SpaceVector™ Variable Frequency Drives

Congratulations on the purchase of a SpaceVector™ SV200 Series drive. This is the most advanced drive on the market today specifically designed and programmed for the overhead material handling industry by the leader in the industry, Columbus McKinnon Corporation.

SpaceVector™ drives have many advantages and features to meet the very specific and demanding needs of the crane and hoist industry. Features such as:

- An energy efficient drive, resulting in less heating of the motor.
- Cooler running motors last longer saving on downtime and maintenance costs.
- Efficient utilization produces more torque, resulting in better load control.
- Reduced motor harmonics, which improve motor performance and lengthen life.
- Easy macro quick set programming for faster start-up and servicing.
- Plain English programming and service manual saves time.

IMPORTANT! PLEASE READ!

Before proceeding any further, please read the following important information regarding the drive and its proper handling and use:

- Please read this manual completely before working with the drive.
- The drive operates on and contains high voltage that can cause electric shock resulting in personal injury or loss of life. Handle the drive with the same care and caution as all other high voltage electrical components.
- Be sure to disconnect all AC input power to the drive before servicing. Lock and tag the main switch in the de-energized position per ANSI Z 244.1.
- Wait at least 3 minutes after disconnecting the AC input power to the drive. If the bus capacitor discharge circuit fails, high voltage can remain in the drive for a period of time after the AC power is disconnected.
- Do not perform high voltage tests such as Megger testing.
- Only qualified personnel should perform service.
- Insure unit is properly grounded.
- Disconnect drive before performing any welding on the bridge crane structure. Do not weld the hook, to the hook or to a load suspended from the hook.

On the following pages are specification and selection tables for the drives and dynamic braking resistors. Please check to insure you have the proper equipment for your application.
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Section 1: Installation

Section 1.1: Inspection of Drive

Section 1.2: Mounting the Drive

Section 1.3: Wiring the Drive
Section 1.1: Inspection of Drive

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORKING IN OR NEAR EXPOSED ENERGIZED ELECTRICAL EQUIPMENT PRESENTS THE DANGER OF ELECTRIC SHOCK.</td>
</tr>
<tr>
<td>TO AVOID INJURY:</td>
</tr>
<tr>
<td>• Disconnect and lockout power to the drive per ANSI Z 244.1</td>
</tr>
<tr>
<td>• Wait 3 minutes after disconnecting power for capacitor to discharge before entering drive.</td>
</tr>
</tbody>
</table>

1. Inspect the drive for any physical damage that may have occurred during its shipment. If any parts of the drive are missing or damaged, contact your SpaceVector™ distributor immediately.

2. Verify the nameplate of the SV200 drive. Verify that the drive part number matches your order and packing slip.

3. Verify that the Dynamic Braking Resistor part number matches your order and packing slip.

4. If there are questions, reference Tables 1.1.1, 1.1.2, 1.1.3, 1.1.4 for Drive and Resistor specifications.
Table 1.1.1: SV200 Drive Specifications for 230 Volts

<table>
<thead>
<tr>
<th>SpaceVector™ Drive Specifications (230 V)</th>
<th>Inverter Type (446485-XX)</th>
<th>-10</th>
<th>-11</th>
<th>-12</th>
<th>-13</th>
<th>-14</th>
<th>-15</th>
<th>-16</th>
<th>-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Motor</td>
<td>[HP] Constant Torque</td>
<td>3</td>
<td>5</td>
<td>7.5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>[kW] Constant Torque</td>
<td>2.2</td>
<td>3.7</td>
<td>5.5</td>
<td>7.5</td>
<td>11</td>
<td>15</td>
<td>18.5</td>
<td>22</td>
</tr>
<tr>
<td>Output Ratings</td>
<td>[kVA] Constant Torque</td>
<td>4.2</td>
<td>6.1</td>
<td>9.1</td>
<td>12.2</td>
<td>17.5</td>
<td>22.5</td>
<td>28.2</td>
<td>33.2</td>
</tr>
<tr>
<td></td>
<td>[FLA] Constant Torque</td>
<td>11</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>46</td>
<td>59</td>
<td>74</td>
<td>87</td>
</tr>
<tr>
<td>Max. Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>120.0 Hz</td>
</tr>
<tr>
<td>Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 Phase, 0 - Input Voltage</td>
</tr>
<tr>
<td>Input Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 Phase, 200 - 230 V (± 10%)</td>
</tr>
<tr>
<td>Input Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 to 60 Hz (± 5%)</td>
</tr>
<tr>
<td>Control</td>
<td>Control Method</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SpaceVector PWM</td>
</tr>
<tr>
<td></td>
<td>Frequency Resolution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.01 Hz</td>
</tr>
<tr>
<td></td>
<td>Frequency Accuracy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Digital Setting: 0.01% of Maximum Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Analog Setting: 0.1% of Maximum Frequency</td>
</tr>
<tr>
<td></td>
<td>V/F ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Linear and User programmable</td>
</tr>
<tr>
<td></td>
<td>Braking Torque</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approximately 20%</td>
</tr>
<tr>
<td></td>
<td>Overload Capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150% for 1 minute</td>
</tr>
<tr>
<td></td>
<td>Torque Boost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 - 20% programmable</td>
</tr>
<tr>
<td>Operating</td>
<td>Operation Method</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Keypad / Terminal Selective</td>
</tr>
<tr>
<td></td>
<td>Frequency Selection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Keypad / Analog: 0 ~ 10 VDC, 4 ~ 20 mA</td>
</tr>
<tr>
<td></td>
<td>Accel. / Decel. time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.1 to 6,000 sec.</td>
</tr>
<tr>
<td></td>
<td>Speed Selection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Up to 5 steps, programmable</td>
</tr>
<tr>
<td>Programmable Input</td>
<td>Programmable Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Six inputs - 2, 3, 4, 5, P, P6 ( P6 is 24 VDC, Sinking to CM)</td>
</tr>
<tr>
<td>Protection</td>
<td>Inverter Fault</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Overvoltage, Undervoltage, Overcurrent, Fuse Open, Ground Fault, Inverter Overheat, Motor Overheat, Main CPU Error, Phase Loss</td>
</tr>
<tr>
<td></td>
<td>Stall Prevention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Overcurrent Prevention</td>
</tr>
<tr>
<td></td>
<td>Instantaneous Power Failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Below 15 msec.: Continuous Operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Over 15 msec.: Automatic Restart (selective)</td>
</tr>
<tr>
<td>Environmental Conditions</td>
<td>Ambient Temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-10° to 40°C (14° to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Under 90% (Non Condensing)</td>
</tr>
<tr>
<td></td>
<td>Altitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Less than 1,000 m (3280 feet)</td>
</tr>
<tr>
<td></td>
<td>Cooling system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Forced Air</td>
</tr>
</tbody>
</table>
# Table 1.1.2: SV200 Drive Specifications for 460 Volts

<table>
<thead>
<tr>
<th>SpaceVector™ Drive Specifications (460 V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter Type (446485-XX)</td>
</tr>
<tr>
<td><strong>Applicable Motor</strong></td>
</tr>
<tr>
<td>[HP] Constant Torque</td>
</tr>
<tr>
<td>[KW] Constant Torque</td>
</tr>
<tr>
<td><strong>Output Ratings</strong></td>
</tr>
<tr>
<td>[kVA] Constant Torque</td>
</tr>
<tr>
<td>[FLA] Constant Torque</td>
</tr>
<tr>
<td>Max. Frequency</td>
</tr>
<tr>
<td>Output Voltage</td>
</tr>
<tr>
<td><strong>Input Ratings</strong></td>
</tr>
<tr>
<td>Input Voltage</td>
</tr>
<tr>
<td>Input Frequency</td>
</tr>
<tr>
<td><strong>Control</strong></td>
</tr>
<tr>
<td>Control Method</td>
</tr>
<tr>
<td>Frequency Resolution</td>
</tr>
<tr>
<td>Frequency Accuracy</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>V/F ratio</td>
</tr>
<tr>
<td>Braking Torque</td>
</tr>
<tr>
<td>Overload Capacity</td>
</tr>
<tr>
<td>Torque Boost</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
</tr>
<tr>
<td>Operation Method</td>
</tr>
<tr>
<td>Frequency Selection</td>
</tr>
<tr>
<td>Accel. / Decel. time</td>
</tr>
<tr>
<td>Speed Selection</td>
</tr>
<tr>
<td><strong>Programmable Input</strong></td>
</tr>
<tr>
<td>Programmable Input</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
</tr>
<tr>
<td>Inverter Fault</td>
</tr>
<tr>
<td>Stall Prevention</td>
</tr>
<tr>
<td>Instantaneous Power Failure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Environmental Conditions</strong></td>
</tr>
<tr>
<td>Ambient Temperature</td>
</tr>
<tr>
<td>Humidity</td>
</tr>
<tr>
<td>Altitude</td>
</tr>
<tr>
<td>Cooling system</td>
</tr>
</tbody>
</table>
### Table 1.1.3: 230 V Class Dynamic Braking Resistors

<table>
<thead>
<tr>
<th>H.P.</th>
<th>Class A, B, C or D Service</th>
<th>Class E Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hoist with MLB*</td>
<td>Traverse</td>
</tr>
<tr>
<td>1</td>
<td>446485-A1 100 W</td>
<td>446485-A1 100 W</td>
</tr>
<tr>
<td>2</td>
<td>446485-A2 50 W</td>
<td>446485-A8 60 W</td>
</tr>
<tr>
<td>3</td>
<td>446485-A3 130 W</td>
<td>446485-B3 30 W</td>
</tr>
<tr>
<td>5</td>
<td>446485-A6 20 W</td>
<td>446485-B6 20 W</td>
</tr>
<tr>
<td>7.5</td>
<td>446485-A9 15 W</td>
<td>446485-C0 16 W</td>
</tr>
<tr>
<td>10</td>
<td>446485-B4 10 W</td>
<td>446485-C3 10 W</td>
</tr>
<tr>
<td>15</td>
<td>446485-B5 8 W</td>
<td>446485-C5 8 W</td>
</tr>
<tr>
<td>20</td>
<td>446485-B7 5 W</td>
<td>446485-C4 7 W</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*MLB = Mechanical Load Brake

### Table 1.1.4: 460 V Class Dynamic Braking Resistors

<table>
<thead>
<tr>
<th>H.P.</th>
<th>Class A, B, C or D Service</th>
<th>Class E Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hoist with MLB*</td>
<td>Traverse</td>
</tr>
<tr>
<td>1</td>
<td>446485-A0 200 W</td>
<td>446485-A1 120 W</td>
</tr>
<tr>
<td>2</td>
<td>446485-A0 200 W</td>
<td>446485-A5 200 W</td>
</tr>
<tr>
<td>3</td>
<td>446485-A1 100 W</td>
<td>446485-B2 120 W</td>
</tr>
<tr>
<td>5</td>
<td>446485-A1 100 W</td>
<td>446485-B2 120 W</td>
</tr>
<tr>
<td>7.5</td>
<td>446485-B8 80 W</td>
<td>446485-A7 85 W</td>
</tr>
<tr>
<td>10</td>
<td>446485-A2 50 W</td>
<td>446485-B9 60 W</td>
</tr>
<tr>
<td>15</td>
<td>446485-A4 33 W</td>
<td>446485-C1 40 W</td>
</tr>
<tr>
<td>20</td>
<td>446485-A6 50 W</td>
<td>446485-C2 30 W</td>
</tr>
<tr>
<td>25</td>
<td>446485-B6 20 W</td>
<td>446485-B6 20 W</td>
</tr>
<tr>
<td>30</td>
<td>446485-C6 20 W</td>
<td>446485-C6 20 W</td>
</tr>
</tbody>
</table>

*MLB = Mechanical Load Brake
Section 1.2: Mounting the Drive

1.2.1 Environmental Conditions

1. Verify the ambient condition of the drive mounting location. The ambient temperature range should be 14° to 104°F (-10° to 40°C) for NEMA 1 and or NEMA 4/12 enclosures.

2. The relative humidity should be less than 90% (non-condensing), below the altitude of 3280 ft. or 1000m.

3. Do not mount the drive in direct sunlight. The drive should also be isolated from excessive vibration.

4. The drive should be protected from moisture, dust, metallic particles, corrosive gases and liquids.

5. Consult Factory for severe environments.

1.2.2 Electrical Conditions

1. Verify that Input voltage is within drive nameplate +/- 10%. If input line voltage varies due to sags and or surges input line reactors are recommended.

2. Analog input requires individually shielded twisted pair cable for installations where the cable leaves the control cabinet.

3. If length of motor leads between drive and motor exceed 100 ft. (30 m) a load reactor between drive and motor is recommended.

Mounting

The SV200 must be mounted vertically with sufficient space (horizontally and vertically) between adjacent equipment to permit proper heat dissipation. See Figure 1.2.1. See Figures 1.2.2 - 1.2.5 for actual drive dimensions.
**Fig. 1.2.1: Recommended Clearances for Drive Mounting**

Note: Allow more room between drive and other heat producing components (such as transformers and drive ballast resistors) than shown in Fig. 1.2.1. These components radiate enough heat to damage the drive and its internal components.
Drive Dimensions and Weights

Fig. 1.2.2: SV200 Part No. - 446485-10 / 446485-11  418.74lbs (8.5kg)
Fig. 1.2.3: SV200 Part Nos. 446485-12 / 446485-13
446485-20 / 446485-21 / 446485-22
446485-23
22.1lbs / 23.2lbs
(10 / 10.5kg)
Fig. 1.2.4: SV200 Part Nos. 446485-14 / 446485-15
446485-24 / 446485-25

46.3 lbs. / 48.5 lbs.
(21kg / 22kg)
Fig. 1.2.5: SV200 Part Nos. 446485-16 / 446485-17
446485-26 / 446485-27
63.9 lbs. / 68.4 lbs.
(29kg / 31kg)
Section 1.3: Wiring the Drive

1.3.1 Remove Cover From Drive
The cover is held on with four screws and must be removed in order to connect the power, motor, and control wires.

Figure 1.3.1 is a reference for the basic Input / Output Terminals of an SV200 drive.

Fig. 1.3.1: SV200 Layout For Basic Wiring
1.3.2 Check For Correct Wire Gauges

Insure the correct wire gauges for the input and output power leads are being used before wiring the drive. Use Table 1.3.1 for reference.

Table 1.3.1: Wire Gauge Reference Table

<table>
<thead>
<tr>
<th>SV200 Drive Class</th>
<th>Drive Rated Amp.</th>
<th>Input AWG</th>
<th>Output AWG</th>
<th>Ground AWG</th>
<th>DB Resistor AWG</th>
<th>Control AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>230V Class</td>
<td>11.0</td>
<td>12</td>
<td>12</td>
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</tbody>
</table>

1.3.3 Fuse and Circuit Breaker Selection

Reference Table 1.3.2 to properly apply fuses and circuit breakers to the drive.

Table 1.3.2: Fuse and Circuit Breaker Selection

<table>
<thead>
<tr>
<th>SV200 Drive Voltage</th>
<th>Ref. HP</th>
<th>SV200 Part Number</th>
<th>Fuse Rating Class (J)</th>
<th>Molded Case Circuit Breaker</th>
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</thead>
<tbody>
<tr>
<td>230V</td>
<td>3</td>
<td>446485-10</td>
<td>20A</td>
<td>25A</td>
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<td></td>
<td>5</td>
<td>446485-11</td>
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<td>30A</td>
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<td>7.5</td>
<td>446485-12</td>
<td>35A</td>
<td>50A</td>
</tr>
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<td></td>
<td>10</td>
<td>446485-13</td>
<td>40A</td>
<td>60A</td>
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<td>15</td>
<td>446485-14</td>
<td>50A</td>
<td>75A</td>
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<td>20</td>
<td>446485-15</td>
<td>80A</td>
<td>100A</td>
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<td>25</td>
<td>446485-16</td>
<td>80A</td>
<td>125A</td>
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<td>30</td>
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<td>150A</td>
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<td>5</td>
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<td>15</td>
<td>446485-24</td>
<td>35A</td>
<td>40A</td>
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<td>446485-25</td>
<td>40A</td>
<td>50A</td>
</tr>
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<td></td>
<td>25</td>
<td>446485-26</td>
<td>50A</td>
<td>60A</td>
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<td></td>
<td>30</td>
<td>446485-27</td>
<td>65A</td>
<td>75A</td>
</tr>
</tbody>
</table>
1.3.4 Wire The Power Leads
Use Figure 1.3.2 as shown below to assist in wiring the power leads to the drive.

Fig. 1.3.2: Input / Output Power and Dynamic Braking Resistor Wiring Diagram.

**Arrangement of Power Terminal Strip**

<table>
<thead>
<tr>
<th>R</th>
<th>S</th>
<th>T</th>
<th>E</th>
<th>U</th>
<th>V</th>
<th>W</th>
<th>E</th>
<th>B1</th>
<th>B2</th>
</tr>
</thead>
</table>

L1  L2  L3  Earth  T1  T2  T3  DBR  DBR

3 Phase Input Power 230 VAC or 460 VAC  Earth Ground  3 Phase Output to Motor  Dynamic Braking Resistor Unit

**Note:** Slotted tongue terminals are recommended for connections shown in Figure 1.3.2.
1.3.5 Wire The Dynamic Braking Resistor Leads

Use Figure 1.3.3 as shown below to assist in wiring the dynamic braking resistor leads to the drive.

Fig. 1.3.3: Input / Output Power and Dynamic Braking Resistor Wiring Diagram

- The Dynamic Braking Resistors dissipate the motor rotational energy in the form of heat. They are required for all hoisting and traverse applications.

- If the dynamic braking resistor has a bad connection or is missing, the drive DC Bus voltage may increase, resulting in an over voltage fault.

- If the dynamic braking resistor generates a lot of heat during its operation. Place the resistor where it may dissipate this energy without damaging other components.
1.3.6 Interface Card Connection:
The SV200 SpaceVector™ Drive comes equipped with the 120VAC Interface Card installed. Figure 1.3.4 below shows the connection of the interface card to the control terminal strip.

Fig. 1.3.4: Interface Card Connection to the Control Terminal Strip
1.3.7 Connect the Pushbutton Pendant Control Wires
Wire the pushbutton pendant control to the pendant input terminals. See Figure 1.3.5 below for wiring diagram. Once the pendant is wired, check to determine that the motor turns in the correct direction with respect to the pendant button pressed. Consult Chapter 4, Troubleshooting, for help if there is a problem.

Note: The Interface card requires 120VAC input signal from your external push button.

Fig. 1.3.5: Push Button Wiring Diagram
1.3.8 Control Wire Description
Reference the control wiring terminal in Figure 1.3.6 below and the descriptions of each terminal listed in Tables 1.3.4 and 1.3.5.

Fig. 1.3.6: Control Wiring Terminal

Table 1.3.4: Most common control terminals used

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>FX</td>
<td>Forward / Up direction command terminal Speed 1 [120VAC Interface Card Input Terminal]</td>
</tr>
<tr>
<td>RX</td>
<td>Reverse / Down direction command terminal Speed 1 [120VAC Interface Card Input Terminal]</td>
</tr>
<tr>
<td>BX</td>
<td>Emergency stop command terminal</td>
</tr>
<tr>
<td>RST</td>
<td>Fault reset command terminal</td>
</tr>
<tr>
<td>P1</td>
<td>MULTI-FUNCTION INPUT</td>
</tr>
<tr>
<td>P2</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td></td>
</tr>
<tr>
<td>CM</td>
<td>Common terminal for [FX], [RX], [BX], [P1], [P2], [P3], [P4], [P5], [RST] [120VAC Interface Card Input Terminal]</td>
</tr>
<tr>
<td>AX1</td>
<td>MULTI-FUNCTION RELAY OUTPUT</td>
</tr>
<tr>
<td>AX2</td>
<td></td>
</tr>
<tr>
<td>30A</td>
<td>Relay output terminal (Normal open contact) [DC 30V, AC 250V, 1A]</td>
</tr>
<tr>
<td>30B</td>
<td>Relay output terminal (normally closed contact) [DC 30V, AC 250V, 1A]</td>
</tr>
<tr>
<td>30C</td>
<td>Relay output terminal (common terminal) [DC 30V, AC 250V, 1A]</td>
</tr>
</tbody>
</table>

Table 1.3.5: Control terminals used for special applications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>MULTI-FUNCTION OPEN COLLECTOR OUTPUT</td>
</tr>
<tr>
<td>Q2</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td></td>
</tr>
<tr>
<td>V1</td>
<td>Analog speed reference input terminal (0~+10 VDC) (Potentiometer connection terminal)</td>
</tr>
<tr>
<td>VR</td>
<td>Voltage power supply for V1 terminal (+11 VDC)</td>
</tr>
<tr>
<td>I</td>
<td>Current speed reference input terminal (4~20 mA)</td>
</tr>
<tr>
<td>FM</td>
<td>Output Frequency Meter [+24 VDC Max. 50mA Max.]</td>
</tr>
<tr>
<td>LM</td>
<td>Load Meter [+24 VDC Max. 50mA Max.]</td>
</tr>
<tr>
<td>5G</td>
<td>Common terminal for [V1], [I], [FM]</td>
</tr>
</tbody>
</table>
1.3.9 Make Precautionary Checks Before Operation

1. Make sure the input voltage level to the drive is correct. Refer to the Drive Specification Tables 1.1.1 and 1.1.2.

2. Check the power and control connections. All wires should be connected tightly to the terminal.

3. Check the 120VAC source for the control pushbutton.

4. The length of the output wires between the SV200 and the motor must not exceed 100 feet.

5. Check the drive and motor ground and make sure there is no ground loop problem. Ensure that all motors and drives connected from a common panel are connected to a single ground point. See Fig. 1.3.7 for an example.

Fig. 1.3.7: Ground Connection Comparison
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Chapter 2: Start Up Programming

Section 2.1: Keypad Layout

Section 2.2: Keypad Operation

  2.2.1: Definitions
  2.2.2: Moving through the Program
  2.2.3: View a Specific Function using Jump Code Location
  2.2.4: View all Functions within a Group Level
  2.2.5: Change Control from Pendant to Keypad

Section 2.3: Initial Setup Programming

  2.3.1: Programming the Drive for a Specific Application
  2.3.2: Programming the Speed Selection
  2.3.3: Drive Operation Checks
Section 2.1: Keypad Layout

The SV200 uses a 32 alphanumeric LCD display for easy reading. All drive functions can be accessed via keypad. The keypad has the capability of uploading or downloading data from the drive. Programming is easy when utilizing the parameter descriptions on the LCD display. Fig. 2.1.1 below illustrates the layout of the SV200 keypad. See Fig. 2.1.2 for a description of the alphanumeric display.

Fig. 2.1.1: SV200 keypad layout

MODE: Press to access different levels of programming (User, Service, Advance).
PROG: Press to begin to change drive parameter data.
ENTER: Saves the changed data of the parameter.
ARROWS: Used to scroll through parameter function codes in each level. Also used to increment and decrement the parameter data value.
REV: No control of drive, LED display function only.
FWD: No control of drive, LED display function only.
STOP: No control of drive, LED display function only.
RESET: Reset drive faults.
Parameter Display - Manual mode is selected here.

Parameter level

Parameter code no.

Direction of rotation

Source control input command [terminal (T) or keypad (K)]

Reference frequency by [terminal (T) or keypad (K)]

Drive output frequency during run, otherwise displays command freq.

USE Manual K/K
00 REV 30.00 Hz
Section 2.2: Keypad Operation

Keypad operation and moving through the parameters of each group access level is a straightforward process. First read the definitions below.

2.2.1 Definitions

**Levels** - The SV200 program consists of three group levels. The levels are the User, Service, and Advanced. Each level consists of different function commands which control how the drive operates, senses, and performs.

**User Level** *(Use on SV200 Display)* - This level allows programming speed, passwords, and the motion application desired. You can also monitor motor current draw and system faults in this level. **You are automatically in the User level upon power up of your drive.**

**Service Level** *(Ser on SV200 Display)* - The functions within this group primarily set how the drive will perform, sense problems, and set parameters catered to your motor for peak operation.

**Advanced Level** *(Adv on SV200 Display)* - Functions within this level are reserved for special performance characteristics and consists of advanced performance parameters.

2.2.2 Moving Through the Program

When the drive is first powered up, the first Function Code of the **User Level** is displayed. Please follow the keypad button prompts illustrated in Figures 2.2.1, 2.2.2 and 2.2.3 and use Table 2.2.1: Function Code List For All Levels to help follow program flow.
The quickest way to move from group level to group level is by following this procedure. In this example, the user is currently in the **User Level** at Speed 1 [USE: Code No. 05].

- Press the **Mode** key. This will take you to the first function of whatever level you are currently in.
- Press the **Mode** key a 2nd time. This will take you to the first function of the next group level.
- Press the **Mode** key again. This will take you to the first function of the next group level.
- Press the **Mode** key again. This will take you back to the first function of the original group level you started in.

**Note:** The 1st speed frequency depends on programmed value.

**Note:** This jump code location value will be different depending on which function code no. the user was previously in.

- To see how to view each Function Code number in a group level, see Figures 2.2.2 and 2.2.3.
2.2.3 View a Specific Function Using Jump Code Location

Fig. 2.2.2: Programming flow chart showing how to view a specific function [Code No.] of a group level.

In this example, the user will use the jump code location in the **Service Level** to quickly get to Freq. Max. [SER: Code No. 15]

- Press the **PROG** key. This places you in programming mode. The cursor will appear on the least significant digit.

- Press the **UP** arrow key until you get the number 5.

- Press the **SHIFT** arrow key once to move to the next significant digit.

- Press the **UP** arrow key once.

- Press the **ENTER** key. This will take you to Freq. Max. [SER: Code No. 15]

- This procedure is the same for the **Advanced Level**.
2.2.4 Viewing all Functions within a Group Level

Fig. 2.2.3: Programming flow chart showing how to view all function [Code No’s.] of a group level.

In this example, the user is currently located in the **Advanced Level** at Code No. 00.

- Press the **UP** key once. This will take you to Drive Mode [ADV: Code No. 01].

- Press the **UP** key again to go to Freq. Set [ADV: Code No. 02].

- Press the **UP** key again to go to Energy Save [ADV: Code No. 03].

- Keep pressing the **UP** key and observe each [Function Code No.] as you go along. Use Table 2.2.1 for reference.

- Once you scroll to the last [Function Code No.] of the level you are in, the program will stop scrolling. To get back to [Function Code No. 00] either press the **DOWN** key and scroll backwards, or press the **MODE** key. In this example the last code number in the Advanced Level is Rev. Plug Dec. [ADV: Code No. 91].

- This procedure is the same for the **Service Level**.
2.2.5 Change Control from Pendant to Keypad

The SV200 comes preset with pendant control. If the user wishes to change to keypad control, refer to Figure 2.2.4 below. Use Table 2.2.1 Function Table for All Levels for reference.

Fig. 2.2.4: Flowchart showing how to change from pendant control to keypad control

- You have now selected the keypad as the method of controlling the SV200.

Press the MODE Key

Press the MODE Key until you see:

SER Jump Code
00 00

Press the Key once. You should see:

SER RUN/STOP
01 Pendant

Now press the PROG Key.

Now press the key.

Now press the ENTER Key.

Press the MODE Key

Press the PROG Key.

The Up and Down arrow keys are now activated.

Pressing the ▲ key will rotate the motor in the Up direction.

Pressing the ▼ key will rotate the motor in the Down direction.

Note: You must hold down the Up or Down arrow key for at least 1.5 seconds before the motor begins to rotate.

Press the ENTER and Keys to exit JOG mode.

• To switch back to Pushbutton Pendant control, change [SER: Code No. 01] from Key back to Pendant.
<table>
<thead>
<tr>
<th>Level</th>
<th>Code No.</th>
<th>Display</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>00</td>
<td>10.0</td>
<td>Displays speed 1 frequency during Stop and actual frequency output during Run</td>
<td>0 - SER 15 Hz</td>
<td>10.0 Hz</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Motion Def</td>
<td>Define drive application</td>
<td>• Traverse</td>
<td>Hoist w LB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hoist wo LB</td>
<td>Hoist w LB</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>Speed Sel</td>
<td>Define speed application</td>
<td>• 2 Step</td>
<td>2 Step</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• 2Step Inf Var</td>
<td>2 Step</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• 3 Step</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• 3Step Inf Var</td>
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<td>• 5 Step</td>
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<td>03</td>
<td>Current</td>
<td>Display only: Output current [rms]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>Speed</td>
<td>Display only: Synchronous speed [rpm]</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>05</td>
<td>Speed 2</td>
<td>Multi-Step Speed. Initial Data depends on the Macro programming in USE 02</td>
<td>0 - SER 15 Hz</td>
<td>60.00 Hz</td>
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<td>06</td>
<td>Speed 3</td>
<td>Initial Data depends on the Macro programming in USE 02</td>
<td>0 - SER 15 Hz</td>
<td>0.00 Hz</td>
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<td>07</td>
<td>Speed 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>08</td>
<td>Speed 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>09</td>
<td>LSW Speed</td>
<td>Low Speed limit switch speed</td>
<td>0 - SER 15 Hz</td>
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<tr>
<td></td>
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<td>Acc. time</td>
<td>Acceleration Time</td>
<td>0 - 6000 sec.</td>
<td>1.0sec</td>
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<td></td>
<td>11</td>
<td>Dec. time</td>
<td>Deceleration Time</td>
<td>0 - 6000 sec.</td>
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<td>Ter. input</td>
<td>Status of input terminal display</td>
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<td>00000000</td>
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<tr>
<td></td>
<td>13</td>
<td>Ter. output</td>
<td>Status of output terminal display</td>
<td></td>
<td>0001</td>
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<td>Fault</td>
<td>Current status (normal or fault)</td>
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<td>15</td>
<td>Last fault 1</td>
<td>Previous faults [current fault-1]</td>
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<tr>
<td></td>
<td>16</td>
<td>Last fault 2</td>
<td>Previous faults [current fault-2]</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Access Lev</td>
<td>Current permitted access level</td>
<td></td>
<td>Advanced</td>
</tr>
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<td>18</td>
<td>Password</td>
<td>Enter password</td>
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<td>****</td>
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<td>Ser Lev PW</td>
<td>Change Service Level password</td>
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<td>0 - 9999</td>
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<td>20</td>
<td>Adv Lev PW</td>
<td>Change Advanced Level password</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>S/W version</td>
<td>Hoist/Grave 02 M = 3 hp - 10 hp L = 15 hp - 30 hp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>00</td>
<td>Jump Code</td>
<td>Get to any code no. in Service Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Run/Stop set</td>
<td>Run command source</td>
<td>• Key</td>
<td>Pendant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Pendant</td>
<td>Pendant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• RS485/PLC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>Acc. pattern</td>
<td>Acceleration Pattern</td>
<td>• Linear</td>
<td>S-Curve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• S-Curve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>Dec. pattern</td>
<td>Deceleration Pattern</td>
<td>• U-Curve</td>
<td>Linear</td>
</tr>
<tr>
<td>Level</td>
<td>Code No.</td>
<td>Display</td>
<td>Description</td>
<td>Range</td>
<td>Default</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>-----------</td>
<td>------------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
| 04    | P1 Input | Define multi-function input 2 | • Not Used  
• Spd Sel 2  
• Spd Sel 3  
• Spd Sel 4  
• Spd Sel 5  
• LSW Imm. Stop  
• LSW Rmp. Stop  
• LSW Low Spd  
• EXT_TRIP | Spd Sel 2 |           |
| 05    | P2 Input | Define multi-function input 3 |                                        | FST_HI |           |
| 06    | P3 Input | Define multi-function input 4 |                                        | FST_HI |           |
| 07    | P4 Input | Define multi-function input 5 |                                        | FST_HI |           |
| 08    | P5 Input | Define multi-function input P |                                        | FST_HI |           |
| 09    | P6 Input | Define multi-function input P6 |                                        | OL |           |
| 10    | AUX Output | Define multi-function output | • FST_LO  
• FST_HI  
• FDT_HI  
• FDT_PULSE  
• FDT_BAND  
• OL  
• STALL  
• LV  
• RUN | OL |           |
| 11    | Q1 Output | Define multi-function output |                                        | FST_LO |           |
| 12    | Q2 Output | Define multi-function output |                                        | FDT_HI |           |
| 13    | Q3 Output | Define multi-function output |                                        | OL |           |
| 14    | Inv Capacity | Drive Model Selection | 3hp @ 230V  
5hp @ 230V  
7.5hp @ 230V  
10hp @ 230V  
15hp @ 230V  
20hp @ 230V  
25hp @ 230V  
30hp @ 230V  
3hp @ 460V  
5hp @ 460V  
7.5hp @ 460V  
10hp @ 460V  
15hp @ 460V  
20hp @ 460V  
25hp @ 460V  
30hp @ 460V  | 3hp @ 230V  
5hp @ 230V  
7.5hp @ 230V  
10hp @ 230V  
15hp @ 230V  
20hp @ 230V  
25hp @ 230V  
30hp @ 230V  
3hp @ 460V  
5hp @ 460V  
7.5hp @ 460V  
10hp @ 460V  
15hp @ 460V  
20hp @ 460V  
25hp @ 460V  
30hp @ 460V  | 30hp @ 460V |           |
| 15    | Freq. max | Maximum output frequency | 40 - 120 Hz | 40 - SER 15 Hz | 60.00 Hz |           |
| 16    | Freq. base | Base Frequency | 40 - SER 15 Hz | 40 - SER 15 Hz | 60.00 Hz |           |
| 17    | Freq. start | Drive Cutoff Frequency | 0.5 - 5 Hz | 0.50 Hz |           |
| 18    | Dwell-freq. | Start Dwell frequency Caution: If motor slip is greater than 3 Hz, then see Brake Release Timing section on page 89 | 0 - SER 15 Hz | 3.00 Hz |           |
| 19    | Dwell time | Start Dwell Time Initial Values: Hoist = 0.5 sec. Traverse = 0.1 sec. | 0 - 10 sec. | 0.5 sec |           |
| 20    | V/F pattern | V/F pattern selection | • Linear  
• 2.0 - Do not use  
• User  
• Auto Boost | Linear |           |
| 21    | Fwd boost | Forward direction torque boost | 0 - 20 % | 5 % |           |
| 22    | Rev boost | Reverse direction torque boost | 0 - 110 % | 2 % |           |
| 23    | Volt control | Maximum drive output voltage | 2 (3600 rpm)  
4 (1800 rpm)  
6 (1200 rpm)  
8 (900 rpm)  
10 (720 rpm)  
12 (600 rpm) | 2 (3600 rpm)  
4 (1800 rpm)  
6 (1200 rpm)  
8 (900 rpm)  
10 (720 rpm)  
12 (600 rpm) | 4 |           |
| 24    | Pole number | Number of motor poles | | | | |
Table 2.2.1: Function Code List For All Levels (continued)

<table>
<thead>
<tr>
<th>Level</th>
<th>Code No.</th>
<th>Display</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
<td>25</td>
<td>FST-freq.</td>
<td>Brake Release Frequency</td>
<td>0.50 - SER 15 Hz</td>
<td>3.01 Hz</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>Para. read</td>
<td>Read all parameters from drive to keypad</td>
<td>• Yes • No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>Para. write</td>
<td>Write all parameters from keypad to drive</td>
<td>• Yes • No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>Para. init</td>
<td>Initialize all parameters with factory default settings</td>
<td>• Yes • No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>Para. lock</td>
<td>Lock on programming all parameters</td>
<td>0 - 255</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>Stop mode</td>
<td>Initial data depends on macro setup</td>
<td>• Decel • DCRB • Immediate stop • Acc/Dec Abs</td>
<td>Immediate stop</td>
</tr>
<tr>
<td></td>
<td>00</td>
<td>Jump Code</td>
<td>Get to any code no. in Advanced Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Drive mode</td>
<td>Only manual mode is available for Hoist/Crane</td>
<td>• Manual • Auto - Do Not Use</td>
<td>Manual</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>Freq. set</td>
<td>Command frequency source</td>
<td>• Key • Terminal • RS485/PLC</td>
<td>Key</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>Energy save</td>
<td>Value for energy saving mode</td>
<td>50 - 100 %</td>
<td>80 %</td>
</tr>
<tr>
<td>Advanced</td>
<td>04</td>
<td>User-1f</td>
<td></td>
<td>0 - SER 15 Hz</td>
<td>60.00 Hz</td>
</tr>
<tr>
<td></td>
<td>05</td>
<td>User-1v</td>
<td></td>
<td>0 - 100 %</td>
<td>100 %</td>
</tr>
<tr>
<td></td>
<td>06</td>
<td>User-2f</td>
<td></td>
<td>0 - SER 15 Hz</td>
<td>60.00 Hz</td>
</tr>
<tr>
<td></td>
<td>07</td>
<td>User-2v</td>
<td>User V/F pattern data points</td>
<td>0 - 100 %</td>
<td>100 %</td>
</tr>
<tr>
<td></td>
<td>08</td>
<td>User-3f</td>
<td></td>
<td>0 - SER 15 Hz</td>
<td>60.00 Hz</td>
</tr>
<tr>
<td></td>
<td>09</td>
<td>User-3v</td>
<td></td>
<td>0 - 100 %</td>
<td>100 %</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>User-4f</td>
<td></td>
<td>0 - SER15 Hz</td>
<td>60.00 Hz</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>User-4v</td>
<td></td>
<td>0 - 100 %</td>
<td>100 %</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>V-I mode</td>
<td>Analog input mode</td>
<td>• Voltage • Current • Volt + Curr</td>
<td>Voltage</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Filter gain</td>
<td>Analog input filter gain</td>
<td>0 - 100 %</td>
<td>50 %</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Analog gain</td>
<td>Analog input scaling</td>
<td>50 - 250 %</td>
<td>100 %</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Analog bias</td>
<td>Analog input bias</td>
<td>0 - 100 %</td>
<td>0.00 %</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Analog dir</td>
<td>Analog input polarity</td>
<td>• Direct • Invert</td>
<td>Direct</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Freq. limit</td>
<td>Setting of frequency limit function</td>
<td>• Yes • No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>F-limit high</td>
<td>Maximum operating frequency</td>
<td>ADV 19 - SER 15 Hz</td>
<td>60.00 Hz</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>F-limit low</td>
<td>Minimum operating frequency</td>
<td>0.0 - ADV 18 Hz</td>
<td>0.00 Hz</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Freq. jump</td>
<td>Selection of frequency jump function</td>
<td>• Yes • No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Freq-jump 1f</td>
<td>Jump (bypass) frequency 1</td>
<td>0 - SER 15 Hz</td>
<td>10.00 Hz</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Freq-jump 2f</td>
<td>Jump (bypass) frequency 2</td>
<td>0 - SER 15 Hz</td>
<td>20.00 Hz</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Freq-jump 3f</td>
<td>Jump (bypass) frequency 3</td>
<td>0 - SER 15 Hz</td>
<td>30.00 Hz</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>Freq. band</td>
<td>Jump (bypass) frequency bandwidth</td>
<td>0.00 - 30.00 Hz</td>
<td>5.00 Hz</td>
</tr>
<tr>
<td>Level</td>
<td>Code No.</td>
<td>Display</td>
<td>Description</td>
<td>Range</td>
<td>Default</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>--------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>25</td>
<td>DC-br freq.</td>
<td>DC brake injection frequency</td>
<td>0.00 - 60.00 Hz.</td>
<td>3.00 Hz</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>DC-br block</td>
<td>Blocking time before DC brake injection</td>
<td>0.0 - 5.0 sec.</td>
<td>1.0sec</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>DC-br time</td>
<td>DC brake injection time</td>
<td>0.0 - 25.0 sec.</td>
<td>0.5sec</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>DC-br value</td>
<td>DC brake injection voltage</td>
<td>0 - 20 %</td>
<td>2 %</td>
<td></td>
</tr>
</tbody>
</table>
| 29    | Slip compen. | Selection of slip compensation function | • Yes  
• No                                                                  |                |
| 30    | Rated slip  | Rated motor slip         | 0.00 - 5.00 Hz.                                                             | 0.00 Hz        |
| 31    | M-rated cur. | Rated motor current     | 0.1 - 110 A                                                                 | 0.1 A          |
| 32    | No load cur. | No load motor current   | 0.1 - 50.0 A                                                                |                |
| 33    | Chk Ph Open | Selection of phase loss check function | • Yes  
• No                                                                  | Yes            |
| 34    | Ph Chk Time | Reference time of checking phase loss | 50 - 5000 msec.                                                             | 50 msec.       |
| 35    | Retry number | Number of retries when drive faults | 0 - 10                                                                     | 0              |
| 36    | Retry time  | Waiting time before retrying | 0.0 - 10.0 sec.                                                             | 1.0sec         |
| 37    | Retry mode  | Mode of fault retry      | • Retry 0  
• All TRIPs  
• LV + Retry 0  
• LV + All Trips                                                                 | Retry 0        |
| 38    | Stall mode  | Stall prevention mode selection | Initial Values: Hoist = None  
Traverse = Acc                                                                 | None           |
|       |           | **DO NOT USE ON HOIST MOTION. FOR TRAVERSE MOTION WITH DB RESISTOR DO NOT USE ANY OF THE 4 “Dec” OPTIONS.** |                |               |
| 39    | Stall level | Stall prevention level   | 30 - 150 %                                                                  | 150 %          |
| 40    | OL level    | Overload warning level   |                                                                          |                |
| 41    | OL time     | Overload warning delay time | 1.0 - 30.0 sec.                                                            | 10.0sec        |
| 42    | OC lim level | Overcurrent suppression level | 30 - 200 %                                                                  | 200 %          |
| 43    | OC lim. time | Overcurrent suppression time | Initial Values: Hoist = 0.1 sec.  
Traverse = 60.0 sec.                                                 | 0 - 3600 sec.  | 0.1sec     |
| 44    | ETH select  | Mode of electronic thermal protection | • None  
• Const Torq  
• Vari Torq                                                                                  | None           |
| 45    | ETH level   | ETH level                | 30 - 150 %                                                                  | 150 %          |
| 46    | Motor type  | Type of motor            | • General  
• Special                                                                                  | General        |
| 47    | IPF select  | Instantaneous power failure function | • Yes  
• No                                                                  | No             |
| 48    | SS acc. time | Acceleration time for speed search | 0.1 - 25.0 sec.                                                            | 2.0sec         |
| 49    | SS dec. time | Deceration time for speed search |                                                                           | 3.0sec         |
| 50    | SS blk. time | Gate blocking time for speed search | 0.0 - 10.0 sec.                                                            | 0.3sec         |
| 51    | RST-restart | Selection of reset restart function | • Yes  
• No                                                                  | No             |
| 52    | Power on st | Selection of power-on restart function | • Yes  
• No                                                                  | No             |
<p>| 53    | Carrier Freq | Carrier frequency of PWM modulator | 3 - 15 kHz                                                                   | 10 kHz         |</p>
<table>
<thead>
<tr>
<th>Level</th>
<th>Code No.</th>
<th>Display</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>Drive Freq 2</td>
<td></td>
<td></td>
<td>0 - SER 15 Hz.</td>
<td>0.00 Hz</td>
</tr>
<tr>
<td>55</td>
<td>Acc. time 2</td>
<td></td>
<td></td>
<td>0 - 6000.0 sec.</td>
<td>5.0sec</td>
</tr>
<tr>
<td>56</td>
<td>Dec. time 2</td>
<td></td>
<td></td>
<td>0 -20 sec.</td>
<td>10.0sec</td>
</tr>
<tr>
<td>57</td>
<td>Freq. base2</td>
<td></td>
<td></td>
<td>40 - SER 15 Hz.</td>
<td>60.00 Hz</td>
</tr>
</tbody>
</table>
| 58    | V/F pattern2 | Two motor application data (Not Available) | • Linear  
• 2.0  
• User  
• Auto Boost | Linear |
| 59    | Fwd boost 2  |         |             | 0 - 20% | 2% |
| 60    | Rev boost 2  |         |             | 0 - 20% | 2% |
| 61    | Stall level2 |         |             | 30 - 150% | 150% |
| 62    | ETH level 2  |         |             |         |         |
| 63    | PI control   | Selection on internal PI function | • None  
• Steady-N  
• Steady-R | None |
| 64    | P-gain       | P gain of internal PI controller | 0 - 30000 | 10 |
| 65    | I-gain       | I gain of internal PI controller | 0 - 30000 | 50 |
| 66    | PI-FB Offset | Offset (bias) of PI feedback signal | 0 - 50 | 0 |
| 67    | PI-FB scale  | Scaling factor of PI feedback signal | 1 - 250 | 100 |
| 68    | Run Prev.    | Prevention of one direction of rotation | • None  
• Reverse Prev  
• Forward Prev | None |
| 69    | Jog freq.    | Jogging frequency | 0 - SER 15 Hz | 30.00 Hz |
| 70    | Analog meter | Mode of analog meter | • Voltage  
• Current | Voltage |
| 71    | Analog adj.  | Adjustment of load meter | 0 - 120 % | 100 % |
| 72    | FM adj.      | Adjustment of frequency meter |         |         |
| 73    | FDT-freq.    | Frequency detection level | 0.50 - SER 15 Hz | 60.00 Hz |
| 74    | FDT-band     | Frequency detection band | 0.00 - 30.00 Hz | 1.00 Hz |
| 75    | Mul factor   | Scaling factor for User-4 display | 0 - 999 | 100 |
| 76    | Div factor   | Scaling factor for User-4 display | 0 - 999 | 100 |
| 77    | LED check    | Check 7 segment keypad | N/A | N/A |
| 78    | Option       | Option (Interface) card | • None  
• RS485  
• PG  
• DI/DA  
• PLC  
• CAN  
• PMU | None |
| 79    | Inv. number  | RS 485 Inverter address | 1 - 32 | 1 |
| 80    | Baud-rate    | RS 485 baud rate | • 1200 BPS  
• 2400 BPS  
• 4800 BPS  
• 9600 BPS  
• 19200 BPS | 9600 BPS |
<table>
<thead>
<tr>
<th>Level</th>
<th>Code No.</th>
<th>Display</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>81</td>
<td>PG Slip Freq</td>
<td>Rated slip of motor</td>
<td>0.00 - 5.00 Hz</td>
<td>2.00 Hz</td>
</tr>
<tr>
<td></td>
<td>82</td>
<td>PG. P-Gain</td>
<td>P gain of PG option</td>
<td>1 - 255</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>83</td>
<td>PG. I-Gain</td>
<td>I gain of PG option</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>Enc signal</td>
<td>Encoder type</td>
<td>A + B</td>
<td>A + B</td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>Enc pulse</td>
<td>Pulses per revolution</td>
<td>360 Pulse</td>
<td>1024 Pulse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>500 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>512 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1000 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1024 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2000 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2048 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4000 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4096 Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>86</td>
<td>DI Mode</td>
<td>Mode of digital input option card</td>
<td>None</td>
<td>Freq.</td>
</tr>
<tr>
<td></td>
<td>87</td>
<td>DA Mode</td>
<td>Mode of digital output option card</td>
<td>Freq.</td>
<td>Freq.</td>
</tr>
<tr>
<td></td>
<td>88</td>
<td>Remote T.Out</td>
<td>RS485/PLC/CAN option</td>
<td>0.0 - 600.0 sec.</td>
<td>0.0sec</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>Rev Plug</td>
<td>Reverse Plug enable - <strong>DO NOT USE ON HOIST MOTION</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>Rev Plug Acc</td>
<td>Acceleration time for reverse plugging</td>
<td>0 - 6000 sec.</td>
<td>1.5sec</td>
</tr>
<tr>
<td></td>
<td>91</td>
<td>Rev Plug Dec</td>
<td>Deceleration time for reverse plugging</td>
<td>0 - 6000 sec.</td>
<td>1.5sec</td>
</tr>
</tbody>
</table>
Section 2.3: Initial Set Up Programming

2.3.1 Programming the Drive for a Specific Application

Initial setup programming involves a few easy steps. Follow the Macro Quick Set Programming instructions shown in Figure 2.3.1 below and your drive will be ready for operation.

Fig. 2.3.1: Programming application flowchart

1. Turn on the power to the SV200 drive

2. USE Manual T/K 00 FWD 10.00 Hz
   • [Code No. 00] - Manual T/K is displayed in the User Level at power up

3. Press the ▲ Key once

4. USE Motion Def 01 Hoist w LB
   • Motion Def [USE: Code No. 01] Hoist w LB is initially displayed

5. Press the PROG Key
   • This will take you into the Program Mode

Choose the application for the drive:
- Hoist w LB - Do nothing. Leave as is
- Traverse - Press the ▼ key once
- Hoist wo LB - Press the ▲ key once

6. Press the ENTER Key
   • This saves the application selection

* The drive has now been programmed for its appropriate application. According to your new selection, other related drive parameters have conveniently changed automatically for quick programming.
Reference Table 2.3.1 below for function parameters affected by the Macro Quick Set Programming procedure in Figure 16. Note: If so desired, these values can be changed individually by entering the respective access level and changing the function data.

<table>
<thead>
<tr>
<th>Access Level</th>
<th>Code No.</th>
<th>Description</th>
<th>Initial Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>00</td>
<td>Speed 1</td>
<td>10.00 Hz.</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>Speed Selection</td>
<td>2 Step</td>
</tr>
<tr>
<td></td>
<td>05</td>
<td>Speed 2</td>
<td>60.00 Hz.</td>
</tr>
<tr>
<td></td>
<td>06</td>
<td>Speed 3</td>
<td>0.00 Hz.</td>
</tr>
<tr>
<td></td>
<td>07</td>
<td>Speed 4</td>
<td>0.00 Hz.</td>
</tr>
<tr>
<td></td>
<td>08</td>
<td>Speed 5</td>
<td>0.00 Hz.</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>ACC Time</td>
<td>3.0 sec.</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>DEC Time</td>
<td>3.0 sec.</td>
</tr>
<tr>
<td>Service</td>
<td>02</td>
<td>ACC Pattern</td>
<td>S Curve</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>DEC Pattern</td>
<td>S Curve</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>2 Input</td>
<td>Spd Sel 2</td>
</tr>
<tr>
<td></td>
<td>05</td>
<td>3 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>06</td>
<td>4 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>07</td>
<td>5 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>08</td>
<td>P Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>Stop Mode</td>
<td>Decel</td>
</tr>
<tr>
<td>Advance</td>
<td>38</td>
<td>Stall Prevention</td>
<td>Acc</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>Overcurrent Limit Operation Time</td>
<td>60.0 sec</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>Reverse Plugging Enable</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>Reverse Plugging Acceleration Time</td>
<td>1.5 sec</td>
</tr>
<tr>
<td></td>
<td>91</td>
<td>Reverse Plugging Deceleration Time</td>
<td>1.5 sec</td>
</tr>
</tbody>
</table>

**Macro Set-Up for Traverse**

**Macro Set-Up for Hoist with Load Brake**
Table 2.3.1: Macro Quick Set Programming values for motion application selection (continued)

Macro Set-Up for Hoist without Load Brake

<table>
<thead>
<tr>
<th>Level</th>
<th>User</th>
<th>Speed 1</th>
<th>Speed Selection</th>
<th>10.00 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td></td>
<td>Speed 2</td>
<td>2 Step</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td></td>
<td>Speed 3</td>
<td>60.00 Hz</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td></td>
<td>Speed 4</td>
<td>0.00 Hz</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td></td>
<td>Speed 5</td>
<td>0.00 Hz</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td></td>
<td>Acceleration Time</td>
<td>1.0sec</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td></td>
<td>Deceleration Time</td>
<td>1.0sec</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service</th>
<th>02</th>
<th>Acceleration Pattern</th>
<th>Linear</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td></td>
<td>Deceleration Pattern</td>
<td>Linear</td>
</tr>
<tr>
<td>04</td>
<td></td>
<td>P1 Input</td>
<td>Spd Sel 2</td>
</tr>
<tr>
<td>05</td>
<td></td>
<td>P2 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td>06</td>
<td></td>
<td>P3 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td>07</td>
<td></td>
<td>P4 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td>08</td>
<td></td>
<td>P5 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>Forward Torque Boost</td>
<td>5 %</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>Reverse Torque Boost</td>
<td>2 %</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>Stop Mode</td>
<td>Immediate Stop</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Advance</th>
<th>38</th>
<th>Stall Prevention</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td></td>
<td>Overcurrent Operation Time</td>
<td>0.1sec</td>
</tr>
<tr>
<td>89</td>
<td></td>
<td>Reverse Plugging Enable</td>
<td>No</td>
</tr>
</tbody>
</table>

**NOTE:** Typically, these settings will be appropriate for most applications however, they may be customized by the using the functions of the user, Service and Advanced Levels.
2.3.2 Programming the Speed Selection

The last step for initial setup programming is selecting the speed for the respective application. Diagrams showing how the drive operates in the different speed configurations are in the Appendix. Follow the flowchart shown in Figure 2.3.2 below.

Fig. 2.3.2: Speed selection flowchart.

Currently you should be in the **User Level.** Press the \( \uparrow \) or \( \downarrow \) key until Speed Sel [USE: Code No. 2] is displayed.

Choose the speed selection for your application:
- **2 Step** - Leave as is. Do nothing.
- **2 Step Inf Var** - Press the \( \uparrow \) key once.
- **3 Step** - Press the \( \uparrow \) key 2 times
- **3 Step Inf Var** - Press the \( \uparrow \) key 3 times
- **5 Step** - Press the \( \uparrow \) key 4 times

Press the PROG key. **This will place you into the Program Mode**

Press the ENTER key. **This saves the speed selection for your application**

* You have now programmed the drive for its push button speed command. According to your new selection, other related drive parameters have also changed automatically for quick programming. See Table 2.3.2 for changes.
Table 2.3.2: Parameters Affected With Speed Selection Programming

- **2 Speed**

<table>
<thead>
<tr>
<th>Access Level</th>
<th>Code No.</th>
<th>Description</th>
<th>Initial Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>0</td>
<td>Speed 1</td>
<td>10 Hz</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Speed 2</td>
<td>60 Hz</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Speed 3</td>
<td>0 Hz</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Speed 4</td>
<td>0 Hz</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Speed 5</td>
<td>0 Hz</td>
</tr>
<tr>
<td>Service</td>
<td>4</td>
<td>P1 Input</td>
<td>Spd Sel 2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>P2 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>P3 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>P4 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>P5 Input</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

- **2 Step Infinitely Variable**

<table>
<thead>
<tr>
<th>Access Level</th>
<th>Code No.</th>
<th>Description</th>
<th>Initial Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>0</td>
<td>Speed 1</td>
<td>10 Hz</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Speed 2</td>
<td>60 Hz</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Speed 3</td>
<td>0 Hz</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Speed 4</td>
<td>0 Hz</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Speed 5</td>
<td>0 Hz</td>
</tr>
<tr>
<td>Service</td>
<td>4</td>
<td>P1 Input</td>
<td>Spd Sel 2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>P2 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>P3 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>P4 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>P5 Input</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

- **3 Step**

<table>
<thead>
<tr>
<th>Access Level</th>
<th>Code No.</th>
<th>Description</th>
<th>Initial Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>0</td>
<td>Speed 1</td>
<td>10 Hz</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Speed 2</td>
<td>30 Hz</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Speed 3</td>
<td>60 Hz</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Speed 4</td>
<td>0 Hz</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Speed 5</td>
<td>0 Hz</td>
</tr>
<tr>
<td>Service</td>
<td>4</td>
<td>P1 Input</td>
<td>Spd Sel 2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>P2 Input</td>
<td>Spd Sel 3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>P3 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>P4 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>P5 Input</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

- **3 Step Infinitely Variable**

<table>
<thead>
<tr>
<th>Access Level</th>
<th>Code No.</th>
<th>Description</th>
<th>Initial Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>0</td>
<td>Speed 1</td>
<td>10 Hz</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Speed 2</td>
<td>30 Hz</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Speed 3</td>
<td>60 Hz</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Speed 4</td>
<td>0 Hz</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Speed 5</td>
<td>0 Hz</td>
</tr>
<tr>
<td>Service</td>
<td>4</td>
<td>P1 Input</td>
<td>Spd Sel 2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>P2 Input</td>
<td>Spd Sel 3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>P3 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>P4 Input</td>
<td>Not Used</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>P5 Input</td>
<td>Not Used</td>
</tr>
</tbody>
</table>
Table 2.3.2: Parameters Affected With Speed Selection Programming (continued)

5 Step

<table>
<thead>
<tr>
<th>Access Level</th>
<th>Code No.</th>
<th>Description</th>
<th>Initial Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>0</td>
<td>Speed 1</td>
<td>10 Hz</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Speed 2</td>
<td>20 Hz</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Speed 3</td>
<td>30 Hz</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Speed 4</td>
<td>45 Hz</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Speed 5</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Service</td>
<td>4</td>
<td>P1 Input</td>
<td>Spd Sel 2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>P2 Input</td>
<td>Spd Sel 3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>P3 Input</td>
<td>Spd Sel 4</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>P4 Input</td>
<td>Spd Sel 5</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>P5 Input</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

- All speeds can be changed individually in the **User Level** if so desired.
- In the Appendix are timing graphs representing the different speed control options.
* Your Drive is now ready to run.

2.3.3 Drive Operation Checks

1. Test with unloaded hoist.

2. Make sure the hoist electric motor brake is operating properly.

3. Run the hoist or traverse, and verify its correct operation in relation to direction of movement verses pendant button pressed.

4. Check all limit switches for correct operation.

If the drive operates incorrectly please follow the troubleshooting charts of this manual, or contact your SpaceVector™ Dealer for further assistance.
Chapter 3: Programming

Section 3.1: Passwords and Group Access Levels
  3.1.1: Passwords
  3.1.2: Entering a Password
  3.1.3: Changing Passwords

Section 3.2: Programming Function Data
  3.2.1: Customizing the Programming

Section 3.3: Establishing Motor Parameters
Section 3.1: Passwords and Group Access Level

Section 3.1.1 Passwords

The SV200 allows you to program up to two passwords. The purpose of a password is to prevent people from inadvertently changing important parameters found in the Service and Advanced Levels. In order to change parameters in the Service or Advanced Levels, you must first enter a password designated to the respective level. The User Level does not require a password to change parameters.

When you first receive your drive, the programming permission level is initially setup for the Advanced Level. This means you can program any parameter in all levels. The initial password for all levels is (0). To help explain how passwords affect programming permission levels, see Figure 3.1.1.

Section 3.1.2 Entering a Password

When you first receive the SV200 drive, the initial password for all levels is (0). To help explain how specific passwords affect each permission level of programming, follow Figure 3.1.1. It is assumed that the initial password of (0) has been changed to a (1) for Service Level and a (2) for Advanced Level. If a password change is desired, see Changing a Password, in Section 3.1.3 of this manual.

Section 3.1.3 Changing a Password

If a password change is desired in either the Service Level or the Advanced Level, reference Figure 3.1.2.

Caution: Once you change your password, make sure it is written down where it can be referenced at a later time if necessary.
Fig. 3.1.1: Flowchart explanation for entering a password and its affect on programming permissions.

Get to Password [USE: Code No. 18].

Press the key.

Press the , , or key to enter the desired password value.

Press the key.

Yes

Does password = (1)

Yes

Permission to program in the Service and User Level is allowed.

No

Does password = (2)

Yes

Permission to program in the Advanced, Service and User Level is allowed.

No

An incorrect password entry will automatically place the user in the User Level permission.

Access Lev [USE: Code No. 17] displays the current access level permission.

Passwords
1 = Service Level
2 = Advanced Level
Fig. 3.1.2: Flowchart showing how to change a password in the **Service and Advanced Levels**.

**Changing Service Level Password**

1. Get to Ser Lev PW [USE: Code No. 19]
2. Press the **PROG** key.
3. Press the ▲, ▼, or ◀ key to enter the old password value.
4. Press the **ENTER** key.
5. Press the ▲, ▼, or ◀ key to enter the new password value.
6. Press the **ENTER** key.

You have now programmed a new password for the Service Level.

**Changing Advanced Level Password**

1. Get to Adv Lev PW [USE: Code No. 20]
2. Press the **PROG** key.
3. Press the ▲, ▼, or ◀ key to enter the old password value.
4. Press the **ENTER** key.
5. Press the ▲, ▼, or ◀ key to enter the new password value.
6. Press the **ENTER** key.

You have now programmed a new password for the Advanced Level.

**Note:** When you first receive the SV200, the old password is (0) for both levels. Otherwise, use the current respective password as the old password.
Section 3.2: Programming Function Data

3.2.1 Customizing the Programming

Changing function data requires a few short steps. A password is required for changing any function data in the Service or Advanced Levels. Changing data in the User Level does not require a password. Figure 3.2.1 demonstrates how to change function data in all levels.

Fig. 3.2.1: Programming Speed 1 frequency from 30.00 Hz to 45.50 Hz

Get to the desired parameter you wish to change listed in the Table 2.1. In this example, Speed 2 [USE: Code No. 5] frequency located in the User Level will be changed.

- Press the PROG key. This places you in the programming mode. The cursor will appear on the lowest digit.
- Press the SHIFT key once to move to the next digit.
- Press the UP arrow key 5 times.
- Press the SHIFT key once to shift the cursor to the next digit.
- Press the UP arrow key 5 times.
- Press the SHIFT key once to shift the cursor to the next digit.
- Press the UP arrow key once to change the value of 3 to a 4.
- Press the ENTER key to store the new value.

Note: In this example, lowering the drive frequency will lower the top speed of the motor.
Section 3.3: Establishing Motor Parameters

When establishing the motor parameters, assure the motor rated current does not exceed the drive current rating. The default values for the Advanced Level Code numbers 30, 31, and 32 may be set to values more closely representing the motor being used with the drive. This is accomplished as follows:

1. Determine the motor synchronous speed and full load speed in revolutions per minute.

2. Calculate the rated motor slip in Hertz using the following equations.

   Rated Motor Slip (rpm) = [motor sync speed (rpm) – motor rated speed (rpm)]

   Rated Motor Slip (Hertz) = \[
   \frac{60 \text{ Hz} \times \text{[rated motor slip (rpm)]}}{	ext{motor sync speed (rpm)}}
   \]


4. Obtain the motor rated current in amperes from the motor nameplate.

5. Obtain the drive current rating in amperes.

6. If the motor rated current obtained in step 4 is greater than the drive current rating obtained in step 5, use a larger drive having a current rating equal to or greater than that of the motor.

7. If the motor rated current obtained in step 4 is less than the drive current rating obtained in step 5, set M-rated cur. [ADV: Code No. 31] to the motor rated current obtained in step 4.

8. Calculate the minimum drive phase loss detection current.

   Minimum Drive Current (Amperes) = 0.15 \times \text{[drive rated current (Amperes)]}

9. Calculate the motor no load current.

   Motor No Load Current (Amperes) = 0.30 \times \text{[motor rated current (Amperes)]}

10. If the motor no load current calculated in step 9 is less than the minimum drive phase loss detection current calculated in step 8, the drive cannot detect phase loss and phase loss protection is no longer guaranteed. Consult the factory.
11. If the motor no load current calculated in step 9 is greater than the minimum drive current calculated in step 8, set No-load cur. [ADV: Code No. 32] to the motor no load current value calculated in step 9.

EXAMPLE:

5 HP drive having rated current of 8 ampere used with 1 HP motor having rated current of 1.3 amp

Minimum drive current = 0.15 x 8 amp = 1.2 amp

Motor no load current = 0.3 x 1.3 amp = 0.39 amp

The no load motor current is less than the minimum phase loss detection current. If the no load motor current is less than 15% of the drive rated current, the drive may detect an erroneous phase loss and phase loss protection is no longer guaranteed.
Chapter 4: Troubleshooting

Section 4.1: Monitoring Motor Current and Error Codes

4.1.1: Monitoring Frequency
4.1.2: Monitoring Current
4.1.3: Monitoring Speed
4.1.4: Monitoring Fault Trips
4.1.5: Fault Codes

Section 4.2: Problem Flowcharts

Section 4.3: Testing Power Components

Section 4.4: Pushbutton Pendant Test

Section 4.5: Multi-function Output Test
Section 4.1: Monitoring Motor Current and Error Codes

4.1.1 Monitoring Frequency

Actual frequency output is displayed at Speed 1 [USE: Code No. 00]. When the drive is not in its running mode, the keypad will display Speed Step 1 Frequency as shown in Figure 4.1.1 below. Once the drive starts to run, the keypad will display actual frequency output.

Fig. 4.1.1: Keypad display for drive at rest and in running mode.

- Speed 1 value when drive is at rest.
- Example of actual speed while drive is in run mode.

4.1.2 Monitoring Current

Actual current output is displayed at Current [USE: Code No. 03]. Figure 4.1.2 below shows what the current display will look like.

Fig. 4.1.2: SV200 actual current output display

- Example of actual current output when drive is in run mode.

4.1.3 Monitoring Speed

Actual motor speed is displayed at Speed [USE: Code No. 04]. Figure 4.1.3 below shows what the motor speed display will look like.

Fig. 4.1.3: Motor speed display

- Example of actual speed of the motor.
4.1.4 Monitoring Fault Trips

If a fault trip should occur, you can view what the fault is, its frequency and current at time of fault by going to Fault [USE: Code No. 14]. You can also view the previous faults at Last fault 1 [USE: Code No. 15] and Last fault 2 [USE: Code No. 16]. See Figure 4.1.4 below for fault displays.

**Fig. 4.1.4: Fault trip and fault trip history displays**

- Example of an over current fault that just occurred.

- Pressing the PROG key will allow you to view the frequency and current at the time of fault.

- Press the UP key once and the frequency at time of fault will appear.

- Press the UP key once more and the current at time of fault will appear.

**Note:** You may also view the frequency and current at time of Last Fault 1 and Last Fault 2 by following the procedure from Fig. 4.1.4 on [Function Nos. 15 and 16].

**Fig. 4.1.5: Last Fault Memory Locations**

- Example of a previous fault.

- Example of the next previous fault.

It is possible to clear the current fault [Function No. 14], by pressing the **RESET** key or by turning power off and back on.
4.1.5 Fault Codes

When a Fault Trip occurs, the inverter cuts off its output and displays the fault status in Fault [USE: Code No. 14]. The last two faults are saved in Last fault 1 [USE: Code No. 15] and Last fault 2 [USE: Code No. 16].

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of Electric Shock</strong> - More than one disconnect switch may be required to de-energize the equipment before servicing.</td>
</tr>
</tbody>
</table>
### Table 4.1.1: Fault Code Description

<table>
<thead>
<tr>
<th>Fault Display</th>
<th>Description</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE Fault 14</td>
<td>GF Trip</td>
<td>1. Check the wiring from the inverter to the motor for ground faults. 2. Check motor windings for a ground fault.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>OV Trip</td>
<td>1. Check whether the input voltage is within 10% of the inverter nameplate value. 2. Extend Dec. time [USE: Code No. 11] to accommodate a high load inertia. Additional Dynamic Braking resistors may be required to dissipate excessive voltage. 3. Eccentric loads and regenerative loads may cause over voltage trips. A larger inverter may be required to accommodate the larger load requirement.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>OC Trip</td>
<td>1. Check for mechanical failure which may have caused excessive motor current (bearing failure, jam, brake sticking, etc.)</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>Phase Loss</td>
<td>1. Check output terminals at the drive and motor splice box. 2. Test motor for open windings.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>Fuse Open</td>
<td>1. Check to see if IGBT s are damaged. See Section 4.3: Testing Power Components. 2. Replace the fuse.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>Over Heat</td>
<td>1. Verify the Cooling Fan is rotating? 2. Check to see if the air inlet and outlet are plugged. 3. Check the ambient temperature.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>ETH</td>
<td>1. Check whether the ETH level is set correctly. 2. Check whether the inverter has been operating at a low frequency with a heavy load for along time.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>EXT Trip</td>
<td>1. Check the multi-function input terminal.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>LV Trip</td>
<td>1. Check the input line voltage.</td>
</tr>
<tr>
<td>USE Fault 14</td>
<td>BX</td>
<td>1. Check the BX terminal.</td>
</tr>
</tbody>
</table>

**Note:** If the problem persists, please contact your local SpaceVector™ distributor for assistance.
Section 4.2: Problem Flowcharts

Fig. 4.2.1: Motor Does not Run

- Is the display on?
  - Yes
    - Is there input power?
      - No
        - Check input fuses.
        - Check circuit breakers.
        - Is the mainline contactor energized?
      - Yes
        - Check RST and BX terminal inputs.
  - No
    - Is RST or BX terminal disabled?
      - Yes
        - Is Run/stop set [SER: Code No. 01] set to Pendant?
          - Yes
            - Check F and R terminal inputs. See Pushbutton Pendant Test in Section 4.4.
          - No
            - Is Freq. set [ADV: Code No. 02] set to Key?
              - Yes
                - Is F-limit high [ADV: Code No. 18] greater than 1st speed
                  - No
                    - Adjust max. frequency
                  - Yes
                    - Voltage output from U, V, W?
                      - Yes
                        - Check output wiring and motor.
                      - No
                        - Call Factory
                    - No
                      - Is there analog signal between V1-5G or I-5G inputs?
                        - Yes
                          - Analog signal source trouble.
                        - No
                          - Is F-limit high [ADV: Code No. 18] greater than Freq. start [SER: Code No. 17]?
                            - Yes
                              - Set F-limit high greater than Freq. start
                            - No
                              - No
                                - Inverter trouble. Check keypad or power components See Section 4.3 for Testing Power Components. Contact factory for assistance.
Fig. 4.2.2: Motor Speed is not equal to the Maximum Operational Frequency

  - No: Adjust for correct frequencies.  
  - Yes: Is F-limit high [ADV: Code No. 18] within Freq-jump 1f, 2f, 3f [ADV: Code Nos. 21, 22, 23] or Freq. band [ADV: Code No. 24]?
    - No: Is Freq. set [ADV: Code No. 02] set to Key?  
      - No: Is there an analog signal between V1-5G or I-5G?  
        - No: Analog signal source trouble.  
        - Yes: Change Acceleration or Deceleration time according to load.
        - Yes: Change Acceleration or Deceleration time according to load.
        - No: Is Stall Mode selected in Stall mode [ADV: Code No. 38]?
          - No: Call Factory  
            - Yes: Change Stall Prevention level according to load  
            - No: Change Stall Prevention level according to load
Fig. 4.2.3: Motor does not run smoothly

  - No:
    - Is Freq. start [SER: Code No. 17] high?
      - Yes: Lower Freq. start [SER: Code No. 17].
      - No: Are control signals fluctuating?
        - Yes: Check for noisy electrical supply.
        - No:
          - Is there balanced output voltage at U, V, W, outputs?
            - Yes: Check the motor.
            - No: Call Factory.
4.2.4: Motor is abnormally overheating

- Is motor overloaded?
  - Yes: Decrease the load or increase motor capacity.
  - No:
    - Does the motor run in low speed regularly?
      - Yes: Use external cooling system or ETH function in [ADV: Function No. 44] and [ADV: Function No. 45]
      - No:
        - Is output current balanced?
          - Yes: Check the motor.
          - No: Call Factory

- What is V/F pattern [SER: Code No. 20]?
  - Linear: Call Factory
  - User or Auto Boost: Change V/F Pattern to Linear, if still having problems call Factory.
Section 4.3: Testing Power Components

4.3.1 How to Check Power Components
Before checking the power components, be sure to disconnect the AC input supply and wait until the main electrolytic capacitor (P1-N) discharges. This may take several minutes.

Fig. 4.3.1: SV200 Power Components Functional Diagram

Table 4.3.1: Power Component Test Values - All resistance values measured with multi-meter leads From + to -.

<table>
<thead>
<tr>
<th>Input Diode Module Check</th>
<th>Resistance to be Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Points</td>
<td></td>
</tr>
<tr>
<td>From R, S, or T to P</td>
<td>50k ohms or more</td>
</tr>
<tr>
<td>From R, S, or T to N</td>
<td>50k ohms or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Charge Resistor Check</th>
<th>Resistance to be Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Points</td>
<td></td>
</tr>
<tr>
<td>From P to P1</td>
<td>Resistance depending on Models.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DB (Dynamic Braking) IGBT*</th>
<th>Resistance to be Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Points</td>
<td></td>
</tr>
<tr>
<td>From B2 to N</td>
<td>50k ohms or more</td>
</tr>
<tr>
<td>From G to N</td>
<td>A few kilo ohms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Diode Module Check</th>
<th>Resistance to be Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Points</td>
<td></td>
</tr>
<tr>
<td>From U, V, or W to P1 and U, V, or W to N</td>
<td>50k ohms or more</td>
</tr>
<tr>
<td>Between Gate and Emitter of each IGBT</td>
<td>A few kilo ohms</td>
</tr>
</tbody>
</table>

*IGBT = Isolated Gate Bipolar Transistor
Section 4.4: Pushbutton Pendant Test

The condition of the interface card can be monitored by using the display. This may be viewed at [Function No. 12] in the User Level. Press the PROG key to make the input display active. See Figure 4.4.1 below for reference.

Fig. 4.4.1: Key for interface card pushbutton pendant test

The status of the input display is dependent upon the status of the corresponding input to the interface card. If the test of the interface card fails it is recommended that the status of the inputs to the control board be tested. The relationship between inputs on the interface card and inputs on the control are illustrated in Table 4.4.1. Using a jumper wire between an input on the control board and the “CM” terminal will test the 24 VDC sinking inputs to the control board.

Table 4.4.1: Interface Card versus Control Board inputs

<table>
<thead>
<tr>
<th>Interface Card</th>
<th>Control Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>FX</td>
</tr>
<tr>
<td>R</td>
<td>RX</td>
</tr>
<tr>
<td>P6</td>
<td>P6</td>
</tr>
<tr>
<td>P</td>
<td>P5</td>
</tr>
<tr>
<td>5</td>
<td>P4</td>
</tr>
<tr>
<td>4</td>
<td>P3</td>
</tr>
<tr>
<td>3</td>
<td>P2</td>
</tr>
<tr>
<td>2</td>
<td>P1</td>
</tr>
</tbody>
</table>

Example: Figure 4.4.2 shows the drive display if the “F” input on the interface card is on, and likewise the “FX” terminal on the control board.

Fig. 4.4.2: Input Status with “F” and “FX” inputs on
Section 4.5: Multifunction Output Test

The condition of the multifunction and analog outputs can be monitored by using the display. This function is located at [Function No. 13] in the User Level. Press the PROG key to make the display active. Reference Figure 4.5.1 below for testing procedure.

Fig. 4.5.1: Key for output terminal test

- Whenever an output is true, a 1 is displayed. If an output is false, a 0 is displayed.

Example: Figure 4.5.2 shows the drive display if the AUX and the Q2 outputs are on.

Fig. 4.5.2: Output Status with AUX and Q2 outputs on

- The display in this example shows that Q2 and AUX are currently closed.
Chapter 5: Function Code Information

Section 5.1: User Level Functions
  5.1.1: Frequency Output Monitor
  5.1.2: Frequency Reference
  5.1.3: Accel / Decel
  5.1.4: Drive Status Monitoring

Section 5.2: Service Level Functions
  5.2.1: Command Reference (Run / Stop Selection)
  5.2.2: Accel / Decel Patterns
  5.2.3: Multi-Function Inputs
  5.2.4: Multi-Function Outputs
  5.2.5: Drive Model Selection
  5.2.6: Frequency Settings
  5.2.7: Dwell Function
  5.2.8: V / F Pattern
  5.2.9: Torque Boost
  5.2.10: Voltage Control
  5.2.11: Motor Poles
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  5.3.5: Analog Frequency Control
  5.3.6: Maximum / Minimum Operating Frequency
  5.3.7: Frequency to Bypass
  5.3.8: DC Injection Braking
  5.3.9: Motor Data
  5.3.10: Drive and Motor Protections
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5.3.20: Frequency Detection
5.3.21: Speed Display Scaling Factor
5.3.22: LED Check
5.3.23: Option Card
5.3.24: Reverse Plugging
Section 5.1: User Level Functions

5.1.1 Frequency Output Monitor

The drive frequency can be monitored via Keypad and Multifunction output terminals.

VIA KEYPAD

**Speed 1** [USE: Code No. 00]: 1st Speed (Factory Default: 10.00 Hz)
Range: 0.00 - SER 15 Hz

The Keypad displays the drive frequency output to the motor once the RUN command is initiated. When the drive is not in RUN mode, the frequency display indicates the programmed speed 1 frequency.

VIA FREQUENCY METER TERMINAL (See Section 5.3.14)

5.1.2 Frequency Reference

**Speed Sel** [USE: Code No. 02]: Speed Sel (Factory Default: 2 Step)
Range: 2 Step
2Step Inf Var
3 Step
3Step Inf Var
5 Step

**Speed 2** [USE: Function No. 05]: 2nd Speed (Factory Default: 60.00 Hz)
Range: 0.00 - SER 15 Hz

**Speed 3** [USE: Function No. 06]: 3rd Speed (Factory Default: 0.00 Hz)
Range: 0.00 - SER 15 Hz

**Speed 4** [USE: Function No. 07]: 4th Speed (Factory Default: 0.00 Hz)
Range: 0.00 - SER 15 Hz

**Speed 5** [USE: Function No. 08]: 5th Speed (Factory Default: 0.00 Hz)
Range: 0.00 - SER 15 Hz

The hoist speed references are set in the User Level. **Speed 1** and **2** will be applied when **Speed Sel** is set to 2 Step or 2 Step Infinitely Variable. **Speed 1, 2, and 3** will be applied when **Speed Sel** is set to 3 Step or 3 Step Infinitely Variable and **Speed 1, 2, 3, 4, and 5** will be applied when **Speed Sel** is set to 5 Step. The value of these speed points will be limited to the value of **Maximum Frequency** set in Freq. max [SER: Code No. 15]. Generally, the maximum frequency is set to the maximum motor allowed output speed.
5.1.3 Accel / Decel

**ACC Time** [USE: Code No. 10]: Acc. time
Range: 0.0 – 6000.0 sec. (Factory Default: 1.0sec Hoist 3.0sec Traverse)

**DEC Time** [USE: Function No. 11]: Deceleration Time
Range: 0.0 – 6000.0 seconds (Factory Default: 1.0sec Hoist 3.0sec Traverse)

Operator can program acceleration and deceleration times via keypad of the drive through the above parameters.

Fig. 5.1.1: Acceleration/Deceleration Time
5.1.4 Drive Status Monitoring

The drive operational status can be monitored via the drive keypad and Multi-Meter output terminal.

FAULT HISTORY

<table>
<thead>
<tr>
<th>Faults</th>
<th>[USE: Code No. 14]</th>
<th>(Display only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Fault 1</td>
<td>[USE: Code No. 15]</td>
<td>(Display only)</td>
</tr>
<tr>
<td>Last Fault 2</td>
<td>[USE: Code No. 16]</td>
<td>(Display only)</td>
</tr>
</tbody>
</table>

The drive keeps detailed fault information in three fault history parameters. Each fault history parameter contains the previous fault status such as fault type, drive output current and the frequency output at the time of the fault. These conditions can be viewed by the using up and down arrow keys of the keypad. See Section 4.1.2 for detailed instructions on all fault code locations.

RESETTING A FAULT

The SV200 drive fault can be reset either from the keypad by pressing RESET or from the external fault reset terminal RST, or by turning power off and back on after approximately 3 min.

For the keypad reset, please refer to Section 4.1.2.

STATUS OF INPUT TERMINAL

Drive input terminal status can be monitored in Ter. Input [USE: Code No. 12]. This feature is a useful tool for drive troubleshooting. The status of each terminal is displayed in binary form. When an input terminal is activated, the display will show High (1), otherwise it will show Low (0). See Section 4.4 for a description of this feature.

SOFTWARE VERSION

S/W Ver. [USE: Code No. 21]: S/W Version (Display only)

<table>
<thead>
<tr>
<th>Hoist/Crane 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>M = 3 hp - 10 hp</td>
</tr>
<tr>
<td>L = 15 hp - 30 hp</td>
</tr>
</tbody>
</table>

This is the software version of the SV200 drive.

PASSWORDS

See Section 3.1 for an explanation of this feature.
Section 5.2: Service Level Functions

5.2.1 Command Reference (Run/Stop Selection)

The drive can receive its command sequence (RUN, STOP, FWD, REV), via external terminals.

**Run/stop set** [SER: Code No. 01]: Run command source (Factory Default: Pendant)
Range: Key
- Pendant
- RS485/PLC

**KEYPAD**
The JOG function works via the keypad only. See Section 2.2.3 for instructions on use.

**EXTERNAL CONTROL**
Each of the sequence command can be initiated via external controls connected through the interface card, or direct to the control board. See Table 5.2.1.

<table>
<thead>
<tr>
<th>Tabel 5.2.1: Drive Input terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Control Board Input Terminals</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Fx</td>
</tr>
<tr>
<td>Rx</td>
</tr>
<tr>
<td>RST</td>
</tr>
<tr>
<td>P1</td>
</tr>
<tr>
<td>P2</td>
</tr>
<tr>
<td>P3</td>
</tr>
<tr>
<td>P4</td>
</tr>
<tr>
<td>P5</td>
</tr>
<tr>
<td>P6</td>
</tr>
<tr>
<td>CM</td>
</tr>
</tbody>
</table>

5.2.2 Accel / Decel Patterns

**Acc. pattern** [SER: Code No. 02]: Acceleration Pattern (Factory Default: S-Curve)
Range: Linear
- S-Curve
- U-Curve

**Dec. pattern** [SER: Code No. 03]: Deceleration Pattern (Factory Default: Linear)
Range: Linear
- S-Curve
- U-Curve

These values are set with Motion Def [USE: Function No. 01], see Table 2.3.1. The user can select different acceleration and deceleration patterns for smoother hoist or traverse ramping.
LINEAR
The linear pattern is generally good for hoists without a mechanical load brake for sufficient output torque.

Fig. 5.2.1: Linear Acceleration/Deceleration Curve

S-CURVE
This pattern is used to initiate smooth ramping during Acceleration or Deceleration sequence. This pattern is suitable for hoists with a mechanical load brake, creating less brake wear.

Fig. 5.2.2: S-Curve Acceleration/Deceleration Curve

U-CURVE
This pattern is used for a smooth initial speed change during Acceleration or Deceleration, and still quickly arrive at the set speed.

Note: This pattern is not suitable for hoist / crane applications.

Fig. 5.2.3: U-Curve Acceleration/Deceleration Curve
5.2.3 Multi-Function Inputs

The SV200 drive is equipped with 6 Multi-Function Inputs, which determine how the drive reacts to inputs from the controls.

- **P1 Input** [SER: Code No. 04]: Multi-Function Input 2 (Factory Default: Spd Sel 2)
- **P2 Input** [SER: Code No. 05]: Multi-Function Input 3 (Factory Default: Not Used)
- **P3 Input** [SER: Code No. 06]: Multi-Function Input 4 (Factory Default: Not Used)
- **P4 Input** [SER: Code No. 07]: Multi-Function Input 5 (Factory Default: Not Used)
- **P5 Input** [SER: Code No. 08]: Multi-Function Input P (Factory Default: Not Used)
- **P6 Input** [SER: Code No. 09]: Multi-Function Input P6 (Factory Default: Not Used)

Range: Not Used
- Spd Sel 2
- Spd Sel 3
- Spd Sel 4
- Spd Sel 5
- LSW Imm. Stop
- LSW Rmp. Stop
- LSW Low Spd
- EXT_TRIP

**SPD SEL 2:** With an input of either run command (F or R) the drive will run at the programmed speed of Speed 2 [USE: Code No. 05].

**SPD SEL 3:** With an input of either run command (F or R) and Multi-Function Input 2 the drive will run at the programmed speed of Speed 3 [USE: Code No. 06].

**SPD SEL 4:** With an input of either run command (F or R) and Multi-Function Inputs 2 and 3 the drive will run at the programmed speed of Speed 4 [USE: Code No. 06].

**SPD SEL 5:** With an input of either run command (F or R) and Multi-Function Inputs 2, 3 and 4 the drive will run at the programmed speed of Speed 5 [USE: Code No. 07].

**LSW IMM. STOP:** When a Multi-Function Input is programmed for this operation and the Normally Closed input opens, the drive output immediately stops. (Default for hoist control).

**LSW RMP. STOP:** When a Multi-Function Input is programmed for this operation and the Normally Closed input opens, the drive output ramps to a stop. (Default for traverse control). NOT RECOMMENDED FOR HOIST MOTION.

**LSW LOW SPD:** When a Multi-Function Input is programmed for this operation and the Normally Closed input opens, the drive output ramps to the value in LSW Speed [USE: Code No. 09].

**EXT_TRIP:** When a Multi-Function Input is programmed for this operation and the Normally Closed input opens, the drive trips out and must be reset before it will operate again.
5.2.4 Multi-Function Outputs

The SV200 drive is equipped with 4 Multi-Function Outputs. One is a Normally Open contact between AX1 and AX2 on the control board. The other three are Open Collector 24 VDC outputs at Q1, Q2, and Q3, see Fig. 5.2.4.

**AUX Output** [SER: Code No.10]: AUX Output (Factory Default: FST_HI)

**Q1 Output** [SER: Code No. 11]: Q1 Output (Factory Default: FST_LO)

**Q2 Output** [SER: Code No. 12]: Q2 Output (Factory Default: FDT_HI)

**Q3 Output** [SER: Code No. 13]: Q3 Output (Factory Default: OL)

Range:
- **FST_LO** (See Section 5.2.12)
- **FST_HI** (See Section 5.2.12)
- **FDT_HI** (See Section 5.3.20)
- **FDT_PULSE** (See Section 5.3.20)
- **FDT_BAND** (See Section 5.3.20)
- **OL** (See Section 5.3.10)
- **LV**
- **RUN**

**LOW VOLTAGE SIGNAL**
Multi-Function Output terminals AX1 and AX2 programmed to LV will close when the DC Link voltage falls below the low voltage level of the drive (200VDC for 230 VAC, and 400VDC for 460 VAC drives).

Fig. 5.2.3: Under-voltage Fault Signal

**RUN / STOP SIGNAL**
The Multi-Function Output terminals AX1 and AX2 programmed to RUN will close when the drive changes from a stop condition to a run condition.

Fig. 5.2.4: Open Collector Multi-function Output
5.2.5 Drive Model Selection

**Inv Capacity** [SER: Code No. 14] (Factory Default: Depends on Model No.)

Range: See Table 5.2.2

The drive model selection for each drive is preset at the factory. This parameter must be set correctly in order for the drive to calculate its output current. Table 5.2.2 cross references the drive model number, horsepower, and voltage rating, and lists the default values for M-rated cur. [ADV: Code No. 31] and No-load cur. [ADV: Code No. 32].

Table 5.2.2: SV200 Part Number Cross Reference to Drive Model Selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Part No.</th>
<th>FLA</th>
<th>NLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>3hp@230V</td>
<td>3 HP - 230 V</td>
<td>446485-10</td>
<td>9.6</td>
<td>2.8</td>
</tr>
<tr>
<td>5hp@230V</td>
<td>5 HP - 230 V</td>
<td>446485-11</td>
<td>15.2</td>
<td>4.4</td>
</tr>
<tr>
<td>7.5hp@230V</td>
<td>7.5 HP - 230 V</td>
<td>446485-12</td>
<td>22</td>
<td>6.6</td>
</tr>
<tr>
<td>10hp@230V</td>
<td>10 HP - 230 V</td>
<td>446485-13</td>
<td>28</td>
<td>8.4</td>
</tr>
<tr>
<td>15hp@230V</td>
<td>15 HP - 230 V</td>
<td>446485-14</td>
<td>42</td>
<td>12.6</td>
</tr>
<tr>
<td>20hp@230V</td>
<td>20 HP - 230 V</td>
<td>446485-15</td>
<td>54</td>
<td>16.2</td>
</tr>
<tr>
<td>25hp@230V</td>
<td>25 HP - 230 V</td>
<td>446485-16</td>
<td>68</td>
<td>20.4</td>
</tr>
<tr>
<td>30hp@230V</td>
<td>30 HP - 230 V</td>
<td>446485-17</td>
<td>80</td>
<td>24.0</td>
</tr>
<tr>
<td>3hp@460V</td>
<td>3 HP - 460 V</td>
<td>446485-20</td>
<td>4.8</td>
<td>1.4</td>
</tr>
<tr>
<td>5hp@460V</td>
<td>5 HP - 460 V</td>
<td>446485-21</td>
<td>7.6</td>
<td>2.2</td>
</tr>
<tr>
<td>7.5hp@460V</td>
<td>7.5 HP - 460 V</td>
<td>446485-22</td>
<td>11</td>
<td>3.3</td>
</tr>
<tr>
<td>10hp@460V</td>
<td>10 HP - 460 V</td>
<td>446485-23</td>
<td>14</td>
<td>4.2</td>
</tr>
<tr>
<td>15hp@460V</td>
<td>15 HP - 460 V</td>
<td>446485-24</td>
<td>21</td>
<td>6.3</td>
</tr>
<tr>
<td>20hp@460V</td>
<td>20 HP - 460 V</td>
<td>446485-25</td>
<td>27</td>
<td>8.1</td>
</tr>
<tr>
<td>25hp@460V</td>
<td>25 HP - 460 V</td>
<td>446485-26</td>
<td>34</td>
<td>10.2</td>
</tr>
<tr>
<td>30hp@460V</td>
<td>30 HP - 460 V</td>
<td>446485-27</td>
<td>40</td>
<td>12.0</td>
</tr>
</tbody>
</table>
5.2.6 Frequency Settings

**Freq. max**  [SER: Code No. 15]: Maximum output frequency  (Factory Default: 60.00 Hz)
Range: 40.00 - 120.00 Hz

**Freq. base**  [SER: Code No. 16]: Base frequency  (Factory Default: 60.00 Hz)
Range: 40.00 - Ser 15 Hz

**Freq. start**  [SER: Code No. 17]: Drive Cutoff Frequency  (Factory Default: 0.50 Hz)
Range: 0.50 - 5.00 Hz

The Freq. base [SER: Code No. 16] is the motor rated speed in the constant torque range. This base frequency value should not be set higher than that of Freq. max [SER: Code No. 15]. If the base frequency is set at 40 Hz and the maximum frequency is set at 60 Hz, the motor will accelerate up to 40 Hz in Constant Torque mode and up to 60 Hz in Constant Horsepower mode. The Drive Cutoff Frequency set in Freq. start [SER: Code No. 17] is the frequency at which the drive shuts off when ramping to a stop.

Fig. 5.2.5: Motor Frequency Relationship Diagram
5.2.7 Dwell Function

**Dwell-freq.** [SER: Code No. 18]: Start Dwell Frequency  
(Factory Default: 3.00 Hz)  
Range: 0 - SER 15 Hz

**Dwell-time** [Ser: Code No. 19]: Start Dwell Time  
(Factory Default: 0.5 sec)  
Range: 0 - 10 sec.

The dwell function is used for torque proving before the brake is released. The current is applied to the motor during the Dwell-time [SER: Code No. 19] before releasing the brake.

**Caution:** Dwell frequency should be set to the slip frequency of the motor if the slip is greater than 3 Hz. To calculate slip frequency, see Section 3.3.

Fig. 5.2.6: Brake Release Timing (Hoist)

Fig. 5.2.7: Brake release Timing (Traverse)
5.2.8 V/F Pattern

V/F pattern [SER: Code No. 20]: V/F Pattern Selection (Factory Default: Linear)
Range: Linear
  2.0 (Do Not Use)
  User
  Auto Boost

Depending on the applications, different Volt/Hertz patterns can be selected. In User Define various points of V/F ratios are programmed for the best output result. Please contact the factory for more information.

LINEAR [Constant Torque Applications]
This pattern is best suited for Constant Torque applications like Hoist/Crane. This Linear pattern has a V/F ratio that is constant throughout the entire frequency range up to the drive base frequency.

Fig. 5.2.8: Linear V/F Diagram

USER
The User Pattern can be used for special purpose applications. There are four V/F points that can be programmed between the starting frequency and the base frequency. See Fig. 5.2.9.

**User 1f** [ADV: Code No. 04]: User V/F Set Frequency 1  (Factory Default: 60.00 Hz)
Range: 0.0 - Ser 15 Hz.

**User 1v** [ADV: Code No. 05]: User V/F Set Voltage 1  (Factory Default: 100%)
Range: 0 - 100 %

**User 2f** [ADV: Code No. 06]: User V/F Set Frequency 2  (Factory Default: 60.00 Hz)
Range: 0.0 - Ser 15 Hz.

**User 2v** [ADV: Code No. 07]: User V/F Set Voltage 2  (Factory Default: 100%)
Range: 0 - 100 %

**User 3f** [ADV: Code No. 08]: User V/F Set Frequency 3  (Factory Default: 60.00 Hz)
Range: 0.0 - Ser 15 Hz.

**User 3v** [ADV: Code No. 09]: User V/F Set Voltage 3  (Factory Default: 100%)
Range: 0 - 100 %

**User 4f** [ADV: Code No. 10]: User V/F Set Frequency 4  (Factory Default: 60.00 Hz)
Range: 0.0 - Ser 15 Hz.

**User 4v** [ADV: Code No. 11]: User V/F Set Voltage 4  (Factory Default: 100%)
Range: 0 - 100 %
AUTO BOOST
When Auto boost is selected the drive senses the output current, and if there is a sudden rise in current, proper torque is automatically given. This only occurs at low frequencies to get the motor started.

Note: Manual torque boost settings of Fwd Boost [SER: Code No. 21] and Rev Boost [SER: Code No. 22] are ignored when Auto Boost is Selected.

5.2.9 Torque Boost
Fwd Boost [SER: Code No. 21]: Forward direction torque boost (Factory Default: 5%)
Range: 0 - 20 %
Rev Boost [SER: Code No. 22]: Reverse direction torque boost (Factory Default: 2%)
Range: 0 - 20 %

The forward and reverse torque boost value can be set separately. This function is used to increase the output voltage to the motor at low speeds for a higher volts/hertz ratio, resulting in a much higher starting current output to the motor. This is for loads that require relatively higher torque than normal starting torque. These parameters are only used if V/F pattern [SER: Code no. 20] is not set to Auto Boost.

Note: If the torque boost is set too high an Overcurrent fault may occur. When this occurs reduce the Torque Boost values.

Fig. 5.2.10: Torque Boost in Linear Pattern
5.2.10 Voltage Control

**Volt Control**  [SER: Code No. 23]: Maximum drive output voltage
Range: 0-110% (Factory Default: 100%)

Inverter output voltage can be adjusted to motor rated input voltage. This function is useful when rated motor voltage is lower than the rated inverter output voltage. 110% means over-modulation in PWM causing a higher output voltage compared to 100% of rated output voltage.

5.2.11 Motor Poles

**Pole number**  [SER: Code No. 24]: Number of motor poles (Factory Default: 4)
Range: 2 (3600 RPM)
4 (1800 RPM)
6 (1200 RPM)
8 (900 RPM)
10 (720 RPM)
12 (600 RPM)

Relate the synchronous speed of the motor to the number of poles and adjust the value of Pole number [SER: Code No. 24] to match.

5.2.12 Brake Release

**FST-freq.**  [SER: Code No. 25]: Brake Release Frequency (Factory Default: 3.01 Hz)
Range: 0.50 - SER 15 Hz.

This is the frequency at which the drive releases the brake. The drive allows time for the motor to build flux before ramping up the drive output and releasing the brake. See Figures 5.2.5 and 5.2.6 in Section 5.2.7 for a graphical representation.
5.2.13 Upload / Download from Keypad and Set Factory Defaults

Para read [SER: Code No. 26]: Read all parameters from drive to keypad
Range: Yes (Factory Default: No)
   No

Para write [SER: Code No. 27]: Write all parameters from keypad to drive
Range: Yes (Factory Default: No)
   No

By setting Para read [SER: Code No. 26] to Yes, all drive data, including fault history, will be uploaded to the Electronically Programmable Read Only Memory (EPROM) of the keypad. This can be a useful way to store drive status at the time of fault. By setting Para write [SER: Code No. 26] to Yes, all drive data stored in the keypad will be downloaded to the drive. This can be a useful option when copying a set of parameters from one drive to another.

Para init [SER: Code No. 28]: Initialize all parameters with factory default settings
Range: Yes (Factory Default: No)
   No

If set to Yes, the factory initial parameter settings will be downloaded to the drive.

5.2.14 Braking

Stop Mode [SER: Code No. 30]: Drive stop mode (Factory Default: Immediate stop)
Range: Decel
   DCBR
   Immediate stop
   Acc/Dec Abs

DECEL
Ramp to Stop is the default value for traverse applications. The drive output ramps down to a stop when the Run command is released. Not recommended for use with worm gear speed reducers. RAMP TO STOP IS NOT ADVISED FOR HOIST MOTION.

DCBR
See Section 5.3.8 for an explanation of this feature.

IMMEDIATE STOP
Immediate Stop is the default value for hoist applications. The drive output turns off when the Run command is released.

ACC/DEC ABS
When ACC/DEC ABS is selected the drive accelerates and decelerates for the amount of time set in Acc. Time [USE: Code No. 10] and Dec. Time [USE: Code No. 11] regardless of the frequency the drive is at. If the drive is running at 60 Hz it takes Dec. Time to decelerate to 0 Hz. If the drive is running at 30 Hz it takes Dec. Time to decelerate to 0 Hz.
5.3.1 Drive Mode

Drive mode [ADV: Code No. 01]: Only Manual mode is available for Hoist/Crane
Range: Manual
       Auto

NOTE: Only Manual should be selected for Hoist / Crane applications.

5.3.2 Frequency Reference Source

Freq. set [ADV: Code No. 02]: Command frequency Source   (Factory Default: Key)
Range: Key
       Terminal
       RS485/PLC

In order for the drive to receive its speed reference from an analog source or from a
PLC instead of the keypad Freq. set [ADV: Code No. 02] must be adjusted. RS485
input requires an optional input module.

5.3.3 Energy Save

Energy save [ADV: Code No. 03]: Value for energy saving mode
Range: 50 - 100 %   (Factory Default: 80 %)

For fan and pump applications, not for hoist/crane.

5.3.4 User V/F Pattern (See Section 5.2.8 for ADV: Codes 04 - 11)

5.3.5 Analog Frequency Control

V-I mode [ADV: Code No. 12]: Analog input mode   (Factory Default: Voltage)
Range: Voltage
       Current
       Volt+Curr

Filter gain [ADV: Code No. 13]: Analog input filter gain   (Factory Default: 50 %)
Range: 0 - 100 %

Analog gain [ADV: Code No. 14]: Analog input scaling   (Factory Default: 100 %)
Range: 50 - 250 %

Analog bias [ADV: Code No. 15]: Analog input bias   (Factory Default: 0.00 %)
Range: 0 - 100 %

Analog dir [ADV: Code No. 16]: Analog input polarity   (Factory Default: Direct)
Range: Direct
       Invert

In order for the drive to receive its speed reference from an external source instead of
the keypad Freq. Set [ADV: Code No. 02] must be set to Terminal. V-I Mode [ADV: Code
No. 12] is used to select the analog frequency reference method. If a 0 ~ 10 VDC signal
is the desired source of reference, then Voltage should be selected. If a 4 ~ 20 mA
signal is the source of reference, then Current should be selected. When both of the
signals are used, then Voltage+Current should be selected. See Fig. 5.3.1.
Filter Gain [ADV: Code No. 13] is used when the analog input source contains a lot of noise. This can result in speed oscillation. If this is the case, then increasing this value will help suppress the noise.

**Note:** The higher this value is, the slower the response.

Fig. 5.3.1: Analog Control Source Daigrams

![Graph 1](image1)

**[V-I mode = Voltage]**

![Graph 2](image2)

**[V-I mode = Volt + Curr]**

![Graph 3](image3)

**[V-I mode = Current]**

Analog gain [ADV: Code No. 14], establishes the correct ratio between the analog input signal and its maximum speed reference of the drive. For example, if the drive needs to accept +5 VDC analog signal as its maximum speed reference instead of +10 VDC, by setting Analog gain to 50% the drive will calculate its maximum analog input as 10 VDC \times (0.5) = 5 VDC. This establishes a +5 VDC input signal as the maximum speed reference. See Fig. 5.3.2.

Fig. 5.3.2: Analog Input Gain

![Graph 4](image4)

**[Analog gain = 100%]**

![Graph 5](image5)

**[Analog gain = 50%]**
Analog bias [ADV: Code No. 15] is used to set the ratio between the minimum analog input signal and the minimum frequency reference. For example, if Analog bias is set at 50 % and the analog input signal is 0 VDC, then the drive will calculate its minimum speed reference (maximum Speed x Analog bias) which becomes half of the set maximum frequency. See Fig. 5.3.3.

Fig. 5.3.3: Analog Input Bias

Analog dir [ADV: Code No. 16] establishes the analog input versus frequency reference slope that is either a positive or negative slope. When set to Direct the analog command signal (0 ~ 10VDC or 4 ~ 20mA) represents an increasing or positive slope. When set to Invert then the signal (0 ~ 10VDC or 4 ~ 20mA) represents a decreasing or negative slope. See Fig. 5.3.4.

Fig. 5.3.4: Analog Reference Slope
5.3.6 Maximum / Minimum Operating Frequency

**F-limit high [ADV: Code No. 18]:** Maximum operating frequency
Range: ADV 19 Hz - SER 15 Hz. (Factory Default: 60.00 Hz)

**F-limit low [ADV: Code No. 19]:** Minimum operating frequency
Range: 0.00 - ADV 18 Hz. (Factory Default: 0.00 Hz)

The output frequency range of the drive is limited to the values set in Max Freq limit [ADV: Code No. 18] and Min Freq limit [ADV: Code No. 19]. See Fig. 5.3.5.

Fig. 5.3.5: Operational Maximum Frequency
5.3.7 Frequency to Bypass

Freq.-Jump [ADV: Code No. 20]: Selection of frequency jump function
Range: Yes (Factory Default: No)
No

Freq.-Jump 1f [ADV: Code No. 21]: Jump (bypass) frequency 1
Range: 0 - SER 15 Hz. (Factory Default: 10.00 Hz.)

Freq.-Jump 2f [ADV: Code No. 22]: Jump (bypass) frequency 2
Range: 0 - SER 15 Hz. (Factory Default: 20.00 Hz.)

Freq.-Jump 3f [ADV: Code No. 23]: Jump (bypass) frequency 3
Range: 0 - SER 15 Hz. (Factory Default: 30.00 Hz.)

Freq. band [ADV: Code No. 24]: Jump (bypass) frequency bandwidth
Range: 0.00 - 30.00 Hz. (Factory Default: 5.00 Hz.)

Undesirable resonance and vibration on the motor shaft of the hoist or crane could occur within a certain frequency range due to the structure of the machine. This frequency bypass function is used to lock that frequency band out of the operation. Most of the time, this phenomenon occurs only at a specific frequency. The jump frequency also has its own bandwidth. This is a span of the particular bypass frequency selected. See Fig. 5.3.6.

Fig. 5.3.6: Frequency Bypass
5.3.8 D.C. Injection Braking

**DC-br freq.** [ADV: Code No. 25]: DC brake injection frequency
Range: 0.00 - 60.00 Hz.  (Factory Default: 3.00 Hz.)

**DC-br block** [ADV: Code No. 26]: Blocking time before DC injection
Range: 0.0 - 5.0 sec.  (Factory Default: 1.0 sec.)

**DC-br time** [ADV: Code No. 27]: DC brake injection time
Range: 0.0 - 25.0 sec.  (Factory Default: 0.5 sec.)

**DC-br value** [ADV: Code No. 28]: DC brake injection voltage
Range: 0 - 20 %  (Factory Default: 2 %)

This function can be used to bring the motor to a quick stop without the use of Dynamic Braking Resistors. DC-br freq [ADV: Code No. 25] sets the starting frequency where the DC Injection begins. DC-br block [ADV: Code No. 26] is the time between the DC Injection command and the actual desired moment of DC injection output. DC-br time [ADV: Code No. 27] is the total braking time. DC-br value [ADV: Code No. 28] is the level of DC Injection Voltage Output (% of rated voltage). The DC Injection Braking can be selected by selecting DCBR in Stop mode [SER: Code No. 30]. This method can also be used to build up magnetic flux in the hoist motor for smooth starting motion. See Fig. 5.3.7. **Caution:** Do not set DC-br time to 0.0 seconds.

Fig. 5.3.7: DC Injection Braking

The hoist decelerates down to the DC Braking Frequency level first before DC Braking. Drive stops producing any Output voltage for t1. Drive will produce the DC braking voltage for t2.
5.3.9 Motor Data
In order for the drive to operate the motor with slip compensation, the name plate data of the motor must be programmed in correctly. Without this data, the drive output torque can be insufficient and could cause the motor to overheat in some instances.

**Slip compen** [ADV: Code No. 29]: Selection of slip compensation function
- Range: Yes (Factory Default: No)
- No

**Rated slip** [ADV: Code No. 30]: Rated motor slip
- Range: 0.00 - 5.00 Hz. (Factory Default: 0.00 Hz.)

**M-rated cur** [ADV: Code No. 31]: Rated motor current
- Range: 0.1 - 110 A (Factory Default: 0.1 A)

**No load Cur** [ADV: Code No. 32]: No load motor current
- Range: 0.1 - 50.0 A (Factory Default: 0.1 A)

Slip Compens [ADV: Code No. 29] is selected to compensate the motor for inherent slip. By selecting this function, the drive will hold a constant speed range by generating a higher frequency output to the motor. Refer to Section 3.3 for formulas to calculate these motor parameters.

M-rated cur [ADV: Code No. 31] and No load cur [ADV: Code No. 32] are used by the drive to calculate drive trip values, ETH level and Phase loss.

5.3.10 Drive and Motor Protections

**Chk Ph open** [ADV: Code No. 33]: Selection of phase loss check function
- Range: Yes (Factory Default: Yes)
- No

**Ph Chk time** [ADV: Code No. 34]: Reference time of checking phase loss
- Range: 50 - 5000 msec. (Factory Default: 50 msec.)

The SV200 has a Phase Loss Detection feature. If the drive detects that there is not enough current output at one or more of the motor terminals the drive will fault on Phase Loss. Setting the value of Chk Ph open [ADV: Code No. 33] to No will disable the phase loss detection feature.
**Retry number** [ADV: Code No. 35]: Number of retries when drive faults
Range: 0 - 10 (Factory Default: 0)

**Retry time** [ADV: Code No. 36]: Waiting time before retrying
Range: 0.0 - 10.0 sec. (Factory Default: 1.0 sec.)

**Retry mode** [ADV: Code No. 37]: Mode of fault retry
Range: Retry 0
- All Trips
- LV + Retry 0
- LV + All Trips

These functions are used so the drive can reset itself automatically from various drive faults (Over Voltage, Over Current, Ground Fault, Torque Limit Fault, etc.) except Under Voltage or BX fault. The operator can set the maximum number of auto-restart trials through Retry number [ADV: Code No. 35], and Retry Time [ADV: Code No. 36], see Fig. 5.3.8. The auto-restart works in conjunction with the Speed Search Mode, see Section 5.3.14.

**OL level** [ADV: Code No. 40]: Overload warning level
Range: 30 - 150% (Factory Default: 150%)

**OL Time** [ADV: Code No. 41]: Overload warning delay time
Range: 1.0 - 30.0 sec. (Factory Default: 10.0 sec.)

This function is used to provide a motor overload warning. When the output current of the drive has reached the value of OL level [ADV: Code No. 40] for an amount of time equal to OL Time [ADV: Code No. 41], a designated multi-function output terminal will be turned on. For an Overload warning to occur, a multi-function output must be set to OL, this function does not cause the drive to fault. See Section 5.2.4.
**OC lim level** [ADV: Code No. 42]: Overcurrent suppression level
Range: 30 - 200%  (Factory Default: 200%)

**OC lim Time** [ADV: Code No. 43]: Over-Current Limit Time
Range: 0.0 - 3600.0 sec.  (Factory Default: 0.1 sec. Hoist 60.0 sec. Traverse)

When output current of the drive reaches OC lim level [ADV: Code No. 42] of rated output current of drive for a continuous time set in OC lim time [ADV: Code No. 43] due to excessive load, the O.C. (Over Current Fault) will occur and the motor will immediately stop. See Fig. 5.3.9.

Fig. 5.3.9: Overcurrent Limit Drive Response.
ETH Select [ADV: Code No. 44]: Mode of electronic thermal protection
Range: None (Factory Default: None)
      Const Torq
      Vari Torq

ETH level [ADV: Code No. 45]: ETH Level
Range: 30 - 150% (Factory Default: 150%)

Motor Type [ADV: Code No. 46]: Type of motor
Range: General (Factory Default: General)
      Special

This function is used to compensate for excessive motor heat generated during long term low frequency operation. This is especially true if the capacity of the hoist motor is lower than that of the inverter. To prevent the motor from overheating, the ETH level [ADV: Code No. 45] must be set according to the provided formula.

\[
\text{ETH level}(\%) = K \times \left( \frac{\text{Motor rated current}}{\text{Inverter rated current}} \right) \times 100\%
\]

\( K = 1.0 \text{ for 50Hz Input Power, } K = 1.1 \text{ for 60 Hz Input Power} \)

Once the ETH level is found, then the Motor Type [ADV: Code No. 46] of the hoist must be determined. There are two electronic thermal motor characteristics, one is General pertaining to a standard AC induction motor, the other is Special for a special motor containing a blower. Once the correct values are programmed, the drive will determine the ETH time from a formula using M-rated cur [ADV: Code No. 31] and ETH level.

5.3.11 Stall Prevention

Stall mode [ADV: Code No. 38]: Stall prevention mode selection
Range: None (Factory Default: None Hoist Acc Traverse)
      Acc
      Steady
      Acc+Steady
      Dec
      Acc+Dec
      Dec+Steady
      Acc+Dec+Steady

Stall level [ADV: Code No. 39]: Stall prevention level
Range: 30 - 150% (Factory Default: 150%)

NOTE: DO NOT USE STALL PREVENTION ON HOIST MOTION.
GREAT CARE SHOULD BE EXERCISED WHEN SELECTING DECELERATION, "Dec", AS A STALL PREVENTION MODE WHEN USING A DYNAMIC BRAKING RESISTOR.

These functions are used to prevent the traverse faults that occur due to load fluctuation by reducing the inverter output frequency until the motor current level decreases below Stall level [ADV: Code No. 39]. Once the motor current level satisfies the value of Stall level, then the drive will increase its output frequency to its set point.
ACCELERATION
If the output current of the drive has reached Stall level during drive acceleration, the drive will stop accelerating until the current level is reduced below Stall level before it resumes acceleration to a set frequency command. See Fig. 5.3.10.

STEADY SPEED
If the output current of the drive has reached the Stall level during a steady speed period, due to load fluctuation, the drive will then reduce its output frequency until the output current level is reduced below Stall level. The drive will then increase its output frequency to a set frequency command. See Fig. 5.3.11.

DECELERATION
If the DC BUS voltage reaches the O.V. fault level (800 VDC for the 460 VAC class, 400VDC for the 230 VAC class) during deceleration, the drive will stop further deceleration until DC Bus voltage drops below the fault level. See Fig. 5.3.12.

Fig. 5.3.10: Stall Prevention during Acceleration

Fig. 5.3.11: Stall Prevention during Steady Speed
5.3.12: Stall Prevention during Deceleration-230V Class

Whenever the drive stalls, if a multi-function output terminal (AX1, Q1, Q2, or Q3) is designated to STALL the multi-function output will change state. This is true throughout the operation during acceleration, deceleration and steady state conditions. See Fig. 5.3.13.

Fig. 5.3.13: Stall Operation and Multi-Function Output Operation
5.3.12 Instantaneous Power Failure and Speed Search

**IPF select [ADV: Code No. 47]:** Instantaneous power failure function  
Range: Yes (Factory Default: No)  
No

**SS acc. time [ADV: Function No. 48]:** Acceleration time for speed search  
Range: 0.1 - 25.0 sec. (Factory Default: 2.0 sec.)

**SS dec. time [ADV: Function No. 49]:** Deceleration time for speed search  
Range: 0.1 - 25.0 sec. (Factory Default: 3.0 sec.)

**SS blk. time [ADV: Code No. 50]:** Gate blocking time for speed search  
Range: 0.0 - 10.0 sec. (Factory Default: 0.3 sec.)

**INSTANTANEOUS POWER FAILURE (IPF)**

This function is used to initiate the automatic restart mode after an IPF of over 15 msec. in duration. After the drive resets itself from an IPF it begins to search for the current speed of the coasting motor following a time period equal to SS blk. time [ADV: Code No. 50]. Once the drive determines the speed of the motor, it then re-accelerates for a time equal to SS acc. time [ADV: Code No. 48]. The drive decelerates for a time equal to SS dec. time [ADV: Code No. 49], to allow the drive output to match the decelerating motor speed. The drive then accelerates to the previous set reference frequency. The SS blk. time, SS acc. time and SS dec. time must be set, considering the moment of inertia and the magnitude of torque demand of the load.

**SPEED SEARCH**

The Speed Search Mode is used when the drive needs to be restarted while a motor is coasting. This function is especially important if the motor has large load inertia. IMPORTANT: Without speed search, restarting into a coasting motor can result in overcurrent in the IGBT’s.

Fig. 5.3.14: IPF Function
5.3.13 Restart After Reset

**RST restart** [ADV: Function No. 51]: Selection of reset restart function

Range:      Yes     (Factory Default: No)
            No

When RST restart [ADV: Function No. 51] is set to Yes, the drive can be selected to have itself initiate auto-restart mode after the manual reset. If this parameter is set to No, then the drive needs to receive the RUN command after the manual reset.

Fig. 5.3.15: Reset Restart Inactive

When RST restart function is No, F (Forward) or R (Reverse) pendant buttons must be released then pushed again after a manual reset in order to run the drive again.

**INPUT POWER DETECTED AUTO-RESTART**

**Power on st** [ADV: Function No. 52]: Selection of power-on restart function

Range:      Yes     (Factory Default: No)
            No

When either F (UP/FORWARD) input terminal or R (DOWN/REVERSE) input terminal is energized and the input power is restored, the drive will initiate the auto-restart automatically when Power on st is set to Yes. See Figs. 5.3.16 and 5.3.17.

When Power on st is set to No, the drive will not run at the time of the Power Up Sequence. An external or keypad Run Command must be given in order to restart the drive.
Fig. 5.3.17: Power On Start Active

When Power On Start is set Active, the drive will run at the time of the Power Up sequence.

5.3.14 Carrier Frequency

**Carrier freq.** [ADV: Code No. 53]: Carrier frequency of PWM modulator
Range: 3 - 15 kHz. (Factory Default: 10 kHz.)

This is the Insulated Gate Bi-Polar Transistor (IGBT) switching frequency. This function is generally used to prevent harmonic resonance in machines and motors. If this Pulse Width Modulation (PWM) carrier frequency is set at a high level, the audible noise can be reduced, however the electrical noise, current leakage, and switching loss may increase. Generally, the carrier frequency is set to a lower value in high ambient temperature environments.
5.3.15 Two Motor Applications

**Drive freq. 2** [ADV: Code No. 54]: Motor no. 2 frequency
- Range: 0 - SER 15 Hz. (Factory Default: 0 Hz.)

**Acc. time 2** [ADV: Code No. 55]: Motor no. 2 acceleration time
- Range: 0 - 6000.0 sec. (Factory Default: 5.0 sec.)

**Dec. time 2** [ADV: Code No. 56]: Motor no. 2 deceleration time
- Range: 0 - 6000.0 sec. (Factory Default: 10.0 sec.)

**Freq. base 2** [ADV: Code No. 57]: Motor no. 2 base frequency
- Range: 40 - SER 15 Hz. (Factory Default: 60.00 Hz.)

**V/F pattern 2** [ADV: Code No. 58]: Motor no. 2 V/F pattern
- Range: Linear
  - 2.0
  - User
  - Auto boost

**Fwd boost** [ADV: Code No. 59]: Motor no. 2 forward boost
- Range: 0 - 20% (Factory Default: 2%)

**Rev boost** [ADV: Code No. 60]: Motor no. 2 reverse boost
- Range: 0 - 20% (Factory Default: 2%)

**Stall level 2** [ADV: Code No. 61]: Motor no. 2 stall level
- Range: 30 - 150% (Factory Default: 150%)

**ETH level 2** [ADV: Code No. 62]: Motor no. 2 ETH level
- Range: 30 - 150% (Factory Default: 150%)

These functions are for controlling a second motor with the drive and are not available.

5.3.16 Closed Loop Speed Control

**PI control** [ADV: Code No. 63]: Selection of internal PI function
- Range: None (Factory Default: None)
  - Steady - N
  - Steady - R

**P-gain** [ADV: Code No. 64]: P gain of internal PI controller
- Range: 0 - 30000 (Factory Default: 10)

**I-gain** [ADV: Code No. 65]: I gain of internal PI controller
- Range: 0 - 30000 (Factory Default: 50)

**PI-FB offset** [ADV: Code No. 66]: Offset (bias) of PI feedback signal
- Range: 0 - 50% (Factory Default: 0%)

**PI-FB scale** [ADV: Code No. 67]: Scaling factor of PI feedback signal
- Range: 1 - 250% (Factory Default: 100%)

The drive has a built in Proprtional - Integral closed loop controller. It requires an analog feedback reference to control the motor speed. Consult the factory for more information.
5.3.17 Rotation Direction Prevention

**Run Prev.** [ADV: Code No. 68]: Prevention of one direction of rotation
Range: None (Factory Default: None)
Reverse Prev.
Forward Prev.

This function will prevent the drive from turning the motor in one or the other direction.

5.3.18 Jog Frequency

**Jog frequency** [ADV: Code No. 69]: Jogging frequency
Range: 0 - SER 15 Hz. (Factory Default: 30.00 Hz.)

The frequency the drive sends to the motor when using the jog command.

5.3.19 Output Current, Voltage and Frequency

**Analog meter** [ADV: Code No. 70]: Mode of analog meter
Range: Voltage (Factory Default: Voltage)
Current

**Analog adjust** [ADV: Code No. 71]: Adjustment of analog meter
Range: 0 - 120% (Factory Default: 100%)

**FM adjust** [ADV: Code No. 72]: Adjustment of frequency meter
Range: 0 - 120% (Factory Default: 100%)

Drive has an LM terminal and an FM terminal which can be programmed to generate either drive voltage or current output (LM terminal) and drive output frequency (FM terminal) measurements in 0 ~ 10VDC pulse signal. See Fig. 5.3.18, which shows frequency meter, but the LM terminal works the same. The measurement selection for drive output voltage or current can be programmed in Analog meter [ADV: Code No. 70]. When a different ratio between LM, or FM, output and actual drive voltage or current measurement is required, the value of Analog adjust [ADV: Code No. 71] for LM and FM adjust [ADV: Code No. 72] for FM can be set at values which will meet the ratio requirements.

See Fig. 5.3.18: Multi-meter Output

![Multi-meter Output Diagram]

```
Frequency meter frequency(f) =
(Output frequency / Maximum frequency) * 1.8 kHz
Duty (%) = (Output frequency / Maximum frequency) * 2/3
Frequency meter voltage =
(Output frequency / Maximum frequency) * 10V
```
5.3.20 Frequency Detection

**FDT-freq.** [ADV: Code No. 73] Frequency detection level
Range: 0.50 - SER 15 Hz.  (Factory Default: 60.0 Hz)

**FDT-band** [ADV: Code No. 74] Frequency detection band
Range: 0.00 - 30.0 Hz.  (Factory Default: 1.00 Hz)

This function is used to operate one of the multi-function outputs. If a Multi-Function Output is programmed for FDT_HI the output signal is set once the drive reaches FDT frequency [ADV: Code No. 73], and resets when the drive frequency falls below FDT frequency less FDT band [ADV: Code No. 74]. See Fig. 5.3.19. If a Multi-Function Output is programmed for FDT_PULSE the output pulses as the increasing frequency passes through FDT frequency and again as the decreasing frequency passes through FDT frequency less FDT band. If a Multi-Function Output is programmed for FDT_BAND the output sets when the drive output is at the requested frequency plus or minus the FDT band. See Section 5.2.4 for more information regarding the Multi-function output.

Fig. 5.3.19 FDT_HI Functions Diagram

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5.3.21 Speed Display Scaling Factor

**Mul factor** [ADV: Code No. 75] Scaling factor for USE 04 display
Range: 0 - 999  (Factory Default: 100)

**Div factor** [ADV: Code No. 76] Scaling factor for USE 04 display
Range: 1 - 999  (Factory Default: 100)

This function is used to scale the display Speed [USE: Code No. 04]. The values in Mul factor [ADV: Code No. 75] and Div factor [ADV: Code No. 76] can be adjusted to account for gear ratios.

5.3.22 LED Check

**LED check** [ADV: Code No. 77] This function is not used.
5.3.23 Option Card

**Option** [ADV: Code No. 78]: Option (Interface) card
- Range: None (Factory Default: None)
- RS485
- PG
- DI/DA
- PLC
- CAN

**Inv. Number** [ADV: Code No. 79]: RS 485 Inverter address
- Range: 1 - 32 (Factory Default: 1)

**Baud Rate** [ADV: Code No. 80]: RS 485 baud rate
- Range: 1200 bps (Factory Default: 9600 bps)
  - 2400 bps
  - 4800 bps
  - 9600 bps
  - 19200 bps

**PG slip freq.** [ADV: Code No. 81]: rated slip of motor
- Range: 0.00 - 5.00 Hz. (Factory Default: 2.00 Hz.)

**PG P gain** [ADV: Code No. 82]: P gain of PG option
- Range: 1 - 255 (Factory Default: 100)

**PG I gain** [ADV: Code No. 83]: I gain of PG option
- Range: 1 - 255 (Factory Default: 10)

**Enc. signal** [ADV: Code No. 84]: Encoder type
- Range: A + B (Factory Default: A + B)
  - A only

**Enc pulse** [ADV: Code No. 85]: Pulses per revolution
- Range: 360 (Factory Default: 1024)
  - 500
  - 512
  - 1000
  - 1024
  - 2000
  - 2048
  - 4000
  - 4096

**DI mode** [ADV: Code No. 86]: Mode of digital input option card
- Range: None (Factory Default: Freq.)
  - Freq.

**DA mode** [ADV: Code No. 87]: Mode of digital output option card
- Range: Freq. (Factory Default: Freq.)
  - Voltage
  - Current

**Remote T. Out** [ADV: Code No. 88]: RS 485/PLC/CAN option
- Range: 0.0 - 600.0 sec. (Factory Default: 0.0 sec.)

These functions relate to a set of option cards for the drive. If more information is required about these functions please consult the factory.
5.3.24 Reverse Plugging

**Rev Plug** [ADV: Code No. 89]: Reverse Plug enable
Range: Yes (Factory Default: No)
No

**Rev. Plug Acc.** [ADV: Code No. 90]: Acceleration time for reverse plugging
Range: 0 - 6000 sec. (Factory Default: 1.5 sec.)

**Rev. Plug Dec.** [ADV: Code No. 91]: Deceration time for reverse plugging
Range: 0 - 6000 sec. (Factory Default: 1.5 sec.)

Reverse plugging allows for a smooth and quick transition from one direction to the opposite direction with minimal load swing.

**Note: To be used for traversing applications only.**
Motors may need to be oversized from standard motor size calculations by approximately 50% to be able to handle the extra current required to be able to reverse plug motors with loads near equipment capacity.

Fig. 5.3.20: Reverse Plugging

![Diagram showing Reverse Plugging](image-url)
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Chapter 6: Maintenance

Section 6.1: Maintenance
Section 6.2: Precautions
Section 6.3: Routine Inspection
Section 6.4: Visual Inspection
6.1 Maintenance

SV200 Series can be influenced by temperature, humidity, and vibration. To avoid any possible uncertainty, the drive must be installed and maintained properly by trained personnel.

6.2 Precaution

Only certified personnel familiar with the equipment are permitted to install, operate and maintain the drive.

Observe the Charge LED on the drive to be sure of complete power dissipation.

The output voltage of your SV200 drive can only be measured by a rectifier voltage meter (such as an RMS meter). Other instruments such as a digital meter will read an incorrect value due to the high switching PWM frequency.

6.3 Routine Inspection

Check Input-Line Voltage to the drive for any fluctuation.
Check the Cooling Fan. If there is any abnormal noise, replace.
Check for any physical vibration to the drive.
Check the temperature for any overheating.

6.4 Visual Inspection

Any loose screws, nuts, or wires?
   → Tighten or replace.

Any deposit of dust or foreign material in the AC Drive or Cooling Fan?
   → Clean off the dust or foreign material.

Are any connectors disconnected from printed circuit boards?
   → Re-insert the connector.

Inspect for corrosion.
   → Clean where possible or replace.
Appendix

Appendix Fig. 1: Sample Traverse Wiring Diagram


Appendix Fig. 2: Sample Hoist Wiring Diagram with Analog Control

Appendix Fig. 3: 2 Speed Control

Appendix Fig. 4: 2 Step Infinitely Variable Control

Appendix Fig. 5: 3 Speed Control
Appendix Fig. 6: 3 Step Infinitely Variable Control

Appendix Fig. 7: 5 Speed Control
WARRANTY

WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

A. Seller warrants that its products and parts, when shipped, and its work (including installation, construction and start-up), when performed, will meet applicable specifications, will be of good quality and will be free from defects in material and workmanship. All claims for defective products or parts under this warranty must be made in writing immediately upon discovery and, in any event, within two (2) years (or as otherwise provided) from shipment of the applicable item unless Seller specifically assumes installation, construction or start-up responsibility. All claims for defective products or parts when Seller specifically assumes installation, construction or start-up responsibility, and all claims for defective work must be made in writing immediately upon discovery and, in any event, within two (2) years (or as otherwise provided) from completion of the applicable work by Seller, provided, however, all claims for defective products and parts must be made in writing no later than thirty (30) months after shipment. Defective items must be held for Seller’s inspection and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS.

B. Upon Buyer’s submission of a claim as provided above and its substantiation, Seller shall, at its option, either (i) repair or replace its product, part or work at either the original f.o.b. point of delivery or at Seller’s authorized service station nearest Buyer or (ii) refund an equitable portion of the purchase price.

C. This warranty is contingent upon Buyer’s proper maintenance and care of Seller’s products, and does not extend to normal wear and tear. Seller reserves the right to void warranty in event of Buyer’s use of inappropriate materials in the course of repair or maintenance, or if Seller’s products have been dismantled prior to submission to Seller for warranty inspection.

D. The foregoing is Seller’s only obligation and Buyer’s exclusive remedy for breach of warranty, and is Buyer’s exclusive remedy hereunder by way of breach of contract, tort, strict liability or otherwise. In no event shall Buyer be entitled to or Seller liable for incidental or consequential damages. Any action for breach of this warranty must be commenced within two (2) years (or as otherwise provided) after the cause of action has accrued.