



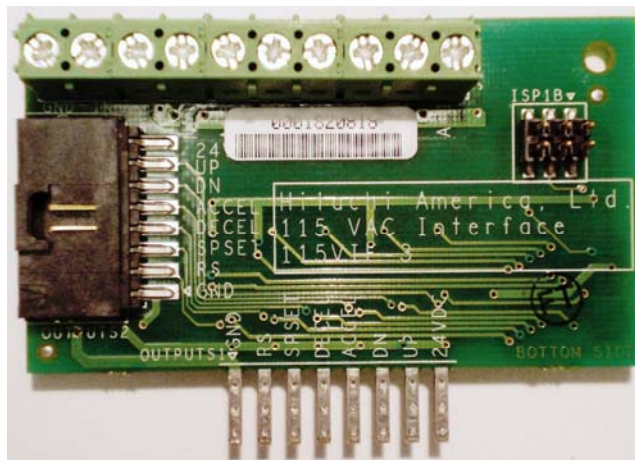
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115VIF-3

115 VAC Input Interface Board Instruction Manual

For Crane & Hoist Pendant Applications

- SJ200 Series
- SJ700 Series



NOTE: REFER ALSO TO SJ200 OR SJ700 SERIES INSTRUCTION MANUAL

Manual Number: HAL1055C
August 2009

After reading this manual,
keep it handy for future reference.

Hitachi America, Ltd.

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Document History

Rev A, March 2009 – modified Figure 2-2; modified table on page 9; deleted SJ300 references; other minor changes.

Rev B, April 2009 – added 3-position pushbutton pendant control.

Rev C, August 2009 – added programming for C004 for 2-speed operation, page 11; changed web address, back cover.

Chapter 1 – General Description

The 115VIF-3 interface board is used to translate 115 VAC control signals – from crane and hoist operator pendant stations – to the 24 VDC logical input signals required by the SJ200 or SJ700 series of Hitachi inverters.



The board provides optical isolation between the 115 VAC pendant voltages and the inverter control inputs. It also incorporates the necessary logic functions to perform application-specific crane and hoist functions, as described in a later section of this manual.

Before using this product, please read this manual and the inverter manual, and be sure to follow all safety precautions noted therein. After unpacking the 115VIF-3 board, carefully inspect it for any defect or damage.

115VIF-3 Carton Contents

- (1) 115VIF-3 Interface Board

IMPORTANT: To use the 115VIF-3 interface in an **SJ700** Series inverter, you will also require the **115VIF-KIT**, purchased separately:

OPTIONAL 115VIF-KIT Carton Contents (one required per 115VIF-3)

- (1) Pigtail wiring harness, 9” long
- (1) M3 x 8mm screw and wave washer

WARRANTY

The warranty period under normal installation and handling conditions shall be eighteen (18) months from the date of purchase, or twelve (12) months from the date of installation, whichever occurs first. The warranty shall cover repair or replacement, at Hitachi’s sole discretion, of the 115VIF-3 interface board.

Service in the following cases, even within the warranty period, shall be to the customers account:

1. Malfunction or damage caused by misuse, modification or unauthorized repair.
2. Malfunction or damage caused by mishandling, dropping, etc., after delivery.
3. Malfunction or damage caused by fire, earthquake, flood, lightning, abnormal input voltage, contamination, or other natural disasters.

If service is required for the product at your worksite, all expenses associated with field repair are the purchaser’s responsibility. This warranty only covers service at Hitachi designated service facilities.

If making a warranty claims in reference to the above, please contact the distributor from whom you purchased the 115VIF-3, and provide the model number, purchase date, installation date, failure date and description of damage, malfunction, or missing components.

SAFETY PRECAUTIONS



HIGH VOLTAGE: This symbol indicates high voltage. It calls your attention to items or operations that could be dangerous to you and other persons operating this equipment. Read the message and follow the instructions carefully.



WARNING: Indicates a potentially hazardous situation that, if not avoided, can result in serious injury or death.



CAUTION: Indicates a potentially hazardous situation that, if not avoided, can result in minor to moderate injury, or serious damage to the product. The situation described in the CAUTION may, if not avoided, lead to serious results. Important safety measures are described in CAUTION (as well as WARNING), so be sure to observe them.



HIGH VOLTAGE: Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there may be exposed components with housings or protrusions at or above line potential. Extreme care should be taken to protect against shock. Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power before checking controllers or performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic controllers or rotating machinery.



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



WARNING: HAZARD OF ELECTRICAL SHOCK. DISCONNECT INCOMING POWER BEFORE WORKING ON THIS CONTROL.



WARNING: Wait at least ten (10) minutes after turning OFF the input power supply before performing maintenance or an inspection. Otherwise, there is the danger of electric shock.



WARNING: Do not install or remove the 115VIF-3 interface board while the inverter or external control circuits are energized. Otherwise there is the danger of electric shock and/or fire.



WARNING: Never modify the board. Otherwise, there is a danger of electric shock and/or injury.



CAUTION: Alarm connection may contain hazardous live voltage even when inverter is disconnected. When removing the front cover for maintenance or inspection, confirm that incoming power for alarm connection is completely disconnected.



WARNING: Do not touch the surface or terminals of the 115VIF-3 interface board while the inverter or external control circuit is energized; otherwise there is the danger of electric shock.

Chapter 2 – Installation and Wiring

Orientation to Product Features

Figure 2-1 below shows the physical layout of the 115VIF-3 interface board.

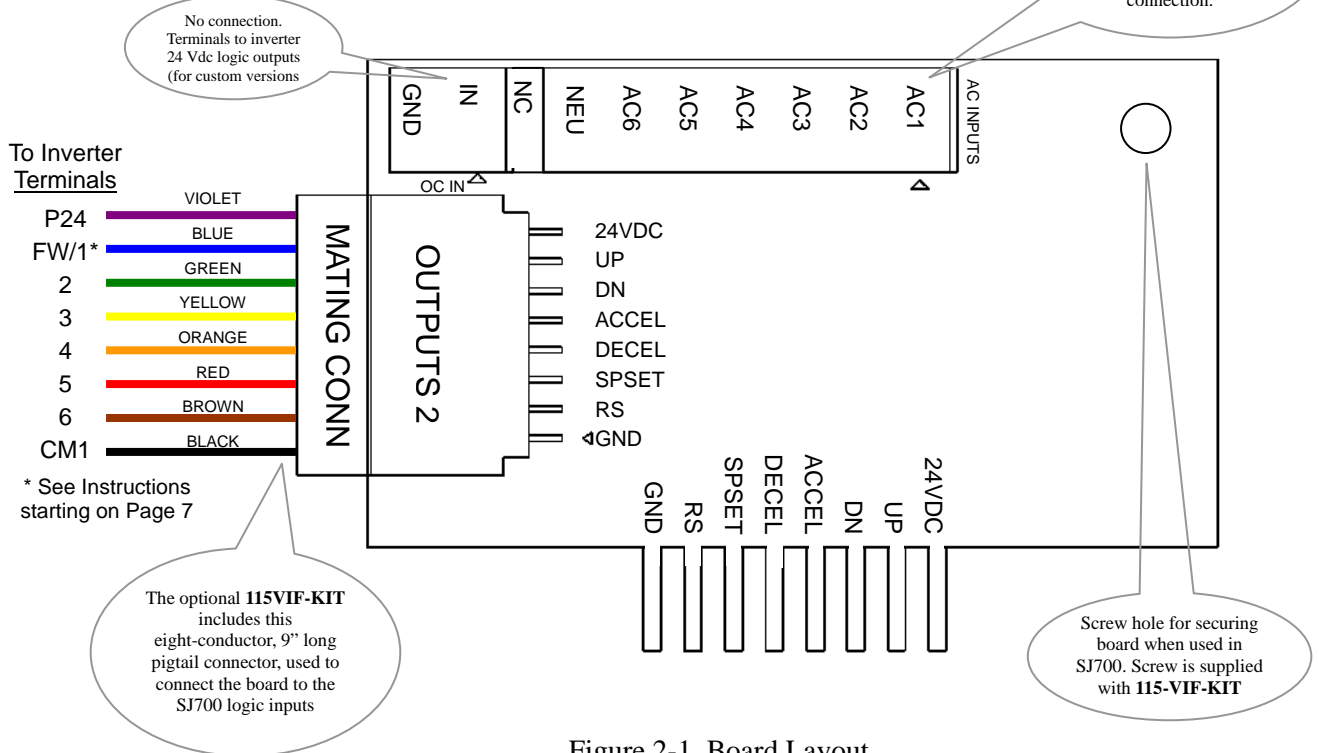


Figure 2-1, Board Layout

Installing the Interface Board



WARNING: Remove power from the inverter and wait at least five minutes before moving to the next step. Open and remove the lower terminal cover. Confirm that the DC bus is fully discharged before proceeding further. Also confirm that the external 115 VAC control circuits are deactivated and locked out before proceeding. Otherwise, there is danger of electric shock, injury or death.



General

The 115VIF-3 interface board may be used with either the SJ200 or SJ700 series of inverters. Follow the appropriate installation instructions on the next pages for the particular model series in which you are installing the board. The boards 115 VAC-side wiring (from the pendant) and the corresponding AC input functions are the same, regardless of which inverter series you are using.

Note: In the standard version of the 115VIF-3, *no* connections are made to the terminals marked IN and GND, or to terminal AC6.

AC Input Wiring – Connecting the Pendant to the 115VIF-3 Interface Board

Connect the pendant 115 VAC input wiring to the terminals marked AC1 through AC5 on the 115VIF-3, with NEU (neutral of the pendant control signals) as their common terminal. AC1 thru AC5 are connected to the HOT side of the pendant control signals, coming from the pendant’s pushbutton contacts. The board’s AC input terminal functions are as follows:

INPUT	HOIST	TRAVERSE
AC1 (Note 1)	Up PB	Forward/Left PB
AC2 (Note 1)	Down PB	Reverse/Right PB
AC3	Increase/2 nd speed	Increase/2 nd speed
AC4 (Note 2)	Jumpered to HOT (Note 3)	Horizontal over-travel limit (NC sensor input; open-circuit forces inverter to MIN speed)
AC5 (Note 2)	Up over-travel photo limit (NC sensor input; open-circuit stops/prevents UP motion – only DOWN motion is possible)	Jumpered to HOT
AC6	Not used/no connection	Not used/no connection
NC		
IN		
GND		

Note 1: Inputs AC1 and AC2 functions are symmetrical with respect to direction in traverse applications. In hoist applications, however, AC1 *must* be used for UP and AC2 *must* be used for DOWN.

Note 2: AC4 and AC5 inputs are intended to be used with over-travel limit sensors. These are secondary safeties, over and above N.C. limit switches that would be wired in series with the AC1 and AC2 pendant inputs. They are “fail-safe” inputs, for use with N.C. type sensors. In this way, a cut wire will have the same effect (inhibited of motion) as a sensor being triggered.

Note 3: AC4 may also be used for **3-Step Hoist Control**. Refer to page 11.

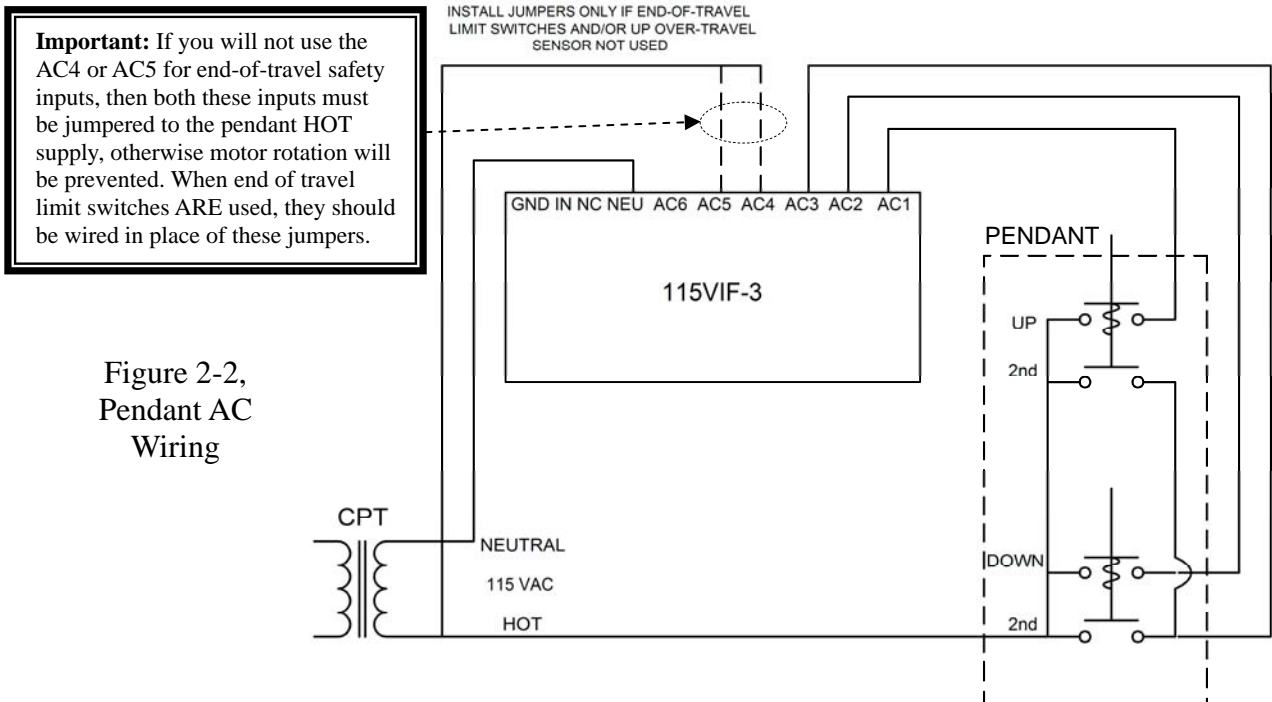


Figure 2-2,
Pendant AC
Wiring

Connecting the Board to the Inverter

The method of connection of the 115VIF to the inverter depends on the inverter model. Refer to the appropriate section below for the inverter model you have.

SJ200

The eight “fingers” on the 115VIF-3, as shown at the bottom of Figure 2-1, are designed to mate directly with the input terminal strip of the SJ200 series inverter. It is best to remove the terminal strip from the inverter first. Then loosen all the terminals to allow the fingers to be easily inserted. The correct orientation for the board is with the integrated circuits facing upward, and the AC input terminals facing downward toward the inverter. Insert the eight fingers until you feel them hit that back of the terminal wiring chambers. Do not try to force them – they should enter easily. Tighten all eight terminals securely. Be careful to not over-tighten.

Connect the AC signal wires from the pendant controls to the terminal as shown in the table on page 6. After carefully tightening all terminals, reinstall the terminal strip with attached board into the inverter mating connector, and route pendant AC wiring carefully out the bottom of the inverter.

Figure 2-3 shows the correctly installed 115VIF-3. Make sure the SR/SK DIP switch is in the default “SR” position. Replace the inverter lower terminal cover, and energize the inverter and external control circuits for configuration and testing.



Figure 2-3, 115VIF-3 Correctly Installed in SJ200 Inverter

SJ700

When installed in an SJ700 inverter, the 115VIF-3 must be mounted behind the inverter top front cover in the area where option boards are installed, as shown in Figure 2-4. Install the board in the lower position (closest to terminal strip) as shown. This will leave the upper option slot free should a SJ-FB feedback board (for closed-loop operation), or other option board be required. The optional 115VIF-KIT mounting kit is required when mounting the interface board in these inverter series. The kit includes a pigtail cable and a M3 x 8mm mounting screw. Plug the pigtail connector into the mating **OUTPUTS2** connector on the board. Align the

mounting hole in the board with the threaded insert as shown in the figure. Secure the board to the inverter with the M3 screw supplied with the mounting kit. Connect the pigtail leads to the I/O terminal strip of the SJ700 inverter. Connect the leads one by one to intelligent input terminals on the inverter following the color coding shown in Figure 2-1 on page 5.

Open-Loop vs. Closed-Loop SJ700

For open-loop applications: the UP (blue) wire from the pigtail is connected to the FW terminal. In this case there is *no connection* to intelligent input 1, which is configured for no function [NO].

For closed-loop (encoder feedback) applications: the UP (blue) wire from the pigtail is connected to intelligent input terminal 1, which is configured for [MI1] function. Refer to parameter tables in Chapter 3.

Sinking/Sourcing Input Set-up

On the SJ700, the factory default setting for the intelligent inputs is for *sinking* logic. The 115VIF-3 interface requires the inputs be set for *sourcing* logic for proper operation. To change the logic setting, locate the small metal jumper bar on the intelligent input terminal strip. Then:

- 1) Remove the jumper from its default position between the P24 terminal and PLC terminal.
- 2) Reinstall the jumper between the PLC terminal and the CM1 terminal

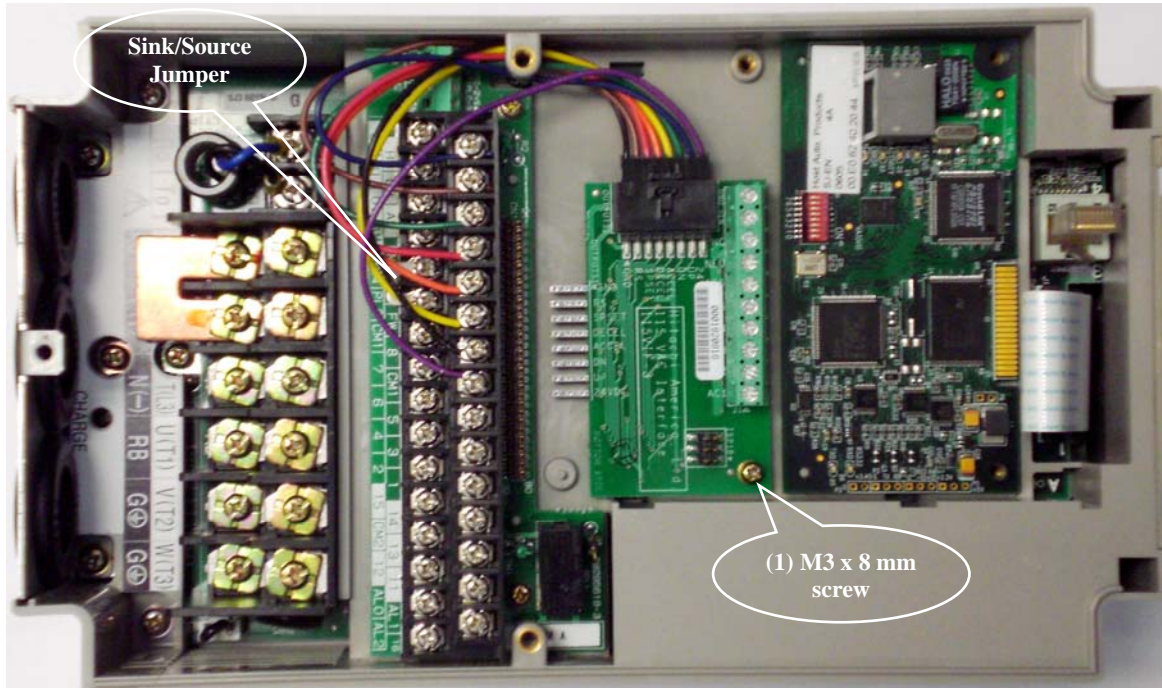
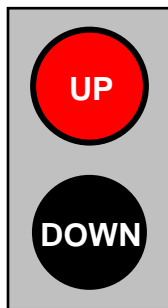


Figure 2-4, 115VIF-3 Correctly Installed in SJ700 Inverter

Chapter 3 – Configuring the Inverter

The configuration of inverter parameters will depend on the specific functionality and performance required for your application. The basic functionality of the board is designed to interface with a two pushbutton, two-position (two-speed) momentary contact type pendant commonly used for crane and hoist applications. This is the basis for the descriptions of the functions of the board presented in this manual. The setup in the table below will result in infinitely variable speed between the programmed MIN and MAX speeds. The defined functions of the pushbuttons are as follows:



UP, first detent: UP – accelerate to minimum speed
UP, second detent: UP – increase speed while held, up to MAX speed (or go to second speed, see page 10)

DOWN, first detent: DOWN – accelerate to minimum speed (RESET fault when inverter is STOPPED and in a fault state)
DOWN, second detent: DOWN – increase speed, up to MAX speed (or go to second speed, see page 10)

Pushing either the UP or DOWN pushbutton to the first position causes the inverter to go to the minimum configured speed in that direction. Pushing that button further to its second position will cause speed to increase in that direction. Releasing back to first position will hold that last speed. Releasing the pushbutton all the way will cause the inverter to come to a stop. If that button is re-pressed to the first position before stop is reached, that speed will be maintained.

In order to achieve this basic functionality, certain parameters must be set differently from factory default values, as described in the following table.

Parameter Code	Function	Setting	Comment
F002	Acceleration Time	Note 1	Set a value between 1 and 3600 seconds, depending on application
F003	Deceleration Time	Note 1	Set a value between 1 and 3600 seconds, depending on application
A001	Frequency Command	02	Tells the inverter to read speed reference from internal register
A002	Run Command	01	Tells the inverter to take the RUN command from the control terminals
A004	Maximum Frequency	Note 1	Depending on the motor limits and application requirements, set the appropriate value
A061	Upper Frequency Limit	Note 1	Usually the same value as A004
A062	Lower Frequency Limit	Note 1	Lowest speed for continuous operation (MIN speed), usually 6 to 10 Hz or so. This is the speed that will be commanded at the first pushbutton position.
B091	Stop Mode Selection	00	For Non-Load Brake Hoist, or for traverse applications: 00 (factory default)
		01	For Load Brake Hoist applications: 01 (free-run or coast to stop)
C001	Terminal 1 Function	00	SJ200 = [FW] Forward run
		no	SJ700 Open Loop = [NO] No function
		56	SJ700 Closed Loop = [MI1]
C002	Terminal 2 Function	01	SJ200&SJ700 Open Loop = [RV] Reverse run
		57	SJ700 Closed Loop = [MI2]
C003	Terminal 3 Function	27	[UP] Accelerate speed input
C004	Terminal 4 Function	28	[DN] Decelerate speed input

C005	Terminal 5 Function	255 (no)	No Function – SJ200 (SJ700)
C006	Terminal 6 Function	18	[RS] Reset
C007	Terminal 7 Function	no	[NO] No Function – SJ700 only
C008	Terminal 8 Function	no	[NO] No Function – SJ700 only
C011 thru C016[DN]	Terminal Active State	00	All inputs should be configured for N.O. (normally open = active on) operation (Note 2)
C102	Reset function selection	2	Makes the RESET [RS] input terminal (input 6) active only when the inverter is in the fault state. In this way, the pendant DOWN pushbutton can also be used to reset an inverter fault.

Note 1: Actual setting is dependent on inverter capacity and your design requirements

Note 2: C011 to C018 in the case of SJ700 series

Other Required Settings

The following were previously noted in the Installation and Wiring chapter, but are important and bear repeating. Make sure the following steps were performed.

SJ200

The SR/SK DIP switch next to the input terminal strip must be in the default “SR” position for proper operation of the 115VIF-3 interface board. Verify that it is in the correct position. Confirm the correct setting of B091 for load-brake vs. non-load-brake applications.

SJ700

Confirm that the silver source/sink jumper bar is between PLC and CM1, as explained in Chapter 2. Confirm the correct setting of B091 for load-brake vs. non-load-brake applications.

Alternative Set Ups

Two-Speed Operation

The inverter can easily be configured for two-speed operation rather than infinitely variable speed operation by using the following parameter settings in lieu of or in addition to those in the table above:

Parameter Code	Function	Setting	Comment
A021	Multi-speed 01	XX.X	Desired second (high) speed, in Hz
C003	Terminal 3 Function	02	[CF1] function – multi-speed select bit 1
C004	Terminal 4 Function	255	[no] No function

This set-up is applicable to pendant stations with two-position pushbuttons, and can be applied to hoist and/or traverse axes. With the above settings, at the first pushbutton position, the inverter will ramp to MIN speed and hold. On depressing the button to the second pushbutton position, the inverter will accelerate to the A021 speed and hold. Releasing the pushbutton back to the first position will cause the inverter to decelerate back to the MIN speed and hold. Releasing the pushbutton will cause the inverter to come to a stop.

Three-Step Hoist Control

Some pendant stations utilize 3-position pushbuttons for the hoist control. This is what is traditionally called “three-step control.” This is simple to implement with the 115VIF-3 and inverter. No programming changes are required in the inverter. The jumper from AC4 to H0T that would be used in normal 2-step operation is not needed in this case. The output wire from the pushbutton second contact is wired to AC4 instead. The increase speed input signal will be taken from the third pushbutton contact for this setup, instead of the second as in 2-step control. To implement this function, refer to Figure 3-1 and the following table which summarizes the connections that are used:

INPUT	THREE-STEP HOIST CONTROL
AC1	Up PB (first contact)
AC2	Down PB (first contact)
AC3	Increase speed (third contact)
AC4	Hold speed (second contact)
AC5	Up over-travel photo limit (NC sensor input; open-circuit stops/prevents UP motion – only DOWN motion is possible)
AC6	Not used/no connection
NC	
IN	
GND	

Three-Step Control Wiring

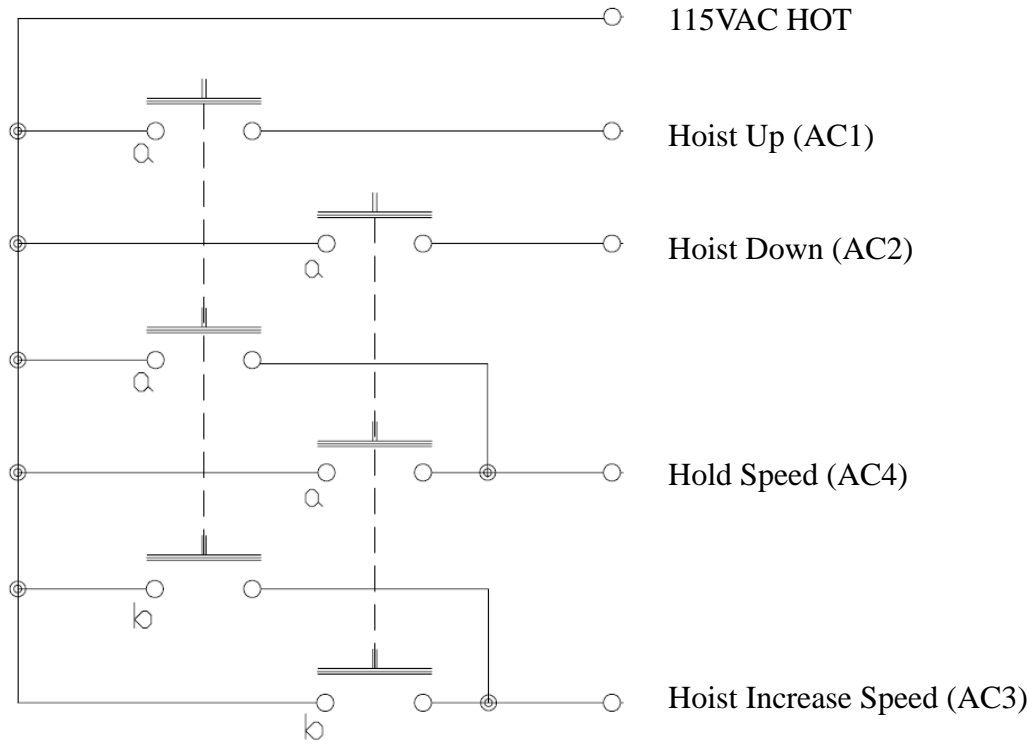


Figure 3-1

Chapter 4 – Operation

Normal Operation

Once the inverter parameters are set as described in Chapter 3, you are ready to verify proper operation. It is recommended to first test the system with the motor mechanically disconnected from the crane or hoist, to ensure that any unexpected behavior will not damage the equipment or risk injury.

Energize the inverter and the pendant or other external control circuit power supplies, and press the pushbutton connected to input terminal AC1. This is the UP hoist or FORWARD/LEFT traverse input. Observe motor rotation. If direction is NOT correct, remove power from the inverter and wait 10 minutes for the capacitors to discharge. Then interchange any two motor leads. Restore power and repeat the initial test. Direction should now be correct.

With the AC1 pushbutton pressed to the first detent, the motor will accelerate in the forward direction, (corresponding to UP motion for the hoist), to the frequency set in A062 (MIN speed), and remain at that speed, unless:

- The pushbutton is released, in which case the motor will come to a stop, OR
- Ramp to a higher speed, while pushbutton is pushed to the second detent (AC3). If AC1 is maintained, and AC3 is subsequently released, the speed attained at that time will be maintained.
- Releasing AC1 at this point will cause the motor speed to ramp down.
- If AC1 remains off long enough, the motor will come to a stop.
- If AC1 is re-activated at any speed above the MIN speed, then that speed will be maintained for the duration. If AC1 is reactivated at a speed below the MIN speed, the motor will accelerate to MIN speed and maintain that speed until one of the above events occurs.

The function of AC2 pushbutton is the same as the AC1 pushbutton, with the exception that rotation direction is reversed (corresponding to DOWN operation for a hoist).

In addition to its normal function, the AC2 (DOWN) pushbutton input doubles as the FAULT RESET if the inverter should enter an alarm (trip) condition for any reason. This eliminates the need to access the inverter keypad itself to clear a fault.

Troubleshooting

Symptom	Remedy
Inverter will not accelerate beyond minimum speed	Input AC4 is not jumpered to HOT
Inverter will only turn the motor in one direction	Input AC5 is not jumpered to HOT

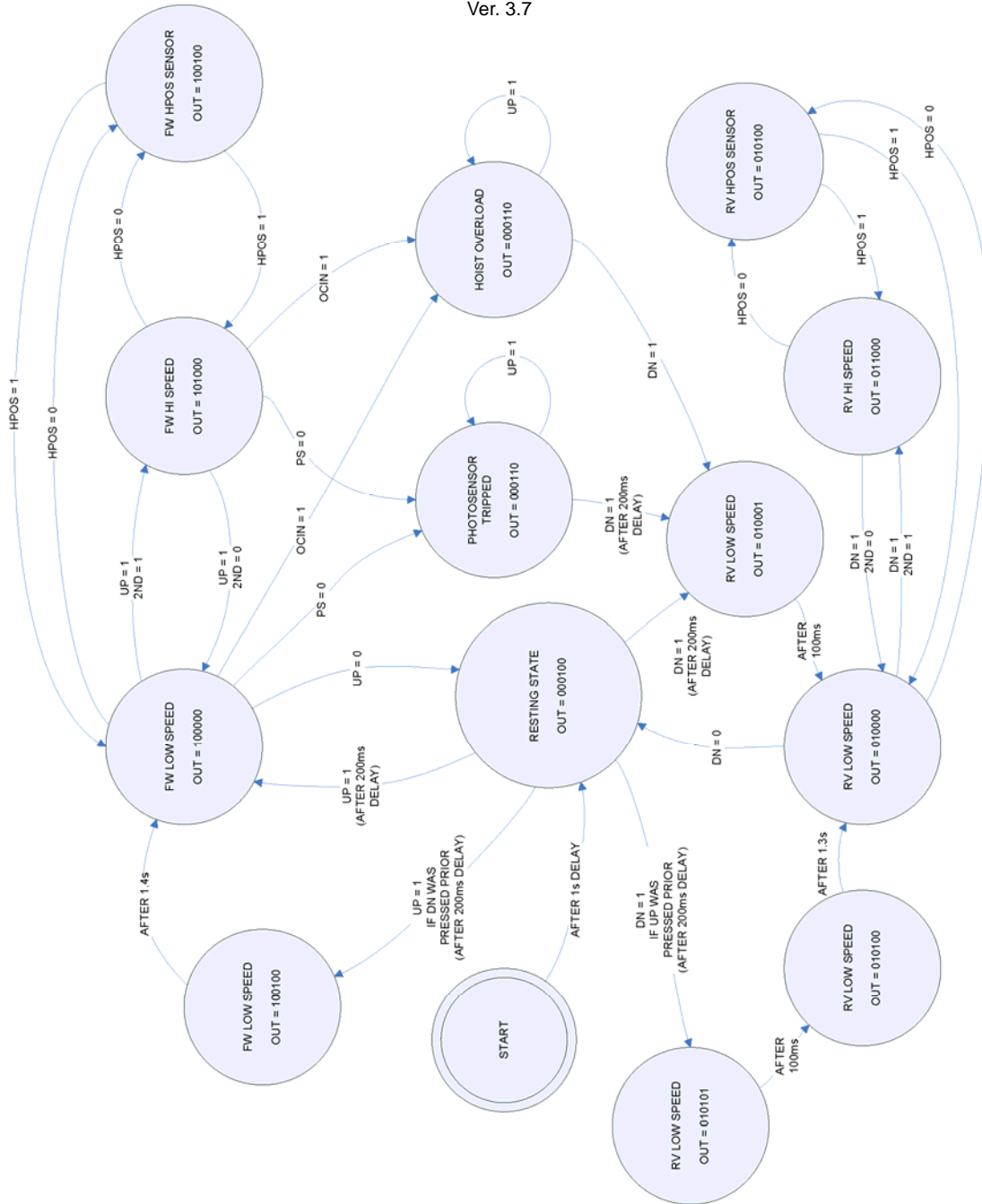
Note: For other troubleshooting tips, refer to Chapter 6 of the pertinent inverter Instruction Manual

Electrical Specifications

The board is internally powered from the inverter's internal 24 Vdc power supply, drawing approximately 21 mA. The AC inputs are optically isolated, and draw approximately 2 mA each. The outputs to the inverter have a 100 mA maximum capacity.

Software State Diagram

Ver. 3.7



Version 3.6

INPUTS
 AC1 - UP (FORWARD)
 AC2 - DN (REVERSE)
 AC3 - 2ND
 AC4 - HPOS
 AC5 - PS
 OPEN COLLECTOR
 INPUT - OCIN
 NOTE:
 HPOS & PS INPUTS
 HAVE INVERTED LOGIC

OUTPUTS
 BIT 5 - FW
 BIT 4 - RV
 BIT 3 - ACCEL
 BIT 2 - DECEL
 BIT 1 - FRS
 BIT 0 - RESET
 NOTE:
 THE OUTPUT IS
 DESCRIBED IN EACH
 STATE BUBBLE.

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