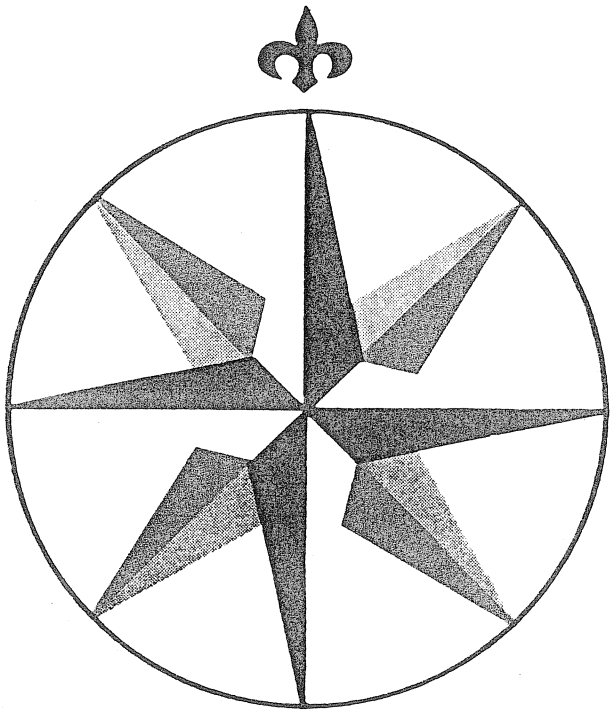
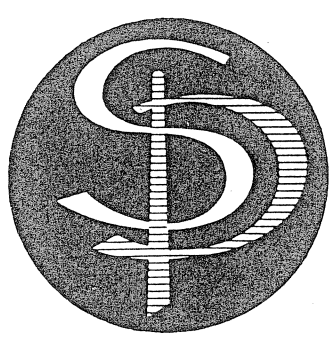


Sailor

Sailor

SERVICE INFORMATION

SAILOR SSB-EQUIPMENT



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SAILOR SSB TRANSMITTER AND RECEIVER SERVICE INSTRUCTIONS.

Introduction.

These instructions contain information enabling the service technician to perform 100% service on Sailor SSB transmitters and receivers. The material is a supplement to the instruction manual provided for each individual product.

Fault-finding.

Faults are quickly and easily located by means of the information provided on those pages of the instruction manual which cover the individual modules, on which pages typical DC voltages are listed. The instruction diagrams comprise test points, indicated by numbers in circles. These points refer to typical AC voltages, and these are listed on the page called "Typical AC Voltages".

DUMMY AERIALS.

1. Receiver.

All receiver adjustments should be performed with 50-ohm source impedance (signal-generator impedance).

2. Transmitter.

Dummy aerials consisting of 10 ohms in series with 250pF will provide a typical load.

Special Requirements.

1. Transmitter.

The microphone capsule must be removed before making any adjustment.

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INSTRUMENTS FOR SERVICING SAILOR SSB TRANSMITTERS AND RECEIVERS.

TONE GENERATOR:

1. Frequency range: 50 Hz - 10 KHz.
2. Output: 1 V RMS in 50 ohms.
3. Distortion: ≤ 1%.

OSCILLOSCOPE:

1. Bandwidth: 5 MHz.
2. Sensitivity: 10 mV/div.
3. Probes: One 10:1 10 Mohms/10 pF.
   One 1:1

FREQUENCY COUNTER:

1. Sensitivity: Better than 1 V pp.
2. Frequency range: 5 MHz.
3. Accuracy: 1 p.p.m. from 0°C to 50°C.

SIGNAL GENERATOR:

1. Frequency range: 150 KHz to 5 MHz.
2. Output: 100 mV RMS: 50 ohms.
   (preferably 1 V RMS in 50 ohms).
3. Modulation: AM 30% 400 Hz or 1000 Hz.

MULTIMETER:

1. DC: 1 V to 500 V full scale.
2. AC: 1 V to 500 V full scale.
3. OHMS: x10 x1K x10K.
4. Sensitivity: 20 Kohms/V DC.

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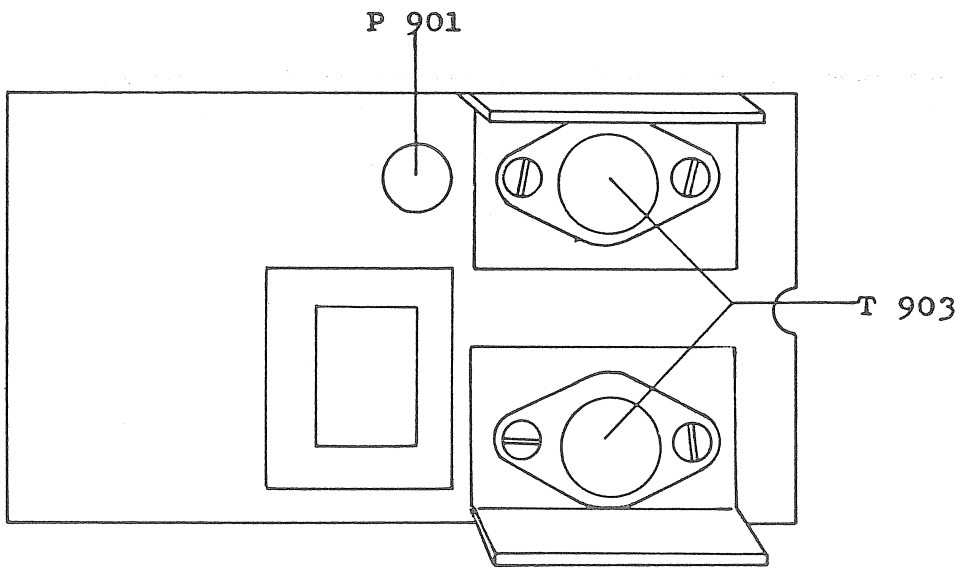
Index of Service Instructions for Sailor SSB Receivers:

Index of Service Instructions for Sailor SSB Transmitters.

AF AMPLIFIER.

Instruments Required:

Multimeter.



1. Adjustment of No-signal Current.

   Function settings:
   RF GAIN: Min.
   AF GAIN: Min.

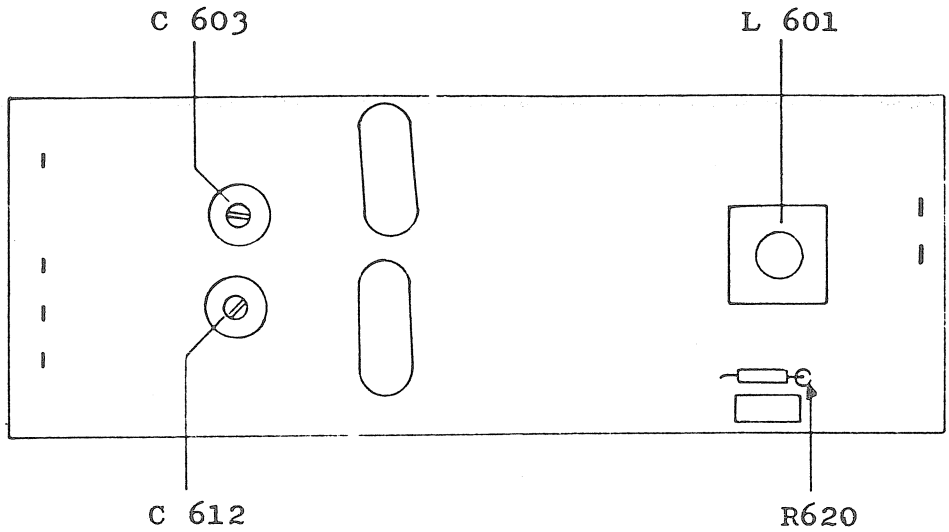
(a) Unsolder both leads from centre tap of AF transformer and insert multimeter (set to 50 or 100 mA range) in series with the leads and transformer.

(b) Adjust P901 so that current is 30 mA.

CLARIFIER.

Instruments Required:

Counter - 10:1 Probe - Oscilloscope.



1. Adjustment of Clarifier Centre Frequency and Control Range:

   Function settings:
   CLARIFIER: mid-position.
   MODE: SSB AGC OFF/AGC ON.
   RF GAIN: Min.

(a) Adjust CLARIFIER for symmetrical control range around dot on front panel and set CLARIFIER to mid-position.

(b) Connect counter to R620.

(c) Turn C612 to mid-position and adjust C603 so that counter reads 600,000± 2 Hz.

(d) Turn CLARIFIER fully clockwise and then fully anti-clockwise; frequency change should be between 200 Hz and 350 Hz (+ and -).

(e) If control range is not satisfactory, perform correction with C612 and repeat (c) and (d).

2. Adjustment of Mixer Coil in SSB Detector and Clarifier:

Function settings:
CLARIFIER: Mid-position.
MODE: SSB AGC OFF/AGC ON.
RF GAIN: Min.

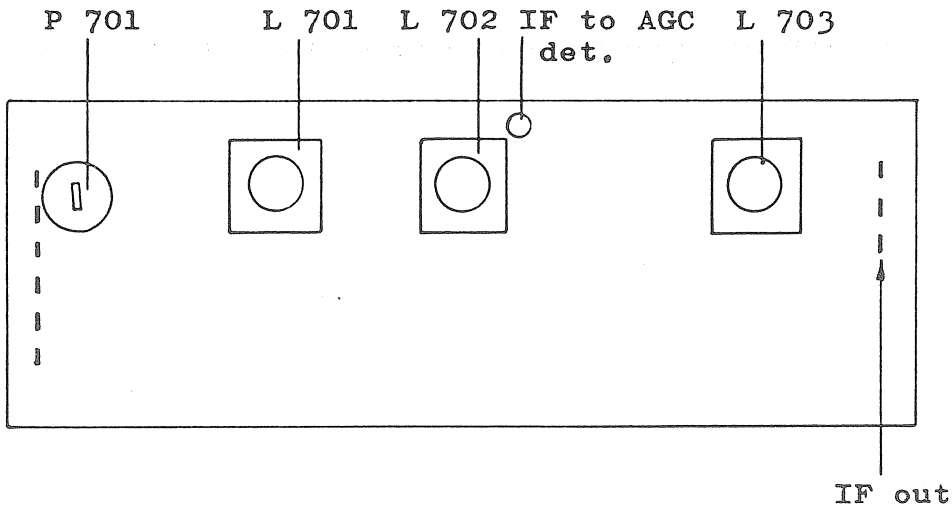
(a) Connect oscilloscope to R620 (10:1 probe).

(b) Adjust L601 for max. signal (approx. 2.5 V pp).

600 KHz IF AMPLIFIER.

Instruments Required:

Signal generator - Oscilloscope - 10:1 Probe.



1. Alignment for Max. IF Gain:

   Function settings:
   AF GAIN: Min.
   RF GAIN: Max.
   MODE: AM - AGC OFF.
   BAND: NW.

(a) Set dial to 535 KHz.

(b) Connect signal generator to aerial input. 600 KHz ± 100 Hz (this is easily performed at zero beat in the SSB setting). Signal generator unmodulated.

(c) Connect oscilloscope to "IF Out".

(d) Set P801 (AGC detector) for max. response on oscilloscope. Keep signal generator output as low as possible to avoid overdriving the IF amplifier.

2. Adjustment of S-meter Zero:

Function settings:
RF GAIN: Max.
MODE: AM - AGC OFF.
Aerial input: No connection. Preferably shorted.

(a) Set P701 so that meter needle is at 0.

3. Alignment of IF Amplifier:

Function settings:
RF GAIN: Max.
MODE: AM - AGC OFF.
BANDS: NW.

(a) Connect signal generator to aerial input and set frequency to 600 KHz ± 100 Hz (this is easily performed at zero beat in the SSB setting). Set dial to 535 KHz. (Signal generator unmodulated).

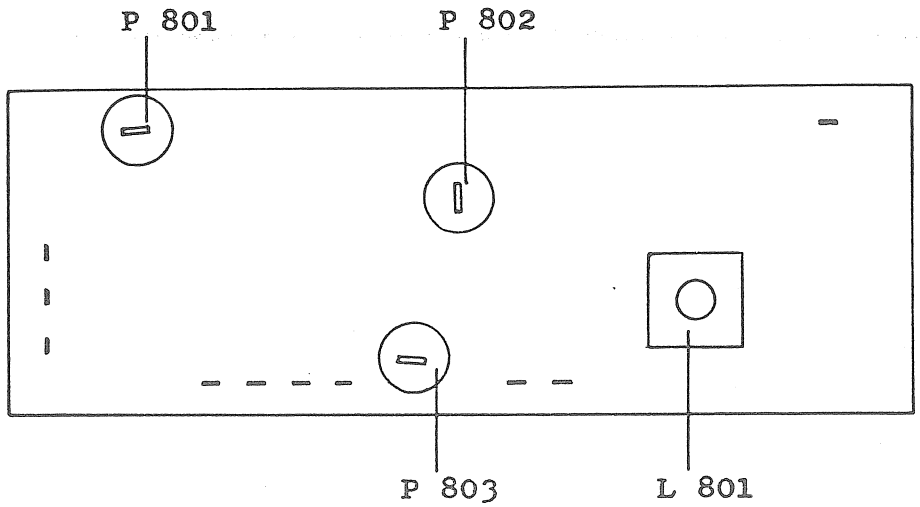
(b) Connect oscilloscope to "IF Out" (10:1 Probe).

(c) Adjust L701, L702 and L703 for max. response on oscilloscope. Use smallest possible signal-generator signal to avoid overdriving the IF amplifier.

AGC DETECTOR.

Instruments Required:

Oscilloscope - 10:1 Probe - Signal generator.



1. Alignment of AGC Amplifier:

   Function settings:
   RF GAIN: Max.
   MODE: AM AGC ON.
   BANDS: NW.

(a) Connect signal generator to aerial input and set dial to 535 KHz (signal generator unmodulated).

(b) Connect oscilloscope (10:1 probe) to "IF out" on IF amplifier.

(c) Set frequency to 600 KHz ± 100 Hz (this is easily performed at zero beat in the SSB setting). Adjust signal generator output so that meter reads 2.

(d) Set L801 for min. response on oscilloscope.

2. Adjustment of Nominal SSB Output (AGC Level).

Function settings:
RF GAIN: Max.
CLARIFIER: Mid-position.
MODE: SSB - AGC ON.
BANDS: NW.

(a) Connect signal generator to aerial input and set dial to 535 KHz.
Set signal generator to 1 mV unmodulated output. Vary the frequency so that an approx. 1000 Hz beat-note is heard.

(b) Connect oscilloscope to "IF to AGC det." (10:1 probe) on IF amplifier.

(c) Set P803 so that voltage, as measured with oscilloscope, is 160 mV pp.

(d) Briefly switch from SSB - AGC ON to SSB - AGC OFF and back, and recheck the 160 mV pp response.

3. Adjustment and Checking of Hang Time.

Function settings:
RF GAIN: Max.
AF GAIN: Suitable level.
MODE: SSB - AGC ON.
CHANNEL TUNER: 2182 KHz.

(a) Connect signal generator to aerial input. Set generator to deliver an unmodulated 1 V carrier at a frequency that will produce a 1000 Hz beat note.

(b) Connect oscilloscope to "IF to AGC det." on IF amplifier.
Set triggering so that sweep starts when signal is momentarily reduced 10 dB on the signal generator.

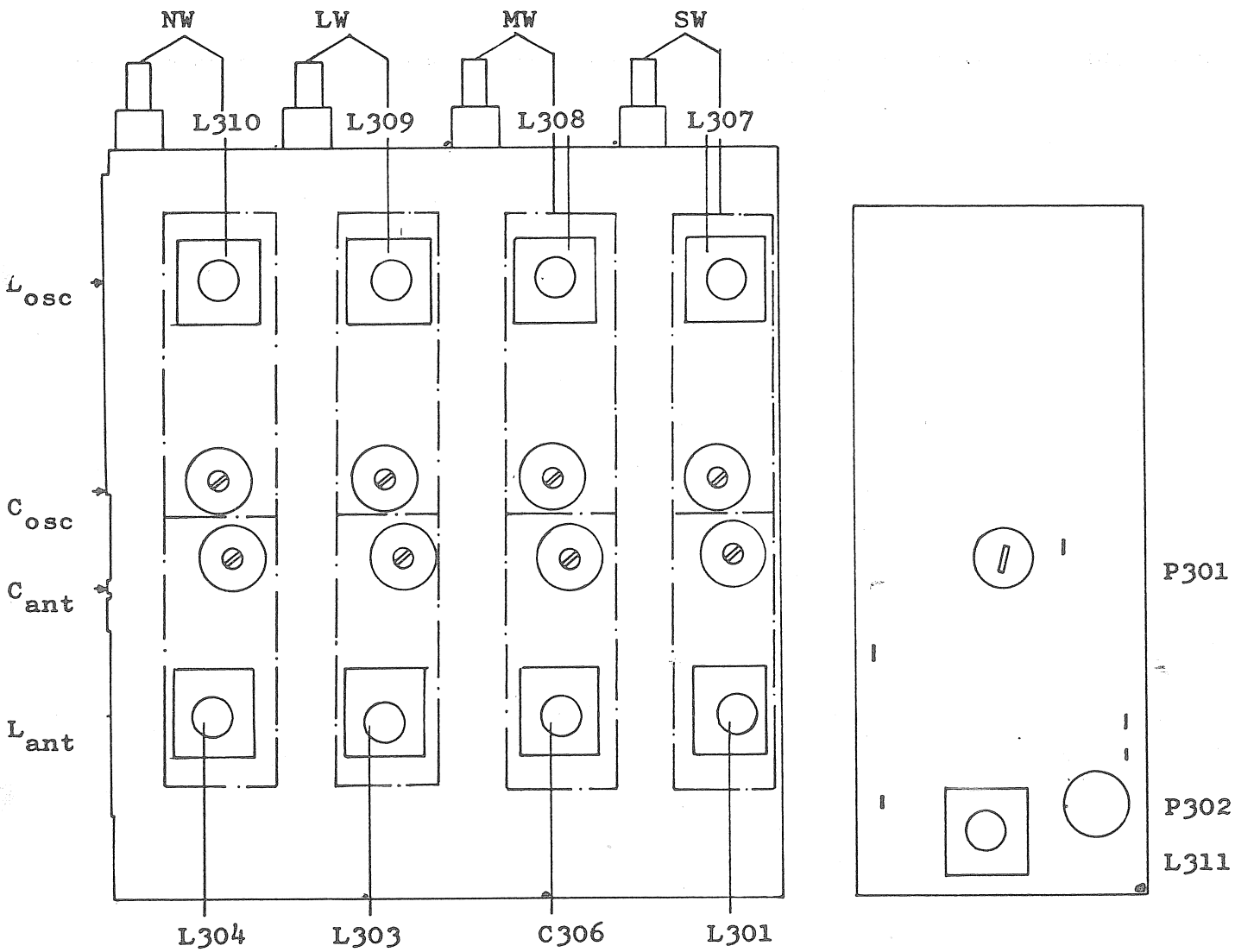
(c) Momentarily reduce signal generator output from 1 V by 10 dB to 20 dB. Time elapsing until signal increases momentarily should be 2 - 3 sec. Time is adjusted with P802.

(d) Perform this check at all signal levels between 1 V and 10 uV.

BANDS SECTION.

Instruments Required:

Signal generator - Output meter - 10:1 Probe - Oscilloscope.



1. Alignment of Oscillator in Bands Section.

Function settings:

RF GAIN: Max.

AF GAIN: Convenient level.

MODE: SSB - AGC OFF.

CLARIFIER: Mid-position

(a) Connect signal generator to receiver aerial input.

(b) Dial setting: NW: 296 KHz - LW: 157 KHz - MW: 652.5 KHz - SW: 1745 KHz (alignments points on deal).

(c) Set signal generator to relevant frequencies and adjust oscillator coils in question (L_{osc}, see sketch) to zero beat in speaker.

(d) Dial setting: NW: 568 KHz - LW: 276 KHz - MW: 1545 KHz - SW: 4210 KHz (alignment points on dial).

(e) Set signal generator to relevant frequencies and adjust trimmer capacitors in question (C_{osc}, see sketch) to zero beat in speaker.

(f) Repeat procedure "b" to "e" inclusive until dial calibration holds at both ends on all ranges.

(g) Check dial accuracy against signal generator, rotating the dial through all ranges whilst checking for "connection" between indicator line on dial cover and dial graduation.
NW and LW: 10 KHz each. MW and SW: 100 KHz each.

(h) If dial calibration does not hold, adjust vanes of osc. section of variable capacitor (the rear section) and repeat procedure "b" to "h" inclusive until accurate dial calibration has been achieved.

2. <u>Alignment of Signal-frequency Circuits in Bands Section.</u>

Function settings:
RF GAIN: Max.
AF GAIN: Convenient level.
CLARIFIER: Mid-position.
MODE: SSB - AGC OFF.

Alignment frequencies:
Alignment points (squares) on dial.
LW: 157 KHz and 276 KHz.
NW: 296 KHz and 568 KHz.

MW: 652.5 KHz and 1545 KHz.
SW: 1745 KHz and 4210 KHz.

(a) Connect signal generator to receiver aerial input.

(b) Connect output meter across speaker.

(c) Set receiver to NW.

(d) Set dial to "low" alignment point.

(e) With receiver in SSB setting, set signal generator, unmodulated, for zero beat in speaker.

(f) With receiver in AM, AGC ON setting, adjust L_{ant} for min. output, Vin = 28 dB/1 uV = 25 uV.

(g) Set dial to "high" alignment point.

(h) With receiver in SSB setting, set signal generator, unmodulated, for zero beat in speaker.

(j) With receiver in AM, AGC ON setting, adjust C_{ant} for min. output Vin = 28 dB/1 uV = 25 uV.

(k) Repeat procedure "d" to "j" inclusive until alignment is no longer necessary.

(l) Repeat procedure "d" - "k" inclusive on LW, MW and SW, respectively.

3. <u>Alignment of 601 KHz Trap, Bands Section.</u>

Function settings:
RF GAIN: Max.
AF GAIN: Min.
MODE: AM - AGC OFF.
BANDS: NW.

(a) Set dial to 535 KHz.

(b) Connect signal generator to receiver aerial input.

(c) Connect oscilloscope with 10:1 probe to "IF out" on IF board, sensitivity 10 mV/div.

(d) Turn P301 fully anti-clockwise.

(e) Feed a 601 KHz signal of convenient level into the receiver and adjust P302 and L311 for absolute minimum response on oscilloscope.

(f) For a 2 V pp input signal, voltage as measured on oscilloscope should be less than 300 mV pp.

4. Alignment of Balanced Mixer, Bands Section.

Function settings:
RF GAIN: Max.
MODE: AM - AGC OFF.
BANDS: NW.

(a) Set dial to 535 KHz.

(b) Connect signal generator to aerial input.

(c) Connect oscilloscope to "IF out" on IF amplifier (10:1 probe).

(d) Set signal generator to 600 KHz ± 100 Hz (this is easily performed at zero beat in the SSB setting) and to approx. 0.8 V (2 V pp) output.

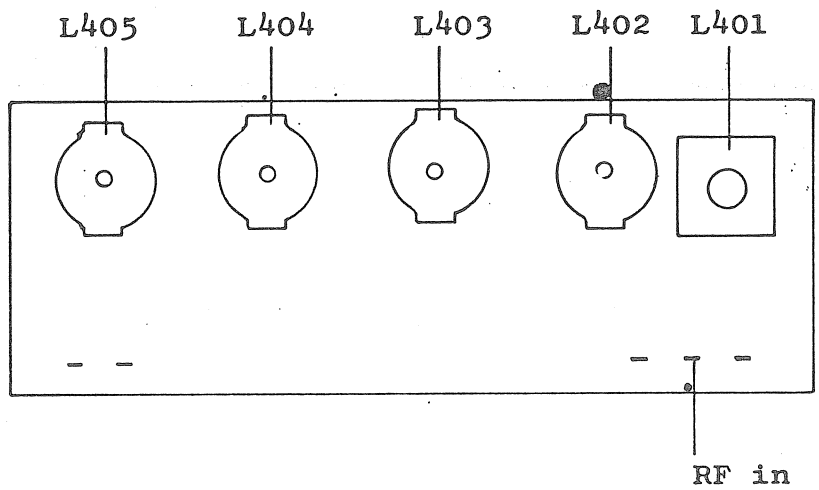
(e) Set P301 for minimum response on oscilloscope.

(f) For 2 V pp aerial input signal, voltage at "IF out", as measured on oscilloscope, should be less than 300 mV pp.

AM FILTER.

Instruments Required:

Signal generator - Oscilloscope - 10:1 Probe.



1. Alignment of AM Filter.

Function settings:
RF GAIN: Max.
MODE: AM - AGC OFF.
CLARIFIER: Mid-position.
CHANNEL TUNER: Any channel.

(a) Connect signal generator to aerial input and set frequency to correspond with frequency selected in channel tuner.

(b) Connect oscilloscope (10:1 Probe) to "RF in" on AM filter.

(c) Set signal generator so that zero beat occurs in SSB setting (the frequency being then 600 KHz ± 10 Hz on account of the filter alignment), oscilloscope to max. sensitivity, and signal generator output for convenient response on oscilloscope.

(d) Turn cores of L401, L402, L403, L404 and L405 all the way out.

(e) Adjust L401 for max. response.
Adjust L402 for min. response.
Adjust L403 for max. response.

Adjust L404 for min. response.
Adjust L405 for max. response.

(f) Connect oscilloscope (10:1 probe) to "IF out" on IF amplifier and set signal generator output so that oscilloscope voltage is 200 mV pp.

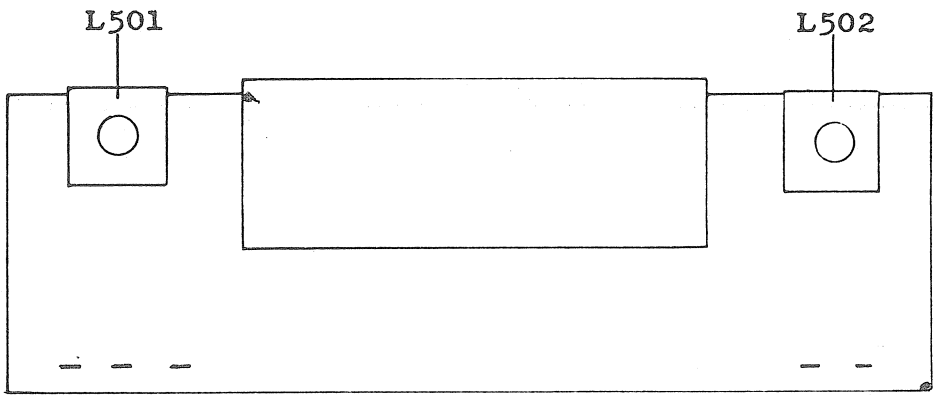
(g) Vary signal-generator frequency across pass band, checking that voltage varies less than 4 dB (representing 35% in relation to largest signal).
Fine adjustment of L401, L402, L403, L404 and L405 permits reducing ripple to a minimum.

(h) Filter curve otherwise as per supplement.

SSB FILTER.

Instruments Required:

Signal generator - Oscilloscope - 10:1 Probe.



1. Alignment of SSB Filter:

   Function settings:
   RF GAIN: Max.
   MODE: SSB - AGC OFF.
   CHANNEL TUNER: Any channel.

(a) Connect signal generator to aerial input and set frequency to correspond with frequency selected in CHANNEL TUNER + 1 KHz so that 1 KHz AF-tone is generated.

(b) Connect oscilloscope (10:1 probe) to "IF out" on IF amplifier and set signal generator output to produce 200 mV pp on oscilloscope.

(c) Adjust L501 and L502 for maximum oscilloscope voltage.

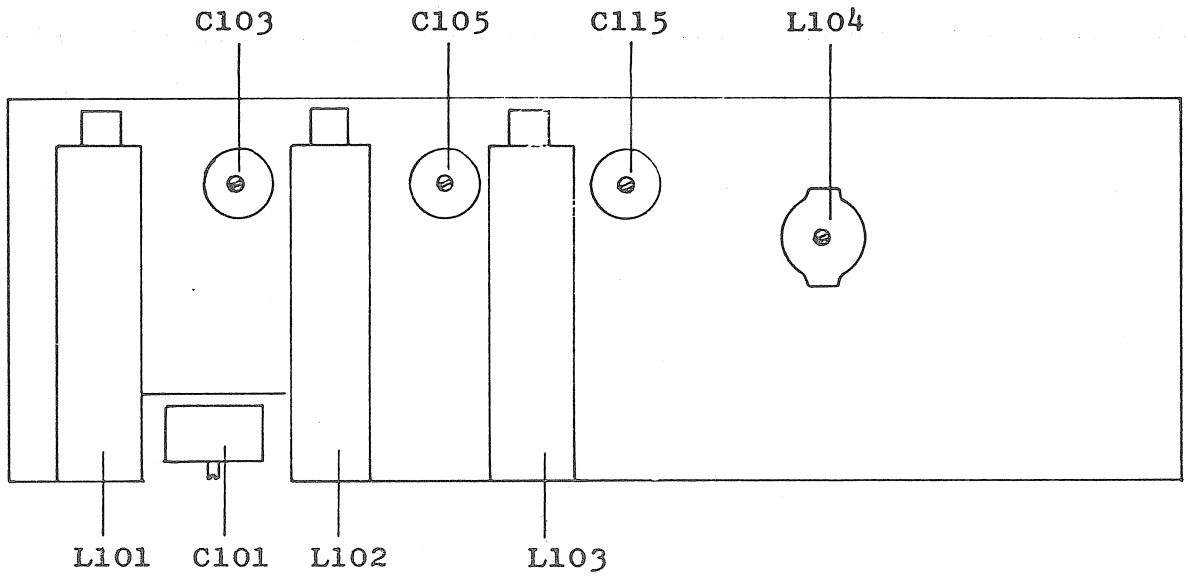
(d) Vary signal generator frequency across pass band, checking that voltage varies less than 2 dB (representing -25% from max. signal). Fine adjustment of L501 and L502 permits reducing ripple to a minimum.

(e) Filter curve otherwise as per supplement.

CHANNEL TUNER.

Instruments Required:

Signal generator - Output meter - Test crystals for f_{ant} = 1.6 MHz and f_{ant} = 4.5 MHz.



1. Inserting Band Limits in Channel Tuner.

Function settings:
RF GAIN: Max.
CLARIFIER: Mid-position.
MODE: SSB - AGC OFF.
CHANNEL TUNER: 1.6 MHz and 4.5 MHz.

(a) Connect signal generator to aerial input.

(b) Connect output meter to speaker output.

(c) Set slotted screws in L101, L102 and L103 to middle of their control ranges. Set C101, C103, C105 and C115 to mid-position (round corners above active portion of trimmer).
Screw the slotted screws associated with the channels, below the crystal cover outwards until they are flush with the front panel.

(d) Activate button at 4500 KHz crystal.

(e) Set signal generator to deliver 1000 Hz AF tone (f = fo + 1 KHz

(f) Screw slotted screw associated with channel in question, below crystal cover inwards until first maximum output meter reading is obtained, $V_{out} < 1$ V.

(g) Align L101, L102 and L103, while reducing the input voltage, for maximum output-meter reading. At end of procedure, V_{in} should be 4 uV.

(h) Activate button at 1600 KHz crystal.

(j) Repeat procedure "e" to "f" inclusive, making sure that a maximum is obtained.

(k) Align C103, C105 and C115, while reducing the input voltage, for maximum output meter reading. At end of procedure, V_{in} shou be 4 uV.

(1) Repeat procedure "d" to "k" inclusive until realignment is no longer necessary.

(m) If no maximum occurs during item "j" above, tune cores of L101, L102 and L103 one to three turns inwards and repeat procedure described in "d" to "1" above.

(n) Secure nuts on dust cores with lacquer.

2. Alignment of 600 KHz Series Trap.

Function settings:
RF GAIN: Max.
CLARIFIER: Mid-position.
MODE: SSB - AGC OFF.
CHANNEL TUNER: Any channel.

(a) Set signal generator to frequency selected until 1000 Hz beat note is obtained.

(b) Connect output meter to speaker output.

(d) Adjust L104 for maximum output (only 1 - 2 dB change will be noted).

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CHECKING SIGNAL-TO-NOISE RATIO AND TRACKING IN CHANNEL TUNER.

Instruments Required:

Signal generator - Output meter.

Function settings:

RF GAIN: Max.

CLARIFIER: Mid-position.

MODE: SSB - AGC OFF.

CHANNEL TUNER: 1.6 MHz - 2182 KHz.
3.5 MHz - 4.5 MHz.

(a) Connect signal generator to receiver aerial input.

(b) Connect output meter across speaker.

(c) Screw the slotted screws associated with the channels, below the crystal cover outwards until they are flush with the front panel

(d) Depress button at 1600 KHz crystal.

(e) Set signal generator to deliver 1000 Hz AF tone (f = fo + 1 KHz).

(f) Screw the slotted screw associated with channel in question, below the crystal cover inwards until first maximum output-meter reading is obtained. $V_{out} \leq 1$ V. While aligning, reduce input voltage so that it is 4 uV ≙ 12 dB/1 uV at the end of alignment procedure.

(g) Set function switch to SSB, AGC ON and note S-meter reading.

(h) Set function switch to SSB, AGC OFF and set RF GAIN to produce same S-meter reading as under item "g" above.

(j) With AF GAIN, adjust AF output to 1V.

(k) Shift signal generator frequency away from receiver frequency.

(l) Check that output drops by not less than 20 dB.

(m) Repeat procedure covered by items "e" to "l" above at 2182 KHz, 3.5 MHz and 4.5 MHz.

CHECKING SIGNAL-TO-NOISE RATIO OF BANDS SECTION.

Instruments Required:

Signal generator - Output meter.

Function settings:
RF GAIN: Max.
CLARIFIER: Mid-position.
MODE: SSB - AGC OFF.
BANDS: LW 157 KHz and 276 KHz.
NW 296 KHz and 568 KHz.
MW 652.5 KHz and 1545 KHz.
SW 1745 KHz and 4210 KHz.
(Alignment points on dial: square marks).

(a) Connect signal generator to receiver aerial input.

(b) Connect output meter across speaker.

(c) Set receiver to NW.

(d) Set dial to "low" alignment point.

(e) With receiver set to SSB, AGC OFF, set signal generator, unmodulated, for zero beat in speaker.

(f) Set function switch to AM, AGC ON.

(g) Modulate signal generator with 1000 Hz to M = 30%
V_{out} = 28 dB/1 uV = 25 uV.

(h) With AF GAIN, adjust output to 1 V rms.

(j) Set signal generator to CW position (unmodulated).

(k) Check that output drops by not less than 20 dB.

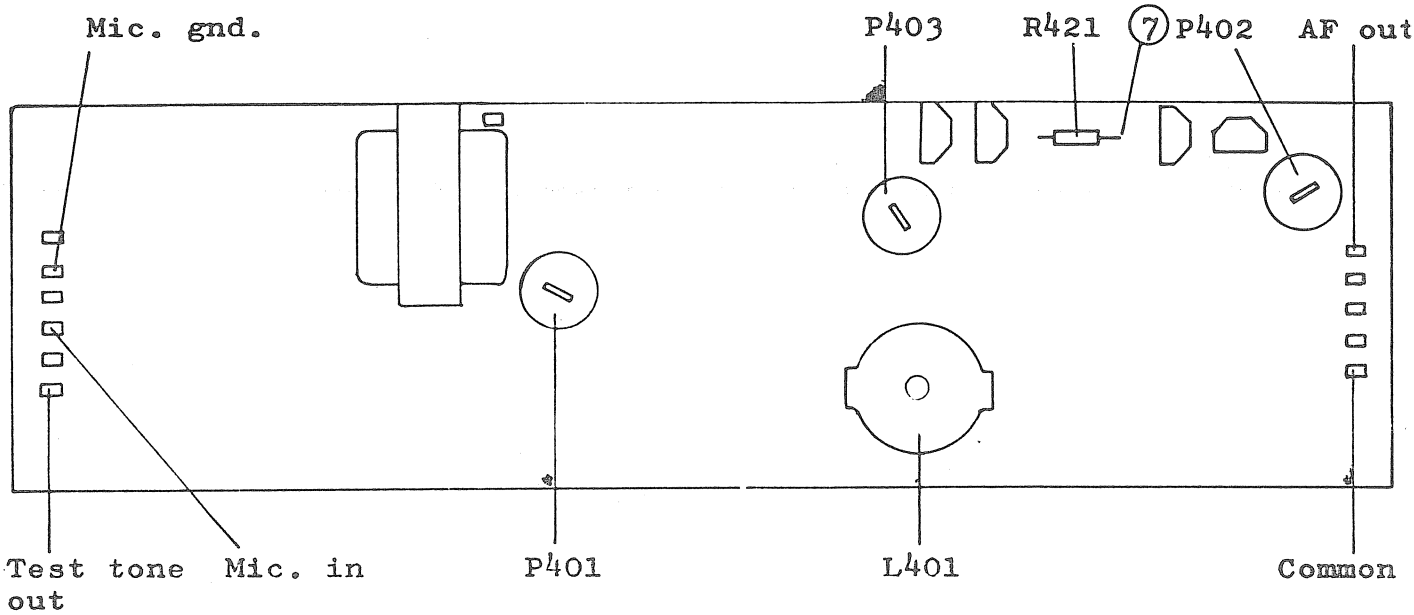
(l) Repeat procedure covered by items "e" to "k" above at "high" alignment point.

(m) Repeat procedure covered by items "d" to "k" above on LW, MW, SW

AF AMPLIFIER (Clipper).

Instruments Required:

Tone generator - Oscilloscope.



1. Adjustment of Clipping Symmetry and Microphone Sensitivity.

   Function settings:
   SERVICE SWITCH: DRIVER (T122) - PRE DRIVE (T121).
   MODE: A3J - Key transmitter with handset.

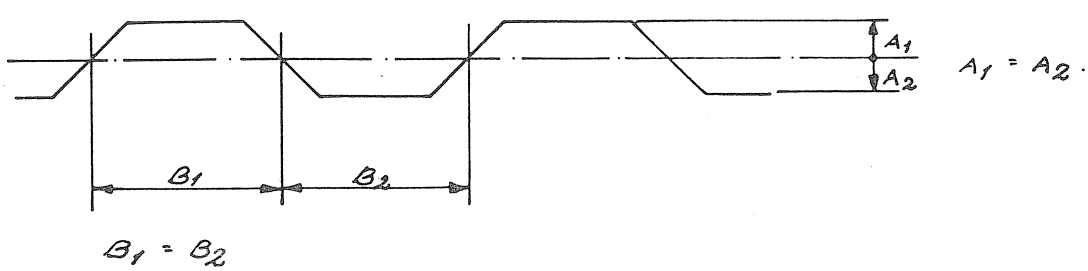
(a) Connect oscilloscope to R421 (test point 7).

(b) Connect tone generator to "Mic. in" and "Mic. gnd".

(c) Increase tone generator output (1 KHz) until clipping sets in, and set P403 so that clipping occurs simultaneously at top and bottom when tone generator output is varied.

(d) Set P401 (sensitivity control) so that clipping (test point 7) sets in at 600 mV pp at "Mic. in".

(e) Increase tone generator output to 1.2 V pp (+6 dB) and again adjust P403 for symmetrical curve on oscilloscope.



2. Adjustment of Output Level.

Function settings:
SERVICE SWITCH: DRIVER (T122) - PRE DRIVE (T121).
CHANNEL: B.

(a) Connect oscilloscope to "AF out" (chassis lead to "Common").

(b) Start transmitter by operating the TUNE function.

(c) Set P402 so that output voltage is 80 mV pp.

3. Checking A3J, A3A and A3H.

Function settings:
SERVICE SWITCH: DRIVER (T122) - PRE DRIVE (T121).
CHANNEL: B.

(a) Set-up with oscilloscope as under item 2 above, input signal to the module as under item 1.

(b) Voltage at "AF out" should be 80 mV pp in A3J, 68 mV pp in A3A and 40 mV pp in A3H.

4. Checking the Low-pass Filter.

Function settings:
SERVICE SWITCH: DRIVER (T122) - PRE DRIVE (T121).
CHANNEL: B.
MODE: A3J - Key transmitter with handset.

(a) Connect oscilloscope to "AF out".

(b) Connect tone generator to "Mic. in" and "Mic. gnd".

(c) Set tone generator output to approx. 1 V pp.

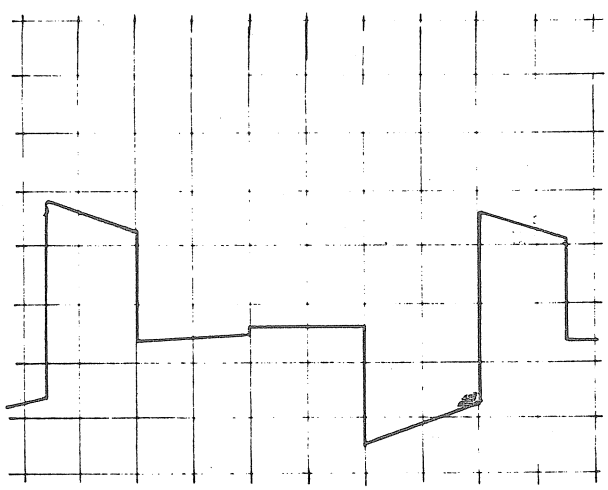
(d) Vary tone generator frequency so that voltage, as measured on oscilloscope, has dropped to one-half. This frequency should be between 3.1 and 3.6 KHz.

5. Checking the Two-tone Generator.

Function settings:
SERVICE SWITCH: DRIVER (T122) - PRE DRIVE (T121).
CHANNEL: B.
MODE: TUNE.

(a) Connect oscilloscope to Test tone out (test point 9) (chassis lead to "Mic. gnd").

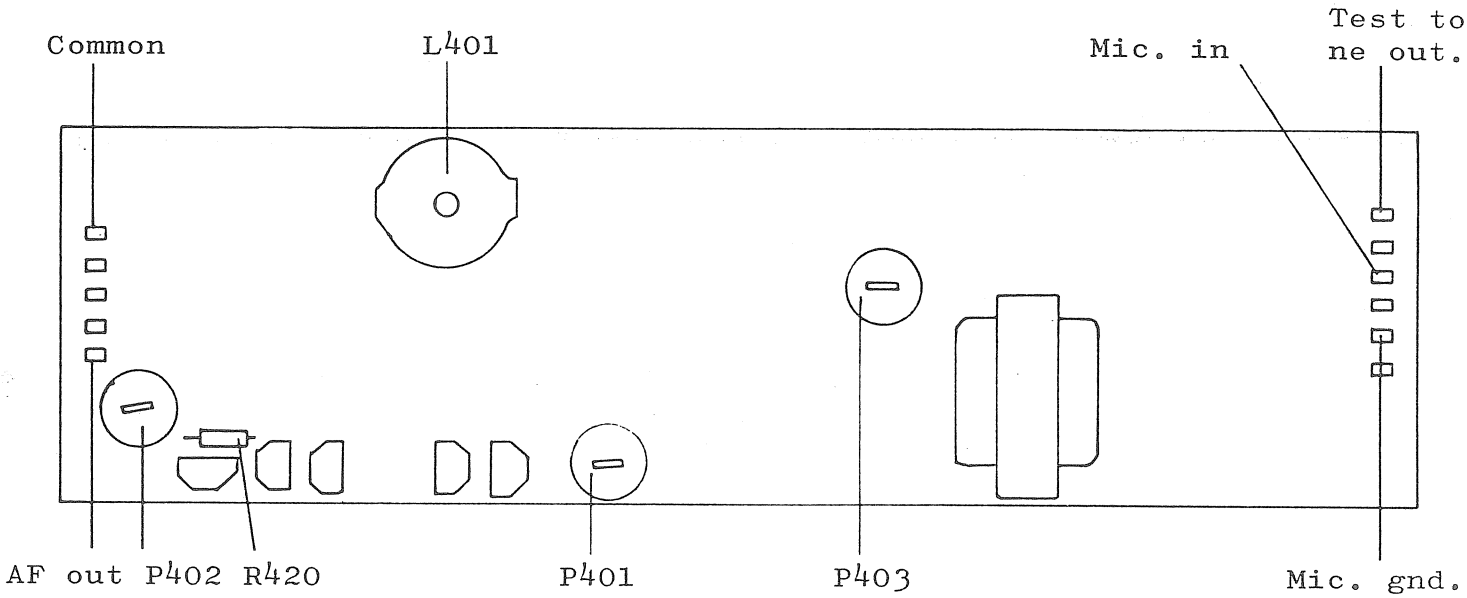
(b) The curve displayed should have this appearance:



AF AMPLIFIER (COMPRESSOR).

Instruments Required:

Tone generator - Oscilloscope.



1. Adjustment of Compressor Symmetry and Microphone Sensitivity.

Function settings:
SERVICE SWITCH: DRIVER (T122)-PRE DRIVE (T121, T124, T128, T126)
CHANNEL: B.
MODE: A3J - Key transmitter with handset.

(a) Connect oscilloscope across R420 (test point 7).

(b) Connect tone generator to "Mic. in" and "Mic. gnd".

(c) Increase tone generator output (1KHz) to the point where no further increase in output voltage occurs. Then increase tone generator output to approx. twice that level.

(d) Set P401 so that curve-shape is the same above and below the zero line, consistent with maximum amplitude.

(e) Reduce tone generator output until voltage at test point 7 starts falling. Tone generator signal should then be approx. 300 mV pp between "Mic. in" and "Mic. gnd".
If not, adjust P403.

2. Adjustment of Output Level.

Function settings:
SERVICE SWITCH: DRIVER (T122)-PRE DRIVE(T121, T124, T128, T126)
CHANNEL: B.

(a) Connect oscilloscope to "AF out" (chassis lead to "Common").

(b) Start transmitter by operating the TUNE function.

(c) Set P402 so that output voltage is 80 mV pp.

3. Checking A3J, A3A and A3H.

Function settings:
SERVICE SWITCH: DRIVER (T122)-PRE DRIVE(T121, T124, T128, T126)
CHANNEL: B.

(a) Set-up with oscilloscope as under item 2 above, input signal to the module as under item 1.

(b) Voltage at "AF out" should be 80 mV pp in A3J, 68 mV pp in A3A and 40 mV pp in A3H.

4. Checking the Low-pass Filter.

Function settings:
FUNCTION SWITCH: DRIVER (T122)-PRE DRIVE(T121, T124, T128, T126
CHANNEL: B.
MODE: A3J - Key transmitter with handset.

(a) Connect oscilloscope to "AF out".

(b) Connect tone generator to "Mic. in" and "Mic. gnd".

(c) Set tone generator output to approx. 1 V pp.

(d) Vary tone generator frequency until voltage, as measured on oscilloscope, has dropped to one-half. This frequency should be between 3.1 and 3.6 KHz.

5. Checking Two-tone Output.

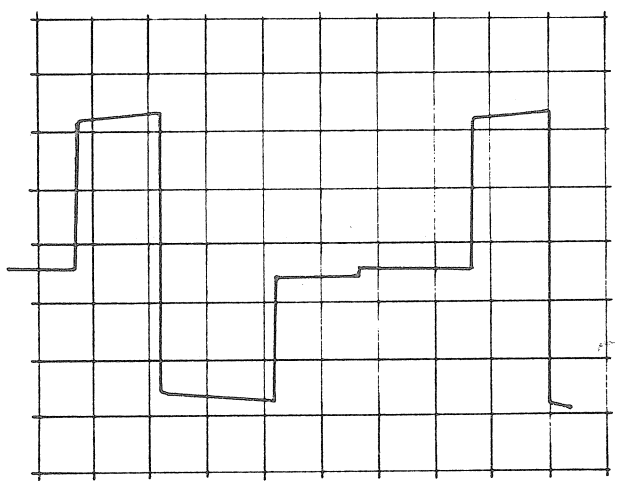
Function settings:

SERVICE SWITCH: DRIVER (T122)
PRE DRIVE (T121, T124, T128, T126)

CHANNEL: B.
MODE: TUNE.

(a) Connect oscilloscope to "Mic. in" and "Mic. gnd".

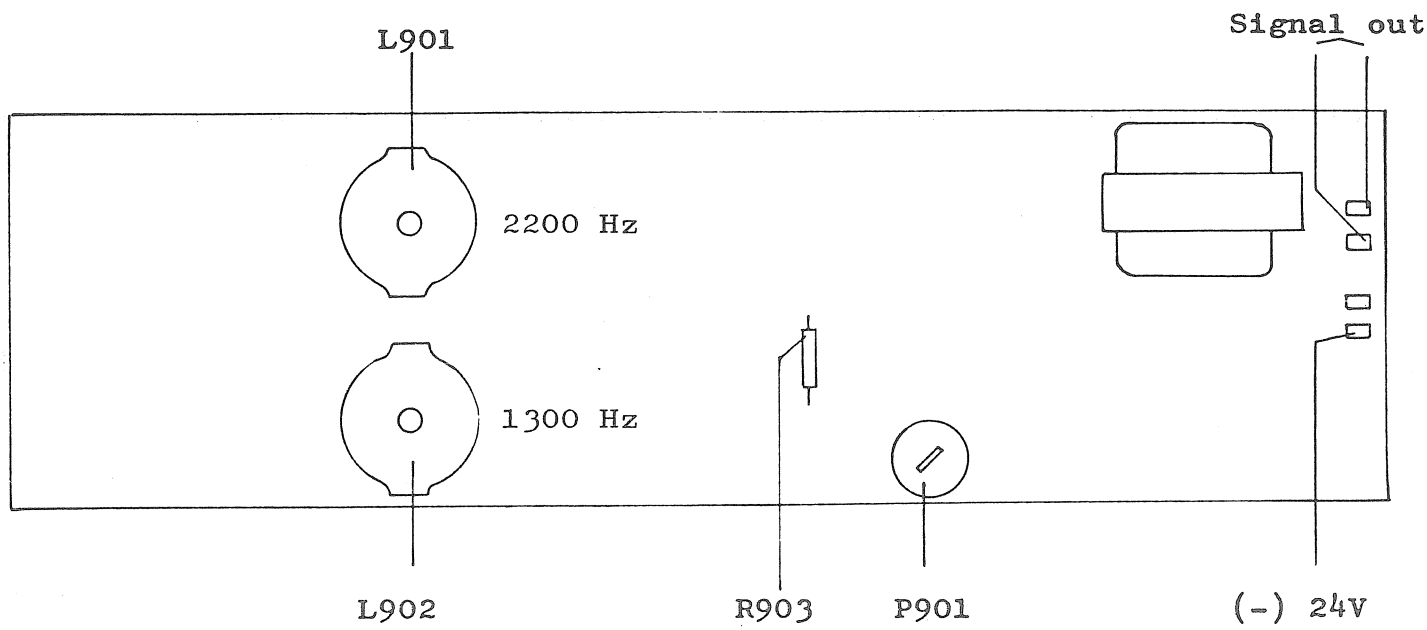
(b) The curve displayed should have this appearance:



ALARM SIGNAL GENERATOR.

Instruments Required:

Counter - Oscilloscope - Tone generator.

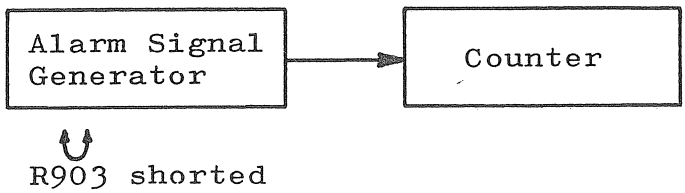


The alarm signal generator can be adjusted in several ways; two alternatives will be described.
Specifications of the alarm signal generator are:
Tone frequencies: 1300 Hz and 2200 Hz.
Tone tolerance: ± 1.5%.
Switching time between tones: 250 ms ± 50 ms.
Auto-stop time: 45 sec. ± 15 sec.

Adjustment of Tones.

Alternative I.

Function settings:
SERVICE SWITCH: DRIVER (T122) - PRE DRIVE (T121, T124, T128, T126)
CHANNEL: A.
MODE: TEST ALARM.



(a) Connect counter to "Signal out" terminals.

(b) Operate TEST ALARM to start one of the tones. Check tone frequency, adjusting with the tuning cores of L901 and L902 if necessary (tone change can be made by repeatedly operating the TEST ALARM).

Alternative II.

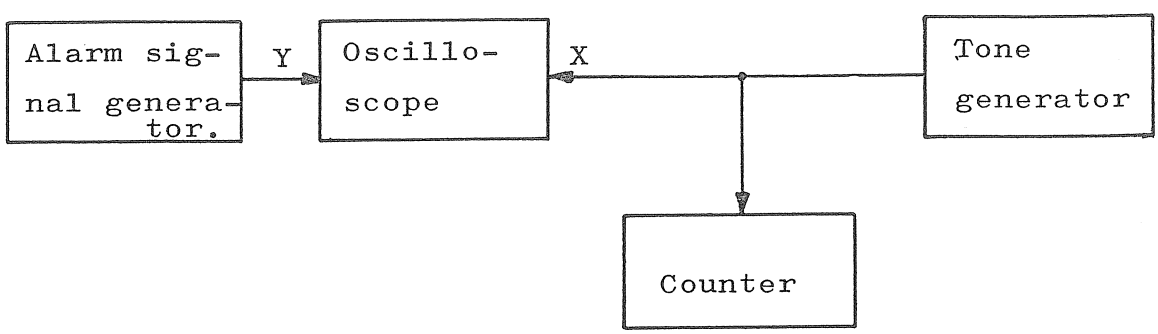
Function settings:
SERVICE SWITCH: DRIVER (T122) -PRE DRIVE (T121, T124, T128, T126)
CHANNEL: A.
MODE: TEST ALARM.

(a) Connect oscilloscope to "Signal out" terminals.

(b) Connect tone generator to X-deflection of oscilloscope and operate TEST ALARM.

(c) Vary tone generator frequency around 1300 Hz or 2200 Hz as the case may be, until a stationary circle appears when the tone in question is transmitted.

(d) Read frequency with counter at tone generator output.



2. Adjustment of 250 ms Pulse Generator.

Function settings:

SERVICE SWITCH: DRIVER (T122) -PRE DRIVE (T121, T124, T128, T126)
CHANNEL: A.
MODE: TEST ALARM.

(a) Connect oscilloscope to R903 (33 ohms). Chassis lead to -24 V.

(b) Set P901 so that 250 ms is present between pulses (if difficulty is encountered in triggering on the brief pulses across R903, measurement may be made at pin 6 of IC901 instead).

(c) The measurement accuracy depends on the time base of the oscilloscope. The time base can be checked by the counter and the tone generator.

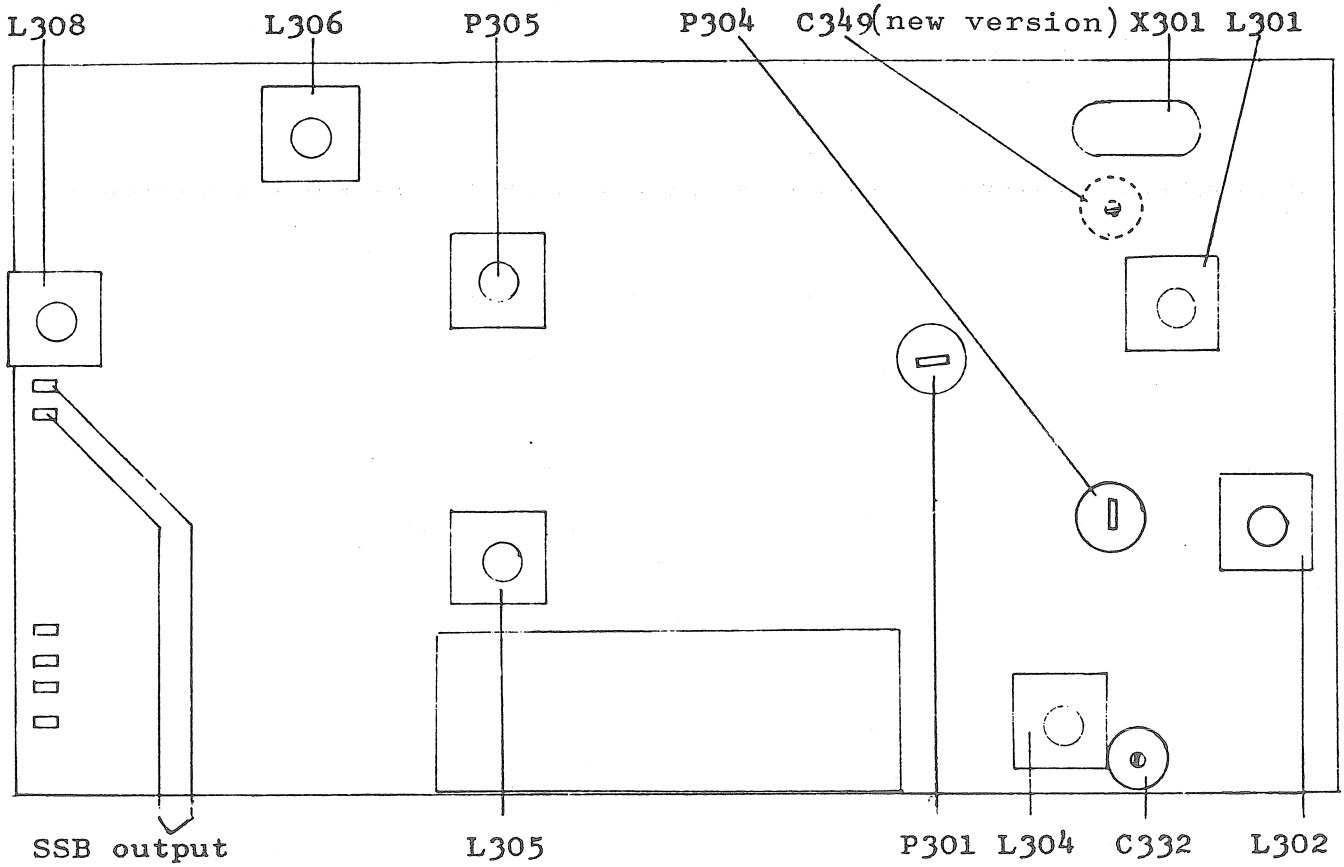
3. Checking the 45-sec. Generator.

Start alarm signal generator with TEST ALARM button and, using a watch, check that time from alarm is started until it stops of itself is between 35 and 55 sec.

SSB GENERATOR.

Instruments required:

Oscilloscope - Tone generator - 10:1 Probe - Frequency counter.



1. Adjustment of 600 KHz oscillator.

Function settings:

SERVICE SWITCH: DRIVER (T122) -PRE DRIVE (T121, T124, T128, T126)

CHANNEL: B.

MODE: A3H - Key transmitter with handset.

POWER RED.: 1/1 FULL.

(á) Connect oscilloscope and frequency counter to "SSB out".

(b1) Old version.

Key transmitter and adjust L301 so that the frequency is 600 KHz ± 10 Hz while simultaneously cheking that dust core can be tuned two to three turns to either side without causing the oscillator to stop.

(b2) New version.

Key transmitter and adjust C349 so that the frequency is 600 KHz ± 10 Hz.

2. Adjustment of 600 KHz Amplifier.

Function settings:
SERVICE SWITCH: DRIVER (T122) -PRE DRIVE (T121, T124, T128, T126)
CHANNEL: B.
MODE: A3H - Key transmitter with handset.

(a) Connect oscilloscope (10:1 probe) to C327 (test point 3), and set L302 for maximum response on oscilloscope.

3. Adjustment of SSB Filter and SSB Amplifier.

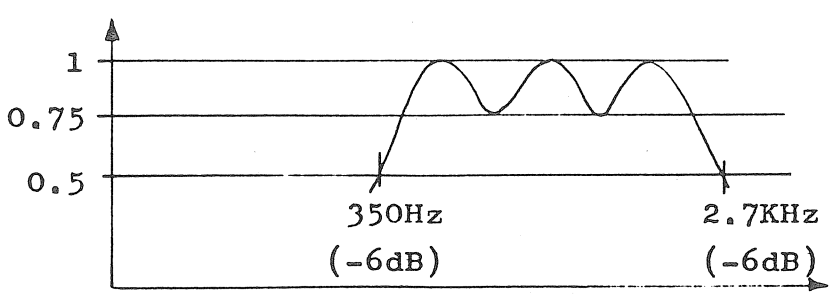
Function settings:
SERVICE SWITCH: DRIVER (T122) -PRE DRIVE (T121, T124, T128, T126)
CHANNEL: B.
MODE: A3J - Key transmitter with handset.
POWER RED.: 1/1 FULL.

(a) Connect oscilloscope to "SSB out".

(b) Connect tone generator to "Mic. in" and "Mic. gnd." on AF amplifier.

(c) Set tone generator frequency to 1.5 KHz and adjust L304, L305, L306 and L308 for max. response on oscilloscope.

(d) Check that the frequency response is within limits of the sketch below, by varying tone generator frequency from 350 Hz to 2.7 KHz. If not adjust L305 and L304 until minimum variation in output signals has been accomplised, max. variation -25% with largest signal as reference (-50% at 350 Hz and 2.7 KHz with largest signal as reference).



4. Adjustment of Carrier Balance.

Function settings:
SERVICE SWITCH: DRIVER (T122)-PRE DRIVE (T121, T124, T128, T126)
CHANNEL: B.
MODE: A3J - Key transmitter with handset.
POWER RED.: 1:1 (T122) FULL (T121, T124, T128, T126).

(a) Connect oscilloscope (1:1 probe) to "SSB out".

(b) Set C332 and P304 for minimum response at full oscilloscope sensitivity, 5 mV/div.

(c) If oscilloscope is not sufficiently sensitive, measure at driver anode instead.
In that case a x-tal should be in place in the channel position, and the driver should be aligned.

5. Adjustment of Levels.

Function settings:
SERVICE SWITCH: DRIVER (T122)-PRE DRIVE (T121, T124, T128, T126)
CHANNEL: B.
POWER RED.: 1/1 (T122) FULL (T121, T124, T128, T126).

(a) Connect oscilloscope to "AF out" on AF amplifier, and check that signal is 80 mV pp with TUNE operated.

(b) Connect oscilloscope to "SSB out".

(c) Operate TUNE button, and set P305 so that signal is 800 mV pp for T122 and 900 mV pp for T121, T128 and 1 V pp for T124,T126 (two-tone signal).

(d) Set oscilloscope sensitivity for an even-number division as close to full deflection as possible.

(e) Operate A3H and key transmitter with handset; also set P301 so that signal on oscilloscope (carrier signal) is 0.55 to 0.5 of two-tone signal at point C.

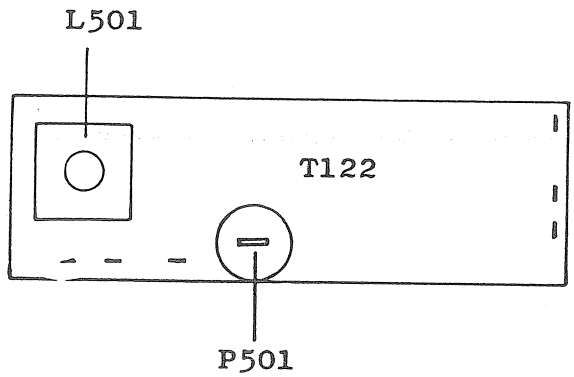
(f) Operate A3A and key transmitter with handset key. Check that signal on oscilloscope is approx. 0.15 of two-tone signal at point C.

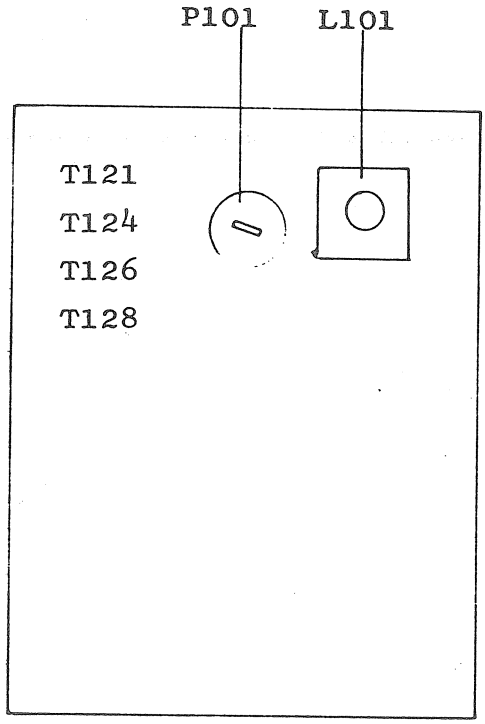
(g) Connect tone generator to "Mic.in" and "Mic.gnd" (output 1V pp, 1KHz) and check that all signals appearing with A3H, A3A and A3J operated have the same peak-to-peak voltage seen on the oscilloscope (variation within approx. 5% permissible).

BALANCED MIXER.

Instruments Required:

Oscilloscope.





1. Adjustment of 600 KHz Circuit.

Function settings:
SERVICE SWITCH: DRIVER (T122) -PRE DRIVE (T121, T124, T128, T126)
CHANNEL: B.
MODE: TUNE.
POWER RED.: 1/1 (T122) FULL (T121, T124, T128, T126)

(a) Connect oscilloscope to driver anode (test point 15), 10:1 probe. (Channel B should be aligned with crystal).

(b) Set L101 on T121, T124, T128 and T126 (L501 on T122) for maximum response.

2. Adjustment of Xtal Oscillator Suppression.

Function settings:
SERVICE SWITCH: DRIVER (T122) -PRE DRIVE (T121, T124, T128, T126)
CHANNEL: B.
MODE: A3J.
POWER RED.: 1/1 (T122) FULL (T121, T124, T128, T126)

(a) Connect oscilloscope to driver anode (test point 15), 10:1

probe. (Channel B should be tuned up with crystal in place).

(b) Key transmitter with handset and set P101 on T121, T124, T128, T126 (P501 on T122) for min. response on oscilloscope (oscilloscope set to max. sensitivity).

(c) If oscilloscope display is blurred, this can be remedied by readjusting C332 and P304 in the SSB generator.

(d) Signal at driver anode should be 200 times larger or more, when TUNE is thereafter operated.

SERVICE CIRCUIT T122, T126.

Instruments Required:

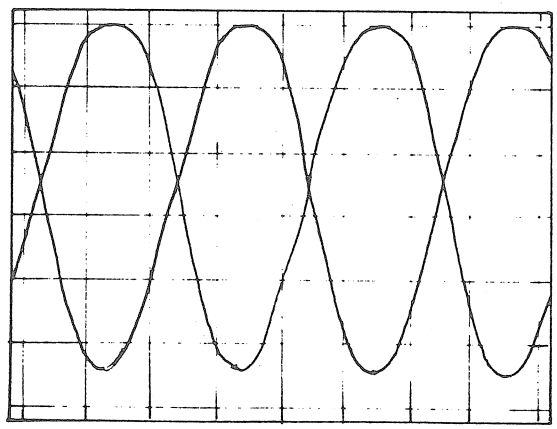
Oscilloscope - 10:1 Probe.

1. Adjustment of P701 (P607 on T126).(NOTE: I_k's must be adjusted to 50 mA for T122, and to 30 mA for T126).

   Function settings:
   SERVICE SWITCH: DRIVER on T122, and PRE DRIVE on T126.
   CHANNEL: B (f~1.6 - 2 MHz).
   MODE: TUNE.
   POWER RED.: 1/1

(a) Connect oscilloscope (10:1 probe) to g_1 of any PA valve and set oscilloscope (DC setting) so that oscilloscope beam, with handset key up, is located on upper dividing line.

(b) Key transmitter, and tune driver grid and anode circuits for max. signal; thereafter adjust drive level so that AC voltage at grid reaches upper dividing line on oscilloscope (see sketch), with only a trace of flat-topping.



Set P701 on T122 (P607 on T126) so that meter reads 10 (max. deflection).

2. Adjustment of P702 and P703 on T122 (P608 on T126).

Function settings:
SERVICE SWITCH: LOAD.
CHANNEL: B. (as under item 1 above).
MODE: TUNE.
POWER RED.: 1/1.

(a) Connect oscilloscope (10:1 probe) to contact 22 of π-network on T122, and contact 26 of loadcapacitor on T126.

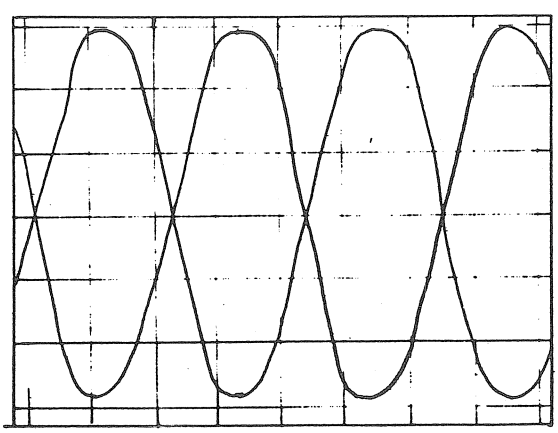
(b) Adjust transmitter anode circuit (π - network) and variometer as described in instruction manual.

(c) Load transmitter so that voltage on oscilloscope has the appearance shown in the sketch below, carefully adjusting the variometer for maximum aerial current.

(d) Set SERVICE SWITCH to DRIVE and adjust drive level to meter reading of 10.
Readjust variometer for maximum aerial current. Check appearance of curve-shape on oscilloscope, and correct load setting if necessary.

(e) The purpose of items "b" and "c" above is to obtain the desired curve-shape on the oscilloscope at meter reading of 10 with the SERVICE SWITCH in the DRIVE position.
Under these conditions, set P703 on T122 (P608 on T126) for zero meter reading with SERVICE SWITCH at LOAD.

(f) T122 only.
Set SERVICE SWITCH to PA, and set P702 so that meter reads 10.



3. Adjustment of P704. (T122 only)

Function settings:
SERVICE SWITCH: LOAD.
MODE: SSB.
POWER RED.: 1/16.

(a) Set P601, P602 and P603 to mid-position.

(b) Start transmitter with handset, and adjust P704 until I_{k1}, I_{k2} and I_{k3} as measured with TEST SWITCH show average reading of approx. 50 mA.

(c) Thereafter adjust zero-signal currents to 50 mA, with P601 for I_{k1} , P602 for I_{k2} and P603 for I_{k3}.

4. Adjustment of P705 on T122 (P701 on T126).

Function settings:
SERVICE SWITCH: LOAD.
TEST SWITCH: I_{ANT} (T122 only).
MODE: A3H.
POWER RED.: 1/1.
CHANNEL: A (2182 KHz).

(a) With the transmitter keyed with the handset, adjust P705 for 3A reading.

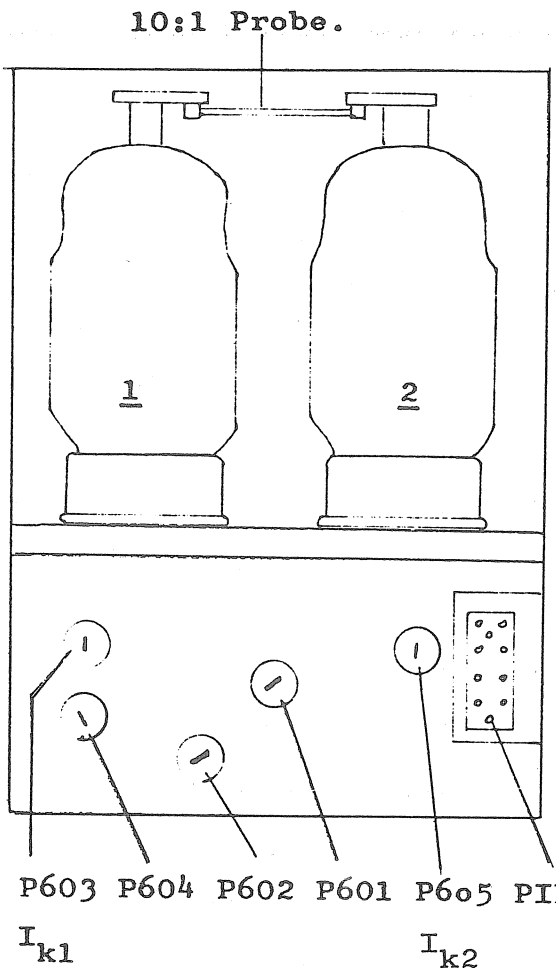
(b) Correct reading requires that adjustment is made using an RF thermocouple instrument as reference. IN THAT CASE: Always calibrate in the A3H setting without any modulation on 2182 KHz. NEVER in the TUNE position.

SERVICE CIRCUIT T121,T124 and T128.

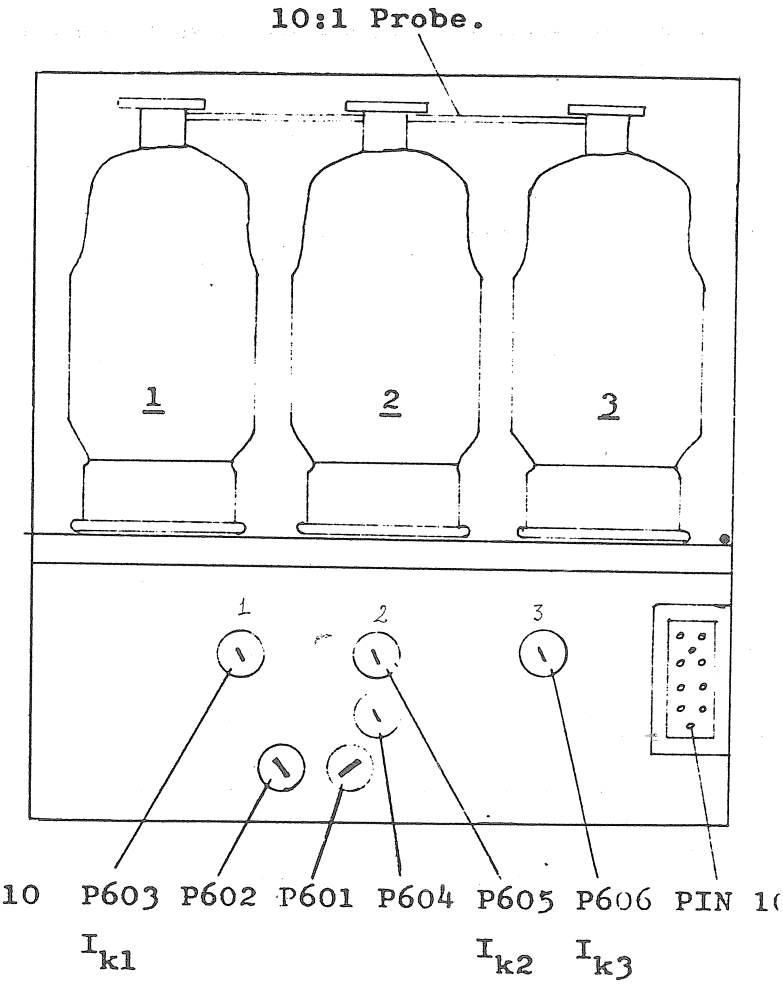
Instruments Required:

Oscilloscope - 10:1 Probe.

T121, T124



T128



1. Adjustment of P602 and P601.

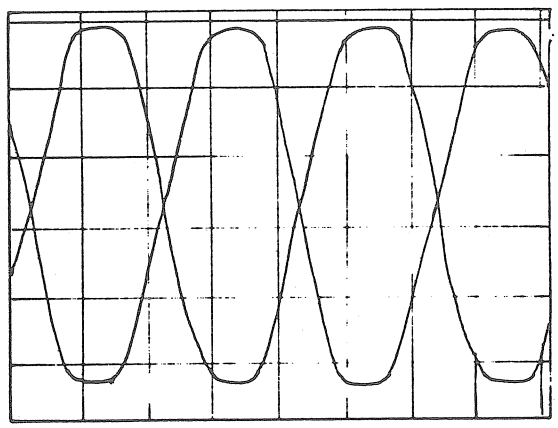
Function settings:
SERVICE SWITCH: LOAD, FINAL DRIVE, PRE DRIVE.
CHANNEL: B (f = 1.6 - 2 MHz).
MODE: TUNE.
POWER RED.: 1/1 FULL.

(a) Connect oscilloscope (10:1 probe) to lead between anodes of PA valves (not directly to the anodes as this will cause permanent damage to probes).

(b) Check that driver grid and anode circuits are tuned for max. meter reading, with SERVICE SWITCH turned to PRE DRIVE.

(c) Adjust transmitter anode circuit (π-network) and variometer as described in instruction manual.

(d) Load transmitter so that voltage displayed on oscilloscope is as high as possible and as shown in the sketch below, with SERVICE SWITCH set at LOAD and so that the meter reads between 1 and 5 with the SERVICE SWITCH turned to FINAL DRIVE. (This is accomplished by adjustment of drive level).
The variometer should be set for maximum aerial current during all measurements.



(e) Under these conditions set P602 so that meter reads 0 with TEST SWITCH set at LOAD.
Under the same conditions set P601 so that meter reads 10 with TEST SWITCH set at PRE DRIVE.

2. Adjustment of P604.

P604 has been adjusted very accurately at the factory, and does not normally have to be touched.
However, adjustment is required after replacement of P603, P605, P604 and R611 on T121, T124 and on T128 also P606.

(a) Remove PA valves.

(b) Measure resistance between pin 10 and chassis potential in the power socket.

(c) Adjust P604 so that said resistance is 14,000 Kohms, preferably with an accuracy of ± 1%.
(Failing this it will be necessary to adjust the no-signal currents after a power supply (N178, N179 or N180) has been replaced).

3. Checking the SERVICE SWITCH.

With the A3J button activated, and the transmitter keyed, and the CHANNEL SWITCH set to any channel except A, check test meter readings by turning the TEST SWITCH through its settings. Readings (with supply voltage set to Vg_2 = 300 V) should be as follows:

T121, T124 and T126.

POS. NO.	Lettering	Reading		(max.)
		T121-T124	T126	
1	PRE DRIVE	10	10	+10
2	I_{k1} (not in T126)	+38±2mA		+100mA
3	I_{k2} (in T126 selected with S1003)	+38±2mA	30mA	+100mA
4	LOAD	0	0	±10
5	FINAL DRIVE	0	10	+10
6	Vg2	+300±10V	+300±10V	+500V
7	Va	+900±50V	+950±50V	+1000V
8	Vg1	-84±3V	-72±5V	-100V
9	+18V	+18±1V	+18±1V	+20V
10	TRANSMIT	0	0	0

T128.

POS. NO.	Lettering	Reading	(max.)
1	PRE DRIVE	10	10
2	Vg1	-84 ± 3V	-100V
3	+18V	$+18\pm1$V	+20V
4	LOAD	0	±10
5	FINAL DRIVE	0	+10
6	Vg2	$+300\pm10$V	+500V
7	Va	$+900\pm50$V	+1000V
8	I_{k1}	35 ± 2mA	+100mA
9	I_{k2}	35 ± 2mA	+100mA
10	I_{k3}	35 ± 2mA	+100mA

FUNCTION CHECK, T121,T122, T124, T128 and T126.

After having completed all transmitter adjustments it is a good plan to perform a function check. To do this, proceed as follows:

(a) Connect dummy aerial.

(b) Connect oscilloscope across dummy aerial resistor.

(c) Key transmitter with TUNE function, checking that all channels can be tuned for maximum aerial current.
Simultaneously observe curve-shape on oscilloscope (slight flat-topping).

(d) Check, with counter loosely coupled (10 cm aerial at counter input) that transmit frequencies of all channels are correct.
REMEMBER mode: A3H and no modulation.

(e) On any channel, except A, check that all transmitting modes A3J, A3A and A3H have the same PEP level as in TUNE position while speaking loudly into the handset (visible on oscilloscope).

(1) Check that carrier in A3H position has a voltage half as large or a little more as the two-tone signal in the TUNE position.
NOTE: Adjust variometer for maximum aerial current in TUNE positions: NEVER in A3J, A3A or A3H positions.

(2) Check the power reduction function.

(f) Set CHANNEL to 2182 KHz.

(1) Check that A3H (carrier) is transmitted regardless of the transmitting mode (A3J, A3A or A3H) selected.

(2) Check, for T121,T124, T128 and T126, that the power reduction facility is inoperative.

(3) Check that alarm-signal system is functioning (modulation per-

centage greater than 70%).
For this check, the TEST SWITCH should be in the PRE DRIVE position (for T121, T124, T128, T126) ı (for T122). Final stage switched off.

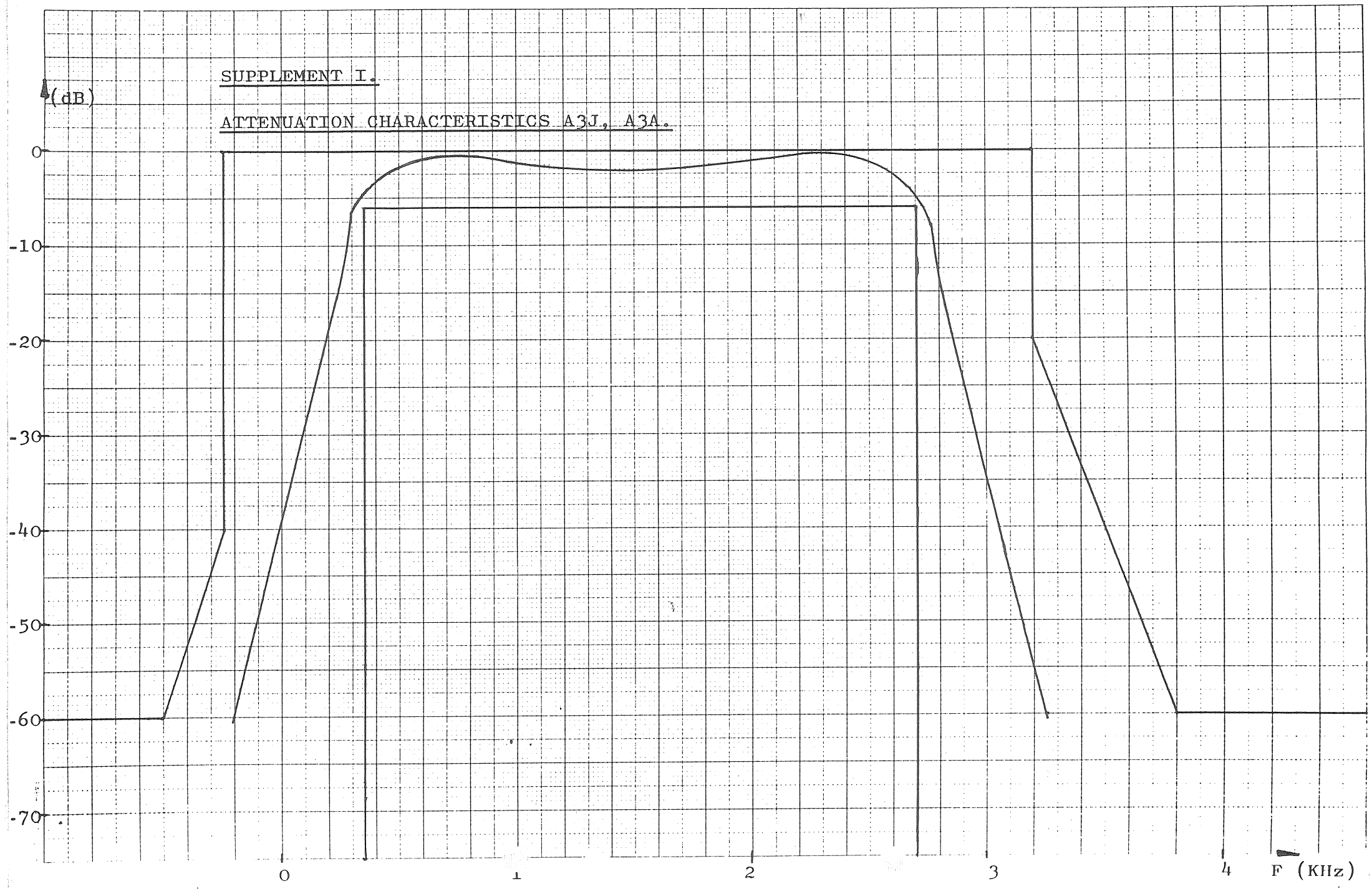
(4) Test the automatic aerial tuning system on 2182 KHz.

(g) Check that main channel/adjacent channel system functions.

(h) Without dummy aerial, run through all channels for POWER RED. = 1/1, checking that I_{k1} does not exceed 55 mA for T121, T124, T128 and 60 mA for T122 and 50 mA for T126 (otherwise the π - network tuning is not correct).

SUPPLEMENT I.

ATTENUATION CHARACTERISTICS A3J, A3A.



SUPPLEMENT II.

ATTENUATION CHARACTERISTICS A3, A3H.