**Step 1: A1000 Model Identification and Mounting**

To make sure you received the correct model, it is essential to verify the A1000 nameplate with your order and make sure the A1000 has the correct rating so it can be used with your motor. Please check the nameplate information as shown in the example below.

- Check that the available power will meet the input power requirements.
- Ensure that the output power from the A1000 is compatible with the motor requirements.
- In the case of systems with more than one A1000, follow the above procedure for each A1000 and motor.

**Mounting the A1000**

The mounting of the A1000 is extremely important regarding environment and accessibility. Depending on your system, there are various models available and the mounting dimensions (footprint) may be different. Because the mounting procedure is fairly extensive, it is beyond the scope of this document; the user is referred to the A1000 User Manual (Document No. SIEP C710606 21A) received with the A1000, Section 2.2 Mechanical Installation. Match the model that you received and follow the procedure described in the manual to ensure a safe and functional installation. In cases where the system has more than one A1000, refer to the proper clearances required for adequate ventilation. Please pay particular attention to:

- The clearances to be maintained around the enclosure for adequate ventilation.
- The environmental specifications such as avoiding excessive dampness, extreme temperatures, chemical exposure, corrosive areas, etc., to avoid damage to the equipment and to maintain safety.

**Removing and Attaching the Terminal Cover**

Improper removal of the A1000 terminal cover as well as front cover can cause extensive damage to the A1000. To avoid damage to these items, please pay particular attention to the A1000 User Manual, Document No. SIEP C710606 21A, Section 3.5, Removing and Attaching the Terminal Cover.

**Step 2: Connect Motor and Line Power**

**Step 3: Install PG-X3 Feedback Card and Wire Encoder Feedback**

In this step the PG-X3 encoder feedback card is installed. WITH POWER OFF install the PG-X3 card as shown below. Make sure to follow good wiring practices and all applicable codes. Ensure that the feedback card is grounded properly as shown in Fig. 3 Item H.

This option card can be inserted into either the CNS-B or CNS-C connectors located on the drive’s control board. If only one option card is connected to the drive, use the CNS-C connector. If two option cards are connected, use both CNS-B and CNS-C. See the A1000 User Manual, Document No. SIEP C710606 21A, Section 3.5, for directions on removing the front cover.

**Encoder Power Supply**

Select Encoder Power Supply (IP = XG TBI2) with Jumper CNS3.

**Encoder Connection**

A single channel encoder can only be used in V/f + PG control mode (A1-02 = 1). It is required to use a quadrature encoder in Flux Vector control mode (A1-02 = 3).

Connect Encoder (PG) signals to TBI1 terminals of the PG-X3 card as shown below. Connect power supply from the PG-X3 card (TBI1 – Terminals IP and IG) to the Encoder (PG).

**Encoder Power Supply Rating**

<table>
<thead>
<tr>
<th>Single Channel Feedback (A Only)</th>
<th>Quadrature / Dual Channel Feedback (A &amp; B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable only for V/f with Feedback.</td>
<td>Suitable for V/f or Flux Vector with Feedback.</td>
</tr>
</tbody>
</table>
**A1000 Cheat Sheet (Closed Loop Operation)**

**Step 4** Check Motor Rotation in Open Loop (Motor uncoupled from Load)

In this step the motor is checked for proper direction and operation. This test is to be performed solely from the digital operator. Apply power to the A1000 after all the electrical connections have been made and protective covers have been re-attached. At this point, **DO NOT RUN THE MOTOR**, the Digital Operator should display as shown in Fig. 3.

**Fig. 3 Digital Operator**

- **Motor Rotation Test**
  - Press \( V \) green LED turns on.
  - First Digit Flashes
  - Next, press \( \triangle \) to move the cursor one position to the right and \( \triangleright \) to increase the frequency reference (d1-01) to 10.00 Hz.
  - Press \( \triangleright \) to save frequency reference.
  - Next, press \( \triangleright \) on the Digital Operator. The motor should now be operating at low speed running in the correct forward (clockwise) direction.
  - Next, press \( \triangleright \) to stop on the Digital Operator.

**Notice**

If motor rotation is not correct, then either reverse “Phase Order” using parameter b1-14 or power down the drive, wait five minutes and swap 2 motor leads.

**DANGER**

After the power has been turned OFF, wait at least five minutes until the charge indicator extinguishes completely before touching any wiring, circuit boards or components.

Use precaution, and refer to Fig. 8 or 2, swap any two of the three output leads to the motor (U11, V12 and W13). After the wiring change, repeat Step 3 and recheck motor direction.

**Digital Operator turned off.**

**Step 5** Changing Parameters and Monitoring the A1000

This step shows how to access and modify a A1000 parameter as well as how to monitor A1000 signals such as output frequency and motor current.

Make sure all protective covers have been re-attached and power is turned on. **DO NOT RUN THE MOTOR.**

**Access Parameter Menu and Change Parameter Value**

- Press \( V \) two times until the digital operator shows the parameter menu.

**Step 6** Rotational Auto-Tuning Closed Loop (Decouple Motor from Load)

In this step the A1000 is setup for use with the motor in closed loop operation. Make sure the following has been done:

- Encoder (PG) connected correctly to the PG-X3 Card
- All protective covers have been re-attached
- Ensure the motor can spin freely and any connected mechanical brake is released
- Connected machinery should be allowed to rotate the motor

**IMPORTANT:**

To achieve optimal drive performance use rotational Auto-Tuning with the load decoupled from the motor. If motor and load can not be decoupled, reduce the motor load so that it is no greater than 30% of the rated load. Performing rotational Auto-Tuning with a higher load can result in incorrect motor parameters and may cause irregular motor rotation.

Next apply power to the A1000. **DO NOT RUN THE MOTOR.**

**Select Closed Loop Control Method**

**A1-02**

- **Select Closed Loop Control Method**
  - Go to parameter A1-02.
  - From the main reference press \( V \) once until the Digital Operator shows parameter A1-02. Check motor speed monitor U1-08 while turning the motor manually in forward direction (CW). If the sign displayed is negative, power down the drive, wait at least five minutes until the charge indicator extinguishes completely then swap encoder wires A+ with A- on the PG-X3 card. Next power-up the drive and repeat this test. Or reverse the encoder direction with parameter F1-05. For encoders with only A & B outputs, exchange A & B.

**Encoder Direction**

- Check the motor speed monitor U1-08 while turning the manually in forward direction (CW). If the sign displayed is negative, power down the drive, wait at least five minutes until the charge indicator extinguishes completely then swap encoder wires A+ with A- on the PG-X3 card. Next power-up the drive and repeat this test. Or reverse the encoder direction with parameter F1-05. For encoders with only A & B outputs, exchange A & B.

**Start here**

From the main reference press \( V \) once until the Digital Operator shows the Auto-Tuning menu then press \( A \).

**Auto-tuning Procedure**

- Press \( A \) once until the Digital Operator shows parameter T1-02 Mtr Rated Power then press \( V \)

**Enter Motor Power in kW**

- Motor HP to kW = HP x 0.746
  - Example: 10 HP = 7.46 kW
  - Press \( \Delta \) to select the digit you would like to change and \( \triangleright \) to adjust value and press \( \triangleright \) to save.

**Check Motor Rotation in Open Loop**

- Press \( V \) to select the next parameter and follow the same procedure described above to adjust its value.

**Continue**

**WARNING:** Sudden movement hazard. The A1000 and motor may start unexpectedly during Auto-Tuning.

**WARNING:** Electric Shock Hazard. High voltage will be supplied to the motor when stationary Auto-Tuning is performed. Do not touch the motor during auto-tuning.

**Note:** Auto-Tuning will not function properly when a brake is engaged on the load. Ensure the motor shaft can freely rotate. Never perform an Auto-Tuning with motor connected to a load.

Next, press \( \triangleright \) on the Digital Operator. The A1000 will now start the Auto-Tuning procedure.

The display will show message “Tune Successful” when the Auto-Tuning procedure has been successfully completed.

Please refer to the A1000 User Manual or repeat the procedure again if the display shows an error message.
A1000 Cheat Sheet (Closed Loop Operation)  

Step 7  
Selecting Start/Stop and Speed Reference Sources  

This step shows how to setup the run and reference source of the A1000. The run source determines how the A1000 drive receives its start and stop command and the reference source determines how the speed of the motor is controlled. Make sure all protective covers have been re-attached and power is turned on. DO NOT RUN THE MOTOR.  

This section may require you to change one or more A1000 parameters. Please refer to Step 5 for a detailed explanation on how to change parameters.  

1. Adjust motor speed / frequency from the Digital Operator  
Go to parameter b1-01, set value to \( \text{Select Reference Source} \).  
To adjust frequency use \( \text{A} / \text{V} \) and press  
2. Adjust motor speed / frequency from external terminals (0 - 10V / 4 - 20mA Signal)  
Go to parameter b1-01, set value to \( \text{Select Reference Source} \) (Factory Default)  

User Terminals  

| Potentiometer 2K Ohm | Located inside the drive on the terminal board  
|---------------------|-----------------------------------------------  
| 0 - 10Vdc |  
| 4 = 20mA |  

Note: 2nd row of terminal board is shown here.  

Step 8  
Motor Performance Fine Tuning  

The following tables show how to fine tune motor operation for V/f with PG and Closed Loop Vector Operation. Please refer to the A1000 User Manual (Document No. SIEP CT70006 21A) for additional information.  

V/f Control with encoder feedback (A1-02 = 1)  

<table>
<thead>
<tr>
<th>Problem</th>
<th>Parameter</th>
<th>Action</th>
<th>Default</th>
<th>Suggested Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor is hunting and oscillation at speeds between 10 and 40Hz</td>
<td>m1-02 Hunting Prevention Gain</td>
<td>If insufficient motor torque relative to the size of the load causes hunting reduce the setting.</td>
<td>1.00</td>
<td>0.10 to 2.00</td>
</tr>
<tr>
<td>Motor noise</td>
<td></td>
<td>When motor hunting and oscillation occur with a light load increase the setting. Lower this setting if hunting occurs when using a motor with a relatively low inductance such as a high-frequency motor or a motor with a larger frame size.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor noise</td>
<td>C6-02 Carrier Frequency Selection</td>
<td>If the motor noise is too loud increase the carrier frequency.</td>
<td>1 (kHz)</td>
<td>1 to max. setting</td>
</tr>
<tr>
<td>Motor noise</td>
<td></td>
<td>When motor hunting and oscillation occur at speeds up to 40 Hz lower the carrier frequency.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor torque or speed response</td>
<td>C4-02 Torque Compensation Primary Delay Time</td>
<td>If motor torque and speed response are too slow, decrease the setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td></td>
<td>If motor hunting and oscillation occur, increase the setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor noise</td>
<td>C4-01 Torque Compensation Gain</td>
<td>If motor torque is insufficient at speeds below 10 Hz, increase the setting.</td>
<td>1.00</td>
<td>0.50 to 1.50</td>
</tr>
<tr>
<td>Motor noise</td>
<td></td>
<td>If motor hunting and oscillation occur with a relatively light load, decrease the setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor instability at low speeds</td>
<td>E1-08 Mid Output Voltage A</td>
<td>If motor instability occurs at motor start, decrease the setting.</td>
<td>E1-08: 15.0 V</td>
<td>Default setting 5V</td>
</tr>
<tr>
<td>Motor instability at motor start</td>
<td>E1-10 Minimum Output Voltage</td>
<td>Note: The recommended setting value shown is for 200 V class drives. Multiply value x 2 for 400V class drives and x 2.875 for 575V class drives.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Closed Loop Vector Control (A1-02 = 3)  

<table>
<thead>
<tr>
<th>Problem</th>
<th>Parameter</th>
<th>Action</th>
<th>Default</th>
<th>Suggested Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor torque or speed response</td>
<td>C5-01 ASR Proportional Gain 1</td>
<td>Adjust the ASR proportional gain 1 (C5-01) and the ASR integral time 1 (C5-02).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td>C5-02 ASR Integral Time 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor instability at low speeds</td>
<td>C5-03 ASR Proportional Gain 2</td>
<td>If the load is less rigid and subject to oscillation, increase this setting.</td>
<td>20.00</td>
<td>10.00 to 50.00</td>
</tr>
<tr>
<td>Motor noise</td>
<td>C5-04 ASR Proportional Gain 2</td>
<td>If motor torque and speed response are too slow, gradually increase the ASR gain setting by 5.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td>C5-05 ASR Proportional Gain 2</td>
<td>If motor torque and speed response are too slow, decrease the setting.</td>
<td>0.500 s</td>
<td>0.300 to 1.000 s</td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td></td>
<td>If motor hunting and oscillation occur, increase the setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td>C5-06 ASR Proportional Gain 3</td>
<td>Perform ASR Auto-Tuning if possible.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td></td>
<td>Parameter C5-03 needs to be adjusted only if C5-07 &gt; 0.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td>C5-07 ASR Gain Tuning Frequency</td>
<td>Have the drive switch between two different ASR proportional gain and integral time settings based on the output frequency.</td>
<td>0.0 Hz</td>
<td>0.0 to max. freq. output</td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td>C5-08 ASR Primary Delay Time Constant</td>
<td>If motor torque and speed response are too slow, gradually increase the setting.</td>
<td>0.004 s</td>
<td>0.004 to 0.020 s</td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td></td>
<td>If the load is less rigid and subject to oscillation, increase this setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor noise</td>
<td>C5-09 ASR Proportional Gain 4</td>
<td>If there is too much motor noise, the carrier frequency is too low.</td>
<td>1</td>
<td>2kHz to max. setting</td>
</tr>
<tr>
<td>Motor hunting and oscillation</td>
<td>C5-10 ASR Proportional Gain 4</td>
<td>If motor hunting and oscillation occur at speeds below 3 Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<1> Default setting value is dependent on parameter A1-02, Control Method Selection, and c2-04, Drive Model Selection.  
<2> Default setting change when the Control Method is changed (A1-02) or a different V/f pattern is selected using parameter E1-03.  
<3> ASR in V/f Control with PG only controls the output frequency, and therefore does not allow for high gain settings like in Closed Loop Vector control.  
<4> Refer to C5: Automatic Speed Regulator (ASR) in the A1000 User Manual (Document No. SIEP CT70006 21A) for details on Automatic Speed Regulator (ASR).  

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Document Number: TM.A1000.02 1/4/2011 © Yaskawa America, Inc.