

3 T837 Initial Tuning & 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 tuning and adjustment procedure and provides information on:

- channel programming
- synthesiser alignment
- modulator adjustment
- external reference frequency configuration (T837-2X-1021 only).

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 2.00 and later of the software.

Refer to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

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3.1 Introduction

When you receive your T837 exciter it will be run up and working on a particular frequency (the "default channel")¹. If you want to switch to a frequency that is within the 8MHz VCO switching range (i.e. ± 4 MHz from the factory programmed frequency), you will need to:

- reprogram the exciter with the PGM800Win software (refer to the PGM800Win programming kit and Section 3.2 below);
- carry out the modulator adjustment procedure described in Section 3.5.

However, if you want to switch to a frequency outside the 8MHz VCO switching range, you will have to:

- reprogram the exciter with the PGM800Win software;
- carry out the synthesiser alignment procedure described in Section 3.4;
- carry out the modulator adjustment procedure described in Section 3.5.

3.2 Channel Programming

You can program up to 128 channel frequencies into the exciter's EEPROM memory (IC820) by using the PGM800Win software package and an IBM™ PC. You can also use PGM800Win to select the exciter's current operating frequency (or "default channel").

If the exciter is installed in a rack frame, you can program it via the programming port in the speaker panel. However, you can also program the exciter before it is installed in a rack frame as follows:

- by using a T800-01-0010 calibration test unit;
- via D-range 1.

If you do not use the T800-01-0010, you will have to connect the PC to the exciter via a module programming interface (such as the T800-01-0004).

For a full description of the channel programming procedure, refer to the PGM800Win programming software user's manual.

1. Use the "Read Module" function in PGM800Win to find out what the default channel is.

3.3 Test Equipment Required

You will need the following test equipment:

- computer with PGM800Win installed
 - T800 programming kit
 - module programming interface (e.g. T800-01-0004 - optional)
 - 13.8V power supply
 - digital multimeter
 - function generator
 - RF power meter
 - frequency counter
 - modulation meter
 - oscilloscope (digital preferred)
 - 20dB pad
- } or modulation analyser

Figure 3.1 shows a typical test equipment set-up.

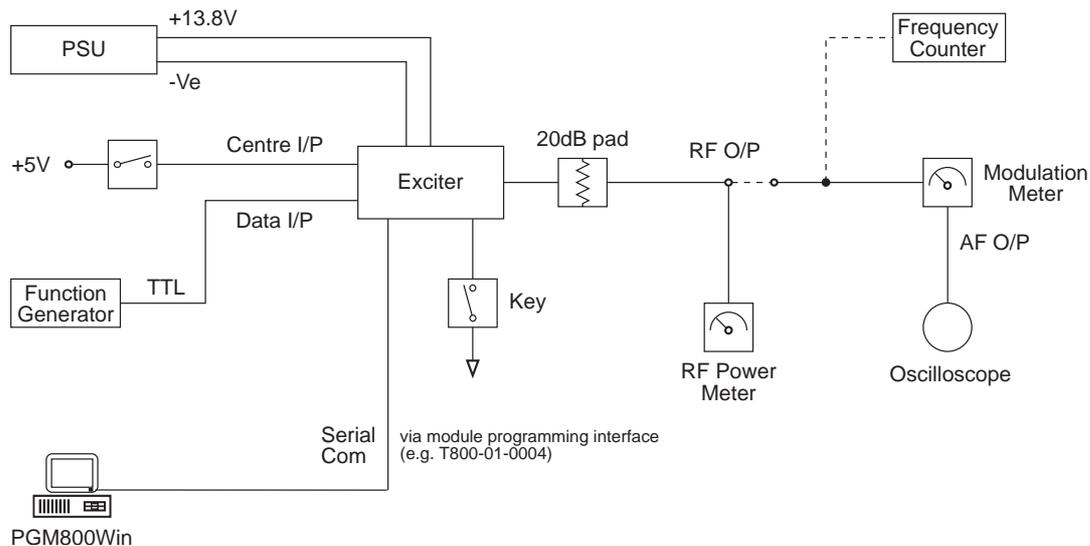


Figure 3.1 T837 Test Equipment Set-up

Note: Although the T800-01-0010 calibration test unit can be used to program the T837 paging exciter, it is not suitable for tuning and adjustment procedures because of the different pin allocations of D-range 1 (PL100).

3.4 Synthesiser Alignment

Ensure that the T837 has been programmed with the required frequencies using PGM800Win software.

Select a channel using PGM800Win.

Connect a high impedance voltmeter to PL4-1 or the junction of L1 and R1 in the VCO (this measures the synthesiser loop voltage).

Key the transmitter by earthing the Tx-Key line.

Tune VCO trimmer CV1 for a synthesiser loop voltage of 9V.

Check that the exciter output power is 800mW \pm 200mW (measured at the rear panel N-type connector).

If required, measure and adjust the exciter output frequency as follows:

- apply +5V DC to pin 11 of D-range 1 (PL100) - this changes the mode of operation to PLL so that the carrier frequency can be observed - and measure the output frequency at the rear panel N-type connector;
- adjust the trimmer on the TCXO (%X100) if required;
- remove the +5V DC from pin 11.



Caution:

This trimmer is susceptible to physical damage. Do not exert a downward force of more than 500g (1lb) when adjusting.

3.5 Modulator Adjustment

Apply +5V DC to pin 12 (DATA input) of D-range 1.

Monitor the exciter output frequency and adjust RV102 (DC frequency offset) to give an output frequency of $F_{\text{carrier}} + 4.5\text{kHz}$.

Remove the +5V DC from pin 12 and apply a 100Hz 5Vp-p square wave to pin 12.

Monitor the signal at TP100 with an AC coupled oscilloscope set to 50mV/div. and adjust RV101 (reference modulation) until the triangle wave amplitude is minimised.

Change the frequency of the square wave to 600Hz.

Monitor the frequency deviation on the exciter output with a modulation meter and adjust RV100 (VCO modulation) to obtain $\pm 4.5\text{kHz}$ deviation.

Monitor the VCO control line at PL4-1 or the junction of L1 and R1 in the VCO using an AC coupled oscilloscope set to at least 20mV/div.

Change the frequency of the square wave back to 100Hz and check that the control line still has a good trapezoidal wave form with flat top and bottom.

Note 1: You may have to readjust RV101 & RV100 alternately to achieve a square wave on the VCO control line at both 600Hz and 100Hz with a deviation of $\pm 4.5\text{kHz}$. Figure 3.2 shows a typical 100Hz VCO control line wave form with RV101 and RV100 set correctly.

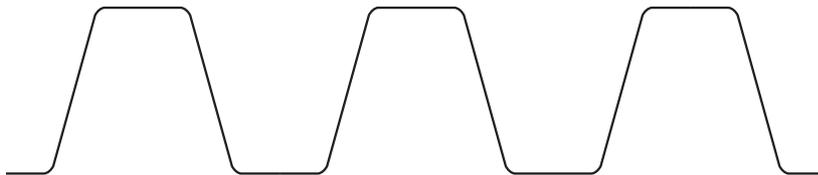


Figure 3.2 T837 100Hz VCO Control Line Wave Form

Note 2: If the lower cut off frequency of an AC coupled oscilloscope is too high, excessive distortion may be introduced which will result in 'sag' on the square wave displayed. Determine if this is a problem by directly monitoring the original square wave source and observe any sag. If there is sag, switch the oscilloscope to DC and use a 10 μ F capacitor in series with the oscilloscope probe (observing the correct polarity) to directly monitor the VCO control line. Note that the trace settling time will be approximately one minute.

3.6 External Reference Frequency Configuration (T837-2X-1021 Only)

When using an external reference frequency, you must set the onboard synthesiser's reference frequency according to the frequency of the external reference. This is achieved by placing resistors *%R240 - *%R247 in a pattern corresponding to a binary number which represents the reference divider ratio.

If you are using a 10MHz external reference frequency, you need only carry out steps 4 and 5 in this section. You do not need to carry out steps 1, 2 and 3 because the T837 has already been configured at the factory for a 10MHz external reference.

However, if you are using an external reference frequency other than 10MHz, you must configure the internal synthesiser as described in steps 1, 2 and 3 before proceeding to steps 4 and 5.

1. Divide the external oscillator frequency by 100kHz.
2. Convert the result to binary. You can use the following table to do this: select the binary values in row three which add up to the result obtained in step 1, then place a "1" in these positions and a "0" in the others.

MSB							LSB
N7	N6	N5	N4	N3	N2	N1	N0
128 ₁₀	64 ₁₀	32 ₁₀	16 ₁₀	8 ₁₀	4 ₁₀	2 ₁₀	1 ₁₀
*%R240	*%R241	*%R242	*%R243	*%R244	*%R245	*%R246	*%R247

3. Where there is a "0" in the binary number, place a zero ohm resistor in the corresponding component location shown in the table. Where there is a "1", leave an open link.

Example: The following example shows the resistor pattern for a 10MHz external reference frequency is calculated.

$$\frac{10\text{MHz}}{100\text{kHz}} = 100$$

$$100 = 64 + 32 + 4$$

therefore place resistors *%R240, *%R243, *%R244, *%R246 and *%R247 and leave all other links open

MSB							LSB
N7	N6	N5	N4	N3	N2	N1	N0
128 ₁₀	64 ₁₀	32 ₁₀	16 ₁₀	8 ₁₀	4 ₁₀	2 ₁₀	1 ₁₀
0	1	1	0	0	1	0	0
*%R240	*%R241	*%R242	*%R243	*%R244	*%R245	*%R246	*%R247

4. Connect the external reference frequency at a level of 0dBm to +10dBm/50Ω into the external reference input and check that green LED *D116 lights.

5. Measure the TCXO (%X100) AFC voltage at %IC160 pin 4 with a high impedance voltmeter and adjust the TXCO trimmer (if necessary) to obtain 2.5V DC ±0.2V.