Technical Specification

Intelligent Measure and Control System for Width of Float Glass

Shanghai Gaozhun Automation System Co., Ltd.

Ⅰ.General description

1.1 Main technical features and indexes

Standard PAL black/white video input

Brightness, chroma and contrast are adjustable via software.

Resolution of image pickup: 768 ×576×16 bit

Image and graph are displayed on the same screen, realizing easy regulation of the control parameters.

1.2 Working principles of the system: As shown in Figure 1

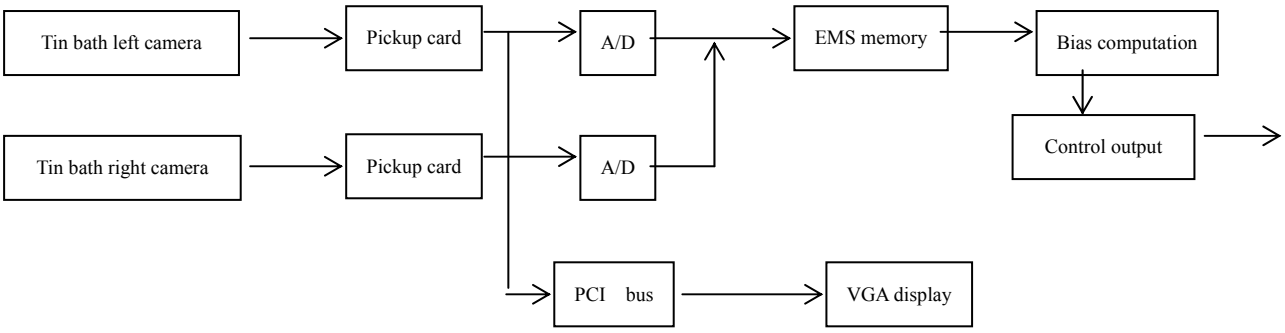


Fig. 1 Working Principle

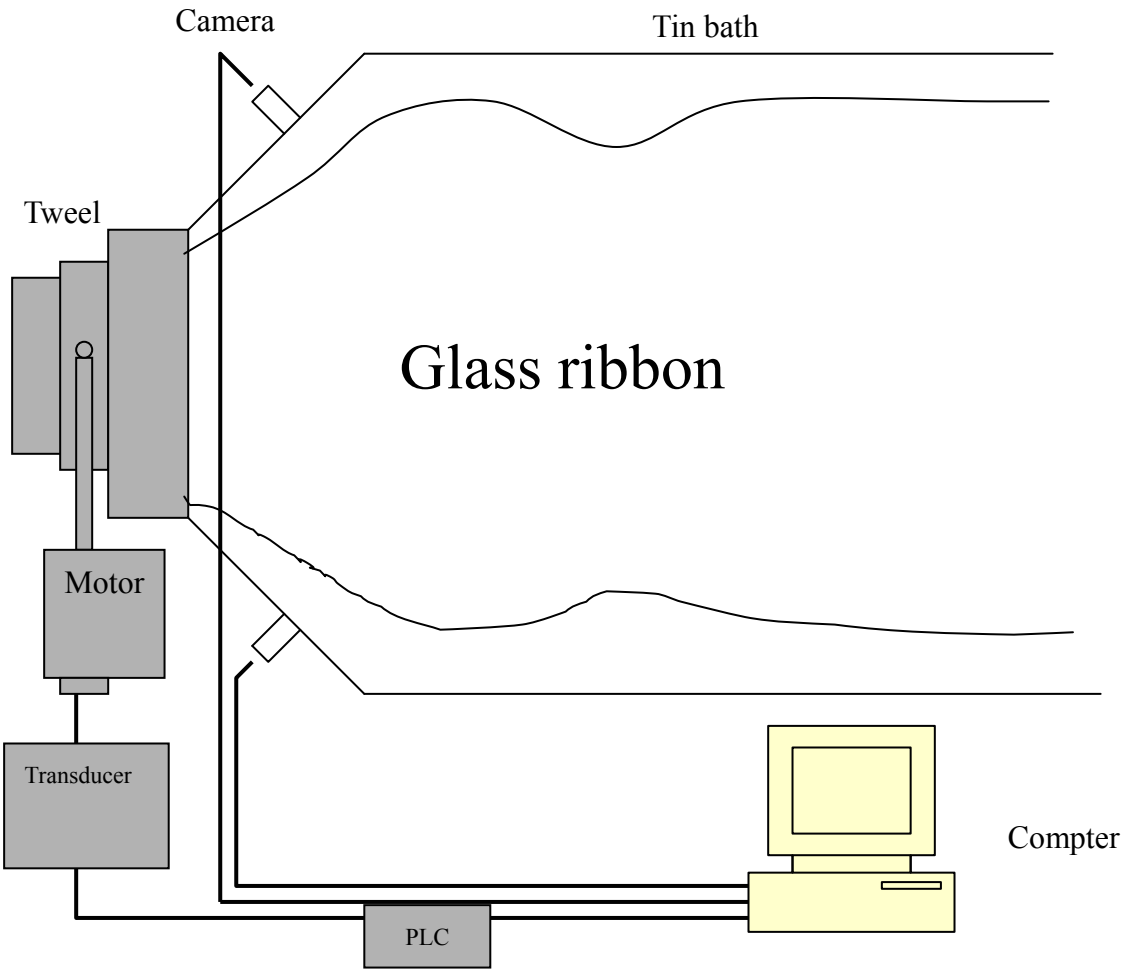


Fig. 2 System Structure

1.3 System structure: as shown in Fig. 2 above

1.4 Configuration of computer system

CPU:	Pentium 586 or chip superior Pentium 586; speed over 500MHz;
Bus speed	133MHz or more
EMS memory	256M or more
Hard disk	Residual space more than 1G
Operating system	Chinese WINDOWS 2000 system or the upwards

Ⅱ. Procedures for installing system hardware

Take off the cover of the computer cabinet, insert two DH-VRT-CG400 image cards into the idle slots of the PIC bus, fix the

retainer on the cabinet with screw and put on the cover, then connect the video source. For the DH-VRT-CG400 image cards, 15-pin socket or the BNC tie-in on the card are used as the input interface. Finally, connect the output socket of the video source with the socket of the image card. Install the softdog on the printer end with parallel ports.

1# input port is used as the video input terminal for the image pickup card.

Ⅲ. Procedures for installing system software

3.1 Confirm that the Chinese WINDOWS 2000 system or upwards is installed, if not, install it.

3.2 Install the driver (cg400_win2000xp) for the image pickup card:

If the driver for the image pickup card is not installed in the system, the system is able to detect the hardware information automatically after the computer starts-up, install the driver of the hardware according to the system prompt. After the said installation is over， open the backup copy of the software（cgcard performance install）, run SETUP program and install according to the given prompt.

After installation, copy the document Taskkeyhock, dll supplied along with the disk to the file under the content of WinNT\SYSTEM32.

3.3 Set the WINDOWS screen to the size of pixel 1024*768, color is set as real multicolor, 32 bits, and the taskbar is set as auto concealed.

3.4 Click “Start/Program/Daheng Imavision CGCard/One card performance” to run the demonstration program of image pickup; click “View/Capture” to observe whether the picture in the window is clear. Click “Parameter/Allocate Memory”, set the allocated EMS memory in “Try to allocate” as 8000, shown as in figure 3.

Insert the installing disc (one CD) of Intelligent Measure & Control System for Float Glass Ribbon Width into the machine, copy DLL document of this program, such as “B12.exe”, “WinIo.dll”, “WinIo.sys” and “WINIO.VXD” etc. to under the content of C:\BK.

3.5 Restart the computer

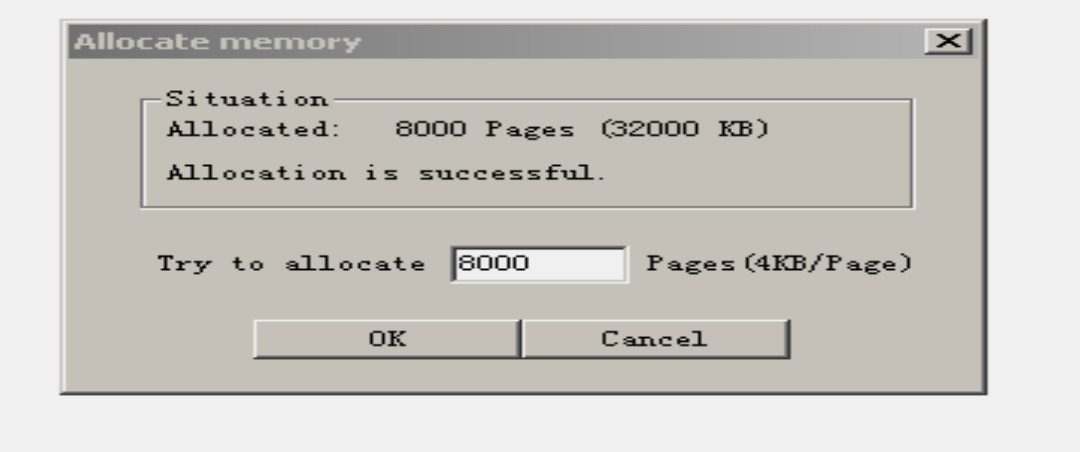


Fig. 3

3.6 Install softdog driver: insert the installing disc into floppy drive and run "instdrv.exe" to execute installation according to the given prompt.

3.7 Setting configuration of the system: open the content of C:\BK, cope the provided data-base document "b12.mdb" and put it under this content. Configuring the data-base in the control panel: select in turn in the control panel "managing tool" →"data source ODBC" →"user's DSN" →"accession" →"Driver Microsoft Access Drive(*.mdb)" →"fulfil" →fill "bl2" into " name of data source"→"select data base" and click "", just as shown in Fig. 4:

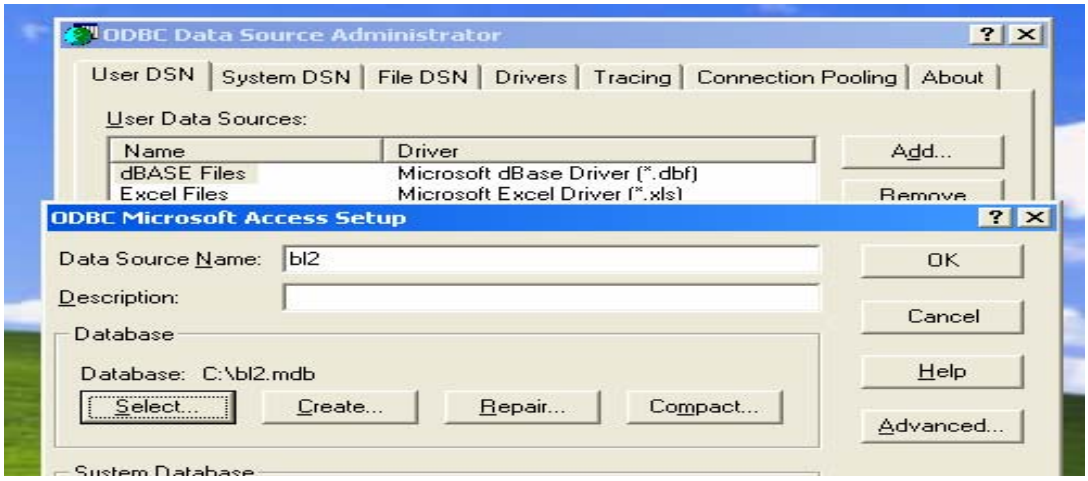
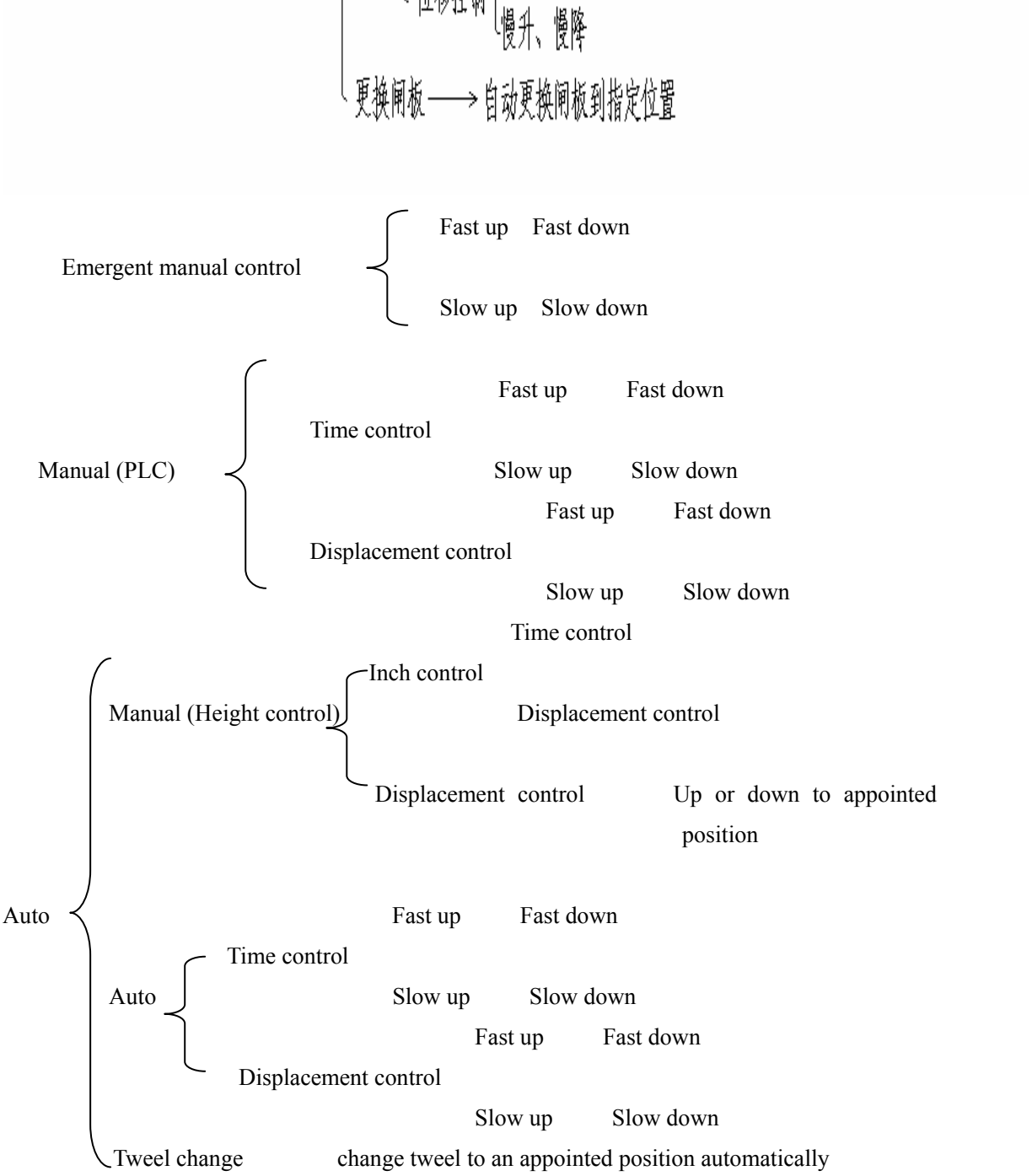


Fig. 4

Ⅳ. Selection of mode for ribbon width control

The structure of mode for ribbon width control is shown as the following figure, in which, except automatic mode (control by computer), the rest control modes are all able to be fulfilled in the control box or on the control panel.



Ⅴ. Introduction to software operation

5.1 After the computer restarted, it will enter into the Intelligent Measure and Control System for Ribbon Width of Float Glass and display its main interface. The main interface is shown as in Fig. 5.

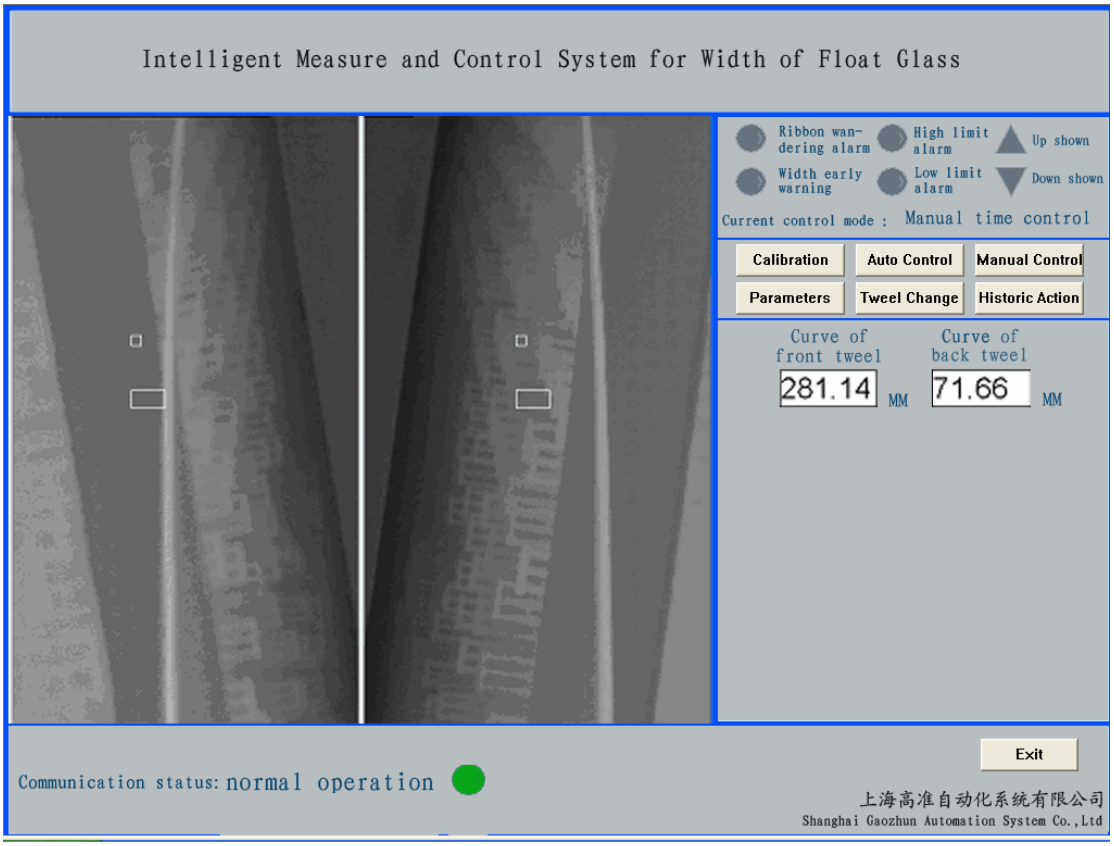


Fig. 5 Main Interface

The main interface of Intelligent Measure and Control System for Width of Float Glass includes the following parts: 4 surveillance windows (2 for width control and another 2 for width measure) are in the middle part of the interface, the camera shows the pictures of the glass ribbon edges here picked-up through the monitor hole opened at the tin bath wall of the 八-shaped section.(It should be assured that glass ribbon locates within the inner sides of the glass edges and on their outer sides is molten tin, the ribbon moves upwards); the downward part is the ribbon width control panel, ribbon width measuring control button and button for exit.

Ribbon width control panel: including six buttons, i.e. “calibration”，“auto control”，“manual control”，“parameters”，“tweel change” and “historic action”. In addition, there is also the control mode for current system running, system running state, altitude position of front and back tweels. Under it there is alarm indication including “ribbon wandering alarm” and “width alarm”, “ascend indication” and “descend indication”, “upper limit alarm” and “lower limit alarm”.

5.2 When click the button of “calibration” with the left key of mouse, it will enter into the interface for calibration, as shown in Fig. 6

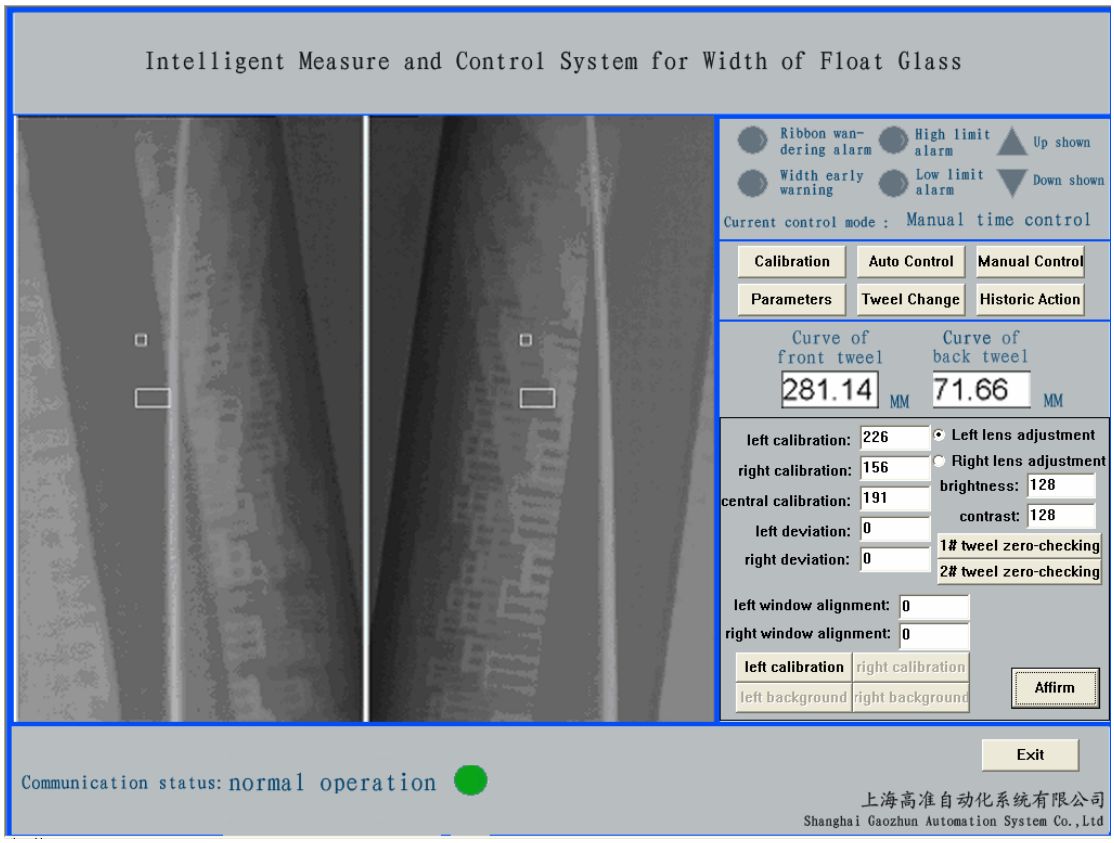


Fig. 6 Interface for Calibration

At the sub-control panel for calibration there are 7 small windows to display “left calibration”, “right calibration”, “central calibration”, “left deviation”, “right deviation”, “left window alignment” and “right window alignment” individually and 7 buttons, i.e. “left calibration”, “left background”, “right calibration”, “right background” , “1# tweel zero-checking”, “2# tweel zero-checking” and “affirm” individually. After click the button of “left calibration” with the left key of mouse, 4 direction keys on the keyboard can be used to move the position of the black rectangle for calibration on the left side of the left monitor window (click each time, the figure will plus or minus 1), use the rectanglar frame for calibration to cover the edges of glass, facilitating auto recognition and tracking of the glass edges by the system. Meanwhile the left window for calibration will display the abscissa of central point of rectangle frame for calibration.

Click the button of “left background”, use 4 arrow keys to move the small white square frame to the interior of the white side of the glass. With the same principle the enactment of the right calibration can be finished too. The value of central coordinate is half of the summation of left and right coordinates. After finishing calibration, click the button of “affirm” with the left key of mouse to confirm the just operation and return to the main interface.

Remark: When it is necessary to increase the glass flow, move the two rectangular frames for calibration towards two sides, and assure that the small frame of background is within the interior of the white glass side.

The parameters of “left deviation”, “right deviation” are used to modify different width of the glass ribbon, which can be revised properly when the tracking cross does not reach the outer edge of the white glass side. After setting is finished, normally no modification is needed, only when the glass width deviated distinctly, fine adjustment becomes necessary.

The parameters of “left window alignment”, “right window alignment” are used to modify the left and right video tailoring positions of the picture window, i.e., when the ribbon edges are over close to the picture window, we can regulate these parameters to redefine the video tailoring positions, and then restart the program.

Of which, the zero-checking button is used to set the present tweel position as the standard position, facilitating used as a reference in control.

5.3 After click the button of “parameter” with the left key of mouse, it enters into the interface of parameter setting，as shown in Fig. 7

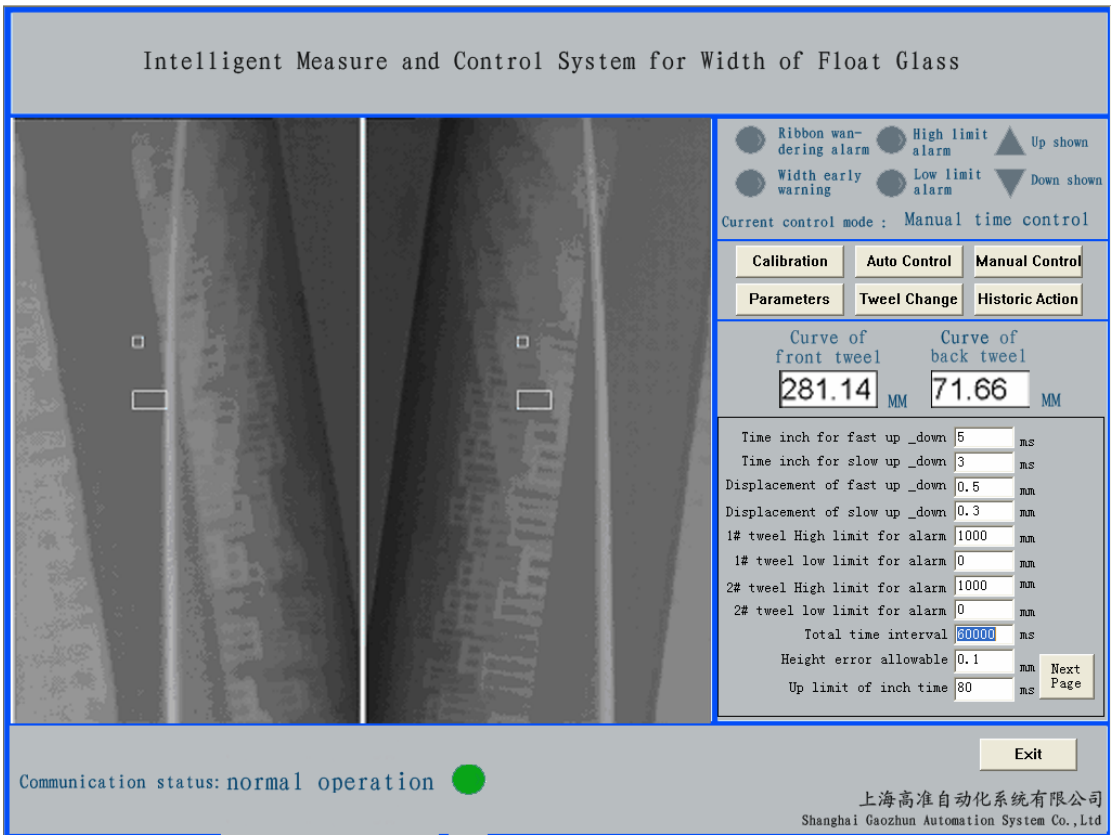


Fig. 7 Interface of Parameter Setting

The parameters listed in the above sub-control panel have the following meanings:

5.3.1 Time control for fast flow increase or decrease: Unit: mS
5.3.2 Time control for slow flow increase or decrease: Unit: mS

The above two parameters determine the controlled output time of flow increase or decrease at a single time (big or small of the switching value) when the system is in the state of automatic or manual control.

5.3.3 Height of displacement for fast flow increase or decrease: Unit: mm
5.3.4 Height of displacement for fast flow increase or decrease: Unit: mm

The above two parameters determine the controlled output displacement of flow increase or decrease at a single time when the system is in the manual state.

5.3.5 Upper limit alarm for 1# tweel: Unit: mm
5.3.6 Lower limit alarm for 1# tweel: Unit: mm
5.3.7 Upper limit alarm for 2# tweel: Unit: mm
5.3.8 Lower limit alarm for 2# tweel: Unit: mm

The functions of the above parameters are as follows: the system will give an alarm automatically (accompanied with howling of buzzer), when the position of the tweel is higher or lower than the set value here.

5.3.9 Upper limit of inch time: unit ms (millisecond)

This parameter is used as the time scope for action control by PLC, when the time is over this set upper limit, the action stops immediately.

5.3.10 Displacement at one worm revolution

This parameter is used for conversion between the value of the coder and the corresponding millimeters of the tweel, i.e. how many millimeters at one revolution of the worm.

5.3.11 Height error allowable: unit mm

The parameter is used to control the motor, i.e. the requirement for change will be regarded as being satisfied, if the height is within the set error allowable.

5.3.12 Controlled time internal: unit mS

5.3.13 Coefficient of controlled time interval: unit mS

The above two parameters determine the time interval for controlling each output of the system, i.e.:

Time interval = controlled time interval – width deviation × coefficient of controlled time interval

5.3.14 Width early warning parameter: It is used to set the initial value of width deviation for early warning. When the width deviation is over this value, the system will give an alarm (accompanied with howling of a buzzer) automatically, in addition, accompanied by a controlled input; the alarm will vanish automatically when the width deviation is less than this initial value.

5.3.15 Parameter for ribbon wandering alarm: used to set the initial value of ribbon wandering warning. When the centre deviation is over this initial value, the system will give an alarm automatically and at this moment, the system has no more the controlled output; when the deviation is less than the initial value, alarm will disappear

automatically.

5.3.16 Threshold value of auto controlled width decrease: used to set the threshold value for starting to decrease the flow when the system is in the state of automatic control. When the system detects that the width deviation is over this value, it will output a controlled quantity at a certain time interval (See item 12).

5.3.17 Threshold value of auto controlled width increase: used to set the threshold value for starting to increase the flow when the system is in the state of automatic control. When the system detects that the width deviation is less than this value, it will output a controlled quantity at a certain time interval.

5.3.18 Height modification of 1# tweel: unit mm
5.3.19 Height modification of 2# tweel: unit mm
The above two parameters are used to modify abrasion loss of the tweel during the production process.

5.3.20 Width of glass ribbon produced: unit mm
5.3.21 Pixel proportion
These two parameters are used to calculate the current factual ribbon width, i.e., how many mm of the corresponding pixel.

After finishing all the settings, click the button of “Affirm” with the left key of mouse to confirm the settings and return to the main interface, all the given values are kept in the register list and can be called for use directly next time.

5.4 Click the button of auto control with the left key of mouse and enter the interface of auto control, as shown in Fig. 8

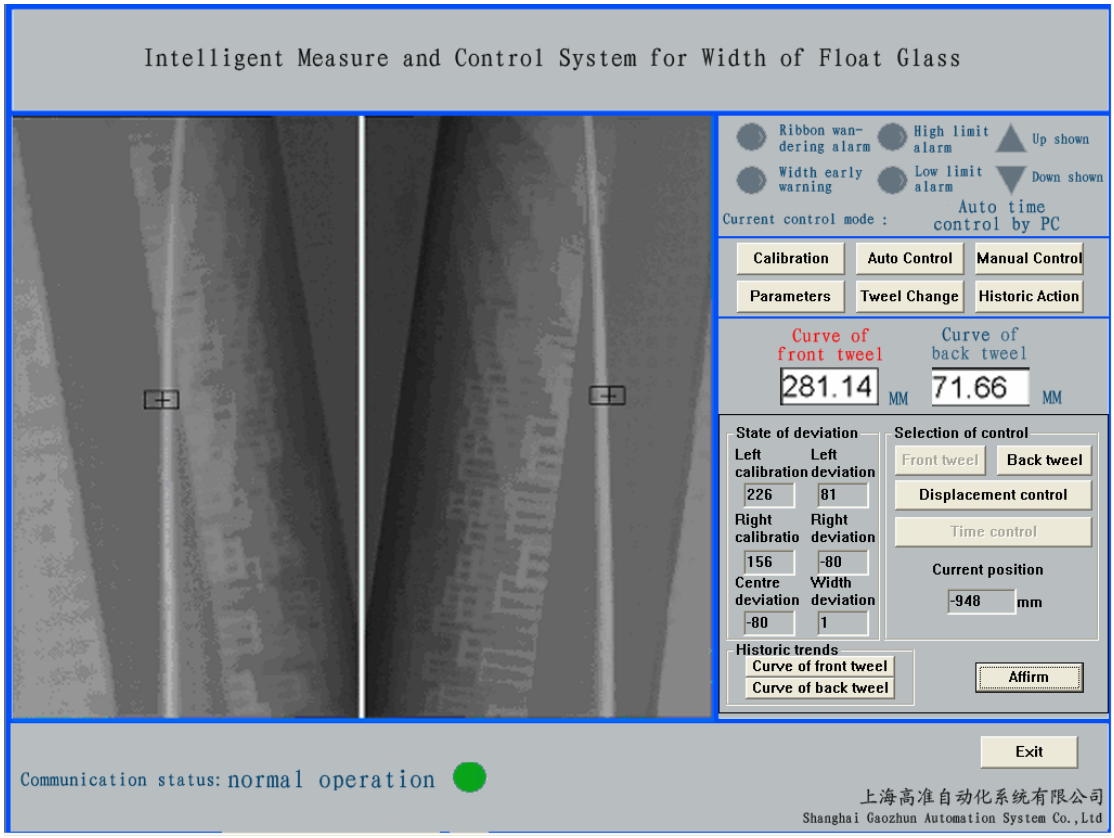


Fig. 8 Auto Control Interface

The sub-control panel of automatic control is divided into deviation state, control selection and historic trends. In the part of deviation state, there are 6 small windows to display coordinate and deviation value; in the part of control selection, there are four buttons of front tweel, back tweel, time control and displacement control (This control mode is selected on the cabinet face) plus the textbox at the present position; in the part of historic trends includes the curve buttons of both the front and back tweels and the textbox for setting and detect the ribbon width. The cross curser for calibration appears close to the centre of the calibration rectangle. The meanings of various parameters are as follows:

5.4.1 Left calibration and right calibration stand for the abscissa of the center point of the calibration rectangle;

5.4.2 Left (right) deviation stands for the difference between left (right) coordinate and left (right) calibration;

5.4.3 Centre deviation stands for half of the summation of the left and

5.4.4 Width deviation stands for the summation of the left and right deviation value.

When the system tracks the glass sides automatically, the centers of the two cross cursors move along with the outer edges of the glass sides. If the value of center deviation (width deviation) is over the pre-set value, the indicating lamp of width alarm (center alarm) will flash and meanwhile the buzzer will send out alarm sound.

When the system has controlled output, the color of "up arrow", "down arrow" changes correspondingly, i.e., grey indicates the system does not act, green indicates the system is acting.

5.5 Click the button of manual control with the left key of mouse and the interface appeared is as shown in Fig. 9

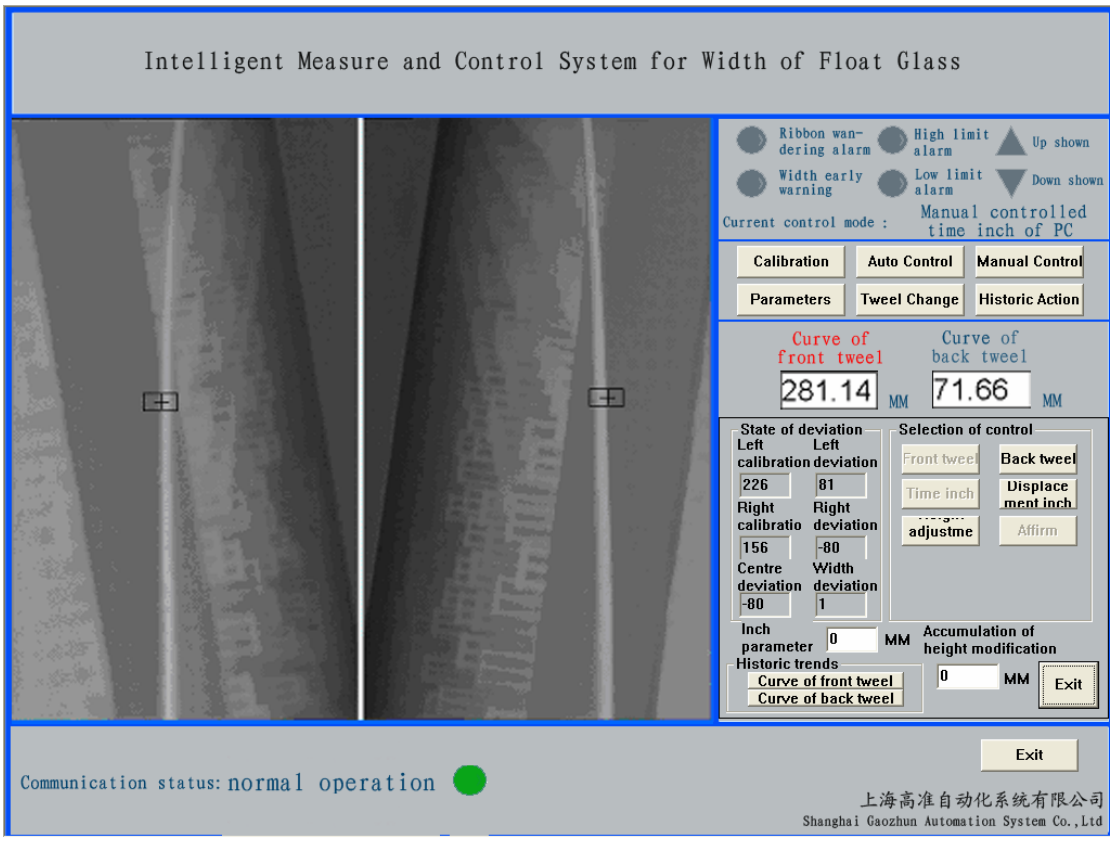


Fig. 9 Manual Control Interface

The sub-control panel of manual control is similar to that for the auto control, but has more control buttons. In which the time inch, displacement inch are also selected on the cabinet face. After clicking

time inch (displacement inch) the button of “up” or “down” appears there under. Press this button bit by bit, the system will send out the corresponding command for action. Under the control of displacement inch, the height adjustment button is also activated, click the height adjustment, the textbox of target position and that of micro-displaced position will appear.

Method for tweel height control

(1) Method of inch control: divided into time inch and displacement inch

Time inch: The operator click the “up”, “down” buttons with the mouse, then the computer sends out an action command. Having received this command, PLC will send out correspondingly an action command at a fixed time interval (which is given in the parameters) to the transducer.

Displacement inch: The operator click the “up”, “down” buttons with the mouse, then the computer sends out an action command. Having received this command, PLC will send out correspondingly an action command of a fixed displacement change (this fixed displacement is given in the parameters) to the transducer.

(2) Method of displacement control

The operator fills the corresponding target position or minor displacement into the dialog box of computer for displacement control. When the minor displacement is filled, the computer will figure out the target position required, then click the “Affirm” button. Having received the target position, PLC will send a action command to the transducer.

5.6 Control method for tweel change

The operator may feed in the target position of 1# tweel and 2# tweel respectively at the same time, the computer will send these target positions to PLC. On the basis of the tweel position feedback by the coder, PLC controls 1# tweel and 2# tweel automatically to the set positions, as shown in Fig.10.

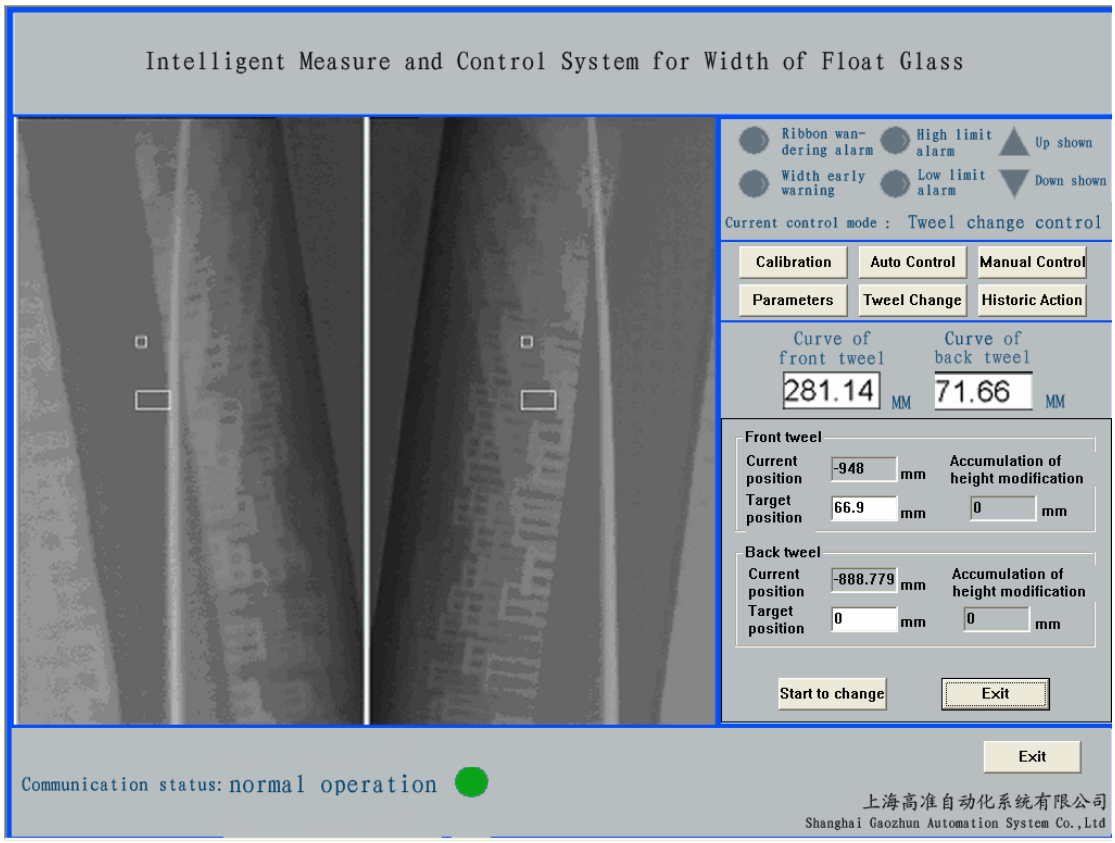

Intelligent Measure and Control System for Width of Float Glass
Ribbon wandering alarm
High limit alarm
Up shown
Width early warning
Low limit alarm
Down shown
Current control mode : Tweel change control
Calibration
Auto Control
Manual Control
Parameters
Tweel Change
Historic Action
Curve of front tweel
Curve of back tweel
281.14
MM
71.66
MM
Front tweel
Current position
-948
mm
Accumulation of height modification
Target position
66.9
mm
0
mm
Back tweel
Current position
-888.779
mm
Accumulation of height modification
Target position
0
mm
0
mm
Start to change
Exit
Exit
Communication status: normal operation
上海高准自动化系统有限公司
Shanghai Gaozhun Automation System Co.,Ltd

Fig. 10

5.7Historic action Click this button, a record frame of historic actions will appear, of which the interface is shown as Fig.11.

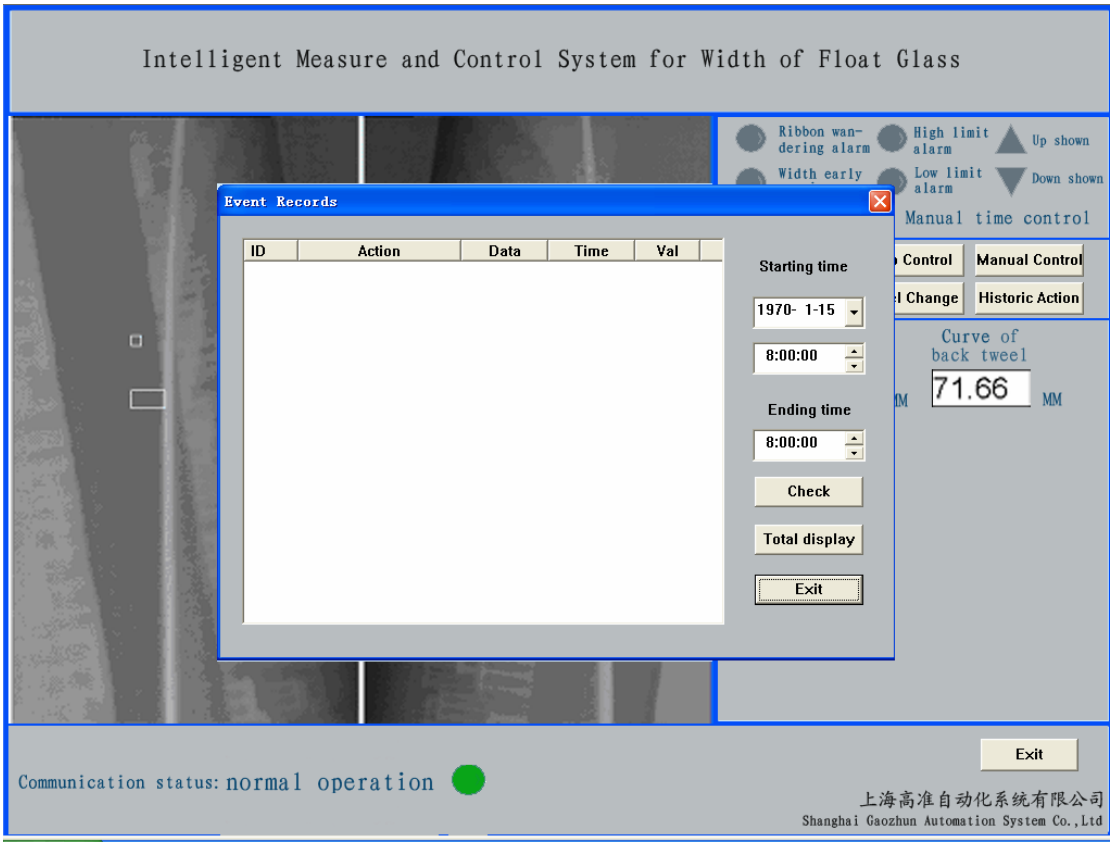


Fig. 11

5.8 When use the left key of mouse to click the exit button, it will enter the exit interface. The exit interface will display alarm information and remind that customer should input password. Only when customers input the correct password, can they exit from the Intelligent Measure and Control System for Width of Float Glass; if the password led in is not correct, it will return to the main interface then. The tolerant password for the auto control system is “1111”.

Ⅵ. Maintenance of the system

The various parts of hardware adopted for the system are of standard products, for their maintenance, one can refer to the instruction manuals of the equipment respectively. Since the system identifies the deviation in conformity with the picture, the quality of the picture is thus highly demanded. It should guarantee that the picture displayed by

the system is legible, without any interference. Accumulation of tin dust on the lens will make the lens blurry, so it should be frequently cleaned in order to assure a legible picture

If the picture shown in the window is accompanied with interference, check firstly whether the video cable of the camera is good or not; and also check whether the camera is insulated from the water jacket. If the outer layer lacquer of the camera is worn-out, it is quite possible that the insulation between the camera and water jacket is destroyed and thus interference over the ground occurs. To solve the problem, one can wrap the camera with insulating tape.

Ⅶ. The present program is provided with encrypt function, before starting the machine, it is a must to insult the softdog on the join port. The encrypt dog should be checked regularly during the running period of the program. It is strictly forbidden to cramp out the softdog in the state of start-up. Otherwise, the errors in the lap of the gods will come into being.