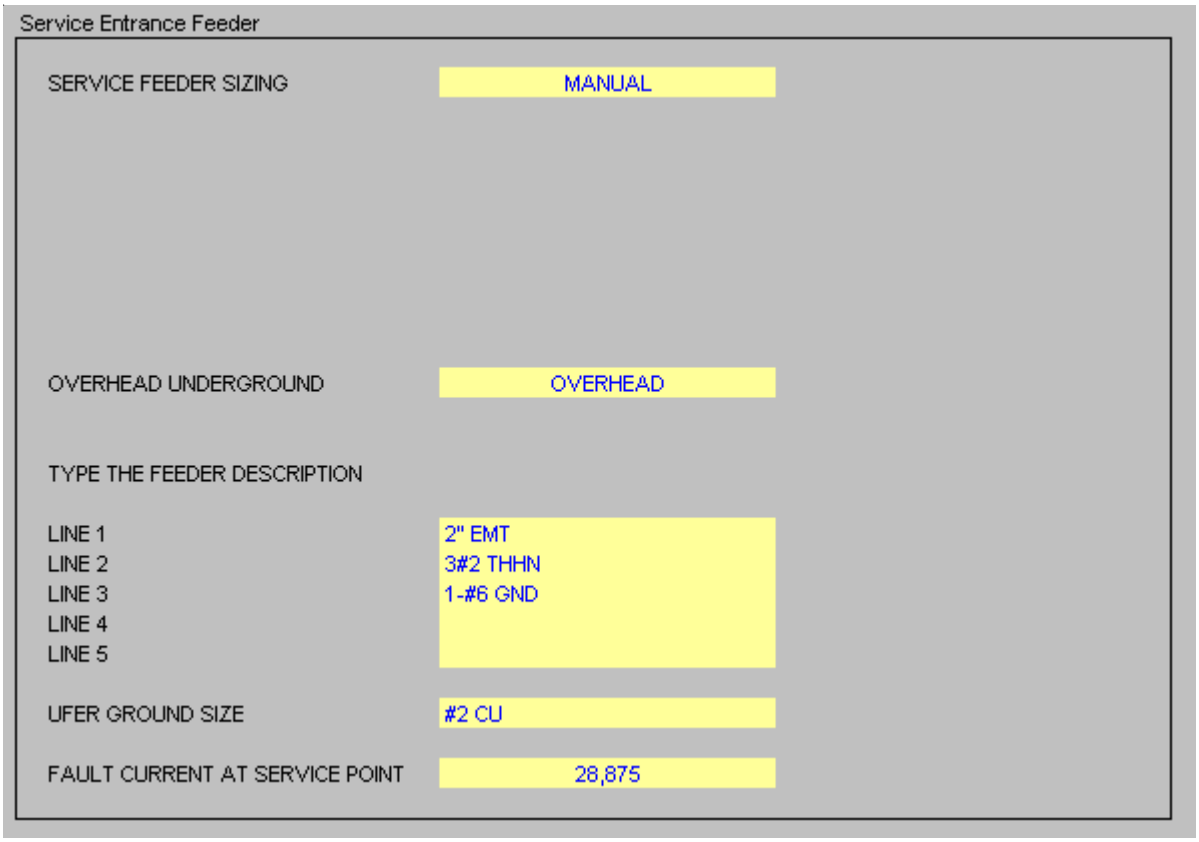
- **Length** (Enter the length of the conduit or cable run)



- **Fault Current at Service Point** (Enter fault current)
  If you have an overhead service, enter the fault current at the service point. The service point would be at the top of your service riser at the service cap.

  If you have an underground service where the utility pulls cable to the meter, enter the fault current at the meter.

- **Wire CU/AL** (Select CU or AL)
- **Wire Temp** (Select 60, 75 or 90)
- **% Factor** (Enter % Factor)
  Enter the % factor. This will increase the design load by the percentage. Example: If the calculated load is 90 amps and you enter 20%, the program will add 18 amps to the calculated load giving you a design load of 108 amps.
- **Ground Wire** (Select YES or NO)
  This option only appears when you are using a conduit feeder.
- **Wire Type** (Select Wire Type)
  This option only appears when you are using a conduit feeder.
- **Conduit Type** (Select Conduit Type)
  This option only appears when you are using a conduit feeder.
- **Overhead Underground** (Select OVERHEAD or UNDERGROUND)

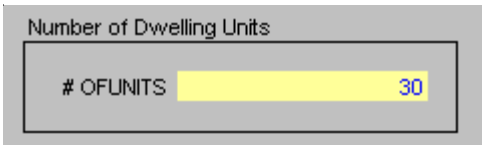


- **Service Feeder Sizing** (Select AUTO or MANUAL)
- **Line 1** (Feeder Description)
- **Line 2** (Feeder Description)
- **Line 3** (Feeder Description)
- **Line 4** (Feeder Description)
- **Line 5** (Feeder Description)
- **Ufer Ground** (Enter Ufer Ground Size)
- **Fault Current at Service Point** (Enter fault current)

  If you have an overhead service, enter the fault current at the service point. The service point would be at the top of your service riser at the service cap.

  If you have an underground service where the utility pulls cable to the meter, enter the fault current at the meter.

NUMBER OF DWELLINGS (continued)

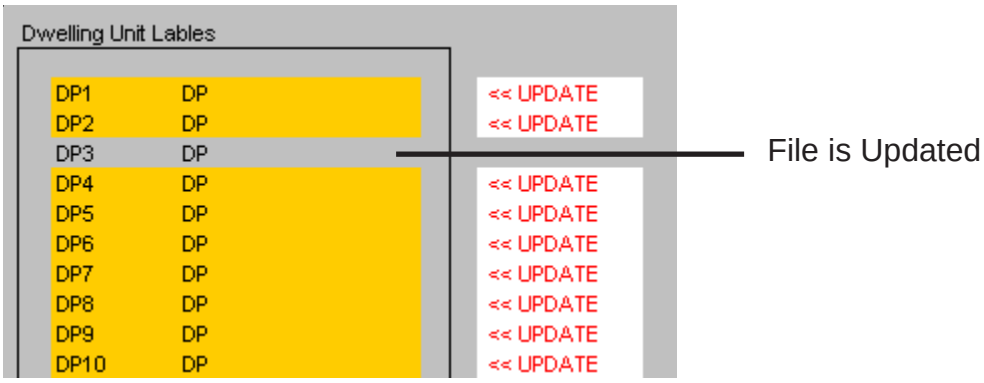


Enter the number of dwellings.

UPDATE DWELLING PANELS

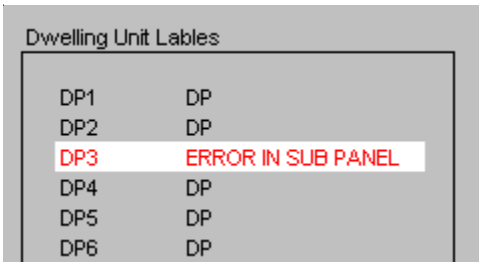
If the Main Pane Voltage or Phase change, the Dwelling Panels may need updating. When this condition is present the dwelling panel display turns orange.

NOTE: To update dwelling panels simply open the file.
Example: Open the DP3 file and the file is automatically updated.



DWELLING PANEL ERRORS

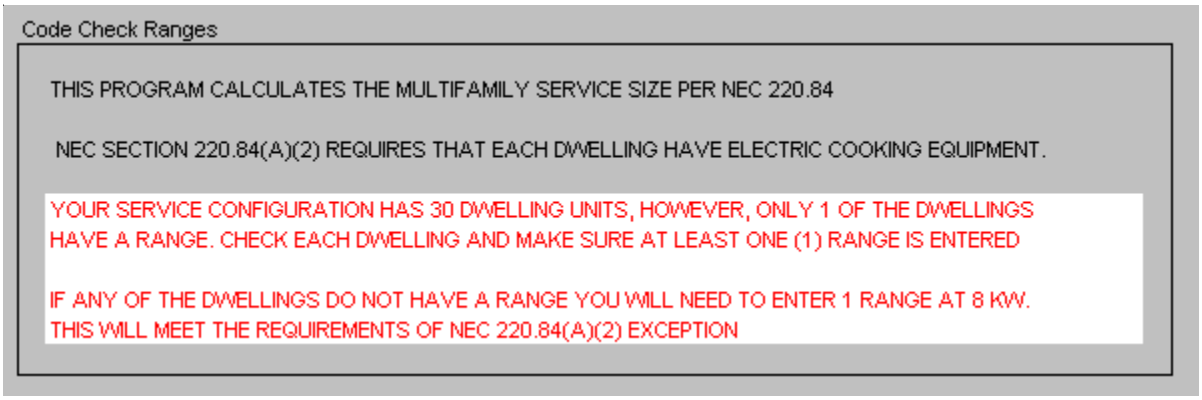
If a Dwelling Panel contains an error, the ERROR will be displayed.



To correct this error open the Dwelling Panel File and correct the error.

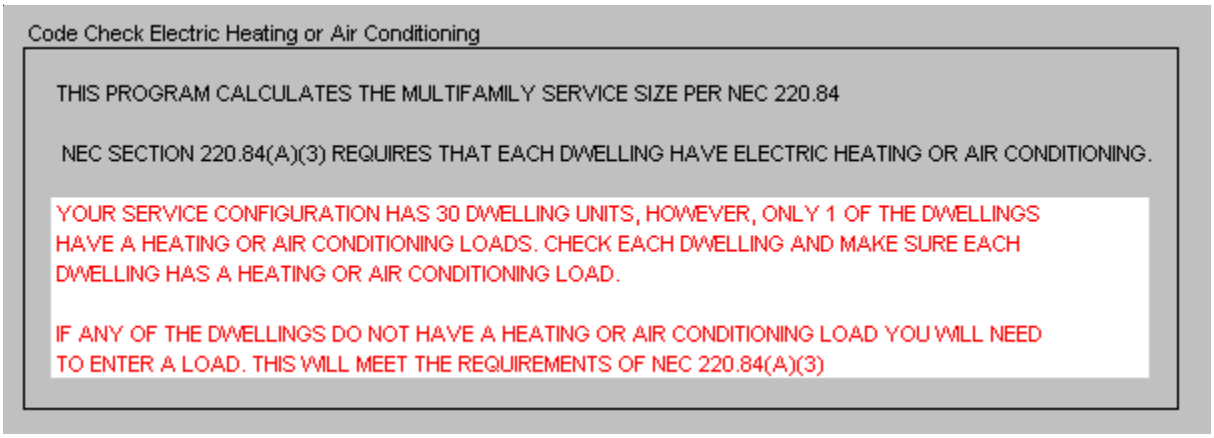
CODE CHECK RANGES

The program automatically checks the Code requirements for ranges.
If an error is detected, it will display the error and solution.



CODE ELECTRIC HEATING OR COOLING

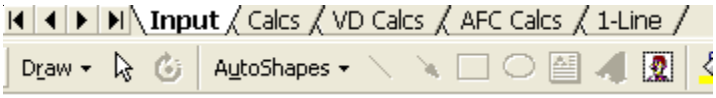
The program automatically checks the Code requirements for heating & cooling.
If an error is detected, it will display the error and solution.



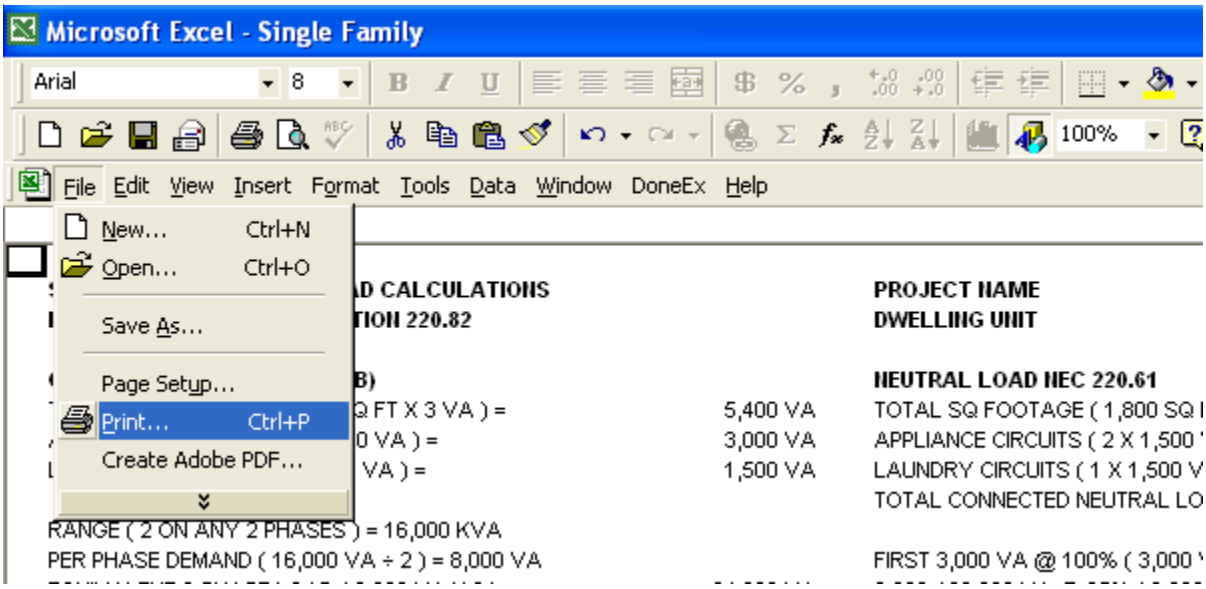
PRINTING

To print your load, voltage drop, or fault current calculations click on the Calcs Tabs.

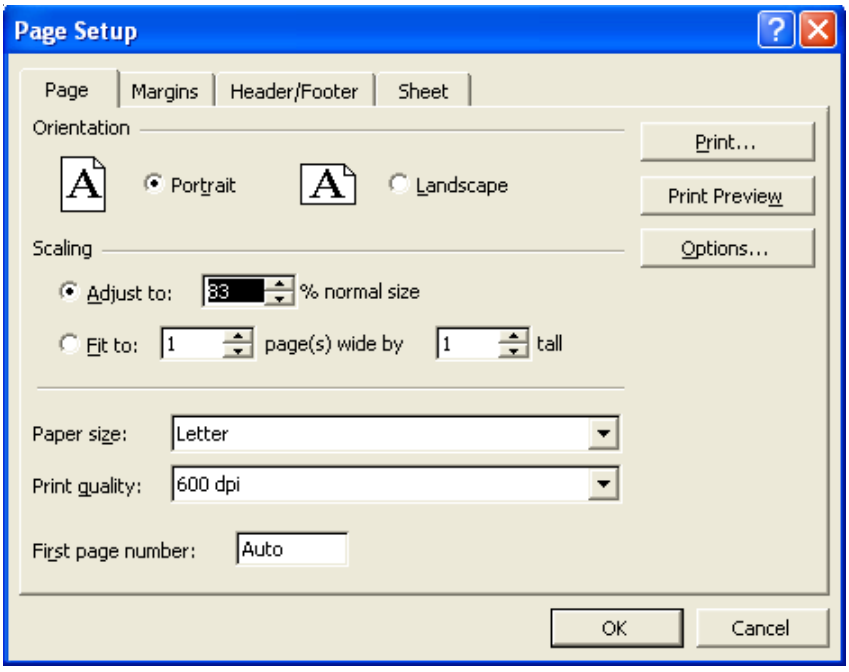
To print your 1-Line Drawing click on the 1-Line Tab.



Then select the File Print Command

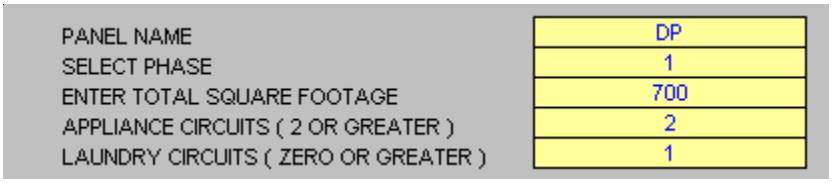


If the calculations print on more than one page, go to the “File Page Setup Command” and reduce the percentage.

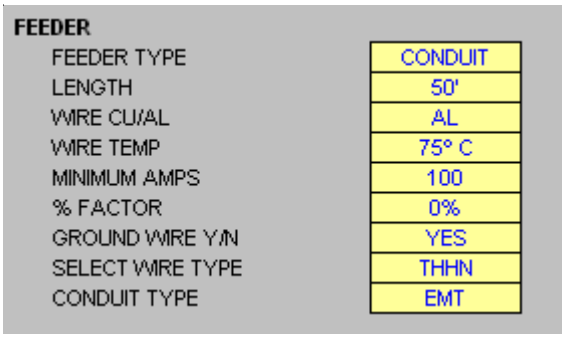


DWELLING UNIT TEMPLATES

GENERAL ENTRIES



PANEL NAME	Enter panel name.
PHASE	Select 1 or 3Y.
TOTAL SQUARE FOOTAGE	Enter the total square footage of the dwelling.
APPLIANCE CIRCUIT	Enter the number of appliance circuits. (Minimum 2)
LAUNDRY CIRCUITS	Enter the number of laundry circuits.



FEEDER TYPE	Select CONDUIT, SER, or MC
LENGTH	Enter total length of wire from service cap to panel.
WIRE CU/AL	Select CU or AL.
WIRE TEMP	Enter wire temperature 60, 75, or 90.
MINIMUM AMPS	Enter the minimum amps.
% FACTOR	Enter the % factor. This will increase the design load by the percentage. Example: If the calculated load is 90 amps and you enter 20%, the program will add 18 amps to the calculated load giving you a design load of 108 amps. **NOTE: Increasing the % factor forces the program to increase the wire size thus reducing the voltage drop.**
GROUND WIRE Y/N	Enter YES or NO. This option only appears when you are using a conduit feeder.
SELECT WIRE TYPE	Select wire type. This option only appears when you are using a conduit feeder.
CONDUIT TYPE	Select conduit type. This option only appears when you are using a conduit feeder.

GENERAL ENTRIES (continued)

MAJOR APPLIANCES

DESCRIPTION	QTY	KVA (EA)
RANGE(S) & OVEN(S)	1	8
CLOTHES DRYER(S)	1	5
WATER HEATER(S)		

RANGE(S) & OVEN(S) — Enter number of ranges, ovens, and KVA rating.

CLOTHES DRYER(S) — Enter number of dryers and KVA rating.

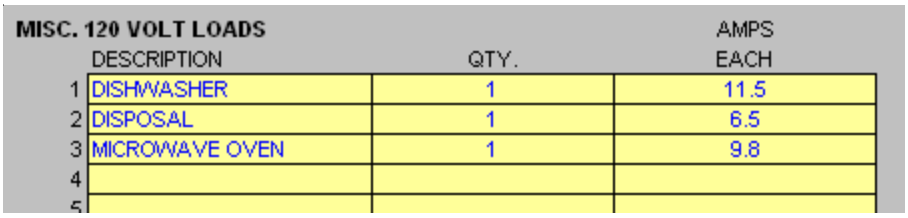
WATER HEATER(S) — Enter number of water heaters and KVA rating.

HEATING/COOLING

1.	ENTER THE TOTAL NAMEPLATE RATING KVA OF AIR CONDITIONING AND COOLING EQUIPMENT.	ENTER KVA: 4
2.	ENTER 100% OF THE NAMEPLATE RATING(S) OF THE HEAT PUMP WHEN THE HEAT PUMP IS USED WITHOUT ANY SUPPLEMENTAL ELECTRIC HEATING.	ENTER KVA: 0
3.	ENTER 100% OF THE NAMEPLATE RATING(S) IN KVA OF THE HEAT PUMP COMPRESSOR.	ENTER KVA: 0
	ENTER 100% OF THE SUPPLEMENTARY ELECTRIC HEAT USED WITH THE HEAT PUMP. NOTE: PROGRAM WILL AUTOMATICALLY ADJUST THIS AMOUNT TO 65%.	ENTER KVA: 0
4.	ENTER 100% OF THE NAMEPLATE RATING(S) OF ELECTRIC SPACE HEATING IF LESS THAN FOUR SEPARATELY CONTROLLED UNITS. NOTE: PROGRAM WILL AUTOMATICALLY ADJUST THIS AMOUNT TO 65%.	ENTER KVA: 0
5.	ENTER 100% OF THE NAMEPLATE RATING(S) OF ELECTRIC SPACE HEATING IF FOUR OR MORE SEPARATELY CONTROLLED UNITS. NOTE: PROGRAM WILL AUTOMATICALLY ADJUST THIS AMOUNT TO 40%.	ENTER KVA: 0
6.	ENTER 100% OF THE NAMEPLATE RATING(S) OF ELECTRIC THERMAL STORAGE AND OTHER HEATING SYSTEMS WHERE THE USUAL LOAD IS EXPECTED TO BE CONTINUOUS AT THE FULL NAMEPLATE VALUE. SYSTEMS QUALIFYING UNDER THIS SELECTION SHALL NOT BE CALCULATED UNDER ANY OTHER SELECTION IN 220.82(C).	ENTER KVA: 0

Enter heating & cooling loads listed above.

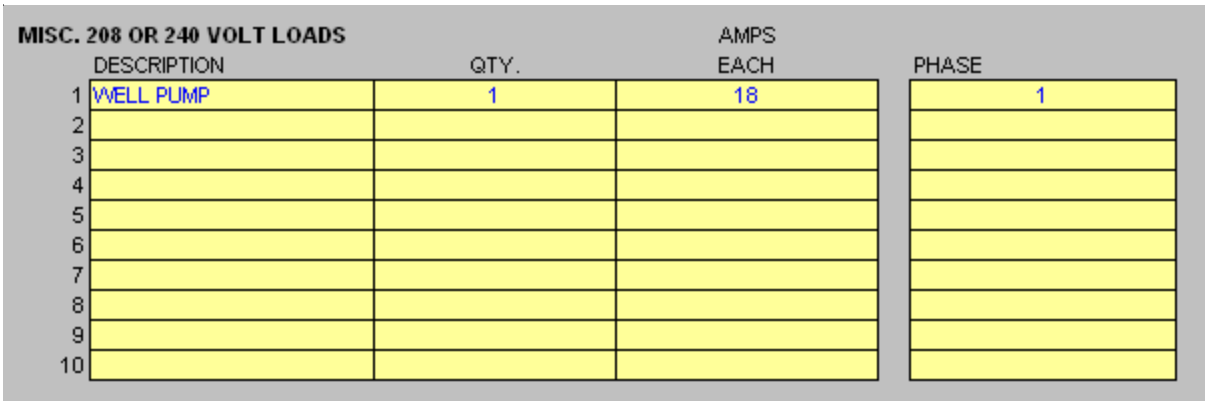
GENERAL ENTRIES (continued)



MISC. 120 VOLT LOADS

	DESCRIPTION	QTY.	AMPS EACH
1	DISHWASHER	1	11.5
2	DISPOSAL	1	6.5
3	MICROWAVE OVEN	1	9.8
4			
5			

Enter the description, number of units, and the amps for each item.



MISC. 208 OR 240 VOLT LOADS

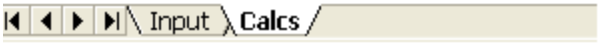
	DESCRIPTION	QTY.	AMPS EACH	PHASE
1	WELL PUMP	1	18	1
2				
3				
4				
5				
6				
7				
8				
9				
10				

Enter the description, number of units, amps, and the phase for each item.

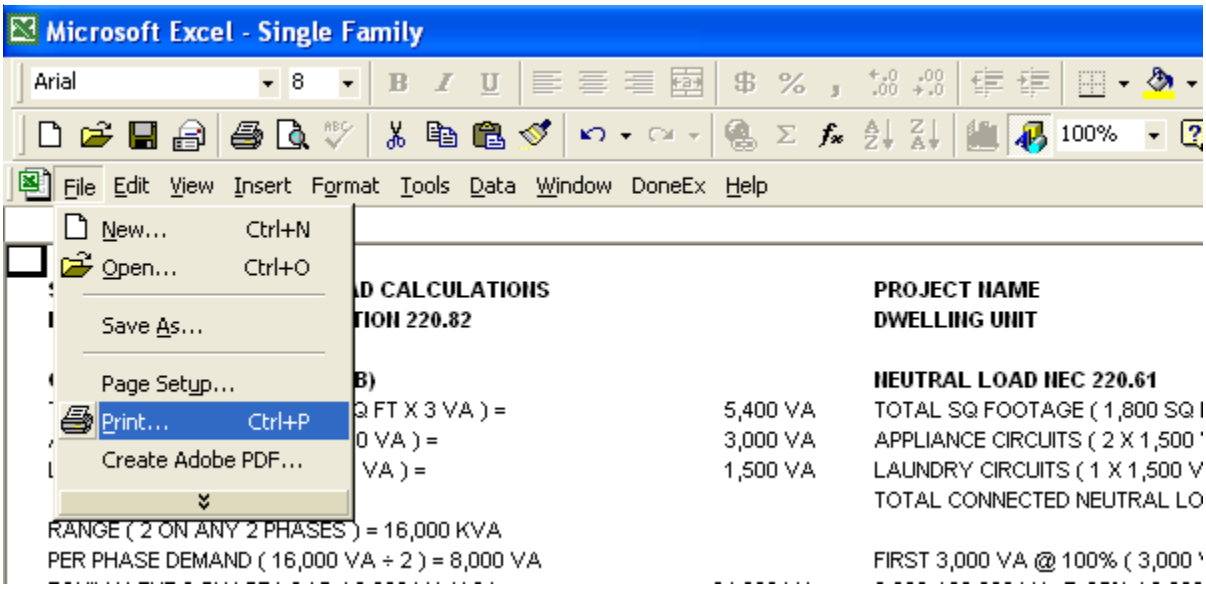
NOTE: Phase column only appears when using a 3-Phase panel.

PRINTING

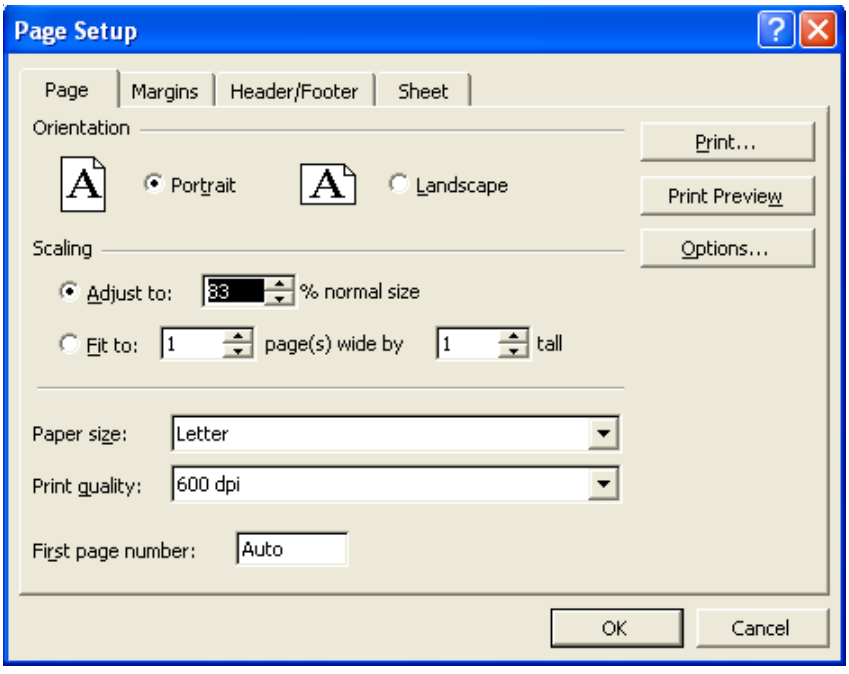
To print your load calculations click on the Calcs Tab.



Then select the File Print Command



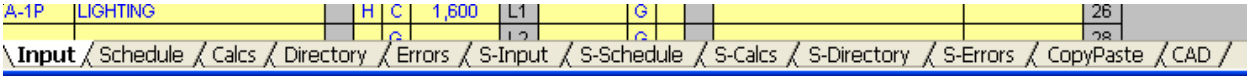
If the calculations print on more than one page, go to the “File Page Setup Command” and reduce the percentage.



USING HOUSE PANEL TEMPLATE

USING THE TABS

The template has twelve (12) tabs.



The first five tabs are for the Panel and the second five tabs are for the Sub Panel.

Each tab has a special purpose:

Panel Tabs

Input - This sheet is used to enter information.

Schedule - This sheet is used to review and print the panel schedule.

Calcs - This sheet is used to review and print load calculations.

Directory - This sheet is used to review and print the circuit directory.

Errors - This sheet is used to review and print the errors.

Sub Panel Tabs

S-Input - This sheet is used to enter information.

S-Schedule - This sheet is used to review and print the panel schedule.

S-Calcs - This sheet is used to review and print load calculations.

S-Directory - This sheet is used to review and print the circuit directory.

S-Errors - This sheet is used to review and print the errors.

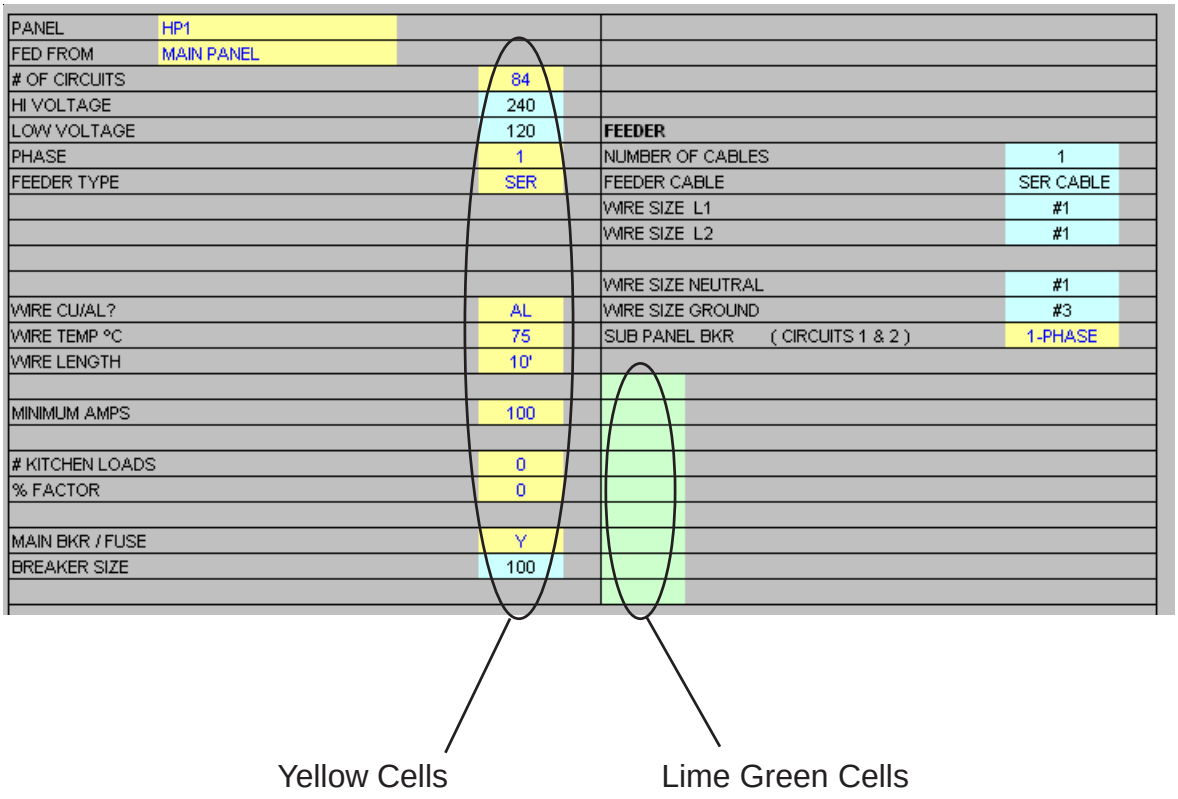
Misc. Tabs

Copy/Paste - This sheet explains the Paste Values command for Excel.

CAD - This sheet explains how to use the Copy Picture command and paste into a CAD program.

GENERAL ENTRIES

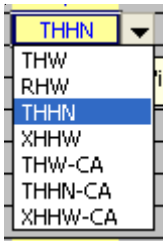
Some cells in the template files are protected. You may only enter information into certain cells. If you are using a color monitor, these cells are yellow or lime green.



Each unprotected yellow cell requires a user entry. If an invalid entry is made, a RED error message will appear to the left of the entry or an error message will appear in a pop up box.

When you select a cell a hint box will appear.

You may also use the pulldown menu



GENERAL ENTRIES (continued)

Below is a list of valid entries for the general information section of the panel schedule.

PANEL	P1	Enter the panel name such as LPA. If entry is too long it may be cut off when printed. (As a general rule 22 characters are allowed.)
# OF CIRCUITS	30	Enter number of circuits. (Even number from 6 to 84) or use the pulldown menu.
PHASE	3Y	Enter phase. Note: You may put a 1-Phase panel on a 3-Phase source.
GND WIRE Y/N	Y	Enter Y or N. If you enter Y, an equipment ground conductor will be added to the feeder conduit(s).
WIRE TYPE	THHN	Select the wire type.
WIRE CU/AL?	CU	Enter CU or AL.
WIRE TEMP	75	Enter the wire insulation temperature.
WIRE LENGTH	20	Enter wire length.
CONDUIT TYPE	EMT	Select conduit type.
MINIMUM AMPS	100	Enter minimum amps. If the load exceeds the minimum amps, the program will automatically size the wire for Code requirements.
KITCHEN LOADS	5	Enter the number of kitchen loads.
% FACTOR	20	Enter percentage factor. Example: If you enter 20, the program will provide 20% spare capacity for future loads. You may also use this factor to adjust for voltage drop.
MAIN BKR / FUSE	Y	Enter Y or N. If you enter Y the program will size the main breaker.

SUB PANEL BKR | 3-PHASE

Select choice from pulldown menu. If you want a sub panel fed from this panel, select 1-Phase or 3-Phase.

NOTE: If you select 1-phase, the program will automatically place a 2-pole circuit breaker in circuit positions 1 & 3.

If this is a 3-phase delta panel feeding 1-phase sub panel, the program will automatically place a 3-pole circuit breaker in circuit positions 1, 3, & 5. In this case the 1-phase sub panel will be connected to L1 and L3.

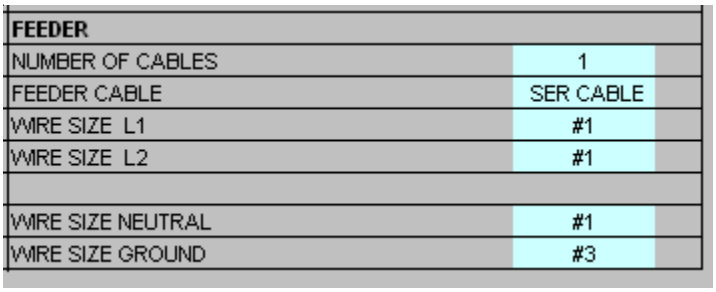
If you select 3-phase, the program will automatically place a 3-pole circuit breaker in circuit positions 1, 3, & 5.

GENERAL ENTRIES (continued)

You may enter any information in the green cells and it will appear on the panel schedule.

DISPLAY ONLY

Also, in the general information section there are a group of cells displaying wire and conduit size information, these cells only display information when no errors are present in the template.

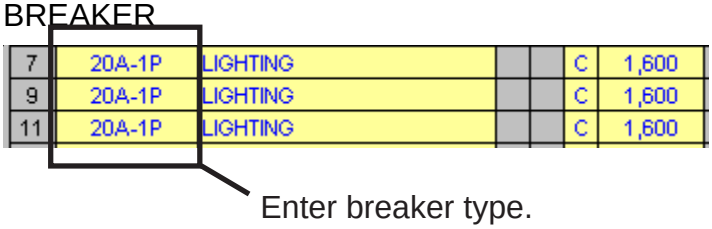


FEEDER	
NUMBER OF CABLES	1
FEEDER CABLE	SER CABLE
WIRE SIZE L1	#1
WIRE SIZE L2	#1
WIRE SIZE NEUTRAL	#1
WIRE SIZE GROUND	#3

CIRCUIT ENTRIES

Once you have completed the general entries, you may begin making the circuit entries. Each circuit entry consists of the following:

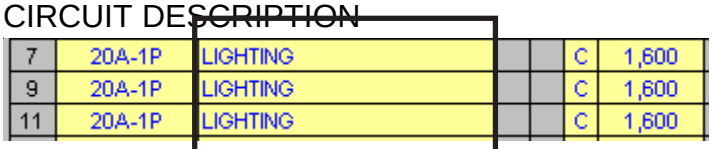
BREAKER



7	20A-1P	LIGHTING			C	1,600
9	20A-1P	LIGHTING			C	1,600
11	20A-1P	LIGHTING			C	1,600

Enter breaker type.

CIRCUIT DESCRIPTION



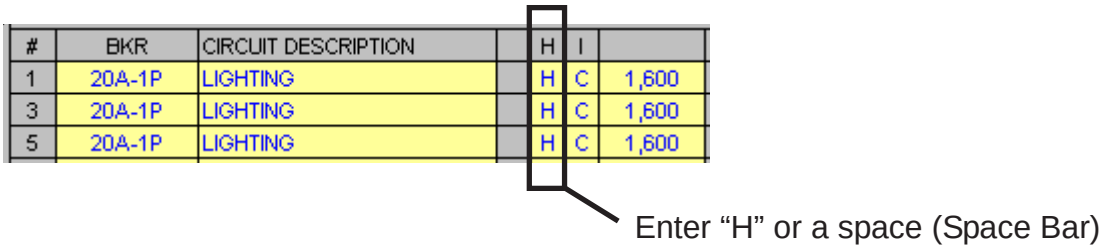
7	20A-1P	LIGHTING			C	1,600
9	20A-1P	LIGHTING			C	1,600
11	20A-1P	LIGHTING			C	1,600

Enter circuit description.

LOAD IDENTIFIERS

H (HARMONIC LOAD)

On 3-phase wye panels, loads subject to harmonic currents (such as electronic ballast and computer equipment) must be identified by placing an “H” in the harmonic identifier column.



#	BKR	CIRCUIT DESCRIPTION		H	I	
1	20A-1P	LIGHTING		H	C	1,600
3	20A-1P	LIGHTING		H	C	1,600
5	20A-1P	LIGHTING		H	C	1,600

HOW THE PROGRAM CALCULATES HARMONIC LOADS.

When the harmonic load is 50% or more of the load (on 3-phase wye panels) the NEC requires the neutral conductor to be considered a current carrying conductor.

Therefore, the feeder conduit has four (4) current carrying conductors and the conductor ampacity must be derated to 80%. The program does this automatically.

ENTERING CIRCUIT LOADS

LINE TO NEUTRAL LOADS (1-Pole Breaker)

#	BKR	CIRCUIT DESCRIPTION	N	H	I		
1	20A-1P	LIGHTING		H	C	1,600	L1
3				H	C		L2
5				H	C		L3

Enter the VA (Volts X Amps) into the cell.

LINE TO LINE LOADS (2-Pole Breaker)

Enter one half of the VA in each cell.

#	BKR	CIRCUIT DESCRIPTION	N	H	I		
1	60A-2P	AC UNIT			M	6,000	L1
3	X X X	X X X			M	6,000	L2
5				H	C		L3

Example: (50 Amps X 240 Volts) = 12,000 VA
(12,000 VA ÷ 2) = 6,000 VA in each cell

LINE TO LINE LOADS (3-Pole Breaker)

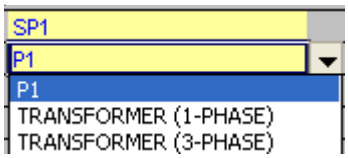
Enter one third of the VA in each cell.

#	BKR	CIRCUIT DESCRIPTION	N	H	I		
1	X X X	X X X			M	4,803	L1
3	50A-3P	AC UNIT			M	4,803	L2
5	X X X	X X X			M	4,803	L3

Example: (40 Amps X 208 Volts X 1.732) = 14,410 VA
(14,410 VA ÷ 3) = 4,803 VA in each cell

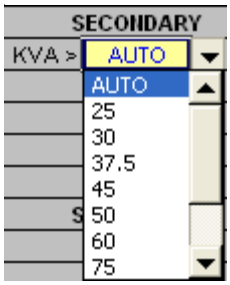
SUB PANEL GENERAL ENTRIES

FED FROM



Select Choice

KVA



If you select a transformer, you can select the KVA rating or select AUTO and the program will size the transformer automatically.

VD ADJUSTMENT | 10

If you are using a transformer, a voltage drop adjustment appears. Use this rather than % Factor to adjust for voltage drop.

XMFR % Z RATING | 10

If you are using a transformer, a transformer % Z rating appears. Enter the % Z rating of the transformer.

PRINTOUTS

Each panel schedule template is designed to print out four (4) sheets for the panel and four (4) sheets for the sub panel.

- Panel Schedule
- Load Calculation
- Directory
- Error Checking Report

Using the mouse, click on the tab to display the sheet you wish to print. When the sheet is displayed, use the FILE/PRINT command.

NO COPY/PASTE

Do not use the COPY and PASTE commands on this template as they can corrupt the file.

Each cell in this template has been formatted with error checking and performance codes. When you copy a cell and use the paste command, these formats and performance codes are pasted to the new location.

PASTE SPECIAL (Values Only)

To avoid corrupting the file use the COPY and the EDIT/PASTE SPECIAL command selecting VALUES from the paste special menu.

Click on “Values” and click OK