3 T826/827 Initial Tuning & Adjustment

The following section describes the full tuning and adjustment procedure and provides information on:

- channel programming
- channel selection
- selecting required audio links
- synthesiser alignment
- PA alignment (T826 only)
- modulator adjustment
- limiter adjustment
- setting line level
- compressor adjustment
- timer adjustment.

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 lists and diagrams for the memory and VCO PCBs are in Part E.

3.1 Channel Programming

Up to 128 channel frequencies can be stored in the EPROM memory (IC1). Each channel can be addressed using the bank of 8 switches (SW1). The most significant bit of this switch is set according to the type of EPROM fitted:

ON = 27C16
OFF = 27C64

Up to 8 channels may be addressed externally when the optional extra rear D-range connector is fitted.

Programming is accomplished by using an IBM[1] PC, a PROM programmer and the PGM800 software package. For a full description of the programming procedure, refer to the T800 Programming Software User's Manual.

3.2 DIP Switch Codes For Channel Addresses

The PGM800 software used to programme the EPROM will present the user with a DIP switch code for each channel address (refer to Section 3.10). For example, channel 125 will be assigned a switch code of X0000011 (1-128 channel numbering), in which case the switches should be set as shown in Figure 3.1, i.e. **0**0000011.

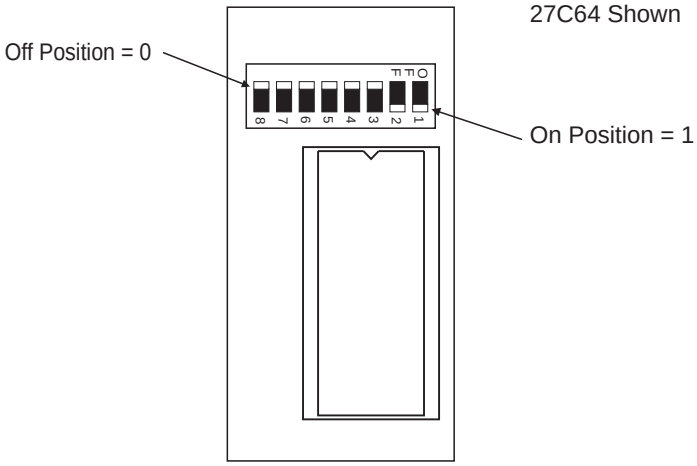

Figure 3.1 Channel DIP Switch Setting

Note 1: For remote multichannel applications using the T800-07 multichannel memory PCB, the DIP switch is not used and should have the first 3 least significant bits (1-3) in the ***off*** position. The next 4 bits (4-7) should be ***on***, while the most significant bit (8) is selected according to the EPROM used (refer to Section 3.1). This will allow the existing CHSEL lines to be used to select up to 8 channels. It is possible to address blocks of 8 channels throughout the 128 channel EPROM capacity by switching bits 4 to 7 on the DIP switch.

Note 2: Alternatively, all 128 channels may be remotely addressed on the T800-07, but bits 1-7 of the DIP switch should be in the ***off*** position. In this case it will be necessary to drill a hole to route the 7 channel select lines from the synthesiser compartment to the D-range connector. Later models have an access slot between these two compartments.

1. IBM is a registered trademark of International Business Machines.

3.3 Audio Processor Links

3.3.1 Link Details

The links available for various circuit block options are listed by function as follows:

Plug	Link	Function
PL100	1-2	not connected
	3-4	microphone pre-amp. output to compressor input
	5-6	microphone pre-amp. output to multiplexer input
PL101	1-2	multiplexer output to pre-emphasis input
	3-4	multiplexer output to compressor input
	5-6	multiplexer output to limiter input
PL102	1-2	not connected
	3-4	not connected
	5-6	compressor output to pre-emphasis input
	7-8	compressor output to limiter input
	9-10	compressor output to multiplexer input
PL103	1-2	pre-emphasis output to multiplexer input
	3-4	pre-emphasis output to limiter input
	5-6	not connected

3.3.2 Typical Options

	PL100	PL101	PL102	PL103
microphone pre-amp. compressed and pre-emphasised; line input pre-emphasised (standard set-up)	3-4	1-2	9-10	3-4
microphone pre-amp. compressed and pre-emphasised; line input unprocessed	3-4	5-6	5-6	1-2
line and microphone compressed and pre-emphasised	5-6	3-4	5-6	3-4
microphone pre-amp. compressed; line and microphone flat response	3-4	5-6	9-10	5-6

3.4 Test Equipment Set-up

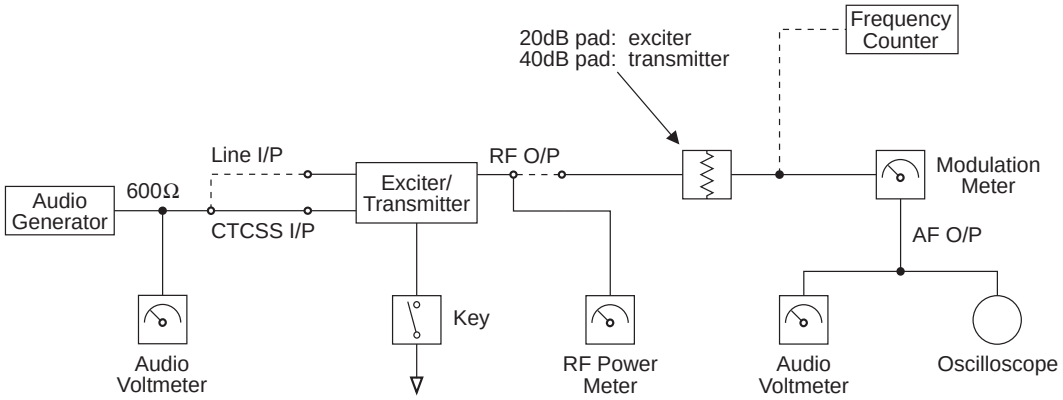

Figure 3.2 T826/827 Test Equipment Set-up

3.5 Synthesiser Alignment

- Ensure that the EPROM (IC1) has been programmed with the required frequencies using PGM800 software.

- **Single Channel** Select a channel on the EPROM PCB DIP switch.

  Multichannel Select the lowest channel via the EPROM PCB DIP switch.

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

- Earth the Tx key line.

  Single Channel Tune VCO trimmer VC1 for a synthesiser loop voltage of 7.5V.

  Multichannel Tune VCO trimmer VC1 for a synthesiser loop voltage of 5V on the lowest channel.

  All channels should lie within the upper and lower limits of 13V and 5V respectively.

  Do not attempt to programme channels with a greater frequency separation than the specified switching range (8MHz).

- Check that the exciter output power is:

T826	500mW +200, -100mW
T827	1W ±300mW.

- Measure the exciter output frequency and adjust the TCXO (=IC1 in the T826; IC1 in the T827) trimmer if required.

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

3.6 PA Alignment (T826 Only)

Check that the exciter is connected to the PA with the coaxial link.

Connect an RF power meter to the PA output.

Turn RV311 (power control) fully clockwise.

Measure and record the voltage (VL) at L301; perform this measurement at room temperature so that the NTC R303 is close to 25°C.

Key the transmitter.

Check that the total current drawn is less than 4.5A for 25W output power.

Adjust RV311 for an output power between 5 and 25W.

3.7 Thermal Shutdown (T826 Only)

Key the transmitter and set the output power to 25W as described in Section 3.6.

Short L301 to ground.

Set RV316 (shutdown level) for an output power of 5W.

Set RV300 (temperature set) to 0.16VL volts (measured at IC301 pin 5/TP6), where VL is the voltage measured at L301 in Section 3.6. This sets the thermal shutdown at 85°C at NTC R303.

3.8 Transmit Key Time (T826 Only)

Ensure that zero ohm resistor R78 is in circuit, and that solder links A & B in the synthesiser are not made.

The key time will be approximately 25ms.

3.9 Audio Processor

3.9.1 Two Point Modulation

The T826 and T827 utilise two point modulation to obtain a wide audio bandwidth independent of the synthesiser loop filter response. This is achieved by simultaneously frequency modulating the VCO and phase modulating the synthesiser reference frequency. The relative signal levels fed to the two modulators are quite critical and cause interaction when setting up.

Both modulating signals require readjustment when the exciter is shifted in frequency greater than the switching range (i.e. $\Delta F > \pm 4MHz$).

Note: In this and following sections deviation settings are given first for wide band sets, followed by settings in brackets for narrow band sets [ ].

3.9.2 Modulator Adjustment

1. Inject an audio signal of 600Hz 1.5V rms (+5dBm) into the CTCSS input (D-range pin 8).

   Earth the key line.

2. Adjust the output from the audio generator to obtain ±3kHz [±1.5kHz] deviation at 600Hz.

3. Change the input frequency to 250Hz and adjust RV105 (ref. mod.) to obtain ±3kHz [±1.5kHz] deviation.

4. Change the input frequency back to 600Hz.

   Repeat steps 2 and 3 above until the deviations achieved at the two input frequencies are within 0.2dB of each other. This will need to be done at least four times.

5. Sweep the audio between 100Hz and 1kHz for peaks.

Note: A peak between 100Hz and 1kHz will indicate a fault condition, i.e:

- incorrectly set-up

or - modulation circuitry fault.

The specification window is ±1dB relative to 150Hz from 65 to 260Hz.

3.9.3 Limiter Adjustment

Set the audio processor links as appropriate for the required audio configuration (refer to Section 3.3).

Inject 1kHz at -10dBm into the line input (D-range pins 1 & 4; pins 2 & 3 shorted and 6 & 7 shorted; refer to Section 1.2 of Part F).

Adjust RV100 (line sensitivity) fully clockwise and earth the key line. Adjust RV106 (deviation) to set the peak deviation to ±4.7kHz [±2.3kHz].

Sweep the audio frequency from 100Hz to 4kHz and ensure that the maximum deviation does not exceed 4.7kHz [2.3kHz]. Readjust RV106 if necessary.

Note: For multichannel operation this test should be performed on the channel with the highest deviation.

3.9.4 Line Level Without Compressor

This section assumes that the compressor is not used. If the compressor is required, refer to Section 3.9.5.

Adjust the line sensitivity as follows:

- set the injected signal at the line input to the required line level (typically -10 to -20dBm);
- adjust RV100 (line sensitivity) to provide ±3kHz [±1.5kHz] deviation.

3.9.5 Compressor

The compressor may be used on the line input only, the microphone input only, or on both the line and microphone inputs. If the compressor is used, refer to one of the following sections as appropriate.

3.9.5.1 Compressor On Line Input Only

Set RV100 (line sensitivity) fully clockwise and earth the key line.

Reduce the line level to -50dBm at 1kHz and set RV104 (compression level) fully clockwise.

Check that 3kHz deviation [1.5kHz] is still available.

Slowly increase the audio input level until the demodulated waveform shows significant signs of clipping (approximately 4.5kHz [2.3kHz] deviation).

Adjust RV104 (compression level) anticlockwise until the demodulated waveform is just clipping (approximately 4kHz [2kHz] deviation).

Increase the input level to -10dBm and check that the test tone is still held just into clipping. The input line level should be typically -10 to -20dBm.

3.9.5.2 Compressor On Microphone Input Only

Open the key line and plug a microphone jack into the front panel socket.

Adjust RV104 (compression level) fully clockwise.

Acoustically couple the microphone to a tone box (1kHz) and close the PTT switch.

Increase the audio level until the demodulated waveform shows significant signs of clipping (approximately 4.5kHz [2.3kHz] deviation).

Adjust RV104 (compression level) anticlockwise until the demodulated waveform is just clipping (approximately 4kHz [2kHz] deviation).

Increase the audio level by 10dB and verify that the test tone is held just into clipping.

Whistle steadily into the microphone, checking that approximately 4kHz [2kHz] deviation is produced. The modulated waveform should be basically sinusoidal.

Speak into the microphone, checking that the modulation peaks reach about 5kHz [2.5kHz] deviation.

As the line is to be used without compression, set the line sensitivity (RV100) as described in Section 3.9.4.

3.9.5.3 Compressor On Both Line & Microphone Inputs

Set up as described in Section 3.9.5.1.

3.10 PGM800 DIP Switch Codes

PGM800 channel numbers can range from 0-127 or 1-128, depending on which version you are using:

Version	Channel Numbers
V2 and earlier	0-127
V2.01	1-128
V2.21 and later PGM800Win	0-127 or 1-128

The following sections provide DIP switch code lists for both numbering systems.

3.10.1 DIP Switch Codes For Channel Numbers 0-127

0 = off 1 = on

Channel	DIP Code	Channel	DIP Code	Channel	DIP Code
0	X1111111	45	X1010010	90	X0100101
1	X1111110	46	X1010001	91	X0100100
2	X1111101	47	X1010000	92	X0100011
3	X1111100	48	X1001111	93	X0100010
4	X1111011	49	X1001110	94	X0100001
5	X1111010	50	X1001101	95	X0100000
6	X1111001	51	X1001100	96	X0011111
7	X1111000	52	X1001011	97	X0011110
8	X1110111	53	X1001010	98	X0011101
9	X1110110	54	X1001001	99	X0011100
10	X1110101	55	X1001000	100	X0011011
11	X1110100	56	X1000111	101	X0011010
12	X1110011	57	X1000110	102	X0011001
13	X1110010	58	X1000101	103	X0011000
14	X1110001	59	X1000100	104	X0010111
15	X1110000	60	X1000011	105	X0010110
16	X1101111	61	X1000010	106	X0010101
17	X1101110	62	X1000001	107	X0010100
18	X1101101	63	X1000000	108	X0010011
19	X1101100	64	X0111111	109	X0010010
20	X1101011	65	X0111110	110	X0010001
21	X1101010	66	X0111101	111	X0010000
22	X1101001	67	X0111100	112	X0001111
23	X1101000	68	X0111011	113	X0001110
24	X1100111	69	X0111010	114	X0001101
25	X1100110	70	X0111001	115	X0001100
26	X1100101	71	X0111000	116	X0001011
27	X1100100	72	X0110111	117	X0001010
28	X1100011	73	X0110110	118	X0001001
29	X1100010	74	X0110101	119	X0001000
30	X1100001	75	X0110100	120	X0000111
31	X1100000	76	X0110011	121	X0000110
32	X1011111	77	X0110010	122	X0000101
33	X1011110	78	X0110001	123	X0000100
34	X1011101	79	X0110000	124	X0000011
35	X1011100	80	X0101111	125	X0000010
36	X1011011	81	X0101110	126	X0000001
37	X1011010	82	X0101101	127	X0000000
38	X1011001	83	X0101100		
39	X1011000	84	X0101011		
40	X1010111	85	X0101010		
41	X1010110	86	X0101001		
42	X1010101	87	X0101000		
43	X1010100	88	X0100111		
44	X1010011	89	X0100110		

3.10.2 DIP Switch Codes For Channel Numbers 1-128

0 = off 1 = on

Channel	DIP Code	Channel	DIP Code	Channel	DIP Code
1	X1111111	46	X1010010	91	X0100101
2	X1111110	47	X1010001	92	X0100100
3	X1111101	48	X1010000	93	X0100011
4	X1111100	49	X1001111	94	X0100010
5	X1111011	50	X1001110	95	X0100001
6	X1111010	51	X1001101	96	X0100000
7	X1111001	52	X1001100	97	X0011111
8	X1111000	53	X1001011	98	X0011110
9	X1110111	54	X1001010	99	X0011101
10	X1110110	55	X1001001	100	X0011100
11	X1110101	56	X1001000	101	X0011011
12	X1110100	57	X1000111	102	X0011010
13	X1110011	58	X1000110	103	X0011001
14	X1110010	59	X1000101	104	X0011000
15	X1110001	60	X1000100	105	X0010111
16	X1110000	61	X1000011	106	X0010110
17	X1101111	62	X1000010	107	X0010101
18	X1101110	63	X1000001	108	X0010100
19	X1101101	64	X1000000	109	X0010011
20	X1101100	65	X0111111	110	X0010010
21	X1101011	66	X0111110	111	X0010001
22	X1101010	67	X0111101	112	X0010000
23	X1101001	68	X0111100	113	X0001111
24	X1101000	69	X0111011	114	X0001110
25	X1100111	70	X0111010	115	X0001101
26	X1100110	71	X0111001	116	X0001100
27	X1100101	72	X0111000	117	X0001011
28	X1100100	73	X0110111	118	X0001010
29	X1100011	74	X0110110	119	X0001001
30	X1100010	75	X0110101	120	X0001000
31	X1100001	76	X0110100	121	X0000111
32	X1100000	77	X0110011	122	X0000110
33	X1011111	78	X0110010	123	X0000101
34	X1011110	79	X0110001	124	X0000100
35	X1011101	80	X0110000	125	X0000011
36	X1011100	81	X0101111	126	X0000010
37	X1011011	82	X0101110	127	X0000001
38	X1011010	83	X0101101	128	X0000000
39	X1011001	84	X0101100		
40	X1011000	85	X0101011		
41	X1010111	86	X0101010		
42	X1010110	87	X0101001		
43	X1010101	88	X0101000		
44	X1010100	89	X0100111		
45	X1010011	90	X0100110		

