Thanks for using the product

Please read the manual carefully before using(install, operation, maintenance, checking) the product.

The manual is used for routine maintenance and check as well as the analysis of abnormal phenomenon.

MVC operation manual, version No.:V1.0.0

Content

1 Chapter 1 Human-Machine Interface

DH1000 HMI adopts MCGS configuration software, which is used for the communication with the control system to realize the visual display system, so that the user may monitor operating conditions and failure alarms more intuitively. The monitoring system uses HMI which has a clear view of the MVC parameters, fault records etc.

⚠Attention
● The touch screen may only be used by the user to monitor the MVC operating state, accessing the system setup or changing the system parameters is forbidden without the authorization of DNH.

1.1 Log-In

User Log-In window is shown in Fig.1-1. User name is - User, password is - DNH.

⚠Attention
● It is forbidden to use the name of any other user to log-in to the system without the authorization of DNH.

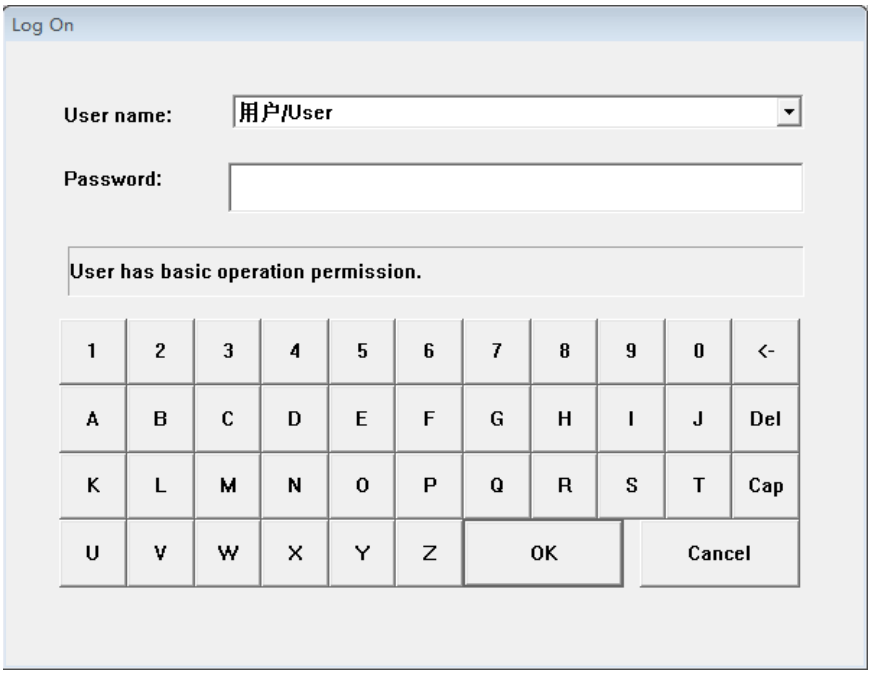


Fig.1-1 User Log-In Window

1.2 Main Screen

The Main Screen is shown in Fig.1-2:

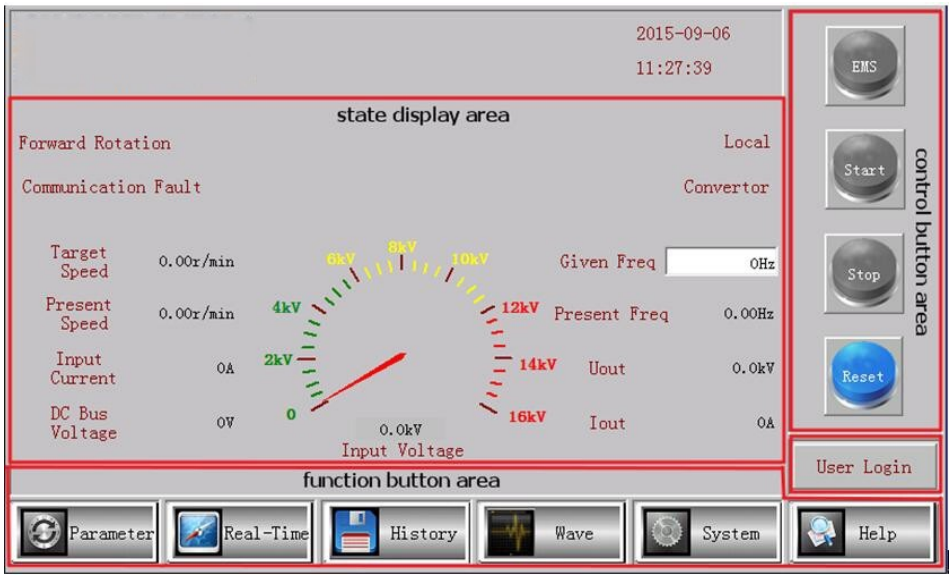


Fig.1-2 Main Screen

The main screen has four parts: a control button area, state display area, function button area and user log-in button.

1.2.1 Control Button Area

The control button area is located on the right side of main screen, including the control buttons for reset, stop, start and one button for emergency stop. As shown in Fig.1-3:

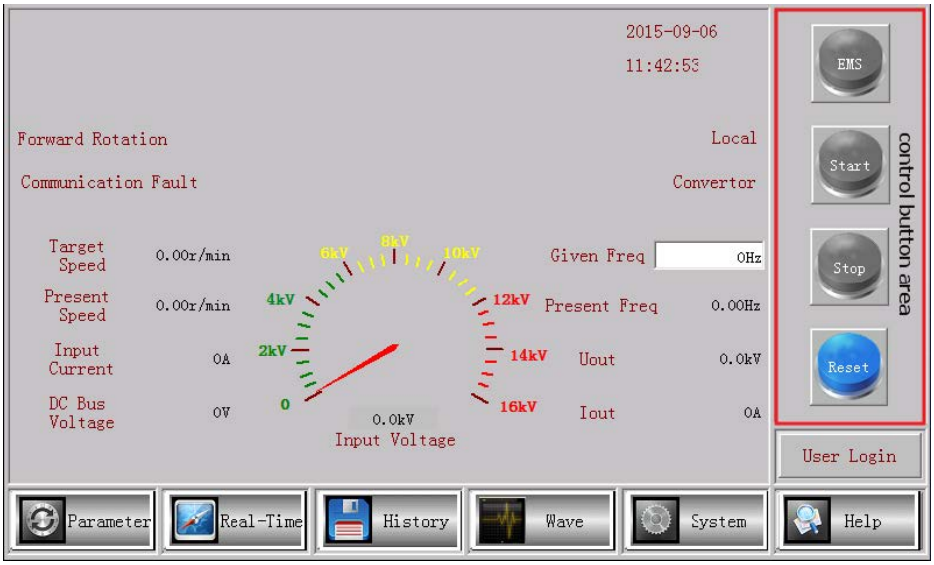


Fig.1-3 Control Button Area

For the function of each button, see Table 1-1.

Table 1-1 Control Buttons and Their Functions

Button	Function	Color
Reset	Control Button Clear MVC fault, charge the MVC, meet ready state	Blue, reset button may be used Gray, reset button may not be used
Start	Control Button After the MVC is ready, click 'Start' button, a dialog box will pop up, select 'Yes' to start the MVC, select 'No' to cancel the start of MVC. The start pop-up box is shown in Fig.1-4.	Green, start button may be used Gray, start button may not be used
Stop	Control Button After the MVC is put into operation, click 'Stop' button, a dialog box will pop up, select 'Yes' to stop the MVC, select 'No' to cancel stopping the MVC. The start pop-up box is shown in Fig.4-2.	Yellow, stop button may be used Gray, stop button may not be used
Emergency stop	Display Button Displays the state of the emergency stop button on MVC control cabinet door	Red, MVC is in emergency stop state Gray, MVC is in non-emergency stop state

The start dialog box shown in Fig.1-4 will pop up if you click the start button, when everything is ready, if you want to start the MVC ,please click Yes, else please click No.

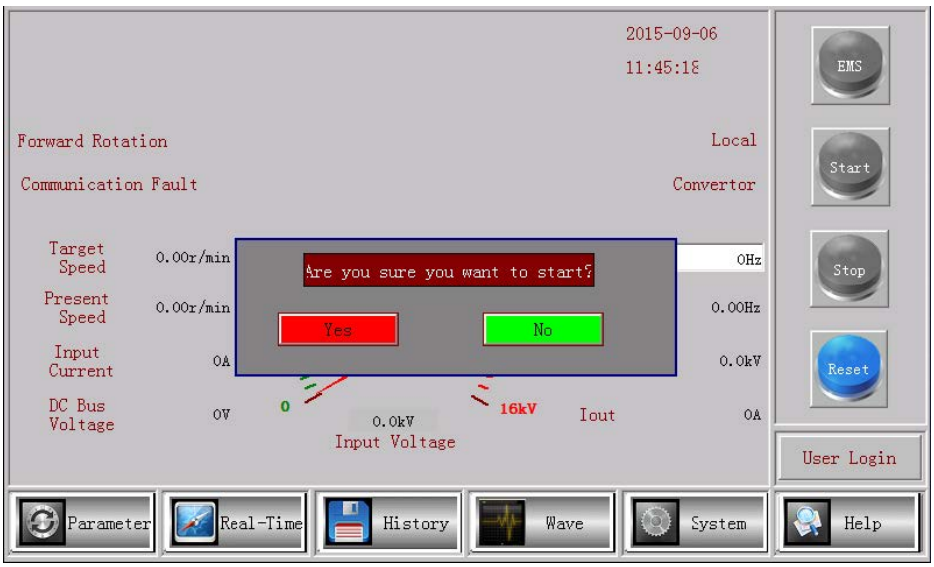


Fig.1-4 Start Button Pop-Up Box

The dialog box shown in Fig.4-5 will pop up if you click the stop button. If you want to stop the MVC ,please click Yes, else please click No.

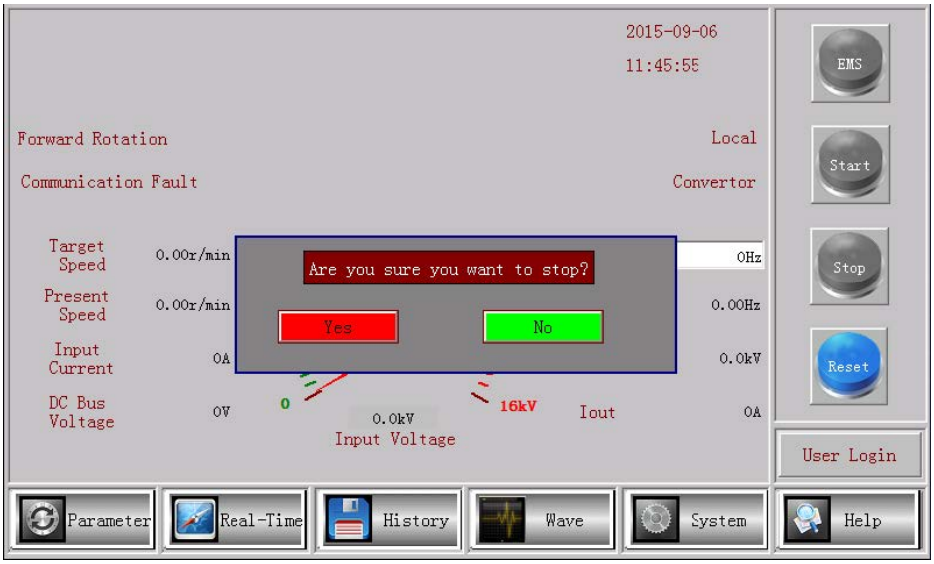


Fig.1-5 Stop Button Pop-Up Box

1.2.2 Function Button Area

The function button area is located at the bottom of the main screen and includes six function buttons: Parameter (Parameter Settings); Real-Time (Real Time-Data); History (Historical Data); Wave (Waveform Display); System (System Configuration) and Help. As shown in Fig.1-6:

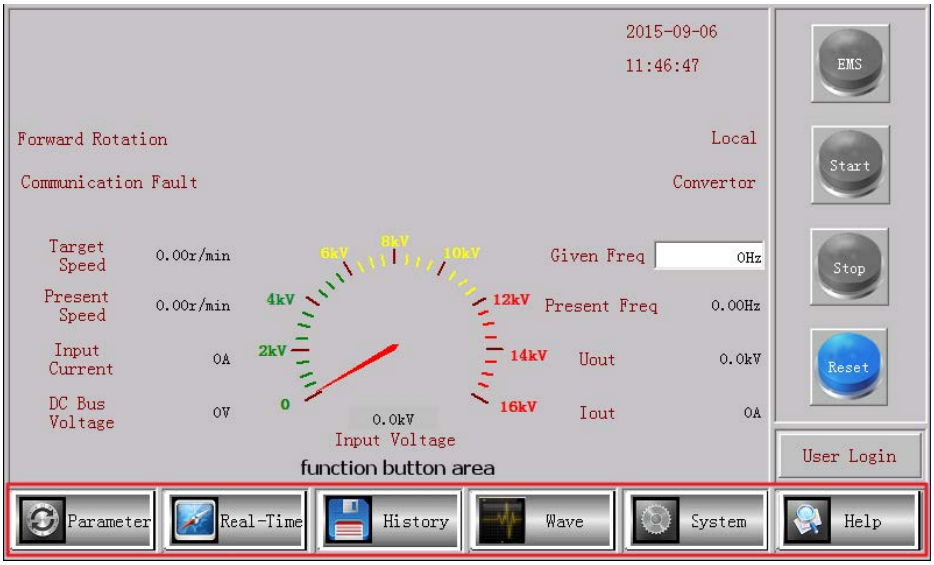


Fig.1-6 Function Buttons

Click the relevant button to enter the corresponding function menu.

1.2.3 State Display Area

The State Display Area is shown in Fig.1-7: the state display area shows the current state of the MVC including Current Time, Communication State of touch screen and controller,Local/Remote Mode, MVC and the load Operational Data, MVC and the load control State.

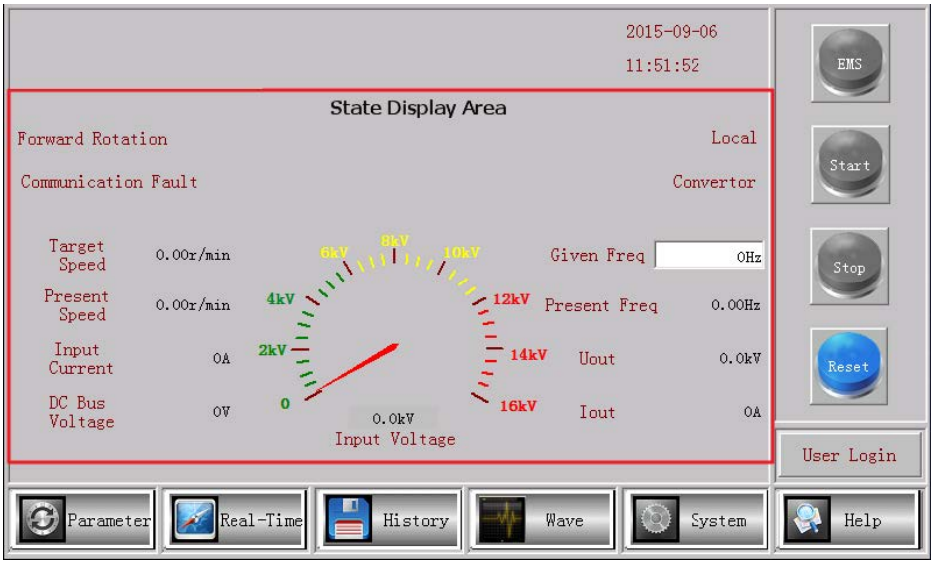


Fig.1-7 State Display Area

The time display column displays the current time.

The MVC 'Given Freq' value may be set (effective only during local control) by clicking the 'Given Freq' value text, the frequency setup popup box will open allowing the frequency value to be entered as required, this will take effect immediately after clicking the'Ok' button. The parameter setup range is 0-50Hz. As shown in Fig.1-8:

Fig.1-8 Setpoint Frequency Pop-Up Box

Present Speed column displays current MVC operating frequency.

The Uout column displays current MVC average three-phase output voltage.

The Iout column displays current MVC average three-phase output current.

The Input Current column displays current MVC average three-phase input current.

The DC Bus Voltage column displays current MVC average three-phase bus voltage.

The Present Freq column displays operating speed of current MVC load.

The Given Freq column displays the given speed of current MVC load.

1.3 Parameter Setup Screen

Click the ‘Parameter Settings’ button on the Main Screen to enter the Parameter Setup Screen. Click the top left button to set the MVC speed regulation parameters,control parameters, vector parameters, motor parameters, communication parameters and sensor parameters. Click the ‘Main Menu’ button to return to the Main Screen, thereinto, the access authority of speed regulation parameters,vector parameter, motor parameter, communication parameter, sensor parameter are granted to: the commissioning personnel, administrator; the access authority of control parameter is granted to :operator, commissioning personnel, administrator.

1.3.1 Speed Regulation Parameters

Click the ‘Speed Regulation Parameters’ button on the Parameter Setup Screen to set the MVC speed regulation parameters, as shown in Fig.1-9. Click Page Down and Page Up to flip over in the speed regulation parameter screen。Fig.1-9 shows the speed up/down setting in speed regulation parameters. Acceleration, Deceleration and transition frequency may be changed to realize the frequency speed regulation function.

Acceleration1:the time from 0Hz to transition frequency 1;

Acceleration2:the time from transition frequency 1 to transition frequency 2;

Acceleration3:the time from transition frequency 2 to highest frequency;

Deceleration1:the time from transition frequency 1 to 0Hz;

Deceleration2:the time from transition frequency 2 to transition frequency 1;

Deceleration3:the time from highest frequency to transition frequency 2;

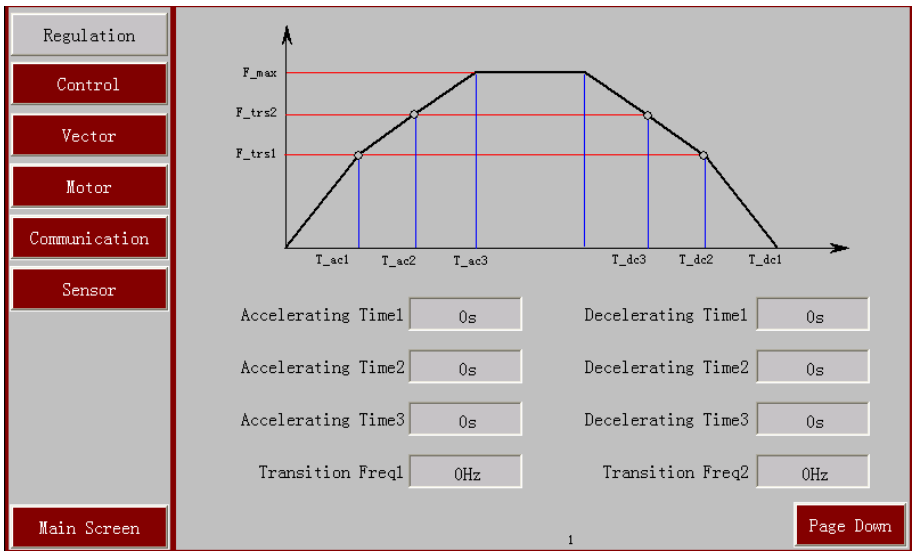


Fig.1-9 Speed Increase/Decrease Setting

Click the dialog box of the parameter to be set on the touch screen, a data input dialog box will pop up, as shown in Fig.1-10:

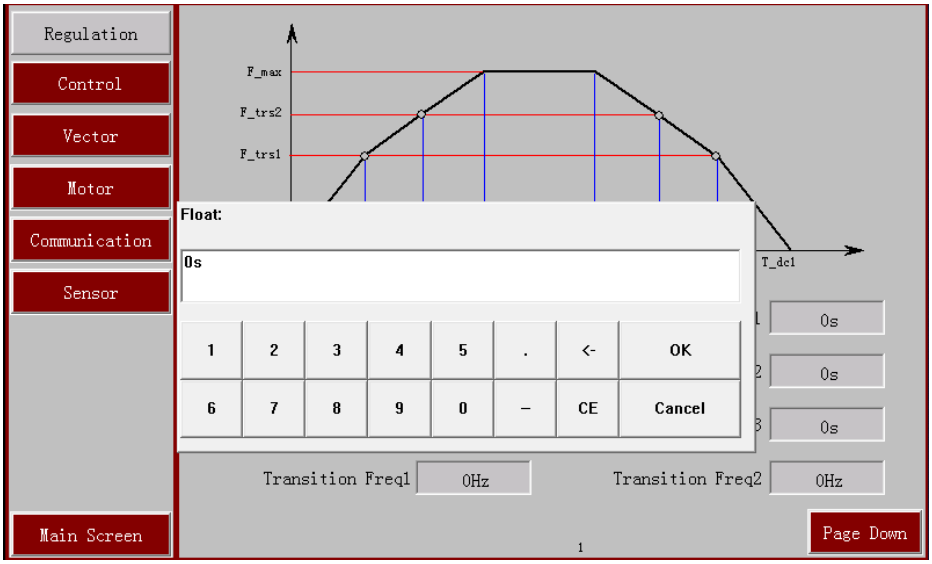


Fig.1-10 data input dialog box

Fig.1-11 Shows the frequency skipping settings in the speed regulation parameters. The frequency skipping upper limit, frequency skipping lower limit, minimum frequency and maximum frequency may be changed for a smooth transition of the variable frequency speed regulation system at resonance point. When frequency skipping is disabled,running the motor and observe its running state. If motor appears large oscillation at one certain frequency,then record the current frequency. Set frequency skipping point of upper limit and lower limit, enable the motor won't run at the frequency of large oscillation.

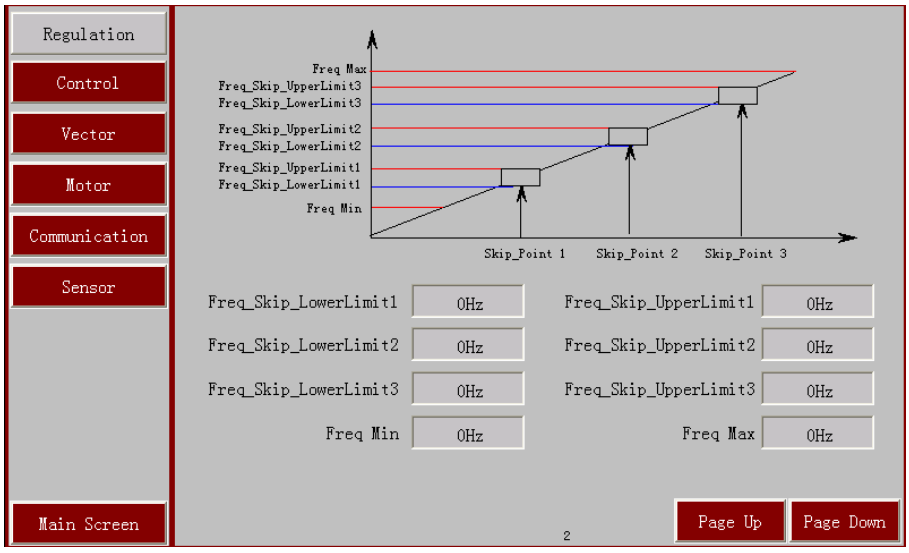


Fig.1-11 Frequency Hopping Setting

Fig.1-12 shows the V/F curve settings in the speed regulation parameters (In this example the control mode is V/F).

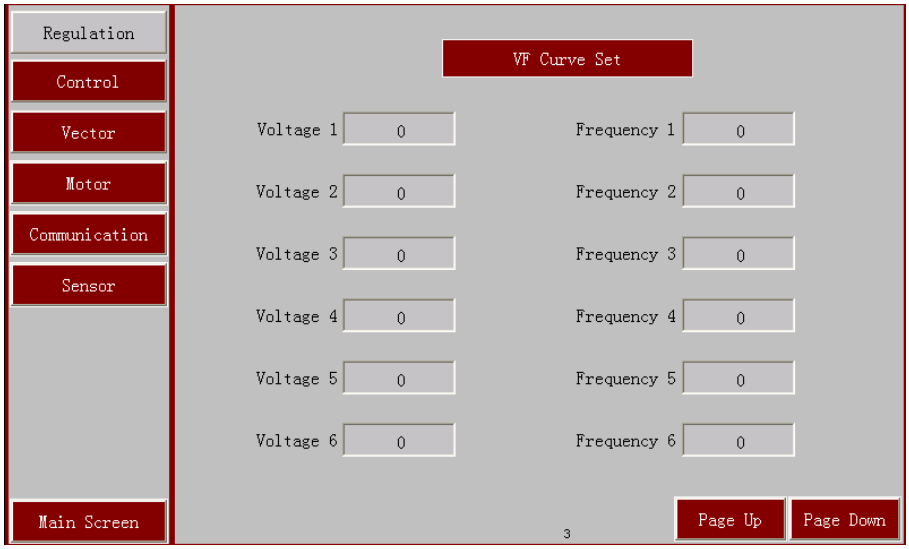


Fig.1-12 V/F Curve Setting

When the MVC control mode is vector control, the V/F curve settings in the speed regulation parameters is shown in Fig.1-13:

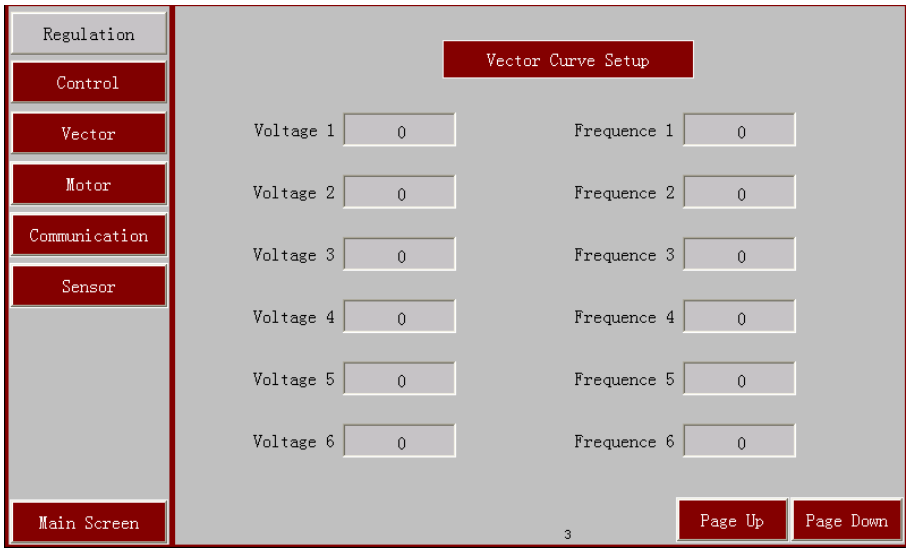


Fig.1-13 Vector V/F Curve Setting

Fig.1-14 Shows the flying control setting and process PID closed loop settings in speed regulation parameters.

MVC with flying start function,once received start command again,search the inertia speed of the motor,and start motor at the inertia speed frequency,which will reduce delay and impact.

MVC process PID closed loop function may enable MVC to achieve external closed loop adjustment for one certain control subject.

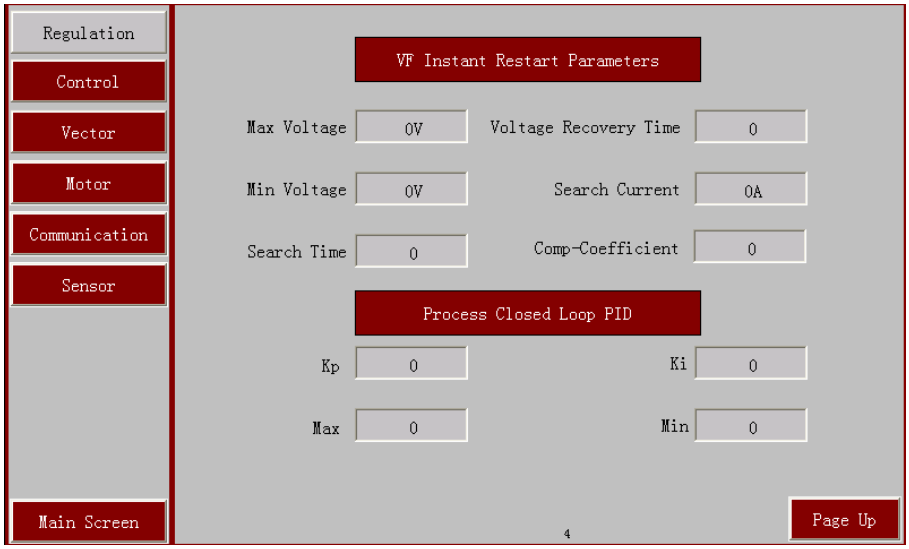


Fig.1-14 Flying and PID setting

1.3.2 Control Parameters

Click the 'Control' button on the Parameter Setup Screen to set the MVC control parameters, as shown in Fig.1-15:

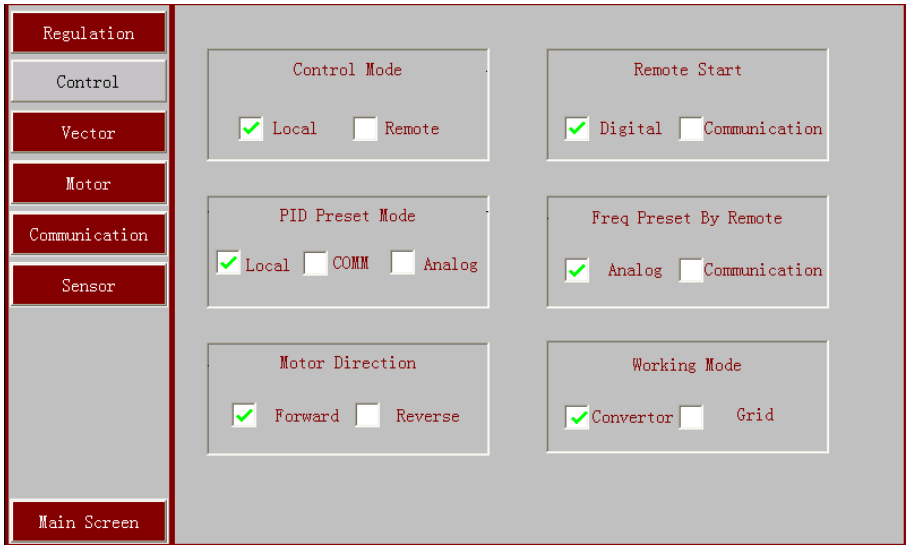


Fig.1-15 Control Parameter Window

Click the 'Motor Direction' and then select 'Forward', and then motor will forward running'; on the contrary, if you select 'Reverse', motor will reverse running.

Click'control mode',and select 'local',then control MVC relevant operation by touch screen; select'remote', then control MVC relevant operation by remote operation machine.

Click closed loop preset mode,select'local',then the closed loop preset value may be set by touch screen; select'communication',then the closed loop preset value may be set by MODBUS communication; select'analog', then the closed loop preset value may be set by external 4-20mA analog signal.

Click remote mode,select'digital',then MVC start,stop command may be controlled by external digital signal;select'communication', then MVC start,stop command may be controlled

by MODBUS communication.

Click remote frequency preset mode,select‘analog’,frequency preset may be set by external 4-20mA analog signal;select‘communication’, frequency preset may be set by MODBUS communication.

Click working mode,select‘converter’,then the motor running may be controlled by MVC; select‘grid’,motor running by grid connection. Thereinto,the function may be switched automatic after grid connection. It is required 50Hz for motor running when grid connection.

1.3.3 Vector Parameters

Click the ‘Vector Parameters’ button on the Parameter Setup Screen to set the MVC vector parameters, Click Page Down and Page Up to flip over in each screen. When the MVC load is a asynchronous motor, the vector parameters are shown in Fig.1-16 and Fig.1-17:

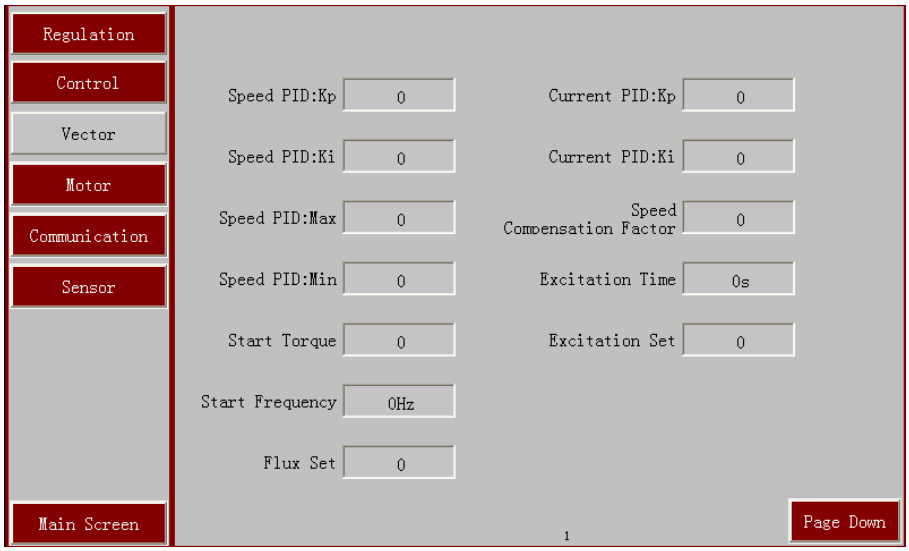


Fig.1-16 Asynchronous Motor Vector Parameter Window (1)

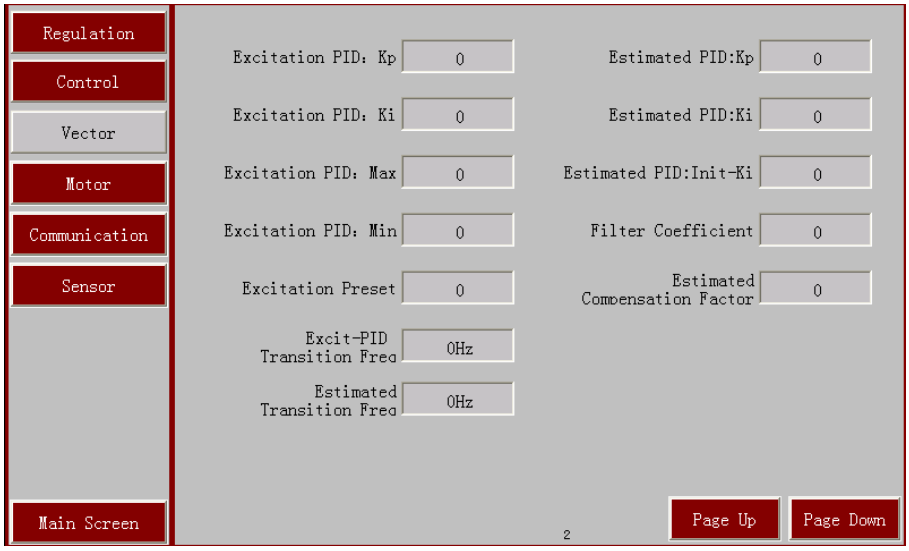


Fig.1-17 Asynchronous Motor Vector Parameters Window (2)

As an example, when the MVC load is a synchronous motor, the vector parameters are shown

in Fig.1-18 and Fig.1-19:

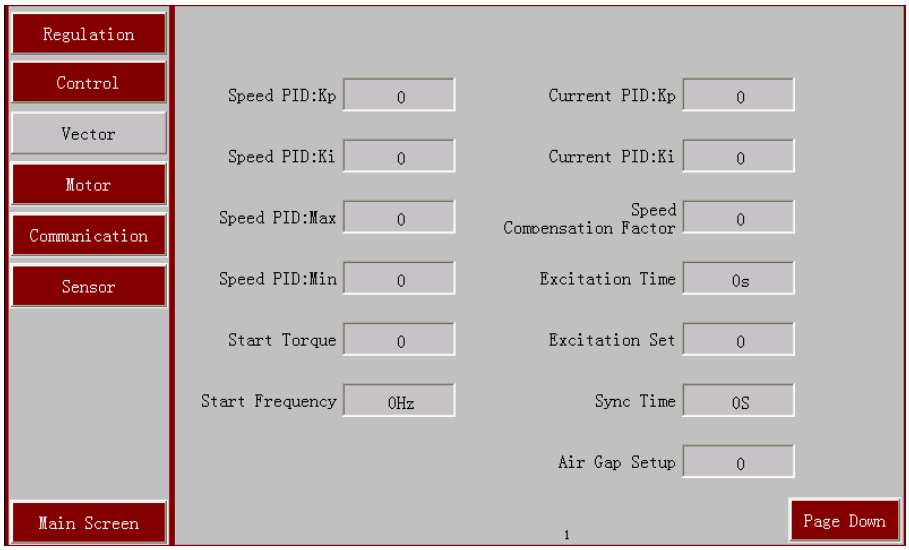


Fig.1-18Synchronous Motor Vector Parameters Window (1)

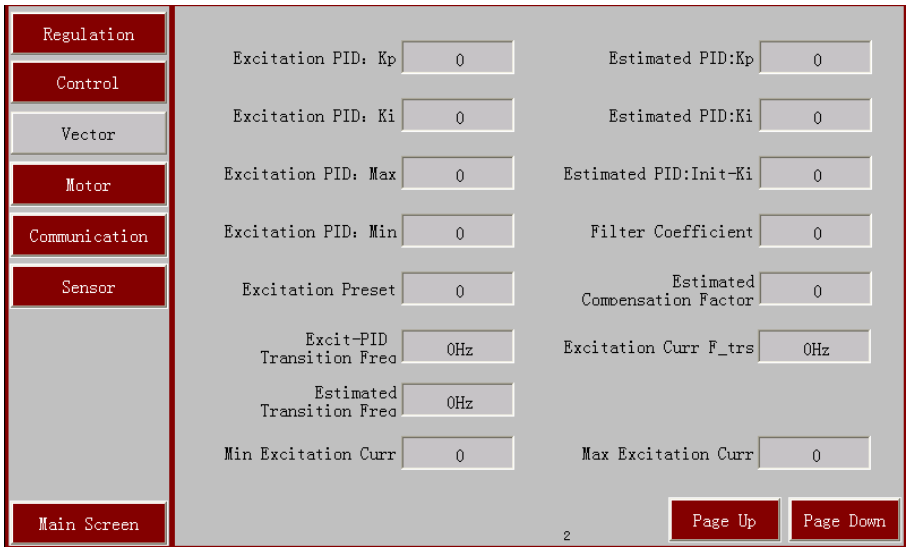


Fig.1-19 Synchronous Motor Vector Parameters Window (2)

The vector instantaneous starting parameter window is shown as Fig.1-20

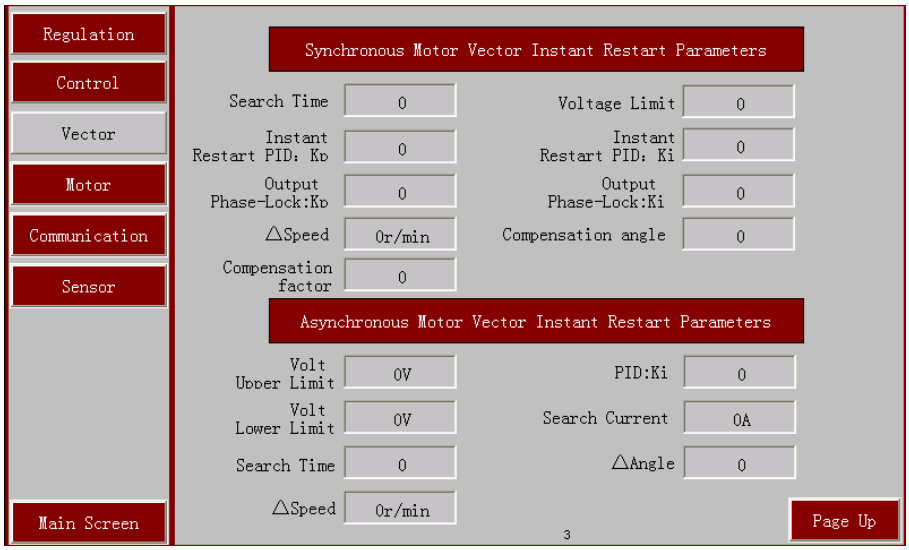


Fig.1-20 Vector Instantaneous Starting Parameter Window

1.3.4 Motor Parameters

Click the 'Motor' button on the Parameter Setup Screen to set the MVC motor parameters, as shown in Fig.1-21. Set according to actual MVC and motor nameplate.

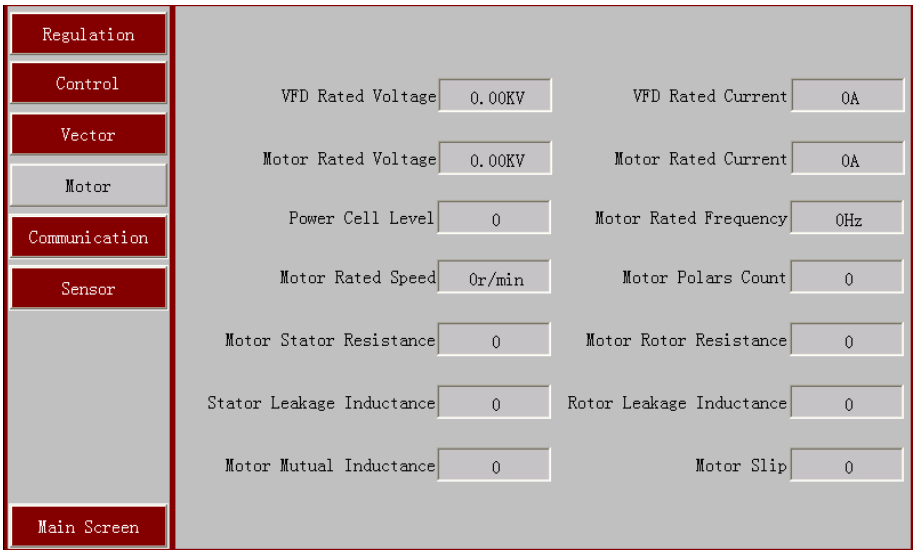


Fig.1-21Motor Parameters Window

1.3.5 Communication Parameters

Click the 'Communication' button on the Parameter setup Screen to set the MVC communication parameters, as shown in Fig 1-22:

For MODBUS protocol communication, the baud rate of2400, 4800, 9600, 14400, 19200, and 38400 are supported, the slave addresses (0-255) may be set to an integer value more than or equal to 0 and less than or equal to 252. The check modes are EVEN, ODD, NONE, i.e. even parity check, odd parity check, no check, corresponding values are 2, 1, 0.

For PROFIBUS protocol communications, The slave addresses may be set to an integer value more than or equal to 0 and less than or equal to 252.

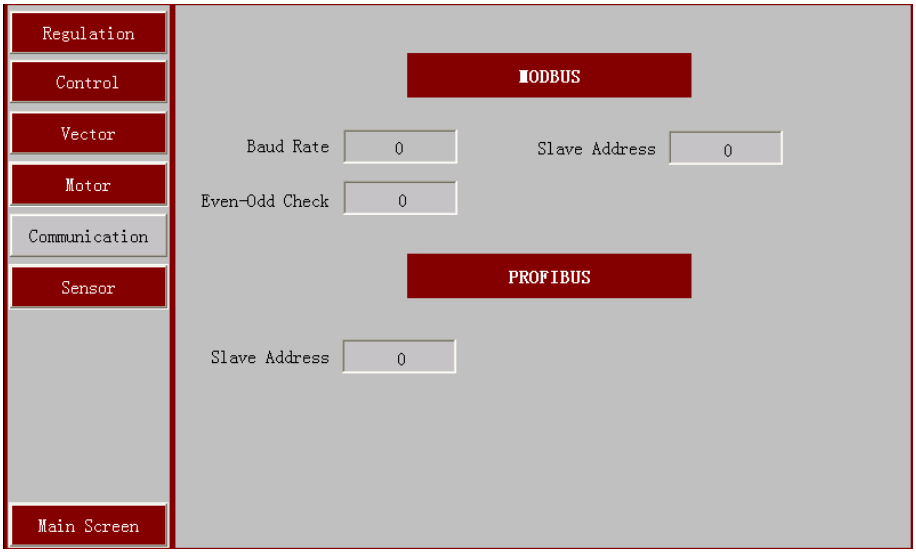


Fig.1-22 Communication Settings Window

1.3.6 Sensor/Measurement Range

Click the 'Sensor Measurement Range' button on the Parameter Setup Screen to set the MVC sensor parameters, click Page Down and Page up to flip over in each screen，as shown in Fig.1-23 and Fig.1-24:

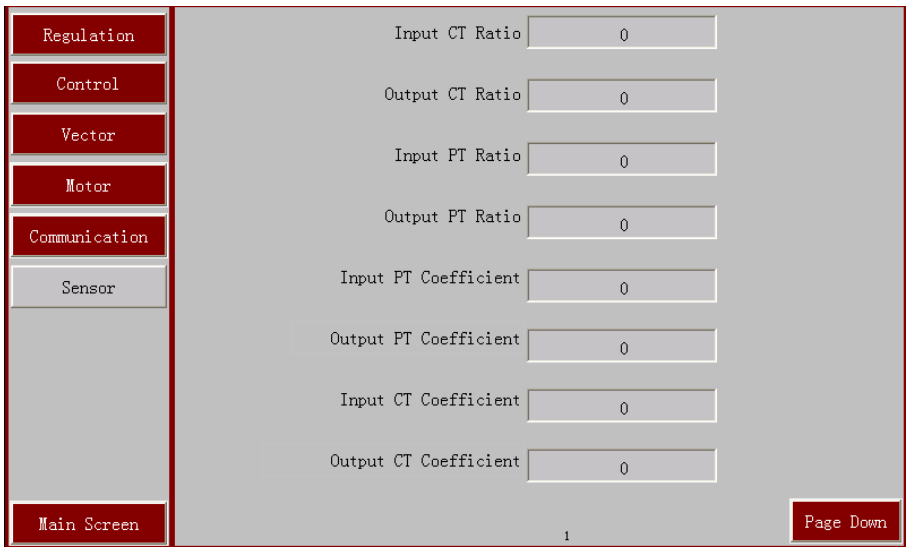


Fig.1-23 Sensor Setup Window (1)

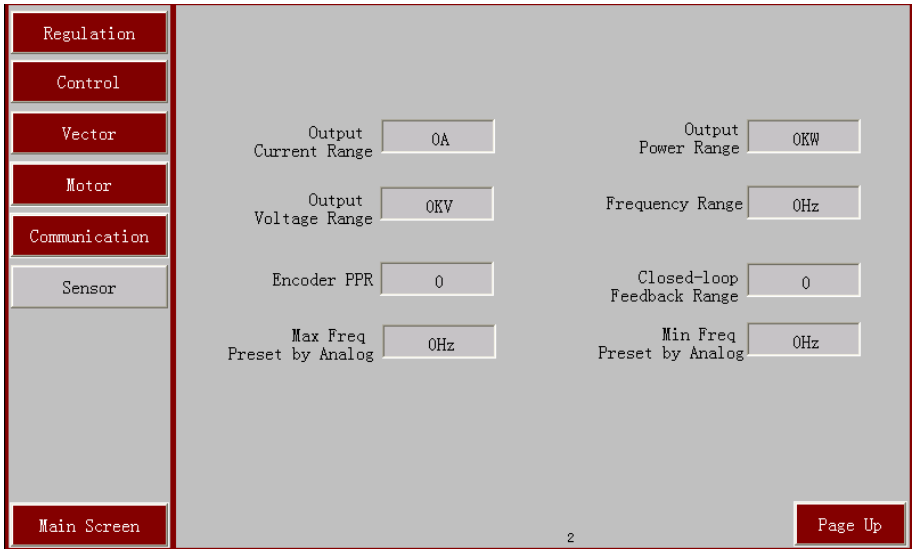


Fig.1-24 Sensor Setup Window (2)

1.4 Real Time Data Screen

Click the 'Real-Time' button on the main screen to enter the Real-Time Data Screen, as shown in Fig.1-25. The Real-Time Data Screen includes system state, inverter state, digital state, analog state, data state, synchronoscope and rectifier unit state. In the Real-Time Data Screen, click the 'Main Screen' to turn back to main screen. The access authority of the real data screen is granted to :commissioning personnel, administrator.

1.4.1 System State

Click the 'System State' button on the Real-Time Data Screen to view the MVC three-phase input voltage value, output voltage value, input current value, output current value, bus voltage value, the state of the input switchgear and the state of output switchgear, as shown in Fig.1-25:

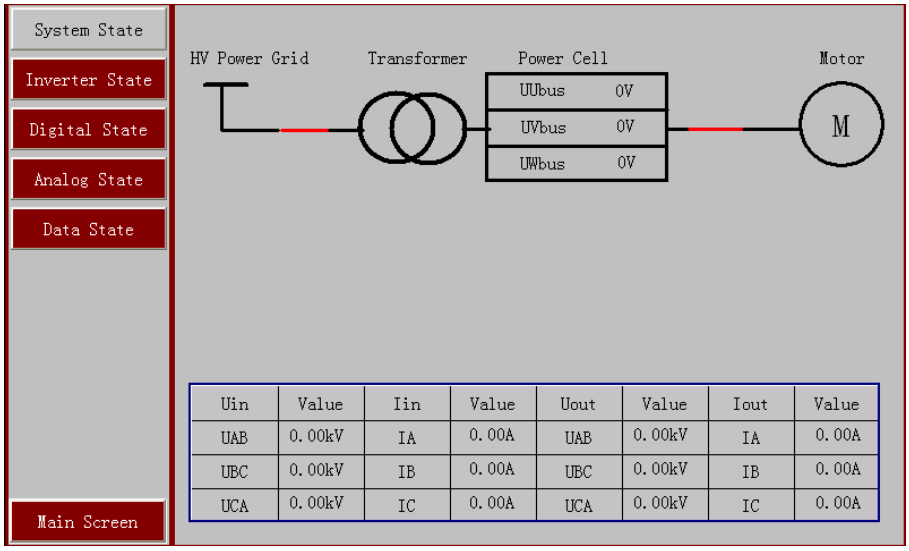


Fig.1-25 System State Screen

If a bypass cabinet is included in the MVC system, click 'Parameter -- Control – Page Down'

then click the button ‘Yes’ in the bypass breaker box; when the green check mark appears in the white box on the left of the button ‘Yes’, you can view the system state, as shown in Fig.1-26: Shows the bypass cabinet in a switching off state.

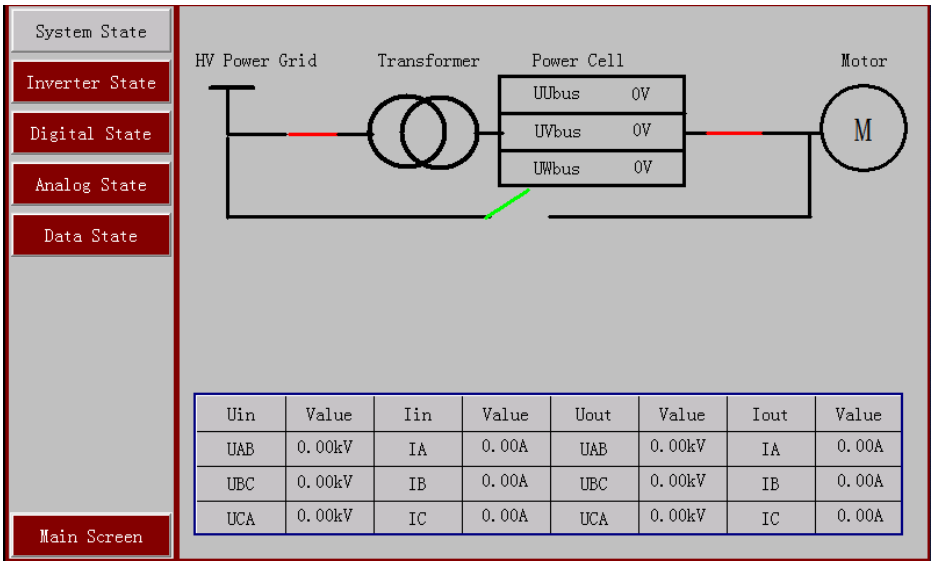


Fig. 1-26 System State Screen

1.4.2 Inverter Unit State

Click the ‘Inverter State’ button on the Real-Time Data Screen to view the inverter unit state, as shown in Fig.1-27:

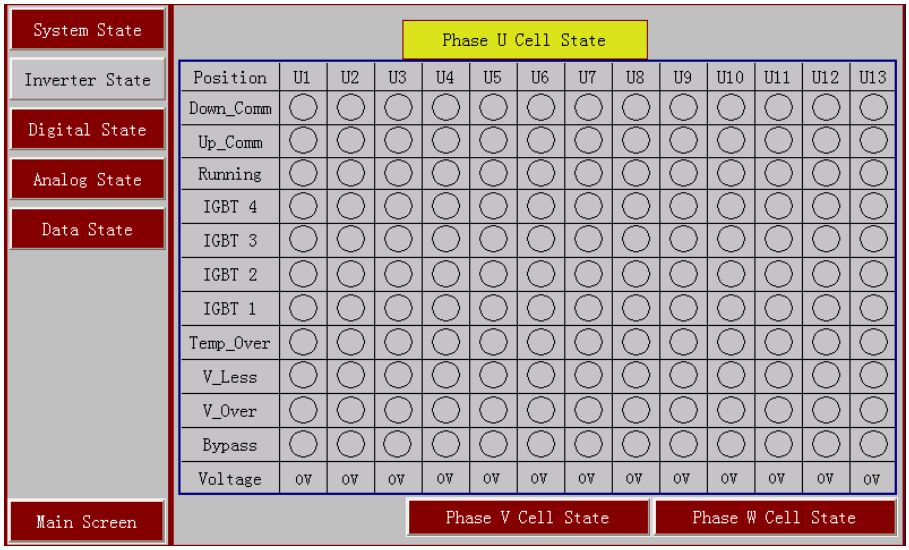


Fig.1-27 U Phase Inverter Unit State Screen

As shown in the figure above, when the inverter unit does not work, all of the corresponding icons in the table are grey. During normal operation of the inverter unit, units in an operating state have green icons and the rest of the units have grey icons. When a unit fails, the corresponding icons are red and the colour of the rest of the icons are grey. During the bypass operation of the

inverter unit, the operating state and unit bypass states have green icons and the rest of the units have grey icons. The unit voltage column displays current voltage values from the DC side of the corresponding inverter unit.

On this screen, click the 'Phase V Cells State' button to view the state of the phase V inverter unit and click 'Phase W Cells State' button to view the state of the phase W inverter unit.

For descriptions of the inverter unit state, see Table 1-2.

Table 1-2 MVC Inverter Unit State

Inverter unit state	Remarks
Down_Comm	The unit could not receive data from the optical fibre, shown red in the event of a fault
Up_Comm	Controlling machine could not receive data from the optical fibre, shown red in the event of a fault
Running	Indicate the state of running unit, green represents the unit in an operating state
No. 1- 4 IGBT	Indicator corresponds to an IGBT fault for a specific unit, shown red in the event of a fault
Temp_Over	The unit temperature exceeds the setpoint, shown red in the event of overtemperature
V_Less	Voltage on the DC side is lower than the setpoint, shown red in the event of undervoltage
V_Over	Voltage on the DC side is higher than the setpoint, shown red in the event of overvoltage
Bypass	Indicate the bypass position when the unit faults during MVC operation, green represents the unit is in bypass state

1.4.3 Digital Port State

Click the Digital State Button on the Real Data screen to view the digital input state and digital output state. Click Page Down and Page up to flip over in each screen. as shown in Fig.1-28:

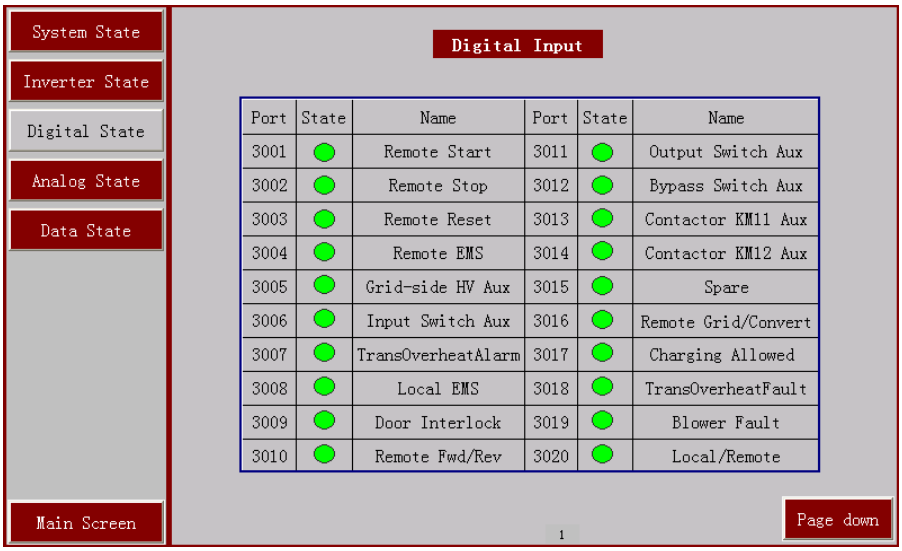
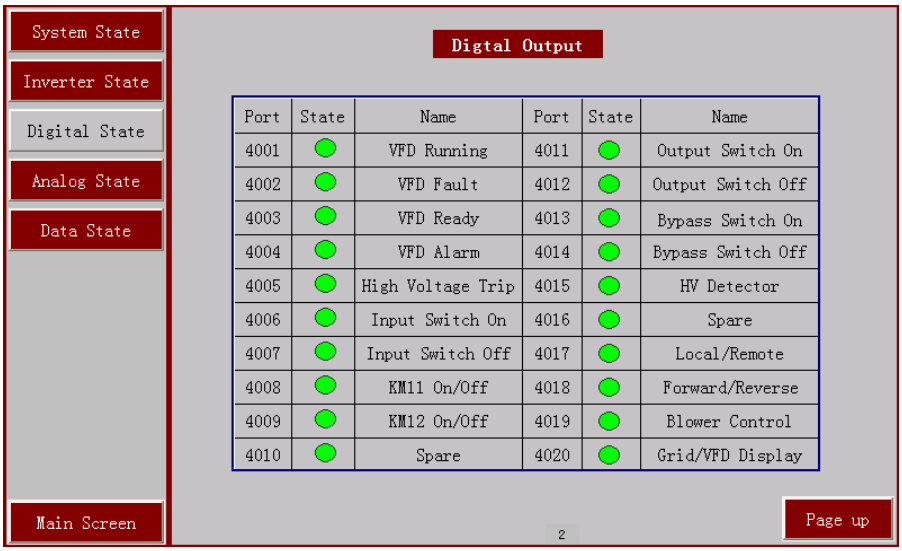


Fig.1-28 Digital Input State Screen

In Fig.1-28, the 20 digital inputs corresponding to the 20 input relays in the MVC are shown. When a green indicator light in a MVC relay illuminates, the corresponding Digital Input indicator icon is coloured green; when a green indicator light in a MVC relay is not lit, the corresponding Digital Input indicator icon is coloured grey. Input function shall refer to actual factory delivery

project design,all above only for reference.



Port	State	Name	Port	State	Name
4001		VFD Running	4011		Output Switch On
4002		VFD Fault	4012		Output Switch Off
4003		VFD Ready	4013		Bypass Switch On
4004		VFD Alarm	4014		Bypass Switch Off
4005		High Voltage Trip	4015		HV Detector
4006		Input Switch On	4016		Spare
4007		Input Switch Off	4017		Local/Remote
4008		KM11 On/Off	4018		Forward/Reverse
4009		KM12 On/Off	4019		Blower Control
4010		Spare	4020		Grid/VFD Display

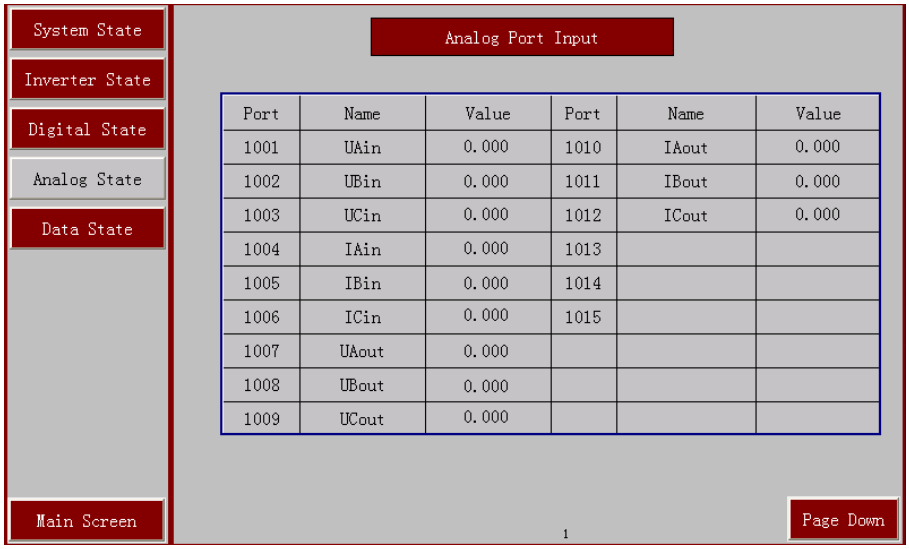
Fig.1-29 Digital Output State Screen

In Fig.1-29, the 20 digital inputs corresponding to the 20 input relays in the MVC are shown. When a green indicator light in a MVC relay illuminates, the corresponding digital Output State indicator icon is green; when a green indicator light of the MVC relay is not lit, the corresponding Digital Output state Indicator Lamp is grey. Output function shall refer to actual factory delivery project design,all above only for reference.

1.4.4 Analog Port State

Click the ‘Analog State’ button on the Real-Time Data Screen to view the MVC Analog Input State and Analog Output State. Click Page Down and Page up to flip over in each screen.

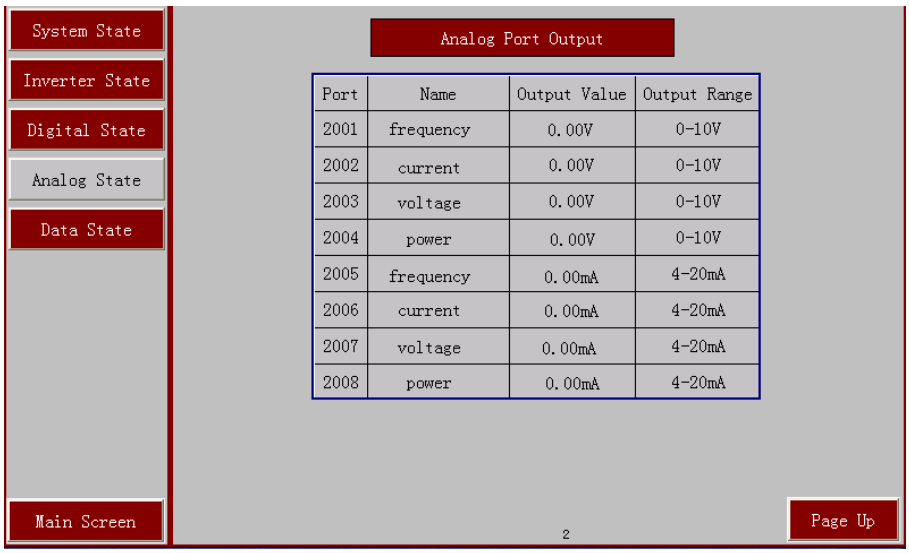
The port numbers ,port name and actual value of analog input port are listed in table on the Analog State screen. As shown in Fig.1-30: the 15 Analog Input channels and corresponding signal detection values are shown. Analog Input channels 1013, 1014 and 1015 are provided for analog input channel.



Port	Name	Value	Port	Name	Value
1001	UAin	0.000	1010	IAout	0.000
1002	UBin	0.000	1011	IBout	0.000
1003	UCin	0.000	1012	ICout	0.000
1004	IAin	0.000	1013		
1005	IBin	0.000	1014		
1006	ICin	0.000	1015		
1007	UAout	0.000			
1008	UBout	0.000			
1009	UCout	0.000			

Fig.1-30 Analog Port Input State Window

The port number, port name and actual value of analog output port are listed in table on the Analog State Screen. The 8 Analog Output channels, corresponding signal output values and corresponding signal output range value are shown in Fig.1-31.



Port	Name	Output Value	Output Range
2001	frequency	0.00V	0-10V
2002	current	0.00V	0-10V
2003	voltage	0.00V	0-10V
2004	power	0.00V	0-10V
2005	frequency	0.00mA	4-20mA
2006	current	0.00mA	4-20mA
2007	voltage	0.00mA	4-20mA
2008	power	0.00mA	4-20mA

Fig.1-31 Analog Port Output State Window

1.4.5 Data State

Click the 'Data State' button in the Real-Time Data Screen to view the MVC data state, as shown in Fig.1-32. As an example, some of the Real-Time Critical Data and Module Information for an industrial lift (load) MVC vector control is shown in Fig.1-32.

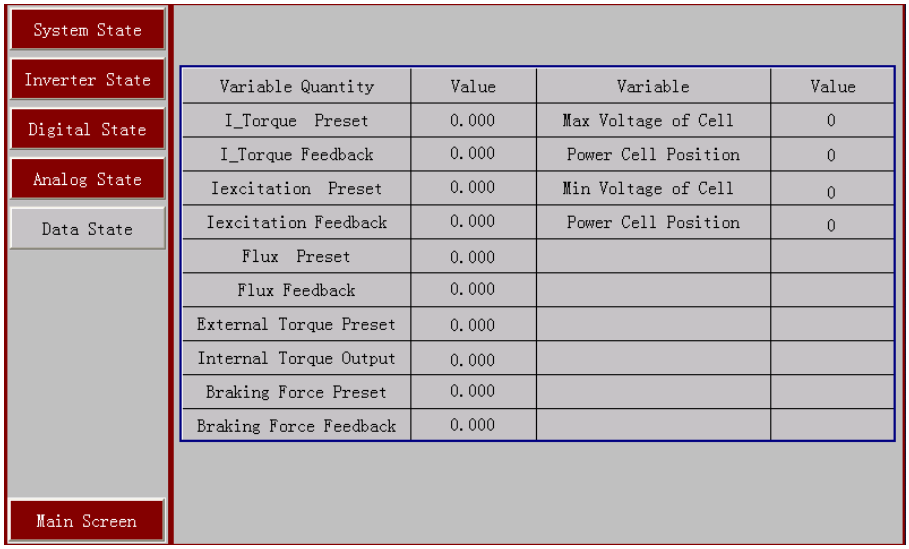


Fig.1-32 Data State Window

1.4.6 Synchronoscope

If the MVC is used on a site where the grid connection function is required, and the 'Grid-Connection' permission is set to 'Yes' in the 'System – Function' settings, then the Real Time Data Screen will display the 'Synchronoscope' button. Click the 'Synchronoscope' button to view the Synchronoscope State. As shown in Fig.1-33: the function of the synchronoscope in the figure is when the control system detects the MVC output voltage and grid voltage to be the same in the aspects of frequency, phase and amplitude. The middle synchronizing indicator above the synchronoscope will flash once instantly when within the allowable error range.

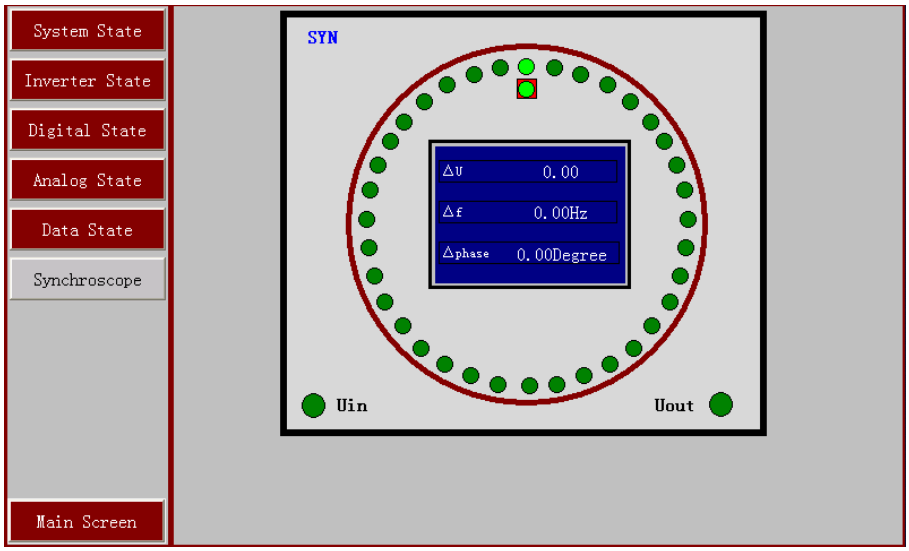


Fig.1-33 Synchronoscope

1.5 Historical Data Screen

Click the 'History 'button on the Main Screen to enter the Historical Data Screen as shown in Fig.1-34. Click the upper left button in History Data Screen to view the fault record, alarm record, operation record and running time of MVC; Click the Main Menu and return to the Home page.

The History Data Screen access authority is granted to: operator, commissioning personnel, and administrator.

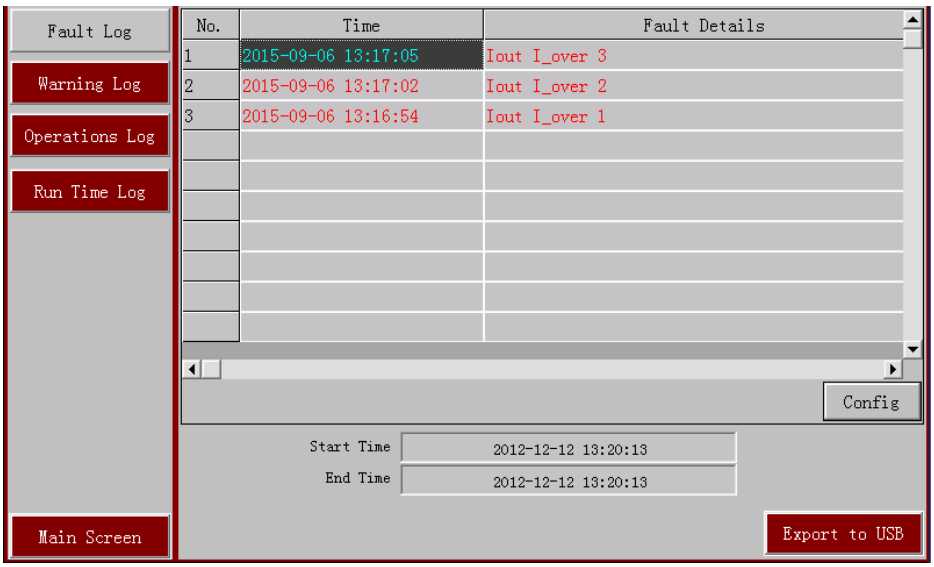


Fig.1-34 historical Data Screen

1.5.1 Fault History

Click the'Fault Log' button on the Historical Data Screen to view the MVC Fault History as shown in Fig.1-32. The Fault History includes the Fault No., Fault Time, Fault Content. The fault records are in date/time order

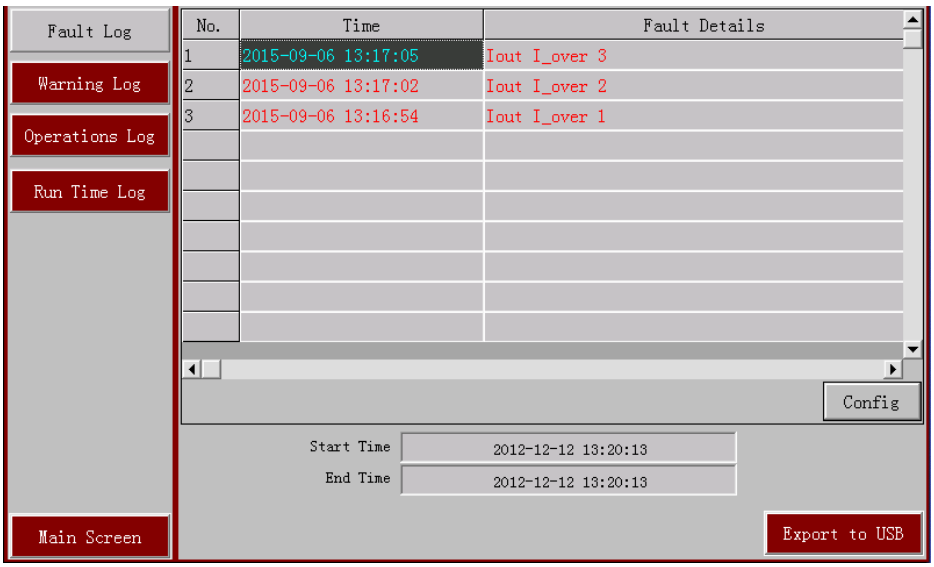


Fig.1-35 Fault History Window

In Fig.1-35, click the 'Start Time' or 'End Time' text will cause a time setting dialog box to pop up, as shown in Fig.1-36. The time value inputted should be consistent with that shown in Fig.1-36.

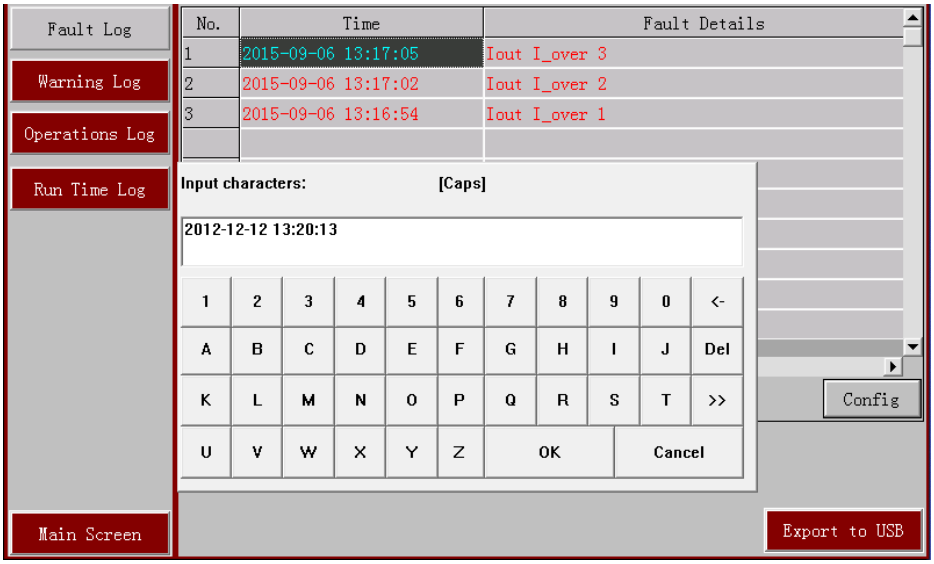


Fig.1-36 Time Setting Dialog Box

There is a 'USB Export' button in the Fault Record Screen. Insert a USB Memory into the touch screen, Choose a start and end time for the historical data that is to be exported, click the button 'USB Export', the touch screen will copy the fault records to the USB memory stick. The record will be stored in the USB in the type of .csv,it is able to check by Excel.

1.5.2 Alarm History

Click the 'Warning Log' button on the Historical Data Screen to view the MVC's warning history records, as shown in Fig.1-37. The alarm history records include: No., Time, Alarm Content. The warning history records are in date/time order.

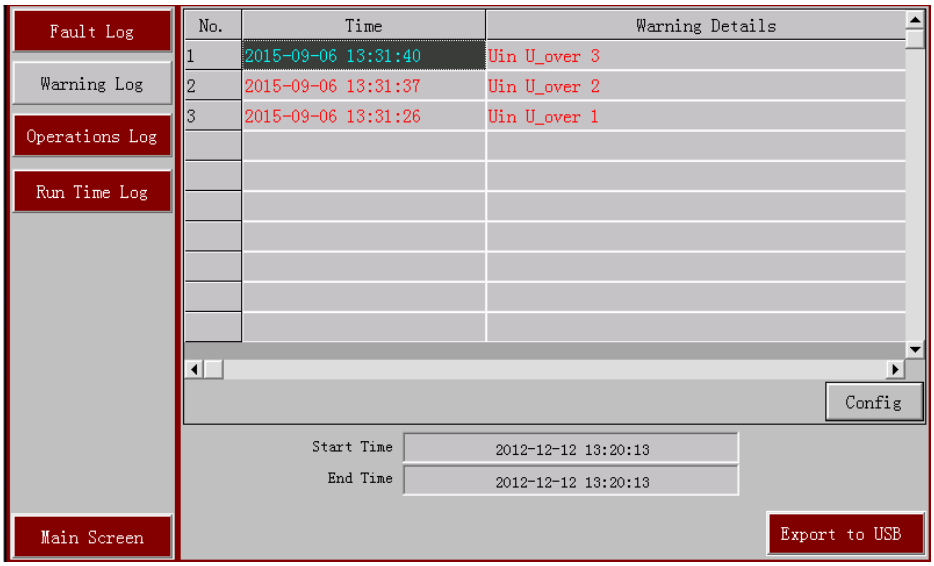


Fig.1-37 Alarm History Window

In Fig.1-38, click the 'start time' or 'end time' box, the time setting window will pop up, as shown in Fig.1-36. The time input should be consistent with that of Fig.1-36.

When a USB Memory Stick is inserted into the touch screen click the 'Start Time' or the 'End Time' text, a time setting dialog box will pop up, and then click the button 'USB Export', the

screen will copy the alarm records selected to the USB Memory Stick. The record will store in the USB in the type of .csv,it is able to check by Excel.

1.5.3 Operating Record

Click the ‘Operation Log’ button on the Historical Data Screen to view the MVC historical operating records, as shown in Fig.1-38. This includes, Record No., Time Operation occurred, Operation Contents The operating records are in date/time order

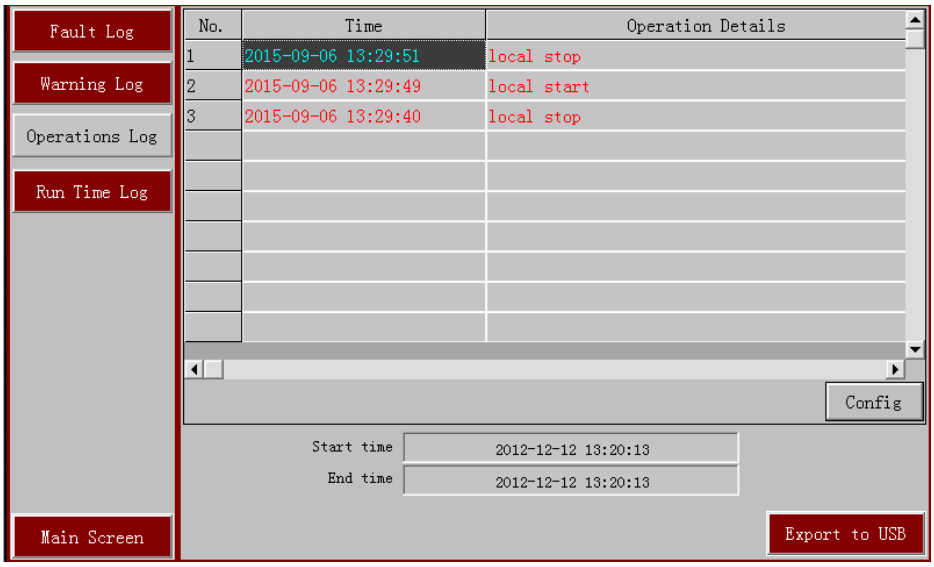


Fig.1-38 Operational History Window

In Fig.1-38, click the ‘Start Time’ or the ‘End Time’ text, a time setting dialog box will pop up, as shown in Fig.1-36. Time value input should be consistent with that in Fig.1-36.

Insert a USB Memory Stick into the touch screen, set the start time and end time of the historical data to be exported, then click the button ‘USB Export’, the touch screen will copy the operating records selected to the USB Memory Stick.

1.5.4 Runtime Log

Click the ‘Runtime Log’ button on the Historical Data Screen to view the MVC runtime information, as shown in Fig.1-39.

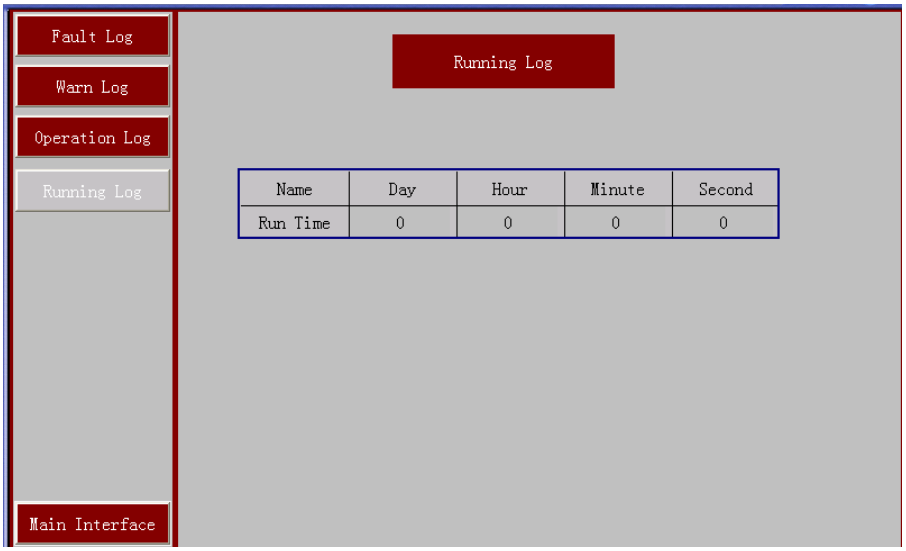


Fig.1-39 Runtime Log Window

1.6 Waveform Display Screen

Click the 'Wave' button on the main interface to enter the waveform display interface, as shown in Fig.1-40. On the waveform display interface, click the top left button to view MVC Instantaneous Curve, Operational Curve, Failure Record and click the 'Main Menu' button to return to the Main Screen.

1.6.1 Transient Curve

Click the 'Transient Curve' button on the Waveform Display Screen to view the MVC Instantaneous Curve. The Input Voltage Waveform is displayed in Fig.1-40

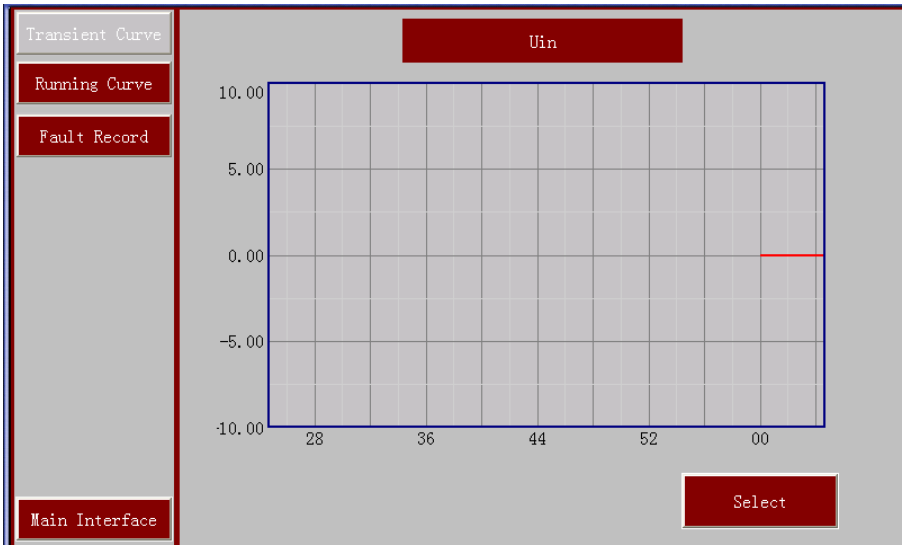


Fig.1-40 Transient Curve Window

In Fig.1-40, click the 'Instantaneous Curve Selection' button, the Instantaneous Curve selection dialog box will pop up. As shown in Fig.1-41, Click on the selection buttons to view various MVC instantaneous curves.

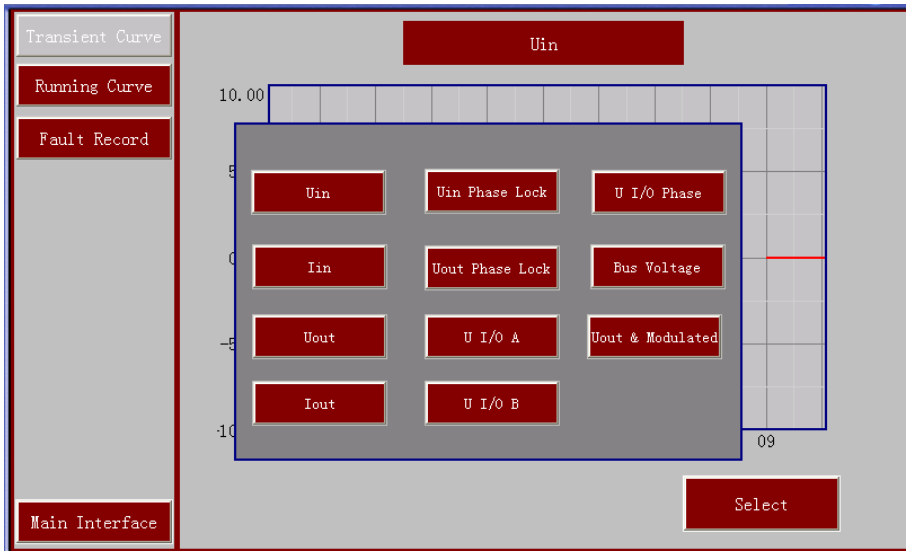


Fig.1-41 Transient Curve Menu Dialog Box

1.6.2 Running Curve

Click the 'Running Curve' button on the Waveform Display Screen to view the MVC Operational Curve., The Input voltage waveform is displayed in the Fig.1-42.

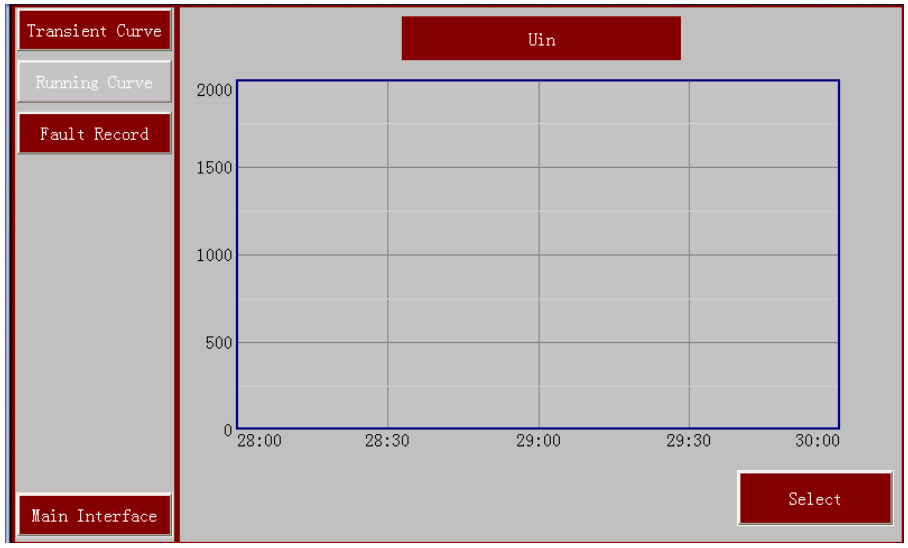


Fig.1-42 Running Curve Window

In Fig.1-42, click the 'Operational Curve Selection' button, the Operational Curve selection dialog box will pop up. As shown in Fig.1-43, Click Select buttons to view the various MVC operational curves.

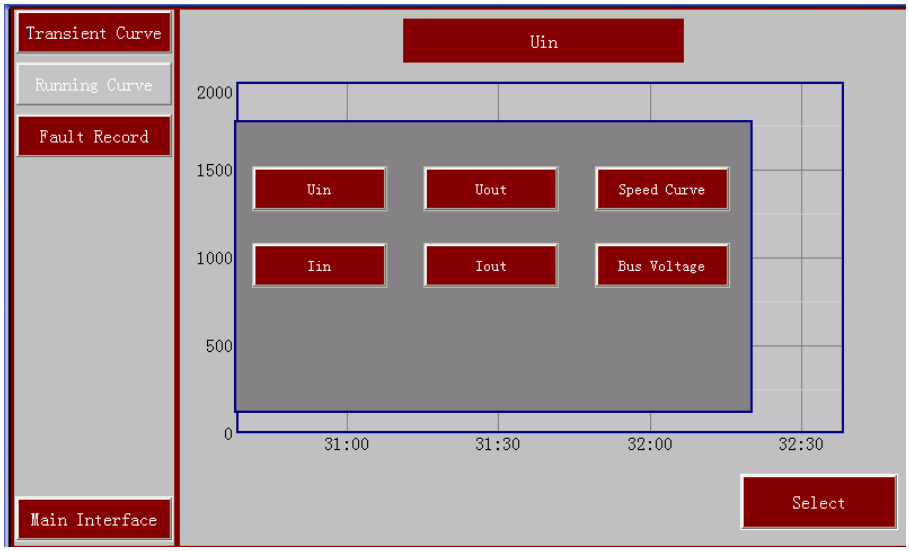


Fig.1-43 Running Curve Menu Dialog Box

1.6.3 Fault Record

Click the 'Fault Record' button on the waveform display interface to view a waveform of the physical quantities in the event of a MVC fault. The input voltage waveform in the event of a fault is displayed in Fig.1-44.

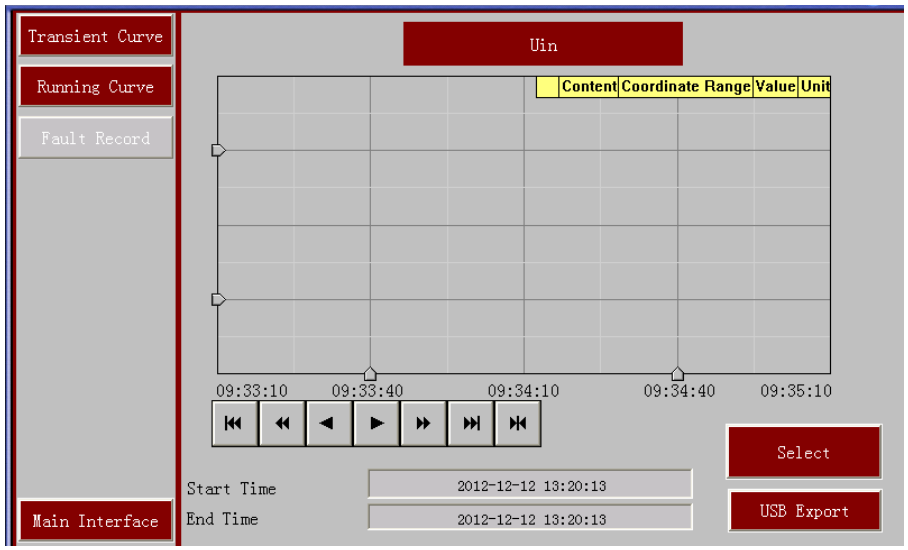


Fig.1-44 Fault Record Window

In Fig.1-44, click the 'Curve Selection' button, a fault curve selection dialog box will pop up. As shown in Fig.1-45, Click the 'Select' buttons to view the waveform curve in the event of a MVC fault.

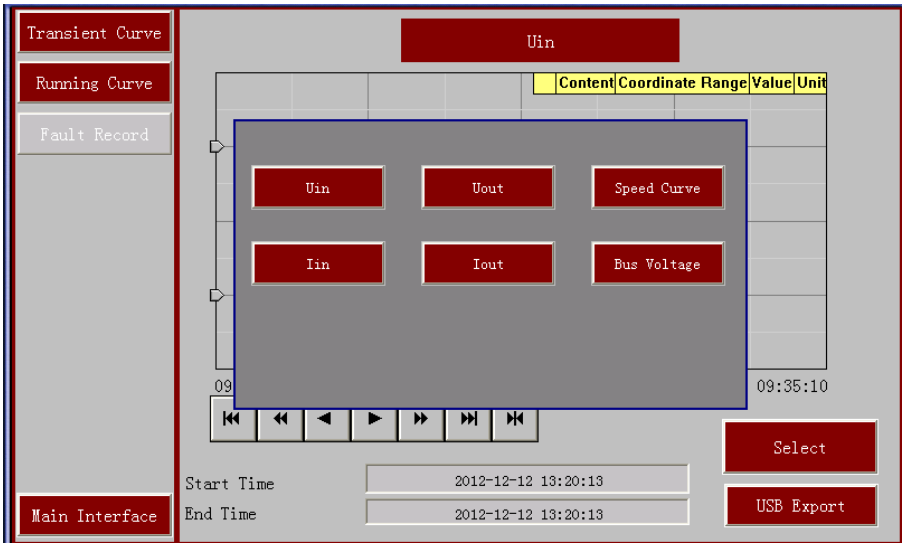


Fig.1-45 Fault Record Menu Dialog Box

In the failure record Screen shown in Fig.1-44, the following keys may be used to query recent data:

 Step back, move forward one screen.

 Step back, move forward 2 columns at a time.

 Step back, move forward 1 columns at a time.

 Step foward, move forward 1 columns at a time.

 Step foward, move forward 2 columns at a time.

 Step forward, move forward one screen.

 Click this button to set the start time of the curve.

1.7 Help Screen

Click the ‘Help’ button on the Main Screen to enter the Help Screen. User and on-site service personnel may view MVC service information such as Process Flow, Safety Info (Safety Information), Version (Version Information) Service Info (Service Information) by clicking the top left buttons, Return to the Main Screen ‘Main Menu’ button to return to the main Screen. Fig.1-46 Shows the Process Map Screen, Fig.1-47 Shows the Safety Information Screen, Fig.1-48 Shows the Version Information Screen,Fig.1-49 Shows the Service Information Screen. The access authority of Help Screen is granted to :monitor, operator, commissioning personnel and administrator.

The Operation Procedure screen describes in detail the operation sequence from start to stop of MVC, which is shown as Fig.1-46.

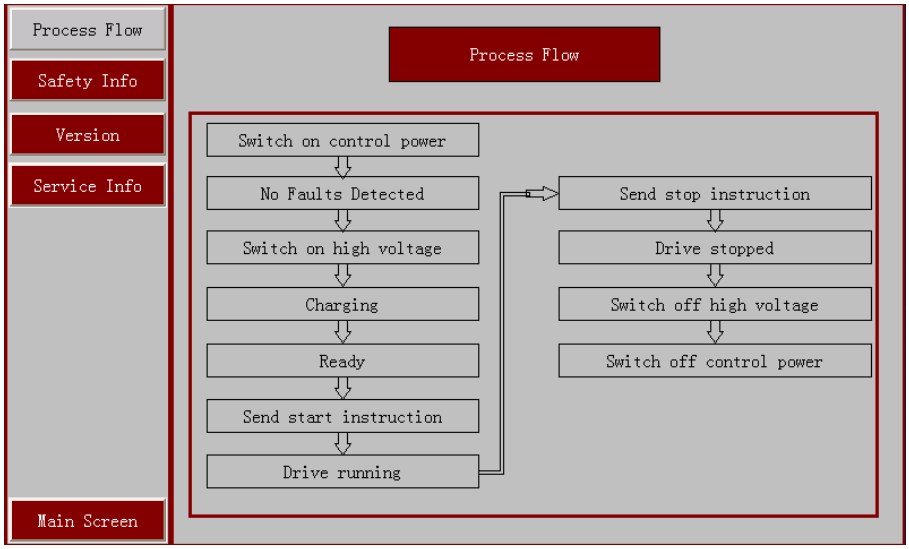


Fig.1-46 Process Flow

The Safety Info. Screen describes the main safety problem of MVC during installation and operation. which is shown as Fig.1-47.

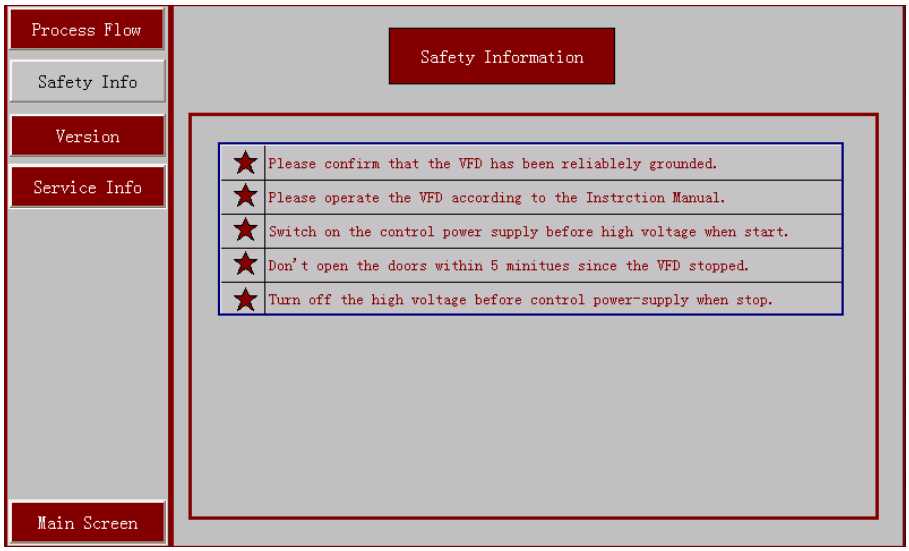


Fig.1-47 Safety Information

The Version Info Screen describes the CPU board and touch screen program version, for the convenience of commissioning personnel. which is shown as Fig.1-48.

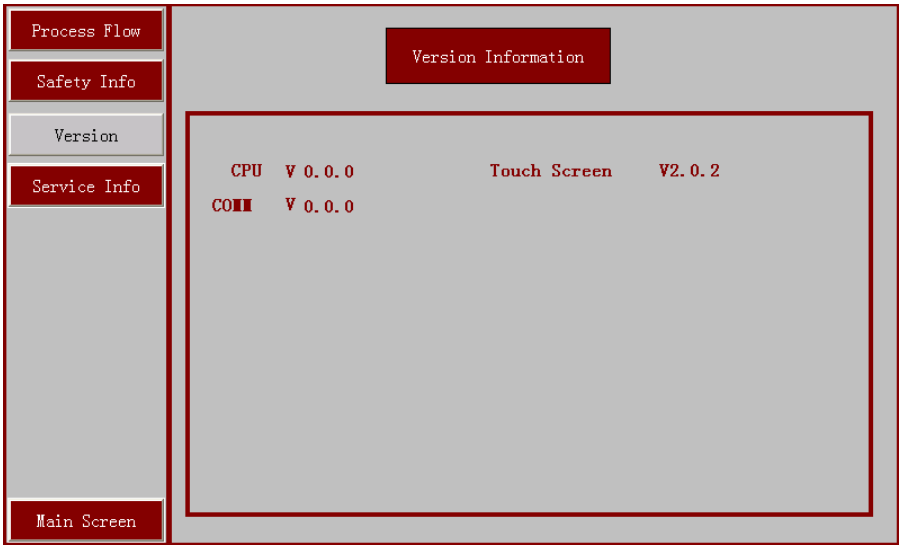


Fig.1-48 Version Information

The Service Info Screen describes the Tel and Fax of the technical support center, as well as the company address, which is shown as Fig.1-49 .

Fig.1-49 Service Information

2 Chapter 2 Trial Run

This section describes the series of steps required for a trial run.

2.1 Trial Run Steps

2.1.1 Check And Screw Fastenings

- Check all safety marks are present, ensure all cabinet components are without damage, ensure there is no foreign material present in the cabinet.
- Check all connections and wiring, ensure their connections are secure.
- Check all components are complete, the circuit boards should be connected securely and firmly.
- Check the retaining screws for each power unit are fastened tightly, check the optical fibres are inserted securely.

2.1.2 Connect Control Power Supply

Always confirm the following before connecting the control power supply:

- Check whether the control power supply is correct.
- Check there is a reliable connection between the control circuit terminals and the other control devices.
- Test whether the control supply voltage is normal.
- Force the cooling fan to run, confirm the following :-
  - The rotation direction is correct and consistent.
  - If there is any vibration.
- Check whether each control circuit Board is working normally and whether the touch screen and control device is operating normally.

2.1.3 Display Confirmation of State

After power on, view the state of the MVC on the Main Screen. The MVC will display fault or alarm information on the Main Screen when a fault or alarm occurs, and specific faults or alarms may be viewed via the Historical Data Menu. The Main Screen is shown in Fig.2-1.

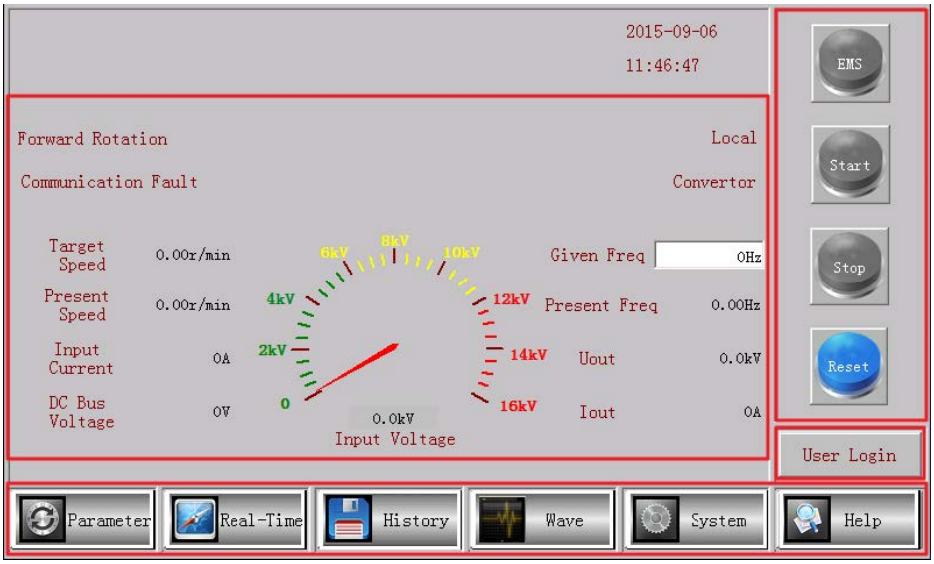


Fig.2-1 Main MVC Display Screen

2.1.4 Basic Parameter Settings

Set the basic parameters of the MVC

Table 2-1 Basic Parameter Settings

Item	Content
MVC Rated Voltage	Take kV as unit to set rated voltage of MVC
MVC Rated Current	Take A as unit to set rated current of MVC
Motor Rated Voltage	Take kV as unit to set rated voltage of motor
Motor Rated Current	Take A as unit to set rated current of motor
Motor Rated Speed	Take r/min as unit to set rated speed of motor
Motor Parameter Setting	Setting is required when vector control is adopted
Operating Instruction Selection	Local \ remote (digital\ communication)
Frequency Setting Selection	Local \ remote (analog \ communication)
AccelerationTime	The time required for 0Hz-50Hz
Deceleration Time	The time required for 50Hz-0Hz

2.1.5 Control Mode Selection

Select according to the control requirements

Control mode	With speed encoder/without speed encoder
VF	----
Vector	With speed encoder
Vector	Without speed encoder

2.1.6 Main Circuit Power Supply Connection

Attention
● Please connect main circuit power supply after confirming the MVC door state is closed. Please do not open the MVC door during the power on process, otherwise electric shock may occur.

Please always confirm the following items before connecting the main circuit power supply:

Make sure all switches are off

- Whether control power is supplied to the MVC.
- Check the MVC Main Circuit Terminals (A, B, C on the input side, U,V, W on the output side) are securely connected.
- Check whether the main circuit supply voltage is correct.
- In addition, please check the following items after connecting the main circuit power supply.

  Observe whether input voltage is normal on the screen

  Whether the MVC is normal

2.2 MVC Start Process

a. VFD with precharged circuit loop,start process is as below:

- Supply power to main circuit if there are no MVC faults.
- MVC enters charging stage.
- After the MVC has charged to certain bus voltage value, the incoming contactor is closed, and the MVC will be entered into MV charging stage and wait for MVC ready.
- If the MVC is started before it is ready,or the startup process will fail.

b. VFD without precharged circuit loop,start process is as below:

- Supply power to main circuit if there are no MVC faults.
- Close incoming contactor,MVC enters charging stage,wait for VFD ready.
- If the MVC is started before it is ready, or the startup process will fail.

2.2.1 Application Settings

MVC control functions are set according to the actual application requirements of the MVC, application setting examples are described below.

- To increase the speed of the motor at the rated operating frequency of 50Hz by 10%, the maximum operating frequency should be set to 60Hz.
- If the MVC output includes switchgear and other equipment, the ‘Output Breaker’ should be set to ‘Yes’ in functional configuration.
- When remote forward & reverse rotation is required, remote forward/reverse rotation should be set to ‘Yes’.

2.2.2 No-Load Operation

- When the motor is in the no-load state (the load device is separated from the motor), select the start mode and frequency setting as local (selected by using the MVC ‘Local/Remote’ ’control knob underneath the touch screen).

- After confirming the area in the vicinity of the machine is safe, operate the MVC locally (not remotely). Please check for normal rotation of the motor, and that no faults are displayed on the MVC.
- When it is unable to operate locally due to site operation condition, please proceed operation remotely after make sure E-stop loop or load machine safe device is normal.

2.2.3 Connection of Load Machine

- Check the connection of the motor shaft with load machine is secure.

2.2.4 Actual Load Operation

- Connect the motor to the equipment directly, and using the above-mentioned no-load operation, operate in local or remote mode.

2.2.5 Local Operation

- The same as no-load operation, please operate the machine in local mode.
- In order to prevent maloperation, always ensure the emergency stop operation is working correctly.
- Test the frequency setting of 10Hz at low speed.

2.2.6 Operating State Confirmation

- Please confirm whether the rotational direction of the load machine is correct in a low speed state, and whether the load machine operates smoothly after the frequency is increased.
- After the frequency or the rotation direction is changed, please check whether there is any vibration or abnormal sound from the machine.
- If a control fault occurs, such as vibration in the event of incorrect adjustment of the settings, please make corrections with reference to the ‘Adjustment Guide’.

2.2.7 Confirm And Save Parameter Settings

Check the parameters that were changed at the trial run stage, and confirm the changed parameters are saved (power down the controlling machine, then power on and check to confirm the parameters have been saved correctly).

3 Common parameter

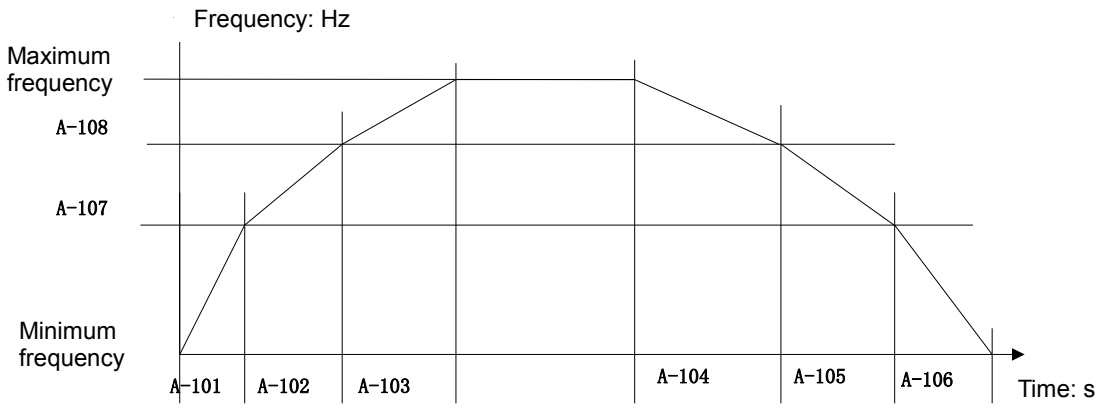
3.1 Parameter List

Name of the Parameter	Name of the Parameter
Parameter Group：Speed Control Parameter	
Acceleration1	Deceleration1
Acceleration2	Deceleration2
Acceleration3	Deceleration3
Transition frequency1	Transition frequency2
Min frequency	Max frequency
Parameter Group： Motor Parameters	
Variable frequency rated voltage	Variable frequency rated current
Rated voltage of the motor	Rated current of the motor
Number of MVC stages	Motor rated frequency
Rated speed of the motor	Motor number of pole pairs
Motor stator resistance	Motor rotor resistance
Motor stator leakage inductance	Motor rotor leakage inductance
Motor mutual inductance	Motor slip

3.2 Parameter Description List

Example [Acceleration 1]

Parameter No.	Parameter Name	Functional Description	Unit	Set Range	Factory Settings	Set During Operation	Control Authority	Remarks
A-101	Acceleration 1	The set time the MVC takes to rise from minimum frequency to transition frequency 1 in the speed up process.	S	0-2000	100	×	T/G	☆



1.Parameter Name :- Parameter name.

2.Functional Description :- The parameters function and setpoint.

3.Unit :- The setpoint unit.

4.Set range :- The set range of parameters, those parameters without a limited set range should be adjusted according to the site conditions.

5.Factory Settings :- Parameter factory settings, those parameters without fixed factory settings should be adjusted according to the site conditions.

6.Settings during operation:

○ :- Settable during operation

× :- Not settable during operation

- Control authority :-

J :- Person with the authority to monitor the running state of the MVC.

C :- Operator with the authority to operate the MVC.

T :- Commissioning personnel with the authority to commission the MVC and modify system parameters.

G :- Responsible person with the authority to modify the MVC control logic.

- Remarks:

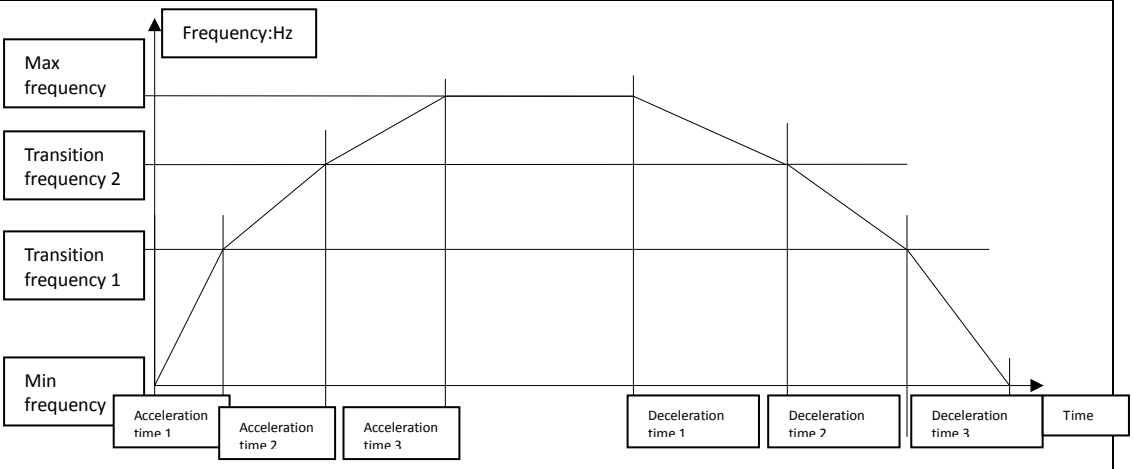
☆ :- Settings and modification of special parameters may be performed only after DNH assesses the site conditions, otherwise unforeseen consequences may occur.

- Chart or text that explains parameter functions.

3.3 Parameter List

3.3.1 Speed Control Parameters

Parameter Name	Functional Description	Unit	Set Range	Factory Settings	Set During Operation	Control Authority	Remarks
Acceleration 1	The set time of MVC to rise from minimum frequency to transition frequency 1 in speed up process.	S	>0	30	×	T/G	☆
Deceleration 1	The set time of MVC to drop from transition frequency 1 to minimum frequency in speed down process.	S	>0	30	×	T/G	☆
Acceleration 2	The set time of MVC to rise from transition frequency 1 to transition frequency 2 in speed up process.	S	>0	30	×	T/G	☆
Deceleration 2	The set time of MVC to drop from transition frequency 2 to transition frequency 1 in speed down process.	S	>0	30	×	T/G	☆

Acceleration 3	The set time of MVC to rise from transition frequency 3 to transition frequency 2 in speed up process.	S	>0	30	×	T/G	☆
Deceleration 3	The set time of MVC to drop from transition frequency 3 to minimum frequency in speed down process.	S	>0	30	×	T/G	☆
Parameter Name	**Functional Description**	**Unit**	**Set Range**	**Factory Settings**	**Set During Operation**	**Control Authority**	**Remarks**
Transition frequency 1	Frequency transition point 1 at which speed up/down time is changed in speed control process.	Hz		10	×	T/G	☆
Transition frequency 2	Frequency transition point 2 at which speed up/down time is changed in speed control process.	Hz		30	×	T/G	☆
							
Minimum frequency	Minimum frequency during the variable frequency operation.	Hz	0-50	10	×	T/G	☆
Maximum frequency	Maximum frequency during the variable frequency operation.	Hz		50	×	T/G	☆

3.3.2 Motor parameter

Parameter Name	**Functional Description**	**Unit**	**Set Range**	**Factory Settings**	**Set During Operation**	**Control Authority**
Variable frequency rated voltage	MVC rated input voltage value	KV	10000	×	T/G	☆
Variable frequency rated current	MVC rated input current	A	50	×	T/G	☆
Rated voltage of the motor	Motor rated operating voltage	KV	10000	×	T/G	☆
Rated current of the motor	Motor rated operating current	A	50	×	T/G	☆
MVC level	MVC unit level	level	8	×	T/G	☆
Motor rated	Motor rated frequency	Hz	50	×	T/G	☆

frequency						
Rated speed of the motor	Rated speed of the motor	R/min	1000	×	T/G	☆
Motor number of pole pairs	Motor number of pole pairs	Pair	4	×	T/G	☆
Motor stator resistance	Motor resistance	Ω	0.005	×	T/G	☆
Motor rotor resistance	Motor rotor resistance	Ω	0.005	×	T/G	☆
Motor stator leakage inductance	Motor stator leakage inductance value	Ω	0.11	×	T/G	☆
Motor rotor leakage inductance	Motor rotor leakage inductance value	Ω	0.12	×	T/G	☆
Motor mutual inductance	Motor mutual inductance value	Ω	2.7	×	T/G	☆
Motor slip	Motor slip value	Ω	0.005	×	T/G	☆

4 Chapter 4 Fault Diagnosis

4.1 Fault Query

When a Medium Voltage MVC shuts down due to a fault, the following method should be used for fault analysis:

- View the fault description on the control cabinet touch screen.
- Confirm the cause of the power unit fault from the indicator lights on the power unit board.
- Fault information may also be exported via USB to a PC for review.

4.2 Troubleshooting

The Rongxin RMVC series MVC has a perfect protection function so as to protect the equipment against damage under abnormal conditions. When the MVC is in a fault state, all IGBTs will be blocked, so that the motor has no power and will freewheel to a stop, the MCGS TPC saves and displays the fault record on the touch screen of the control cabinet.

When a MVC fails, the operator on site should record the input voltage, voltage on the DC side, output voltage, output current and fault information etc at the moment of the fault, and carry out a preliminary analysis based on the fault record.

4.3 Causes of Faults, Alarms And Their Remedies

Table 4-1 Fault Information Table

Fault Display	Type	Probable Fault Cause	Remedy
Primary Overvoltage	Alarm	Effective value of MVC input voltage exceeds the setpoint	1. Eliminate the factors that cause too high a voltage on the input side 2. Check voltage sensor and its wiring 3. Check sensor factorand the overvoltage level parameter settings 4. Replace the analog circuit Board, CPU circuit Board
Secondary Overvoltage	Alarm	Effective value of MVC input voltage exceeds the setpoint	
Tertiary Overvoltage	Fault	Effective value of MVC input voltage exceeds the setpoint	
Instantaneous Overvoltage	Fault	Effective value of MVC input voltage exceeds the setpoint	
Primary Undervoltage	Alarm	MVC input voltage is lower than the setpoint	1. Eliminate the factors that cause too low a voltage on the input side 2. Check the voltage sensor and its wiring 3. Check the sensor and the undervoltage level parameter setting 4. Replace the analog board card, CPU board card
Secondary Undervoltage	Alarm	MVC input voltage is lower than the setpoint	
Tertiary Undervoltage	Fault	MVC input voltage is lower than the setpoint	
Voltage Unbalance	Fault	Software detects the MVC input (line) voltage three-phase unbalance beyond the setpoint	1. Check the sensor and its wiring 2. Check whether the Grid side input three-phase voltage is balanced on site 3. Check the unbalance setting
Input Open Phase	Fault	One or more input medium voltage cable(s) could not supply power to the input transformer	1. Check sensor and its wiring 2. Check whether the open phase of higher level input voltage is true on site 3. Check the sensor setting

Ground Fault	Alarm	Software detects ground fault	It is generally caused by input grounding, find which phase is grounded, and eliminate this problem
Primary Overcurrent	Alarm	Motor current exceeds the setpoint and protection time	1. Too high load, reduce the load 2. Check sensor and its wiring 3. Check sensor factor, overcurrent level setting 4. Check the wiring from variable frequency output to the motor 5. Replace the analog board card, PWM board card, CPU board card
Secondary Overcurrent	Alarm	Motor current exceeds the setpoint and protection time	
Tertiary Overcurrent	Fault	Motor current exceeds the setpoint and protection time	
Instantaneous Overcurrent	Fault	Motor current exceeds the setpoint and protection time	
Motor Three-Phase Unbalance	Fault	Motor line is not connected to the MVC, current sensor is damaged or output voltage is unbalanced or other reasons	1. Check sensor and its wiring 2. Check the connecton lines for the motor and unit stage 3. Check unbalance setting 4. Replace the analog board card, bus board card, CPU board card
Transformer Overtemperature Alarm	Alarm	Transformer iron core temperature alarm temperature (generally 110℃)	1. Check whether the cooling fan works normally 2. Check whether ambient temperature is too high 3 Check whether in overload operating state 4. Check whether temperature parameter setting is correct or not
Transformer Overtemperature Fault	Fault	Transformer iron core temperature fault temperature (generally 130℃)	
Screen Communication Fault	Fault	Touch screen and CPU communication failure	1. Check the mobus terminal interface cable; 2. Check whether the connecting line of the RS485 interface is correct, secure; 3. Reset communication board or CPU; 4. Replace the CPU board card.
Contactor Fault	Fault	When the contactor is opened/closed, there is no auxiliary point feedback signal; Or the relay (contactor) is damaged, contactor adhesion occurs	1. Open back cover of the contactor auxiliary point, check whether auxiliary rod reaches the designated position after the contactor is closed 2. Replace the contactor 3. Check power module, protector tube, If there is any damage, replace the component 4. Check DC 220V power supply, 220V protector tube, if there is any damage, replace the component
Cabinet Top Fan Fault	Alarm or fault	Operating current of the fan in ventilation system is too high, thermal relay operates, alarm is given; if such state lasts continuously beyond the specified time, fault alarm will be given	1. Check whether thermal relay setting pointer knob is above 1.8A, if not, adjust to above 1.8A 2. Check whether protection parameter setting is correct 3. Check whether cooling fan is blocked or whether the fan is damaged
Charging could not meet target value	Fault	Unit voltage does not reach charging target value	1. The user connected too low a control power, standard 380V power supply should be used 2. Power unit is damaged, replace the power unit 3. Charging target value setup error

Unit upgoing, downgoing communication fault	Fault	Unit board card loses power, optical fibre is broken	1. Check whether power unit light illuminates normally 2. Replace the unit or replace the power unit control board card 3. Replace the PWM board card 4. Check the fuse, whether diode is damaged, replace the damaged components 5. Check whether fibre pigtail is inserted firmly, if optical fibre is damaged, replace it
Unit fault	Fault	Any unit fault will lead to this fault information, corresponding detailed fault information will be accompanied.	1. Eliminate corresponding fault, generally, this fault will not appear separately, it will be related to a specific fault 2. If there is no other fault corresponding to the unit, contact the manufacturer
Unit IGBT Fault	Fault	IGBT short circuit, open circuit or drive circuit fault might appear.	1. In overload operation, instant fluctuation occurs, reduce the load 2. Replace the power unit or power unit control board card. 3. Check whether the drive line is connected firmly 4. Replace the IGBT module
Unit Overtemperature	Fault	Temperature of the power unit radiator reaches 75 º, ventilation is poor or temperature switch is damaged.	1. Deal with the air duct 2. Check whether cooling fan is normal 3. Replace the power unit or power unit control board card 4. Replace the temperature switch 5. Deal with the system interference problem
Unit Undervoltage	Fault	Unit DC bus voltage is lower than 550V DC	1. Replace the power unit or power unit control board card 2. Check the fuse, whether diode is damaged, replace the damaged component 3. Check poor connection between the unit input terminal and cabinet body plug-in unit. 4. Check whether system input voltage is too low
Unit Overvoltage	Fault	Bus voltage in the unit exceeds 1200V DC. Generally this is caused by too high regenerative braking or out of control	1. Check V/F curve, acceleration time, Deceleration parameter setting 2. Check whether system input voltage is too High 3. Replace the power unit or power unit control board card
Medium voltage drop during operation	Fault	Input voltage is lower than the setpoint	1. Check power grid, and confirm the higher level HV switchgear is disconnected; 2. Check whether input voltage sensor is damaged.
The unit loses power during operation	Fault	When unit bus voltage is lower than the setpoint	1. Check unit board card; 2. Test the diode.
Cabinet door is not closed	Alarm	MVC cabinet door is not closed	1. Check whether all cabinet doors are closed; 2. Check whether the wiring of travel switch is correct.
Analog setting signal is missing	Alarm	Some analog input signals are not fed into the controlling machine	1. Check whether relevant signal lines are loose, confirm remote output; 2. Analog board is damaged.
Communication Board fault	Fault	Communication failure between the CPU and communication board	1. Check the communication board; 2. Board card is not inserted firmly.
Remote Emergency Stop	Fault	Remote emergency stop input signal is to low a level	1. Check whether the remote emergency stop button is engaged; 2. Remote emergency stop signal input line is loose; 3. Corresponding relay in the MVC is damaged; 4. Digital board or CPU board is damaged.
PWM Blockade	Fault	PWM fault	1. Wrong setting for the number of unit stage; 2. Unit fault.

Settings of the PWM Board and CPU Board are Inconsistent	Fault	The sent value and feedback value of the CPU and PWM are inconsistent	1. PWM board is damaged; 2. Back board is damaged; 3. CPU board shuts down or is damaged.
Encoder Signal is Missing	Alarm or Fault	Missing time of encoder signal exceeds the setpoint, alarm or fault will be reported	1. Check whether the pulse number is correctly set; 2. Check whether the encoder signal line is connected correctly; 3. The 15V encoder is not connected; 4. Replace the digital board or the CPU board; 2. Select a mode with speed encoding, start the VF or rotate the rotor to observe whether the operating speed is correct.
Overspeed	Fault	Difference in value between the set motor frequency and the operating frequency exceeds the set point	1. PID parameter settings are incorrect; 2. In multimachine drive, the host torque feedback signal line is loose or not connected to the slave correctly; 3. The motor rated speed parameter is not set.
Contactor Bypass Fault	Alarm or Fault	Faults or alarms such as bypass contactor, bypass communication, qty of bypass exceed the set limit, bypass enabling is inconsistent with the wave board, bypass is not ready etc, are all in this category	1. Check the bypass contactor control line is in good condition; 2. Check the bypass board; 3. Check the wiring between bypass and the unit; 4. Check bypass settings; 5. Update the wave board and CPU software; 6. Correct the bypass optical fiber.
Control power fault	Fault	Send fault when VFD control power supply is power off, shortage equal abnormal	1. Check the relay circuit (3015) loop; 2. Check control electric power supply circuit;

4.4 User Side Faults

4.4.1 User Power Supply Problems

- User voltage or input line voltage is too low.
- When high power charging mode is adopted, the user's low voltage is inconsistent with the medium voltage phase sequence.

4.4.2 Incorrect Operation By The User

- User does not use the MVC according to appropriate operating instructions.
- Brake ON and other conditions that prevent the variable frequency start of the motor or increase the variable frequency load and are not present during a normal start operation.

4.4.3 User Environmental Factors

- The user has a high temperature or unventilated installation site which can lead to over-temperature of the variable frequency transformer or power unit.
- The users site has powerful electromagnetic interference which can effect and even

block the communication between the various MVC components i.e. aluminium processing plant.

- User's grounding conditions are poor and medium voltage exists in the ground bar.