

iOptimizer[®] User Manual



This manual will guide you through the installation and setup process of your iOptimizer[®]. Please read the manual completely before installing your controller.

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Customer Service

At Link4[®], we are committed to providing professional, efficient and high-quality solutions and support for your greenhouse business. For help from Technical Support during Monday thru Friday (not including holidays), from 6:00 a.m. to 6:00 p.m. PST, please call 714-975-9474 or email support@link4controls.com. For after hours, weekends and holidays, please leave a message and your call or email will be responded to by the next business day.

If a highly critical need arises during non-business hours, please call our main office line at 866-755-5465 and leave a message. These calls are screened and if they meet the criteria for an emergency, a call will be returned before the next business day.

Gold Package Customers — please refer to the private phone number on your warranty letter to access emergency support after hours, and on weekends and holidays.

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Terms and Conditions

Limited Warranty

Link4 warrants that the goods sold will be free from defects in material and workmanship for a period of 12 months after the date of purchase. This warranty will be limited to the repair and replacement of parts and the necessary labor and services required to repair the goods. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.

Moreover, any description of the goods contained in this Installation and User's Guide is for the sole purpose of identifying them, is not part of the basis of the bargain, and does not constitute a *warranty* that the goods will conform to that description. The use of any sample or model in connection with this Installation and User's Guide is for illustrative purposes only, is not part of the basis of the bargain, and is not to be construed as a *warranty* that the goods will conform to the sample or model. No affirmation of fact or promise made by Link4, whether or not in this in this Installation and User's Guide, will constitute a *warranty* that the goods will conform to the affirmation or promise.

Link4 shall not be responsible for replacement(s) or repair(s), which become defective from user negligence, modification, abuse, any types of improper usage, acts of God and/or force majeure. Nonconformance to any of the specifications in the product manual will void the warranty. Furthermore, Link4's liability to the goods sold, whether on warranty, contract, or negligence, will be released upon the expiration of the warranty period when all such liability shall terminate. Link4 shall not be responsible for any loss or claims due to consequential damages caused by the Buyer. Link4 also reserves the right to make any necessary changes to features and specifications, and to the terms and conditions of this warranty.

Notwithstanding any provision hereof which may be or appear to be to the contrary, in no event whatsoever shall Link4 Corporation's liability in respect to any claim or action of any kind arising out of, in connection with, or resulting from the manufacture, sale, delivery, resale, use or repair of the goods or component parts thereof or the services rendered by Link4 Corporation pursuant to the agreement, or any breach by Link4 Corporation of any term of the agreement, exceed the price for the goods or component part thereof or service which gives rise to such claim or action. Customer assumes all other liability for any loss, damage or injury to persons or property arising out of, connected with or resulting from the use of the goods, either alone or in combination with other products, including, without limitation, any "special damages" or any loss, damage or injury to customer (or to customer's employees or property or to the employees or property of any customer of customer or other user of the goods) due to the acts or omissions of customer, its agents, employees or customers, in the installation, maintenance, use or operation of such goods.

Return, Exchange or Refund

Please refer to Link4's Return and Exchange Policy at <http://link4controls.com/support>.

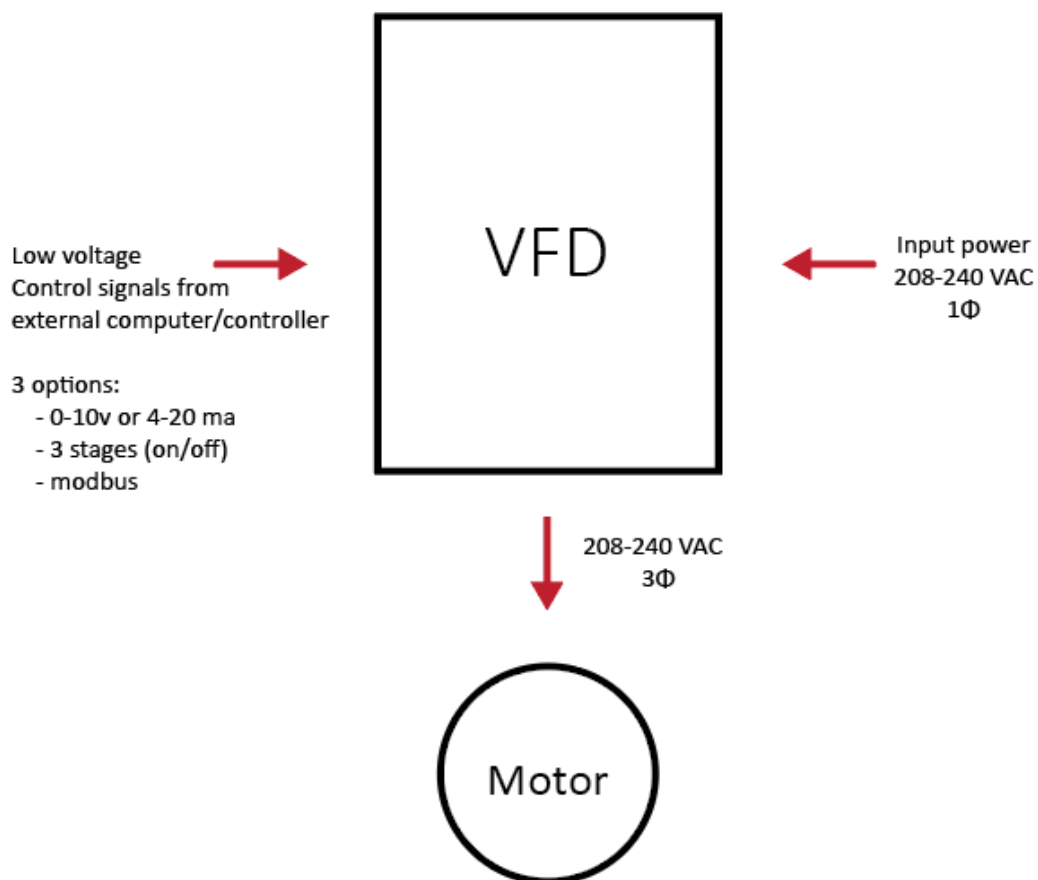
Introduction

Link4's iOptimizer[®] is a Variable Frequency Drive (VFD) controller designed to optimize energy savings, reduce fan belt maintenance, enable control of static pressure in your facility, provide enhanced airflow patterns for the well-being of greenhouse plants along with other advantages. With the VFD controller, when a fan or pump is to turn on, the motor turns on slowly (soft start) and increases in power until it reaches the required set point. This eliminates the bang-bang effect of an on/off control for the fan or pump motor. The VFD's smooth turn-on feature eliminates the sudden power surge generated by a motor that only turns on to its maximum. The VFD is designed to receive one of three types of inputs from an external controller or computer. The options are: 0-10 volt or 4-20 ma, 3 stages of on/off, and a RS485 Modbus signal.

Applications of the iOptimizer[®] include, fans, pumps and other applications where multi-speed motor control is a valuable feature.

The iOptimizer[®] is a prewired self-contained VFD controller mounted in an enclosure with an input power terminal and disconnect and a low voltage terminal block. A conceptual drawing is shown in Figure 1 illustrating the inputs and outputs of the unit and how it fits in with the application.

Figure 1 Variable Frequency Drive (VFD) - Inputs and Outputs



Installation

The iOptimizer[®] should be located no more than 50 feet from the motor it will control. The closer the better. Our recommendation is that it be located right in the vicinity of the motor.

The following factors should be taken into consideration:

- readily accessible;
- a sturdy surface to hold the weight of the controller and the additional weight of the equipment power cords;
- away from direct sunlight and grow lights;
- minimum vibration

There are four (4) mounting tabs on the outside of the Optimizer enclosure to help you attach it to a suitable surface. Make sure you use appropriate tools.

Power Requirements

Input voltage: 200 – 240 VAC ; Single phase; 50/60Hz

Input current: 16 AMPS

Output voltage: 200-240 VAC; Three phase; 50/60Hz

Output current: 7.1 AMPS

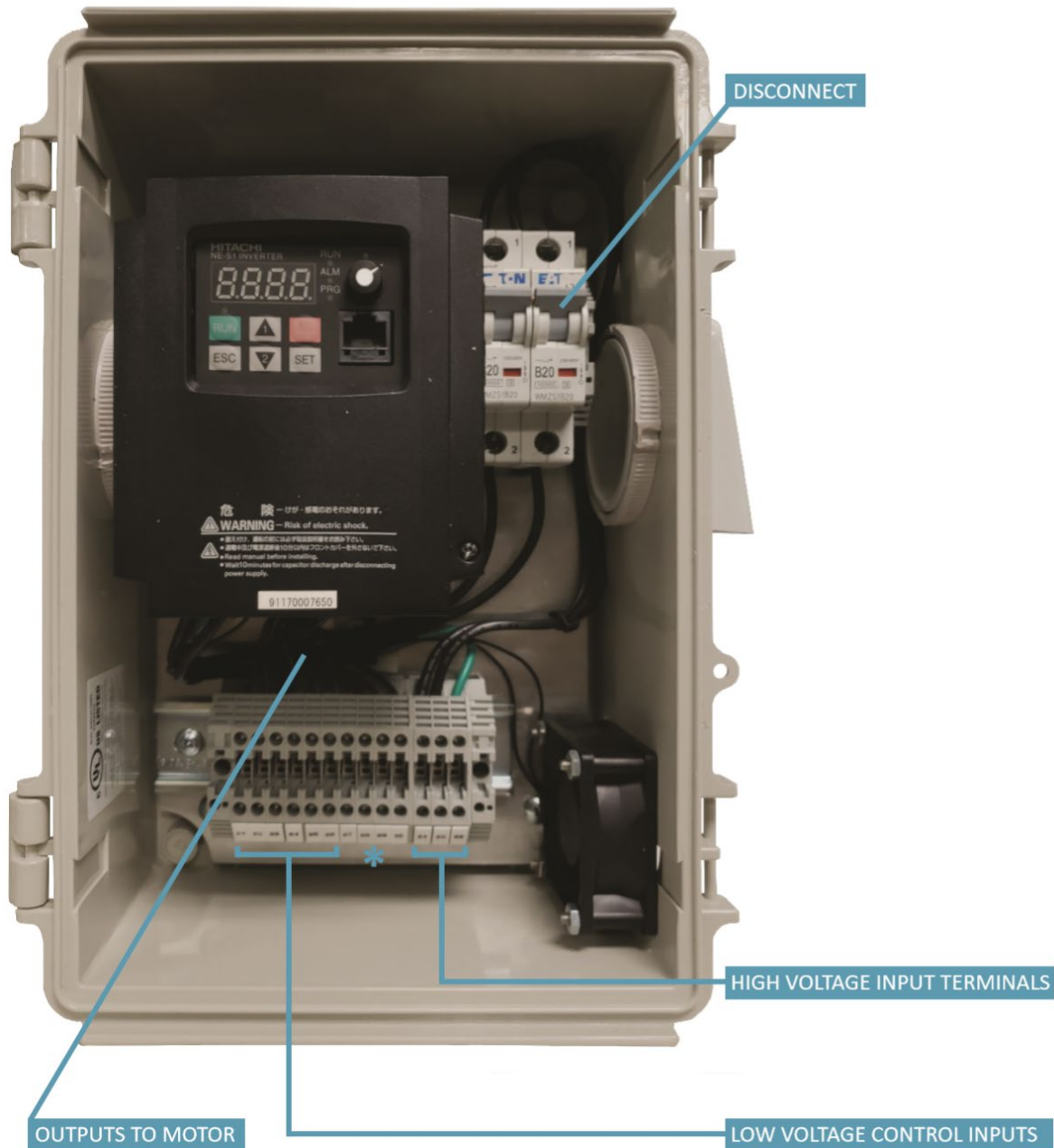
Motor must be rated for 200 – 240 VAC 3phase (insulation class F or better)

A 120-volt motor will not work

Electrical Wiring

Figure 2 is a picture of the iOptimizer[®] panel layout. The inverter is in the upper left side. The high voltage inputs are on TB2 and power disconnect is on upper right side. The low voltage terminal block is near the bottom.

The high voltage connections to the motor are landed directly on the Hitachi inverter.



* Not available on all models

Figure 2 Inside View of the iOptimizer[®]

A more detailed electrical connection drawing is shown in Figure 3.

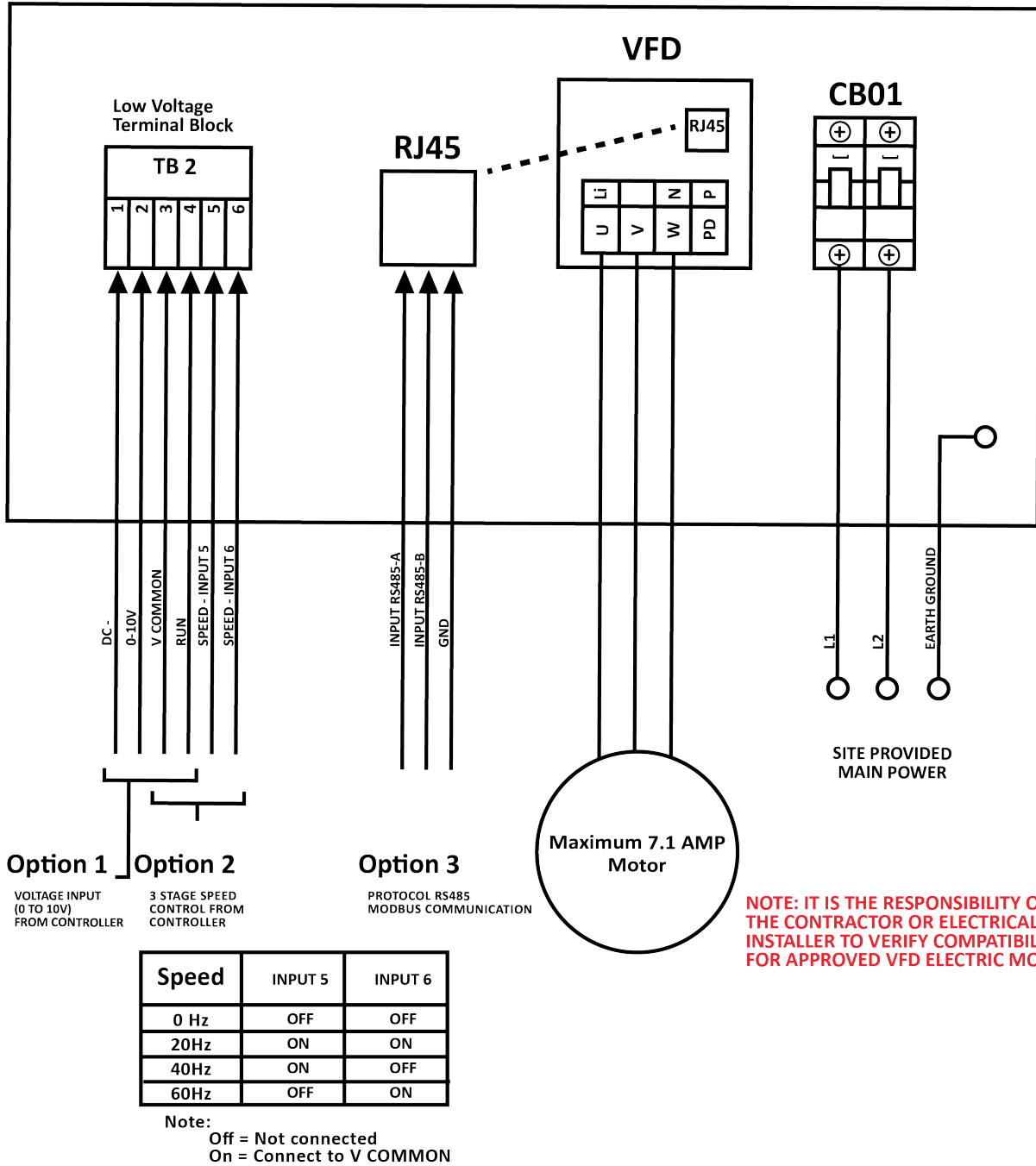


Figure 3 Electrical Connection Diagram

The main power 208/240 VAC feeds into the disconnect terminal on the right side of the panel. You will make the earth ground connection on the lower right corner of the panel. The motor will connect directly to the VFD controller in the center of the box. **You must follow the electrical notes regarding the cable requirements between the iOptimizer[®] and the Motor.**

The low voltage terminal block consists of six terminals.

Option 1: Used to continuously vary the speed of the motor:

A 0-10V analog signal is applied to pin 1 (analog common) and pin 2 (analog voltage) to control the motor speed. Link4 has remote controlled analog voltage output modules for this purpose.

Use a dry switched relay or a Link4 controller relay output to connect pin 3 and pin 4 to run the motor.

Be careful not to exceed the max current output specification of the analog output module when connecting the 0-10V to multiple drives.

Option 2: Used to discretely vary the speed of the motor in 4 speeds:

Reference Figure 3 for the different motor speeds. The exact speed can be changed at the VFD if desired.

Use dry switched relays or Link4 controller relay outputs to connect V Common (pin 3) to Speed 1 input (pin 5) and/or Speed 2 input (pin 6).

Use a dry switched relay or a Link4 controller relay output to connect pin 3 and pin 4 to run the motor.

Option 3: Used to remote control and program the iOptimizer[®] completely using the ModBus protocol.

Connect the RS485 ModBus communication bus to the provided RJ45 connector on the VFD. Consult the VFD manual for the specific pinout of the RJ45 and the available ModBus points. Link4 has Modus communication modules for controlling the drive remotely.

You may only use one of these three control signal options.

Additional electrical requirements are shown in Appendix A.

Programming the Inverter

You will need to obtain and get familiar with a few things before we begin the programming of the inverter. Actually, there is very little programming to do since most of it is already done at the Link4 factory.

Motor data:

First, you will need to collect the following data from the main plate of the motor.

- Motor rated voltage
- Motor rated amperage
- Number of motor poles:
 - 2 poles = 3600 RPM
 - 4 poles = 1800 RPM
 - 6 poles = 1200 RPM

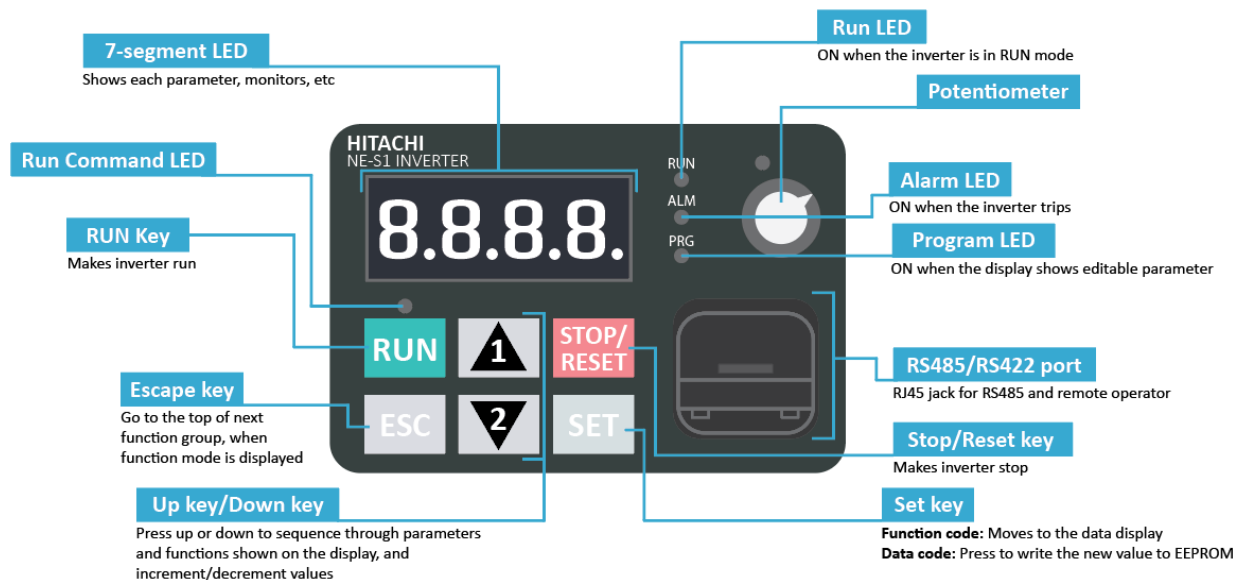


Figure 4 VFD Operator Panel

The display has four seven segment digits. There are only two types of entries that are needed for the VFD program. The first is the Function Code which identifies the type of data to be entered. The second is the data itself. The details are explained below.

Function Code and Data Display

Function Code: This code begins with a letter followed by three digits, for example, d001. For each letter there are numerous 3-digit codes. Each letter and digit combination define certain parameters and functions that can be programmed. These lists are described in great detail in the Hitachi inverter manual, pages 7-10. But do not worry, we only need to use a few of the function codes and a few of the 3-digit codes. These are shown in a table below.

Data Display: This is simply the data you will enter for the particular function code. For example, function code A082 is where you will enter the motor rated voltage from the monitor main plate.

Table for VFD Parameters

Below is the table for the VFD parameters that need to be set for the iOptimizer[®]. Most of the parameters will be set at the Link4 factory. However, there are a few pieces of data that you will need from the motor plate as discussed above. (We can program the VFD for a fee, if we get your motor plate data).

Function codes, A082, B012, and H004 are the only codes where you must enter the data. The others are optional. The next page gives you instructions for using the keypad to enter the function code and data.

Function Code	Default Parameter	What we set to	Comments
B037	000	000	Unlocks the functions in the display
B038	001	000	Unlocks the display
The motor data for the next 3 lines must be entered with actual information.			
A082	Drive rated voltage	Motor rated voltage	Get motor data for this entry and next two from the plate attached to the motors.
B012	Drive rated amperage	Motor rated amperage	
H004	4	2 or 4 or 6 or 8	Motor poles 2 = 3600 RPM
			Motor poles 4 = 1800 RPM
			Motor poles 6 = 1200 RPM
			Motor poles 8 = 900 RPM
Making changes below is optional			
A61 (upper frequency limit)	60	60	Always set the upper frequency limit before the lower limit.
A62 (lower frequency limit)	0	20	20 for fans or pumps; unless it is a special application, do not go lower than this.
A001	01	01	
A002	01	01	
C001	00	00	Forward Start – For Fan and Pump applications.
C002	01	01	Reverse Start – Only used in iDrive application (i.e. forward and reverse).
C003	02	02	
C004	03	03	
C005	18	18	Remote fault reset
The next 3 lines are for the multi-speed input (three stages)			
A023	20	20	Input 3, ON; Input 4, ON NOTE: If there is no input, then unit runs off of A001 input which is 0-10 volts or 4-20 ma.
A022	40	40	Input 3, ON; Input 4, OFF
A021	60	60	Input 3, OFF; Input 4, ON

Navigation on the Keypad

Below is a picture of the operator panel:



Pressing the up and down key at the **same time** gets you to the digit-by-digit navigation mode.

The illustration below takes you through the various steps for selecting the function code – the letter followed by the three-digit number.

STEP 1: Press both up key and down key at the same time.



1st digit will be blinking.

STEP 2: When the digit is blinking, you use the **SET** and **ESC** keys to move the cursor to the right or the left, respectively. You can use the up key **↑** and down **↓** key to change the value of the “blinking” digit. For example, to go from **d001** to **b081** you will press the down key twice, then the set key twice, and then the up key eight times. To get to the least significant digit, press the set key once.

STEP 3: Once the least significant digit is the number you want, press the **SET** key to store the function code with the new number.

Once you have the Function code and you press Set, then you will see the data associated with the function you selected. If you want to change the data (parameter), you will go through Steps 2 and 3 using the up/down keys to change the data and the ESC and Set keys to change the particular digit. When you are finished, press the SET key and the new value is stored in permanent memory (EEPROM).

APPENDIX A

ELECTRICAL NOTES:

USE THE FOLLOWING CHECKLIST TO ENSURE THE INVERTER IS WITHIN PROPER OPERATING RANGES AND CONDITIONS:

1. The power supply to NE-S1 inverters must meet these specifications:
 - Voltage fluctuation $\pm 10\%$ or less
 - Voltage imbalance $\pm 3\%$ or less
 - Frequency variation $\pm 4\%$ or less
 - Voltage distortion THD = 10 or less
2. Installation measure:
 - You are required to satisfy the EMC directive (2004/108/EC) when using a NE-S1 inverter in an EU country.
 - To satisfy the EMC direct and to comply with standard, its recommended to use a dedicated EMC filter suitable for each model
 - Applicable EMC filter –
 - APPROVED Filter Model: (Schaffner) PN# FS24828-27-07
3. Wiring:
 - Shielded wire (screened cable) is required for motor wiring, and the length must be 20 meter or less (required for EU standard).
 - If the motor cable length exceeds the value shown above, use output choke to avoid unexpected problem due to the leakage current from the motor cable.
 - The carrier frequency setting must be 2 kHz to satisfy EMC requirements.
 - Separate the power input and motor wiring from the signal/process circuit wiring.
4. Environmental conditions—when using a filter, follow these guidelines:
 - Ambient temperature: -10 to 50 °C
(Derating is required when the ambient temperature exceeds 40 °C)
 - Humidity: 20 to 90% RH (non-condensing)
 - Vibration: 5.9 m/sec² (0.6 G) 10 ~ 55Hz
 - Location: 1000 meters or less altitude, indoors (no corrosive gas or dust)
5. Maintenance, inspection, and parts replacement:
 - Before inspecting the inverter, be sure to turn off the power supply and wait for 10 minutes or more. Otherwise, you run the risk of electric shock.
(Before inspection, confirm that the Charge lamp on the inverter is off.)
In case the power indication of the operator does not turn ON after power-up, inverter may be damaged. In that case, the inspection must be done after waiting two hours or more of the power OFF. Otherwise, there is a danger of electric shock and/or injury.
 - Commit only a designated person to maintenance, inspection, and the replacement of parts. (Be sure to remove wristwatches and metal accessories, e.g., bracelets, before maintenance and inspection work and to use insulated tools for the work.) Otherwise, you run the risk of electric shock and injury.
 - Minimum wait time between power cycle > 15 seconds.

This equipment should be installed, adjusted, and serviced by qualified personal familiar with construction and operation of the equipment and the hazards involved. Failure to observe this precaution could result in bodily injury.

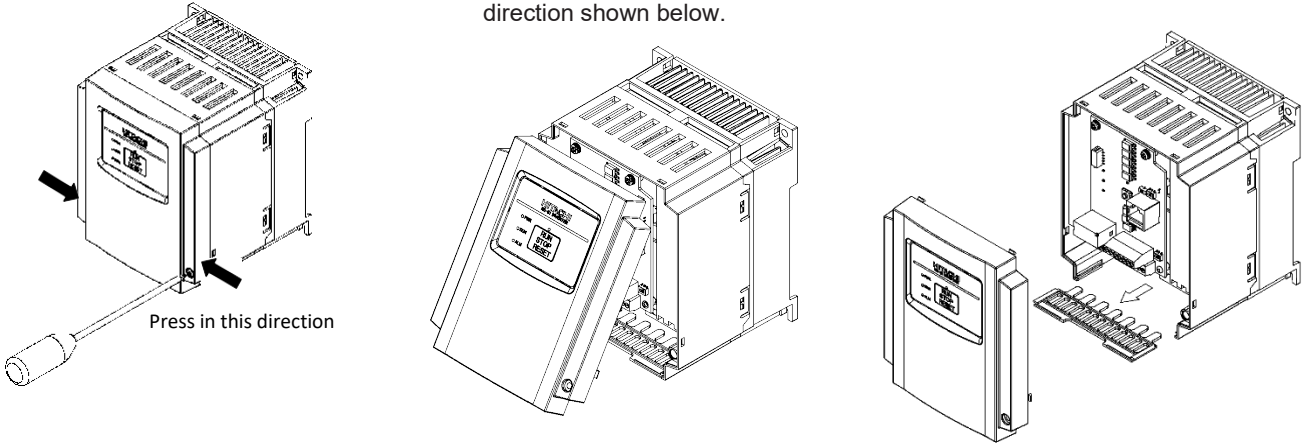
VERIFY WITH MFG INSTALLATION MANUAL FOR WIRING SPECIFICATION.

APPENDIX B

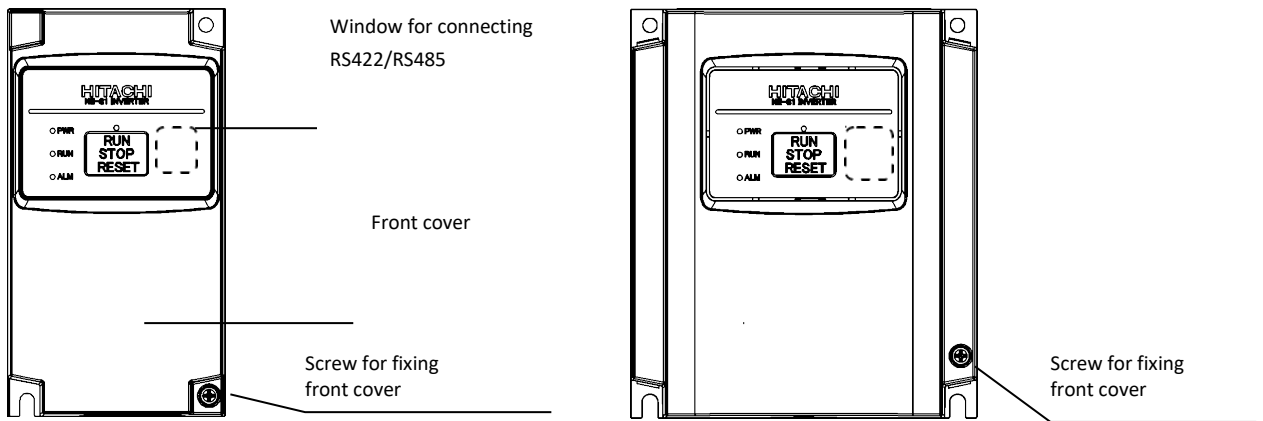
How to attach and remove the front cover

1. How to remove

1. Loosen up the screw
2. Remove the cover by pressing the bottom side of the cover to the direction shown below.
3. Move the wiring plate like shown below in case of wiring.



Screw for fixing the front cover is located at right-bottom side.



2. How to attach

- Press the front cover to the main body until there is a click sound.
- Do not tighten the screw too much.



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