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Function Addition of Silk to Silk Clearance for Power PCB Design using User- Menu Features on Zuken CR-5000

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Abstract

The use of Printed Circuit Board (PCB) must never be missed in electronics field because its pivotal function as the connector of electrical terminals or leads. Thus, PCB design has to be made properly to create functions that are precise to the system designed. Almost every electronic device manufactory uses machine or robot for fabrication. Each manufactory has their own rule check for fabrication (Manufacture Rule Check) that should be implemented to maintain the run of production process well without error. One of the error check process that is advanced now is using user menu feature on Zuken CR-500 application used by Samsung Electro Mechanic South Korea company. Not every error check using user menu can fulfill the whole design rule check determined by the industry, with the development of this user menu feature, it is hoped can handle the undergone error check. The distance between components assembled using machine or robot has minimum clearance rule that is 1mm. Adding functions on user menu feature can detect the error when the distance between the components does not correspond to the determined standard. According to the conducted research result, user menu function can be added to check the distance between components well. By viewing contents of command on environment feature, the syntax of executed actions while the process of designing can be seen. Briefly, the system flow is to make log file saved in certain directory that is later called by adding user menu button and taking the data from the log file made

Keywords: User menu, Desain PCB, pabrikasi, Manufacture Rule Check

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INTRODUCTION

PCB is a board where electronic circuits connect electronic components to one another. PCB coated metal (copper) which serves as a link between components. With the PCB, electronic components can be arranged neatly, orderly, and it's easy to track damage if the equipment is damaged/interrupted one day.

Using the Zuken CR-5000 application makes it easy for PCB designers to work on complex electronic circuits and overcome design challenges such as multilayer technology. This software has a User Menu feature that is used to check design errors on PCBs, both single layer and multilayer. Error checking or Error Checking on a PCB design is very important because it can cause losses if the PCB that is produced/printed has an error.

The User Menu feature contained in the Zuken CR-5000 application has limited checking. In designing a Switching Power Supply PCB there are several design rules (Design Rule) that must be met when designing a PCB layout. The lack of features to check for errors on a Switching Power Supply PCB requires designers to check manually or use other software. Based on this description, this thesis aims

to develop the User Menu feature in the Zuken CR-5000 software for checking the silk to silk clearance check.

RESEARCH METHOD

System Block

System design describes the overall rocket system design steps in outline. Starting from editing the log file to adding a new user-menu button. From the log file data that already exists in the Zuken CR-5000 application, the first thing to do is copy the log file then edit the contents of the log file. When editing the data log file, look for the command that suits your needs by looking at the customize dialog box in the Zuken CR-5000 application. Editing the contents of a log file can be opened using the Notepad program or other programs that support editing log file data, edit the contents of the log file according to the program to be created.

Figure 1. Example of opening a log file using Notepad

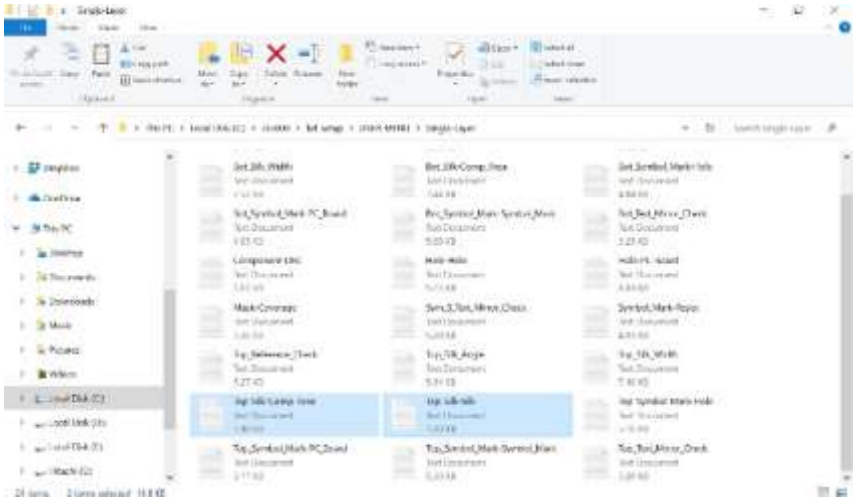
Program design

Program design can be started by copying one of the existing log data files or by creating a new one using the Notepad application and then saving it with the ".log" extension. In this case modifying the contents of the data log file for the function of checking the error clearance distance between silk components.

Copy Log Data Files

All contents of the data log file used by the Zuken CR-5000 application are located in the D:\bd_setup\USER-MENU\ folder. Then select one of the log files to be edited, select according to the function that is correlated with the function to be created. In this research, the function of checking error clearance is the distance between silk components, therefore the "Top_Silk-Comp Area" log file was selected. Then copy the file with a new name, for example "Top_Silk-Silk".

Figure 5. Copying one of the log data files in the bd_setup folder



Edit Log Files

After copying one of the log files that existed before, what needs to be done is to edit the contents of the log file. To find out what commands are used when editing a data log file, use the command feature in the Zuken CR-5000 application. The Command feature can be accessed via the Environment → Customize toolbar. How to access the command feature can be seen in the following image.

Without closing the command feature, then open the Settings feature by way of Check → Settings. The Settings feature will appear regarding the design rules needed by designers to minimize PCB design errors.

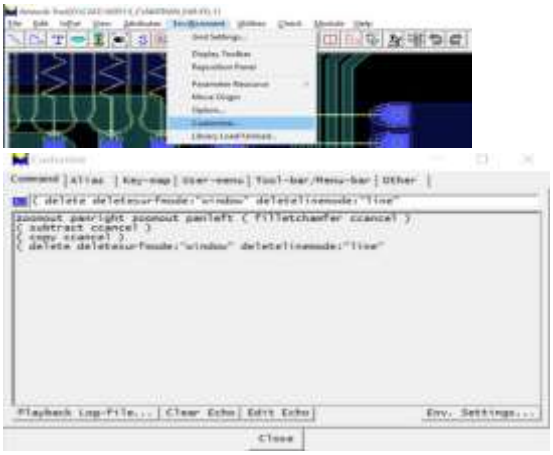
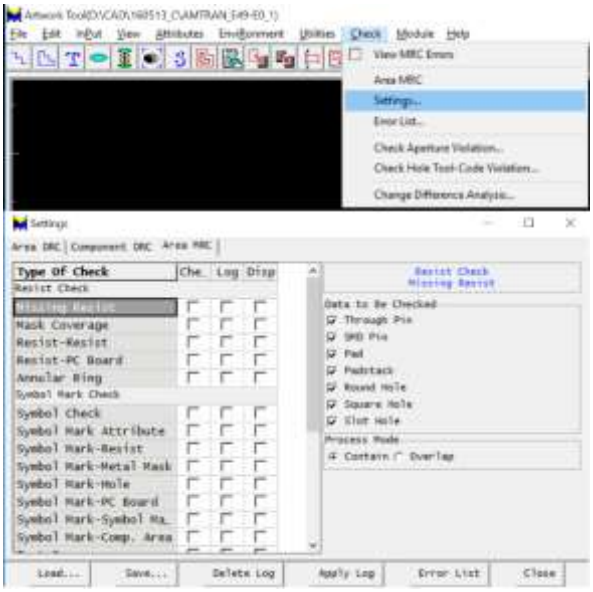


Figure 7. Accessing the Settings feature on the Zuken CR-5000 application



Activate the check and display options in the available checkboxes, and set the clearance value. In accordance with the rules used by Samsung Electro Mechanic the specified distance between the silk components is 1mm. Also check the choice between the specified targets, in this case the selected targets are Figures.

After checking, also pay attention to the command dialog box. From the dialog box, you can see the command that appears (logs) when a setting changes.

Figure 8. The command log feature in the Zuken CR-5000 application

By paying attention to the results of the command log feature, it can be used to edit an existing log file. Below is the code to check for errors on Zuken cr-5000 top/bottom component references.

Addition of User Menu Features

Adding User Menu features to the Zuken CR-5000 application can be accessed via the Environment → Customize toolbar. In the Customize dialog box, select the User Menu Tab, then select an empty page menu (example: select Page-7).

8. Addition of user menu features to the Zuken CR-5000 application

Click Change Page Label to change the name of the Menu Page (Example: TEST). On the User-Menu page several other functions can be added as long as button space is still available or not used.

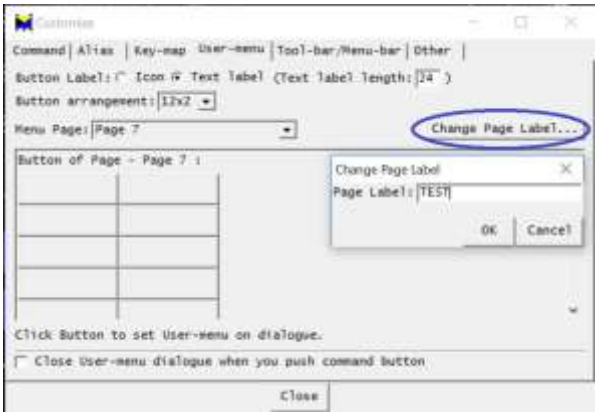


Figure 9. Renaming Menu Page

Foradded new function in user menu feature. Then name the Button Label and Tool-tip, namely TOP_SILK SILK. On Command Strings filled with command to run the data log file and include the log file storage directory () (playback) filepath: "D\\bd_setup\\USER-MENU\\Single-Layer\\Top_Silk-Silk.log")).

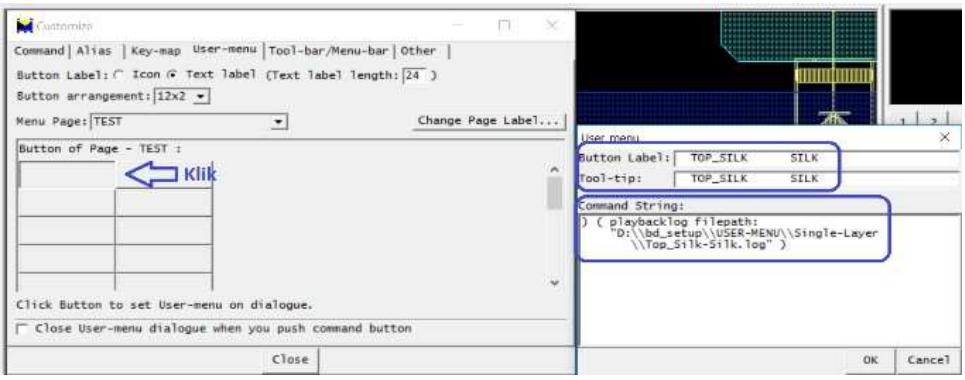


Figure 10. The stages of creating a new button in the user menu feature

Figure 11. The new button that has been added

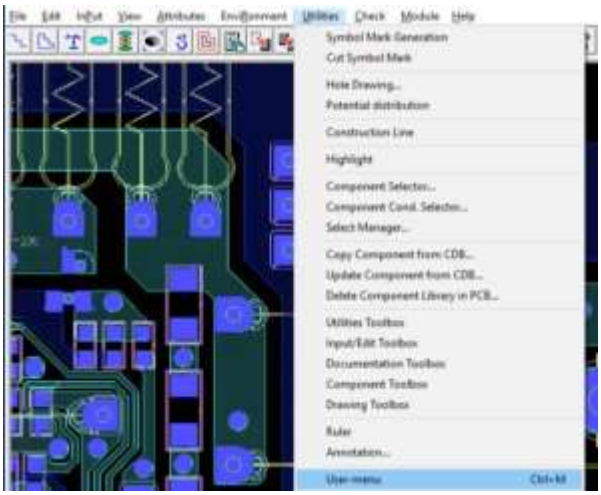


Figure 12. Access the User-Menu Feature via the Utilities toolbar

RESULTS AND DISCUSSION

Testing and Analysis

For example cases carried out for this study, namely testing the AMTRAN_EXX-EX model which is one of the PCBs in the Power Display section. This PCB board measures 155mm x 245mm, with an input voltage of 100-240VAC 50-60Hz, LED Driver Output is 182VDC 4.7A, and manufacture in China.

User-Menu Testing

User menu testing is carried out when the entire design has been completed and is ready for inspection. In placement and wiring tool mode select Utilities then User-menu, or can be accessed by pressing the Ctrl-M key on the keyboard.

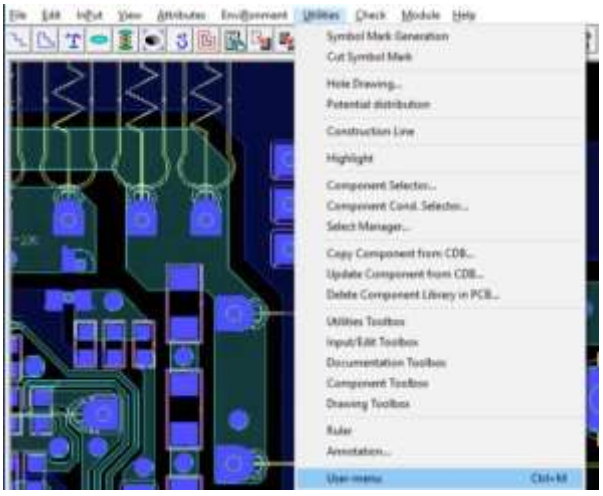


Figure 12. Access the User-Menu Feature via the Utilities toolbar

Defaults fromThe User Menu will appear as shown in figure 13. By clicking the command button on the user menu, the commands contained in the log file will be executed and checked.

Figure 13. Default user-menu display

By clicking each command button the command will be executed and error information will appear based on the selected error checking category. In the user menu dialog box, select the tab that was created with the name TEST to check the function of the minimum distance between Silk to Silk components. Then analyze any errors that appear.

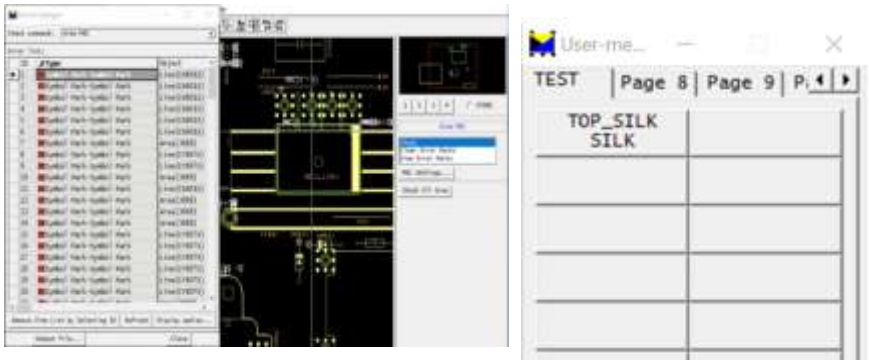


Figure 14. The previously created TEST dialog box

The results of checking errors using the "TOP_SILK-SILK" command button are shown in Figure 4.4. The error results that appear in the table are areas where there is a component silk on the top layer (Top Layer) that has a distance that does not match the other component silks. Silk components that are defined with Symbol-A will be compared with Symbol-A on other components so that if the distance between the silk components does not match or overlap, it will display an error list dialogue contained on the designed PCB.

Designers can easily search for error areas on the design canvas by simply clicking on an error in the Type table column and the canvas automatically points to the area where the error occurred so that the designer can correct the error. After all errors have been checked one by one, the PCB designer is required to re-check by executing the same command button again and making sure no errors appear.

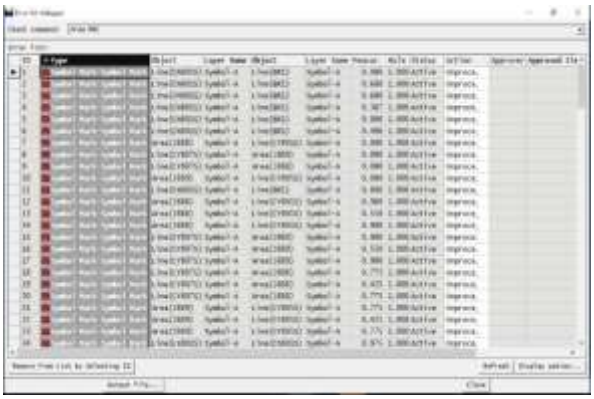


Figure 16. Complete Error List display

Error Type Analysis

The Error List Dialogue that appears is not entirely an error, therefore the designer must know which errors must be corrected or not. Because this check calculates the distance between the component silks using Symbol-A, there will be a situation where the silk which is a complementary information to the component symbol data will also be detected as an error if the distance between the silks does not comply with the rules. That matter is not a design error, therefore the designer must be aware of this and ignore the type of error by changing the action parameter to False error.

Figure 17. Types of Silk to Silk Errors that must be corrected

Figure 26 shows the types of Silk to Silk errors that must be fixed. In the Error list dialogue on ID 73, the distance between the CP814S capacitor silk component and the RM820 resistor silk component is 0.875mm, which means it does not meet

the specified rules, namely 1mm. For that the designer had to fix the location of the RM820 with the CP814S until the distance between them reached 1mm.

Figure 18 Ignored Error Types

Figure 18 shows the type of error that is ignored, because the SEALANT silk component is included in the non-electrical component category. Then the designer can give a sign by changing the status of the error by selecting the action tab then selecting False Error. So a designer must know which parts are non-electrical components.

Figure 19. Types of errors that are ignored due to stacked components

Figure 19 also shows the type of error that is ignored, because the stacked components are placed intentionally by the designer. So even in this case the designer can give a false error on the action tab.

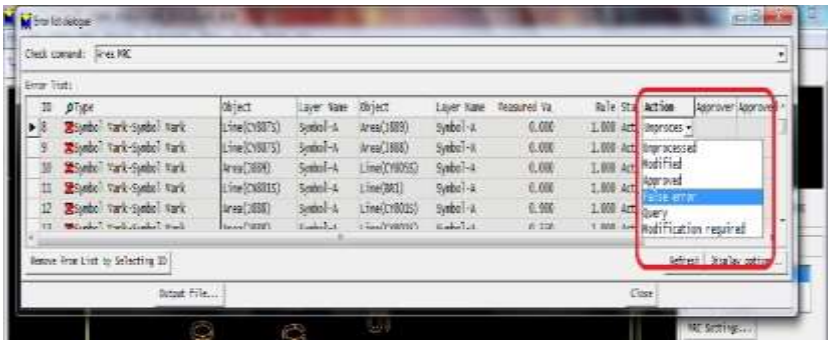


Figure 20 Changing Action to False Error condition

After everything has been checked, repeat the steps to check Silk to Silk clearance on the user menu feature by pressing the command button. Look again at the error information that appears in the error list dialog. If there are still errors, re-analyze the type of error then repeat the user menu checking steps until no errors appear.

Figure 21 Display Error List Dialogue free of errors

The PCB design can be said to be complete or has fulfilled all the regulatory requirements if all the commands contained in the user menu display feature on the error list dialogue are free of errors. However, after everything is finished, the design must be checked again using other software to check design rules that are not contained in the Zuken CR-5000 user menu feature.

Table 1. Cases and test results

Kasus dan hasil uji			
Parameter Uji	**Yang diharapkan**	**Pengamatan**	**Kesimpulan**
Symbol Mark terhadap *Symbol Mark*	Dapat memberikan informasi terhadap jarak antar *silk* diatas 1mm.	Hasil dari pengujian menampilkan data untuk jarak antar silk yang kurang dari 1mm, *silk* yang bertumpuk dengan *nonelectrical component*, dan bertumpuk dengan komponen lainnya	[√] Diterima [ ] Ditolak

CONCLUSION

Based on the results of the design and analysis that the author did, several points of conclusion were obtained regarding the design of the Zuken CR-5000 user menu as follows. Creating a silk to silk clearance function can reduce the error rate. Can understand methodadded user-menu functions to the Zuken CR-5000 application. Can design log file for silk to silk clearance function.

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