6. SIMPLE SERVICE

6.1. Incorrect Operation

If the equipment is not functioning correctly, a check should be made that it is being operated properly. Go through adjustment procedures 2.2 to 2.4 if necessary.

6.2. Battery

The condition of the battery should be checked at frequent intervals. The battery must always be fully charged and should be topped up frequently with distilled water (liquid should rise 5 to 10 mm above the plates).

6.3. Replacement of Fuses

All fuses are located on top of the power pack which is mounted on the back of the receiver.

7. REPAIR AND ALIGNMENT

7.1. Introduction

Repairs and adjustments on the equipment should be performed only by qualified technicians, to whom this chapter is addressed. Before attempting any repairs or adjustments, a study of Chapter 5, Technical Description, is recommended.

7.2. Cross-Slot Screws

The cross-slot screws used to secure the printed circuit boards are Pozidriv screws. A Pozidriv screwdriver No. 1 should be used in order to avoid damaging such screws.

7.3. Locating Subunits and Components

Locations of circuit boards in the equipment appear from the photographs on page 8-45. Locations of components on each circuit board appear on the component location drawings against the respective circuit diagrams.

7.4. Locating Faults

Fault finding, as described in section 7.5. below, is aided by test points provided for the purpose of permitting rapid localization of faulty circuit boards on the basis of DC measurements. Since not all types of faults can be traced by means of DC measurements, supplementary AC measurements with an oscilloscope may be required; see section 7.6. To facilitate fault finding on each individual circuit board, typical voltages are listed on the circuit diagrams.

7.5. Test Points

Several circuit boards contain one or more test points. They are small pin-type terminals, colour coded following the standard colour code in addition to being numbered. In the circuit diagrams, test points are marked TP 1, TP 2 etc., and typical voltages at the test points are listed there.

The terminals of the circuit boards may to a great extent also be regarded as test points. Typical voltages are therefore also listed against relevant terminals on the circuit diagrams.

If a voltage measured at a test point differs markedly from the listed value it is a fairly certain indication that the circuit board in question is faulty, assuming that the voltages applied to the circuit board are the correct ones. This should likewise be checked.

7.6. AC Voltages

AC voltages listed on the circuit diagrams are typical voltages. Voltages specified are based on measurement with an oscilloscope having an input impedance of 10 Mohms in parallel with 7 pF, a sensitivity of the order of 50mV/div. and a frequency range of not less than DC-50 MHz.

7.7. DC Voltages

DC voltages listed on the circuit diagrams are based on measurement with a 25 kohm/volt multimeter. If a stated voltage is dependent on the setting of a control, this is also stated on the circuit diagrams.
Typical logic levels (LOW/HIGH) are indicated in brackets.

7.8. Typical Sensitivity Levels

Input voltages to be applied at the input to S 203 2nd mixer and the input to 205 IF amplifier, detector and AGC to obtain an AGC voltage of 2.3 V DC measured at terminal 205-17:

Receiver control settings:

MODE switch on A3J. A3A-AGC ON
SENSITIVITY turned fully clockwise
Frequency higher than 10 KHZ

Input to	Generator output impedance	Generator Frequency	Generator Modulation	Typical input level
203-8	50 ohm	37999 kHz	0	10 dB/1uV
205-5	1 k ohm	1.399 kHz or 1.401 kHz	0	30 dB/1uV

7.9. Adjustments

The following sections describe alignment procedures for printed circuit boards that contain adjustable components. Bear in mind that no adjustment should be carried out unless there is a clear indication that it is really necessary. Moreover, adjustments should be carried out only by a qualified technician with the necessary equipment at his disposal.

When a unit or printed circuit board is replaced, adjustments are in some cases necessary. These cases are listed in the table below:

Replacement of unit board:	Adjustment required of:	Procedure given in section:
209	209-R13 209-R14	7.15.3. 7.15.4.
210	210-R5	7.17.2.

7.10. Realignment of Input Filters (216)

Measuring Equipment:

Standard signal generator covering the range 0.1-30 MHz and having an output impedance of 50 ohm. Accuracy better than 10 kHz. RF millivoltmeter having a sensitivity of 10 mV f.s.d. Input impedance better than 10 K ohm in parallel with 6 pF.

Connect signal generator to antenna input socket and set it to alignment frequency indicated in table below. Output voltage 100 mV.

7.10.1. Duplex Band

Receiver settings:

Band switch to the desired band.

1) Connect RF millivoltmeter probe to the input terminals 216-3 and 216-4.

2) Detune second and third tuned circuits of filter to be aligned by turning core anti-clockwise.

3) Adjust first tuned circuit for maximum voltage as indicated by RF millivoltmeter. Adjust second circuit for minimum reading and third tuned circuit for maximum.

7.10.2. Preselector Bands. MF

Bandswitch to the desired band:
0.060-0.180. 0.180-0.530. 0.530-1,6 MHz.

1) Connect RF millivoltmeter probe to test point 1.

2) Turn the preselector fully clockwise.

3) Adjust the signal generator.

4) Tune the coil to maximum.

7.10.3. Fixed Tuned Bands

Bandswitch to 500 KHz.

1) Connect RF millivoltmeter probe to test point 1.

2) Adjust the signal generator.

3) Adjust C3 to maximum.

7.10.4. Realignment of the Bands 1.6-4 MHz and 2182 KHz

Bandswitch to 2182 kHz

1) Adjust signal generator

2) Connect RF millivoltmeter probe to the input terminals 216-3 and 216-4.

3) Detune the second tuned circuit in the band 1.6-4 MHz by turning core anti-clockwise (T14).

4) Adjust first tuned circuit (T8) for maximum.

5) Adjust second circuit for minimum.

6) Bandswitch to 1.6-4 MHz.

7) Turn preselector fully clockwise.

8) Adjust signal generator (5000 kHz).

9) Adjust C 49 for maximum.

10) Adjust C 76 for minimum.

11) Bandswitch on 2182 kHz.

12) Adjust signal generator (2182 kHz).

13) Adjust C2 for maximum.

14) Adjust C1 for minimum.

7.10.5. Preselector Bands HF

Bandswitch to the desired band

4-12. 12-30 MHz.

1) Turn preselector fully anti-clockwise.

2) Connect RF millivoltmeter probe to the input terminals 216-3 and 216-4.

3) Detune second turned circuit of filter to be aligned by turning core anticlockwise.

4) Adjust signal generator.

5) Adjust first tuned circuit for maximum (T9 or T10).

6) Adjust second tuned circuit for minimum (T15 or T16).

7) Turn preselector fully clockwise.

8) Adjust signal generator.

9) Adjust C50 or C51 for max.

10) Adjust C 77 or C 78 for min.

7.10.6. Realignment of 1st mixer on circuit board (216)

1) Connect signal generator to antenna input socket and adjust it to the frequency 37.999 kHz. Output voltage 10 mV.

2) Set bandswitch to the band 12-30 MHz.

3) Select the mode A3J. A3A.

4) Switch off the AGC.

5) Key-in the frequency 28.000.0 kHz.

6) Adjust 216-R25 for minimum whistling in the LF output.

7) Adjust the signal generator to 28.001.0 kHz. Output voltage 1 mV.

8) Adjust 216-T25 for maximum LF output.

Band	Alignment Frequencies	
4	4400 kHz	
6	6550 kHz	
8	8778 kHz	
12	13226 kHz	
16	17533 kHz	
22	23000 kHz	
25	26000 kHz	
0.06-0.18	175 kHz	
0.18-0.53	530 kHz	
0.53-1.6	1750 kHz	
500	500 kHz	
2182	2182 kHz	
	(Capacity)	(coil)
4-12	11.9 MHz	4 MHz
12-30	29	12 MHz

7.11 S 203 Realignment of 2nd Mixer and Clarifier Oscillator

Measuring equipment:

Standard signal generator covering 1400 kHz. Output impedance 50 ohm.
Frequency counter having an accuracy better than 10^{-6}.
AF output meter.

1) Connect signal generator to antenna input and tune it to the frequency for which the receiver is set. Output level approx. 0.1 mV.

2) Switch AGC off and adjust SENSITIVITY to a convenient output level.

7.11.1. Realignment of 1.4 MHz Mixer, 38 MHz Filter and 36.6 MHz Filter.

1) Adjust 203-T5, T3, T1 and T2 one by one for maximum AF output.

7.11.2. Realignment of the Clarifier Oscillator

1) Disconnect the wire to terminal 203-3.

2) Connect the counter to the test point TP 2.

3) Adjust the potentiometer R8 to the frequency 3000.000 Hz.

4) Replace the wire to terminal 203-3.

7.11.3. Realignment of Balancing Potentiometer R 36

1) Disconnect the coaxial cable to the terminal 203-8.

2) Connect the signal generator to the terminal 203-8.

3) Adjust the signal generator to the frequency 1399 kHz. Output level approx. 1 mV.

4) Select the mode A3J.A3A - AGC-OFF on the receiver.

5) Adjust the potentiometer R 36 for min. AF output.

7.12. 205 Realignment of IF amplifier Detector and AGC

Measuring equipment:

Standard Signal generator covering 2182 kHz.

7.12.1. Realignment of 1.4 MHz IF Filter and 2.8 MHz AGC Filter

1) Connect signal generator to antenna input and tune it to 2182 kHz. Signal level approx. 20 dB/1uV.

2) Set the BANDSWITCH to 2182.

3) Adjust cores in 205L1 and 205T1 for maximum AF output.

4) Increase signal generator level to approx. 40 dB/1uV and adjust 205 L2 for minimum AF output.

7.13. M 220 , S 220 Realignment of AF Amplifier.

Measuring Equipment:

Frequency counter, accuracy better than 10^{-7}.
RF millivoltmeter having a sensitivity of 10 mV f.s.d.
Input impedance better than 10 k ohm in parallel with 6 pF.
Extension board 259 .

7.13.1. Realignment of 1.4 MHz Coils

1) Connect the RF voltmeter between 220-10a and common.

2) Adjust the coil 220 T2 for maximum output (typically 90 mV).

3) Connect the RF voltmeter between 220-12C and 220-12a.

4) Adjust the coil 220T5 for maximum output (typically 350 mV unloaded).

7.13.2. Realignment of 33.6 MHz Filter

1) Connect the RF-voltmeter between 220-28c and 220-30c.

2) Adjust the coils 220 T3 and 220 T4 for maximum output (typically 53 MV).

7.14. M 220 , S 220 Frequency Adjustment of the TCXO

1) Connect the counter between 220-28c and 220-30c (11.2 MHz multiplied by 3).

2) At approx. 25°C the frequency must be within ± 2 Hz of the nominal frequency 11,2 MHz.

If the frequency is not whithin these limits, the value of the resistor R2 must be changed, generally with a lower value. A resistor can therefore be placed in parallel with R2.

7.15 209 Realignment of VCO_1 and VCO_2

Measuring equipment:

Frequency Counter having an accuracy better than 10^{-3} and a sensitivity of at least 0.5 V.

Extension Board 259

7.15.1. Realignment of VCO1

1) Connect a shorting lead between terminal 209-32c and common.

2) Connect the frequency counter between 209-22c and common.

3) Adjust transformer 209T1 until the counter reads 23.0 MHz.

4) Remove the shorting lead referred to in (1).

7.15.2. Realignment of VCO_2

1) Connect shorting lead between terminal 209-2c and common.

2) Connect the frequency counter between 209-16c and common.

3) Select the (3.7-4.69) MHz VCO_2-band.

4) Adjust transformer 209T2 until the counter reads 5.0 MHz.

5) Select the (4.70-5.69) MHz VCO_2-band.

6) Adjust coil 209 L6 until the counter reads 6.1 MHz.

7) Select the (5.70-6.69) MHz VCO_2 band.

8) Adjust coil 209 L5 until the counter reads 7.1 MHz.

9) Remove the short circuit referred to in (1).

7.15.3. Realignment of Phase/Frequency Detector 1 error signal

1) Unsolder the yellow lead from terminal 205-1.

2) Select by means of the keyboard 1.0 kHz as the receiving frequency.

3) Select the SSB-mode.

4) Set the clarifier to "0".

5) Adjust 209 R13 for minimum tone level from the loudspeaker.

6) Re-solder the yellow lead to terminal 205-1.

7.15.4. Realignment of Phase/Frequency Detector 2 error signal

1) Unsolder the yellow lead from terminal 205-1.

2) Select by means of the keyboard 9.0 kHz as the receiving frequency.

3) Select the SSB-mode.

4) Set the CLARIFIER to "0".

5) Adjust 209R14 for minimum tone level from the loudspeaker.

6) Resolder the yellow lead to terminal 205-1.

7.16.  Realignment of LOOP TRANSLATOR

Measuring Equipment:

Signal Generator covering the range 100 kHz to 10 MHz.

Oscilloscope or RF Voltmeter having an input impedance greater than 10 kohm and a sensitivity of at least 10 mV/Div.

Extension board  .

7.16.1. Realignment of 1.5 MHz LP-Filter

1) Remove p.c.b. 209 and 210 from their sockets.

2) Connect the signal generator to pin 12 of 2081C4 through a 0.1 pF capacitor and common.

3) Connect the oscilloscope probe tip to the collector of 208 TR5 and the oscilloscope ground clip to common.

4) Adjust the signal generator to 20mV rms.

5) Sweep the signal generator from 60 kHz to 1.45 MHz; the voltage reading level on the oscilloscope must not change more than 1 dB. (Take care that the output level of the signal generator does not change during the sweep).

6) Readjust the signal generator until the signal level measured is decreased by 3 dB related to the maximum signal level found under 5). The frequency should then be between 1.5 MHz and 1.9 MHz.

7) Readjust the signal generator until the signal level measured is decreased by 20 dB related to the maximum signal found under 5). The frequency should then be between 1.8 MHz and 1.9 MHz.

7.16.2. Realignment of Transformer △208 T1

1) Insert the p.c.b. △207 into its socket.

2) Select by means of the Keyboard 29.900.0 MHz as the receiving frequency.

3) Connect the oscilloscope probe tip to pin 1 of 2081C4.

4) Adjust the transformer △208 T1 until the signal measured is approximately 2Vpp.

7.17. △210 Realignment of VCO_3

Measuring equipment:

Frequency Counter having an accuracy better than 10^{-3}, a sensitivity of at least 1 V and an upper frequency limit of at least 75 MHz.

Extension Board △259 -

7.17.1. Realignment of VCO_3

1) Connect a shorting lead between terminal 210-6c and common.

2) Connect the frequency counter between 210-16c and common.

3) Select VCO_{3z}

4) Adjust 210C24 until the counter reads 51.0 MHz.

5) Select VCO_{3y}

6) Adjust 210C26 until the counter reads 61.3 MHz.

7) Select VCO_{3x}

8) Adjust 210C28 until the counter reads 71.3 MHz.

9) Remove the shorting lead referred to in (1).

7.17.2. Realignment of Phase/Frequency Detector 3 Error Signal

1) Select by means of the Keyboard 100.0 kHz as the receiving frequency.

2) Select the SSB-mode.

3) Adjust the CLARIFIER until an audible tone is heard from the loudspeaker. Adjust 210 R5 for minimum tone level from the loudspeaker.