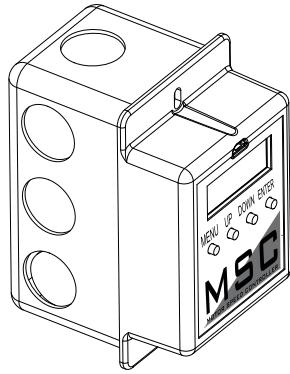
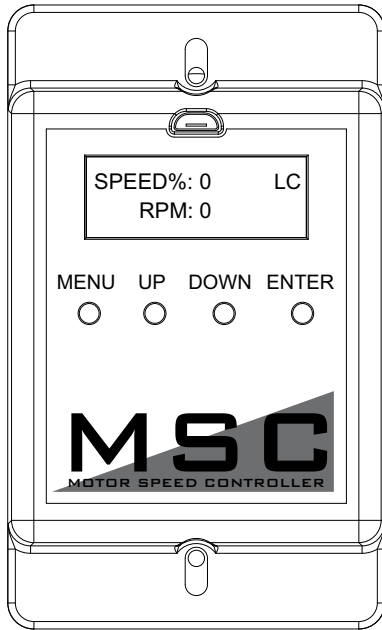


Motor Speed Controller Installation, Operation, and Maintenance Manual



RECEIVING AND INSPECTION

Check for any signs of damage upon receipt, and if found, report it immediately to the carrier. Check that all items are accounted for and damage free.

WARNING!

Installation of this package should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on electrical equipment.

Save these instructions: This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

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WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 2-years from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product.
2. The equipment is not installed in accordance with Federal, State, and Local codes or regulations.
3. The equipment is misused or neglected, or not maintained per the MANUFACTURER'S maintenance instructions.
4. The equipment is not installed and operated within the limitations set forth in this manual.
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 2-year warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization, and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

Motor Speed Controller (MSC) Installation

The Motor Speed Controller (MSC) is a versatile device able to output various signal types to many different Electrically Commutated Motors (ECMs). The MSC signal output types can be selected under the 'Motor Type' section of the MSC menu. The MSC may be installed in a fan, remotely in a kitchen space, or in a mechanical room. While this device can be mounted remotely and powered using 24V, it may also be mounted with the fan where it will be exposed to higher voltages. If installed in the fan, the electrical installation must be carried out according to the appropriate regulations (e.g., cable cross-sections, circuit breaker, protective earth [PE] connection). National and local codes must be followed during the installation process.

The MSC board may be powered through a 120VAC/24VAC CLASS 2 transformer, 120V AC/24V DC CLASS 2 power supply, or through MODBUS connections.

The MSC contains static sensitive components. Therefore, you must handle with care to avoid damage to these components. All operations concerning installation, commissioning, and maintenance must be carried out by qualified, skilled personnel who are familiar with the installation, assembly, commissioning, and operation of the electronic board and the application for which it is being used.

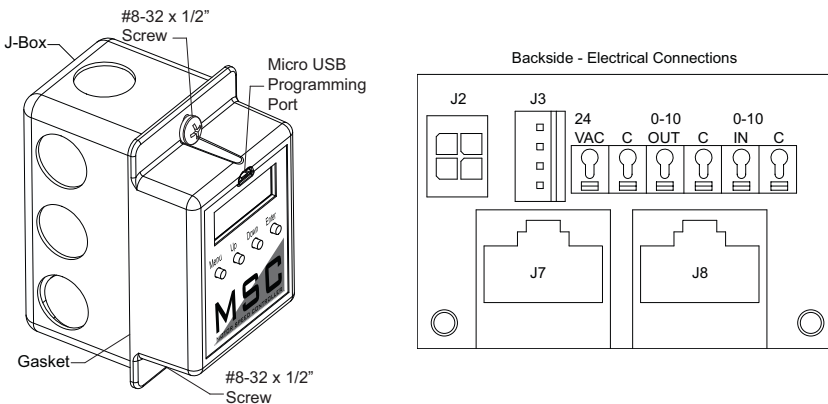
Ensure proper handling and avoid excessive mechanical stress. Do not bend any components when handling or installing component. **Do not touch any electronic components or contacts.**

Precautions must be adhered to during installation, testing, servicing, and repairing of this board. Component damage may result if proper procedures are not followed.

Do not install the MSC where it is subjected to adverse environmental conditions such as combustibles, oils, hazardous vapors, corrosive chemicals, excessive dust, moisture, direct sunlight, or extreme temperatures. When removing or installing the MSC to the j-box, verify the gasket is present. All electrical connections for the MSC are located on the backside of the controller. Refer to **Figure 1** for details on installation and electrical connections. When the micro-USB programming port is not in use, place the weather-seal plug into the port location.

NOTE: The MSC can be daisy-chained to VFDs. Each component must have a unique Modbus address for proper operation.

Figure 1 - Installation/Electrical Connections



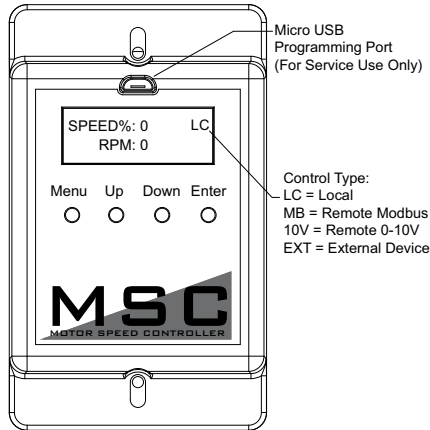
MSC Controller Overview

There are four buttons to navigate through the menu screens, refer to **Figure 2**.

Press the **MENU** button to access menu settings/parameters, pressing **MENU** will also back out of the current menu screen. To scroll through menus, use **UP** and **DOWN** buttons. Press the **ENTER** button to change setting/parameter selection.

To enter password, press MENU, then press **ENTER** when 'Board Config' is displayed. Use **UP** and **DOWN** to scroll through numbers, press **ENTER** to advance to the next numerical setting. To save changes, press **MENU** until the screen displays 'SAVE CHANGES? [ENTER] TO SAVE.' Press the ENTER button to save changes.

Figure 2 - MSC Front Detail View



MSC Menu

Board Config - Password (default is 0225)

- **Motor Type** - User may change motor type between motor brands. Select "Other" when using an existing 3rd-party motor.
- **Control Type** - This setting adjusts how the fan will be controlled.
 - **Local** - The fan will be controlled by the MSC.
 - **Remote Modbus** - The fan will be controlled by another master board through the MSC. A connection between the 0-10V Out to 0-10V In must be made for start command.
 - **Remote 0-10V** - The fan will be controlled by an external 0-10V signal.
- **Speed Settings** - Provides access to speed and voltage settings.
 - **Low Speed** - Adjustable speed from 20% up to high speed setting, or 0-10V. Setting cannot go above High Speed parameter.
 - **High Speed** - Adjustable speed from 100% down to low speed setting, or 0-10V. Setting cannot go below Low Speed parameter.
 - **Set Speed%** - Adjustable speed range is dependent on Low Speed and High Speed settings. This controls the output of the motor.
 - **Voltage Range** - Only available when Motor Type 'OTHER' is selected. Default setting is 24V. Other available voltages are 5V and 10V.
- **Modbus #** - Adjustable Modbus ID. Exhaust Fan range 11 through 18, Supply Fan range 21 or 22. **A VFD and MSC cannot use the same Modbus #.**
- **Options**
 - **Feedback Fault** - If set to ENABLED, the MSC will monitor RPM feedback. If the MSC does not receive data for 30 seconds or 70% of the expected RPM, this fault will be displayed. **Ziehl motors do not provide feedback.**
 - **2 Speed** - The 0-10V output cannot be used when the 2 Speed or Manual Speed options are On, or if the 'Control Type' is set to Modbus. When the 0-10V OUT and 0-10V IN terminals are **not** jumped together, the fan will operate at low speed. When 0-10V OUT and 0-10V IN terminals are jumped together, the fan will operate at high speed.
 - **Analog Speed** - The user may enable/disable the option, and calibrate a potentiometer for proper operation that is connected between the 0-10V OUT and 0-10V IN terminals. When enabled, you must calibrate the potentiometer. Follow the MSC's on-screen instructions. The speed will be adjustable between 0V (low speed) to 10V (high speed).
 - **Input Threshold** - When control type is set to Remote 0-10V, an input threshold will be created for motor control. Refer to **Figure 3 on page 8** for threshold examples.
 - **Zero Operation** - The user may select how the motor will operate when the 0-10V input is at 0V. The options will be Off or Low Speed (default).
 - **Threshold** - Increasing the threshold value will allow for the device to hold its voltage/RPM output while the input is between the 0 - threshold value.
- **Restore Settings** - Provides access to restore factory settings, and test & balance settings.
 - **Factory Settings** - This will reset all values back to factory settings.
 - **T & B Settings** - This will reset all values back to last saved test & balance settings.
- **Change Password** - Users may update the password setting to their own preference. Password 0225 will also be stored for backup. Both passwords will allow users to enter 'Board Config' settings.

Software Version - Displays the current software version installed on the board.

Faults - This provides access to 'Fault History,' 'Fault Totals,' and 'Clear Faults.'

- **Fault History** - Displays fault history and board reboots in chronological order. Possible displayed faults are:

- **No Faults** - There are no active faults with the system.
- **Feedback Fault** - Only displayed for motors with feedback capabilities.
- **Reboot** - Any time the fan goes from OFF to ON, this "fault" will be logged. This fault will only display in 'Fault History.'
- **Modbus** - Issue with Modbus communication between the MSC and master board.
- **Variable Device Fault** - When 'Analog Speed' is selected and a potentiometer is connected, if the voltage drops below 1V, this fault will be displayed.

- **Fault Totals** - Displays the number of faults for Modbus, Feedback, Var Device, Reboot, and Total Faults.

- **Clear Faults** - Users may clear all faults from the board.

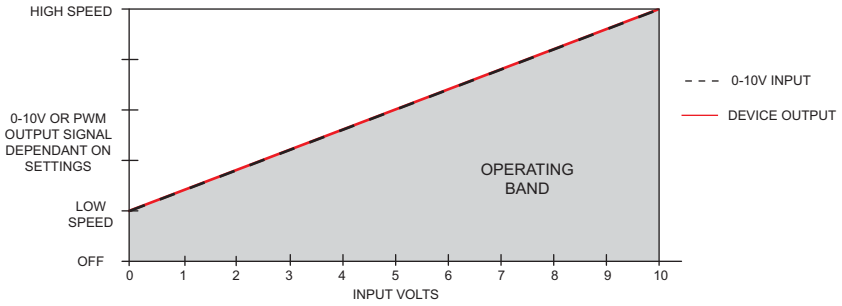
Service - This provides access to service settings. Password: 1234

- **Save T & B** - After the test & balance process has been completed, save adjustments under this menu.
- **IO Status** - Provides access to information about the inputs and outputs of the MSC board.
 - **V In** - Displays the incoming voltage (0-10V) to the MSC.
 - **V Out** - Displays the output voltage (0-10V) to the motor.
 - **RPM** - Displays motor RPM feedback. **Ziehl motors do not provide feedback.**
 - **PWM V** - Displays equivalent voltage reading of the PWM output to the motor.
 - **Speed%** - Displays PWM percentage output value to the motor.
- **Modbus Status** - Provides access to expected and actual speeds in hertz and percentage.

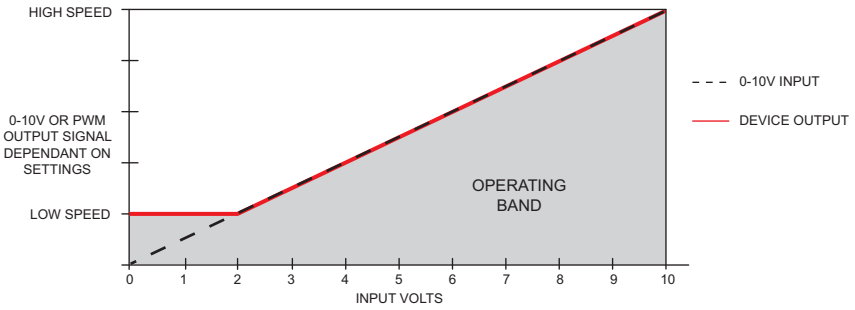
Input Threshold

Figure 3 - Input Threshold Examples

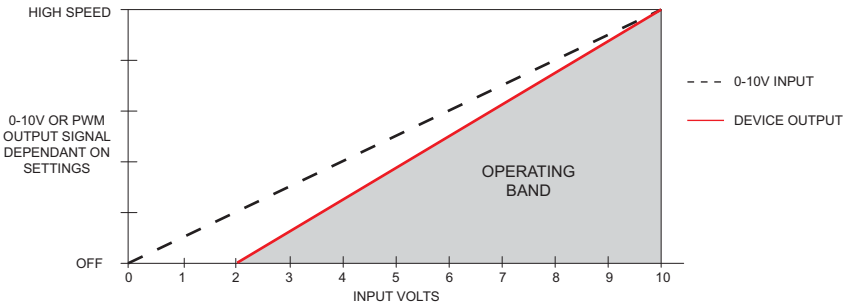
Factory Default: Zero operation set to low speed, threshold set to 0V.



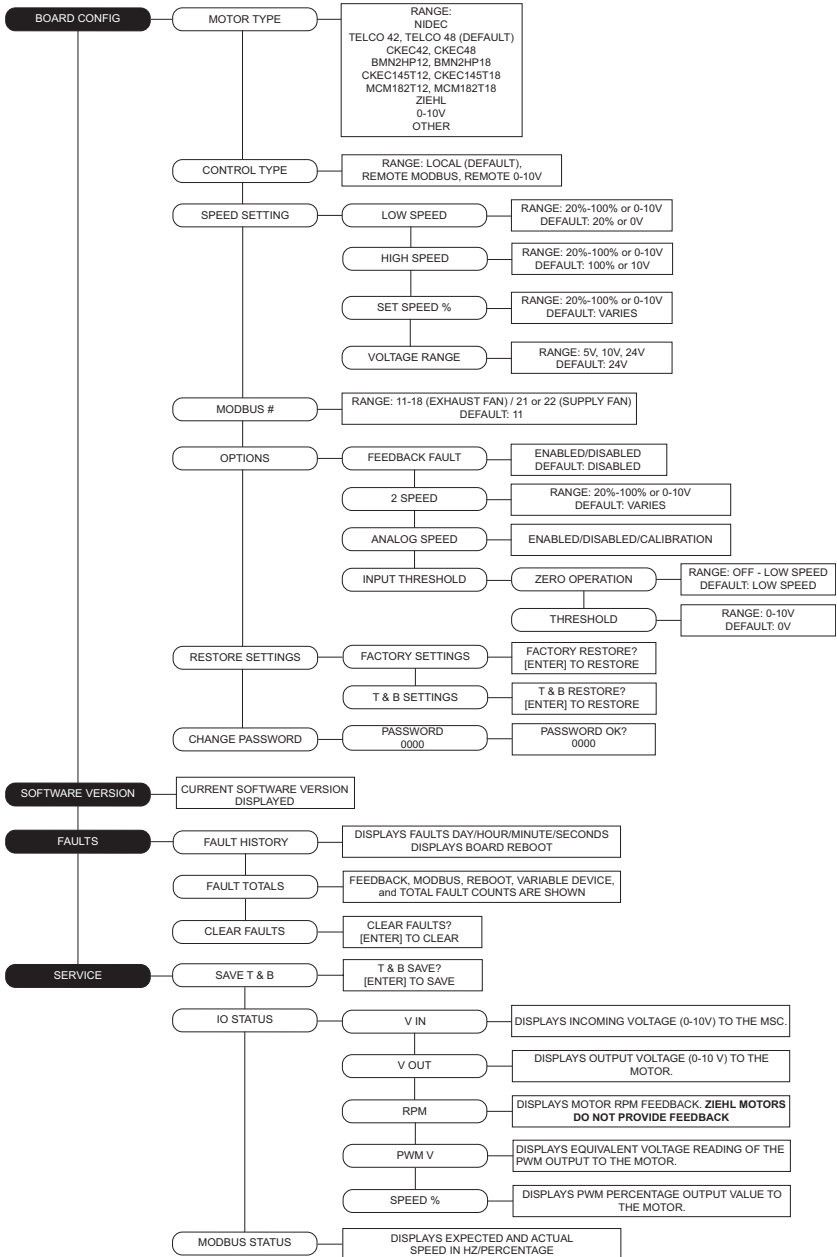
Zero operation set to low speed, threshold set to 2V.



Zero operation set to off, threshold set to 2V.



MSC Menu Tree



MSC Troubleshooting

Fault	Problem	Potential Cause	Corrective Action
Feedback Fault	Feedback Fault on MSC Display	Disconnected/faulty wiring.	Secure connections to fan. If faulty wiring is found, repair, or replace as required.
		No feedback for 30 seconds.	Check parameters.
		Less than 70% of RPM.	Check duct/fan for obstructions.
Modbus	Modbus fault on MSC Display	Faulty Cat 5 connection/cable.	Find and replace faulty cable.
		ECPM03 does not recognize device.	Verify Modbus # on device is set correctly.
Variable Device Fault	Motor not responding to changes made on variable device (potentiometer)	Defective potentiometer.	Replace potentiometer.
		Faulty wiring to motor.	Find and replace faulty wiring.
Motor not responding	Motor not functioning as expected	2-Speed switch not working.	Check switch and wiring.
		Wiring to motor defective.	Find and replace faulty wiring.
		Check for other faults on MSC display.	If no other faults are present, motor may be defective.

TURN OFF POWER TO THE MOTOR WHILE PROGRAMMING THIS DEVICE.

- If the device has a potentiometer or a 2-Speed switch, a jumper wire can be placed in between the 10V In and 10V Out terminals to rule out a defective device. This will cause the motor to go to HIGH SPEED.
- The IO STATUS menu can be used to verify the inputs and outputs of the device are functioning as expected.
- The FAULT HISTORY menu can be used to keep track of faults while working on the device.

