DEVELOPMENT OF USER-MENU FEATURE BY ADDING TEST POINT REPORT, TEST POINT SIZE CHECK AND TEXT MIRROR CHECK FUNCTION ON ZUKEN CR-5000

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ABSTRACT

CR-5000 is Zuken's design suite for electronics systems and printed circuit boards aimed at the enterprise market. It was developed to tackle complex design needs that involve managing the complete development and manufacturing preparation process on an enterprise-wide scale. CR-5000 offers relevant functionality for the design of complex and high-speed boards, addressing design challenges such as signal integrity and electromagnetic compatibility.

Based on the description, the additional functions on Zuken CR-5000 will increase efficiency in progress of design PCB (printed circuit board) in Zuken CR-5000. As a result of the addition of TEST POINT REPORT, TEST POINT SIZE CHECK and TOP/BOTTOM TEXT MIRROR CHECK function on USER-MENU feature is to know the size of the Test Point and knowing Test Point details before it will be printed. Also to ensure the placement of references designator on the right components.

After applied to the USER-MENU feature and performed testing on several PCB designs, it can be concluded that function of TEST POINT REPORT, TEST POINT SIZE CHECK AND TOP / BOTTOM TEXT MIRROR CHECK can be able to facilitate user when checking and minimize the losses to the company.

***Keyword** : Zuken CR-5000, PCB, Test Point, Soldering, designing of PCB*

1. INTRODUCTION

Information Technology is a technology used to process the data, including processing, obtain, compile, store, manipulate data in various ways to produce quality information, ie information that is relevant, accurate and timely, which is used for personal, business, and government and is a strategic information for decision-making. Technology in education has become one of the studies that a lot of attention in the education expert. The study is essentially an attempt to solve problems of human learning (human learning). The solution is taken through the study of technology in education that needs to learn problem-solving using appropriate approaches with many functioning uses of learning resources (learning resources).

Based on observations of the author, the technology can help accelerate complete a job, not to mention the work of the design manufacture PCB (printed circuit board). There are some computer programs that are used in the design of PCB (printed circuit board), one of which is Zuken CR-5000.

Zuken Inc. (株式会社 図 研 Kabushiki-gaisha Zuken) is a Japanese multinational company, which specializes in software and consulting services for end-to-end electrical and electronic engineering. Zuken emerged as a pioneer in the development of CAD system in Japan to contribute in the field of electronics manufacturing. Zuken is the literal translation of "graphic laboratory." Founded in 1976 in Yokohama, Japan.

Zuken CR-5000 is a series of designs for electronic systems and PCB (printed circuit board) which is intended for companies that are engaged in the design of PCB (printed circuit board). Zuken CR-5000 was developed to address the needs of complex designs that require the management of the complete development and manufacturing process of manufacturing on a large scale. Zuken CR-5000 offers the functionality that is relevant for the design of printed boards at the high-speed complex and overcomes the difficulties in the design such as signal integrity and electromagnetic compatibility.
Often companies PCB (printed circuit board) losses caused by the amount of PCB (printed circuit board) failed to print. Failure itself due to the lack of investigation at the time of designing the PCB (printed circuit board). There are several stages of examination at the time of designing the PCB, which is mainly at the stage of designing the layout of the PCB (printed circuit board). Zuken CR-5000 itself is equipped with features USER-MENU, this feature serves for final inspection before being printed. But USER-MENU own features only includes standard

inspection only, while the existence of customer demand that varies each year, USER-MENU features still to be developed.

Based on these problems, the authors aimed to develop feature USER-MENU by adding some function on the USER-MENU the customer needs in recent years.

1.1.1 Zuken CR-5000

Zuken CR-5000 is a series of designs for electronic systems and PCB (printed circuit board) which is intended for companies that are engaged in PCB design PCB (printed circuit board). Zuken CR-5000 was developed to address the needs of complex designs that require the management of the complete development and manufacturing process of manufacturing on a large scale. Zuken CR-5000 offers the functionality that is relevant for the design of printed boards at the high-speed complex and overcomes the difficulties in the design such as signal integrity and electromagnetic compatibility.

CR-5000 is the successor to the fourth generation of CREATE1000 that was originally developed for the PDP-11 by Zukei-Gijutsu-Kenkyusho (Japanese for "Graphic Technology and Research Laboratory"). CR-5000 software was first developed in Zuken Inc.'s headquarters in Yokohama, Japan. Additional modules developed at Zuken is EMC Technology Center in Paderborn, Germany which is famous for its research in the EMC and SI simulation settings, and Zuken Technology Center in Bristol, England which focuses on routing tool. The latest version of Zuken CR-5000 per June 2012 is CR-5000 version 14.

1.1.2 USER-MENU Feature on Zuken CR-5000

Features USER-MENU in Zuken CR-5000 is an application for examination at the end of the work or after completion of design, many user or client that wants neatness or the suitability of the design PCB. With the USER-MENU application has minimized checks on PCB design. Similarly, the USER-MENU function does not always suit the user or client. Even more user or client requests that did not exist in the USER-MENU. In an effort to simplify the process of working on the application Zuken CR-5000 and adds several users desires that often arise, the authors attempt to add a function to the USER-MENU in Zuken CR-5000 applications.

Here is the view USER-MENU,

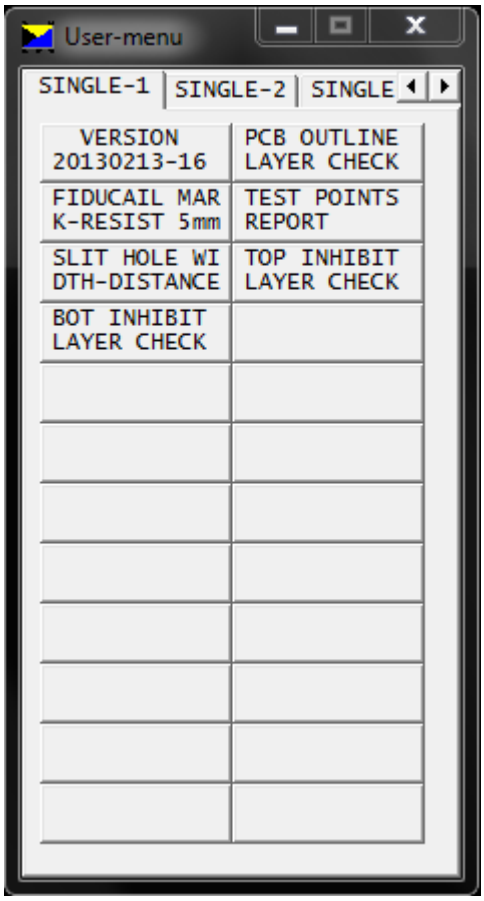


Figure 1.1 Display USER-MENU Single-1

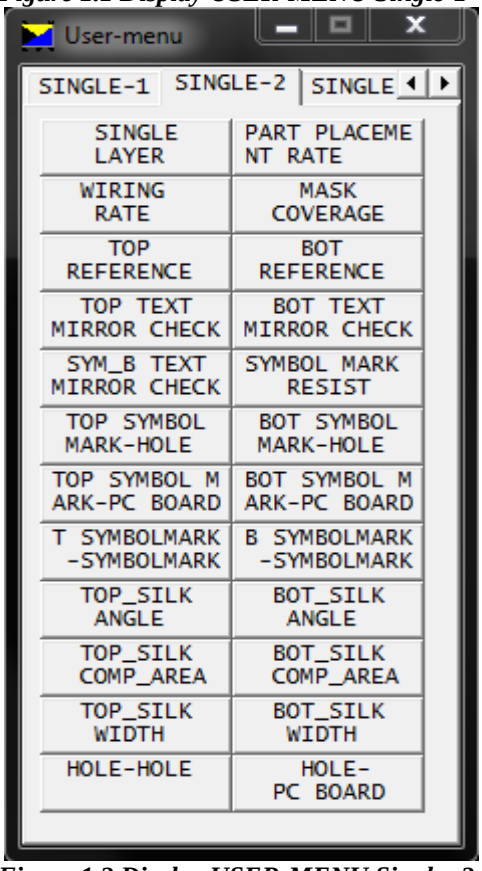


Figure 1.2 Display USER-MENU Single- 2



Figure 1.3 Display USER-MENU Single-3

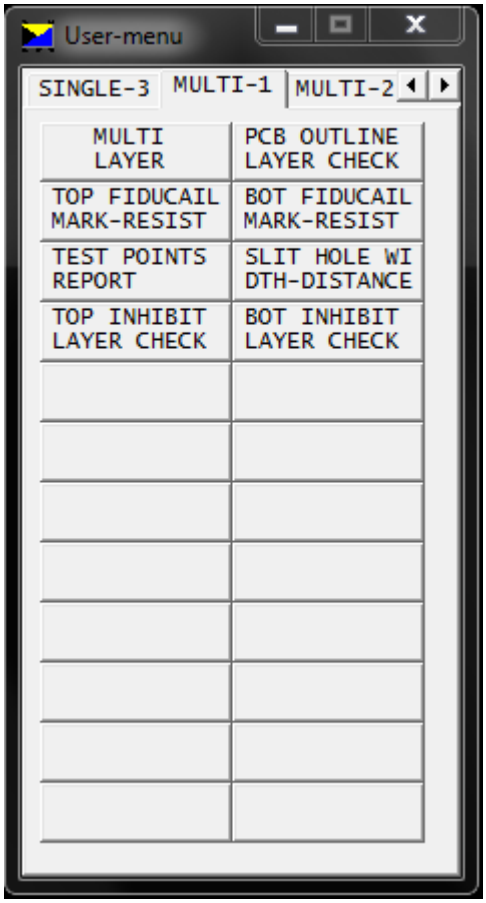


Figure 1.4 Display USER-MENU Multi-1

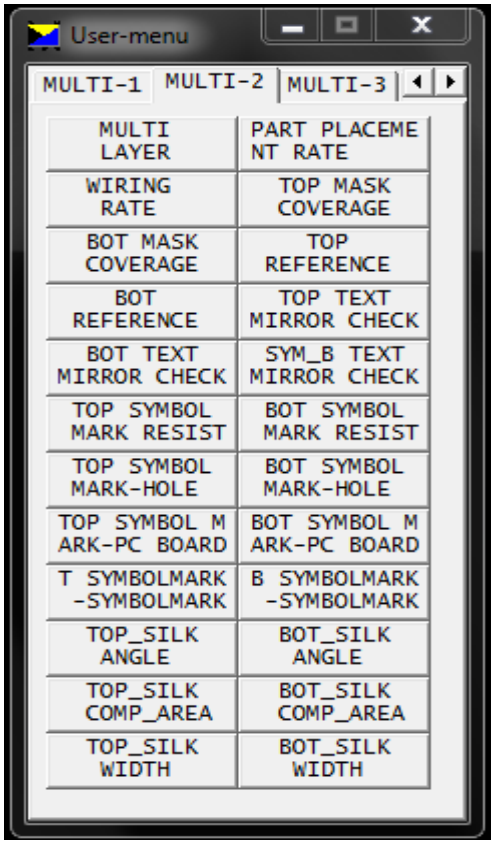


Figure 1.5 Display USER-MENU Multi-2



Figure 1.6 Display USER-MENU Multi-3

1.1.3 PCB

PCB is a basic board that physically support and connect the components in almost all electronic goods. "Printed circuit board" is a continuation of the PCB, or "printed circuit board" in Indonesian. Most PCBs are made with fiberglass or glass-reinforced plastic, with conductor paths (conductive trace) made from copper. Copper conductor lanes connecting the components on the PCB, to form a circuit.

PCBs are used in computers, both laptops and desktops. PCB serves as the foundation for a wide range of internal components in the computer such as graphics cards, controller cards, network interface cards, and expansion cards. All of these components are connected to the motherboard, which is also the PCB.

PCB can be either a specific layer (single-layer) for simple electronic devices. Meanwhile, the PCB for hardware (hardware) complex such as a motherboard, can have up to as many as 12 layers (multi-layer). PCB usually have a green tint, but the PCB can be made in any color.

Although PCB usually associated with a personal computer or laptop, the actual PCB is also used in many other electronic devices. Most televisions, digital cameras, radios, cell phones, and tablets have one or more PCBs. Although PCBs are found in mobile devices look similar to those found in electronic devices with a larger size, the PCB on mobile devices are usually thinner and has circuits tidier.

1.2.1 Test Point on PCB

In the world of Electronics Test Point is a point that has a gate or a vital function as a line or a single point that serves as a tester for the overall performance of the modules or electronic devices. With the Test Point, so the technicians could be more effective in locating trouble spots in a module or in a Primary device.
Test point has a very high risk, considering the function and placement in areas that are vital in a Digital Module. Besides, the point of the Test Point is usually very small with a size of 1 to 2 millimeters. Both are embedded in the PCB track outside or embedded in the PCB Fiberglass.
Thus the PCB designers should be more careful about the placement and size of the Test Point.

1.2.2 Reference Designator on PCB Commponent

Reference Designator serves to identify the components in the schematic or the PCB. Reference designator usually consists of one or two letters followed by a number, for example, R13, C1002. This amount is sometimes followed by a letter, indicating that the components are grouped or matched to one another, for example, R17A, R17B. IEEE 315 lists the Class Designation Letters are used for electrical and electronic circuits. For example, the letter R is the leading reference for resistor, C for capacitor, K for the relay.

IEEE 200-1975 or "Standard Reference Designations for Electrical and Electronics Parts and Equipment" is the standard used to determine reference naming system for the collection of electronic equipment. IEEE 200 was passed in 1975. The renewed IEEE standard in the 1990s, but resigned from the active support shortly thereafter. This document also has a number of ANSI document, ANSI Y32.16-1975.

Construction of reference designators is protected by IEEE 200-1975 / ANSI Y32.16-1975 (replaced by ASME Y14.44-2008) and IEEE-315-1975.

The table below is a Reference Designator is commonly used in general;

Table 1. 1 References Designator

Designator	Component Type
A	Separable assembly or sub-assembly (e.g. printed circuit assembly)
AT	Attenuator or isolator
BR	Bridge rectifier
BT	Battery
C	Capacitor
CN	Capacitor network
D	Diode (including LED, TVS, Thyristor, Zener)
DL	Delay line

DS	*Display*
F	*Fuse*
FB	*Ferrite bead*
FD	*Fiducial*
FL	*Filter*
G	*Generator or oscillator*
GN	*General Network*
H	*Hardware, e.g., screws, nuts, washers*
HY	*Circulator or directional coupler*
J	*Jack (least-movable connector of a connector pair) | Jack connector (connector may have "male" pin contacts and/or "female" socket contacts)*
JP	*Jumper (Link)*
K	*Relay or contactor*
L	*Inductor or coil or ferrite bead*
LS	*Loudspeaker or buzzer*
M	*Motor*

MK	*Microphone*
MP	*Mechanical part (including screws and fasteners)*
P	*Plug (most-movable connector of a connector pair) | Plug connector (connector may have "male" pin contacts and/or "female" socket contacts)*
PS	*Power supply*
Q	*Transistor (all types)*
R	*Resistor*
RN	*Resistor network*
RT	*Thermistor*
RV	*Varistor*
S	*Switch (all types, including push-buttons)*
T	*Transformer*
TC	*Thermocouple*
TP	*Test point*
TUN	*Tuner*
U	*Inseparable assembly (IC)*

V	Vacuum tube
VR	Variable resistor (potentiometer or rheostat)
X	Socket connector for another item not P or J, paired with the letter symbol for that item (XV for vacuum tube socket, XF for fuse holder, XA for printed circuit assembly connector, XU for integrated circuit connector, XDS for light socket, etc.)
Y	Crystal or oscillator
Z	Zener diode

2. RESEARCH

2.1 Function Analysis

The analysis aims to analyze the function of the functions in the USER-MENU features, including analysis of the function of running, which will be built analytic functions and comparison functions.

2.1.1 Problem Analysis

In doing PCB design required a special skill and accuracy. When designing a PCB, things that should always be considered is the general rules and standards of the company. PCB design rules every company is different, so are the results and the quality is different. The more rules are in use, it will be the more likely failure in design. But it does not rule out the possibility there will no problem when printing PCB or when mounting components.

With a large number of customers will certainly grow too diverse customer wishes. Lately too often encountered problems when testing the PCB which was fitted with components. The one problem is at the test point. In the world of electronics test point is a point that has a gate or a vital function as a line or a single point that serves as a tester for the overall performance of the modules or electronic devices. With the test point, so the technicians could be more effective in locating trouble spots in a module or in a Primary device.

Test point has a very high risk, considering the function and placement in areas that are vital in a Digital Module. Besides that point test point is usually very small with a size of 1 to 2 millimeters. Both are embedded in the PCB track outside or embedded in the PCB Fiberglass. Thus the PCB designers should be more careful about the placement and size of the test point.

Definition of test point there are 2 types of hard and soft test point test point and following a full description:

a. The hard test point is that dlakukan rigorously test the suppression of hardware or specific paths, bias by making jumpers point and the cut line at a certain point, the ultimate goal is pass protection bootcore. Examples of the hard grade test point: Flash for SIEMENS A55, C55, S55, S57, A70, M55. And for Sony Erisson: K800, W600, W660, and others.

b. Soft test point is to test a trigger using an algorithm embedded in a program whose function lock access changes bootcore or checksum loader IC Flash or EPROM, test point has the same goal with a hard test point, but it is usually used in IC bga Atua microchip foot ballnya bga ic or covered with a protective glue, making it impossible to perform a hard test point. Examples of soft test point bias on the SE K800, SE W660, and others using the D-Ultimate cient and Credit Log Supreme.

With the function TEST REPORT POINTS, the user can determine the number of test points that are already installed and are not yet installed on board. So the user can ensure the accuracy of the presentation of the installation of up to 100%. While with the function TEST POINT SIZE CHECK, the user can determine the size of the test point that is already installed on the board. Because if on some boards are the size of a small test point will be easy to switch to a larger size.

In some cases there are problems on the PCB company references designator is missing or illegible due to incorrect placement. Many companies PCB that take the design of the PCB to PCB new length just by adding a few components. Therefore references designator very important role in reading the names of the components for reinstalling or redesigned in the new PCB.

Reference Designator serves to identify the components in the schematic or the PCB. Reference designator usually consists of one or two letters followed by a number, for example R13, C1002. This amount is sometimes followed by a letter, indicating that the components are grouped or matched to one another, for example, R17A, R17B. IEEE 315 lists the Class Designation Letters are used for electrical and electronic circuits. For example, the letter R is the leading reference for resistor, C for capacitor, K for the relay.

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electronic equipment. IEEE 200 was passed in 1975. The renewed IEEE standard in the 1990s, but resigned from the active support shortly thereafter. This document also has a number of ANSI document, ANSI Y32.16-1975.

Sometimes errors often occur when a placement at the time of designing. The most common error is the designator references mirror components that are currently in placement at the time of designing. With the TEXT function MIRROR CHECK, the user can check references designator on each component mirror. With so can enable organizations to create a new PCB to look a long list of components on the PCB.

2.1.2 The Function Analysis Ongoing

Analysis functions are being run by interview directly to employees Meister PCB Co., Ltd. to obtain a complete picture of the functions.

2.1.3 Analysis Functions Built

Analysis The analysis function built a complete picture function will be built. The analysis is carried out as follows:

a. *analyze any customer requirement for PCBs to be made.*
b. *Analyzing what functions will be applied to the feature USER-MENU.*
c. *Comparing the new functionality with existing ones.*

2.2 Design Functions

The design function is to design the functions of the USER-MENU features, includes the design function TEST REPORT POINTS, design functions TP-C1.0-M SIZE CHECK, function design TP-C1.2-M SIZE CHECK, function design TP-C1 .5-M SIZE CHECK, function design TP-C2.0-M SIZE CHECK, design TOP TEXT function and design function CHECK MIRROR BOTTOM TEXT MIRROR CHECK.

2.3 Implementation Function

Implementation of the function is the stage of application functions have been built into the USER-MENU features through the log files. Implementation and testing aimed to find out the results of the functions in the wake. Implementation of the function started by adding functions to the USER-MENU features and adds the log files into the installation folder Zuken CR-5000.

2.4 Testing Function

In the testing phase function USER-MENU features that have been added to test whether the function TEST REPORT POINT, POINT TEST TEXT SIZE MIRROR CHECK CHEK and it is appropriate or not.

2.4.1 Alpha Testing

Alpha testing is done using Black Box method that focuses on the functionality requirements of the system.

Here is the scenario functionality testing functionality built using the Black Box. Here is what explains the features to be tested.

Table 2. 1 Scenario Testing Functionality Function USER-MENU

No	Functionality in Test	Scenario	examination
1	*TEST POINTS REPORT*	*Displays the number of test point presentation that is already installed on the PCB board design.*	*Blackbox*
2	*TP-C1.0-M SIZE CHECK*	*Displays test point size 1.0mm*	*Blackbox*
3	*TP-C1.2-M SIZE CHECK*	*Displays test point size 1.2mm*	*Blackbox*
4	*TP-C1.5-M SIZE CHECK*	*Displays test point size 1.5mm*	*Blackbox*

5	*TP-C2.0-M SIZE CHECK*	*Displays test point size 2.0mm*	*Blackbox*
6	*TOP TEXT MIRROR CHECK*	*Displaying text mirror the top layer if there*	*Blackbox*
7	*BOTTOM TEXT MIRROR CHECK*	*Displaying text mirror on the bottom layer if there*	*Blackbox*

2.4.2 Beta Testing

Beta testing is testing conducted objectively conducted directly by the users who will be using the function USER-MENU. This is done in order to determine the extent to which functions are built to help facilitate and address the issues described in the identification of problems.

Here are the results of a customer questionnaire:

Table 2.2 Results of Questionnaire employees

Category Answers	***Score***	***frequency response***	***Sore Total***	***Value Percentage (%)***	***Decision***
Strongly agree	*5*	*2*	*10*	*(21/(5*5))*100= 84%*	*Strongly agree*
Agree	*4*	*2*	*8*		
Less Agree	*3*	*1*	*3*		
Disagree	*2*	*0*	*0*		
Strongly Disagree	*1*	*0*	*0*		
amount		*5*	*21*		

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Agree	*4*	*2*	*8*		
Less Agree	*3*	*1*	*3*		
Disagree	*2*	*0*	*0*		
Strongly Disagree	*1*	*0*	*0*		
amount		*5*	*21*		

3. Closing

3.1 CONCLUSIONS AND SUGGESTIONS

Based on test results functionality added in the application USER-MENU in Zuken CR-5000, then obtained the following results:

1. *Function TP-C1.0-M SIZE CHECK, TP-C1.2-M SIZE CHECK, TP-C1.5-M SIZE CHECK and TP-C2.0-M SIZE CHECK built capable of helping the user to check Test Point in greater detail and is able to adjust the size of the desired Test Point.*
2. *Function TEST REPORT POINTS in the wake capable of helping the user to find out how many Test Point that already exists and is able to determine the net Which is not installed Test Point.*
3. *Functions TOP and BOT TEXT TEXT CHECK MIRROR MIRROR CHECK that was built was able to help the user know when their References Designator mirrored component when the component is moved or added.*

The advice in the development of this function in the future
are as follows:

1. *Resize Test point in the coding function if there is a Test Point to the new size.*
2. *Function - a function that has been built is still used for PCB Board Design Rule and the latest in application Zuken CR-5000 up until the renewal application Zuken CR-5000 in the days to come.*

THANK YOU

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