

# **T809 Power Supply Service Manual**

**Issue 1**

**March 2003**

**M809-00-001-812**

## About This Manual

<b>Scope</b>	This manual contains general and technical information on the T809 power supply.
<b>Format</b>	This manual is published as a booklet that can be inserted into the T800 Series II Ancillary Equipment Service Manual ring binder.
<b>Updated Issues</b>	If this manual becomes outdated, a new issue will be released.
<b>Errors</b>	If you find an error in this manual, or have a suggestion on how it might be improved, please do not hesitate to contact Customer Support (contact details are on <a href="#">page 20</a> ).

## Technical Information

If further information is required about the T809 Power Supply or this Manual, it may be obtained from your nearest Tait Dealer or Customer Service Organisation. Further technical assistance may be obtained from Customer Support (contact details are on [page 20](#)).

## Updating Equipment And Manuals

In the interests of improving performance, reliability or servicing, Tait Electronics Ltd reserve the right to update their equipment and/or manuals without prior notice.

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You can order additional copies of this service manual from your nearest Tait Dealer or Customer Service Organisation. When ordering, make sure you quote the correct Tait product code ("M" number). Note that only the latest issue of the manual will be available for order.

## Publication Information

T809 Power Supply Service Manual		
Issue	Publication Date	Product Code
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# 1 General Information

This section provides a brief description of the T809 Switch Mode Power Supply, as well as detailed specifications.

## 1.1 Introduction

The T809 is a switching power supply capable of supplying 13.8V DC at up to 14.5A when operated from a 230V mains supply, or 8.5A when operated from a 110V mains supply.

The T809 power supply is designed as a low-tier replacement for the T807, to power T800 series base stations. Specifically, the T809 will power 25W base stations.

Electromagnetic compatibility (EMC) and operator safety are both important and critical parameters for the trouble free functioning of a switching power supply. Refer to [Section 1.2.3 \(EMC Conformity\)](#) and [Section 1.2.4 \(Safety Approvals\)](#) for specifications.

The T809 is protected against damage caused by faults in the line or load, or by temperature variations (refer to [Section 1.2](#) for specifications). The protection features include:

- Short circuit protection.
- Overload protection.
- Over voltage protection.
- Over temperature protection.

A T809 may be housed together with other Tait fixed equipment modules in a standard 484mm (19") rack frame, where it occupies the space of one standard 60mm module.



**Caution:** To prevent the T809 equipment from overheating, do not exceed the rated current.

## 1.2 Specifications

### 1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment operating at standard room temperature (+22°C to +28°C).

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

### 1.2.2 General

Basic Power Supply Concept	..	switched mode technology pulse width modulation
Overtemperature Protection	..	shuts down when PC Board temperature rises above 95°C ±5°C
Cooling	..	convection and forced air (fan)
Power LED:		
Mains supply switched on	..	Power LED glows
Mains supply not connected	..	Power LED is off
Efficiency	..	80%, full load
Temperature Range	..	-10°C to +40°C
Isolation:		
Input to Output	..	3000V AC, 1 minute
Input to Ground/Chassis	..	1500V AC, 1 minute
Output to Ground/Chassis	..	500V AC, 1 minute
Dimensions:		
Height	..	183mm
Width	..	60mm
Length	..	330mm
Weight	..	2.1 kg

### 1.2.3 EMC Conformity



All equipment bearing the logo shown left, conforms with EEC EMC Directive 89/336 and is in accordance with the requirements of ETS 301 489.

### 1.2.4 Safety Approvals

This equipment complies with IEC950, EN60950 & AS3260.

**Note:** Refer to [Section 6.1.3](#) for *cabinet requirements* regarding the above safety specification.

### 1.2.5 AC Mains Input

Voltage:	.. 200V to 264V AC or 95V to 130V AC, 50/60Hz
AC Input Current	.. 1.4A maximum (230V at full load)
Maximum Inrush Current	.. 40A maximum (230V at full load)
Connection to mains supply	.. IEC plug on rear panel
Power Factor at full load:	
230V AC supply	.. >0.95
115V AC supply	.. >0.98

**Note:** Exact power factor depends on impedance of mains supply.

## 1.2.6 Output

Output Voltage .. 13.8V DC

**Note:** A drop of up to 0.5V may be expected across the wiring from the power supply to the load.

Voltage Regulation ..  $\pm 0.5\%$

Current:  
(Continuous Operation Up To +40°C)

230V AC supply .. 0A to 14.5A DC

115V AC supply .. 0A to 8.5A DC

Output Overvoltage Protection .. 14.8V to 18.2V

Output Hum & Noise .. <100mV pp  
(At full load, with mains supply voltage = 230V)

Current Overload Limit .. 15.6A to 22.4A

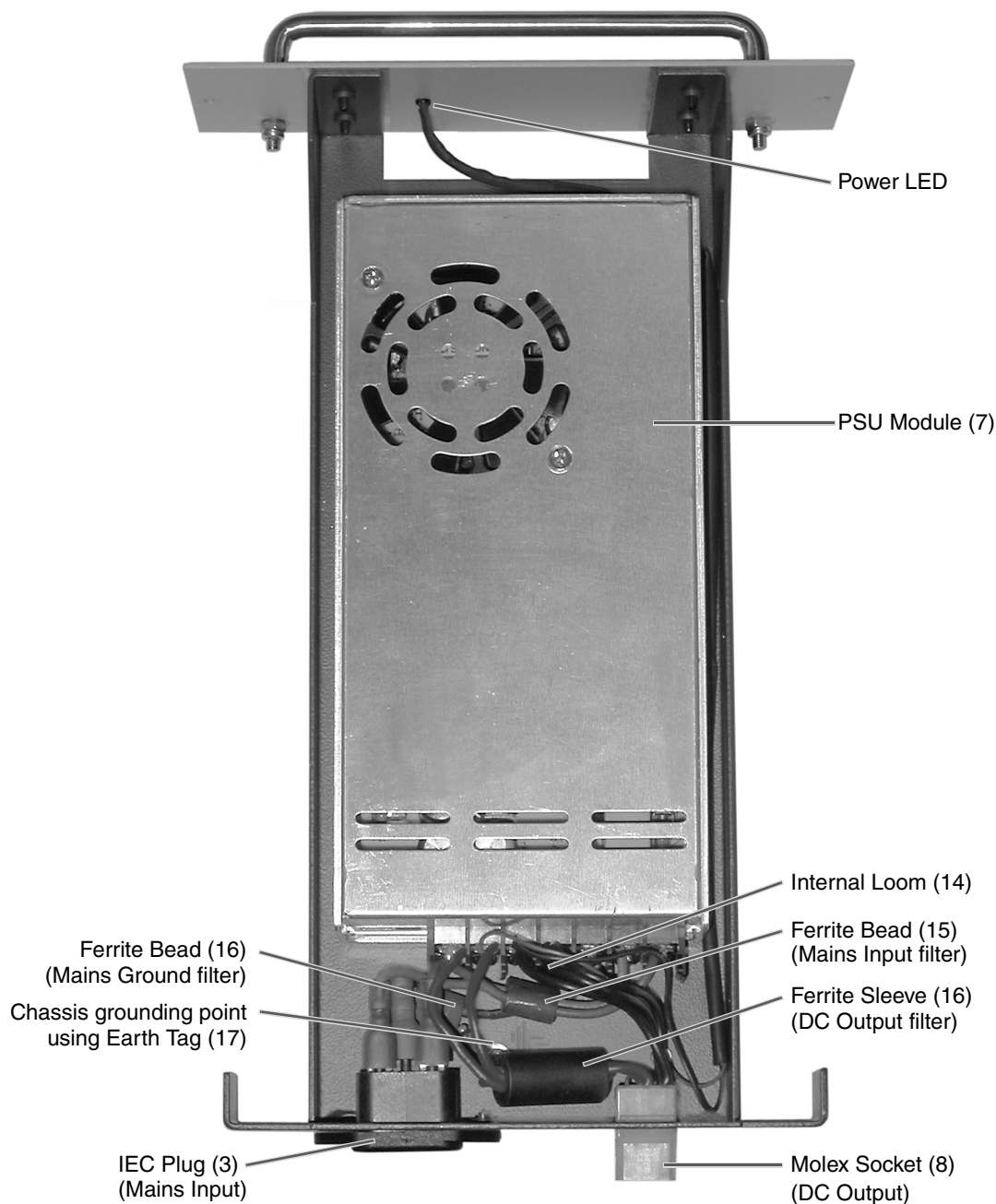
Output Connector .. Molex 6-way receptacle

**Note:** Refer to [Figure 3.1](#) in [Section 3.2](#) for the output connector pinouts.

## 2 Power Supply Description

### 2.1 Introduction

The T809 power supply consists of a Power Supply Unit (PSU) Module, connectors, ferrite filters and a power indicator Light Emitting Diode (LED). These components are shown in the photograph in Figure 2.1 below.



**Figure 2.1** T809 internal view. The numbers shown in brackets correspond to the item numbers in the Parts List on [page 19](#).



## 2.2 Functional Description

### 2.2.1 PSU Module

The PSU module used in the T809 power supply has over temperature, current overload and overvoltage protection. Refer to [Section 1.2](#) for specification details.

Overvoltage applied on the module's output will cause the module to shutdown. To reset the module, remove the mains supply to the T809, allow 30 seconds for charges to leak away, and then reconnect the T809.

The module is protected from current overload by a voltage foldback method. If the load on the output starts drawing more current than the specified maximum, the voltage will start dropping away. This condition will recover automatically when the load is removed or returns to normal.

Over temperature will cause the module to shutdown. It will recover automatically when it has cooled down to an acceptable operational temperature.



**Caution:** Correct mounting of the T809 power supply is important: Refer to [Section 3.4 \(Equipment Cooling\)](#) for ventilation guidelines. Ignoring these conditions may cause the module to overheat, and consequently, to shut down.

### 2.2.2 Internal Loom

Mains power to the PSU module is supplied via an IEC plug on the rear panel and then filtered by a Ferrite bead (shown in [Figure 2.1](#)). The mains ground line is filtered by a Ferrite bead and then connected to the T809 chassis and to the PSU module's floating ground contact.

The PSU module's output is filtered by a Ferrite sleeve and then interfaces to the rack via a Molex connector on the T809 rear panel.

For the wiring diagram, turn to [page 18](#).

### 2.2.3 Power LED

A single Power LED on the T809 front panel indicates the power supply status.

When the power supply is on, the Power LED will illuminate. A bright light will mean that the T809 is operating normally and within its operational conditions. A faint light indicates that the PSU module has entered current overload protection mode.

If the LED is off, it means that the power supply is either not switched on, or that it has shutdown due to over voltage or over temperature.

## 3 Installation Guidelines

The following section gives a brief description of the basic rack mounting and wiring procedures.

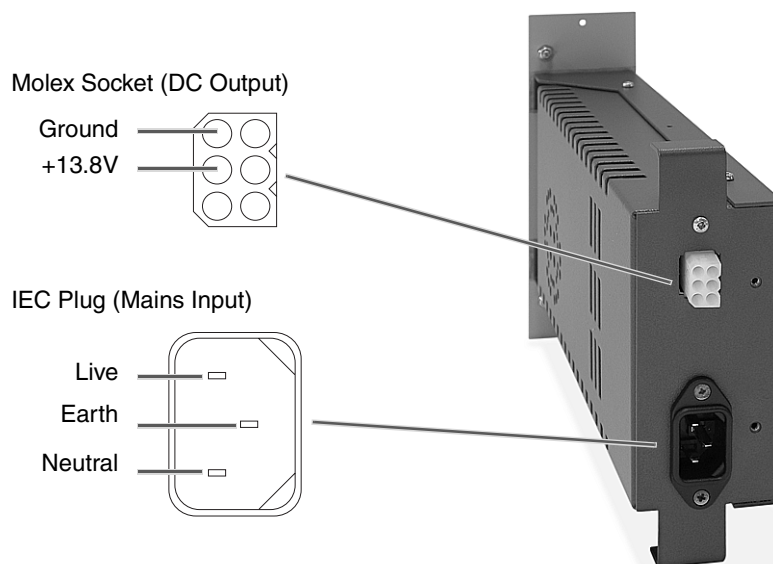
### 3.1 General

The DC output wiring must be of sufficient gauge to carry the current required without excessive voltage drops, i.e. less than 0.5V in total. The minimum recommended wire size is 2.0mm (e.g. 152/153 auto cable) for a 15A rated output current.

Use only an IEC type connector for normal mains input wiring and ensure that this wiring has a current rating of at least 5A.

### 3.2 Connector Pinouts

The pinouts for the AC mains input connector and the DC output connector are shown in Figure 3.1 below.



**Figure 3.1 Connector Pinouts on the T809 rear panel.**

### 3.3 Rack Mounting

The T809 is designed for use in a standard 483mm rack frame using the supporting guide rails supplied with the unit.



**Caution:** Do not install this unit with any other type of guide rail, as this may prevent adequate ventilation through and past the unit.

The guide rails are located in the rack frame with three screws, two at the rear and one at the front. The unit is secured into the guide with two front panel mounting screws.

### 3.4 Equipment Cooling

Although the T809 is a high efficiency switching power supply, a considerable amount of heat is generated during normal operation. An adequate flow of cooling air is therefore essential for reliable operation.



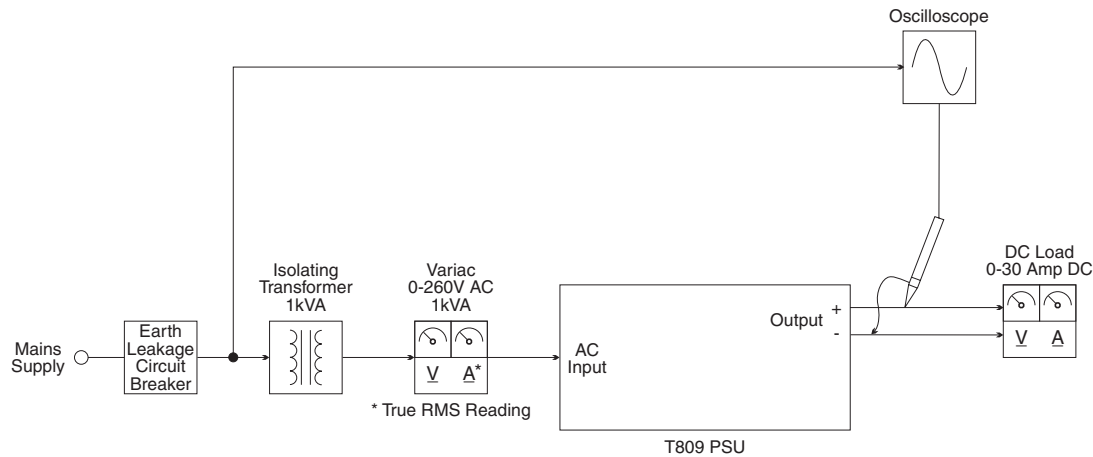
**Caution:** Do not operate this unit in a completely enclosed cabinet.

It is estimated that the average life expectancy of this unit will double with every 10°C drop in ambient temperature. It is therefore recommended to:

- Keep the ambient temperature low.
- Ensure that airflow is not restricted.

## 4 Functional Testing

The following test procedures will confirm that the T809 has been set up and adjusted correctly and is fully operational. Refer to Figure 4.1 for test equipment details.



**Figure 4.1** Test equipment setup

### 4.1 Basic Operation

To confirm the basic operation of the power supply, proceed as follows.

- Ensure that the main supply to the T809 is switched off. Set up the test equipment as shown in [Figure 4.1](#).
- Set the output DC load to maximum resistance/minimum current.
- Connect the T809 to the mains supply and switch it on. The Power LED should now illuminate.
- Vary the DC load and check that the output voltage and current are within the specifications (refer to [Section 1.2.4](#)).

### 4.2 Output Current Overload

To confirm the operation of the current overload protection circuitry, proceed as follows.

- Ensure that the main supply to the T809 is switched off. Set up the test equipment as shown in [Figure 4.1](#).
- Set the output DC load to draw approximately 11A.
- Switch on the mains supply and slowly decrease the load resistance, thereby increasing the current until voltage foldback occurs. The current should not rise above the Current Overload Limit (refer to [Section 1.2.6](#)), but voltage should drop away and the LED's intensity should decrease.

## 4.3 Output Noise

To check that output noise is within specification, proceed as follows.

- Ensure that the main supply to the T809 is switched off. Set up the test equipment as shown in [Figure 4.1](#). Connect the T809 to the mains supply and switch it on. The Power LED should now illuminate.
- Connect a digital voltmeter (e.g. Fluke 77) across the load terminals and set the meter to its lowest AC volts range.
- Check that the reading is less than 100mV AC under all load and line conditions.

**Note:** A *real* reading of the level of noise present on the output of a switching power supply is very difficult to obtain, as low noise levels, common mode noise paths and ground loops all lead to inaccurate measurement results. The procedure outlined above will, however, give a good indication of the output noise.

## 4.4 Overall Power Supply Stability

To check for overall PSU stability, proceed as follows.

- Ensure that the main supply to the T809 is switched off. Set up the test equipment as shown in [Figure 4.1](#). Connect the T809 to the mains supply and switch it on. The Power LED should now illuminate.
- Connect the oscilloscope across the output.
- Vary the mains voltage and DC load over the full specified range (refer to [Section 1.2](#)).
- Check on the oscilloscope that no oscillations occur.

## 5 Troubleshooting

The following is a list of possible power supply fault symptoms and possible causes.

Symptoms		Possible Causes and their Solutions	
1.	<ul style="list-style-type: none"> <li>• LED does not light up</li> <li>• No output voltage</li> </ul>	Mains supply not present or too low	Check and rectify mains supply
		Equipment has overheated and thermal cut-out has operated	See Symptom 3 below
		Defective switching circuitry	Replace module & return faulty module for servicing
2.	<ul style="list-style-type: none"> <li>• Output voltage below specification</li> <li>• LED lights up but the intensity is low</li> </ul>	Mains supply is too low	Check and correct mains supply problem
		Current overload protection is active	Check for possible causes, i.e. short-circuits
		Defective switching circuitry	Replace module or return faulty module for servicing
3.	<ul style="list-style-type: none"> <li>• Power Supply overheats</li> </ul>	Mains supply is too low	Check and correct mains supply problem
		Equipment cooling is inefficient due to incorrect installation of the T809	Refer to <a href="#">Section 3.4</a> for installation guidelines
		The T809 internal fan has failed	Replace module or return faulty module for servicing

## 6 Service Information

This section provides specific information on servicing procedures for the T809.

### 6.1 General



#### 6.1.1 Warning: Lethal Voltages

The T809 power supply contains voltages that may be lethal.

Disconnect the mains IEC connector and wait for 5 minutes for the internal voltages to drain away before dismantling.

Servicing should be carried out only by qualified technicians and should be attempted only when powered through a mains isolating transformer of sufficient rating. It is ***strongly recommended*** that the mains supply to the whole of the repair and test area is supplied via an ***earth leakage circuit breaker***.



#### 6.1.2 Caution: Ventilation

Always ensure there is adequate ventilation around this unit and ***do not*** operate it in a sealed cabinet. For more information, refer to [Section 3.4 \(Equipment Cooling\)](#).



#### 6.1.3 Caution: Cabinet Requirements To Meet Safety Specifications

In order to meet stringent safety obligations, it is imperative that the power supply is mounted in a cabinet which meets the requirements of IEC950. Specifically the top and sides of the cabinet must comply with one of the following:

- Holes must not exceed 5mm in any dimension, or
- holes must not exceed 1mm in width regardless of length, or
- side panels must be provided with louvres that are shaped to deflect outwards an external vertically falling object, or
- tops must be so constructed that direct, vertical entry of a falling object is prevented from reaching bare parts by means of a trap or restriction.

Additionally, for units mounted in a slimline configuration, the bottom of the cabinet must be constructed so as to contain any material emitted from the unit under fault conditions which could ignite the supporting surface. ***If in doubt, refer to IEC950 or your nearest approved Tait Dealer or Service Centre.***



### 6.1.4 Caution: Handle With Care

Although this is a lightweight unit, it contains a number of quite heavy and fragile individual components which are mounted directly on the PC Board. Severe mechanical shock may damage the PC Board (i.e. solder joints, copper tracks) and/or components (i.e. fragile ferrite magnetic materials).

### 6.1.5 Torx Recess Head Screws

Torx recess head screws are becoming the standard screw head type in all T800 Series II equipment, with Pozidriv and Philips recess head screws being used in fewer applications.

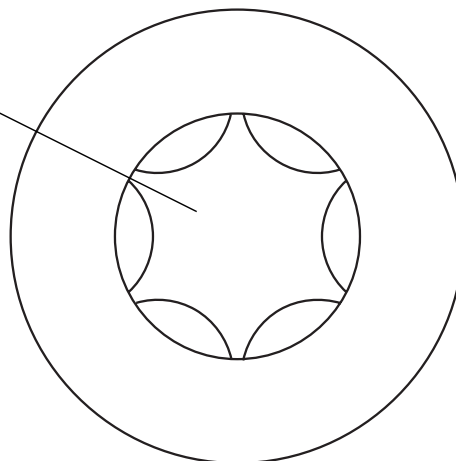
The Torx recess head has the advantage of improved screwdriver tip location, reducing the chances of screw head damage caused by the driver tip rotating within the recess. In addition, using a ball-tip Torx screwdriver allows you to drive a Torx head screw with the driver on a slight angle, which can be useful in situations where access is restricted.

It is important that you use the correct Torx screwdriver tip:

- M3 screws - T10
- M4 screws - T20.

Figure 6.1 below shows a typical Torx recess head screw (actual hardware may differ slightly from this illustration due to variations in manufacturing techniques).

"star" shaped recess with  
six internal notches



**Figure 6.1 Torx Screw Identification**



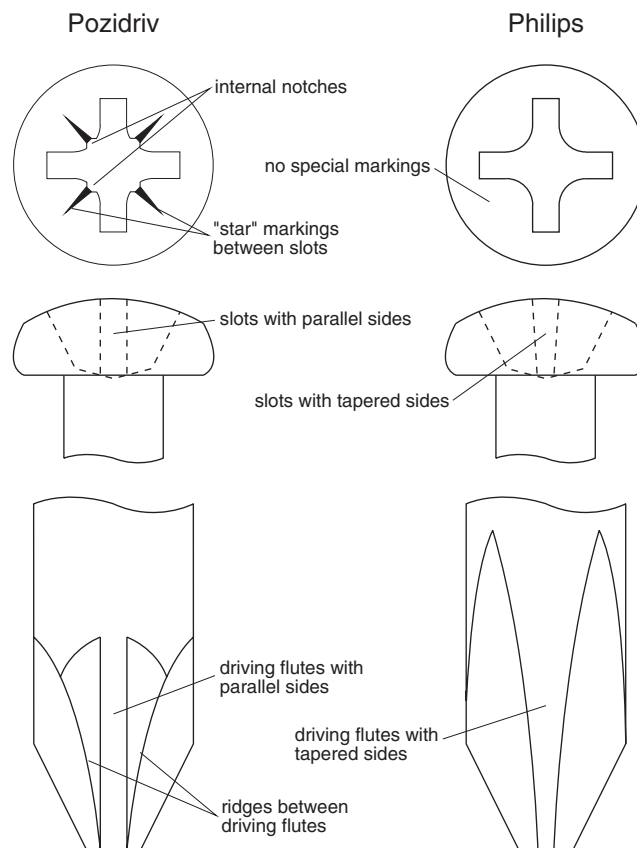
## 6.1.6 Pozidriv & Philips Recess Head Screws

Pozidriv and Philips recess head screws are used in the T809. It is important that you use the correct type and size screwdriver for each screw type to avoid damaging the screw head.

It is particularly important that you do not use Philips screwdrivers on Pozidriv screw heads, as the tapered driving flutes of the Philips screwdriver do not engage correctly with the parallel-sided slots in the Pozidriv screw head. This can result in considerable damage to the screw head if the screwdriver tip turns inside the recess.

**Note:** If you find you need excessive downwards pressure to keep the screwdriver tip in the Pozidriv screw head, you are probably using the wrong type and/or size screwdriver.

Figure 6.2 below shows the main differences between typical Pozidriv and Philips screw heads and screwdriver tips (actual hardware may differ slightly from these illustrations due to variations in manufacturing techniques).



**Figure 6.2 Pozidriv & Philips Screw & Screwdriver Identification**

## 6.2 Mechanical

This section provides information necessary for replacement of various parts and modules of the T809 power supply.



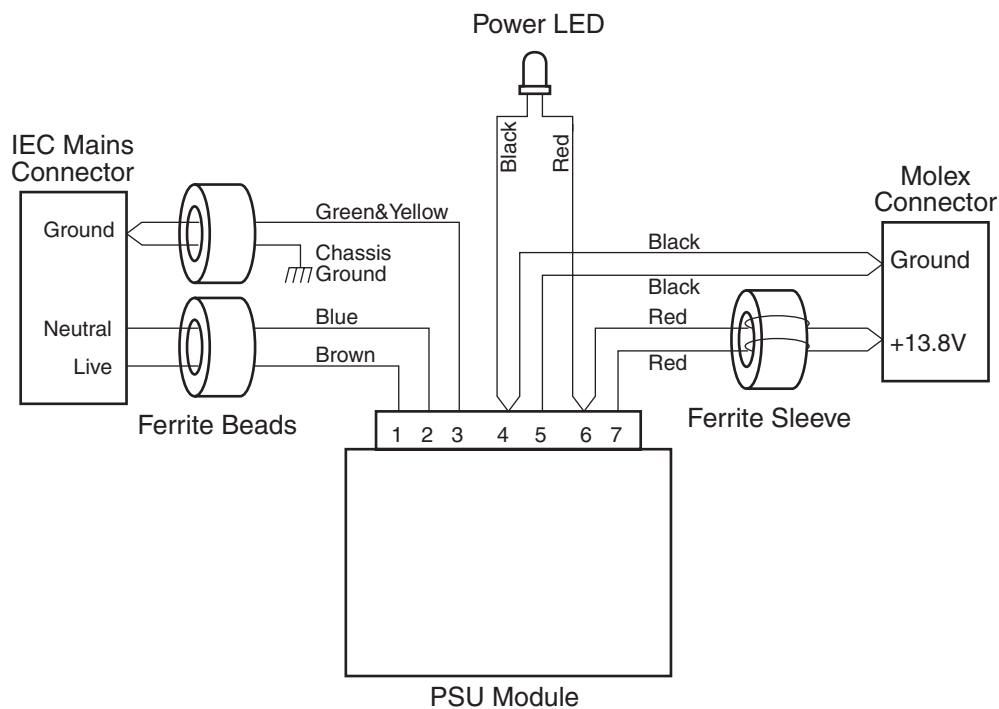
**Caution:** Disconnect the mains IEC connector and wait for 5 minutes for the internal voltages to drain away before dismantling the T809.



**Warning:** The power supply module is not a user serviceable item. This module contains components that operate at voltages that may be lethal. Do not open this module.

### 6.2.1 Wiring Diagram

Refer to the diagram shown below for connection information between the T809's connectors and powers supply module.



**Figure 6.3 T809 Wiring Diagram**

## 6.2.2 Assembly Drawing

Figure 6.4 below shows an exploded view of the T809.

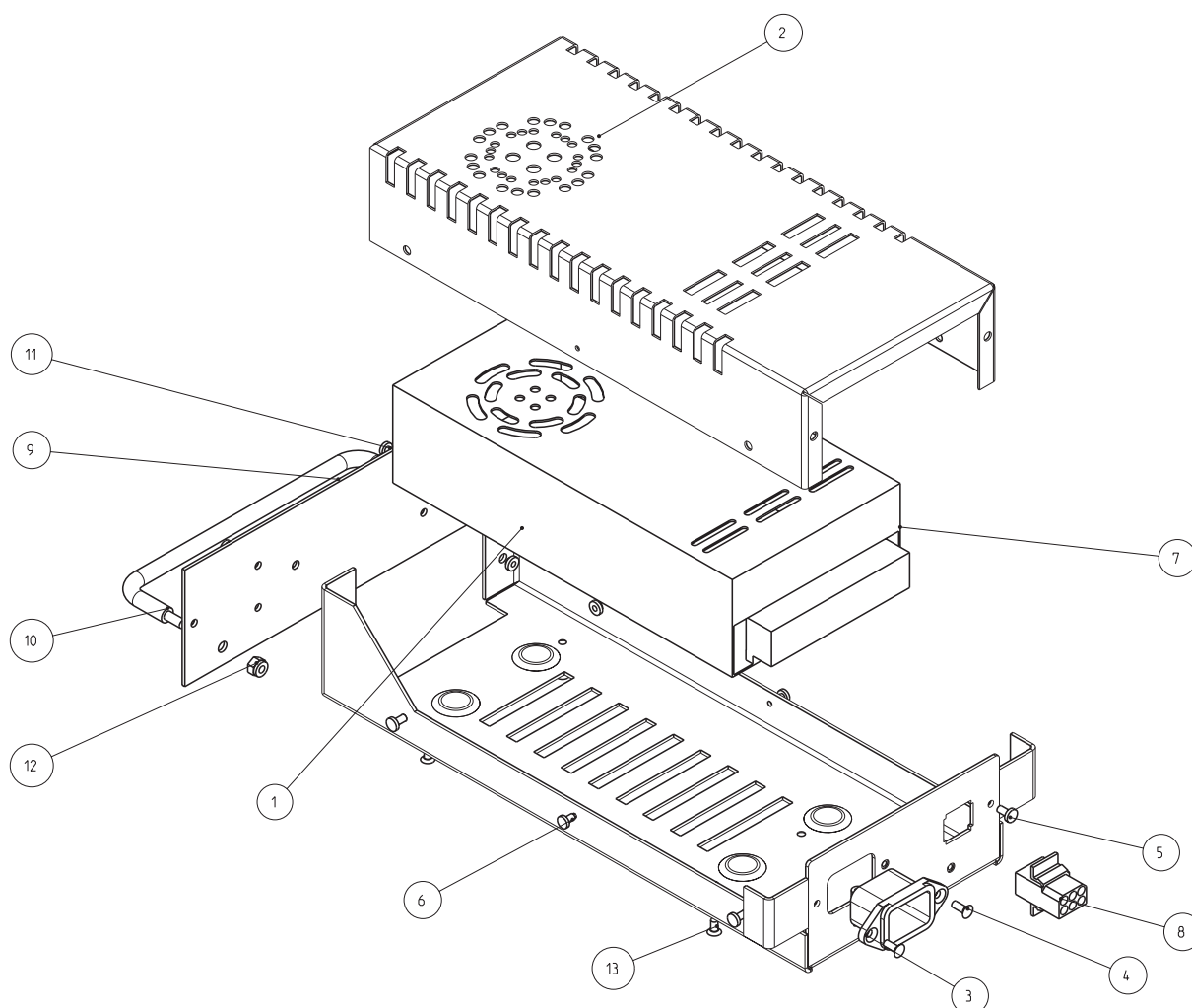


Figure 6.4 Mechanical assembly of the T809.

## 6.2.3 Parts List

IPN	Item No.	Description
303-10001-00	1	Power Supply Chassis
303-20001-00	2	Power Supply Cover
240-00011-16	3	Plug 3pin IEC 230V 6.35mm Pnl mtg
345-00040-07	4	M3x8 csk pozi
345-00040-10	5	M3x6 pan pozi
349-00010-10	6	4x1/4" pan pozi self tap
009-00001-00	7	Switched mode PSU
240-02020-31	8	Conn 6way Recep Molex
316-06837-00	9	Front Panel
308-01007-01	10	Handle, Base-station
349-00020-36	11	M3x8 pan torx tap (11)
352-00010-29	12	M4 Nyloc
345-00040-09	13	M3x6 tcsk pozi
219-00970-00	14	Internal Loom X800-23-0011
065-00010-20	15	Bead Ferrite bal 4B1 Philips
069-00010-30	16	Clamp Ferrite For 9mm MN Lead
356-00010-04	17	Tag solder 3mm h/duty earth



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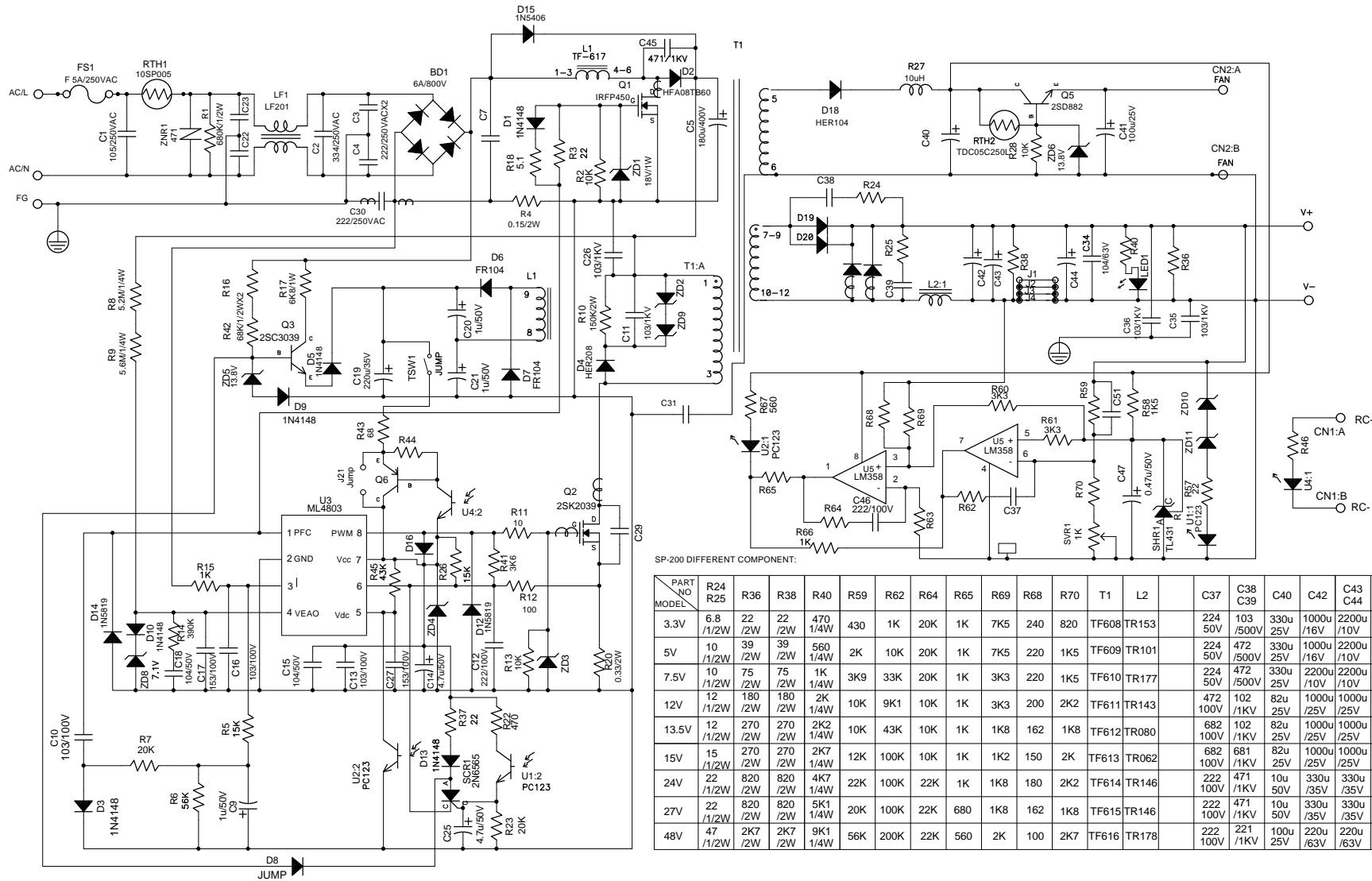
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SP-200 DIFFERENT COMPONENT:

PART NO	R24	R25	R36	R38	R40	R59	R62	R64	R65	R69	R68	R70	T1	L2	C37	C38	C39	C40	C42	C43	C51	D19	D20	J1,J2	J3,J4	ZD10	ZD11	C29	ZD2	ZD9	R63						
3.3V	6.8	/1/2W	22	/2W	470	1/4W	430	1K	20K	1K	7K5	240	820	TF608	TR153	224	50V	103	/500V	330u	1000u	/16V	2200u	/10V	682	100V	S30SC4M	JUMP	JUMP	4.2V	221	/1KV	P6KE	220A	300		
5V	10	/1/2W	39	/2W	560	1/4W	2K	10K	20K	1K	7K5	220	1K5	TF609	TR101	224	50V	472	/500V	330u	1000u	/16V	2200u	/10V	472	100V	S30SC4M	JUMP	JUMP	5.4V	221	/1KV	P6KE	220A	300		
7.5V	10	/1/2W	75	/2W	1K	1/4W	3K9	33K	20K	1K	3K3	220	1K5	TF610	TR177	224	50V	472	/500V	330u	2200u	/10V	2200u	/10V	102	100V	C25P06Q	JUMP	J4:X	JUMP	8.3V	X	P6KE	200A	JUMP		
12V	12	/1/2W	180	/2W	270	2K	10K	9K1	10K	1K	3K3	200	2K2	TF611	TR143	472	100V	102	/1KV	82u	1000u	/25V	2200u	/25V	682	100V	D9202	JUMP	J3.4:X	JUMP	13.8V	X	P6KE	200A	JUMP		
13.5V	12	/1/2W	270	/2W	2K2	1/4W	10K	43K	10K	1K	1K8	162	1K8	TF612	TR080	682	100V	472	/1KV	1000u	1000u	/25V	2200u	/25V	102	100V	D9202	JUMP	J3.4:X	JUMP	16.1V	X	P6KE	200A	JUMP		
15V	15	/1/2W	270	/2W	2K7	1/4W	12K	100K	10K	1K	1K2	150	2K	TF613	TR062	682	100V	471	/1KV	1000u	1000u	/25V	2200u	/25V	102	100V	D9202	JUMP	J3.4:X	JUMP	18V	X	P6KE	200A	JUMP		
24V	22	/1/2W	820	/2W	4K7	1/4W	22K	100K	22K	1K	1K8	180	2K2	TF614	TR146	222	100V	471	/1KV	10u	330u	/35V	330u	/35V	102	100V	D9202	JUMP	D19:X	JUMP	30V	1W	X	P6KE	200A	JUMP	
27V	22	/1/2W	820	/2W	5K1	1/4W	20K	100K	22K	680	1K8	162	1K8	TF615	TR146	222	100V	471	/1KV	10u	330u	/35V	330u	/35V	222	100V	D9202	JUMP	D19:X	JUMP	7.1V	27V	1W	X	P6KE	200A	JUMP
48V	47	/1/2W	2K7	/2W	9K1	1/4W	56K	200K	22K	560	2K	100	2K7	TF616	TR178	222	100V	221	/1KV	100u	220u	/63V	220u	/63V	102	100V	C16P40F	JUMP	D19:X	JUMP	30V	1W	X	P6KE	200A	JUMP	