TECHNICAL MANUAL
POCSAG INTERFACE
FOR T2010

JOB NUMBER AE185

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TA185-01 TECHNICAL MANUAL

<u>SECTION 1 : INTRODUCTION</u>

To allow POCSAG DATA to be transmitted over T2000 radio's a POCSAG Interface Board has been developed to modify the radio performance so as to accommodate the requirement for DC modulation of the synthesiser, when in POCSAG mode.

The T2000 Synthesiser in its standard format has a modulation cut off frequency of 16Hz. Modifications to the circuitry have increased the modulation bandwidth down to DC.

Data shaping to the correct levels of modulation takes place on the Interface board mounted in the standard option board place internal to the T2000.

IMPORTANT: This version of the POCSAG Interface board (227-18501-00 A and higher) is designed to work with TCXO Board: 220-01201-17 and higher.

The old version of the POCSAG Interface Board (227-18501-00 P2) is designed to work with the earlier version of the TCXO board of the T2000. IPN:220-01201-16. The difference between the two TCXO boards is that the Xtal modulation has been moved to the opposite side of the Xtal, requiring an additional inversion on the POCSAG interface board.

All radios with POCSAG boards delivered after 1 Sept. 1994 are of the new version and in line with the documentation supplied in this manual (issue1.5)

SECTION 2 : CIRCUIT DESCRIPTION

Refer to CCT diagram 227-181501-03

Part 1: Interface board

The radio is able to operate in speech mode and in data mode. Selection is possible via pin 1 of S21 (D-range at the back of the radio). The Pocsag Interface is set up for speech with Link-1 shorted 1-2 and Link 2 shorted. If pin 1 of S21 is pulled to GND the mode of operation changes to Data.

In the speech mode Audio-out, which is transmit audio from the radio, is connected through via analogue switch IC3 3-4 to TX-AF to the VCO. The original Xtal trimmer (RV927) on the TCXO board of the radio has been disconnected and the frequency tuning is now done by RV4 on the POCSAG board. In speech mode IC3 8-9connects RV4 to the Xtal on the TCXO board.

In the DATA mode both the audio path and the X-tal tuning are changed. Speech is disconnected and the DC tuning voltage is replaced by two levels connected to the X-tal via IC2 1-2 and 8-9. The data stream arriving at pin of S21 shaped by Q2 and the following inverter. When a 0 is passed the X-tal will see the DC level from RV1 and with a 1 the Xtal is connected to RV2. The data pattern will be reproduced with controllable high and low levels at the output of IC2 pin 2 and 9. This signal is firstly via a unity gain buffer connected to a non inverting amplifier to provide modulation to the VCO and secondly directly to the TCXO tune input. This second connection provides the low frequency modulation down to DC.

The DC levels at RV1 and RV2 define the positive and negative deviation of the transmitter.
RV3 defines the deviation relative to the TCXO modulation

SECTION 3 : INSTALLATION AND RUN-UP PROCEDURE

3.1 RADIO MODIFICATIONS TCXO PCB: the old one

Modifications to Radio take place on TCXO board only

1.1 Remove C916 and C917 from TCXO PCB to remove dual point modulation.
1.2 cut track between pin7 IC901 and pin 8 of S6 on bottom side of TCXO PCB.
1.3 Remove R926 on topside of TCXO PCB.

1.4 Connect the flat cable from the POCSAG board as follows:
      SK1-1 to IC901 pin7 on TCXO board
      SK1-2 to S6-8 of TCXO board
      SK1-3 to junction of C916/C917 (R926 end)on TCXO board
      SK1-4 to GND on TCXO board

3.2 **RADIO MODIFICATIONS TCXO PCB: 220-01389-02**

Modifications to Radio take place on TCXO board only

1.1 Remove C916 and C917 from TCXO PCB to remove dual point modulation.
1.2 Cut track between C904 and pin 8 of S6 on component side of TCXO PCB.
1.3 Remove R926 on topside of TCXO PCB.

1.4 Connect the flat cable from the POCSAG board as follows:
      SK1-1 to IC901 pin7 on TCXO board
      SK1-2 to S6-8 of TCXO board
      SK1-3 to junction of C916/C917 (R926 end)on TCXO board
      SK1-4 to GND on TCXO board

3.3 SET UP PROCEDURE

1. Connect the antenna output of the radio to a frequency counter via 30dB pad.

2. Set link1 1-2, set link2 1-2. The radio is now forced into SPEECH mode

3. Short pin3 of D-range to GND to make the radio transmit and tune RV4 on Pocsag PCB to frequency

4. Change link 2 to 2-3 and tune RV1 to give a frequency offset of
+2.3kHz.

5. Connect pin2 of D-range to +13.8V and tune RV2 to give a frequency offset of -2.3kHz.

6. Connect pin2 of D-range to a function generator and apply a square wave signal of 10Hz 5Vpp.

7. Connect the Transmit output of the T2010 via an appropriate attenuator to a test receiver input. The test receiver must have a DC connection to its detector output. A standard modulation analyser like a Sayrosa or a HP8901 does not provide the DC coupling required and cannot be used.
A T2010 receiver is the ideal instrument to tune the POCSAG modulation correctly. Program the receiver of this radio to the transmit frequency of the POCSAG transmitter.

8. Connect a DC Oscilloscope to the detector output of the test receiver. If a T2010 is used: pin 9 of IC101. To suppress 455kHz use a RC filter like 27K/1nF.

9. Activate the transmitter by shorting pin3 on the D-range to GND.
Tune RV3 to read a perfect square wave on the oscilloscope