CHAPTER

ONE

Sign Up become a User/Sign In and Use
Create your Users Group
Cloud Collaboration

1. Go to Home Page at *www.powercalc.co* to *Sign Up* and *Sign In*

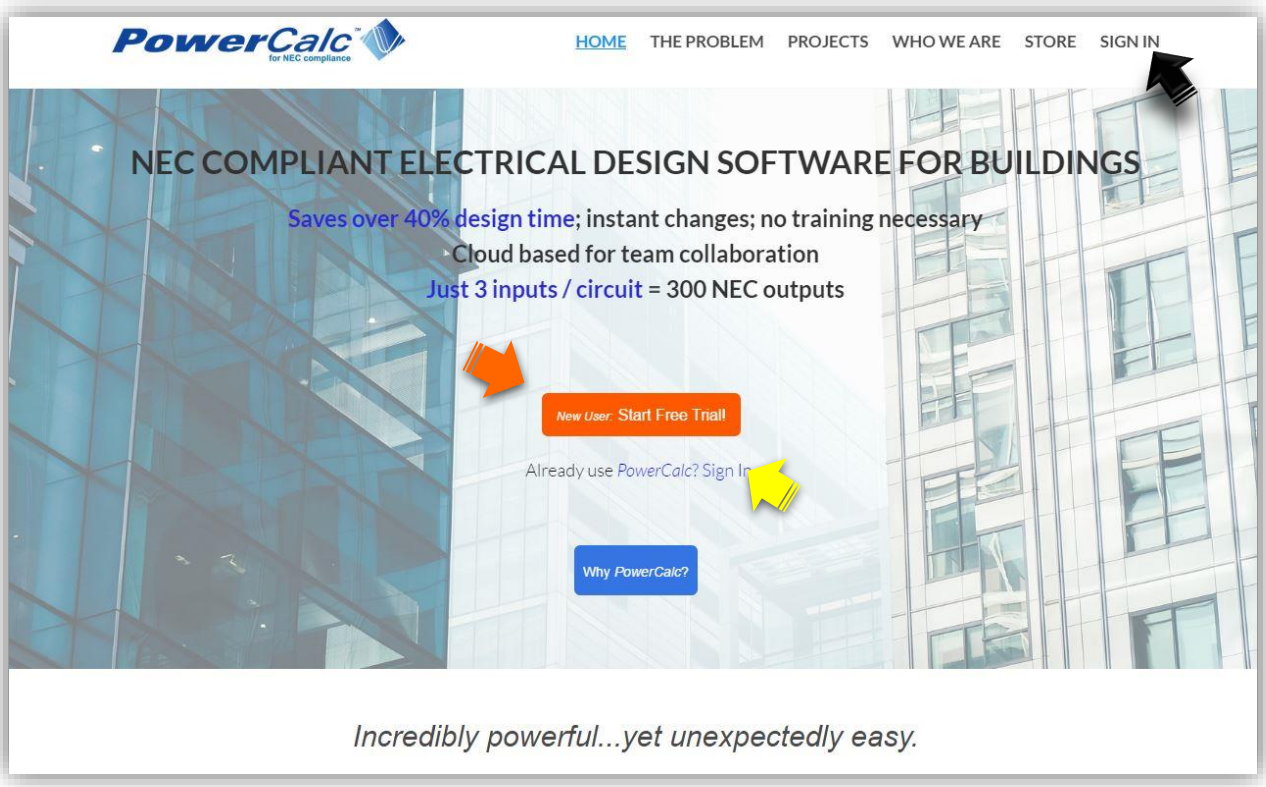


Fig 1.01

1.1 *Sign Up*

To *Sign Up* as a New User

Click on *New User* Start Free Trial

Once Clicked, you will be redirected to the Store page - *POWERCALC™* PRODUCTS – Fig 2.01 (See Section 2 below)

1.2 *Sign In*

Current Users can *Sign In* three ways

1. Already use *PowerCalc? Sign In*

Once clicked, you will be redirected to Dialog Box - Project List Sign In. Fig 1.02

2. *Sign In*

Once clicked, you will be redirected to Dialog Box - Project List Sign In. Fig 1.02

3. In your Browser enter the following

http:// Organization Name.powercalc.co.

1.3 Project List *Sign IN*

Enter you email address and then click **Submit**

Once submitted, access your Project List (your account)

You may be asked to *Sign In* with your credentials again

Fig 1.02

2. *PowerCalc™* Products

The Store consists of the following Products

2.1 Single Project

Can be used on One Project and consists of one Electrical Bus (MDP) with capability to connect up to four (4) Branch Circuit Panels and up to eight (8) Building Equipment Schedule. This product is suitable for a Single Family Home, Small Retail, Restaurant and Professional Offices.

2.2 Core: See PowerCalc Products Fig 2.01

2.3 Pro: See PowerCalc Products Fig 2.01

2.4 Pro Plus: PowerCalc Products Fig 2.01

Select the Product that meets your needs, then Click on either Monthly Subscription or Annual Subscription (annual gets 10% discount at check out)

2.5 Upgrades

Select "Global" upgrade. This upgrade allows you to design in either US imperial units or SI international Units. Make this selection at the Shopping Cart

Next: Shopping Cart

Once the Product and Monthly or Annual billing plan is selected, you will be redirected to the Shopping Cart.

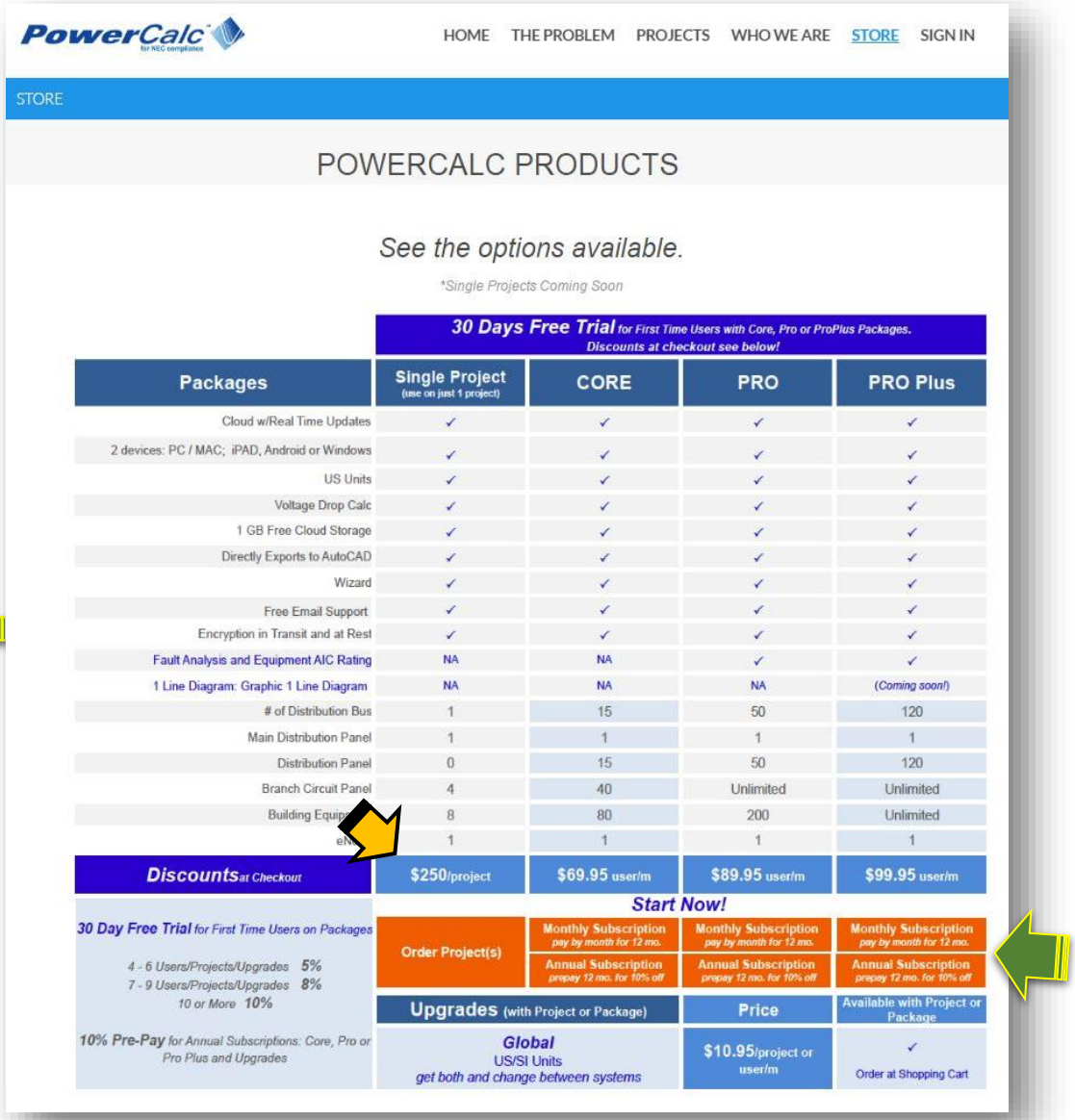


Fig 2.01

3. Shopping Cart

Once the Product is selected, you will be redirected to the Shopping Cart to configure your subscription (Package). The Monthly or Annual Billing Plan form Fig 3.01 consists of 3 segments.

3.1 Configure Your Package

Enter number of Users. Hover over **x varies?** Button to display applicable Quantity Discount.

Click on **Select** button if you want to UPGRADE to include the Global upgrade (both US and SI Units)

Then Click on **Update Total** to update the Order Summary

3.2 Customer Information

Enter the following Information

First Name (Mandatory)
Last Name (Mandatory)
Email Address (Mandatory). This will be the Primary Email for the Subscription Manager (a.k.a. the Group Administrator).
Phone (Optional, it is recommended to provide us with your phone # for ease of communication)
Organization (Optional. If you do Not provide at time of registration, we will use your First and Last Name to register the Subscription, this Information will appear on ALL reports generated by the software)

NOTE: The person signing up will be the Group Administrator on the account. Only the Group Admin can add and delete Users, grant privileges and permissions as indicated in Section 9.

3.4 Coupon or referral code

If Applicable, Enter Coupon or Referral Code and then Click on **Apply Code**

TIP: How to obtain a Coupon Code
If available, emailed or posted.

TIP: How to obtain a Referral Code
If you were referred to *PowerCalc™* by someone, input the referral number provided.

Next: 4. Notifications

Once the Product and Monthly or Annual billing plan is selected and the Order is placed, you will be Notified via email as indicated in Section 4 Notifications.

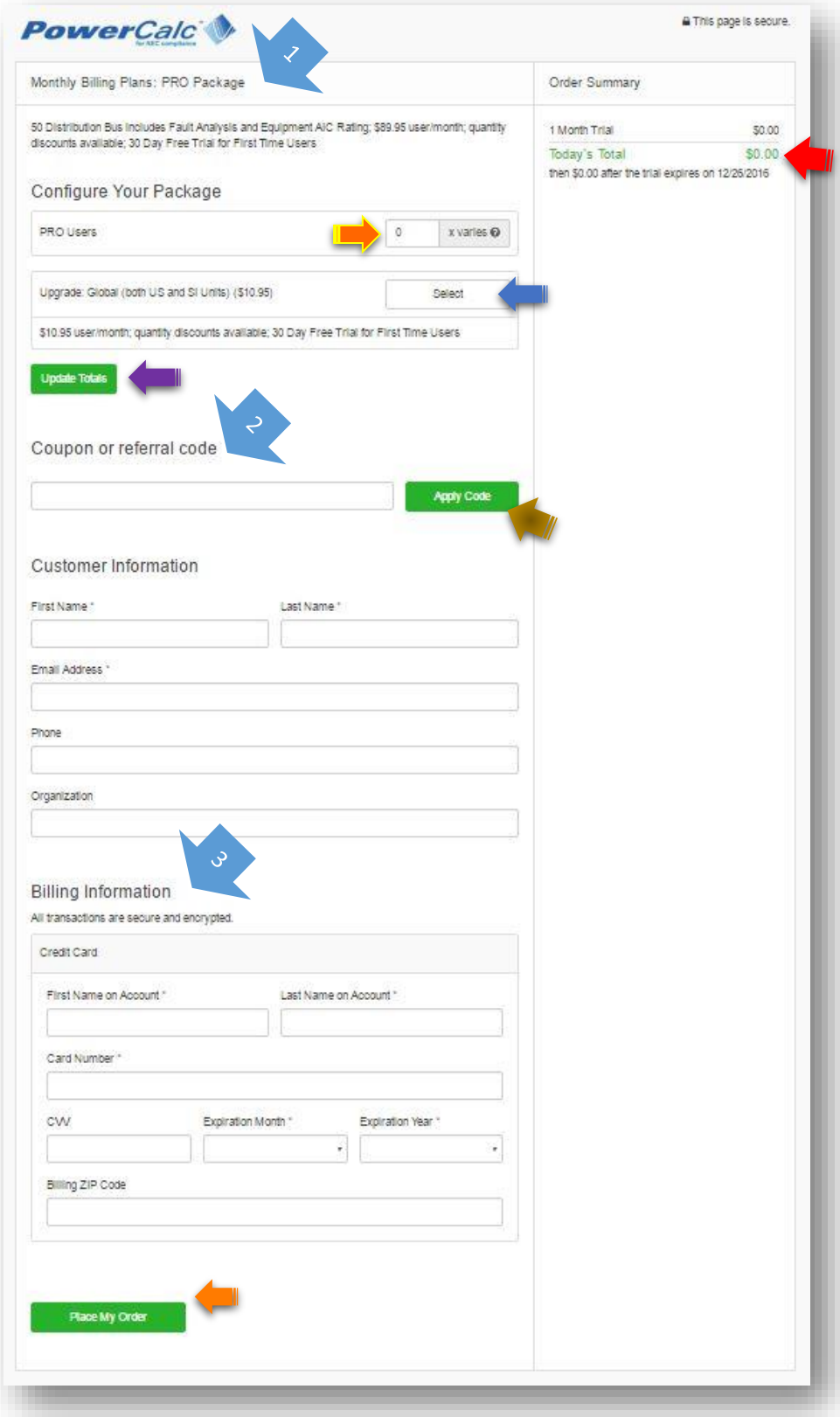


Fig 3.01

4. Notifications

4.1 *On your Screen:* Thanks, your purchase was successful.

You will receive a notification on your browser screen that your purchase was successful as shown on Fig 4.01.

If your purchase was *not* successful, then this notification will let you know the reason. See Fig 4.01

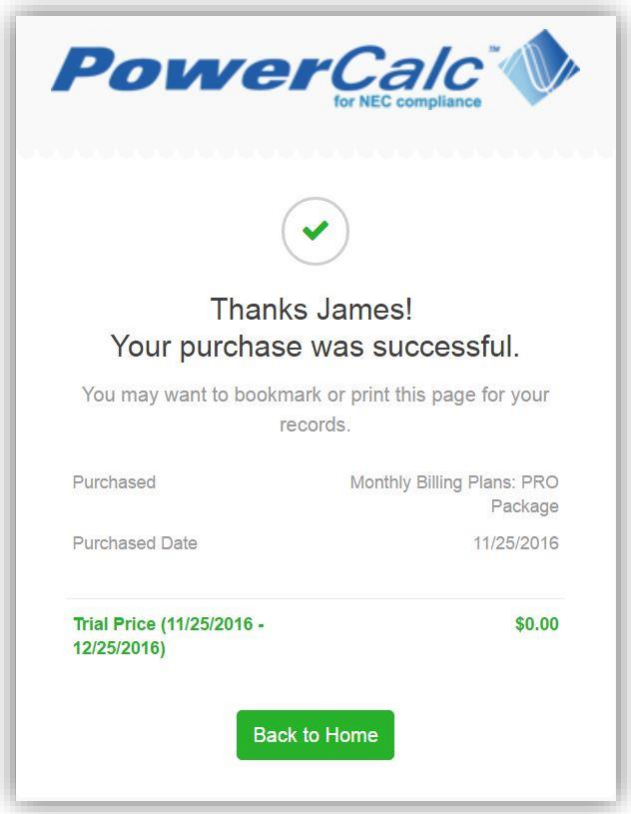


Fig 4.01

4.2 Emails (2 emails)

Then, if the purchase was *successful* you will receive 2 more emails.
Check your Inbox for email from sales@powercalc.co

4.2.1 Thanks for your purchase email (email #1)

Email notifying you with your purchase. In this email you will also be asked to set up your Billing Portal. Your Billing Portal will provide you with the following:

4.2.2 Welcome email (email #2)

You will also receive a "Welcome to *PowerCalc™*" email from sales@powercalc.co. See Sample Fig 4.02

Click here to Login to your account

This action will redirect you to the Create a new Password Dialog Box Fig 5.01

4.3 Trouble with emails?

Check your Inbox for email from sales@powercalc.co

TIP: If the Welcome to *PowerCalc™* email (Fig 4.2.1) is NOT in your Inbox, Then check your Junk or Spam Box.

TIP: If the Welcome to *PowerCalc™* email is NOT to be found, then Sign In via www.PowerCalc.co for more details see Section 1.

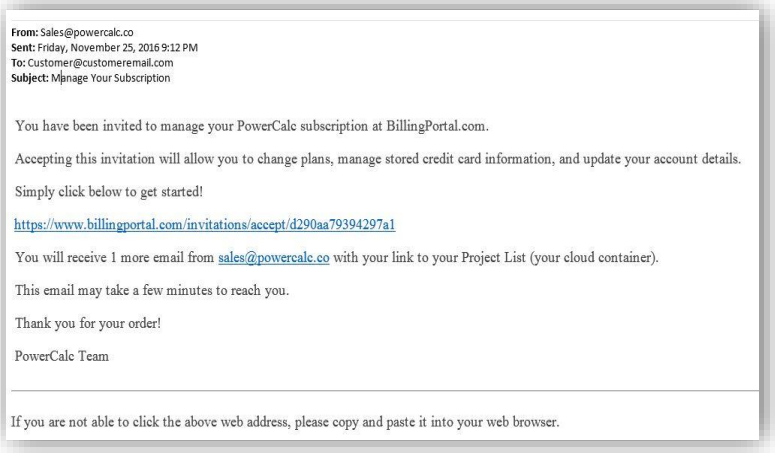


Fig 4.2.2

Fig 4.2.1

5. Create a New Password

Enter New Password and then Confirm it.

Click on Update Password.
This action will redirect you to the next Dialog Box "Find all Projects here" - Fig 5.01

Tip: If you forgot your Password, go to www.powercal.co and click on Sign In and follow the instructions

5.1 Password Composite

At least 8 characters with (1) UPPERCASE Letter, (1) Number, and (1) Special Character.

5.2 Find all Projects Here

Click on Find all projects here to enter your Project List in the Cloud.
This action will redirect you to the next Dialog Box "Project List" Fig 5.02

Fig 5.01

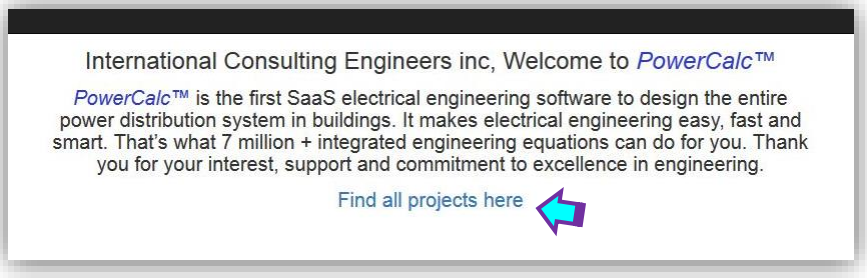


Fig 5.02

6. Project List

On your Project List, you will find 3 buttons. Fig 6.01

6.1 New Project

To start a New Project, Click on the New Project button (Fig 6.01).
This will redirect you to the Start a New Project Dialog Box Fig 7.01 in Section 7

6.2 Archived Projects

To access the list of your Archived Projects, Click on "Archived Projects" button. Fig 6.01
This will redirect you to the Archived Projects Dialog Box Fig 8.02 in Section 8

6.3 Users

To access the list of the Users or to set up Users, Click on the "Users" button. Fig 6.01
This will redirect you to the Archived Projects Dialog Box Fig 9.02 in Section 9

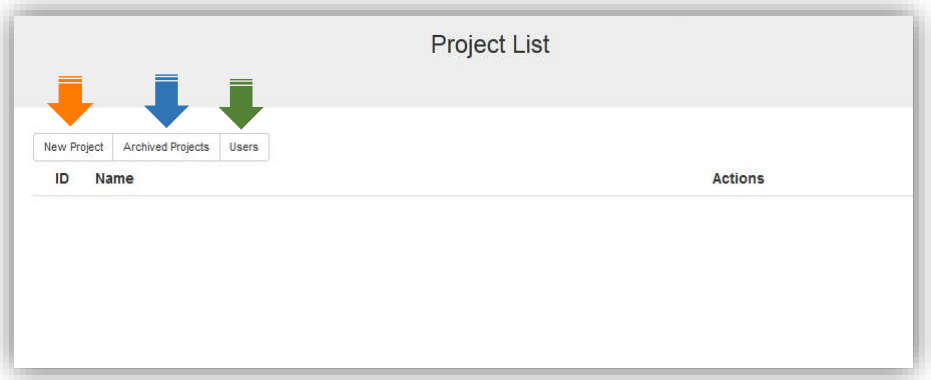


Fig 6.01

Each one of these buttons is separately addressed on the following pages.

7. New Project

In the Start a "New Project" Dialog Box shown in Fig 7.00

- Enter Project Name in the provided field
- Enter Project Number in the provided field
- Enter Client name in the provided field

The above information is needed to clearly identify the project.
Then Click on **Create New Project** Button in Fig 7.00

This action will redirect you to the next dialog box, "Project Information", Figure 7.02.

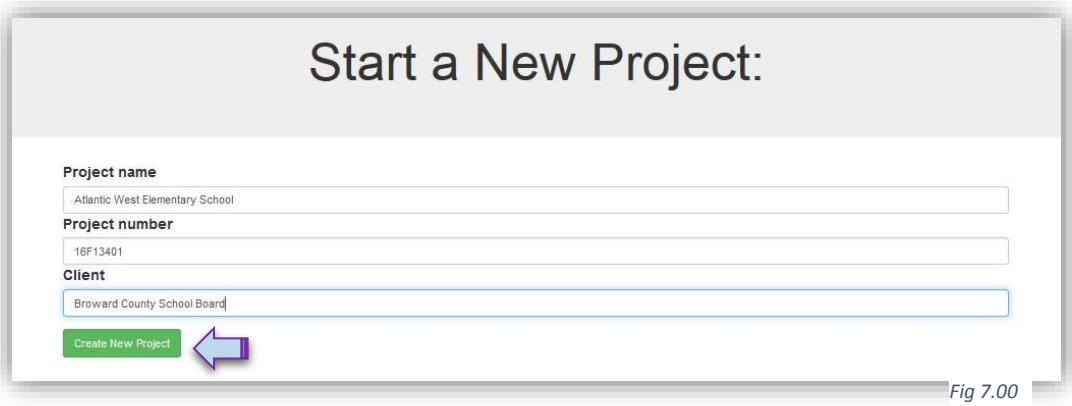


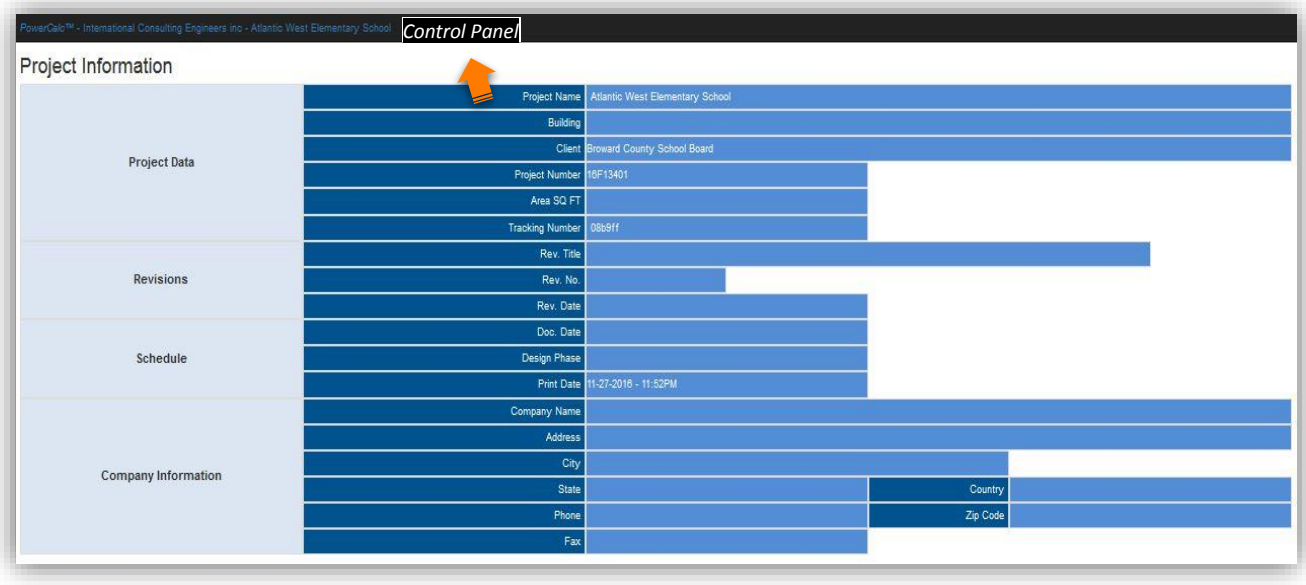
Fig 7.00

7.1 Project Information

The information from "Start a New Project" Dialog Box - Fig 7.00 will automatically populate the respective fields on the Project Information Dialog Box – Fig 7.01. For the information not populated, it is recommended to complete with the requested information. This information will be shown on every Report generated by the User for this particular project.

7.2. How to *PowerCalc™*

To start building up the Project Power Distribution System of the Project, Click on ***Control Panel*** in the Main Ribbon (Fig 7.01) to access the Project Power Distribution System (PDS) Fig 7.03.



For more information on How to *PowerCalc*, See Chapter III

7.3 Power Distribution System (PDS)

Initially, all Projects will be created with the following: ***Project Info, eNode™*** and ***MDP (Main Distribution Panel)***

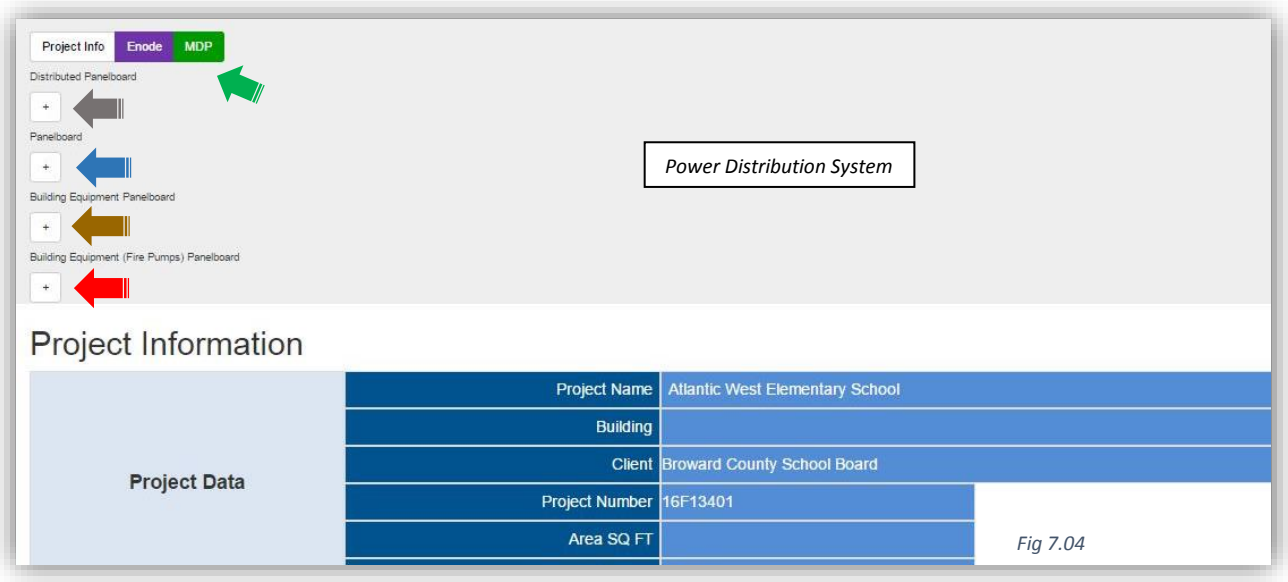


Fig 7.04

7.4.1. To ADD a Distribution Panel (DP), CLICK on the + Button

7.4.2. To ADD a Branch Circuit Panel (PN), CLICK on the + Button

7.4.3. To ADD a Building Equipment (BE), CLICK on the + Button

7.4.4. To ADD a Fire Pump (FP), CLICK on + Button

The default name for the Distribution Panels are DP1, DP2, DP3 etc.
The default name for the Branch Circuit Panels are PN1, PN2, PN3 etc.
The default name for the Building Equipment Schedules are BE1, BE2, BE3 etc.
The default name for the Fire Pumps are FP1, FP2, FP3 etc.

TIP: The User can change the PANEL Name to fit the Project. See Chapter III for more information.

TIP: To delete a PANEL from the Power Distribution System, CLICK on X Red Button.

Subsequentley, after you add Panels, the Project Power Distribution System may look like the example shown in Fig 7.04

[Project Information] **[Enode]** **[MDP]**

[DP1] **[DP2]**

[PN1] **[PN2]** **[PN3]** **[PN4]**

[BE1] **[BE2]** **[BE3]** **[BE4]**

[FP1]

7.5 How to Access the Panel(s)

To ACCESS *Project Info, eNode™ or MDP*, CLICK on the respective button

Click on Enode™ to access the PANEL
This action will redirect you to the Enode PANEL - See Chapter 3

Click on MDP to access the PANEL
This action will redirect you to the MDP PANEL – See Chapter 3

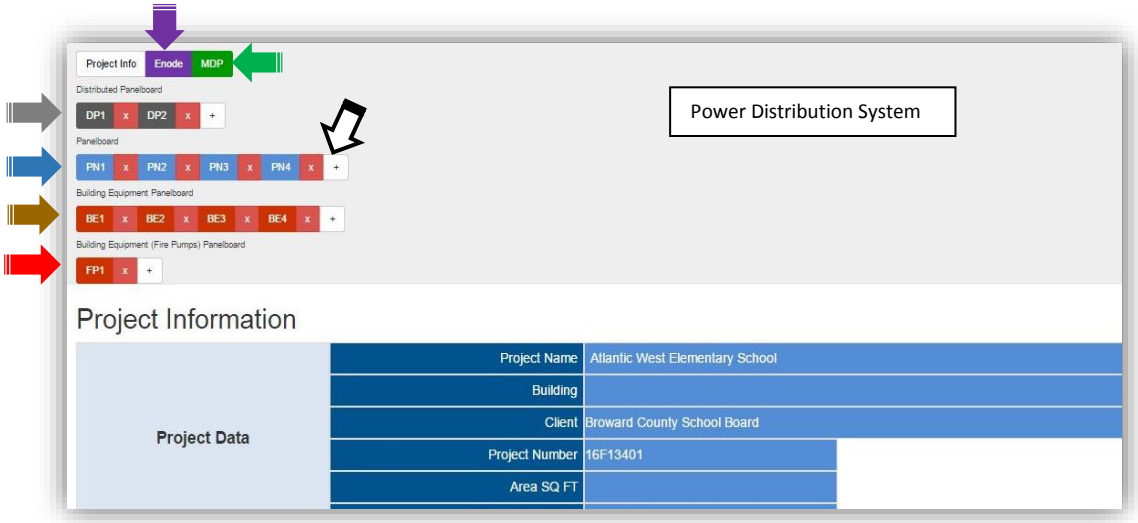


Fig 7.05

7.5.1. To Open/Access *Distribution Panel (DP)*, CLICK on the respective DP button, for more information see Chapter III.

7.5.2. To Open/Access Branch Circuit Panel (PN), CLICK on the respective PN button, for more information see Chapter III.

7.5.3. To Open/Access Building Equipment (BE)
CLICK on the respective BE button for more information see Chapter III.

7.5.4. To Open/Access Fire Pump (FP), CLICK on the respective FP button for more information see Chapter III.

TIP: The User can change the PANEL Name to fit the Project. See respective PANEL for more information.
TIP: To delete a PANEL from the power distribution system, CLICK on X Red Button.

Refer to Chapter 2: The Power of the Panel

Refer to Chapter 3: How to *PowerCalc™*

8. Archived Projects

These are projects which have been moved to "Archived Projects" from the "Project List".

8.01 To access the list of the Archived Projects, Click on **Archived Projects** button, Fig 8.01. This Action will redirect you to Archive Projects Dialog Box Fig 8.02

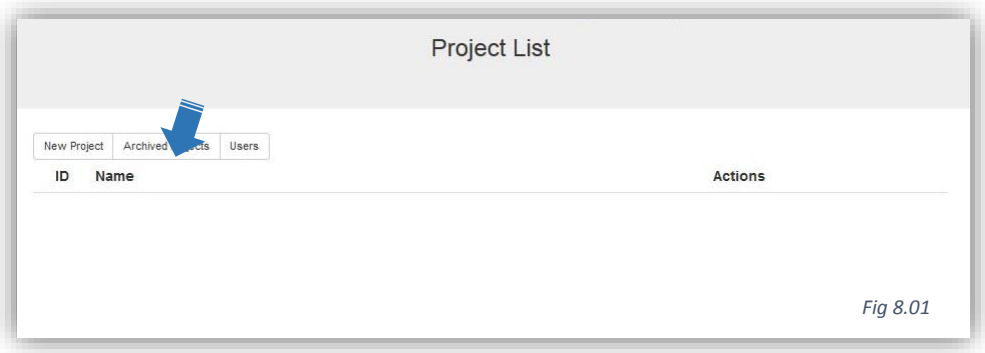


Fig 8.01

8.02 Archived Project Dialog Project

Once you are in the Archived Projects Dialog Box, you will see a complete list of all Archived Projects.

To move an Archived Project to your Active Project List, check the square and then click on the **Activate** button.

Click on the **Active Projects** button to go back to the "Project List".

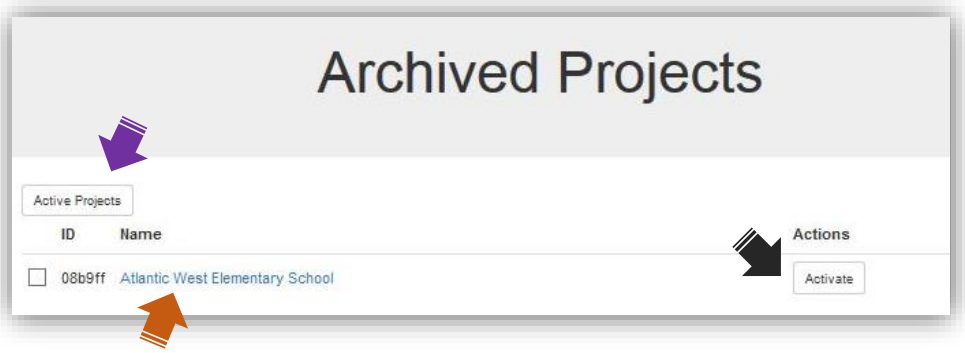


Fig 8.02

9. Users

To add Users to your Group, the Group Administrator clicks on the **User** button as shown in Fig 9.00.

This will open **Create User** Dialog Box Fig 9.01

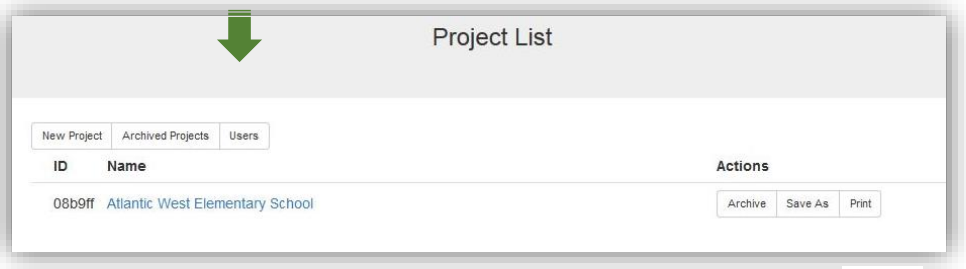


Fig 9.00

9.1 Create Users

Only the Group Administrator can add/delete a User to the group.

For each User, fill in the requested information.

To add User(s) to your Group, Click the **Create User** button. The User will be notified via email to join the Group by signing in and creating a password.
Next: As the Group Admin, you will have to set up Privileges as outlined in Section 9.2

TIP: You must purchase a subscription for each User in your Group.

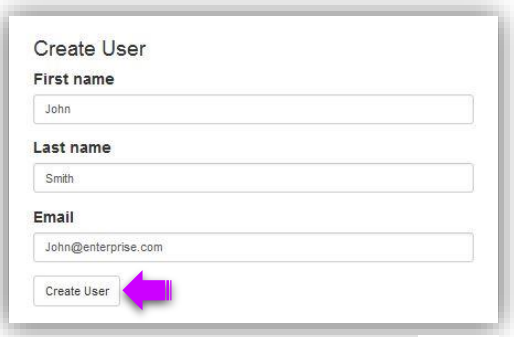


Fig 9.01

9.2 Administration of Users

In the Users Dialog Box Fig 9.02, the Group Administrator can set up the below privileges for each User. A User can have access to all projects, just a few projects or no projects.

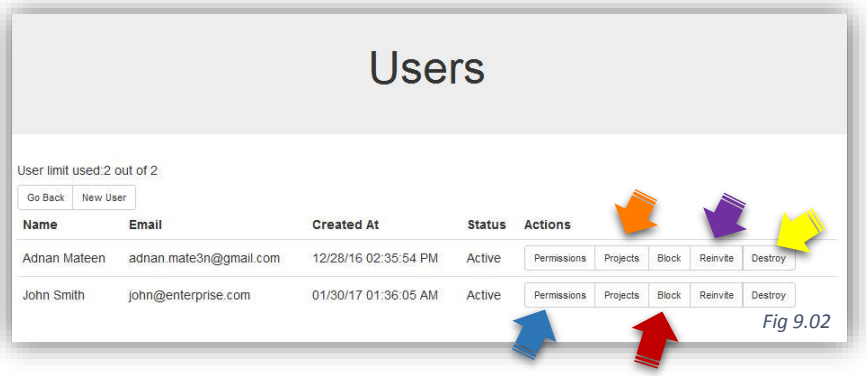


Fig 9.02

9.2.1 Privileges

The Group Administrator is the only one who has the authority to set up the Privileges.
Check the appropriate box to grant the Privilege to the User, or uncheck the box to deny the Privilege

Create
User can start a project

View
User can view a project – Editing NOT allowed

Edit
User can View and Edit the Project

Print
User can print a project

Copy
User can copy a project.
The User is Prompt to give the copy a different Name

Archive
User can archive/unarchive a project

Fig 9.2.1

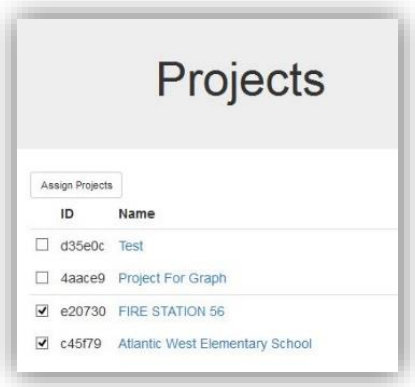
After making the selections, CLICK Assign Permissions button

9.2.2 Projects
The Group Administrator can grant access or deny access to the User for projects.

9.2.3 Block
The Group Administrator can Block the User from accessing to the Group's Project List.

9.2.4 Re-invite
The Group Administrator can re-invite a User by sending him/her an email to re-join the Group.

9.2.5 Disabled
The Group Administrator can remove a User from the Group by disabling the User.
The User will be notified.



Refer to Chapter 2: *PowerCalc™* Architecture

Refer to Chapter 3: How to *PowerCalc™*

CHAPTER

TWO

Power of the Panel

PowerCalc™ Architecture
Power Panel Calculations
Total Electrical Load
Static Calculations
Appendix

1. Power of the Panel

1.1 A New Way to Design

PowerCalc™ is a new way to design the Power Distribution System in a building. It's a powerful tool with database driven results for fewer design hours, errors, process hiccups and costly mistakes.

PowerCalc's Panel takes center stage. With just ***three*** Independent Values, the Panel does all the calculations, look ups in code tables and displays the results directly on the Panelboard, instantly and accurately. All *calculations,* and *re-calculations* for changes, are automatic, instant and in real time across all Panels for all electrical values.

The ***three independent values are (1) Load kVA, (2) Load Type and (3) Number of Poles*** for each Branch Circuit. The User starts at the most downstream Panel inputting *these three independent values* for each Branch Circuit. Then, *PowerCalc* calculates and recalculates for changes all ***dependent values*** upstream automatically, instantly and in real time across all Panels to design the facility's Power Distribution System.

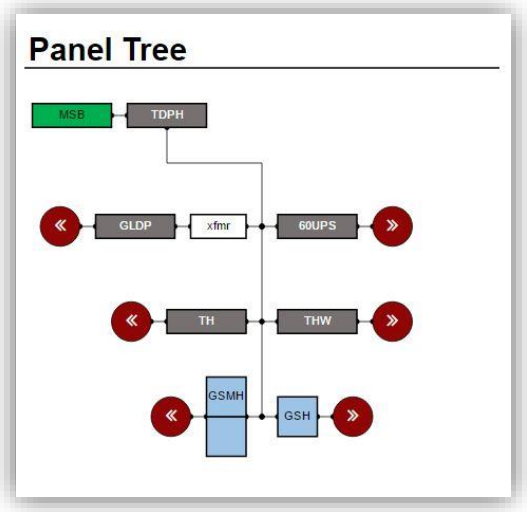


Fig. 1.1.1 A

The Panel not only automatically calculates Branch Circuit Values, Feeder Values, Service Entrance Values and Panel Values, but also calculates the Voltage Drop at the Branch Circuit Level as well as at the Feeder Level, the Fault Current, Panel Amerage Interrupting Capacity (AIC) and automatically draw the Project Distrbution Tree, the Riser Diagram and the One Line Diagram.

Futher, the Panel tabulates the Connected Loads by Load Type and displays the Connected Loads by Load Type as well as the accumulative Connected Load. Then, instantly the Panel automatically applies the Demand Load Factors and calculates the Demand Load by Load Tpyes as well as the accumulative Demand Load. Every time the User inputs the *three independent values listed above*, *PowerCalc* calculates all *dependent values* in real time and updates all relevant data and values upsream/downsream from the Branch Circuit to the Service Entrance.

In addtion to the above automatic, realtime, error free, accurate and comprehensive calculation, the intellegent Smart Database can run calculations on Non-Coincidental Load, Continuous Load, Lead/Lag Loads and Load Diversification.

We have made the design of the Power Distribution System simple and comprehensive. Instead of design by hand held calculators, dummy spreadsheets, AutoCAD Blocks, top-down calculations and "rule of thumb", *PowerCalc* aggregates the load from the circuit to the service entrance of the building (bottom - up) for exacting results. No more one-off calculations, *PowerCalc* is 7 million + electrical equations bundled for a single integrated result.

Instead of using the Panel as a placeholder inputting cell-by-cell the results of manually performed calculations, PowerCalc's Panel takes center stage doing all the calculations, look ups in code tables and displaying the results directly on the Panel form, instantly and accurately. All *calculations,* and *re calculations for changes*, are automatic and instant across all Panels for all electrical values in real time.

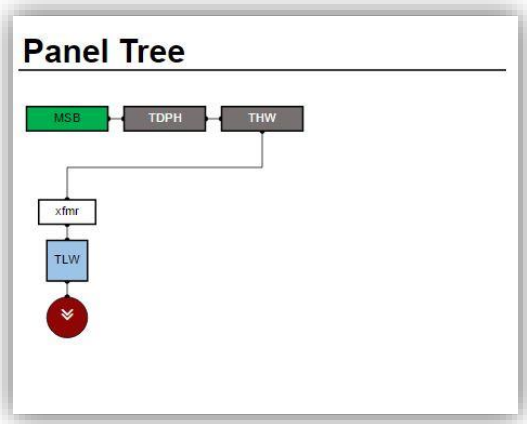


Fig 1.1.1.B

Main Distribution and Distribution Panel

Main Service CondR™ and CondT™ Size, Ground Electrode CondR, Overcurrent Protection Device (OC PD), Equipment Feeder Size, Voltage Drop, Equipment Grounding CondR, Grounding Electrode CondR and Equipment AIC Rating.

Branch Circuit Panel

CondR and CondT Size, Ampacity, Overcurrent Protection Device (OCPD), Voltage Drop and Equipment Grounding CondR.

Building Equipment Schedule

Electrical characteristics of each Branch Circuit, size of the Overcurrent Protection Device (OCPD) (fuse or circuit breaker), Conductor Size and the Electrical Enclosure Frame Size and Characteristics.

eNODE™

Tracks general information about the project and maps the entire Power Distribution System aggregating information from the Panels, Modules and Schedules to determine connectivity, power flow, short circuit analysis, equipment AIC, etc.

1.2 Design Panels

In addition to the eNODE, *PowerCalc* consists of 5 Panel Types:

1.2.1 MDP: Main Distribution Panel
1.2.2 DP: Distribution Panel DP1, DP2, DP3… etc.
1.2.3 PN: Branch Circuit Panel PN1, PN2, PN3… etc.
1.2.4 BE: Building Equipment BE1, BE2, BE3… etc.
1.2.5 FP: Fire Pump FP1, FP2, FP3 … etc.

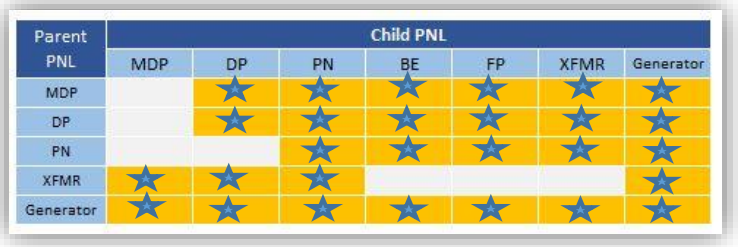


Fig. 1.3.1

TIP: If multiple Panels are connected to a transformer, use a Distribution Panel as a transformer.
Then, the User can connect multiple loads and Panels same as connecting a Branch
Circuit Panel to a Distribution Panel.

1.3 The Panel, the "Family" Connections

1.3.1 Parent / Child – Connection

Whether the Parent Panel and the Child Panel are at the same or different voltage levels, *PowerCalc* allows the connection. If the two Panels (Fig. 1.01) are at the same voltage level, then the eNODE allows the connection passing the load directly from the Child Panel to the Parent Panel upstream. If the Child Panel is at a lower or higher voltage than the Parent Panel, then the eNODE allows the connection passing the load through a Step-Down Transformer or a Step-Up Transformer as appropriate. *PowerCalc* automatically sizes the Transformer kVA and also the associated primary and secondary feeders.

TIP: For the Pro and Pro Plus Packages:
PowerCalc also simultaneously performs the Short Circuit Calculation and selects the appropriate Amperage Interrupting Capacity (AIC). See Section 2.1.2.4.

1.3.2 Twin Panels – Connection

This type of connection facilitates the industry standard known as "Double Lugs" (DBL Lugs) or "Fed Thru" (FD Thru) connection. The total number of spaces should not exceed 84 poles.

Whether the connection is "DBL Lugs" as depicted on Fig 1.3.2A for PN 11 and PN12 or "FD Thru" as depicted on Fig 1.3.2B for PN11 and PN12, *PowerCalc* considers these Twin Panels (PN11 and PN12) as one. The eNODE™ allows the automatic calculation of the engineering values including the demand load on these "Twin Panels" as one single Panel (instead of two separate Panels).

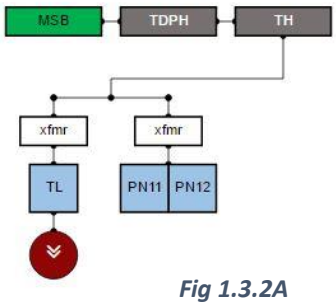


Fig 1.3.2A

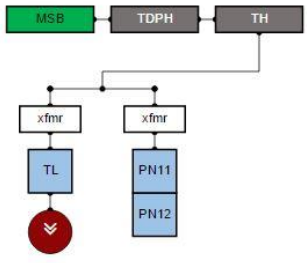


Fig 1.3.2B

1.3.3 Brother / Sister – Connection

This type of connection facilitates the industry standard known as Sub Fed or Sub Panel connections.
Fig 1.3.3A: Brother/Sister Connection – at the same Voltage level
Fig 1.3.3B: Brother/Sister Connection – at different Voltage level

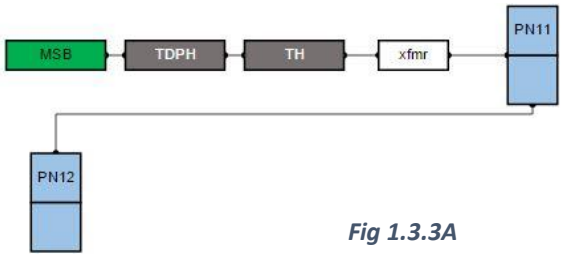


Fig 1.3.3A

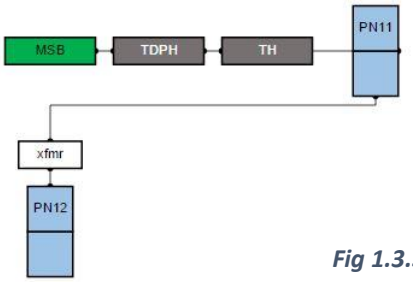


Fig 1.3.3B

1.4 The Wizard

As part of the Panel Architecture and contributing to a minimum of 40% design time savings, *PowerCalc* provides two WIZARDS to make the design process even easier and faster for a streamlined User Interface. Fig. 1..4.1 and Fig. 1.4.2 are screen shost of the WIZARD – Panel and WIZARD – Branch Circuit respectively.

1.4.1 WIZARD - Panel

In lieu of using the Panel's Header (see 2.4.1) to set up the Panel Characteristics and Features, *PowerCalc* provides the WIZARD - Panel to input information in the Panel Header. The WIZARD - Panel depicts all the Fields with associated Panel Values. *Powercalc* uses these settings in the calculation of the Panel Frame, Main, Feeder values, Branch Circuit Values, Connected and Demand load . Note that most of these values are set on |**Auto**|. When set on Auto, *PowerCalc* calculates and displays the appropriate values every time a Load (Branch Circuit) is added or removed from the Panel. Each one of these |**Auto**| setting can also be manually set by the User to override the [Auto] setting.

See Chapter THREE and learn how to access ths WIZARD.

Fig. 1.4.1

1.4.2 WIZARD – Branch Circuit

In lieu of using the Panel's Center to input each Branch Circuit's 3 Independent Values (Load kVA, Load Type and Circuit Number of Poles), *PowerCalc* provides the WIZARD - Branch Circuit to input these Independent Values. While input is ongoing, *PowerCalc* is busy in the background calculating all Dependent Values at the same time.

See Chapter THREE and learn how to access ths WIZARD.

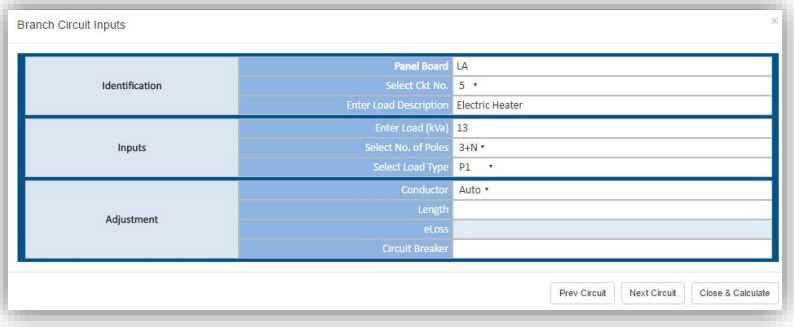


Fig. 1.4.2

1.4.3 WIZARD – eNODE

The eNode Wizard Contains 3 Regions used for the User Interface to add items to the Data Base and make it part of the calculations associated with the respective project.

Region ONE	Measuring Units	Mounting Method	AIC (kA)	Line Voltage	Phase Voltage	Phase Notation
User Interface	US Units					A
						B
						C

Region TWO	Main Rating (Amps)	Frame Rating (Amps)	MIN CONDT Size	MIN BKR Trip Amp	Cycle Hz	Ckt Bkr Option
User Interface			0.5	20		

Region THREE	AIC Method	% VD	Fuse Size	Wire Gauge	NEMA	PNL Board Status
User Interface						Status 1
						Status 2
						Status 3

Fig. 1.4.3

1.4.4 WIZARD – eRASE Module

The eRASE Wizard is provided to activate the Electrical Reduction and Saving Electricity (eRASE™) Module.

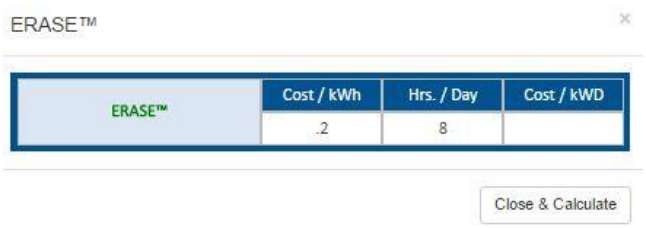


Fig. 1.4.4

2. Power Panel Architecture

Whether the Panel is MDP, DP or PN type, the architecture of the Panel are:
(1) MDP and DP layouts resemble the industry standard for a Switchboard similar to Square-D I-Line Switchboard and
(2) PN layout resembles the industry standard for a Lighting/Power Panel or Load Center.

All *Panels* have identical formats and layout:

Each *Panel* has three (3) *Parts*: (A) Header, (B) Center and (C) Footer.
Each *Part* > has several *Regions*, each *Region* > has several *Fields*, each *Field* > has several *Cells*.

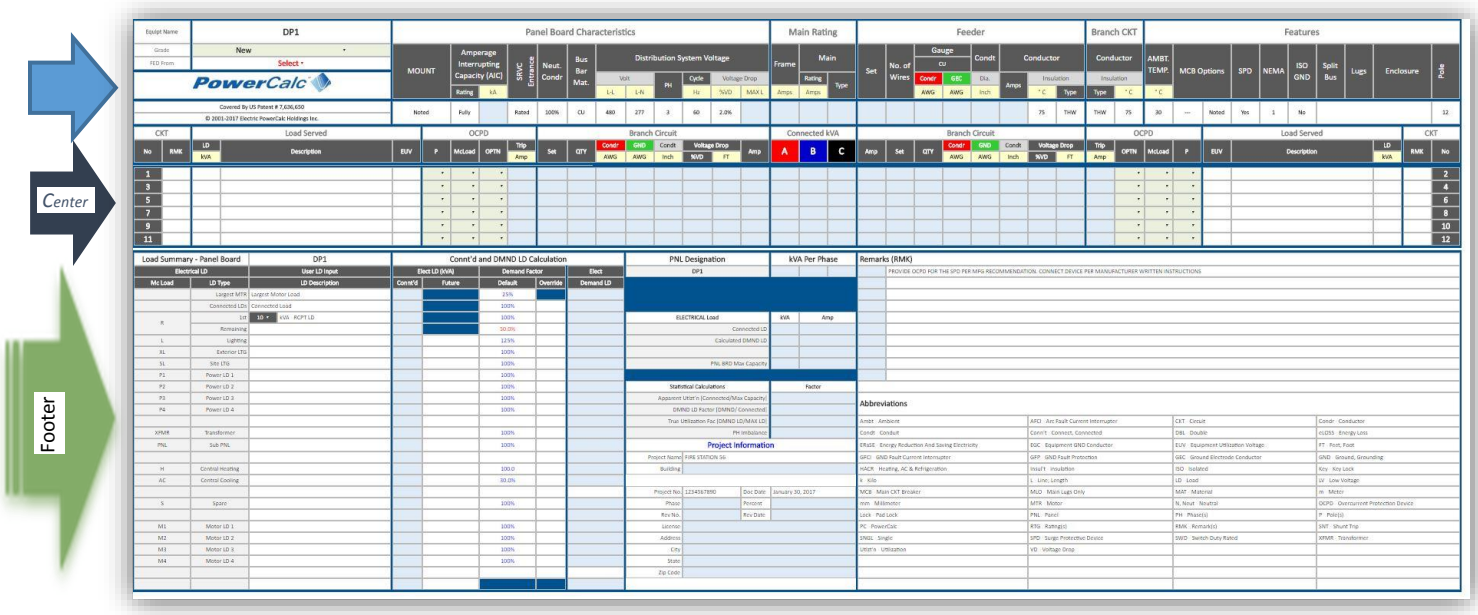


Fig. 2.0

2.1 Main Distribution and Distribution Panels

2.1.4 HEADER

The Header of the Panel consists of 6 Regions: (1) Equipment, (2) Panel Board Characteristics, (3) Main Rating, (4) Feeder, (5) Branch CKT and (6) Features.

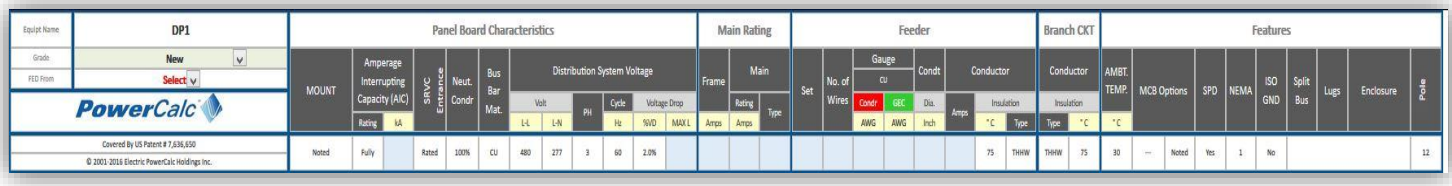


Fig. 2.1.4

2.1.1 Equipment

This Region is broken down into the following 3 Fields: Equipment Name, Grade and Fed From.

2.1.1.1 Equipment Name: *CLICK* on *Equipment Name* to change/edit the Name of the Equipment.

2.1.1.2 Grade: *CLICK* on the drop down menu *Grade* and select the equipment Grade. Use this field to indicate whether the equipment is New, Existing, Modified, etc.

Pulldown |Menu|
New	Existing	Modified	As Built DWGs	Record DWGs	Shown for Ref. Only
No Equipment Tag	No Name Plate	Assumed PNL BRD Designation
Status 1	Status2	Status3

TIP: Status 1 thru Status 3 are User Interface items / Values that can be added to the Database at the User's discretion. See eNODE Section 1.4.3.

2.1.1.3 Fed From: *CLICK* on the drop down menu *Fed From* and select where the Child Panel is Fed From (Parent Panel) upstream or downstream in the Power Distribution System.

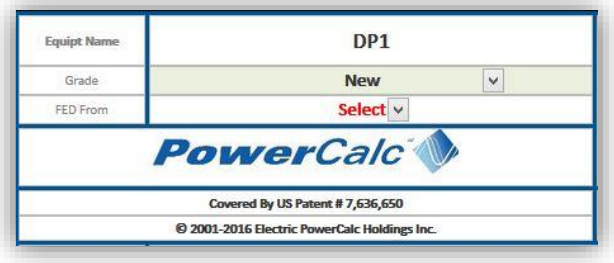


Fig. 2.1.1

TIP: The Feeder Values, OCPD and the Demand Load of the *Child Panel* automatically migrate upstream to the *Parent Panel*. When a change occurs at the *Child Panel*, the respective change will automatically appear on the *Parent Panel*.

TIP: The connection between the Parent Panel and the Child Panel is monitored by the Voltage Heirchacy Module in the Database . When there is a voltage mis-match between the Parent Panel and the Child Panel, then the software automatically recommends a Transformer. The recommended Transformer is sized to support the Demand Load and NOT the Connected Load. Alternatively, the User can manually adjust the Transformer's kVA size, then *PowerCalc* recalulates the Transformer's Primary and Secondary Feeder and OCPD.

TIP: Alternatively, the User can select a Transformer manualy from the dropdown menu by accessing the WIZARD - Panel. See Chapter THREE to access the WIZARD.

Fig. 2.1.2

2.1.2 Panel Characteristics

This Region is broken down into the following 9 Fields.

2.1.2.1 Measuring Unit (only on the WIZARD)
When you subscribed, you selected either *US Units* or *SI Metric Unit*.

TIP: An Upgrade (Combo) is available for *PowerCalc* containing both US Units and SI Metric Units. This Upgrade allows you to change between these two systems.

2.1.2.2 XFMR (appears only on the WIZARD)
The default setting is | **Auto** |**.** When set on | **Auto** |, *PowerCalc* will automatically run voltage hierarchy level test between the Parent Panel and the Child Panel and will recommend a Transformer Size to support the calculated Demand Load when the Voltage is "mismatch".

Pulldown | Menu |
|Auto|9|15|30|45|75|112 ½|150|225|300|500|750|1000|1500|2000|3000|4000|

TIP: The connection between the *Parent Panel* and *Child Panel* is monitored by the Voltage Heirchacy Module in the Database . When a voltage mismatch between the *Parent Panel* and the *Child Panel* is detected, *PowerCalc* automatically recommends a Transformer (XFMR). The XFMR is sized by the Database to support the autmatically calculated Demand Load. Alternatively, the User can manually adjust the XFMR kVA size and *PowerCalc* will recalulate the XFMR's Primary and Secondary Feeders and OCPD. The User can select a XFMR kVA manually from the drop down menu in the WIZARD - Panel. See Chapter THREE for more information.

Panel Board Characteristics

MOUNT	Amperage Interrupting Capacity (AIC)		SRVC Entrance	Neut. Condr	Bus Bar Mat.	Distribution System Voltage					
						Volt		PH	Cycle	Voltage Drop	
	Rating	kA				L-L	L-N		Hz	%VD	MAX L
Noted	Fully		Rated	100%	CU	480	277	3	60	2.0%	

2.1.2.3 Mounting
The default setting is | **Noted** |. Select other *Mounting Methods* from the dropdown menu.
Pulldown | Menu |
| **Noted** | Surface | Recessed | Flushed |Method 1 | Method 2 | Method 3 |

TIP: Method 1 thru Method 3 are User Interface items. These Values can be added to the Database at the User's discretion. See Chapter THREE for more information.

2.1.2.4 AIC (Amperage Interrupting Capacity): This field contains the following Cells:

2.1.2.4.1 Rating: The default setting is |**Fully Rated**|. Select *Other AIC Methods* from the dropdown menu. The User can add other methods by inputting this information on the eNODE.

Pulldown | Menu |
| Noted | Fully (Rated) | Series (Rated) | AIC Method 1 | AIC Method 2 | AIC Method 3 |

TIP: AIC | Method 1 | thru | Method 3 | are User Interface items. These values can be added to *PowerCalc's* Database at the User's discretion. See Chapter THREE for more information.

2.1.2.4.2 AIC – kA: Amperage Interrupting Capacity
The default setting is | **Auto** |. Select *Other AIC Values* from the dropdown menu. The *Fault Analysis APP* is required to perform this calculation automatically.

TIP: The User can add other AIC Values by inputting this information on the eNODE. See Chapter THREE for more information.

2.1.2.5 SER: Service Entrance Rated
The default setting is | **YES** |. Alternatively, the User can select |**NO**| from the dropdown menu if the equipment is not *SER*.
Pulldown | Menu |:
| YES | NO |

2.4.2.6 Neut. RTG: Neutral Rating
The default setting is | **100%** |. Alternatively, the User can select |**200%** | from the dropdown menu.
Pulldown | Menu |
| 100% | 200% |

2.1.2.7 Bus Bar Mat (Material of Equipment Bus Bar)
The *default* setting is |**CU| (**Copper). Alternatively, the User can select |**AL|** (Aluminum) from the dropdown menu.
Pulldown | Menu |
| CU | AL |

2.1.2.8 Distribution System Voltage
This field contains the following Cells.

2.1.2.8.1 Volt
Line Voltage: The default setting is *480V* on the MDP, DP and BE and *208V* on PN equipment. Select other *Voltages* from the dropdown menu.
Pulldown | Menu |
| 480 | 230 | 208 | V1 | V2 | V3 |

Tip: V1 thru V3 are User Interface items / Values that can be added to the Database at the User discretion. See Chapter THREE for more information.

2.1.2.8.2 L – N Volt (Line to Neutral Voltage, AKA Phase Voltage)
PowerCalc calculates this field based on the *Line Voltage* and *Phase* selected by the User.

2.1.2.8.3 PH (Phase)
The default value is | **3** | for *3 Phase* power distribution. Alternatively, the User can select |1| from the dropdown menu for *Single Phase* power distribution.

Pulldown | Menu |
| **3** | 1 |

2.1.2.8.4 Cycle (Frequency)
The system's Frequency is in Hertz |Hz|. The default value is "60". Alternatively, the User can select "50" Hz from the dropdown menu when applicable.
Pulldown [Menu]
| **60** | 50 |

2.1.2.8.5 Feeder % VD: Voltage Drop
This Region is broken down into the following FIELDS*:*

2.1.2.8.5.1 %VD: Percent Voltage Drop
The default setting is | **Auto** |. When set on [Auto], *PowerCalc* will automatically assign 2% VD to the Feeder and 3% VD to all Branch Circuits on the Panel for a total of 5% VD. Alternatively, the User can select other % VD from the dropdown menu.

Pulldown Menu
| Auto | 1% | 1.5% | 2% | 2.5% | 3% | 3.5% | 4% | 4.5% | 5% |

TIP: The User can input other %VD 1 thru %VD 3 utilizing the User Interface. See Chapter THREE for more information.

2.1.2.8.5.2 L: Length of Feeder
The Length of Feeder (L) is the distance (**NOT** the Electrical Circuit Conductor total length) between the Power Source and Panel.
PowerCalc automatically calculates the total Length of Feeder and the associated %VD.

TIP: Max length "L" is the calculated maximum distance between the Load and the power source to maintain the %VD. The User can manually edit this value to reflect his/hers design. See Chapter THREE for more information.

2.1.3 Main Rating

This Region is broken into the following FIELDS:

2.1.3.1 Frame

The default setting is | **Auto** |. When set on *Auto*, *PowerCalc* automatically calculates and displays the Panel Frame Capacity in the Amps necessary to support the Electrical Load added to the Panel. The Frame Size is automatically selected from the database, these sizes are based on the industry's standard frame sizes available in the US market.

Pulldown |Menu|
| Auto |100|125|200|225|250|400|600|800|1000|1200|1600|2000|3000|4000|6000|| Frame1 | Frame2 | Frame3 |

TIP: The User can manually set the Frame Ampacity size to fit the Project. See Chapter THREE for more information.

TIP: |**Frame 1**| through |**Frame 3**| are User Interface (UI) items/values that can be added to the Database at User's discretion. See Chapter THREE for more information.

2.1.3.2 Main

This Field is broken into the following Cells.

4.1.3.2.1 Rating

The default setting is |**Auto**|. When set on |**Auto**|, *PowerCalc* automatically calculates and displays the Panel's Main Ampacity in Amps necessary to support the calculated *Demand Load* of the connected loads.
The Main Ampacity size is automatically selected from the database. The size is based on the standard sizes for circuit breakers as listed in *NEC Article 240 Overcurrent Protection, Section 240.6 Standard Amperage Ratings*

Pulldown | Menu |
| Auto | 60 | 70 | 80 | 90 | 100 | 110 | 125 | 150 | 175 | 200 | 225 | 300 | 350 | 400 | 500 | 600 | 700 | 800 | 1000 | 1200 | 1600 | 2000 | 2500 | 3000 |
|4000 | 6000 | Main1 | Main2 | Main3 |

TIP: The User can manually set the *Main Ampacity* size to fit the Project. See Chapter THREE for more information.

TIP: | Main 1 | through | Main 3 | are User Interface items/values that can be added to the Database by the User. See Chapter THREE for more information.

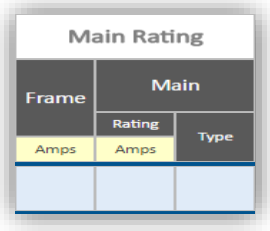


Fig. 2.1.3

2.1.3.2.2 Type

The default setting is | **MCB** | *(Main Circuit Breaker).* Alternatively, the User can select | **MLO** | *(Main Logs Only*).

Pulldown | Menu |
| MCB | MLO |

2.1.4 Feeder

This Region is broken into the following Fields: (1) Sets, (2) QTY, (3) CondR AWG, (4) GND AWG, and (5) CondT size. The Feeder will be displayed in the following format:
Sets _ QTY _ CondR AWG _ GND AWG _ CondT size or (2) **3#500 MCM, 1/O GND, 4" C**

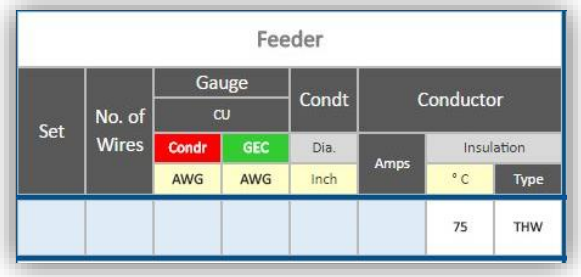


Fig. 2.1.4

2.1.4.1 Set(s)

The default setting is |**Auto**|. When set on Auto, *PowerCalc* automatically calculates and displays the number of SETS of feeders run in parallel.

Pulldown |Menu|
| Auto | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 |

TIP: The User can manually set the number of *SETS* to fit the Project. See Chapter THREE for more information.

2.1.4.2 No. of Wires

The default setting is |**Auto**|. When set on Auto, *PowerCalc* automatically calculates and

displays the Number of Wires. The Number of Wires depends on the Electrical Phase (PH) of the Power Distribution System and if the Neutral CondR™ is required.

Pulldown | Menu |
| Auto | 2 | 3 | 4 | 5 |

TIP: The User can manually set the *Number of Wires* to fit the Project. See Chapter THREE for more information.

2.1.4.3 Gauge
The Wire Gauge can be | **CU** | (*Copper*) or | **AL** | (*Aluminum*). The default setting is | **CU** |.

Pulldown | Menu |
| CU | AL |

TIP: The User can manually select |AL| and *PowerCalc* will automatically re-select the appropriate CondR size and asscoaited CondT size. See Chapter THREE for more information.

TIP: The Wire Gauge can be automatically set for either |75° C| or |90° C| Conductor temperature rating. *PowerCalc* will automatically re-select the appropriate CondR size and asscoaited *CondT* size for the selected teperature rating.

2.1.4.4 CondR ™ (Conductor)
The default setting is | **Auto** |. When set on *Auto*, *PowerCalc* automatically calculates and displays the CondR size. Depending on your subscription, the CondR unit will be either kCMils (AWG) or mm^2. The ampacity of the calculated CondR Size will be large enough to carry the Load, but not smaller than the Main Ampacity.

Imperial Units: | Auto | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 1 | 1/0 | 2/0 | 3/0 | 4/0 | 250 | 300 | 350 | 400 | 500 | 700 | 750 | 800 | 900 | 1000 | 1250 | 1500 | 1750 | | 2000 |
Metric SI Units: | Auto | 2.5 | 4 | 6 | 10 | 16 | 25 | 27 | 35 | 50 | 55 | 70 | 95 | 120 | 127 | 152 | 177 | 203 | 253 | 304 | 355 | 380 | 405 | 456 | 507 | 633 | 760 | 887 | 1013 |

TIP: The User can manually set the *CondR™* size to fit the Project. See Chapter THREE for more information..

TIP: When *CondR* size is set manually, then the *Frame Capacity* should also be manually set as well. See Chapter THREE for more information.

2.1.4.5 GND (Ground)
The default setting is | **Auto** |. When set on *Auto*, *PowerCalc* automatically calculates and displays the Ground CondR Size. Depending on your subscriptions the CondR unit will be either in Circular Mils (AWG) or in mm^2. The Ampacity of the calculated Ground CondR Size is based on ***NEC Article 250 Grounding and Bonding.***

Imperial Units: | Auto | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 1 | 1/0 | 2/0 | 3/0 | 4/0 | 250 | 300 | 350 | 400 | 500 | 700 | 750 | 800 | 900 | 1000 | 1250 | 1500 | 1750 | | 2000 |
Metric SI Units: | Auto | 2.5 | 4 | 6 | 10 | 16 | 25 | 27 | 3 5| 50 | 55 | 70 | 95 | 120 | 127 | 152 | 177 | 203 | 253 | 304 | 355 | 380 | 405 | 456 | 507 | 633 | 760 | | 887 | 1013 |

TIP: The User can manually set the size of the Ground CondR to fit the Project. See Chapter THREE for more information.

TIP: Changed in size: When a feeder or a branch circuit CondR size is changed due to Voltage Drop issue, *PowerCalc* automatically adjusts the *Ground CondR* size as required by ***NEC Article 250 Grounding and Bonding, Section 250.122 Size of Equipment Grounding Conductors Paraphage (B).*** See Chapter THREE for more information..

TIP: When equipment is | **SER** | (*Service Entrance Rated*), the Panel will display the Grounding Electrode CondR (GEC) Value in lieu of Equipment Grounding CondR (EGC) as required by ***NEC Article 250.66 Size of Alternating Current Grounding Electrode Conductor.*** See Chapter THREE for more information.

2.1.4.6 CondT™ (Conduit)
The default setting is |**Auto**|. When set on *Auto*, *PowerCalc* automatically calculates the CondT Size. Depending on your subscription, the CondT Size will be either in inches or mm^2. The CondT Size is calculated in compliance with NEC CondR Fill (See NEC Chapter 9 Tables, Table 1 "Percent of Cross Section of Conduit and Tubing for Conductors." Alternatively, the User can also manually set the CondT Size

Imperial Units: | Auto | ½" | ¼" | 1" | 1 ¼" | 1 ½" | 2" | 2 ½" | 3" |3 ½" | 4" | 4 ½" | 5" | 6" |
Metric SI Units: | Auto | 16 | 21 | 27 | 35 | 41 | 53 | 63 | 78 | 91 | 103 | 129 | 155 |

TIP: The User can set the size of the minimum *CondT* size (1/2" or ¾") to fit the Project. See Chapter THREE for more information.

2.1.4.7 CondR™ (Conductor)

2.1.4.7.1 Amps
This Cell will automatically display the Ampacity of the Calculated Feeder Conductor.

2.1.4.7.2 Insulation type

The default setting is PHHN.

For 75◦ C: | Romex | RHW | THHW | THW | THWN | XHHW | USE | ZW |
For 90◦ C: | RHW-2 | THW-2 | THHN | THHW | USE-2 | ZW-2 | XHHW | XHHW-2 | XHH | RHH |

TIP: The User can manually select other the CondR *Temperature Type* from the pulldown menu to fit the Project. Then, *PowerCalc* will automatically re-calculate all circuit values upstream and downstream of the total Power Distribution System. See Chapter THREE for more information.

Fig. 2.1.3

TIP: For Insulation Type Code Letter: See Appendix at the end of this Chapter TWO for more information.

2.1.4.7.3 Temp º C
The default setting Temperature Rating of CondR is | **75º** C |.

TIP: The User can manually select 90 º C and *PowerCalc* will automatically re-select the appropriate *CondR* size and asscoaited *CondT* size. See Chapter THREE for more information.

2.1.5. Branch CKT: Branch Circuit CondR

This Region is broken down into the following Fields.

Fig. 2.1.5

2.1.5.1 Insulation Type
The default setting is | **THHN** |.

For 75◦ C: | Romex | RHW | THHW | THW | THWN | XHHW | USE | ZW |
For 90◦ C: | RHW-2 | THW-2 | THHN | THHW | USE-2 | ZW-2 | XHHW | XHHW-2 | XHH | RHH |

TIP: The User can manually select 90 º C and *PowerCalc* will automatically re-select the appropriate *CondR* size and associated *CondT* size. See Chapter THREE for more information.

2.1.5.2 Temp º C: Temperature Degree Celsius
The default setting Temperature Rating of CondR is | **75º C** |

TIP: The User can manually select 90 º C and *PowerCalc* will automatically re-select the appropriate *CondR* size and asscoaited *CondT* size. See Chapter THREE for more information.

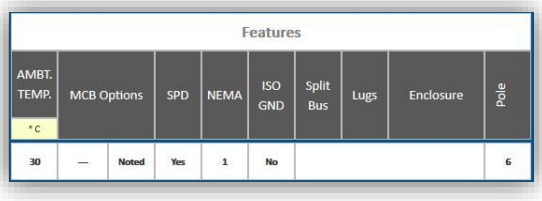


Fig. 2.1.6

2.1.6 Features

This Region is broken down into the following 9 Fields:

2.1.6.1 AMBT. TEMP. (Ambient Temperature) º C and Associated De-rating Factors
The default setting for Ambient Temperature is|30| º C (86 º F) per ***NEC Article 310, Table 310.15(B) (16) Allowable Ampacities of Insulated Conductors Rated up to and Including 2000 Volts, 60 º C through 90 º C (140 º F – 194 º F).***

2.1.6.2 MCB Options (Main Circuit Breaker Options)
This Field is broken into two (2) Cells.

The 1st Cell is automatically populated with GFP (Ground Fault Protection) when applicable as required by ***NEC Article 230 Servgices,Section 230.82 Equipment Connected to the Supply Side of Service Disconnect.***

The 2nd Cell is a pulldown menu that contains several industry standard options. The User can manually select | MCB | option from the drop down menu. See Chapter THREE for more information.

2.1.6.3 SPD (Surge Protection Device)
The default setting is | **YES** |. Alternatively, the User can select | **NO** | from the dropdown menu if the *SPD* is not required.

TIP: | Yes | selection will automatically add a note on the Panel report to include the installation and circuit requirement. The User should clearly specify whether the SPD Unit is integral or external to the Panel.

2.1.6.4 NEMA (National Electrical Manufacturing Association). See the Appendix at the end of this Chapter TWO for more information.

Pulldown | Menu |
|1 | 10 | 11 | 12 | 12R | 13 | 2 | 3 | 3R | 3S | 4 | 4x | 4XSS | 5 | 6 | 6P | 7 | 8 | 9 |

2.1.6.5 ISO GND (Isolated Ground)
The default setting is | **NO** |. Alternatively, the User can select | **YES** | from the dropdown menu if ISO GND is required.

2.1.6.6 Split Bus (available only in PN)
The default setting is | **NO** |. Alternatively, the User can select | **YES** | from the dropdown menu if *Split Bus* is required

2.1.6.7 Lugs (available only in PN)
The default setting is | **SNGL** | (Single Lugs). Alternatively, the User can select lugs arrangement from the dropdown menu.

Pulldown | Menu |
| SNGL | FD Thru | DBL |

TIP: When field is set on |SNGL |, the User can set the Panel capacity up to 84 Spaces and *PowerCalc* will automatically adjust the number of spaces accordingly.

2.1.6.8 Enclosure (available only in PN)
This Field defines the number of Enclosures that comprise the Panel. The default setting is | **Auto** |. Alternatively, the User can select other types from the dropdown menu.

Pulldown | Menu |
| Auto | SNGL | DBL |

2.1.6.9 Tub (available only in PN)
This Field define the Left (L) or Right (R) enclosure. The default setting is | **Auto** | and alternatively, the User can select | **L** | or | **R** |.

Pulldown | Menu |
| Auto | L | R |

2.1.6.10 P (Number of Poles)
The default setting is | **6** | Spaces. The User can input a number for 6 to 84 (even numbers only) Spaces as needed for the Project.

2.2 CENTER

The Center is where the User inputs the required 3 inputs (Load kVA, Load Type and # of Poles) for each Branch Circuit. The Center consists of three blocks, (1) Odd Circuit Blocks, (2) Connected kVA, and (3) Even Circuit Blocks. These Blocks resemble the actual Panel layout in the field.

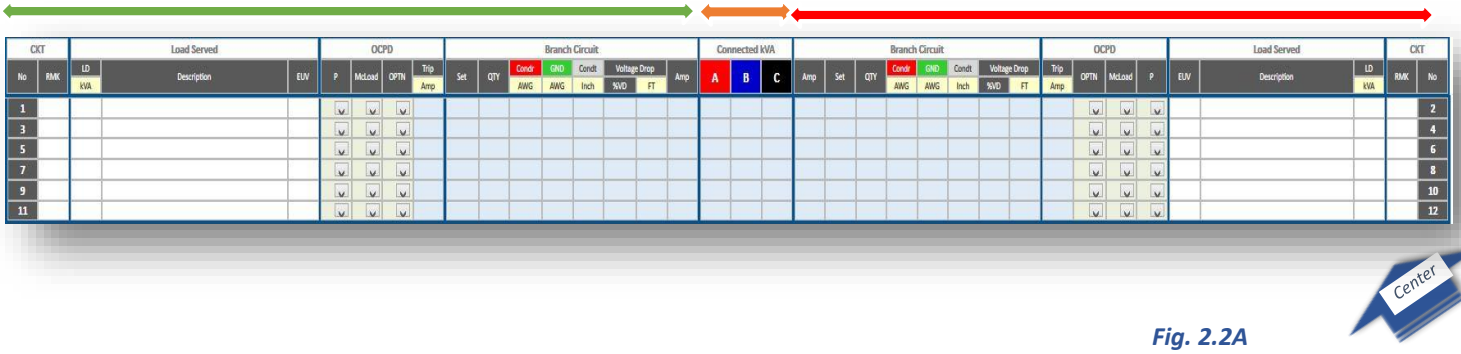


Fig. 2.2A

The screen shot above shows twelve (12) Spaces Distribution Panel layout or six (6) rows, each row represents two circuits. The rows on the left represent the Odd Branch Circuit Block while the rows on the right represent the Even Branch Circuit Block. These Blocks are separated by the connected kVA Block.

The layout of MDP, DP and PN is identical with one exception. Each row in an MDP or DP can be a 1, 2 or 3 Pole Branch Circuits, while each row in a PN represents a 1 Pole Circuit such that a 1 pole Branch Circuit will occupy 1 row, a 2 Pole Branch Circuit will occupy 2 rows and a 3 Pole Branch Circuit will occupy 3 rows. However the User will always input the total load kVA without dividing by the number of the circuit poles.

2.2.1 Odd Circuits Block
This Block is broken into (4) Regions: (1) CKT, (2) Load Served, (3) OCPD, and (4) Branch Circuit.

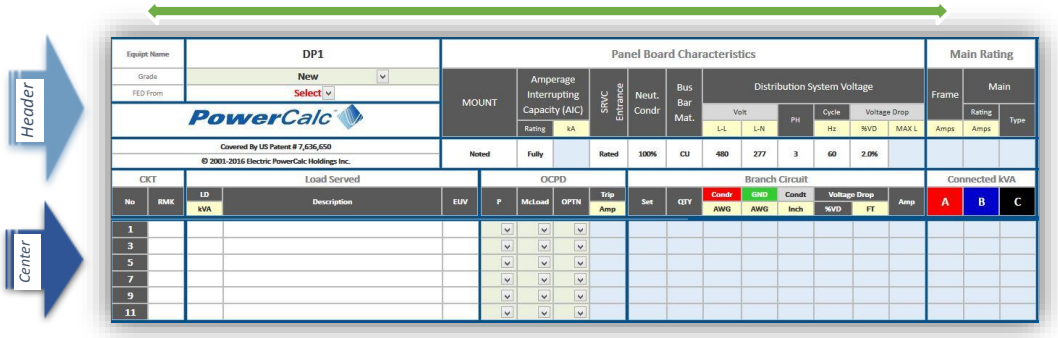


Fig. 2.2B

2.2.1.1 CKT (Circuit)
This Region is broken into (2) Fields.
2.2.1.1.1 No.: This represents the Row Number in the Panel.

2.2.1.1.2 RMK (Remark)
The User can input a Remark No. for specific specification associated with a Circuit such as "CONTROLLED VIA LIGHTING CONTACTOR". The User inputs their Remark in the Remarks Block in the Footer. See 2.3.

2.2.1.2 Load Served
This Region is broken down into three (3) Fields.

2.2.1.2.1 LD kVA (Load kVA)
This Field is one of the three (3) inputs that are required to calculate the Branch Circuit Values as well the Panel and Feeder Values.

2.2.1.1.2 Description
The User inputs the respective Circuit Description, such as "Lighting RM 101-105", or "Air Handling Unit".

2.2.1.1.3 EUV (Equipment Utilization Voltage)
This Field only appears in the MDP and DP and indicates the Child Panel or Equipment Utilization Voltage. This Field is automatically populated.

2.2.1.3 OCPD (Over Current Protection Device)
This Region is broken into (4) Fields.

2.2.1.3.1 P (Poles)
The User selects the Circuit Number of Poles from the dropdown menu. This Field is one of the three (3) inputs that are required to calculate the Branch Circuit Values.

Pulldown | Menu |
| 1 | 2 | 3 | 3+N |

2.2.1.3.2 McLoad™ (Macro of the Load Type)
The User selects the Load Type from the dropdown menu. Each Load Type is identified by an abbreviation as listed below.

TIP: This field is one of the three (3) inputs that are required to calculate the Branch Circuit Values.

Pulldown | Menu | (Load Type)
| R | Receptacles **| L |** Lighting **| XL |** Exterior Lighting **| SL |** Site Lighting **| P1 | P2 | P3 |** and **| P4 |** Power Load 1, Power Load 2, Power Load 3 and Power Load 4 **| XFMR |** Transformer **| PNL |** Sub Panel **| H |** Heating **| AC |** Air Conditioning (Compressor) **| S |** Spare **| M1 | M2 | M3 |** and **| M4 |**

TIP: Power Load 1, Power Load 2, Power Load 3 and Power Load 4 are load defined load types and MUST be resistive non- reactive type loads.
TIP: Motor Load 1, Motor Load 2, Motor Load 3 and Motor Load 4, are User defined load types and MUST be a motor type loads.

2.2.1.3.3 OPTN (Option)
The User selects the Circuit Breaker Option from the dropdown menu.

Pulldown | Menu |
| GFCI | Ground Fault Circuit Interrupter | KEY | Key Lock | LV | Low Voltage Controlled | SNT | Shunt Trip | GFP | Ground Fault Protection | Noted | Noted by Note | Option 1 | User input option | Option 2 | User input option | Option 3 | User input option.

TIP: The User can Define Option 1 thru Option 3 via the UI in eNode.

2.2.1.3.4 Trip Amp
This Field is automatically populated after the three inputs (Load kVA, # of Poles, and Load Type) are entered. The calculated value represents the OCPD Trip Amp. The selection is based on the Circuit Breaker Standard Sizes per *NEC Article 240, Section 240.6 Standard Amperage Ratings.*

2.2.1.4 Branch Circuit
This Region is broken into 7 Fields. These Fields will define the Branch Circuit Values.

2.2.1.4.1 Set
This Field is automatically populated with the Number of the Branch Circuit Parallel Sets after the three (3) inputs are entered.

2.2.1.4.2 QTY (Quantity)
This Field is automatically populated with the Number of the Branch Circuit Conductors after the "three inputs" are entered.

2.2.1.4.3 CondR AWG
This Field is automatically populated with the Conductor Size after the "three inputs" are entered.

TIP: The User has the option to use US units or SI units – available only with the Global Upgrade.

2.2.1.4.4 GND AWG
This Field is automatically populated with the Equipment Ground Conductor Size after the three inputs are entered.

TIP: The User has the option to use US units or SI units – available only with the Global Upgrade.
TIP: If the Panel is Service Entrance Rated (SER), then this field will automatically display the Ground Electrode Conductor (GEC) size.

2.2.1.6 CondT
This Field is automatically populated with the CondT Size after the "three inputs" are entered.

TIP: The User has the option to use US units or SI units – available only with the Global Upgrade.

2.2.1.7 Voltage Drop
This Field is broken into (2) Cells.

2.2.1.7.1 %VD: Percent Voltage Drop
This Cell is automatically populated with % VD after the three inputs are entered.
The User can alternatively select %VD from the drop down menu in the Control Panel or the WIZARD – Branch Circuit.

2.2.1.7.2 FT: Length for Conductor in Feet
This Cell is automatically populated with the Branch Circuit Conductor Length after the three inputs are entered. The displayed Length is the maximum distance from the power source to the furthest load. The User can alternatively input a value for the Conductor Length in the Control Panel or the WIZARD – Branch Circuit.

2.2.2 Connected kVA

This Block is a representation of the Panel Bus Arrangement and the Connected Load kVA on each of the Electrical Phases and is automatically populated after the three inputs are entered.

The User can easily change between 3 Phase and Single Phase. *PowerCalc* will automatically re-arrange the circuits in the Panel and re-calculate all Panel Values and Feeder Values.

This Block is broken down into the following Regions (1) Phase A, (2) Phase B and (3) Phase C.

TIP: Depending on the Power Distribution System, this Field will automatically display ***Phases A***, ***B***, and ***C*** for a 3 Phase Power System (Fig 2.2.2A) and *Phases* ***A*** and ***C*** for a Single Phase Power System (Fig 2.2.2B). If the Panel is set on 3 Phase, *PowerCalc* will automatically Show ***Phase A***, ***B***, and ***C*** and the Panel will accept either 1, 2 or 3 Pole However, if the Panel is set on Single Phase, *PowerCalc* will automatically Show **Phase *A***, and ***Phase C*** and will only accept 1 or 2 Poles Circuit Loads.

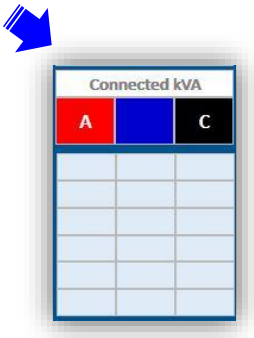


Fig 2.2.2A

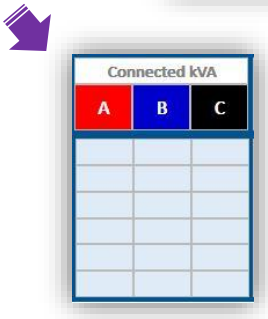


Fig 2.2.2B

2.2.3 Even Circuit Blocks

This Block is broken down into the following Regions: (1) CKT, (2) Load Served, (3) OCPD and (4) Branch Circuit.

The layout of the Even Circuit Block is identical to Odd Circuits Block but in reverse order. See section Odd Circuit Blocks above.

Fig. 2.2.3

2.3 Footer

The Footer displays a summary of the Electrical Loads and Equipment powered by the Panel. The Footer automatically calculates
It lists the Electrical Load by (1) Load Type, (2) connected and Demand Load, (3) Total Electrical Load, (4) Statistical Calculations, (5) Project Information, (6) Remarks and Abbreviations.

2.3.1 Load Type

The Load Types are:
|R| Receptacles **|L|** Lighting **|XL|** Exterior Lighting **|SL|** Site Lighting **|P1|P2|P3| and |P4|** Power Load 1, Power Load 2, Power Load 3 and Power Load 4 **|XFMR|**

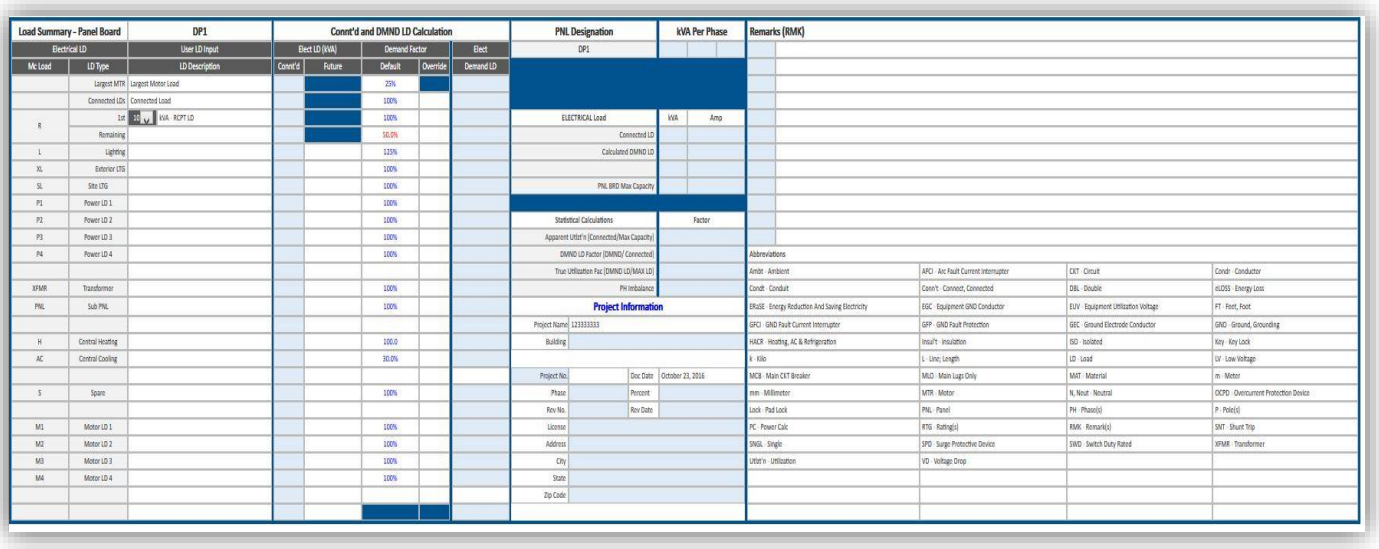


Fig. 2.3.1

Transformer **|PNL|** Sub Panel **|H|** Heating **|AC|** Air Conditioning (Compressor) **| S |** Spare **| M1 | M2 | M3 | and | M4 |**

Tip: Power Load 1, Power Load 2, Power Load 3 and Power Load 4 are load defined load types and MUST be resistive non- reactive type load
Tip: Motor Load 1, Motor Load 2, Motor Load 3 and Motor Load 4, are User defined load types. This load MUST be a motor type load.

2.3.2 Connected and Demand Load Calculations

PowerCalc will automatically aggregate the Connected Loads and tabulate said loads by Load Type as listed in 2.3.1 above.
Then *PowerCalc* applies the Design Demand Factors as required by the NEC. Alternatively, the User can manually override the Design Demand Factors for the design of the particular project.

2.3.2.1 Largest Motor: Demanded at 25% - No Override allowed.
2.3.2.2 R (Receptacle Outlet)
Receptacle Outlet: First 10kVA demanded at 100% - No Override allowed
Remaining Load demanded at 50% - Override allowed

TIP: For Residential Projects: The User should manually override the Remaining Load Demand factor to 40%, **NEC Article 220 Branch Circuit, Feeder, and Service Calculations, Optional Feeder and Service Load Calculations**

TIP: For Residential Projects: To take advantage of the **NEC Article 220 Branch Circuit, Feeder, and Service Calculations, Optional Feeder and Service Load Calculations, Para 220.83 Existing Dwelling Units,** the User should Click on and select |8|from the drop down menu

2.3.2.3 L (Lighting) Interior lighting is demanded at 125% to meet the Continuous Operation requirement of the NEC. Override is allowed.
2.3.2.4 XL (Exterior Lighting) Exterior lighting is demanded at 100%. Override is allowed.
2.3.2.5 SL (Site Lighting) Site lighting is demanded at 100%. Override is allowed.
2.3.2.6 P1 – P4: General Power is demanded at 100%. Override is allowed
TIP: The User can utilize these McLoads for non-coincidental demand load Calculations.

2.3.2.7 M1 – M4: Motor Load is demanded at 100%. Override is allowed (coordinate with para 2.3.3).

TIP: The User can utilize these McLoads for non-coincidental demand load Calculations.

2.3.2.8 XFMR: Transformer is demanded at 100%. Override is allowed.

TIP: Cannot resize Primary and Secondary feeder.

2.3.2.9 PNL: Sub Panel or Child Panel is demanded at 100%. Override is allowed.

TIP: The Parent Panel will see the Sub PNL is demanded load at a100%.

2.3.2.10 H: Central Heating, the demand of Central Heating (Item 3.2.11) and Central Cooling (Item 3.2.12) are dependent on each other.
PowerCalc will demand the largest of the two loads at 100%, and the other load at 30%. Override is allowed.

2.3.2.11 AC: Central Cooling, the demand of Central Cooling (Item 3.2.12) and Central Heating (Item 3.2.11) are dependent on each other.
PowerCalc will demand the largest of the two loads at 100%, and the other load at 30%. Override is allowed.

TIP: The User should discuss the HVAC heating and cooling cycle with the mechanical engineer and adjust the demand calculation to suite the project.

2.3.3 Electrical Load

PowerCalc will automatically display the Total Connected Electrical Load as well as the Total Demand Load. Both loads will be listed in kVA and Amps. Also the size either the recommended XFMR kVA or the selected XFMR kVA is displayed.

2.3.4 Statistical Calculation

PowerCalc will automatically display the following Calculation Factors. These factors are a quick snap shot indicators of the performance

2.3.4.1 Utilization Factor:
Percent ratio of Connected Load kVA over Panel Max Load kVA.

2.3.4.2 Demand Load Factor:
Percent ratio of Demand Load over Connected Load.

2.3.4.3 True Utilization Factor:
Percent ratio of Demand Load over Panel Max Load kVA.

2.3.4.4 Phase Imbalance:
To display this Factor, the User should turn this Cell on.
Go to Panel Wizard > General > PH Balance Pull Down menu and select |ON | or |OFF |

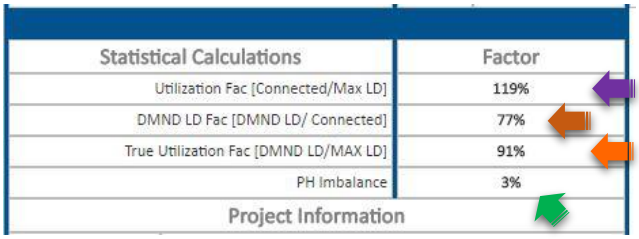


Fig. 2.3.4

3. Branch Circuit Panel

The Branch Circuit Panel organizes the Electrical Load requirements for a specific project and displays the relevant standard industry information. The User inputs just three (3) electrical values per Branch Circuit. These 3 Independent Values are:
(1) Electrical Load in kVA,
(2) Selects the Number of Poles
(3) Selects the Electrical Load Type

Then, the User activates the eNODE (electrical node) by connecting the Child Panel to the Power Distribution System by selecting the Parent Panel from the Power Distribution System tree.

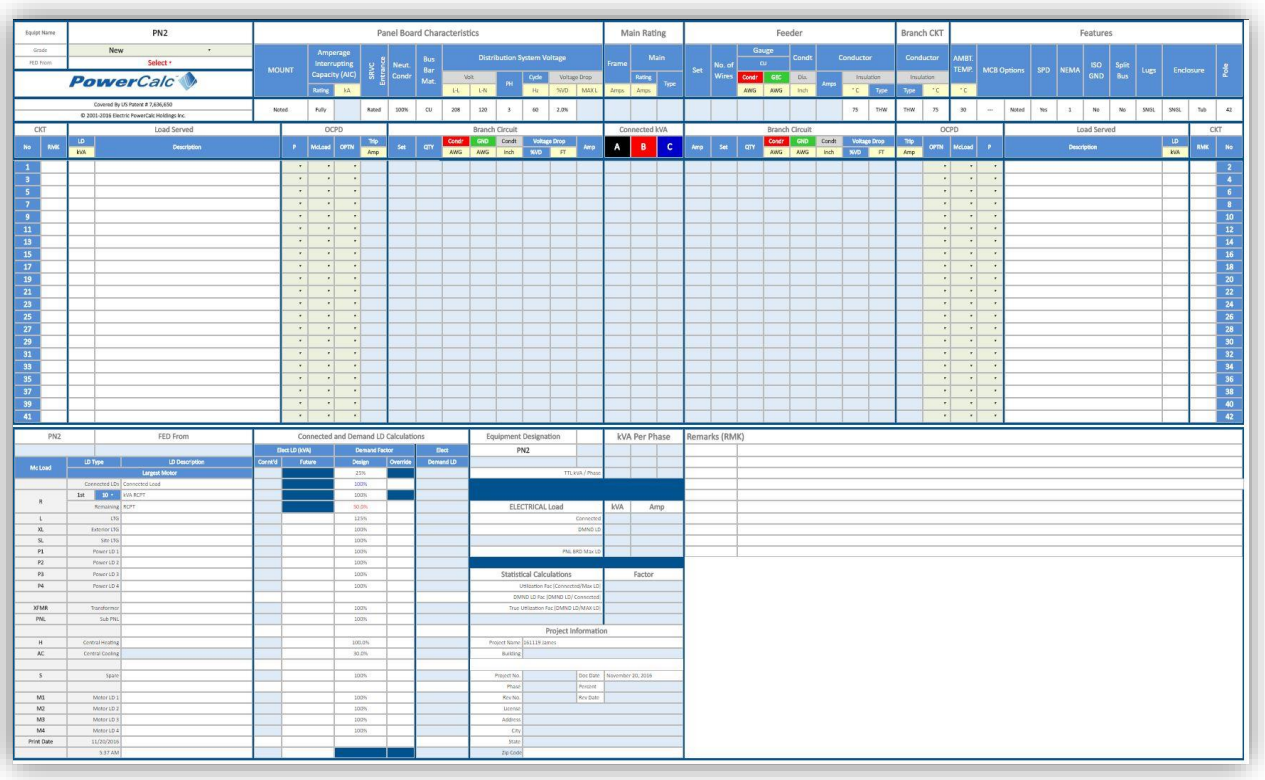


Fig. 3.0

The result: *PowerCalc automatically calculates* and displays all Branch Circuit and Panel Values. And *instantly*, *PowerCalc's* dynamic database *automatically-calculates* and *updates* all values upstream / downstream across the design for each change. All Panel Values are always calculated based on the Demand Load. Throughout the design process, the Branch Circuit Panel also tracks Load kVA sorted by Load Type, Total Connected Load and Demand Load.

PowerCalc's Panel takes center stage and only with *three* Independent Values, the Panel does all the calculations, look ups in code tables and displaying the results directly, instantly and accurately. All *calculations,* and *re-calculations* for changes, are automatic instant and in real time across all Panels for all electrical values.

The *three* Independent Values are Load kVA, Load Type and Number of Poles for each Branch Circuit. The User starts at the most downstream Panel by input these *three* Independent Values for each Branch Circuit and *PowerCalc* will calculate and recalculate for changes all Dependent Values upstream throughout the facility's Power Distribution System.

The Panel not only calculates Branch Circuit Values, Feeder Values, Service Entrance Values and Panel Values but also calculates the Voltage Drop at the Branch Circuit Level as well as at the Feeder Level, Fault Current, Panel Amerage Interrupting Capacity (AIC). Futher more, the Panel tabulates the Connected Loads by Load Types and displays the Connected Loads by Load Type as well as the accumulative Connected Load, and instantly in real time, automatically applies the Demand Load Factors and calculates the Demand Load by Load Types as well as the accumulative Demand Load. Every time the User inputs the three Independent Values, *PowerCalc* calclates all Dependent Values in real time and updates all relevent data and values upstream/downsream from the Branch Circuit to the Service Entrance.

In addtion to the above automatic, realtime, error free, accurate and comprehensive calculation, the intelligent Smart Database can run calculations on Non-coincidental Loads, Continuous Loads, Lead/Lag Loads and Load Diversification.
As part of the Panel Architecture and further saving a minimum of 40% design time, *PowerCalc* provides two WIZARDS to facilitate the ease and and speed of the User Interface for this incredibly powerful, yet unexpectedly easy software. Fig 2.3.1 and Fig 2.3.2 are screen shotd of the Panel WIZARD – Panel and WIZARD – Branch Circuit.

2.3.1 WIZARD - Panel

In lieu of using the Panel Header to set up the Panel Characteristics and Features, *PowerCalc™* provided this WIZARD that represents the Panel Header and depicts all the Fields with the values associated with the Panel. *Powercalc™* will use these settings in the calculation of the Panel, Feeder and Branch Circuit Values. Note that most of these values are set on |**Auto**|.
When set on Auto, *PowerCalc™* will calculate and display the apprporiate values every time a Load (Branch Circuit) is added to, or removed from the Panel. Each one of these |**Auto**| setting can be manually set.
See Chapter THREE and learn how to Access ths WIZARD

Fig. 2.3.1

2.3.2 WIZARD – Branch Circuit

Instead of using the Panel Center to input the 3 Independent (Load kVA, Load Type and Circuit Number of Poles) for Branch Circuit. This WIZARD can be used to input these Independent Values while *PowerCalc* is calculating all Dependent Values in the background.
See Chapter III and learn how to Access ths WIZARD

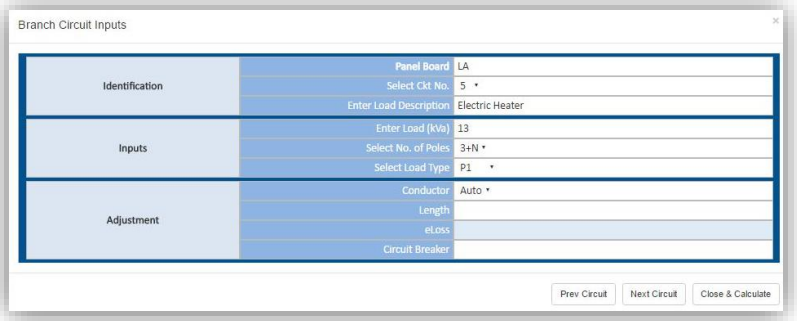


Fig. 2.3.2

2.4 Building Equipment Schedule

Electrical characteristics of each Branch Circuit, Size of the Overcurrent Protection Device (OCPD) (fuse or circuit breaker), Conductor Size and the Electrical Enclosure Frame Size and Characteristics.

Building Equipment Schedule(s) organize the Electrical Load requirements for Equipment such as HVAC Equipment, Elevators, Fire and Other Pumps and more in the project. A separate schedule is required for each piece of equipment used in the project, then an eNODE (electrical NODE) is activated connecting the Building Equipment Schedule to the Power Distribution System.

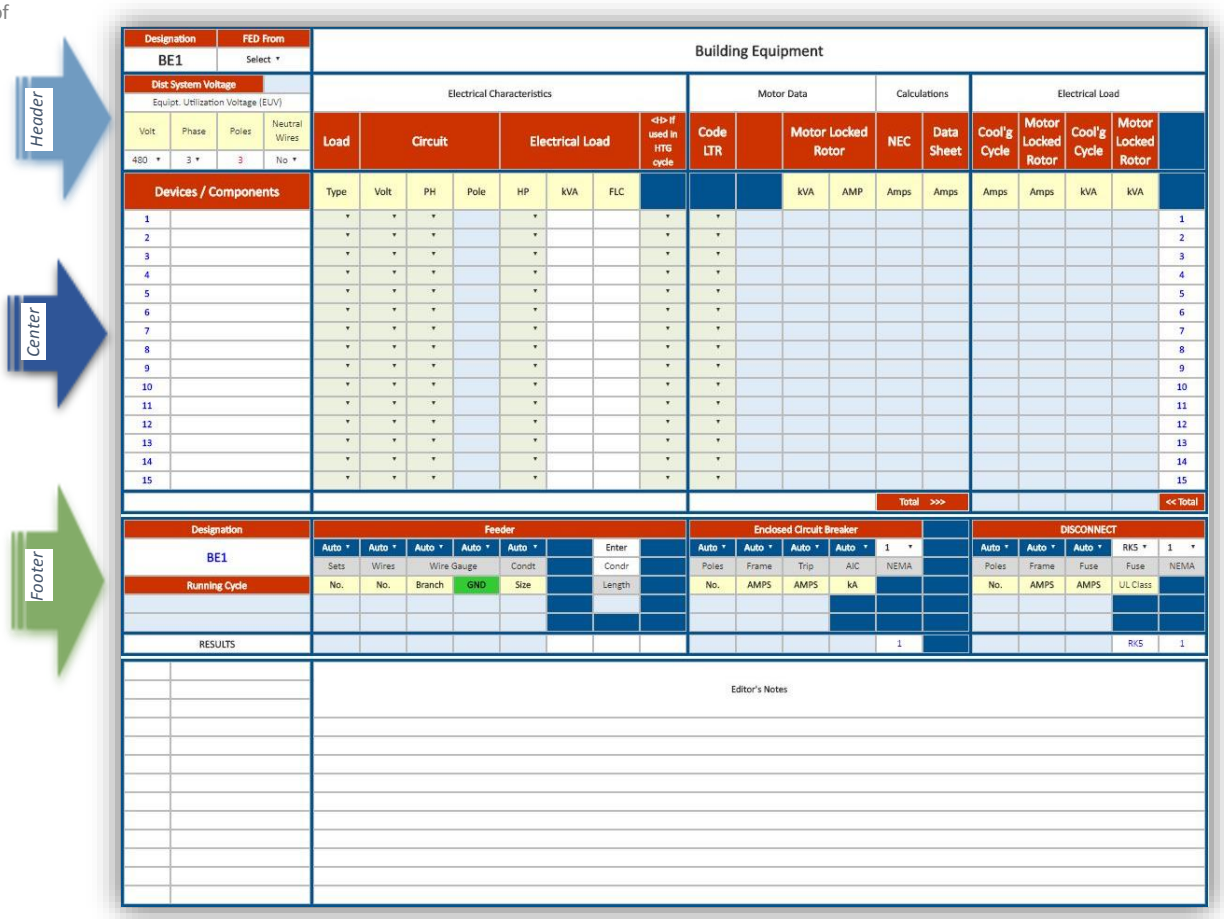


Fig. 2.4

Matching existing conditions, *PowerCalc automatically calculates,* and *re-calculates for changes,* the electrical requirements for the Building Equipment listed on each Schedule. The User can override the automatic calculations for specific project and design requirement. These schedules display relevant and standard industry information in a format for ready identification.

The Building Equipment can be used to document the electrical load for mechanical equipment such as pump(s), conveyor(s), air handling units (AHU), Condensing Unit(s), Chiller(s) etc. as well as Water Heaters.

3.0 APPENDIX

3.1 Panel Module

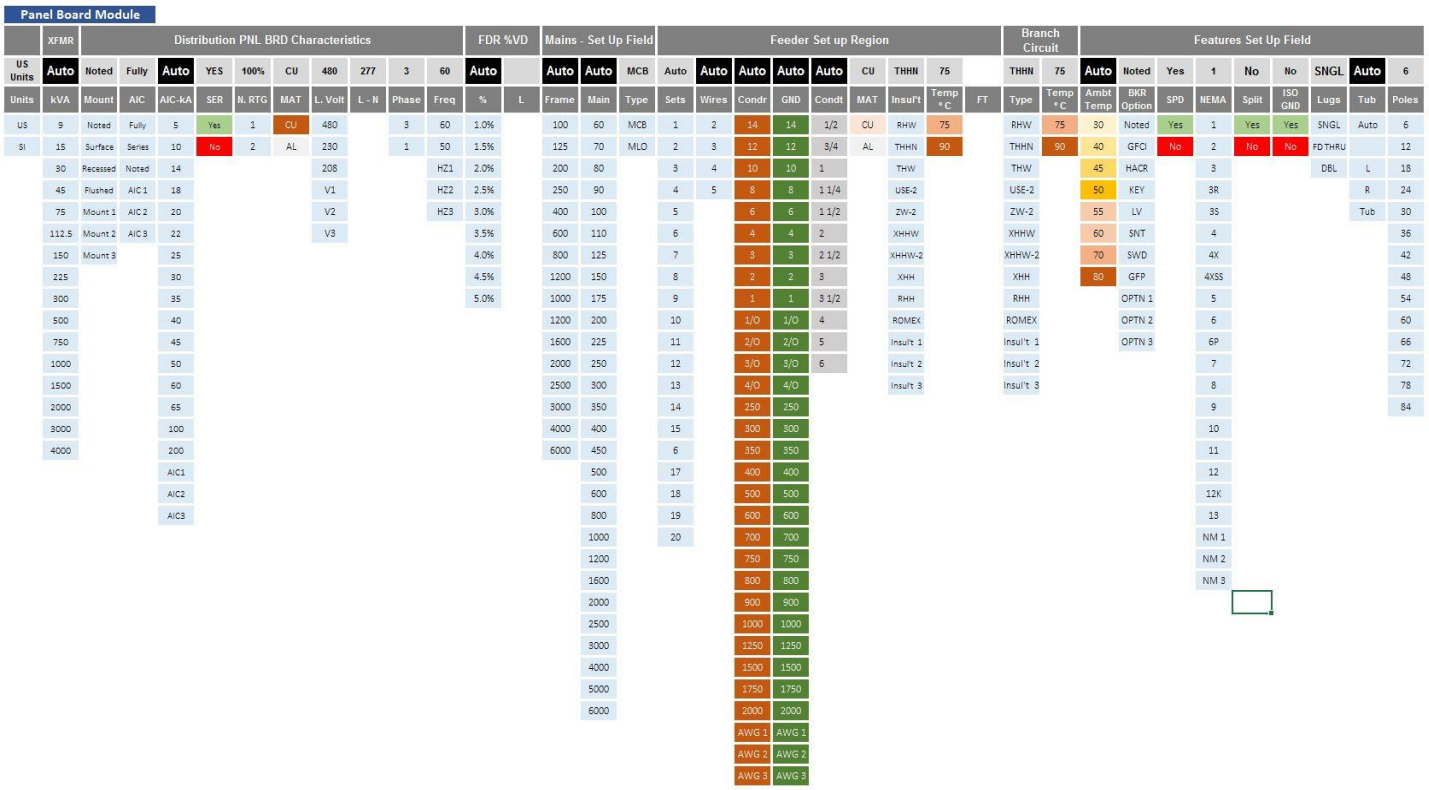


Fig. 3.0

A: Asbestos (obsolete; now must be glass fiber or similar material)
FEP: Fluorinated ethylene propylene insulation
H: 75 º C (Note: Lack of "H" indicated 60 º C)
HH: 90 º C
L: Lead sheath
N: Nylon jacket
PF: Perfluoroalkoxy insulation
R: Thermoset insulation
S: Silicone (Thermoset) insulation
T: Thermoplastic insulation
U: Underground use
W: Moisture resistant
X: Cross-linked synthetic polymer insulation
Z: Modified tetrafluoroethylene insulation

Examples:

RHW: Thermoset Insulation, 75 º C Wet
THHN:Thermoplastic Insulation, 90 º C dry, nylon jacket

Abbreviations

CondR™: Conductor

CondT™: Conduit

GEC: Grounding Electrode CondR

EGC: Equipment Grounding CondR