

# LABVIEW'S APPLICATION IN CYCLIC EXAMINATION OF POWER SUPPLY

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## Abstract

This paper introduced the cyclic examination of Power Supply. We build own data acquire system used LabVIEW write program take place C program. This data acquire system is required not only can examine the stability of new power supplies or improved power supplies for twenty-four hours, but also can convenient make circuit of examination for power supply that using. The interface of user is simply and beautiful, the user of LAN can convenient transfer this system and acquired data. The acquired data stored in Excel, it is get ready for build database in the future.

## 1 SIMPLE INTRODUCTION

Beijing Electron Positron Collider (BEPC) have 170 power supply of high precision. When BEPC be in motion, operator needs to know whether the current stability of every power supply accord with requirement of design, so we develop the cyclic examination system of current stability of power supply. This system is a PC measure system of many channels, high precision, high reliability and many functions. BEPC cyclic examination system of current stability of power supply build in 1986 originally, and it been rebuild use TC2.0 on DOS system in 1986, through four years, the technology of computer control develop always, the system is outmoded already, and it can't satisfied the requirement of user, so, we rebuild it once more, follows is need to improve:

- Old interface isn't directly, we use fictitious instrument interface replace the old interface, simplify the operation.
- Old program is on DOS system, it is inconvenient to use network and software resource.
- The print pattern of old program is take a data then print a data, it is waste time.
- The file of acquired data is .dat type, it is can't analysis use compute.

## 2 IMPROVE SCHEME

### 2.1 Software

Data acquire system base on PC should improve itself function follow the development of computer, it can full use software resource too, and LabVIEW of NI is flexible graphic program that technician link up computer and instrument, so we use LabVIEW 5.1 as program tool, operate system is Windows 98.

### 2.2 Hardware

The work mode is not change because insufficient funds. For improve the execute speed of program and convenient write new program, we change the digital I/O card, use PCI-DIO-96 replace IPC-5373, and change the relevant choose devices, add some choose channel. The PC use P III, main frequency is 500M, there is four PCI slot on the main board, distribute to PCI-DIO-96, GPIB and net card.

## 3 CONCRETE IMPLEMENT

### 3.1 Work principle as follows:

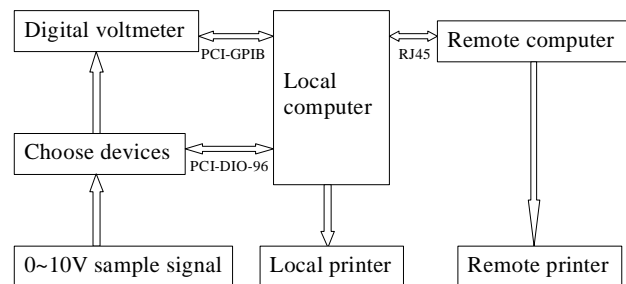
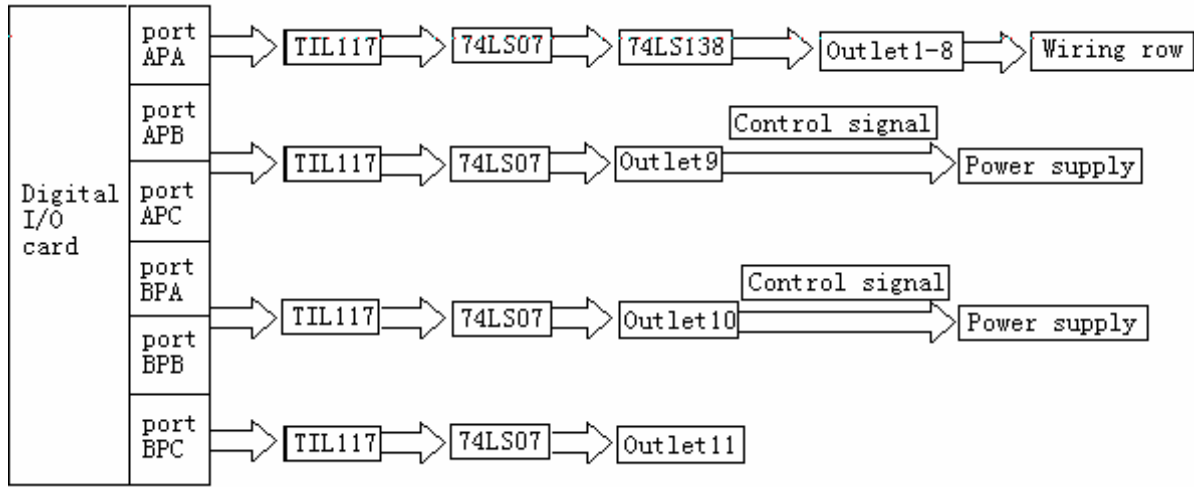


Figure 1: frame of work principle

Brief introduction of work principle: firstly, from local computer through digital I/O card PCI-DIO-96 send chooses code (binary digital signal). Secondly, through 3-8 decoder 74LS138 choose the switch card of the choose devices. Thirdly, through 74LS154 let the relay of this code on the switch card combine, corresponding sample signal through digital voltmeter of high precision change to digital signal. Lastly, through PCI-GPIB send to computer, the data file store as excel, the user on the LAN can skim the history data and present data, it can use those function in excel deal with the large quantity data, such as chart display.

### 3.2 The distribution of digital I/O port

Because add more I/O port, we use TANGO design and make the circuit card of choose devices again, digital I/O card. PCI-DIO-96 have twelve port, divided two symmetric port, the distribute scheme of I/O port as follows:



Figuer2: distribution of the digital I/O card port

Now we only use port APA for data acquire, for convenient the job of repair power supply, we should let port APB, port APC, port BPA and port BPB combine output two line binary digital signal to control the current of power supply in local computer.

### 3.3 Measure relay the combine time of relay (DS2Y-DC-12)

For define the delay time of relay in program, we use oscilloscope measure the voltage waveform of the moment of the relay combine, as follows:

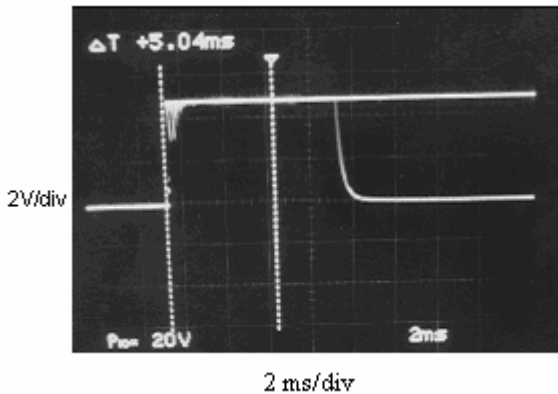


Figure3: Voltage sample waveform at the moment when relay combine.

So the combine time of this kind of relay is 10ms.

## 4 THE BOTTLENECK OF MEASURE SPEED

### 4.1 Digital voltmeter

Because the requirement of measure precision is very high, but digital voltmeter (HP3455A) measure speed in remote mode is 5/s, it is confine the measure speed. If we

use the hardware of NI, the measure speed will reach 1.5K/s.

### 4.2 Relay

To combine the relay is need 10ms, if we only monitor one power supply, this duration can ignore, if we monitor many power supply, relay isn't a good way obviously.

## 5 THE MAIN FUNCTION OF THIS MEASURE SOFTWARE

We write the measure software again use LabVIEW5.1, its main function as follows:

### 5.1 Measure all power supply long-term in To storage ring.

When operator measures the power supply, he only decides the sample number, measure number and measure interval. On computer screen, then he can measure the long-term stability of power supply. When BEPC be in motion, we not only measure current of many power supplies, but also long-term measure current stability of one power supply. The formula of stability is:

$$\text{Stability} = \frac{|\text{Max.} - \text{Min.}|}{\text{mean} \times 2}$$

### 5.2 Calculate Max., Min., mean and stability

When user skim through the sample data, the program should automatic calculate the Max., Min., mean and stability.

### 5.3 Sample data save as Excel

When the measurement begin, it is automatic jump out a dialog frame, prompt user input the save path, user can open the data file to skim all sample data and stability of power supply when it is measuring.

5.4 Display the real-time data on computer Screen

Display the Max., Min., mean of the present current of power supply.

5.5 After urgent stop, all sample data automatic save in, appointed path.

After write program, we measure 24 hours continuous that use the voltage of battery (1.5 V) as simulate input, system work normal, the experiment is over, this system have work half a year, it is in good state.

System quota:

Maximum measure channel: 256

Maximum distinguish rate:  $1.0 \times 10^{-6}$

Zero float:  $< 1.0 \times 10^{-5}$  V (12 hours)

Stability: superior  $1.0 \times 10^{-5}$  V (12 hours)

REFERENCE

[1] Instrumentation Catalogue 2000.

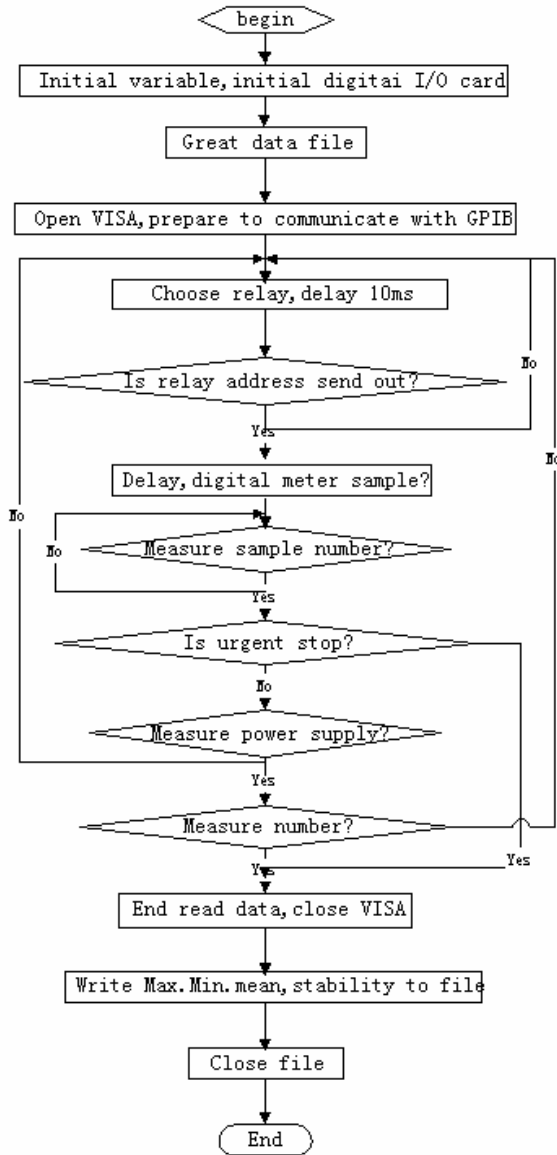


Figure4: The flow chart: