BANTAM
V.H.F. F.M.
RADIOTELEPHONE

Type HP1 FM

This service manual is for the maintenance of Pye Telecommunications equipment. The performance figures quoted are typical and are subject to normal manufacturing and service tolerances.

The right is reserved to alter the equipment described in this manual in the light of future technical development.

SERVICE MANUAL

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PYE TELECOMMUNICATIONS LIMITED · CAMBRIDGE · ENGLAND

TP260

CONTENTS

ILLUSTRATIONS

CHAPTER 1

GENERAL DESCRIPTION

The Pye Bantam, type HP 1 FM, is a portable v.h.f. radiotelephone working on fixed frequencies in the band 25 to 174MHz. This manual describes equipment covering the bands 25 to 54MHz 68 to 108MHz and 132 to 148MHz.

Employing frequency modulation the Bantam provides two-way speech communication over a distance of up to 15 miles when used with a base station, or 2 to 3 miles between two Bantams.

It has a self contained 16.8 volts nickel cadmium storage battery but dry or mercury cells may be used as alternatives.

The Bantam can have up to three working channels within ±0.5% of a centre frequency. It has a detachable telescopic antenna and provision for an external antenna. A flexible wire antenna within the leather shoulder strap or a flexible whip are alternatives. The fist microphone serves as an earphone when the loudspeaker is switched off.

The Bantam is housed in a steel case and is supplied with a sturdy carrying case and shoulder strap.

SPECIFICATION

GENERAL

Service	F3. Single or two frequency simplex.
Frequency range	Equipment for 25 to 54 MHz, 68 to 108 MHz and 132 to 174 MHz is described in this manual.
Channel spacing	12.5 kHz, 20/30 kHz or 40-60 kHz.
Antenna	Built-in telescopic whip antenna, flexible whip or flexible wire antenna. 50Ω coaxial socket is provided for connecting an external antenna.
Power supply	16.8 volt battery
Battery endurance (approximate)	Nickel-cadmium battery - 22 hours Dry cells in a cassette - 15 hours Mercury cells in a cassette - 100 hours The above figures assume a transmit-receive ratio of 1:50 for two hours per day.
Current consumption	Receive: 15mA Transmit: 250mA
Controls	OFF-ON (with earphone) - LS (on with loudspeaker). (Note: the microphone acts as an earphone when the loudspeaker is switched off). VOLUME control SQUELCH control CHANNEL switch (on multi-channel equipment) Press-to-Transmit on the microphone.
Dimensions	(Over controls) 9in. high x $5\frac{5}{8}$ in. wide x 2 1/16 in. deep, (22.9 x 14.3 x 5.25 cm.) (In carrying case) $9\frac{3}{4}$ in. x 6 in. x $2\frac{1}{2}$ in. (24.7 x 14.6 x 6.35 cm).
Weight	Approximately 4 lb. 12 oz. (2.1 kg.) in carrying case.

RECEIVER

Sensitivity	0.5μV p.d. for 20dB quieting
Audio output	200mW at less than 10% distortion
Intermediate frequencies	10.7 MHz and 455 kHz
Spurious responses	Better than 60dB down
Selectivity	55dB at ± 12.5 kHz spacing 60dB at ± 25 kHz spacing 60dB at ± 50 kHz spacing
Audio response	Within +1 to -8dB of 6dB/octave de-emphasis from 300 Hz to 3 kHz

TRANSMITTER

Output power	Approximately 1 watt ($\frac{1}{2}$ watt - U.K. equipment)
Output impedance	50Ω
Modulation	Frequency modulation adjustable up to 15 kHz peak deviation
Audio response	Within +1 to -3dB of 6dB/octave pre-emphasis from 300 Hz to 3 kHz
Microphone impedance	2kΩ

COMPONENT CODING

Components can be identified by their reference numbers as follows:-

Receiver R.F. Section	1-50
1st I.F. Section	51-100
2nd I.F. Section	101-150
A.F. and Squelch Section	151-200
Transmitter Audio Section	201-250
Transmitter	251-300

For example: TR103 is in the 2nd I.F. Amplifier section and TR255 is in the transmitter.

CHAPTER II

OPERATION

The Bantam is already pre-tuned to its working frequencies and is thoroughly tested before despatch from the factory.

OPERATING INSTRUCTIONS

All that is necessary to put the Bantam into service is to insert the battery, pull out the telescopic antenna to its fullest extent and switch on. If a separate antenna is to be used leave the telescopic antenna closed and insert the coaxial feeder plug into the socket provided on the front panel. If a shoulder strap antenna is to be used, plug the antenna lead into the external antenna socket. Use the earphone if the location is at all noisy. To transmit, press the transmit switch on the microphone.

BATTERIES

A choice of batteries is available for use with the Bantam. They are:-

(i) Separate dry cells, Ever Ready type U7 or similar, thirteen of which are assembled into the cassette to fit into the battery compartment.

(ii) Mercury cells, Mallory type ⁄M9 or similar, fourteen of which fit into the same cassette.

(iii) Sealed nickel cadmium storage battery (Pye part no. AT25928/2) which is rechargeable.

Fitting the Batteries

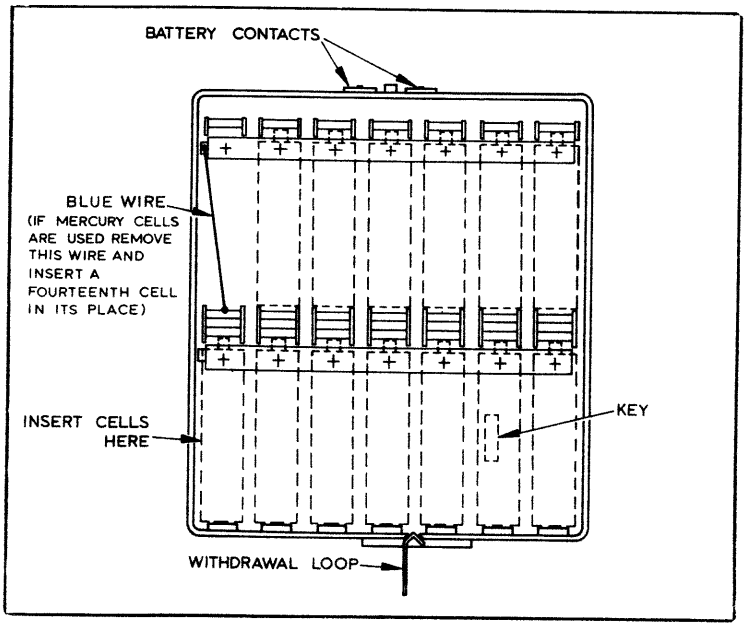


Fig. 1 Battery Cassette

Dry and mercury cells are fitted into a reloadable plastic cassette, part no. AT25929/2. If dry cells are to be used thirteen U7 or similar cells are clipped into the cassette in the positions shown, carefully observing the polarity. The blue wire must be in position. When mercury cells are used the blue wire is removed and a fourteenth mercury cell is inserted in its place.

Full instructions for loading the cassette are given on a label on the cassette itself.

Nickel cadmium cells are supplied as a sealed battery.

To insert the cassette or battery first remove the oblong panel at the bottom of the Bantam case by turning the two small spring fasteners. Fit the cassette or battery firmly into the compartment, ensuring that the key piece is the right way round, and replace the panel.

Checking Batteries

Whichever batteries are employed their terminal voltage should be checked before use. Whenever possible the best way of doing this is to measure the battery terminal voltage on load. Alternatively, the battery terminal voltage can be measured with the Pye Test Meter type TM1.

Dry cells will give a terminal voltage of approximately 21 volts when new, falling slowly throughout their working life. Renew when the open circuit voltage falls below 15 volts. Exhausted or doubtful cells must be removed from the cassette to prevent leakage and corrosion. If there is any doubt about the condition of the battery, a spare should be carried.

The nickel cadmium storage battery should always be charged before use. A constant current charger, type BC1, with complete operating instructions is available for use with this storage battery. If the BC1 charger is not available a completely exhausted battery should be charged at not more than 45mA for 14 hours. Otherwise trickle charge the battery at less than 10mA.

Operating Technique

Correct use of the microphone is essential to obtain the best results from the Bantam. Hold the microphone two or three inches from and a little to one side of the mouth and speak in a normal conversational tone across the face of the microphone.

It will be found that greater range will be obtained when the equipment is working out-of-doors, preferably from high ground unobstructed by trees buildings, machinery etc.

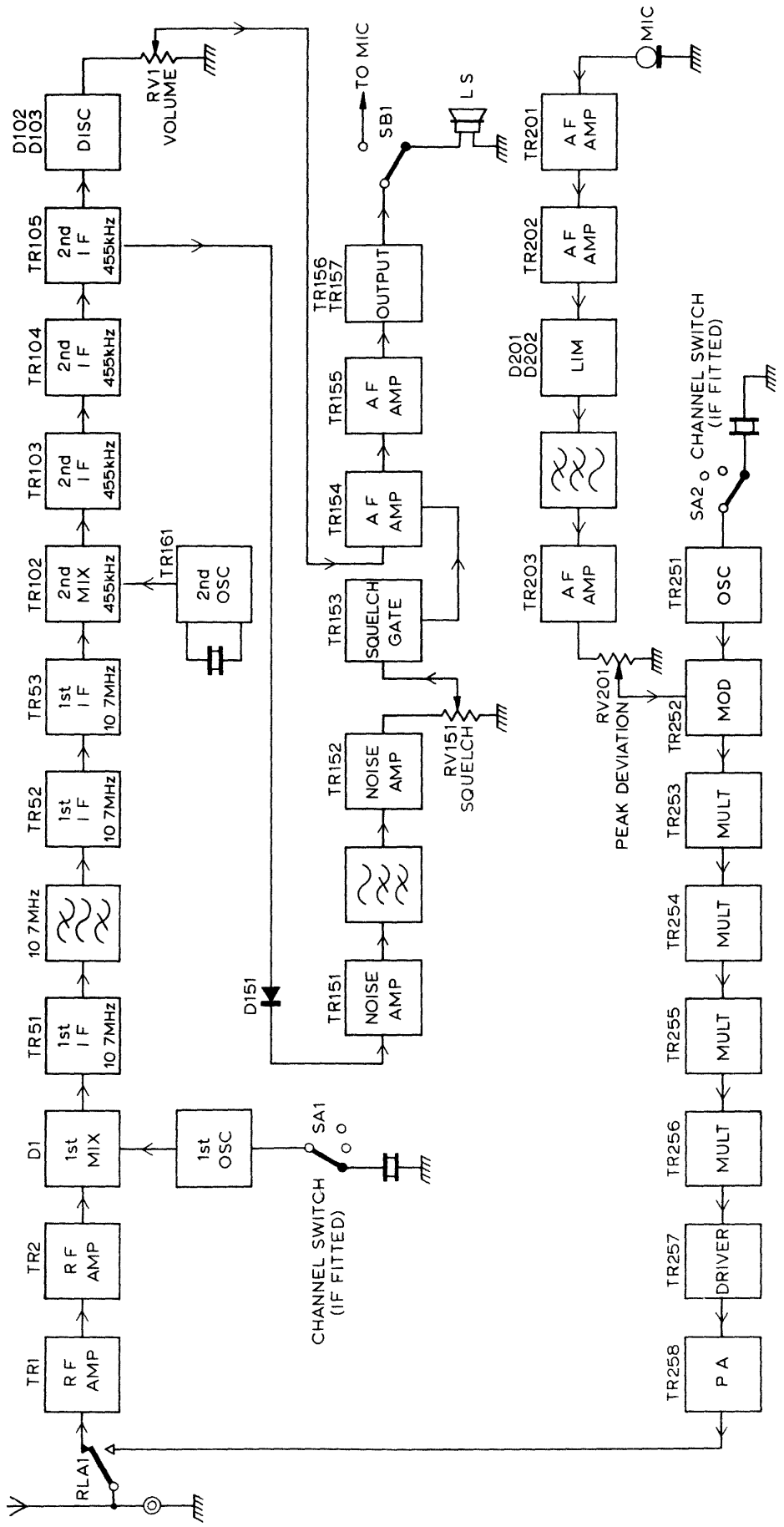


Fig. 2 Bantam Block Diagram

CHAPTER III

CIRCUIT DESCRIPTION

RECEIVER

CIRCUIT FEATURES

The receiver employs eighteen transistors and five diodes in a double-superheterodyne circuit. Two r.f. amplifiers feed a diode mixer which, with a crystal controlled first local oscillator, produces a first i.f. of 10.7 MHz. The three first i.f. amplifier stages include a crystal band pass filter. These are followed by a second mixer/oscillator to produce the second i.f. of 455 kHz. At this frequency one amplifier drives the two limiters which precede the discriminator. The audio voltage produced by the discriminator is fed to the a.f. amplifier via the squelch gate. The a.f. amplifier has two amplifying stages feeding a single-ended push-pull output stage. Output can be fed to either the loudspeaker or the electro-magnetic microphone which then acts as an earphone.

DETAILED DESCRIPTION See Circuit Diagram

Signal input is fed through the antenna changeover relay contact, RLA1, to the tuned circuit L2, C1, C2. L1 is used on A band only and is connected between the whip antenna base and chassis to prevent the closed whip loading the antenna circuit when an external antenna is employed. The tuned circuit matches the antenna impedance of 50Ω to the input impedance of the first r.f. amplifier, transistor TR1. This transistor is connected in a common emitter circuit with the amplified signal output taken from the transformer, T1, in the collector circuit. The second r.f. amplifier stage, TR2, has a similar circuit. The collector of TR2 has two tuned circuits, L3, C9 and L4, C11 which are capacitively coupled through C10. This arrangement gives the necessary r.f. bandpass characteristic. TR1 and TR2 are series connected across the d.c. supply, the collector of TR1 being fed from the emitter of TR2.

The first mixer is a diode, D1. It is directly coupled to L4 and is fed by a local oscillator, TR3. A 10.7 MHz i.f. is developed across the tuned circuit formed by the primary of T51 and C51.

TR3 is a crystal oscillator with the crystal, selected by the channel selection switch if fitted, operating in the series mode at its third overtone. The exact frequencies of oscillation can be adjusted by the variable inductors L5, L6 and L7. For the exact crystal frequency, see the Crystal Information section in Chapter IV.

On the high bands a harmonic of the oscillator is selected by L9, C17, L10, C19 and fed to the mixer diode. On G H and J Band the diode D1 is fed directly from the collector of TR3.

To prevent the mixing voltage from being short circuited to chassis through T51, the network formed by L51 is placed between the mixer diode, D1 and the first i.f. transformer, T51. This network has a high impedance at the signal and local oscillator frequencies but a low impedance at the first i.f. of 10.7 MHz. R52 and C52 form a biasing network to set the mixer diode to its optimum working point.

First I.F. Amplifier

Three stages are used, TR51, TR52 and TR53. All are operated as common emitter amplifiers. TR51 is inductively coupled to the mixer diode by T51. This stage feeds TR52 through the 10.7 MHz crystal bandpass filter unit FL51. This filter can have a bandpass characteristic which is suitable for 12.5 kHz, 25 to 30 kHz or 50 to 60 kHz channel spacing. Which filter characteristic is used depends upon the channel spacing required by the customer. The appropriate filter is fitted during manufacture.

The output from TR53 is coupled through T53, the secondary winding of which feeds the 10.7 MHz signal to the base of TR102, the second mixer.

Second I.F. Section

TR101 is the second local oscillator and is connected in a crystal controlled circuit working at 11.155 MHz, (or, for certain signal frequencies, 10.245 MHz). Output is taken from the emitter through C105 to the base of the mixer, TR102. The second intermediate frequency of 455 kHz is taken from the collector of TR102 by L101, C109 and fed via C110 and T101 to the 455 kHz amplifier stage TR103 and the limiter stages TR104, TR105 which drive the discriminator through T104.

D101 enables the signal level at the limiter input (TR105) to be measured.

Note: D.C. Connection

As in the r.f. section, the transistors employed in the i.f. stages are connected in series across the d.c. supply. This means that 16.8 volts from the line is applied to the collector of TR53, the emitter of which feeds the collector of TR52 which in turn feeds TR51. Similarly TR101 feeds TR102, and TR105 feeds TR104 and TR103. This arrangement reduces the current drain of the receiver thereby increasing the battery life.

Discriminator

D102, D103 are connected in a Foster Seeley discriminator circuit. A.F. signals are developed across the Volume control and fed via the de-emphasis network, R126 C131 and R125 to the a.f. amplifier.

Squelch Gate

A.F. output from the discriminator is passed to the base of the first a.f. amplifier TR154. The emitter and base potentials of this stage are controlled by the squelch gating transistor, TR153. The current flow through TR153 cuts off TR154 preventing it from passing a.f. signals and also reduces the base/emitter potential of TR155 so that it is also cut off.

The squelch gate transistor, TR153, is fed from the output of limiter stage, TR105, via the noise amplifier, TR151, and noise rectifier, TR152.

In the absence of any signal, noise appearing at the collector of TR105 is rectified by D151 and biases the noise amplifier, TR151, into conduction. This stage then amplifies the noise and passes it to TR152 via a high pass filter formed by C154, C156, C157 and R155. This filter ensures that only noise will silence the Bantam. The noise is detected by TR152 and the resultant d.c. causes TR153 to conduct switching off TR154 and TR155.

When a signal appears, TR105 limits sharply and the a.m. noise output is very much reduced. The current through TR153 is then reduced and TR154 conducts allowing a.f. signals from the discriminator to pass into the a.f. amplifier.

A.F. Amplifier

A.F. signals from the discriminator are fed through TR154 which is controlled by the squelch circuit, to TR155. This stage drives the output transistors, TR156, TR157, which are connected as a single ended push-pull output stage. The output is coupled via C164 and the ON-OFF, LS switch to either the loudspeaker or the microphone (acting as an earphone).

TRANSMITTER

CIRCUIT FEATURES

The transmitter is crystal controlled and employs up to eight transistors in the r.f. section and three in the audio section. Frequency modulation is employed and up to three working frequencies can be selected by the channel switch. When more than one channel is used, the working frequencies must be within a band which is ± ½% the nominal frequency or the performance of the Bantam will be seriously affected due to misalignment of tuned circuits.

DETAILED DESCRIPTION

R.F. Section

TR251 is a crystal controlled oscillator and uses one of the crystals, XL201, XL202 or XL203, as selected by the Channel switch SA2. The exact frequency of each crystal can be calculated from the formula given in the Crystal

Information section of Chapter IV, and can be adjusted by shunt capacitors, C251, C252, C253. Output is taken from the emitter through C260 to the base of the modulator stage, TR252. Audio voltage from the transmitter audio amplifier is applied to the emitter of TR252 which phase modulates the r.f. voltage developed across L251. There follow four more multiplier stages TR253 - TR256, a driver stage, TR257, and the power amplifier, TR258. From TR253 to TR255, double tuned circuits are employed between each stage to reduce unwanted harmonics. The p.a. tank circuit is coupled to the antenna circuit by C291.

Transmitter Audio Section

When the Press-to-Transmit switch on the microphone is pressed, the microphone is connected through C201 to the base of TR201 which is connected as a differentiator to provide a 6dB per octave pre-emphasis characteristic. TR202 is a voltage amplifier which drives the series limiter diodes, D201, D202 which are biased into conduction by a current flow through R212, R211, R213. When the audio input voltage exceeds this bias, it is clipped by the diodes. Harmonics produced by the clipping are filtered off by C208, L201, C209. The output from the filter feeds the phase modulator driver TR203, which introduces a 6dB per octave de-emphasis slope to compensate for the phase modulation characteristic and so produce a true f m. signal The output from TR203 is fed to the modulator, TR252, through RV201 which controls the maximum deviation

POWER SUPPLY

The Bantam is powered by either dry or mercury cells, or a rechargeable nickel cadmium battery. The terminal voltage is nominally 16.8 volts and the equipment is switched on by a single contact on the ON-OFF-LS switch, SB2 .

The receiver common supply line is positive since with the exception of TR152 TR155 and TR157, all of the receiver transistors are p.n.p. types. In the transmitter stages which employ n.p.n. types, the reverse applies

Relay RLA is energised when the Press to Transmit switch on the microphone is pressed Contact RLA1 changes over the antenna from the receiver to the transmitter whilst RLA2 transfers the battery from the receiver to the transmitter

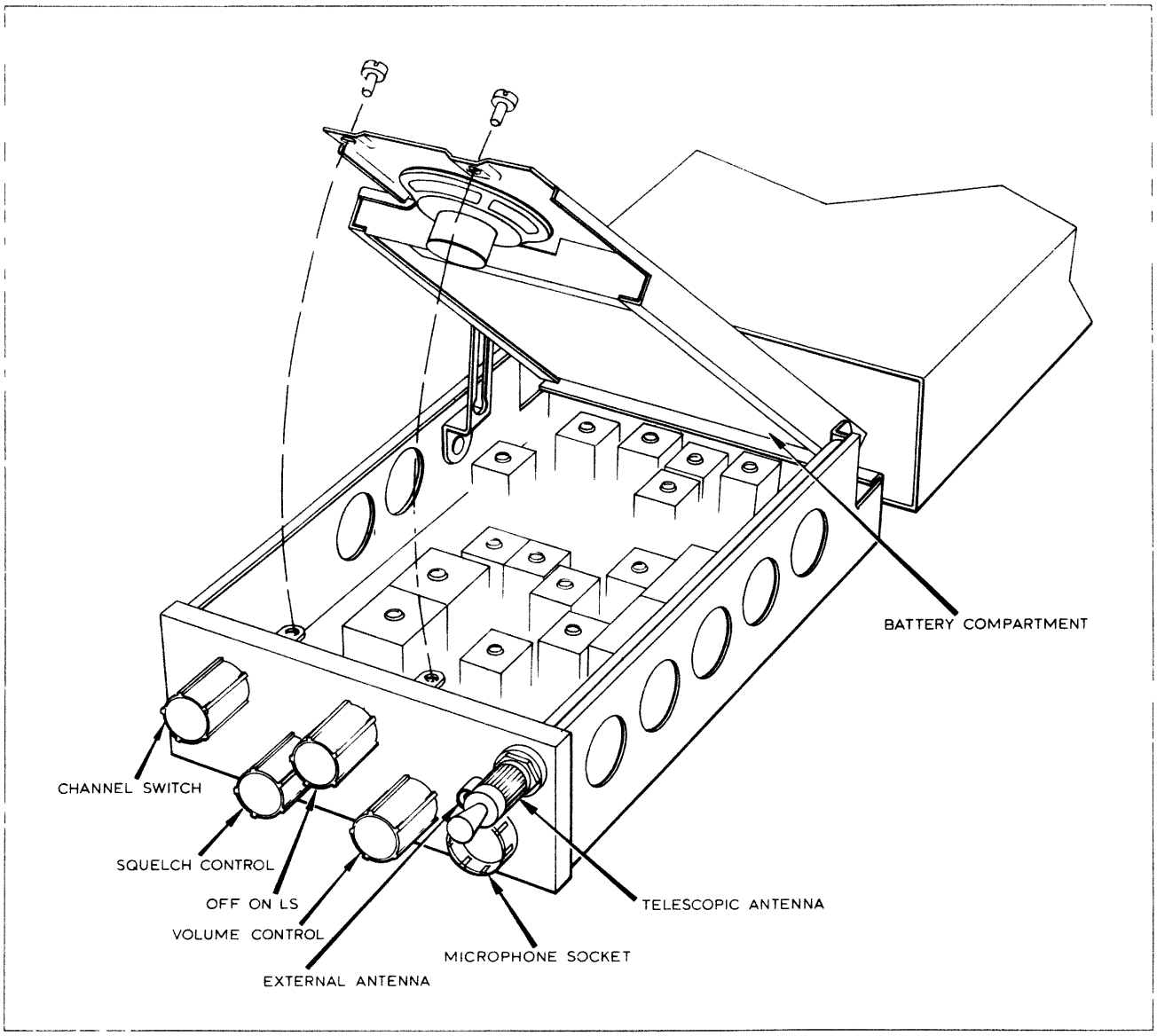


Fig. 3 Dismantling Diagram

CHAPTER IV

SERVICING

In this chapter full information is given to allow a service engineer to test and align the Bantam, to check the performance and generally maintain its efficiency. Also included are notes dealing with transistors and printed circuits together with other data to assist in fault tracing.

DISMANTLING

1. To remove the case, loosen the captive screw below the battery panel and slide the Bantam forwards out of its case.

2. The loudspeaker and battery compartment are carried on a panel which is hinged at the bottom of the frame carrying the printed circuit assembly. Remove the two screws holding this panel and swing the panel up to give access to the top of the printed circuit board.

SERVICING TRANSISTOR CIRCUITS

Some transistors are easily damaged by overheating, excessive current or reversed power supply polarity. Special care should be taken when dealing with Bantam printed circuit boards, particularly when fault tracing, and the following points should be remembered.

1. Small test meter prods and suitably insulated crocodile clips should be used to reduce the risk of accidental short circuits.

2. On completing a repair make sure that transistor, diode and electrolytic capacitor connections are the right way round.

3. Make it a habit, whilst soldering, to grip the wire between the transistor and the connection with a pair of snipe nosed pliers or tweezers to prevent excessive heat reaching the transistor.

4. Transistors can also be damaged by the voltage present on the terminals of test equipment or between an a.c. operated soldering iron and earth. It is preferable to use a low voltage soldering iron. Ensure that the equipment is isolated from the power supply or test equipment when soldering. This will prevent earth currents from damaging the transistors. Always set the output controls on the signal generators and similar equipment to MINIMUM before connecting them to the Bantam. Increase the output to the required level afterwards.

5. Make as much use as possible of high impedance test equipment such as the oscilloscope and valve voltmeter.

6. Never use continuity testers of the buzzer type.

7. Do not remove or replace components with the power supply on.

8. Care is needed when working on the Bantam to avoid damaging the thin metal foil circuitry, especially when soldering.

9. Make sure that the wire ends of the replacements are thoroughly clean before attempting to re-solder them to the board. A 60/40 resin cored solder is recommended. Remove any excess solder carefully.

GENERAL

1. Care must be taken never to connect the receiver and transmitter "chassis" lines together as the battery will be short circuited when the Press-to-Transmit switch is operated.

ROUTINE MAINTENANCE

Required Test Equipment

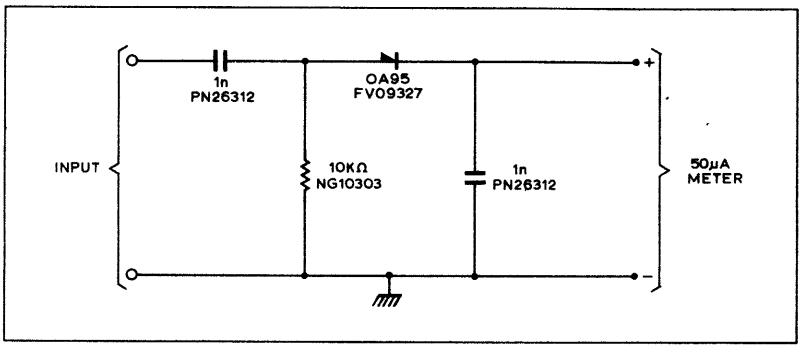


Fig.4 Diode Probe
(Sensitivity approx. 100μA/volt)

1. Hum-free 16.8 volt d.c. supply, preferably current limited.
2. H.F. Valve Voltmeter, or a Diode Probe (Fig.4, used with an AVO 8 or Pye Test Meter, type TM1). (See Fig.10).
3. Audio power output meter capable of reading up to 0.5 watts at 80Ω impedance.
4. Signal Generator (Marconi TF995A).
5. Multi-range Meter 20,000Ω per V. (Pye type TM1, or AVO 8).
6. R.F. power output meter reading up to 1 watt full scale. (See Fig.4a)
7. 455 kHz Crystal Marker Oscillator (Pye PT 503).
8. A.F. Signal Generator.
9. Carrier Deviation Meter, (Marconi TF 791C), or similar.

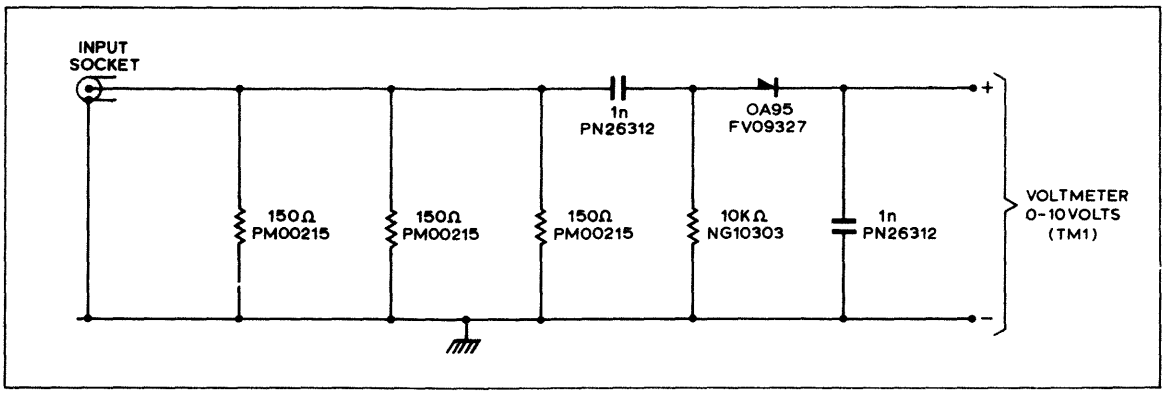


Fig.4A R.F. Power Output Indicator

General Checks

1. Remove the Bantam from its case and examine the circuit board for obvious damage. Remove dust with an air blower.

2. Connect the power supply. If possible communicate with the base station on all channels. Operate the Bantam transmitter on all channels with the Diode Probe as a dummy load. Check the operation of the relay.

Field Checks

1. Test the battery before it is inserted into the Bantam. If a nickel cadmium battery is used, make sure that it is fully charged.

2. Operate the Bantam on all channels and check the squelch control. If there is any doubt about the operation, test by adjusting the squelch control until the set is just silenced and then inject a signal from a 455 kHz marker oscillator into the second i.f. section. The squelch gate should open when the oscillator is switched on.

3. Working Frequencies

The exact working frequencies of the equipment have been carefully adjusted with high accuracy frequency measuring equipment during manufacture. Although these settings will hold good for a long time, it is advisable to check the working frequencies from time to time.

If the Bantam is used in conjunction with a high power base station, the frequencies can be checked by the procedure given below.

Under no circumstances should the setting of the transmitter or receiver crystal trimmers be altered without reference to a frequency sub-standard or to the associated base station.

Receiver

1. Arrange for the base station to transmit an unmodulated carrier.

2. Switch on the 455 kHz crystal marker oscillator (PT 503) and hold it close to the second i.f. section of the Bantam.

3. If an audio beat is heard in excess of 500 Hz for 12.5 kHz channel spacing, 1000 Hz for 25 kHz channel spacing, or 2000 Hz for 50 kHz channel spacing, the appropriate Bantam receiver crystal trimmer, L5, L6 or L7, should be adjusted for zero beat. Repeat this procedure on all of the working channels.

Transmitter

1. Switch on the Bantam transmitter and arrange for the base station to monitor the transmission with a crystal marker oscillator switched on and held close to the appropriate i.f. of the base station receiver. The marker oscillator frequency should be suitable for the base station employed.

2. If the beat note heard at the base station is outside the tolerance given in (3) above the appropriate transmitter crystal trimmer in the Bantam (C251, C252, C253) should be adjusted for zero beat as reported by the base station. On no account should be base station trimmers be altered. Repeat the procedure on all channels.

RECEIVER PERFORMANCE

A more rigorous check on the performance of the Bantam is given below. Figures for normal operation are given. For alignment procedures, see the chart at the back of this manual.

1. Check the second local oscillator

   Using the valve voltmeter (or Diode Probe with the AVO 8 or TM1 meter) check that the local oscillator injection voltage at the emitter of TR101 is at least 0.5 volts.

2. Check the first local oscillator

   Transfer the valve voltmeter (or Diode Probe) to the junction of D1 and L51. The injection voltage should be at least 0.25 volts.

3. Check the overall sensitivity

   Connect the signal generator to the antenna socket and the d.c. voltmeter, set to the 2.5V range across C130. Set the OFF-ON-LS switch on the Bantam to ON, inject an r.f. signal of 2mV e.m.f. Adjust the signal generator frequency to obtain zero balance reading on the meter.

Connect the audio output meter, set to 80Ω impedance, between pins C and E of SKA. Switch off the signal generator, turn the Squelch control fully clockwise and adjust the Volume control to obtain a noise output of 100mW on the audio output meter.

Switch on the signal generator and reduce its output until the noise output is 20dB below that obtained with the signal generator switched off.

Check that a change in the noise level of 20dB is obtained when the signal generator is switched on and off. The signal generator output, to obtain 20dB quieting should be 1.0μV e.m.f. or less.

4. Check the Signal-to-Noise ratio

With the signal generator and the audio output meter connected as in (3) above, inject an r.f. signal of 1.6μV e.m.f. modulated 30% (±750 Hz for 12.5 kHz channel spacing, ±1.5 kHz deviation for 25 kHz channel spacing or ±4.5 kHz deviation for 50 kHz channel spacing) at 1000 Hz.

Adjust the Volume control to obtain an audio output of 100mW. Note the reading on the dB scale. Switch off the modulation and again note the difference in output in dB. This difference is the approximate signal-to-noise ratio which should be at least 20dB.

5. Check the Squelch

Set the Squelch control to the threshold of operation with no incoming signal. With the signal generator connected to the antenna socket, check that the squelch opens on an unmodulated signal which gives 20dB quieting.

6. Check the Audio Output

With the signal generator and audio output meter as in (3) above, inject an r.f. signal of 2mV e.m.f. modulated 30% (i.e. ±750 Hz for 12.5 kHz channel spacing, ±1.5 kHz deviation for 25 kHz channel spacing or ±4.5 kHz for 50 kHz channel spacing) at 1000 Hz. Adjust the Volume control to obtain an audio output of 100mW. Reduce the modulation frequency to 400 Hz and check that the audio output is at least 3dB greater. Check with an oscilloscope across the A.F. Power Meter, that when the Volume control is turned further clockwise audio clipping occurs with not less than 200mW output.

TRANSMITTER PERFORMANCE

An alignment procedure is given at the back of this manual

1. Check each r f. stage

Measure the d c voltage between chassis and the collector of each transistor

Typical voltages only -

	A & B BANDS	D BAND	E & F BANDS	C, H & J BANDS
TR251 (R253)	3.5	2 3	2 5	3.5
TR252 (R258)	3 5	3.0	3 2	3.6
TR253 (R263)	5 0	3 5	3 [illegible]	4 3
TR254 (R265)	0 5	10 0	11	5 0
TR255 (R266)	0 6	6 3	6 3	-
TR256 (R268)	0 5	8 0	[illegible] 0	4 4
TR257 (R270)	1.6	2 0	6 6	14 4
TR258 (R273)	1.4	1 4	1 4	1.5

2. Check the modulator

Connect the R F Power Meter, and loosely couple the Carrier Deviation meter to the dummy load via a 2pF capacitor Connect the a f oscillator across the modulation input (i e SKA pins D and C) Switch on With an audio input of 12mV, ±3dB at 1000 Hz, check that 50% peak deviation (i e ±1 25 kHz for 12 5 kHz channel spacing, ±2 5 kHz for 25 kHz channel spacing ±7 5 kHz for 50 kHz channel spacing) is obtained Raise the audio input level by 20dB (i e to 120mV) and check that peak deviation is obtained (± 2 5 kHz for 12 5 kHz channel spacing ±5 kHz for 25 kHz channel spacing and ±15 kHz for 50 kHz channel spacing)

3 Check the carrier for noise by listening on a monitor receiver or by monitoring the deviation meter output Speak into the microphone and ensure that the modulation is satisfactory

4 Check the output power which should be at least 0 5 watts Remove all test gear and call up the base station for a final check

If there is any serious deterioration in performance, carry out the alignment procedure

CHANGING TRANSISTORS

If any transistors in the Bantam are changed, that section should be realigned and the receiver or transmitter performance, whichever is affected, re-checked

But special care should be taken if TR202, TR203 or TR252 in the modulator are changed, since the value of R209 and/or L251 will require adjustment

Similarly, if TR257, TR258 are changed then the value of R269 will require adjustment.

1. Changing TR202, TR203

If either of these transistors is changed the following procedure should be carried out:-

(a) Connect a dummy load to the antenna socket, loosely couple a Carrier Deviation meter to it and switch on the transmitter. Inject an a.f. input of 1 kHz at 120mV, into pins C and D on SKA and adjust the Peak Deviation control, RV201, for peak deviation (±2.5 kHz for 12.5 kHz channel spacing ±5 kHz for 25 kHz channel spacing, ±15 kHz for 50 kHz channel spacing).

(b) Reduce the a.f. input to 12mV ±3dB and adjust the value of R209 (See Parts List) for 50% deviation (i.e. ±1.25 kHz for 12.5 kHz channel spacing, ±2.5 kHz for 25 kHz channel spacing, ±7.5 kHz for 50 kHz channel spacing).

2. Changing TR252

If TR252 is changed, L251 must be adjusted as follows:-

(a) Inject a 300 Hz sine wave voltage into pins C and D on SKA. With a dummy load and Carrier Deviation meter at the antenna socket, switch on the transmitter.

(b) Adjust the a.f. generator output to give ±10 kHz deviation. Observe the waveform of the demodulated signal with an oscilloscope coupled to the deviation output.

(c) Adjust L251 for minimum distortion.

(d) Carry out checks for peak deviation and 50% deviation given in 1 (a) and (b) above.

3. Changing TR257, TR258

If TR257 or TR258 are changed, select the value of R269 (See Parts List) so that the voltage developed across R273 is 1.2 to 1.8 volts. This reading must coincide with an r.f. output of 0.5 to 1.0 watt.

D. C. RESISTANCE OF INDUCTORS

		Resistance
T51	Primary	Less than 1Ω
	Secondary	
T52	Primary	
	Secondary	
T53	Primary	
	Secondary	
L101		10Ω
T101	Primary	10Ω
	Secondary	1Ω
T102	Primary	10Ω
	Secondary	1Ω
T103	Primary	10Ω
	Secondary	1Ω
T104	Primary	10Ω
	Secondary	1Ω
L102		1Ω
L201		20Ω
T151	Primary	20Ω
	Secondary	3Ω

VOLTAGE ANALYSIS FOR HP1FM

The equipment under test should be fitted with a new or recharged battery or alternatively it should be connected to a smoothed d.c. supply of 16.8 volts.

1. Connect the positive lead of the test meter to the positive side of the supply and apply the negative test meter lead to the following test points.

	Test Points	Voltage
1.	Across power supply	16.8 ± 0
2.	Junction of R121, R120	16.2 ± 0.4
3.	" " R115, R122	11.3 ± 0.8
4.	" " R110, R116	5.3 ± 1.0
5.	" " R101, R102	16.1 ± 0.5
6.	" " R104, R105	8.0 ± 1.0
7.	" " R63, R64	16.2 ± 0.4
8.	" " R59, R65	11.2 ± 0.8
9.	" " R55, R60	5.1 ± 1.0
10.	" " R5, R6	16.0 ± 0.4
11.	" " R1, R7	8.2 ± 1.0
12.	" " R12, R14	13.0 ± 1.0
13.	" " L8, R13	2.1 ± 0.5
14.	" " R169, R170	8.4 ± 0.4
15.	" " R163, R164	15.3 ± 0.5
16.	" " C163, R164	15.3 ± 0.5

2. Connect the negative lead of the test meter to the negative side of the supply and apply the positive test meter lead to the following test points.

	Test Points	Voltage
1.	Junction of TR201e, R203	1.4 ± 0.2
2.	" " TR201c, R204	10.6 ± 1.0
3.	" " R205, R207	3.5 ± 0.5
4.	" " D201, R212	11.0 ± 1.0
5.	" " D201, R211	10.5 (equal or not more than 0.6V below 4)
6.	" " D202, R213	10.5 Ditto.
7.	" " R216, R217	1.8 ± 0.4

	Test Points (Cont.)	Voltage
8.	Junction of TR203e, R218	1.25± 0.4
9.	" " TR203c, RV201	9.6 ± 1.0
10.	" " TR251e, R254	5.8 ± 1.0
11.	" " TR251c, R253	14.2 ± 1.0
12.	" " TR252e, R259	2.2 ± 0.5
13.	" " L251, R258	13.8 ± 1.0

CRYSTAL INFORMATION

RECEIVING SECTION

Multiplication Factors

Carrier Freq. (MHz)	Band	Multiplication factor
148 - 174	A	3
132 - 156	B	3
88 - 108	D	3
79 - 101	P	2
68 - 88	E	2
25 - 54	G, H & J	1

CRYSTAL FORMULAE (EXCEPT U.S.A. and CANADA)

1st Local Oscillator

Carrier Freq. (fc) MHz	Crystal Frequency	Crystal Specification No. (Channel Spacing) 50 kHz	25 kHz	12.5 kHz
148 - 174	$\frac{fc - 10.7}{3}$	P58J/CB	P55J/CB	P55J/CB
132 - 156	$\frac{fc - 10.7}{3}$	P57J/CB	P58J/CB	
88 - 108	$\frac{fc - 10.7}{3}$	P57J/CB	P58J/CB	
79 - 101	$\frac{fc - 10.7}{2}$	P58J/CB	P58J/CB	
68 - 88	$\frac{fc - 10.7}{2}$	P57J/DB	P57J/CB	P57J/CB
42 - 54	$\frac{fc - 10.7}{1}$	P57J/CB	P57J/CB	
25 - 42	fc + 10.7	P57J/CB	P57J/CB	

2nd Local Oscillator

Specification No. P53J

The second oscillator crystal will be normally 11.155 MHz except when the assigned frequency is within ±100 kHz of any of the following requirements, when it will be 10.245 MHz.

33.465, 44.620, 78.085, 89.240, 100.395, 133.860, 145.015, 156.170, 167.325 MHz.

TRANSMITTER SECTION

Multiplication Factors

Band	Carrier Freq.	TR253	TR254	TR255	TR256	Total
A	148-174 MHz	3	3	2	2	36
B	132-156 MHz	3	3	2	2	36
D	88-108 MHz	2	3	2	2	24
P	79-101 MHz	2	3	2	2	24
E	68-88 MHz	2	3	2	2	24
G	42-54 MHz	2	3	-	2	12
H	32.5-42 MHz	2	3	-	2	12
J	25-32.5 MHz	2	3	-	2	12

Specification No.

Band	50 kHz	25 kHz	12.5 kHz
A	T 18	T 25	T 25
B	T 18	T 18	
D	T 18	T 18	
P	T 18	T 18	
E	T 19	T 18	T 18
G	T 19	T 18	
H	T 19	T 18	
J	T 19	T 18	

APPENDIX

When a Bantam is supplied uncrystallised and with a carrying strap antenna, the antenna should be cut and assembled as follows:-

1. The carrying strap and antenna are supplied separately. The antenna consists of a length of metal braid fitted at one end with a short piece of insulating flexible tube and a miniature coaxial socket. Cut the antenna for the frequency required in accordance with the Antenna Cutting Chart in the back of the Bantam manual.

2. Attach the free end of the antenna to the loop of the cord pull-through already in the carrying strap by folding the last $\frac{1}{4}$ in. or so of the antenna through the loop and fixing it with a spot of solder.

3. Pass the antenna into the strap by pulling on the other end of the pull through cord. Take off any buckles on the strap to allow the antenna to pass easily.

4. When all of the antenna up to the insulating sleeve is inserted cut off the surplus pull-through cord.

5. Assemble the carrying strap and attach it to the Bantam case. The antenna plug fits into the miniature socket on the front panel of the Bantam.

PARTS LISTS

AND

DIAGRAMS

ORDERING OF SPARE PARTS

To avoid delays and possible errors in the supply of spare parts the reference numbers shown in these parts lists should be quoted in all orders.

The right is reserved to fit alternative types of semiconductors with equal or improved performance to those quoted in the Parts Lists.

R.F. & 1st OSCILLATOR

CAPACITORS

Code	Value	Freq. MHz	Part No.
C1	100pF	25-32.5	PP08508
	56pF	32.5-42	PP07205
	33pF	42 - 54	PP06174
	10pF	68 - 88	PN09031
	12pF	79 -101	PN09111
	10pF	88 -108	PN09031
	15pF	132-156	PN10037
	12pF	148-174	PN09111
C2	470pF	25-32.5	PP11251
	250pF	32.5-42	PP10158
	150pF	42 - 54	PP09405
	47pF	68 - 88	PP06671
	100pF	79 -101	PP08508
	100pF	88 -108	PP08508
	56pF	132-156	PP07205
	47pF	148-174	PP06671
C3	100pF	25-32.5	PP08508
	56pF	32.5-42	PP07205
	33pF	42 - 54	PP06174
	10pF	68 - 88	PN09031
	12pF	79 -101	PN09111
	10pF	88 -108	PN09031
	12pF	132-156	PN09111
	10pF	148-174	PN09031
C4	2nF		PN33301
C5	2nF		PN33301
C6	2nF		PN33301
C7	2nF		PN33301
C8	2nF		PN33301
C9	82pF	25-32.5	PP08203
	47pF	32.5-42	PP06671
	27pF	42 - 54	PP05869
	10pF	68 - 88	PN09031
	10pF	79 -101	PN09031
	10pF	88 -108	PN09031
	15pF	132 -156	PN10037
	10pF	148-174	PN09031
C10	0.3pF	25-32.5	PN00001
	0.3pF	32.5-42	PN00001
	0.7pF	42 - 54	PN00013
	0.3pF	68 - 88	PN00001
	0.3pF	79 -101	PN00001
	0.3pF	88 -108	PN00001
	0.2pF	(10mΩ res. used as cap.) 132-156	PM00273
	0.2pF	(10mΩ res. used as cap.) 148-174	PM00273
C11	100pF	25-32.5	PP08508
	56pF	32.5-42	PP07205
	33pF	42 - 54	PP06174
	12pF	68 - 88	PN09111
	10pF	79 -101	PN09031
	10pF	88 -108	PN09031
	18pF	132-156	PN10118
	15pF	148-174	PN10037
C12	33pF		PP06174

CAPACITORS (Cont.)

Code	Value	Freq. MHz	Part No.
C13	47pF	25 -156	PP06671
	68pF	148-174	PP07654
C14	15pF	25 -156	PP05015
	22pF	148-174	PP05639
C15	2nF		PN33301
C16	2nF		PN33301
C17		25 - 54	
	12pF	68 - 88	PN09111
	15pF	79 -101	PN10037
	12pF	88 -108	PN09111
	15pF	132-156	PN10037
	12pF	148-174	PN09111
C18		25 - 54	
	0.3pF	68 - 88	PN00001
	0.3pF	79 -101	PN00001
	0.3pF	88 -108	PN00001
	0.3pF	132-156	PN00001
	0.3pF	148-174	PN00001
C19		25 - 54	
	15pF	68 - 88	PN10037
	22pF	79 -101	PP05639
	15pF	88 -108	PN10037
	18pF	132-156	PN10118
	15pF	148-174	PN10037
C20		25 - 54	
	47pF	68 - 88	PP06671
	39pF	79 -101	PP06405
	15pF	88 -108	PN10037
	56pF	132-156	PP07205
	47pF	148-174	PP06671
C21	39pF	25-32.5	PP06405
	39pF	32.5-42	PP06405
	39pF	42 - 54	PP06405
		68 -174	
C22	6.8pF	(switch chan only)	PP02601
C23	6.8pF	(switch chan only)	PP02601
C24	6.8pF		PP02601
C27	15pF	25 - 54	PP05013

RESISTORS

R1	39kΩ		PM01455
R2	6.8kΩ		PM01446
R3	560Ω		PM01433
R4	6.8kΩ		PM01446
R5	39kΩ		PM01455
R6	470Ω		PM01432
R7	560Ω		PM01433
R8	680Ω	(switch chan only)	PM01434
R9	680Ω	(switch chan only)	PM01434

R.F. & 1st OSCILLATOR (Cont.)

RESISTORS

Code			Part No.
R10	680Ω		PM01434
R11	12kΩ		PM01449
R12	47kΩ		PM01456
R13	470Ω		PM01432
R14	1kΩ		PM01436
R15	470Ω	32.5-54	PM01432
		68 -174	
†R16	10kΩ		PM01448

† May be fitted during manufacture

INDUCTORS

L1	25-32.5	
	32.5-42	
	42 - 54	
	68 - 88	
	79 -101	
	88 -108	
	132-156	AT31226/1
	148-174	AT31226/1
L2	25-32.5	278584/16
	32.5-42	278584/16
	42 - 54	278584/16
	68 - 88	278584/16
	79 -101	278584/6
	88 -108	278584/6
	132-156	278665
	148-174	278665
L3	25-32.5	278584/12
	32.5-42	278584/12
	42 - 54	278584/12
	68 - 88	278584/12
	79 -101	278584/22
	88 -108	278584/22
	132-156	278665/1
	148-174	AT31750/1
L4	25-32.5	278584/31
	32.5-42	278584/31
	42 - 54	278584/31
	68 - 88	278584/31
	79 -101	278584/35
	88 -108	278584/35
	132-156	278665/10
	148-174	278665/10
L5	25-32.5	AT31608/12
	32.5-42	AT31608/11
	42 - 54	AT31608/10
	68 - 88	AT31608/7
	79 -101	AT31608/2
	88 -108	AT31608/9
	132-156	AT31608/6
	148-174	AT31608/6

INDUCTORS (cont)

Code	Freq. MHz	Part No.
L6	25-32.5	AT31608/1
	32.5-42	AT31608/1
	42 - 54	AT31608/1
	68 - 88	AT31608/7
	79 -101	AT31608/2
	88 -108	AT31608/9
	132-156	AT31608/6
	148-174	AT31608/6
L7	25-32.5	AT31608/1
	32.5-42	AT31608/1
	42 - 54	AT31608/1
	68 - 88	AT31608/7
	79 -101	AT31608/2
	88 -108	AT31608/9
	132-156	AT31608/6
	148-174	AT31608/6
L8		FT05511
L9	25-32.5	
	32.5-42	
	42 - 54	
	68 - 88	278584/32
	79 -101	AT31614/1
	88 -108	AT31614/2
	132-156	278665/1
	148-174	278665/1
L10	25-32.5	
	32.5-42	
	42 - 54	
	68 - 88	278584/33
	79 -101	278584/36
	88 -108	AT31614/3
	132-156	278665/12
	148-174	278665/12
L11	25-32.5	AT31751/1
	32.5-42	AT31610/7
	42 - 54	AT31610/6
	68 - 88	
	79 -101	
	88 -108	
	132-156	
	148-174	

TRANSFORMERS

T1	25-32.5	278584/15
	32.5-42	278584/15
	42 - 54	278584/15
	68 - 88	278584/15
	79 -101	278584/21
	88 -108	278584/21
	132-156	278665/8
	148-174	278665/8

R.F. & 1st OSCILLATOR (Cont.)

TRANSISTORS

Code	Type	Freq. MHz	Part No.
TR1	AFZ11	25 - 54	FV05067
	AFZ12	68 - 88	FV05017
	AFZ12	79 -101	FV05017
	AFZ12	88 -108	FV05017
	GM378B	132-156	FV09827
	GM378B	148-174	FV09827
TR2	AF124	25 - 88	FV05100
	AF124	79 -101	FV05100
	AF124	88 -108	FV05100
	GM378B	132-156	FV09827
	GM378B	148-174	FV09827

TRANSISTORS (Cont.)

Code	Type	Freq MHz	Part No.
TR3	AF124	25 - 88	FV05100
	AF124	79 -101	FV05100
	AF124	88 -108	FV05100
	GM378B	132-156	FV09827
	GM378B	148-174	FV09827

MISCELLANEOUS

D1	S555G	FV09074
	Ant. Socket Co-axial	FS43812
	Antenna	ET00001
XL1-XL3	Crystal frequency to order	

1st I.F. UNIT

CAPACITORS

Code			Part No.
C51	68pF	(Part of TS1)	PP07654
C52	10nF		PN50301
C53	10nF		PN50301
C54	10nF		PN50301
C55	2nF		PN33301
C56	10pF		PP04509
C57	10nF		PN50301
C58	68pF		PP07654
C59	150pF		PP09405
C61	10nF		PN50301
C62	82pF		PP08203
C63	10nF		PN50301
C64	10nF		PN50301
C65	10nF		PN50301
C66	82pF		PP08203
C67	10nF		PN50301

RESISTORS

R51			
R52	1kΩ		PM01436
R53	18kΩ		PM01451
R54	5.6kΩ		PM01445
R55	510Ω	12.5kHz	NG51103
	1kΩ	25 kHz	PM01436
	2.2kΩ	50 kHz	PM01440
R56	820Ω		PM01435
R57	390Ω	12.5 kHz	PM01431
	1.2kΩ	25 kHz	PM01437
	3.9kΩ	50 kHz	PM01443

RESISTORS (cont)

Code		Part No.
R58	5.6kΩ	PM01445
R59	18kΩ	PM01451
R60	820Ω	PM01435
R61	2.7kΩ	PM01441
R62	5.6kΩ	PM01445
R63	18kΩ	PM01451
R64	390Ω	PM01431
R65	820Ω	PM01435
R66	2.7kΩ	PM01441

TRANSFORMERS

T51	278578/17
T52	AT31607/1
T53	AT31607/1

TRANSISTORS

TR51	AF124	FV05100
TR52	AF124	FV05100
TR53	AF124	FV05100

MISCELLANEOUS

		MHz	kHz	
L51	Choke			278582
	Filter	10.7	12.5	FC03220
	Filter	10.7	25	FC03201
	Filter	10.7	50	FC03202

2nd I.F. OSCILLATOR

CAPACITORS

Code	Value/Type		Part No.
C101	39pF		PP06405
C102	10nF		PN50301
C103	220pF		PP10054
C104	100pF		PP08508
C105	33pF		PP06174
C106	0.1µF		PQ32000
C107	0.1µF		PQ32000
C108	0.1µF		PN62305
C109	330pF	Part of L101	PQ10703
C110	10pF	12.5 & 25kHz	PP04509
	22pF	50 kHz	PP05639
C111	330pF	Part of T101	PQ10703
C112	0.1µF		PN62305
C113	330µF	Part of T102	PQ10703
C114	0.1µF		PN62305
C115	0.1µF		PN62305
C116	0.1µF		PN62305
C117	0.1µF		PQ32000
C118	330pF	Part of T103	PQ10703
C119	18pF		PP05400
C120	0.1µF		PN62305
C121	1nF		PN26350
C122	0.1µF		PN26305
C123	0.1µF		PQ32000
C124	12.5µF		PS24144
C125	0.1µF		PN62305
C126	2nF		PP16510
C127	620pF		PP11974
C128	5nF		PQ21012
C129	5nF		PQ21012
C130	3nF		PR06503
C131	0.1µF		PQ32000

RESISTORS

R101	27kΩ		PM01453
R102	470Ω		PM01432
R103	12kΩ		PM01449
R104	2.2kΩ		PM01440
R105	27kΩ		PM01453
R106	5.6kΩ		PM01445
R107	820Ω		PM01435
R108	68kΩ	12.5 & 25kHz	PM01458
	18kΩ	50 kHz	PM01451
R109	68kΩ	12.5 & 25kHz	PM01458
	18kΩ	50 kHz	PM01451
R110	18kΩ		PM01451
R111	5.6kΩ		PM01445
R112	820Ω		PM01435
R113	10kΩ		PM01448

RESISTORS (cont)

Code	Value/Type		Part No.
R114	5.6kΩ		PM01445
R115	18kΩ		PM01451
R116	820Ω		PM01435
R117	100kΩ		PM01460
R118	10kΩ		PM01448
R119	5.6kΩ		PM01445
R120	18kΩ		PM01451
R121	390Ω		PM01431
R122	820Ω		PM01435
R123	10kΩ	12.5 kHz	PM01448
	4.7kΩ	25 kHz	PM01444
	1.8kΩ	50 kHz	PM01439
R124	10kΩ	12.5 kHz	PM01448
	4.7kΩ	25 kHz	PM01444
	1.8kΩ	50 kHz	PM01439
R125	3.9kΩ		PM01443
R126	10kΩ		PM01448
R127	15kΩ		PM01450
RV101	100kΩ		281401

TRANSFORMERS

T101	IF	278578/11
T102	IF	278578/11
T103	IF	278578/11
T104	Disc.	278578/5

TRANSISTORS

TR101	AF124	FV05100
TR102	AF124	FV05100
TR103	AF124	FV05100
TR104	AF124	FV05100
TR105	AF124	FV05100

MISCELLANEOUS

L101		278578/64
L102		278646
D101	OA95	FV09327
D102	HG1012	FV09002
D103	HG1012	FV09002
XL101	11.155 MHz	FC03011
	10.245 MHz	FC03012

SQUELCH & RECEIVER AUDIO

CAPACITORS

Code	Value	Part No.
C151	1nF	PN26350
C152	10nF	PN50301
C153	47nF	PQ29453
C154	1nF	PN26350
C155	0.1µF	PQ32000
C156	2nF	PN33301
C157	10nF	PN50301
C158	6.4µF	PS21000
C159	6.4µF	PS21000
C160	25µF	PS28078
C161	0.47µF	PN65401
C162	10nF	PQ25000
C163	12.5µF	PS24144
C164	125µF	PS38206
C165	25µF	PS28078

RESISTORS

R151	5.6kΩ	PM01445
R152	15kΩ	PM01450
R153	8.2kΩ	PM01447
R154	1.5kΩ	PM01438
R155	10kΩ	PM01448
R156	33kΩ	PM01454
R157	100kΩ	PM01460
R158	22kΩ	PM01452
R159	3.9kΩ	PM01443
R160	33kΩ	PM01454
R161	12kΩ	PM01449
R162	6.8kΩ	PM01446
R163	470Ω	PM01432

RESISTORS (cont)

Code	Value	Part No.
R164	1.5kΩ	PM01438
R165	10kΩ	NE10303
R166	47Ω	NE47003
R167	47Ω	NE47003
R168	10kΩ	NE10303
R169	10Ω	PM01412
R170	10Ω	PM01412
RV151	10kΩ	281400

TRANSISTORS

TR151	NKT223	FV06070
TR152	SE4001	FV07751
TR153	OC200	FV05073
TR154	2S323	FV09802
TR155	SE4001	FV07751
TR156	NKT212) Matched	FV06447
TR157	NKT713) pair	

MISCELLANEOUS

T151		Transformer audio	AL21104
D151		Diode	FV09327
SKA		Socket 7 way	FS43151
LS		Speaker	FS13019
RLA	1250Ω	Relay	FR01092
SB		Switch Off/ On/LS On	FS07006

TRANSMITTER AUDIO

CAPACITORS

Code		Part No.
C201	10nF	PQ25000
C202	12.5µF	PS24144
C203	25µF	PS28078
C204	12.5µF	PS24144
C205	100µF	PS38112
C206	0.1µF	PQ32000
C207	25µF	PS28078
C208	10nF	PQ25000
C209	10nF	PQ25000
C210	25µF	PS28078
C211	22nF	PQ27000
C212	100µF	PS38112
C213	12.5µF	PS24144
C214	2nF	PN33301
C215	2nF	PN33301

RESISTORS

Code		Part No.
R201	39kΩ	PM01455
R202	10kΩ	PM01448
R203	2.2kΩ	PM01440
R204	5.6kΩ	PM01445
R205	10kΩ	PM01448
R206	470Ω	PM01432
R207	39kΩ	PM01455
R208	5.6kΩ	PM01445
* R209	18Ω	PM01415
	22Ω	PM01416
	27Ω	PM01417
	33Ω	PM01418
	39Ω	PM01419
	47Ω	PM01420
	56Ω	PM01421

TRANSMITTER AUDIO

RESISTORS (cont)

Code		Part No.
	68Ω	PM01422
	82Ω	PM01423
	100Ω	PM01424
	120Ω	PM01425
	150Ω	PM01426
	180Ω	PM01427
	220Ω	PM01428
	270Ω	PM01429
	330Ω	PM01430
	390Ω	PM01431
	470Ω	PM01432
R210	2.2kΩ	PM01440
R211	47kΩ	PM01456
R212	12kΩ	PM01449
R213	68kΩ	PM01458
R214	300Ω	PM01430
R215	5.6kΩ	PM01445
R216	12kΩ	PM01449
R217	1.5kΩ	PM01438
R218	220Ω	PM01428
RV201	1.5kΩ	PL02580

TRANSISTORS

Code		Part No.
TR201	SE4001	FV07751
TR202	SE4001	FV07751
TR203	SE4001	FV07751

MISCELLANEOUS

D201	OA200	FV09303
D202	OA200	FV09303
L201	Choke	279840
PLA	Microphone plug 7-way	FP13153
	Microphone & lead assy	AT29650
SC	Microphone switch	FS07002

* Selected on Manufacture

TRANSMITTER

CAPACITORS

Code		Freq. MHz	Part No.
C251	3-10pF	switch chan only	PV05083
C252	3-10pF	switch chan only	PV05083
C253	3-10pF		PV05083
C254	18pF	single chan only	PP05400
	15pF	switch chan only	PP05013
C255			
C256	0.1µF	25 - 68	PN62305
	0.1µF	68 -174	PQ32000
C257	10nF		PN50301
C258	150pF		PP09405
C259	100pF	25-32.5	PP08508
	100pF	32.5-42	PP08508
	100pF	42 - 54	PP08508
	100pF	68 - 88	PP08508
	82pF	79 -101	PP08203
	100pF	88 -108	PP08508
	100pF	132-156	PP08508
	100pF	148-174	PP08508
C260	56pF		PP07205
C261	25µF		PS28078

CAPACITORS (cont)

Code		Freq. MHz	Part No.
C262	130pF	25-32.5	PP09101
	68pF	32.5-42	PP07654
	100pF	42 - 54	PP08508
	47pF	68 - 88	PP06671
	47pF	79 -101	PP06671
	47pF	88 -108	PP06671
	56pF	132-156	PP07205
	56pF	148-174	PP07205
C263	10nF		PN50301
C264	10nF		PN50301
C265	620pF	25-32.5	PQ12100
	220pF	32.5-42	PQ10041
	270pF	42 - 54	PQ10364
	220pF	68 - 88	PQ10041
	220pF	79 -101	PQ10041
	150pF	88 -108	PQ09308
	270pF	132-156	PQ10364
	330pF	148-174	PQ10707
C266	430pF	25-32.5	PQ11253
	250pF	32.5-42	PQ10244
	470pF	42 - 54	PQ11357
	250pF	68 - 88	PQ10244
	150pF	79 -101	PQ09308
	150pF	88 -108	PQ09308

CAPACITORS (Cont)

Code	Value	Freq. MHz	Part No.
	300pF	132-156	PQ10502
	430pF	148-174	PQ11253
C267	10nF		PN50301
C268	0.1μF	25-32.5	PN62305
	10nF	32.4-174	PN50301
C269	240pF	25-32.5	PQ10201
(Part	150pF	32.5-42	PP09405
of	82pF	42 - 54	PP08203
L252)	300pF	68 - 88	PQ10502
	220pF	79 -101	PQ10041
	180pF	88 -108	PP09664
	76pF	132-156	PP08140
	62pF	148-174	PP07555
C270	4.7pF	25-32.5	PP01772
	4.7pF	32.5-42	PP01772
	2pF	42 - 54	PP00501
	4.7pF	68 - 88	PP01772
	4.7pF	79 -101	PP01772
	3.3pF	88 -108	PP01121
	2.7pF	132-156	PN01105
	1pF	148-174	PN00039
C271	300pF	25-32.5	PQ10502
(Part	180pF	32.5-42	PP09664
of	120pF	42 - 54	PP08869
L253)			
	300pF	68 - 88	PQ10502
	220pF	79 -101	PQ10041
	200pF	88 -108	PQ10004
	82pF	132-156	PP08203
	68pF	148-174	PP07654
C272	10nF		PN50301
C273	10nF		PN50301
C274	39pF	25-32.5	PP06405
(Part	22pF	32.5-42	PP05619
of	12pF	42 - 54	PP04679
L255)			
	33pF	68 - 88	PP06174
	22pF	79 -101	PP05639
	18pF	88 -108	PP05400
	47pF	132-156	PP06671
	39pF	148-174	PP06405
C275	6.8pF	25-32.5	PP02601
	3.3pF	32.5-42	PN02043
	0.7pF	42 - 54	PN00013
	1.7pF	68 - 88	PN00153
	1.7pF	79 -101	PN00153
	0.7pF	88 -108	PN00013
	1.7pF	132-156	PN00153
	1.7pF	148-174	PN00153
C276	39pF	25-32.5	PP06405
(Part	22pF	32.5-42	PP05619
of	12pF	42 - 54	PP04679
L254)	33pF	68 - 88	PP06174
	22pF	79 -101	PP05639
	18pF	88 -108	PP05400
	47pF	132-156	PP06671
	39pF	148-174	PP06405

CAPACITORS (cont)

Code	Value	Freq. MHz	Part No.
C277		32.5-54	
	2nF	88 -174	PN33301
C278		25 - 54	
(Part	33pF	68 - 88	PP06174
of	27pF	79 -101	PP05869
T251)	27pF	88 -108	PP05869
	18pF	132-156	PP05400
	15pF	148-174	PP05015
C279		25 - 54	
	10nF	88 -174	PN50301
C280	2nF		PN33301
C281	150pF	25-32.5	PP09405
(Part	82pF	32.5-42	PP08203
of	56pF	42 - 54	PP07205
T252)			
	27pF	68 - 88	PP05869
	18pF	79 -101	PP05400
	12pF	88 -108	PP04679
	8.2pF	132-156	PP03523
	4.7pF	148-174	PP01772
C282	2nF		PN33301
C283		25-32.5	
		32.5-42	
		42 - 54	
		68 - 88	
		79 -101	
	33pF	88 -108	PP06174
		132-156	
	12pF	148-174	PP04679
C284		25-32.5	
		32.5-42	
		42 - 54	
	220pF	68 - 88	PP10054
	120pF	79 -101	PP08869
	100pF	88 -108	PQ08505
	47pF	132-156	PP06671
	39pF	148-174	PP06405
C285		25-32.5	
		32.5-42	
		42 - 54	
	27pF	68 - 88	PP05869
	22pF	79 -101	PP05639
	18pF	88 -108	PP05400
	18pF	132-156	PP05400
	15pF	148-174	PP05015
C286	10nF	25-32.5	PN50301
	10nF	32.5-42	PN50301
	10nF	42 - 54	PN50301
	10nF	68 - 88	PN50301
	10nF	79 -101	PN50301
		88 -108	
		132-156	
	2nF	148-174	PN33301
C287	10nF	25-32.5	PN50301
	2nF	32.5-42	PN33301
	2nF	42 - 54	PN33301
	2nF	68 - 88	PN33301
	2nF	79 -101	PN33301

CAPACITORS (cont)

Code		Freq. MHz	Part No.
	2nF	88 -108	PN33301
	1nF	132-156	PN26350
	1nF	148-174	PN26350
C288	220pF	25-32.5	PP10054
	220pF	32.5-42	PP10054
	220pF	42 - 54	PP10054
		68 - 88	
	47pF	79 -101	PP06671
		88 -108	PP06671
	15pF	132-156	PP05015
	33pF	148-174	PP06168
C289	150pF	25-32.5	PP09405
	82pF	32.5-42	PP08203
	47pF	42 - 54	PP06671
	22pF	68 - 88	PP05639
	15pF	79 -101	PP05015
	22pF	88 -108	PP05639
	22pF	132-156	PP05639
	18pF	148-174	PP05400
C290	0.1µF	25-32.5	PN62305
	10nF	32.5-42	PN50301
	10nF	42 - 54	PN50301
	10nF	68 - 88	PN50301
	10nF	79 -101	PN50301
	10nF	88 -108	PN50301
	1nF	132-156	PN26350
	1nF	148-174	PN26350
C291	5.6pF	25-32.5	PP02102
	3.3pF	32.5-42	PP01121
	2pF	42 - 54	PP00501
	2pF	68 - 88	PP00501
	2pF	79 -101	PP00501
	1.7pF	88 -108	PN00153
	1.7pF	132-156	PN00153
	0.5pF	148-174	PN00008
C292		25-32.5	
		32.5-42	
		42 - 54	
		68 - 88	
		79 -101	
	68pF	88 -108	PP07654
		132-156	
		148-174	
C293	120pF	25-32.5	PP08869
	82pF	32.5-42	PP08203
	47pF	42 - 54	PP06671
	18pF	68 - 88	PP05400
	15pF	79 -101	PP05015
	27pF	88 -108	PP05869
	22pF	132-156	PP05639
	18pF	148-174	PP05400
C294	10nF	25-32.5	PN50301
	10nF	32.5-42	PN50301
	10nF	42 - 54	PN50301
	10nF	68 - 88	PN50301
	10nF	79 -101	PN50301
	10nF	88 -108	PN50301

CAPACITORS (cont)

Code		Freq. MHz	Part No.
	2nF	132-156	PN33301
	2nF	148-174	PN33301
C295	110pF	25-32.5	PP08702
(Part	100pF	32.5-42	PP08508
of	56pF	42 - 54	PP07205
T253)			
		68 - 88	
		79 -101	
		88 -108	
		132-156	
		148-174	
C296	100pF	25-32.5	PP08508
	100pF	32.5-42	PP08508
	100pF	42 - 54	PP08508
	22pF	68 - 88	PP05639
	18pF	79 -101	PP05400
		88 -108	
		148-174	
C297	2nF		PN33301
C298	2nF		PN33301
C299	10nF	25-32.5	PN50301
		32.5-136	
	10nF	148-174	PN50301
C300		25 -136	
	10nF	148-174	PN50301
C301		25 -136	
	0.1µF	148-174	PN62305
C302			
C303	33pF	148-174	PP06168
C304	12pF	148-174	PP04679
C305	6.8pF	148-174	PP02601

RESISTORS

R251	27kΩ		PM01453
R252	100kΩ	25-32.5	PM01460
	27kΩ	32.5-174	PM01453
R253	1kΩ		PM01436
R254	1kΩ	25-32.5	PM01436
	3.3kΩ	32.5-54	PM01442
	3.3kΩ	68 - 88	PM01442
	2.2kΩ	79 -101	PM01440
	3.3kΩ	88 -108	PM01442
	2.2kΩ	132-174	PM01440
R255	12kΩ	25 - 88	PM01449
	22kΩ	88 -108	PM01452
	12kΩ	108-174	PM01449
R256	3.3kΩ		PM01442
R257	4.7kΩ	25-32.5	PM01444
	4.7kΩ	32.5-42	PM01444
	4.7kΩ	42 - 54	PM01444
	4.7kΩ	68 -108	PM01444
	1.8kΩ	148-174	PM01439
R258	1kΩ		PM01436
R259	1kΩ		PM01436

TRANSMITTER (Cont.)

RESISTORS

Code	Value	Freq. MHz	Part No.
R260	47kΩ	25-32.5	PM01456
	47kΩ	32.5-42	PM01456
	47kΩ	42 - 54	PM01456
	47kΩ	68 - 88	PM01456
	47kΩ	79 -101	PM01456
	27kΩ	88 -108	PM01453
	27kΩ	132-156	PM01453
	27kΩ	148-174	PM01453
R261	5.6kΩ	25-32.5	PM01445
	5.6kΩ	32.5-42	PM01445
	5.6kΩ	42 - 54	PM01445
	5.6kΩ	68 - 88	PM01445
	5.6kΩ	79 -101	PM01445
	5.6kΩ	88 -108	PM01445
	2.2kΩ	132-156	PM01440
	2.2kΩ	148-174	PM01440
R262	100Ω		PM01424
R263	1kΩ	25-32.5	PM01436
	1.5kΩ	32.5-42	PM01438
	2.2kΩ	42 - 54	PM01440
	560Ω	68 - 88	PM01433
	1kΩ	79 -101	PM01436
	560Ω	88 -108	PM01433
	1kΩ	132-156	PM01436
	1kΩ	148-174	PM01436
R264	150Ω	25-32.5	PM01426
	150Ω	32.5-42	PM01426
	150Ω	42 - 54	PM01426
	150Ω	68 - 88	PM01426
	150Ω	79 -101	PM01426
	150Ω	88 -108	PM01426
	390Ω	132-156	PM01431
	390Ω	148-174	PM01431
R265	2.2kΩ	25-32.5	PM01440
	1kΩ	32.5-42	PM01436
	2.2kΩ	42 - 54	PM01440
	2.2kΩ	68 - 88	PM01440
	2.2kΩ	79 -101	PM01440
	2.2kΩ	88 -108	PM01440
	1kΩ	132-156	PM01436
	1kΩ	148-174	PM01436
R266		25.32.5	
		32.5-42	
		42 - 54	
	330Ω	68 - 88	PM01430
	330Ω	79 -101	PM01430
	330Ω	88 -108	PM01430
	100Ω	132-156	PM01424
	100Ω	148-174	PM01424
R267		25-32.5	
		32.5-42	
		42 - 54	
	330Ω	68 - 88	PM01430
	100Ω	79 -101	PM01424
	100Ω	88 -108	PM01424
	270Ω	132-156	PM01429
	270Ω	148-174	PM01429

RESISTORS (cont)

Code	Value	Freq. MHz	Part No.
R268	330Ω	25-32.5	PM01430
	330Ω	32.5-42	PM01430
	330Ω	42 - 54	PM01430
	330Ω	68 - 88	PM01430
	330Ω	79 -101	PM01430
	330Ω	88 -108	PM01430
	100Ω	132-156	PM01424
	100Ω	148-174	PM01424
†R269	68Ω	25-32.5	PM01422
	47Ω	32.5-174	PM01420
	56Ω	32.5-174	PM01421
	68Ω	32.5-174	PM01422
	82Ω	32.5-174	PM01423
	100Ω	32.5-174	PM01424
	120Ω	32.5-174	PM01425
	150Ω	32.5-174	PM01426
	180Ω	32.5-174	PM01427
	220Ω	32.5-174	PM01428
	270Ω	32.5-174	PM01429
	330Ω	32.5-174	PM01430
	390Ω	32.5-174	PM01431
	470Ω	32.5-174	PM01432
R270	180Ω	25-32.5	PM01427
	180Ω	32.5-42	PM01427
	180Ω	42 - 54	PM01427
	180Ω	68 - 88	PM01427
	180Ω	79 -101	PM01427
	47Ω	88 -108	PM01420
	100Ω	132-156	PM01424
	150Ω	148-174	PM01426
*R271	4.7Ω	25-32.5	NG04703
	10Ω	25-32.5	PM01412
	12Ω	25-32.5	PM01413
	15Ω	25-32.5	PM01414
	18Ω	25-32.5	PM01415
	22Ω	25-32.5	PM01416
	27Ω	25-32.5	PM01417
	33Ω	25-32.5	PM01418
	4.7Ω	42 - 54	NG04703
	4.7Ω	68 -101	NG04703
		88 -108	
	10Ω	132-174	PM01412
R272			
R273	10Ω		PM01412
R274	4.7kΩ		PM01444
R275	4.7kΩ	148-174	PM01444

COILS

L251		25-32.5	AL06087
		32.5-42	AL06087
		42 - 54	AL06082
		68 - 88	AL06089
		79 -101	AL06082
		88 -108	AL06082
		132-156	AL06082
		148-174	AL06057

† Selected on manufacture 32.5-174 MHz

* Selected on manufacture 25-32.5 MHz

COILS (cont)

Code	Freq. MHz	Part No.
L252	25-32.5	AT32301/18
	32.5-42	AT32301/14
	42 - 54	AT32301/8
	68 - 88	278578/71
	79 -101	278578/97
	88 -108	AT31651/1
	132-156	AT31651/6
	148-174	278578/65
L253	25-32.5	AT32301/18
	32.5-42	AT32301/15
	42 - 54	AT32301/9
	68 - 88	278578/72
	79 -101	278578/91
	88 -108	AT31651/2
	132-156	AT31651/7
	148-174	278518/66
L254	25-32.5	AT32301/21
	32.5-42	AT32301/17
	42 - 54	AT32301/11
	68 - 88	278578/74
	79 -101	278578/93
	88 -108	AT31651/4
	132-156	AT31658/2
	148-174	278518/68
L255	25-32.5	AT32301/20
	32.5-42	AT32301/16
	42 - 54	AT32301/10
	68 - 88	278578/73
	79 -101	278578/92
	88 -108	AT31651/3
	132-156	AT31658/1
	148-174	278578/67
L256	25-32.5	
	32.5-42	
	42 - 54	
	68 - 88	AT31652/3
	79 -101	278578/96
	88 -108	AT31652/2
	132-156	278578/70
	148-174	278578/70
L257	25-32.5	
	32.5-42	
	42 - 54	
	68 - 88	FT05510
	79 -101	FT05510
	88 -108	FT05510
	132-156	FT05510
	148-174	FT05510
L258		
L259	25-32.5	AT31513/3
	32.5-42	AT31613/1
	42 - 54	AT31613/1
	68 - 88	AT31610/2
	79 -101	AT31610/2
	88 -108	AT31615/1
	132-156	AT31612/5
	148-174	AT31612/1

COILS (cont)

Code	Freq. MHz	Part No.
L260	25-32.5	AT31613/2
	32.5-42	AT31613/2
	42 - 54	AT31613/2
	68 - 88	AT31610/3
	79 -101	AT31610/3
	88 -108	AT31615/2
	132-156	AT31612/3
	148-174	AT31612/3
L261	25 - 54	279051
	54 -174	

TRANSFORMERS

T251	25-32.5	
	32.5-42	
	42 - 54	
	68 - 88	278578/75
	79 -101	278578/94
	88 -108	AT31651/5
	132-156	AT31659/1
	148-174	278578/69
T252	25-32.5	AT31653/5
	32.5-42	AT31653/1
	42 - 54	AT32301/12
	68 - 88	278578/76
	79 -101	278373/95
	88 -108	AT31652/1
	132-156	AT31660/1
	148-174	278578/78
T253	25-32.5	AT31653/6
	32.5-42	AT31653/2
	42 - 54	AT32301/13
	68 - 88	
	79 -101	
	88 -108	
	132-156	
	148-174	

TRANSISTORS

TR251	BC118	25 - 54	FV07766
	2N706	54 -174	FV09764
TR252	2N706		FV09764
TR253	A1572		FV07082
TR254	A1572		FV07082
TR255		25 - 68	
	A1572	68 -174	FV07082
TR256	A1572		FV07082
TR257	2N2476	25-32.5	FV07056
	2N2476	32.5-42	FV07056
	2N2476	42 - 54	FV07056
	2N2476	68 - 88	FV07056
	2N2476	79 -101	FV07056
	2N2476	88 -108	FV07056
	SM6509	132-156	FV07709
	SM6509	148-174	FV07709

TRANSMITTER (Cont.)

TRANSISTORS (cont)

Code		Freq. MHz	Part No.
TR258	BFY44	25-32.5	FV05168
	BFY44	32.5-42	FV05168
	BFY44	42 - 54	FV05168
	BFY44	68 - 88	FV05168
	BFY44	79 -101	FV05168
	2N3553	88 -108	FV07557
	2N3553	132-156	FV07557
	2N3553	148-174	FV07557

MISCELLANEOUS

Code		Part No.
SA	Switch channel select	FS07005
XL201-XL203	Crystal frequency to order	

MECHANICAL ITEMS

		Part No.
Antenna		ET00001
Cap Antenna		BT02401
Set Screw cup point	4BAx 1/8"	QJ05279
Nut retaining	134-174	BT03252/1
	105-134	BT03252/2
	87 -105	BT03252/3
	75 - 87	BT03252/4
	54 - 75	BT03252/5

On G to J Bands antenna ET00001 is used with nut retaining BT03252/5 in conjunction with coils L1 and L11.

Antenna Whip (69 -- 97 Mc/s - cut to frequency) FA00631

	Part No.
Antenna Socket coaxial	FS43812
Knob Assembly	AT10125
Case assembly	AT25930
Cover plate (battery)	AT25931
Microphone head assembly	AT29650
Battery Cassette	AT25929/2
Battery Complete	AT25928/2
Carrying case	AT11546
Carrying strap & antenna assembly	AT11550/2
Carrying Case Canvas (Optional)	AT26098/1
Spindle adaptor 3/16" to $\frac{1}{4}$"	FA00032
(Plug Ant. Optional)	FP13785
Motif 'FM'	203112
Call Sign Label	BT18148

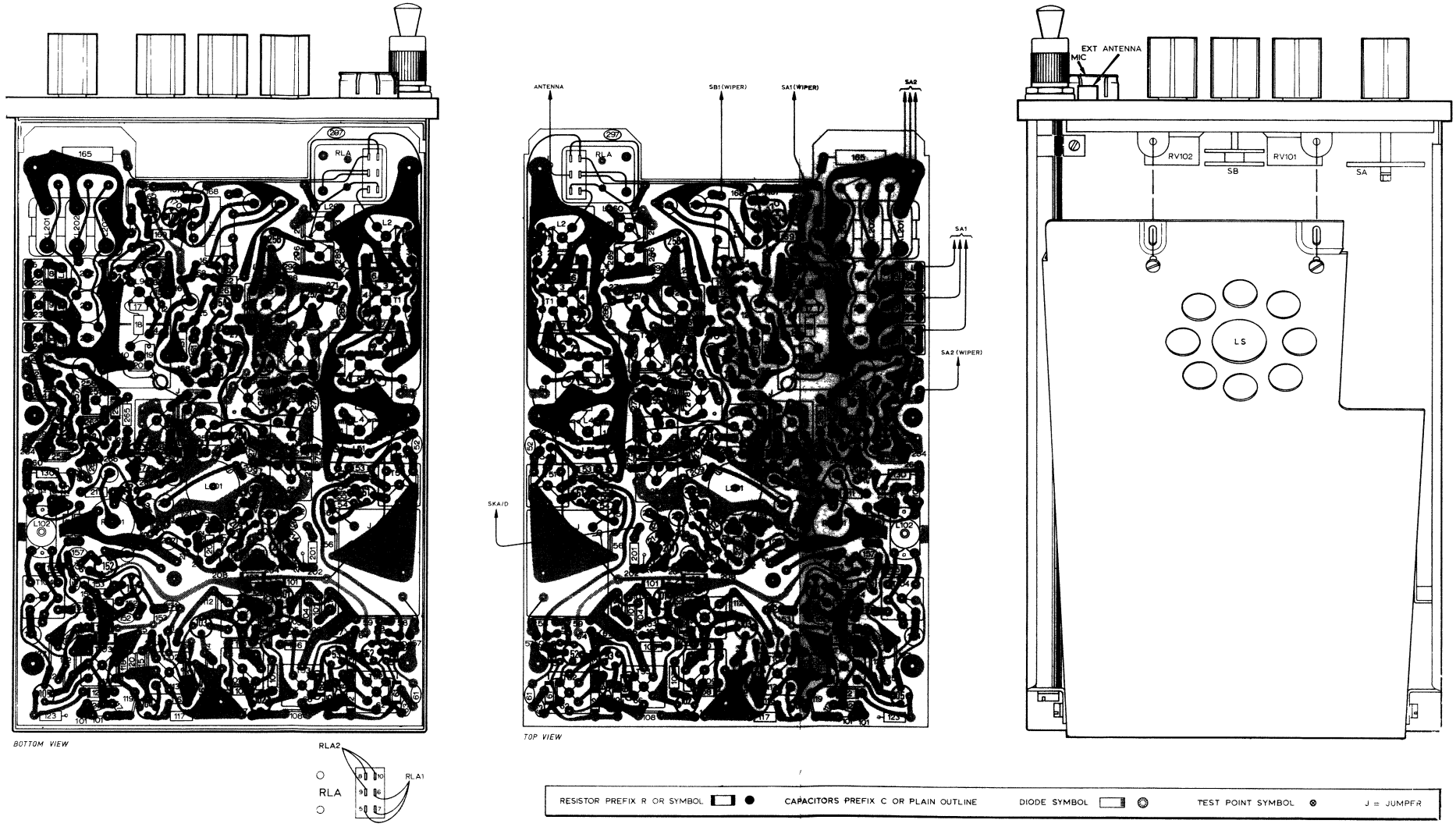
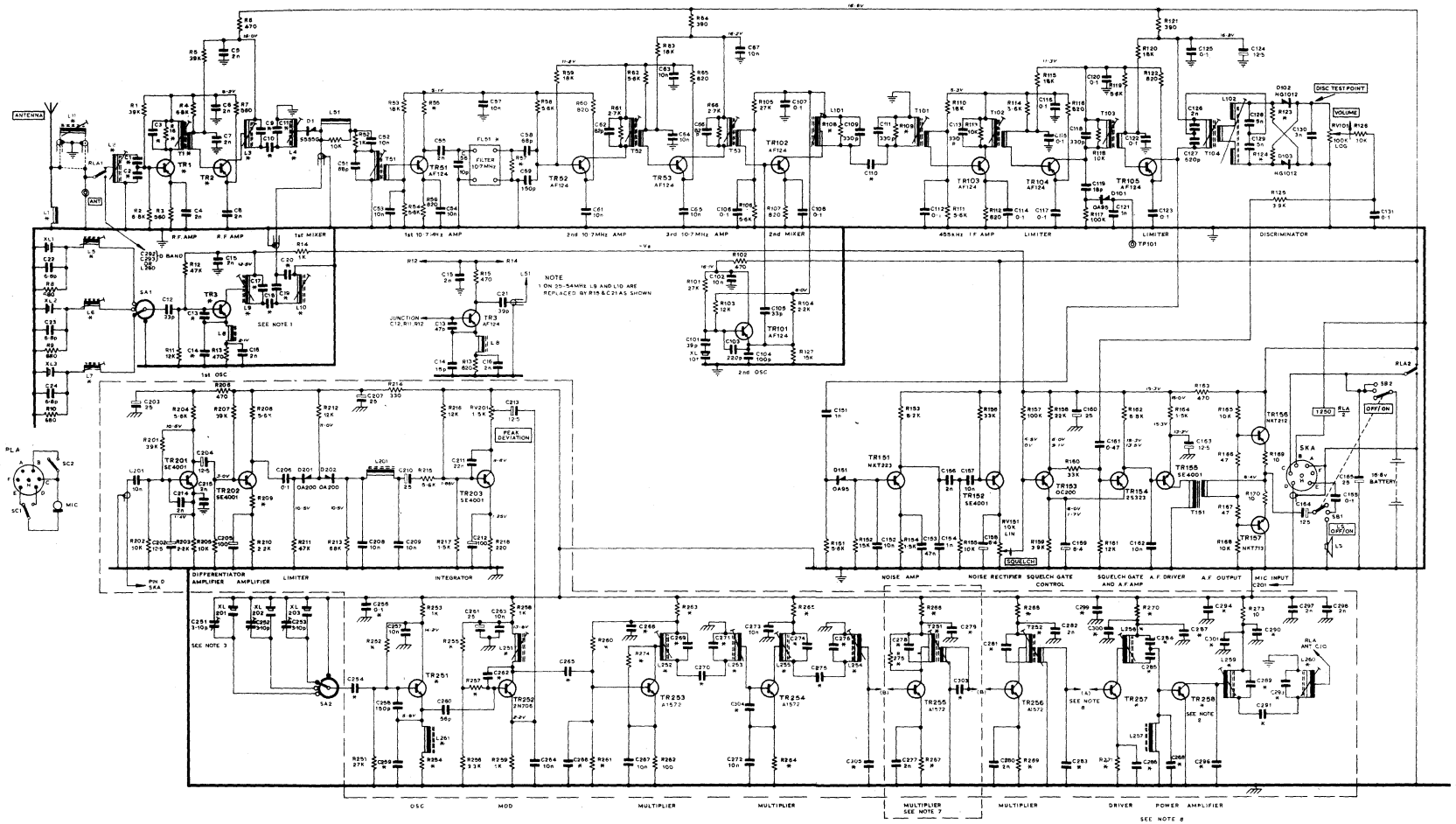
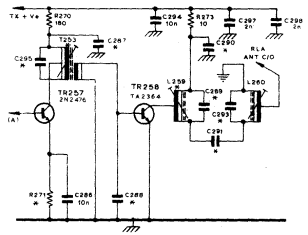


Fig. 5 COMPONENT LOCATION DIAGRAM
(HP1FM)

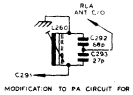


NOTES (CONTINUED)

2. FOR LOW POWER MARINE APPLICATION THE FOLLOWING MODIFICATIONS ARE REQUIRED:
   TR258 DELETE 2N3553 REF No FVG7557
   ADD BFY44 REF No FVG7568
   C284 DELETE 39pF ADD 47pF REF No PR06871
3. CRYSTAL DAMPING (4 x 220Ω) COMP @ 10V, REF No. NG22403 MAY BE REQUIRED ON TX WHERE CRYSTAL ACTIVITY VARIES WIDELY (S.O.T.)
4. R FOR ALL UNSPECIFIED VALUES SEE CODE LIST
5. ⏚ DENOTES +Ve EARTH LINE AND FRAME
   ⏚ DENOTES -Ve TRANSMITTER EARTH LINE
6. ALL VALUES IN Ω's OR μF UNLESS OTHERWISE STATED
7. MULTIPLIER STAGES SHOWN FOR 68-174 MHz
   FOR 25-54 MHz DELETE TR255, T251, C277-C279, R266 AND R257 JOIN ARROWS B-B
8. DRIVER AND POWER AMPLIFIER CIRCUIT SHOWN FOR 68-88 MHz 79-101 MHz AND 148-174 MHz
   FOR 25-54 MHz OR 88-108 MHz ADD APPLICABLE MODIFICATION TO P.A STAGE AS SHOWN BELOW
9. +6V TYPICAL VOLTAGES, TRANSMITTER STAGES - POSITIVE WITH RESPECT TO TX CHASSIS ⏚
   RECEIVER STAGES - NEGATIVE WITH RESPECT TO RX CHASSIS ⏚ MEASURED ON AVO MODEL 8 (20,000Ω / VOLT) SET TO LOWEST APPROPRIATE D.C VOLTAGE RANGE
   WHERE DOUBLE VOLTAGES ARE SHOWN THE UPPER FIGURE INDICATES SQUELCH CONTROL FULLY COUNTERCLOCKWISE. THE LOWER FIGURE INDICATES SQUELCH CONTROL FULLY CLOCKWISE.



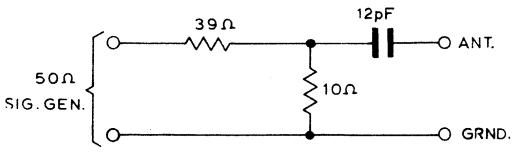
MODIFICATION TO DRIVER & PA CIRCUIT FOR 25-54 MHz



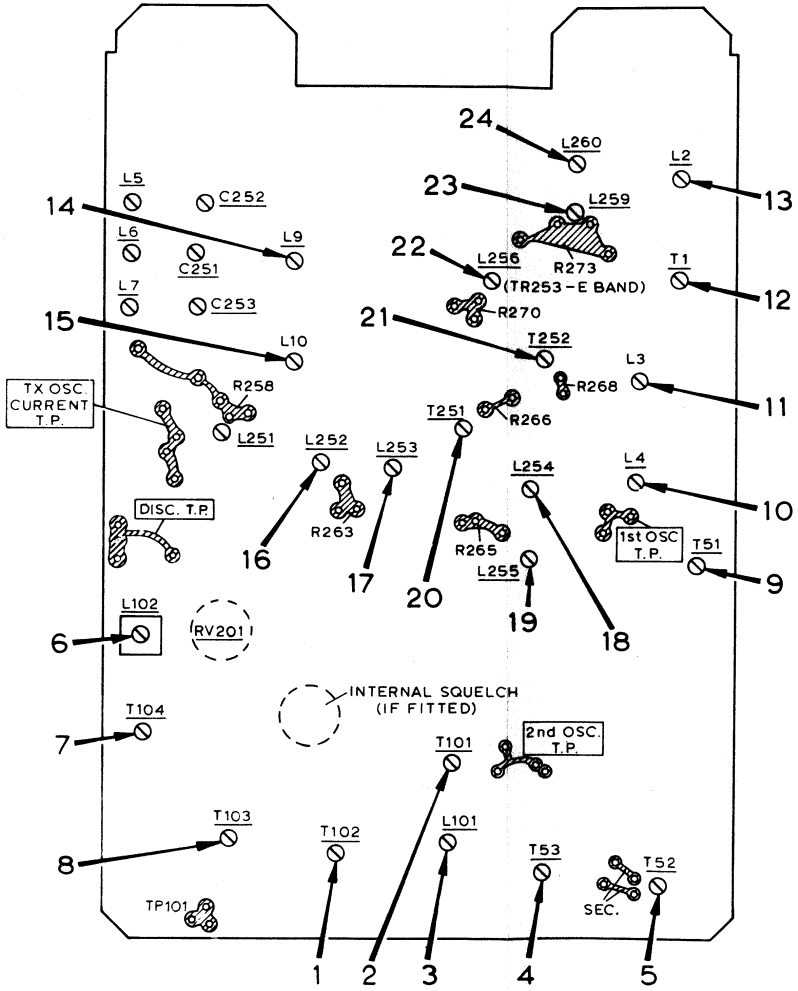
MODIFICATION TO PA CIRCUIT FOR 88-108 MHz

Fig. 6 CIRCUIT DIAGRAM
HP1FM (& Marine 148-174 MHz)

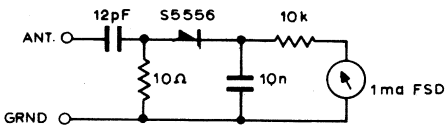
RECEIVER ALIGNMENT	
REF.	ADJUSTMENT
1 to 5	Adjust in turn for maximum meter reading
	Connect the meter to the Disc. test point.
6	Adjust for zero d.c.
	Remove the meter. Temporarily short circuit the secondary of T52. Connect the audio output meter across SKA pins C and E.
7, 8	Adjust for maximum noise output.
	Remove the short circuit.
9 to 15	Adjust in turn for maximum quieting reducing the signal generator as the circuits come into line.
	Carry out the performance checks.



RX ANTENNA INPUT PAD
(G,H & J BANDS ONLY)



TRANSMITTER ALIGNMENT	
REF.	ADJUSTMENT
	Connect the meter, positive to chassis (frame) negative to test point R263
16	Adjust for minimum reading.
17	Transfer meter to R265. Adjust for maximum reading. Repeat (16) tuning for maximum. Adjust (19) for minimum.
18,19	Transfer meter to R266. Adjust for maximum.
20	Transfer meter to R268. Adjust for maximum.
21	Transfer meter to R270. Adjust for maximum.
22	Transfer meter to R273. Adjust for maximum. Adjust (23) for minimum.
	Connect the test meter to the diode probe and connect probe across the 50Ω dummy load.
23, 24	Adjust with (22) for maximum output.



TX DUMMY LOAD (G,H & J BANDS ONLY)

Fig. 7 ALIGNMENT CHART (HP1FM)

RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. Hum free l.t. supply of 16.8 volts d.c.
2. Signal Generator (See Chapter IV)
3. Crystal controlled 455 kHz marker oscillator (the Pye PT503 is suitable).
4. 0-50μA meter with a resistance of 2.5kΩ (Pye TM1. or AVO model 8 are suitable)
5. H.F. Valve Voltmeter or diode probe (see fig. 4 on page 14) used in conjunction with item 4 above.
6. Audio output reading meter up to $\frac{1}{2}$W (most standard multirange instruments are suitable).
7. Oscilloscope (Telequipment "Serviscope")

NOTES

1. First Local Oscillator

   Crystal trimmers L5, L6, and L7 must not be adjusted except as described in Chapter IV or against a frequency sub-standard.

2. Switched Channel Equipment

   This equipment should be aligned on the channel nearest to the centre frequency and the performance on the remaining channels checked after alignment. On equipment using two widely spaced channels compromise tuning of the r.f. stages must be used to equalise the performance on both channels. Performance figures quoted relate to channels within ±0.5% of the main carrier frequency.

3. Squelch Control

   Any test of the r.f. stages must be carried out with the SQUELCH control fully clockwise.

4. On G, H & J bands use the input pad shown opposite. The following additional tuning procedure is necessary.
   (a) Tune L2 for maximum deflection of a meter connected between TP101 and chassis
   (b) Check the tuning of T1. Nominal sensitivity is 8μV for 1.5 volts at TP101.

PRELIMINARY PROCEDURE

It is recommended that a practice run through the procedure be carried out before the equipment is aligned.

1. Connect the signal generator to the antenna socket and turn the SQUELCH control fully clockwise.
2. Check the 1st and 2nd oscillators with the diode probe and test meter.
   1st oscillator output at L51 should be at least 0.25V.
   2nd oscillator output at TR101 emitter should be at least 0.5V.
3. Hold the 455 kHz oscillator close to the second I.F. section and adjust the signal generator frequency for zero beat.
4. Connect the AVO Model 8 on the 2.5V range to TP101, positive lead to chassis.
5. Carry out the alignment procedure shown in the chart opposite, reducing signal output as the circuits come into line.

PERFORMANCE CHECK

1. Connect the audio output meter to the a.f. output (SKA pins C and E with SB1 in the ON position).
2. With a signal generator output of 1.6μV e.m.f. and modulated 30% (i.e. ±750 Hz for 12.5 kHz channel spacing, ±1.5 kHz for 25 kHz channel spacing, ±4.5 kHz for 50 kHz channel spacing), adjust the VOLUME control to obtain an output of 100mW and check that the signal-to-noise ratio is not less than 20dB.
3. Check that the signal generator output for 20dB quieting is 1.0μV e.m.f. or less.

TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. Hum free l.t. supply of 16.8 volts d.c.
2. Low reading, high sensitivity voltmeter (Pye TM1. or AVO Model 8 on the 2.5 volt range).
3. Diode probe (fig. 4).

NOTES

1. Crystal Oscillator

   Trimmer C251. C252 and C253 must not be adjusted except as described in the Field Testing Procedure or against a frequency sub-standard.

2. On G, H & J band the following additional tuning procedure is necessary:-
   (a) Connect the dummy load shown opposite between the earth surround of the 50Ω antenna socket and the top of the unexpanded whip antenna. Set the case three quarters over the chassis.
   (b) Tune L11 (rear of front panel) for maximum output.
   (c) Retune L259, L260 and T253 for maximum output.
   (d) Recheck L11.

PRELIMINARY

2. Loading

   A non reactive 50Ω load capable of dissipating at least 1 watt should be connected across the antenna output socket during alignment. A 50Ω 1 watt carbon resistor is suitable.

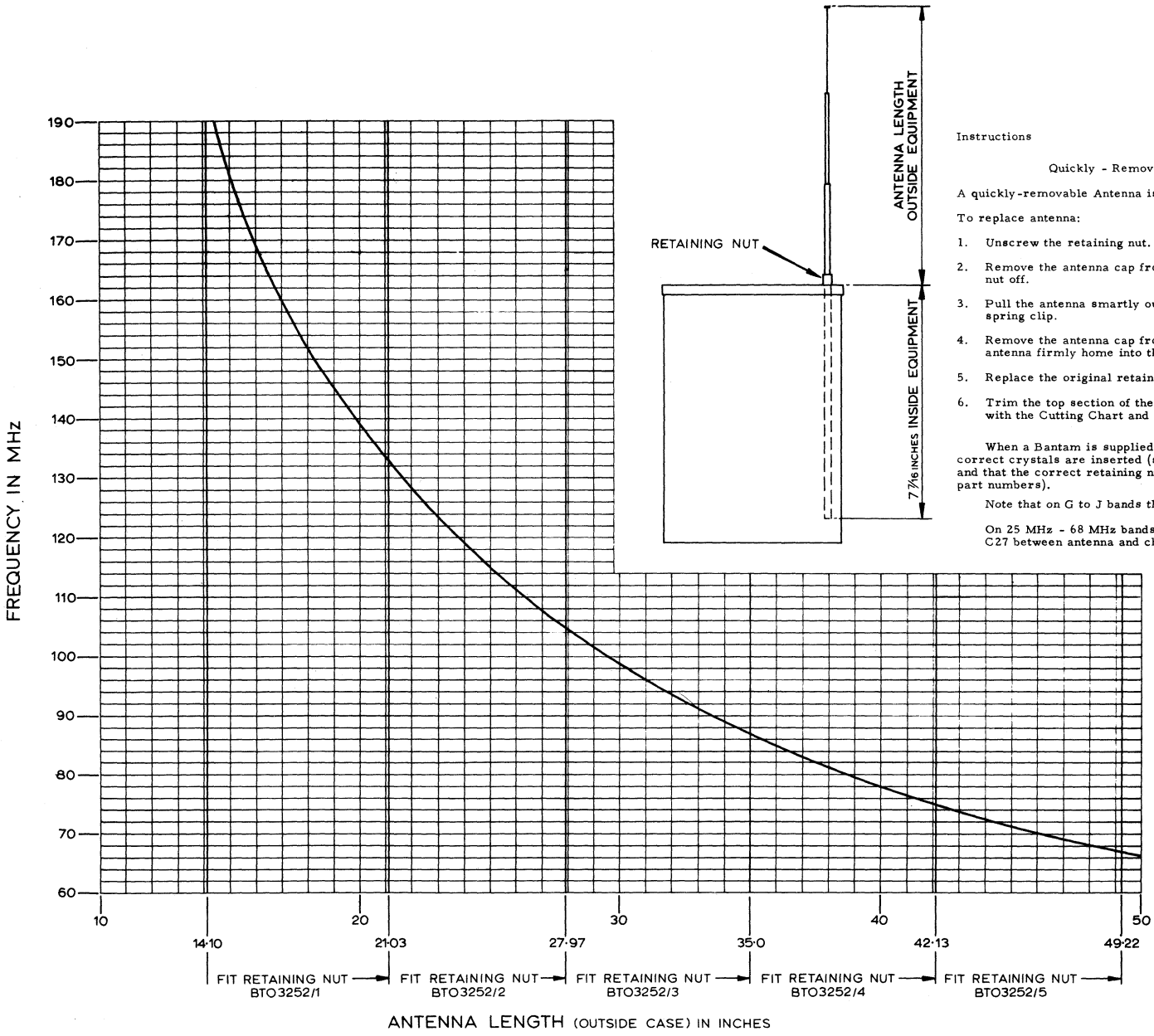
3. Power Supply

   If the transmitter is thought to be badly misaligned the supply voltage should be reduced to 14 volts to avoid excessive dissipation in TR258.

PRELIMINARY PROCEDURE

It is recommended that a practice run through the procedure be carried out before aligning the transmitter.

Connect the Voltmeter to each test point positive to chassis and carry out the procedure given in the chart.



Instructions

Quickly - Removable Antennas

A quickly-removable Antenna is now fitted to all Bantam Equipment.

To replace antenna:

1. Unscrew the retaining nut.
2. Remove the antenna cap from the antenna and slide the retaining nut off.
3. Pull the antenna smartly out of the Bantam where it is held by a spring clip.
4. Remove the antenna cap from the replacement antenna. Push the antenna firmly home into the Bantam.
5. Replace the original retaining nut and screw down tight.
6. Trim the top section of the antenna, if necessary, in accordance with the Cutting Chart and replace the antenna cap.

When a Bantam is supplied without crystals it is essential that the correct crystals are inserted (see Crystal Formula in the Handbook) and that the correct retaining nut is used (see the cutting chart for part numbers).

Note that on G to J bands the full length of antenna is used.

On 25 MHz - 68 MHz bands when the whip antenna is used add C27 between antenna and chassis.

Fig. 8 ANTENNA CUTTING CHART

Battery Charger Type BC1

The Battery Charger type BC1 is especially designed for use with the nickel cadmium batteries used in the Bantam radiotelephones. It is of the constant current type and can charge up to three batteries simultaneously.

Operation

Note: The BC1 requires a supply voltage of 95-130V (T1 primary taps 1 & 2) or 200-260V (taps 1 & 3), and the connections to T1 should be checked before the charger is first used.

1. Switch on the BC1 and note that the indicator light comes on. (This light indicates that a.c. is being applied to the unit. It does not show that the batteries are being charged).

2. Insert the batteries to be charged into the charger. The batteries are fitted with a key piece so that they can only be inserted into the charger the correct way round. Close the battery retaining lid. This is essential to ensure that the batteries make contact.

3. Charge for the required time (See instructions on the Charger). At the end of the charge switch off and remove the batteries. Do not just switch off the charger.

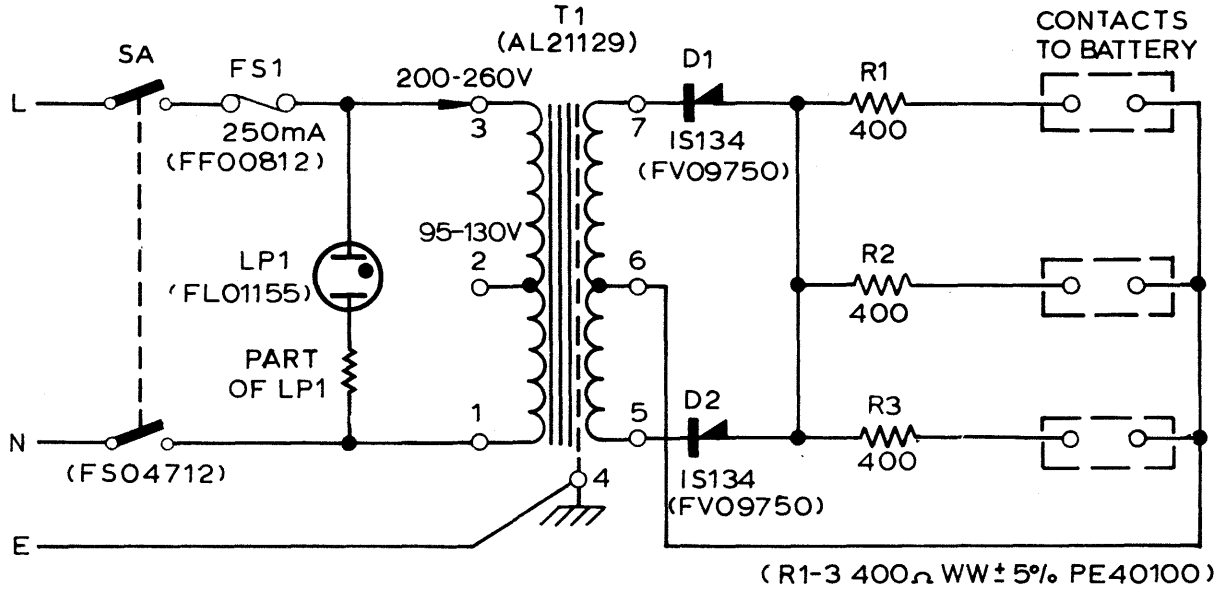


Fig. 9 CIRCUIT DIAGRAM - BATTERY CHARGER BC1