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Mariner II Two Way Radio

VHF FM

International Marine Frequencies

(TM-530MA)

Issue A

TECHNICAL INFORMATION

For further information about this manual, or the equipment it describes, contact Product Distribution Group, Tait Electronics Ltd, at the above address.

UPDATING EQUIPMENT AND SERVICE MANUALS

In the interests of improving performance, reliability or servicing, Tait Electronics Ltd reserve the right to update their equipment and/or Service Manuals without prior notice.

SCOPE OF MANUAL

This manual contains the 'General', 'Technical' and 'Servicing' Information on the Mariner II two way radio.

Ordering Tait Service Manuals

When ordering Tait Service manuals quote the Tait Internal Part Number (IPN) (and where applicable the version) viz;

IPN TM-530MA Mariner II Service Manual

Issue A Published December 1986

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SECTION 1 GENERAL INFORMATION

1.1 INTRODUCTION

The Mariner II is a high performance, synthesized mobile two way radio with a nominal RF power output of 25 watts. It is intended for operation in the international marine frequency band with 25kHz channel spacing at ±5kHz deviation. The standard set is capable of operating on all international marine frequencies.

Operation of the Mariner II is by hand held microphone and press-to-talk switch, plus six front panel mounted controls: 'Volume', 'Squelch', 'Channel Change', 'Scan 16', 'Low Power' and an 'On/Off' switch. Visual indication of 'On', 'Low Power', 'Transmit' and 'Channel 16' is by illuminated front panel display.

The two injection moulded plastic covers and the plastic front panel can be easily removed to expose both sides of the printed circuit board for ease of servicing.

The Mariner II employs the dual modulus system of frequency synthesis. Channel information is held in an EPROM on the memory PCB.

The dual conversion receiver employs both discrete components and integrated circuits. It also includes a signal-to-noise ratio operated squelch circuit. The receiver delivers approximately 4 watts of audio power to a 4 ohm speaker.

The VCO provides about 10 milliwatts of frequency modulated RF drive to the four stage broad band RF power amplifier. An audio processor provides the modulation level control and deviation limiting and a transmit timer returns the Mariner II to receive after approximately one and a half minutes of transmission.

The Mariner II is light and compact and is supplied with a versatile mounting system to allow easy installation in any vessel. Mains operation is possible when the Mariner II is used with the Tait T508 power supply.

The DC supply to the Mariner II must be negative earth and must be between 10.8 and 16 volts. The Mariner II is protected against reversal of the DC supply polarity.

Features included on the Mariner II are:

(a) Operation on all marine channels.

(b) Scanning between front panel channel selection and channel 16.

(c) Instant switch-controlled access to channel 16.

(d) Low power switch for in-harbour use.

(e) Transmit inhibit on channels 70, 75 and 76.

(f) Low power only on channels 15 and 17.

1.2 SPECIFICATIONS

1.2.1 GENERAL

The performance figures given are typical figures, unless otherwise indicated, for equipment tuned with the maximum switching band and operating at standard room temperature (+22°C to +28°C).

Where applicable the test methods used to obtain the following performance figures are those described in the New Zealand Post Office Specification RT5 or RTA25.

Details of test methods and the conditions which apply for type approval testing in all countries can be obtained from Tait Electronics Ltd.

Modulation System	.. Frequency Modulation
Frequency Range	.. All international marine frequencies
Allocated Channels	.. ITU Regulation Channels 1-28, 60-88
Switching Range	.. 6MHz
Supply Voltage:	
Operating Range	.. 10.8 to 16 volts DC
Standard Test Voltage	.. 13.8 volts DC
Polarity	.. Negative earth only
Protection	.. Internal crow-bar diode
Supply Current:	
Receiver - Squelched	.. 200mA
Receiver - Full Audio	.. 700mA
Transmitter - At 25W	.. 4.5A
Transmitter - Low Power	.. 1.0A (typical)
Antenna Impedance	.. 50 ohms
T/R Change-over Switching	.. Relay
Operating Temperature Range	.. -10°C to +60°C
Dimensions:	
Length	.. 225mm
Width	.. 150mm
Height	.. 45mm
Weight	.. 1.2kg

1.2.2 RECEIVER

Type	.. Dual conversion superhet
Intermediate Frequencies	.. 455kHz and 21.4MHz
I.F. Bandwidth	.. 15kHz
Sensitivity:	
12dB Sinad	.. -119dBm (0.25µV pd)

Signal-to-Noise Ratio:	
RF: -107dBm (1μV pd)	.. 35dB
RF: -47dBm (1mV pd)	.. 50dB
Selectivity (adjacent channel)	.. 80dB
Spurious Response Attenuation	.. 85dB
Intermodulation Response Attenuation	.. 75dB
Spurious Emissions (conducted)	.. -65dBm
Audio:	
Output into internal 8 ohm speaker	.. 2 watts
Output into external 4 ohm speaker only	.. 4 watts
Distortion (at 4 watts)	.. 2%
Minimum Load Impedance	.. 2 ohms
Response	.. Within +1, -3dB of a 6dB/octave de-emphasis characteristic (ref. 1kHz)
Bandwidth	.. 300Hz to 3kHz
Squelch:	
Sensitivity	.. 6dB to 20dB Sinad
Ratio	.. 70dB

1.2.3 TRANSMITTER

Power Output:	
High Power	.. 25 watts
Low Power (see also Section 1.2.5)	.. 0.8 watts
Frequency Stability	.. Refer to Section 1.2.4
Mismatch Capability:	
Stability	.. VSWR < 5:1 (all phase angles)
Ruggedness	.. 2 minute transmit into infinite VSWR (all phase angles)
Spurious Emissions (conducted)	.. -30dBm
Adjacent Channel Power (15kHz bandwidth)	.. 80dB below carrier
Modulating System	.. Direct FM
Deviation Response:	
In limiting	.. Within +0, -4dB of max. system deviation
Below limiting	.. Within +1, -3dB of 6dB/octave pre-emphasis (ref. 1kHz)
Frequencies above 3kHz	.. Greater than 25dB/octave roll off

Deviation Limiting	.. ±5kHz (peak) maximum Adjustable to ±5kHz

Audio:

Input For Maximum Deviation	.. 1mV rms at 1kHz
Bandwidth	.. 300Hz to 3kHz
Distortion (Modulated at 1kHz to 60% of maximum deviation)	.. 2%
Hum & Noise	.. 45dB below maximum deviation

1.2.4 FREQUENCY REFERENCE

Stability:

± 5ppm (-10°C to +60°C)	.. TE/9
Oscillator frequency	.. 12.8MHz

1.2.5 TRANSMITTER OPERATION

In accordance with ITU Regulations, the following restrictions have been incorporated into the transmitter design:

Channels 15 and 17	.. automatic power turndown to less than 1 watt
Channels 70, 75 and 76	.. transmission inhibited
Non-allocated Channels	.. transmission inhibited

1.3 OPERATING INSTRUCTIONS

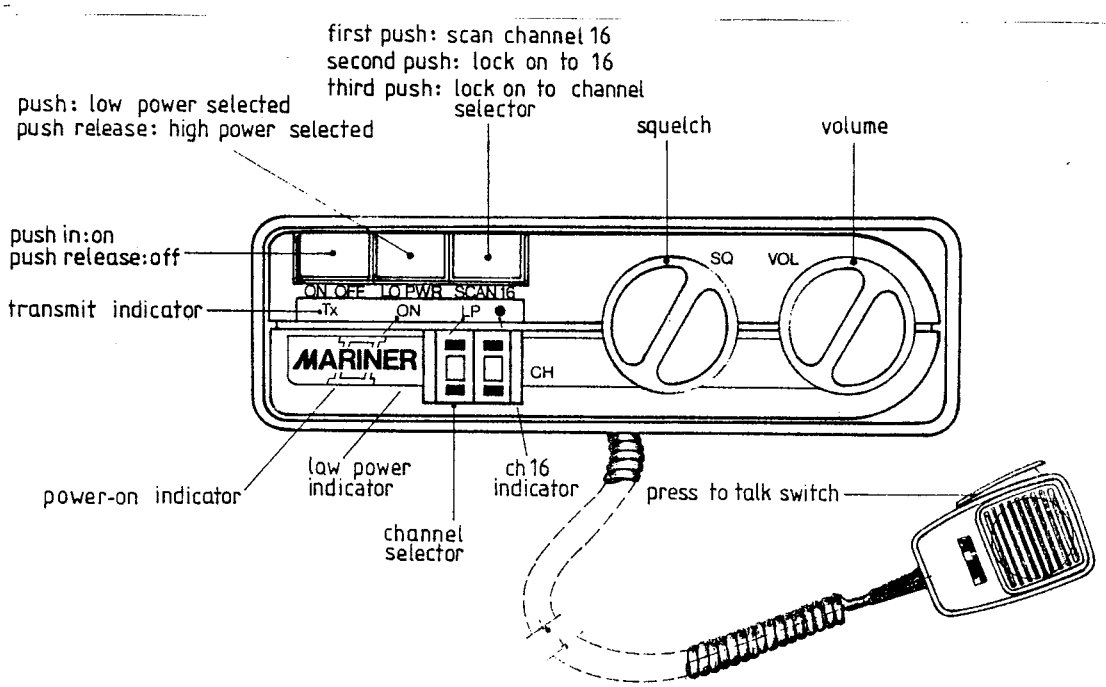


Figure 1 Front Panel Layout

1.3.1 FRONT PANEL CONTROLS

(a) ON-OFF SWITCH

With the radio connected to the battery, the 'ON' indicator should light up when the radio is switched on via the ON-OFF push button.

(b) LOW POWER SWITCH

Low power (less than 1 watt) may be selected by pushing the low power button. The low power indicator should then light up.

Note: In accordance with ITU Regulations, the RF output power on channels 15 and 17 is always restricted to less than 1 watt, indicated by the 'LP' indicator.

(c) CHANNEL SELECTOR

The channel selector on the front panel allows the operator to select up to 99 channels. However, only the internationally allocated marine channels are programmed (i.e. channels 1 to 28 and channels 60 to 88). All the remaining channels have no frequencies programmed and do not allow transmission.

(d) SCAN 16

When switched on, the radio operates on the channel selected by the channel selector on the front panel.

Pushing the 'SCAN 16' button for the first time will initiate the scan facility, indicated by the channel 16 LED flashing. Channel 16 and the front panel selected channel will then be scanned alternately.

If a signal is present when the scan mode is activated, or as soon as a signal arrives on either channel 16 or the other selected channel, the radio stops the scan and locks onto that signal. The radio remains locked onto that signal until it is no longer being received.

Note: Transmit is inhibited in the scan mode.

Pushing the 'SCAN 16' button for the second time will lock the transceiver to channel 16 (indicated by the channel 16 LED being lit continuously) and transmission can be made on channel 16.

Pushing the 'SCAN 16' button for the third time returns the radio to the channel selected on the front panel (indicated by the channel 16 LED being extinguished) and transmission can be made on the selected channel.

(e) VOLUME CONTROL

This controls the output of the speaker. Clockwise rotation increases the volume.

(f) SQUELCH CONTROL

This control sets the squelch sensitivity which quietens the radio when no signal is present. Turning the control fully clockwise gives maximum sensitivity.

To set the squelch:

Select a quiet channel.

Set the volume to an acceptable level, and then set the squelch control until the set just quietens.

Do not rotate the squelch control more than is necessary to silence the transceiver so as to avoid undue desensitisation of the receiver.

(g) PTT SWITCH

The press-to-talk switch activates the transmitter. The RF relay can be heard switching over and the 'TX' indicator lights up.

No transmission is possible on channels 70, 75 or 76 nor on any non-allocated channels.

(h) EXTERNAL SPEAKER

An external speaker may be connected via the rear panel connector (refer to Figure 3). Use an external speaker with an impedance of 3 to 4 ohms.

SECTION 2 CIRCUIT OPERATION

Refer to the Block Diagram and Circuit Diagrams at the rear of this Manual.

2.1 SYNTHESIZER

The Mariner II employs the dual modulus system of frequency synthesis. The voltage controlled oscillator (VCO, Q35 and buffer Q36) output is directed to the receiver or to the transmitter by the switching diodes D47 and D48 respectively. CV208 and D36 provide the receive injection frequency offset while the varicap diode D37 is used to frequency modulate the VCO when the Mariner II is in the transmit mode.

A crystal provides a stable reference frequency of 12.8MHz which is divided down to 6.25kHz and fed to one input of a phase comparator within IC8. For applications which require high frequency stability over a wide temperature range, a crystal heater is added. The crystal and heater are mounted on the LED board.

The VCO frequency is divided by the 40/41 prescaler, IC9, and then further divided within IC8 to provide the other input to the phase comparator. The division ratio in IC8, and hence the channel frequency, is determined by the pre-programmed EPROM on the memory PCB.

The phase comparator output (pins 7 & 8 of IC8) is fed to the VCO tuning varicap via the speedup circuit (Q27, Q28) and the loop filter (R180, C180, R185, C181, R190 and C205).

2.2 RECEIVER

The RF signal from the relay is amplified by Q15 and fed to the balanced mixer (Q16, Q17) via a double tuned circuit. 10mW from the VCO is fed in antiphase to the gates of the two mixer J-FETs.

The IF output from the mixer passes through the 21.4MHz crystal filter and is amplified by Q18 before being fed to IC6.

IC6 contains circuitry for: IF conversion from 21.4MHz to 455kHz with external crystal X1; amplitude limiting; quadrature detection with CD1; and squelch. CF1 determines the 455kHz IF bandwidth and Q19 provides additional limiting gain.

Audio from pin 9 of IC6 is de-emphasised by R68 and C55 and is fed through the audio processor (see Section 2.4.2) to the audio output amplifier, IC4a.

2.3 SQUELCH

An input signal to the squelch circuit is obtained from the audio output of IC6 via RV150. This signal has a noise level which is inversely related to the level of an RF signal at the receiver input.

An op-amp within IC6 is used in a band pass filter configuration to select and amplify noise frequencies above the audio band. The centre frequency is approximately 8kHz.

This signal is rectified by Q20 to give a positive going DC voltage which is an inverse function of the RF signal strength.

This DC voltage is then fed to a threshold detector within IC6, in such a way that pin 14 of IC6 is high in the presence of noise and low in the absence of noise. The threshold point occurs at approximately 0.7 volts.

The switching signal from the threshold detector is then inverted by Q7. R34, C17 and R26 provide an extended tail time (to prevent squelch closure during rapid fades) while maintaining a fast opening time.

Q6 drives the squelch element, which is part of the audio processor.

2.4 TRANSMITTER

2.4.1 RF STAGES

The 10mW output of the frequency modulated VCO is amplified to a level of 25 watts by a 4 stage broad band amplifier (Q40, Q44, Q45, Q46). High level RF then passes via the relay through the low pass filter to the aerial connector.

The transmit power output is set at 25 watts by RV260 which controls the collector voltage of Q44, and hence the gain of the broad band amplifier. The circuit utilises a power detector, D50, and a feed back loop to hold the transmitter power to 25 watts under conditions of varying supply voltage.

Transistor Q41 prevents the transmitter turning on when the synthesizer is out of lock.

2.4.2 AUDIO PROCESSOR

Transistor Q10 provides microphone preamplification while IC2 provides the necessary gain limiting and filter functions for the audio signal. An automatic level control (ALC) function is performed by detector Q11 and shunt elements D15 and D16. The analogue switches within IC3 allow either transmit or receive audio to be directed through the audio processor. Connection points for CTCSS or Selcall options are shown on the Circuit Diagram.

2.5 POWER SUPPLY

2.5.1 GENERAL

Note: The Mariner II is suitable for negative earth applications only.

The unit is protected by a crowbar diode (D1) which will blow the fuse if the supply is reverse connected.

DC is connected to the audio output IC and the transmitter final and driver whenever the Mariner II is connected to a supply.

2.5.2 CONTINUOUS SUPPLIES

DC from the on/off switch supplies the audio output IC enable, the power turn down stage and the short circuit protected 9 volt regulator. A continuous 9 volts is applied to the audio processor and synthesizer.

2.5.3 RECEIVE

When the PTT switch is open IC1 turns Q5 on and Q4 off, enabling the following circuits:

D47
Receiver
Squelch control
IC3b

2.5.4 TRANSMIT

When the PTT switch is closed IC1 turns Q4 on and Q5 off, enabling the following circuits:

D48
Low power transmitter stages
IC3a and IC3d
Aerial change-over relay

Closing the PTT switch also initiates a timer circuit around IC1 which will return the Mariner II to receive after 1½ minutes of transmission.

2.5.5 FREQUENCY INFORMATION

The channel frequency is selected from data stored in the Marine EPROM.

2.6 MEMORY AND REGISTER PCB'S

2.6.1 GENERAL

The additional circuitry in the Mariner II is accommodated on two printed circuit boards. These are designated as a memory PCB and a register PCB. The majority of the logic circuit is on the memory PCB.

2.6.2 MEMORY CIRCUIT

All channel information is contained within a 27C16, 2k x 8 EPROM (IC702). Channel selection is made with the thumbwheel switches, which present a BCD number at addresses A3-A6 for the 'units' thumbwheel, and addresses A7-A10 for the 'tens' thumbwheel.

The channel data is presented serially to the register PCB as two 8 bit words. To count through the 8 bits, a 4060 counter (IC700) addresses the remaining 3 address lines of IC702, A0-A2.

2.6.3 MODE SELECTION

The front panel scan switch is debounced by half of IC703 wired as a flip-flop. This signal is used to clock a Johnson ring counter (IC705a & b), whose outputs determine the current mode. A wired AND gate of D713, D714 and R730 modifies the count so that an invalid count (Qb high, Qa low) cannot occur.

The Mariner II recognises three modes accessible via the scan switch:

(1) Receive and transmit on the channel selected by the front panel channel switch.

(2) Receive only on either channel 16 or the front panel selected channel.

(3) Receive and transmit on channel 16 only.

The ring counter outputs, IC705 pin 13 and pin 1, are fed to IC701b and Q704. Together, the inverter and transistor form a tri-state totem pole output. When high, channel 16 is selected through diodes D710-D712, asserting the appropriate BCD code on the EPROM address lines. IC701c pulls the thumbwheel common lines low, thus ensuring they have no effect on the channel selected. When the mode selector output is low, normal front panel operation is enabled.

2.6.4 SCANNING

Scanning occurs during a tri-state condition at the totem pole output (IC701, pin 4). Output Q14 (IC700, pin 3) of the 4060 counter is used to switch between channel 16 and the front panel selection at a rate of approximately 2Hz.

When the scanning mode is first selected, the counter is reset so that scanning always begins at the front panel selected channel. A differentiator, consisting of C703, R704 and D701, produces the reset pulse.

If the radio scans into a busy channel, the scanning ceases for the period of time that the channel is busy. IC701f stops IC700 counting without resetting it. IC701a allows the busy signal to interfere only during scanning.

2.6.5 TRANSMIT INHIBIT

Transmission is inhibited in two situations:

(a) if the channel is designated receive only;

(b) if the radio is in the scanning mode.

These inputs are wired OR by D703, D704 and R712. The OR gate output switches Q703, which in turn switches Q702 to produce the 'Tx inhibit' signal.

2.6.6 LOW POWER SWITCH

When activated, the low power circuit restricts the PA output power to 0.8 watts nominal. The switch pulls the low power line low, thus lighting the 'low power' LED. IC703d buffers the signal to IC701e, which activates the low power circuit of R737, R738 and D715. These components work in conjunction with the power control circuitry at the power amplifier.

On channels 15 and 17, the low power function is operated automatically. Output O5 (IC702, pin 15) of the EPROM switches Q705 which in turn switches the low power circuit.

2.6.7 TRANSMIT/RECEIVE SWITCHING

Tx reg. is used to switch between transmit and receive data streams. IC704 (a 4066) is wired as a multiplexer for this purpose. It is controlled by IC701d which is connected to Tx reg.

2.6.8 REGISTER PCB

This PCB contains one level shifter, IC750 (a 40109), and two shift registers, IC751 and IC752 (both 4094's). The data is clocked into the shift registers by the clock signal. The strobe signal latches the data at the shift register outputs, which are addressed to the synthesizer input A and N lines.

SECTION 3 ANCILLARY EQUIPMENT

3.1 T508 POWER SUPPLY

The T508 Power Supply will allow operation of a Mariner II two way radio from a 230V (nominal) 50Hz or a 115V (nominal) 60Hz mains supply (specify voltage when ordering).

The T508 is an attractively styled unit which matches the Mariner II two way radio. The radio can be mounted on the T508 to give a compact desk top installation, or they can be separately wall mounted to save desk space.

The T508 provides a 13.8V DC 6.5A (intermittent) regulated supply for the Mariner II two way radio and incorporates current limiting and thermal protection.

3.2 T220/2 REMOTE SPEAKER ASSEMBLY

The T220/2 remote speaker assembly may be used with the Mariner II. It comprises a heavy duty 3 watt speaker mounted in a rugged enclosure which pivots on its mounting bracket. The 3.5 ohm voice coil of the speaker is connected by a short lead terminated in a 2 pin cord mounted connector. The enclosure is compact and easily mounted in any convenient position.

3.3 TA-500/CRDL

The TA-500/CRDL is a mounting cradle supplied with microphone clip and mounting screws to mount the Mariner II two way radio.

3.4 TA-500/RCM

The TA-500/RCM is a rugged cradle affording a higher level of environmental and mounting security than the standard cradle. It is available in either black or white and comes complete with mounting screws and cradle unlocking key.

SECTION 4 INSTALLATION

CAUTION: The Mariner II is suitable for negative earth installation only.

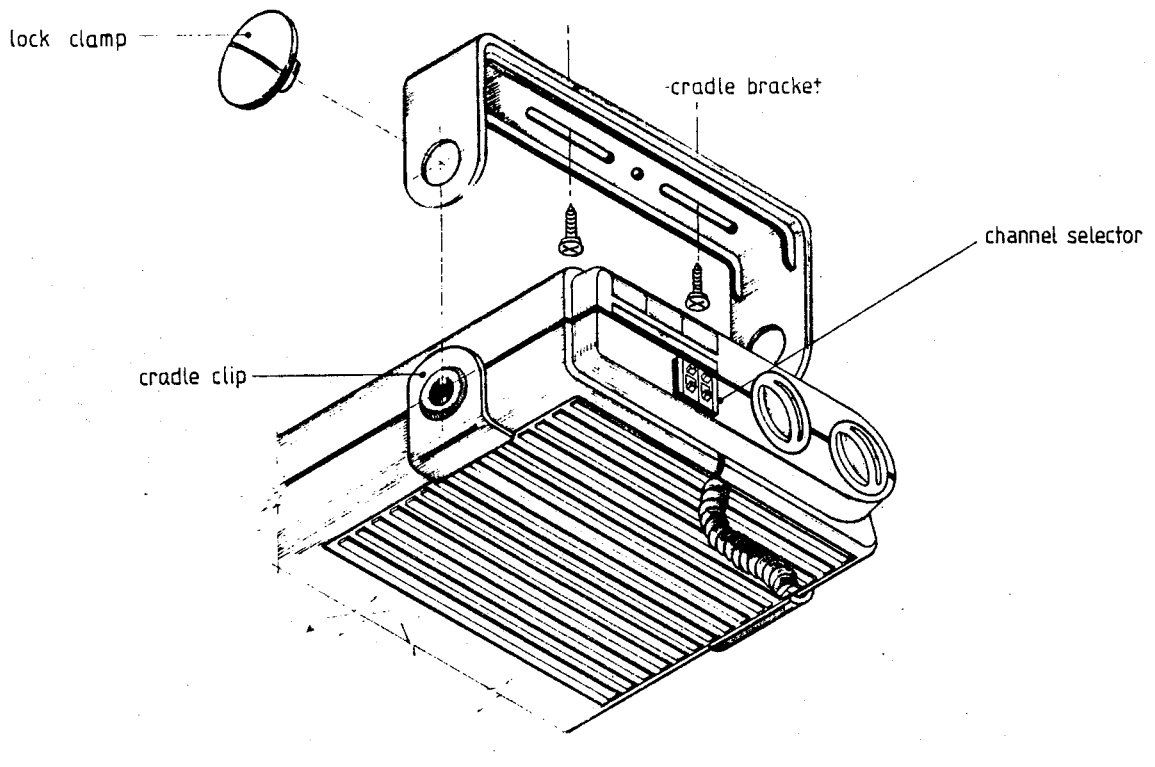


Figure 2 Mariner II Standard Mounting System

4.1 MOUNTING SYSTEM

4.1.1 STANDARD MOUNTING CRADLE

The Mariner II is supplied complete with a versatile mounting system. The mounting hardware includes one bracket, two clamps, two clips, and an assortment of self tapping screws.

To detach the bracket, rotate each clamp $\frac{1}{4}$ turn anticlockwise with a suitable coin. The two clips which mesh into the speaker grill are now free to be removed and refitted anywhere along the sides of the Mariner II. The bracket can be attached in any position above or below the Mariner II.

4.1.2 RUGGED MOUNTING CRADLE

The rugged cradle kit includes the cradle assembly, 2 cradle clips, 2 plastic keys and 4 self tapping screws.

To mount the Mariner II in the cradle, fasten the 2 cradle clips as indicated in Figure 3, then slide the radio (heatsink first) into the cradle. The spring clips in the cradle assembly will lock into the cradle clip grooves, holding the radio securely in place. It can then be released only with the cradle unlocking key.

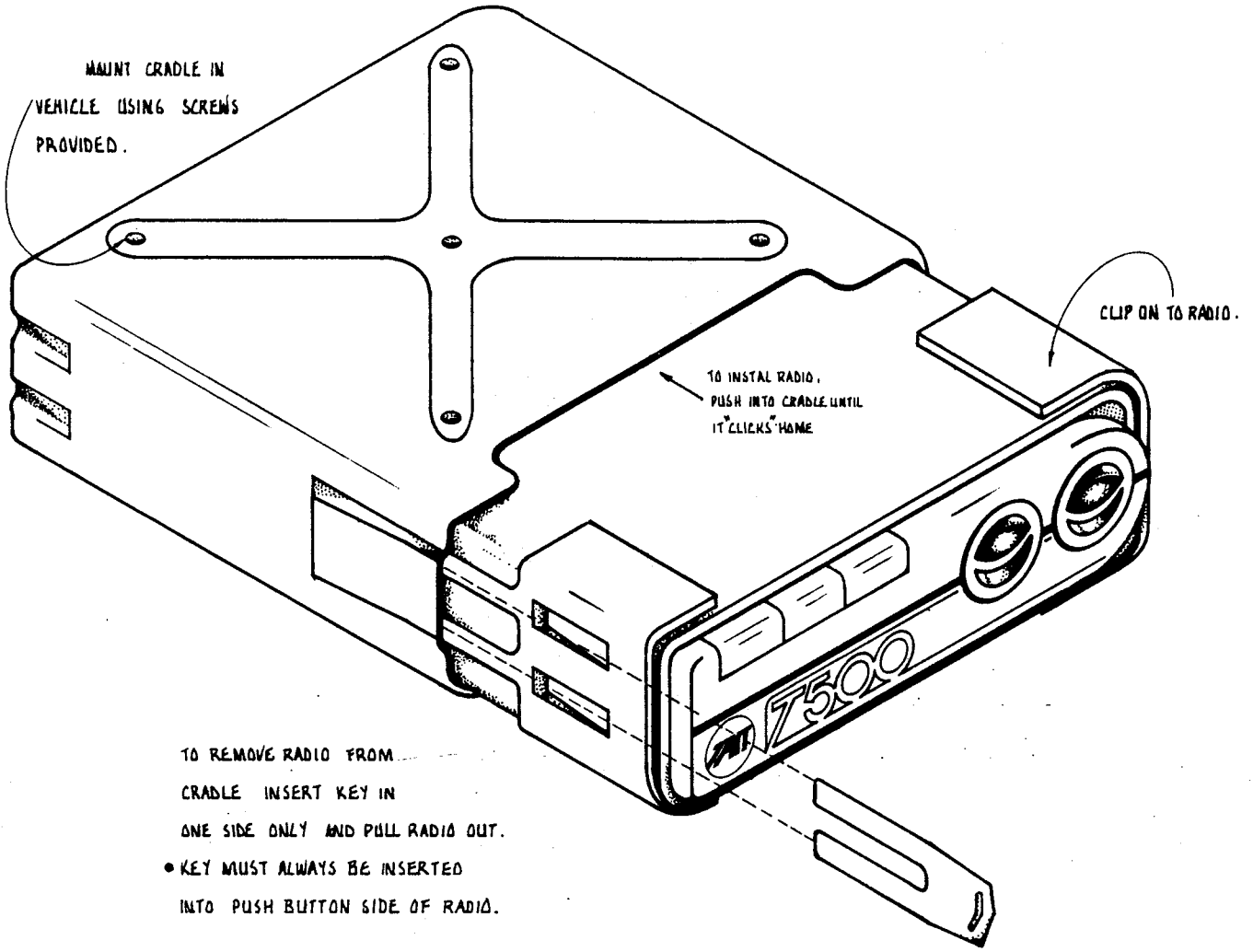


Figure 3 Mariner II Rugged Mounting System

4.2 RADIO INSTALLATION

Consider the following when looking for a suitable mounting position:

If the speaker grill is obscured an external speaker will be necessary.

The aerial and power connectors protrude beyond the heatsink fins.

The versatility of the standard mounting system allows the Mariner II to be inclined and/or moved back and forth once the bracket is mounted.

4.3 EXTERNAL SPEAKER

An external speaker may be necessary when the Mariner II is used in noisy conditions. Use Tait speaker type T220/2, 3.5 ohms.

Mount the speaker as close to the operator as is practicable.

Connect the speaker cable to the Mariner II 4 way connector socket as shown in Figure 4.

The Mariner II speaker can be disconnected internally or may remain connected provided that the impedance presented to the audio output stage does not fall below 2 ohms.

4.4 DC SUPPLY

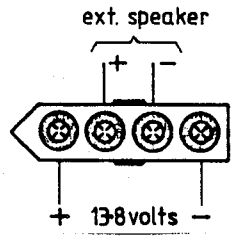


Figure 4 Mariner II Power Socket

The pins for the four way connector should be attached to the wires using an appropriate crimping tool.

Take both the positive (red) and the negative (black) from the 4 way socket directly to the vehicle battery (see Figure 4).

Fit an in-line fuse in the positive cable close to the battery. The fuse rating is 10 amps.

4.5 AERIAL

4.5.1 GENERAL

Mount the aerial in the desired location and run the aerial lead to the cradle using the shortest possible length of coaxial cable.

The following points should be considered when selecting a suitable position for the aerial:

(a) As communications at VHF frequencies are limited to line of sight distances, the aerial should be mounted as high as possible to ensure maximum operating range.

(b) The aerial should be kept at least 2 metres away from metal masts, stays, etc.

(c) The standard marine aerials have an inbuilt ground plane and need not be mounted onto metal to obtain their "earth".

(d) Standard marine aerials are pretuned and therefore need no further adjustment.

Use 50 ohm coax eg. RG58 or UR76.

Use the connector supplied to connect the aerial to the Mariner II (see Section 4.5.2 for the assembly procedure). Otherwise use a similar good quality UHF connector such as a Greenpar GE 40001, plus GE 40008, which may require a different assembly procedure.

Tune the aerial by connecting a VSWR indicator or a thru-line wattmeter (eg. Bird 43) between the Mariner II and aerial cable.

4.5.2 AERIAL CONNECTOR

Remove the coupling nut from the body of the connector and place it over the cable.

Prepare the cable, with the braid folded back over the outer sheath, to the dimensions given in Figure 5.

Screw the body sub-assembly onto the cable so that the braid is visible through the two holes made accessible by removal of the coupling nut.

Solder the braid to the body sub-assembly via the two holes in the centre, then solder the centre conductor to the centre contact.

Screw the coupling nut forward over the body sub-assembly.

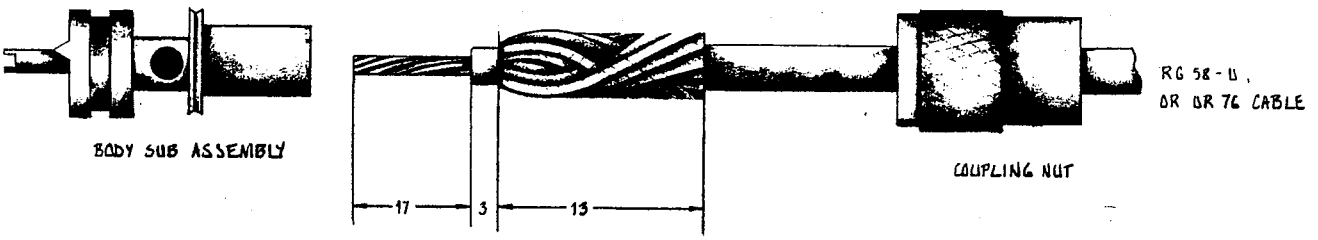


Figure 5 Aerial Connector Assembly

4.6 MICROPHONE CLIP

Ensure that the mic. clip is mounted in a position where the PTT switch cannot be inadvertently jammed on.

Refer to Section 1.4 for operating instructions.

SECTION 5 SERVICING

5.1 GENERAL

5.1.1 NOTES

If further information is required about the Mariner II or this manual, it may be obtained from Tait Electronics Ltd or accredited agents. When requesting this information, refer to "Mariner II" and quote the serial number (found adjacent to the aerial connector at the back of the set). In the case of the Circuit Diagrams quote the 'Title' and 'Issue' and for the Service Manual quote the internal part number (IPN) and Issue, eg. TM-530MA Issue A.

CAUTION: CLEANING

This is a plastic based product with a secondary finish on the outer case. Use a cloth dampened with warm, soapy water to clean. If solvent cleaners are to be used for stubborn stains, test first on a part of the set normally out of sight.

CAUTION: AERIAL LOADING

The equipment has been designed to operate over a wide range of aerial loading conditions. However, it is strongly recommended that the transmitter is not operated in the absence of a suitable load. Failure to observe this precaution may result in damage to the transmitter power output stage.

CAUTION: BERYLLIUM OXIDE & POWER TRANSISTORS

The RF power transistors in current use all contain some beryllium oxide. This substance, while perfectly harmless in its normal solid form, can become a severe health hazard when it has been reduced to dust. For this reason the RF power transistors should not be scratched, mutilated, filed, machined, or physically damaged in any way that can produce dust particles.

CAUTION: CMOS DEVICES

The equipment contains CMOS devices which are susceptible to damage from static charges. Care when handling these devices is essential. For correct handling procedures refer to the manufacturers data books, eg Philips data books covering CMOS devices, or Motorola CMOS data books, Section 5 'Handling', etc.

5.1.2 TECHNICAL INSTRUCTIONS

From time to time 'Technical Instructions' (TI's) are issued by Tait Electronics Engineering Division. These TI's may be used to update equipment or information, or to meet specific operational requirements.

5.2 MECHANICAL

5.2.1 POSIDRIV RECESS HEAD SCREWS

Posidriv screws are the preferred standard on all Tait manufactured equipment. The very real advantages of this type of screw will not be realised unless the correct screwdrivers are used by servicing personnel.

Posidriv No 1 screwdrivers will fit the posidriv screws used in the Mariner II. Phillips cross-head screwdrivers are not satisfactory for use on these screws.

5.2.2 DISASSEMBLY INSTRUCTIONS

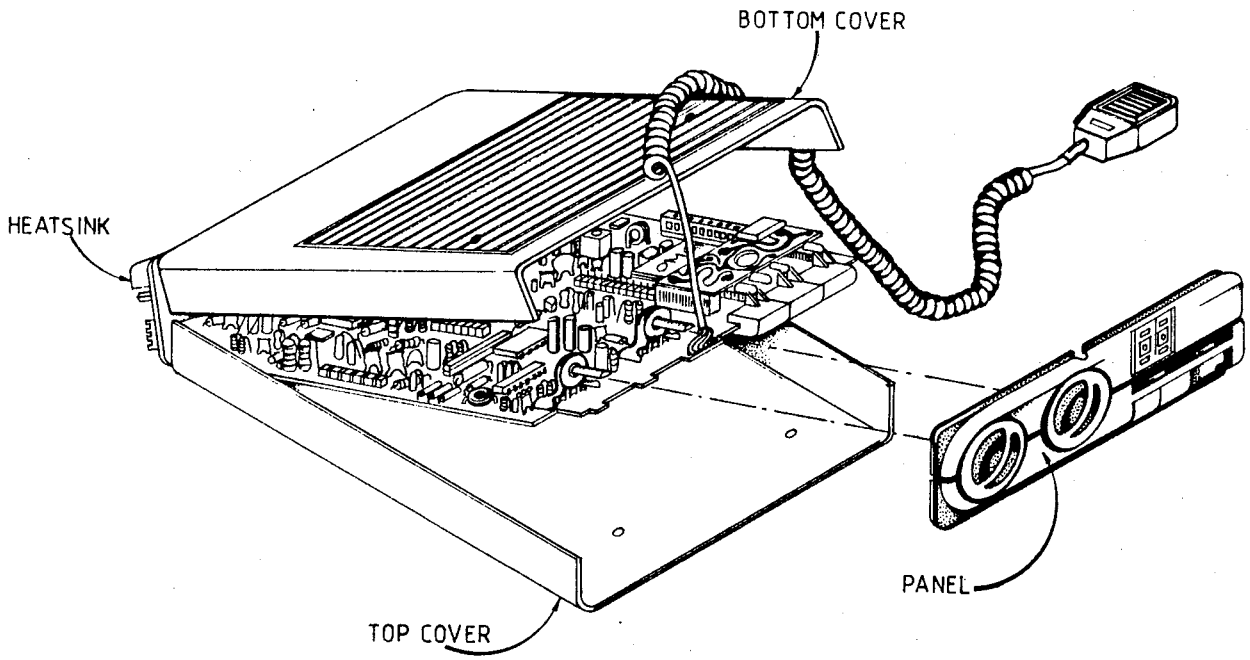


Figure 6 Mariner II Exploded View

Note 1: To carry out alignment procedures it is necessary to remove only the bottom cover as given in Section 5.2.2.1 below.

Note 2: To assist in separating the top and bottom covers, a thin plastic strip (such as a plastic rule) may be inserted between the covers and used as a lever.

5.2.2.1 To Gain Access To The Component Side Of The PCB

Place the Mariner II upside down on the bench.

Remove the 2 bottom cover retaining screws.

Gently lift the front end of the bottom cover until it clears the front panel.

Pull the cover forward to disengage the four small plastic lugs at the rear of the bottom cover.

Lift away the bottom cover.

5.2.2.2 To Gain Access To The Track Side Of The PCB

Remove the bottom cover as in Section 5.2.2.1 above.

Turn the Mariner II over on the bench.

Gently raise the front end of the top cover until it clears the front panel.

Pull the cover forward to disengage the 4 lugs at the rear of the cover.

5.2.2.3 To Remove The Front Panel

Remove the bottom and top covers as in Sections 5.2.2.1 and 5.2.2.2 above.

Slide the front panel forward.

It is not necessary to remove the knobs - they may be left in situ.

5.2.2.4 To Gain Access To The PA Components

To gain access to the PA, remove the shield cover from its position forward of the heatsink.

5.2.2.5 Speaker Removal/Refitting

The speaker in the Mariner II is held in place with four "push-on fix" spring clips (IPN 357-00010-09, Spire No. SFP 3253) which may cause problems when the speaker is removed.

To remove the speaker, cut the spring clips off the plastic locating pegs with wire cutters. Do not attempt to prise off the spring clips as this will damage the pegs.

Fit four new clips when refitting the speaker.

5.2.3 VCO CAN

CAUTION: When loosening or tightening the 4 retaining screws of the VCO can, support the can from the component side as undue pressure on the PCB may fracture some of the chip capacitors.

5.2.4 REASSEMBLY

Note: If the PCB has been removed, it must be refitted hard up against the heatsink along its entire length, as shown in Figure 7.

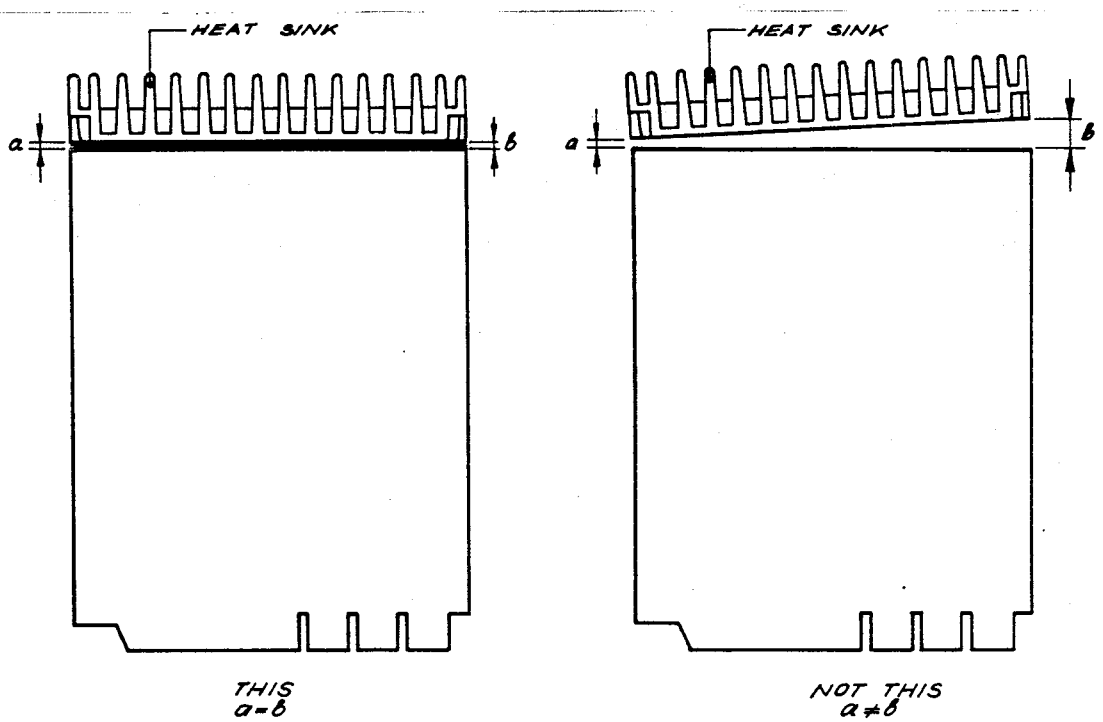


Figure 7 Fitting The Heatsink

Reassembly is carried out in the reverse order of the above.

Replace the PA shield.

Slide on the front panel, taking care to guide the four LEDs into their respective channels in the plastic moulding.

Press the microphone cord into its retaining slot.

Fit the top cover:

With the top cover at an angle of about 20°, slide the 4 plastic lugs at the rear of the cover into their respective slots in the heatsink.

Gently press the cover into position, taking care not to damage the 4 lugs. Ensure that the rim of the front panel fits into the groove around the front of the top cover.

Fit the bottom cover:

Invert the Mariner II.

With the bottom cover at an angle of about 20°, slide the 4 plastic lugs into their respective slots in the heatsink.

Gently press the cover into position, taking care not to damage the 4 lugs. Ensure that the rim of the front panel fits into the groove round the front of the bottom cover.

While fitting the bottom cover, check that the right hand retaining screw pillar slides into the hole in the LED PCB.

5.2.5 PA - SPECIAL INSTRUCTIONS

CAUTION: As the location of certain components in the PA is critical to performance, it is important that any components removed or disturbed be refitted in exactly the same location.

5.2.5.1 To Replace The PA Transistors

Unsolder the tabs by heating them with a soldering iron, then lifting them up towards the transistor with a thin stainless steel spike or screwdriver. Unscrew the transistor mounting screws or stud nuts and remove the transistor.

Trim the tabs of the replacement to make them similar to the faulty item, then lightly tin the underside of the tabs.

Smear the underside of the transistor with heatsink compound.

Screw the transistor tightly to the heatsink then solder the tabs.

CAUTION: Do not solder the tabs before tightening the screws, as this will fracture the device.

5.3 REPAIR

5.3.1 COMPONENT CHECKS

If a transistor is suspected of faulty operation, an indication of its performance can be assessed by measuring the forward and reverse resistance of the junctions. First make sure that the transistor is not shunted by some circuit resistance (unless the device is completely unsoldered). An AVO model 8 or equivalent meter should be used for taking the measurements, using only the medium or low resistance ranges.

The collector current drawn by multijunction transistors is a further guide to their operating performance.

If an integrated circuit (IC) is suspect, the most reliable check is to measure the DC operating voltages. Due to the catastrophic nature of most IC failures, the pin voltages will usually be markedly different in the presence of a fault from the recommended values. These values can be found on the Circuit Diagram, or in the component data catalogue.

5.3.2 COMPONENT REPLACEMENT

Whenever components are removed from, or fitted to the printed circuit track, care must be taken to avoid damage to the track. If it is necessary to remove a component from the track, the following procedure is recommended:

Remove the solder from the component leads using a solder wick.
Loosen the individual leads from the printed track.
Withdraw the component from the top of the PCB.

Because of the delicate nature of the printed track, the use of solder suckers is not recommended.

Do not remove the component from the PCB while the solder is still molten.

Keep all soldering operations, and the heat and solder applied, to a minimum. A thermally controlled, fine tip soldering iron should be used. Ensure that the iron is earthed back to the frame of the set.

5.3.3 CRYSTAL FILTER REPLACEMENT

Should it become necessary to replace the crystal filter, both cans should be replaced together as the new parts are supplied as matched pairs. Observe polarity when fitting.

5.3.4 CHIP COMPONENT REMOVAL/REPLACEMENT

Note: The temperature of the soldering iron must be maintained at 320-370°C (600-700°F) and low temperature solder should be used.

5.3.4.1 Removal

1. Place the soldering iron tip directly on the component in order to melt the solder and glue as shown in Figure 8. Remove the component with tweezers or long nose pliers.

2. Completely remove the old solder from the PCB, using a solder wick. Application of a small amount of flux will greatly aid in the removal of old solder. The use of 'solder suckers' is not recommended.

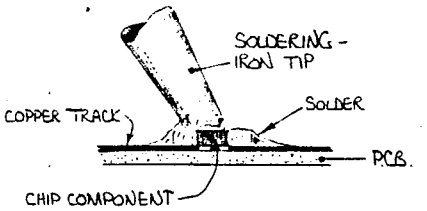


Figure 8

5.3.4.2 Replacement

1. After a component has been removed and the PCB pattern cleaned, apply a small amount of solder on the PC pattern and allow to cool, as shown in Figure 9.

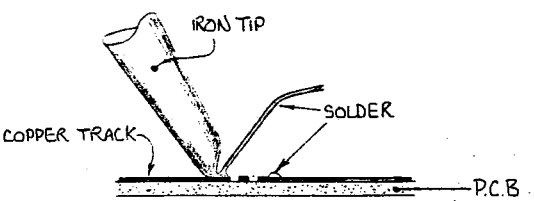


Figure 9

2. Insert the new components and apply the soldering iron tip to the PC pattern as shown in Figure 10 (a), (b) and (c).

CAUTION: As patterns and components are close to each other, extreme care must be excercised when soldering so as not to damage components or bridge the PCB pattern paths. High soldering iron temperatures can cause component damage. Do not apply the soldering iron tip to the new component during installation.

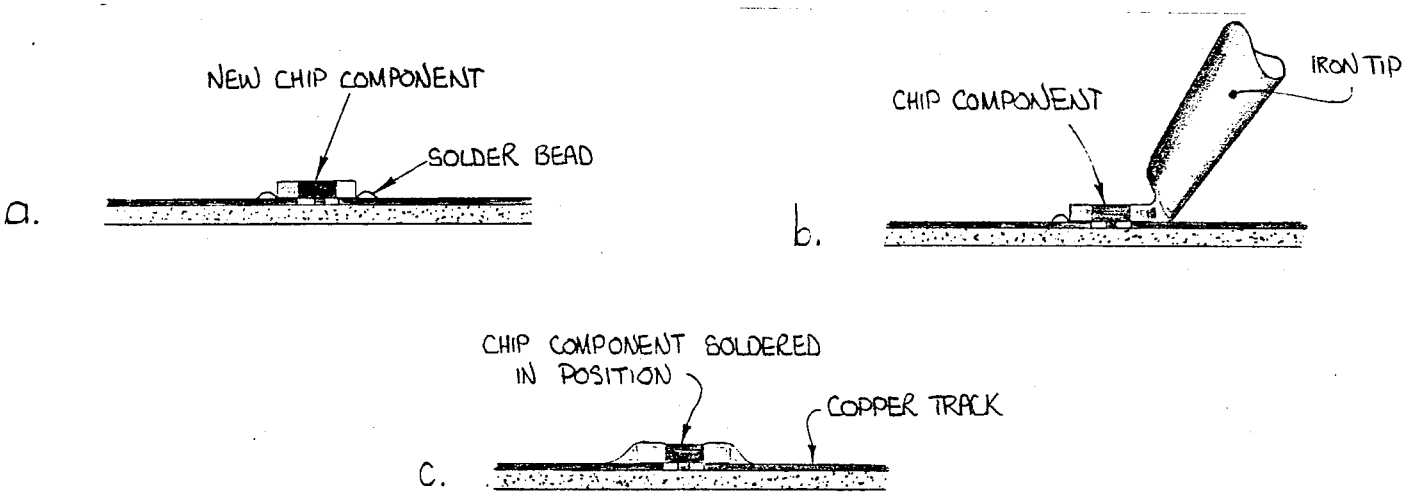


Figure 10

5.3.5 INTER-BOARD CONNECTIONS

To assist circuit tracing, all plugs and connections are shown on the outer edge of the Circuit Diagram, where the 'Function' is shown.

5.4 SETTING UP

5.4.1 TEST EQUIPMENT REQUIRED

1. Multimeter (eg. AVO Model 8)
2. DC electronic voltmeter (eg. Tech TE65)
3. RF power meter 30 watts FSD usable to 520MHz with 5 and 30 watt elements (eg. Bird Model 6154 or 611).
4. Power Supply - output adjustable between 9 and 16 volts DC with a capacity of at least 8 amps.
5. Modulation meter (eg. Sayrosa 252)
6. Sinad meter (eg. Helper Instruments Sinadder)
7. VHF signal generator. Good quality FM. Useable from 0.1µV (-127dBm) to 200mV (0dBm) pd. (eg. HP 8640B).
8. VHF frequency counter accurate to within 2ppm.
9. 10.7MHz Crystal marker (second harmonic gives beat for 21.4MHz IF)
10. Audio oscillator, 10Hz to 10kHz (eg. HP 204C/D)
11. Tone Box: Audio amplifier, with about 1.5 watts output, to drive a small speaker which can be coupled to the Mariner II microphone. An adaptor should be made whch will hold the speaker and microphone close together.
12. AC millivoltmeter
13. Calibrated oscilloscope
14. Speaker 4 ohm voice coil
15. RF power attenuator, total attenuation 50dB
    (eg. Weinschel 40-40-33 30dB 150W, plus Coline 1200 85 20dB 1w)
16. RF diode probe (eg.Greenpar GE 88202)

5.4.2 TUNING HINTS

1. Diagram 1 shows the test set-up for receiver and transmitter alignment.
2. For accurate tuning, the test cable connecting the signal generator or power meter to the Mariner II should be as short as practical and fitted with a 'mating' UHF connector. Do not use adaptors, 'sniffer' couplings, etc, which introduce changes to cable impedance and errors in test results.
3. Non-metallic tuning tools must be used for the alignment of all coil slugs to avoid the tuning errors introduced by the use of metallic tools. Tuning tools need to be of the correct size to avoid the damage to slugs which results from the use of incorrect tuning tools.

   Tuning tool WT 11 (Tait IPN 9360112) is suitable for adjusting trimming capacitors.

4. When using the RF diode probe, the earth return should be kept as short as possible and connected as close as possible to the point at which the measurement is being taken. This is to minimise stray pick-up which may affect the reading.

5. The front panel 'on/off' switch removes power from the regulated supplies only. The RF power amplifier, the audio output IC and the DC hash filter are not controlled by this switch.

6. Check for obvious mechanical faults in the printed circuit board, controls, microphone, etc.

7. Check the printed fuse on the PCB. Its rating is about 2 amps, and it can be replaced by a 0.1mm diameter copper link.

5.4.3 CHANNEL PROGRAMMING

5.4.3.1 Reference Frequency Selection

For 12.5kHz or 25kHz channel spacing use a 6.25kHz reference (12.8MHz crystal).

5.4.3.2 Programming

Note: The switching range is defined by the minimum change in frequency for loop voltages between 1.75 and 6.5 volts.

Table 1 shows how, when starting with A0, each successive input influences the synthesizer frequency by a multiple of 6.25kHz in an ascending binary sequence. (Note that it is sometimes possible to have two correct solutions for one particular frequency).

Table 1

Frequency Increment	Code
6.25kHz Ref.	
128MHz	N9
64MHz	N8
32MHz	N7
16MHz	N6
8MHz	N5
4MHz	N4
2MHz	N3
1MHz	N2
500kHz	N1
250kHz	N0
200kHz	A5
100kHz	A4
50kHz	A3
25kHz	A2
12.5kHz	A1
6.25kHz	A0

The following examples show a simple method of calculating the correct input programme.

Example 1

Tx frequency (channel 6) = 156.3MHz, 6.25kHz reference frequency.

VCO frequency:	156.300
subtract	128.000
	28.300
subtract	16.000
	12.300
subtract	8.000
	4.300
subtract	4.000
	0.300
subtract	0.250
	0.050
subtract	0.050
	0.000

In each case subtract the largest value from Table 1 which yields a positive result. Continue the process until zero is reached.

To check: The sum of the extracted values should equal the required VCO frequency.

N9 + N6 + N5 +N4 + N0 + A3 = VCO

128 + 16 + 8 + 4 + 0.250 + 0.050 = 156.3

Example 2

Rx frequency (channel 16) = 156.800, 6.25kHz reference frequency. The receiver has a 21.4MHz IF and low side injection.

$f_{VCO} = f_{Rx} - 21.4 = 135.400$

VCO frequency:	135.400
subtract	128.000
	7.400
subtract	4.000
	3.400
subtract	2.000
	1.400
subtract	1.000
	0.400
subtract	0.250
	0.150
subtract	0.100
	0.050
subtract	0.050
	0.000

In each case subtract the largest value from Table 1 which yields a positive result. Continue the process until zero is reached.

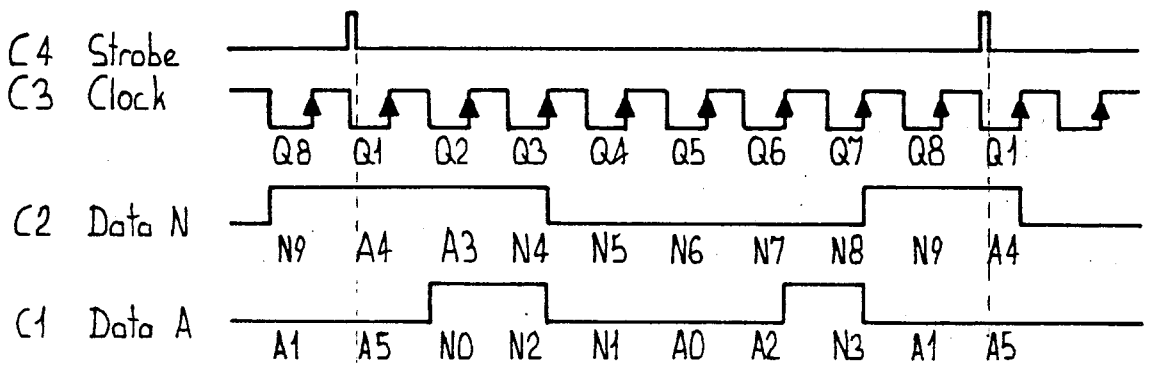
Check:

N9 + N4 + N3 + N2 + N0 + A4 + A3 = VCO
128 + 4 + 2 + 1 + 0.25 + 0.1 + 0.05 = 135.4
VCO + IF = f_{Rx}
135.4 + 21.4 = 156.8

5.5 VERIFICATION OF PROGRAMMING

5.5.1 CHECKING THE DATA FRAME

To check the data frame offered to the registers (IC751 and IC752), monitor the following points on the register PCB (refer to Circuit Diagram A2C559).



The data frame shown, between the two strobe points, is for channel 16 in the receive mode used for Example 2 on Page 5.9, where:

N9 + N4 + N3 + N2 + N0 + A4 + A3 = VCO

5.5.2 MARINE FREQUENCY ALLOCATIONS

Refer to Table 2 at the rear of this Section.

5.6 VCO ALIGNMENT

5.6.1 GENERAL

Connect the Mariner II to the RF power meter.

Connect a 13.8V DC power supply, observing the correct polarity.

Connect a frequency meter (high impedance input) to TP3.

Short the TP2 centre pin to the +ve pin.

With the VCO in the transmit mode (PTT closed), tune CV210 to 160MHz to establish VCO operation.

Remove the short from TP2.

5.6.2 REFERENCE FREQUENCY ADJUSTMENT

Ensure that a correctly programmed EPROM memory unit and register is fitted.

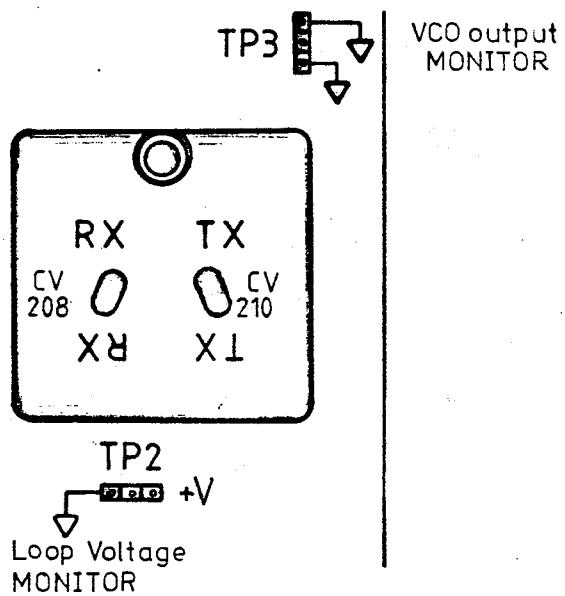
Select a channel having a known frequency (refer to Table 2 for channel allocations).

Monitor the VCO frequency at TP3.

Adjust L30 for the correct VCO frequency.

5.6.3 VCO ADJUSTMENTS

Note: It is always necessary to set transmit (CV210) before receive offset (CV208).



5.6.3.1 Transmit Mode (PTT switch closed)

Select channel 88.

Adjust CV210 for 4 volts at TP2.

Check frequency at TP3.

5.6.3.2 Receive Mode

Adjust CV208 for 6.25 volts at TP2.

Check frequency at TP3.

Note 1: A loop voltage of less than 0.5V or more than 7.5V indicates the VCO is out of lock.

Note 2: Check the frequency of transmit and receive on several channels to verify the synthesiser programming.

5.7 TRANSMITTER ADJUSTMENTS

5.7.1 ALIGNMENT

Select channel 88.

Remove the component side PA shield.

Connect a power meter to the aerial socket.

Set RV260 (power control) fully clockwise (viewed from component side).

Set CV289 & CV290 for half capacitance.

Close the PTT switch.

Adjust CV281 for maximum power.

Adjust CV289 for maximum power.

Adjust CV290 for maximum power.

Repeat CV281, CV289 and CV290 tuning.

Set RV260 for 25 watts.

Increase the capacitance of CV290 to reduce the total current to below 4.5 amps.

Readjust RV260 for 25 watts output if necessary.

Press the low power switch and check that the output power is less than 1 watt (typically 0.8 watts).

Refit the PA shield.

5.7.2 MODULATION ADJUSTMENT

Connect the Mariner II antenna output through a 50dB RF power attenuator (see Section 5.4.1, item 15) to a modulation meter.

Short circuit C49 to disable the ALC circuitry.

Connect the microphone to the tone box (see Section 5.4.1, item 11) or connect the audio oscillator to the microphone pads on the PCB.

Apply a 1kHz sine wave to give -40dBm (8mV rms) at the microphone pads.

Select channel 88.

Set the modulation meter to read '-' deviation.

Close the PTT switch and adjust RV79 for approximately -5kHz deviation.

Reduce the audio input to obtain -3kHz deviation, and then increase it by 20dB.

Sweep the audio frequency 300Hz to 3kHz and find the frequency of maximum '-' deviation.

Set RV79 to give -5kHz deviation at this frequency.

Set the modulation meter to read '+' deviation.

Sweep the audio signal 300Hz to 3kHz and readjust RV79 if a peak exceeding +5kHz is found.

Remove the short from C49.

5.8 RECEIVER ALIGNMENT

Connect a signal generator modulated to ±5kHz at 1kHz AF.

Connect a sinad meter across the speaker terminals.

Select channel 60 (160.625MHz).

Increase the signal generator output until 12dB sinad is reached.

Tune L19, L15, L13, L12 and L10 for best sinad while reducing the signal generator output level to maintain approximately 12dB sinad.

Note: The signal generator frequency must be accurately set when tuning L19.

Repeat the above tuning.

Reduce the signal generator deviation to ±3kHz.

Check that the signal generator output does not exceed -117dBm for 12dB sinad.

Check the sensitivity of channels 6 and 88.

Some minor readjustment of L10, L12 and L13 for equal sensitivity on all channels (±1.5dBm) may be necessary.

Note 1: The lowest receive frequency is channel 6; the highest receive frequency is channel 88.

Note 2: Sensitivity will degrade towards -117dBm (worst case) as the channel separation extends to 4MHz.

5.9 FAULT FINDING

5.9.1 GENERAL

During servicing it may be necessary to measure specific performance parameters as a means of verifying the presence of a fault condition.

The following performance tests provide a means for checking the various two way radio parameters. When used in conjunction with the voltage level test points which are given on the Circuit Diagrams (shown in blue) a fault can be readily pin-pointed.

5.9.2 RECEIVER PERFORMANCE TESTS

Carry out the following checks only after the alignment has been completed.

5.9.2.1 Squelch

(a) TO CHECK THE SQUELCH OPERATION

Connect a Sinad meter across the speaker terminals.

Connect a VHF signal generator to the aerial input terminal.

Set the signal generator output level to zero and the modulation to ±3kHz deviation at 1kHz.

Adjust the front panel squelch control until the noise just disappears.

Slowly increase the signal generator output level until the squelch gate 'opens', this should be at about 6 to 8dB sinad.

(b) TO CHECK THE SQUELCH RATIO

Set the signal generator output level to -107dBm (1µV), modulated to ±5kHz deviation at 1kHz.

Replace the sinad meter with a mV/meter across the speaker terminals.

Turn the squelch control fully anti-clockwise.

Adjust the volume control to give a reading of 3 volts on the mV/meter.

Reduce the signal generator output level to zero.

The fall in output is the 'squelch ratio' and this should be at least 70dB.

5.9.2.2 To Check The Audio Output Level

Connect an AC mV/meter and an oscilloscope across the speaker terminals.

Connect a VHF signal generator to the aerial input socket, with the output set to -107dBm (1µV) modulated to ±5kHz deviation at 1kHz.

Set the volume control to the onset of clipping.

The receiver output should be 3.7 volts across 4 ohms at +13.8V supply.

Check the distortion with the aid of a distortion analyzer connected across the speaker terminals.

The distortion should not exceed 5%.

5.9.2.3 To Check The Sinad Sensitivity

Connect a sinad meter across the speaker terminals.

Connect the signal generator to the aerial input terminal.

Set the signal generator accurately on receive frequency. (Couple a 10.7MHz reference oscillator loosely into the receiver IF stage, then tune the signal generator for a zero beat, uncouple the reference oscillator).

Set the signal generator deviation to ±3kHz at 1kHz.

Note: It is important that the modulating frequency matches the notch of the sinad meter.

Set the signal generator output level to zero.

Increase the signal generator output level until a sinad of 12dB is reached.

The signal generator output should not be greater than -119dBm and is typically -121dBm.

5.9.2.4 To Check The Signal+Noise to Noise Ratio

Set-up the signal generator and mV/meter as in Section 5.9.2.1 (b).

Set the squelch control fully clockwise.

Set the volume control for a reading of 0.8V ('0'dB) on a convenient scale on the mV/meter.

Switch the signal generator modulation off.

Note the reading on the mV/meter.

The fall in reading when the modulation is switched off should be at least 30dB for single channel use or two channels separated by less than 1MHz. As the channel separation extends towards 4MHz, the signal + noise to noise ratio will degrade towards 27dB.

5.9.2.5 To Check The Ultimate Signal To Noise Ratio

Note: A good quality low noise RF signal generator should be used for this check (eg, HP8640B or 8656).

Set the signal generator to give an 'on channel' signal, modulated to ±5kHz with a 1kHz tone.

Set the signal generator output level to -47dBm.

Connect an AC mV/meter across the speaker terminals.

Adjust the volume control for a reading of 0.8V ('0'dBm) on a convenient scale.

Turn the signal generator modulation off.

Note the reading on the mV/meter.

The fall in reading when the modulation is switched off should be at least 45dB. (A low reading could be caused by a faulty IC6 or a noisy VCO).

5.9.3 TRANSMITTER PERFORMANCE TESTS

5.9.3.1 Audio Processor

(a) TO CHECK THE LIMITER CIRCUIT

Connect an oscilloscope to monitor the waveform at pin 14 of IC2d.

Provide an audio signal to the audio processor as in Section 5.7.2.

Set the frequency of the audio signal generator to 1kHz.

Slowly increase the signal generator output level until the waveform begins to distort (squaring) indicating that limiting has commenced.

Any further increase in signal generator output level should not increase the amplitude of the waveform.

(b) TO CHECK THE AUDIO ALC OPERATION

Set up the audio signal as described above in Section 5.7.2.

Set the oscilloscope to monitor the waveform at pin 1 of IC2a.

Connect an EVM to the junction of C49/R52.

Increase the output level of the signal generator to 10dB above the limiting level [Section 5.9.3.1(a)]. Note the amplitude on the oscilloscope, then increase the signal generator output level by another 10dB.

Check that the amplitude of the waveform does not increase or distort significantly.

The EVM should show a 'positive DC' reading.

(c) TO CHECK THE GAIN OF THE AUDIO PROCESSOR

Provide an audio signal to the audio processor as in Section 5.7.2.

Connect the Mariner II antenna output through a 50dB RF power attenuator (see Section 5.4.1 item 15) to a modulation meter.

Connect a mV/meter across the microphone terminals on the PCB. (To monitor the input to the audio processor).

Set the frequency of the audio signal generator to 1kHz.

Check the deviation control, RV79, as in Section 5.7.2.

Slowly increase the output level of the audio signal generator until a deviation of ±3kHz is reached.

Check that the mV/meter reads approximately 1mV rms.

Note: The audio processor gain must be checked at a level below that at which the audio ALC or limiting are influencing the measurements.

5.9.3.2 Modulation Characteristics

(a) TO CHECK THE ABOVE LIMITING RESPONSE

Connect the Mariner II aerial output via a 50dB RF power attenuator to a modulation meter.

Provide an audio signal to the audio processor.

Increase the audio signal generator output level to 20dB above the limiting level [Section 5.9.3.1 (a)].

Vary the frequency of the signal generator between 0.3 and 10kHz

Note the deviation on the modulation meter.

Between the specified bandwidth for the Mariner II the deviation should be within 4dB of maximum.

Above 3kHz the deviation should decrease in excess of 25dB/octave.

(b) TO CHECK THE BELOW LIMITING RESPONSE

Decrease the audio signal generator output level to 10dB below the limiting level [Section 5.9.3.1 (a)].

Vary the frequency of the audio signal generator between 0.3 and 10kHz.

Note the reading on the modulation meter.

Between the specified bandwidth for the Mariner II the deviation should increase at the rate of 6dB/octave (+1 -3dB relative to 1kHz).

Above 3kHz the deviation should decrease in excess of 25dB/octave.

5.9.3.3 To Check The Power Control Circuit

Connect an RF power meter to the transmitter output.

Close the PTT switch.

Ensure that the transmitter is correctly tuned (Section 5.7).

Vary the supply voltage between 10 and 16 volts.

Above 13.8 volts the RF power output should not increase by more than 2 watts.

At 10.8 volts the RF power output should be more than 10 watts.

5.9.3.4 To Check The Transmission Timer

Connect an RF power meter to the transmitter output.

Close the PTT switch.

Check that the Mariner II reverts to 'receive' after approximately 1.5 minutes (+15, -45 seconds) of transmission time .

The transmission time may be set accurately by changing the value of either C16 (100µF) and/or R18 (1M).

To increase the transmission time increase the value of resistance or capacitance as required.

5.9.3.5 To Check The VCO Control Range

Plug a frequency counter onto the VCO test plug (TP3).

Short the middle pin on TP2 alternately to each of the outer pins of TP2.

The frequency shift should be more than 10MHz.

5.9.4 SYNTHESISER FAULT FINDING

Note: Refer to TI-294 for further information on synthesiser operation.

5.9.4.1 If The VCO Gives No Output

Ensure the frequency counter is connected to the middle pin of TP3.

Check the supply voltages at L39 (6.5V) and L48 (7.5V) for the VCO.

Remove the VCO box and check for shorts inside.

Check the gate and source voltages as per the Circuit Diagram.

5.9.4.2 If The Synthesiser Does Not Lock Up

Check the VCO control range following the instructions in Section 5.9.3.5.

If the control range is less than 8MHz, check the circuit for faults between TP2 and the varicaps. The voltage on the varicaps must be the same as the loop voltage.

Tune the VCO until its programmed frequency is within the switching range.

If the loop voltage is still either less than 0.6V or more than 7.5V, check pin 7 and pin 8 of the synthesizer (IC 8):

(Under normal operating conditions the loop voltage is between 1.75 and 6.5V and both pin 7 and pin 8 are high, except for very narrow pulses [100ns] at the same rate as the reference frequency.)

(a) if pin 7 pulses low and the loop voltage is low (TP2), or if pin 8 pulses low and the loop voltage is high, check the circuitry between R176/D31 and TP2. The voltage at C176 (use a 10M ohm probe) and TP2 should differ by no more than 200mV. If not check the behaviour of the buffer amplifier (Q29, Q30).

(b) if both stay high and the loop voltage is high, check the crystal oscillator.

Measure the VCO frequency.

Measure the prescaler output frequency (pin 3).

Check that $f_{prescaler} = f_{VCO}/40$

Note: The prescaler should not be loaded with 50 ohms - a 1M ohm input counter must be used.

Check that the input voltage of the synthesizer (pin 1) is more than 500mV pp around half-rail voltage.

5.9.4.3 To Check The VCO Output Frequency Stability

If the synthesizer locks up but does not reach a stable VCO output frequency, or if the VCO output frequency is a few channels off frequency, check:

(a) that the input power to the prescaler from the VCO is not too low; (Check the VCO output power and the circuitry between the VCO and the prescaler.)

(b) that the modulus control pulse (pin 1 of the prescaler) is more than 4.0V.

5.9.4.4 To Check The Transmitter Switch-On

If the synthesizer locks up but there is no transmitter power, check:

(a) that if the synthesizer is locked, the lock detect output (IC8, pin28) is high; (This output pulses low if the synthesizer is out of lock.)

(b) that the voltages are as shown in the Circuit Diagram (Q25, Q41).

5.9.4.5 Microphonics

If the set shows a high level of microphonics:

(a) Check that all components inside the VCO box are flush mounted to the PCB, paying special attention to the trimmer capacitors. (Resoldering may be attempted, but a solvent cleaner must never be used inside the VCO box.)

(b) Check the sensitivity of L37. Cracked lacquer inside the coil may cause microphonics. Remove the can, disassemble, and recoat the coil with nail polish.

(c) Remove any excess solder where the VCO box touches the PCB.

(d) Ensure that all screws are securely tightened.

5.9.5 MEMORY AND REGISTER PCB FAULT FINDING

5.9.5.1 Initial Tests

Before commencing further circuit tests, carry out the following checks:

(a) Ensure that the +5V power rail is present on all IC's (highest pin number on all IC's).

(b) Check that the 4060 oscillator is working (IC700, pin 11) at approximately 80kHz.

5.9.5.2 Data Stream

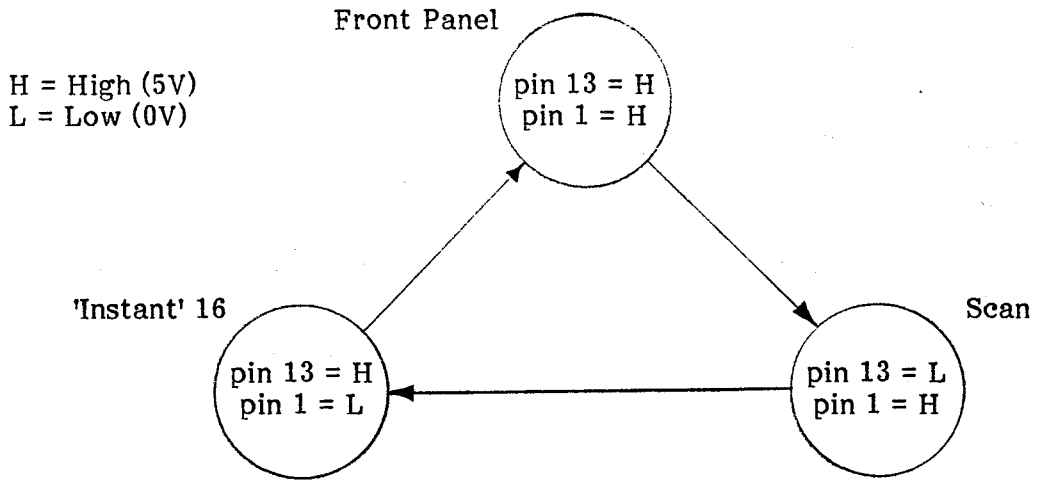
Check that data is present at the EPROM (IC702) outputs, and that the data changes with changing channel selection.

Check also the outputs of the 4066 (IC704).

5.9.5.3 Mode Selection

Check the mode selection switch action by testing pins 6 and 8 of the 4011 (IC703) while operating the switch.

Check that the resultant clocking signal can be seen on pins 3 and 11 of the 4013 (IC705). The mode counter (IC705) should traverse the following states:



Ensure that the correct signal for each mode can be found on pin 5 of the 74LS05 (IC701):

Mode	Signal
Front panel	Low
Scan	Hi-Z (approx. 2Hz oscillation)
'Instant' 16	High

Check also that the correct binary pattern is asserted on the EPROM (IC702) address lines for each mode.

5.9.5.4 Transmit Inhibit

The transmit inhibit signal is essentially a two-input OR gate. If the scan mode is active (collector Q701 high) or transmit is prohibited (IC702 [27C16], pin 14 high), then the transmit inhibit line (B4) will be pulled high.

Check the logical operation of this gate by monitoring the voltages on the gate inputs and output.

Note: The output is either high or HI-Z.

5.9.5.5 Low Power Switch

Switch the Mariner II to low power.

Check that pin 12 of the 4011 (IC703d) is signalled.

Select either channel 15 or 17.

Check that pin 15 of the 27C16 (IC702) goes low, pulling both pins 12 and 13 of the 4011 (IC703d) low.

Check that pin 10 of the 74LS05 (IC701e) pulls low for either input (switch or EPROM).

5.9.5.6 Register PCB

Check that the clock and strobe signals are present on pins 3 and 1 respectively of each 4094 shift register (IC's 751 and 752).

Check that the signals either side of the 40109 level shifter (IC750) correspond.

By triggering off the strobe signal, check that the data pattern on the shift register input corresponds to that on its outputs (Q1 to Q8).

Refer also to Section 5.5 "Verification of Programming" on page 5.10 for the formation of the data stream.

Table 2

VHF FM INTERNATIONAL MARINE CHANNELS

Channel	Frequency		Channel	Frequency	
	Ship Rx	Ship Tx		Ship Rx	Ship Tx
01	160.650	156.050	60	160.625	156.025
02	160.700	156.100	61	160.675	156.075
03	160.750	156.150	62	160.725	156.125
04	160.800	156.200	63	160.775	156.175
05	160.850	156.250	64	160.825	156.225
06*	156.300	156.300	65	160.875	156.275
07	160.950	156.350	66	160.925	156.325
08*	156.400	156.400	67*	156.375	156.375
09*	156.450	156.450	68*	156.425	156.425
10*	156.500	156.500	69*	156.475	156.475
11*	156.550	156.550	70*	156.525	- -
12*	156.600	156.600	71*	156.575	156.575
13*	156.650	156.650	72*	156.625	156.625
14*	156.700	156.700	73*	156.675	156.675
15*	156.750	156.750	74*	156.725	156.725
16*	156.800	156.800	75*	156.775	- -
17*	156.850	156.850	76*	156.825	- -
18	161.500	156.900	77*	156.875	156.875
19	161.550	156.950	78	161.525	156.925
20	161.600	157.000	79	161.575	156.975
21	161.650	157.050	80	161.625	157.025
22	161.700	157.100	81	161.675	157.075
23	161.750	157.150	82	161.725	157.125
24	161.800	157.200	83	161.775	157.175
25	161.850	157.250	84	161.825	157.225
26	161.900	157.300	85	161.875	157.275
27	161.950	157.350	86	161.925	157.325
28	162.000	157.400	87	161.975	157.375
			88	162.025	157.425

Note 1: * indicates a simplex channel.

Note 2: Channels 70, 75 and 76 are transmit inhibited.

Note 3: Channels 15 and 17 are restricted to low power.

SECTION 6 PARTS LIST

6.1 GENERAL

The 10 digit numbers (000-00000-00) in this parts list are 'internal part numbers' (IPN's).

Your spare parts orders can be handled more efficiently if you quote: equipment type, circuit reference and IPN, along with a brief description of the part.

VERSION	SUB-GROUPS	
T530B/MA:	B530	T530 PCB Assembly Parts
	B530/V	T530 Preformed Vertical Parts
	C530/B	Add With C530/BV For 15kHz Bandwidth
	C530/BV	T530 15kHz IFBW Vertical Parts
	C530/AF1	Mariner II Audio Response Parts
	C530/MA	Mariner II Unique Parts
	B530/MECH	T530 Mechanical Parts
	C530/MAM	Mariner II Mechanical Parts
	B500/LED	T500 Series LED/Crystal Assembly Parts
	C500/12.5	Parts For 12.5kHz Channel Increment
	B500/MISC	T500 Series Cradle Parts
	BMA2	Mariner II Memory And Register PCB Parts

6.2 B530 T530 PCB ASSEMBLY PARTS

6.2.1 TRANSISTORS

INTERNAL PART NO.	QTY/SET	DESCRIPTION	REFERENCE		CH/N
000-00010-60	2	BC327 TRANSISTOR	Q4, Q5		
000-00011-10	11	BC548B TRANSISTOR	Q1, Q2, Q7, Q10, Q19, Q20 Q27, Q29, Q32, Q41, Q42		
000-00011-30	7	BC557B TRANSISTOR	Q6, Q11, Q25, Q26, Q28, Q30 Q31		
000-00011-70	2	BD136 TRANSISTOR	Q3, Q43		
000-00022-30	1	2N4427 TRANSISTOR	Q44		
000-00023-13	1	MRF237 TRANSISTOR	Q45		
000-00023-23	1	SRFH1001 TRANSISTOR	Q46		
000-00031-10	1	BF961 TRANSISTOR	Q18		
000-00031-75	1	3SK97K TRANSISTOR	Q36		
000-00031-95	1	MPS 3646 TRANSISTOR	Q40		
000-00033-10	4	J310 TRANSISTOR	Q15, Q16, Q17, Q35		

6.2.2 DIODES

0	0	1	0	0	0	1	0	2	6	2	BA482 DIODE	D47, D48		
0	0	1	0	0	0	1	1	6	0	1	SR2607 DIODE	D1		
0	0	1	0	0	0	1	2	0	0	7	1N4148 DIODE	D8, D20, D31, D42, D43 D44, D45		
0	0	1	0	0	0	1	2	5	3	2	BB405 VARICAP DIODE	D35, D37		
0	0	8	0	0	0	1	0	1	3	1	LED TLY174 YELLOW LESS MTG	D14		85/5-165

6.2.3 INTEGRATED CIRCUITS

0	0	2	0	0	0	1	3	7	0	1	TDA 1020 INT CCT	Ic4		
0	0	2	0	0	0	1	4	4	0	1	MLM324 INT CCT	Ic2		
0	0	2	0	0	0	1	4	7	0	1	MC3357 INT CCT	Ic6		
0	0	2	0	0	0	1	4	9	1	1	4001B INT CCT	Ic1		
0	0	2	0	0	0	1	5	7	0	1	4066 INT CCT	Ic3		
0	0	2	0	0	0	1	7	5	5	1	SP8793 INT CCT	Ic9		
0	0	2	0	0	0	1	7	6	0	1	MC145152 INT CCT	Ic8		

6.2.4 CAPACITORS

0	1	1	0	0	5	0	0	0	1	2	0P5 CAP P100 ±0·25P 50V CERAMIC	, C209, C288		86/07-157
0	1	1	0	1	1	8	0	0	1	1	1P8 CAP NPO ±0·25P 50/63V CERAMIC	C204		
0	1	1	0	1	2	7	0	0	1	1	2P7 CAP NPO ±0·5 P 50/63V CERAMIC	C115		
0	1	0	0	2	1	8	0	0	1	1	18P CAP NPO 500V 5% CERAMIC	C299		86/10-317
0	1	1	0	1	3	3	0	0	1	1	3P3 CAP NPO ±0·5P 50/63V CERAMIC	C191		
0	1	1	0	1	4	7	0	0	1	5	4P7 CAP NPO ±0·5P 50/63V CERAMIC	C101, C107, C211, C213 C251		
0	1	1	0	1	6	8	0	0	1	1	6P8 CAP NPO ±0·5P 50/63V CERAMIC	C103		
0	1	1	0	1	8	2	0	0	1	1	8P2 CAP NPO ±0·5P 50/63V CERAMIC	C100	REF	C630/6772
0	1	1	0	1	8	2	0	0	6	1	8P2 CAP N750 ±0·5P 50/63V CERAMIC	C206		
0	1	1	0	2	1	0	0	0	1	2	10P CAP NPO ±0·5P 50/63V CERAMIC	, C117, C255		
0	1	1	0	2	1	2	0	0	1	1	12P CAP NPO 5% 50/63V CERAMIC	C116		
0	1	1	0	2	1	5	0	0	1	2	15P CAP NPO 5% 50/63V CERAMIC	C250, C118		
0	1	1	0	2	1	5	0	0	6	1	15P CAP N750 5% 50/63V CERAMIC	C174		
0	1	1	0	2	1	8	0	0	1	4	18P CAP N150 5% 50/63V CERAMIC	C281A, C109, C273, C102		85/12-428
0	1	1	0	2	2	2	0	0	1	2	22P CAP N150 5% 50/63V CERAMIC	C132, , C274		
0	1	1	0	2	2	2	0	0	6	1	22P CAP N750 5% 63V CERAMIC	C173		84/11-574
0	1	1	0	2	2	7	0	0	1	5	27P CAP N150 5% 50/63V CERAMIC	C110, C111, C183, C257, C229		86/10-299
0	1	1	0	2	3	3	0	0	1	2	33P CAP N150 5% 50/63V CERAMIC	C63, C228		85/9-346
0	1	1	0	2	3	9	0	0	1	2	39P CAP N150 5% 50/63V CERAMIC	C258, C259		
0	1	1	0	2	4	7	0	0	1	2	47P CAP N150 5% 50/63V CERAMIC	C48, C133,		85/9-346
0	1	1	0	2	5	6	0	0	1	1	56P CAP N150 5% 50/63V CERAMIC	C67		
0	1	1	0	2	6	8	0	0	1	1	68P CAP N150 5% 50/63V CERAMIC	C57		85/12-426
0	1	1	0	3	1	0	0	0	1	3	100P CAP N150 5% 50/63V CERAMIC	C45, C46, C135		85/7-247

Mariner II Parts List

0	1	1	0	3	1	2	0	0	1	2	120P CAP N150 5% 50/63V CERAMIC	C119, C120	
0	1	1	0	3	1	5	0	0	1	4	150P CAP N150 5% 50/63V CERAMIC	C15, C40, C137, C261	
0	1	1	0	3	2	2	0	0	1	4	220P CAP N750 10% 50/63V CERAMIC	C129, C122, C172, C262	86/07-162
0	1	1	0	3	4	7	0	0	2	3	470P CAP T/C B 10% 50/63V CERAMIC	C83, C114, C175	
0	1	1	0	4	1	0	0	0	1	13	1n CAP T/C B, 10% 63V CERAMIC	C7, C190, C207, C212, C214	
												C223, C227, C254,	85/12-428
												C266, , C271, C277	86/10-317
												C215, C11	85/01-012
0	1	1	0	4	4	7	0	1	3	28	4n7 CAP T/C B 10% 50V CERAMIC DISC	C1, C3, C6, C8, C42,	85/1-008
												C65, , C104, C106, C121	
												C126, C127, C128	86/09-162
												C131, C134, ,	85/07-249
												C179, C185, C188	86/04-087
												C220, C222, C225, C226	
												C252, C256, C260, C268	
												C286, C287, C56	85/01-011
0	1	5	0	2	4	7	0	0	1	2	47P CAP N150 5% CHIP 3·2×1·6mm	CC276, CC280,	85/12-428
0	1	5	0	3	1	0	0	0	1	1	100P CAP N150 5% CHIP 3·2×1·6mm	CC275	
0	1	5	0	3	2	7	0	0	2	1	270P CAP NP0 5% 100V CHIP Hi Q. 3·2×2·54mm	CC282,	
0	1	5	0	4	1	0	0	0	4	2	1n CAP T/C B 10% 50V CHIP 3·2×1·6mm	CC272, CC265	85/12-428
0	1	5	1	2	1	5	0	0	1	2	15P CAP 200V WEDGE 5×0·9mm	C293, C297	
0	1	5	1	2	1	8	0	0	1	1	18P CAP 200V WEDGE 5×0·9mm	C291	
0	1	5	1	2	3	0	0	0	1	2	30P CAP 200V WEDGE 5×0·9mm	C294, C296	
0	1	5	1	2	3	3	0	0	1	1	33P CAP 200V WEDGE 5×0·9mm	C295	
0	1	5	1	4	1	0	0	0	1	1	1n CAP 200V WEDGE 5×0·9mm	C292	
0	1	7	1	5	4	7	0	0	1	1	47N CAP 50V SURFACE BARRIER	C298	86/10-317
0	2	0	0	7	1	0	0	0	2	6	1µ CAP 50V ELECTRO 5×11mm	C4, C17 C41, C75, C76, C77	86/4-073 85/8-270
0	2	0	0	7	3	3	0	0	1	1	3µ3 CAP 50V ELECTRO 5×11mm	C143	
0	2	0	0	8	1	0	0	0	3	4	10µ CAP 50V ELECTRO 5×11mm	C113, C186, C189, C253,	
0	2	0	0	8	4	7	0	0	2	11	47µ CAP 16V ELECTRO 6×11mm	C5, C44, C49, C80, C130	
												C171, C177, C178, C182, C285	
												C269	
0	2	0	0	9	1	0	0	0	3	1	100µ CAP 16V ELECTRO 8×11mm	C16	
0	2	0	0	9	2	2	0	0	1	1	220µ CAP 16V ELECTRO 10×12·5mm	C82	
0	2	0	1	9	1	0	0	0	2	2	1000µ CAP 16V ELECTRO 12×25mm	C2, C9	
0	2	2	0	4	2	2	0	0	1	2	2n2 CAP 50V MYLAR	C50, C78	85/1-008
0	2	2	0	4	4	7	0	0	1	1	4n7 CAP 50V MYLAR	C181	
0	2	2	0	5	1	0	0	0	1	5	10n CAP 50V MYLAR	C66, C187, C209, C270, C267	86/10-317 REF C530/STD
0	2	2	0	5	1	5	0	0	1	1	15n CAP 50V MYLAR	C53	85/1-008
0	2	2	0	5	2	2	0	0	1	2	22n CAP 50V MYLAR	C47, , C61	85/1-008 85/3-071
0	2	2	0	5	4	7	0	0	1	10	47n CAP 50V MYLAR	C43, C54, C55, C68, C112	
												C136, C144, C170, C180 C221	

0220568002	1	68n CAP 50V MYLAR	C62	85/1-008
0220610002	2	100n CAP 50V MYLAR	C81, C284	
0220710002	1	1µ CAP 50V MYLAR	C176	
0280170002	2	1-7P TRIM CAP, TOP ADJUST, BLUE (MURATA)	CV208, CV210	
0280230003	1	5-30P TRIM CAP N750 GREEN MURATA TZ	CV281	85/12-428
0280260001	2	5-60P TRIM CAP 8TTMG PHILIPS	CV289, CV290	

6.2.5 RESISTORS

0302470002	2	47E RESISTOR 5% C/F 7x2.5mm	R101, R232
0301000002	2	100E RESISTOR 5% C/F 7x2.5mm	R186, R234
0301500001	1	150E RESISTOR 5% C/F 7x2.5mm	R110
0302200001	1	220E RESISTOR 5% C/F 7x2.5mm	R15
0303470001	1	470E RESISTOR 5% C/F 7x2.5mm	R197
0303680002	1	680E RESISTOR 5% C/F 7x2.5mm	R40, 86/06-157
0304100006	6	1K RESISTOR 5% C/F 7x2.5mm	R17, R177, R225, R231, R43, R264 — 84/11-530, 85/8-294, 86/10-317
0304150001	1	1K5 RESISTOR 5% C/F 7x2.5mm	R220
0304180001	1	1K8 RESISTOR 5% C/F 7x2.5mm	R198 — 85/3-075
0304220002	2	2K2 RESISTOR 5% C/F 7x2.5mm	R11, R118,
0304470005	5	4K7 RESISTOR 5% C/F 7x2.5mm	R27, R29, R226, R273, R66 — 85/03-075, 84/11-530, 85/01-008
0305100005	5	10K RESISTOR 5% C/F 7x2.5mm	R119, R146, R176, R179, R121
0305220002	2	22K RESISTOR 5% C/F 7x2.5mm	R20, R195, — 85/1-008, 86/06-157
0305470007	7	47K RESISTOR 5% C/F 7x2.5mm	R25, R46, R67, R68, R120, R181, R185
0306100002	2	100K RESISTOR 5% C/F 7x2.5mm	R64, R205
0306150001	1	150K RESISTOR 5% C/F 7x2.5mm	R70 — 85/8-294
0307100001	1	1M RESISTOR 5% C/F 7x2.5mm	R28
0323210001	1	10 E RESISTOR 5% M/F 10x 4 mm	R271 (MOUNTED UNDER PCB) — 86/10-317
0323318001	1	180E RESISTOR 5% M/F 10x4mm	R269 — 86/10-317
0400510013	1	10K LOG POT, LESS SW, PCB MTG	RV85 (VOL) (POT MARKED '10KA')
0400510014	1	10K LIN POT, LESS SW, PCB MTG	RV150 (SQUELCH) (POT MARKED '10KB')
0402042001	2	2K2 PRE-SET RES 10mm FLAT C/F	RV79, RV260

6.2.6 COILS

0521081235	1	COIL A/W 1.5T/2.3mm HOR	L58
0521081305	2	COIL A/W 1.5T/3mm HOR	L38, L70 — 86/10-317, 85/9-319
0521081345	1	COIL A/W 4.5T/3mm HOR	L64
0521081355	1	COIL A/W 5.5T/3mm HOR	L55

052081355	1	COIL A/W 1.5T/3.5mm HOR	L77	
052081355	2	COIL A/W 5.5T/3.5mm HOR	L79, L80	
052081365	1	COIL A/W 6.5T/3.5mm HOR	L56	
052081401	1	COIL A/W 1.5T/4.0mm HOR	L65	85/9-319
052081402	1	COIL A/W 2.5T/4.0mm HOR	L57	85/7-250
052081403	1	COIL A/W 3.5T/4mm HOR	L74, L63	86/10-317
052081602	2	COIL A/W 2.5T/6mm HOR	L78, L81	
052081604	1	COIL A/W 4.5T/6mm HOR	L48	
050000016 17	1	COIL TAIT No 617	L30	
050000016 23	4	COIL TAIT No 623	L10, L12, L13, L15	
050000016 33	1	COIL TAIT No 633	L37	
056000010 17	1	FXD IND TAIT NO. 17 6T 38	L75 (VERT MTG)	86/4-118
056000021 00	2	FXD IND 3.3μH (HOR)	L18, L32	86/07-162
056000021 01	5	FXD IND 1.5μH (HOR)	L11, L35, L36, L39, L46, (L1 - refer to C530)	
056000021 02	1	FXD IND 100μH (HOR)	L45	86/07-162
056000021 07	1	FXD IND 33μH (HOR)	L20	
056000021 10	2	FXD IND 3.3μH VERT MTG.	L14, L31	86/07-162
056000021 11	1	FXD IND 1.5μH VERT MTG.	L47	

6.2.7 PCB MISCELLANEOUS

065000101	1	FERRITE BEAD 3B	L69	
065000104	2	FERRITE BEAD 4×2×5mm F8	L67, L68	
200000104	30mm	TINNED COPPER WIRE 0.7mm	LINK IN P.A FROM 13.8V TO COLLECTOR OF FINAL TRANSISTOR	85/7-261
220000109 6	1	PRINTED CCT BOARD	ISSUE 'I'	
	2	~~SWITCH, PUSH, DPDT, LATCHING, PCB MTG~~	~~SW1, 3~~ refer C530	85/2-038
	1	~~SWITCH, PUSH, DPDT MOMENTARY LESS BUTTON~~	~~SW2~~ refer C530	85/2-038
237000102 3	1	RELAY, DPDT. 9V 14PIN DIL.	P/2.	
240000205 8	2	PLUG 5WAY HEADER		
240000205 9	2	PLUG 3 WAY HEADER	TEST POINTS (Also refer C530)	
	1	~~PLUG 18 WAY HEADER~~	refer C530	
240040205 7	1	SOCKET 10WAY TOP ENTRY, PCB MTG.		
274000102	1	CRYSTAL 20.945MHZ TO 15		
276000102	1	CERAMIC DISCRIMINATOR CDB455C7	CD1	
356000102 7	100	HARWIN TRACK PINS		86/06-152
	17	~~PIN 1.3mm PCB MOUNTING~~	refer to C530	85/9-345
362000108	1	SIL PAD	UNDER Q44	
400000205	7mm	SLEEVING 1.5mm SILICON RUBBER	REQUIRED FOR LINK	85/7-261

6.3 B530/V T530 PREFORMED VERTICAL PARTS

6.3.1 DIODES

001 000 0120 0	12	1N4148 DIODE	D2, D6, D7, D15, D16 D23, D24, D25, D26, D30, D40, D41		86/4-073
001 000 0126 6	1	HP5082-3080 PIN LO PWR DIODE	D36		85/12-447
001 000 0134 5	1	15597-2 DIODE	D50		
001 000 1509	1	BZX79/C3V9 ZENER	D3		
001 000 1511	1	BZX79/C5V1 ZENER	D46		
001 000 1513	1	BZX79/C6V2 ZENER	D22		

6.3.2 RESISTORS

030 000 0000 0	2	0E RESISTOR 5% C/F 7x2.5mm	(D9), R60		86/8-209 86/4-073
030 012 2000	1	2E2 RESISTOR 5% C/F 7x2.5mm	R89		
030 018 2000	1	8E2 RESISTOR 5% C/F 7x2.5mm	R251		
030 023 3000	2	33E RESISTOR 5% C/F 7x2.5mm	R256, R267		
030 024 7000	4	47E RESISTOR 5% C/F 7x2.5mm	R100, R229, R233, R257		
030 031 8000	2	180E RESISTOR 5% C/F 7x2.5mm	R265, R266		
030 033 3000	4	330E RESISTOR 5% C/F 7x2.5mm	R103, R109, R201, R230		
030 034 7000	1	470E RESISTOR 5% C/F 7x2.5mm	R206		86/11-530
030 035 6000	2	560E RESISTOR 5% C/F 7x2.5mm	R250, R252		
030 036 8000	5	680E RESISTOR 5% C/F 7x2.5mm	R5, R10, R44, , R262 R263		86/06-159
030 041 0000	7	1K RESISTOR 5% C/F 7x2.5mm	R8, R52, R173, , R188 R258, R3, R84		86/5-104 85/3-097 86/3-145 85/8-294
030 041 2000	3	1K2 RESISTOR 5% C/F 7x2.5mm	R2, R253, R259		
030 041 5000	5	1K5 RESISTOR 5% C/F 7x2.5mm	R115, R116, R218, R219 R221		
030 042 2000	11	2K2 RESISTOR 5% C/F 7x2.5mm	R9, R16, R41, R45, R73, R145, R228, R255 R261, R104, R105		85/1-008
030 043 3000	1	3K3 RESISTOR 5% C/F 7x2.5mm	R175		86/05-104
030 043 9000	1	3K9 RESISTOR 5% C/F 7x2.5mm	R7		
030 044 7000	9	4K7 RESISTOR 5% C/F 7x2.5mm	TR1, TR6, R21, R63, R80 R148, R170, R174, R254		
030 045 6000	1	5K6 RESISTOR 5% C/F 7x2.5mm	R71		85/1-008
030 046 8000	1	6K8 RESISTOR 5% C/F 7x2.5mm	, R199	REF	C530/STD
030 048 2000	3	8K2 RESISTOR 5% C/F 7x2.5mm	R183, R184, R227		
030 051 0000	10	10K RESISTOR 5% C/F 7x2.5mm	R30, R42, R47, R53, R54 R142, R144 R175, R187, R196	REF	C530/STD 85/1-008
030 051 5000	2	15K RESISTOR 5% C/F 7x2.5mm	R75, , R275	REF	C530/STD

0300522000	9	22K RESISTOR 5% C/F 7x2.5mm	R61, R102, R172, R190 R200, R207, R208, R272 R274		
0300533000	1	33K RESISTOR 5% C/F 7x2.5mm	R50		
0300539000	2	39K RESISTOR 5% C/F 7x2.5mm	, R86, R180	Ref	C530/STD
0300547000	4	47K RESISTOR 5% C/F 7x2.5mm	R4, R31, R33, R88		85/3-071
0300610000	3	100K RESISTOR 5% C/F 7x2.5mm	R19, R82, R87		
0300612000	1	120K RESISTOR 5% C/F 7x2.5mm	R26		
0300622000	1	220K RESISTOR 5% C/F 7x2.5mm	R117		85/3-284
0300647000	8	470K RESISTOR 5% C/F 7x2.5mm	R48, R49, R51, R65, R72 R143, R171, R189		
0300710000	2	1M RESISTOR 5% C/F 7x2.5mm	R15, R62		
0323210000	1	10E RESISTOR 5% M/F 10x4mm	R270		

6.4 C530/B MARINER II 15kHz IFBW PARTS

0110168001	1	6P8 CAP ±0.5P NP0 50/63V CERAMIC	C125
0110410001	1	1n CAP T/C B 10% 63V CERAMIC	C142
0223043001	2	3n3 CAP 50V MYLAR	C140, C141
0300456000	1	5K6 RESISTOR 5% C/F 7x2.5mm	R106
0300482000	1	6K2 RESISTOR 5% C/F 7x2.5mm	R149
0500001630	1	COIL TRIT No 630	L19
2760001014	1	CERAMIC FILTER CFW455E	CF1
2760001043	1	CRYSTAL FILTER 21.4MHz 15kHz B/W	XF1

6.5 C530/BV MARINER II 15kHz IFBW VERTICAL PARTS

0300333000	1	330E RESISTOR 5% C/F 7x2.5mm	R141
0300366800	1	680E RESISTOR 5% C/F 7x2.5mm	R122
0300422000	1	2K2 RESISTOR 5% C/F 7x2.5mm	R108
0300447000	1	4K7 RESISTOR 5% C/F 7x2.5mm	R107
0300612000	1	120K RESISTOR 5% C/F 7x2.5mm	R140
0300627000	1	270K RESISTOR 5% C/F 7x2.5mm	R147

6.6 C530/AF1 MARINER II AUDIO RESPONSE PARTS

0220510001	1	10n CAP 50V MYLAR	C51	85/11-417
0220522001	1	22n CAP 50V MYLAR	C52	85/11-417
0300468000	2	6K8 RESISTOR 5% C/F 7×2.5mm	R74, R76	85/11-417
				85/11-417
0300512000	1	12K RESISTOR 5% C/F 7×2.5mm	R77	85/11-417
0300547000	1	47K RESISTOR 5% C/F 7×2.5mm	R78	85/11-417

6.7 C530/MA MARINER II UNIQUE PARTS

0010001509	1	BZX79/C3V9 ZENER	Replaces P215 6052	
0110110001	1	1P CER P100 50/63V CERAMIC	C108	
0300210000	1	10E RESISTOR 5% FILM 7×2.5mm	R268	86/67-181
0300327000	2	270E RESISTOR 5% FILM 7×2.5mm	R224, R32	86/9.262
2320001019	2	SWITCH, PUSH, DPDT, LATCHING, PC MT.	POWER, LOW POWER	
0560002101	1	INDUCTOR FIXED NO 101 1.5UH HOR	L1	86/4.335
2320001020	1	SWITCH, PUSH, DPDT, MOMENTARY, PC MT	SCAN,	
2400002059	1	HEADER 3WAY 1ROW PC MTG		
2400002060	1	HEADER 18WAY 1 ROW PC MTG		
2400402072	1	SKT HOUSING 2WAY ULTREX CARD MTG.	TO MEMORY	
2400402076	2	SKT RECEPTACLES ULTREX		
3560002023	6	PIN 1.5mm PCB MTG.	MIC 4, SPKR 2.	
	1	MARINER 2 MEMORY & REGISTER	[illegible]	
2010003009	110mm	WIRE 7/0.2 PVC WHITE	ULTREX SKT	
2010003010	110mm	WIRE 7/0.2 PVC BLACK		

6.8 BMA2 MARINER II MEMORY AND REGISTER PCB PARTS

0000001110	2	BC548B TRANSISTOR	Q700, Q703
0000001130	4	BC557B TRANSISTOR	Q701, Q702, Q704, Q705
0010001201	0.013	1 THOU 1N4148 DIODES	D701, D702, D703, D704 D706, D709, D710, D711 D712, D715 (ALL VERT MTG) D707, D713, D714 (HOR MTG)
0010001512	1	BZX79/C5V6 ZENER	D700
0020001500	1	4011B INT CCT	IC703
0020001515	1	4013B INT CCT	IC705
0020001570	1	4066B INT CCT	IC704
0020001627	1	4060B INT CCT	IC700
0020001651	2	4094B INT CCT	IC751, IC752

Mariner II Parts List

0	0	2	0	0	0	1	6	6	5	1	40109B INT CCT	IC750		
0	0	2	0	0	0	1	7	3	0	1	74LSØ5 INT CCT	IC701		
0	0	2	0	0	0	1	8	0	1	1	27C16 INT CCT	IC702		
0	1	1	0	4	1	0	0	0	1	3	1n CAP T/C B 10% 63V CERAMIC	C702, C703, C705		
0	2	0	0	8	1	0	0	0	4	2	10µ CAP 16V ELECTRO 4x7mm	C700, C750		
0	2	2	0	6	1	0	0	0	1	1	100n CAP 50V MYLAR	C701		
											4x1.6mm HORIZONTAL RESISTORS - PREFORM TO 7.5mm LEAD SPACING			
0	3	0	0	2	8	2	0	0	0	1	82E RESISTOR 5% FILM 7x2.5mm	R700 (VERT)		
0	3	0	0	3	2	7	0	0	0	1	270E RESISTOR 5% FILM 7x2.5mm	R715 (VERT)		
0	3	0	0	4	1	8	0	2	0	3	1K8 RESISTOR 5% FILM 4x1.6mm	R703, R706, R716 (ALL HOR MTG)		
0	3	0	0	4	2	2	0	2	0	6	2K2 RESISTOR 5% FILM 4x1.6mm	R701, R709, R737 (ALL VERT MTG) R707, R728, R729 (ALL HOR MTG)		
0	3	0	0	5	1	2	0	0	0	1	12K RESISTOR 5% FILM 7x2.5mm	R738 (VERT)		
0	3	0	0	5	1	5	0	0	0	1	15K RESISTOR 5% FILM 7x2.5mm	R702 (VERT)		
0	3	0	0	5	2	2	0	2	0	13	22K RESISTOR 5% FILM 4x1.6mm	R704, R708, R710, R711, R712, R713, R726, R735, R736, (ALL VERT MTG) R705, R730, R734 (ALL HOR MTG) R727		
0	3	4	0	6	1	0	0	4	0	2	100K x4 RESISTOR 5% S.I.L. PACK	RP700, RP701		
2	0	1	0	0	0	3	0	0	1	200mm	WIRE 7/0.2 PVC BROWN	MEMORY - 5WAY ULTREX SKT		86/07-178
2	0	1	0	0	0	3	0	0	2	200mm	WIRE 7/0.2 PVC RED	"		"
2	0	1	0	0	0	3	0	0	3	200mm	WIRE 7/0.2 PVC ORANGE	"		"
2	0	1	0	0	0	3	0	0	4	200mm	WIRE 7/0.2 PVC YELLOW	"		"
2	0	1	0	0	0	3	0	0	5	200mm	WIRE 7/0.2 PVC GREEN	"		"
2	2	5	0	0	0	1	1	6	6	1	PRINTED CCT BOARD, MARINER 2 MEMORY			
2	2	5	0	0	0	1	1	6	7	1	PRINTED CCT BOARD, MARINER 2 REGISTER			
2	4	0	0	0	0	2	0	5	7	1	HEADER 10WAY 1 ROW MOLEX	REGISTER R1 - R3		
2	4	0	0	0	0	2	0	7	5	1	HEADER 5 WAY 1 ROW ULTREX	REGISTER C1 5		
2	4	0	0	0	0	2	0	8	0	1	HEADER 10WAY 1 ROW ULTREX	MEMORY		
2	4	0	0	4	0	2	0	3	8	1	SOCKET 24 PIN DIL.	IC 702		
2	4	0	0	4	0	2	0	5	7	1	SKT. 10WAY 1 ROW. TOP ENTRY (MOLEX)	REGISTER		
2	4	0	0	4	0	2	0	5	8	2	SKT. 5 WAY 1 ROW TOP ENTRY (MOLEX)	MEMORY C 5		
2	4	0	0	0	0	2	0	7	2	1	HEADER, 2WAY, PCB MTG., ULTREX	MEMORY E1 2		
2	4	0	0	4	0	2	0	7	5	1	SKT HOUSING, 5 WAY 1 ROW, CORD MTG ULTREX	MEMORY C1 - 5		
2	4	0	0	4	0	2	0	7	6	5	SKT RECEPTACLES ULTREX	FOR 5 WAY SKT		
3	5	6	0	0	0	1	0	2	7	0.035	1THOU HARWIN TRACK PINS	MEM 24, REG 11		

6.9 B530/MECH T530 MECHANICAL PARTS

012 041 00 01	2	1n CAP, CERAMIC FEED THRU, LEADLESS	C298, C299	
065 000 10 07	2	FERRITE BEAD 5×2×4mm 4S3 RED	L98, L99	
201 000 30 04	90mm	WIRE 7/0.2mm PVC YELLOW	90mm PCB/SPKR CONNECTOR	
201 000 40 12	80mm	WIRE 0.5mm² PVC RED (16/0.2 OR 10/0.25)	80mm PCB/POWER CONNECTOR	
240 000 10 60	1	PLUG HOUSING, 4 WAY, PNL MTG		86/7-227
240 000 10 61	4	PLUG TERMINALS, SOLDER TAIL		86/2-030 86/5-153 86/7-227
240 021 00 35	1	SKT, COAXIAL, UHF, PNL MTG		
302 000 51 75	1	BRACKET, FEED THRU A3M1597		
308 001 30 65	1	HEATSINK, DRIVER A4M1816		85/3-086
319 000 11 00	1	SHIELD PA, COMPONENT SIDE A2M1592		
319 000 11 01	1	SHIELD PA, SOLDER SIDE A3M1593		
319 000 11 04	1	SHIELD PA, COVER A3M1594		
319 000 11 08	1	SHIELD BOX, VCO A3M1654		
319 000 11 09	1	SHIELD LID, VCO A3M1655		
319 000 11 14	1	SHIELD, PA COVER, SOLDER SIDE A3M1675		
				86/7-181 85/3-086
349 000 10 22	2	SCREW NO. 4×3/8 PAN PLASTITE 2-90	COVER	86/2-047
349 000 20 30	4	SCREW M3×6mm PAN POZI TAPTITE	UHF SKT 2, Ic4 1, Q43 1.	85/4-112
349 000 20 31	4	SCREW M3×10mm PAN POZ TAPTITE	VCO 4.	85/5-139
349 000 20 32	3	SCREW M3×8mm PAN POZ TAPTITE	Q3 MTG 1, HEATSINK 2	85/5-139
352 000 10 05	5	NUT M3	Q3 1, Q43 1, Ic4 1, H/S 2	85/4-112
353 000 10 10	1	WASHER M3 FLAT	1 FOR BD136 XSTER MTG	86/10-294
353 000 10 13	3	WASHER M3 SHAKEPROOF	Q3 1, Q43 1, Ic4 1	
357 000 10 09	4	PUSH ON FIX SFP3253		
369 000 10 12	1	FURNITURE FOOT, R/C R359		85/7-242
399 000 10 56	1	PLASTIC BAG, 200×250mm		
399 000 10 10	1	RUBBER BAND		85/4-106
400 000 20 07	55mm	SLEEVING 2mm SILICON RUBBER	4 × 13mm	85/11-405

6.10 C530/MAM MARINER II MECHANICAL PARTS

201 000 30 01	200mm	WIRE 7/0.2 PVC BROWN	200mm CODE SW/10W SKT
201 000 30 02	200mm	WIRE 7/0.2 PVC RED	" " "
201 000 30 03	200mm	WIRE 7/0.2 PVC ORANGE	" " "
201 000 30 04	350mm	WIRE 7/0.2 PVC YELLOW	200mm CODE SW/10 SKT, 150mm SPKR
201 000 30 05	425 mm	WIRE 7/0.2 PVC GREEN	200mm " " , STRIP + TIN 5mm EACH END: 1×25mm, 1×40mm, 1×65mm, 1×85mm	86/9-241
201 000 30 06	200mm	WIRE 7/0.2 PVC BLUE	"
201 000 30 07	350mm	WIRE 7/0.2 PVC VIOLET	200mm " " , 150mm

201000300 8	300mm	WIRE 7/0.2 PVC GREY	200mm " " , 100mm	
201000300 9	260mm	WIRE 7/0.2 PVC WHITE	200mm " " , 60mm	
201000301 0	350mm	WIRE 7/0.2 PVC BLACK	200mm " " , 150mm SPR	
234000102 6	2	SWITCH, PUSH, BCD CODE, PICO 131	CHANNEL SELECT	
234000202 8	1 PR	SW SIDE COVERS FOR PICO 131		
240040207 6	10	SKT RECEPTACLE, ULTREX		
240040208 0	1	SKT HOUSING 10WAY 1ROW, CRD MT. ULTREX		
250000101 4	1	SPEAKER 8 OHM A3M1799		
252000101 2	1	MICROPHONE 600Ω.		
302004002 3	3	PUSH BUTTON, PLASTIC. A3M1585		
303002002 2	1	COVER, TOP, WHITE PLASTIC		
303002002 3	1	COVER, BOTTOM, WHITE PLASTIC		
308001305 5	1	HEATSINK, DIECAST A1M1579		
309000103 9	1	INSULATOR CARD A4M1828		
311000103 3	2	KNOB A3M1584		
312000103 8	1	LENS A4A446 A3M1586		
316000063 2 5	1	FRONT PANEL, WHITE, MARINER 2. A4A438		
316008705 7	1	PILLAR 11.5mm M3 A4M1600		
319000110 1	1	SHROUD, INDICATOR A4M1587		
349000203 0	2	SCREW M3 x 6mm PAN POZI TAPTITE		
				86/07-138
356000201 4	6	RECEPTACLE 1.5mm.	MIC 4, SPKR 2.	
369000101 4	7	CABLE TIE NYLON 100mm x 2.6mm	FRNT PNL LOOM (3), PCB LOOM (4)	86/10-288
409530MAHB	1	MARINER II OPERATORS HANDBOOK		86/08-231
410000104 9	1	PACKAGING CARD SLEEVE MARINER 2 A1A449	RETURN TAIT T500 SLEEVE TO STORE	

6.11 B500/LED T500 LED/CRYSTAL ASSEMBLY PARTS

008000113 2	4	LED, 3mm, RED, HIGH INTENSITY	D302, D303, D304, D305	84/8-365
030000000 0	2	ZERO OHM 5% 7x2.5mm C/F	R309, R306 TO REPLACE LINKS CONNECTED TO L3 & L4	86/07-165
240040205 9	1	SKT 3WAY 1ROW, PCB MTG, TOP ENTRY		
240040206 1	1	SKT 7WAY 1 ROW, PCB MTG, TOP ENTRY		
			XTAL – REFBC500/12.5 OR CD0/5	
225000113 6	1	PRINTED CCT BOARD		

6.12 C500/12.5 12.5kHz CHANNEL INCREMENT PARTS

2	7	4	0	0	0	1	0	0	7	1	CRYSTAL 12.8MHz TE9	X3 FITTED TO LED ASSY		

6.13 B500/MISC T500 CRADLE AND INSTALLATION PARTS

2	0	5	0	0	0	1	0	0	6	3.2M	AUTO CABLE 153 2/28/0.3 RED/BLK			86/1-013
2	4	0	0	0	1	0	0	3	5	1	PLUG, COAXIAL UHF			
2	4	0	0	2	0	1	0	6	0	1	SKT HOUSING			
2	4	0	0	2	0	1	0	6	1	2	SKT RECEPTACLE, 152 AUTO.			
2	4	0	0	2	0	1	0	6	2	2	SKT RECEPTACLE, 7/0.2.			
2	5	2	0	0	0	1	0	1	6	1	CLIP, MIC MTG A3M1868			86/8-275
2	6	5	0	0	0	1	0	1	7	1	FUSE 10 CARTRIDGE 6x32 NON SPEC			86/3-062
3	0	3	0	0	3	0	0	4	6	1	CRADLE, BRACKET, SHRT PLASTIC A3M1887			86/1-009
3	0	3	0	0	3	0	0	4	3	2	CRADLE CLIP, PLASTIC A3M1656			
3	0	3	0	0	3	0	0	4	4	2	CRADLE LOCKING CLAMP PLASTIC A3M1657			
3	4	0	0	0	0	1	0	1	0	1	FUSEHOLDER INLINE BOOK HOUSING			86/3-062
3	4	0	0	0	0	1	0	1	1	2	BOOK FUSEHOLDER CRIMP TERMINAL			86/3-062
3	4	9	0	0	0	1	0	3	9	2	SCREW No 6 x 5/16" PAN POZI SELFTAP	MIC CLIP MTG		85/8-275
3	4	9	0	0	0	1	0	4	9	2	SCREW No 10 x 1/2" PAN POZI SELFTAP			
3	5	3	0	0	0	1	0	2	0	2	WASHER M4 SHAKEPROOF	MIC CLIP MTG		85/8-275
3	5	3	0	0	0	1	0	3	2	2	WASHER M5 SHAKEPROOF, EXTERNAL			
3	6	9	0	0	0	1	0	1	4	2	CABLE TIE NYLON 100MM x 2.6MM	BATTERY LEAD TIE		86/04-090
3	9	9	0	0	0	1	0	5	1	1	PLASTIC BAG 75 x 100mm			
4	1	0	0	0	0	1	0	3	7	1	T500 PACKAGING SLEEVE A4M1814			
4	1	0	0	0	0	1	0	4	8	1	T500 PACKAGING, POLYSTYRENE 2 Pcs. A1M1787			86/01-012

6.14 B/TA-500/RCM MARINER II RUGGED CRADLE PARTS

3	0	3	0	0	3	0	0	5	3	1	CRADLE ASSY, WHITE A3M1965			
3	0	3	0	0	3	0	0	4	9	2	CLIP, PLASTIC A2M1922			
3	0	3	0	0	3	0	0	5	2	2	KEY, PLASTIC A4M1925			
3	4	9	0	0	0	1	0	4	9	4	SCREW No 10 x 1/2" PAN POZI SELFTAP			
3	5	3	0	0	0	1	0	3	2	4	WASHER M5 SHAKEPROOF			
3	5	9	0	0	0	1	0	3	7	4	RIVET 3x5mm ST FLAT HD, TINMANS No7	SUPPLY TO MANUFACTURER OF CRADLE ASSY		
-	INSTRUCTION							11						
3	9	9	0	0	0	1	0	5	4	1	PLASTIC BAG 175 x 225			
3	9	9	0	0	0	1	0	5	6	1	PLASTIC BAG 200 x 250mm			
4	0	9	T	M	5	0	0	R	C	1	OPERATORS INSTRUCTIONS			

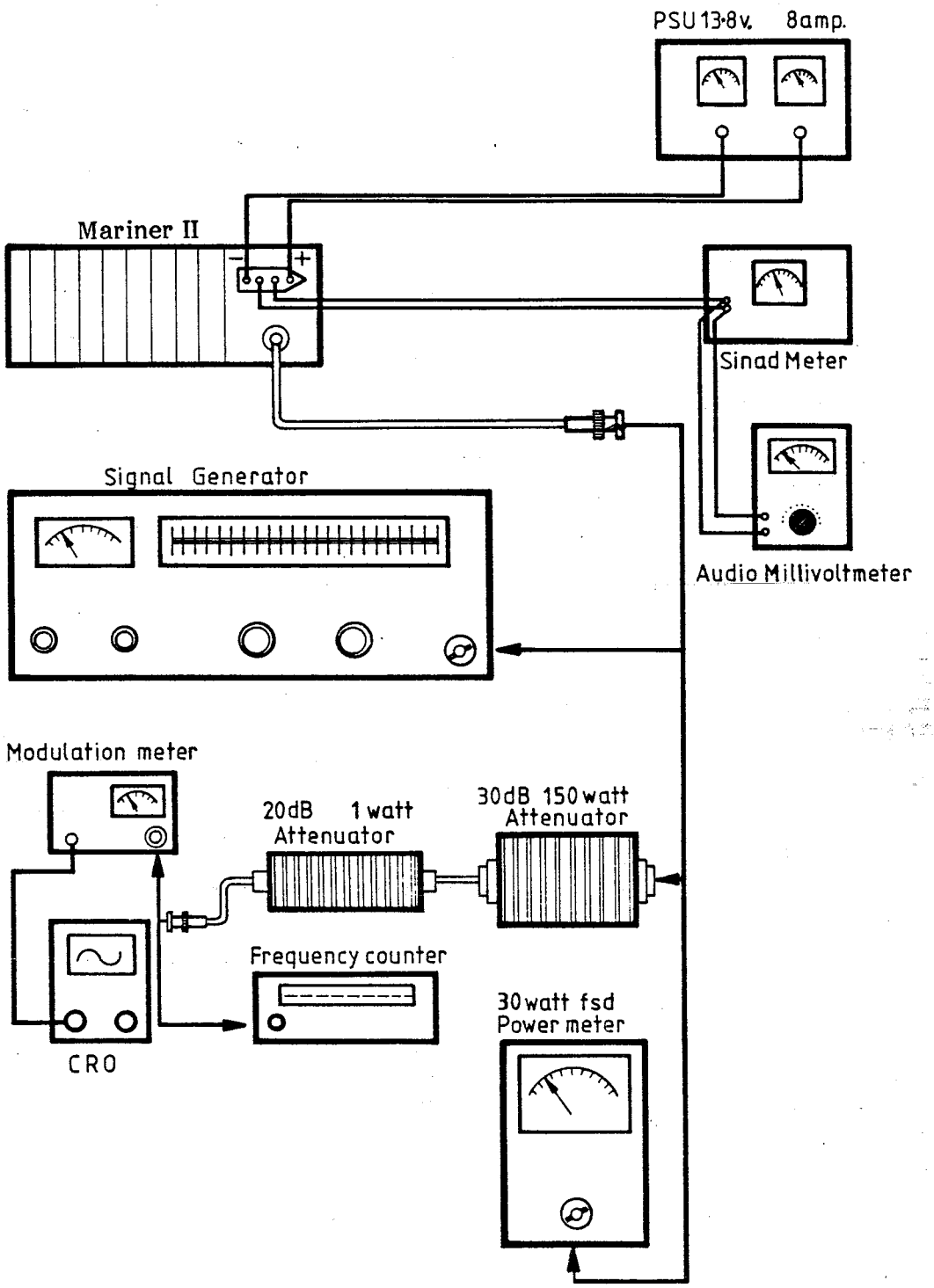


Diagram 1 Suggested Test Equipment Set-up

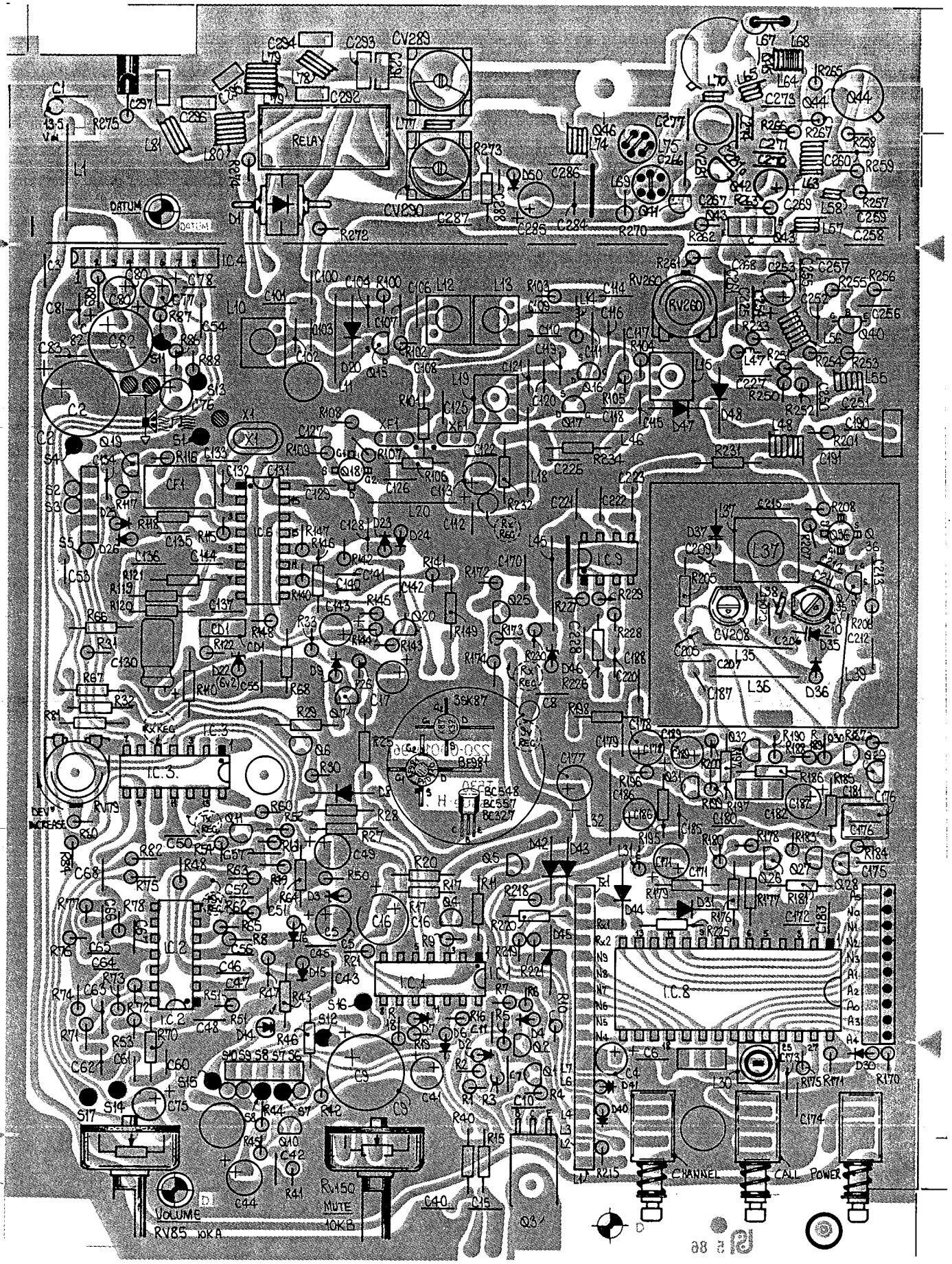


Diagram 2 Mariner II PCB Encoding

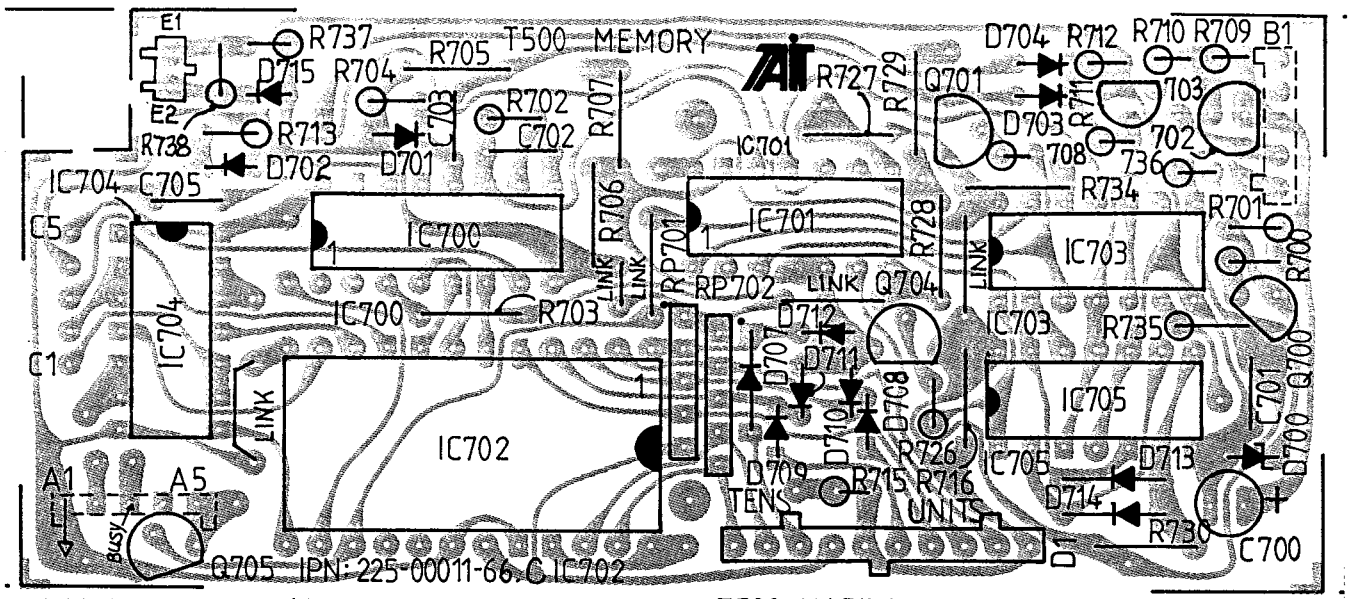


Diagram 3 Mariner II Memory PCB Encoding

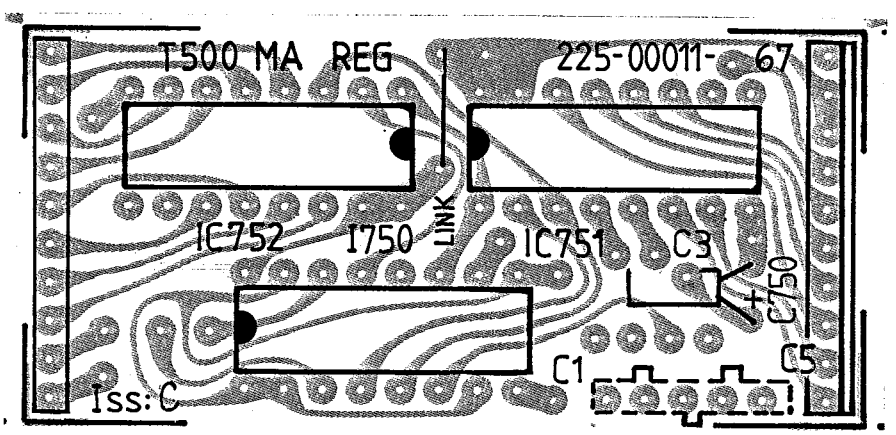


Diagram 4 Mariner II Register PCB Encoding

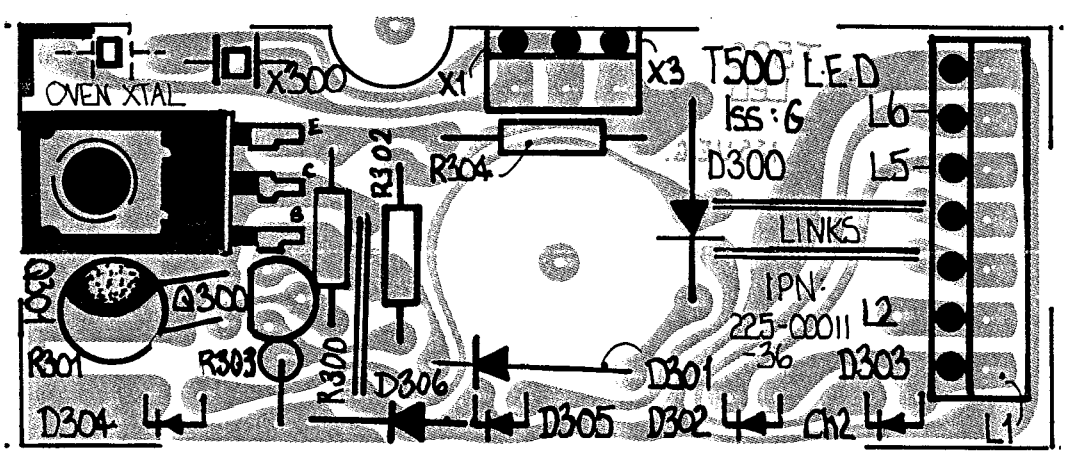
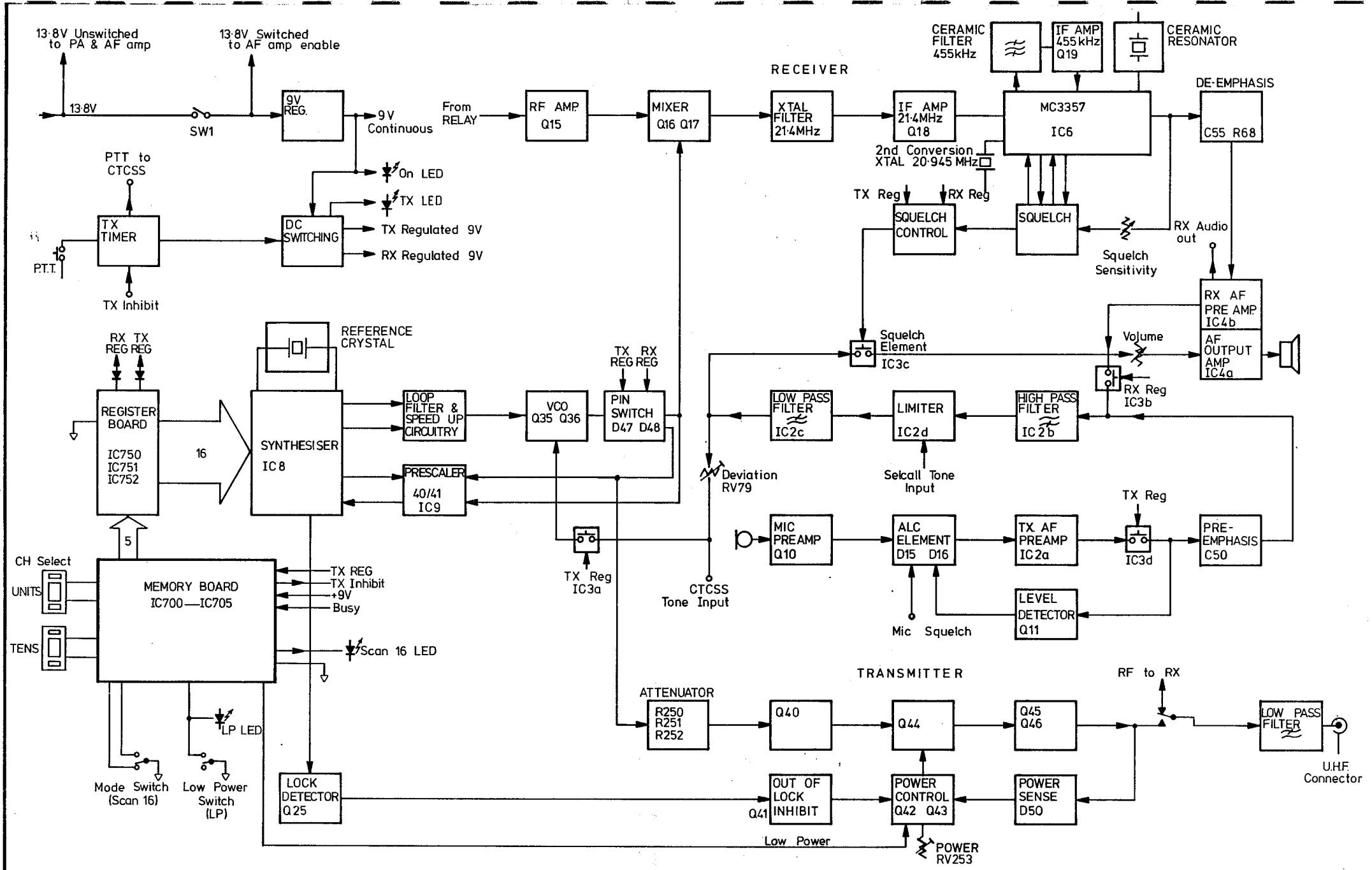


Diagram 5 T500/LED & Crystal Heater PCB Encoding



ISSUE	AMENDMENTS	DRN.	CHKD	APVD	DATE
A	ORIGINAL	D.H.	H.C.	[illegible]	13-7-82

ISSUE	AMENDMENTS	DRN.	CHKD	APVD	DATE

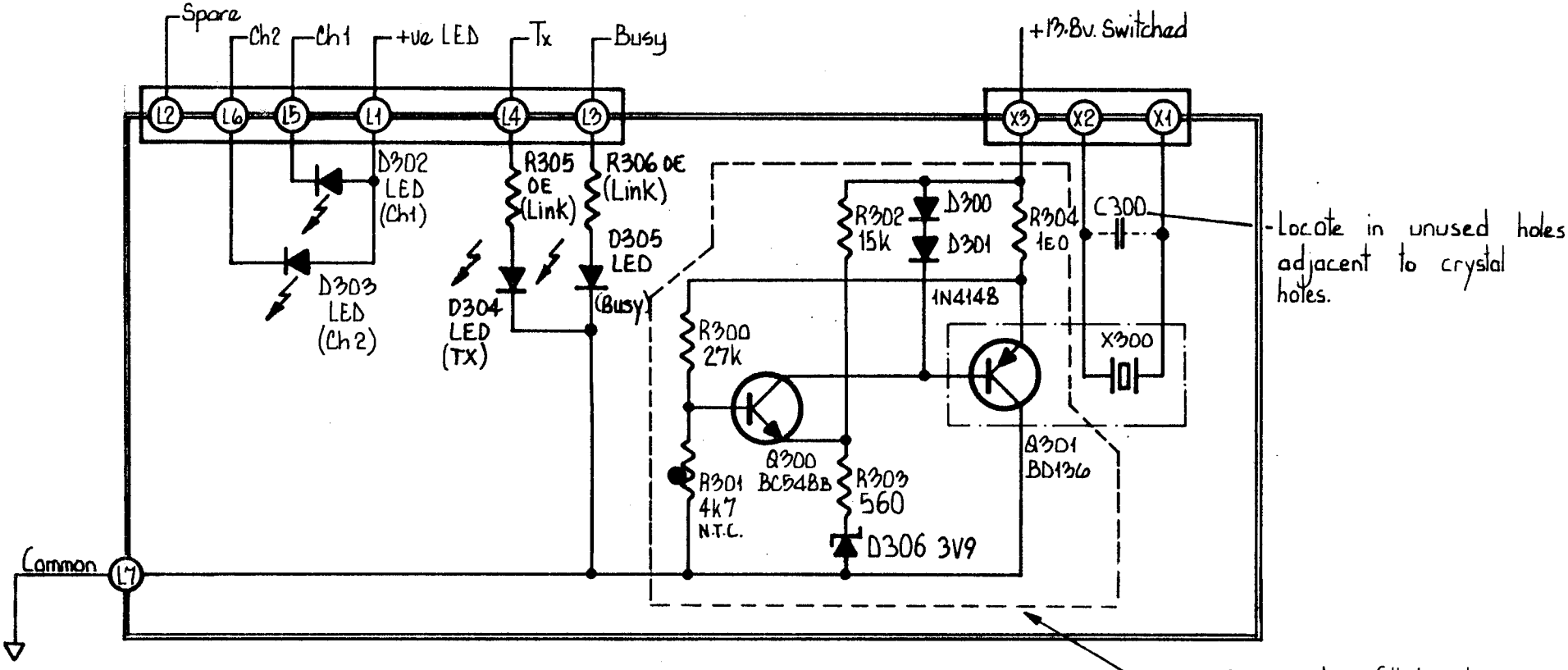
BLOCK DIAGRAM—MARINER II

TAIT ELECTRONICS Ltd.
Christchurch New Zealand

DRAWING NUMBER A2C565

ISSUE A

DO NOT SCALE OFF DRAWING



CH. SPACE	X300	C300
6.25 KHz	12.8	not fitted
5kHz	10.24	1p8

USED ON
T510
T520
T530
T540
T550

SCALE :
MATERIAL :
FINISH :
GEN. LIMITS :

IPN

ISS	AMENDMENTS	DRN	CHKD	APVD	DATE
A	ORIGINAL	WW	MM	S.C	30-8-89
B	Ch/N 85/08 304, 09 353 TO 374 10 384	D.H.	H.O.	S.C	21.10.89
C	Ch/N: 86-07-175	[illegible]	D.C.	S.C.	5.9.90
D	Ch/N: 86-07-165	[illegible]	[illegible]	S.C.	7.10.90

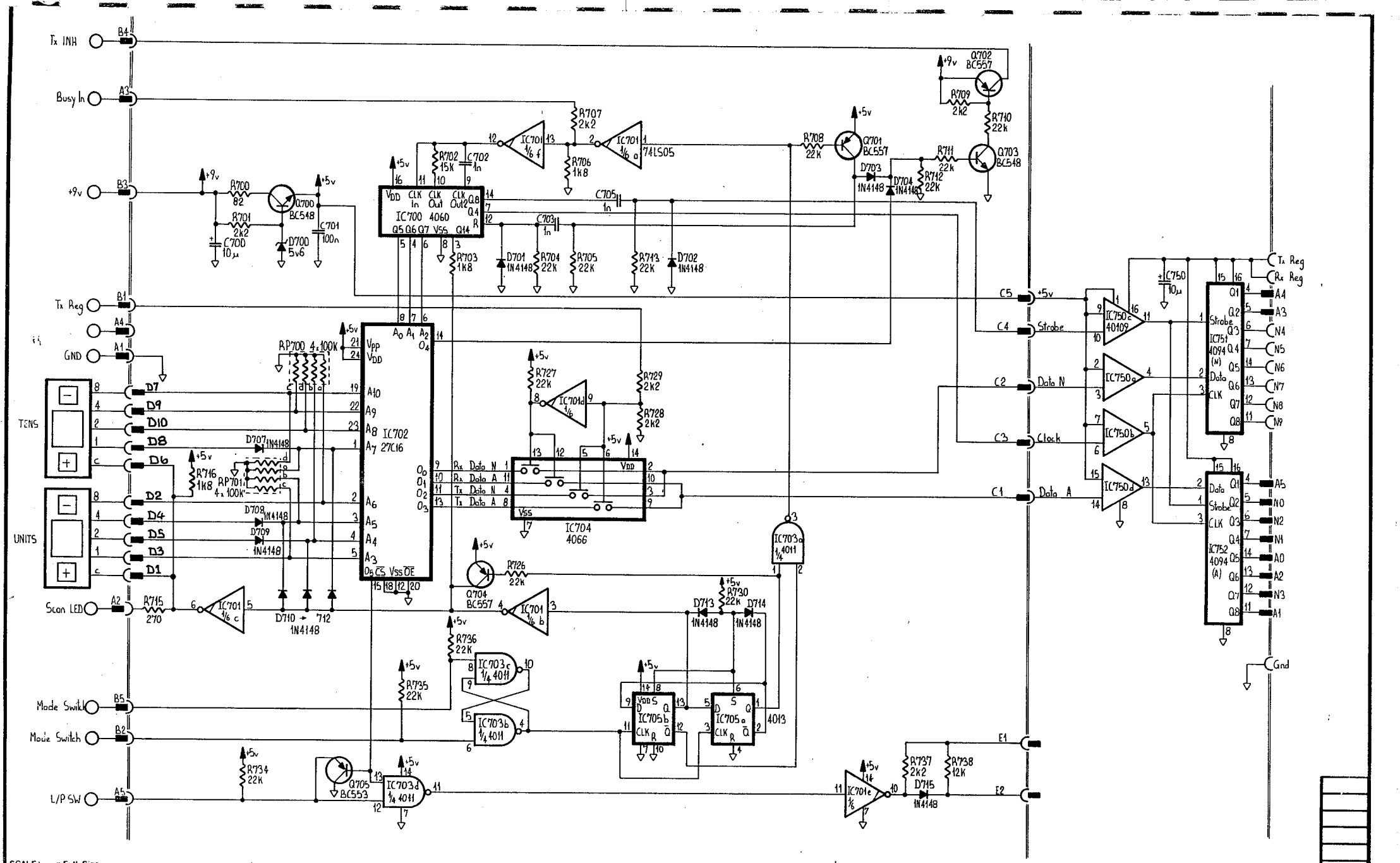
CIRCUIT DIAGRAM—T500/LED & OPTIONAL CRYSTAL HEATER.

TAIT ELECTRONICS LTD.

DRAWING NUMBER A4 C509

ISSUE D

DO NOT SCALE OFF DRAWING



SCALE: x Full Size
MATERIAL :
FINISH :
GEN LIMITS :

THIRD ANGLE PROJECTION

ISSUE	AMENDMENTS	DRN	CHKD	APVD	DATE
A		D.M.	H.G.		16.6.88

ARTWORK	IPN	USED ON

MARINER II MEMORY BOARD AND REGISTER BOARD

TAIT ELECTRONICS Ltd.
Christchurch New Zealand

DRAWING NUMBER A2C559

ISSUE