2 T889 Circuit Operation

This section provides a basic description of the circuit operation of the T889 PA.

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.

2.1 Introduction

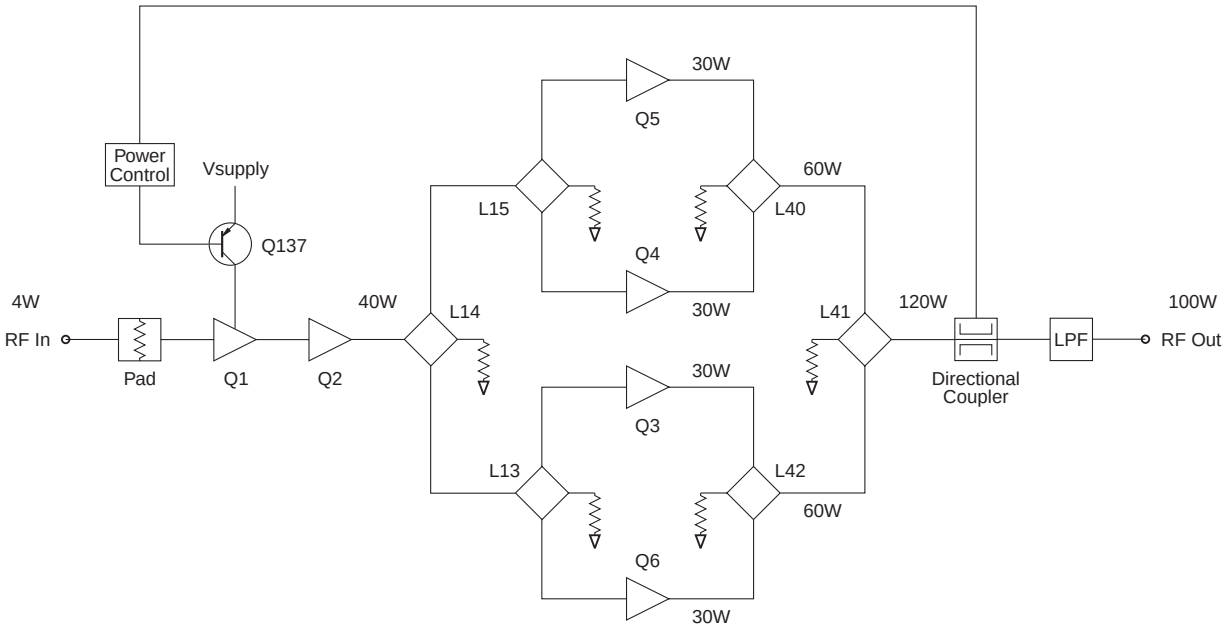

Figure 2.1 T889 High Level Block Diagram

The T889 comprises a three stage RF power amplifier with extensive control circuitry. The final stage is composed of four transistors (Q3, Q4, Q5 & Q6) whose outputs are combined to provide the rated output power.

The configuration of each of the main circuit blocks may be seen on a functional level in Figure 2.1.

2.2 RF Circuitry

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

The driver stage of the T889 consists of a two stage transistor amplifier (Q1, Q2) which delivers a minimum of 40W. This signal is split via three 3dB couplers (L13, L14 & L15) and used to drive the four final amplifiers (Q3, Q4, Q5 & Q6). These outputs are recombined by L40, L41 & L42 and passed to the antenna socket via the directional coupler and low pass filter.

The directional coupler senses forward and reflected power, which is rectified (DCIC1, DCIC2) 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 the collector of the driver transistor (Q1).

2.3 Control Circuitry

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

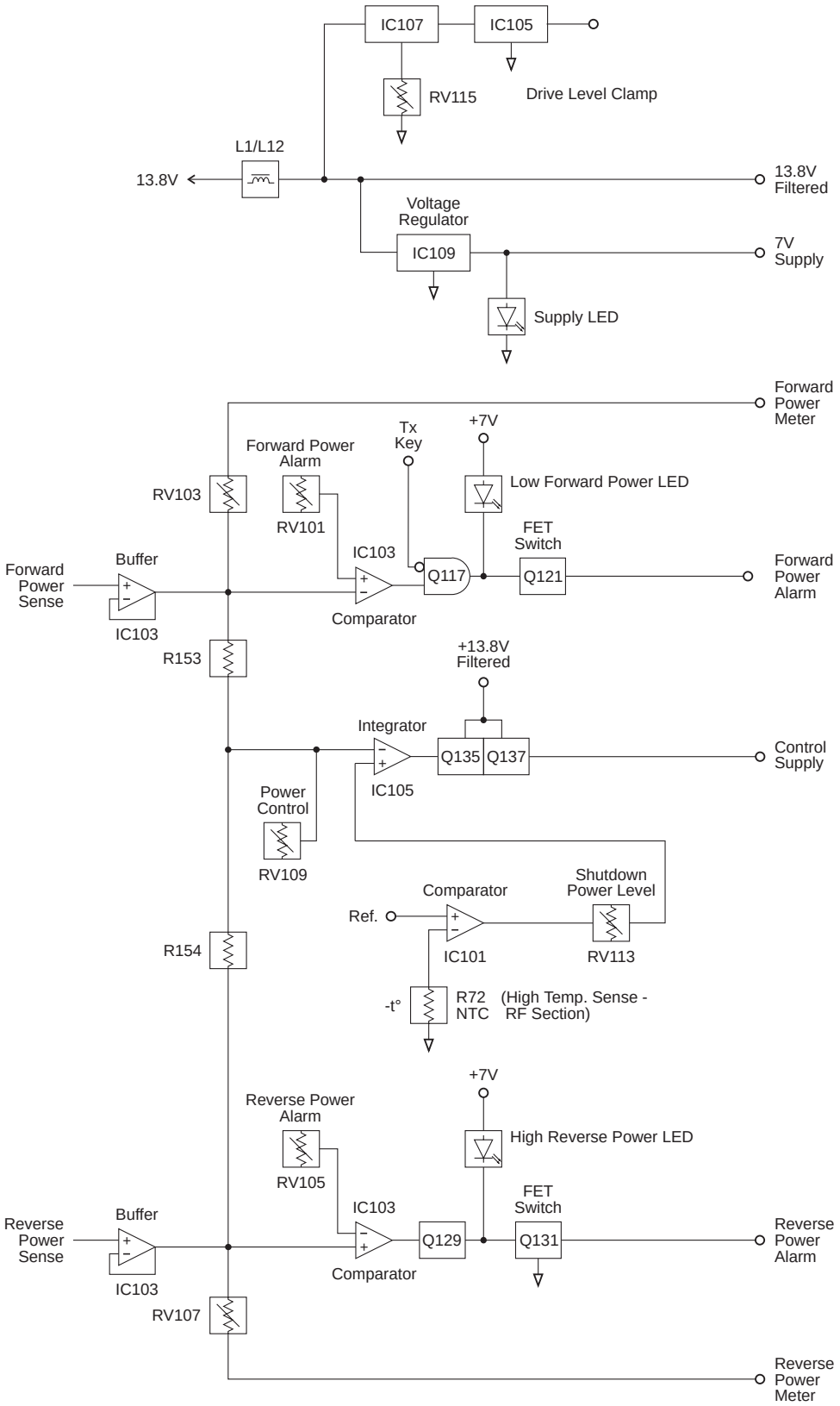

Figure 2.2 T889 Control Circuitry Block Diagram

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 element (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 T889 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.

Note: You must make this adjustment at the operating frequency of the PA. If you change the operating frequency, you must readjust RV115 to clamp the power at the new frequency.

Caution: **You must set the driver power level clamp (RV115) according to the operational output power and ambient temperature, as described in Section 3.3. The unit may be damaged if RV115 is not set correctly.**

2.3.3 Thermal Protection

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

A thermistor controlled voltage divider (R168, R72) applies a voltage to a comparator with hysteresis (IC101 pins 8, 9 & 10).

The output current from the comparator 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 IC103 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

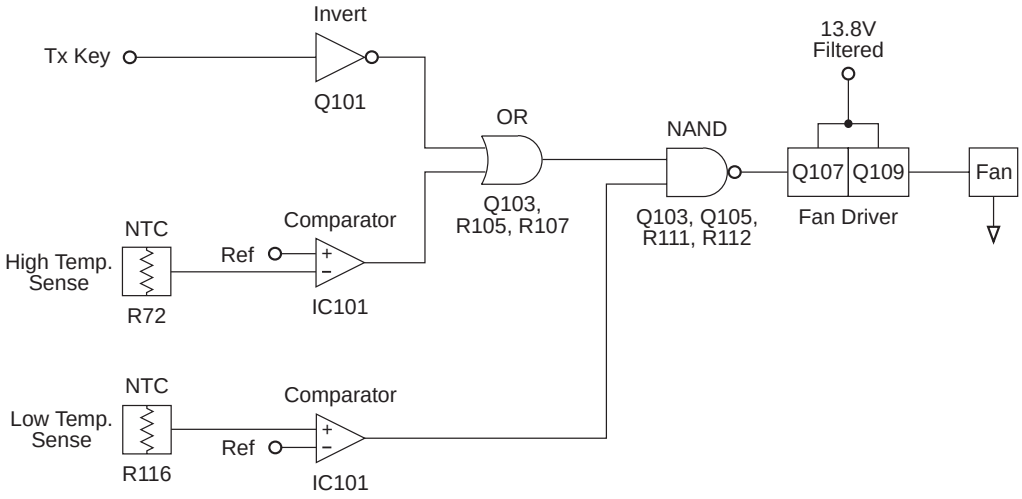

Figure 2.3 T889 Fan Control Logic Diagram

Comparator IC101 pins 8, 9 & 10 are set to trigger at heatsink temperatures greater than +70°C, and pins 1, 2 & 3 at temperatures greater 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 +70°C.

A logic OR function is applied to comparator IC101 pins 8, 9 & 10 and Tx-Key signals, thereby turning on the fan when the transmitter is keyed and the temperature is between -10°C and +70°C.

If the temperature drops below -10°C, Q105 is turned off, preventing either Q101 or Q103 from activating the fan.

Fan operation may be summarised as follows:

T < -10°C	- fan unconditionally turned off
-10°C < T < +70°C	- fan turned on only when transmitter keyed
T > +70°C	- fan unconditionally turned on.

2.4 Power Supply & Regulator Circuits

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

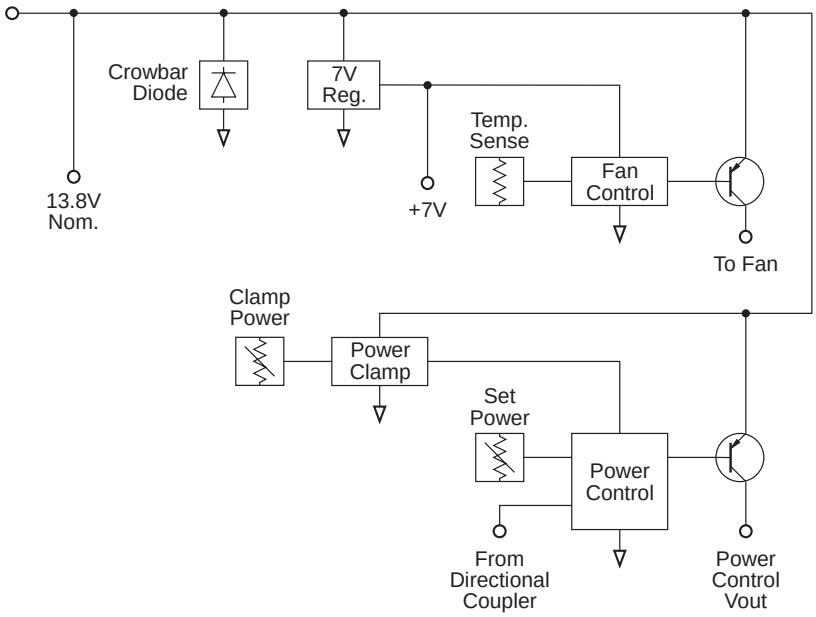

Figure 2.4 T889 Power Supply & Regulator Circuitry Block Diagram

The T889 is 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.

