

## Part D T838 & T839 Power Amplifiers



**Caution:** There are no user serviceable components in these power amplifiers. Refer all servicing to your nearest Tait Dealer or Customer Service Organisation.

This part of the manual is divided into five sections, as listed below. There is a detailed table of contents at the start of each section.

Section	Title
1	General Information
2	Circuit Operation
3	Initial Adjustment
4	Fault Finding
5	PCB Information



# 1 T838/839 General Information

This section provides a brief description of the T838/839 PA, along with detailed specifications and a list of types available.

The following topics are covered in this section.

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## 1.1 Introduction

The T838 & T839 are FM base station power amplifiers designed for single or multichannel operation in the 136 to 174MHz frequency range. The typical output power capabilities are as follows:

T838 -	10 to 60W
T839 -	20 to 120W.

The T838 PA comprises a single broad band RF power module whose output is filtered before being fed to the output socket.

The T839 PA comprises two broad band RF power modules whose outputs are recombined (using a quadrature hybrid combiner) and filtered before being fed to the output socket. This dual module design enables the transmitter to produce at least one quarter of its rated power if one of the modules fails.

VSWR and thermal protection is incorporated into the basic design, while monitoring and alarm signals are available for both forward and reverse power. The output power is adjustable from the front panel.

The main PCB is mounted directly on a die-cast chassis/heatsink. Extensive use is made of the latest surface mount technology. Effective RF isolation between the PA control circuitry and RF stages is achieved by internal metal shields.

Forced air cooling for the heatsink is provided on the T839 by a fan, which is activated whenever the transmitter is keyed. Thermal sensors will also activate the fan automatically if the internal temperature reaches an unacceptable level.

The T838 has a width of 60mm and occupies a single space in a Tait rack frame, which has the ability to accommodate up to seven standard modules. The T839 has a width of 120mm and occupies a double space.

## 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) and standard test voltage (13.8V DC).

Ambient temperature is defined as the temperature of the air at the input to the cooling fan mounted on the heatsink, or immediately surrounding the heatsink if a fan is not fitted

Where applicable, the test methods used to obtain the following performance figures are those described in the ETS specification. Refer to [Section 1.2.3](#) for details of test standards.

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

Power Output:

T838	- Rated Power	.. 50W
	- Range Of Adjustment	.. 10 to 60W (typical)
T839	- Rated Power	.. 100W
	- Range Of Adjustment	.. 20 to 120W (typical)

Input Power .. 600 to 1000mW

Duty Cycle Rating:

T838	.. 50W continuous to +60°C ambient temperature
T839	.. 100W continuous to +60°C ambient temperature

Intermodulation (PA with output isolator) .. -70dBc or -40dBi<sup>1</sup> with 25dB isolation & interfering signal of -30dBc

Mismatch Capability:

Ruggedness	.. refer to your nearest Tait Dealer or Customer Service Organisation
Stability	.. 5:1 VSWR (all phase angles)

1. dBi denotes the level of the intermodulation product relative to the interfering signal.



## Supply Voltage:

Operating Voltage	..	10.8 to 16V DC
Standard Test Voltage	..	13.8V DC
Polarity	..	negative earth only
Polarity Protection	..	crowbar diode

## Maximum Supply Current (T838 @ 50W, T839 @ 100W):

Standby	..	50mA
Transmit - T838	..	12A (10A typical)
- T839	..	20A (17.5A typical)

## Spurious Emissions:

Conducted	- Transmit	..	-36dBm to 1GHz -30dBm 1GHz to 4GHz
	- Standby	..	-57dBm to 1GHz -47dBm 1GHz to 4GHz
Radiated	- Transmit	..	-36dBm to 1GHz -30dBm 1GHz to 4GHz
	- Standby	..	-57dBm to 1GHz -47dBm 1GHz to 4GHz

Operating Temperature Range .. -30°C to +60°C ambient temperature

## Dimensions:

Height	..	183mm
Width - T838	..	60mm
- T839	..	120mm
Length	..	340mm

## Weight:

T838	..	3.2kg
T839	..	3.4kg

## 1.2.3 Test Standards

Where applicable, this equipment is tested in accordance with the following standards.

### 1.2.3.1 European Telecommunication Standard

#### ETS 300 086 January 1991

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment with an internal or external RF connector intended primarily for analogue speech.

**ETS 300 113 March 1996**

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment intended for the transmission of data (and speech) and having an antenna connector.

**ETS 300 219 October 1993**

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment transmitting signals to initiate a specific response in the receiver.

**ETS 300 279 February 1996**

Radio equipment and systems; electromagnetic compatibility (EMC) standard for private land mobile radio (PMR) and ancillary equipment (speech and/or non-speech).

**1.2.3.2 DTI CEPT Recommendation T/R-24-01****Annex I: 1988**

Technical characteristics and test conditions for radio equipment in the land mobile service intended primarily for analogue speech.

**Annex II: 1988**

Technical characteristics of radio equipment in the land mobile service with regard to quality and stability of transmission.

**1.2.3.3 Telecommunications Industry Association****ANSI/TIA/EIA-603-1992**

Land mobile FM or PM communications equipment measurement and performance standards.

## 1.3 Product Codes

The three groups of digits in the T830 Series II product code provide information about the model, type and options fitted, according to the conventions described below.

The following explanation of T830 Series II product codes is not intended to suggest that any combination of features is necessarily available in any one product. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models, types and options.

### Model

The Model group indicates the basic function of the product, as follows:

<b>T83X</b> -XX-XXXX	T835 receiver
	T836 25W transmitter
	T837 exciter
	T838 50W power amplifier
	T839 100W power amplifier

### Type

The Type group uses two digits to indicate the basic RF configuration of the product.

The first digit in the Type group designates the frequency range:

T83X- <b>X</b> X-XXXX	'1' for 136-156MHz
	'2' for 148-174MHz

The second digit in the Type group indicates the channel spacing and is not applicable to power amplifiers:

T83X- <b>X</b> X-XXXX	'0' for all power amplifiers
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### Options

T83X-XX- <b>XXXX</b>	The Options group uses four digits and/or letters to indicate any options that may be fitted to the product. This includes standard options and special options for specific customers. '0000' indicates a standard Tait product with no options fitted. The large number of options precludes listing them here.
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## 1.4 Standard Product Range

The following table lists the range of standard T838 and T839 types (i.e. no options fitted) available at the time this manual was published. Consult your nearest Tait Dealer or Customer Service Organisation for more information.

Output Power (W)	50		100	
Frequency Range (MHz)	136-156	148-174	136-156	148-174
PA Type: T838-	10-0000	20-0000		
PA Type: T839-			10-0000	20-0000

You can identify the PA type by checking the product code printed on a label on the rear of the heatsink ([Figure 1.1](#) in Part A shows typical labels). You can further verify the PA type by checking the placement of an SMD resistor in the table that is screen printed onto the PCB (refer to Section 5.1 for more details).

The photograph in [Figure 1.1](#) on the next page will help you to identify the main circuit blocks in the T838/839.

There is a similar photograph in [Figure 3.3](#) which shows the main adjustment controls.

Extending both these fold-outs will allow you to refer to both photographs while using the manual.

The photograph in [Figure 1.2](#) on the next page shows the T838/839 front panel controls.

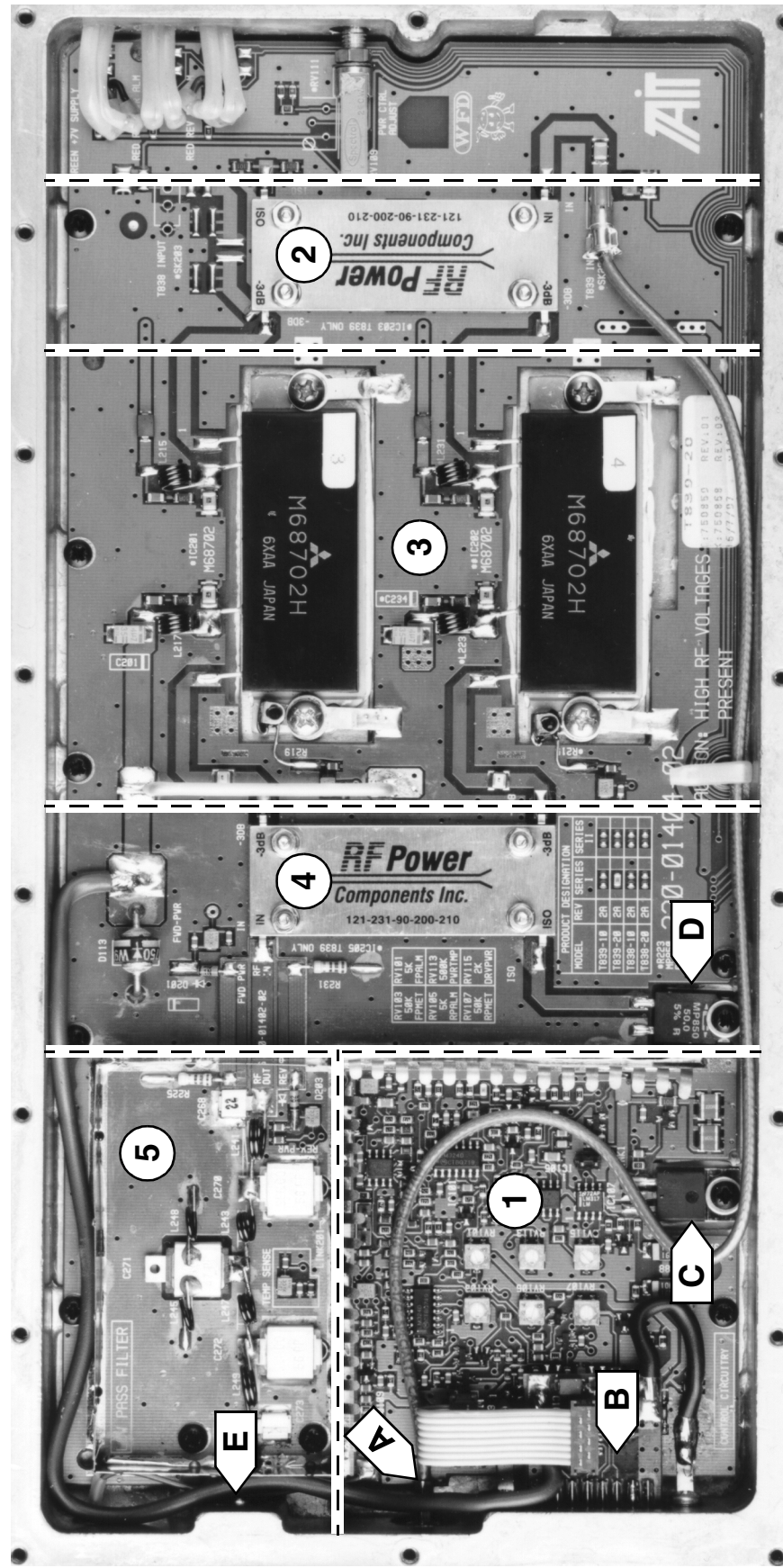


Figure 1.1 T838/839 Main Circuit Block Identification (T839 Shown)

- Key:**
- 1 power control & alarms circuitry
  - 2 input power splitter<sup>1</sup>
  - 3 RF power modules<sup>2</sup>
  - 4 output power combiner<sup>1</sup>
  - 5 low pass filter & directional coupler
- A RF input
  - B D-range connector (incl. DC in, alarm & metering outputs - refer to Section 3.2 in Part F)
  - C power control transistor (Q137)
  - D output combiner termination (\*R223)<sup>1</sup>
  - E RF output

- 1. T839 only.
- 2. The T838 has a single module (the uppermost of the two shown in the photograph).

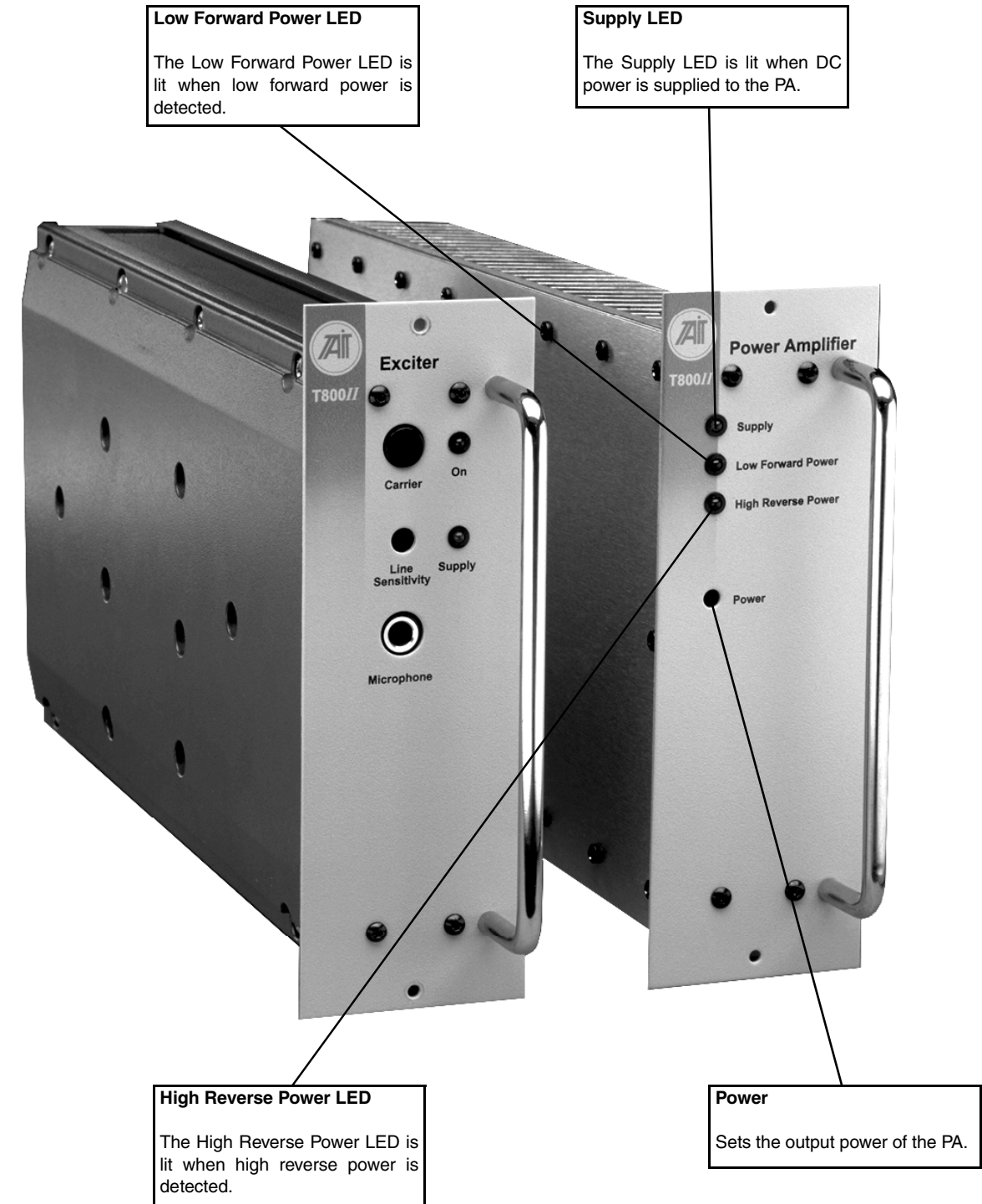


Figure 1.2 T838/839 Front Panel Controls (T838 Shown With T837 Exciter)

## 2 T838/839 Circuit Operation

This section provides a basic description of the circuit operation of the T838/839 PA.

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components. Refer also to [Figure 3.3](#) which shows the location of the main adjustment controls.

The following topics are covered in this section.

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## 2.1 Introduction

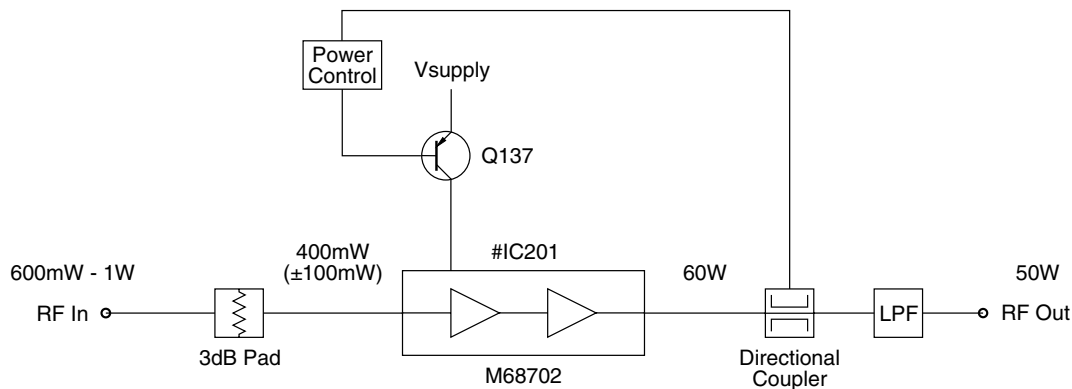


Figure 2.1 T838 High Level Block Diagram

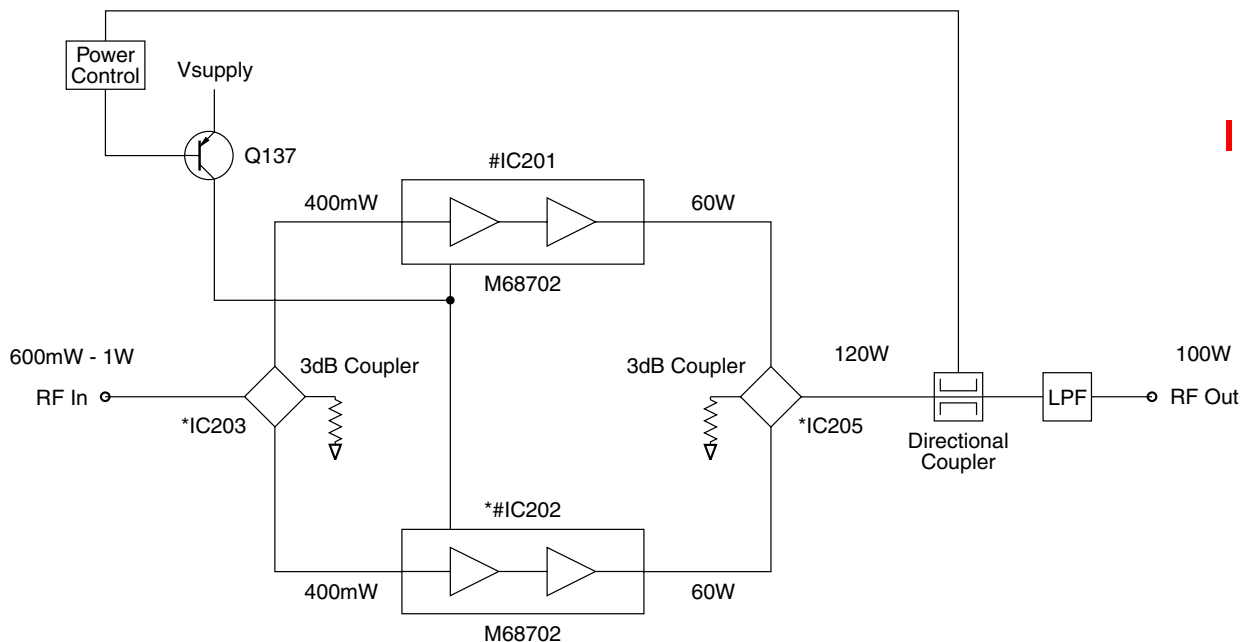


Figure 2.2 T839 High Level Block Diagram

The T838/839 comprise a single stage RF power amplifier with extensive control circuitry:

- in the T838 this stage consists of a single, two-stage RF power module which increases the drive level to approx. 60W;
- in the T839 this stage consists of two, two-stage RF power modules, each of which increases the drive level to approx. 60W; the outputs from these modules are then combined to provide the rated output power.

Figure 2.1 and Figure 2.2 show the configuration of each of the main circuit blocks on a functional level, while the fold-out Figure 1.1 shows their location on the PCB.

## 2.2 RF Circuitry

(Refer to the RF & thermistor control sections circuit diagram in Section 5.)

The T838 consists of a single RF power module (#IC201) which delivers 60-70W. The input signal is fed directly into the module, and the output from the module is passed to the antenna socket via the directional coupler and low pass filter.

The T839 consists of two RF power modules (#IC201 & \*#IC202), each of which delivers 60-70W. The input signal to these modules is split via a 3dB quadrature hybrid (\*IC203). The outputs from the modules are recombined by a second 3dB quadrature hybrid (\*IC205) before being passed to the antenna socket via the directional coupler and low pass filter.

The directional coupler senses forward and reflected power, which is rectified (D201 & D203) and passed to the control circuitry for metering, alarm and power control purposes.

Power control is via a series pass transistor (Q137), which controls the supply voltage on pin 2 of #IC201 in the T838, and pin 2 of both #IC201 and \*#IC202 in the T839.

## 2.3 Control Circuitry

(Refer to the control section circuit diagram in Section 5.)

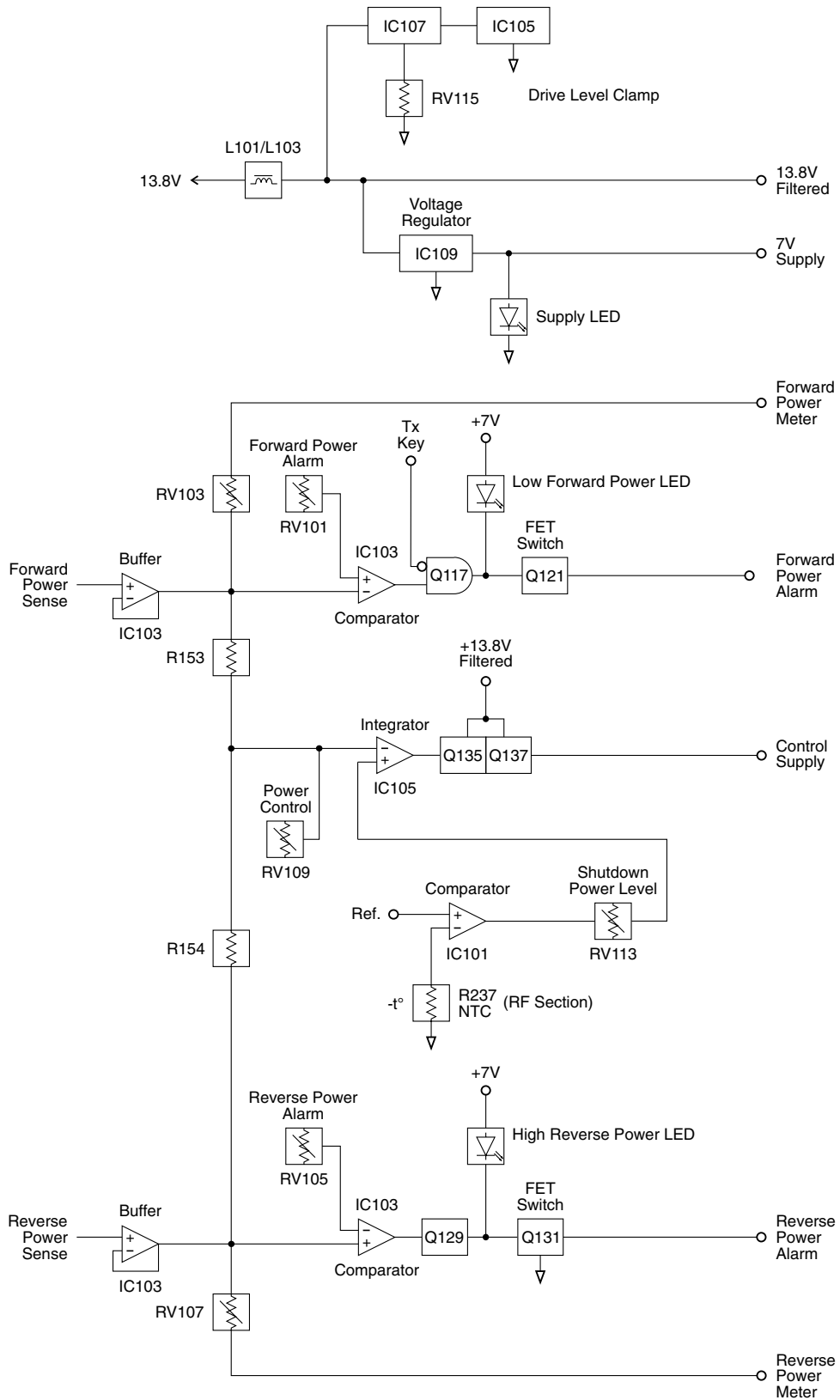


Figure 2.3 T838/839 Control Circuitry Block Diagram

### 2.3.1 Power Control

The DC voltages from the directional coupler representing forward and reflected power are buffered by the two voltage followers, IC103 pins 1, 2 & 3 and pins 8, 9 & 10. Their outputs are summed at an integrator (IC105 pins 1, 2 & 3), which drives the series pass control elements (Q135 & Q137).

Forward and reflected power are summed so that, under high output VSWR, the power control turns the PA down. This is because the control loop adjusts for the same DC voltage from the directional coupler that would have been present if there were no reflected power.

### 2.3.2 Driver Power Level

The maximum output power of the T838/839 can be limited by placing a ceiling on the driver output power level using RV115 (accessible through the side cover). For example, if RV115 is set for a maximum output power of 50W, the range of adjustment using RV109 (front panel power adjust) will be 20 to 50W.



**Caution:** The driver power level clamp (RV115) is factory set to give a maximum power output of 60W for the T838 and 120W for the T839. The unit may be damaged if this level is increased.

### 2.3.3 Thermal Protection

At excessively high temperatures, the output power will automatically reduce to a pre-set level (set by RV113), thus preventing the PA from overheating.

Ambient temperature within the PA is measured by a thermistor controlled voltage divider (R168, R237) which applies a voltage to a comparator with hysteresis (IC101 pins 8, 9 & 10). This thermistor is located on the PCB in the low pass filter cavity.

Thermal protection is also provided for each RF power module to prevent the module itself from overheating. This protection consists of a thermistor controlled voltage divider (R207, \*R215 and R220, R219) which sets a voltage on a comparator with hysteresis (IC204 pins 1, 2 & 3 and 5, 6 & 7). These thermistors are located on the module flanges.

The output current from all comparators is summed into the power control network via RV113 so that the power level to which the PA must turn down may be set.

### 2.3.4 Forward And Reverse Power Alarms

If forward power drops below, or reverse power rises above, presettable limits, alarms may be triggered.

The alarm outputs are open drain configuration and are low under normal conditions (i.e. forward and reverse power levels are normal).

IC103 pins 12, 13 & 14 and pins 5, 6 & 7 form comparators with thresholds adjusted via RV101 and RV105 respectively. The inputs are from the forward and reverse power signals from the directional coupler, buffered by IC103 pins 1, 2 & 3 and pins 8, 9 & 10. Thus, the power levels at which the forward and reverse power alarms are triggered are defined by RV101 and RV105 respectively.

### 2.3.5 Forward And Reverse Power Metering

Forward and reverse power signals from the two IC1 buffers are available for metering purposes. The output currents are adjustable via RV103 (forward power) and RV107 (reverse power).

### 2.3.6 Fan Control Circuitry

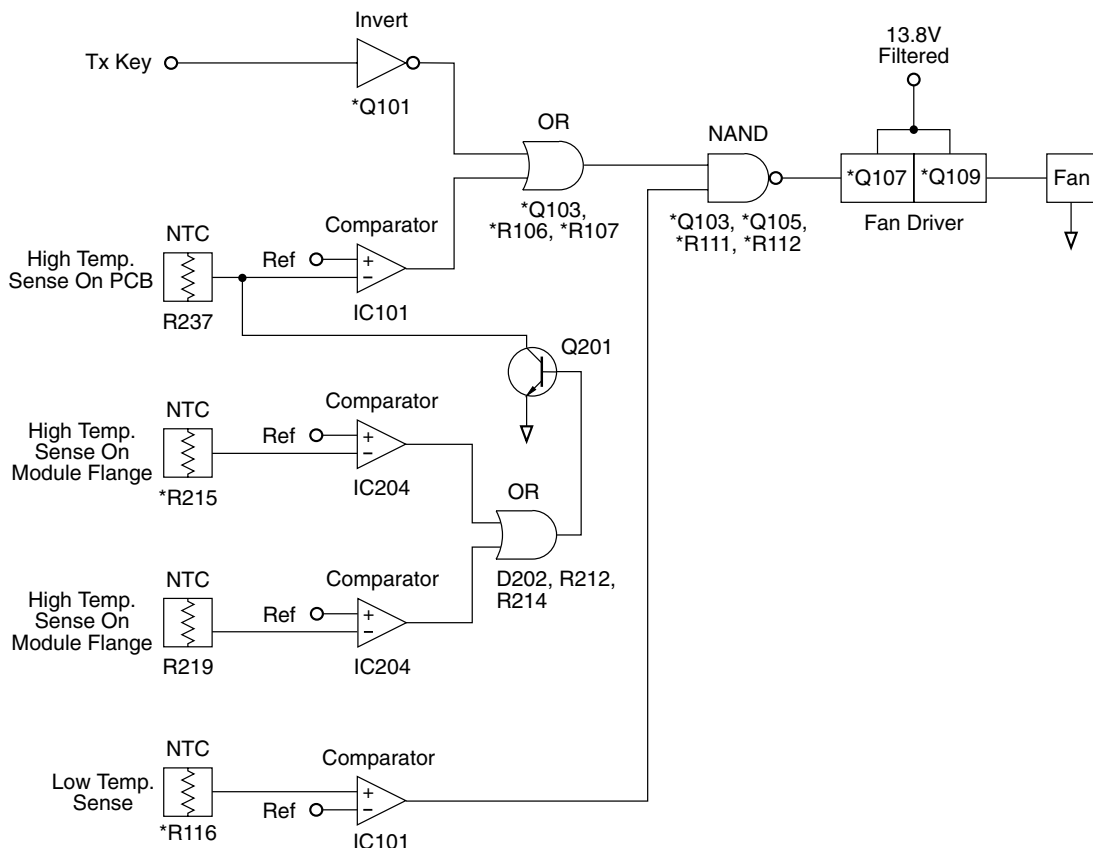


Figure 2.4 T839 Fan Control Logic Diagram

Comparator IC101 pins 12, 13 & 14 are set to switch at heatsink temperatures greater than +90°C or RF power module flange temperatures greater than +110°C, and pins 1, 2 & 3 at temperatures less than -10°C.

A logic AND function is applied to the comparator outputs by \*Q103 and \*Q105, thereby turning on the fan unconditionally (via \*Q107 and \*Q109) if the heatsink temperature exceeds +90°C or the module flange temperatures exceed +110°C.

A logic OR function is applied to comparator IC101 pins 12, 13 & 14 and Tx KEY signals, thereby turning on the fan when the transmitter is keyed and the temperature is between -10°C and +90°C (or +110°C for the module flanges).

If the temperature drops below -10°C, \*Q105 is turned off, preventing \*Q103 from activating the fan.

## 2.4 Power Supply & Regulator Circuits

(Refer to the control section circuit diagram in Section 5.)

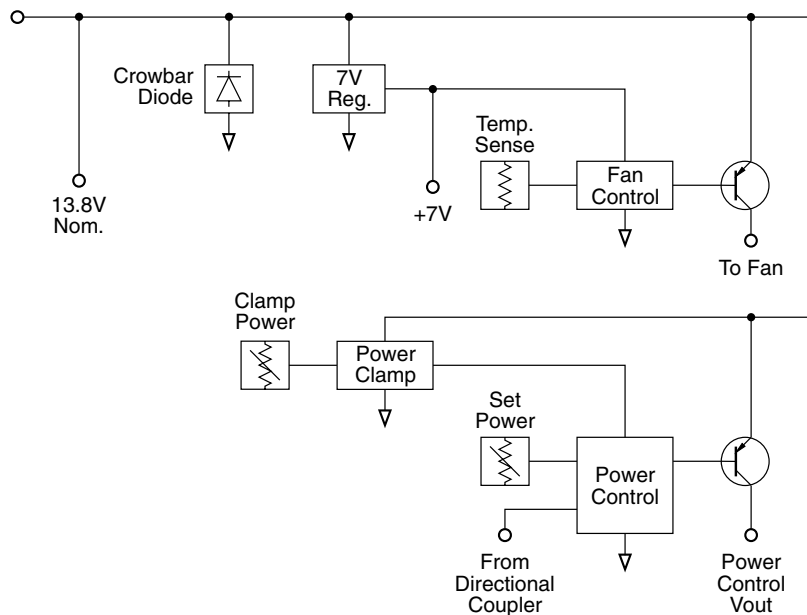


Figure 2.5 T838/839 Power Supply & Regulator Circuitry Block Diagram

The T838/839 are designed to operate off a 10.8-16V DC supply (13.8V nominal). A 7V supply runs directly off the 13.8V rail, driving the fan control, power control and alarm circuitry.

A crowbar diode is fitted for protection against connection to a power supply of incorrect polarity. It also provides transient overvoltage protection.

**Note:** A fuse must be fitted in the power supply line for the diode to provide effective protection.

## 3 T838/839 Initial Adjustment



**Caution:** This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to [Section 1.2](#) in Part A for more information on anti-static procedures when handling these devices.

The following section describes the full adjustment procedure to be carried out before operating the T838/839.

**Note:** The T838/839 require no RF tuning or alignment.

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components. Refer also to [Figure 3.3](#) which shows the location of the main adjustment controls.

The following topics are covered in this section.

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### 3.1 Test Equipment Required

- DC power supply capable of delivering 30A at 13.8V.
- Multimeter or DMM (e.g. Fluke 77).
- RF power meter (e.g. HP 435 series or Bird Wattmeter).
- 150W 30dB attenuator.
- 150W 3dB 50 ohm pad.
- 'BNC' to 'N' type adaptors (e.g. Amphenol, Greenpar).
- Appropriate trimming tools.

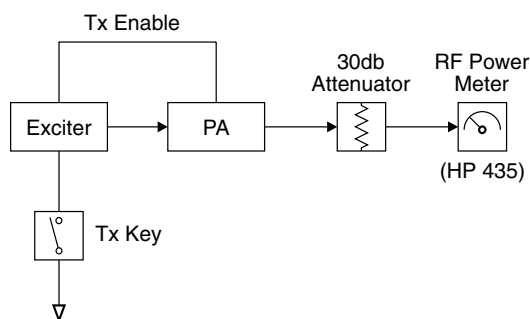


Figure 3.1 T838/839 Test Equipment Set-up



**Caution:** Do not connect attenuators or DC blocks between the T837 and T838/839 or the cyclic keying circuitry will not function correctly.

### 3.2 Preliminary Checks

Check for short circuits between the positive rail and earth.

Set up the test equipment as in [Figure 3.1](#).

Connect the T838/839 to a 13.8V DC supply.

Check that the quiescent current is <50mA.

To key the transmitter, earth the key line (pin 13) on the exciter.

Check that the power supply is still at 13.8V under load.

Check that the regulated power control supply is approximately 7V.

**Note:** The output power and alarm levels should be set with the side cover on. If the cover is removed for other adjustment procedures, make a final check of the output power and alarm levels with the side cover on.

## 3.3 Setting The Output Power



**Caution:** If the high temperature shutdown power level has not yet been set or is unknown, check that the unit does not overheat while setting the output power.

**Note 1:** You must set up the T838/839 according to the following instructions *before* operation in a radio system. *Do not* use the factory default settings as they may not suit your operating frequency.

To obtain optimum performance from the T838/839, ensure that the exciter used in this set-up procedure is the one that will be used with the PA in the radio system.

**Note 2:** Cables and connectors can easily cause a power loss of several watts if either too long or poorly terminated. Always use the shortest possible leads (or connectors instead of leads) between the T838/839 and power meter set-up.

You will need appropriate extension leads if you wish to carry out the adjustment procedures with the T838/839 withdrawn from the rack in the latched position. Alternatively, disconnect and withdraw the T838/839 and reconnect it behind the rack.

**Note 3:** The actual power used may be limited by regulatory requirements.

Set the exciter to the required operating frequency.

Connect the exciter output to the PA input via a thru-line wattmeter with a 1W full scale reading. Special BNC/N leads will be required.

Connect an RF power meter to the PA output connector.

With the exciter *not* keyed:

- remove the label over the adjustment hole for RV115 (driver power clamp);
- set RV115 to maximum (fully clockwise);
- set RV109 (front panel power control) to maximum (fully clockwise).

Key on the exciter.

Quickly (within 30 seconds) adjust RV115 until the output power is:

T838 - 60W  
T839 - 120W.

Adjust RV109 to set the power output to the following levels (or less if required):

T838 - 50W  
T839 - 100W.



**Caution:** Do not allow the output power to exceed these levels as this will seriously reduce the reliability of the PA.

Do not use RV115 to set the output power as this will disable the thermal protection circuitry. The power clamp must always be 10W (T838)/20W (T839) above the set output power.

Replace the label over the adjustment hole for RV115.

### 3.4 Limiting The Maximum Output Power

Refer to the control section circuit diagram in Section 5.

Two chip resistors are provided on the PCB if there is a requirement to set an absolute limit to the maximum output power. These two resistors are normally bypassed by a zero Ohm resistor (LINK2).

Remove LINK2 as shown in Figure 3.2 to bring R173 & R174 into circuit.

You can now limit the maximum output power by selecting the appropriate values for R173 & R174. Two examples are given in the table below:

@174MHz	60W max. (T838 & T839)	110W max. (T839 only)
R173	470Ω	470Ω
R174	3k9	1k8

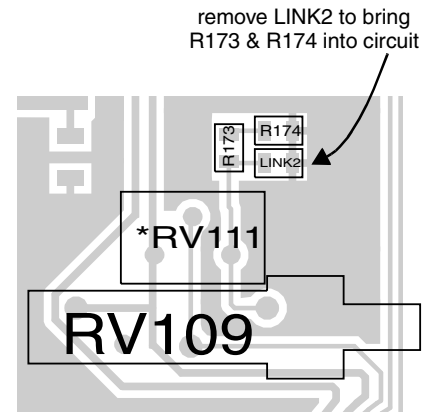


Figure 3.2 Modifications To Limit Maximum Output Power

**Note:** The resistor values given in the above table are valid at 174MHz only. Different frequencies may require different values, and you will have to determine the correct values for your application by testing. At any given frequency an increase in resistance will result in a decrease in maximum output power.

## 3.5 High Temperature Shutdown Power Level

Set RV109 (power control) to the required output power.

Earth pin 9 of IC101.

Adjust RV113 (shutdown power level) for an output power of:

T838 -	16W
T839 -	40W.

Remove the earth from pin 9 of IC101.

To check the operation of the RF power module thermistor(s), place shorting links across pins 1 & 2 and 2 & 3 of LINK201.

Check that the output power drops to:

T838 -	16W
T839 -	40W.

**Remove the shorting links from LINK201.**

## 3.6 Remote Forward Power Meter Calibration

If a remote meter is connected, adjust the forward power meter calibration control (RV103) for the remote reading to agree with the RF power meter reading.

## 3.7 Remote Reverse Power Meter Calibration

If a remote meter is connected, connect a 50 ohm 3dB pad (with the output open circuit) to the PA output.

Apply RF drive and Tx key.

Adjust the reverse power meter calibration control (RV107) for a quarter of the forward power reading.

## 3.8 Setting Alarm Levels

**Note:** If forward and reverse power metering is being used, set up their calibration ([Section 3.6](#) and [Section 3.7](#)) before setting the alarm levels.

### 3.8.1 Forward Power

Power up the T838/839 and adjust the front panel power control (RV109) so that the output power is at the alarm level required (e.g. 80W if the T839 normally operates at 100W).

Adjust the forward power alarm set control (RV101) so that the forward power alarm LED lights.

Check the alarm level setting by adjusting the power up and down and observing the alarm LED. A few watts hysteresis can be expected.

Readjust RV109 for the normal operating level.

**Note:** Remote indication is available at pin 3 of D-range 1.

### 3.8.2 Reverse Power

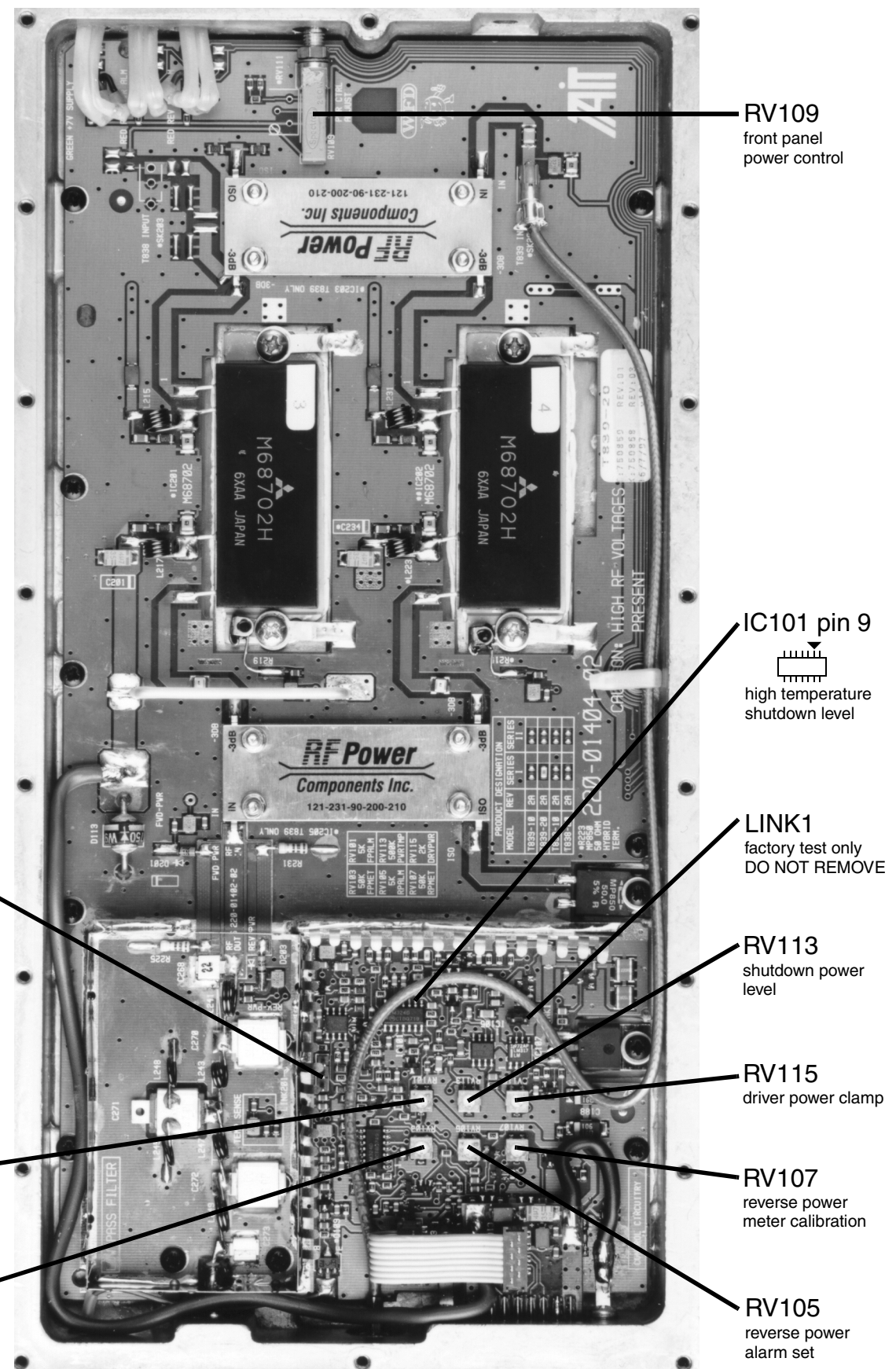
Power up the T838/839 and adjust the front panel power control (RV109) for the normal operating power level.

Place a known mismatch of the required value (e.g. 3:1 VSWR) and adjust the reverse power alarm set control (RV105) so that the reverse power alarm LED lights.

**Example:** A VSWR of 3:1 can be simulated by connecting an unterminated 3dB pad (100W) to the PA output. This will result in a return loss of 6dB.

**Note:** Remote indication is available at pin 4 of D-range 1.





The photograph printed at right will help you to identify the main controls used in tuning and adjusting the T838/839.

There is a similar photograph in [Figure 1.1](#) which shows the main circuit blocks.

Extending both these fold-outs will allow you to refer to both photographs while using the manual.

Figure 3.3 T838/839 Main Adjustment Controls (T839 Shown)





## 4 T838/839 Fault Finding



**Caution:** This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to [Section 1.2](#) in Part A for more information on anti-static procedures when handling these devices.

The following test procedures and fault finding flow charts may be used to help locate a hardware problem, however they are by no means a complete fault finding procedure. If you still cannot trace the fault after progressing through them in a logical manner, contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Customer Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components.

The following topics are covered in this section.

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4.4.4	Fan Control Circuitry	4.10
4.5	Replacing RF Power Modules	4.11
4.6	Removing The PCB From The Heatsink	4.12

Figure	Title	Page
4.1	Positioning Of Test Leads	4.6



## 4.1 Visual Checks

Remove the side cover from the T838/839 and inspect the PCB for damaged or broken components, paying particular attention to the surface mounted devices (SMDs). Also check for defective solder joints.

Refer to [Section 4.5](#), [Section 4.6](#) and [Section 3](#) of Part A for more details on repair and replacement of components.

## 4.2 DC Checks

Check that +13.8V is present on pin 3 of \*#IC202 and/or #IC201. Make this measurement when the transmitter is not keyed.

Key the transmitter and check that approximately 6-13V is present on pin 2 of \*#IC202 and/or #IC201 (the level is dependent on the setting of RV109).

Check that +13.8V is present at pin 4 of IC103.

Check that approximately +12V is present at pin 8 of IC105 (the level is dependent on the setting of RV109).

Check that +7.0V is present at the output of regulator IC109.

## 4.3 RF Checks

The PA Fault Finding Charts ([Section 4.4.1](#) & [Section 4.4.2](#)) provide a systematic approach for locating a fault in the RF circuitry. Use these charts in conjunction with [Figure 4.1](#), which shows the locations of the 50Ω input and output test points for RF power modules #IC201 and \*#IC202.

**Note 1:** Use good quality 50Ω coax for the “flying” test leads.

**Note 2:** Ensure each output is terminated in a 50Ω load of the correct power rating.

For problems with the power control circuitry, refer to the Power Control Fault Finding Chart ([Section 4.4.3](#)).

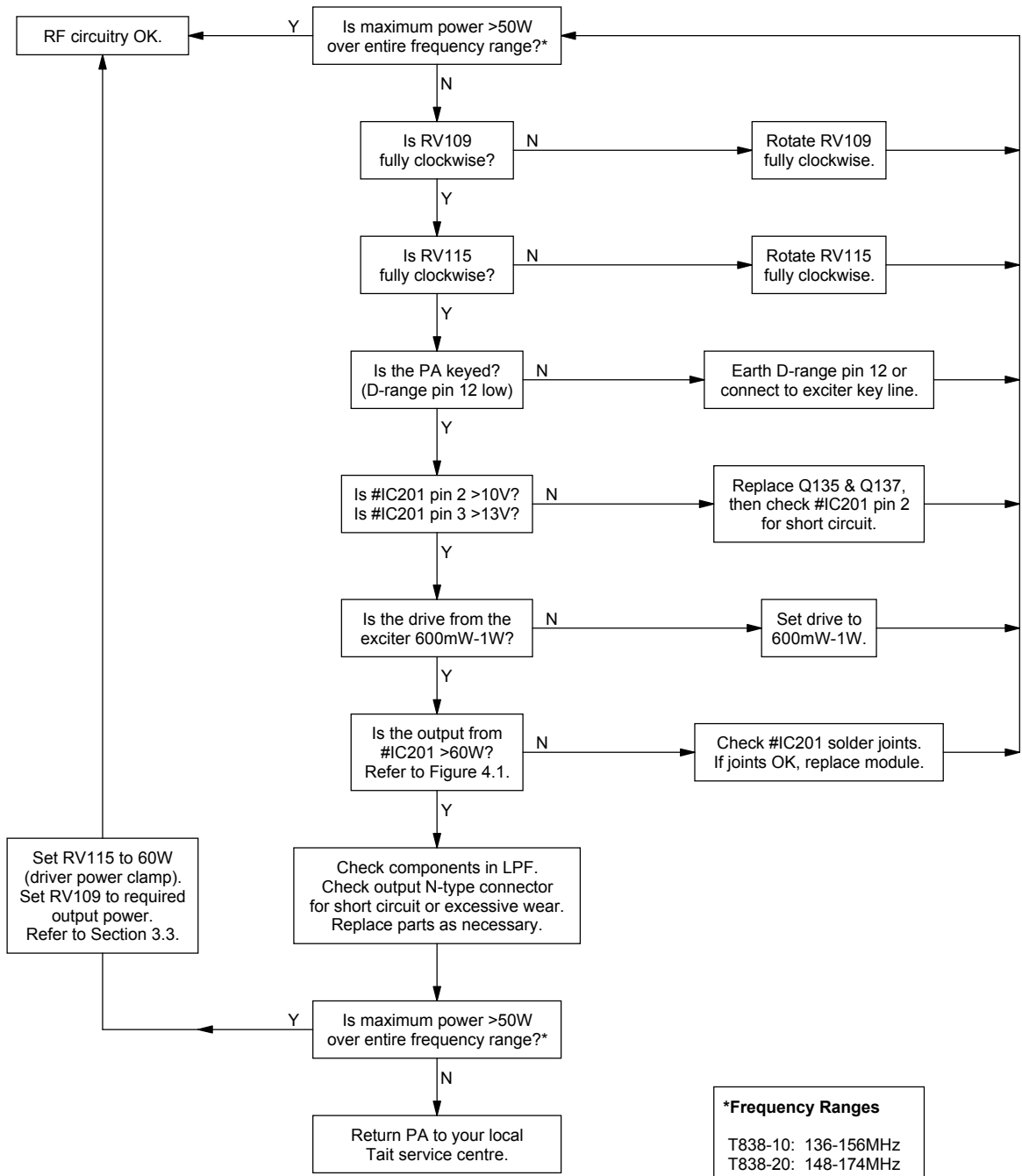


**replace A4 pages D4.5/D4.6 with A3 pages D4.5/D4.6**

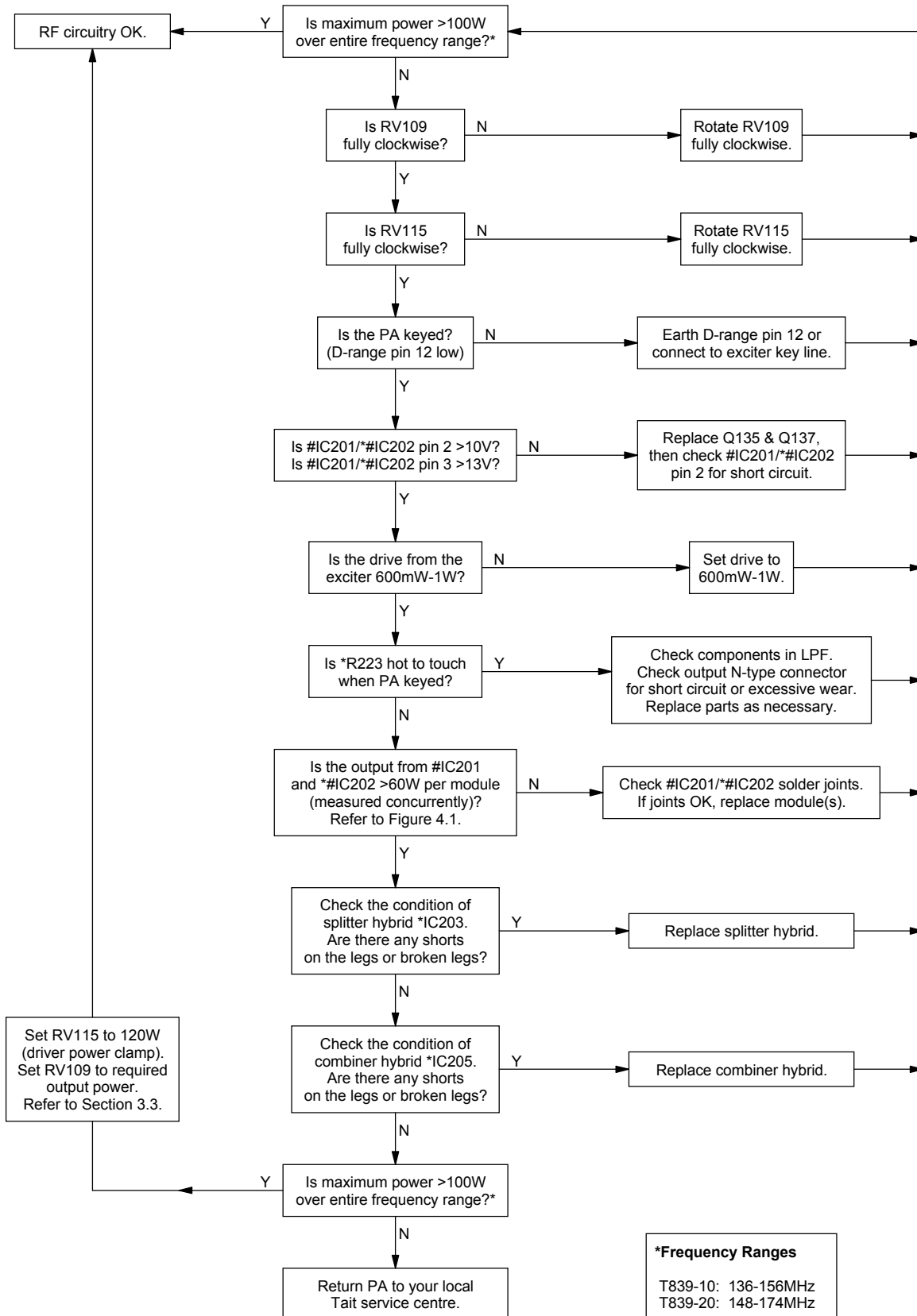
**replace A4 pages D4.5/D4.6 with A3 pages D4.5/D4.6**

## 4.4 Fault Finding Charts

### 4.4.1 T838 PA



4.4.2 T839 PA





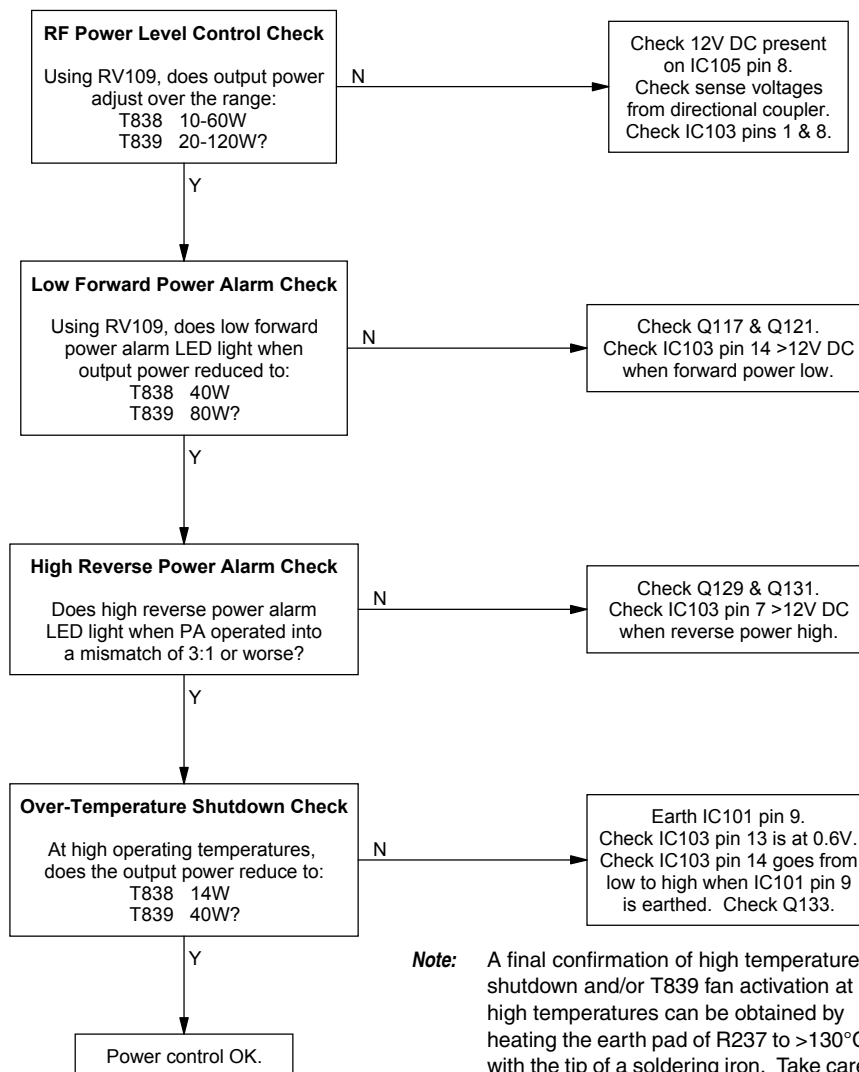
### 4.4.3 Power Control

Approximate voltages (@ 174MHz) under normal operating conditions:

Forward & Reverse Power Measurement	Output Power	
	50W	100W
forward power at IC103 pin 1	2.3V	3.3V
forward power at C261	4.1V	6.0V
reverse power at IC103 pin 8	0.6V	0.6V
reverse power at C295	0.3V	0.6V

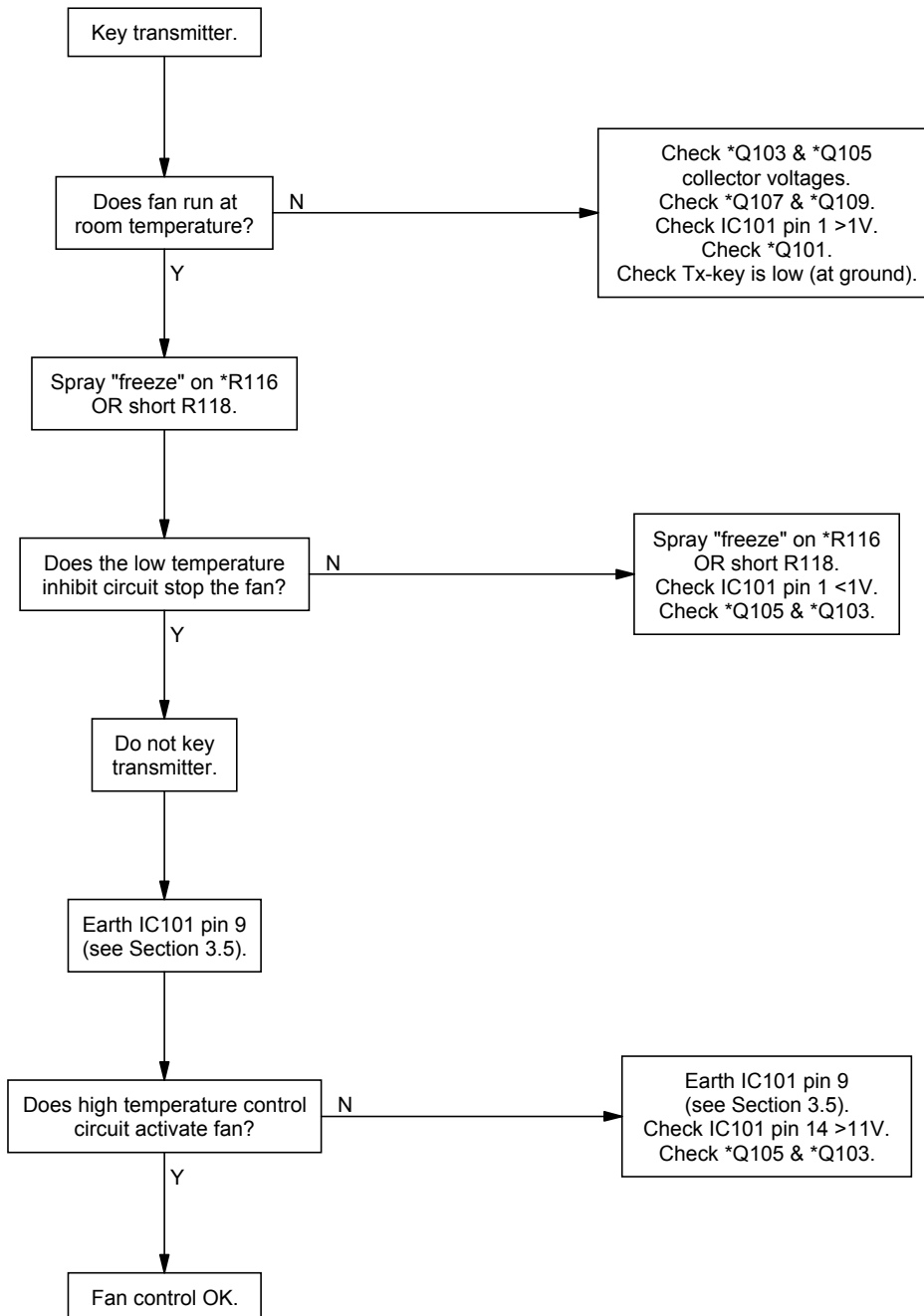
**Caution**

The following voltage checks are all done with RV115 (driver power clamp) set to maximum. When these tests are finished, reset RV115 to 60W (T838) or 120W (T839).



**Note:** A final confirmation of high temperature shutdown and/or T839 fan activation at high temperatures can be obtained by heating the earth pad of R237 to >130°C with the tip of a soldering iron. Take care not to damage R237.

## 4.4.4 T839 Fan Control Circuitry



## 4.5 Replacing RF Power Modules



**Caution:** Follow these instructions carefully, otherwise the module can fail because of poor heatsinking or cracked substrates.



**Caution:** Do not apply too much heat to the original type of thermistor assembly as the epoxy used may give off fumes that will cause eye irritation. If necessary, replace this device as a complete assembly (see note 1 below).

Desolder the module and thermistor<sup>1</sup> legs by heating with a soldering iron and lifting away from the PCB with a screwdriver or thin stainless steel spike.

Undo the module screws and remove the thermistor assembly.

Desolder and remove both earth tags.

Gently lift the module away from the heatsink.

**Note:** The module may be stuck down quite firmly with heatsink compound. You may need to carefully prise it away from the heatsink with a small screwdriver. Keep the heatsink compound clean while the module is detached.

Apply a small amount of heatsink compound (Dow-Corning 340 or equivalent) to the replacement module mounting surface. Use enough compound to ensure an even film over the entire mounting surface.

Reposition the module in the correct orientation and ensure it is well pasted to the heatsink.

Replace the earth tags and thermistor<sup>1</sup> assembly in their original positions and hand-tighten the screws, ensuring the tags and thermistor remain in place. Alternately tighten each screw evenly, finally torquing them down to 56N.cm/5in.lbf. with an accurate torque driver.



**Caution:** It is essential that you apply the correct torque to these screws to allow the module flange to expand and contract under temperature cycling. Also, do not solder any module legs before torquing down otherwise the device may be broken.

Solder all module legs to the PCB.

Carefully solder the thermistor leg to the PCB<sup>1</sup>.

- 
1. Later production PAs are fitted with a different type of thermistor which you do not need to desolder from the PCB before removing a power module. Refer to the top side PCB layout diagrams in Sections 5.2 and 5.3 for further details.

## 4.6 Removing The PCB From The Heatsink

**Note:** This is a lengthy procedure and should be considered only after all other checks have been carried out. There are no components on the bottom of the PCB.

Remove the harmonic filter shield lid.

**T839 Only:** Desolder the power feed to the fan from the PCB.

Remove the output 50 ohm coaxial connector by unscrewing it from the heatsink casting and desoldering it from the PCB and harmonic filter shield wall.

Unplug the input 50 ohm coaxial cable from the PCB, unscrew the BNC connector from the heatsink, and remove the connector and cable.

Desolder the positive and negative power feed wires from the D-range PCB.

Disconnect the ribbon cable from the D-range PCB.

Remove the 2 screws securing the D-range connector and PCB to the heatsink and withdraw the assembly from the heatsink.

Remove the mounting screws for the TO-220 device(s): Q137 (and \*R223 in the T839).

Remove the screws securing the RF power module(s): #IC201 (and \*#IC202 in the T839).

**T839 Only:** Remove the four hex nuts and washers from the splitter/combiner hybrids (\*IC203 and \*IC205).

Remove the 11 PCB retaining screws.

Push the three LEDs out of their front panel grommets.

Lift the PCB gently from the heatsink to gain access to the underside of the board.

**Note:** #IC201, \*#IC202 and \*R223 may be stuck down with heatsink compound. You may need to carefully prise them away from the heatsink with a small screwdriver.



**Caution:** Keep the heatsink compound clean while the PCB is detached. Any objects caught in the heatsink compound underneath the module which prevent effective earthing and/or heatsinking will cause catastrophic failure.



**Caution:** Do not operate the PA with the PCB detached as the heatsink is used for earthing and heat dissipation.

To replace the PCB, reverse the order of removal, taking care that the wiring is correctly positioned and not 'pinched'.

Make sure that the heatsink compound has stayed clean, and that the insulating pad for Q137 is not damaged.

If you have difficulty refitting the LEDs, try pushing the body of the LED back into the grommet with a thin screwdriver or spike.

**Caution:**

Tighten the splitter/combiner hybrid hex nuts to a torque of 22N.cm/2in.lbf. Any greater force will damage the devices.

Tighten the RF power module screws to a torque of 56N.cm/5in.lbf. with an accurate torque driver. Deviating from this figure can cause the device to fail (refer to [Section 4.5](#)).



Figure 4.1 on the next page shows the locations of the 50Ω input and output test points and how to connect the test leads.

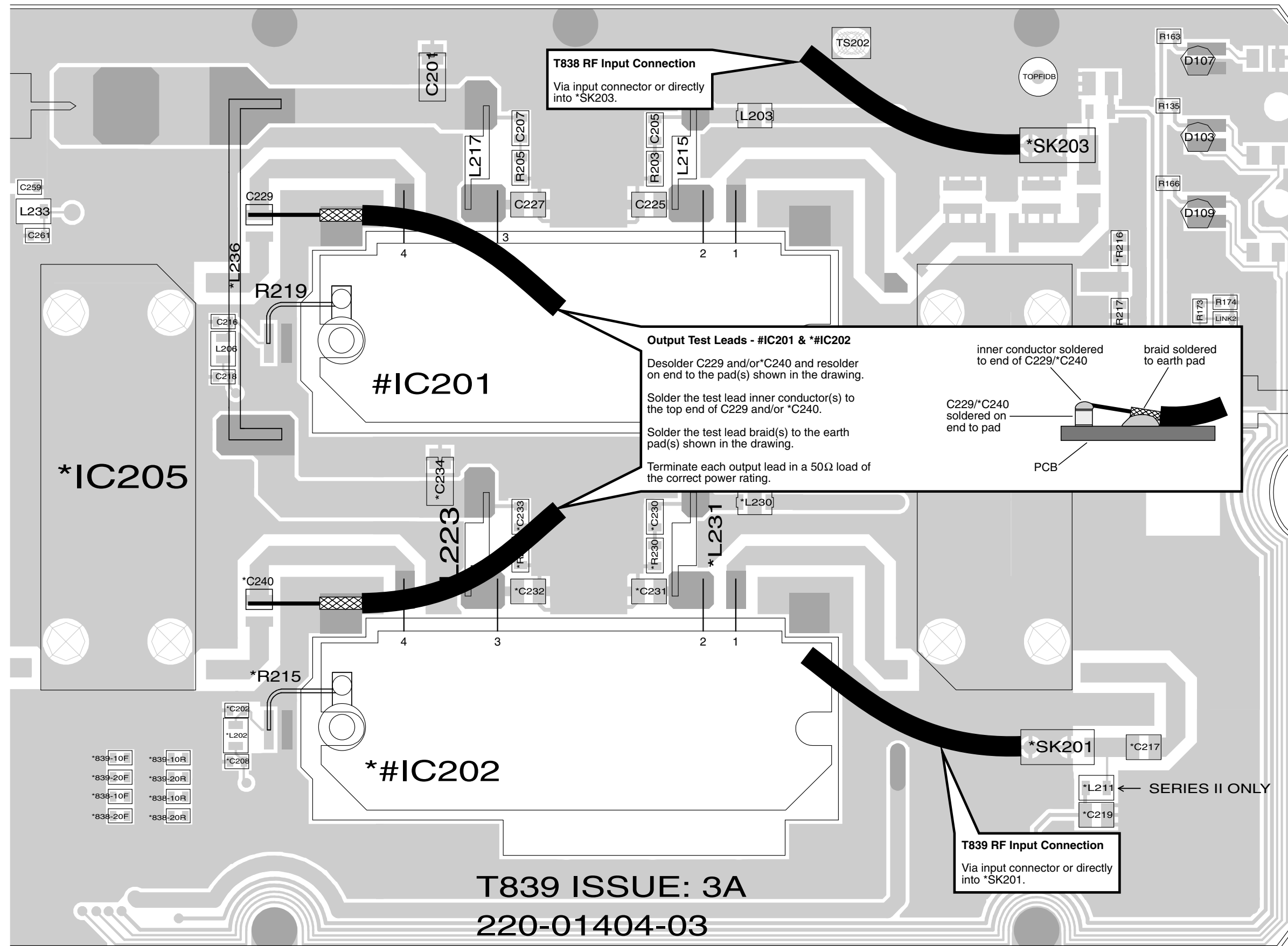


Figure 4.1 Positioning Of Test Leads



## 5 T838/839 PCB Information



**Caution:** This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to [Section 1.2](#) in Part A for more information on anti-static procedures when handling these devices.

This section provides the following information on the T838 and T839 power amplifiers:

- parts lists
- grid reference indexes
- mechanical assembly drawings
- PCB layouts
- circuit diagrams.

Section	Title	IPN	Page
5.1	Introduction		5.1.3
5.2	T838 Power Amplifier PCB	220-01404-03	5.2.1
5.3	T839 Power Amplifier PCB	220-01404-03	5.3.1

The T838 and T839 share the same basic design and are built on the same PCB. However, in order to simplify the presentation of the PCB information for each product, we have provided a separate parts list, grid reference index and set of drawings for both the T838 and T839, even though this has meant duplicating some information (e.g. grid reference index and circuit diagrams) in each section.



## 5.1 Introduction

### Product Type Identification

You can identify the PA type by checking the product code printed on a label on the rear of the heat-sink (product codes are explained in [Section 1.3](#) in this Part of the manual, and [Figure 1.1](#) in Part A shows typical labels). You can further verify the PA type by checking the placement of an SMD resistor in the table that is screen printed onto the PCB, similar to the example drawn below. In this example, the resistor indicates that the product was built as a T830 Series I compatible T838-10-XXXX. See below for further details on T830 Series I/Series II compatibility.

PRODUCT TYPE			
MODEL	REV	SERIES I	SERIES II
T839-10	3A		
T839-20	3A		
T838-10	3A	■	
T838-20	3A		

**Note:**

The only function of this resistor is to indicate the product type. It has no effect on the circuitry or operation of the PA.

### T830 Series I / Series II Compatibility

T838 and T839 PAs can be built compatible with either T830 Series I or Series II equipment. You can check whether your PA was built as Series I or Series II compatible by checking the table that is screen printed onto the PCB, as explained above.

The table below explains briefly the differences between Series I and Series II compatible PAs. Apart from these differences, Series I and Series II compatible PAs are electrically and mechanically the same. Refer to Part I for detailed information on Series I/Series II compatibility.

**Note:** This manual covers the latest design T838 PA which uses an RF power module and is identified by the product code T838-X0-XXXX. Please refer to service manual M830-00-100 for information on the earlier model (Series I) T838 PA which is identified by the product code T838-10.

Item	Series I Compatible PA	Series II Compatible PA
*L201 (T838) *L211 (T839)	not fitted	fitted
*R120	fitted	not fitted
cyclic keying	disabled	enabled
RF input	front panel SMC	rear panel BNC
front panel	Series I with black Tait logo and Series I handle	Series II with blue Tait logo and Series II handle

## PCB Identification

All PCBs are identified by a unique 10 digit “internal part number” (IPN), e.g. 220-12345-00, which is screen printed onto the PCB (usually on the top side), as shown in the example below:



The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

**Note:** It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

## Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:

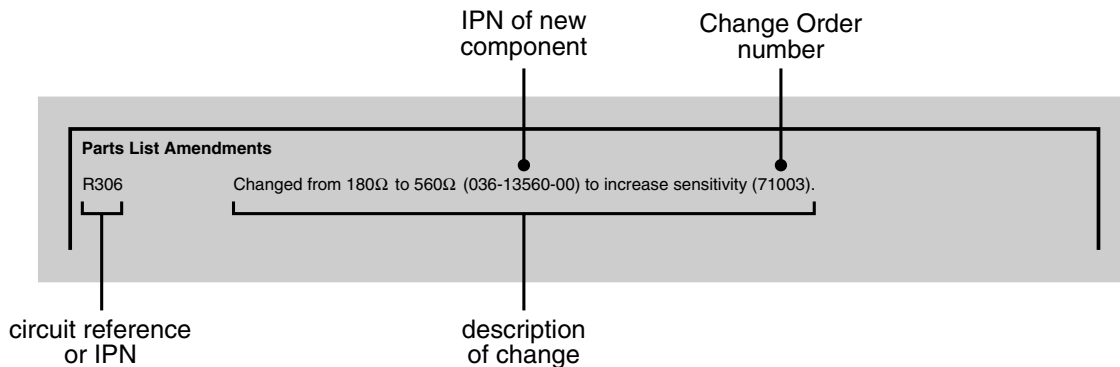
Ref	Var	IPN	Description
C126		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C127		020-09220-01	CAP ELECT RADL 220M 16V 10X12.5MM
C128		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C129		015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
&C130	10	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	15	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
&C130	20	015-25100-08	CAP CER 0805 CHIP 10N 10% X7R 50V
&C130	25	015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C131		015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V
C132		015-24470-08	CAP CER 0805 CHIP 4N7 10% X7R 50V
C133		015-05470-08	CAP CER 1206 CHIP 47N 10% X7R 50V

circuit reference - lists components in alphanumeric order  
 variant column - indicates that this is a variant component which is fitted only to the product type listed  
 description - gives a brief description of the component  
 Internal Part Number - order the component by this number

The mechanical and miscellaneous section lists the variant and common parts in IPN order.

## Parts List Amendments

At the front of the parts list is the Parts List Amendments box (an example of which is shown below). This box contains a list of component changes which took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order. The number in brackets at the end of each entry refers to the Tait internal Change Order document.



## Variant Components

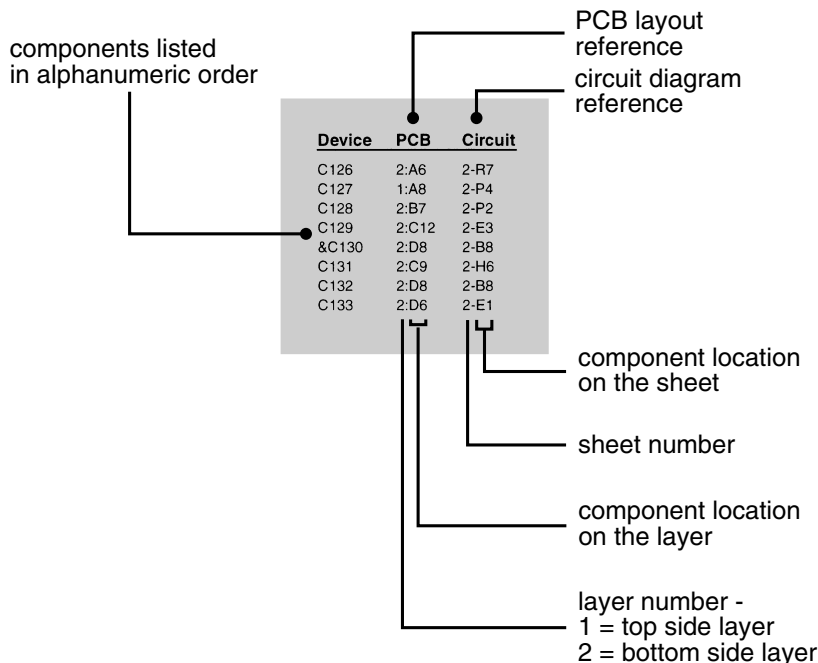
A variant component is one that has the same circuit reference but different value or specification in different product types. Where two products share the same PCB, the term “variant” is also used to describe components unplaced in one product. Variant components have a character prefix, such as “&”, “=” or “#”, before the circuit reference (e.g. &R100).

The table below explains the variant prefixes used in T800 Series II products:

If the variant prefix is. . .	the component will. . .
&	change according to channel spacing
=	change according to frequency stability
#	change according to frequency range
%	change or placed/unplaced for special applications
*	be unplaced in one product (where two products share the same PCB)

## Grid Reference Index

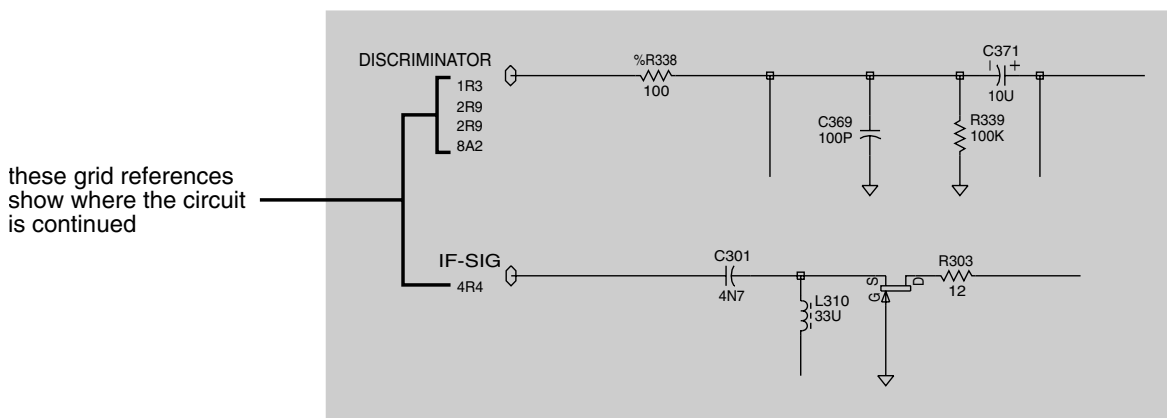
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alphanumeric order, along with the appropriate alphanumeric grid references, as shown below:



## Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram "grid references" are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



## 5.2 T838 Power Amplifier PCB

This section contains the following information.

IPN	Section	Page
220-01404-03	Parts List	5.2.3
	Mechanical & Miscellaneous Parts	5.2.6
	Mechanical Assembly	5.2.7
	Grid Reference Index	5.2.9
	PCB Layout - Bottom Side	5.2.11
	PCB Layout - Top Side	5.2.12
	Control Section Circuit Diagram	5.2.13
	RF & Thermistor Control Sections Circuit Diagram	5.2.14





## T838 Parts List (IPN 220-01404-03)

### How To Use This Parts List

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed. Static sensitive devices are indicated by an (S) at the start of the description column.

The miscellaneous and mechanical section lists the variant and common parts in IPN order. Where possible, a number in the legend column indicates their position in the mechanical assembly drawing.

The Parts List Amendments box below lists component changes that took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order.

### Parts List Amendments

C155	Component designator changed to %C155.	
D101, D105	Removed from the main PCB and replaced by two 1N4148 diodes (IPN 001-50012-00) placed on the D-range PCB: one soldered between PL101 pins 5 and 7 (cathode), the other between PL101 pins 6 and 8 (cathode). To allow external power meters to read zero and still provide meter overvoltage protection (710978).	
D113	Changed from MR750 (IPN 001-00011-60) to MR2520L (IPN 001-00012-90) to provide overvoltage transient suppression (750087/88/89/90/91/92).	
IC204	Changed from LMC622CM to LM358 (710382).	
*R120	*R120 is no longer fitted to Series I compatible T838s. T838 will not transmit in Tx tail if cyclic keying is disabled and *R120 is fitted. Designator changed to %R120 (760207)	
R123, R158	Changed from 1k resistors (IPN 036-14100-00) to BA592 diodes (IPN 001-10059-20) to allow external power meters to read zero (710978).	
R207	Changed from 47k (IPN 036-15470-10) to 4k7 (IPN 036-14470-10)	} 100k thermistor assembly replaced with 10k item; values of associated components changed accordingly (710394/411/447).
R209	Changed from 1k5 (IPN 036-14150-10) to 390W (IPN 036-13390-10)	
R210	Changed from 4k7 (IPN 036-14470-10) to 390W (IPN 036-13390-10)	
R213	Changed from 3k9 (IPN 036-14390-00) to 560Ω (IPN 036-13560-00)	
R218	Changed from 390Ω (IPN 036-13390-10) to 100Ω (IPN 036-13100-10)	
R219	Changed from 100k NTC (IPN 045-06100-05) to 10k NTC (IPN 045-05100-02)	
R220	Changed from 47k (IPN 036-15470-10) to 4k7 (IPN 036-14470-10)	
R222	Changed from 47k (IPN 036-15470-10) to 4k7 (IPN 036-14470-10)	
R224	Changed from 1k5 (IPN 036-14150-10) to 390Ω (IPN 036-13390-10)	
R228	Changed from 4k7 (IPN 036-14470-10) to 390Ω (IPN 036-13390-10)	
R229	Changed from 56k (IPN 036-15560-10) to 6k8 (IPN 036-14680-10)	
RV109	Changed from 2k 10 turn (IPN 044-04200-03) to 2k 15 turn (IPN 044-04200-06)	
349-00020-36	The two M3x8 Torx screws which secure the module into the rack frame have been replaced by M3x8 Pozidriv screws (IPN 349-00020-55) (750101/2/3/5/6).	

Ref	Var	IPN	Description	Ref	Var	IPN	Description
<p><b>Note:</b> The T838 and T839 share the same basic design and are built on the same PCB. While most components in this design are common to both products, there are a number of components that are placed in only one product.</p> <p>Because the circuit diagrams for this design cover both products, we have indicated on the diagrams those components which are placed only in the T838 by enclosing them in a labelled box. The circuit reference for each of these components is also prefixed with the "*" character.</p> <p>The "*" character is used in this parts list to indicate components used only in the T838.</p>							
C129		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D103		008-00013-32	(S) LED 3 RED LO CURRENT NO MTG
C131		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V	D105		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
C132		015-24100-08	CAP CER 0805 1N 10% X7R 50V	D107		008-00013-35	(S) LED 3 GRN LO CURRENT NO MTG
C133		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D109		008-00013-32	(S) LED 3 RED LO CURRENT NO MTG
C137		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D111		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
C138		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	D113		001-00011-60	(S) DIODE SR2607 -- USE MR750
C139		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D201		001-00013-45	(S) DIODE SCHTTKY 1SS97/2
C141		014-07100-02	CAP TANT CHIP 1U0 3.2 X 1.6MM	D202		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
C143		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D203		001-00013-45	(S) DIODE SCHTTKY 1SS97/2
C145		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC101		002-10003-24	(S) IC SMD 324 4X O-AMP SO14
C147		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	IC103		002-10003-24	(S) IC SMD 324 4X O-AMP SO14
C149		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC105		002-10003-58	(S) IC SMD LM358 DUAL O-AMP
C151		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC107		002-10003-17	(S) IC LM317L REG S0-8 100MA
C153		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC109		002-10003-17	(S) IC LM317L REG S0-8 100MA
C155		015-25100-08	CAP CER 0805 10N 10% X7R 50V	#IC201	10	004-00687-02	MODULE M68702L 135-160MHZ 60W
C159		015-23680-08	CAP CER 0805 680P 10% X7R 50V	#IC201	20	004-00687-03	MODULE M68702H 150-174MHZ 60W
C161		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC204		002-10006-62	(S)IC SMD LMC662CM 2X O-AMP
C162		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L101		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C164		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	L103		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C165		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L105		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C167		015-24100-08	CAP CER 0805 1N 10% X7R 50V	*L201		056-10330-02	(L) IND SMD 330NH
C169		014-07470-03	L) CAP TANT SMD 4U7 35V 20%	L203		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C171		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	L206		056-14150-02	(L) IND SMD 1.5UH
C173		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L208		056-14150-02	(L) IND SMD 1.5UH
C174		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L215		052-08340-40	COIL A/W 4T/4.0MM SMD 0.8MM
C176		015-06100-08	CAP CER 1206 100N 10% X7R 50V	L217		052-08340-40	COIL A/W 4T/4.0MM SMD 0.8MM
C178		015-25100-08	CAP CER 0805 10N 10% X7R 50V	L233		056-10330-02	(L) IND SMD 330NH
C179		015-06150-08	CAP CER 1206150N10% X7R25VWV 25V	L239		056-10330-02	(L) IND SMD 330NH
C180		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L241		052-08360-20	COIL A/W 2T/6.0MM SMD 0.8MM
C181		015-23100-01	CAP CER 0805 100P 5% NPO 50V	L243		052-08340-20	COIL A/W 2T/4.0MM SMD 0.8MM
C182		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	L245		052-08345-10	COIL A/W 1T/4.5MM SMD 0.8MM
C184		015-25100-08	CAP CER 0805 10N 10% X7R 50V	L247		052-08340-20	COIL A/W 2T/4.0MM SMD 0.8MM
C185		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L248		052-08345-10	COIL A/W 1T/4.5MM SMD 0.8MM
C186		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L249		052-08360-20	COIL A/W 2T/6.0MM SMD 0.8MM
C187		015-06100-08	CAP CER 1206 100N 10% X7R 50V	L264		056-10330-02	(L) IND SMD 330NH
C188		014-08100-00	CAP TANT CHIP 10M 16VW +-20%	LINK1		240-00020-68	HEADER 2W PCB MTG STD
C189		015-25100-08	CAP CER 0805 10N 10% X7R 50V	LINK2		036-10000-00	RES M/F 0805 ZERO OHM
C190		015-23680-08	CAP CER 0805 680P 10% X7R 50V	LINK201		240-00020-59	HEADER 3 W 1 R PCB MTG
C192		015-06100-08	CAP CER 1206 100N 10% X7R 50V	PL101		240-00010-55	PLUG 15 W D RANGE W/W PNL MT
C193		015-06100-08	CAP CER 1206 100N 10% X7R 50V	Q111		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C195		014-08100-00	CAP TANT CHIP 10M 16VW +-20%	Q113		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
C201		014-07470-03	L) CAP TANT SMD 4U7 35V 20%	Q115		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
*C203		015-03680-06	CAP CER 1210 680P NPO200VGRM42	Q117		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
*C204		015-03680-06	CAP CER 1210 680P NPO200VGRM42	Q119		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
C205		015-06100-08	CAP CER 1206 100N 10% X7R 50V	Q121		000-10017-00	LS) XSTR SMD BF170LT1 SOT23
*C206		015-03680-06	CAP CER 1210 680P NPO200VGRM42	Q123		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C207		015-06100-08	CAP CER 1206 100N 10% X7R 50V	Q125		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C215		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q127		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C216		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	Q129		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
C218		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q131		000-10017-00	LS) XSTR SMD BF170LT1 SOT23
C220		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q133		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
C221		015-06100-08	CAP CER 1206 100N 10% X7R 50V	Q135		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
C222		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	Q136		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
C223		015-24100-08	CAP CER 0805 1N 10% X7R 50V	Q137		000-00030-95	(S) XSTR 2N6107 PNP T0220 AF
C224		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q201		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
C225		015-03680-06	CAP CER 1210 680P NPO200VGRM42	R101		036-14100-00	RES M/F 0805 1K 5%
C226		015-23680-08	CAP CER 0805 680P 10% X7R 50V	R103		036-15330-00	RES M/F 0805 33K 5%
C227		015-03680-06	CAP CER 1210 680P NPO200VGRM42	R104		036-16470-00	RES M/F 0805 470K 5%
C229		015-03680-03	CAP CER 680P 5% NPO100V GRH111	R117		036-16220-00	RES M/F 0805 220K 5%
C259		015-23680-08	CAP CER 0805 680P 10% X7R 50V	R118		036-15270-00	RES M/F 0805 27K 5%
C261		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	R119		036-16470-00	RES M/F 0805 470K 5%
C268		029-02220-02	CAP MICA 5 CASE 22P 5%	R123		036-14100-00	RES M/F 0805 1K 5%
C270		029-02560-03	CAP MICA 10 CASE 56P 2%	R124		036-16100-00	RES M/F 0805 100K 5%
C271		029-02470-03	CAP MICA 10 CASE 47P 2%	R125		036-15100-00	RES M/F 0805 10K 5%
C272		029-02560-03	CAP MICA 10 CASE 56P 2%	R126		036-14100-00	RES M/F 0805 1K 5%
C273		029-02220-02	CAP MICA 5 CASE 22P 5%	R127		036-15100-00	RES M/F 0805 10K 5%
C294		015-23680-08	CAP CER 0805 680P 10% X7R 50V	R128		036-15220-00	RES M/F 0805 22K 5%
C295		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	R129		036-17100-00	RES M/F 0805 1M 5%
C297		015-23680-08	CAP CER 0805 680P 10% X7R 50V	R130		036-14220-00	RES M/F 0805 2K2 5%
C298		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	R131		036-16180-00	RES M/F 0805 180K 5%
D101		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23	R132		036-14100-00	RES M/F 0805 1K 5%
				R133		036-15100-00	RES M/F 0805 10K 5%
				R134		036-13470-00	RES M/F 0805 470E 5%
				R135		036-13680-00	RES M/F 0805 680E 5%
				R136		036-15100-00	RES M/F 0805 10K 5%
				R137		036-13470-00	RES M/F 0805 470E 5%
				R138		036-15100-00	RES M/F 0805 10K 5%
				R141		036-15100-00	RES M/F 0805 10K 5%
				R142		036-15100-00	RES M/F 0805 10K 5%
				R143		036-15100-00	RES M/F 0805 10K 5%
				R144		036-15820-00	RES M/F 0805 82K 5%
				R145		036-15470-00	RES M/F 0805 47K 5%
				R146		036-14180-00	RES M/F 0805 1K8 5%
				R148		036-14820-00	RES M/F 0805 8K2 5%
				R149		036-13470-00	RES M/F 0805 470E 5%
				R150		036-12220-00	RES M/F 0805 22E 5%
				R151		036-15100-00	RES M/F 0805 10K 5%
				R152		036-15100-00	RES M/F 0805 10K 5%
				R153		036-14680-00	RES M/F 0805 6K8 5%
				R154		036-14680-00	RES M/F 0805 6K8 5%
				R155		036-13220-00	RES M/F 0805 220E 5%
				R156		036-13100-00	RES M/F 0805 100E 5%

Ref	Var	IPN	Description	Ref	Var	IPN	Description
R157		036-12220-00	RES M/F 0805 22E 5%				
R158		036-14100-00	RES M/F 0805 1K 5%				
R159		036-15100-00	RES M/F 0805 10K 5%				
R160		036-14470-00	RES M/F 0805 4K7 5%				
R161		036-14100-00	RES M/F 0805 1K 5%				
R162		036-17100-00	RES M/F 0805 1M 5%				
R163		036-13680-00	RES M/F 0805 680E 5%				
R164		036-14220-00	RES M/F 0805 2K2 5%				
R165		036-14100-00	RES M/F 0805 1K 5%				
R166		036-13680-00	RES M/F 0805 680E 5%				
R168		036-15100-10	RES M/F 0805 10K 1%				
R169		036-14100-00	RES M/F 0805 1K 5%				
R170		036-14100-00	RES M/F 0805 1K 5%				
R171		036-14100-00	RES M/F 0805 1K 5%				
R172		036-15100-10	RES M/F 0805 10K 1%				
R173		036-13470-00	RES M/F 0805 470E 5%				
R174		036-13220-00	RES M/F 0805 220E 5%				
R175		036-16220-00	RES M/F 0805 220K 5%				
R176		036-15100-00	RES M/F 0805 10K 5%				
R177		036-14470-00	RES M/F 0805 4K7 5%				
R178		036-16100-00	RES M/F 0805 100K 5%				
R179		036-15100-00	RES M/F 0805 10K 5%				
R180		036-16150-00	RES M/F 0805 150K 5%				
R181		036-14560-00	RES M/F 0805 5K6 5%				
R182		036-16100-00	RES M/F 0805 100K 5%				
R183		036-14470-00	RES M/F 0805 4K7 5%				
R184		036-14100-00	RES M/F 0805 1K 5%				
R185		036-03100-02	RES 100E 1206 200V 250MW RC01				
R186		036-13100-00	RES M/F 0805 100E 5%				
R187		036-03150-03	RES 1218 PWR CHIP 150E 20% 1W				
R188		036-13220-00	RES M/F 0805 220E 5%				
R189		036-12100-00	RES M/F 0805 10E 5%				
R190		036-12220-00	RES M/F 0805 22E 5%				
R191		036-14100-10	RES M/F 0805 CHIP 1K 1%				
R192		036-13220-10	RES 0805 220E 1%				
R193		036-12100-00	RES M/F 0805 10E 5%				
R194		036-03220-03	RES 1218 PWR CHIP 220E 20% 1W				
R195		036-14220-00	RES M/F 0805 2K2 5%				
R196		036-13100-00	RES M/F 0805 100E 5%				
R197		036-10000-00	RES M/F 0805 ZERO OHM				
*R201		036-03330-03	L) RES 1218 PWR 330E 20% 1W				
*R202		036-02100-03	L) RES 1218 PWR 10E 20% 1W				
R203		036-02100-02	RES 10E 1206 200V 250MW RC01				
*R204		036-03330-03	L) RES 1218 PWR 330E 20% 1W				
R205		036-02100-02	RES 10E 1206 200V 250MW RC01				
R207		036-15470-10	RES M/F 0805 47K 1%				
R209		036-14150-10	RES MF 0805 CHIP 1K5 1%				
R210		036-14470-10	RES M/F 0805 CHIP 4K7 1%				
R212		036-15100-00	RES M/F 0805 10K 5%				
R213		036-14390-00	RES M/F 0805 3K9 5%				
R214		036-14470-00	RES M/F 0805 4K7 5%				
R218		036-13390-10	RES MF 0805 CHIP 390E 1%				
R219			available as sub-assembly only - refer to ⑩ (045-06100-05) in the mechanical parts list				
R220		036-15470-10	RES M/F 0805 47K 1%				
R222		036-15470-10	RES M/F 0805 47K 1%				
R224		036-14150-10	RES MF 0805 CHIP 1K5 1%				
R225		030-03120-00	RES FILM 120E 5% 0.25W 7X2.5				
R228		036-14470-10	RES M/F 0805 CHIP 4K7 1%				
R229		036-15560-10	RES MF 0805 CHIP 56K 1%				
R231		030-03120-00	RES FILM 120E 5% 0.25W 7X2.5				
R237		045-04470-00	RES NTC SMD 4K7 5% 20MW				
RV101		042-04500-05	RES PRESET SMD 5K CER 4MM SQ				
RV103		042-05500-05	RES PRESET SMD 50K CER 4MM SQ				
RV105		042-04500-05	RES PRESET SMD 5K CER 4MM SQ				
RV107		042-05500-05	RES PRESET SMD 50K CER 4MM SQ				
RV109		044-04200-03	RES PRE 2K 10 TURN PNL MTG				
RV113		042-06500-05	RES PRESET SMD 500K CER 4MM SQ				
RV115		042-04220-05	RES PRESET SMD 2K CER 4MM SQ				
SK101		240-10000-05	CONN SMD SKT 8W 2R M-MATCH				
SK103		240-10000-05	CONN SMD SKT 8W 2R M-MATCH				
*SK203		240-02100-44	SKT COAX MINI JACK PCB MT ANG.				

## T838 Mechanical &amp; Miscellaneous Parts (220-01404-03)

IPN	Legend	Description	IPN	Legend	Description
000-00030-95	9	Q137	319-30064-00	13	SPACER HSINK RF MODULE
004-00687-02/3	14	#IC201	345-00040-16	23	SCRW M3X20MM P/POZ ST BZ
012-04150-01	22	CAP CER F/THRU 1N5 NO LEAD	349-00010-59	17	SCRW 6-32 X 3/8 P/PH T/T ZP
045-06100-05	16	ASSY 100K NTC FOR MODULE R219	349-00020-07	7	SCRW 4-40 X 5/16 P/POZ T/T BLK
051-00006-02		SOLDER SPRING 1.3MM A4M1877 Support for front panel LED solder joints.	349-00020-09	12	SCRW T/T 4-40X3/8 IN P/POZ BLK
051-00641-01	3	COAX SEMI-RIG N-TYPE EXTN	349-00020-36	37	LIM)SCREW TT M3X8m PANTORX BLK
051-00642-01	28	COAX SEMI-RIG N-TYPE EXTN	352-00010-29	36	NUT M4 NYLOC HEX
065-00010-13	21	BEAD FER 7D 1.9X0.9X3.8	353-00010-10	11	WSHR M3 FLAT 7MMX0.6MM ST BZ
201-00030-02		WIRE T/C 7/0.2 PVC RED Front panel LEDs.	356-00010-03	24	TAG SOLDER 3MM LONG M614/3.2
201-00030-10		WIRE T/C 7/0.2 PVC BLACK Front panel LEDs.	356-00010-05	15	TAG SOLDER 4MM LONG M6144/4.2
201-00050-25		AUTO 154 RED 41/0.3 PVC DC+ from D-range PCB.	360-00010-41	34	BUSH SHORTY BLK
201-00050-26		AUTO 154 BLACK 41/0.3 PVC DC- from D-range PCB.	362-00010-07	8	GASKET SIL INSULATING TO-220
206-00010-11		COAX 50 OHM RG316-U PTFE Coax from BNC connector to *SK203.	362-00010-13	10	BUSH INSULATING 1.1MM TOP HAT
219-02591-00	18	LOOM RIBBON 8 WAY FOR PA	362-00010-33	33	GROMMET LED MTG 3MM
219-02592-00		CABLE ASSY RG223/U N TO BNC Exciter/PA connecting cable.	365-00100-20		LABEL WHITE S/A 28X11MM
220-01402-02	2	PCB T838/9 TEFLON DIRNL COUPLER	365-01391-01		LABEL 30X10.8 T/MARK VOID
220-01404-03	1	PCB T838/9 PA MODULE DESIGN	365-01538-00		LABEL WARNING 60W/PWR CLAMP
240-00010-55	20	PLUG 15 W D RANGE W/W PNL MT PL101	369-00010-14		TIE CABLE NYLON 100X2.6MM
240-00100-43		PLG COAX MINI PIN CRIMP 1.5D Coax from BNC connector to *SK203.	399-00010-56		BAG PLASTIC 200X250MM
240-02010-54		SKT 15W DRANGE PNL MTG 125 C Matching socket for D-range plug PL101.	400-00020-07		SLEEVING 2MM SIL RUBBER
240-02100-06	27	SKT COAX N TYPE PNL MTG OP-TER	410-00010-43		PKG T296 AMPAC REF 73-46
240-02100-17	29	SKT COAX BNC PNL JAC CRP RG316			
240-04020-62		SKT 2 W RECEP SHORTING LINK LINK1			
240-06010-14		CLAMP LATCHING 15 W D RANGE Cover for D-range socket.			
240-06010-15	25	BLOCK LATCHING 15W D RANGE			
240-06010-44	26	HOOD CONN UHF & N-TYPE			
303-23120-00	30	COVER A3M2288 HOLE BLANKING			
303-23146-00	38	COVER SIDE T838/9PA			
308-01007-01	35	HANDLE BASE STATION SERIES II			
308-13122-02	6	HEATSINK T838/9 PA COMPLETE			
316-06617-00	32	PNL PA NO INP DRV SER II SNGL			
319-01152-00	19	SHIELD A3M2250 F/THRU MTG			
319-01190-01	4	SHIELD WALL HARM. FILTER			
319-01201-00	31	SHIELD LID HARM. FILTER			
319-01202-00	5	SHIELD PA CONTROL CIRCUIT			

**replace A4 pages D5.2.7/D5.2.8 with A3 pages D5.2.7/D5.2.8**

**replace A4 pages D5.2.7/D5.2.8 with A3 pages D5.2.7/D5.2.8**

## T838 Grid Reference Index (IPN 220-01404-03)

**How To Use This Grid Reference Index**

The first digit in the PCB layout reference is a "1" or "2", indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit
<b>Note:</b>			C187	1:D3	1-K1	D113	1:F7	1-Q2	PL101	1:L3	1-C2
This grid reference index covers both the T838 and T839 and is reproduced in both PCB Information sections for your convenience.			C188	1:C2	1-L1	D201	1:F6	2-Q3	*Q101	1:C3	1-C9
*C101	1:E4	1-B8	C189	1:C3	1-M1	D202	1:D4	2-18	*Q103	1:B3	1-E8
*C103	1:E4	1-B9	C190	1:C3	1-N1	D202	1:D4	2-18	*Q105	1:C4	1-D7
*C105	1:B3	1-D8	C192	1:B2	1-N1	D203	1:E6	2-R2	*Q107	1:B5	1-F8
*C107	1:B3	1-D9	C193	1:B2	1-P1	IC101	1:D4	1-C6	*Q109	1:A5	1-G9
*C109	1:B3	1-D8	C195	1:C2	1-Q1	IC101	1:D4	1-G0	Q111	1:A3	1-J7
*C111	1:C4	1-D8	C201	1:J7	2-L5	IC101	1:D4	1-B8	Q113	1:A3	1-K6
*C113	1:B5	1-F8	*C202	1:H3	2-B8	IC101	1:D4	1-C0	Q115	1:A3	1-L7
*C115	1:B5	1-F8	*C203	1:P7	2-C1	IC101	1:D4	1-N0	Q117	1:B4	1-K8
*C117	1:B5	1-F9	*C204	1:M6	2-E1	IC103	1:C4	1-D4	Q119	1:B4	1-L6
*C119	1:B5	1-G8	C205	1:L7	2-I5	IC103	1:C4	1-J8	Q121	1:B3	1-L8
*C121	1:D4	1-B6	*C206	1:P6	2-C1	IC103	1:C4	1-F0	Q123	1:E3	1-E7
*C123	1:D4	1-B6	C207	1:K7	2-K5	IC103	1:C4	1-J5	Q125	1:E3	1-F7
*C124	1:E3	1-C6	*C208	1:H3	2-C8	IC103	1:C4	1-E3	Q127	1:D3	1-G7
*C125	1:C4	1-D7	*C209	1:C5	2-D8	IC105	1:D3	1-M0	Q129	1:B4	1-L4
*C127	1:C4	1-D6	*C210	1:C5	2-E8	IC105	1:D3	1-P0	Q131	1:B3	1-M5
C129	1:B3	1-H5	*C212	1:D5	2-G9	IC105	1:D3	1-G2	Q133	1:D4	1-D0
C131	1:B3	1-J6	*C213	1:D4	2-H9	IC107	1:D3	1-K1	Q135	1:E2	1-H0
C132	1:A3	1-K7	C215	1:D5	2-J8	IC109	1:B2	1-N1	Q136	1:E3	1-H0
C133	1:B4	1-K8	C216	1:H6	2-B6	#IC201	1:K7	2-I4	Q137	1:D2	1-J0
C137	1:B2	1-K8	*C217	1:P3	2-E3	*#IC202	1:K4	2-I1	Q201	1:D5	2-K8
C138	1:B2	1-L8	C218	1:H5	2-C6	*IC203	1:N5	2-F2	R101	1:E4	1-A8
C139	1:B4	1-M6	*C219	1:P2	2-E3	IC204	1:D5	2-H7	*R102	1:E4	1-A9
C141	1:B3	1-M8	C220	1:E5	2-D6	IC204	1:D5	2-H8	R103	1:E4	1-A8
C143	1:E3	1-E7	C221	1:E5	2-N8	IC204	1:D5	2-N8	R104	1:E4	1-B9
C145	1:E3	1-F7	C222	1:E5	2-E6	*IC205	1:G5	2-P2	*R105	1:D4	1-C8
C147	1:D3	1-F6	C223	1:D5	2-G7	L101	1:K3	1-P3	*R106	1:B3	1-C8
C149	1:D3	1-F7	C224	1:D5	2-M8	L103	1:K2	1-Q3	*R107	1:C4	1-D7
C151	1:C5	1-D5	C225	1:L6	2-I4	L105	1:E2	1-K0	*R108	1:B3	1-E9
C153	1:B5	1-D3	C226	1:D4	2-H7	*L201	1:P7	2-C1	*R109	1:C3	1-E9
C155	1:D3	1-G3	C227	1:K6	2-J4	*L202	1:H3	2-B8	*R111	1:B5	1-E8
C159	1:B3	1-H2	C229	1:H6	2-K4	L203	1:L7	2-I6	*R112	1:B5	1-E9
C161	1:B4	1-K4	*C230	1:L4	2-I2	*L204	1:C5	2-D8	*R113	1:B5	1-F9
C162	1:B3	1-L4	*C231	1:L4	2-I1	L206	1:H5	2-B7	*R114	1:C4	1-A6
C164	1:B3	1-L4	*C232	1:K4	2-J1	L208	1:E5	2-D7	*R115	1:C5	1-A6
C165	1:B3	1-M4	*C233	1:K4	2-K2	*L211	1:P2	2-D3	*R116	1:D4	1-A7
C167	1:K3	1-P3	*C234	1:J4	2-L1	L215	1:L7	2-I5	R117	1:C4	1-A6
C169	1:K3	1-P3	*C240	1:H4	2-K1	L217	1:J7	2-K5	R118	1:D4	1-B6
C171	1:K3	1-Q3	C259	1:F7	2-Q3	*L223	1:J4	2-K2	R119	1:D4	1-C7
C173	1:D4	1-B0	C261	1:F6	2-Q4	*L230	1:L4	2-I3	*R120	1:E3	1-H7
C174	1:E4	1-B0	C268	1:E6	2-S2	*L231	1:L4	2-I2	*R121	1:C4	1-C7
C176	1:D4	1-E0	C270	1:D6	2-T2	L233	1:F6	2-Q3	*R122	1:C4	1-D6
C178	1:C4	1-F0	C271	1:C6	2-T2	*L236	1:H6	2-M2	R123	1:B4	1-H7
C179	1:D3	1-G2	C272	1:B6	2-U2	L239	1:E5	2-R2	R124	1:B4	1-H8
C180	1:E2	1-H0	C273	1:B6	2-V2	L241	1:D6	2-S3	R125	1:B4	1-H8
C181	1:D3	1-G0	C294	1:D6	2-R1	L243	1:C6	2-T3	R126	1:B3	1-H6
C182	1:D3	1-H1	C295	1:D6	2-R1	L245	1:C7	2-T2	R127	1:A3	1-H7
C184	1:D4	1-G0	C297	1:C5	2-L8	L247	1:C6	2-U3	R128	1:A3	1-J7
C185	1:D2	1-J1	C298	1:C6	2-L8	L248	1:D7	2-U2	R129	1:B4	1-J9
C186	1:E2	1-J0	D101	1:B3	1-H5	L249	1:B6	2-V3	R130	1:B4	1-J8
			D101	1:B3	1-G5	L264	1:C6	2-L8	R131	1:A3	1-J7
			D103	1:P7	1-K9	LINK1	1:D3	1-L0	R132	1:B5	1-J8
			D105	1:C2	1-J2	LINK2	1:P6	1-D1	R133	1:A3	1-K7
			D105	1:C2	1-J2	LINK201	1:D5	2-F8	R134	1:B3	1-K6
			D107	1:P7	1-K5	P101	1:A5	1-R9	R135	1:P7	1-K9
			D109	1:P6	1-L5	P103	1:K3	1-R0	R136	1:A3	1-K7
			D111	1:C2	1-M1	P105	1:K2	1-R0	R137	1:B3	1-K6
			D111	1:C2	1-M1	P201	1:B6	2-V3	R138	1:B4	1-L6

<u>Device</u>	<u>PCB</u>	<u>Circuit</u>	<u>Device</u>	<u>PCB</u>	<u>Circuit</u>	<u>Device</u>	<u>PCB</u>	<u>Circuit</u>	<u>Device</u>	<u>PCB</u>	<u>Circuit</u>
R141	1:E3	1-C6	*R223	1:F2	2-P2						
R142	1:E3	1-E7	R224	1:D4	2-G7						
R143	1:E4	1-F6	R225	1:E6	2-R3						
R144	1:D3	1-F6	R228	1:E4	2-G7						
R145	1:E4	1-F7	R229	1:D4	2-H7						
R146	1:E4	1-G7	*R230	1:L4	2-I2						
R148	1:C5	1-D5	R231	1:F5	2-Q2						
R149	1:C5	1-C4	*R232	1:K4	2-K1						
R150	1:C4	1-F0	R237	1:C5	2-K8						
R151	1:B5	1-D5	RV101	1:C4	1-H8						
R152	1:B5	1-C3	RV103	1:C4	1-H6						
R153	1:C5	1-F4	RV105	1:C3	1-J5						
R154	1:C5	1-F3	RV107	1:C3	1-J3						
R155	1:D3	1-F2	RV109	1:P5	1-C2						
R156	1:D3	1-F3	*RV111	1:P5	1-D1						
R157	1:D4	1-G0	RV113	1:C3	1-D0						
R158	1:C4	1-H3	RV115	1:C3	1-K0						
R159	1:C4	1-H4	SK101	1:K3	1-A2						
R160	1:C3	1-J5	SK103	1:B4	1-B2						
R161	1:B3	1-J3	*SK201	1:N3	2-D3						
R162	1:B3	1-K4	*SK203	1:N7	2-C1						
R163	1:P8	1-K5									
R164	1:B3	1-K4									
R165	1:B4	1-K4									
R166	1:P7	1-L5									
R168	1:E4	1-A1									
R169	1:E4	1-A0									
R170	1:D4	1-B0									
R171	1:E4	1-B0									
R172	1:E4	1-B0									
R173	1:P6	1-C1									
R174	1:P6	1-C1									
R175	1:D4	1-C0									
R176	1:D4	1-D0									
R177	1:D4	1-D0									
R178	1:D3	1-E1									
R179	1:D4	1-E0									
R180	1:D4	1-E0									
R181	1:E3	1-F2									
R182	1:D4	1-E0									
R183	1:D4	1-F1									
R184	1:E3	1-G1									
R185	1:E2	1-J0									
R186	1:D2	1-H1									
R187	1:E2	1-H0									
R188	1:D2	1-L1									
R189	1:D2	1-L1									
R190	1:C3	1-M1									
R191	1:B2	1-P1									
R192	1:B2	1-P1									
R193	1:C2	1-Q1									
R194	1:D2	1-H0									
R195	1:D3	1-J0									
R196	1:D3	1-J0									
R197	1:D3	1-L1									
*R201	1:N6	2-D1									
*R202	1:N6	2-D1									
R203	1:L7	2-I5									
*R204	1:N6	2-D1									
R205	1:K7	2-K4									
*R206	1:C5	2-E8									
R207	1:D4	2-F8									
*R208	1:C5	2-G9									
R209	1:D5	2-G8									
R210	1:D5	2-G8									
*R211	1:D4	2-H9									
R212	1:D4	2-I8									
R213	1:D5	2-E7									
R214	1:E4	2-J8									
*R215	1:H3	2-B8									
*R216	1:P6	2-E2									
*R217	1:P6	2-E2									
R218	1:E5	2-E7									
R219	1:H6	2-B6									
R220	1:E5	2-F7									
R222	1:D5	2-G7									

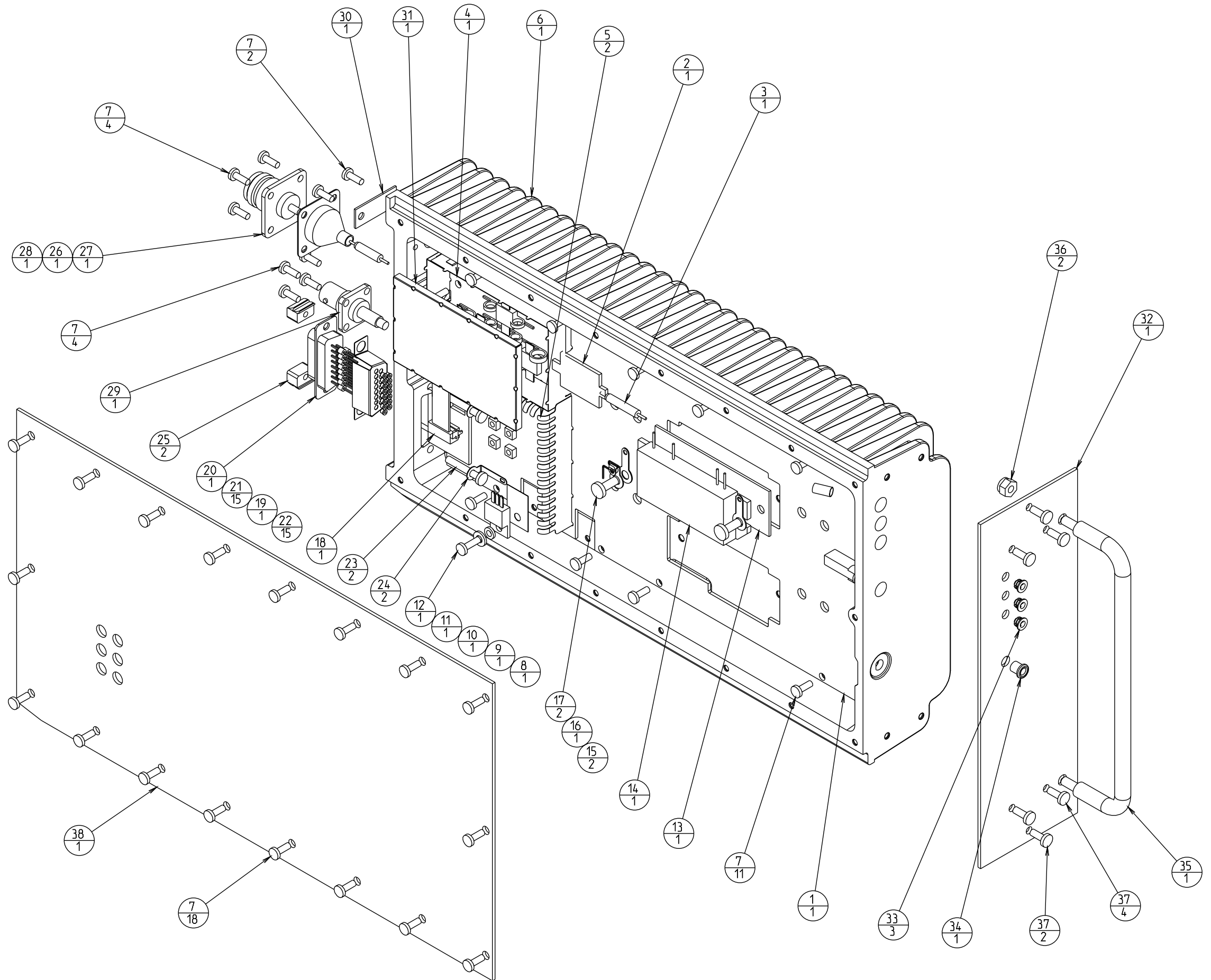


**Key**

The upper number is the component identification number which appears in the "Legend" column of the Mechanical & Miscellaneous Parts on the facing page.

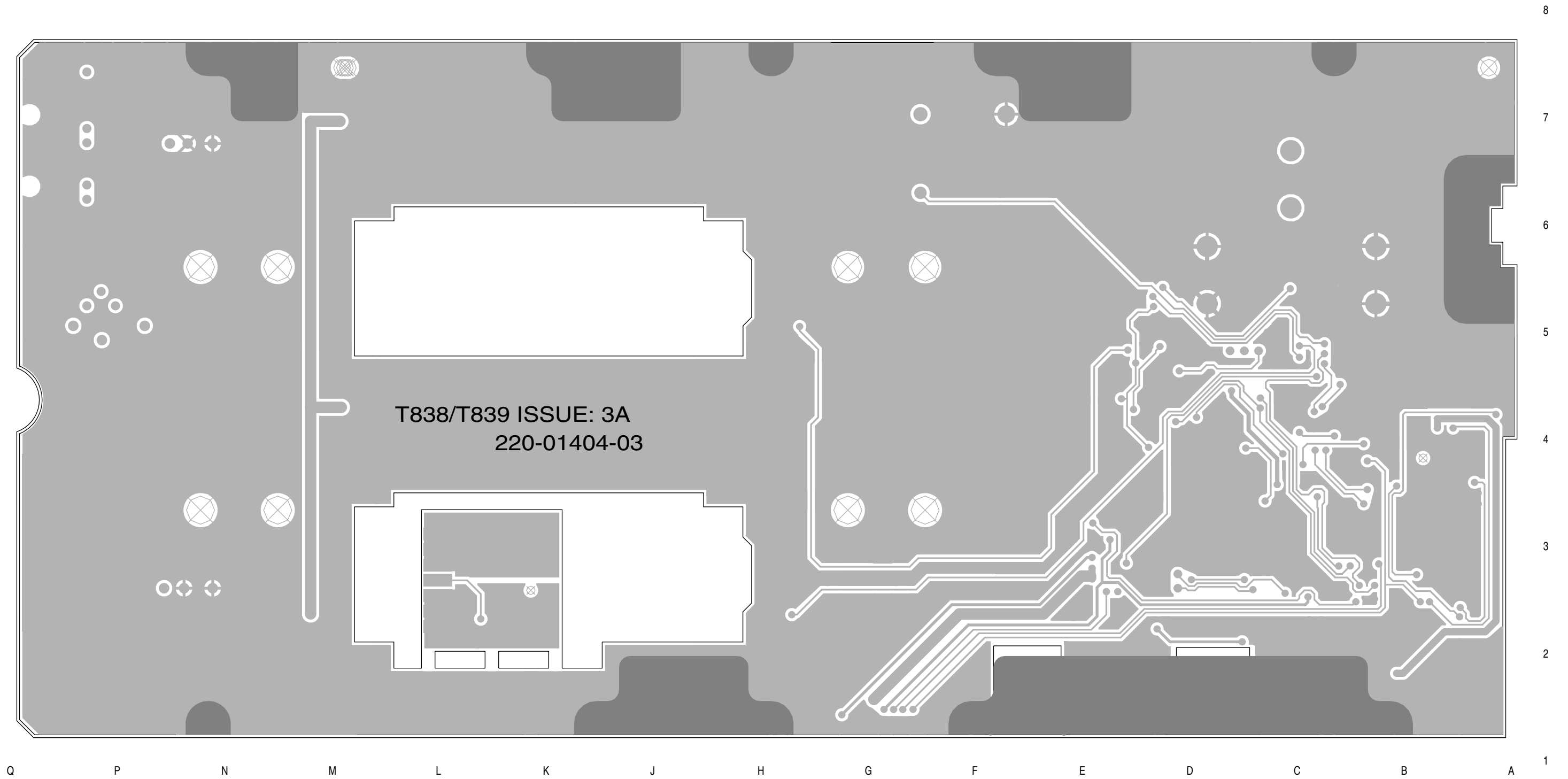
**33**  
**2**

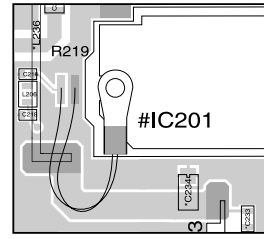
The lower number indicates how many of this component are used in this location or function.



**T838 Mechanical Assembly**  
220-01404-03



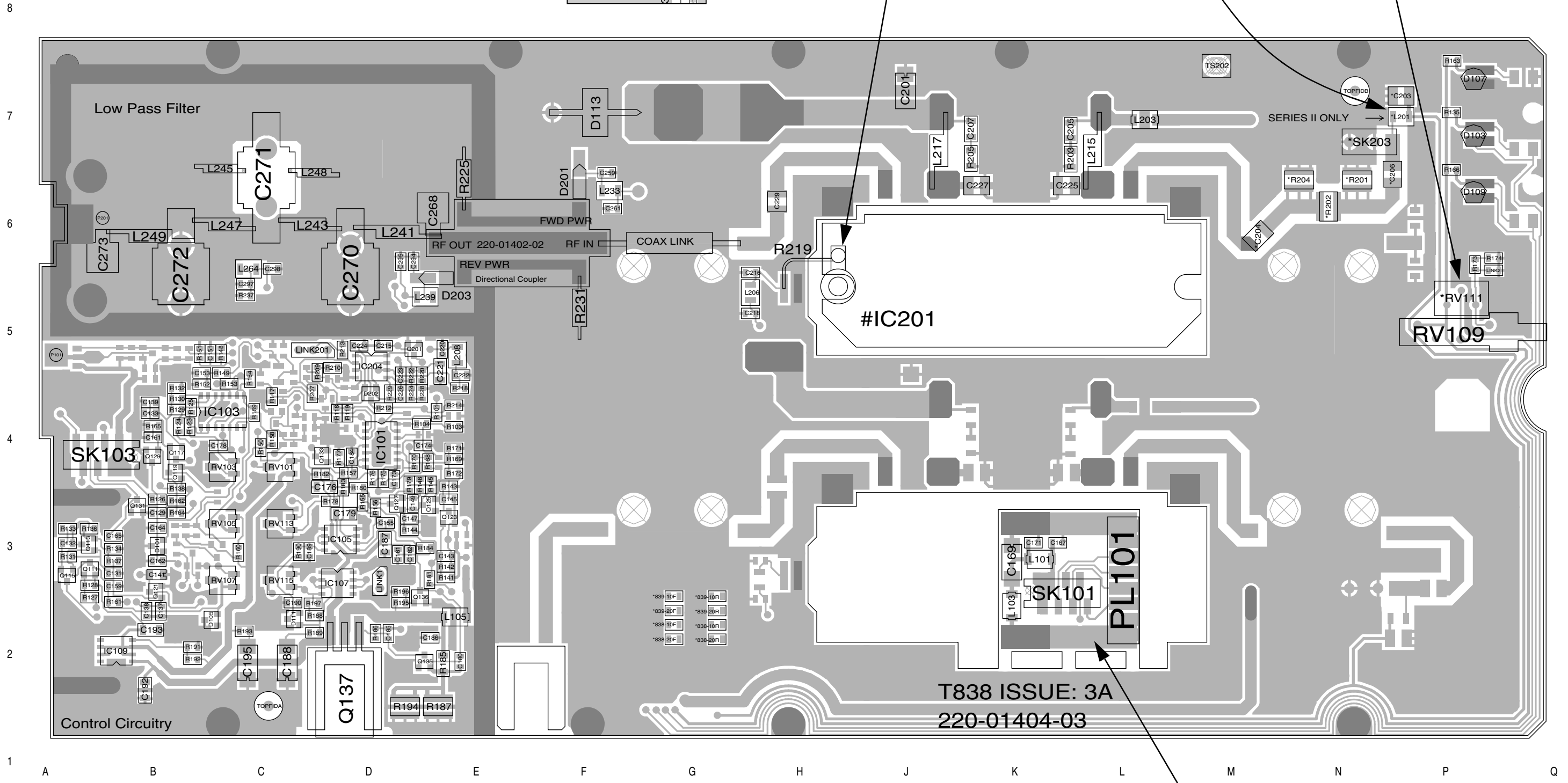




A different type of thermistor is used for R219 in later production PAs, as shown at left. This thermistor must be positioned as shown in the drawing so that its performance is not affected by high levels of RF in adjacent tracks.

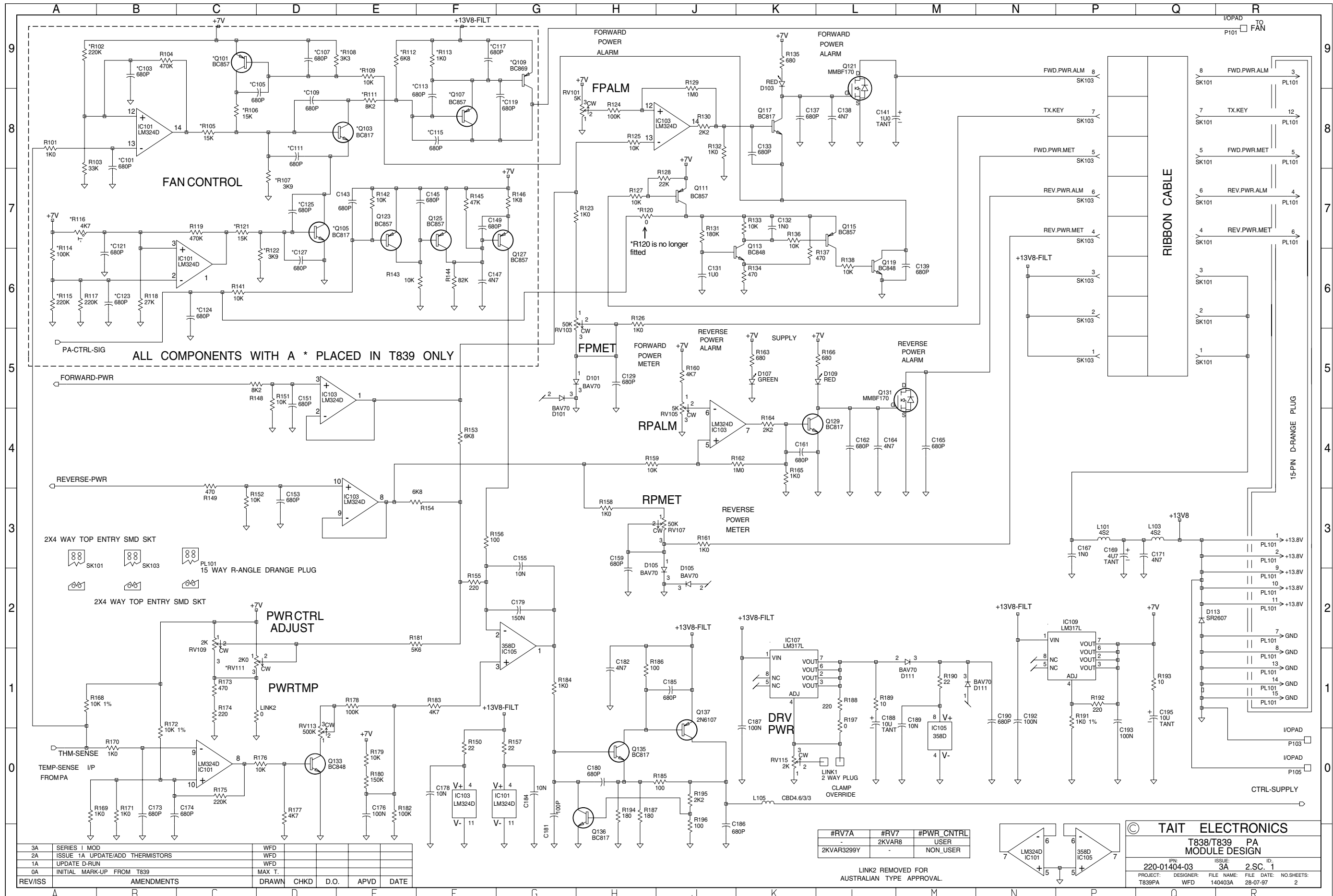
\*L201 is fitted to Series II compatible PAs only.

\*RV111 may be fitted instead of RV109 to convert the output power adjustment to internal access only.



T838 ISSUE: 3A  
 220-01404-03

The circuitry for the break-off D-range PCB is shown on the control section circuit diagram.



3A	SERIES 1 MOD	WFD				
2A	ISSUE 1A UPDATE/ADD THERMISTORS	WFD				
1A	UPDATE D-RUN	WFD				
0A	INITIAL MARK-UP FROM T839	MAX T.				
REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE

#RV7A	#RV7	#PWR_CNTRL
2KVAR3299Y	2KVAR8	USER
		NON_USER

© TAIT ELECTRONICS  
T838/T839 PA MODULE DESIGN

IPN: 220-01404-03  
ISSUE: 3A  
ID: 2.SC. 1

PROJECT: T839PA  
DESIGNER: WFD  
FILE NAME: 140403A  
FILE DATE: 28-07-97  
NO. SHEETS: 2

The control section circuit diagram is the same for both the T838 and T839 and is reproduced in both PCB information sections for your convenience.



## 5.3 T839 Power Amplifier PCB

This section contains the following information.

IPN	Section	Page
220-01404-03	Parts List	5.3.3
	Mechanical & Miscellaneous Parts	5.3.8
	Mechanical Assembly	5.3.9
	Grid Reference Index	5.3.11
	PCB Layout - Bottom Side	5.3.13
	PCB Layout - Top Side	5.3.14
	Control Section Circuit Diagram	5.3.15
	RF & Thermistor Control Sections Circuit Diagram	5.3.16





## T839 Parts List (IPN 220-01404-03)

### How To Use This Parts List

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed. Static sensitive devices are indicated by an (S) at the start of the description column.

The miscellaneous and mechanical section lists the variant and common parts in IPN order. Where possible, a number in the legend column indicates their position in the mechanical assembly drawing.

The Parts List Amendments box below lists component changes that took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order.

### Parts List Amendments

C155	Component designator changed to %C155.	
D101, D105	Removed from the main PCB and replaced by two 1N4148 diodes (IPN 001-50012-00) placed on the D-range PCB: one soldered between PL101 pins 5 and 7 (cathode), the other between PL101 pins 6 and 8 (cathode). To allow external power meters to read zero and still provide meter overvoltage protection (710978).	
D113	Changed from MR750 (IPN 001-00011-60) to MR2520L (IPN 001-00012-90) to provide overvoltage transient suppression (750087/88/89/90/91/92).	
IC204	Changed from LMC622CM to LM358 (710382).	
*L236	Changed from through-hole link (IPN 051-00640-01) to SMD link (IPN 051-00640-02) (710580).	
Q137	Changed 2N6107 (IPN 000-00030-95) to 2N6107 HI (IPN 000-00030-97) to improve gain (711292).	
*R120	*R120 is no longer fitted to Series I compatible T838s. T838 will not transmit in Tx tail if cyclic keying is disabled and *R120 is fitted. Designator changed to %R120 (760207)	
R123, R158	Changed from 1k resistors (IPN 036-14100-00) to BA592 diodes (IPN 001-10059-20) to allow external power meters to read zero (710978).	
*R206	Changed from 390W (IPN 036-13390-10) to 100W (IPN 036-13100-10)	} 100k thermistor assembly replaced with 10k item; values of associated components changed accordingly (710394/411/447).
R207, *R208	Changed from 47k (IPN 036-15470-10) to 4k7 (IPN 036-14470-10)	
R209	Changed from 1k5 (IPN 036-14150-10) to 390W (IPN 036-13390-10)	
R210	Changed from 4k7 (IPN 036-14470-10) to 390W (IPN 036-13390-10)	
*R211	Changed from 56k (IPN 036-15560-10) to 6k8 (IPN 036-14680-10)	
R213	Changed from 3k9 (IPN 036-14390-00) to 560W (IPN 036-13560-00)	
*R215	Changed from 100k NTC (IPN 045-06100-05) to 10k NTC (IPN 045-05100-02)	
R218	Changed from 390W (IPN 036-13390-10) to 100W (IPN 036-13100-10)	
R219	Changed from 100k NTC (IPN 045-06100-05) to 10k NTC (IPN 045-05100-02)	
R220, R222	Changed from 47k (IPN 036-15470-10) to 4k7 (IPN 036-14470-10)	
R224	Changed from 1k5 (IPN 036-14150-10) to 390W (IPN 036-13390-10)	
R228	Changed from 4k7 (IPN 036-14470-10) to 390W (IPN 036-13390-10)	
R229	Changed from 56k (IPN 036-15560-10) to 6k8 (IPN 036-14680-10)	
RV109	Changed from 2k 10 turn (IPN 044-04200-03) to 2k 15 turn (IPN 044-04200-06)	

- 258-00010-03 Cooling fan: some T839 PAs may be fitted with a different fan (IPN 258-00010-06). If so, a 100 $\mu$ H inductor (IPN 056-00021-02) may be fitted in series in the fan power feed wire with a 10 $\mu$ F capacitor (IPN 025-08100-03) fitted in parallel with this inductor (710977).  
Fan changed to IPN 258-00010-08 to reduce noise. The extra inductor and capacitor are not required with this fan (711435).
- 349-00020-36 The two M3x8 Torx screws which secure the module into the rack frame have been replaced by M3x8 Pozidriv screws (IPN 349-00020-55) (750101/2/3/5/6).

Ref	Var	IPN	Description	Ref	Var	IPN	Description
<p><b>Note:</b> The T838 and T839 share the same basic design and are built on the same PCB. While most components in this design are common to both products, there are a number of components that are placed in only one product.</p> <p>Because the circuit diagrams for this design cover both products, we have indicated on the diagrams those components which are placed only in the T839 by enclosing them in a labelled box. The circuit reference for each of these components is also prefixed with the "*" character.</p> <p>The "*" character is used in this parts list to indicate components used only in the T839.</p>							
C222		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	C222		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C223		015-24100-08	CAP CER 0805 1N 10% X7R 50V	C223		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C224		015-23680-08	CAP CER 0805 680P 10% X7R 50V	C224		015-23680-08	CAP CER 0805 680P 10% X7R 50V
C225		015-03680-06	CAP CER 1210 680P NPO200VGRM42	C225		015-03680-06	CAP CER 1210 680P NPO200VGRM42
C226		015-23680-08	CAP CER 0805 680P 10% X7R 50V	C226		015-23680-08	CAP CER 0805 680P 10% X7R 50V
C227		015-03680-06	CAP CER 1210 680P NPO200VGRM42	C227		015-03680-06	CAP CER 1210 680P NPO200VGRM42
C229		015-03680-03	CAP CER 680P 5% NPO100V GRH111	C229		015-03680-03	CAP CER 680P 5% NPO100V GRH111
*C230		015-06100-08	CAP CER 1206 100N 10% X7R 50V	*C230		015-06100-08	CAP CER 1206 100N 10% X7R 50V
*C231		015-03680-06	CAP CER 1210 680P NPO200VGRM42	*C231		015-03680-06	CAP CER 1210 680P NPO200VGRM42
*C232		015-03680-06	CAP CER 1210 680P NPO200VGRM42	*C232		015-03680-06	CAP CER 1210 680P NPO200VGRM42
*C233		015-06100-08	CAP CER 1206 100N 10% X7R 50V	*C233		015-06100-08	CAP CER 1206 100N 10% X7R 50V
*C234		014-07470-03	L) CAP TANT SMD 4U7 35V 20%	*C234		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
*C240		015-03680-03	CAP CER 680P 5% NPO100V GRH111	*C240		015-03680-03	CAP CER 680P 5% NPO100V GRH111
C259		015-23680-08	CAP CER 0805 680P 10% X7R 50V	C259		015-23680-08	CAP CER 0805 680P 10% X7R 50V
C261		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	C261		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C268		029-02220-02	CAP MICA 5 CASE 22P 5%	C268		029-02220-02	CAP MICA 5 CASE 22P 5%
C270		029-02560-03	CAP MICA 10 CASE 56P 2%	C270		029-02560-03	CAP MICA 10 CASE 56P 2%
C271		029-02470-03	CAP MICA 10 CASE 47P 2%	C271		029-02470-03	CAP MICA 10 CASE 47P 2%
C272		029-02560-03	CAP MICA 10 CASE 56P 2%	C272		029-02560-03	CAP MICA 10 CASE 56P 2%
C273		029-02220-02	CAP MICA 5 CASE 22P 5%	C273		029-02220-02	CAP MICA 5 CASE 22P 5%
C294		015-23680-08	CAP CER 0805 680P 10% X7R 50V	C294		015-23680-08	CAP CER 0805 680P 10% X7R 50V
C295		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	C295		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C297		015-23680-08	CAP CER 0805 680P 10% X7R 50V	C297		015-23680-08	CAP CER 0805 680P 10% X7R 50V
C298		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	C298		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
*C101		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D101		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
*C103		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D103		008-00013-32	(S) LED 3 RED LO CURRENT NO MTG
*C105		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D105		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
*C107		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D107		008-00013-35	(S) LED 3 GRN LO CURRENT NO MTG
*C109		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D109		008-00013-32	(S) LED 3 RED LO CURRENT NO MTG
*C111		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D111		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
*C113		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D113		001-00011-60	(S) DIODE SR2607 -- USE MR750
*C115		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D201		001-00013-45	(S) DIODE SCHTTKY 1S97/2
*C117		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D202		001-10000-70	(S) DIODE SMD BAV70 D-SW SOT23
*C119		015-23680-08	CAP CER 0805 680P 10% X7R 50V	D203		001-00013-45	(S) DIODE SCHTTKY 1S97/2
*C121		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC101		002-10003-24	(S) IC SMD 324 4X O-AMP SO14
*C123		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC103		002-10003-24	(S) IC SMD 324 4X O-AMP SO14
*C124		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC105		002-10003-58	(S) IC SMD LM358 DUAL O-AMP
*C125		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC107		002-10003-17	(S) IC LM317L REG SO-8 100MA
*C127		015-23680-08	CAP CER 0805 680P 10% X7R 50V	IC109		002-10003-17	(S) IC LM317L REG SO-8 100MA
C129		015-23680-08	CAP CER 0805 680P 10% X7R 50V	#IC201	10	004-00687-02	MODULE M68702L 135-160MHZ 60W
C131		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V	#IC201	20	004-00687-03	MODULE M68702H 150-174MHZ 60W
C132		015-24100-08	CAP CER 0805 1N 10% X7R 50V	*#IC202	10	004-00687-02	MODULE M68702L 135-160MHZ 60W
C133		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*#IC202	20	004-00687-03	MODULE M68702H 150-174MHZ 60W
C137		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*IC203		051-00005-36	RFPOWER 3DB HYBRID COUPLER
C138		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	IC204		002-10006-62	(S) IC SMD LMC662CM 2X O-AMP
C139		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*IC205		051-00005-36	RFPOWER 3DB HYBRID COUPLER
C141		014-07100-02	CAP TANT CHIP 1U0 3.2 X 1.6MM	L101		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C143		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L103		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C145		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L105		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C147		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	*L202		056-14150-02	(L) IND SMD 1.5UH
C149		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L203		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C151		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*L204		056-14150-02	(L) IND SMD 1.5UH
C153		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L206		056-14150-02	(L) IND SMD 1.5UH
C155		015-25100-08	CAP CER 0805 10N 10% X7R 50V	L208		056-14150-02	(L) IND SMD 1.5UH
C159		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*L211		056-10330-02	(L) IND SMD 330NH
C161		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L215		052-08340-40	COIL A/W 4T/4.0MM SMD 0.8MM
C162		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L217		052-08340-40	COIL A/W 4T/4.0MM SMD 0.8MM
C164		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	L219		052-08340-40	COIL A/W 4T/4.0MM SMD 0.8MM
C165		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*L223		052-08340-40	COIL A/W 4T/4.0MM SMD 0.8MM
C167		015-24100-08	CAP CER 0805 1N 10% X7R 50V	*L230		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
C169		014-07470-03	L) CAP TANT SMD 4U7 35V 20%	*L231		052-08340-40	COIL A/W 4T/4.0MM SMD 0.8MM
C171		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	L233		056-10330-02	(L) IND SMD 330NH
C173		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*L236		051-00640-01	LNK 65.5 COP STPL C/W SLCN SLV
C174		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L239		056-10330-02	(L) IND SMD 330NH
C176		015-06100-08	CAP CER 1206 100N 10% X7R 50V	L241		052-08360-20	COIL A/W 2T/6.0MM SMD 0.8MM
C178		015-25100-08	CAP CER 0805 10N 10% X7R 50V	L243		052-08340-20	COIL A/W 2T/4.0MM SMD 0.8MM
C179		015-06150-08	CAP CER1206150N10% X7R25VW 25V	L245		052-08345-10	COIL A/W 1T/4.5MM SMD 0.8MM
C180		015-23680-08	CAP CER 0805 680P 10% X7R 50V	L247		052-08340-20	COIL A/W 2T/4.0MM SMD 0.8MM
C181		015-23100-01	CAP CER 0805 100P 5% NPO 50V	L248		052-08345-10	COIL A/W 1T/4.5MM SMD 0.8MM
C182		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	L249		052-08360-20	COIL A/W 2T/6.0MM SMD 0.8MM
C184		015-25100-08	CAP CER 0805 10N 10% X7R 50V	L264		056-10330-02	(L) IND SMD 330NH
C185		015-23680-08	CAP CER 0805 680P 10% X7R 50V	LINK1		240-00020-68	HEADER 2W PCB MTG STD
C186		015-23680-08	CAP CER 0805 680P 10% X7R 50V	LINK2		036-10000-00	RES M/F 0805 ZERO OHM
C187		015-06100-08	CAP CER 1206 100N 10% X7R 50V	LINK201		240-00020-59	HEADER 3 W 1 R PCB MTG
C188		014-08100-00	CAP TANT CHIP 10M 16VW +20%	PL101		240-00010-55	PLUG 15 W D RANGE W/W PNL MT
C189		015-25100-08	CAP CER 0805 10N 10% X7R 50V	*Q101		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C190		015-23680-08	CAP CER 0805 680P 10% X7R 50V	*Q103		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
C192		015-06100-08	CAP CER 1206 100N 10% X7R 50V	*Q105		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
C193		015-06100-08	CAP CER 1206 100N 10% X7R 50V	*Q107		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C195		014-08100-00	CAP TANT CHIP 10M 16VW +20%	*Q109		000-10008-69	(S) XSTR SMD BC869 PNP 1W SOT89
C201		014-07470-03	L) CAP TANT SMD 4U7 35V 20%	Q111		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
*C202		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	Q113		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
C205		015-06100-08	CAP CER 1206 100N 10% X7R 50V	Q115		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C207		015-06100-08	CAP CER 1206 100N 10% X7R 50V	Q117		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
*C208		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q119		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
*C209		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q121		000-10017-00	(LS) XSTR SMD BF170LT1 SOT23
*C210		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	Q123		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
*C212		015-24100-08	CAP CER 0805 1N 10% X7R 50V	Q125		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
*C213		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q127		000-10008-57	(S) XSTR SMD BCW70 PNP SOT23 SS
C215		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q129		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
C216		015-24470-08	CAP CER 0805 4N7 10% X7R 50V	Q131		000-10017-00	(LS) XSTR SMD BF170LT1 SOT23
*C217		015-03680-06	CAP CER 1210 680P NPO200VGRM42	Q133		000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS
C218		015-23680-08	CAP CER 0805 680P 10% X7R 50V	Q135		000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23
*C219		015-03680-06	CAP CER 1210 680P NPO200VGRM42				
C220		015-23680-08	CAP CER 0805 680P 10% X7R 50V				
C221		015-06100-08	CAP CER 1206 100N 10% X7R 50V				

IPN	Legend	Description	IPN	Legend	Description
Q136	000-10008-17	(S) XSTR SMD BC817-25 NPN SOT23	R207	036-15470-10	RES M/F 0805 47K 1%
Q137	000-00030-95	(S) XSTR 2N6107 PNP TO220 AF	*R208	036-15470-10	RES M/F 0805 47K 1%
Q201	000-10008-48	(S) XSTR SMD BCW60 NPN SOT23 SS	R209	036-14150-10	RES MF 0805 CHIP 1K5 1%
R101	036-14100-00	RES M/F 0805 1K 5%	R210	036-14470-10	RES M/F 0805 CHIP 4K7 1%
*R102	036-16220-00	RES M/F 0805 220K 5%	*R211	036-15560-10	RES MF 0805 CHIP 56K 1%
R103	036-15330-00	RES M/F 0805 33K 5%	R212	036-15100-00	RES M/F 0805 10K 5%
R104	036-16470-00	RES M/F 0805 470K 5%	R213	036-14390-00	RES M/F 0805 3K9 5%
*R105	036-15150-00	RES M/F 0805 15K 5%	R214	036-14470-00	RES M/F 0805 4K7 5%
*R106	036-15150-00	RES M/F 0805 15K 5%	*R215		available as sub-assembly only - refer to (20) (045-06100-05) in the mechanical parts list
*R107	036-14390-00	RES M/F 0805 3K9 5%	*R216	036-03100-02	RES 100E 1206 200V 250MW RC01
*R108	036-14330-00	RES M/F 0805 3K3 5%	*R217	036-03100-02	RES 100E 1206 200V 250MW RC01
*R109	036-15100-00	RES M/F 0805 10K 5%	R218	036-13390-10	RES MF 0805 CHIP 390E 1%
*R111	036-14820-00	RES M/F 0805 8K2 5%	R219		available as sub-assembly only - refer to (20) (045-06100-05) in the mechanical parts list
*R112	036-14680-00	RES M/F 0805 6K8 5%	R220	036-15470-10	RES M/F 0805 47K 1%
*R113	036-14100-00	RES M/F 0805 1K 5%	R222	036-15470-10	RES M/F 0805 47K 1%
*R114	036-16100-00	RES M/F 0805 100K 5%	*R223	039-05050-00	RES TO22050E 50W MP850
*R115	036-16220-00	RES M/F 0805 220K 5%	R224	036-14150-10	RES MF 0805 CHIP 1K5 1%
*R116	045-04470-00	RES NTC SMD 4K7 5% 20MW	R225	030-03120-00	RES FILM 120E 5% 0.25W 7X2.5
R117	036-16220-00	RES M/F 0805 220K 5%	R228	036-14470-10	RES M/F 0805 CHIP 4K7 1%
R118	036-15270-00	RES M/F 0805 27K 5%	R229	036-15560-10	RES MF 0805 CHIP 56K 1%
R119	036-16470-00	RES M/F 0805 470K 5%	*R230	036-02100-02	RES 10E 1206 200V 250MW RC01
*R121	036-15150-00	RES M/F 0805 15K 5%	R231	030-03120-00	RES FILM 120E 5% 0.25W 7X2.5
*R122	036-14390-00	RES M/F 0805 3K9 5%	*R232	036-02100-02	RES 10E 1206 200V 250MW RC01
R123	036-14100-00	RES M/F 0805 1K 5%	R237	045-04470-00	RES NTC SMD 4K7 5% 20MW
R124	036-16100-00	RES M/F 0805 100K 5%	RV101	042-04500-05	RES PRESET SMD 5K CER 4MM SQ
R125	036-15100-00	RES M/F 0805 10K 5%	RV103	042-05500-05	RES PRESET SMD 50K CER 4MM SQ
R126	036-14100-00	RES M/F 0805 1K 5%	RV105	042-04500-05	RES PRESET SMD 5K CER 4MM SQ
R127	036-15100-00	RES M/F 0805 10K 5%	RV107	042-05500-05	RES PRESET SMD 50K CER 4MM SQ
R128	036-15220-00	RES M/F 0805 22K 5%	RV109	044-04200-03	RES PRE 2K 10 TURN PNL MTG
R129	036-17100-00	RES M/F 0805 1M 5%	RV113	042-06500-05	RES PRESET SMD 500K CER 4MM SQ
R130	036-14220-00	RES M/F 0805 2K2 5%	RV115	042-04220-05	RES PRESET SMD 2K CER 4MM SQ
R131	036-16180-00	RES M/F 0805 180K 5%	SK101	240-10000-05	CONN SMD SKT 8W 2R M-MATCH
R132	036-14100-00	RES M/F 0805 1K 5%	SK103	240-10000-05	CONN SMD SKT 8W 2R M-MATCH
R133	036-15100-00	RES M/F 0805 10K 5%	*SK201	240-02100-44	SKT COAX MINI JACK PCB MT ANG.
R134	036-13470-00	RES M/F 0805 470E 5%			
R135	036-13680-00	RES M/F 0805 680E 5%			
R136	036-15100-00	RES M/F 0805 10K 5%			
R137	036-13470-00	RES M/F 0805 470E 5%			
R138	036-15100-00	RES M/F 0805 10K 5%			
R141	036-15100-00	RES M/F 0805 10K 5%			
R142	036-15100-00	RES M/F 0805 10K 5%			
R143	036-15100-00	RES M/F 0805 10K 5%			
R144	036-15820-00	RES M/F 0805 82K 5%			
R145	036-15470-00	RES M/F 0805 47K 5%			
R146	036-14180-00	RES M/F 0805 1K8 5%			
R148	036-14820-00	RES M/F 0805 8K2 5%			
R149	036-13470-00	RES M/F 0805 470E 5%			
R150	036-12220-00	RES M/F 0805 22E 5%			
R151	036-15100-00	RES M/F 0805 10K 5%			
R152	036-15100-00	RES M/F 0805 10K 5%			
R153	036-14680-00	RES M/F 0805 6K8 5%			
R154	036-14680-00	RES M/F 0805 6K8 5%			
R155	036-13220-00	RES M/F 0805 220E 5%			
R156	036-13100-00	RES M/F 0805 100E 5%			
R157	036-12220-00	RES M/F 0805 22E 5%			
R158	036-14100-00	RES M/F 0805 1K 5%			
R159	036-15100-00	RES M/F 0805 10K 5%			
R160	036-14470-00	RES M/F 0805 4K7 5%			
R161	036-14100-00	RES M/F 0805 1K 5%			
R162	036-17100-00	RES M/F 0805 1M 5%			
R163	036-13680-00	RES M/F 0805 680E 5%			
R164	036-14220-00	RES M/F 0805 2K2 5%			
R165	036-14100-00	RES M/F 0805 1K 5%			
R166	036-13680-00	RES M/F 0805 680E 5%			
R168	036-15100-10	RES M/F 0805 10K 1%			
R169	036-14100-00	RES M/F 0805 1K 5%			
R170	036-14100-00	RES M/F 0805 1K 5%			
R171	036-14100-00	RES M/F 0805 1K 5%			
R172	036-15100-10	RES M/F 0805 10K 1%			
R173	036-13470-00	RES M/F 0805 470E 5%			
R174	036-13220-00	RES M/F 0805 220E 5%			
R175	036-16220-00	RES M/F 0805 220K 5%			
R176	036-15100-00	RES M/F 0805 10K 5%			
R177	036-14470-00	RES M/F 0805 4K7 5%			
R178	036-16100-00	RES M/F 0805 100K 5%			
R179	036-15100-00	RES M/F 0805 10K 5%			
R180	036-16150-00	RES M/F 0805 150K 5%			
R181	036-14560-00	RES M/F 0805 5K6 5%			
R182	036-16100-00	RES M/F 0805 100K 5%			
R183	036-14470-00	RES M/F 0805 4K7 5%			
R184	036-14100-00	RES M/F 0805 1K 5%			
R185	036-03100-02	RES 100E 1206 200V 250MW RC01			
R186	036-13100-00	RES M/F 0805 100E 5%			
R187	036-03150-03	RES 1218 PWR CHIP 150E 20% 1W			
R188	036-13220-00	RES M/F 0805 220E 5%			
R189	036-12100-00	RES M/F 0805 10E 5%			
R190	036-12220-00	RES M/F 0805 22E 5%			
R191	036-14100-10	RES M/F 0805 CHIP 1K 1%			
R192	036-13220-10	RES 0805 220E 1%			
R193	036-12100-00	RES M/F 0805 10E 5%			
R194	036-03220-03	RES 1218 PWR CHIP 220E 20% 1W			
R195	036-14220-00	RES M/F 0805 2K2 5%			
R196	036-13100-00	RES M/F 0805 100E 5%			
R197	036-10000-00	RES M/F 0805 ZERO OHM			
R203	036-02100-02	RES 10E 1206 200V 250MW RC01			
R205	036-02100-02	RES 10E 1206 200V 250MW RC01			
*R206	036-13390-10	RES MF 0805 CHIP 390E 1%			



## T839 Mechanical &amp; Miscellaneous Parts (220-01404-03)

IPN	Legend	Description	IPN	Legend	Description
000-00030-95	15	Q137	319-01152-00	23	SHIELD A3M2250 F/THRU MTG
004-00687-02/3	18	#IC201, *#IC202	319-01190-01	3	SHIELD WALL HARM. FILTER
012-04100-05	35	CAP F/THRU 1N SUPPR FLTR S-MTG	319-01201-00	41	SHIELD LID HARM. FILTER
012-04150-01	26	CAP CER F/THRU 1N5 NO LEAD	319-01202-00	4	SHIELD CONTROL CIRCUIT
039-05050-00	11	*R223	319-30064-00	17	SPACER HSINK RF MODULE
045-06100-05	20	ASSY 100K NTC FOR MODULE *R215, R219	345-00040-16	27	SCRW M3X20MM P/POZ ST BZ
051-00005-36	9	*IC203, *IC205	349-00010-59	21	SCRW 6-32 X 3/8 P/PH T/T ZP
051-00006-02		SOLDER SPRING 1.3MM A4M1877 Support for front panel LED solder joints.	349-00020-07	8	SCRW 4-40 X 5/16 P/POZ T/T BLK
051-00642-01	32	COAX SEMI-RIG N-TYPE EXTN	349-00020-08	7	SCRW T/T 4-40X3/8 CSK POZI BZ Secure *IC203/205 couplers to heatsink.
065-00010-13	25	BEAD FER 7D 1.9X0.9X3.8	349-00020-09	13	SCRW T/T 4-40X3/8 IN P/POZ BLK
201-00030-02		WIRE T/C 7/0.2 PVC RED Front panel LEDs.	349-00020-36	47	LIM)SCREW TT M3X8m PANTORX BLK
201-00030-10		WIRE T/C 7/0.2 PVC BLACK Front panel LEDs.	349-00020-43	40	SCRW T/T M4X12MM P/POZ BZ
201-00050-25		AUTO 154 RED 41/0.3 PVC DC+ from D-range PCB.	349-00020-49	38	SCRW T/T M4X35MM P/POZ BZ
201-00050-26		AUTO 154 BLACK 41/0.3 PVC DC- from D-range PCB.	352-00010-04	10	NUT M2.5 MACH HEX ST BZ
206-00010-11		COAX 50 OHM RG316-U PTFE Coax from BNC connector to *SK201.	352-00010-29	46	NUT M4 NYLOC HEX
219-02591-00	22	LOOM RIBBON 8 WAY FOR PA	353-00010-10	12	WSHR M3 FLAT 7MMX0.6MM ST BZ
219-02592-00		CABLE ASSY RG223/U N TO BNC Exciter/PA connecting cable.	356-00010-01	36	TAG SOLDER 3MM SHORT M6132/3.2
220-01402-02	2	PCB T838/9 TEFLON DIRNL COUPLER	356-00010-03	2	TAG SOLDER 3MM LONG M614/3.2
220-01404-03	1	PCB T838/9 PA MODULE DESIGN	356-00010-05	19	TAG SOLDER 4MM LONG M6144/4.2
240-00010-55	24	PLUG 15 W D RANGE W/W PNL MT PL101	357-00010-45	39	CLAMP CABLE 4.8MM P CLIP
240-00100-43		PLG COAX MINI PIN CRIMP 1.5D Coax from BNC connector to *SK201.	360-00010-41	44	BUSH SHORTY BLK
240-02010-54		SKT 15W DRANGE PNL MTG 125 C Matching socket for D-range plug PL101.	362-00010-07	14	GASKET SIL INSULATING TO-220
240-02100-06	31	SKT COAX N TYPE PNL MTG OP-TER	362-00010-13	16	BUSH INSULATING 1.1MM TOP HAT
240-02100-17	33	SKT COAX BNC PNL JAC CRP RG316	362-00010-33	43	GROMMET LED MTG 3MM
240-04020-62		SKT 2 W RECEP SHORTING LINK LINK1	365-00100-20		LABEL WHITE S/A 28X11MM
240-06010-14		CLAMP LATCHING 15 W D RANGE Cover for D-range socket.	365-01391-01		LABEL 30X10.8 T/MARK VOID
240-06010-15	29	BLOCK LATCHING 15W D RANGE	365-01539-00		LABEL WARNING 120W/PWR CLAMP
240-06010-44	30	HOOD CONN UHF & N-TYPE	369-00010-14		TIE CABLE NYLON 100X2.6MM
258-00010-03	37	FAN 12V 119X119X25MM TUBE AX	399-00010-56		BAG PLASTIC 200X250MM
302-05204-00	34	BRKT A3M2314 F/THRU MTG	400-00020-07		SLEEVING 2MM SIL RUBBER
303-23146-00	48	COVER SIDE T838/9 PA	400-00020-30		HEATSHRINK 3MM
308-01007-01	45	HANDLE BASE STATION SERIES II	410-00010-43		PKG T296 AMPAC REF 73-46
308-13122-02	5	HEATSINK T838/9 PA COMPLETE			
308-13125-00	6	HEATSINK T839 COUPLER			
316-06651-00	42	PANEL PA 100W REAR DRV SER II			

**replace A4 pages D5.3.9/D5.3.10 with A3 pages D5.3.9/D5.3.10**

**replace A4 pages D5.3.9/D5.3.10 with A3 pages D5.3.9/D5.3.10**



## T839 Grid Reference Index (IPN 220-01404-03)

**How To Use This Grid Reference Index**

The first digit in the PCB layout reference is a "1" or "2", indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit
<b>Note:</b>			C187	1:D3	1-K1	D113	1:F7	1-Q2	PL101	1:L3	1-C2
This grid reference index covers both the T838 and T839 and is reproduced in both PCB Information sections for your convenience.			C188	1:C2	1-L1	D201	1:F6	2-Q3	*Q101	1:C3	1-C9
*C101	1:E4	1-B8	C189	1:C3	1-M1	D202	1:D4	2-18	*Q103	1:B3	1-E8
*C103	1:E4	1-B9	C190	1:C3	1-N1	D202	1:D4	2-18	*Q105	1:C4	1-D7
*C105	1:B3	1-D8	C192	1:B2	1-N1	D203	1:E6	2-R2	*Q107	1:B5	1-F8
*C107	1:B3	1-D9	C193	1:B2	1-P1	IC101	1:D4	1-C6	*Q109	1:A5	1-G9
*C109	1:B3	1-D8	C195	1:C2	1-Q1	IC101	1:D4	1-G0	Q111	1:A3	1-J7
*C111	1:C4	1-D8	C201	1:J7	2-L5	IC101	1:D4	1-B8	Q113	1:A3	1-K6
*C113	1:B5	1-F8	*C202	1:H3	2-B8	IC101	1:D4	1-C0	Q115	1:A3	1-L7
*C115	1:B5	1-F8	*C203	1:P7	2-C1	IC101	1:D4	1-N0	Q117	1:B4	1-K8
*C117	1:B5	1-F9	*C204	1:M6	2-E1	IC103	1:C4	1-D4	Q119	1:B4	1-L6
*C119	1:B5	1-G8	C205	1:L7	2-I5	IC103	1:C4	1-J8	Q121	1:B3	1-L8
*C121	1:D4	1-B6	*C206	1:P6	2-C1	IC103	1:C4	1-F0	Q123	1:E3	1-E7
*C123	1:D4	1-B6	C207	1:K7	2-K5	IC103	1:C4	1-J5	Q125	1:E3	1-F7
*C124	1:E3	1-C6	*C208	1:H3	2-C8	IC103	1:C4	1-E3	Q127	1:D3	1-G7
*C125	1:C4	1-D7	*C209	1:C5	2-D8	IC105	1:D3	1-M0	Q129	1:B4	1-L4
*C127	1:C4	1-D6	*C210	1:C5	2-E8	IC105	1:D3	1-P0	Q131	1:B3	1-M5
C129	1:B3	1-H5	*C212	1:D5	2-G9	IC105	1:D3	1-G2	Q133	1:D4	1-D0
C131	1:B3	1-J6	*C213	1:D4	2-H9	IC107	1:D3	1-K1	Q135	1:E2	1-H0
C132	1:A3	1-K7	C215	1:D5	2-J8	IC109	1:B2	1-N1	Q136	1:E3	1-H0
C133	1:B4	1-K8	C216	1:H6	2-B6	#IC201	1:K7	2-I4	Q137	1:D2	1-J0
C137	1:B2	1-K8	*C217	1:P3	2-E3	*#IC202	1:K4	2-I1	Q201	1:D5	2-K8
C138	1:B2	1-L8	C218	1:H5	2-C6	*IC203	1:N5	2-F2	R101	1:E4	1-A8
C139	1:B4	1-M6	*C219	1:P2	2-E3	IC204	1:D5	2-H7	*R102	1:E4	1-A9
C141	1:B3	1-M8	C220	1:E5	2-D6	IC204	1:D5	2-H8	R103	1:E4	1-A8
C143	1:E3	1-E7	C221	1:E5	2-N8	IC204	1:D5	2-N8	R104	1:E4	1-B9
C145	1:E3	1-F7	C222	1:E5	2-E6	*IC205	1:G5	2-P2	*R105	1:D4	1-C8
C147	1:D3	1-F6	C223	1:D5	2-G7	L101	1:K3	1-P3	*R106	1:B3	1-C8
C149	1:D3	1-F7	C224	1:D5	2-M8	L103	1:K2	1-Q3	*R107	1:C4	1-D7
C151	1:C5	1-D5	C225	1:L6	2-I4	L105	1:E2	1-K0	*R108	1:B3	1-E9
C153	1:B5	1-D3	C226	1:D4	2-H7	*L201	1:P7	2-C1	*R109	1:C3	1-E9
C155	1:D3	1-G3	C227	1:K6	2-J4	*L202	1:H3	2-B8	*R111	1:B5	1-E8
C159	1:B3	1-H2	C229	1:H6	2-K4	L203	1:L7	2-I6	*R112	1:B5	1-E9
C161	1:B4	1-K4	*C230	1:L4	2-I2	*L204	1:C5	2-D8	*R113	1:B5	1-F9
C162	1:B3	1-L4	*C231	1:L4	2-I1	L206	1:H5	2-B7	*R114	1:C4	1-A6
C164	1:B3	1-L4	*C232	1:K4	2-J1	L208	1:E5	2-D7	*R115	1:C5	1-A6
C165	1:B3	1-M4	*C233	1:K4	2-K2	*L211	1:P2	2-D3	*R116	1:D4	1-A7
C167	1:K3	1-P3	*C234	1:J4	2-L1	L215	1:L7	2-I5	R117	1:C4	1-A6
C169	1:K3	1-P3	*C240	1:H4	2-K1	L217	1:J7	2-K5	R118	1:D4	1-B6
C171	1:K3	1-Q3	C259	1:F7	2-Q3	*L223	1:J4	2-K2	R119	1:D4	1-C7
C173	1:D4	1-B0	C261	1:F6	2-Q4	*L230	1:L4	2-I3	*R120	1:E3	1-H7
C174	1:E4	1-B0	C268	1:E6	2-S2	*L231	1:L4	2-I2	*R121	1:C4	1-C7
C176	1:D4	1-E0	C270	1:D6	2-T2	L233	1:F6	2-Q3	*R122	1:C4	1-D6
C178	1:C4	1-F0	C271	1:C6	2-T2	*L236	1:H6	2-M2	R123	1:B4	1-H7
C179	1:D3	1-G2	C272	1:B6	2-U2	L239	1:E5	2-R2	R124	1:B4	1-H8
C180	1:E2	1-H0	C273	1:B6	2-V2	L241	1:D6	2-S3	R125	1:B4	1-H8
C181	1:D3	1-G0	C294	1:D6	2-R1	L243	1:C6	2-T3	R126	1:B3	1-H6
C182	1:D3	1-H1	C295	1:D6	2-R1	L245	1:C7	2-T2	R127	1:A3	1-H7
C184	1:D4	1-G0	C297	1:C5	2-L8	L247	1:C6	2-U3	R128	1:A3	1-J7
C185	1:D2	1-J1	C298	1:C6	2-L8	L248	1:D7	2-U2	R129	1:B4	1-J9
C186	1:E2	1-J0	D101	1:B3	1-H5	L249	1:B6	2-V3	R130	1:B4	1-J8
			D101	1:B3	1-G5	L264	1:C6	2-L8	R131	1:A3	1-J7
			D103	1:P7	1-K9	LINK1	1:D3	1-L0	R132	1:B5	1-J8
			D105	1:C2	1-J2	LINK2	1:P6	1-D1	R133	1:A3	1-K7
			D105	1:C2	1-J2	LINK201	1:D5	2-F8	R134	1:B3	1-K6
			D107	1:P7	1-K5	P101	1:A5	1-R9	R135	1:P7	1-K9
			D109	1:P6	1-L5	P103	1:K3	1-R0	R136	1:A3	1-K7
			D111	1:C2	1-M1	P105	1:K2	1-R0	R137	1:B3	1-K6
			D111	1:C2	1-M1	P201	1:B6	2-V3	R138	1:B4	1-L6

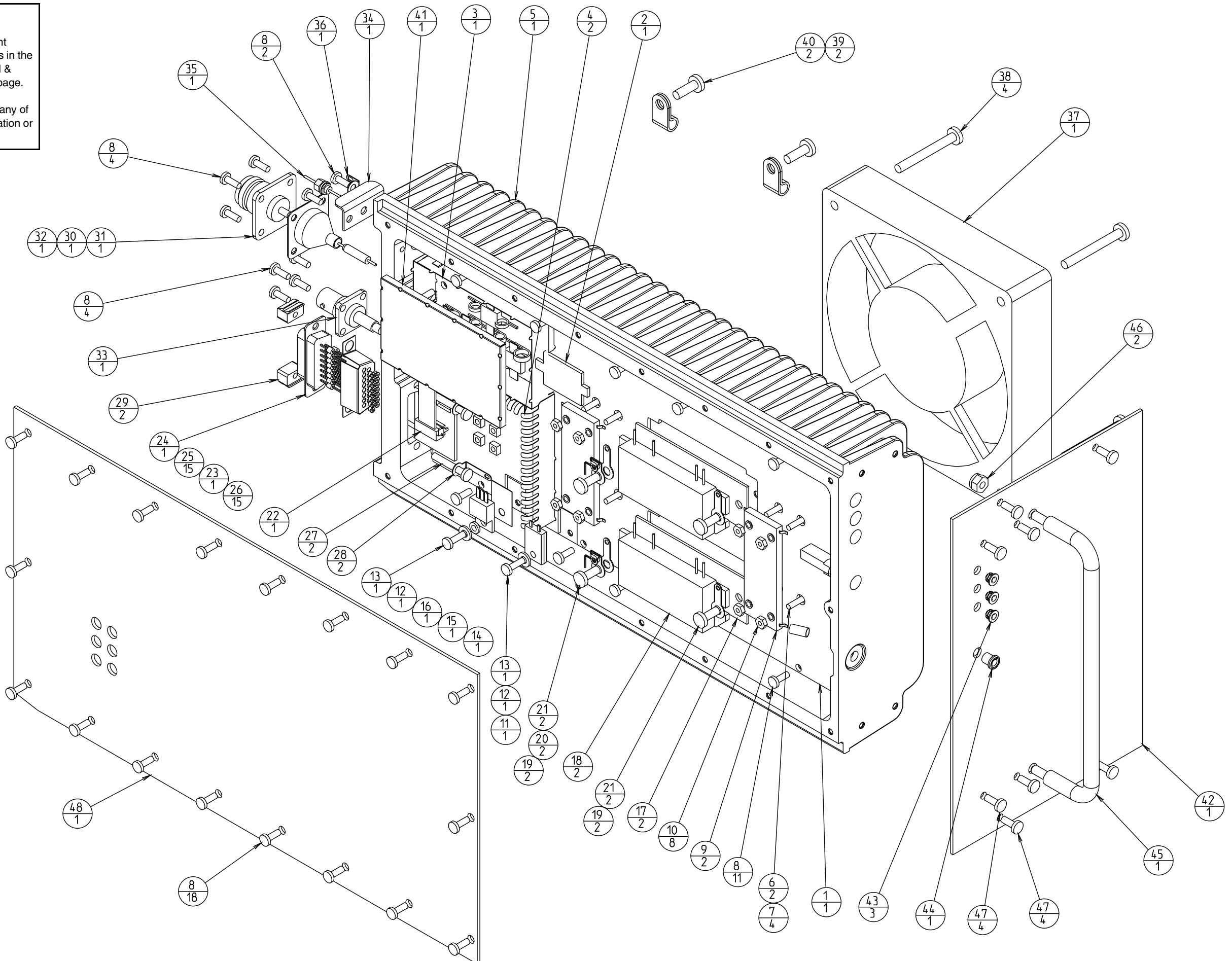
<u>Device</u>	<u>PCB</u>	<u>Circuit</u>	<u>Device</u>	<u>PCB</u>	<u>Circuit</u>	<u>Device</u>	<u>PCB</u>	<u>Circuit</u>	<u>Device</u>	<u>PCB</u>	<u>Circuit</u>
R141	1:E3	1-C6	*R223	1:F2	2-P2						
R142	1:E3	1-E7	R224	1:D4	2-G7						
R143	1:E4	1-F6	R225	1:E6	2-R3						
R144	1:D3	1-F6	R228	1:E4	2-G7						
R145	1:E4	1-F7	R229	1:D4	2-H7						
R146	1:E4	1-G7	*R230	1:L4	2-I2						
R148	1:C5	1-D5	R231	1:F5	2-Q2						
R149	1:C5	1-C4	*R232	1:K4	2-K1						
R150	1:C4	1-F0	R237	1:C5	2-K8						
R151	1:B5	1-D5	RV101	1:C4	1-H8						
R152	1:B5	1-C3	RV103	1:C4	1-H6						
R153	1:C5	1-F4	RV105	1:C3	1-J5						
R154	1:C5	1-F3	RV107	1:C3	1-J3						
R155	1:D3	1-F2	RV109	1:P5	1-C2						
R156	1:D3	1-F3	*RV111	1:P5	1-D1						
R157	1:D4	1-G0	RV113	1:C3	1-D0						
R158	1:C4	1-H3	RV115	1:C3	1-K0						
R159	1:C4	1-H4	SK101	1:K3	1-A2						
R160	1:C3	1-J5	SK103	1:B4	1-B2						
R161	1:B3	1-J3	*SK201	1:N3	2-D3						
R162	1:B3	1-K4	*SK203	1:N7	2-C1						
R163	1:P8	1-K5									
R164	1:B3	1-K4									
R165	1:B4	1-K4									
R166	1:P7	1-L5									
R168	1:E4	1-A1									
R169	1:E4	1-A0									
R170	1:D4	1-B0									
R171	1:E4	1-B0									
R172	1:E4	1-B0									
R173	1:P6	1-C1									
R174	1:P6	1-C1									
R175	1:D4	1-C0									
R176	1:D4	1-D0									
R177	1:D4	1-D0									
R178	1:D3	1-E1									
R179	1:D4	1-E0									
R180	1:D4	1-E0									
R181	1:E3	1-F2									
R182	1:D4	1-E0									
R183	1:D4	1-F1									
R184	1:E3	1-G1									
R185	1:E2	1-J0									
R186	1:D2	1-H1									
R187	1:E2	1-H0									
R188	1:D2	1-L1									
R189	1:D2	1-L1									
R190	1:C3	1-M1									
R191	1:B2	1-P1									
R192	1:B2	1-P1									
R193	1:C2	1-Q1									
R194	1:D2	1-H0									
R195	1:D3	1-J0									
R196	1:D3	1-J0									
R197	1:D3	1-L1									
*R201	1:N6	2-D1									
*R202	1:N6	2-D1									
R203	1:L7	2-I5									
*R204	1:N6	2-D1									
R205	1:K7	2-K4									
*R206	1:C5	2-E8									
R207	1:D4	2-F8									
*R208	1:C5	2-G9									
R209	1:D5	2-G8									
R210	1:D5	2-G8									
*R211	1:D4	2-H9									
R212	1:D4	2-I8									
R213	1:D5	2-E7									
R214	1:E4	2-J8									
*R215	1:H3	2-B8									
*R216	1:P6	2-E2									
*R217	1:P6	2-E2									
R218	1:E5	2-E7									
R219	1:H6	2-B6									
R220	1:E5	2-F7									
R222	1:D5	2-G7									

**Key**

The upper number is the component identification number which appears in the "Legend" column of the Mechanical & Miscellaneous Parts on the facing page.

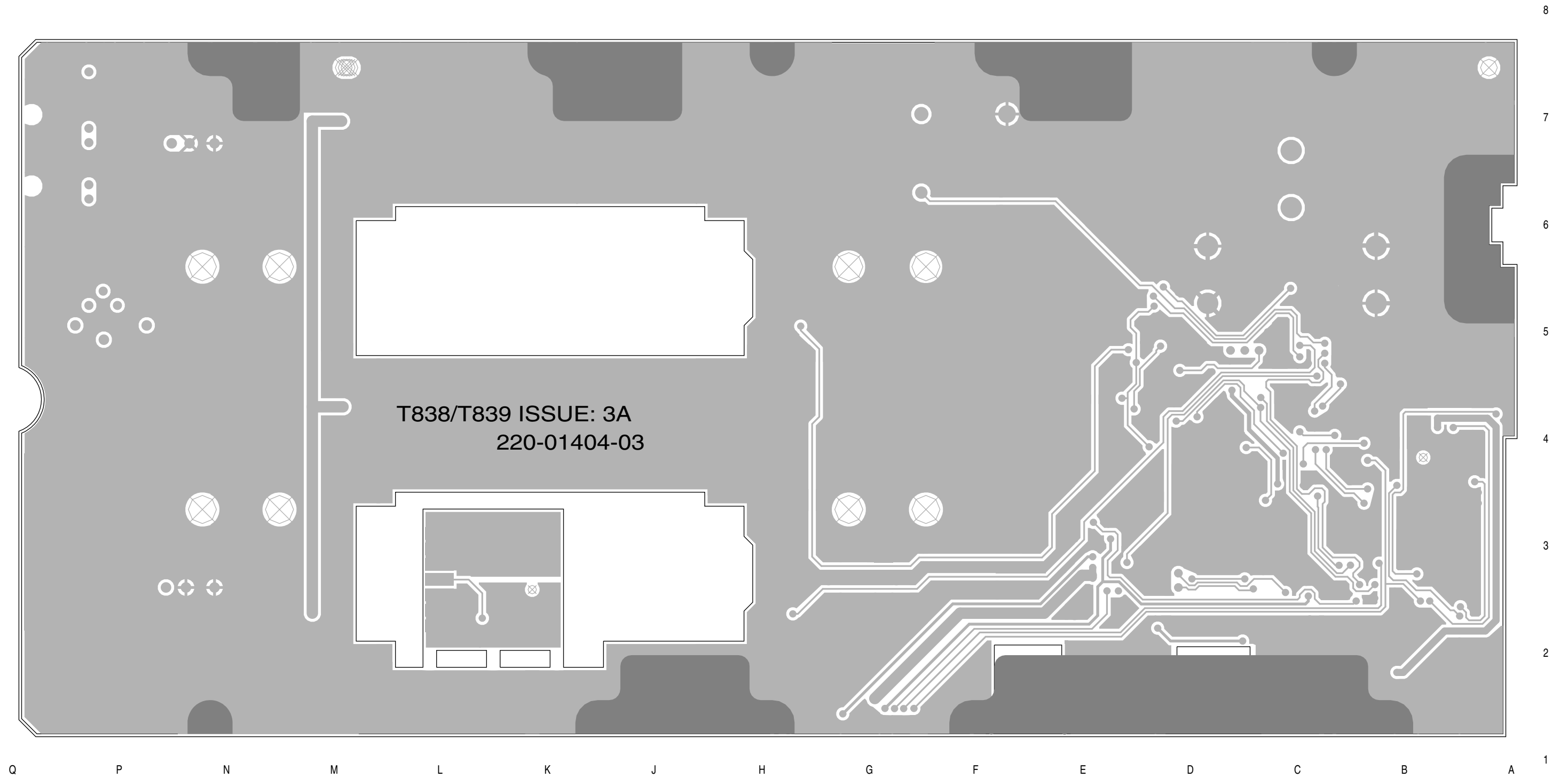
**33**  
**2**

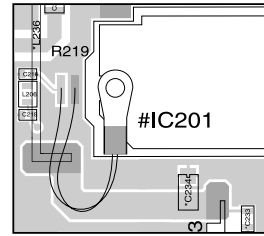
The lower number indicates how many of this component are used in this location or function.



**T839 Mechanical Assembly**  
**220-01404-03**

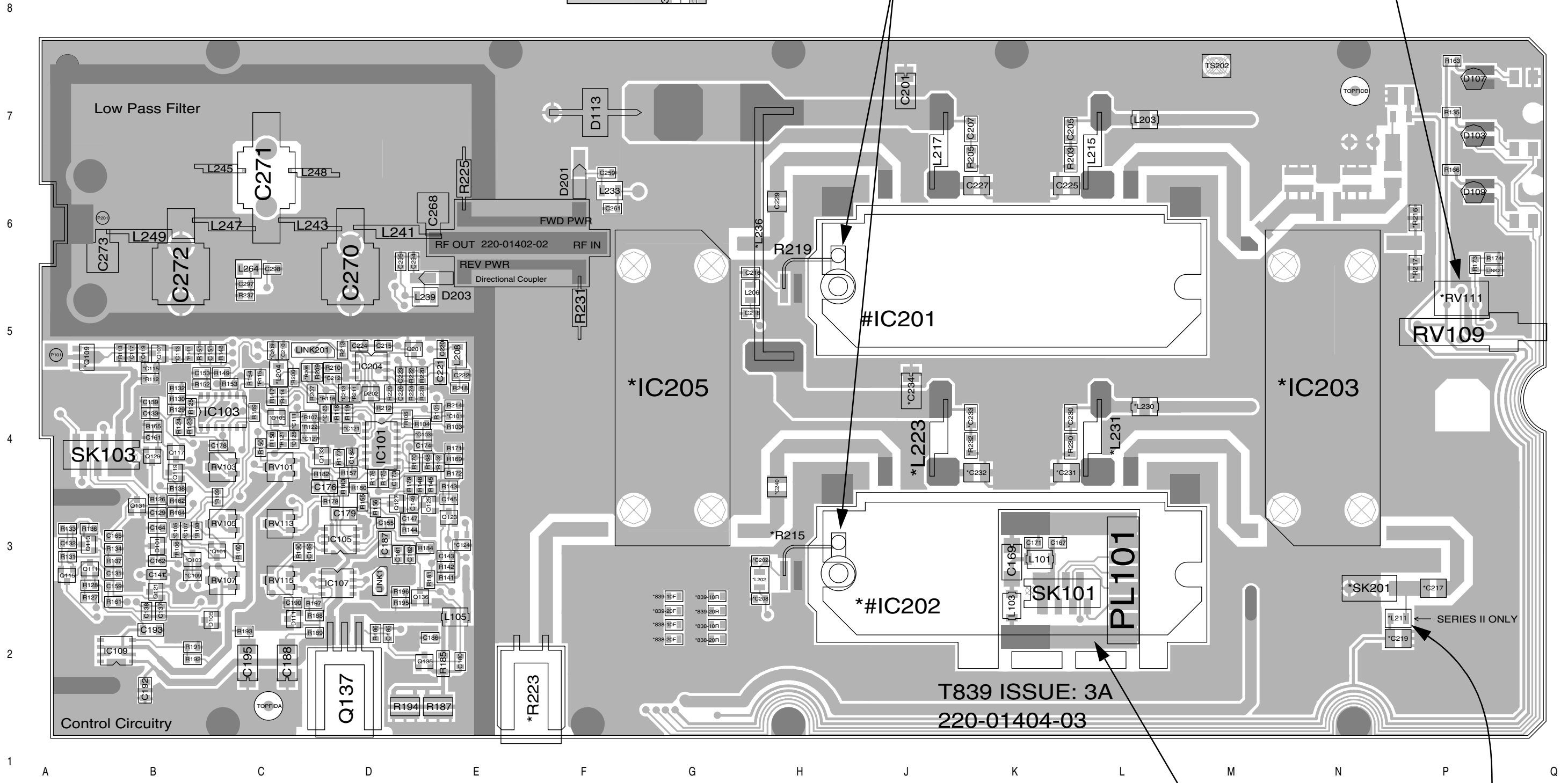






A different type of thermistor is used for R219 and \*R215 in later production PAs, as shown at left. Both these thermistors must be positioned as shown in the drawing so that their performance is not affected by high levels of RF in adjacent tracks.

\*RV111 may be fitted instead of RV109 to convert the output power adjustment to internal access only.



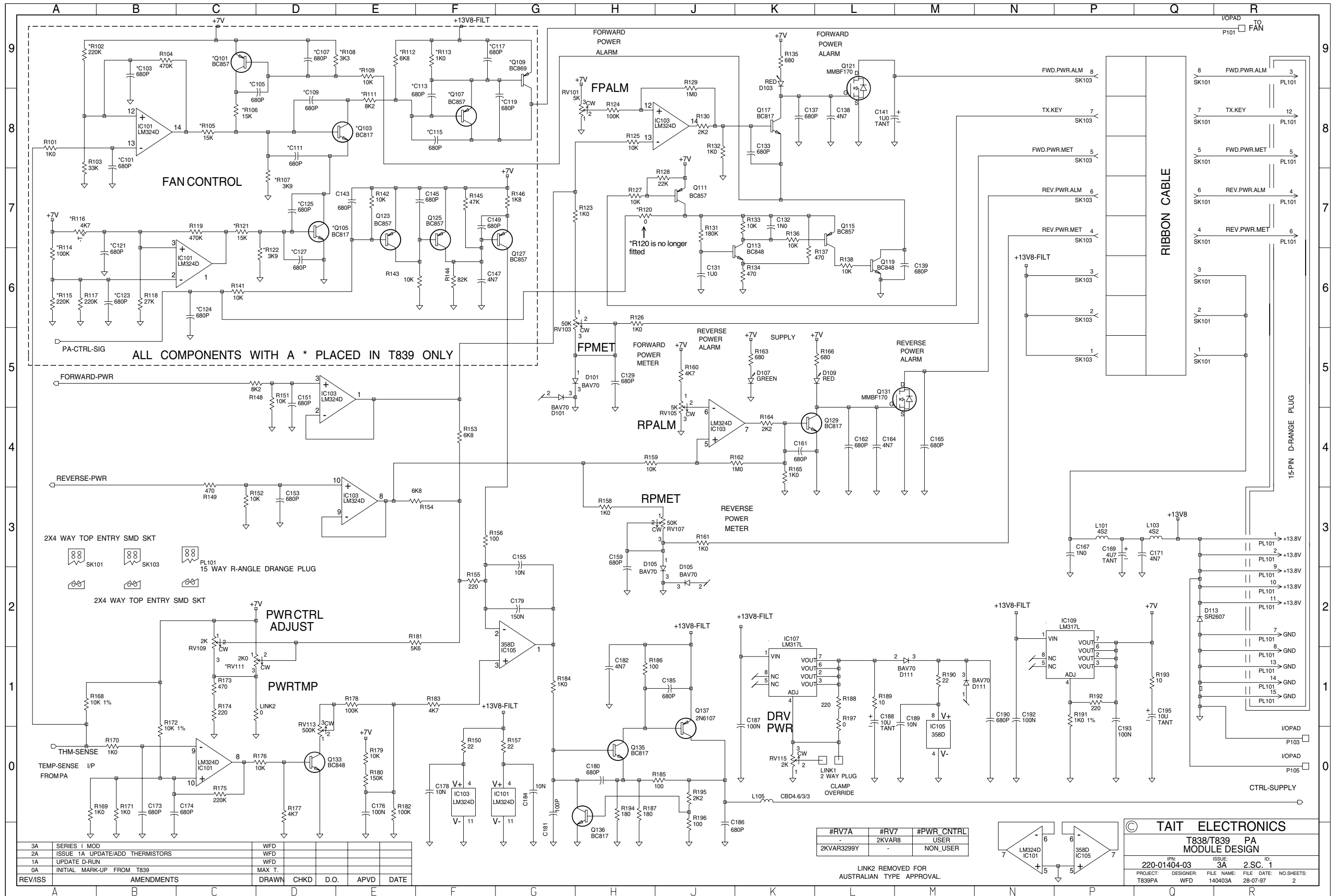
*838 10F	*838 10R
*838 20F	*838 20R
*838 10F	*838 10R
*838 20F	*838 20R

T839 ISSUE: 3A  
 220-01404-03

The circuitry for the break-off D-range PCB is shown on the control section circuit diagram.

\*L211 is fitted to Series II compatible PAs only.





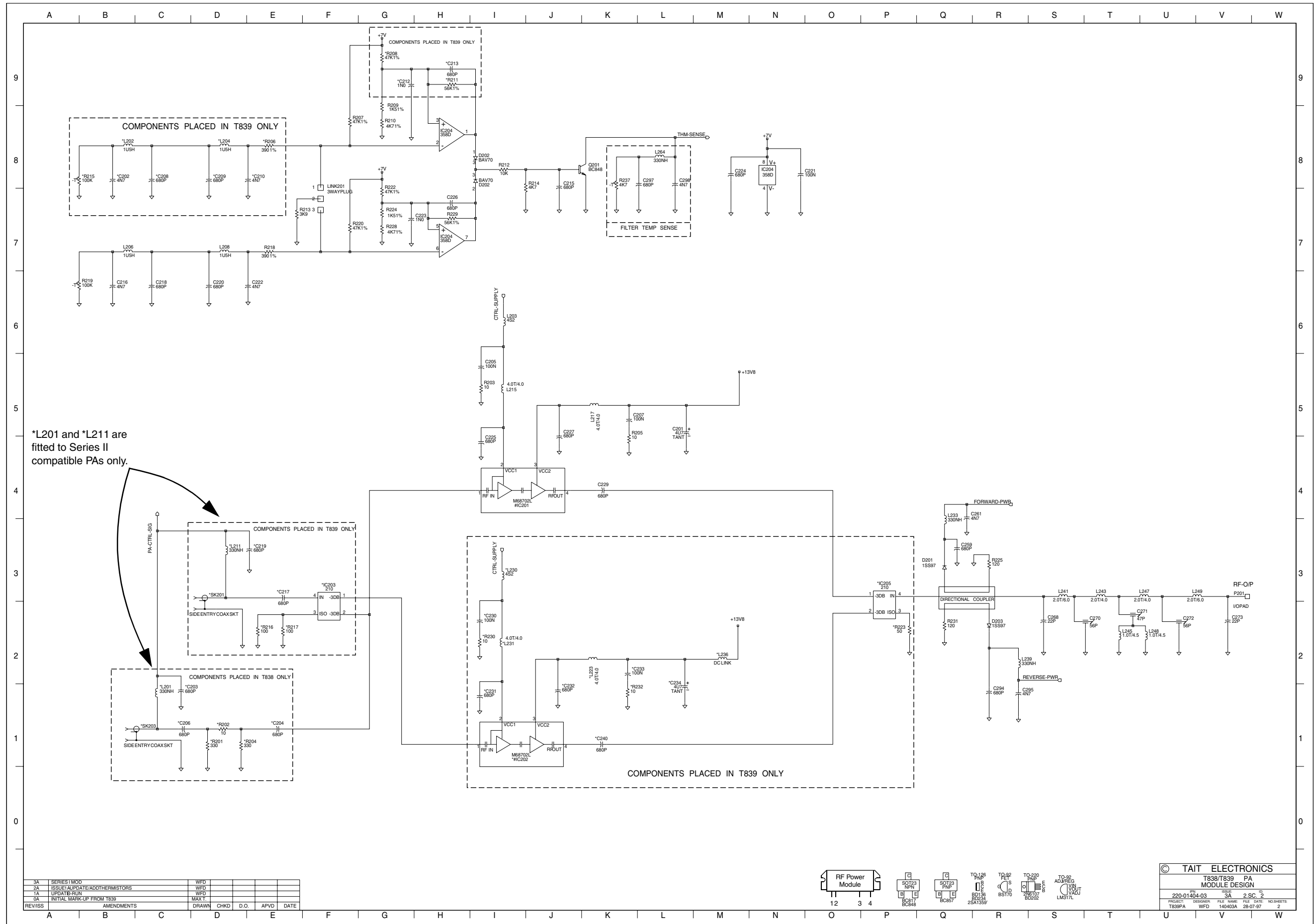
3A	SERIES 1 MOD	WFD				
2A	ISSUE 1A UPDATE/ADD THERMISTORS	WFD				
1A	UPDATE D-RUN	WFD				
0A	INITIAL MARK-UP FROM T839	MAX T.				
REV/ISS	AMENDMENTS	DRAWN	CHKD	D.O.	APVD	DATE

#RV7A	#RV7	#PWR_CNTRL
2KVAR3299Y	2KVAR8	USER
		NON_USER

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 T838/T839 PA  
 MODULE DESIGN  
 IPN: 220-01404-03  
 ISSUE: 3A  
 ID: 2.SC. 1  
 PROJECT: T839PA  
 DESIGNER: WFD  
 FILE NAME: 140403A  
 FILE DATE: 28-07-97  
 NO. SHEETS: 2

The control section circuit diagram is the same for both the T838 and T839 and is reproduced in both PCB information sections for your convenience.

Sheet 1 - T839 Control Section  
 220-01404-03



\*L201 and \*L211 are fitted to Series II compatible PAs only.

3A	SERIES I MOD	WFD			
3A	ISSUE/REV/DATE/ADDITIONAL COMMENTS	WFD			
1A	UPDATE/REV	WFD			
0A	INITIAL MARK-UP FROM T839	MAXT.			
REVISS	AMENDMENTS	DRAWN	GKHD	D.O.	APVD DATE

The circuit diagram for the RF & thermistor control sections is the same for both the T838 and T839 and is reproduced in both PCB information sections for your convenience.

Sheet 2 - T839 RF & Thermistor Control Sections  
220-01404-03