

# **DRAFT 2.5**

## **T809-10 Power Supply Service Manual**

**Issue 1**

**November 2004**

**MBZ-00001-01**

## About This Manual

<b>Scope</b>	This manual contains general and technical information on the T809-10 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	If this manual becomes outdated, a new issue will be released.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 Technical Support (contact details are on <a href="#">page 42</a> ).

## Technical Information

If further information is required about the T809-10 power supply or this Manual, it can be obtained from your nearest Tait Dealer or Customer Service Organisation. Further technical assistance may be obtained from Technical Support (contact details are on [page 42](#)).

## Updating Equipment and Manuals

In the interests of improving performance, reliability or servicing, Tait Electronics Ltd reserve the right to update the power supply 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

T809-10 Power Supply Service Manual		
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# 1 General Information

This section provides:

- A brief description of the T809-10 switched mode power supply.
- Detailed specifications.

## 1.1 Introduction

The T809-10 is a switched mode power supply with universal AC input capability and built-in active Power Factor Correction (PFC). The power supply is capable of supplying 13.8V<sub>DC</sub> at up to 30A.

The T809-10 power supply is designed as a replacement for the T807 and T808 power supplies, and as such, it is intended to supply T800 Series Base Stations. The T809-10 power supply is available in two configurations – the T809-10-0000 and the T809-10-00C1 (or -00C2), as described below.

### 1.1.1 Description

The T809-10-0000 is a 60mm wide vertical module designed for use in a standard 483mm (19inch) T800 subrack.

The T809-10-00C1 and the T809-10-00C2 are both 2U subracks designed to fit directly into a standard 483mm rack or cabinet. The T809-10-00C1 has a single power supply unit fitted horizontally on the 2U front panel, while the -00C2 has two power supplies.

Functions of the power supply include remote ON/OFF control, remote sense, output voltage adjust, and a number of circuit protection features. The remote functions are accessible on the options connector (9-way D-range) on the rear panel (refer to Section 3.3).

### 1.1.2 Protection Features

The circuit protection features protect against damage caused by faults in the line or the load, or by temperature variation.

They include:

- Inrush current limiting.
- Over-current protection (short circuit protection).
- Over-voltage protection.
- Over-temperature protection.

For more information on protection features, refer to Section 2.3.2.

Electromagnetic Compatibility (EMC) and operator safety are both critical parameters for the trouble-free functioning of a switched mode power supply. For detailed specifications, refer to Sections 1.3.1 (EMC Conformity) and 1.3.2 (Safety Approvals).

**Caution:**

To prevent the T809-10 equipment from overheating, do not exceed the rated current. Note: the rated output of the power supply may need to be lowered (derated), depending on AC input voltage and ambient temperature (refer to Section 3.9).

## 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
Power Switch	... Illuminated when mains supply is present
ON LED (DC Power Indicator)	... LED glows green when DC output is ON
Cooling	... Convection and forced air (fan)
Efficiency	... 85%, full load (typical)
Working Temperature Range	... -10°C to +60°C (ambient air temp <sup>1</sup> )
<b>Note:</b>	Derating may apply, depending on AC input voltage and ambient temperature.
Over-temperature Protection	... Shutdown of output voltage ... Auto recovery with temperature reduction ... Temperature sensed on power transistors and diodes
Withstand Voltage	
Input to Output	... 3000V <sub>AC</sub> , 1 minute
Input to Ground/Chassis	... 1500V <sub>AC</sub> , 1 minute
Output to Ground/Chassis	... 500V <sub>AC</sub> , 1 minute
Dimensions	
Height	... 183mm

1 Ambient temperature refers to the air temperature circulating around the power supply unit, inside the rack cabinet, during normal operation. It does not refer to the temperature in the equipment room.

Width	... 60mm
Length	... 390mm
Weight	... 2.8kg

### 1.2.3 AC Mains Input

Input Voltage Range	... 100 to 240V <sub>AC</sub>
Frequency Range	... 50/60Hz
AC Input Current	
230V <sub>AC</sub> supply	... 3.5A maximum (full load)
115V <sub>AC</sub> supply	... 6.5A maximum (full load)
Inrush Current	
230V <sub>AC</sub> supply	... 40A maximum (cold start, full load)
115V <sub>AC</sub> supply	... 25A maximum (cold start, full load)
Connection to Mains Supply	... IEC plug on rear panel
Power Factor	
230V <sub>AC</sub> supply	... >0.95 (full load)
115V <sub>AC</sub> supply	... >0.98 (full load)
<b>Note:</b>	Exact power factor depends on the impedance of the mains supply.
Input Fuse (Internal to module)	... 10A 250V fast acting ... Glass tube 5 x 20mm (Tait IPN 265-00010-21)

### 1.2.4 Output

Output Voltage	... 13.8V <sub>DC</sub> (adjustable 13.5 to 18V)
Load Regulation	... ± 0.5%
Line Regulation	... ± 0.3% (full load)
Current Range	... 0 to 30A
Output Derating	... Derating may apply depending on Input voltage and ambient temperature <sup>1</sup> (refer to Section 3.9)

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<sup>1</sup> Ambient temperature refers to the air temperature circulating around the power supply unit, inside the rack cabinet, during normal operation. It does not refer to the temperature in the equipment room.





**Warning:** Exceeding the deratings shown in Section 3.9 (Power Supply Cooling and Derating) will cause the equipment to overheat.

Output Over-voltage Protection	...	18 to 21V <sub>DC</sub> Type: Shutdown Reset: Power OFF and ON
Output Hum and Noise	...	<40m V <sub>pp</sub> (25A load with 230V <sub>AC</sub> supply)
Overload Current Limit	...	37 to 48A Type: Constant current limiting (voltage foldback) Reset: Auto recovery
DC Output Connector	...	Phoenix Contact Feed-through terminal block (refer to Section 3.3.1)

### 1.2.5 Miscellaneous

Remote Control (Auxiliary inputs +RC and -RC)

Power OFF	...	4 to 10V across +RC and -RC
Power ON	...	0 to 0.8V across +RC and -RC

**Note:** The remote control circuit is optically isolated from the rest of the power supply.

Remote Sense (Auxiliary inputs +S and -S)	...	0.3V maximum voltage drop between sense inputs and load terminals
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## 1.3 Regulatory Information

### 1.3.1 EMC Conformity

This equipment complies with:

**EN 301 489-5 V1.3.1:** 'Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 5: Specific conditions for Private land Mobile Radio (PMR) and ancillary equipment (speech and non-speech)', when tested in accordance with EN 301 489-1 V1.4.1: 'Common Technical Requirements'.

Tested in accordance with:

- **EN 55022: 1998+A1: 2000** (Radiated and conducted emissions).
- **EN 61000-3-2: 2000** (Limits for harmonic current emissions).
- **EN 61000-3-3: 1995+A1: 2001** (Limitation of voltage changes, fluctuations and flicker).
- **EN 61000-4-2: 1995+A1** (Electrostatic discharge immunity).
- **EN 61000-4-3: 1995+A1** (Radiated, RF and electromagnetic field immunity).
- **EN 61000-4-4: 1995** (Electrical Fast Transient / burst immunity).
- **EN 61000-4-5: 1995** (Surge immunity).
- **EN 61000-4-6: 1996+A1** (Immunity to conducted disturbances, induced by RF fields).
- **EN 61000-4-11: 1994** (Voltage dips, short interruptions and voltage variations immunity).

For a Declaration of Conformity, refer to [eudocs.taitworld.com](http://eudocs.taitworld.com).

**FCC 47 Part 15: 2004** (for Class B of the FCC rules for the United States). Radiated and conducted emissions, and electromagnetic susceptibility specifications.

Operation is subject to the following conditions:

- 1 This device may not cause harmful interference.
- 2 This device must not accept any interference received, including interference that may cause undesired operation.



**Warning:**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

There is, however, no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception (which can be determined by turning the equipment

OFF and ON) the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

**Canadian ICES-003: 2004** (for Class B). Radiated and conducted emissions, and electromagnetic susceptibility specifications.

**AS/NZS CISPR22: 2004** (for Class B). Radiated and conducted emissions, and electromagnetic susceptibility specifications.

### 1.3.2 Safety Approvals

This equipment complies with:

**IEC 60950-1: 2001 (edition 1)**. Safety of information technology equipment.

Tested according to national requirements for the following countries:

- All CB members as listed in CB Bulletin 107A, May 2004, including Australia, New Zealand, Israel and the Republic of Korea.
- All CENELEC members as listed in EN 60950-1: 2001.

For the European Declaration of Conformity, refer to [eudocs.taitworld.com](http://eudocs.taitworld.com)

**CAN/CSA-C22.2 No 60950-1**. Safety of information technology equipment.

**ANSI/UL Std No 60950-1**. Safety of information technology equipment.



**Warning:** Safety approval will be void if T809-10 components are replaced with non-equivalent rated or non-certified/non-approved components. Contact Tait Electronics Technical Support before replacing T809-10 components. For important servicing information, refer to Section 6.



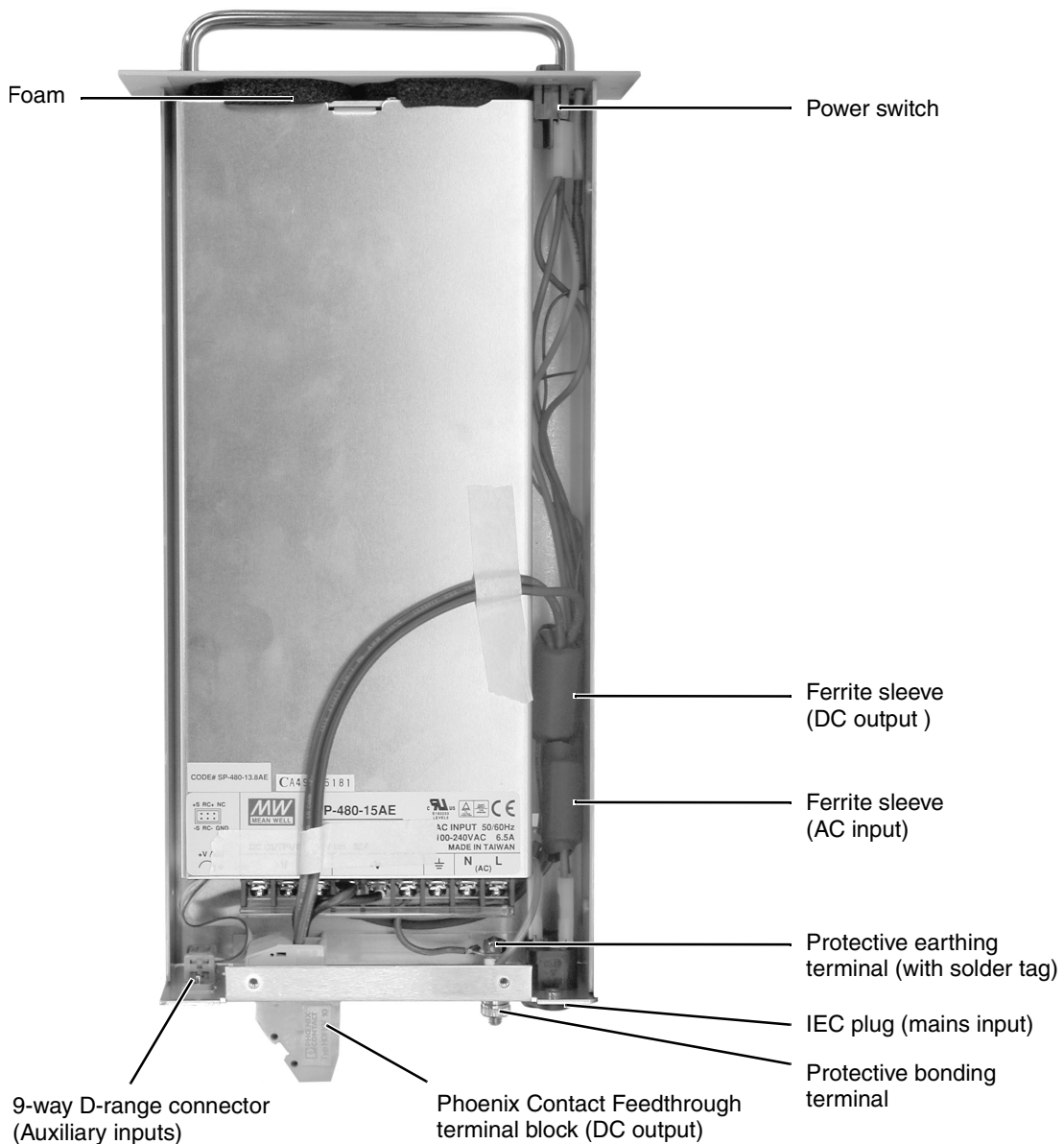
## 2 Power Supply Description

This section provides an overview of the power supply's features.

### 2.1 Introduction

The T809-10 power supply consists of:

- A Power Supply Unit (PSU) module.
- Connectors.
- Ferrite filters.
- ON LED (DC power indicator).
- Mains power switch.



**Figure 2.1** T809-10 internal view. Refer to Section Section 6.2.4 (Parts List) for more detail.

Mains power to the PSU module is supplied via an IEC plug on the rear panel and the illuminated power switch on the front panel (refer to Figure 2.1). This path is filtered. The mains ground line is connected directly to the T809-10 chassis (stud terminal), and from there to the module's ground terminal.

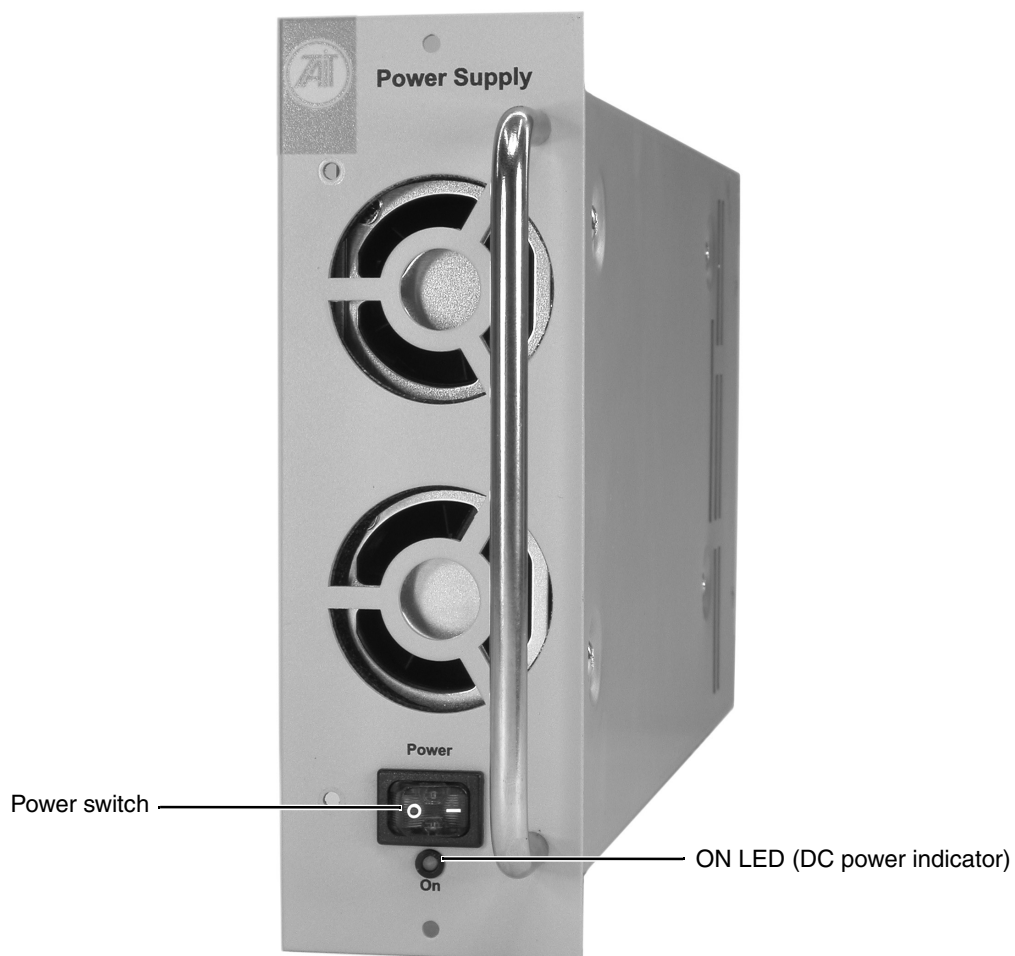
The PSU module's output is filtered by a ferrite sleeve, and then interfaces to the rack through a Phoenix Contact Feed-through terminal block on the T809-10 rear panel.

For the wiring diagram, refer to Section 6.2.1.

## 2.2 Front Panel Indicators

The status of the T809-10 is shown on the front panel by two indicators – an illuminated power switch and an LED.

Indicator	Status
Power switch illuminates when the unit is connected to the mains power supply	The power supply has AC power
Green ON LED illuminates brightly	Voltage output is at normal operational level
Green ON LED illuminates faintly	PSU module has entered over-current mode
Green LED is OFF, but the power switch is in the ON position	Power supply has shut down due to over-temperature or over-voltage conditions



**Figure 2.2** T809-10 Power Supply Front Panel

## 2.3 Features

This section describes the main features of the T809-10 power supply.

These include:

- Universal AC input capability.
- Built-in active Power Factor Correction (PFC).
- Remote control (ON/OFF).
- Remote sense.
- Circuit protection features.
- Output Voltage Adjust.

### 2.3.1 Input Voltage Range

The T809-10 power supply has universal AC input range capability. It is designed to operate for an input voltage range of 100 to 240V<sub>AC</sub>. If used at any other input voltage the power supply may operate improperly and/or lose the PFC function.

**Note:** When operated at low AC input voltages, the power supply is less efficient and produces more heat. Output derating may apply in this situation – refer to Derating Curves in Section 3.9 (Power Supply Cooling and Derating).

### 2.3.2 Protection

The PSU module has inrush current limiting, and over-temperature, over-current and over-voltage protection. For detailed specifications, refer to Section 1.2.

#### 2.3.2.1 Inrush Current

A thermistor and relay are used within the PSU module for protection from inrush current.



**Caution:** After turning the power supply OFF, a 10-second cool-down period is recommended before turning it on again. Inrush current will be a lot higher than the specified value if the input thermistor is not allowed sufficient time to cool down.

#### 2.3.2.2 Over-voltage

An over-voltage of 18 to 21V<sub>DC</sub> applied to the power supply output will cause the module to shut down. To reset the module, turn OFF the mains switch and **wait 30 seconds before switching it ON again.**



### 2.3.2.3 Current Overload

The module is protected from current overload (short circuit) by a voltage fold-back method. If the load on the output starts drawing more than 35A (approximately), the output voltage will start decreasing. The power supply recovers automatically when the load is removed or returns to normal.



**Caution:** If the over-current condition lasts more than 30 seconds the power supply may be damaged.

### 2.3.2.4 Over-temperature

Over-temperature will cause the module to shut down. Sensors monitor the temperature on the power transistors and power diodes. If over-temperature shutdown occurs, switch OFF the input voltage and eliminate the cause of the overheating. Allow the power supply to cool down to normal working temperature before switching it back ON.



**Caution:** Correct mounting of the T809-10 power supply is important. For ventilation guidelines, refer to Section 3.9 (Power Supply Cooling and Derating). Ignoring these conditions may cause the module to overheat and consequently shut down.

## 2.3.3 Remote Sense

The remote sense function enables the power supply to adjust its output to compensate for voltage drop lost along the cables to the load. Connecting the remote sense allows the power supply to maintain a 13.8V<sub>DC</sub> at the load terminals (for example, a transmitter).

This feature is accessible on the auxiliary input connector (9-way D-range) on the rear panel of the T809-10. For more information, refer to Section 3.5 (Remote Sense).

## 2.3.4 Remote Control

The output voltage of the PSU module can be remotely controlled (ON/OFF) by applying a DC control voltage across the remote control input terminals. The remote control input circuit is optically isolated from the rest of the PSU circuit.

This feature is accessible on the auxiliary input connector (9-way D-range) on the rear panel of the T809-10. For more information, refer to Section 3.6 (Remote Control).

## 2.3.5 Output Voltage Adjust

If it is not possible or desirable to use the remote sense feature to maintain the required

DC voltage at the load, the output voltage of the power supply can be increased (up to 18V approximately) to compensate for the voltage drop lost along the cable.

For more information, refer to Section 3.8 (Output Voltage Adjust).

## 3 Installation Guidelines

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

### 3.1 Rack Mounting

The T809-10 is available in two configurations. The T809-10-0000 and the T809-10-00C1 (or -00C2).

#### 3.1.1 T809-10-0000) Configuration

The T809-10-0000 is designed for use in a standard 483mm (19inch) T800 subrack fitted with the same supporting guide rails as those used for the T808/T807.

To mount the T809-10-0000 into a subrack, use the two front-panel mounting screws.

#### 3.1.2 T809-10-00C1 and -00C2 Configuration

The T809-10-00C1 and the T809-10-00C2 are both 2U subracks designed to fit into a standard 483mm rack or cabinet. The T809-10-00C1 has a single power supply unit fitted horizontally on a 2U front panel. The T809-00C2 has two power supply units fitted.

To mount the 2U subracks, secure the power supply into the rack using four front-panel mounting screws.

## 3.2 Wiring and Protection Devices

For safety reasons, all T800 subracks must be fitted with a protection device (fuse or circuit breaker) positioned after the output of the T809-10 power supply. The T809-10 outputs a high current when overloaded – up to 48A for an output short circuit.

### 3.2.1 Protection Device Positioning

The location of the DC output protection device depends on whether or not the remote sense feature is used – refer to Sections 3.2.1.1 (When Remote Sense Is Not Used) and 3.2.1.2 (When Remote Sense Is Used).

#### 3.2.1.1 When Remote Sense Is *Not* Used

When the remote sense is not used, the DC output protection device should be located as close as possible to the output of the power supply, as shown in the diagram:

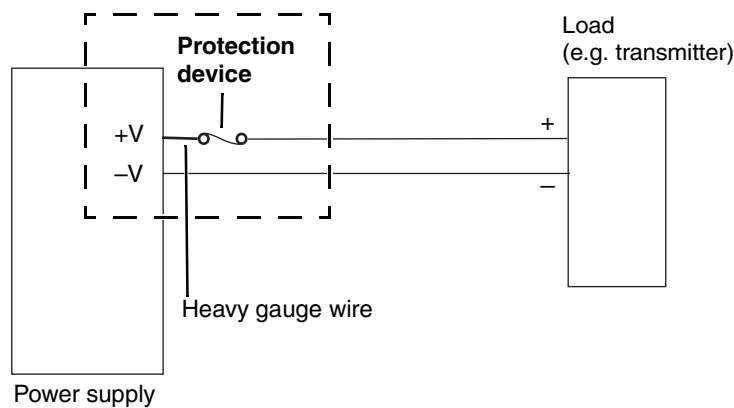


Figure 3.1 Protection device without remote sense

#### 3.2.1.2 When Remote Sense Is Used

When installing a protection device with the remote sense connected:

- Connect the sensing wires to the *power supply side* of any protection device. Failure to do this will cause the power supply to shut down if the protection device opens the circuit. This happens because the power supply senses 0V across the remote sense terminals and the output voltage then increases to compensate for the apparent reduction.
- Connect the sensing wires as close as possible to the load terminals to ensure the remote sense feature functions effectively.

As a consequence of applying these procedures, the protection device will be located close to the load, as shown in the diagram below (Figure 3.2).

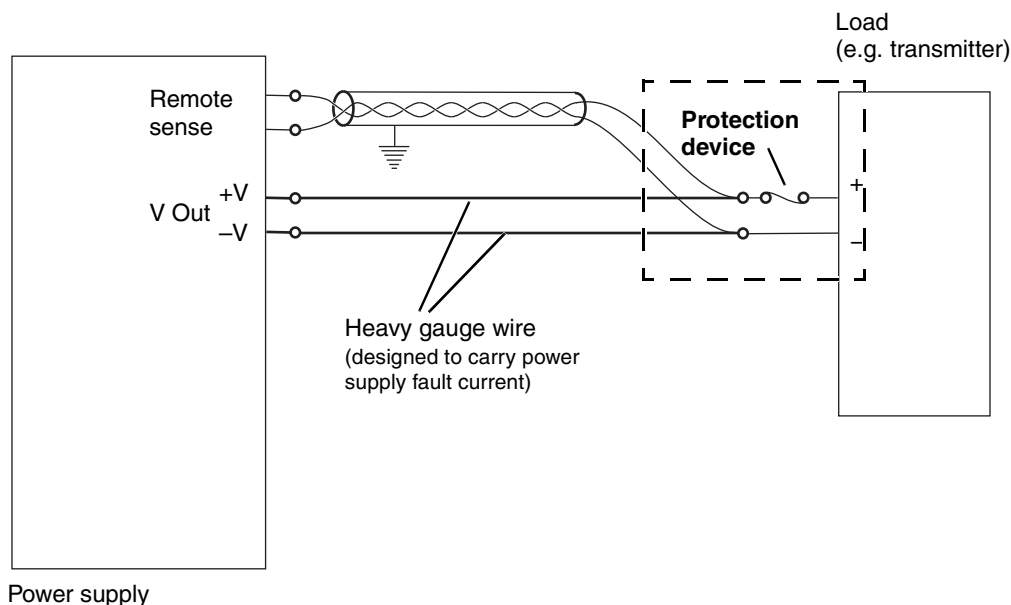


Figure 3.2 Protection device with remote sense connected

**Note:** The purpose of the *heavy gauge* wire between the power supply and the protection device is twofold: it carries the power supply fault current, and it ensures the low voltage drop necessary for proper remote sense operation.

### 3.2.2 Wire Gauges

The wire used to connect the power supply output to the load must be rated for the maximum current it will carry, at maximum ambient operating temperature. The required wire gauge will also be determined by whether the wiring is between the power supply and the protection device (3.2.2.3), or between the protection device and the load (3.2.2.4).

#### 3.2.2.3 Between Power Supply and Protection Device

The wire length between the power supply output and the protection device is essentially unprotected and must be rated for the power supply's overload current (that is, 48A max). The minimum allowable wire gauge for this connection also depends on the type and temperature rating of the wire insulation.

The minimum recommended wire sizes for a maximum operating temperature of 60°C, are as follows:

Wire Temperature/Insulation	Wire Gauge
90°C PVC or Neoprene	8mm <sup>2</sup> CSA (Cross Sectional Area) (8AWG – American Wire Gauge )

Wire Temperature/Insulation	Wire Gauge
105°C PVC or Neoprene	5mm <sup>2</sup> CSA (10AWG)

**Note:** These values are a guideline only. Smaller wire gauges may be used for lower operating temperatures. Check with the wire manufacturer's specifications to ensure safe and proper use.

### 3.2.2.4 Between Protection Device and Load

The wire lengths running between the protection device and the load only need to be of sufficient gauge to:

- Carry the required load current (at maximum operating temperature).
- Ensure that voltage drop between the power supply output and the load does not exceed 0.3V – when the remote sense feature is connected.

The minimum recommended wire sizes for a maximum operating temperature of 60°C, are as follows:

Load	Wire Gauge
25A load (T800 subrack with 100W PA)	3.3mm <sup>2</sup> CSA (12AWG)
15A load (T800 subrack with 50W PA)	2mm <sup>2</sup> CSA (14AWG)

**Note:** The recommended wire insulation temperature rating for all output wiring is 105°C.

### 3.2.3 Power Supply Cord (AC Input)

For the AC input connection:

- Use only an IEC type power supply cord.
- Ensure the power supply cord has a current rating of at least 10A.
- Ensure that the power supply cord is approved in the country of use and meets the local electrical safety regulations.

### 3.3 Rear Panel Connectors

The pinouts of the rear panel connectors are shown below:

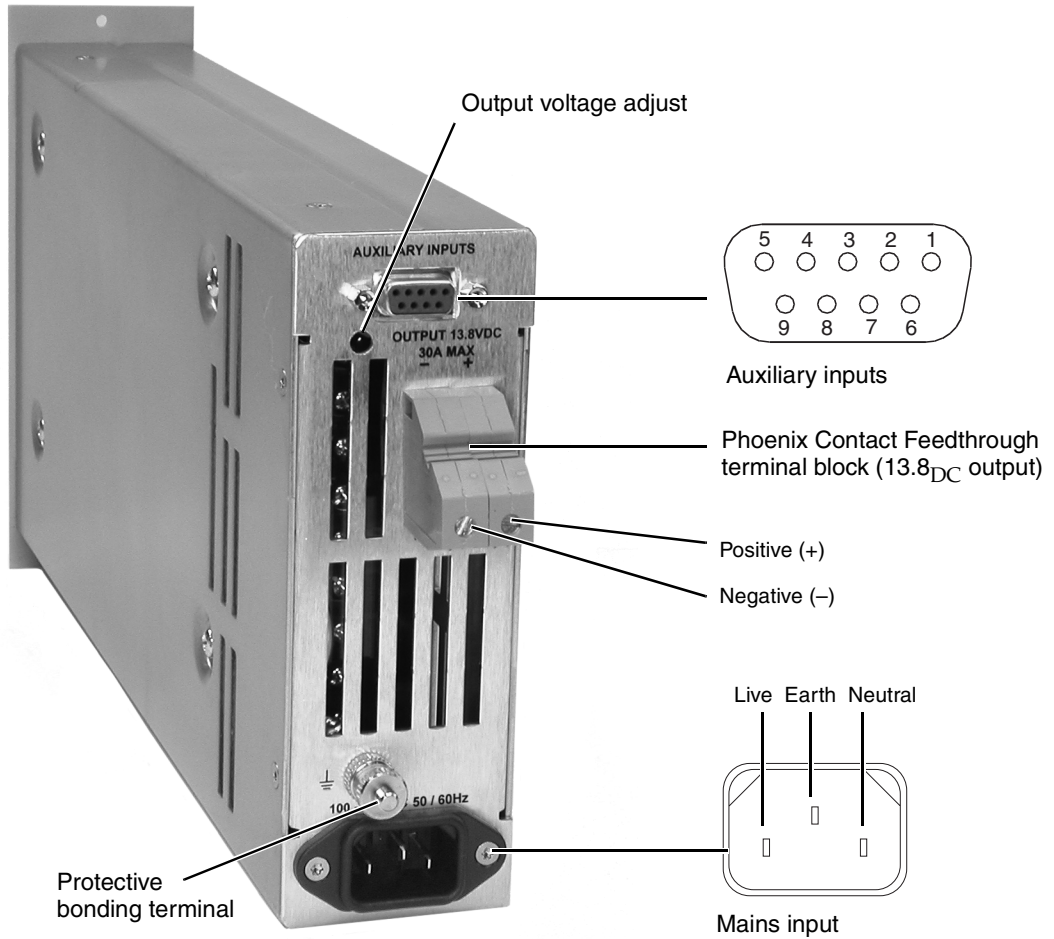


Figure 3.3 T809-10 Rear panel

### 3.3.1 DC Output Terminal Block

The DC Output Terminal block on the rear of the T809-10 is a Phoenix Contact HDFKV 10. This is a screw-type terminal connector that uses a cage mechanism to clamp the conductor(s).

When installing:

- Use a stripping length of 11mm.
- Do not twist the strands of the conductor prior to clamping.
- Securely fasten the conductor(s) with a tightening torque of 1.5Nm (recommended minimum).
- Observe maximum wire cross-sections as outlined in the table below.

Conductor Type	Number of Conductors	Maximum Cross-section
Flexible (stranded)	1	10mm <sup>2</sup> (AWG = 6)
	2 <sup>†</sup>	4mm <sup>2</sup> (each)
Solid	1	16mm <sup>2</sup>
	2 <sup>†</sup>	4mm (each)
Flexible with ferrule and plastic sleeve	1	10mm <sup>2</sup>
	2 <sup>†</sup>	2.5mm <sup>2</sup>
Flexible with ferrule without plastic sleeve	1	10mm <sup>2</sup>
Flexible with twin ferrule and plastic sleeve	2	6mm <sup>2</sup>

<sup>†</sup> These conductors use the same cross-section

### 3.3.2 Auxiliary Inputs Connector

The 9-way D-range connector on the T809-10 rear panel (auxiliary inputs) provides access to the remote control and remote sense functions of the power supply. For connection details, refer to Sections 3.5 (Remote Sense) and 3.6 (Remote Control).



## 3.4 Rack Frame Earthing

The power supply case is internally connected to the mains earth. Because the unit's case and the subrack guide rail are unpainted, a good electrical earthing connection should be made between the unit and the subrack.

In addition, it is strongly advised that a further secure electrical connection is provided by means of a dedicated earthing wire.



**Warning:** Failure to use a dedicated earthing wire may result in harmful voltage levels between the subrack and the power supply, and/or miscellaneous power supply switching noise problems in both receivers and transmitters.

### 3.4.1 Earthing Procedure: Method 1

To earth the power supply:

- Connect an earthing wire between the earthing stud terminal at the rear of the T809-10, and a conveniently located screw on the subrack. The connection to the power supply's M5 earthing stud can be made using bare wire or a Ring/Spade Terminal.
- Ensure that a secure electrical and mechanical connection is achieved by testing continuity.

### 3.4.2 Earthing Procedure: Method 2



**Warning:** This method can only be used if a mechanically and electrically secure connection between the -DC terminal and the subrack exists as part of the system.

To earth the power supply:

- Connect the earthing wire from the T809-10 earthing stud terminal to a -DC rail (0V) terminal. The earthing connection can be made between the stud terminal and the negative output of the power supply.
- Ensure that a secure electrical and mechanical connection is achieved by testing continuity.

**Note:** Ensure that the wire cross-section specifications of the DC output connector are observed (refer to Section 3.3.1).

## 3.5 Remote Sense

The remote sense function enables the power supply to adjust its output to compensate for voltage drop lost along the cables as the current travels from the power supply output to the load. Connecting the remote sense allows the power supply to maintain a  $13.8V_{DC}$  at the load terminals (for example, when connected to a transmitter).

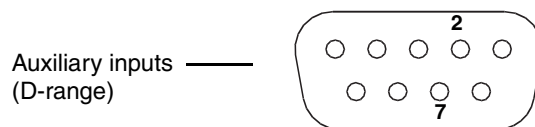
For proper operation of the remote sense function, the voltage drop along the wire length between the power supply output and the load must be limited to less than  $0.3V_{DC}$ . Heavy gauge wire must be used to minimise this voltage drop.

### 3.5.1 Connecting the Remote Sense Wires

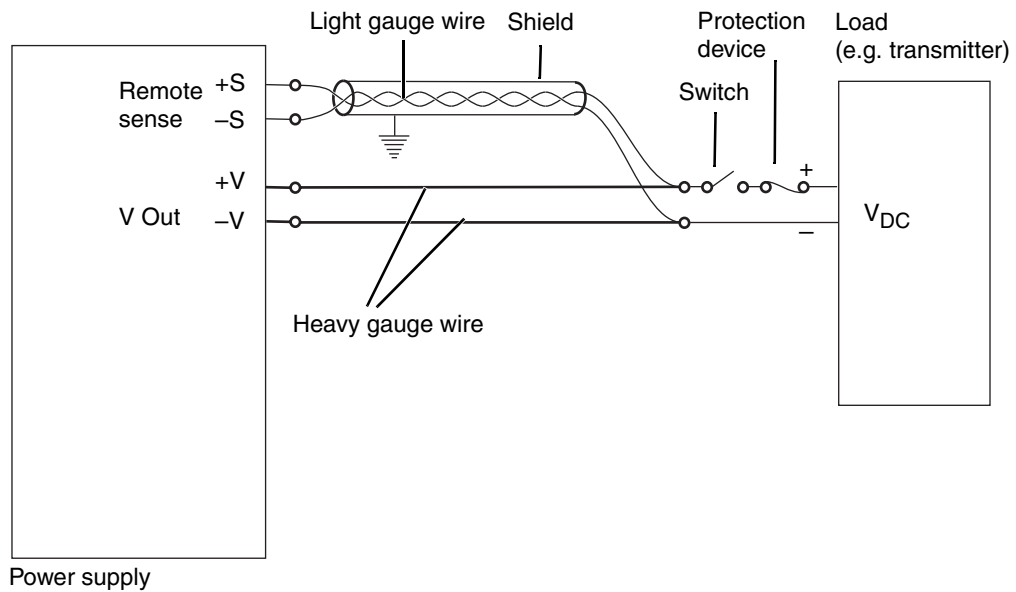
The remote sense feature is located on the auxiliary input connector (9-way D-range) on the rear panel of the T809-10 (refer to Figure 3.3 on page 23).

To connect the remote sense feature, use the information supplied below:

Function	Aux Input Name	D-range Pin	Details
Remote Sense	+S	2	Connected to +V at the load
	-S	7	Connected to -V at the load



The remote sense wires should be connected as close as possible to the load terminals but must be connected to the *power supply side* of the protection device and any switch (if used), as shown in the diagram below (Figure 3.4). For best performance, the sensing wire should consist of a 'twisted pair' of wires and/or a shielded pair.



**Figure 3.4** Output voltage remote sense with shielded twisted pair

**Note:** Ensure that the remote sense connections are made with the correct polarity before the mains supply is connected (that is, positive to positive and negative to negative).

Failure to connect the remote sense on the power supply side of any protection device or switch, will cause the power supply to shut down when the protection device or switch opens the circuit. This happens because the power supply senses 0 volts across the remote sense terminals, and the output voltage then increases to compensate for the apparent reduction.

If this occurs, the power supply can be reset by switching OFF the mains supply, disconnecting the load, and disconnecting the remote sense wires. Wait 30 seconds before switching the power supply ON again.



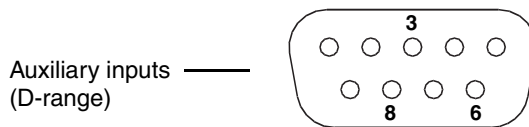
**Warning:** The heavy gauge wire connection between the power supply and the protection device and switch (if used) must be rated to carry the fault current of the power supply – refer to Section 3.2 (Wiring and Protection Devices).

## 3.6 Remote Control

The output voltage of the T809-10 can be remotely controlled by applying a DC control voltage across the auxiliary inputs +RC and –RC. The auxiliary inputs are located on the auxiliary input connector (9-way D-range) on the rear panel of the T809-10.

To connect the remote control feature, use the information supplied in the table below:

Function	Aux Input Name	D-range Pin	Details
Remote Control	+RC	6	<b>PSU OFF</b> = 4 to 10V <sub>DC</sub> across +RC and –RC <b>PSU ON</b> = 0 to 0.8V <sub>DC</sub> across +RC and –RC <b>Note:</b> Additional current limiting resistor required if >10V is used.
	–RC	3	
Ground	GND	8	<b>Warning:</b> Pin 8 is connected to the negative output. It will only be chassis ground when the power supply is used in a T800 subrack



A 'high' voltage level (4 to 10V<sub>DC</sub>) across +RC and –RC will switch the output OFF, while a 'low' level (0 to 0.8V<sub>DC</sub>) switches the output ON.

### 3.6.1 Using a Control Voltage Above 10V<sub>DC</sub>

If a control voltage greater than 10V<sub>DC</sub> is used, an additional series current-limiting resistor is required to keep the input current below 10mA (1mA/1V). The additional series resistor is shown as R\* in the circuit diagrams below (Figure 3.5).

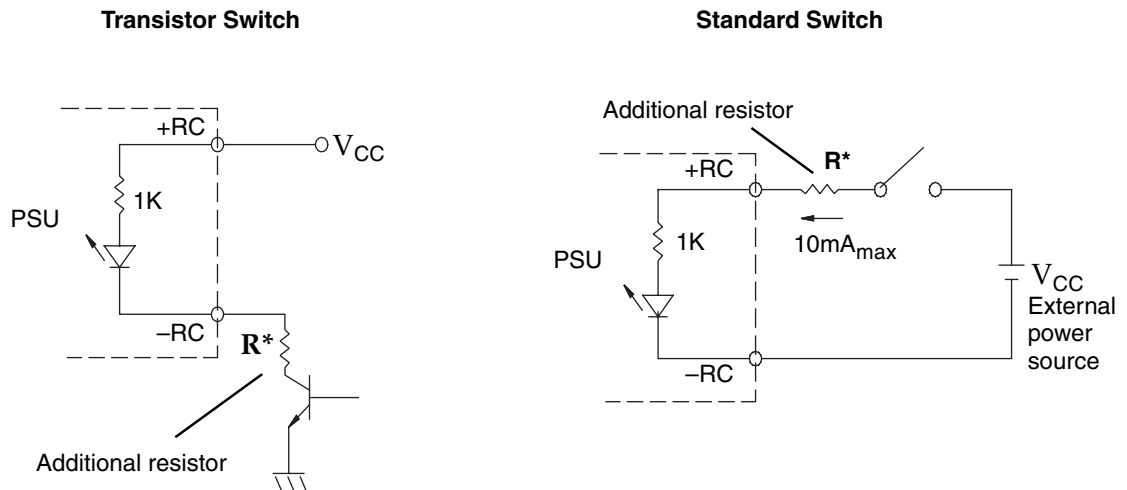


Figure 3.5 Remote control using a transistor or standard switch

**Note:** When  $V_{CC}$  is 4 to  $10V_{DC}$ , the resistor  $R^*$  is not required. When  $V_{CC}$  is  $>10V_{DC}$  the resistor  $R^*$  must be connected.

The value of  $R^*$  in  $k\Omega$  is given by:

$$R(K\Omega) = \left[ \frac{V_{CC} - 1.1}{10} \right] - 1$$

### 3.7 Parallel Operation for Redundancy

[Content to come]

## 3.8 Output Voltage Adjust

If it is not possible or desirable to use the remote sense feature to maintain the required DC voltage at the load, the output voltage of the power supply can be increased (up to 18V approximately).

The output voltage adjustment trim-pot is accessible through a small hole on the rear panel, just below the auxiliary inputs connector.

### 3.8.1 Adjusting the Output Voltage

To adjust the output voltage you will need a 3mm blade, or Phillips head trimmer tool (do not use a standard flat blade screwdriver to make the adjustment):

- To increase the output voltage, turn the trim-pot clockwise.
- To decrease the output voltage, turn the trim-pot anticlockwise.



**Warning:** If the output voltage is increased on a power supply operating at, or close to, full load, the power supply loading must be reduced accordingly or the module may overheat.

Always check, using the following calculation, to ensure that the total output power has not exceeded the maximum rated power:

$$\text{Output voltage} \times \text{load current} < (414\text{W} \times \text{derating factor})$$

If necessary, reduce the load current to compensate for the increased output voltage.

**Note:** A derating factor may or may not apply depending on operating conditions. Refer to Section 3.9 (Power Supply Cooling and Derating).

### 3.9 Power Supply Cooling and Derating

Although the T809-10 is a high efficiency switched mode power supply, a considerable amount of heat is generated during normal operation. While in use, ensure that an adequate flow of cooling air is able to circulate around the power supply, and that the air intake vents on the rear and sides of the unit are not inadvertently covered.

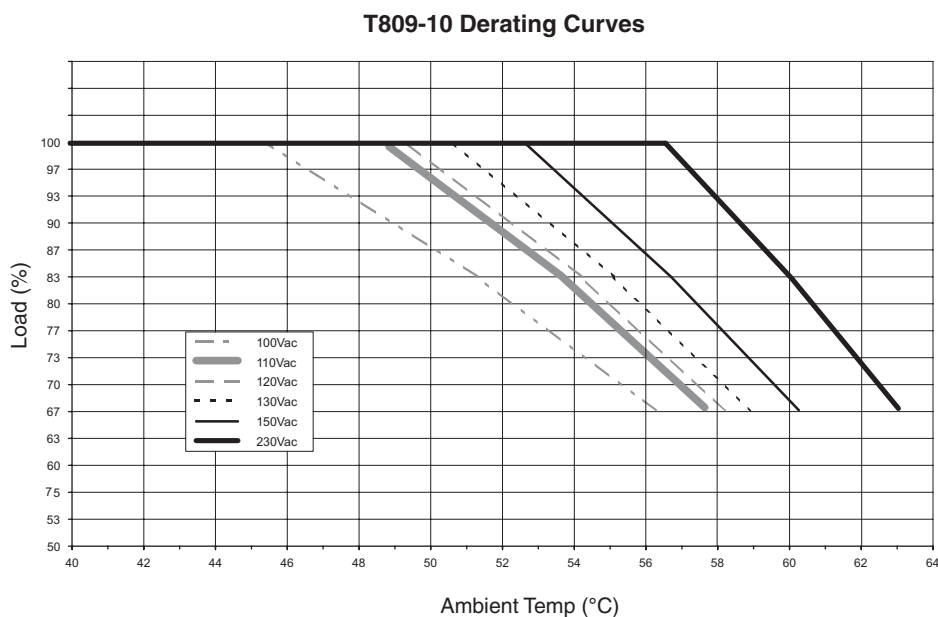


**Caution:** Do not operate this unit in a completely enclosed cabinet.

The maximum output capability of the power supply may need to be derated based on the following conditions:

- The ambient temperature immediately around the power supply unit during normal operation.
- The AC supply voltage.

The following chart can be used to determine the derating factor (%load x 0.01) for the given operating conditions. The derating factor can then be used to calculate the maximum output current.



Use the following information to calculate the maximum output current:

Output Voltage	Maximum Output Current
13.8V <sub>DC</sub>	30A x derating factor
Adjusted	414W x derating factor ÷ by output voltage

It is estimated that the average life expectancy of this unit will double with every 10°C reduction in ambient temperature.

To achieve this:

- Keep the ambient temperature low in the area immediately around the power supply.
- Ensure airflow is not restricted.

## **3.10 Battery Charging**

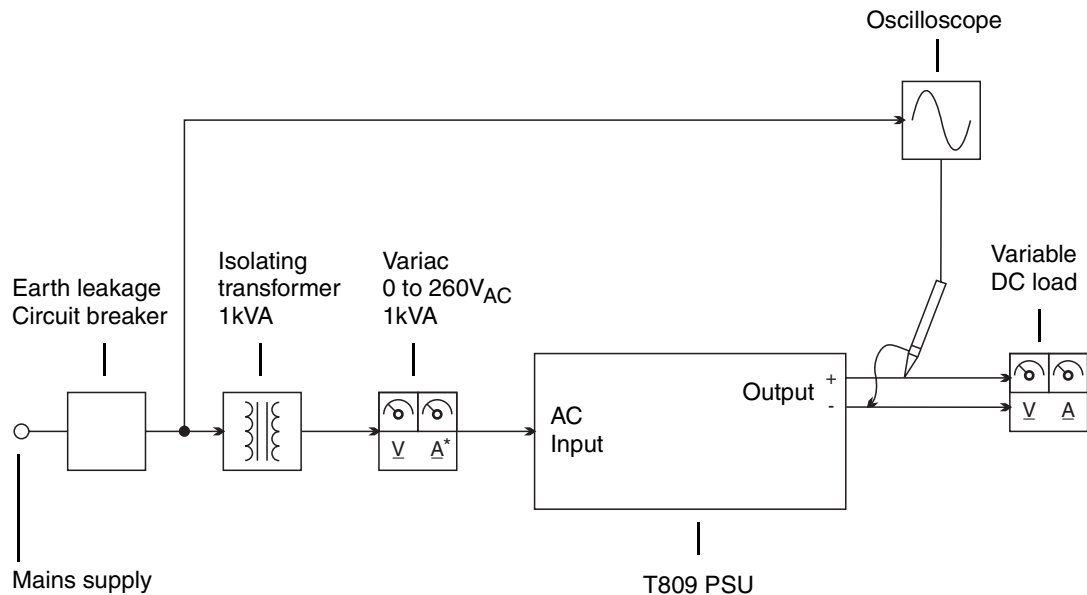
The T809-10 is not designed for battery charging. In order to use the T809-10 as a battery charger, a battery management module will be required.

Any current T808/T807 installations being replaced with the T809-10 and set up for battery charging, must be fitted with a battery management module if not already fitted.



## 4 Functional Testing

The following test procedures will confirm that the T809-10 has been set up and adjusted correctly and is fully operational. For the test equipment refer to the diagram below:



**Figure 4.1** Test equipment setup

### 4.1 Basic Operation

To confirm the basic operation of the power supply:

- 1 Ensure that the mains supply to the T809-10 is switched OFF.
- 2 Set up the test equipment as shown in [Figure 4.1](#) above.
- 3 Set the DC output load to maximum resistance/minimum current.
- 4 Connect the T809-10 to the mains supply and switch it on. The power switch and the ON LED should be illuminated.
- 5 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:

- 1 Ensure that the mains supply to the T809-10 is switched OFF.
- 2 Set up the test equipment as shown in [Figure 4.1](#) above.

- 3 Set the output DC load to draw approximately 30A.
- 4 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 1.2.4), but voltage should drop away and the ON LED's intensity should decrease.

## 4.3 Output Noise

To check that output noise is within specification:

- 1 Ensure that the mains supply to the T809-10 is switched off.
- 2 Set up the test equipment as shown in [Figure 4.1](#).
- 3 Connect the T809-10 to the mains supply and switch it ON. The power switch and the ON LED should be illuminated.
- 4 Connect a digital voltmeter (for example, Fluke 77) across the load terminals and set the meter to its lowest AC volts range.
- 5 Check that the reading is less than  $70\text{mV}_{\text{rms}}$  AC under all load and line conditions.

**Note:** While the procedure outlined above will give a good indication of the output noise level, an *accurate* reading is very difficult to obtain on a switched mode power supply. This is because low noise levels, common mode noise paths and ground loops all lead to inaccurate measurement results.

## 4.4 Overall Power Supply Stability

To check for overall PSU stability:

- 1 Ensure that the mains supply to the T809-10 is switched OFF.
- 2 Set up the test equipment as shown in [Figure 4.1](#).
- 3 Connect the T809-10 to the mains supply and switch it ON. The power switch and ON LED should be illuminated.
- 4 Connect the oscilloscope across the output.
- 5 Vary the mains voltage and DC load over the full specified range (refer to Section 1.2).
- 6 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	Suggested Solutions
1	<ul style="list-style-type: none"> <li>• ON LED does not light up</li> <li>• No output voltage</li> </ul>	Equipment has overheated and thermal cut-out has operated	See solutions for 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>• ON 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, that is, 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 T809-10	For installation guidelines, refer to Section 3.9
		The T809-10 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 T809-10.

### 6.1 Warnings

Please observe the following warnings and cautions.



#### 6.1.1 Warning: Lethal Voltages

The T809-10 power supply contains voltages that may be lethal.

Before dismantling, disconnect the mains IEC connector and wait 5 minutes to allow the internal voltages to drain away.

Servicing should only be carried out 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: Handle With Care

Although this is a lightweight unit, it contains a number of quite heavy and fragile individual components that are mounted directly onto the module's printed circuit board (PCB). Severe mechanical shock may damage the PCB (for example, solder joints and copper tracks) and/or components (for example, fragile ferrite magnetic materials).



#### 6.1.3 Warning: Safety Approval

Safety Approval will become void if T809-10 components are replaced with non-equivalent rated or non-certified/non-approved components. Contact Tait Electronics Support before replacing components of the T809-10.

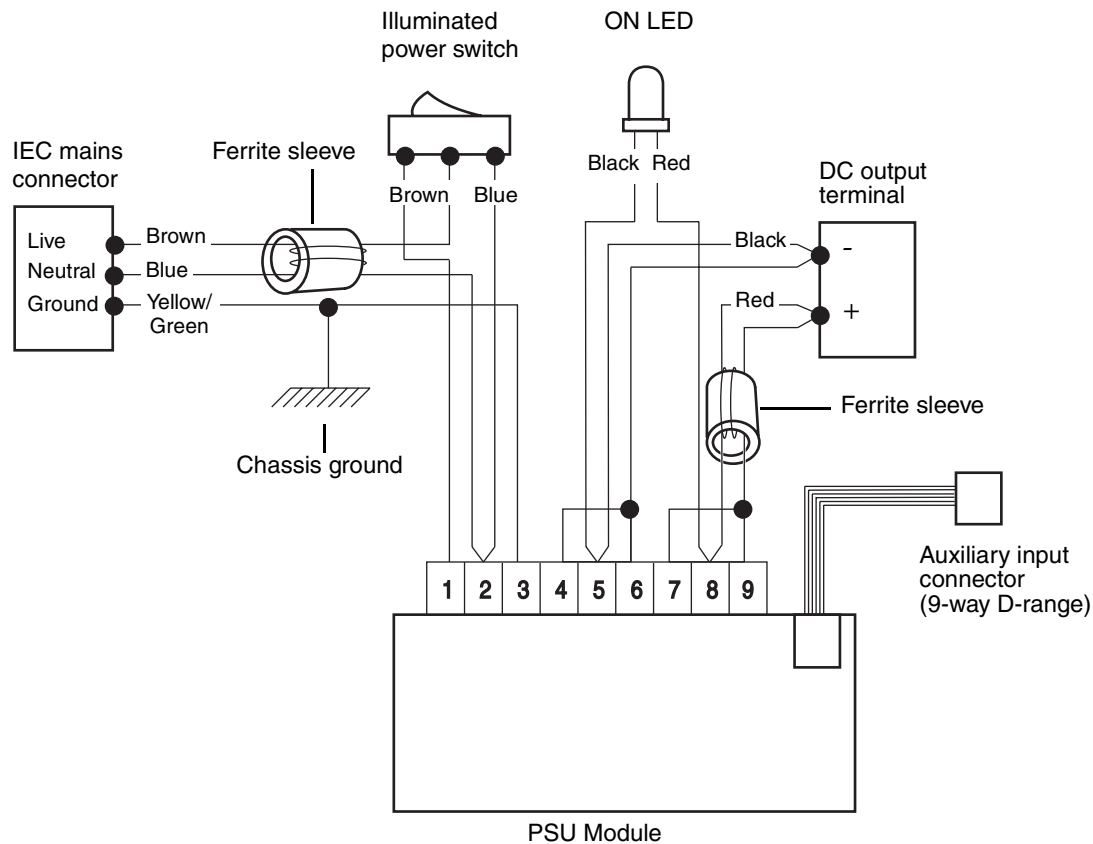
The power supply module inside the T809-10 is not a user serviceable item. This module contains components that operate at voltages that may be lethal. Do not open this module.

## 6.2 Mechanical

This section provides information on replacing various parts and modules of the T809-10 power supply.

### 6.2.1 Wiring Diagram

The diagram below shows the wiring layout for the T809-10's connectors and power supply module.



**Figure 6.1 T809-10 Wiring Diagram**



**Caution:**

After servicing, the wiring inside the power supply must be refitted to duplicate the original layout, as shown above, and in Figure 2.1 on page 13. Any deviation from the original layout may void safety approvals and/or adversely affect airflow through the power supply. This in turn may result in overheating.

## 6.2.2 Screw Heads and Torque Settings

The T809-10 uses three types of screw head. To avoid damaging the screw heads, please ensure when servicing the power supply that you select the appropriate screwdriver tip from the table below.

Screwdriver	Screw Head	Screwdriver Tip	Torque Setting
Hex	M4 x 10mm	2.5mm	1.7Nm
Torx	M3	T10	0.9Nm
Posidriv	M4	PZ2	1.7

### 6.2.3 Assembly Drawing

Figure 6.2 below shows an exploded view of the T809-10-0000. For information on each part, see the corresponding number in the Parts List (6.2.4)

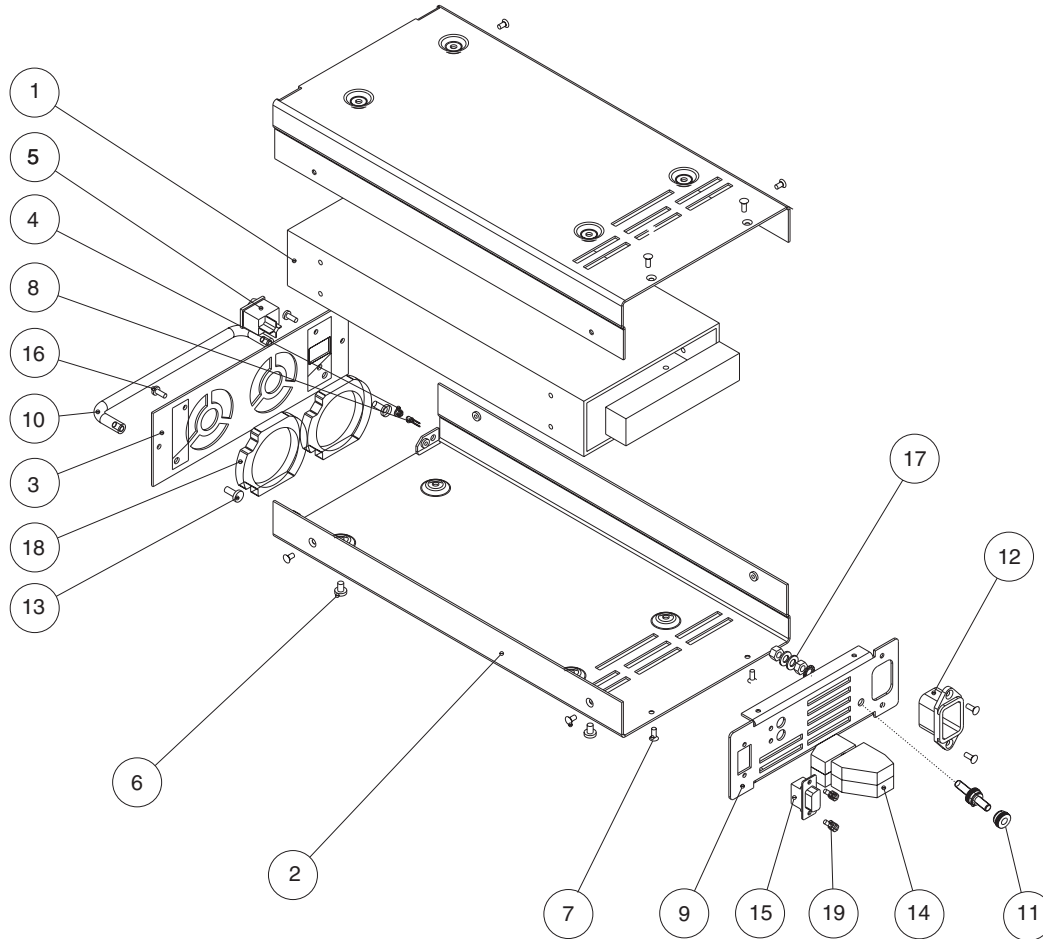


Figure 6.2 Mechanical assembly of the T809-10-0000.

### 6.2.4 Parts List

Item No.	Description	IPN	Item No.	Description	IPN
1	PSU 13.8V 34A Meanwell	009-00008-00	15	Loom 6way with D-range & Header	219-02946-00
2	Side Cover	303-20078-00	16	Screw Mx8mm Torx	349-00020-36
3	Front Panel	316-06809-01	17	Spring Washer M5	353-00010-30
4	LED Grommet	362-00010-33	18	Foam Fan Baffle	369-00003-01
5	Panel Rocker Switch 250V 8A	230-00010-23	19	Screw Lock Fastener (4-40)	354-01043-00
6	Screw M4x6mm Pozi	345-00050-08	<b>Internal Parts (refer to page 13)</b>		
7	Screw M3x6 C/sunk Torx	345-40460-00		Ferrite Sleeve 7mm (AC input)	069-00010-50
8	LED 3mm Green 14V w/int Res	008-00010-17		Ferrite Sleeve 9.5mm (DC output)	069-00010-51
9	Rear Panel	316-02024-01			
10	Handle - internal thread	308-01007-02			
11	Terminal Earthing Stud	356-00010-61			
12	IEC plug - 3pin panel mount	240-00011-16			
13	Screw M4x10mm hex head	345-00050-16			
14	Feed-through Term Block HDFKV10	240-04031-00			







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