

Introduction

The T800-35 is a DFSK Modulator for T800 transmitters, suitable for POCSAG or similar paging data formats. Analogue transmissions (e.g. tone or speech) are still possible by disabling the data path with control line S6. 512 or 1200 baud data rates are link selectable and the T800-35 is adapted for use with an external reference oscillator for simulcast transmission. External frequency standards of 100kHz multiples up to 12.7MHz are link programmable and reference frequency stability is determined by the external standard. The T800-35 PCB is not designed for use with 66 to 88MHz equipment.

Parts Required

The T800-35 kit should contain the following items:

1 x T800-35 DFSK modulator board	1 x terminated coaxial cable
1 x assembled D-range plug with terminated coaxial lead	1 x 11-way D-range socket less coaxial insert
1 x coaxial insert socket	4 x M3 x 8 Taptite screws
1 x 47 ohm resistor	4 x cable ties
	2 x locating pins, nuts and washers

Installation

⚠ Caution: The radio must be powered off for this modification. After modification, do not remove the coaxial lead from the socket unless the radio is powered off.

1. Unplug the EPROM PCB from the T800 transmitter and desolder and remove the TCXO module from the synthesiser compartment.

Fit the miniature coaxial socket and 47 ohm resistor to the PCB pads provided beneath the TCXO as shown in Figure 1.

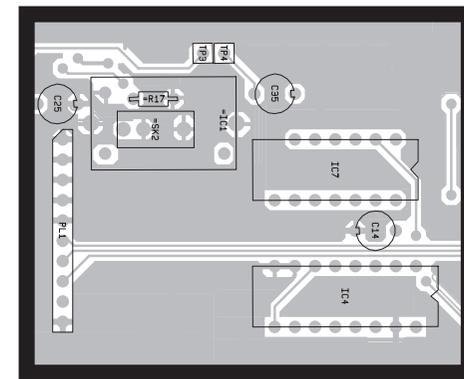


Figure 1 Location of Socket and SMD Resistor

Early model T800 transmitters do not have provision for the socket and resistor. In this case, fit the components as in Figure 2.

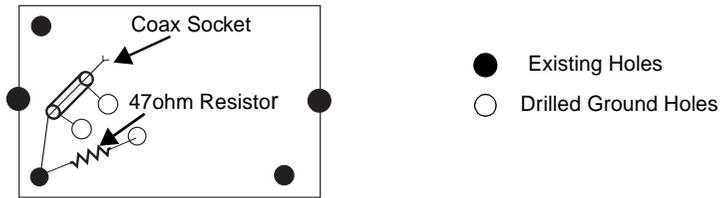


Figure 2 Location of Socket and SMD Resistor in Early T800 Transmitters

Figure 3 shows this section of the circuit after modification.

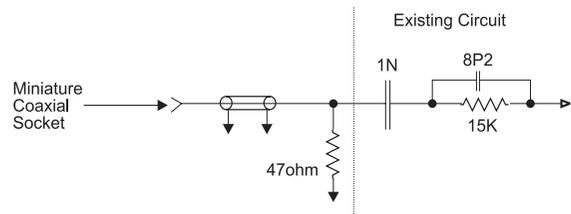


Figure 3 Circuit After Modification

- Remove C154 and RV105 from the audio processor (shown in Figure 4), and clear the holes of solder.

Clear the holes marked 'PAD1' and 'PAD4' of solder.

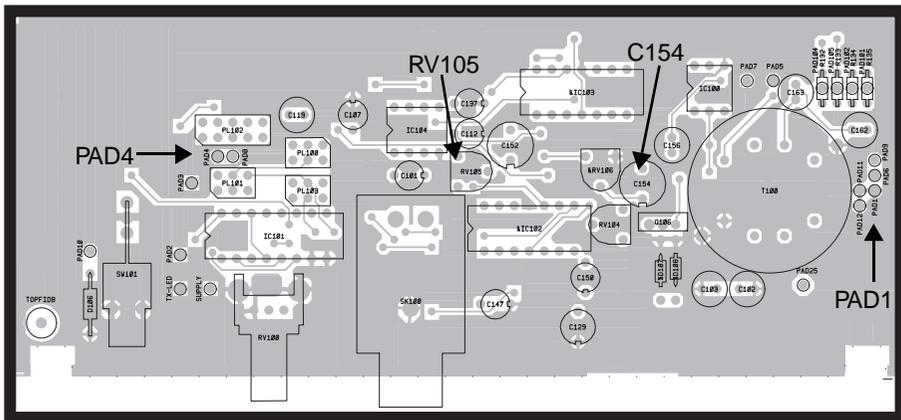


Figure 4 T800 Transmitter Audio Processor - Top Side

- Remove the two screws and cover plate from the second D-range mounting hole at the rear of the T800 chassis.

the deviations achieved at the two input frequencies are within 0.2dB of each other.

You will need to do this at least four times.

Data Modulation Adjustment

- Inject a 100Hz 1:1 square wave into S4 of the T800-35 PCB (D-range 2, pin 13) of at least 5Vp-p, to simulate a data input.
- Monitor the carrier FM with a modulation meter via a suitable attenuator (if necessary), and observe the modulation level.
- Monitor the control line of the VCO (pin 1 on the VCO PCB) with an AC coupled oscilloscope set to a sensitivity of at least 10mV/div.
- Adjust both RV1 (VCO modulation) and RV2 (reference modulation) on the T800-35 PCB to achieve a flat topped square wave on the oscilloscope, corresponding to $\pm 4.5\text{kHz}$ peak on the modulation meter.

Figure 8 shows a typical 100Hz VCO control line waveform with correctly set RV1 and RV2.

You may need to repeat this procedure several times.

Note: Be aware that 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 $10\mu\text{F}$ capacitor in series with the scope probe (observing the correct polarity) to directly monitor the VCO control line. Note that the trace settling time will be approximately one minute.

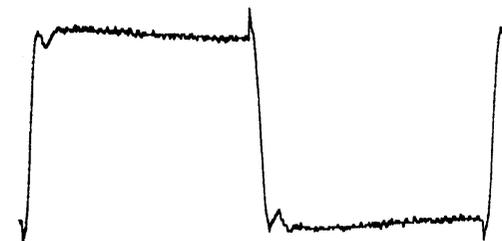


Figure 8 100Hz VCO Control Line Waveform

DATA/SPEECH Input (S6)

With S6 low, data mode is enabled. If no data is present, the DFSK modulator defaults to speech mode. However if S6 is high, only speech mode is enabled, regardless of the presence of data.

Servicing

Refer to TI-373A.

- Fit the D-range socket to the extra hole provided on the T800 rack frame float plate, orientated in such a way that it will fit onto the second D-range plug added to the T800 transmitter.

Adjustment

It is preferable to set up the T800-35 with an applied external standard, otherwise the slave VTCXO on the T800-35 will not be locked. However, the adjustment procedure for setting the modulator levels will still be valid.

External Standard Lock Confirmation

- Check that the T800-35 PCB links 6 to 12 are set to equal the external frequency standard.
- Apply an external frequency standard at an output level of about 1Vp-p (+48dBm, 50 ohm). Levels from 0 to +10dBm are acceptable.
- Confirm that phase lock has been achieved by checking with an oscilloscope that the 'LOCK DETECT' line on pin 3 of the second D-range plug switches to below 0.2V.

Modulator Adjustment

The following instructions for modulator adjustment with a T800-35 DFSK modulator PCB should be carried out instead of Section 4.9.2 in the T836, T856 or T881 Service Manual, or Section 4.7.2 in the T837 or T857 Service Manual.

During adjustment do not provide an input on the DATA/SPEECH terminal (S6).

Audio test frequencies used are as follows:

Transmitter	Frequency 1	Frequency 2
T836/7	120Hz	600Hz
T856/7	100Hz	250Hz
T881	100Hz	250Hz

Note: Deviation settings are given first for wide band radios, followed by settings for narrow band radios in brackets [].

Speech Modulator Adjustment

- Inject an audio signal of frequency 2 at approximately +5dBm (1.4Vrms) into the CTCSS input (D-range1, pin 8) and earth the key line.
- Adjust the audio generator output to obtain $\pm 3\text{kHz}$ [$\pm 1.5\text{kHz}$] peak deviation at frequency 2.
- Change the audio generator frequency to frequency 1 and adjust RV3 (reference deviation speech) on the T800-35 PCB to obtain $\pm 3\text{kHz}$ [$\pm 1.5\text{kHz}$] peak deviation.
- Change the audio generator input frequency back to frequency 2 and repeat steps 2 and 3 until

If no access slot is provided in the chassis from the D-range compartment to the synthesiser, drill a 7.5mm hole through the end wall of the synthesiser compartment. This wall can be reached by passing the drill through the uncovered D-range hole.

Clean all swarf from the edges of the hole and remove any filings which may have fallen into the radio.

- Lay the T800-35 PCB above the exciter compartment with the component side up and positioned so that the wires are facing the front panel of the radio.

Twist the orange, yellow, green and blue wires together and secure with the cable ties provided.

Route the wires via the loom channel cast into the chassis to the synthesiser compartment and through the hole to the D-range compartment.

Pass the wires through the D-range hole and connect to the new D-range plug as follows:

Wire	Length (mm)	Connection	Signal
orange	370	S10 pin 3	LOCK DETECT
yellow	370	S4 pin 4	DATA
green	370	S5 pin 5	GROUND
blue	370	S6 pin 6	DATA/SPEECH

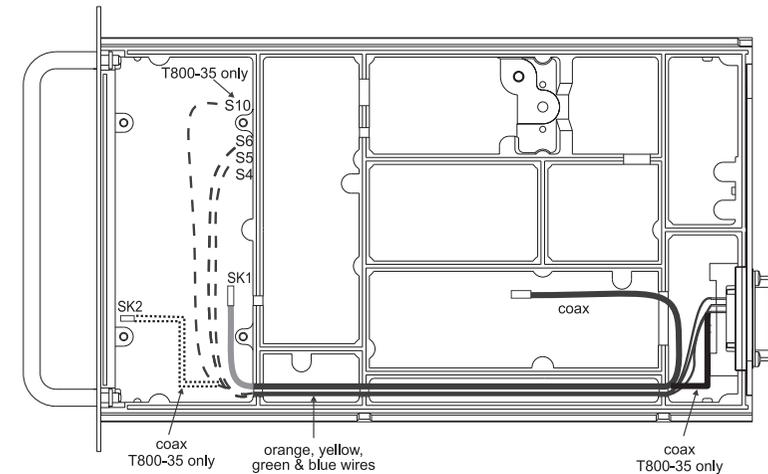


Figure 5 Cable Routing

- Screw the second D-range plug with the coaxial lead in place, using the two locating pins, washers and nuts supplied.
- Connect the wires from the T800-35 PCB to the audio processor as follows :

Wire	Length (mm)	Connection
brown	150	S1 wiper of RV105
red	140	S2 positive side of C154
orange	190	S3 negative side of C154
purple	100	S7 Pad4 (+9V)
grey	150	S8 top hole of RV105
white	205	S9 Pad1 (Ground)

- The T800-35 PCB links are set for UHF operation and 512 baud data rate. For the location of the PCB links refer to Figure 6.

For 1200 baud rate, solder short LINK2.

For VHF operation, solder short LINK3, LINK4 and LINK5

To set the links for the external oscillator frequency, solder short the links as follows:

- 1MHz reference LINK10, LINK11, LINK12, LINK7, LINK9
- 5MHz reference LINK10, LINK6, LINK7, LINK9
- 10MHz reference LINK12, LINK6, LINK8, LINK9.

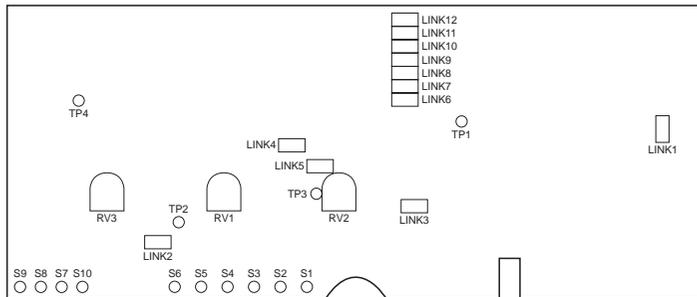


Figure 6 T800-35 Link Location - Top Side

To set the links for 12.8MHz reference, use the following method:

- Cut pin 18 (shown in Figure 7) approximately half way down the pin and bend it away so that its logic level floats high.

Caution: Do not cut the pin too close to IC15 if you are likely to reverse the procedure in the future to enable different reference frequencies to be applied.

- Solder short the links as follows: LINK6, LINK7, LINK8, LINK9, LINK10, LINK11, LINK12.

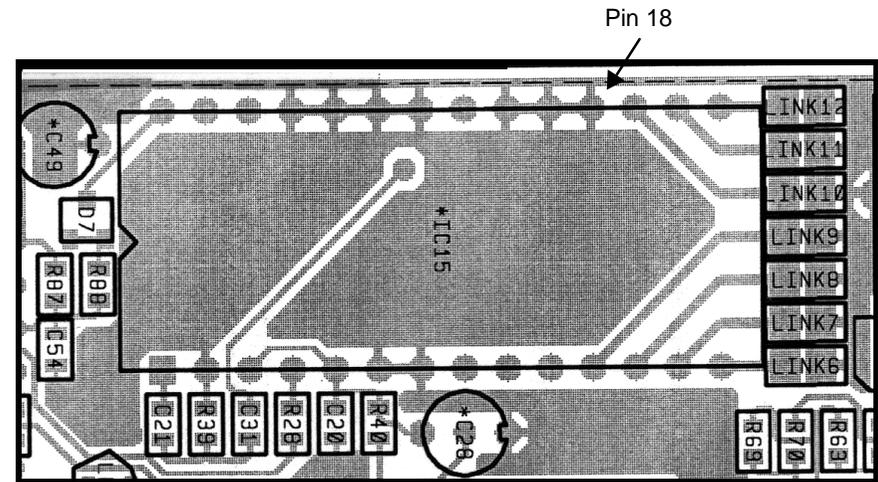


Figure 7 T800-35 Location of Pin 18 - Top Side

If other external oscillator frequencies are required, the link code can be calculated using the following method:

- Divide the external oscillator frequency by 100kHz.
- Convert the result into binary.
- Program the T800-35 PCB links 6 to 12 as shown, using the calculated binary number.

MSB						LSB
N6	N5	N4	N3	N2	N1	N0
LINK10	LINK11	LINK12	LINK6	LINK7	LINK8	LINK9

Note: A shorted link represents 'logic 0' and an open link represents 'logic 1'.

- Connect the coaxial cable provided between SK1 on the T800-35 PCB and the socket fitted in place of the TCXO on the T800 transmitter as shown in Figure 5.
- Position the T800-35 PCB above the audio processor compartment, with the wires and components facing down.

Screw in place using the 4 M3 x 8 screws provided.

Rack Frame Modifications

- Assemble the coaxial insert as required and fit to the 11-way D-range socket.

Note: Once the coaxial insert socket has been fitted to the D-range, it cannot be easily removed.

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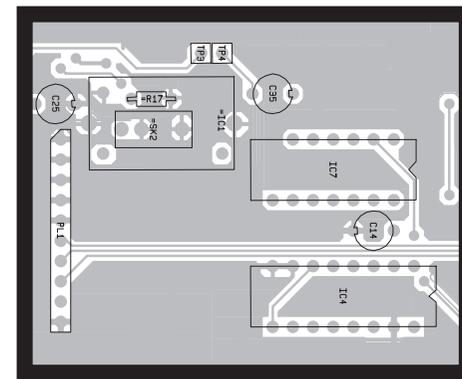


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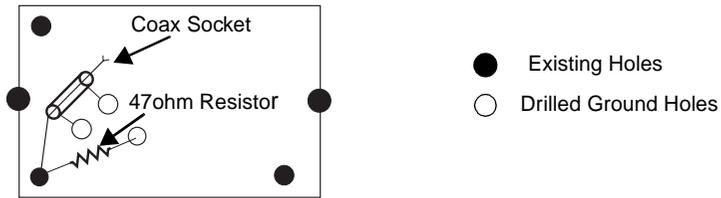


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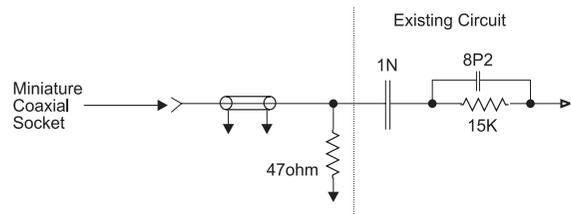


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Clear the holes marked 'PAD1' and 'PAD4' of solder.

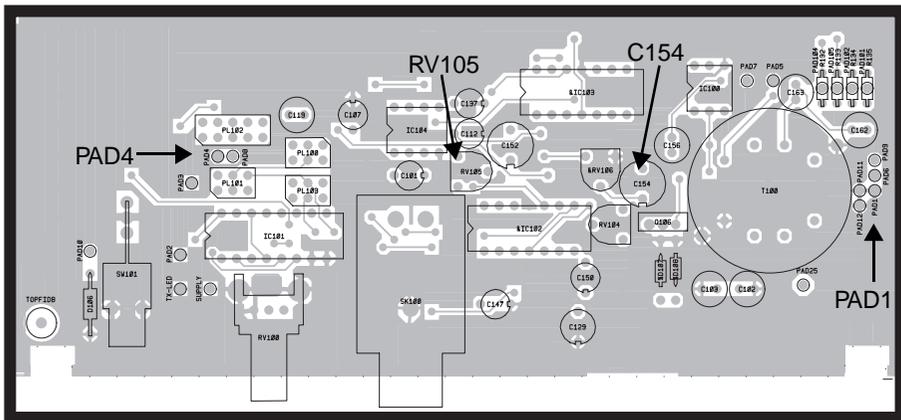


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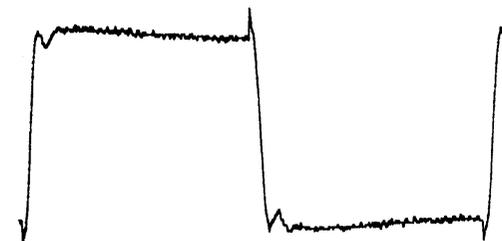


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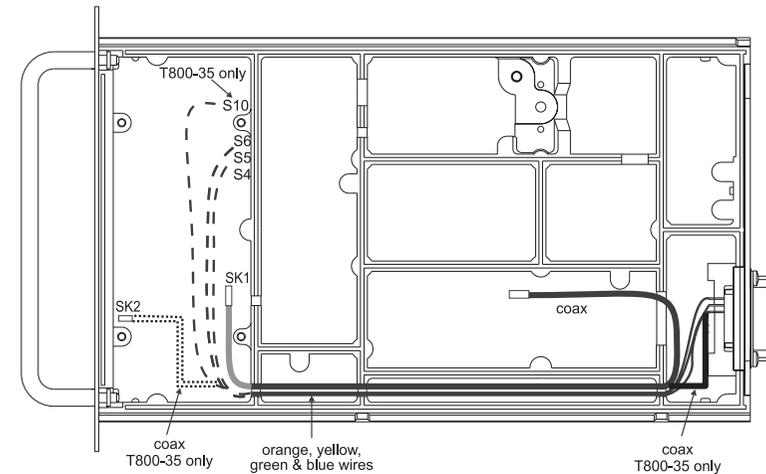


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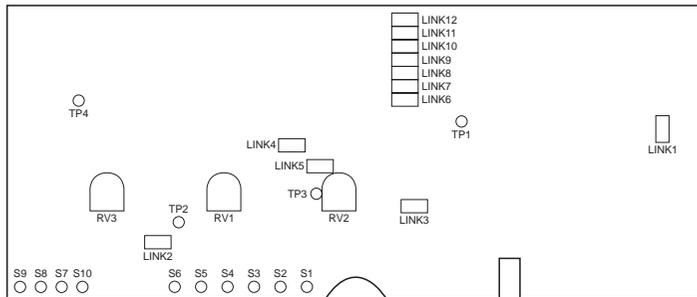


Figure 6 T800-35 Link Location - Top Side

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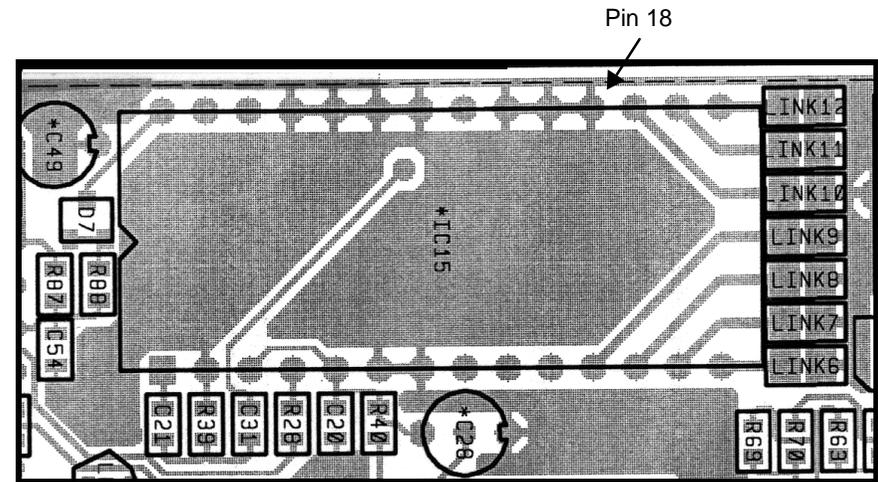


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Rack Frame Modifications

- Assemble the coaxial insert as required and fit to the 11-way D-range socket.

Note: Once the coaxial insert socket has been fitted to the D-range, it cannot be easily removed.