

# SAM-III p/n BEN-1 Box Enclosure Assembly Instructions

## 1.0 General

The p/n BEN-1 polycarbonate plastic enclosure consists of a top and bottom section. It includes cutouts and hardware for mounting the SAM-III printed circuit boards, DB-9M serial interface connector and 2.1 x 5.5 mm dc coaxial power jack. All mounting holes are slightly oversize to allow for manufacturing tolerances and alignment.

The liquid crystal display (LCD) PCB and keyboard PCB are installed on the top section and the main controller PCB, DB-9M connector and dc power jack are installed on the bottom section. Specific hardware and fasteners, some metric and some non-metric, are required for each item to be mounted. Refer to the parts lists (section 5) and drawings (section 6).

Brass hex spacers are used to mount the PCBs. An example of the spacer nomenclature is *M3x10x6 M-F threaded spacer*. This means the spacer has male (M) and female (F) sections, 3 mm threads, the spacer body is 10 mm long and the threaded male portion of the spacer is 6 mm long. The drawings show the proper orientation of the spacers. To prevent cracking the plastic enclosure, do not over-tighten the fasteners.

## 2.0 Bottom section

2.1  Before installation, remove all cables and the pluggable connectors XP1 and XP2 from the main controller PCB. Install the (3) M3x10x6 M-F threaded spacers and 3 mm hardware on the bottom of the PCB; refer to drawings. Place the PCB in the enclosure and fasten with (3) M3 machine screws. Note that connectors X1 and X2 slip through the slot on the enclosure bottom section. Do not fully tighten the hardware until the PCB is in position and then only tighten until snug.

2.2  Two types of DB-9M connectors are supplied with the SAM-III kit, one without captive nuts and one with captive nuts. Mount the DB-9M connector with captive nuts in the oblong hole from the inside of the enclosure using (2) 4-40 jack screws; do not use any washers or nuts. Mount the DB-9M connector without captive nuts from the outside using (2) 4-40 jack screws; place the washers as shown in the drawings. The mating DB-9F connector on the cable should connect with a snug fit; if it seems loose, remove the two flat washers from the jackscrews on the outside of the enclosure. Center the connector in the cutout and then tighten the hardware.

2.3  Mount the dc coaxial power jack in the 10 mm diameter hole with the included split lock washer and nut. To prevent damage, do not use pliers to hold the power jack while tightening the nut. Grip the jack with fingers and tighten the nut with a wrench.

Optional: To prevent the nut from loosening, it may be permanently secured by using either one but not both of the following methods:

- a. Before installing the nut, put a tiny drop of thread-lock or fingernail polish on the first two threads exposed on the outside of the enclosure. Do not put thread-lock or fingernail polish on the connector threads that are exposed after the nut is in-place and do not allow it to seep into the jack. Install the nut as described above. Do not disturb or connect to the power jack until the glue has fully cured (24 hours);
- b. After installing and tightening the nut, place a tiny drop of superglue where the nut meets the jack threads. Be very careful that the glue does not seep into the jack. Do not disturb or connect to the power jack until the glue has fully cured (24 hours).

2.4  Clean the outside-bottom corners of the enclosure bottom section with a lint-free cloth and 90% alcohol. After the alcohol has evaporated, install the four self-adhesive rubber feet.

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### 3.0 Top section

3.1  Mount the liquid crystal display PCB. First place (4) M2.5x14 machine screws through the holes in the enclosure top section, then thread (4) M2.5x4 F-F hex spacers onto the screws; refer to the drawings. The screws will protrude beyond the spacers several mm. Do not fully tighten the hardware (finger-tight only). Install the LCD PCB from the inside of the enclosure and fasten with (4) M2.5 hex nuts and internal star washers. The LCD connector should be closest to the end of the top section opposite the keyboard holes. The display itself will protrude slightly through the top section.

3.2  Mount the keyboard PCB. First place (2) M3x14 machine screws through the holes in the enclosure top section, then thread the (2) M3x4 F-F hex spacers onto the screws; refer to the drawings. The screws will protrude beyond the spacers several mm. Do not fully tighten the hardware (finger-tight only). Install the keyboard PCB from the inside of the enclosure. Carefully align the keyboard pushbuttons and LED with their respective holes and fasten with (2) M3 hex nuts and internal star washers; be careful that the LED is inserted properly in its hole and is not bent over or crushed.

3.3  After loosely mounting the LCD and keyboard PCBs as described above, carefully center them in the cutouts and tighten the fasteners from both sides. Do not overtighten.

3.4  Clean the slightly depressed area on the enclosure top section next to the keyboard pushbuttons with a lint-free cloth and 90% alcohol; refer to the drawings for location. After the alcohol has evaporated, install the self-adhesive keyboard label by very carefully aligning it with the corners of the slightly depressed area.

### 4.0 Assemble the top to the bottom section

4.1  Connect the cables from the DB-9M connector to the PCB JP1 header and from the dc power jack to the PCB power header.

4.2  Install the rubber seal in the top section grooves; note that the seal is preformed to fit.

4.3  Install the two ribbon cables in their respective sockets on the main controller PCB and then to the keyboard and LCD PCBs.

4.4  Place the top section on the workbench and install the captivating screws, one in each corner. Note that the captivating screws have threads on the lower part only and the unthreaded part between the threads and screw head is slightly smaller in diameter. Install a screw in each corner of the top section by threading into the plastic until the screw turns freely.

Now place the top section on the bottom section and carefully tighten the four mounting screws. The top section can be oriented so the external connectors are facing either end with respect to the display. When the display is directly over the main controller PCB, a 150 mm long display ribbon cable may be used. If the cover is rotated 180° so that the display is at the other end, a 175 mm long display ribbon cable is required. A 150 mm long keyboard ribbon cable may be used in either orientation. Prior to September 2021, all SAM-III kits were supplied with a 150 mm ribbon cable for the display, but later kits are supplied with a 175 mm cable.

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### 5.0 Required parts (\* indicates parts supplied with enclosure option BEN-1)

Application	Qty	Description
Enclosure	1	Box BEN-70P enclosure, predrilled and cut, includes the following: *
<input type="checkbox"/>	1	Top section *
<input type="checkbox"/>	1	Bottom section *
<input type="checkbox"/>	4	Pan head machine screw, captivating *
<input type="checkbox"/>	1	Rubber seal *
<input type="checkbox"/>	4	Rubber feet, self-adhesive *
<input type="checkbox"/>	1	Keyboard label, self-adhesive *
Main controller PCB	1	Main controller PCB (supplied with SAM-III kit)
<input type="checkbox"/>	3	M3 x 8 pan head machine screw *
<input type="checkbox"/>	3	M3 hex nut *
<input type="checkbox"/>	3	M3 internal star washer *
<input type="checkbox"/>	3	M3 x 10 x 6 M-F hex spacer *
Keyboard PCB	1	Keyboard printed circuit board (supplied with SAM-III kit)
<input type="checkbox"/>	2	M3 x 14 pan head machine screw *
<input type="checkbox"/>	2	M3 hex nut *
<input type="checkbox"/>	2	M3 internal star washer *
<input type="checkbox"/>	2	M3 x 4 F-F hex spacer *
LCD PCB	1	LCD with 34-pin connector (supplied with SAM-III kit)
<input type="checkbox"/>	4	M2.5 x 14 pan head machine screw *
<input type="checkbox"/>	4	M2.5 hex nut *
<input type="checkbox"/>	4	M2.5 internal star washer *
<input type="checkbox"/>	4	M2.5 x 4 F-F hex spacer *
DB-9M connector	1	DB-9M connector and cable assembly (supplied with SAM-III kit)
<input type="checkbox"/>	2	4-40 x 0.187 x 0.375 jack screw (M-F hex spacer) *
<input type="checkbox"/>	4	No. 4 flat washer *
<input type="checkbox"/>	2	No. 4 split lock washer *
<input type="checkbox"/>	2	4-40 hex nut *
DC power Jack	1	DC power jack and cable assembly (supplied with SAM-III kit)
<input type="checkbox"/>	1	10 mm hex nut (part of power jack)
<input type="checkbox"/>	1	10 mm split lock washer (part of power jack)

**Notes:**

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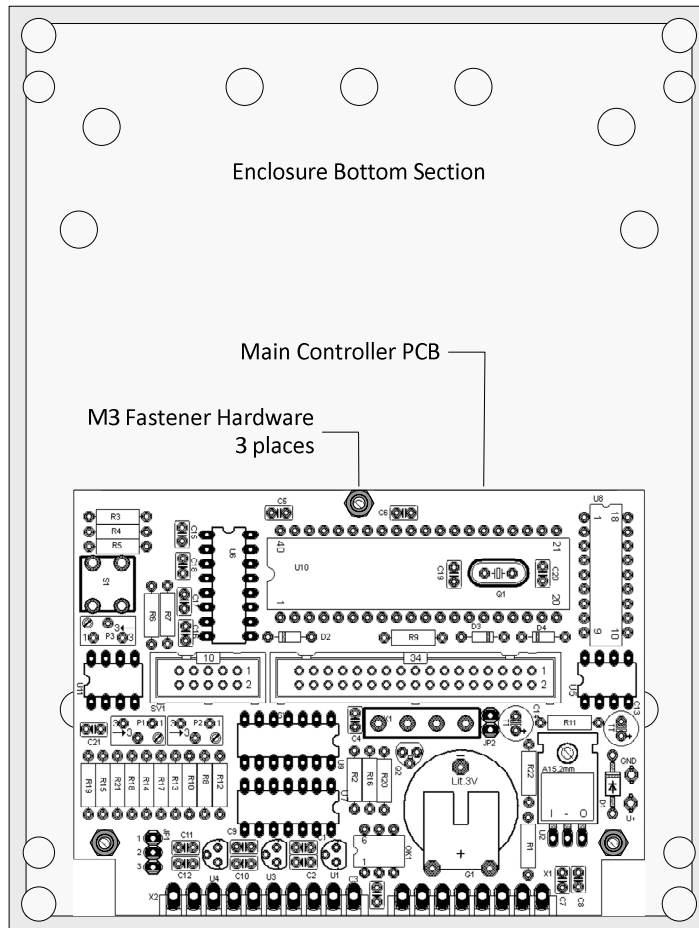
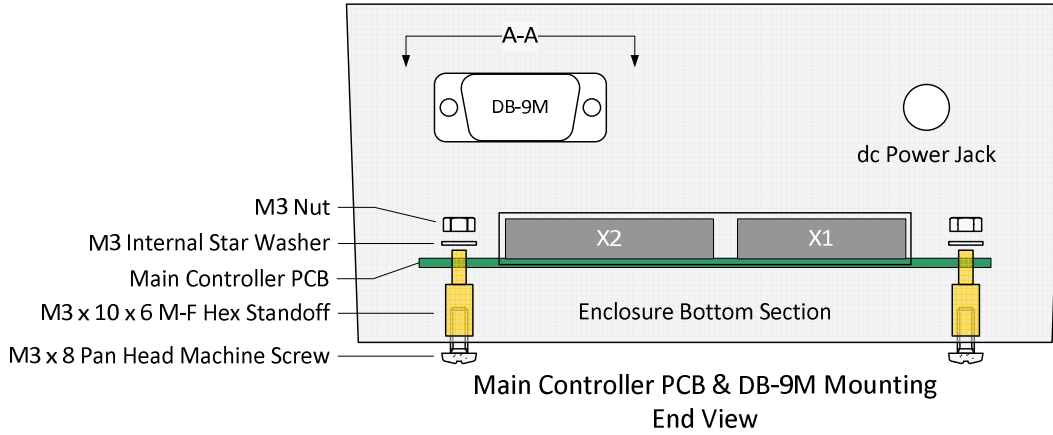
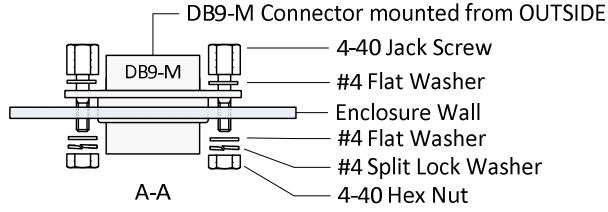
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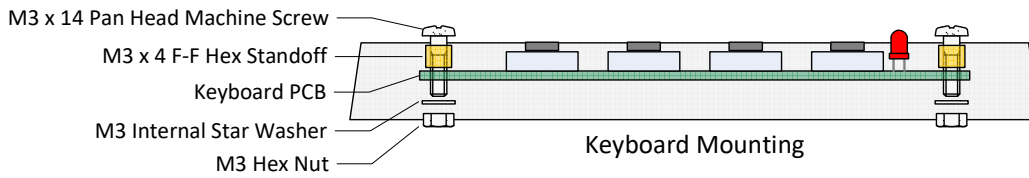
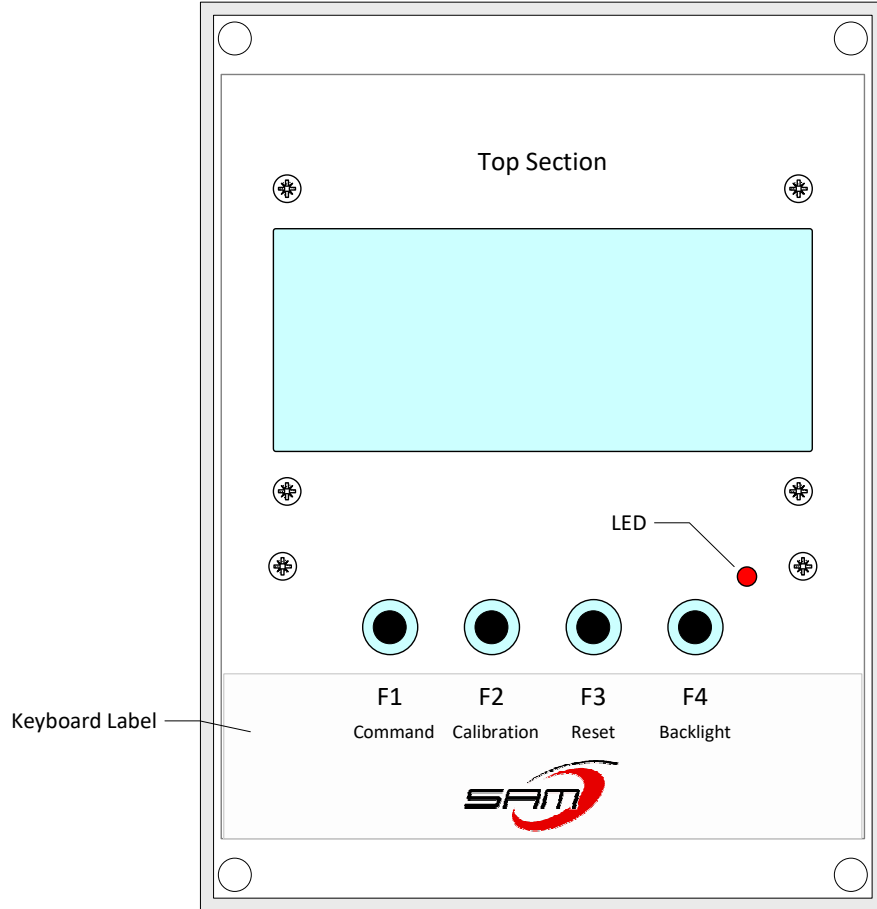
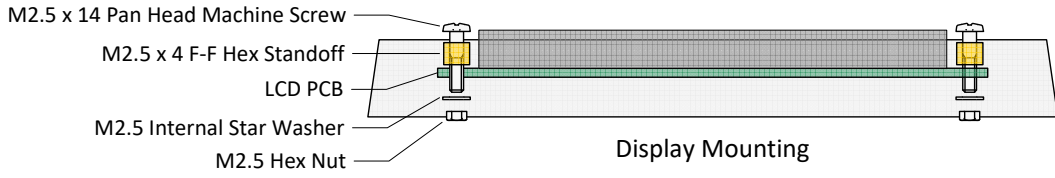
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## 6.0 Drawings



Main Controller PCB Mounting  
Top View

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### **Document Information**

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0.4 (Revised DB-9M installation procedures, 22 Jul 2022)

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