RF15

Door Control Unit

User Manual

roboodor

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HW V1.0

Contents

1 Safety Information

IMPORTANT SAFETY INSTRUCTIONS For your safety, it is crucial to follow these instructions. Failure to comply may result in personal injury or damage to the control unit.

- **Qualified Personnel Requirement:** Setup, operation, and maintenance should only be performed by qualified personnel trained in handling the control unit. Unauthorized personnel should not operate or handle the unit.
- **Power Isolation Before Maintenance:** Ensure that the Control Box (CB) is disconnected from the power supply before opening it. Never open or operate the CB with the cover removed.
- **Damaged Cable Handling:** If the CB cable is damaged or unsealed, it should only be replaced by the manufacturer, an authorized service company, or qualified personnel.
- **Residual Voltage Warning:** DC capacitors in the CB may retain a high voltage even after the power is turned off. Wait at least 1-2 minutes for the voltage to drop below 10V. During this period, avoid any contact with CB components as they could still be dangerous.
- **Grounding Requirement:** Ensure the CB is properly grounded at all times. Operating without proper grounding can cause severe electrical damage and pose a shock hazard.
- **Moisture and Water Exposure:** The CB must never be exposed to water or operated in a humid environment. Exposure to water may cause malfunction or damage to the CB components.
- **Temperature Limits:** Do not operate the CB outside of the specified temperature range. If the operating environment is too cold, a heater may be required to maintain optimal temperatures.
- **Keypad Usage Warning:** The CB should not be used if the keypad or display is damaged. Damaged components must be replaced. Only use fingers to operate the keypad; avoid using sharp objects that might damage it.
- **Cable Connection Verification:** Before the first use, check all electrical connections and portable modules connected to the CB. Incorrect connections can damage the CB.
- **Manual Mode Safety:** In manual mode, operate the door only with an operator present. This mode disables the safety edge and light curtain, so it is crucial to ensure there is no hazard nearby.
- **Parameter Verification:** Verify all parameter settings and safety gear adjustments in the CB before operation. Only qualified personnel should modify these settings.
- **Hazard of Non-Compliance:** Not adhering to these safety instructions may lead to severe harm to the user and potential damage to the control unit.

Warning: Failure to follow safety instructions may result in harm or damage to the CB.

2 Technical Informations

Table 1: MR220 Control Unit Specifications

Property	Specification
Housing Dimensions (W x H x D)	Approx. 300 x 300 x 135 mm (emergency stop excluded)
External Supply Voltage	230 VAC ±10%, 50-60 Hz
Fuses	1 x 2A and 1 x 1A fast-blowing, K characteristics
Control Voltage	24V DC regulated (±5% at nominal 230 V), max. 2000 mA to 40℃, max. 1500 mA to 60℃ 15V DC, max. 750 mA for electronic limit switches and safety edge
Controller Inputs	24 VDC / typ.15 mA, max. 26 VDC / 20 mA
Internal Power Consumption	Max. 10 W (motor not running)
Limit switch	Digital Encoder/ Mechanic Switch For electronic limit switches, terminated with 120 Ω
Safety Chain / E-STOP	3 Inputs NC Contact
Safety Edge Input	For electrical safety edges pneumatic (NC type) and dynamic optical systems (OSE)
Outputs	3 programmable relay outputs
Brake Relay	Changeover contact for brakes, 230 VAC / 4A
Power Output	Supports drives up to 1.5 kW, overload up to 12A for 0.5s
Temperature Range	-10℃ to +50℃ (operating), -20℃ to +70℃ (storage)
Relative Humidity	Up to 95%, non-condensing
Enclosure Rating / Weight	IP54 / Approx. 2.0 kg
Installation Orientation	Vertical

3 Installing the Control Unit

CAUTION: Follow all instructions carefully; improper installation may lead to serious damage.

- Ensure the control system is not connected to mains during installation.
- Check the control unit for damage before installation.
- Avoid touching electronic components, especially processor components, to prevent electrostatic discharge damage.

Installation Location:

- Install the unit in a location that is free from direct sunlight, high humidity, dust, and extreme temperatures.
- Choose a wall that is stable and vibration-free to prevent any operational issues.

Height and Clearance:

- Ensure a minimum height of 1300 mm from the ground to the base of the control unit.
- Maintain a minimum clearance of 100 mm above and below the unit for proper ventilation.

Mounting Position:

- Mount the unit vertically, avoiding any horizontal installation.
- Ensure it is mounted securely on a flat surface.

Safety Precautions:

- Use insulated gloves and appropriate tools to prevent electric shock.
- Ground the unit properly to protect against static electricity.

Electrical Connections:

- Use the correct voltage and current values for the connection. The main input voltage must be single-phase 230V, and connections should be made to phase (L), neutral (N), and ground (PE). Incorrect connections may damage the unit.
- Install fuses and circuit breakers for additional safety.

4 First Installation

CAUTION: Ensure all installation steps have been completed and verified before powering on the control unit for the first time.

- **Power Connection Verification:** Before switching on, double-check that the main power input (single-phase 230V) is correctly connected to phase (L), neutral (N), and ground (PE).
- **Visual Inspection:** Inspect the control unit and surrounding area for any loose connections or exposed wires.
- **Initial Power-On:**
  - Press the Emergency button before switching on.
  - Switch on the power supply carefully and observe the control unit for any unusual sounds or smells.
  - Check that the indicator lights (if available) show normal operation status.
- **Initial Startup & Setting:** Some units may require an initial reset or calibration after the first power-on.
  - After the initial power-on, release the emergency stop button and check the unit for any error messages.
  - If everything is installed correctly, the unit should display the door status such as "Door Stopped" or "Door Opened."
  - If there is an error message, do not enter the limit settings menu until the issue is resolved.
  - If no errors are present, press and hold the Stop and Up buttons simultaneously to enter the menu.
  - In the menu, go to **2. Service Menu - 11. Motor Param. Configurations** and enter the label values of the motor connected to the unit. You may set the motor current 1A higher than the rated value to allow the unit's protection to activate if the motor draws excessive current.
  - If a safety edge is installed, go to **2. Service Menu**, then select **2. Safety Sensor Function** and choose the appropriate safety edge sensor.
  - Next, enter **3. Door Limit Learning** to set the lower and upper limits of the door following the instructions on the display. To save the limits, press and hold the Stop button.
  - After this step, exit the menu and test the door. It will automatically calibrate its limits by performing three initial movements to fine-tune its range.
  - It is essential to operate the door three times to ensure it registers the desired limits correctly. **(This step is very important; make sure to operate the door three times after training to finalize the settings.)**
- **Testing Safety Functions:** Confirm that all safety features, such as the emergency stop button, are functioning properly.
  - Press the emergency stop button to ensure it stops the unit as expected.
  - Verify that any connected safety sensors (such as limit switches or safety edges) are working and properly integrated.

- **Functionality Check:** Run a basic operational test to verify that the unit is responding correctly.
  - Activate the unit's basic functions to confirm that it operates as expected without issues.
  - Monitor the control unit for any unexpected behavior during this initial test.

5 Connections

5.1 Power & Motor Connections

As shown in Figure 1, the RF15 controller board supports a 230V mono-phase power input and three-phase motor output. Below is a detailed description of each terminal group and their connection purpose.

Terminal Block X1-X2 receives the phase line (**L**) of the 230V AC mono-phase power. It is the main line supplying voltage to the controller's internal systems and motor driver stage. A fuse (4A) is placed just after this line to provide overcurrent protection.

Terminal Block X3 is used to connect the neutral (**N**) line of the mono-phase supply. It is marked as **NOTR** and provides the return path for the AC power line.

Terminal Block X4 provides two PE terminals. One should be connected to the controller's chassis ground and the other to the motor body. Proper grounding is critical for user safety and ensuring electromagnetic compatibility (EMC) in industrial environments.

Terminal Block X9 provides three-phase power output to the motor windings. These outputs directly power the 230V AC three-phase asynchronous motor.

The motor brake is connected Terminal Block X10. The terminal provides a dedicated control signal to activate or release the motor's braking system. This is crucial for applications where precise stopping is required, such as vertical door systems.

Terminal Blocks X6–X8 provide programmable relay outputs that can be configured via the system menu. Each relay can be assigned to a custom function such as Door open/close status output, Warning light activation, Alarm or external lock control. Relays are designed for versatility in automation scenarios.

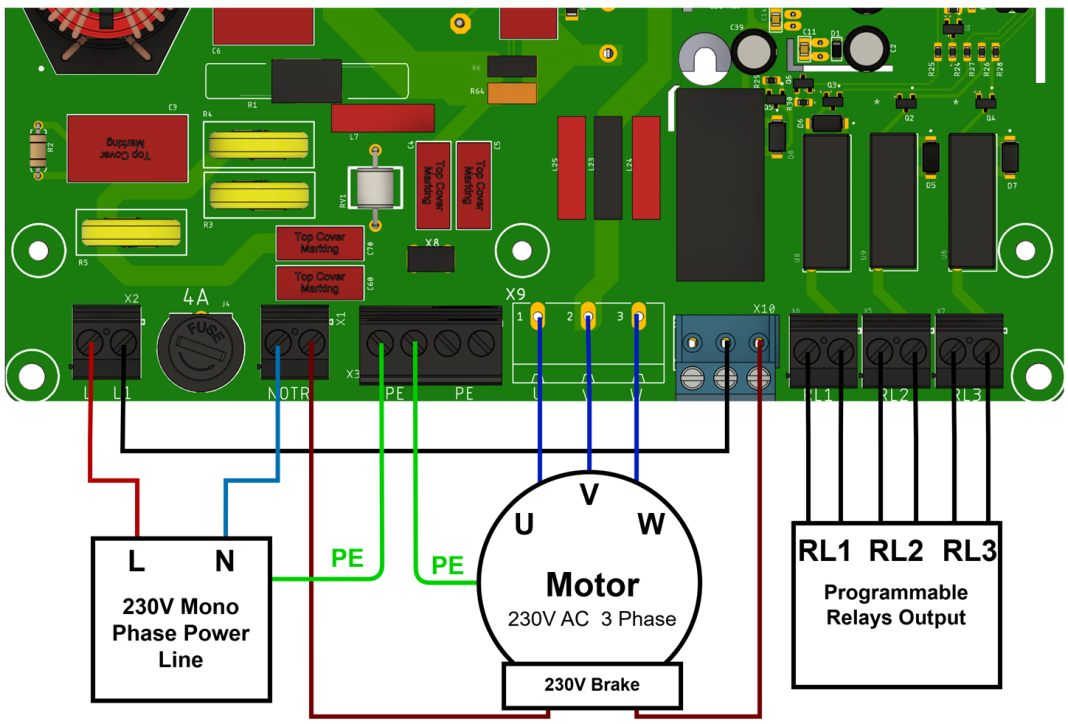


Figure 1: Power & Motor Connection Diagram

5.2 Sensor Connections

As shown in Figure 2, the wiring layout of the RF15 controller board—used in Robodor control systems—supports various safety and control components through its clearly labeled and organized terminal blocks.

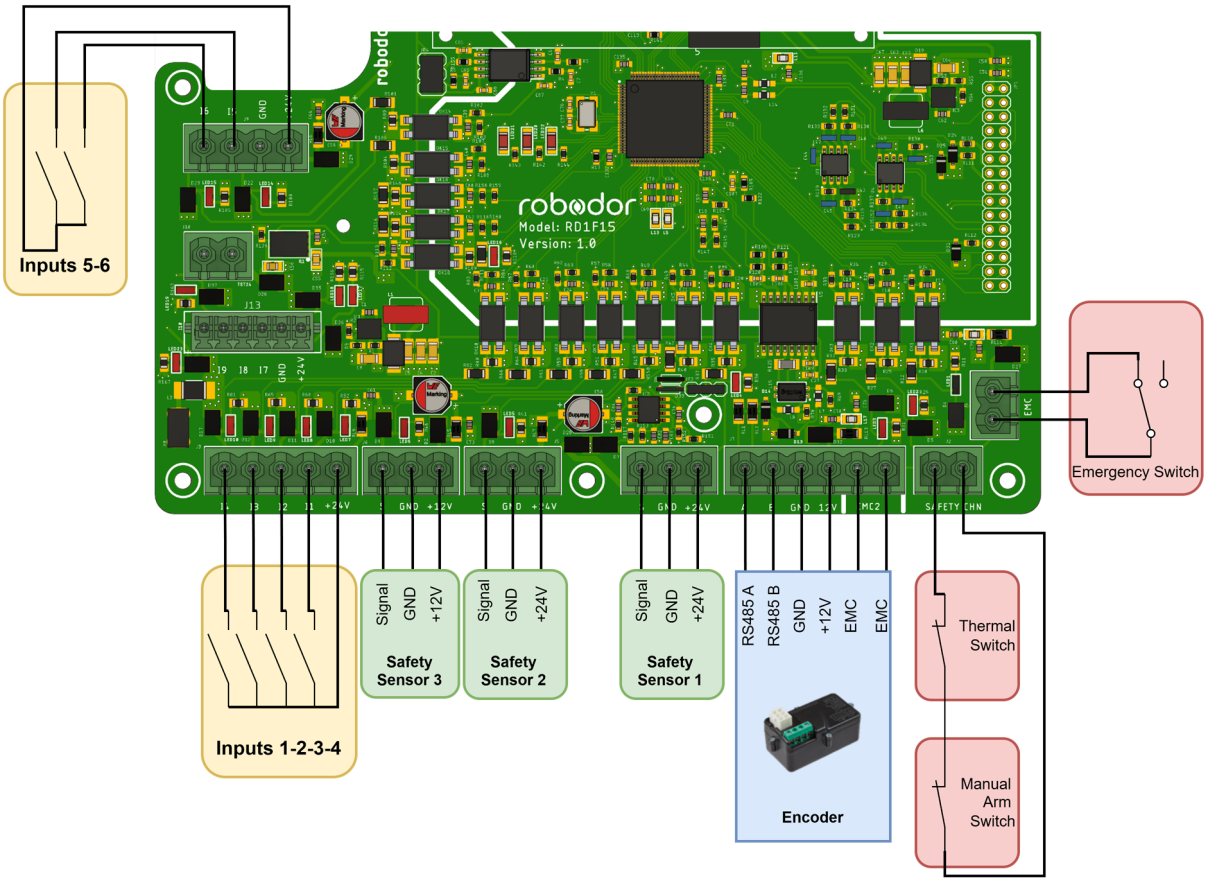


Figure 2: Power & Motor Connection Diagram

- **Inputs 1–6:** These are digital input lines used for receiving signals from external command devices such as remote controls, push buttons, or sensors. Inputs 1–4 and 5–6 are grouped and connected on the left side of the board. Since these inputs are programmable, any input can be assigned to any desired function, such as open, stop, close, fire alarm, airlock, or other special control operations.
- **Safety Sensors:** Three individual safety sensors (labeled as Safety Sensor 1, 2, and 3) are connected via 4-pin terminals that provide signal, ground, and voltage lines (+12V or +24V). These connections help ensure the door operates safely and opens immediately when an obstacle or hazard is detected.
- **Encoder Module:** A high-resolution digital encoder is connected through a 6-pin terminal, which includes RS485 A/B differential communication lines, dedicated power lines (GND, +12V), and EMC pins. The EMC (Electromagnetic Compatibility) connections help suppress noise and prevent signal distortion in environments with electromagnetic interference.
- **Emergency and Safety Chain:** On the far right, critical switches such as the Emergency Stop, Thermal Switch, and Manual Arm Switch are wired into the safety chain terminals. The safety chain ensures the system is immediately interrupted in emergency scenarios and provides layered protection.

5.3 PLC Connections (RS485/MOBUS RTU)

The RF15 system communicates via the Modbus RTU slave protocol. Communication is established using an RS485 half-duplex interface through the A (+) and B (-) terminals located on the device's socket as shown in Figure 3.

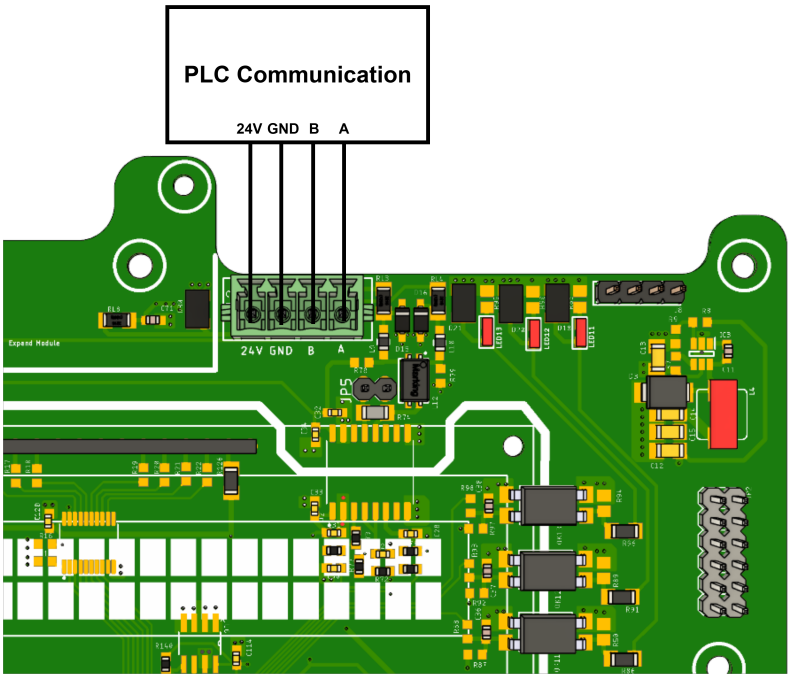


Figure 3: RF15 RS485 Connection

The standard serial port settings required for communication are summarized in the table below.

Table 2: Modbus RTU Communication Parameters

Parameter	Value
Protocol	Modbus RTU Slave
Physical Interface	RS485 Half-Duplex
Baud Rate	115200 bps
Data Bits	8
Parity	None
Stop Bit	1

Note: For more detailed information and the device's Modbus register map, please contact an authorized service center.

6 Main Screen and Information Displays

6.1 Welcome Screen

When the RF15 control unit is powered on, the welcome screen is displayed as shown in Figure 4. This screen provides essential information, including the manufacturer's name (ROBODOR), the model number (RF15), and the current firmware version (v1.005d).

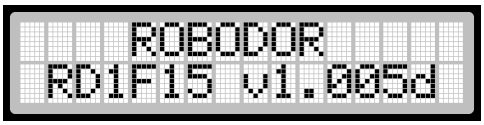
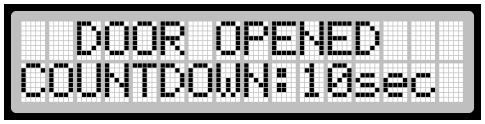


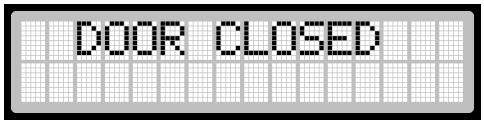
Figure 4: RF15 Welcome Screen Display

6.2 Main Screen Information

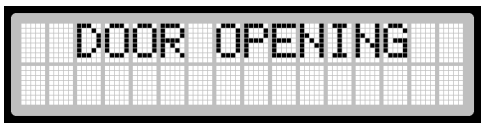
The main screen informs users of the current operational status of the door, including movement direction and any active error warnings. It visually communicates real-time door states such as opening, closing, stopped, or fully opened/closed, providing immediate feedback to both users and operators during operation, as illustrated in Figure 5.



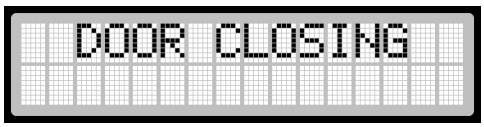
(a) Door is Opened



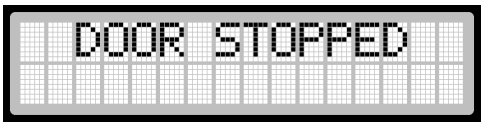
(b) Door is Closed



(c) Door is Opening



(d) Door is Closing



(e) Door is Stopped

Figure 5: Door Operation Status Main Screens

6.3 Diagnostic Screens

The diagnostic information screens, accessible through parameter "14.SCREEN DEBUG MODE SETTINGS" in the service menu, present detailed parameters such as motor speed, current, voltage, and system diagnostics. These screens facilitate monitoring and troubleshooting by providing essential technical data required for maintenance or operational adjustments.

6.3.1 Info 1

As illustrated in Figure 6, the diagnostic screen displays several critical position parameters that assist in the precise configuration and monitoring of the door system:

- **T (Top Fine Adjust):** Located at the top-left of the screen, this parameter enables automatic fine-tuning of the upper limit. After door calibration is performed, the controller adjusts this value during the first three door movements to ensure that the door stops precisely at the upper limit without error.

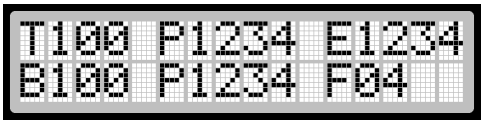


Figure 6: Information 1 Screen Display

- **B (Bottom Fine Adjust):** Found at the bottom-left, this parameter performs a similar fine adjustment for the bottom limit position.
- **P (Top Limit Reference):** Displayed at the top-center, this value represents the recorded upper limit position of the door as determined during calibration.
- **E (Current Position):** Shown at the top-right, this indicates the door's real-time position during operation.
- **P (Bottom Limit Reference):** Located at the bottom-center, this value corresponds to the recorded lower limit position from calibration.
- **F (Stop Position Deviation):** At the bottom-right, this parameter shows the positional deviation when the door stops at the upper or lower limit—essential for identifying overrun or undershoot during movement.

6.3.2 Info 2

Figure 7 illustrates the second diagnostic screen, which displays key electrical and thermal parameters related to the motor and its controller. These values are crucial for performance monitoring, fault detection, and preventive maintenance. The displayed parameters are:

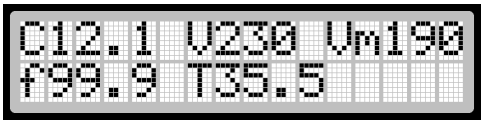


Figure 7: Information 2 Screen Display

- **C (Current):** Located at the top-left, this value represents the RMS phase current of the motor in amperes.
- **f (Frequency):** Shown at the bottom-left, this indicates the current operating frequency of the motor in hertz.
- **V (DC Bus Voltage):** At the top-center, this displays the rectified DC voltage of the supply input, also known as the DC bus voltage.
- **Vm (Motor Voltage):** At the top-right, this value shows the RMS voltage applied between motor phases.
- **T (Module Temperature):** Positioned in the bottom-center, this parameter reflects the temperature of the power module, providing critical thermal monitoring during operation.

7 Faults and Warnings

7.1 Faults

7.1.1 E01 – Encoder Connection Error

The controller cannot communicate with the encoder mounted on the motor. Possible causes include:

- Incorrect wiring between the encoder and controller
- Loose socket or terminal screw connections
- Insufficient encoder supply voltage (should be 15V)
- Electrical noise on encoder lines

Solution: Verify wiring and encoder supply voltage. Ensure ferrite cores are installed. Reset the system using Stop + Up + Down for 5 seconds.

7.1.2 E02 – Door Not Moving

The door is unable to move. Possible causes:

- Mechanical obstruction
- Motor not wired correctly (e.g., in star instead of delta)
- Motor not connected
- Inadequate torque or open phase

Solution: Check mechanical movement, motor wiring, and increase torque/speed if needed.

7.1.3 E03 – SPM Fault

A fault occurred in the Smart Power Module. Causes:

- Motor short circuit
- Attempting to move with locked motor
- Damaged driver IC (SPM)

Solution: Requires service center repair.

7.1.4 E04 – Door Direction Error

Motor moves in the opposite direction from command.
Solution: Change Motor Direction to REVERSE. If problem persists, also adjust Encoder Direction.

7.1.5 E05 – Emergency Triggered

An emergency input (button, thermal switch, or manual override) is triggered.
Solution: Check emergency button status, motor manual release, thermal condition, and input terminal wiring.

7.1.6 E06 – Motor Over Current

Motor current exceeds limit for over 1 second.
Solution: Increase motor current limit by 20%. Check wiring and mechanical resistance.

7.1.7 E07 – Motor Under Current

Motor current is significantly below expected values.
Solution: Check motor load, wiring, and phase continuity.

7.1.8 E08 – Over Voltage Fault

DC bus voltage exceeded safe limits (typically from regeneration).
Solution: Verify supply voltage and deceleration ramps. Check braking resistor circuit if available.

7.1.9 E09 – Low Voltage Fault

Input voltage is below safe minimum.
Solution: Check line voltage and power connections.

7.1.10 E10 – Over Temp. Fault

Inverter temperature exceeds safety threshold.
Solution: Improve ventilation, wait for cooldown, and check fan/heatsink.

7.1.11 E11 – Inverter Max Current

Current surpassed inverter's maximum threshold.
Solution: Verify motor and load. Inspect for short circuits or friction.

7.1.12 E12 – Encoder Noise Error

High-frequency interference affecting encoder signal.
Solution: Use shielded cables and ferrite cores, ensure proper grounding.

7.1.13 E13 – Over Pulse Error

Encoder pulse count exceeds expected range.
Solution: Recalibrate encoder or retrain door limits.

7.1.14 E14 – Door Too Slow

Door operates slower than expected.
Solution: Verify torque, ramp values, and mechanical resistance.

7.1.15 E15 – Door Too Fast

Door moves faster than expected.
Solution: Check encoder settings and speed limits.

7.1.16 E16 – Safety Chain Triggered

The Safety Chain mechanism might be engaged due to a triggered safety condition. Possible causes include a malfunctioning internal motor switch or a wiring fault within the safety circuit.
Solution: Check the safety chain status, inspect the motor's internal switch for malfunction, and verify all safety-related wiring connections.

7.1.17 E17 – Unknown Error

The occurred fault is either not registered in the system or may have been triggered due to a processor malfunction.
Solution: Press and release the emergency stop button. If the issue persists, restart the system. If the problem continues, contact the manufacturer.

7.2 Warnings

The following warnings indicate non-critical but attention-required conditions during operation. Although these do not stop the system, they may signal configuration problems, environmental issues, or user-related conditions that need addressing.

7.2.1 W01 – Safety Sensor 1 Triggered

The first safety sensor has been triggered, possibly due to an obstacle or signal noise.
Solution: Inspect the sensor connected to Safety 1 input and ensure proper alignment and operation.

7.2.2 W02 – Safety Sensor 2 Triggered

The second safety sensor is active.
Solution: Check for obstacles or faults in the Safety 2 input wiring or sensor hardware.

7.2.3 W03 – Safety Sensor 3 Triggered

The third safety sensor has been triggered.
Solution: Inspect and test the sensor connected to Safety 3 input.

7.2.4 W04 – Open Button Long Pressed

The Open button was held down for an extended duration.
Solution: Verify if the button is stuck or if manual control was held unintentionally. Prolonged input may prevent normal function.

7.2.5 W05 – Stop Button Long Pressed

The Stop button has been pressed and held longer than acceptable.
Solution: Ensure the button is not mechanically stuck and investigate any potential misuse or malfunction.

7.2.6 W06 – Close Button Long Pressed

The Close button remained pressed beyond its timeout limit.
Solution: Check button functionality and avoid prolonged input unless required for configuration.

7.2.7 W07 – Input 1 Long Pressed

Programmable Input 1 has been held active for too long.
Solution: Check the logic device or sensor connected to IN1 and validate its behavior.

7.2.8 W08 – Input 2 Long Pressed

Programmable Input 2 has remained continuously active.
Solution: Inspect the related connection and function assigned to IN2.

7.2.9 W09 – Input 3 Long Pressed

Input 3 has exceeded the allowed activation time.
Solution: Ensure proper signal logic and no physical faults in input wiring or triggering devices.

7.2.10 W10 – Input 4 Long Pressed

Long input condition detected on Input 4.
Solution: Inspect whether the signal should be momentary or continuous and correct configuration if needed.

7.2.11 W11 – Input 5 Long Pressed

Input 5 remains in a pressed state.
Solution: Investigate connected switches or automation components for misbehavior.

7.2.12 W12 – Input 6 Long Pressed

Input 6 has remained active beyond expected time.
Solution: Review external devices or logic assigned to IN6 input.

7.2.13 W13 – Unknown Warning

An undefined or unexpected warning condition has occurred.
Solution: Restart the system and review logs or contact support for investigation.

Note: Repeated long-press warnings may indicate physical switch damage, input misconfiguration, or poor signal logic in automation systems.

8 Menus

The keypad has three buttons: UP, DOWN, and STOP. These are used to navigate menus, start motor movements, and adjust settings.
In the main screen, by long pressing STOP and UP buttons, the user can enter the settings menu. You will see the first menu screen.
Note: Pressing STOP, DOWN, and UP buttons together performs a soft reset of the processor.

8.1 User Menu

The User Menu provides access to basic configuration and operational monitoring options suitable for general users. The current structure includes the following items:

8.1.1 Opening Count

Displays the total number of door openings since the initial installation. Useful for maintenance tracking and usage analytics.

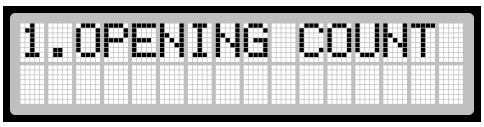


Figure 8: Opening Count screen in User Menu

8.1.2 Operation Mode

Allows the user to select the desired door control mode. Available options typically include:

- **Automatic:** Standard mode for everyday operation.
- **Manual:** Enables dead-man door movement.
- **Service:** Manual mode without safety limits and positions, primarily for service.
- **Test Mode:** Similar to automatic mode, but after the door closes, it automatically reopens after a preset duration. This is mainly used for functional endurance testing or cycle-based performance checks.

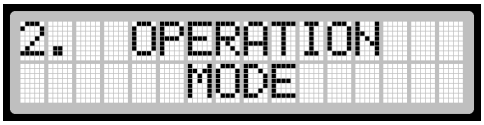


Figure 9: Operation Mode selection screen

8.1.3 Auto Close Time

This setting defines the duration the door remains open before automatically closing in Automatic or Test Mode.

The value entered in this menu is expressed in **seconds**. Once the door reaches its fully open position, the controller starts counting down the auto-close time. When the countdown reaches zero, the door begins its closing operation automatically.

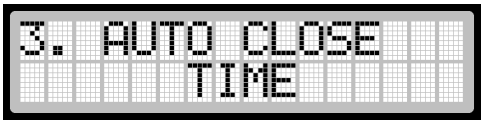


Figure 10: Fault History screen

8.1.4 Relay Settings

This menu allows the user to configure one of the three available relays.

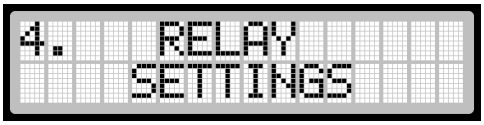


Figure 11: Relay Settings configuration screen

Upon entering this setting, the user is first prompted to select which relay to program:

- **Relay 1**
- **Relay 2**
- **Relay 3**

Once a relay is selected, the user proceeds to two configuration options described below.

8.1.4.1 Relay Function

This setting defines the logic or condition under which the selected relay is activated. Available functions include:

- **When Door is Opened** — Relay activates while the door is in fully opened position.
- **When Door is Closed** — Relay activates while the door is fully closed.
- **While Door is Opening** — Relay activates during the opening movement.
- **While Door is Closing** — Relay activates during the closing movement.
- **While Door is Moving** — Relay activates during any movement (opening or closing).
- **While Door is Not Moving** — Relay activates only when the door is idle.
- **While Door is on Error** — Relay activates when the system detects an error.

8.1.4.2 Relay State

This setting determines the relay's electrical switching behavior. The available states are:

- **Passive:** The relay is inactive.
- **Normally Open (NO):** The circuit is open when inactive and closes upon activation.
- **Normally Closed (NC):** The circuit is closed when inactive and opens when activated.
- **Blink Mode:** Each activation inverts the relay state, acting like a flip-flop.

8.1.5 Language Settings

Lets users choose the interface language.

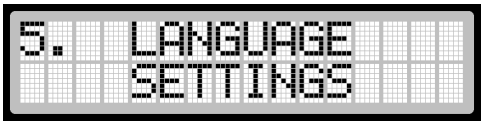


Figure 12: Language selection screen

Currently supported options include:

- **English**
- **Turkish**

8.2 Service Menu

8.2.1 Fault History

Displays the list of recent system faults with codes and timestamps to assist in diagnostics and troubleshooting.

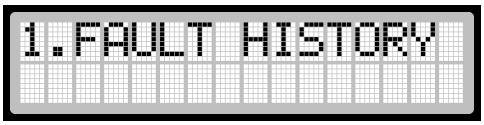


Figure 13: Fault History screen

8.2.2 Safety Sensor Function

The *Safety Sensor Function* menu is used to configure the functionality of each safety sensor input on the controller. This model supports **three independent safety sensor inputs**, each of which can be configured separately through submenus labeled:

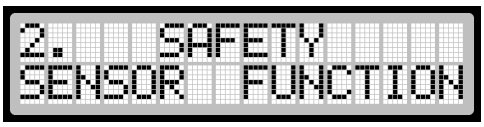


Figure 14: Safety Sensor Function settings

- **Safety Sensor 1**
- **Safety Sensor 2**
- **Safety Sensor 3**

To configure a sensor:

1. Use the **Up** and **Down** buttons to highlight the desired sensor input.
2. **Press the Stop button briefly** to enter the function setting menu.
3. Select the appropriate sensor type from the available options.
4. **Press and hold the Stop button** to save and return.

Available Safety Sensor Functions:

- **Passive:** No active monitoring; the input is not evaluated. Use this if the sensor input is unused.
- **Light Curtain 24V NC:** Monitors a **Normally Closed** sensor with **24V DC** COM line. Triggered when the circuit opens.
- **Light Curtain GND NC:** Monitors a **Normally Closed** sensor with **GND** as COM reference. Useful for GND-referenced mechanical edges.
- **Light Curtain Square Wave:** Accepts a **square wave signal**, typically 800–900 Hz, from a dynamic safety device. Any signal dropout is interpreted as a safety fault.
- **OSE:** For use with **Optical Safety Edges** which generate a dynamic coded signal.
- **Pneumatic:** Designed for **pneumatic safety edges**. This mode evaluates a pressure-sensitive edge that changes circuit state when compressed.

- **Photocell:** Monitors a standard **photocell sensor** with a Normally Closed output. Often used for detecting objects in the door's travel path.

Note: Make sure the physical wiring of each sensor matches the selected function mode. Incorrect configuration may lead to false triggering or failure to detect obstacles.

8.2.3 Safety Blind Position

The *Protection Level Setting* menu is used to define how far into the door's closing movement the safety sensors remain active. It allows the controller to deactivate safety inputs at a specified percentage of the closing stroke. This feature is useful for optimizing system behavior and avoiding false triggers near the end of door travel.

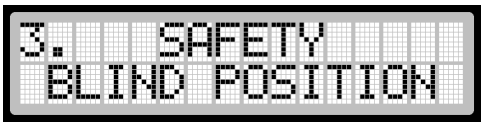


Figure 15: Safety Blind Position setting

Within this menu, configuration is available separately for:

- **Safety Sensor 1**
- **Safety Sensor 2**
- **Safety Sensor 3**

Each sensor can be assigned a percentage value (0–99), indicating the portion of the closing stroke during which the sensor remains active.

How it works:

- A setting of **0%** means the safety sensor is active throughout the entire closing movement.
- A setting of **10%**, for example, means the sensor is only active until the final 10% of the closing stroke. During the last 10%, the sensor will be automatically ignored by the controller.

This feature is particularly helpful when mechanical tolerances or environmental factors cause unnecessary triggering near the fully closed position.

Note: For maximum safety, it is recommended to keep the protection level as low as possible unless there is a valid reason to deactivate the sensor near the end of travel.

8.2.4 Input Sensor Configurations

This menu is used to assign and configure the functions of digital input terminals. Each input can be linked to specific operational or safety functions. The settings also include logic type (NO/NC) and trigger behavior (active high/low). As shown in Figure 16, the available input functions include:

- **Open Command:** Triggers the door to open when activated (active high).
- **Close Command:** Triggers the door to close when activated (active high).
- **Stop Command:** Immediately stops door movement. This function uses a **Normally Closed (NC)** input for fail-safe protection.
- **Fire Alarm:** Overrides standard operation in case of emergency; also uses a **Normally Closed (NC)** input.
- **Tunnel Mode:** Coordinates door movement with another door in interlocked setups.

Most control inputs operate with positive triggering, while safety-critical inputs like *Stop* and *Fire Alarm* are configured as NC to ensure safety in the event of a wiring fault or disconnection.

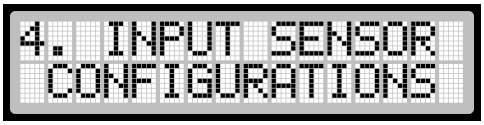


Figure 16: Relay Settings screen

8.2.5 Door Type Selection

The Door Type Selection menu enhances the accuracy of door control by saving essential door parameters.
These parameters include:

- Raductor Ratio
- Encoder Pulses Ratio
- Motor Speed in RPM

In this menu, users can either choose from predefined configurations such as Ultra Fast, Fast, Slow, Ultra Slow, etc., or manually configure parameters using the Custom Door option.

1. **Predefined Options:** To select a preset (e.g., Ultra Fast, Fast), press and hold the Stop button.
2. **Custom Door:** Press and hold Stop to enter custom mode. Set parameters (reductor ratio, encoder pulses ratio, motor RPM) using the arrow keys. Hold Stop again to save.

This ensures optimized door control based on specific mechanics and settings.

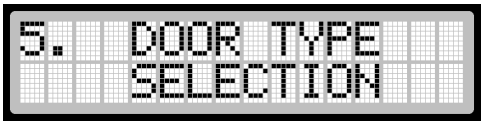


Figure 17: Door Type Selection

8.2.6 Door Limit Learning

The Learning menu is used to define the mechanical travel limits of the door by teaching the controller where the fully closed and fully open positions are. This process is essential for enabling accurate stopping, preventing mechanical overtravel, and ensuring the safety and consistency of motor control. It must be performed during initial installation or after any mechanical change to the motor, drive system, or door configuration.

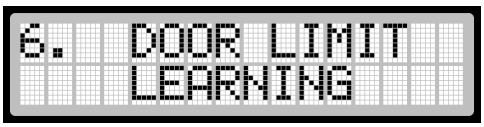


Figure 18: Door Limit Learning screen

1. **Entering the Menu:** Navigate to the “Door Learning” menu using the controller interface. Upon entering, the screen will display: `Move door to down limit` This indicates that the system is ready to record the bottom (closed) position of the door.

2. **Set the Down Limit:** Using the **Up** and **Down** buttons on the controller, move the door slowly to the desired closed position. Once the door is in place, **press and hold the Stop button** until the controller confirms the position. The screen will then display something like: `Down limit: 1234` indicating that the encoder position has been recorded successfully.

3. **Set the Up Limit:** After saving the down limit, the controller will prompt: `Move door to up limit` Again, use the **Up** and **Down** buttons to move the door to its fully open position. Once adjusted, **press and hold the Stop button** to save the position. The screen will confirm: `Up limit: 5678` and automatically return to the menu.

4. **Limit Calibration Process:** After both limits have been saved, the door must be operated **three times up and down by the user** using the Up and Down buttons. This process allows the controller to fine-tune the stopping behavior and finalize the encoder reference points. Skipping this step may result in inaccurate limit behavior during normal operation.

   This process ensures precise operation by automatically adjusting any small discrepancies in movement range.

Note: It is crucial to allow the door to complete the three full movements after teaching. This process allows the controller to refine and finalize the learned limits internally. Skipping this step may result in inaccurate door positioning during operation.

8.2.7 Door Limit Fine Tuning

The Limit Fine Tuning menu allows for precise manual adjustment of the previously taught upper and lower door limits. This feature is especially useful when small mechanical or positional changes are required without performing the full door learning procedure again.

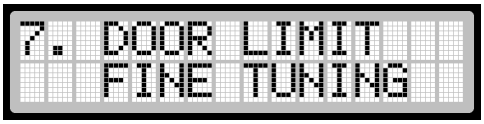


Figure 19: Door Limit Fine Tuning

The menu is divided into two submenus:

- **Upper Limit Fine Tuning**
- **Lower Limit Fine Tuning**

Once the door limits have been taught and the system has completed its self-calibration routine, this menu can be used to make fine positional corrections. These adjustments can shift the door's stop position slightly upward or downward.

When entering the fine tuning screen:

- Pressing the **Up** button will **increase the value** and shift the limit upward.
- Pressing the **Down** button will **decrease the value** and shift the limit downward.

The adjustment is shown as a positive or negative number on the screen. A **positive value** means the door will stop at a position slightly **above** the originally taught limit, while a **negative value** means the door will stop slightly **below** that limit. This method provides a flexible way to fine-tune stopping positions for mechanical alignment or user preference without modifying the main encoder reference points.

Note: Limit fine tuning only affects the stop position offset; it does not override the original taught limit values in the encoder. Use this function for minor corrections only.

8.2.8 Speed Configurations

The *Speed Setting* menu allows configuration of various speed parameters that control how fast the door moves under different operating conditions. These settings are crucial for adjusting door performance according to mechanical constraints, safety requirements, and user expectations.

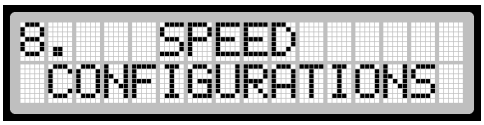


Figure 20: Speed Configuration screen

All values in this menu are entered in **Hertz (Hz)**, which directly corresponds to the motor's drive frequency and therefore its speed.

Available Speed Parameters:

- **Automatic Opening Speed:** The maximum speed used during automatic door opening.
- **Automatic Closing Speed:** The maximum speed used during automatic door closing.
- **Manual Opening Speed:** The speed used when the door is opened manually with the deadman mode.
- **Manual Closing Speed:** The speed used during manual closing with the deadman mode.
- **Opening Stop Speed:** The reduced speed applied just before the door fully opens to ensure smooth stopping.
- **Closing Stop Speed:** The reduced speed applied before the door fully closes for accurate and gentle landing.
- **Start Speed:** The initial speed used when the door begins moving from a stationary state.

Note: Proper configuration of these speed parameters is essential for balancing performance and durability. Too high speeds can cause safety issues and excessive wear, while overly low speeds may reduce operational efficiency.

8.2.9 Ramp Configurations

The *Ramp Configurations* menu is used to configure acceleration and deceleration profiles for the door during opening and closing. These settings ensure smooth motion transitions, reduce mechanical stress, and improve safety and comfort during operation.

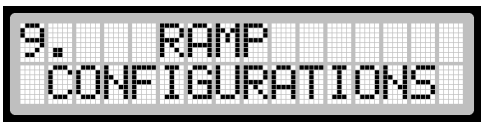


Figure 21: Ramp Configuration screen

There are a total of six ramp segments that can be configured independently:

- Open Start Ramp
- Open Slowdown Ramp
- Open Stop Ramp
- Close Start Ramp

- Close Slowdown Ramp
- Close Stop Ramp

Each ramp is defined as a **percentage of the total travel distance**, indicating when the corresponding speed behavior should begin.

Ramp Definitions:

- **Start Ramp:** Determines how quickly the door accelerates from zero to maximum speed. For example, a value of 15% means the door will gradually accelerate during the first 15% of its travel.
- **Slowdown Ramp:** Defines when the door starts decelerating from maximum speed to stop speed. This transition begins at the specified percentage and continues until the stop ramp begins.
- **Stop Ramp:** Represents the final phase of movement, where the door moves at a low speed to complete its travel and stop smoothly. This phase typically starts after the slowdown ramp ends.

Each of these settings applies separately to the **upward (opening)** and **downward (closing)** directions, allowing full customization based on door weight, motor strength, and safety requirements.

Example: If the upward start ramp is set to 10%, the door will accelerate from zero to full speed in the first 10% of its opening distance. Similarly, if the downward stop ramp is set to 5%, the door will reduce to stop speed and gently finish its travel in the final 5% of the closing distance.

Note: Careful tuning of these parameters helps prevent sudden jolts, minimizes wear on mechanical components, and ensures precise

8.2.10 Torque Configurations

The *Torque Configurations* menu allows fine-tuning of the motor's torque output during different phases of door movement. This feature is particularly useful for overcoming mechanical resistance during startup and ensuring sufficient force during acceleration and stopping.

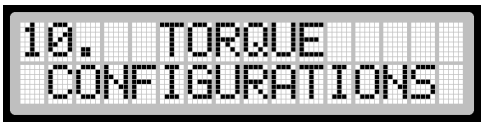


Figure 22: Torque Configuration screen

There are four torque parameters available in this menu:

- **Torque Boost During Opening:** Increases motor torque during the acceleration phase of door opening.
- **Torque Boost During Closing:** Applies additional torque when the door is accelerating during closing.
- **Torque Boost Opening Stop:** Extra torque applied when the door speed falls below 20 Hz at the end of opening, helping to stabilize the door before it fully stops.
- **Torque Boost Closing Stop:** Similar to above, but applied when the door is about to complete closing. Useful for maintaining position and preventing rebound.

All torque values are entered as percentages, representing the additional torque relative to the motor's nominal operating level.

Recommendation: It is generally advised to keep torque boost levels within a maximum of **15%**. Excessively high torque settings may lead to motor overheating or mechanical wear over time.

Note: These torque boosts are particularly helpful in doors with high friction, heavy panels, or tight mechanical constraints.

8.2.11 Motor Parameter Configurations

The *Motor Parameter Configurations* menu is used to define the key electrical properties of the motor connected to the controller. These parameters are required for safe, accurate motor operation and are typically found on the motor's nameplate.

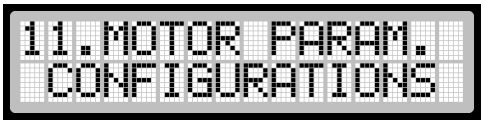


Figure 23: Motor Parameter Configuration

Upon entering this menu, four configuration options appear:

- **Motor Voltage**
- **Motor Frequency**
- **Motor Current**
- **Motor Direction**

To adjust any of these parameters:

1. Use the **Up** and **Down** buttons to navigate to the desired setting.
2. Once the selection is highlighted, **press the Stop button briefly** to enter the configuration screen.
3. Use the Up/Down buttons to set the value.
4. When finished, **press and hold the Stop button** to save and return to the previous menu.

Parameter Descriptions:

- **Motor Voltage:** Enter the motor's rated voltage (e.g., 230V). This ensures the controller can scale the output voltage appropriately.
- **Motor Frequency:** Enter the rated operating frequency (usually 50 Hz or 60 Hz).
- **Motor Current:** Enter the rated motor current in amperes. This value determines the overload protection threshold and must be accurate.

  Note: For fine tuning or initial setup, it may be acceptable to enter a motor current slightly above the nominal value (e.g., up to 25% higher) to avoid premature overcurrent faults. However, this should only be temporary. For regular operation, the exact nameplate current should be used to protect the motor.
- **Motor Direction:** This setting defines the rotation direction of the motor relative to the door movement. If the door moves in the wrong direction (e.g., moves down when the *Up* button is pressed), select the **Reverse** option in this menu. Adjusting the motor direction ensures that control commands match the actual movement of the door.

Proper configuration of these motor parameters is essential for reliable system behavior and the protection of both electrical and mechanical components.

8.2.12 Mechanical Brake Config.

The *Mechanical Brake Config.* menu is used to configure the engagement and release behavior of the mechanical brake attached to the motor. This setting is particularly important for heavy doors, where unintended movement due to gravity must be prevented when the motor is not actively driving.

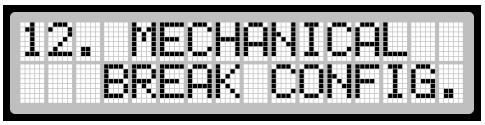


Figure 24: Mechanical Brake Configuration

Functionality:

The parameter configured in this menu is a frequency value, expressed in **Hz**. It defines the threshold at which the brake is released or engaged:

- When the motor is being driven at a frequency **higher than** the set value, the brake is **released**.
- When the motor frequency falls **below** the threshold, the brake is **engaged**.

This mechanism ensures that the brake is only released when the motor is actively driving with sufficient torque, preventing the door from moving under its own weight during idle conditions.

Important Note: The brake release frequency must be set **lower than the minimum motor drive frequency** used in normal operation. If it is set too high, the motor may attempt to run while the brake is still engaged, potentially leading to mechanical stress or controller fault conditions.

Recommended Usage: In applications involving large, heavy doors or vertical movement, brake control becomes critical. Proper adjustment of this parameter improves stability and prevents load slippage when the motor is not powered.

8.2.13 Limit Sensor Configurations

The *Limit Sensor Configurations* menu is used to select the type of position sensing method that will be used to track the door's movement and limits. This setting is crucial for ensuring accurate position feedback and safe operation.

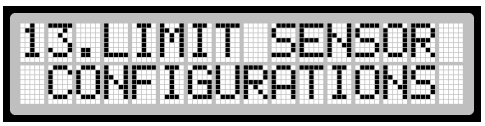


Figure 25: Limit Sensor Configuration

Available sensor types include:

- **KOSTAL 9600** – KOSTAL encoder with 9600 baud communication speed
- **KOSTAL 19200** – KOSTAL encoder with 19200 baud communication speed
- **GFA Encoder** – Encoder type used in GFA-brand.
- **Mechanical Limit Switches** – Traditional physical switches that detect open and close ramp and limit positions (4 switches)

Selection Guidance:

- Choose the correct sensor type based on the actual hardware connected to the system.

- If a digital encoder such as **KOSTAL 9600** or **KOSTAL 19200** is selected, ensure that the baud rate matches the encoder's specifications.
- After selecting a digital encoder option, **a full power cycle of the controller is required** for the change to take effect.

Note: Incorrect selection may result in missing or unstable position feedback, leading to malfunction during door movement. Always refer to the encoder's datasheet or motor specifications when choosing the appropriate sensor type.

8.2.14 Screen Debug Mode Settings

Enables selection of diagnostic information screens (e.g., motor voltage, current, temperature) to assist technical analysis.(see Section 6.3)

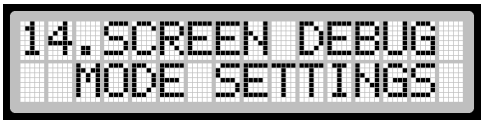


Figure 26: Screen Debug Mode Setting

8.2.15 Factory Reset

Resets all configurations to factory defaults after password confirmation. Used to restore initial system state.

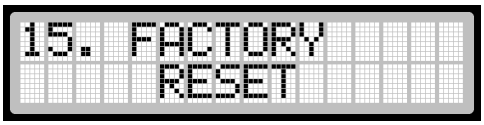


Figure 27: Factory Reset Screen

9 Terms and Warranty

Return Policy

You may return the product within seven (7) days of delivery by providing a petition that includes the invoice and reason for return. The product must remain unused beyond trial purposes, and its originality must be intact. If the product has been altered, damaged, or used extensively, a return will not be accepted.

Inspecting for Damage Upon Delivery

At the time of delivery, inspect the package in the presence of the cargo authority for any visible damage. If damage is identified, do not accept the product, and ensure a record is made by the cargo company. Accepting the package confirms that the cargo company has met its obligations fully.

Conditions for Return Acceptance

Products that are returned must have their original packaging intact and be in the same condition as delivered. If the product or packaging shows signs of damage, deterioration, or extensive use upon inspection, a return will not be processed, and no refund will be issued.

Consulting Authorized Services

For any issues after delivery, consult the manufacturer's authorized services to address potential concerns with the product.

Warranty and Repair Periods

During the warranty period, any repair time will be added to the warranty duration. The maximum repair time is fourteen (14) working days. In case of a defect arising from manufacturing, assembly, or material faults, the repair will be carried out at no cost to the customer, covering all labor and part replacement expenses.

Warranty Exclusions

Faults due to user misuse or non-compliance with the instructions in the operating manual are not covered by the warranty. Additionally, if a device sent for service is not claimed within three (3) months from the service date, the manufacturer holds no responsibility for its delivery.

Manufacturer's Limitations

The manufacturer will not be liable for any repairs or damages caused by failure to comply with these terms or for faults outside of the warranty scope.