

Selectric

Energy of Innovation

Dynamic Voltage Restorer
User Manual

Selectric – SPV
(100-3150 kVA)

Equipment Safety Instructions

- Operate the dynamic voltage restorer strictly according to the Product User Manual.
 - The dynamic voltage restorer must be installed and maintained by personnel designated or authorized by the manufacturer.
 - Be aware of the high voltage inside the dynamic voltage restorer device! Unauthorized contact with the internal components of the dynamic voltage restorer device is prohibited
 - Observe the relevant national regulations and industry specifications for the installation and use of this equipment.
 - Do not block or obstruct the ventilation openings or cooling ducts with foreign objects to ensure proper heat dissipation during equipment operation.
 - Unauthorized opening of the dynamic voltage restorer casing or removal of any internal protective covers is strictly prohibited. The manufacturer assumes no liability for any unrepairable component damage resulting from such actions.
 - Ensure the protective earth (PE) is properly connected before connecting the power cable.
 - DC capacitors inside the dynamic voltage restorer (DVR) equipment may retain high voltage even after the mains power input is disconnected. To prevent severe hazards, operation must be performed strictly under the guidance of personnel designated or authorized by the manufacturer. To prevent damage and personal injury, perform all operations under the guidance of personnel designated or authorized by the manufacturer.
 - Install the dynamic voltage restorer device indoors, ensuring a controlled environment that meets the specified operating temperature and humidity requirements. During continuous full-load operation, the operating temperature of the dynamic voltage restorer device must be maintained below 40°C, and the relative humidity must be below 95% (non-condensing).
- ◆ The manufacturer reserves the right to modify product specifications without prior notice.

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1. SYSTEM OVERVIEW

1.1. Key Features

Dynamic Voltage Restorer Functions

The Dynamic Voltage Restorer (DVR) utilizes supercapacitors and lithium-ion batteries for energy storage. By adopting advanced power electronics conversion and digital control technologies, it provides a comprehensive voltage disturbance management solution. The system effectively mitigates transient voltage sags, swells, and short-term interruptions, featuring high stability, excellent reliability and superior efficiency.

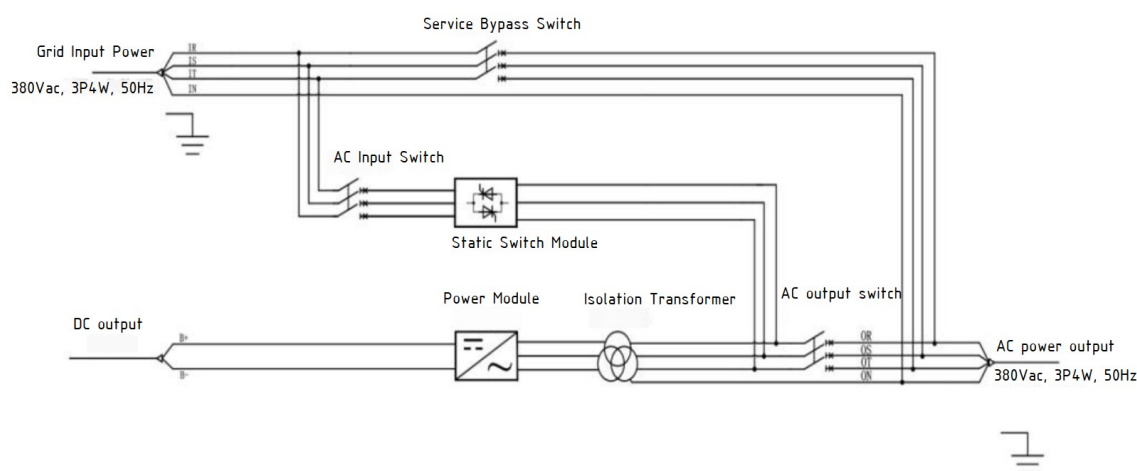
The main performance characteristics of the dynamic voltage restoration system are detailed below:

- 1) The high-efficiency inverter of the dynamic voltage restoration system utilizes IGBT modules and pulse width modulation (PWM) technology to provide continuous AC power delivery from the DVR device to the load. Optimizing and streamlining components during the design stage while maintaining system reliability and stability significantly reduces equipment size and weight. This minimizes material, production, and shipping costs, ultimately lowering the total cost for the customer.
 - 2) Isolated Output Design. The output of the dynamic voltage restorer incorporates an isolation transformer to isolate the inverter from the customer's load. This effectively reduces the grid's neutral-to-ground voltage on the load side and minimizes the impact of low-order harmonics and high-frequency interference on the DVR equipment load, preventing equipment damage that could otherwise affect customer operations.
 - 3) Dual-DSP Control Technology. To further enhance system reliability, a dual-core DSP controller is implemented in the DVR controls. One core is dedicated to processing critical data, while the other handles auxiliary and heavy data. This architecture ensures stable, reliable, and efficient operation of the dynamic voltage restorer, while providing maximum ease of operation.
 - 4) The system design of the DVR is foolproof to prevent equipment failure or damage caused by misoperation. The dynamic voltage restorer is equipped with input and output load break switch status sensors to prevent device damage resulting from human error.
 - 5) Intelligent Communication Interface. The dynamic voltage restoration system supports real-time control via a remote computer, allowing centralized management of up to 99 DVR units. The status, data and commands of each DVR unit can be transmitted to external modules and user's monitoring terminals via RS485 (primarily for long-range communication) or RS232 interfaces (for short-range communication). The remote-control panel (via RS485) provides the same real-time DVR operation monitoring function.
 - 6) Large capacity historical data storage. The timestamp and details of every abnormal event within the DVR operation is logged in the device. With a memory capacity supporting up to several thousand log entries, users can easily and intuitively assess the operating status of the dynamic voltage restorer equipment. All saved historical data is retained in non-volatile memory and will not be lost even when the dynamic voltage restoration equipment is disconnected from the power supply.
 - 7) User-friendly control panel. The dynamic voltage restoration system features a high-brightness, true-color industrial touchscreen. Its graphical user interface (GUI) provides a clear, real-time display of the system's operational status. The intuitive user interface enables operators to quickly check status, retrieve data and execute control commands.
 - 8) Intelligent Maintenance Bypass Design: The maintenance bypass system of the DVR utilizes smart control.
- 

A dedicated detection circuit ensures that if the maintenance bypass switch is closed during normal operation mode, the inverter output shuts down automatically. This fail-safe mechanism guarantees that misoperation of the bypass switch under any conditions will neither cause output power interruption nor damage the DVR. This design significantly simplifies equipment operation and eliminates the risk of severe accidents due to human error.

9) Ultra-Long Mean Time Between Failures (MTBF). All components used in the dynamic voltage restoration system have passed rigorous inspection and are properly derated to guarantee maximum system stability, reliable operation and safety.

1.2. System Architecture



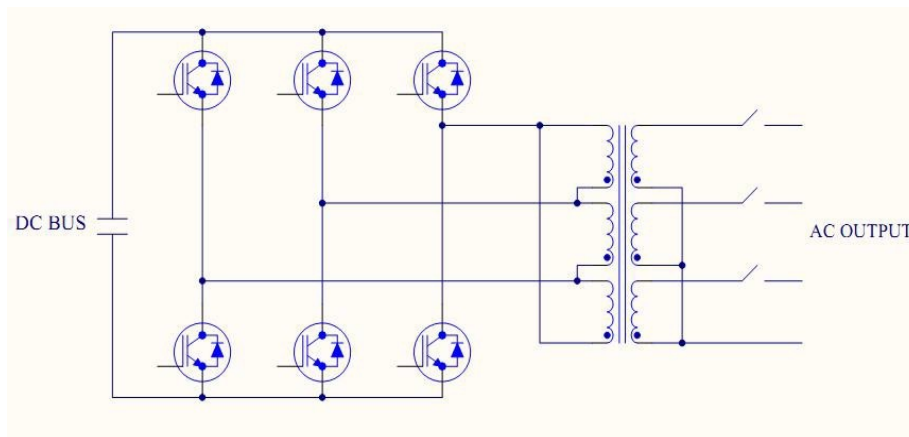
The basic system architecture is shown in the figure below. The unit comprises the following five key functional components:

- Charging device
- Inverter
- Static Bypass (AC Utility)
- Maintenance Bypass
- Output isolation transformer

The dynamic voltage restorer comprises an AC input breaker, a charger, an inverter, a supercapacitor, a manual maintenance bypass switch, an output filter and protection circuit, an output isolation transformer and an AC output breaker. In the event of a mains power failure, energy storage components such as supercapacitors deliver power via the inverter to provide AC output, effectively ensuring the continuity of the system's power supply.

All components are covered in detail in the subsequent chapters of this manual.

1.3. Inverter



- The primary function of the inverter is to convert DC power from the energy storage system into AC power to supply the load.
- Low Waveform Distortion: $\text{THDv} \leq 1\%$ with linear loads, and $\text{THDv} \leq 3\%$ with non-linear loads.
- Ultra-High Accuracy (Tolerance): Voltage accuracy $\leq \pm 1\%$, frequency accuracy $\leq \pm 0.1\%$.
- Excellent Dynamic Response: in steady-state or transient conditions AC output voltage accuracy is $\leq \pm 1\%$ with a recovery time of ≤ 10 ms, frequency accuracy is $\leq \pm 0.1\%$.
- 100% Unbalanced Load Capability: The inverter utilizes a three-phase half-bridge topology combined with a wye (Y) transformer, allowing it to support a 100% unbalanced load. The output voltage accuracy is maintained at $\leq \pm 1\%$ under balanced load conditions and $\leq \pm 2\%$ under a 100% unbalanced load.

1.4. Charging Device

- A modular charging module is adopted to facilitate capacity expansion and maintenance.
- High-frequency charger delivers high conversion efficiency and rapid response.

1.5. Static Bypass Switch

- The static bypass switch enables a seamless load transfer between the AC mains power supply and the inverter power supply, ensuring zero-break output from the dynamic voltage restorer. The static switch is a critical component for the dynamic voltage restorer (DVR) device.
- Since a detection circuit is integrated into the control system and a high-speed thyristor component is used as the core element of the static switch, the AC mains power and the inverter output can be switched rapidly.

1.6. Maintenance Bypass

For ease of operation, this equipment series features an internal maintenance bypass. The maintenance bypass switch must only be closed when performing maintenance or service on the dynamic voltage restorer device.

If the maintenance bypass switch is closed during inverter operation, the detection circuit transmits the switch's closed-position signal to the DVR control system in real time. The control system then issues an

immediate shutdown command to the inverter to prevent a short circuit between the mains input and the inverter output. Concurrently, the dynamic voltage restoration system seamlessly switches to 'maintenance bypass mode' without disturbance, delivering the AC mains power directly to the load via the maintenance bypass line.

When maintenance or major repair is required, refer to Section 3.3.3, “Operating Procedure for Transferring the System to Maintenance Bypass Mode”.

Warning!

To ensure the safety of service personnel, once the unit is in 'maintenance bypass mode,' you must ensure that the DVR AC input switch (Input), AC output switch (Output), and the DC switch of the supercapacitor cabinet or other energy storage devices are completely isolated before performing any maintenance procedures.

Since residual high-voltage energy remains within the internal energy storage system, allow at least 5 minutes for discharge before performing maintenance on any internal components of the dynamic voltage restorer.

If a supercapacitor is used as the energy storage and the cabinet is equipped with a DC switch, be sure to disconnect the DC switch before maintenance. If the cabinet is not equipped with a DC switch, be sure to wait until the supercapacitor energy is fully discharged before allowing any maintenance operations!



2. INSTALLATION

2.1. Installation Instructions

Transportation and Storage of Equipment

Upon delivery to the site, visually inspect the equipment and its external packaging for any transit damage, surface scratches, or other defects. Document any identified damages immediately. If the equipment is not to be installed immediately upon receipt, store it in accordance with the guidelines specified below.

- Store the equipment in a well-ventilated and dry indoor environment, protected from direct sunlight and rain. Do not store the equipment in corridors or walkways. Store the equipment away from moving machinery to prevent mechanical damage.
- If the original packaging of the Dynamic Voltage Restorer has been removed upon receipt, store the DVR in a well-ventilated and clean place away from heat sources and electromagnetic radiation.

Handling Operations

The Dynamic Voltage Restorer is a complex electronic device; therefore, it is recommended that only experienced personnel operate forklifts for loading and unloading operations. To handle the equipment, ensure the unit is securely fastened to prevent any collisions with other objects while the forklift is in motion.

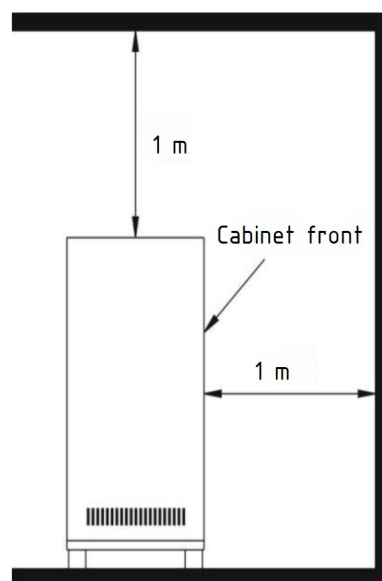
2.2. Site Selection and Environmental Conditions

The primary function of the Dynamic Voltage Restorer is to provide a safe, clean, and reliable power supply to the load. In the event of a mains power interruption, the energy storage element rapidly takes over from the rectifier to supply DC power to the inverter, ensuring an uninterrupted output.

Generally, the design life of the Dynamic Voltage Restorer (DVR) exceeds 30 years. Therefore, selecting an appropriate installation and operating environment for the DVR, along with meticulous maintenance in compliance with the operating rules, ensures warranty fulfillment and effectively extends its service life.

Carefully read the following precautions, site selection criteria, and environmental recommendations:

- a) Install the DVR in a well-ventilated location. If the unit is installed indoors, carefully evaluate its heat dissipation characteristics and maintain adequate clearance around and on top of the unit.



- b) As shown in the figure, to allow full opening of the main door during maintenance and repair a space of at least one meter must be maintained in front of the DVR; a clearance of one meter must also be provided above the DVR to ensure proper heat dissipation.
- c) Do not place foreign objects on top of the unit to avoid blocking the heat dissipation vents. Do not locate the unit near heat sources and prevent the ingress of iron filings, airborne particles, corrosive substances or vapors.
- d) Ensure that the operating ambient temperature and relative humidity for the DVR comply with the rated requirements of the DVR. The standard operating temperature range for the equipment is -5°C (23°F) to 40°C (104°F). To ensure system reliability, operational stability and maximum service life, it is recommended to operate the equipment indoors with a temperature range of 0°C to 25°C and relative humidity below 80%.
- e) If the unit is installed outdoors, protect it from direct sunlight, rain, sand and dust ingress.
- f) The installation floor must have sufficient load-bearing capacity for the equipment. The equipment can be fixed on the floor using four corner brackets to prevent the unit from tipping or shifting during earthquakes or other unforeseen events. During transportation, the unit must be secured on a pallet.
- g) The walls, ceilings, floors, and other structural elements of the electrical room containing DVR must be constructed of non-combustible materials. Fire extinguishers must be placed in the immediate vicinity of the equipment.
- h) Place the unit in a clean, controlled environment to prevent the ingress of metallic particles, debris, or other foreign objects that could cause a short circuit or equipment failure.
- i) Access to the electrical room must be strictly restricted; therefore, the room must be equipped with a key-controlled entry system. Only authorized operating or maintenance personnel can be granted access to this room.
- j) All personnel operating the unit must be properly trained and familiar with both normal and emergency operating modes. Personnel commencing work with the unit must be trained and assessed to verify their knowledge and competence.

2.3. Unpacking Instructions

Carefully remove the equipment packaging and install the unit in accordance with the recommendations specified in Section 2.2.

The Dynamic Voltage Restorer (DVR) has successfully passed all required factory tests. Upon receipt of the equipment, thoroughly inspect it to ensure that no damage has occurred to the coating or mechanical components during transportation.

Ensure that all accessories are complete. If optional items are included, cross-check them thoroughly against the order list. The list of standard enclosed items:

- Main enclosure door key
- Product User Manual
- Factory Test Report
- Drawings Package

Double check that the following main technical parameters of the equipment comply with the order requirements:

- DVR rated capacity
- Input voltage and frequency
- Output voltage and frequency
- Number of output phases (3 or 1)
- DC input voltage specifications

2.4. Terminal Connections

The terminal layout specifications for the equipment vary accordingly based on the rated capacities and input/output phase configurations. Verify the corresponding terminal layout specifications and connection methods according to the rated capacity and input/output phase configurations of the unit purchased.

Terminal connections must be executed using dedicated flame-retardant copper cables that comply with international standards and meet the requirements of relevant regulatory documents. All wiring operations must be performed by the manufacturer's service engineers or qualified end-user technicians trained by the manufacturer.

WARNING!

High currents flow through the terminal blocks during operation. Do not remove the front cover of the main unit to work on the terminals without proper authorization. Ensure the system is fully isolated from all power sources before any wiring operations are performed by qualified professionals.

Please note that the terminal block layout and specific pin assignments are subject to change depending on individual project requirements. In this regard, the actual terminal wiring diagram shall prevail.

Appendix: Wiring Identification Instructions (This table represents a general layout; the actual definition depends on the specific model)

Serial number	ID / Label	Description	Serial number	ID / Label	Description
1	IN	AC Mains Input Neutral Line	9	B+	Battery/ DC input positive
2	IR	R-phase, AC mains input	10	B+	Battery/ DC input negative
3	IS	S-phase, AC mains input	11	GND/PE	Ground wire
4	IT	T-phase, AC mains input	12		
5	ON	Neutral, system output	13		
6	OR	R-phase, system output	14		

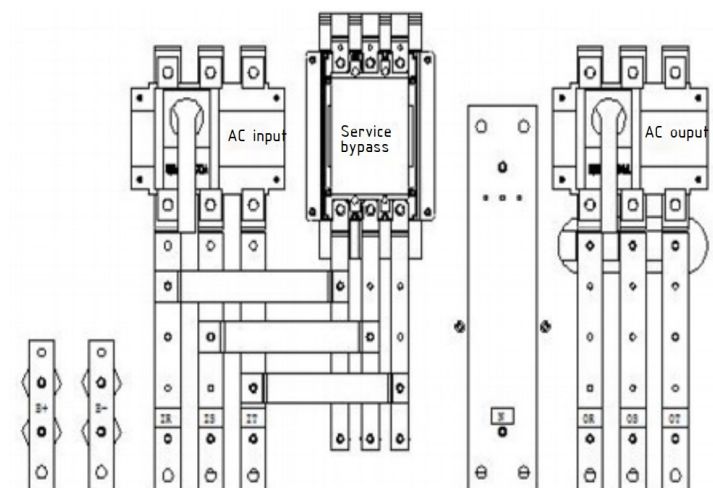
7	OS	S-phase, system output	15		
8	OT	T-phase, system output			

2.5. Architecture of Dynamic Voltage Restorer

A. 100kVA~ 250kVA

1. AC Input terminal
2. Service bypass input terminal
3. AC output terminal
4. AC Input terminal

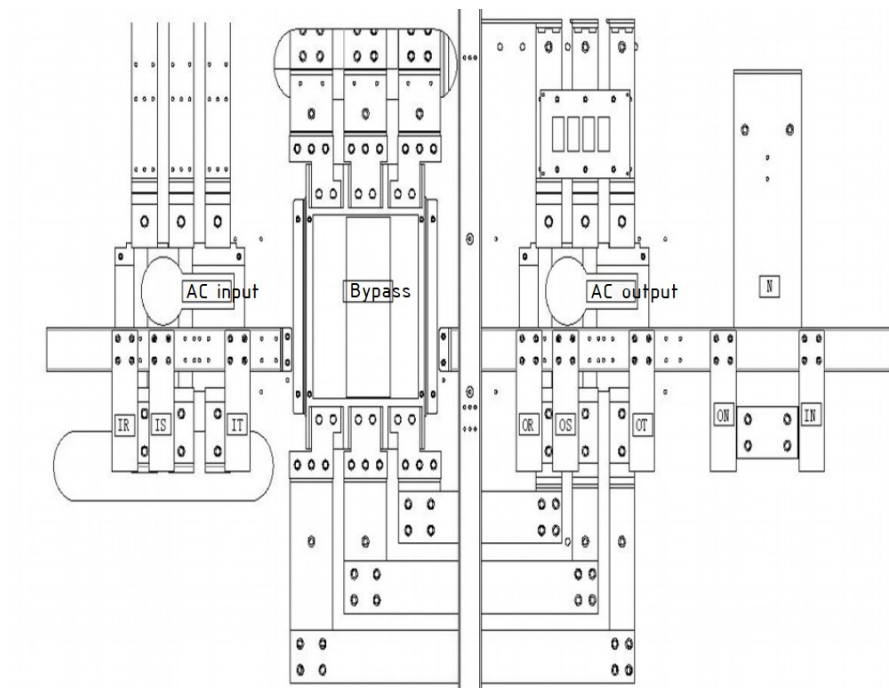
3-phase 3-wire (3-phase 4-wire) input/ 3-phase 4-wire output



B. 300kVA~ 1000kVA

1. AC Input terminal
2. Service bypass input terminal
3. AC output terminal

3-phase 3-wire (3-phase 4-wire) input/ 3-phase 4-wire output



3. OPERATION MODES AND CONTROL PANEL

Overview

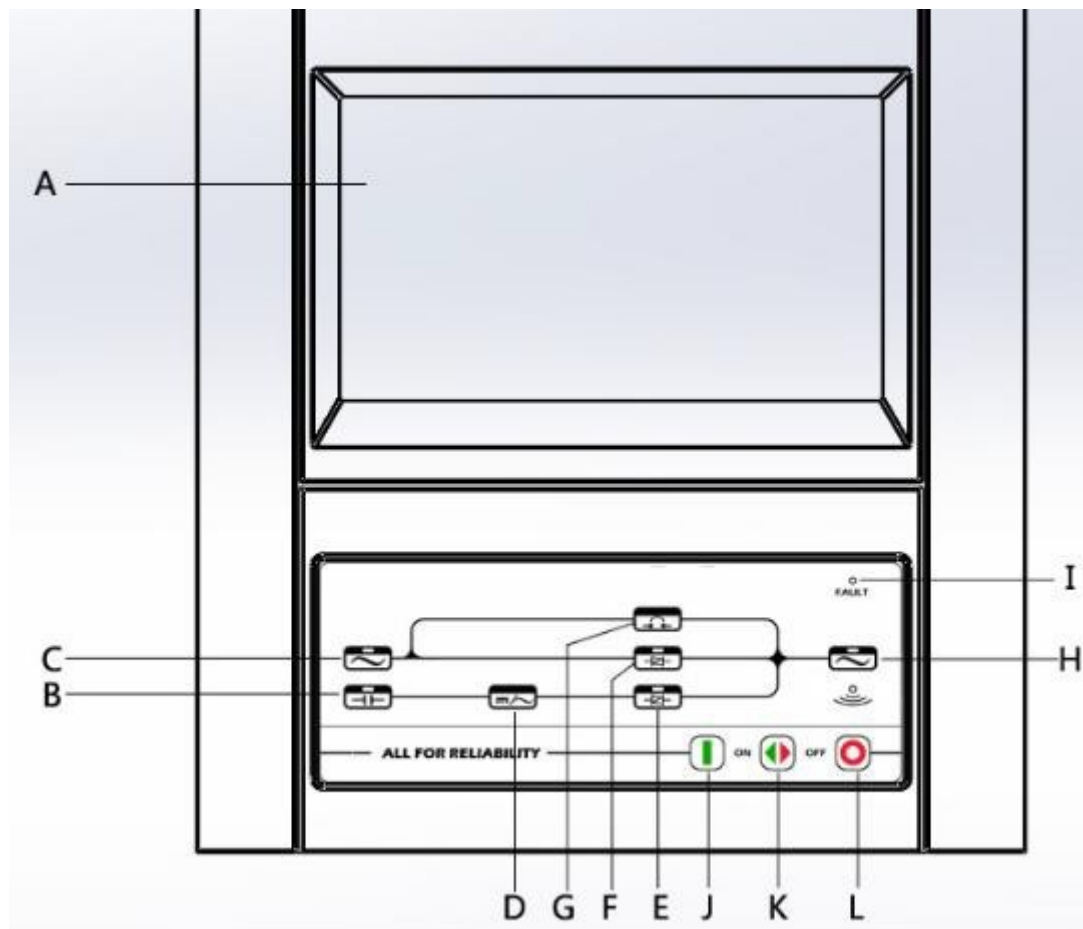
Industrial Dynamic Voltage Restorers (DVRs) feature multiple operating modes. It transits between operating modes seamlessly, ensuring a stable and high-quality AC output to the user's load.

Warning!

Changing of the factory-preset operating parameters or unit configuration without prior authorization is prohibited. The manufacturer shall not be liable for any system malfunction resulting from unauthorized modifications.

3.1. Control Panel

The control panel is located on the front of the unit. The touchscreen displays all required real-time information. The operating status and parameters can be monitored and configured using the buttons. The specific definitions and functions of the control panel are as follows:



- A. Touchscreen for real-time status and historical data display. The DVR, clock, inverter and buzzer parameters can also be configured via the touchscreen. The touchscreen LEDs provide a bright and clear display. To extend the LED service life, the display automatically turns off if no keys

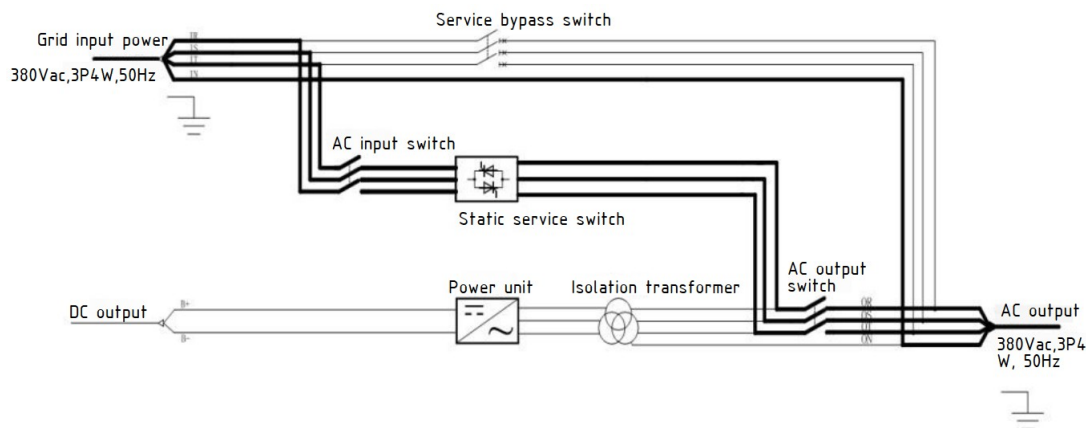
are pressed within 5 minutes. The backlit touchscreen display illuminates instantly upon pressing any key.

- B. DC LED indicator, which illuminates when the DC input is normal.
- C. Mains LED indicator, which illuminates when the AC input is normal.
- D. Inverter LED indicator, which illuminates when the inverter starts operating, to indicate the inverter status.
- E. Inverter static switch LED indicator, which illuminates when the inverter static switch is closed, the bypass static switch is open, and the inverter supplies power to the load.
- F. Electronic bypass static switch LED indicator, which illuminates when the electronic bypass switch is closed. At this time, mains power is supplied to the load via the AC network. The battery power static switch and the inverter static switch will not be closed simultaneously; therefore, the inverter static switch LED indicator and the battery static switch LED indicator will not illuminate at the same time.
- G. Service bypass LED indicators, which illuminate when the service bypass switch is closed. When the service bypass switch is closed, the inverter is interlocked from starting; if the inverter is running at that time, it will shut down immediately.
- H. Output LED indicator, which illuminates when the AC output is energized.
- I. Fault LED indicator, which activates to signal an internal equipment fault.
- J. Inverter start button ["⏏"], which functions as one of the inverter activation controls. The inverter will start only when the ["⏏"] button and the ["⏏"] button are pressed simultaneously.
- K. Inverter control key combination ["⏏"], which serves as one of the control inputs to start or stop the inverter operation. The inverter will be started when the ["⏏"] and ["⏏"] buttons are pressed simultaneously, and it will stop when the ["⏏"] and ["⏏"] buttons are pressed simultaneously. This dual-button control method for simultaneous start or stop operations effectively prevents accidental operation of the unit.
- L. Inverter stop button ["⏏"]. The inverter will stop when the ["⏏"] and ["⏏"] buttons are pressed simultaneously.

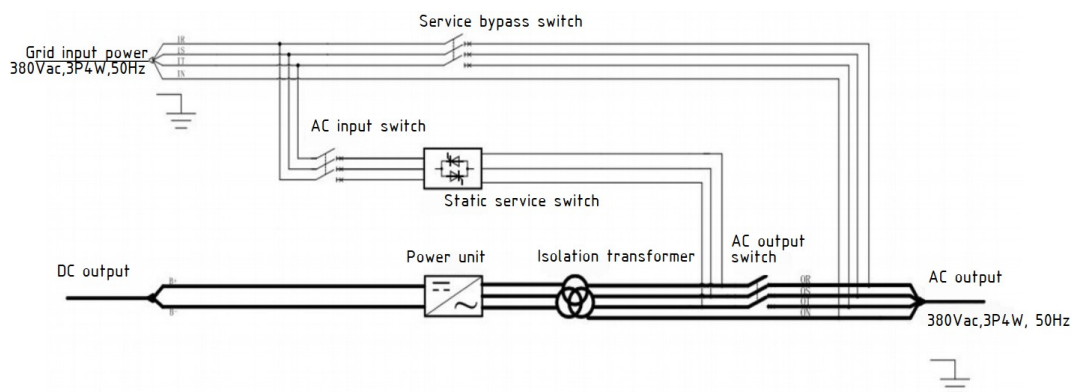
3.2. System Operation Mode

3.2.1. Mains Supply Mode

Under normal mains power conditions, AC power is supplied to the load via the electronic bypass switch while charging the energy storage components, such as supercapacitors. At the same time, the inverter operates in standby mode and does not supply power to the load.

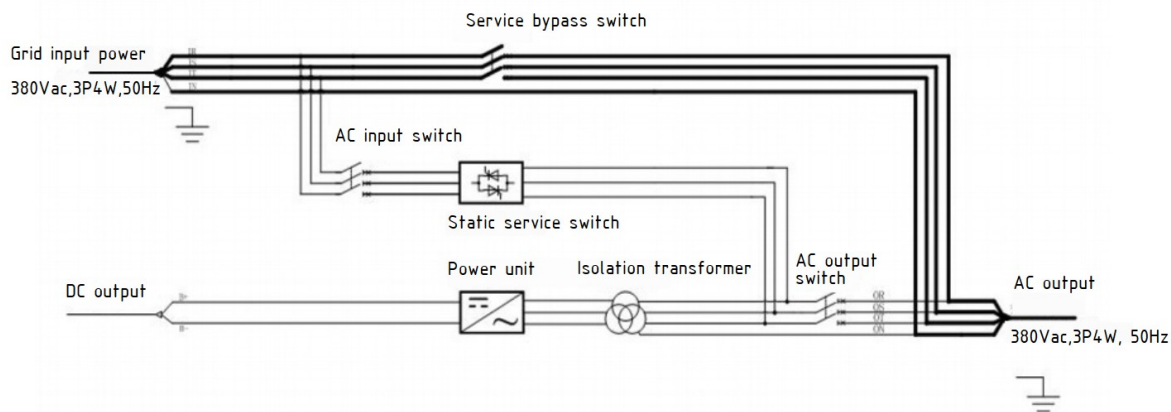


3.2.2. Inverter Power Supply Mode



In the event of a mains power failure, energy storage components such as supercapacitors deliver power via the inverter to provide AC output, effectively ensuring the continuity of the system's power supply.

3.2.3. Service Bypass Mode



To enhance system reliability and safety, and to facilitate simpler and faster system maintenance and operation, a dedicated AC output switch has been added.

When switching to the service bypass, once the AC output switch is open, the user load is completely isolated from the DVR output, allowing maintenance to be performed safely without risk of system damage. The service bypass has intelligent control. According to the interlocking logic, the inverter output automatically shuts down when the service bypass switch is closed, ensuring that accidental operation will not cause a power outage or output damage.

3.3. Operating Procedures

3.3.1. System Startup Sequence

To start the unit and operate it in mains supply mode, perform the following steps:

- (1) Close the AC input switch (Input).
- (2) Close the DC output switch of the supercapacitor enclosure and start the main inverter.

Once the DVR screen illuminates, check that no message such as "DC Switch Closing is Prohibited" is displayed on the screen. If this message is displayed on the screen, the DC switch must not be closed. Press and hold the ["⏏"] and ["⏏"] buttons simultaneously for one second. Wait until the charger is fully charged and the "DC Switch Closing Prohibited" prompt disappears from the screen. The DC switch can be closed now. After closing the DC input switch, the charger will automatically charge the busbar and other components. Once it reaches a predefined value, the inverter will start. Thereafter, the unit operates correctly with the inverter, and the charging process is complete.

- (3) Check the power flow direction of the busbar on the display. Once the busbar power is routed to the line side of the output switch, close the AC output switch (OUTPUT).
- (4) The unit supplies power to the load via the electronic bypass, and the inverter automatically switches to hot standby mode.

NOTE: The unit must be started manually during the initial startup. After the machine runs normally, the machine does not need to be manually turned off.

3.3.2. System Shutdown Sequence

To completely shut down the Dynamic Voltage Restorer (no AC output power, no internal residual energy), perform the following steps:

- (1) Shutdown the inverter

After pressing and holding the ["⏏"] and ["⏏"] buttons simultaneously for one second, the inverter will shut down, and the static switch will supply power to the load from the AC source.

- (2) Open the DC output switch of the supercapacitor cabinet.
- (3) Open the AC input switch (INPUT) and the AC output switch (OUTPUT).

Before commencing work, ensure that the unit is completely shut down and the equipment output is fully disconnected.

- (4) All input power is isolated, and there is no output from the unit. When the DC bus power is disconnected, the LCD and all indicators turn off, and the Dynamic Voltage Restorer completely shuts down.

3.3.3. Transfer to Service Bypass Mode

If the Dynamic Voltage Restorer (DVR) requires maintenance and repair, and the DVR output must not be interrupted, proceed as follows:



- (1) Shutdown the inverter

After pressing and holding the ["⏏"] and ["⏻"] buttons simultaneously for one second, the inverter will shut down, and the static switch will supply power to the load from the AC source.

- (2) Open the DC output switch of the supercapacitor cabinet.
- (3) Close the service bypass switch.

Once this switch is closed, due to the low impedance of the service bypass, utility power will be output to the load through the service bypass, even though the AC input switch (INPUT) is still in the closed position.

- (4) Open the AC input switch (INPUT) and the AC output switch (OUTPUT).

Once this switch is opened, the Dynamic Voltage Restorer (DVR) input is completely isolated, except for the service bypass.

- (5) The load is powered through the service bypass. After the device display turns off, verify that the DC bus energy is completely discharged before performing maintenance.

NOTE: If a supercapacitor is used as the energy storage and the cabinet is equipped with a DC switch, be sure to disconnect the DC switch before maintenance. If the cabinet is not equipped with a DC switch, be sure to wait until the supercapacitor energy is fully discharged before allowing any maintenance operations!

3.3.4. Transfer from Service Bypass to Normal Operation

Following maintenance or repair, if the Dynamic Voltage Restorer (DVR) is to be restored to normal operation, proceed as follows:

- (1) Close the AC input switch.
- (2) After the display turns on, verify that the static bypass switch indicator on the screen lights up and power reaches the front end of the output switch, then close the AC output switch.
- (3) Once the bypass power indicator lights up on the screen, open the service bypass switch.
- (4) Close the DC switch

Check if the message "DC Switch Closing Prohibited" is displayed. If this message is displayed on the screen, the DC switch must not be closed. Press and hold the ["⏏"] and ["⏻"] buttons simultaneously for one second. The charging process will start and continue until the 'Permit to Close' prompt is displayed. The DC switch can be closed now. After closing the DC input switch, the charger will automatically charge the busbar and other components. Once the voltage reaches the set value, the inverter turns on, and the hot standby mode is automatically initiated. Inverter is operating and charging is in progress.

WARNING!

Unauthorized personnel are strictly prohibited from performing any work!

4. TOUCH-SCREEN DISPLAY

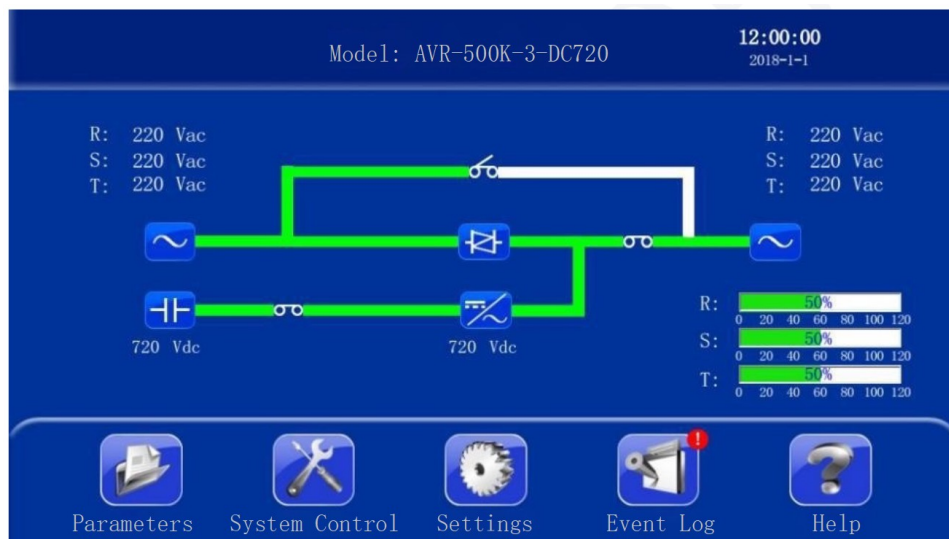
Overview

The touchscreen interface allows users to check the DVR operating status and specific parameters. The main touchscreen interface consists of six sections: Energy Flow, Operating Parameters, System Control, System Settings, Event Log and Info. To make the display clearer and more user-friendly for data reading, it is equipped with LED indicators. To prolong the LED service life, the display automatically goes into sleep mode if there is no key activity for 5 minutes. The touchscreen backlight turns back on immediately upon pressing any key.

Disclaimer. The illustrations and tabular data presented in this document are for reference purposes only. The manufacturer reserves the right to modify them without prior notice.

4.1. Energy Flow

After the device is powered on, the 'Energy Flow' screen opens automatically to display the system operating mode and the real-time status of each functional unit.



The device model is displayed at the top of the interface, and the local time (year, month, day, hour, minute, second) of the DVR operation is displayed in the upper right corner. Information regarding any abnormal condition during operation is logged in real time, accompanied by an alarm pop-up window. The 'Event Log' screen allows users to verify the specific type of fault, as well as the precise timestamps for both its occurrence and clearance.

4.2. Operating Parameters



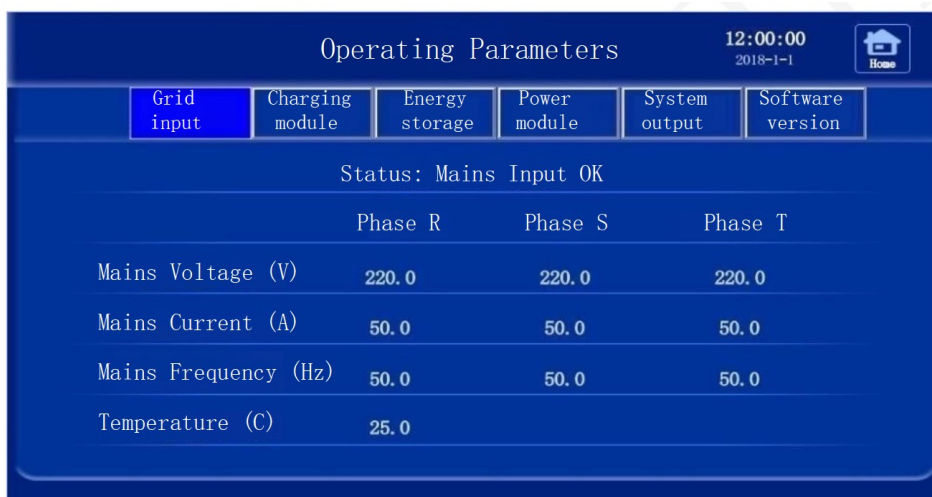
Upon selecting 'Parameters', the screen displays the following data: grid input, power supply module, energy storage module, system output parameters and system version information. Press the 'Home' button located in the upper right corner to return to the main screen.

Some operating parameters are displayed across multiple pages; click the right arrow button ">" to go to the next page, or the left arrow button "<" to return to the previous page.

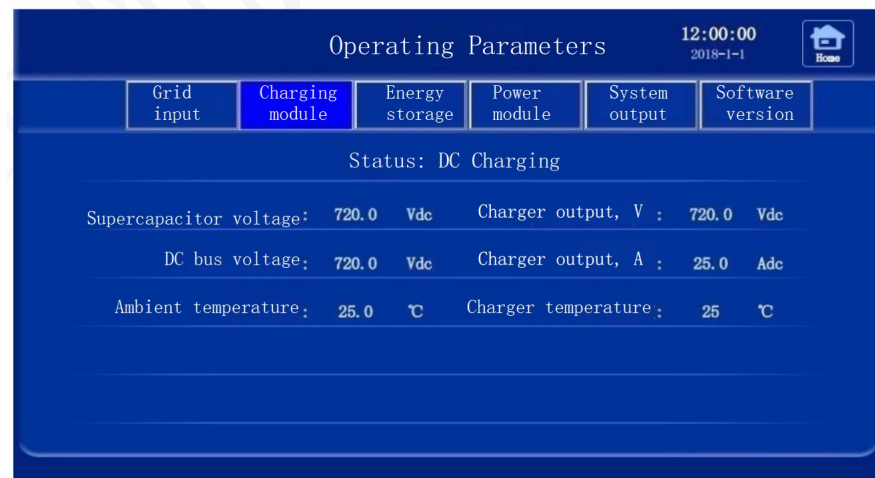
WARNING!

Do not alter any factory-set operating parameters or system configurations of the Dynamic Voltage Restorer. All DVR parameters are highly interdependent. Unauthorized modifications to system settings may cause widespread changes, leading to system failure or operational disruption.

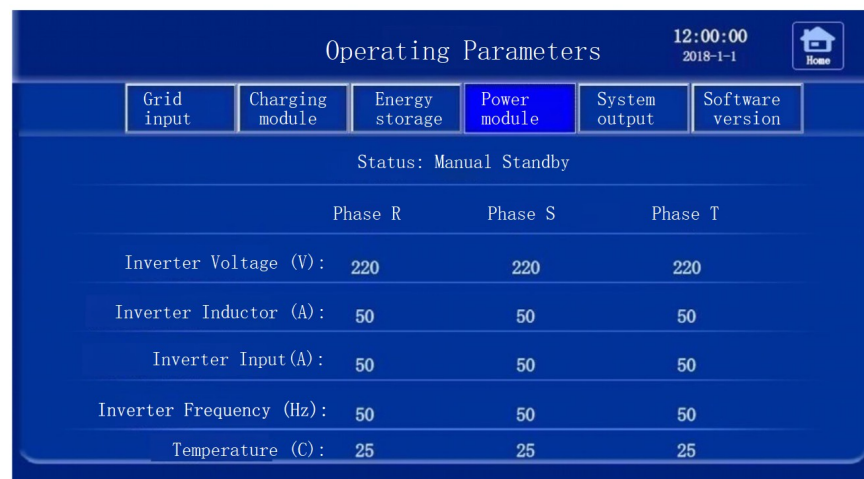
4.2.1. Mains Input



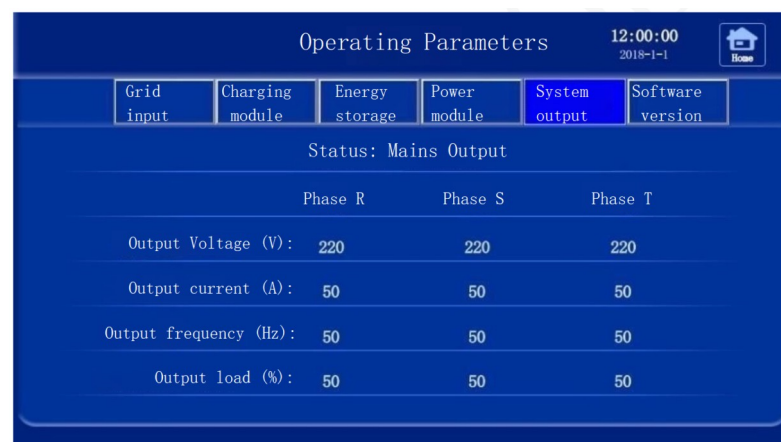
4.2.2. Charging Module



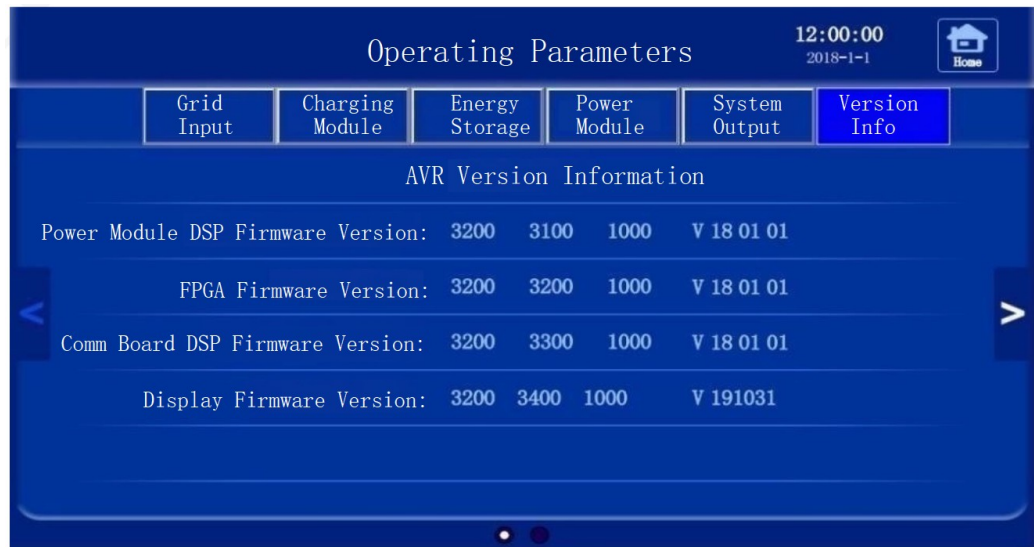
4.2.3. Power Module



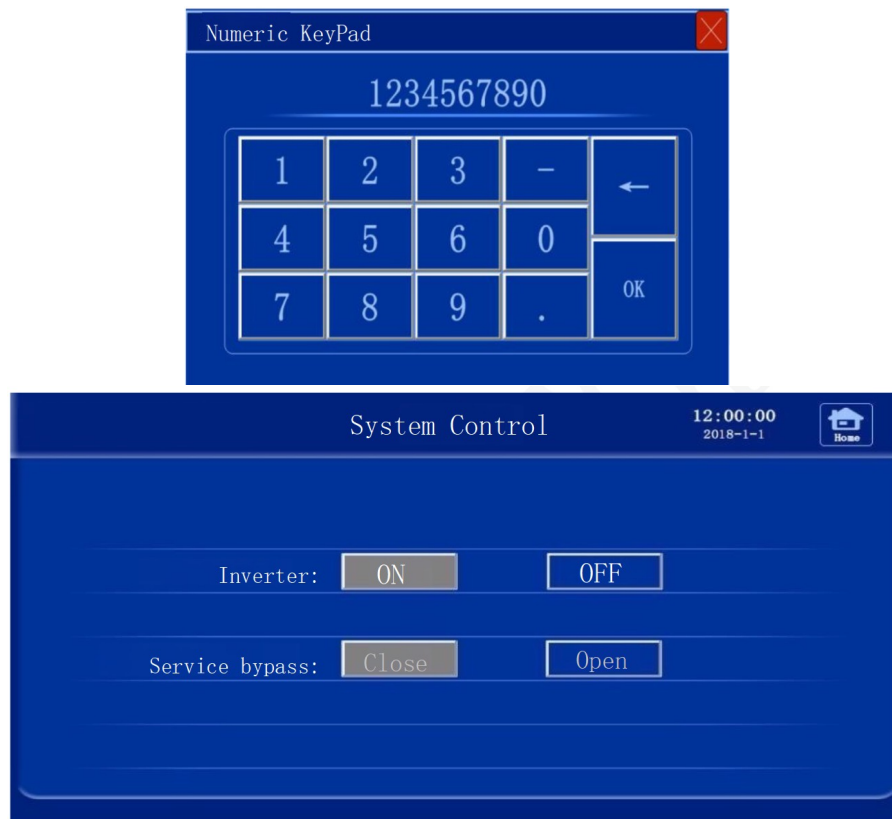
4.2.4. System Output



4.2.5. Version Information



4.3. System Control

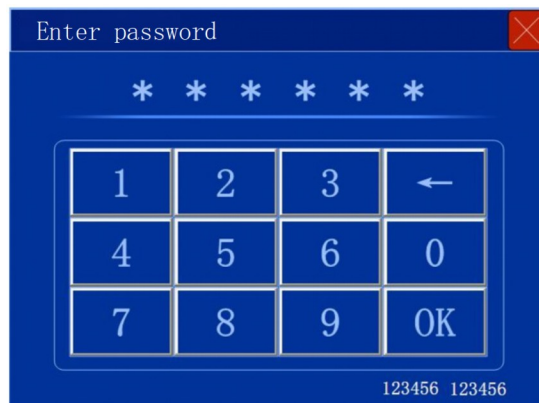


The "System Control" tab must be operated exclusively by trained technical personnel, and the default password for the "System Control" menu is 000000. If the user changes the password, appropriate records must be made to prevent equipment downtime. When selecting the 'System Control' menu, the screen transitions to the inverter and battery operation page to monitor their current status. Press the 'Home' button located in the upper right corner to return to the main screen.

Click 'Start' to initiate the inverter; click 'Stop' to stop the inverter.

4.4. System Settings

To modify communication parameters, language, time, or password, you must first select 'System Settings' and enter a valid password. Press the "Home" button in the top right corner to return to the main interface. Press the right arrow button '>' to advance to the next page; press the left arrow button '<' to go back to the previous page.



NOTE: The default password is 0-0-0-0-0-0. If the user changes the password for control setting management purposes, appropriate records must be made to prevent equipment downtime.

4.4.1. Communication Parameters Settings Interface

COM1 settings:

The screenshot shows the 'System Settings' screen with the 'Communication Parameters' tab selected. The settings for COM1/RS232 are as follows:

Parameter	Value
Device Address	1
Comm. Protocol	MEGATEC ☐ MODBUS-RTU ☒
Data Format	8. N. 1 ☒ 8. O. 1 ☐ 8. E. 1 ☐
Baud Rate	1200 ☐ 2400 ☐ 4800 ☐ 9600 ☒ 14400 ☐ 28800 ☐ 19200 ☐

COM2 settings:

The screenshot shows the 'System Settings' screen with the 'Communication Parameters' tab selected. The settings for COM2/RS485 are as follows:

Parameter	Value
Device Address	1
Comm. Protocol	MEGATEC ☐ MODBUS-RTU ☒
Data Format	8. N. 1 ☒ 8. O. 1 ☐ 8. E. 1 ☐
Baud Rate	1200 ☐ 2400 ☐ 4800 ☐ 9600 ☒ 14400 ☐ 28800 ☐ 19200 ☐

4.4.2. Language Settings

The screenshot shows the 'System Settings' screen with the 'Language' tab selected. The language settings are as follows:

Language	Selected
Chinese	☒
English	☐

4.4.3. Date and Time Settings

System Settings

12:00:00
2018-1-1

Home

Communication Parameters

Language

Time

Password

Dry Contact

Time Setting

yearmonthday

hourminsec

4.4.4. Password Settings

The screenshot shows the 'System Settings' menu. At the top, the time is 12:00:00 and the date is 2018-1-1. A 'Home' button with a house icon is in the top right. The menu options are 'Communication Parameters', 'Language', 'Time', 'Password', and 'Dry Contact'. The 'Password' option is highlighted in blue. Below this, there are three input fields for password changes: 'Enter 6-digit old password:', 'Enter 6-digit new password:', and 'Confirm new password:'. Each field contains six asterisks. At the bottom, there is an 'OK' button.

Enter the current password in the first text field, enter the new password in the second text field, re-enter the new password to confirm in the third text field, and press the OK button. If the current password is correct and the new password is entered correctly twice, the message "Password changed successfully" will appear.

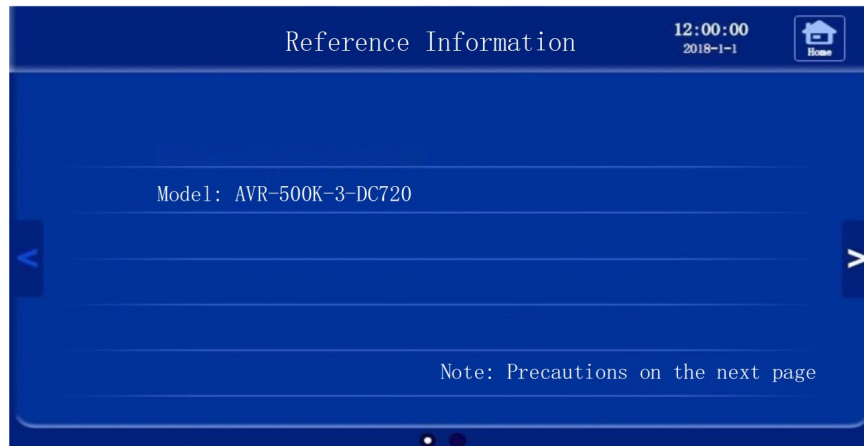
4.5. Event Log

Upon selecting 'Event Log', the screen displays the event log contents, the specific timestamp of the fault occurrence, and the timestamp when the fault was cleared. Press the "Home" button in the top right corner to return to the main interface

[illegible]

4.6. Reference Information

The 'Info' page shows the specific equipment model, the manufacturer's technical support contact details and general operational notes. Press the "Home" button in the top right corner to return to the main interface Press the right arrow button '>' to advance to the next page; press the left arrow button '<' to go back to the previous page.

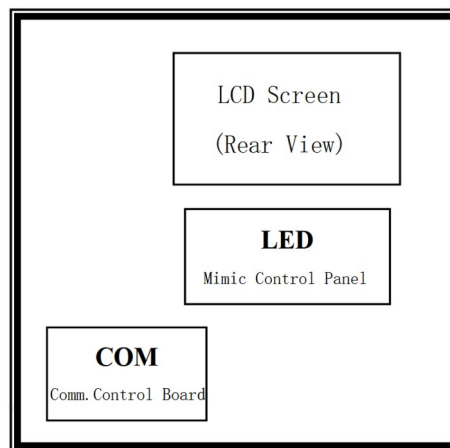


5. PCB FUNCTIONS DESCRIPTION

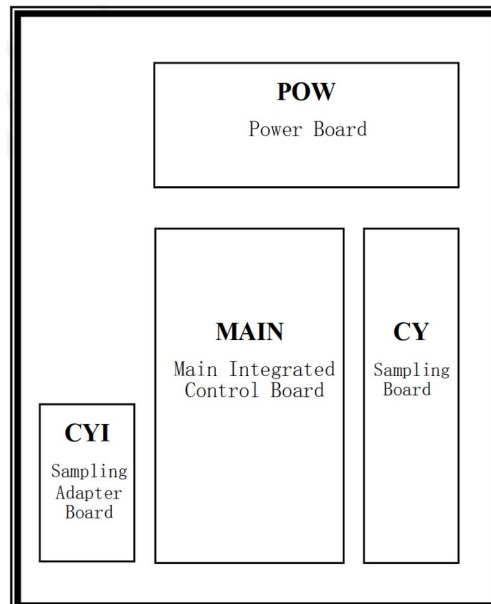
5.1. PCB Overview

The PCB (Printed Circuit Board) of the Dynamic Voltage Restorer consists of the display section, control section, drive section, and external communication section; the display section and control section are located on two separate PCB modules, respectively: The communication and display PCB enclosure is located behind the front door of the DVR main unit. Opening the upper cover panel of the device reveals the control PCB enclosure behind it. The drive section is distributed across each power module chassis. The external communication section includes a parallel interface board, an RS485/RS232 communication board, a dry contact board, a transmitter board (optional), and an SNMP card (optional). This communication section is located in the lower part of the device and becomes visible after removing the bottom cover panel.

The layout of the display section inside the PCB enclosure is shown in the figure below:



The layout of the control section inside the PCB enclosure is shown below:



5.2. PCB Control Logic

5.2.1. MAIN (Host) Integrated Control Board

- Key system components, which execute overall unit control via advanced DSP technology, utilize an independent modular architecture to achieve secure, dependable, and high-speed processing of critical data.

5.2.2. CY Sampling Board

- Inverter Output Voltage Sampling
- AC Input Voltage Sampling
- Battery Voltage Sampling
- DC Bus Voltage Sampling
- Status monitoring of critical components, such as AC output circuit breakers, maintenance bypass switches, output transformers, cooling fans, etc.

5.2.3. POW Power Board

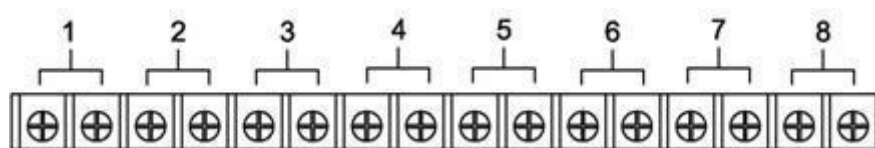
- Control Power Requirements

5.2.4. COM Communication Control Board

- LCD touch screen
- RS485/RS232 communication interface
- Dry contact alarm controls
- Transmitter control (optional)
- SNMP communication control (optional)

5.2.4.1. Dry Contact

The Dynamic Voltage Restorer (DVR) is equipped with eight programmable dry contact outputs to indicate specific faults or normal operating states. In the event of an anomaly, the DVR control system identifies the fault type and triggers the corresponding alarm contact. These dry contact alarms can be routed to the customer's monitoring system.



The eight groups of alarm dry contacts are specifically defined as follows (corresponding to the terminal block numbers in the figure above; each terminal block constitutes one group, where the left terminal of each group is positive and the right terminal is negative):

1. Bypass operation dry contact: closes when power is supplied in the static bypass state;
2. Inverter operation dry contact: closes when the inverter is in the power supply state;
3. Service bypass operation dry contact: closes when power is supplied in the service bypass mode;
Overload alarm dry contact: closes when the equipment experiences an overload;
4. Abnormal AC input dry contact: closes upon AC input power failure, overvoltage, undervoltage, phase sequence fault, or frequency anomaly;
5. Abnormal DC input dry contact: closes when the DC input exhibits abnormally high/low voltage, is disconnected, or has reverse polarity;
6. Abnormal inverter dry contact: closes when any of the following conditions occur (abnormal output overvoltage/undervoltage, overload trip, output short circuit, inverter fault, or maintenance bypass trip).

7. General alarm dry contact: This dry contact signal is used for aggregate indication and can be configured to perform a comprehensive logical evaluation based on any combination of dry contact states; the dry contact closes when an abnormal condition is determined through this evaluation.

NOTE: The specific definitions of the alarm dry contacts may change due to the requirements of different projects. Therefore, provided that the equipment quality and use are not affected, the actual product shall prevail.

5.2.4.2. Communication Interface

The Dynamic Voltage Restorer comes standard with RS485 and RS232 interfaces for user selection, enabling intercommunication and data transmission between the DVR and other equipment, as well as providing comprehensive operational monitoring. The RS485 interface is primarily used for long-distance communication (supporting the Modbus communication protocol), while the RS232 interface is mainly used for short-distance communication (supporting the Megatec communication protocol). Additionally, communication protocols can be customized by the customer.

6. FAULTS AND TROUBLESHOOTING

	Abnormal Condition	Fault Analysis	Corrective Action
1	Mains power is normal, but the Dynamic Voltage Restorer (DVR) fails to start.	The AC input switch is not closed, and the control panel indicator is off.	Close the input switch.
		Input grid voltage exceeds the maximum nominal range tolerated by the unit.	Ensure the input power source meets the nominal voltage specifications of the device.
2	When there is no display on the touch screen, power is not supplied to the DVR control circuit.	The Dynamic Voltage Restorer (DVR) has no power input.	Close the AC input switch or the DC switch.
		POW Power Board failed.	Replace POW Power Board.
3	Excessive voltage differential between the neutral (N) and ground (G) lines.	The external input and output phases (R, S, T) of the device are incorrectly connected to the neutral line (N) or the ground terminal.	Connect correctly according to the wiring diagram.
4	The inverter fails to start: the fault indicator illuminates, and a continuous buzzer alarm sounds.	The service bypass switch is closed.	Open the service bypass switch.
		Inverter circuit failure.	Replacement of Molded IGBT Modules and Related Components.
		Inverter control circuit failure.	Replace MAIN board.
5	The fan fails to start during equipment operation.	Fan failure.	Replace the fan.
		Inverter failure.	Refer to section 4 for troubleshooting.
6	Abnormal DC input.	The DC output switch is not closed.	Close the ultracapacitor DC switch.
		Faults caused by the DC input voltage exceeding the specified limits.	Connect to a power source that complies with the nominal DC input voltage range.



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**ELECTRICAL EQUIPMENT
DESIGNED FOR MAXIMUM RELIABILITY**

Office in China

Address: Building C, No. 888, Huanhu West Second Road, Lingang New District, Free Trade Pilot Zone, Shanghai, China

Tel.: +86 180 1775 8966

Email: info.cn@selectric.ru

Office in Russia

Address: Business Center G10, Bld. 10, 21st km, Kievskoye shosse, Moscow

Tel.: +7 499 390 80 00

Email: Info@selectric.ru





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