Terminal equipment information security

Jianhua Wang, Xiaoshi Fang

Tianjin Reprography Technology Institute National Copying Machine Quality Supervision Testing Center No.7, Changtu road, Hongqiao district, Tianjin , China

Abstract

The Internet development caused the guard of the terminal equipment information security already to be imminent.

The digital integrated stenograph is obtains the widespread application in the market, uses in the massive printing papers printing office equipment. Uses the digital technology to picture signal processing and the transmission in the digital integrated stenograph. It has much nonvolatile storage in the equipment. At the same time, for service and operation convenient, but also uses the CF card to take the data exchange medium. Therefore, besides makes plate making purpose, image data whether can use in other goals to become the user extremely kind question. If these image data do not have the strict control. That will give the user the information security to bring the risk.

The CF card (Compact Flash Memory Card) is one kind of portable memory card. Its storage capacity is bigger. May complete mass data exchange between the computer and the equipment, the equipment and the equipment with the CF card.

To similar copier, stenograph and so on such equipment. They have the function has far exceeded in the traditional significance only to use in the hard copy duplication. This equipment already may transform the electronic information as the people obviously hard copy. Also may transform the hard copy as the electronic information. Can these information storages in the many kinds of media.

Keyword

Internet, Terminal equipment, Information security, Digital integrated stenograph, CF card, Data bus, Memory

1. Question proposing

When we talk about the information security question, more attention net boundary security and core resources security. The terminal equips the information security question is often neglected. The Internet development caused the guard of the terminal equipment information security already to be imminent.

The digital integrated stenograph is the widespread application office equipment in the market. It uses in the massive printing hard copy. Its principle is transforms the original manuscript the digital signal, which use scanning system in the digital integrated stenograph. Then, to digital signal processing. Makes lithograph plates through the thermal head on the stencil paper. The use printing ink completes massive printing. Uses the digital technology to picture signal processing and the transmission in the digital integrated stenograph. It has much nonvolatile storage in the equipment. At the same time, for service and operation convenient, but also uses the CF card to take the data exchange medium. Therefore, besides makes plate making purpose, image data whether can use in other goals to become the user extremely kind question. If these image data do not have the strict control. That will give the user the information security to bring the risk.

The CF card (Compact Flash Memory Card) is one kind of portable memory card. Its storage capacity is bigger. May complete mass data exchange between the computer and the equipment, the equipment and the equipment with the CF card.

2. Data transmission and processing system of the digital integrated stenograph

The image data which makes plate making needs in the digital integrated stenograph, May the scanning system which provides by its self provides or the computer. When provides the data by the scanning system, its data transmission process like fig. 1 shows. When provides the data by the computer, its data transmission process like fig. 2 shows.

2.1 Data transmission process that use interior image scanning system makes plate making in the digital integrated stenograph

The scanning system to the manuscript scanning has the image data. The image data is transmitted to the image processes IC, through data bus between the scanning system and the main controller. It will produce halftone the image data after the many kinds of adjustments and processing. The image processes IC have three possibly to approach exterior transmission data channel:

1. The halftone image data will transmit to the thermal print head through the image data mainline. Uses in to make plate making.

2. Transfer Data to printing card through data bus that connects to input/output interface.

3. Transfer data to CPU, FLASH ROM, CF card, SRAM, through memory data bus. That also has the data exchange between CPU and FRAM, E²PROM.

Data transfer process in printing card as follows:

The printing card receives image data from the main controller through Input/output interface. Image data transportation to image interface IC in printing card. Completes the data exchange through the memory data bus between the image interface IC and CPU, FLASH ROM, CF card, SDRAM.



Fig. 1 Data transfer process diagram with the scanning system to make plate making



Fig. 2 Data transfer process diagram with computer to make plate making

2.2 Data transmission process with the computer make plate making in the digital integrated stenograph

Has the image data by the computer. Image data is transported to image interface IC in the printing card through the communication interface between computer and printing card. The data exchange through the memory data bus between the image interface IC and CPU, FLASH ROM, the CF card, SDRAM.

Image data passable transmit to the image processing IC in main controller with the input/output interface between printing card and main controller. After many kinds of processing, production halftone image data. The picture processes IC possibly to have two channels to exterior transmission data:

1. The halftone image data will transmit through the image data mainline to the thermal print head. That uses in to make plate making.

2. Through the memory data bus, completes with CPU, FLASH ROM, the CF card, the SRAM data transfer. That also has the data exchange between CPU and FRAM, E^2 PROM.

3. The analysis of image data store up the mechanism

3.1 data quantities analyses

The width of plate making most greatly may reach the A3 size in RISO 2/3 series digital integration stenograph. The image data carries on the analysis under only by to A4 width (an A3 half width).

The width size is 210×297 mm, the resolution is 300dpi. Then the A4 width data quantity (halftone image) is:

$$\frac{210 \times 297 \times 300 \times 300}{25.4 \times 25.4 \times 8} = 1087579 = 1062K(byte)$$

The data quantity probably is the 1062K byte in each page of A4 width image. If each page according to 30 lines of ideas, each line of data quantities probably is the 35.4K byte.

3.2 Each memories analysis

Memory analysis in the main controller of stenograph:

1. MCU (IC30): The storage capacity is the 512K byte. It is used in to save the control procedure of stenograph. After the stenograph power failure, its interior saves the data can the long time maintenance. The data is not easy to vanish.

2. FLASH ROM (IC42): The storage capacity is the 512K byte. It uses in the Rev Data storage. After the stenograph power failure, its interior saves the data can the long time maintenance. The data is not easy to vanish.

3. The image processing IC (IC65): It is an internal buffer. Storage capacity is the 3K byte. It uses in to the image data which processing carries on the buffer in image processing. It is a RAM structure memory. After the stenograph power failure, its interior saves the data will vanish. Its interior will be automatic clear after electrify. The original memory data cannot restore.

4. CF card: The storage capacity is different from the 16K byte to the 4G byte. It is one kind of ROM structure memory. The interior saves the data can the long-term preservation not is easy to vanish when the external power supply is not provided. May carry

on to it reads/writes the operation after the external power supply is provided. Through "reads" the operation, may read takes the data which its interior saves. Through "writes" the operation, may renew in its internal memory the data.

5. SRAM: The static read/write memory, uses in the metadata storage. After the stenograph power failure, its interior saves the data will vanish. Its interior will be automatic clear after electrify. The original memory data cannot restore.

6. FRAM (IC37): The storage capacity is 512 bytes. It is one kind of RAM structure memory. As a result, it is by exterior battery power supply. After the stenograph power failure, the data which saves to its interior carries on the maintenance take the battery as the power source. On after the stenograph electrify, its interior saves again the data cannot change.

7. E^2PROM (IC41): The storage capacity is 512 bytes. It is one use serial mode carries on read/write ROM. When the external power supply has not been provided, its interior saves the data can the long-term preservation, not be easy to vanish. After the external power supply is provided, may carry on to it reads/writes operation. Through "reads" the operation, may read takes the data which its interior saves. Through "writes" the operation, may renew in its internal memory the data.

8. SDRAM: Dynamic RAM, by automatically refresh circuit to carry on the maintenance to its memory data. After the stenograph power failure, its interior saves the data automatically will vanish.

May analyze by the above memory structure and the capacity obtains:

The image processing IC (IC65), SRAM and the SDRAM memory is the RAM structure. After the equipment is separated the power source, its interior saves the data automatically vanishes. They may not take the inspection object.

The data which is stored up in FRAM (IC37) and E2PROM (IC41) although after the power failure may the long-term maintenance. But its storage capacity too is small. Therefore also may not take the inspection object.

The memory of MCU (IC30) uses in to save the controlling program of the stenograph. Its not unnecessary space saves other data. In summary, CF card and FLASH ROM which is in the main controller and printing card in the stenograph will take the main inspection object. The below inspection will revolve these two kind of parts to carry on.

3.3 Access process analysis of CF card

The data which is embraced in CF is carries on the memory by the word mode. Namely in each address correspondence memory cell has stored up a word (2 bytes, 16 bit). In the CF card operation, the read state and the writes state all to have two operating modes, respectively be word operating mode and byte operating mode.

3.3.1 Read mode by the word mode in CF card

When the below control level had been established, may read data to the CF card by the word mode (16 bits, D15~D0). Chip selection (CE1 and CE2) are in the low level. Output enable (OE) is in the low level. Read enable (WE) is in the high level. It can be possible simultaneously to read 16 bits data in identity period.

3.3.2 Read mode by the byte mode in CF card

There are two operating statuses to read data by the byte mode in CF card. An operating status uses in to read the low byte (8 bits, D7~D0) in each memory cell (word). Another operating status uses in to read the high byte (8 bits, D15~D8) in each memory cell (word). When actual use, these two operating status carries on in turn. Thus completes to read data operation.

When the below control level had been established, may read the low byte data (8 bits, D7~D0) in each memory cell to the CF card by the byte mode. Chip selection CE1 is in the low level and CE2 is in the high level. Output enable (OE) is in the low level. Read enable (WE) is in the high level. It can be possible simultaneously to read 8 bits data in identity period.

When the below control level had been established, may read the high byte data (8 bits, D15~D8) in each memory cell to the CF card by the byte mode. Chip selection CE1 is in the high level and CE2 is in the low level. Output enable (OE) is in the low level. Read enable (WE) is in the high level. It can be possible simultaneously to read 8 bits data in identity period.

3.3.3 Write mode by the word mode in CF card

When the below control level had been established, may write the data to the CF card by the word mode (16 bits, D15~D0). Chip selection (CE1 and CE2) are in the low level. Output enable (OE) is in the high level. Read enable (WE) is in the low level. It can be possible simultaneously to write 16 bits data in identity period.

3.3.4 Write mode by the byte mode in CF card

There are two operating statuses to write data by the byte mode in CF card. An operating status uses in to write the low byte (8 bits, D7~D0) in each memory cell (word). Another operating status uses in to write the high byte (8 bits, D15~D8) in each memory cell (word). When actual use, these two operating status carries on in turn. Thus completes to write data operation.

When the below control level had been established, may write the low byte data (8 bits, D7~D0) in each memory cell to the CF card by the byte mode. Chip selection CE1 is in the low level and CE2 is in the high level. Output enable (OE) is in the high level. Read enable (WE) is in the low level. It can be possible simultaneously to write 8 bits data in identity period.

When the below control level had been established, may write the high byte data (8 bits, D15~D8) in each memory cell to the CF card by the byte mode. Chip selection CE1 is in the high level and CE2 is in the low level. Output enable (OE) is in the high level. Read enable (WE) is in the low level. It can be possible simultaneously to write 8 bits data in identity period.

3.4 FLASH ROM data storage process analysis

When Chip selection (CE) is in the low level, reads enable (WE) is in the low level, May to FLASH ROM in the stored datum.

4. Examinations processes

4.1 test point establishments

In order to guarantee image information security which is duplicated, altogether establishes 4 test points, like in Fig. 1 and Fig. 2 shows. Goal which is established is the guarantee that the equipment not saves the image information in the CF card and FLASH ROM when duplication image. If the image data which is duplicated has not saved to the CF card and FLASH ROM, then any person all cannot obtain the image data message which related duplicated when the stenograph tail-in work.

Test point 1: In the copy process, the image data has not transmitted to the memory data bus.

Test point 2: In the copy process, the CF card which is located main controller is not to carry out the data storage operation.

Test point 3: When uses the scanner of the stenograph makes plate making, that is non- image data transmission in the interface in the main controller and the printing card. When uses the computer makes plate making, it is not save the image data to FLASH ROM in the printing card.

Test point 4: In the copy process, CF card which is in the printing card has not carried out the data storage operation.

4.2 examinations processes implementation

In the examination, the logical analyzer is the main experimental instrument which uses. The examination carries on less than two kinds of conditions, separately makes plate making by the scanner or the computer. When examination, Will carry on the real-time analysis to on various data bus signal with logical analyzer, will determine various the active status of memories.

4.2.1 Uses the scanner in the stenograph to make plate making

Under this way, the image data produces by the scanner. The image data is processed by image processing IC. Then the halftone image information will be produced. The data will be transmitted to the thermal print head by the image data bus. Completes makes plate making.

In the makes plate making process under this way, the memory data bus in the main controller should not appear the image data, the interface and the data bus should not appear the image data between the main controller and the printing card. See also Fig.1. When examination, test point 1 to test point 4 will be detected, the FLASH ROM in the main controller and the FLASH ROM in the printing card will be detected. The logical analyzer takes the main testing tool. Concrete operating process as follows:

Will the input port of the logical analyzer separately with to the test object linking, as follows:

A. the image scanning data bus of the main controller: Uses in to judge the beginning and the terminal time when image data transmission process in making plate making

B. With the data memory bus in main controller, namely the data bus port of the image processing IC connection. Establish for the test point 1.

C. With the control line (CE1, CE2, OE, WE) and data bus connection in CF card plug in main controller. Establish for the test point 2.

D. With the control line (CE, WE) and data bus connection in FLASH ROM of the main controller. That uses in to inspect FLASH ROM whether is at the write (storage) state.

E. With the data bus of the image interface IC connection in the printing card. That uses in to inspect the image data whether transmits to the printing card. Establish for the test point 3.

F. With the control line (CE1, CE2, OE, WE) and data bus connection in CF card plug in the printing card. Establish for the test point 4.

G. With the control line (CE, WE) and data bus connection in FLASH ROM of the printing card. That uses in to inspect FLASH ROM whether is at the write (storage) state.

When with scanning system scanning image, the data bus in image scanning data bus has the image data transmission in the main controller. This time, the signal state of each examination position as follows:

1. Test point 1: Is located the image processing IC in the main controller. It uses in to examine the state of the memory data bus. That should not have the data transmission in the bus when image data transmission.

2. Set point 2: Is located the CF card plug in the main controller. It uses in to examine the CF card whether is at the data write (storage) state. When image data transmission, chip selection control line (CE1 and CE2) must be in the high level, the output enable control line (OE) to have to be in the low level, read control line (WE) to have to be in the low level. This time, the CF card has not been at the data write state. Exterior data cannot write in the CF card.

3. FLASH ROM: Is located the main controller. When image data transmission, chip selection control line (CE) is in the high level, read control line (WE) to be in the high level. This time, cannot to stored data in the FLASH ROM.

4. Set point 3: Is located image interface IC in the printing card. It uses in to examine the data bus state in the printing card. When image data transmission, must not have the data transmission in the bus.

5. Set point 4: Is located the CF card plug in the printing card. It uses in to examine the CF card whether is at the data write (storage) state. When image data transmission, chip selection control line (CE1 and CE2) must be in the high level, the output enable control line (OE) to have to be in the low level, read control line (WE) to have to be in the low level. This time, the CF card has not been at the data write state. Exterior data cannot write in the CF card.

6. FLASH ROM: Is located the printing card. When image data transmission, chip selection control line (CE) must be in the high level, read control line (WE) to have to be in the high level. This time, cannot to stored data in the FLASH ROM.

4.2.2 Uses the image data which the computer provides to make plate making

Under this way, the image data provides by the computer. Through the image interface IC in the printing card and the image data main line, the image data is transmitted to the thermal print head. Completes makes plate making.

When makes plate making, that should not appear the image data in the memory data bus of the main controller. That should not appear the image data in the memory data bus in the printing card. See also Fig. 2.

When examination, priority test the test point 1 to 4, FLASH ROM in the main controller and FLASH ROM in the printing card.

The logical analyzer takes the main testing tool. Concrete operating process as follows:

Is respectively measured the logical analyzer input port distinction the object linking, as follows:

A. With the computer image data bus in the printing card connection. Use in to judge the beginning and terminal time of image data transmission process when makes plate making.

B. With the memory data bus in the main controller and the data bus in the image processing IC connection. Establish for the test point 1.

C. With the control line (CE1, CE2, OE, WE) of CF card plug and the data bus is connected. Establish for the test point 2.

D. With the control line (CE, WE) of FLASH ROM and the data bus is connected. Use in to inspect FLASH ROM whether is at write (storage) state.

E. With the control line (CE, WE) of FLASH ROM in the printing card and the data bus is connected. Use in to inspect FLASH ROM whether is at write (storage) state. Establish for the test point 3.

F. With the control line (CE1, CE2, OE, WE) of CF card plug in the printing card and the data bus is connected. Establish for the test point 4.

The computer provides the image data to the system. That must have the image data transmission in the computer image data bus in the printing card. This time, respectively the test signal state as follows:

1. Test point 1: Is located the image processing IC in the main controller. It uses in to examine the state of the memory data bus. When image data transmit, that must not have the data transmission in the data bus.

2. Test point 2: Is located CF card plug in the main controller. It uses in to examine the CF card whether is at write (storage) state. When image data transmission, chip selection control line (CE1 and CE2) must be in the high level, the output enable control line (OE) to have to be in the low level, read control line (WE) to have to be in the low level. This time, the CF card has not been at the write state. Exterior data cannot write in the CF card.

3. FLASH ROM: Is located in the main controller. When image data transmission, chip selection control line (CE) is in the high level, read control line (WE) to be in the high level. Therefore, cannot the stored data to FLASH ROM.

4. Test point 3: Is located in the printing card. When image data transmission, chip selection control line (CE) is in the high level, read control line (WE) to be in the high level. Therefore, cannot the stored data to FLASH ROM.

5. Test point 4: Is located the CF card plug in the printing card. It uses in to examine the CF card whether is at write (storage) state. When image data transmission, chip selection control line (CE1 and CE2) must be in the high level, the output enable control line (OE) to have to be in the low level, read control line (WE) to have to be in the low level. Therefore, the CF card has not been at write state. Exterior data cannot write in the CF card.

4.2.3 examinations conclusions

Through the above two tests, may draw such conclusion:

The image data with makes plate making already cannot store up in the CF card, also cannot store up in FLASH ROM when plate making this integrated stenograph (provides image data by scanner or computer). Inexistence information revelation danger when makes plate making.

5. Conclusion

Along with technical developed, the information technology, specially the Internet is changing in world all. Along with the modern communication development and the rapid popularization, specially unify the computer internet by the correspondence and

the computer which is born comprehensively to enter everyone. Causes the information sharing application day by day widespread and is thorough. The information revolution of world scope stimulated in the human history the most active productive forces. But simultaneously also causes the information the security problem to highlight day after day, moreover the situation more and more is also complex.

The information security involves the domain is quite widespread. Regarding is similar to equipment and so on copier, stenograph says, they have the function has far exceeded in the traditional significance which only to use in the hard copy duplication. This equipment already may transform the electronic information as the people obviously replica, also may transform each kind of document as the electronic information, can these information storages in each kind of medium.