TB8100 base station

Modifying the AC Boost Converter on a TB8100 PMU

Technical Note TN-804
1 October 2003

Confidentiality

Applicability

This Technical Note applies to TB8100 power management units (PMUs) fitted with an AC module (product code TBA30AXX-XXXX), and with the serial number 18002512 or lower.

Note Some PMUs with the serial number 18002512 or lower will have been modified at the factory. These PMUs will have a label stating "Modified To TN-804" fixed to the rear panel (refer to Figure 4).

Introduction

There is a possibility that a component on the AC converter PCB may fail when the PMU is powered up. This Technical Note explains why this might happen, and describes the modifications needed to prevent it from happening.

Description

Problem

When AC mains power is applied to the PMU, the input can be connected to an instantaneous peak voltage of up to 370 VDC (depending on the mains cycle when the PMU is connected). This voltage could cause a high current surge, due to the bulk storage capacitor, but is prevented from doing so by a series resistor, which allows the capacitor to charge up slowly.

However, the main switching FET (Q305/Q306) of the boost converter still receives this instantaneous peak voltage. Because of the drain gate capacitance of the FET, the gate of the FET is pulled to about 3 V during this time, until the capacitors are charged. The gate threshold voltage of this FET is between 2 V and 4 V. This unwanted voltage on the gate of the FET can cause an uncontrolled switching-on of the FET, which will result in failure of the device.

All this happens before the control circuitry is powered up and can take active control over the FET. The risk is only when connecting the PMU to the AC mains input. After that, it is under the full protection of the control circuitry.

Solution

To keep the gate voltage low during this time, an improved high gain transistor gate drive circuit has been developed. This modification will be incorporated into the PCB layout in future production PMUs, but can also be fitted to existing PMUs.

A modified BD139 transistor sub-assembly has been prepared, which is fitted in place of the original BD139 (Q304). This sub-assembly consists of a BD139 transistor, a BC327 transistor, a 47Ω resistor, and a 220Ω resistor. R336 is also changed from 15k to 2k2. Refer to Figure 5 for details of the modifications to the circuit.

Note If the PMU is in service and not being switched off and on regularly, you may decide you don't need to perform this modification. If you are unsure about the need to perform the modification, contact Technical Support for further assistance.

Safety

Warning!! **The PMU contains voltages that may be lethal. Refer to the ratings label on the rear of the module.**

Disconnect the mains IEC connector and wait for five minutes for the internal voltages to self-discharge before dismantling.

The AC power on/off switch does **not** isolate the PMU from the mains. It breaks only the phase circuit, not the neutral.

The PMU should be serviced only by qualified technicians. All servicing should be carried out only when the PMU is powered through a mains isolating transformer of sufficient rating. We **strongly recommend** that the mains power to the whole of the repair and test area is supplied via an earth leakage circuit breaker.

Caution **The magnetics in the PMU get hot when they are operating. Take care when working on a PMU that has been in recent use.**

Caution **The PMU can weigh up to 6.4kg (14.1lb). Take care when handling the PMU to avoid personal injury.**

Important This equipment contains devices which are susceptible to damage from static charges. Refer to "ESD Precautions" in the TB8100 Installation and Operation Manual for more information on antistatic procedures when handling these devices.

Parts Required

You will be supplied with a kit of parts containing the items listed below. Each kit contains the parts to modify one PMU.

Description	IPN	Quantity
modified BD139 transistor sub-assembly	none	1
Res Flm 4x1.6 2k2 5% 0.4w	030-54220-20	1
"Modified to TN-804" label	none	1

Tools Required

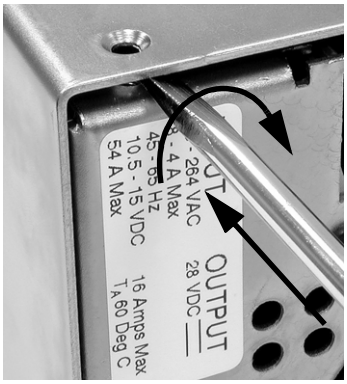
- Torx T10 screwdriver
- flat-blade screwdriver
- card remover (IPN 220-02034-01)
- soldering iron
- solder

Important We **strongly recommend** that you use the TB8100 card remover, as shown in Figure 1. A flat-blade screwdriver may reach too far through the slot and damage the components on the card.

Method

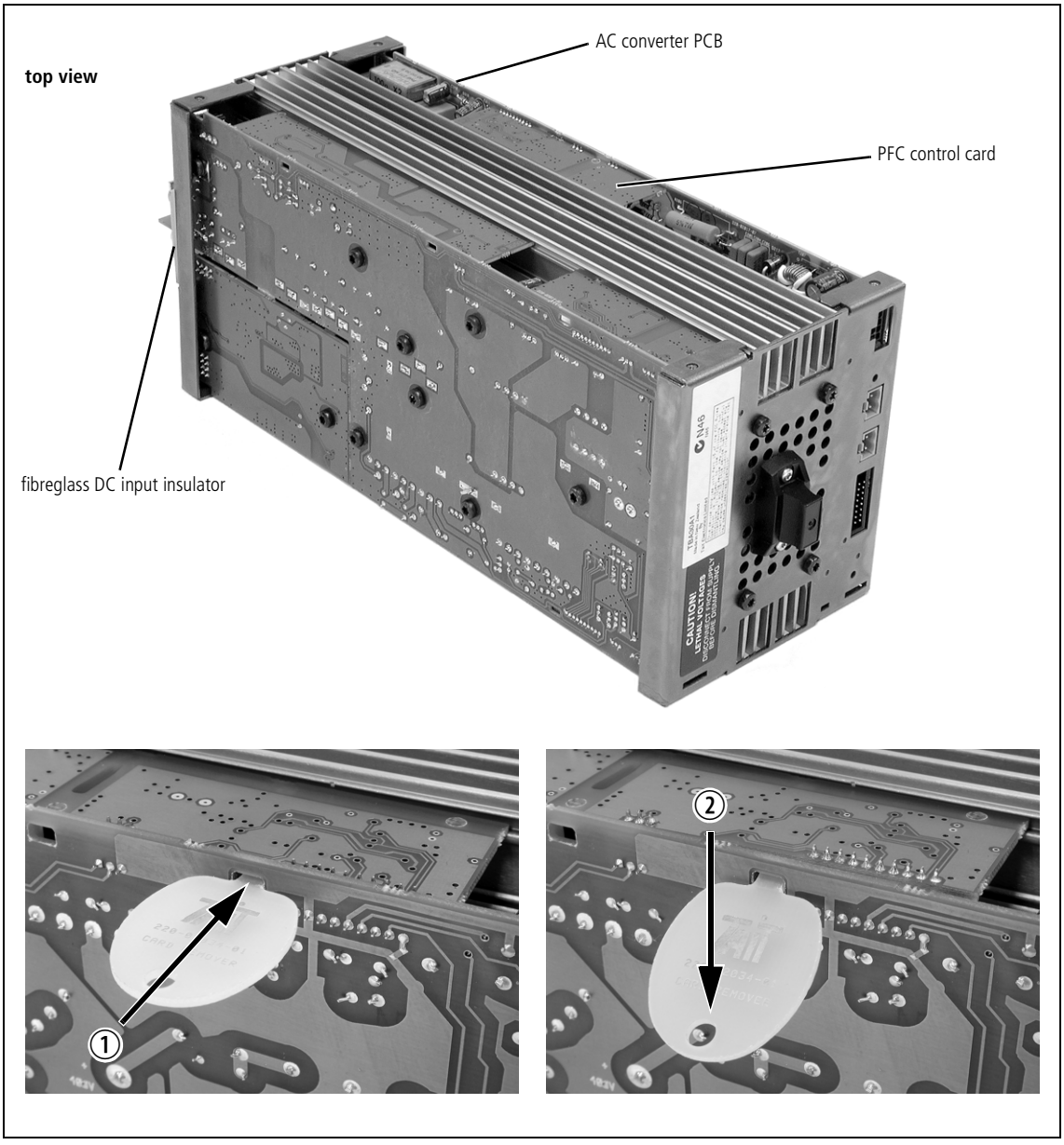
1. Remove the four M3 Torx screws securing the top cover to the front and rear panels. Lift off the top cover.

Note If the top cover is difficult to move, we suggest you lift one end of the cover away from the end panel with a flat-blade screwdriver. The cover should then be loose enough to lift off.



2. Remove the PFC control card, as shown in Figure 1.
   a. Insert the card remover into the slot in the AC converter PCB ① and push down ② to lift the nearest plug out of its socket.
   b. Repeat this procedure at the other end of the card.
   c. When both plugs are free of their sockets, slide the card out from the groove in the heatsink.

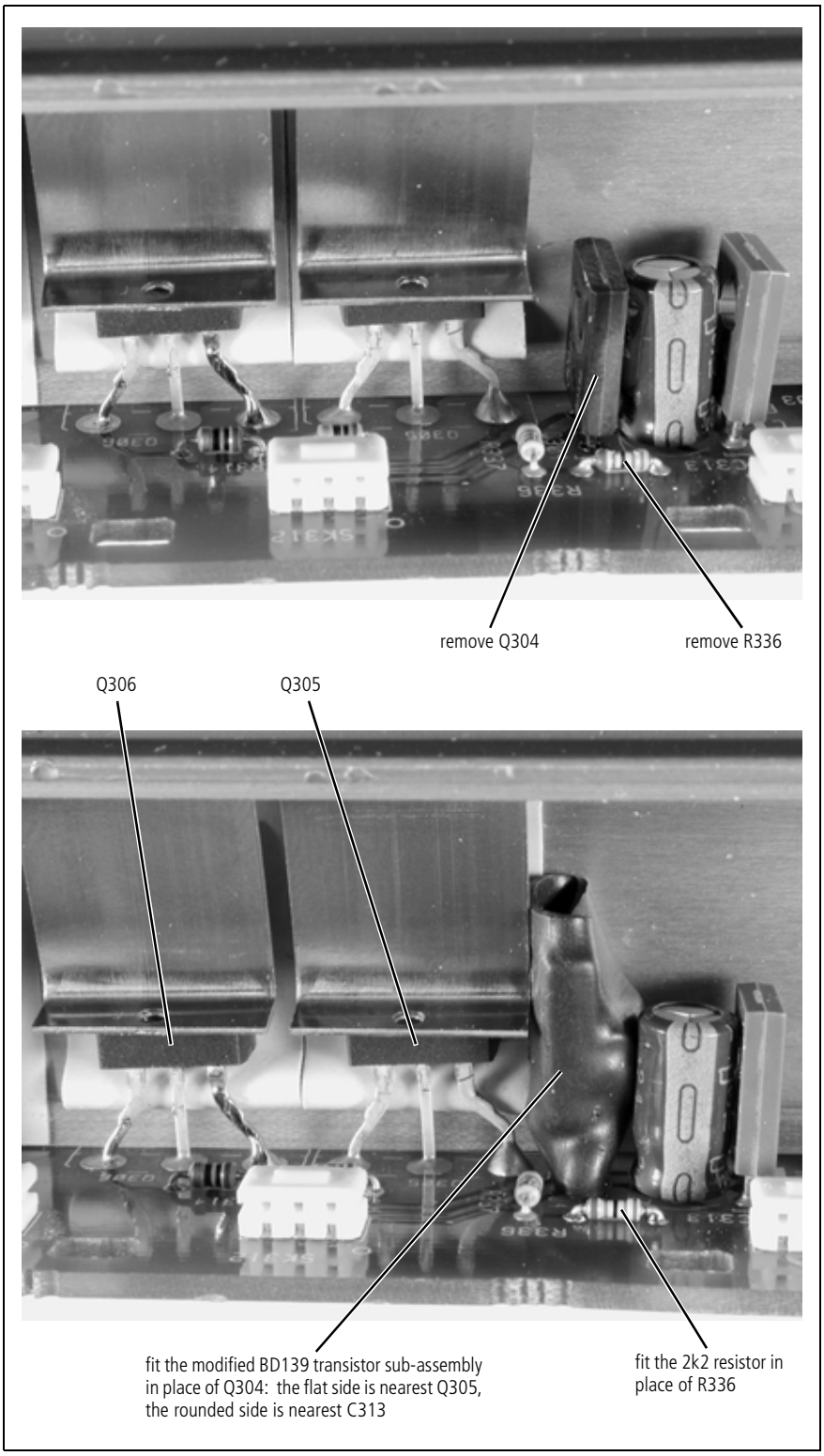
Figure 1 Removing the PFC Control Card



3. Remove Q304 and R336 from the AC converter PCB, as shown in Figure 2.

4. Fit the modified BD139 transistor sub-assembly in place of Q304, with the correct orientation, as shown in Figure 2.

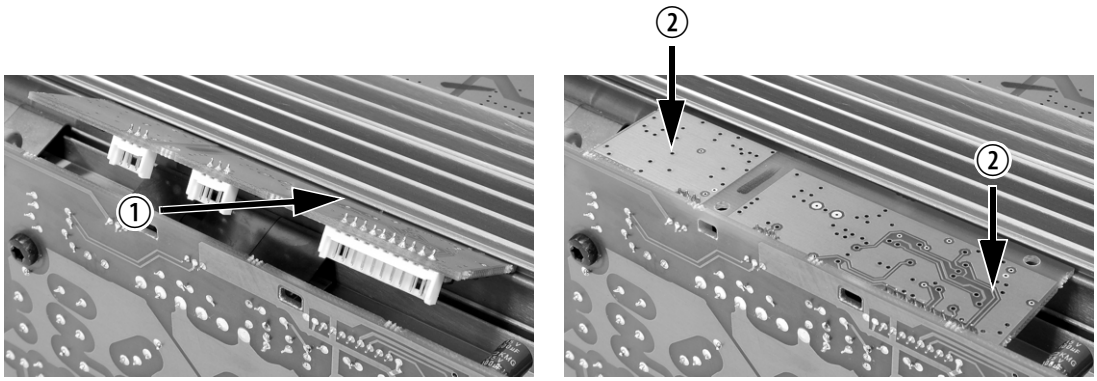
Figure 2 Replacing Q304 and R336



5. Fit the 2k2 resistor in place of R336, as shown in Figure 2.

6. Refit the PFC control card, as shown in Figure 3.
   a. Insert the top of the card into the groove in the heatsink ①.
   b. Align the plugs on the card with their matching sockets on the AC converter PCB.
   c. Press the card down firmly at each end ② so that each plug fits correctly into its matching socket. There should be an audible "click" when each plug is fully inserted.

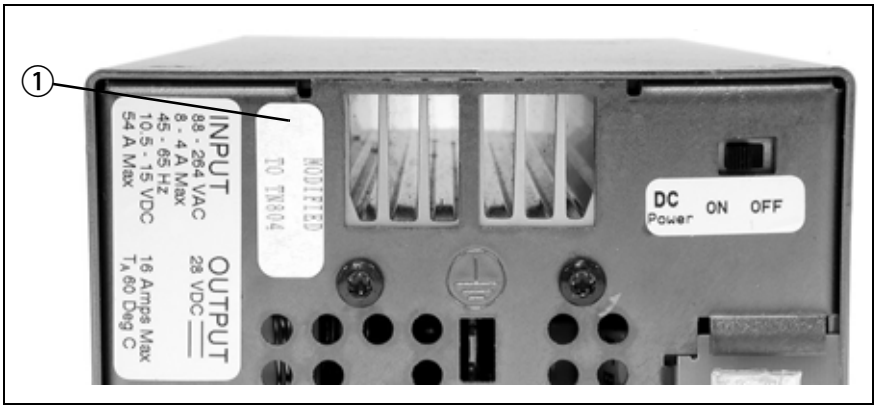
Figure 3 Replacing the PFC Control Card



7. Refit the top cover.
   a. Align the top cover over the front and rear panels. Carefully slide the cover down until the locating tabs engage with the bottom cover. Ensure that the fibreglass DC input insulator (refer to Figure 1) sits inside the top cover.
   b. Push the top cover down firmly and secure with the four M3 Torx screws.

8. Stick the "Modified to TN-804" label ① onto the rear panel to indicate that the PMU has been modified, as shown in Figure 4.

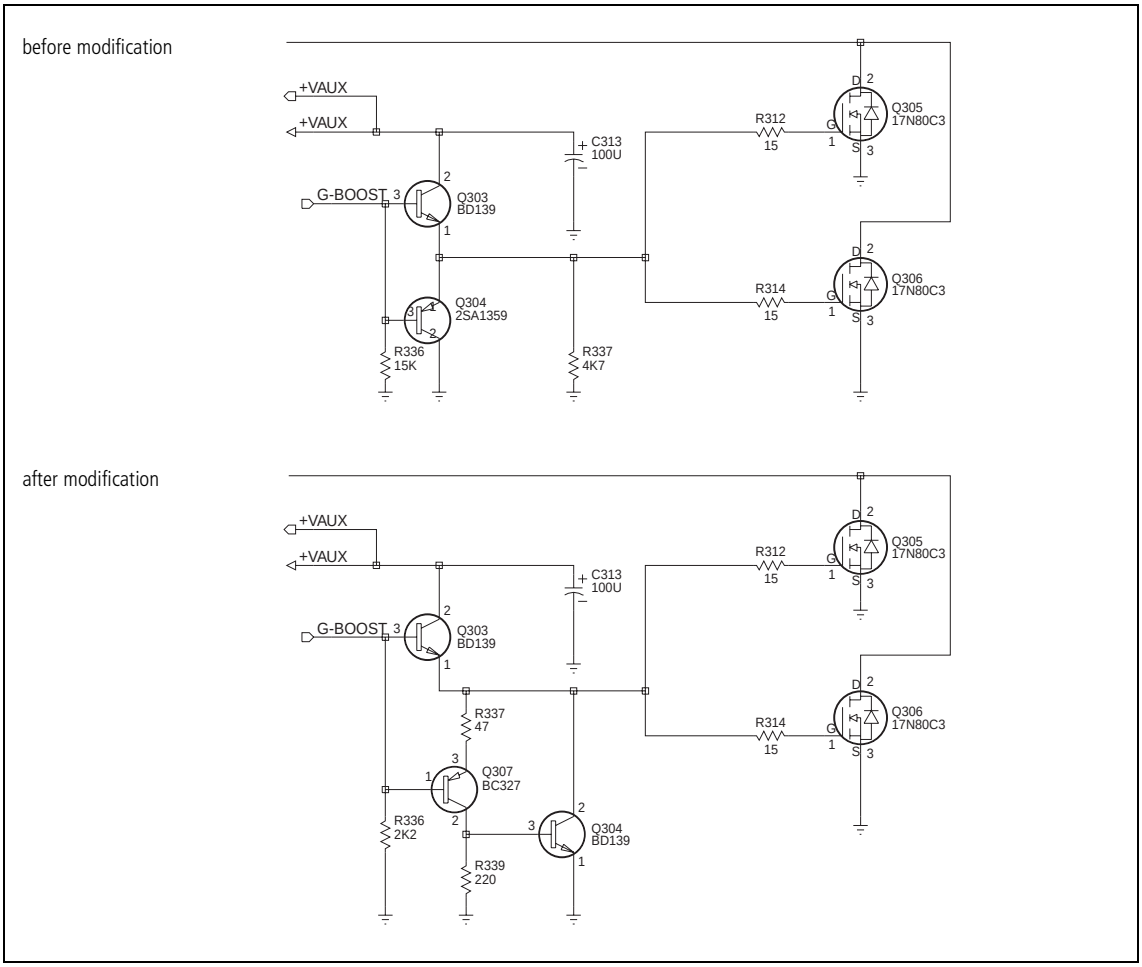
Figure 4 Positioning the Modification Label



Modifications to the Circuit

Figure 5 below shows the AC converter circuit before and after these modifications.

Figure 5 Modifications to the Circuit



Identifying the Fault

If you have a PMU which is not working, carry out the following checks to identify if the problem is the one described in this TN.

1. Check the fuse on the AC converter PCB.

2. If the fuse has blown, check Q305 and Q306 on the AC converter PCB (refer to Figure 2).

3. If Q305 or Q306 is damaged (i.e. low impedance), replace with IPN 000-00040-20. You must use this part, and not an equivalent device.

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Tait Contact Information

Corporate Head Office New Zealand

Tait Electronics Ltd, P.O. Box 1645, Christchurch, New Zealand
E-mail (Marketing): taitnet@taitworld.com
E-mail (Sales): sales@taitworld.com

Technical Support

Technical Support Manager
Tait Electronics Ltd, P.O. Box 1645, Christchurch, New Zealand
E-mail: support@taitworld.com

Internet

http://www.taitworld.com