

Subject: Absolute Encoder Battery Options

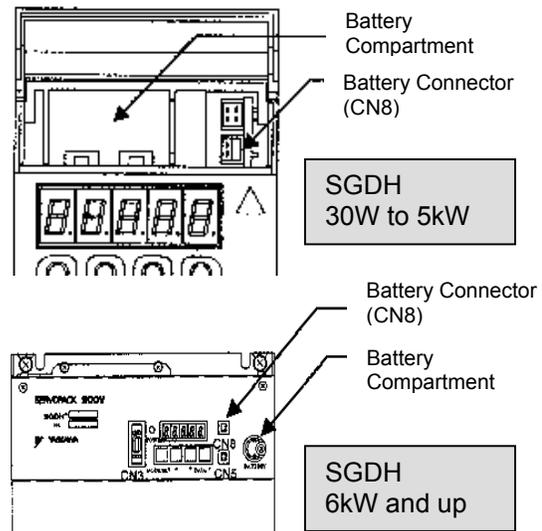
Product: Sigma II

Summary: The Sigma II absolute encoder requires a battery to backup the multi-turn data. There are various ways of connecting the battery to the circuit that should be considered.

Battery Connection Options

In all, there are three options for connecting a backup battery for an absolute encoder. *Only one of these options needs to be used to back-up the absolute encoder.* Yaskawa does not recommend connection of multiple batteries to the absolute encoder circuit.

- Apply a battery (YEA part JZSP-BA01) through connector CN8. A compartment to hold this battery is built-in to the SGDH amplifier (see figure below). This is the most common option and allows for the easiest replacement of a depleted battery.
- Apply a battery (see specifications below) through the CN1 connector (pins 21 & 22).
- The final method is the battery backup cable as described in this document. The battery backup cable is the best option in situations where the encoder cable is disconnected often during machine maintenance. The backup cable will eliminate the need to re-initialize the encoder after encoder cable disconnection.



Battery Specifications

The backup battery specified for Sigma II motors with absolute encoders is Toshiba ER3V* or equivalent. This battery is a thionyl chloride lithium battery rated at 3.6V with a life of 1000mAh. The Yaskawa part number for the battery (with Yaskawa-added leads and connector) is JZSP-BA01. This is the battery that is designed to be installed in the battery compartment of SGDH amplifier.

If it is preferred to connect the absolute encoder battery through the CN1 connector, the recommended battery is Toshiba ER6VC3*, rated at 3.6V and 2000mAh. The Yaskawa equivalent battery is BA000518. It is *not* necessary to install batteries at both the host controller and the SGDH amplifier.

*Specifications for Toshiba ER3V and ER6V batteries are available at http://www.tbcl.co.jp/tb_e/ult_a_el.htm.

Alternate Battery Source

An alternate source for batteries is Tadiran Battery (www.tadiranbat.com), available through electronic distributors such as Newark. Like the Toshiba batteries used in Yaskawa JZSP-BA01, the Tadiran batteries are "thionyl chloride lithium" batteries, available in a 1/2-AA size that is 3.6V, 1000mAh (like the SGDH abs. enc. battery JZSP-BA01) and a AA size that is 3.6V, 2000mAh (like MP940 battery BA000518). Note: Tadiran batteries do not come with the pre-wired leads and connectors for conveniently attaching to Yaskawa equipment like the Yaskawa JZSP-BA01 and BA000518.

Battery Life

The serial encoder used in the Sigma II motor typically draws about 20 μ A of current when the power to the SGDH amplifier is turned off. In this condition, the maximum life of the standard encoder data backup battery (P/N JZSP-BA01) is:

$$1000 \times 10^{-3} \text{ A-hour} / 20 \times 10^{-6} \text{ A} = 50,000 \text{ hours (5.7 years)}$$

When power is applied to the SGDH amplifier, the current draw from the battery is typically 3 μ A. Assuming that the SGDH amplifier is on for 12 hours and off for 12 hours each day, the maximum life of the battery in this condition is:

$$3 \times 10^{-6} \text{ A} \times 12 \text{ hour} = 0.036 \text{ mAh} \quad 20 \times 10^{-6} \text{ A} \times 12 \text{ hour} = 0.24 \text{ mAh}$$

$$0.036 \text{ mAh} + 0.24 \text{ mAh} = 0.276 \text{ mAh per day}$$

$$1000 \text{ mAh} / 0.276 \text{ mAh per day} = 3623.2 \text{ days (9.9 years)}$$

Battery Alarm

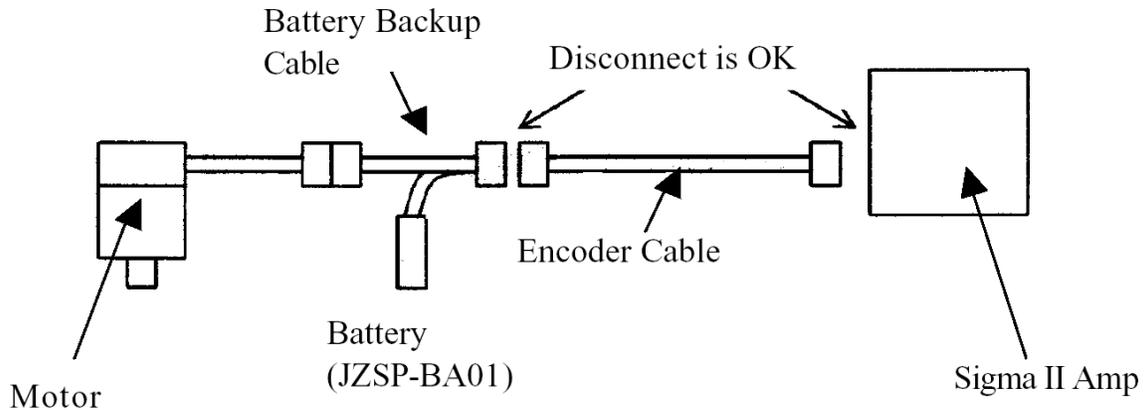
If the voltage of the battery for an absolute encoder drops to approx. 2.7V, the SGDH will generate an Absolute Encoder Battery (A.83) Alarm. This alarm occurs when the SGDH receives a signal from the absolute encoder when the power to the SGDH is turned on. Therefore, the SGDH will not display the alarm when the battery voltage drops below 2.7V while power is being supplied to the SGDH. Follow the procedure outlined below when replacing the battery:

1. Replace the battery while the control power to the SGDH is ON.
2. After battery replacement, turn OFF the power to the SGDH to clear the A.83 Absolute Encoder Battery Alarm.
3. Turn ON the power to the SGDH and confirm that it operates properly.



Constructing a Battery Backup Cable

Because the Sigma II absolute encoder does not have a high-storage capacitor as in the Sigma I, multi-turn position data will be lost within a few seconds once the encoder cable is disconnected. Normally, the encoder cable is not disconnected, and the data will be retained by the backup battery installed in the amplifier. In some cases, it may be necessary to disconnect the encoder cable, and the system must be able to backup the data in the absolute encoder. In these cases, it is recommended to use a battery backup cable.



If machine maintenance requires frequent disconnection of the encoder cable, it is recommended that a battery backup cable be built. This cable is installed at the motor upon machine commissioning. With this backup cable in place, the encoder cable can be safely detected without losing absolute encoder position. To construct this cable, place an absolute encoder battery so that it is connected to the BAT+ and BAT- connections of the encoder (consult *Sigma II User's Manual* for wiring diagrams). A blocking diode should be added to the backup cable (see diagram below).

