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OPERATIONAL MANUAL

CIRCUIT BREAKER MOTORISED RACKING SYSTEM

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Table of Contents

Home Screen 3
Main Screen 4
Out Start Point Table 5 6
Alarm List 7
Point Table 8
Torque Limit 9

Instructions for **Operating the Human-Machine Interface (HMI)** for Automatic Circuit Breaker Racking Unit

This manual serves as a comprehensive guide for operating the Human-Machine Interface (HMI) designed for the circuit breaker automation unit. Within our program, users will encounter eight distinct screens, each serving specific functions as outlined below:

1. Home Screen:
   The home screen provides users with an initial interface upon system activation. It serves as a central point for accessing various functions and settings of the HMI.

2. Main Screen:
   The main screen acts as the primary operational interface, offering a comprehensive overview of system status, controls, and parameters for efficient management of the circuit breaker automation unit.

3. Out Start Point Table 5:
   This screen presents detailed information regarding outbound start points, facilitating precise monitoring and adjustment of associated parameters crucial for system operation.

4. Alarm List:
   The alarm list screen provides users with a comprehensive overview of active alarms and alerts, enabling prompt identification and resolution of any system anomalies or malfunctions.

5. Point Table:
   The point table screen offers a structured display of various data points and parameters relevant to system operation, allowing users to monitor and configure settings in real-time.

6. Torque:
   The torque screen provides insights into torque-related parameters and measurements, essential for ensuring optimal performance and safety of the circuit breaker unit.

Throughout this manual, users will find detailed instructions on navigating through each screen, interpreting displayed data, adjusting parameters, and troubleshooting common issues encountered during operation.

By adhering to the guidelines outlined in this manual, operators can effectively utilize the HMI interface to maximize the performance, reliability, and safety of the circuit breaker automation unit.

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Home Screen

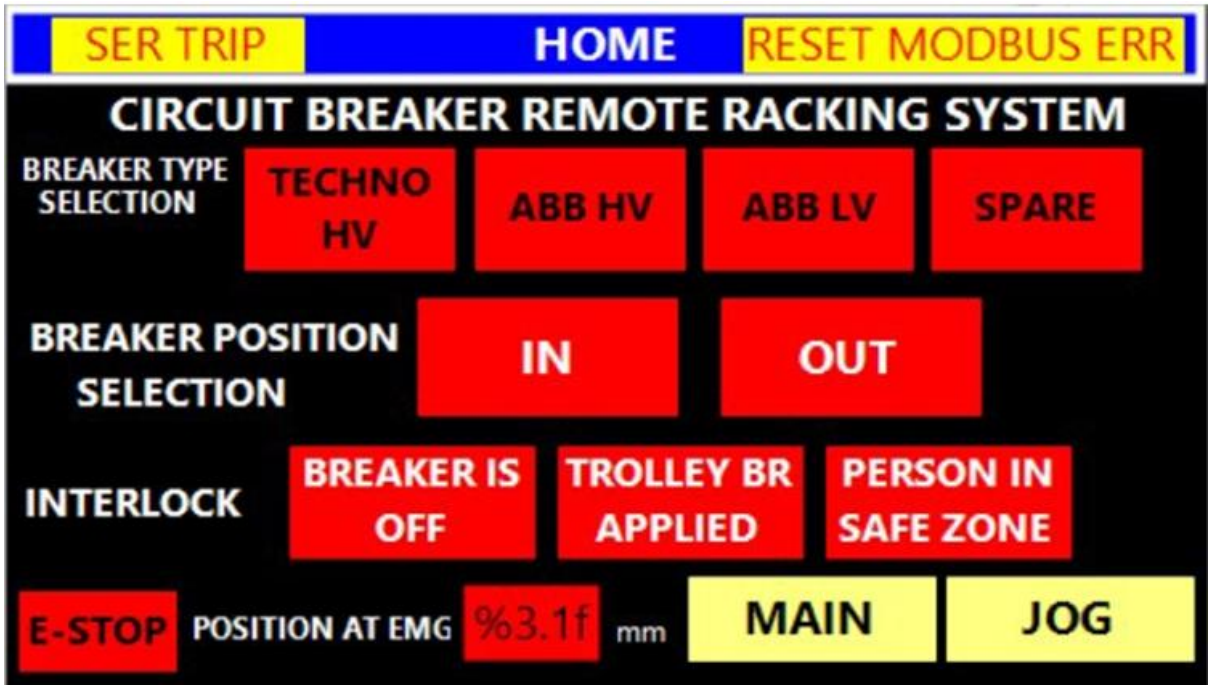

Figure 1: Home Screen

The home screen of the Human-Machine Interface (HMI) serves as the initial interface when the power is turned on. It presents users with four selections for different types of breakers, including HV, ABB HV, ABB LV, and SPARE. Additionally, users can choose the position of the breaker, indicating whether it is physically racked in (Service position) or physically racked out (Test position).

This screen is equipped with three interlocks:

1. Selected Breaker is OFF
2. Trolley brakes are applied
3. Person is in the safe zone

Upon selecting each interlock button and making the appropriate choice of table (breaker), users are directed to the main screen, which functions as the operational screen of the HMI. Failure to select any of the interlocks prevents access to the main operation screen.

An EMERGENCY button is provided at the bottom of the screen. The position displayed during an emergency reflects the last position value at which the breaker unit was stopped. This value can be reset by selecting any breaker option.

Additionally, a JOG function is available for manual movement of the breaker in and out. Users can adjust the speed of the jog by selecting the servo jog speed.

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Main Screen

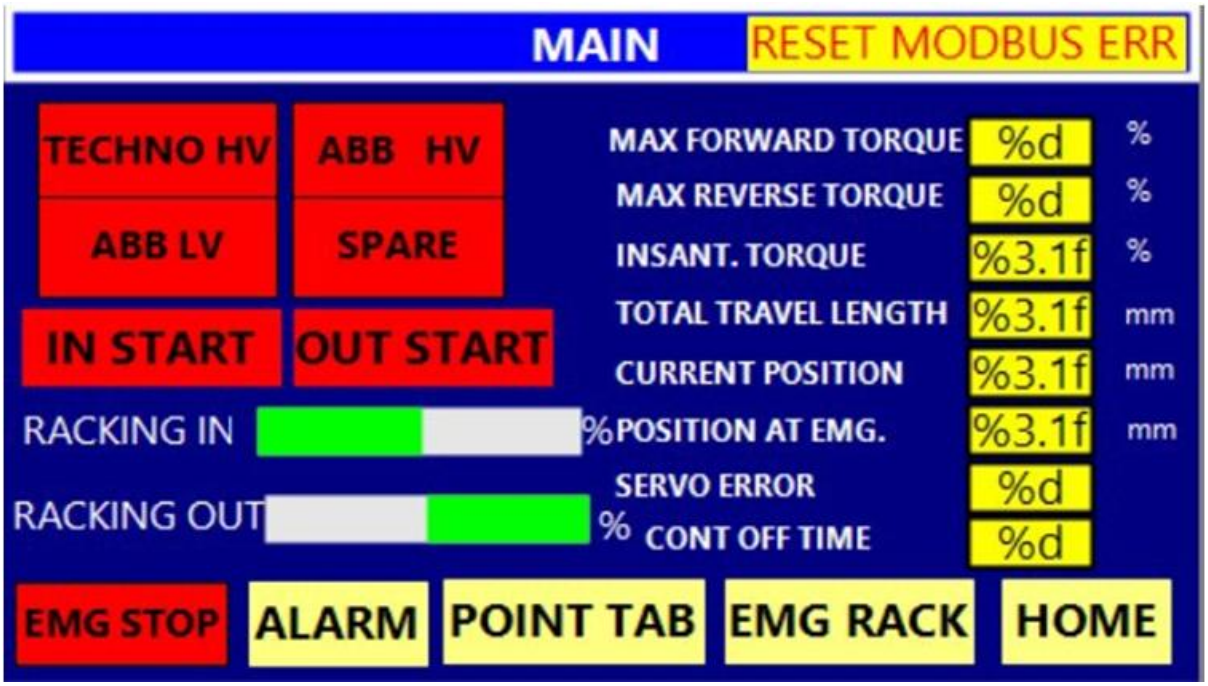

Figure 2: Main Screen

The main screen of the HMI represents the operational hub, appearing when the breaker unit is in operation. This screen offers vital functionalities and real-time data to facilitate effective management of the circuit breaker system.

Upon accessing the main screen, the table (breaker) selected by the user in the home screen is automatically carried over. Users are then required to initiate the start command by selecting either IN START or OUT START, streamlining the operation process.

Key features of the main screen include:

- Torque Monitoring:

  The user-configured maximum Forward and Reverse torque parameters, established during commissioning, ensure optimal performance. The instantaneous torque reflects the actual torque generated by the motor during operation.

- Travel Length Display:

  The total travel length parameter indicates the predetermined distance for the specific breaker. The current position provides real-time feedback on the breaker's actual position, while the position at emergency denotes the position at which the emergency stop was initiated.

In the event of an emergency stop, users are instructed to release the EMG STOP and activate the EMG RACK button, redirecting them to a dedicated emergency screen for further action.

Additionally, the main screen provides insight into the system's status through:

- Servo Error Monitoring: Any errors within the drive are promptly flagged through the servo error display. Faults trigger alarm notifications, allowing users to access the alarm dialog box for detailed diagnosis and resolution.

This comprehensive display of critical parameters and functionalities empowers users to effectively manage and monitor the circuit breaker system, ensuring smooth and safe operation under various conditions.

Out Start Point Table 5

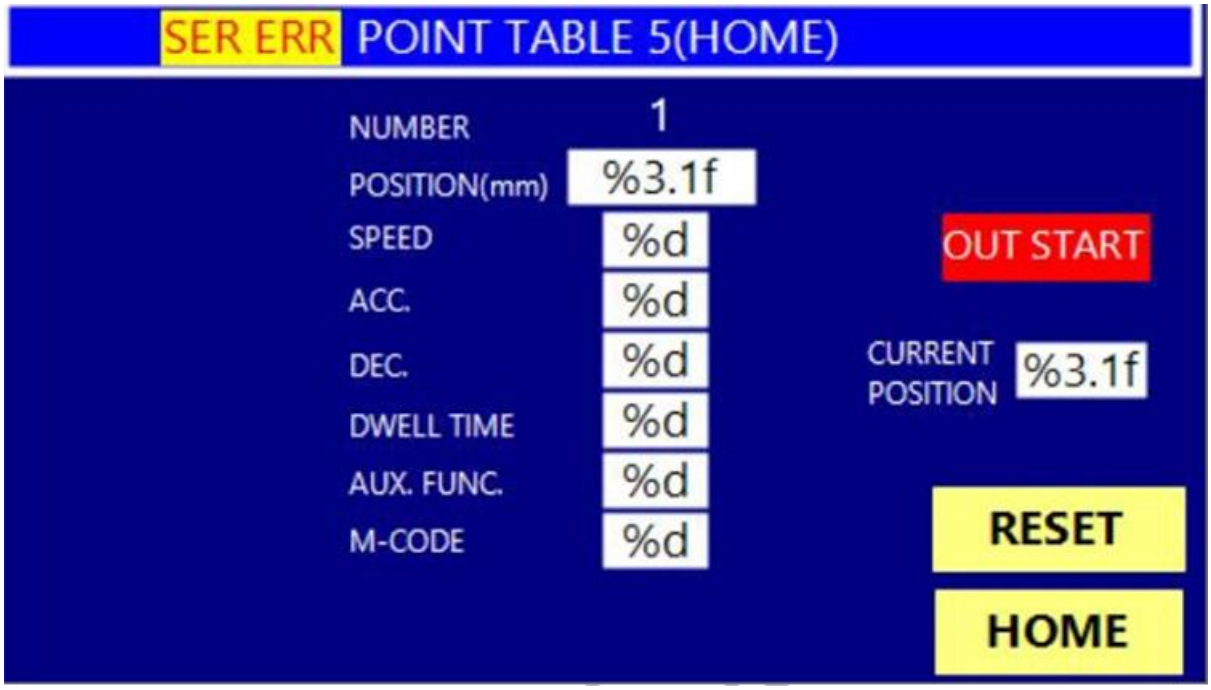

Figure 3: Out Start Home Point Table

The Out Start Point Table 5 screen, represented in Figure 3, serves as a pivotal interface accessible under specific conditions from the main screen of the HMI.

This screen, referred to as the Home Point Table 5, becomes visible to the user when either the EMG RACK button is pressed due to a drive fault or when the drive is halted in an emergency situation. It provides a structured layout enabling users to navigate and manipulate the breaker to its designated home position efficiently.

Utilizing this table, users can effectively maneuver the breaker unit to its home position, crucial for system stability and re-establishing operational integrity. Upon pressing the OUT START button, users initiate the process of racking out the breaker, followed by pressing the home button to return to the home screen (refer to Figure 1).

Note: In the event of any emergency situation, regardless of whether the breaker was in the process of racking in or out, activating the emergency stop always mandates racking out the breaker using the OUT START button.

This screen serves as a vital component of the HMI interface, offering users a streamlined approach to handle emergency situations and ensure the safe and efficient operation of the circuit breaker system.

Alarm List

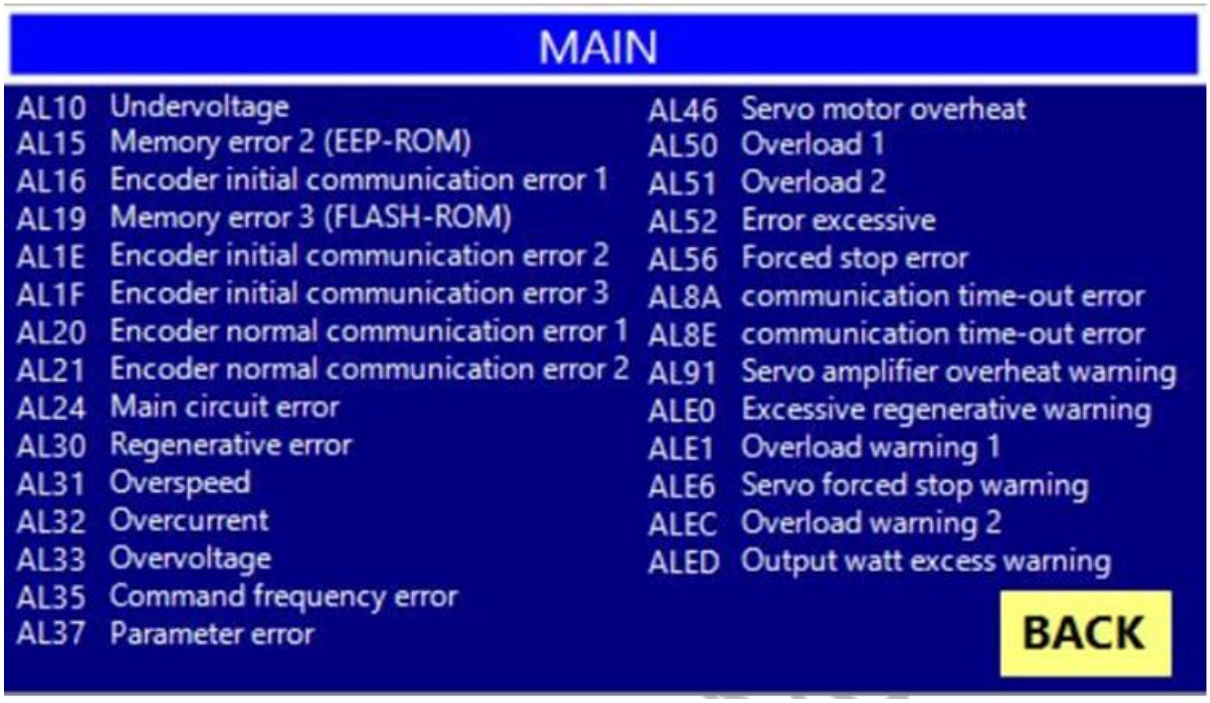

Figure 4: Alarm List

The Alarm List screen, depicted in Figure 4, plays a crucial role in alerting users to critical system malfunctions or anomalies, particularly when the servo drive encounters a fault condition.

When a fault occurs within the servo drive, a pop-up notification promptly appears on the main screen, signalling the user to address the issue. Subsequently, users can navigate to the Alarm List screen to obtain detailed information about the specific fault.

Upon accessing the Alarm List screen, users are presented with a comprehensive list of fault codes corresponding to the detected errors. Each error code is indicative of a particular fault scenario, allowing users to accurately identify the nature of the issue.

To resolve the error, users are advised to consult the drive manual for appropriate troubleshooting steps corresponding to the identified fault code. Alternatively, users may contact our support team for further assistance and guidance in resolving the issue effectively.

The Alarm List screen serves as a valuable tool in ensuring the timely detection and resolution of system faults, thereby minimizing downtime and maintaining the operational integrity of the circuit breaker automation unit.

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Point Table

Figure 5: Point Table

The Point Table, illustrated in Figure 5, constitutes a pivotal component of the HMI interface, accessible to authorized users via password authentication.

This screen empowers users to manually input crucial data, including position in millimetres, speed, acceleration, deceleration, dwell time, and auxiliary functions. Upon inputting the desired parameters, users can initiate the data-saving process by clicking the "Save" button, thereby updating the servo drive with the specified settings.

During the commissioning phase, users have the flexibility to establish the maximum Forward and Reverse torque thresholds tailored to the operational requirements of the system. This calibration process involves observing the maximum torque during running operations and subsequently configuring the settings accordingly to ensure optimal performance and safety.

At the bottom of the screen, users have convenient access to essential controls, including the Home button for navigating back to the home screen and the Alarm button for quick access to the alarm list in case of any system malfunctions or anomalies.

By leveraging the capabilities of the Point Table screen, users can meticulously configure and fine-tune the operational parameters of the circuit breaker automation unit, thereby enhancing efficiency, accuracy, and overall system performance.

Torque Limit

Figure 6: Torque Limit Reached

The Torque Limit screen, depicted in Figure 6, plays a pivotal role in monitoring and regulating torque levels within the circuit breaker system.

When the breaker unit exceeds the predefined torque limit, a notification prompt, known as "Torque Limit Reached," appears to alert the user of the anomaly.

This notification serves as a crucial warning mechanism, signalling potential issues such as excessive mechanical stress or operational inefficiencies within the system. Addressing the torque limit breach promptly is essential to prevent equipment damage, ensure operational safety, and maintain optimal performance.

Upon receiving the torque limit alert, users are advised to investigate the underlying cause of the torque overload and take appropriate corrective actions. These actions may include adjusting operational parameters, conducting maintenance checks, or implementing operational protocols to mitigate the torque excursion.

The Torque Limit screen acts as a proactive tool in safeguarding the integrity and longevity of the circuit breaker system, facilitating timely intervention and resolution of torque-related issues to uphold operational reliability and safety standards.

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