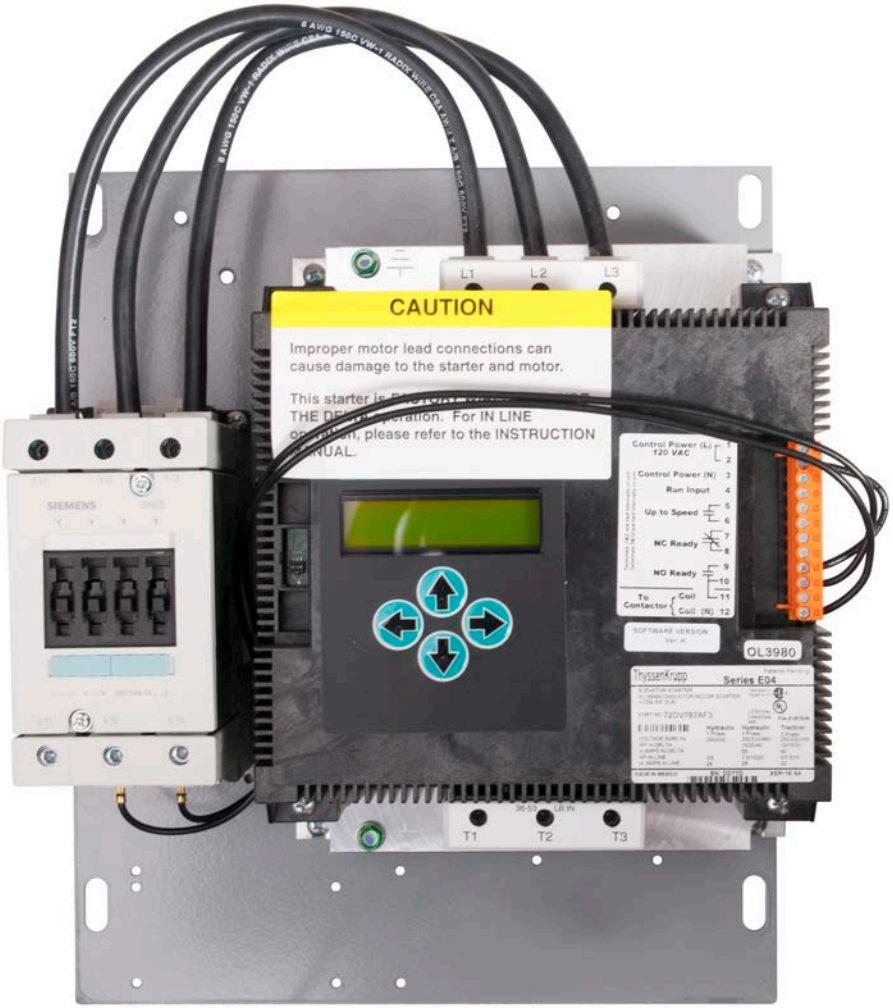
VERTICAL EXPRESS

72DV Starter



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Safety Precautions

IMPORTANT!

Read this page before any work is performed on elevator equipment. The procedures contained in this manual are intended for the use of qualified elevator personnel. In the interest of your personal safety and the safety of others, do not attempt any procedure that you are not qualified to perform.

All procedures must be accomplished in accordance with the applicable rules in the latest edition of the National Electrical Code, the latest edition of ASME A17.1, and any governing local codes.

Terms in This Manual

CAUTION

CAUTION statements identify conditions that may result in damage to the equipment or other property if improper procedures are followed.

WARNING

WARNING statements identify conditions that may result in personal injury if improper procedures are followed.

General Safety

CAUTION

Before applying power to the controller, check that all manufacturing wire connections are tight on relays, contactors, fuse blocks, resistors, and terminals on cards and DIN rail terminals. Connections loosened during shipment may cause damage or intermittent operation.

Other specific warnings and cautions are found where applicable and do not appear in this summary. See the *Elevator Employee Safety and Accident Prevention Program Manual* and the *Elevator Industry Field Employees' Safety Handbook* for electrical equipment safety information on installation and service.

Electrical Safety

All wiring must be in accordance with the National Electrical Code and be consistent with all state and local codes.

Use the Proper Fuse

To avoid fire hazards, use only a fuse of the correct type, voltage, and current rating. See the job specific drawings sheet (Power Supplies) for fusing information.

Electric shocks can cause personal injury or loss of life. Circuit breakers, switches, and fuses may not disconnect all power to the equipment. Always refer to the wiring diagrams. Whether the AC supply is grounded or not, high voltage will be present at many points.

Printed Circuit Cards

Printed circuit boards may be damaged if removed or installed in the circuit while applying power. Before installation and/or removing printed circuit boards, secure all power. Always store and ship printed circuit cards in separate static bags.

Mainline Disconnect

Unless otherwise directed, always Turn OFF, Lockout, and Tagout the mainline disconnect to remove power from elevator equipment. Before proceeding, confirm that the equipment is de-energized with a volt meter. Refer to the *Elevator Employees' Safety and Accident Prevention Program Manual* for the required procedure.

Electrical Safety
(continued)

When Power Is On

To avoid personal injury, do not touch exposed electrical connections or components while power is ON.

Test Equipment Safety

Always refer to manufacturers' instruction book for proper test equipment operation and adjustments.

Buzzer-type continuity testers can damage electronic components. Connection of devices such as voltmeters on certain low level analog circuits may degrade electronic system performance. Always use a voltmeter with a minimum impedance of 1M Ohm/Volt. A digital voltmeter is recommended.

Mechanical Safety

See the *Elevator Employees' Safety and Accident Prevention Program Manual* and the *Elevator Industry Field Employees' Safety Handbook* for mechanical equipment safety information on installation and service.

Power Unit Fluid System

If working on the power unit fluid system, the static car weight is applying pressure to the jack and valve system and this stored pressure is present at the power unit.

Before working on any component of the power unit, do one of the following:

- Manually lower the car onto the buffers to relieve the stored pressure.
- Close the machine room oil line shutoff valve, and then release the power unit pressure by momentarily opening the manual lowering adjuster valve.

Asbestos Compliance

Vertical Express elevator personnel will no longer drill or modify any doors with asbestos containing materials (ACM) or possible asbestos containing materials (PACM). All elevator doors manufactured or installed 1980 and earlier will be treated as having ACM/PACM.

Doors with ACM/PACM should be replaced rather than modified. If replacement is not feasible, abatement modifications shall be done by a licensed asbestos abatement company. Vertical Express mechanics will safely stage equipment for the abatement team, or remove the doors and seal them with plastic for delivery or pick up by the asbestos abatement company.

Doors manufactured or installed 1980 and earlier may be modified by Vertical Express employees if a test is conducted by a licensed asbestos company prior to work showing zero evidence of ACM/PACM.

All employees that risk exposure to asbestos will complete the safety department approved asbestos awareness training.

All employees will stop any work that could expose them to ACM/PACM, and immediately contact their supervisor and their safety manager. All exceptions must be approved by the Director of Health and Safety.

Arrival of Equipment

Receiving Upon arrival of the equipment, inspect it for damage. Promptly report all visible damage to the carrier. All shipping damage claims must be filed with the carrier.

Storing During storage in a warehouse or on the elevator job site, precautions should be taken to protect the equipment from dust, dirt, moisture, and temperature extremes.

Static Protection Guidelines

IMPORTANT!

Read this page before working with electronic circuit boards.

Elevator control systems use a number of electronic cards to control various functions of the elevator. These cards have components that are extremely sensitive to static electricity and are susceptible to damage by static discharge.

Immediate and long-term operation of an electronic-based system depends upon the proper handling and shipping of its cards. For this reason, manufacturing bases warranty decisions on the guidelines below.

Handling

- Cards shipped from manufacturing in separate static bags must remain in the bags until time for installation.
- Anti-static protection devices, such as wrist straps with ground wire, are required when handling circuit boards.
- Cards must not be placed on any surface without adequate static protection.
- Only handle circuit cards by their edges, and only after discharging personal static electricity to a grounding source. Do not touch the components or traces on the circuit card.
- Extra care must be taken when handling individual, discrete components such as EPROMS (which do not have circuit card traces and components for suppression).

Shipping

- Complete the included board discrepancy sheet.
- Any card returned to manufacturing must be packaged in a static bag designed for the card.
- Any card returned to manufacturing must be packaged in a shipping carton designed for the card.
- “Peanuts” and styrofoam are unacceptable packing materials.

Failure to adhere to the above guidelines will void the card warranty!

Access and Egress Procedures

The access and egress procedures that are used entering the hoistway determine whether or not power is needed to perform the required task(s). If not, Turn OFF, Lockout, and Tagout the mainline disconnect.

WARNING **DO NOT stand on the car top emergency access cover.**

Car Top Safety

Safety Precautions When Accessing/Egressing Car Tops

- Before opening the hoistway door, ensure that the correct hoistway has been selected and that the car is at the proper floor (to avoid a fall hazard).
- Access car tops from the top terminal landing whenever possible.
- Never access a hoistway, unless a reliable method of controlling the car has been determined.
- Locate the emergency stop switch.
- Before accessing the car top, place the stop switch in the STOP position, and confirm the proper operation.
- Locate a safe refuge area.
- Always maintain control of the hoistways doors during access/egress.
- Fall protection is to be used when a fall hazard exists. The only exception to this is when routine maintenance is being performed on top of complete, operational elevator cars, Do Not use fall protection where there is a greater risk of entanglement.
- When opening hoistway doors from the car top, do so slowly, so that no one steps in from the landing thinking a car has arrived.
- Observe overhead clearances.
- Use extra care when working on car tops that are curved, domed, or located in unenclosed hoistways.

WARNING **DO NOT turn the following switches to Automatic Operation until the hoistway door interlock is open–and remains open–and the hoistway is empty.**

- When egressing the hoistway/car top, ensure that the stop switch is in the STOP position, and that the inspection switch is on Inspection Operation.

Safety Precautions When Working on Car Tops

- Before beginning work, check the car top for oil or grease, and clean as required.
- Locate the position and counterweights of the car being accessed, as well as any other cars/counterweights in the vicinity. Take appropriate measures to avoid hazards.
- Verify proper operation of the top-of-car inspection operating buttons. Where outlets are provided, use a grounded, portable light with a suitable, non-conductive; or use a grounded lamp guard and reflector.

CAUTION **DO NOT attach electrical cords on the car or counterweight ropes.**

Access and Egress Procedures
(continued)

Pit Safety

Before entering a pit, ensure that every employee is aware of the hazards. Some common hazards are:

- Recognized refuge space
- Inadequate lighting
- Improper access
- Tripping hazards
- Improper use of pit ladders
- Moisture/water/fluid
- Moving equipment

Before entering a pit, take appropriate steps to minimize the following hazards and any others that are identified:

- Locate the position of the car being accessed, as well as any other cars in the vicinity.
- Before accessing the pit, the car MUST be located high enough to allow the placement of the pit prop pipe stands to be inserted into the buffers.
- Once the pit is initially accessed, the pit props must be installed and the oil line shutoff valve closed to prevent car movement.
- Obtain control of the car.
- Identify a refuge space.
- If movement of the elevator is not needed to complete the work being performed, Turn OFF, Lockout, and Tagout procedures are required.
- If notified by the building owner or representative that the pit and/or hoistway has been classified as a Permit Required Confined Space (this notification could be verbal or the pit/hoistway may be labeled), contact the appropriate person for authorization. In either case, DO NOT enter the pit/hoistway until you receive authorization.

Safety Precautions When Working In Pits

- Before entering the pit, test and verify the door lock circuit and stop switch circuit.
- Ensure that all portable lights and tools are connected through a ground fault (GFCI).
- Take care to protect all lighting from damage.
- DO NOT work in a pit with standing water.
- Before climbing, always examine shoes for fluid/grease.
- Use both hands when working with ladders and when accessing/egressing the pit.
- Be aware of moving equipment (e.g., pump, motors, belts, and sheaves), and ensure that clothing and hands cannot get caught in them.
- Avoid smoking or the use of open flames in the pit.

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Overview

Solid State Starter

- Controls the current during the start.
- Provides the overload, the current imbalance, the reverse phase, the single phase, and the shorted SCR protection.
- On power up, the starter checks the motor configuration.

MC1 (Fault Contactor)

- Provides a way to interrupt the current during shorted SCR conditions.
- If wired In-Delta, the 72DV starter does not provide electrical isolation when opened.

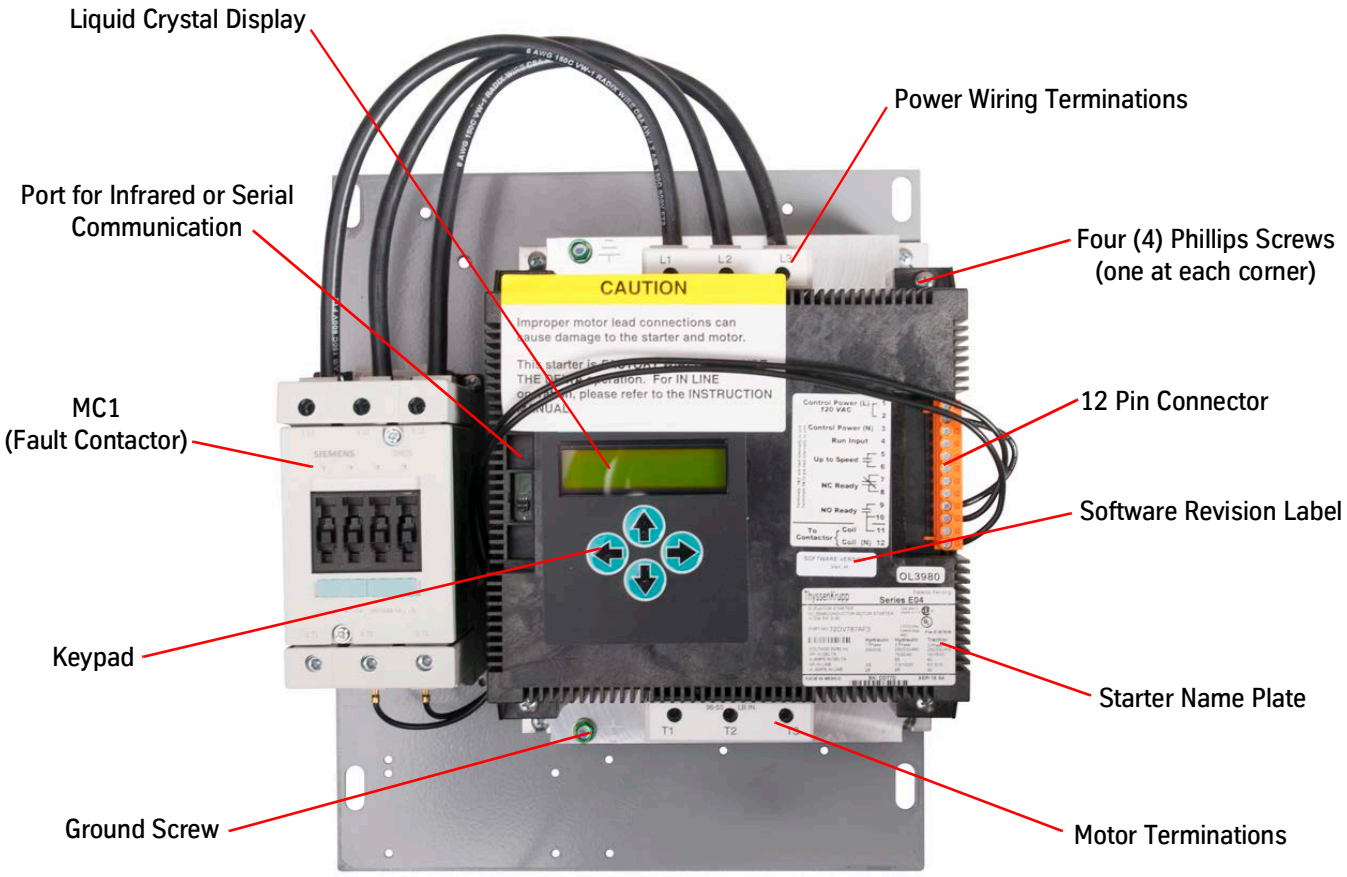


Figure 1 - 72DV Starter

Typical Control Power Connections

CAUTION The wrong voltage or power rating may cause property damage. To avoid possible starter or motor damage, ensure the line and control voltage sources are as specified on the starter label and that the motor rating corresponds to the type of wiring used (In-Delta).

- Terminals 1 and 2 are tied internally in unit.
- Terminals 3 and 12 are tied internally in unit.
- Terminals 10 and 11 are tied internally in unit.

CAUTION The load on terminals 5 and 6 must not be greater than 1 amp at 120 VAC. The load on terminals 7-11 must not be greater than 3 amps at 240 VAC. All terminals are rated for AC voltage only.

Terminal	Connection
Control Power (L) 120VAC 1 2	A 120 VAC supply is connected between the Line and Neutral terminals, points 1 and 3. This supply also powers fault contactor.
Control Power (N) 3	The neutral of the motor run circuit must be referenced to terminal 3, the neutral of the Control Power input.
Run Input 4	The 120 VAC motor run input is connected to terminal 4.
CAUTION	**The Up to Speed output is an AC circuit ONLY. Use of this output in a DC circuit ruins the output, and voids the warranty.**
Up to Speed 5 6	This output is used to either directly supply power to the Up valves for temporary operation, or to supply a signal to a control board to indicate the motor is up to speed for normal operation. This output uses a triac rated for 1 Amp at 120 VAC.
NC Ready 7 8	This contact is used to signal to a control board that the starter unit is in a fault condition.
NO Ready 9 10 To Contactor Coil 11 Coil (N) 12	Terminal 9 provides a hot feed to the fault contactor coil when the NO Ready contact is closed from terminal 121 in the controller. The terminal marked 10 is the switched side of the NO Ready contact. This configuration allows terminal 10 to function as the MC1 (fault) contactor, and opens the MC1 (fault) contactor in the event of a fault.

Electrical Specifications

Input Power and Control	Control Power	± 15% of 120 VAC
	Operating Frequency	50/60 Hz
	Three Phase	-15%/ + 10% 200-460 VAC
		-15%/ + 10% 460-575 VAC
		± 5 Hz of 50/60 Hz
	Motor Run Input	Pull in: 79 VAC max.
		Drop out: 20 VAC min.
		Off State Leakage: 1.5mA max.
	Up to Speed Output	Solid State, AC Voltages Only
	Number of Contacts	1 Normally Open
	Rated Operational Current	1 Amp @ 120 VAC
	Make/Break VA	–
	Expected Operations at rated load	10 x 10^6 cycles
	Ready Output	Mechanical Relay
	Number of Contacts	1 Normally Open, 7 and 8
	–	1 Normally Closed 9 and 10, 11
	Rated Operational Current	1.5 Amps @ 120 VAC
	Make/Break VA	–
	Expected Operations at rated load	100,000 cycles
Duty Cycle Rating	Duty Cycle	30% @ 140% of rated FLA.
	Starts per hour	80
Motor Protection	Overload	Class 5, adjustment range is 33% to 125% of Rated Amps.
	Current Imbalance	Adjustable trip ratio (lowest motor winding current divided by the highest motor winding current) from 0.1 to 0.75. Two second delay allows for system to recover if possible.
	Shorted SCR	Trips in two seconds if a current flow that is greater than 5% of the starters FLA is sensed when the starter is in the Off state.
	Fault Contactor	Opens on all faults. Note: The motor is not electrically isolated with the contactor open when wired In-Delta.
Starter Protection	Fusing or circuit breaker (provided by customer)	Fuse: Sized per NEC with maximum interruption capability of 100,000 amps. Breaker: Sized per NEC with maximum interruption capability of 42,000 amps.
Adjustment	Current Limit	100% to 425% of starters rating in amps.
	Overload	33% to 125% of starters rating in amps.
	Incoming Phase Rotation	ABC or CBA
	Off Delay	0 to 2500 mS
	On Delay	0 to 2500 mS
LCD	Type	16 characters by two lines
	Backlight	Displays for 2 minutes after last keypad input.
Environmental	Operating Temperature	0 - 50° C
	Humidity	5%...95% non-condensing
Agency Approvals	UL and cUL	UL and cUL 508
		File Number: E1878467, 02NK50596
	CSA	File Number: LR6535
		Report Number: 2003-1

LCD Menu

Power Up Status

Upon power up, the LCD displays the status of the starter. See Figure 2 below. If a fault displays, see the Troubleshooting Guide on page 17.

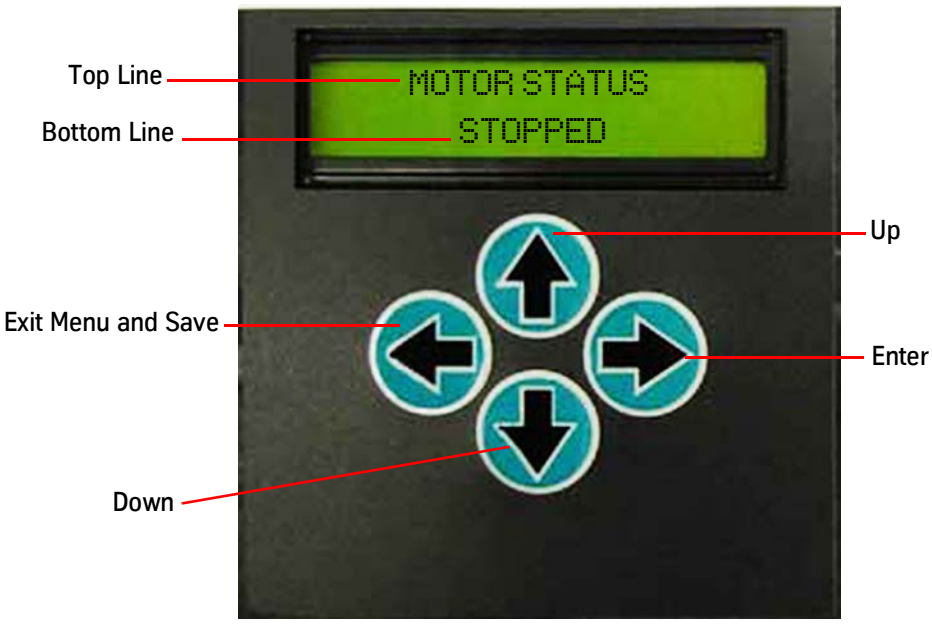


Figure 2 - LCD Readout

Parameter Menu Setup

Enter desired settings in Parameter Menu. See Figure 4 on page 13, LCD Menu Tree.

1. Press ↑ or ↓ to reach the desired parameter.
2. Press → to enter edit mode.
3. Press → to select the digit to edit.
4. Press ↑ and ↓ to decrease or increase the flashing digit.
5. Enter the desired value, and press ← to exit. ACCEPT or REJECT displays. The bottom line of the display shows the new parameter. See Figure 3.
6. Press ↑ to accept the changes, or press ↓ to reject the changes.

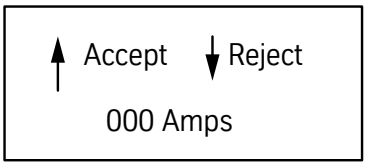
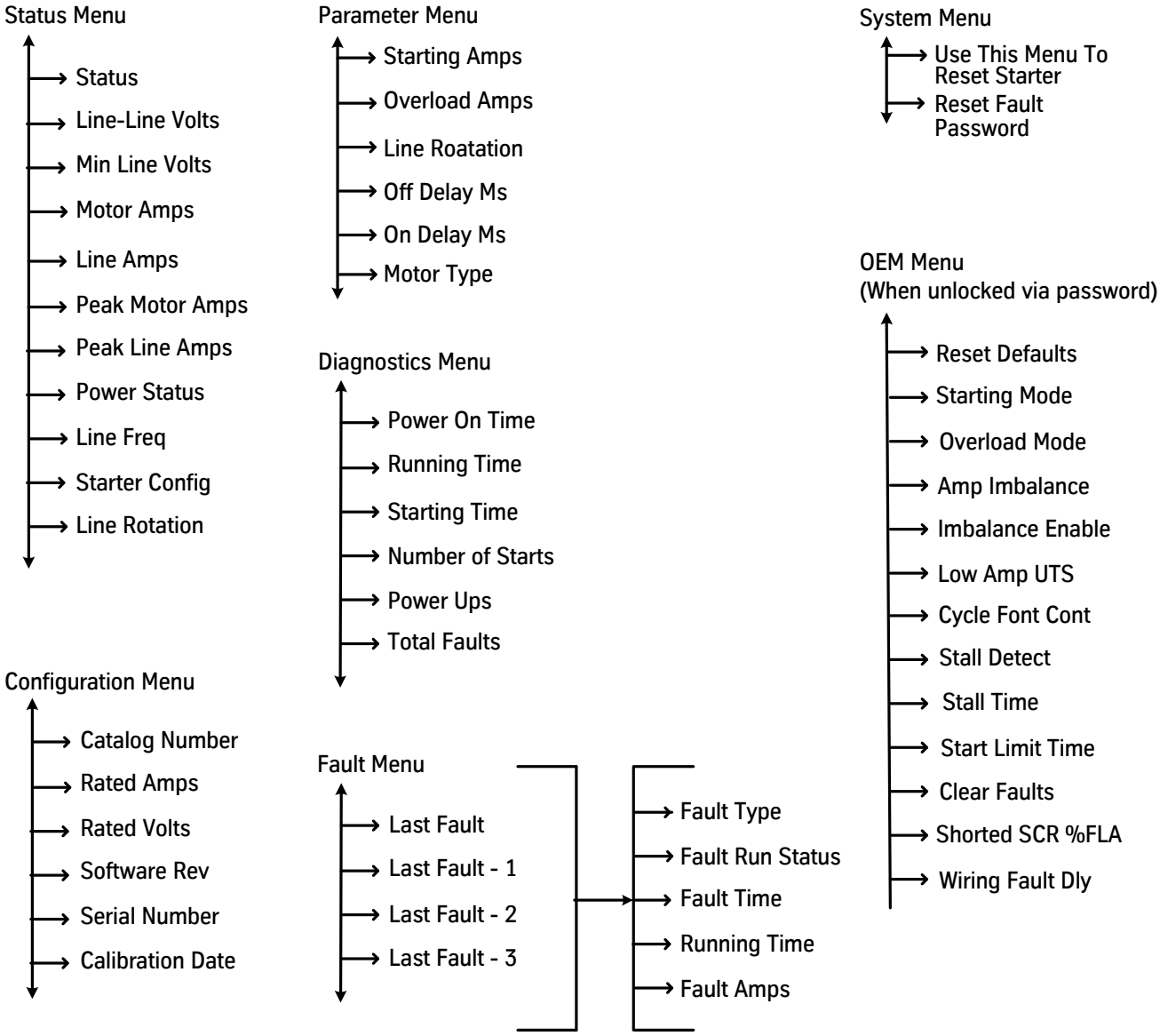


Figure 3 - Parameter Menu Example

LCD Menu
(continued)



After 2 minutes of inactivity on the keypad, the menu defaults to the first line of the Status Menu (Status).

Fault amps are the actual motor currents at the time of the fault. These currents are shown as Delta currents for In-Delta connections and as Line currents for In-Line connections.

Software releases may add parameters to the OEM menu and are set so that the operation for products are not adversely affected. The Menu parameters remain the same.

Figure 4 - LCD Menu Tree

LCD Menu Descriptions

Status Menu

Displays current operational status including Active Faults.

Configuration Menu

Displays the starter unit Manufacturer's information: ratings, serial number, software version, and test date.

Diagnostics Menu

Displays internal counters for the starter: power on time, runtime, starting time, number of starts, number of power ups, and total number of faults.

All times are taken from the Power on the time counter instead of a date and time format. The Power On time is not adjustable.

Fault Menu

Displays internal fault log, which contains the history of the last four faults and information relating to each fault. The presence of a fault in this menu does not indicate a fault is active, only that a fault occurred in the past. Any active fault is listed in the Status Menu.

System Menu

Permits the last active fault to be reset. Place the last active fault into the Fault (log) submenu – "Last Fault"– via the Reset Fault command. To reset faults use System Menu% Reset Fault: select Reset On, and then select Accept Change. Press both ↑ and ↓ at the same time to cycle the control power. Enter password 1024 to access the OEM Menu.

If the condition that caused the last fault is not found and corrected, another identical to the previous fault displays. If the condition is corrected, Status displays MOTOR STOPPED.

Parameter Menu

Displays and allows edits of the current settings, line rotation, and time delays.

Adj.	Unit	Range	Default	Description
Starting Amps	Amps	0 - 4.25 x Overload	3 x Motor Full Load Amps (FLA) from Nameplate	Level that elevator starter holds the current limit to at the start. Note: Lower settings reduce the inrush currents and increase the start time. This setting must not be less than twice the motor's FLA (Max.: 4.25 x FLA). Low Starting Amps setting results in the motor leads heating up.
Overload Amps	Amps	Dependent on Starter Model	Motor Full Load Amps (FLA)	The level of motor current used by the starter for over current detection. Currents above this setting during a run are consid-ered an overload.
Line Rotation	–	ABC/CBA	Defaults: ABC for Standard Dry Units, CBA for Wet (Submergible) Units	The choices for this setting are either ABC or CBA. This setting changes the phasing of the voltage supplied to the motor without moving the motor leads. Perform any physical phase swapping by feeding the L1/L2/L3 wiring into the starter without moving the cross-connects to the fault contactor (MC1).
Off Delay	ms	0 - 2500	Zero	The time the starter continues to run after run signal is removed.
On Delay	ms	0 - 2500	Zero	Time the starter waits before running after receiving a run signal.
Motor Type	–	1 - 3	Per application	Single phase incoming or three phase incoming.

LCD Menu Descriptions
(continued)

OEM Menu

When unlocked via password, this menu contains adjustments that include Reset Defaults, Clear Faults, and Shorted SCR % FLA.

Adj.	Unit	Range	Default	Description
Reset Defaults	–	–	Reset Off	Resets starter back to defaults. **CAUTION!** **This action resets to the Siemens default settings, which differ from the Vertical Express default settings. For proper operation with equipment, the starter needs to be reset to the default settings. See Starter Verification on page 23.**
Starting Mode	–	Average Current / Peak Current	Average Current	Average Current uses all 3 line currents for the starting mode. Peak Current uses the line with highest current for starting mode.
Overload Mode	–	Average Current / All 3 Phases	Average Current	Average Current selection results in the starter's overload working as a function of the average of the 3 line currents. "All 3 Phases" use the motor winding with the most current for comparison with the Overload setting. Regardless of the mode selected, the adjustment is always "In-Line" Amps.
Amp Imbalance	Percentage Difference between Highest and Lowest Winding Current	10 - 75	60	% Difference between highest and lowest winding current (highest and lowest 2 line currents). A fault is registered when this setting is enabled by the Imbalance. Overload Amps rating equals the motors Full Load Amps (FLA) rating. See the Parameter Menu. Enable the setting, and the calculated difference is less than this setting's value.
Imbalance Enable	% Overload	1 - 100	50	Disables the Amp Imbalance protection while the line currents are below this setting. This setting is a percentage of the Overload setting (FLA). A setting of zero enables Amp Imbalance at all times. A setting of 100 disables Amp Imbalance when all three line currents are less than the overload setting.
Low Amp UTS	–	Enable / Disable	Disable	Enable - Allows Up To Speed output to close with line currents less than 5% of the starter's rated current. Disable - Allows Up To Speed output to close only after line currents have reached 5% of the starter's rated current.
Cycle Fault Contactor	–	Enable / Disable	Disable	Enable - Allows the starter to check for motor wiring issues before each run. To prevent damage to the starter unit when operating with the Enabled option, use an Off Disable Delay timer for the fault contactor to ensure that the SCRs are shut off BEFORE the fault contactor opens. Disable - Allows the starter to verify that the proper motor wiring is on with power up.
Stall Detect	–	0 - 99	1	Tunes the Stall Detection. The counts represent the change in the motor voltage's running average sampled on an interval set by the Stall Time setting (see below). If the Stall Detect counts representing the running average of the motor voltage, do not increase in one sample period because the starter initiates the ramp to 450% mode. Increasing the count value increases the chances of initiating the ramp to 450% mode.

Adj. (cont.)	Unit	Range	Default	Description
Stall Time	ms	0 - 1000	Zero	The amount of time in which the sample is taken for stall detection. Zero disables Stall Detect. Decreasing this setting as low as one increases the chance of initiating a ramp to 450%.
Start Limit Time	ms	0 - 5000	Zero	The amount of time that the starter remains at the Starting Current limit setting. If the motor is not up to speed within this time period and not at full voltage, the starter increases the Starting Current Limit. If the setting is zero, the starter uses twice its average start time as the start limit.
Clear Faults	–	–	–	Use masks over the fault buffer to effectively clear the faults. Once this option is initiated, all of the faults listed in the Fault Menu are no longer visible from the LCD.
Shorted SCR %FLA	% FLA	0 - 100	25	The fault level for an individual SCR as a percentage of FLA. If the current in one of the SCRs exceeds this setting when the starter is in a stopped condition, it displays Shorted SCR Fault.
Wiring Fault DLY	Seconds	–	–	Adjusts the time delay before the starter registers a motor wiring fault when control power is applied.

Troubleshooting Guide

LCD Not Working

LCD Display	Problem	Solution
No characters displayed on the LCD screen.	Supply voltage for starter is too low.	Inspect the starter terminals for proper connections. 1. Check for loose terminations and wires terminated on insulation. 2. Dress the connection as necessary. 3. Verify voltage between terminals 1 and 3 on the starter. a. If the voltage is above 80 VAC, replace the defective starter. 80 VAC is a Low Control Power situation, but the LCD still operates. b. If no voltage is present between terminals 1 and 3 on the starter, verify MCC1 I/O is active. Then verify that the MCC1 relay coil is energized and supplying 120 VAC to the starter via the relay contact. Refer to the system schematics. c. If the MCC1 (I/O) is not active, STOP and check the controller system for faults, and troubleshoot the controller error.

Motor Will Not Start

LCD Display	Problem	Solution
Status Ready	Voltage too low or not present at Run Input, terminal 4.	Inspect the starter terminals for proper connections. 1. Check for loose terminations and wires terminated on insulation. 2. Dress the connection as necessary. 3. Verify Run Input 102 - 138 VAC between terminals 3 and 4 on the starter by placing the car on Inspection Operation, and run the car up. a. If the Run Input voltage is within range, replace the starter. The Run Input circuit is defective. b. If no voltage is present: • Verify that MCC2 and MCC3 I/O are active, and their relay coils are energized. Refer to system schematics for I/O locations. • Verify that MCC2 and MCC3 contacts are closed. Refer to the system schematics. • If MCC2 or MCC3 I/O are not active, STOP and check controller system for faults, and troubleshoot controller error.
Control Voltage Powered Down	Voltage too low at Control Power Input, terminal 1.	Confirm the voltage between terminals 1 and 3. 1. If the voltage is less than 102 VAC, correct the voltage problem. 2. If the voltage is 102 VAC or greater, replace the defective starter.
Control Voltage Brown Out	Voltage too low at Control Power Input, terminal 1.	Confirm the voltage between terminals 1 and 3. 1. If the voltage is less than 102 VAC, correct the voltage problem. 2. If the voltage is 102 VAC or greater, replace the defective starter.
Control Voltage Over Voltage	Voltage too high at Control Power Input, terminal 1.	Confirm the voltage between terminals 1 and 3. 1. If the voltage is greater than 138 VAC, correct the voltage problem. 2. If the voltage is less than 138 VAC, the starter indicates this fault.
Fault EEPROM Memory	The starter detected a problem with the EEPROM Memory.	On the controller's CPU, press **RST** to cycle power to the starter. If the EEPROM Memory Fault is still present, replace the starter.

LCD Display	Problem	Solution
Fault ROM Memory	The starter detected a problem with the ROM Memory.	On the controller's CPU, press **RST** to cycle power to the starter. If the ROM Memory Fault is still present, replace the starter.
Fault Watchdog	The starter detected an internal fault with the software.	On the controller's CPU, press **RST** to cycle power to the starter. If the Watchdog Fault is still present, replace the starter.
Wrong Rotation CBA set as ABC or Wrong Rotation ABC set as CBA	Incoming 3 phase is opposite of the Line Rotation Setting.	Verify the correct motor wiring to the starter per the job schematics. Set the Line Rotation in the starter from the Parameter Menu, and see Pump Motor Rotation on page 26.
Fault Motor Wiring	The motor is incorrectly connected to the starter.	1. De-energize equipment, and then Turn OFF, Lockout, and Tagout the mainline disconnect. 2. Verify 10 ohms or less at the following In-Delta locations: a. T1 to MC1-4 (T4) b. T2 to MC1-6 (T5) c. T3 to MC1-2 (T6) 3. Turn ON the mainline disconnect when checks are complete. 4. Ensure each winding has similar resistive value to the other 2 windings. 5. Verify high resistance value from ground to T1 through T3. 6. See Motor Wiring Check Out on page 22.
	The fault contactor (MC1) is not energized.	1. Verify the fault contactor (MC1) is energized after power up. The starter pulls in, then drops out upon starter faulting. a. If the starter does not pull in, measure the voltage between terminals 10 and 12. The optimum voltage is between 102 and 138 VAC. b. If the voltage is within range, use the job schematics to verify wiring to the fault contactor (MC1). c. Correct wiring as necessary. d. Connect voltmeter set to read the VAC between terminals 9 and 12. e. Simultaneously press ↑ and ↓ on the starter and look for 110 VAC to appear briefly. If the fault contactor (MC1) cycles as expected and the Motor Wiring Fault persists, refer to MC1 (Fault Contactor) Check Out on page 22. 2. Verify the incoming line power. a. Line to Line must be contract voltage. b. Line to GND = Line to Line voltage divided by 1.73.
	Motor is wired correctly, starter still indicates Motor Wiring fault.	1. Verify Fault Contactor (MC1) contacts make good connections. See MC1 (Fault Contactor) Check Out on page 22. 2. Verify motor wiring. See Motor Wiring Check Out on page 22.
Fault High Line Volts	The starter has detected a high line condition on the incoming voltage supply (L1, L2, L3).	In the Status Menu, use a voltmeter to check the line voltages. 1. If incoming voltage exceeds 527 VAC for 460 VAC units or 631 VAC for 575 VAC units, STOP, and correct incoming line voltage. 2. If the incoming voltage is acceptable, use the Reset Fault command in the System Menu, and reset the starter. 3. If the starter status shows MOTOR STOPPED and functions properly, use a power analyzer, multimeter with a Min/Max function, or similar voltage monitoring instrument to monitor and record incoming power to the unit. Suspect building power.

LCD Display	Problem	Solution
Fault Shorted SCR A or Fault Shorted SCR B or Fault Shorted SCR C	The starter has a shorted SCR in the indicated phase.	1. Turn OFF, Lockout, and Tagout the mainline disconnect. 2. Note the motor wiring terminations, marking wires as necessary. 3. Disconnect the motor wires from the starter terminals T1, T2, and T3. 4. Use an ohmmeter, and record the following resistance checks: a. L1 to T1 b. L2 to T2 c. L3 to T3 d. Less than 3K ohms is considered shorted. e. 8000 ohms or 0.8M ohms is average, and all three SCRs have balanced resistance within 1000 ohms of each other. 5. Restore motor wiring. 6. Turn ON the mainline disconnect.
Status Maintain Start before switching to Status Ramp to 450%	Current limit is set too low, or there is an excessive load on the system during the start.	1. In the Parameter Menu check the Starting Amps setting, and ensure the setting is not below 2 x Overload Amps. The default is 3 x motor FLA. 2. Check the Overload Amps settings. 3. Verify the valves are not energized during the start. 4. Verify the pump and the motor are not in a bind.
Fault Low Leg Amps	The starter has detected an imbalance in the motor currents.	Record the motor currents for future reference including Warranty Claims if applicable. 1. Check the fault currents in the Fault Menu. 2. Look for the leg with the severely lower current in Amps. 3. Use an ohmmeter to verify each of the motor's windings. Expect approximately 0.5 - 2.0 ohms. a. All windings need about the same resistance (+/- 0.2 ohms). b. Check each winding lead against all other winding leads to find two windings shorted together. 4. Use an ammeter, verify the current draw of each of the three motor leads on the bottom side of the starter, and compare the readings to the starter's Fault Menu's current listing for each leg. 5. Use a voltmeter across the line and load terminals of the starter, and measure the voltage AC while the motor is up to speed. There must not be any readings above 10 VAC. 6. Use a voltmeter across one of the three sets of contacts on the fault contactor (MC1), and measure the voltage while the motor is up to speed. Readings must not exceed 10 VAC. Notes: • See MC1 (Fault Contactor) Check Out on page 22 for more details. • See The Phantom Phase on page 38.
Fault Phase Loss	The starter detected a problem with the incoming three phase power during a run condition.	This fault resets when the power returns to normal. 1. Go to Status Menu % Line-Line Volts. Use a voltmeter to verify the starter's reading. 2. If the starter measurements and the voltmeter measurements agree, correct the phase loss condition. 3. If the starter measurements and the voltmeter measurements do not agree, replace the starter.

Motor Trips Out On An Overload Fault After Coming Up To Speed

LCD Display	Problem	Solution
Fault Overload	Overload setting is too low.	1. Check Run Status and Running Time fault currents from the Fault Menu for the last fault. 2. Verify Starting Amps in the Parameter Menu is set to at least 2 x motor nameplate FLA. 3. If the overload fault occurs during the "maintain 450%" and the run time is several seconds as verified from the Faults Menu, there may be a mechanical issue preventing the motor from coming up to speed.
	Overload condition is detected.	1. Verify the starter overload and starting current settings. 2. Correct to defaults if necessary. 3. If the overload settings are correct, verify that the currents displayed by the starter's Fault Menu agree with actual ammeter readings. 4. If the overload mode is set for "All 3 Phases" and one winding's current is significantly higher than the other windings, nuisance overload trips may occur during long up runs near or at the rated up load.

Other Problem Indicators

LCD Display	Problem	Solution
Hot Motor Leads (The motor leads are too hot to comfortably hold.)	The current is excessive for wire capabilities.	Verify the current through the conductors is acceptable for the wire size and in accordance with the following NEC Tables: • NEC 310.17 - Amps of conductors in free air. • NEC 310.16 - Amps of less than 3 conductors in a raceway. • NEC 310.15 (B)(2)(A) - Correction factors for more than 3 current carrying conductors in a raceway. Note: The lead length from the motor is intended for Power Unit mounted controllers. Any modifications to motor lead length must be in accordance with NEC specifications.
Starter and MC1 (fault contactor) continuously cycle.	MCF input to controller is active.	1. Place the car on Inspection Operation. 2. Turn OFF, Lockout, and Tagout the mainline disconnect. 3. Mark MCF output on the starter and pin 8 on the connector. 4. Disconnect the MCF output from the starter, and put a wire nut on the end to prevent accidental shorting. 5. Turn ON the mainline disconnect to power up the controller and the starter. 6. Verify the following: a. Voltage on starter connector pin 7 is 24VDC. b. Voltage on connector pin 8 is less than 1VDC. c. The contact is open with no fault. (If the contact is closed, verify starter status.) d. If there is a fault condition indicated, refer to proper LCD display. e. If there is not a fault condition indicated, the READY (FAULT) contact is defective.

Starter Checks

Control Power (L) 120VAC 1 2	120 VAC input power for starter.
Control Power (N) 3	120 VAC (Starter) common.
Run Input 4	Signal for starter to run from controller output(s).
NC Ready 7 8	Inputs to MCF I/O in the controller - when the starter faults, this contact closes activating the MCF I/O.
NO Ready 9 10	Output to MC1 contactor coil - the system's fault contactor.
To Contactor Coil 11 Coil (N) 12	120 VAC common, used as MC1 (fault) contactor common while terminal 12 is internally tied to terminal 3.

Reference Name	Point A Starter Terminal	Point B Starter Terminal	Control Power Available (volts)	Control Power NOT Available (ohms)	Description
Control Power Input	1	3	120 VAC	Infinite	–
Run Input	4	3	120 VAC*	Several mega-ohms	–
Up To Speed	6	5	Less than 2 VAC**	Several mega-ohms	–
Fault (N.C.)	7	8	24 VDC	Less than 2 ohms	Measured in a ready to run state when the contact is held open by the starter.
Fault (N.O.)	9	10	Less than 2 VAC	Several mega-ohms	Measured in a ready to run state when the contact is closed by the starter.
SCR A	L1	T1	Less than 10 VAC**	Greater than 3K ohms	For resistance checks: Ensure motor wires are labeled, note their termination location on the starter, and disconnect the motor wires. Complete the starter resistance checks, and then reconnect the motor wires.
SCR B	L2	T2	Less than 10 VAC**	Greater than 3K ohms	
SCR C	L3	T3	Less than 10 VAC**	Greater than 3K ohms	

Notes: Terminals 1 and 2 are tied internally in unit.
Terminals 3 and 12 are tied internally in unit.
Terminals 10 and 11 are tied internally in unit.

* With a demand to run from the controller via relays or with zero (0) volts AC present.
** With motor running and Up To Speed output energized.

Table 1 - Starter Checks

MC1 (Fault Contactor) Check Out

1. Place the controller on Inspection Operation.
2. Turn OFF, Lockout, and Tagout the mainline disconnect.
3. Mark or label the wire in starter terminal 9.
4. Move the wire from starter terminal 9 to starter terminal 10.
5. Turn ON the mainline disconnect.

NOTE The MC1 contactor coil is now energized, and the contacts are closed.

6. Verify MC1 Energized measurements. See Table 2.
7. Reset faults on the starter and controller as necessary.
8. Turn OFF, Lockout, and Tagout the mainline disconnect.
9. Restore the original wiring, and place starter's terminal 9 wire back on terminal 9.
10. Verify MC1 Not Energized measurements to confirm that MC1 contacts are not held close (shorted). See Table 2.

NOTE All contacts must be open and have infinite resistance.

Point A	Point B	MC1 Energized (volts)	MC1 Not Energized (ohms)
MC1-3	MC1-4 (T4)	Less than 2 VAC	Several mega ohms
MC1-5	MC1-6 (T5)	Less than 2 VAC	Several mega ohms
MC1-1	MC1-2 (T6)	Less than 2 VAC	Several mega ohms

Table 2 - MC1 Measurements

Motor Wiring Check Out

Point A	Point B	Resistance Measurements (ohms)	Purpose
T1	MC1-4 (T4)	Less than 10 (0.5-2.5 ohms typical)	Verify good motor windings.
T2	MC1-6 (T5)	Less than 10 (0.5-2.5 ohms typical)	
T3	MC1-2 (T6)	Less than 10 (0.5-2.5 ohms typical)	
T1	To each: T2, T3, T5, T6	Several mega ohms	Verify motor windings are not shorted to each other or ground.
T2	To each: T1, T3, T4, T6	Several mega ohms	
T3	To each: T1, T2, T4, T5	Several mega ohms	
T4	To each: T2, T3, T5, T6	Several mega ohms	
T5	To each: T1, T3, T4, T6	Several mega ohms	
T6	To each: T1, T2, T4, T5	Several mega ohms	
GND	To each: T1 - T6	Several mega ohms	
Note: Motor leads are labeled 1 - 6 corresponding to T1 - T6, respectively.			

Table 3 - Energized Measurements

Starter Verification

Verify Starter and Overload settings. See Figure 5.

- If the display does not display MOTOR STATUS STOPPED, reset the starter and correct any problem indicated on the display. MOTOR STATUS STOPPED displays when the system is normal.
- After two minutes of inactivity on the keypad, the menu defaults to the first line of the Status Menu (STATUS).
- After five minutes of inactivity on the keypad, the starter's display defaults to read MOTOR STATUS.
- Fault amps are the actual motor currents at the time of the fault. The motor currents shown as Delta currents are for In-Delta connections, and the currents shown as Line currents are for In-Line connections. Fault amps are the actual motor currents at the time of the fault.

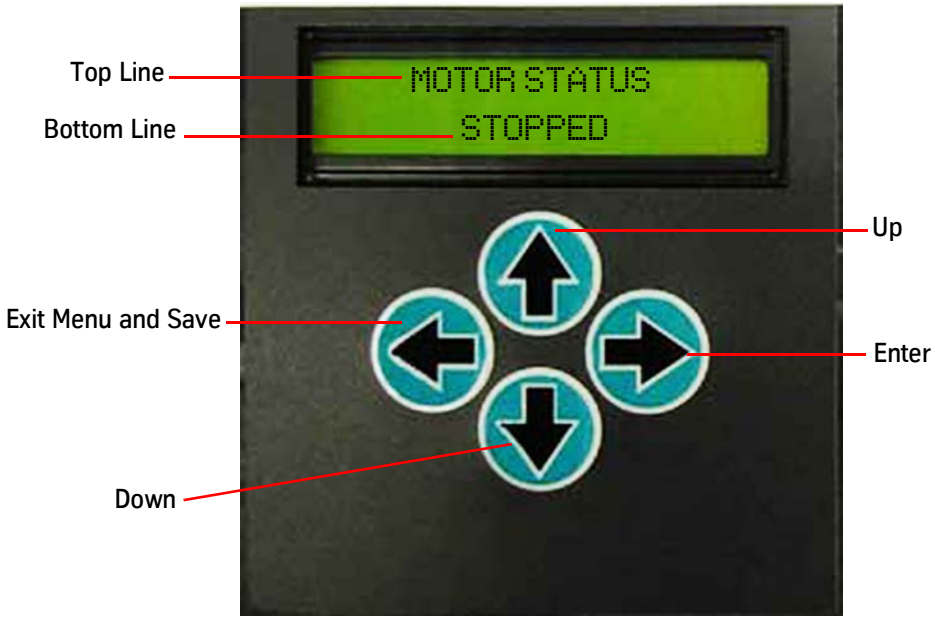


Figure 5 - Electronic Starter Display

Verify Starter Software Revision

1. Press ← once, then press ↓ until SYSTEM Menu displays.
2. To change the password:
   a. Press → once, then press ↓ once. Verify that PASSWORD 0 displays.
   b. Press → once. Verify that PASSWORD **0**000 displays. Be sure that the first zero (at the far left of the display) is flashing.
   c. To access the OEM Menu, use the following sequence of key strokes to enter password 1024. Press ← once, then press ↑ once to accept the new password, and the **bold number** flashes in the display window.

Key	Strokes	Display Reads
↑	1	**1**000
→	2	10**0**0
↑	2	10**2**0
→	1	102**0**
↑	4	102**4**

3. Press ← once, then press ↓ once. Verify that the OEM Menu displays.
4. To change the amp imbalance:
   a. Press → once, then press ↓ until Amp Imbalance displays.
   b. If 60% displays, skip to step 5 on page 25.
   c. If 33% displays, continue to step d below.
   d. Enter the following sequence of key strokes to change the Amp Imbalance value from 33% to 60%. The **bold number** flashes in the display window.

Key	Strokes	Display Reads
→	1	**3**3%
↑	3	**6**3%
→	1	6**3**%
↑	3	6**0**%

   e. Press ← once, then press ↑ once to accept the new 60% Amp Imbalance value.

Verify Starter Software Revision
(continued)

5. To change the imbalance ensemble:
   a. Press ↓ once. Verify Imbalance Enable of overload (OL) display.
   b. If 50% is displayed, skip to step f below.
   c. If 100% is displayed, continue to step d below.
   d. Enter the following sequence to change the Imbalance Enable value from 100% to 50% of overload (OL). The **bold number** flashes in the display window.

Key	Strokes	Display Reads
→	1	**1**00%
↑	1	**0**00
→	1	0**0**0%
↑	5	0**5**0%

   e. Press ← once, then press ↑ once to accept the new 50% Imbalance Enable value.
   f. Press ← once, then press ↑ four times to display the PARAMETER Menu.

NOTE After five minutes of inactivity, the OEM Menu is locked out, and the starter returns to the Default Status Menu.

Verify Overload Amps = Motor Nameplate Amps (FLA)

1. From the PARAMETER Menu, press → once. STARTING AMPS displays.
2. Set the Starting Amps value equal to three times the Nameplate Amps (FLA) value.
   a. Press → once to access the value.
   b. Press ↑ or ↓ to adjust value of the flashing digit. Press → to move to next digit.
3. Press ← to exit the STARTING AMPS parameter.

NOTE A prompt to ACCEPT or REJECT the change displays. Press ↑ to accept or ↓ to reject, and correct the parameter.

4. Press ↓ once, and OVERLOAD AMPS displays.
   a. If the value is correct, skip to step 6.
   b. If the value is incorrect, continue to step 5.
5. Press → once to access the value. Press ↑ or ↓ to adjust the value of the flashing digit. Press → to move to the next digit.
6. Press ← to exit to the Parameter Menu.

NOTE A prompt to ACCEPT or REJECT the change displays. Press ↑ to accept or ↓ to reject, and correct the parameter.

Pump Motor Rotation

Siemens Electronic Soft Starters monitor motor wiring configurations, and swap line rotation through the SCR operation. Swapping motor leads to correct motor rotation results in a MOTOR WIRING fault. Motor rotation is controlled via adjustments in the starter and the line input to the starter.

CAUTION

Before attempting to operate the motor with the replacement unit, verify that all applicable Field Engineering Bulletins are completed.

All published Field Engineering Bulletins are available on verticalexpress.com.

Set Line Rotation Starter

1. Press ← once. The Status Menu displays.
2. Press ↓ two times. The Parameter Menu displays.
3. Press → once. STARTING AMPS displays.
4. Press ↓ until LINE ROTATION appears in the display. Press → to access the value.
   a. ABC for standard Dry (AP) units:
      - Standard Dry units have the motor mounted to the left of the pump.
      - CW rotation is standard when viewed from the shaft end.
   b. CBA for standard Wet (EP) units:
      - CCW rotation as viewed from the pump end.
5. Press ↑ or ↓ to adjust the value of the flashing digit.
6. Press ← to save the value and exit LINE ROTATION.
7. Check the starter status. If WRONG ROTATION displays:
   a. De-energize the controller.
   b. Turn OFF, Lockout, and Tagout the mainline supply to the controller.
   c. Swap any two of the incoming lines at the top of the starter.
   d. Turn ON the mainline disconnect.
   e. Verify proper operation by momentarily running the unit in the UP direction.

If the motor is not in view, have someone else available to listen to the power unit for proper operation.

- For Temporary Operation mode, use the RUNBUG.
- For Automatic Operation mode, place the controller on Inspection Operation and press **Inspection Station Control**.

   f. If the unit runs in the proper direction but makes an unusual noise, check for:
      - Proper mechanical mating between the pump or motor.
      - Binding issues with the pump.
      - Ensure that the pump screen is intact.

Clear the Starter Fault Log

NOTE To access this option, install starter software Version E or later.

1. Capture the elevator, and place the elevator on Inspection Operation.
2. Verify that the Electronic Starter's LCD readout is illuminated.
3. Press ← once, then press ↓ until the System Menu displays.
4. From the System Menu, press → once, then press ↓ once, so PASSWORD 0 displays.
5. From the Password display, press → once. Verify that PASSWORD **0**000 displays. Ensure that the first zero (at the far left of the display) is flashing.
6. Use the following sequence of key strokes to enter the password 1024:

NOTE The **bold number** flashes in the display window.

Key	Strokes	Display Reads
↑	1	**1**000
→	2	1**0**0
↑	2	10**2**0
→	1	102**0**
↑	4	102**4**

7. Press ← once, then press ↑ once to accept the new password.
8. Press ← once, then press ↓ once. Verify that the OEM Menu displays.
9. Press ↓ so that CLEAR FAULTS displays.
10. Press % once, then press ↑ once so that YES displays.
11. Press ↑ to accept.

Starter Replacement

WARNING **Before maintenance, always de-energize and ground equipment. Dangerous voltages present in the equipment can cause death, serious injury, or property damage. Only qualified personnel perform maintenance.**

NOTE Before ordering or replacing a 72DV Starter, see the Troubleshooting Guide on page 17, all of the check out procedures on page 21, and Verify the Starter and Overload Settings on page 23.

1. Check the electronic soft starter terminal connections for the following, and make corrections as necessary.
   a. Clean conductors, so there is no corrosion and no contamination.
   b. Ensure the electronic soft starter terminal connections are not loose and are not terminated on insulation.
2. Check the MC1 (fault) contactor for the following, and make corrections as necessary. See Figure 6.
   a. Clean conductors, so there is no corrosion and no contamination.
   b. Ensure the electronic soft starter terminal connections are not loose and are not terminated on insulation.
   c. Mechanical operation - With the power off, press **starter manual** on the contactor to verify that the contactor is free of mechanical binding.
   d. Verify that the suppressor is present, and that the terminations are free of corrosion and make good contact on the relay tabs or terminal screws as applicable.
3. If the starter has a fan, verify that the fan is operating and that the fan's opening is clear of obstructions.

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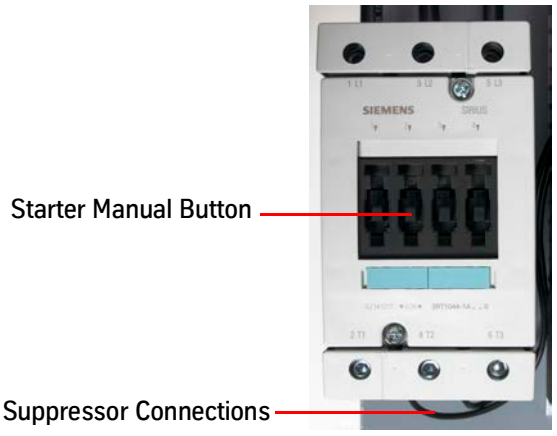

Figure 6 - MC1 Contactor

Starter Replacement
(continued)

WARNING

Make certain that the motor wires do not get hot. Check Starting Amp setting in the Parameter Menu. If the controller is remote to the power unit, verify the interconnecting wiring is large enough to carry the FLA current of the motor for the distance between the controller and the power unit. The Manufacturing wire size is for controllers mounted to the power unit only.

1. Place the elevator on Inspection Operation.
2. Tun ON the mainline disconnect.
3. Verify that 102-138 VAC is present between starter terminals 1 and 3. If necessary, stop and correct the voltage issue.
4. Verify that the incoming line voltage matches the job nameplate +/- 5%. If necessary, stop and correct the voltage issue.
5. Verify the part numbers on the original starter and the replacement starter match.
   a. If the part numbers do not match, verify that the line voltage measured in step 4 and FLA from the controller nameplate are acceptable for the replacement starter.
   b. Compare the measurements to the starter's data tag. A larger starter with a higher current rating is acceptable, but a smaller starter with a lower current rating is not.
6. Record Starting Amps, Overload Amps, and Line Rotation from the Parameter Menu.
7. Turn OFF, Lockout, and Tagout the mainline disconnect.
8. Mark or label the terminated wires on the starter.
9. Remove the wires from L1-L3 and T1-T3. See Figure 7 on page 30.
10. Disconnect the 12-pin connector from the starter.
11. Carefully loosen the four screws holding the starter unit to the rear panel of controller.
12. Slide the defective starter up and out.
13. Mount the replacement starter unit.
14. Reconnect the 12-pin connector.
15. Reconnect L1-L3 and T1-T3. See Figure 7 on page 30.
16. Turn ON the mainline disconnect.

Starter Replacement
(continued)

17. Set the Starting Amps, Overload Amps, and line rotation to the values recorded in step 6 on page 29. If the information is not available, set the parameters per the Parameter Menu on page 14.

18. Use the Troubleshooting Guide on page 17 to address any starter faults or issues.

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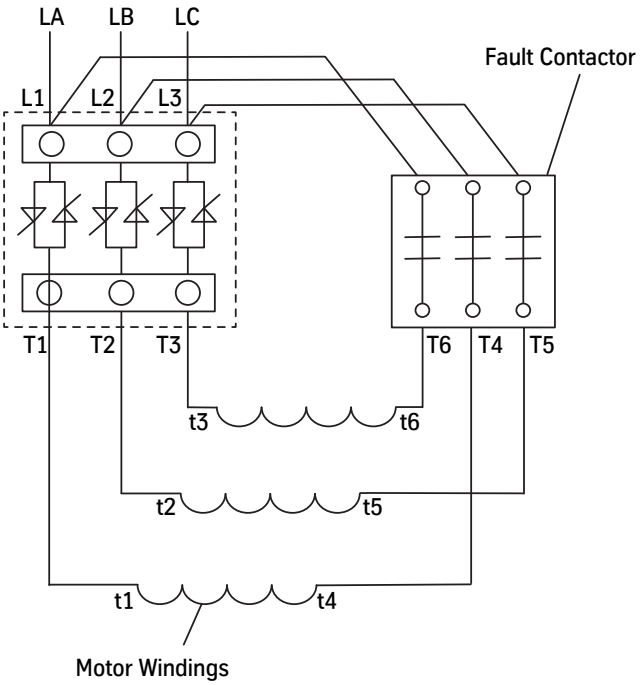


Figure 7 - Wiring Diagram

Starter Logic Card Replacement

1. Turn OFF, Lockout, and Tagout the mainline disconnect.
2. Unplug the starter's 12 pin connector. See Figure 1 on page 9.
3. Locate and remove the four #2 Phillips screws in the four corners of the starter's cover.

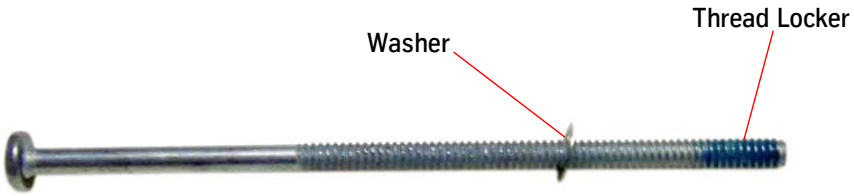
NOTE These screws are held in place with a thread locker. See Figure 8 on page 32.

4. Lift the cover straight off.
5. Release the wedge clamp holding the interface cable in J1. See Figure 8 on page 32.
   a. Gently lift up on each side.
   b. Rock the wedge up until it is fully extended or released.
   c. Remove the interface cable.

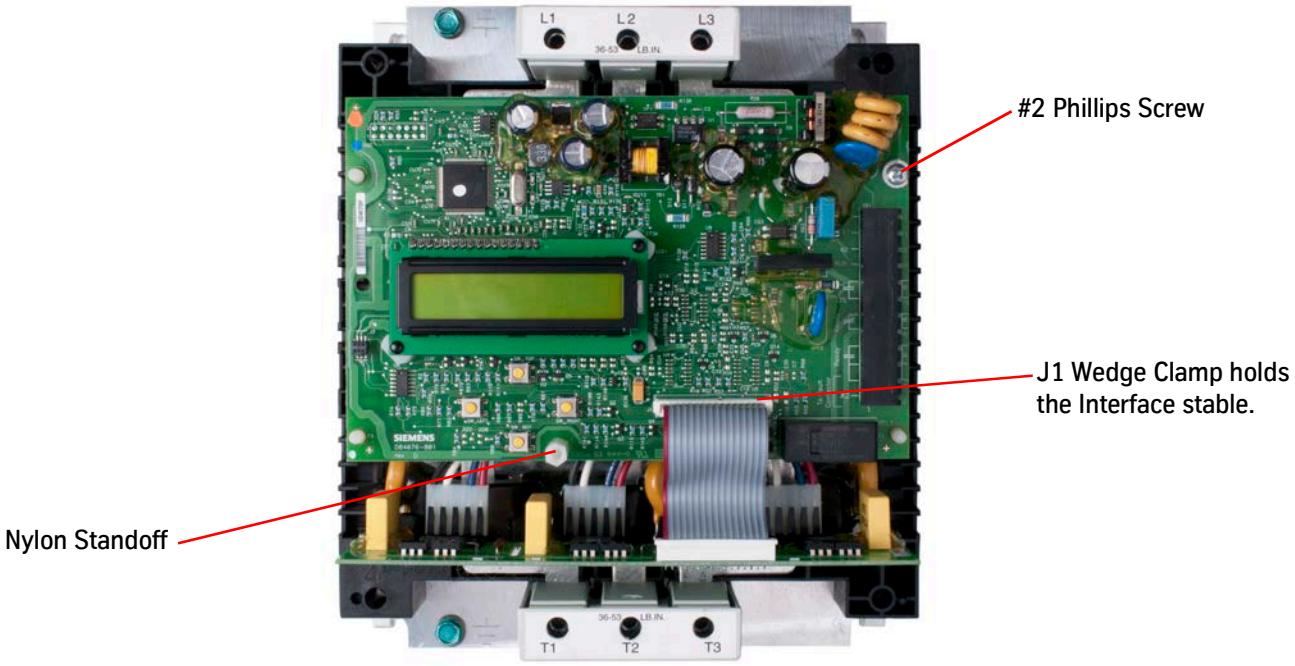
CAUTION **Do not bend the interface pins on the end of the cable. See Figure 8 on page 32.**

6. Remove the #2 Phillips screw located above the starter's connector. This screw is held in place with the thread locker. See Figure 8 on page 32.
7. Remove the nylon standoff located in the lower left section of the logic card. See Figure 8 on page 32.
8. Remove the faulty logic card, and install the replacement logic card.
9. Re-install the nylon standoff.
10. Lift the wedge clamp for J1 on the replacement logic card, and carefully install the interface cable to J1 of the logic card.
    a. Ensure that the pins align, and the cable is flush with the connector.
    b. Push the wedge clamp back into place to retain the cable.
11. Re-install the starter's cover.
12. Ensure the flat washer is in place prior to applying the thread locker. Place a small amount of medium strength thread locker on the end of the #2 Phillips screw for the logic card, and re-install. Repeat this step for the three remaining #2 Phillips screws. See Figure 8 on page 32.
13. Connect the 12 pin connector into the starter.
14. Place the controller on Inspection Operation.
15. Turn ON the mainline disconnect.
16. Set the Starting Amps, Overload Amps, and Line Rotation.

Starter Logic Card Replacement
(continued)



Thread Locker on #2 Phillips Screw



Starter Logic Card

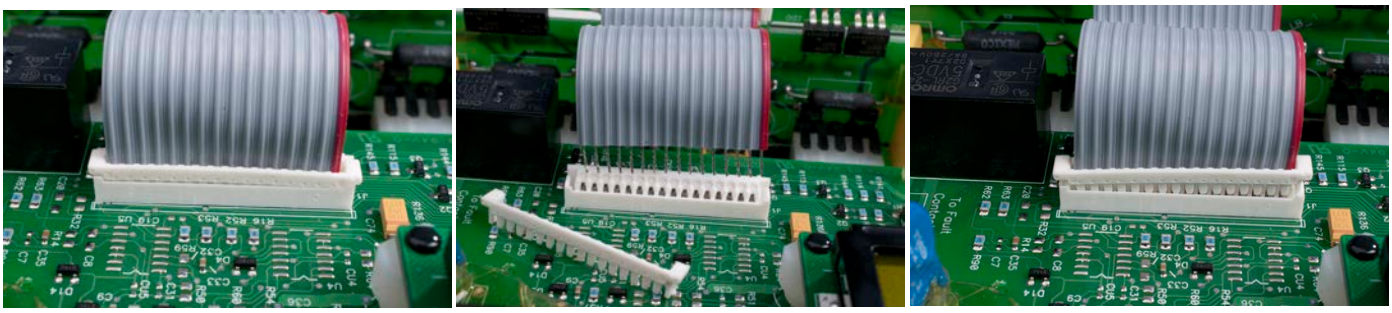
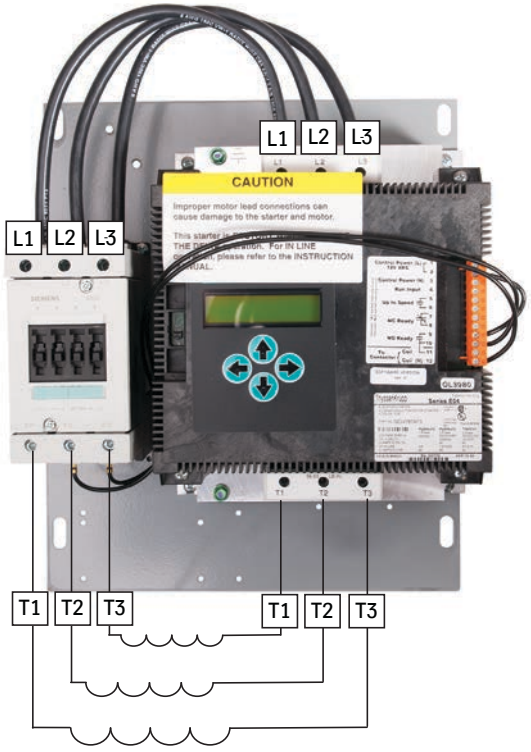


Figure 8 - Remove Interface Cable

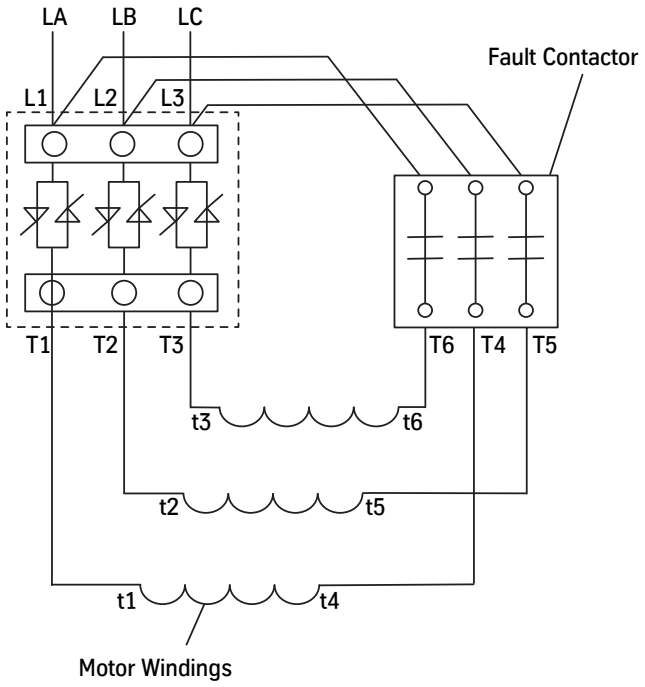
In-Delta Motor Wiring

6 Lead Motors

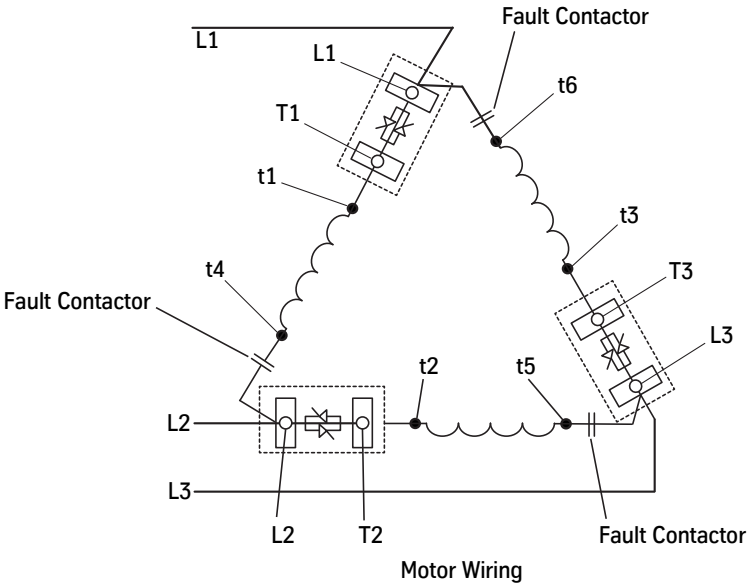
CAUTION Connect the motor wiring exactly as shown. If not, the starter detects a motor wiring error.



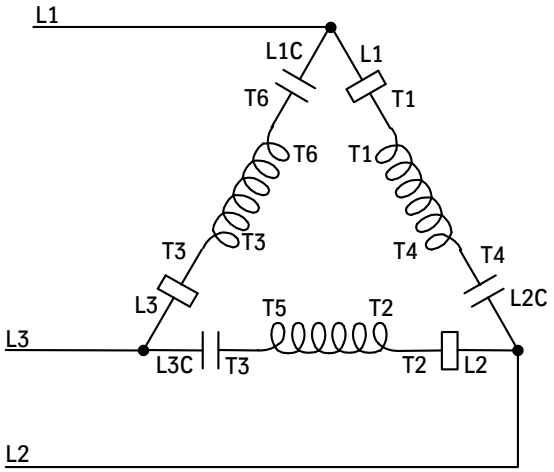
Power Wing



Connection Diagram



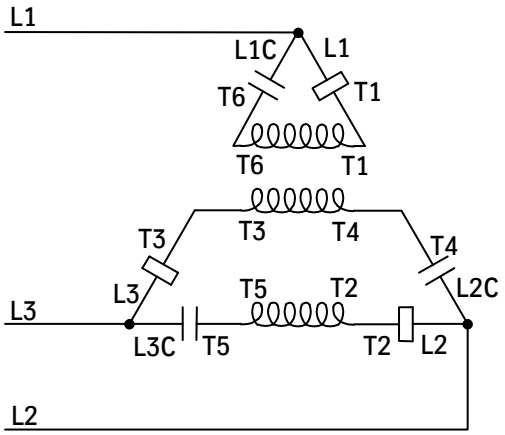
Motor Wiring



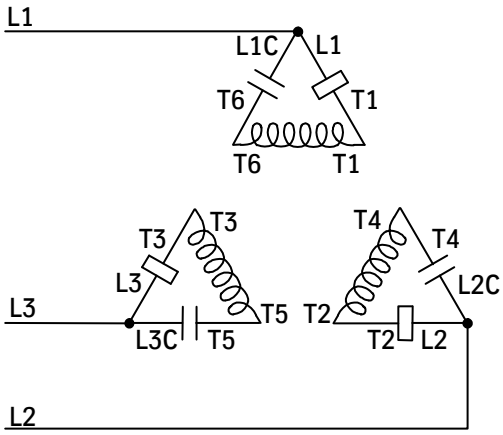
Typical Connection Diagram

Motor Wiring

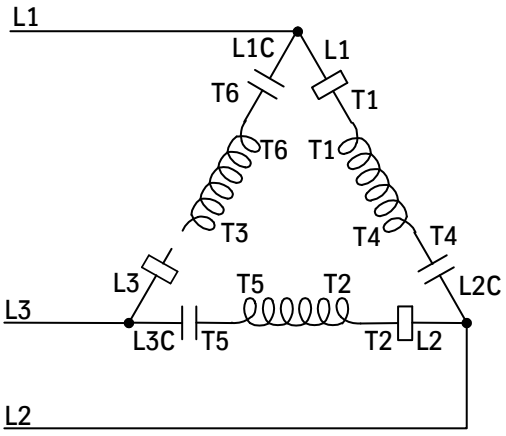
Incorrect In-Delta Connection Examples



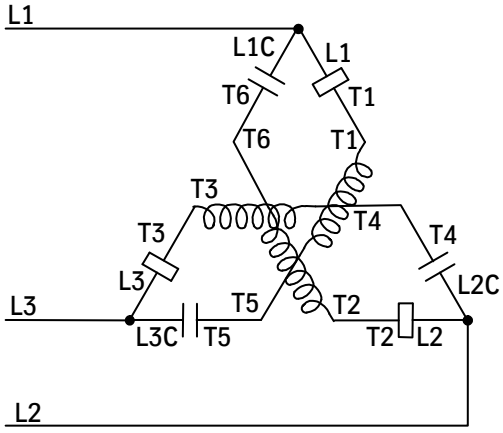
1 Winding Dead



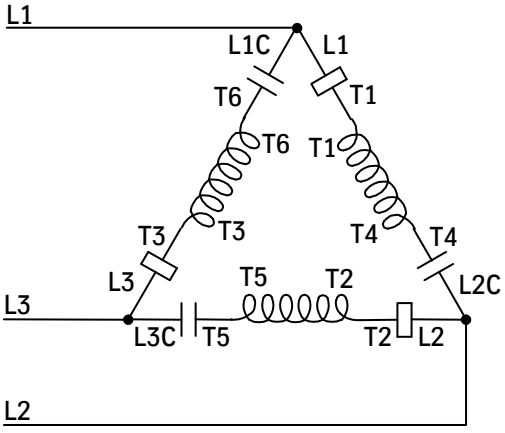
3 Windings Dead



Open Connection



Swapped Motor Leads



Open Contactor with Power Applied

Modernization Motor Wiring

12 Lead Dual Motor Connection

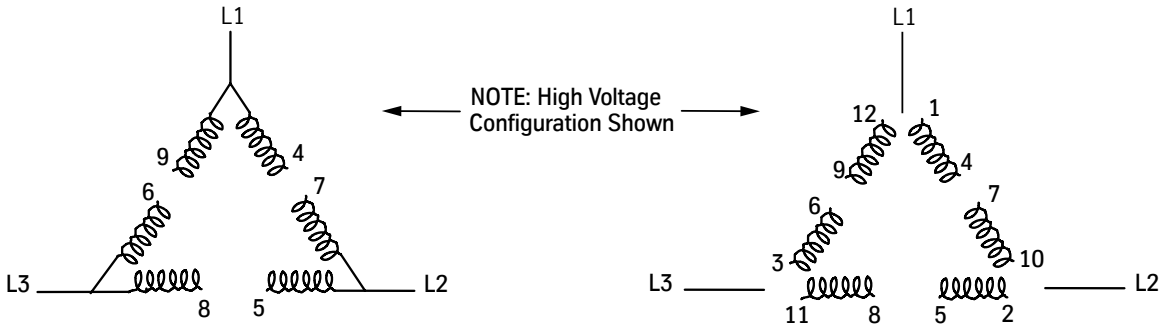
Solid State Starter is wired at Manufacturing for In-Delta operation ONLY. See Table 4.

9 Lead Motor Connections

- A 9 lead motor MUST be wired in an "In-Line" configuration. "In-Line" configuration is not a standard option. Contact Vertical Express at 866-448-3789 or at srt@thyssenkrupp.com.
- When running "In-Line", the starter is sized differently than In-Delta. For assistance refer to the Siemens Starter pamphlet included with the starter, or contact Vertical Express at 866-448-3789 or at srt@thyssenkrupp.com.
- In a submersible application, where only 3 motor leads are brought to the starter, the starter may also run "In-Line."

Dual Voltage Motors						
High Voltage Connections 12 lead motor (460 - 480 VAC)						
Starter Terminals	T1	T2	T3	T4	T5	T6
Motor Leads	1	2	3	10	11	12
Motor Leads	Connect 4 and 7		5 and 8		6 and 9	
Low Voltage Connections 12 lead motor (220 - 240 VAC)						
Starter Terminals	T1	T2	T3	T4	T5	T6
Motor Leads	1, 7	2, 8	3, 9	10, 4	11, 5	12, 6

Table 4 - Dual Voltage Motor Connections



Low Voltage	L1 to 1, L2 to 2, L3 to 3
Connect:	6 & 7 to 1, 5 & 9 to 3, 4 & 8 to 2
High Voltage	L1 to 1, L2 to 2, L3 to 3
Connect:	6 to 9, 4 to 7, 5 to 8

9 Lead Dual Voltage

Low Voltage	L1 to 1 & 12 & 7 & 6 L2 to 2 & 10 & 4 & 8 L3 to 3 & 11 & 5 & 9
High Voltage	L1 to 1 & 12, L2 to 2, L3 to 3
Connect:	6 & 9, 5 & 8, 4 & 7, 5 to 8

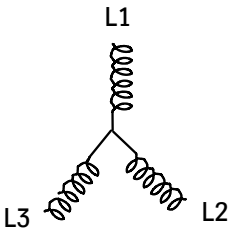
12 Lead Dual Delta

9 and 12 Lead Dual Delta Wiring Diagrams

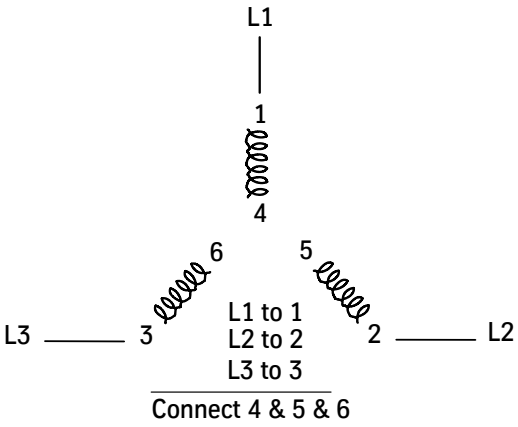
Wye Motor Wiring Diagrams

CAUTION

- A WYE motor must be wired in an "In-Line" configuration, which is not a standard option. Contact Vertical Express at 866-448-3789 or srt@thyssenkrupp.com for job engineering.
- When running "In-Line", the starter is sized differently than In-Delta. For assistance see the Siemens Starter pamphlet included with the starter, or contact Vertical Express at 866-448-3789 or srt@thyssenkrupp.com.



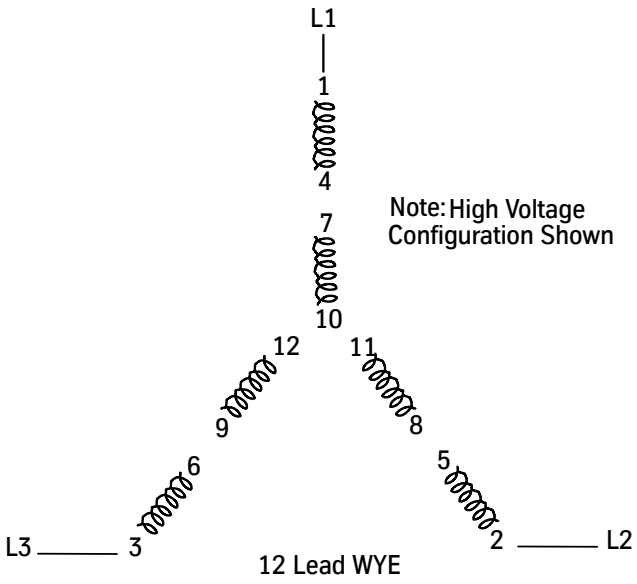
3 Lead WYE



6 Lead WYE

Low Voltage	L1 to 1 & 7 L2 to 2 & 8 L3 to 3 & 9
Connect:	10 & 11 & 12

High Voltage	L1 to 1 L2 to 2 L3 to 3
Connect:	6 & 9, 5 & 8, 4 & 7, 10 & 11 & 12



12 Lead WYE

Replacement Parts

Part Number	In-Delta Current Rating	Voltage	Siemens Part Number
787AF1	22	200V - 460V	72DV787AF1
787AF2	22	575V	72DV787AF2
787AF3	55	200V - 460V	72DV787AF3
787AF4	55	575V	72DV787AF4
787AF5	105	200V - 460V	72DV787AF5
787AF6	105	575V	72DV787AF6
787AF7	130	200V - 460V	72DV787AF7
787AF8	130	575V	72DV787AF8
787AF9	157	200V - 460V	72DV787AF9
787AF10	157	575V	72DV787AF10
787AF11	68	200V - 460V	72DV787AF11
787AF12	80	200V - 460V	72DV787AF12
787AF13	68	575V	72DV787AF13
787AF14	252	200V - 230V	72DV787AF14

The Phantom Phase

(excerpt taken from the Team Service Tips for Field Operations)

The Winning Edge - "Siemens Soft Start vs. The Phantom Phase"

A "Low Leg Amps" fault is difficult to troubleshoot when it occurs intermittently. After trying all of the suggestions in the Troubleshooting Guide on page 17, the next response is to replace the Soft Start. In some cases this replacement solves the problem, but in other cases the problem resurfaces.

If the problem is not the starter, it may be the electrical utility company's infrastructure. Certain older residential metropolitan areas have a "Phantom Phase" that also causes the "Low Leg Amps" fault.

As seen in Figure 9, the two feeders on top of the pole are feeding the transformer's that develop the third phase. This three phase supply reads a little over 250 VAC between the Phases and 125 VAC, 220 VAC, and 125 VAC to ground. The fault occurs when the incoming voltage is at the higher level of the acceptable range. Move the phase rotation on top of the starter, and monitor amp readings in the starter. "High Leg" moves accordingly.

Use the Dranetz Power monitor. It is obvious that the green phase is oddly shaped. See Figure 10 on page 39. The "Phantom Phase" abnormality is also seen with an oscilloscope. The best option to correct this problem is to have the utility company bring a true third phase into the building.

Figure 9 - Utility Pole Examples

The Phantom Phase
(continued)

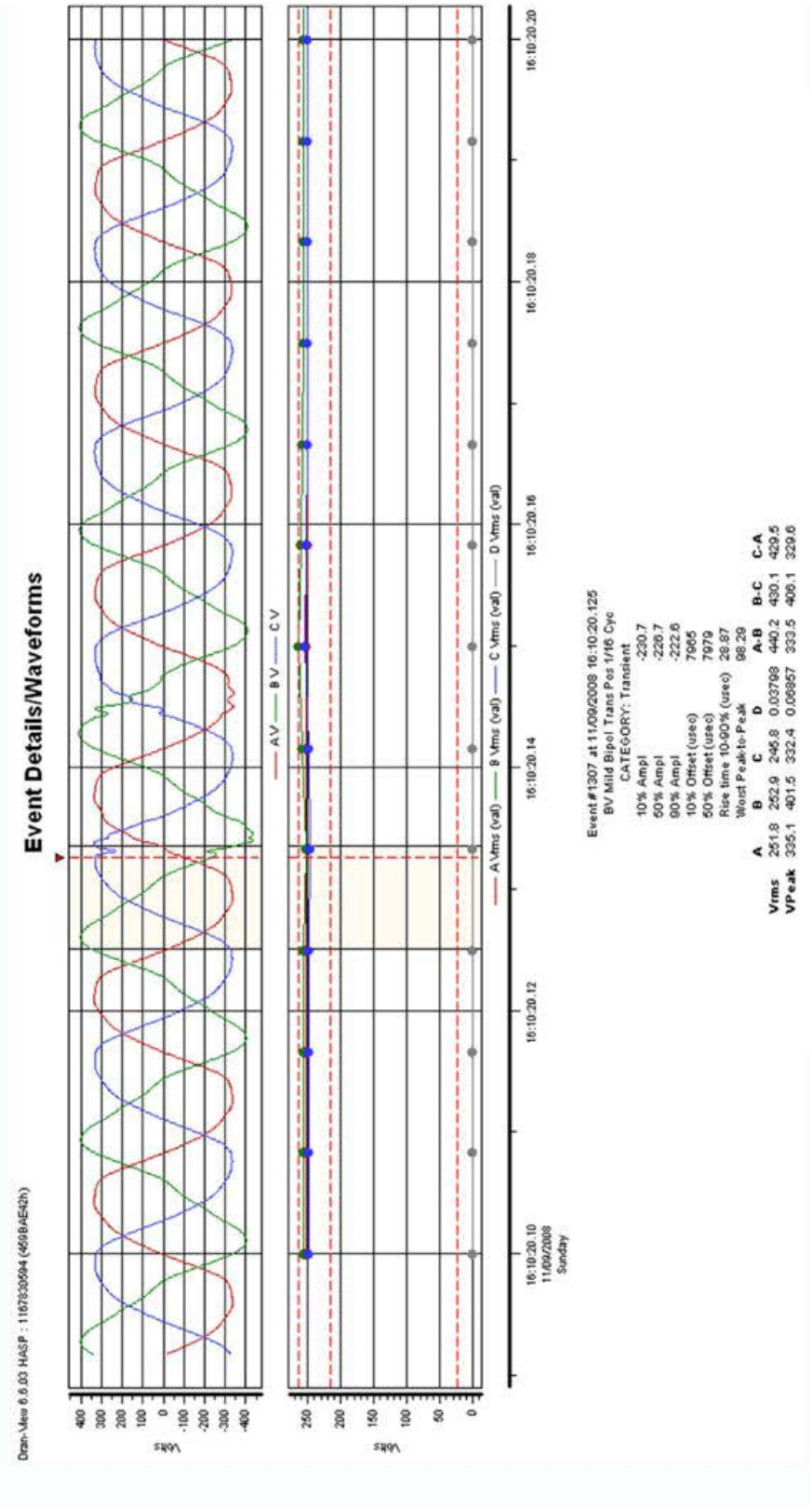


Figure 10 - Screen from Dranetz Power Monitor

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