

# Research on the Image Conversion Group of a Business Machine

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**Abstract**—The audio conversion and image conversion are always combined together in commercial applications but only the function image conversion is used for a business machine. The main function of the image conversion is to switch and display different video sources on one screen. For examples: the choice of papers, the safety amount of the toner, the location of the paper jam, the proportion of the color toner, the mode of paper printing (single-sided of double-sided printing), etc.

The image converter is designed specially for the personal computer and the notebook. It can transfers the signal of the computer's video graphics array (VGA) to the screen of the television and the projector and provides the high quality filter and the control of the on-screen display (OSD). It provides a simple initial setting function and automatically adjusts output screens of position and size. It have functions of the local amplification and the rapid page curling.

**Keywords**—*video graphics array, digital filter, on-screen display, local amplification, rapid page curling*

## I. Noun explanation (glossary)

### 1. VGA:(video graphic array) The

video graphic array is a display device that is designed on the basis of a picture tube (cathode ray

tube) (analog) and the transmission unit is a horizontal scanning line, so no digitalized discrete signals are used. The video signal transmitted by analog is to change the output voltage to control the density of the electronic beam in scanning and to express the brightness and the degree of color.

### 2. HDMI:(high definition multimedia

Interface). HDMI is a fully digital interface. It can transmit uncompressed audios and video signals. It is a distributor.

### 3. DVI:(digital visual interface) DVI

is a standard of the video interface. The design objective of DVI is used to transmit uncompressed digital images. The DVI is widely currently applied in display devices like as a LCD, digital projectors and so on. The DVI's standard specification is developed by the Digital Display Working Group (DDWG) and is used to transmit the uncompressed digital video information to display devices.

### 4. OSD:(on- screen display) OSD is

an on-screen menu-style section method. The general procedure of OSD is to press and hold the menu button and the camp screen will pop up a rectangular menu of various adjustment items in the display. OSD can use this menu to adjust the working indicators of the display including color, mode and geometric shape to achieve the best using state. If the OSD is locked, it means the barrier menu is locked. It

needs to be unlocked to enter the display menu devices again.

### 5. LED:(light emitting diode) The

LED is a light source of the semiconductor. The LED is lighted up when the current passes through. The LED is a semiconductor electronic component that can emits the light due to the electric current. The interior of the LED is composed of electrons (negatively charged) and electron holes (positively charged) and releases energy in the form of photons. The core part of the LED structure is the p-n chain. The outer side is sealed with epoxy resin, and the lead and frame are sealed to protect the inner core wire. When a forward current is added to the p-n chain, then it can emit the visible or invisible radiation. This radiation is transmitted through a light source that is composed of trivalent and pentavalent elements.

## II. Introduction.

The image conversion group has a very wide range of functions. It is not only used in business machines but also in multimedia presentations, education and training, product presentations, video walls, video conferences, store displays, computer teaching video production, etc. It covers all industrial and commercial activities. The principle of image conversion group is very widely including bipolar junction transistor (BJT), enhancement N-type metal oxide semiconductor transistor, CMOS (complementary metal oxide semiconductor), filter, operation amplifier and so on. Its principle is broad and profound, so it needs technology transfer.

The image conversion group can be divided into some following parts. ①interlinking switch, front cover, the safety switch of light emitting diode (LED) ② interlinking switch, duplex unit, LED safety switch ③ image temperature sensor (i.e. thermistor) ④ temperature sensor of the shutter solenoid ⑤

temperature sensor of the rear ⑥temperature sensor of the center ⑦temperature sensor of the front.

## III. Literature Review

We take some examples with regard to technologies of image conversion in a business machine. In the literature [1], Taiwan Ricoh company made the operation method of a business machine that is produced by himself into a manual, the content is very detailed. In the literature [2], postgraduate Ding Heshuang published thesis "Research on the robust invisible watermark based on the frequency domain of the image conversion". The advantage of this thesis is that the performance difference of image conversions is very greatly under different frequency domains. The user can adjust the frequency according to characteristics of the device and needn't to adjust hardware components. The disadvantage of this thesis that the assembly of the hardware component is very complicated. In the literature [3], postgraduate Chaung Yiquan published "Learning aligned and misaligned image-to- image transition". The advantage of this thesis is that the aligned and misaligned conversion can exchange each other simply and conveniently. The disadvantage of this thesis is that there are some distortions when the aligned image and misaligned image are swapped with each other. In the literature [4], postgraduate Lai Yanzhen published "A study of HDR image conversion and color difference evaluation of 3D objects". (HDR: high dynamic range). The advantage of this thesis is that it describes the benefits of high dynamic range and its use in color and lighting technology. This thesis has not any disadvantage. In the literature [5], postgraduate Wu Jiajin published "A hardware design for converting the low dynamic range to the high dynamic range image". The advantage of this thesis is that it can exchange each other between low dynamic range images and high dynamic range images, which can make engineering applications more conveniently. The disadvantage of this thesis is

that the integrated circuit (IC) required for the hardware design is very difficult and the price of IC required is not cheap.

#### IV. Explanation of principle

##### A. The introduction of the overall business machine



Fig.1 The appearance of a business machine

##### B. The position of the image conversion on a business machine

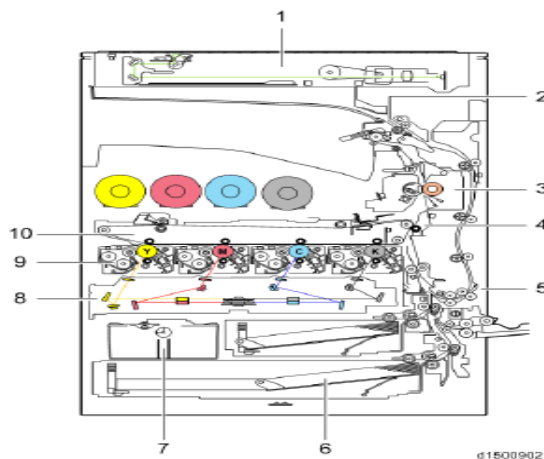


Fig.2 The position of the image conversion on a business machine.

10. The image conversion group is located at the center of a business machine.

##### C. The detail design of the image conversion group.

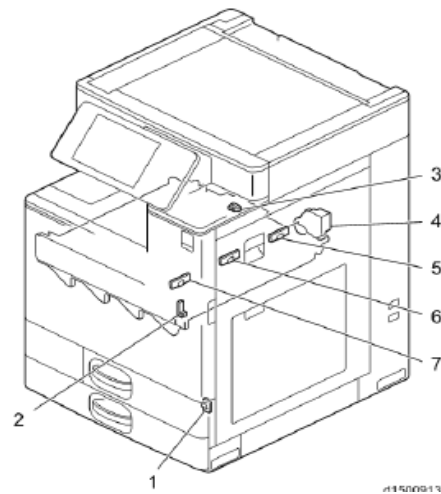


Fig.3 The fine construction of the image conversion group

- (1) Interlinking switch, front cover (light Emitting diode (LED) safety switch).
- (2) Interlocking switch, duplex unit (LED safety switch).
- (3) image temperature sensor (i. e. thermistor).
- (4) Temperature sensor of the shutter solenoid
- (5) Temperature sensor of the rear.
- (6) Temperature sensor of the center.
- (7) Temperature sensor of the front.

##### V. The practical operation of the Image conversion group of a business machine



Fig.4 Detecting the lighting group of the image conversion group

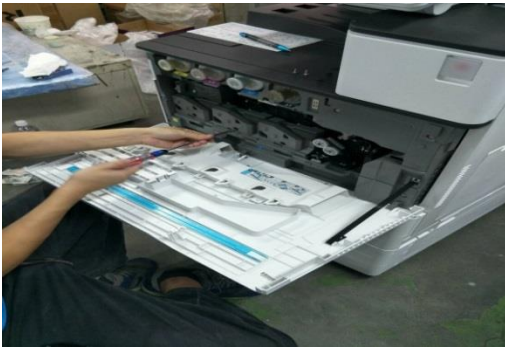


Fig.5 Detecting sensors of the image conversion group



Fig.6 image conversion group after inspection

## VI. Conclusion

Comparing the new business machine and the old business machine, there are some improvements for the image conversion group.

### 6.1 The cleaning position of the image

transfer belt (ITB) of the new machine is above the image conversion belt. Comparing with the old business machine, the cleaning position of the old business machine is on the left hand side of image transfer belt, the new machine can reduce the size of the machine.

### 6.2 The lubricant is not required in the

image transfer belt device of the new machine, whereas the lubricant is required for the image conversion belt device of the old machine. The new machine is more simplified.

### 6.3 The power transformer of the new

business machine need no bias voltage, whereas the bias voltage is required for the power transformer

of the old machine. The new machine is more simplified.

### 6.4 The image transfer belt of the new

Machine has no encoder control. The image transfer belt of the old machine has an encoder control. The new machine is simpler.

### 6.5 The new machine adopts the optical

characteristic registration system (OCR) to analyze and recognize image files of the text data to obtain the text and the layout information. This is what the old machine didn't have.

### 6.6 The new machine adopts the

imaginable area extension group, which can extent the wide angle of the image to make the image more completely.

## VII. Reference

[1](2015), "Service manual of Ricoh university: learning, knowledge, performance", page 1-4~1-43, Ricoh Americas corporation, 1st edition.

[2]H.H. Ding, (2019), "Research on the robust invisible watermark based on the frequency domain of the image conversion", master's dissertation, Taipei, Taiwan, Taipei city university, master's degree in information science, electricity engineering.

[3]Y.Q. Chaung, (2018), "Learning aligned and misaligned image-to-image transition", master's dissertation, Hsinchu, Taiwan, national Tsing Hua university, department of information engineering.

[4]Y.Z. Lai, (2018), "A study of HDR image conversion and color difference evaluation of 3D objects", master's dissertation, Taipei, Taiwan, national university of science and technology, institute of color and lighting technology.

[5]J.J. Wu, (2017), "A hardware design for converting the low dynamic range image to the high dynamic range image", master's dissertation, Doliu, Taiwan, national Yunlin university of science and technology, department of electrical engineering.