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T496 Mobile Two Way Radio

UHF FM 400-520MHz

Frequency Synthesized

(TM-496)

Issue D

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 covers General, Technical and Servicing Information for all versions of the Tait T496 mobile two way radio.

Additional information relating to the T496/USA is given in a Supplement to this Manual.

Ordering Service Manuals

When ordering the T496 Service Manual, quote the Tait Internal Part Number (IPN) e.g. TM-496, and give full details of the version of your equipment, e.g. T496/470520BTSO.

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Manual Revisions

This Tait Service Manual may incorporate textual revisions and, where necessary, updated Parts Lists and Diagrams.

Those portions of the text that have been changed from the previous issue Manual are indicated by a vertical line in the outer margin of the page.

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SECTION 1 GENERAL INFORMATION

1.1 INTRODUCTION

The T496 is a high performance, fully-synthesized, all solid state, frequency modulated, mobile two way radio with a nominal RF power output of 25 watts. It is designed for operation in the 400 - 520MHz frequency range with 25kHz channel spacing and ±5kHz deviation (or 12.5kHz channel spacing and ±2.5kHz deviation). The standard set has 10 channels.

Operation of the T496 is by hand-held microphone and press-to-talk switch, plus three front panel controls: 'volume' with integral 'on/off' switch, 'squelch' and 'channel'. Visual indication of the 'transmit', 'busy' and 'call' (if Selcall is fitted) functions is by front panel mounted LEDs. The channel selected is displayed by illuminated numbers incorporated in the switch.

Provision is made for 'Selcall' or 'CTCSS' to be incorporated within the case of the T496.

Channel information for the T496 synthesizer is stored in the TA-490 Memory Module, which is programmed by either the T400 or T601 EPROM Programmer. (Further information can be obtained from the TM-400 or TM-601 Service Manual as appropriate.) A two channel diode memory module is also available where one or two channels only are required.

The front panel, heat-sink, and five printed circuit boards are assembled on a simple frame which provides ready access to the circuit components above and below the printed circuit boards (PCBs). This frame slides into a robust, oxyplast finished metal sleeve which provides mechanical and environmental protection.

The single conversion receiver employs both discrete components and integrated circuits. It includes a 'noise reducer' effective against ignition noise, and a signal-to-noise ratio operated 'squelch' (mute) circuit. The receiver delivers approximately 3 watts of audio to a 3 ohm speaker.

The transmitter exciter provides about 350mW of frequency modulated RF drive to the two stage broad-band RF power amplifier. An 'audio processor', which provides automatic modulation control and deviation limiting, is included on the 'exciter PCB' along with a 'transmit timer' which returns the T496 to receive after one minute of transmission.

The T496 is light and compact and can be plugged into a T276 vehicle cradle, a T163 FM portable pack or a bench top power supply/speaker unit such as the T286/FM. The set is easily removed from its mounting as no wires need disconnecting. Provision is made to automatically reduce the transmitter RF power output when the T496 is plugged into a portable pack. The reduced power level may be preset between 5 and 15 watts (350mW if PA bypass circuitry is fitted).

The DC supply to the T496 **must** be negative earth and may be between 10.8 and 16 volts. The set is protected against reversal of the DC supply polarity.

1.2 SPECIFICATIONS

1.2.1 GENERAL

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

The performance figures given are typical figures unless otherwise indicated.

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

Modulation System	.. Frequency Modulation
Frequency Range	.. 400 to 520MHz
Frequency Increments	.. 12.5kHz or 10kHz (to order)
Number Of Channels	.. 10 standard (2 or 100 to order)
Switching Range:	
Transmitter	.. 6MHz
Receiver	.. 3MHz
Supply Voltage:	
Operating Range	.. 10.8 to 16 volts DC
Standard Test Voltage	.. 13.8 volts DC
Supply Current:	
Receiver Squelched (NMOS Memory)	.. 400mA
Receiver Squelched (CMOS Memory)	.. 250mA
Full Audio	.. 650mA
Transmitter	.. 6.5 amps
Polarity Protection	.. internal crow-bar diode
Coaxial Cable Impedance	.. 50 ohms
T/R Changeover Switching	.. solid state
Operating Temperature Range:	
Standard	.. -10°C to +60°C
Optional	.. -30°C to +60°C
Dimensions:	
Length -	
Short chassis	.. 245mm
Long chassis	.. 300mm
Width	.. 161mm
Height	.. 57mm
Weight:	
T496	.. 1.5kg
Cradle	.. 0.8kg

1.2.2 RECEIVER

Type	.. single conversion superhet
Intermediate Frequency	.. 10.7MHz
I.F. Bandwidth	.. 15kHz
Sensitivity (12dB Sinad)	.. -118dBm (-115dBm for a 3MHz switching range)
Signal-To-Noise Ratio : (RF: -107dBm, modulated at 1kHz to full system deviation)	.. 36dB
Selectivity	.. 80dB
Blocking	.. -3dBm
Spurious Response Attenuation	.. 75dB
Intermodulation Response Attenuation	.. 65dB
Conducted Spurious Emissions	.. -57dBm
Audio:	
Output (into 3 ohms)	.. 3 watts
Distortion (at 3 watts)	.. 5%
Response : 0.3 to 3kHz	.. within +2dB, -4dB of a 6dB/octave de-emphasis characteristic. (ref. 1kHz)
Squelch:	
Sensitivity	.. 6dB to 20dB Sinad
Ratio	.. 70dB
Noise Limiter	.. impulse noise blanker

1.2.3 TRANSMITTER

Power Output:	
Maximum	.. 25 watts
Range Of Adjustment	.. 5 to 25 watts
Conducted Spurious Emissions	.. -30dBm
Adjacent Channel Power	.. -75dBc
Modulation System	.. direct FM
Deviation Response:	
In limiting, 0.3 to 3kHz	.. within +0, -2dB of maximum deviation
Below limiting, 0.3 to 3kHz	.. within +1, -3dB of 6dB/octave pre-emphasis (ref. 1kHz)
Above 3kHz	.. greater than 30dB/octave roll off

Deviation Limiting	.. ±5kHz peak maximum adjustable to ±5kHz
Audio Input For Maximum Deviation	.. 1.8mV rms at 1kHz
Audio Distortion (modulation at 1kHz to 60% of maximum deviation)	.. 2%
Hum & Noise (below 60% of full system deviation)	.. 45dB

1.2.4 FREQUENCY REFERENCE

Stability:

± 5ppm (-10°C to +60°C)	.. TE/9
± 5ppm (-30°C to +60°C)	.. TE/9 + crystal oven PCB

Oscillator frequency:

For channel spacing at multiples of 12.5kHz	.. 12.8MHz
For channel spacing at multiples of 10kHz	.. 10.24MHz

* TE/9 refers to Tait Electronics Ltd crystal specification numbers.

1.3 VERSIONS

1.	T496/400450BT00	T496	400-450MHz	25kHz	Long	10 Channel
2.	T496/400450BTS0	T496	400-450MHz	25kHz	Short	10 Channel
3.	T496/420470BT00	T496	420-470MHz	25kHz	Long	10 Channel
4.	T496/420470BTS0	T496	420-470MHz	25kHz	Short	10 Channel
5.	T496/450500BT00	T496	450-500MHz	25kHz	Long	10 Channel
6.	T496/450500BTS0	T496	450-500MHz	25kHz	Short	10 Channel
7.	T496/470520BTS0	T496	470-520MHz	25kHz	Short	10 Channel
8.	T496/400450USA	T496	400-450MHz	25kHz	Short	10 Channel
9.	T496/USA	T496	450-500MHz	25kHz	Short	10 Channel
10.	T496/420470BH00	T496	420-470MHz	25kHz	Long	100 Channel
11.	T496/420470BHS0	T496	420-470MHz	25kHz	Short	100 Channel

1.4 OPERATING INSTRUCTIONS

1. To Receive

(a) Insert the T496 into the appropriate housing, e.g. Portable Pack, Vehicle Cradle or Power Supply.

(b) Ensure that the correct supply is present: mains supply correct; battery fully charged; vehicle supply correct voltage and polarity.

(c) Ensure that the aerial is securely fitted.

(d) Turn the volume control clockwise to switch on.

(e) Turn the squelch control clockwise until noise is heard, then turn it anti-clockwise 10° beyond the point at which the receiver quietens.

2. To Transmit

(a) Close the press-to-talk switch. (Always check that the channel is not in use before transmitting).

(b) The transmitter will revert to 'receive' after one minute of transmission. To continue transmitting, release then close the press-to-talk switch.

3. Caution

When using the T496 with a portable pack, it is advisable to switch the set off when it is not in use.

SECTION 2 CIRCUIT OPERATION

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

2.1 VCO AND PHASE LOCKED LOOP (PLL)

A stable reference frequency is generated by IC401 and X401. The oscillator operates at 12.8MHz or 10.24MHz and is divided in IC401 to give the desired reference frequency (refer Section 5.4.3). Q401 provides a buffered output of the reference oscillator at TP1.

The main Phase Locked Loop consists of a phase comparator programmable divider (IC401). The charge pump/voltage translator (Q402 to Q405), together with speed up circuit and low pass filter (IC402, Q407), control the VCOs (Q411 on transmit and Q414 on receive).

The VCO frequency is equal to the channel frequency for transmit, and channel frequency minus 10.7MHz for receive. The VCO frequency is divided by 64/65 within the prescaler (IC403) and is further divided in IC401. The division ratio is controlled by the output of the memory module, TA-490.

Separate on-frequency VCOs are used to generate the receive and transmit frequencies. Each VCO consists of a J-FET Colpitts oscillator buffered by a dual-gate MOSFET. The output of the receive VCO is fed via a 50 ohm line to the local oscillator buffer (Q105) on the receive board.

The output of the transmit VCO is fed to Q413, Q416 and Q417 which amplify the signal to 3 watts for the transmitter. The transmit VCO is frequency modulated by the audio applied to the gate of J-FET Q411.

2.2 RECEIVER

The receiver is fed via the aerial switching diodes (D501 & D502) and a coaxial cable to the tuned RF amplifier (Q101). The output of Q101 as well as the local oscillator injection voltage is applied to the mixer stage (Q102). The local oscillator injection voltage is obtained from Q415 which is then buffered by a tuned amplifier, Q105.

The IF output from the mixer at a frequency of 10.7MHz (L116) is applied via a delay line (L117, L118), two 10.7MHz crystal filters (XF101 & XF201) and an IF amplifier (Q201, Q202) to an integrated circuit (IC201).

A 'noise limiter' circuit (IC101, IC102, Q109, Q110 and Q111) samples the signal at the input to the delay line. Impulse type of noise voltages are processed and used to turn on Q111 which short circuits the output of the delay line for the duration of the noise pulse.

The integrated circuit (IC201) provides further stages of IF amplification and limiting followed by a quadrature detector.

The output from the quadrature detector is applied to an audio pre-amplifier (IC202d) which provides high frequency roll-off above 5kHz and 6dB/octave de-emphasis. The output from IC202d is amplified by the audio power amplifier (IC203) to a maximum of 3 watts to drive a 3 ohm speaker.

2.3 SQUELCH (MUTING)

The circuit which controls the receiver squelching system consists of a bandpass filter, rectifier, dual smoothing circuits, adjustable threshold detector and a squelching device connected across the audio path. An additional circuit optimises the squelch characteristics in high signal conditions.

The squelch characteristics are described by the following parameters:

Hysteresis .. the difference in RF signal levels which causes the squelch to open and close (given as a ratio in dB)

Tail-time .. the length of time for which the squelch switch is open at the end of a signal

Turn-on time .. the time required for the receiver audio to turn-on after a signal is received

A front-panel control is provided as a means of adjusting the signal level required to open the squelch switch.

2.3.1 INPUT STAGES

An input signal to the squelching control circuit is obtained from the audio output of the IF detector. This signal has a noise level which is inversely related to an RF signal at the receiver input.

R-C networks in the first two stages cause the noise component to be band-pass filtered: C241/R241 and C242/R243 are high-pass sections at 15kHz; and C245, C246 cause roll-off above 60kHz.

Q203 is an amplifier with a gain control (RV245) in its emitter circuit, while Q204 is an active rectifier for the noise pulses.

2.3.2 RECTIFIER AND SMOOTHING CIRCUITS

Negative-going pulses at the base of Q204 cause the voltage of Q204 collector to rise, which enables C244 (the 'reservoir' capacitor) to charge via R247 and R249.

A dual time-constant circuit consisting of R251, D204 and C247 is used to obtain the DC control voltage for the squelch switch (Q206). C247 charges through R251, but discharges, via D204, at a much faster rate through R249.

The quasi DC voltage at pin 3 of IC202a is therefore representative of the noise level from the detector IC and is approximately 4.0 volts in the absence of an RF signal. The voltage level decreases as the RF signal level increases.

Audio turn-on time is determined by the combined decay time-constants for C244/C247, and at approximately 20mS provides a rapid response to the application of an RF signal.

The audio tail-time is determined by the combined attack time-constants for C244/C247 and the setting of the 'squelch' control; it has been optimised to minimise the occurrence of audio interruptions (chopping) in signal-fade conditions.

2.3.3 THRESHOLD DETECTOR AND HYSTERESIS

IC202a is configured as a voltage comparator with variable positive feedback and an adjustable reference voltage.

The reference voltage on pin 2 is set by the voltage divider consisting of R252, R256 and the squelch control, RV259.

Voltage feedback, and hence input voltage hysteresis, is obtained via R253; the amount of feedback is modified by the presence of D202, which acts to clamp the junction of R254 and R255 at a voltage which is determined by the squelch control setting.

When the squelch control is on a 'hard' setting (i.e. well back from threshold), D202 is forward biased and the amount of feedback is determined by a voltage which varies with the squelch control setting. Thus, the amount of feedback, and hence the input voltage hysteresis, reduce for the 'harder' settings.

With a 'light' setting on the squelch control, D202 is reverse biased and the amount of feedback is fixed at a higher level by the voltage divider R254, R255. In this situation the input voltage hysteresis is increased.

The presence of this input voltage hysteresis at the voltage comparator affects two squelch characteristics:

(a) The voltage hysteresis is transferred to RF signal hysteresis at the receiver input; this is required to avoid squelch 'chatter' on constant level signals.

(b) A change in the voltage hysteresis means a corresponding change in the squelch tail-time since with less hysteresis the voltage on C247 has to rise a smaller amount (when the RF signal ceases) for the squelch to close.

2.3.4 DRIVE CIRCUITS

When a signal is received, the voltage on pin 3 of IC202a decreases, which causes the voltage comparator output (pin 1) to switch 'low'. In this condition, the squelching transistor (Q206) is turned OFF and the 'busy' LED driver (Q205) is turned on.

2.3.5 FAST SQUELCH

The AGC output from pin 13 of IC201 is stored in C290 on the input of comparator IC202C. When this level is higher than that preset on pin 10 of IC202C, the output is low, enabling the fast squelch circuit.

When the received signal drops out, the average voltage on the collector of Q204 rises above IC202b threshold, causing the output of IC202b to switch high, turning on Q207 and effectively cutting short the squelch tail.

2.4 TRANSMITTER

The RF output from the exciter (Q417) is taken via a co-axial link to the RF power amplifier assembly (RF PA) where the power output is raised to the required level by the driver (Q501) and the final power amplifier (Q502). The RF from Q502 is taken via the aerial switching diodes (D501, D502) and the harmonic filter to the aerial.

The level of the RF power output may be set to a value between 5 and 25W by the power adjust circuit (Q314, Q315) which controls the drive to the RF PA by varying the supply voltage to the exciter output. This circuit utilizes a feedback loop to hold the output power constant at the preset level. RV376 and RV377 set the high and low power levels.

An out of lock crowbar circuit (Q313) is also included to prevent the transmitter turning on if the synthesiser is out of lock.

Audio from the microphone (and Selcall or CTCSS if fitted) is tailored to meet the required specifications by the audio processor (Q301, IC302, Q302 and Q303). The audio processor provides automatic modulation control (AMC), deviation limiting, and frequency compensation to suit the characteristics of the directly modulated, phase locked VCO.

2.5 TRANSMIT - RECEIVE SWITCHING

Note: The DC supply is fed to the PA assembly via a filter so that DC is present on this unit while the T496 is connected to the supply. The DC input is protected by a 'crow-bar' diode (D504) which will blow the fuse if the supply is reverse connected.

2.5.1 UNSWITCHED CIRCUITS AND REGULATED SUPPLIES

The positive supply is taken from the PA assembly via the exciter board hash filter (L301, C303) and the front panel mounted 'on/off' switch to:

1. The regulators on the exciter board (IC301, Q305, Q306, and Q307) which provide continuous 5V & 9V supplies to the following circuits:

   Memory module
   P.L.L. control and divider
   Tx audio processor
   VCO & VCO buffer stages
   Loop filter stages
   Tx/Rx switching circuits.

2. The receiver RF amplifier, mixer, noiseblanker, detector and audio amplifier on the receiver PCB.

2.5.2 RECEIVE

When the press-to-talk switch is 'open', the 'Tx/Rx switch' (IC303) performs the following functions:

a) Turns off Q308:
   i) allowing Q410 to turn on, enabling the receive VCO;
   ii) enabling the selected receive memory location to be addressed;
   iii) removing 9V reg. from the exciter control circuits;
   iv) turning off D501, isolating the PA from the aerial;
   v) turning off D502, enabling aerial signals to reach the receiver.

b) Turns on Q309:

i) applying +9V reg. to the receiver RF amplifier, local oscillator buffer, IF, squelch control and audio processor;

ii) clamping pin 9 of IC302 to disable the transmit audio processor;

iii) turning off Q409, disabling the transmit VCO.

2.5.3 TRANSMIT

Note: When the microphone press-to-talk switch is 'closed', a timing signal is initiated within the Tx/Rx switch (IC303) which will return the T496 to receive after one minute of transmission.

Closing the press-to-talk switch also:

a) Turns on Q308:

i) turning Q410 off, disabling the receive VCO;

ii) enabling the selected transmit memory location to be addressed;

iii) applying +9V reg. to the exciter and exciter control circuits;

iv) turning on D501, connecting the PA to the aerial;

v) turning on D502, isolating the receiver from the aerial (D502 with L519, C523 and L520).

b) Turns off Q309:

i) removing the +9V reg. from the receiver switched circuits;

ii) removing the clamp from pin 9 of IC302 to enable the audio processor;

iii) turning on Q409 to enable the transmit VCO.

2.5.4 FREQUENCY INFORMATION

The channeling data for the T496 synthesizer is stored in the TA-490 memory module, which houses two 2716 EPROMs. The memory module is programmed on a T400 or T601 EPROM programmer and then inserted into the row of connectors in the T496 exciter PCB.

SECTION 3 ANCILLARY EQUIPMENT

Note: Further details of the ancillary equipment described briefly in this section can be obtained from the relevant Service Manual.

3.1 T276 VEHICLE CRADLE

The T276 vehicle cradle is supplied complete with mounting screws and connecting cables. It contains a mating socket which connects the battery supply, speaker and aerial to the T496.

3.2 T163 FM PORTABLE PACK & ASSOCIATED CHARGERS

The T163 FM portable pack is used to provide 'personal portable' operation of the T496. The portable pack consists of robust metal housing with a built-in speaker. It is designed to accommodate a Tait T496 two way radio and either a Tait T166 1.2Ah or a T166A 2.2Ah nickel cadmium battery pack as plug-in items.

A leather carrying case is available which will hold the complete two way radio. The microphone is held in a separate external pocket for easy access.

Provision is made to automatically reduce the transmitter output power of the set when it is plugged into the T163 FM.

The T166 or the T166A battery pack may be re-charged while still plugged into the portable pack, using a T270 Battery Charger.

3.3 T286/FM POWER SUPPLY

The T286/FM is a 13.8V DC, 6 ampere power supply, which will power the T496 from a 230V ±10% 50Hz mains source, or to special order from a 115V ±10% 60Hz mains.

The two way radio plugs into the T286/FM to give an attractive bench-top unit, with integral 3 ohm speaker. The aerial connection is via a coaxial connector at the back of the T286/FM.

A 12 volt lead acid cell can be float-charged with the T286/FM under constant voltage conditions. The current limit circuit prevents the charging current from being excessive should a completely discharged battery be connected to the power supply.

The output of the T286/FM does not compensate for the temperature dependence of lead acid batteries. If this feature is required, a T273 Battery Charger/Power Supply should be used.

3.4 T220/2 EXTENSION SPEAKER ASSEMBLY

The T220/2 extension speaker assembly is intended for use with the T496. It comprises a heavy duty 3 watt speaker mounted in a rugged enclosure which pivots on its mounting bracket. The 3 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.

3.5 T289/6 REMOTE CONTROL UNIT

The T289/6 is a remote control system designed for use with the T496. This system permits remote operation of all the two way radio front panel controls, plus LED displays, from a single control unit.

The control head itself is small and has a swivel mounting arrangement which allows it to be mounted in the most convenient position in any installation.

The T289/6 is a wire-for-wire extension of the two way radio front panel. Remote operation is thus obtained without the introduction of any additional electronic circuits. This includes 100 channel operation.

When a two way radio is converted for remote control operation, the front panel control PCB is removed and replaced by a PCB which serves as an interface between the set internal wiring and the remote interconnecting cable.

3.6 T281/2 SERVICE LEAD

The T281/2 bench service lead which should be used when bench testing the Tait T490 Series two way radios is available from Tait Electronics Ltd. This service lead consists of a BNC connector wired to speaker plugs and battery leads.

3.7 T400 EPROM PROGRAMMER

The Tait T400 is a field set-up ancillary dedicated for use with the Tait T490 Series of synthesized two way radios. It is designed to programme the TA-490 RF synthesizer memory and, if required, a tone calling memory.

The capacity of the RF programming is 100 channels, that is 200 frequencies. If reverse channel operation (contra) is required, 400 frequencies may be programmed within the confines of 100 channels.

The T400 will programme either NMOS or CMOS variations of the industry standard '2716' ultra violet erasable PROM devices.

3.8 T601 EPROM PROGRAMMER

The Tait T601 is a compact, easy to use EPROM programmer. With a T601/1 adaptor kit, comprising a special interface board and a programmed EPROM, it will programme the TA-490 memory module as used in the T490 Series of two way radios.

The T601 will programme either NMOS or CMOS variations of the '2716' ultraviolet erasable PROM devices up to 100 channels.

3.9 TA-490/2 DIODE PROGRAMMER

The TA-490/2 is a diode memory module for use with the T490 Series of two way radios, where only one or two channels are required and the reduction in power consumption is an important aspect.

It replaces the EPROM memory unit supplied as standard and can be field programmed for two channels by cutting the leads of appropriate diodes.

It plugs into the T496 in place of the TA-490 EPROM unit which is then no longer required.

3.10 TA-490/CTCSS

The TA-490/CTCSS is a high performance CTCSS encoder/decoder designed specifically for the T490 Series of FM two way radios. The CTCSS will generate and decode two tone frequencies within the range of 67 to 250.3Hz with either of the two tones, or no tone, being programmable on the first eight channels (0-7) on the mobile. Channels 8 and 9 are repeats of channel 0 and 1 frequencies.

Facilities include:

i) 'no tone' on any of the eight channels;

ii) 'deep mute', providing extra attenuation of the audio when the two way radio is muted;

iii) 'call' LED is turned on when the two way radio is muted;

iv) 'hookswitch monitoring' can be provided if the 'call' LED function is not being used;

v) 'transmit inhibit' is fitted as standard.

Further information and instructions for fitting the TA-490/CTCSS unit are given in TI-287.

SECTION 4 INSTALLATION

4.1 VEHICLE INSTALLATION OF THE T496

1. Mount the T276 vehicle cradle in any convenient position in the vehicle. If remote operation of the T496 is required, a T289 remote control unit may be fitted (for details see the T289 Service Manual).

2. Connect the auto cable from the cradle to the battery circuit; include the in-line fuse holder in the 'live' lead. The fuse rating is 10 amps. Both leads must be connected (the cradle is isolated to DC). Ensure that the red lead goes to the battery positive. To minimize noise pick-up both leads should be taken direct to the battery.

3. Mount the speaker enclosure by its bracket in any convenient position.

4. Connect the 2/7/0.2 plastic lead from the cradle to the 2 pin parallel socket provided, and plug in the speaker.

5. Mount the aerial in the required location; the centre of the vehicle roof is the recommended location. A suitable aerial for this location is a base loaded 5/8 wavelength whip giving a gain of 2.5dB. If it is necessary to tune the aerial, a VSWR indicator or thru-line wattmeter (eg. Bird 43) should be connected between the aerial and the T496.

   If the aerial must be side or fender mounted, use an aerial giving a gain of 4.5dB (eg. a centre loaded whip) instead of the base loaded whip mentioned above.

6. The T496 should be correctly tuned on the bench and this tuning should not be disturbed during installation.

7. Plug the T496 into the cradle and secure it with the two thumb screws (one on each side of the cradle at the front of the set).

8. After the installation has been completed, carry out a test call, or check the radiated power with a field strength meter.

4.2 TRIGGER BASE STATION INSTALLATION OF THE T496

For 'trigger base station operation' the T496 plugs directly into a T286/FM power supply (see Section 3.3).

The T496 should be correctly tuned on the bench before being fitted to the power supply.

Any suitable type of aerial giving a low angle of radiation may be used. The skirted dipole is a suitable choice, being simple and easy to install. Details of installation may be found in Tait Technical Instruction TI-30.

SECTION 5 SERVICING

5.1 GENERAL

5.1.1 NOTES

If further information is required about the T496 or this manual, it may be obtained from Tait Electronics Ltd or accredited agents. When requesting this information, please quote either the equipment serial number or works order number (found on a label 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, e.g. TM-496, Issue D.

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 (TI's)

From time to time 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 recess head 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 T496. Phillips cross-head screwdrivers are not satisfactory for use on these screws.

5.2.2 DISASSEMBLY INSTRUCTIONS

1. Remove the securing screws and slide the T496 from the metal sleeve.

2. To gain access to the PCB components:

   Invert the T496.
   Remove the 2 screws opposite the hinges (receiver PCB).
   Open out the receiver PCB.

3. To gain access to the PA PCB:

   Remove the 2 top screws from the PA heatsink assembly.
   Loosen the 2 bottom screws.
   Rotate the assembly.
   Remove the 2 grommets from the slots.
   Remove the PA assembly metal cover.

4. To remove the PA PCB:

   Refer to Section 5.2.3.2.

5. To reassemble:

   Carry out the reassembly in the reverse order to the disassembly.

   Note the cut-out in the metal sleeve which accommodates the microphone cord.

5.2.3 PA MODULE - 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.

5.2.3.1 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 may cause the tabs to break.

5.2.3.2 To Remove The PA PCB From The Heatsink

Most components are soldered on the topside only, but in some cases access to the underside of the PCB is necessary.

Carefully unsolder the coaxial connector adjacent to L525, or the coaxial cable, earth and centre conductor connections from the PCB so they are clear of the copper track.

Remove the 3 PCB retaining screws and the transistor securing screws or stud nuts.

To remove the connector from the plug, insert the 'coaxial insert extractor tool' over the coaxial connector. Press firmly until the retaining clip is compressed.

Lift the PCB (with the transistors still attached) away from the heatsink.

CAUTION: Do not operate the PA with the PCB detached from the heatsink because the heatsink is used for earthing and the transistors will quickly overheat.

5.2.3.3 To Remove Large Cased Mica Capacitors

Apply a heavy duty soldering iron to the top of the capacitor case.

When the solder is molten, ease the capacitor away from the PCB with a thin stainless steel spike or screwdriver.

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 from the recommended values in the presence of a fault. 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.

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 CHIP COMPONENT IDENTIFICATION

Chip components used in Tait T490 Series two way radios can be identified as follows:

Colour	Component Type
Black	Metal film resistor
Light brown	Ceramic capacitor
Green	Ceramic capacitor
White (no marking)	Ceramic capacitor

5.3.4 CHIP COMPONENT REMOVAL/REPLACEMENT

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

5.3.4.1 Component Removal

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

2. Completely remove the old solder from the PCB, using a desoldering tool. Application of a small amount of flux will greatly aid in the removal of old solder.

5.3.4.2 Chip Component Replacement

1. After the component has been removed and the PC pattern cleaned, apply a small amount of solder on the PC pattern and let cool, as shown in Figure 2.

2. Insert the new components and apply the soldering iron tip to the PC pattern as shown in Figure 3 (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 PC pattern paths. High soldering iron temperatures can cause component damage. Do not apply the soldering iron tip to the new component during installation.

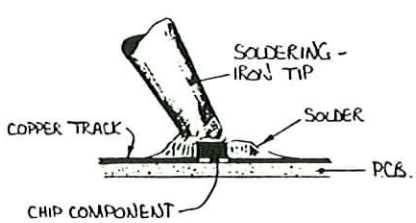


Figure 1

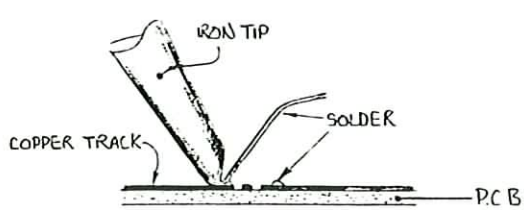


Figure 2

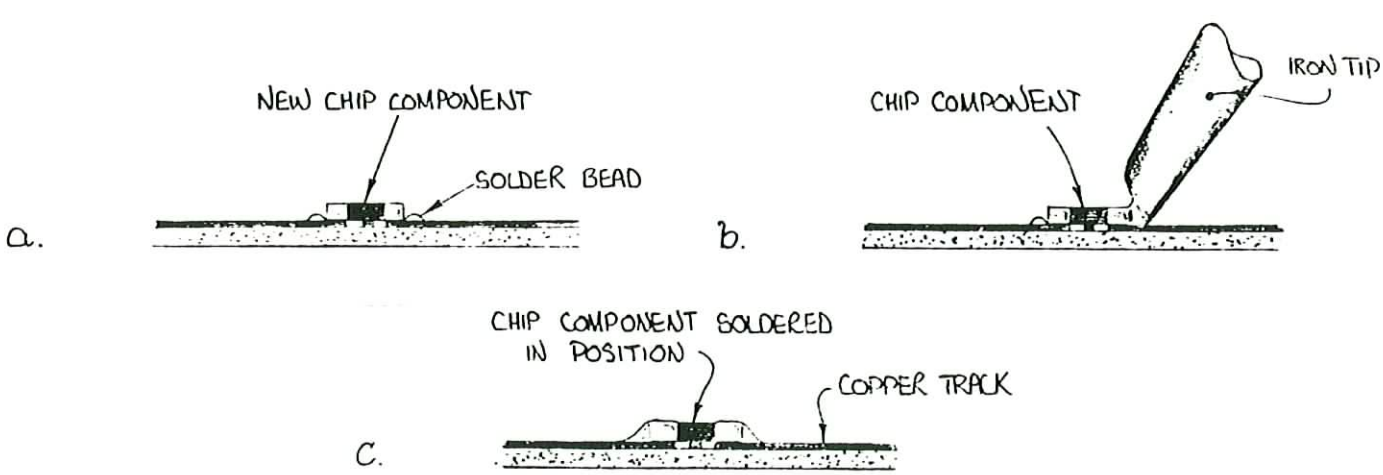


Figure 3

5.3.5 INTER BOARD WIRING

To assist circuit tracing, all plugs and connections are shown on the outer edge of the Circuit Diagrams, where the 'Function', 'Plug' and 'Pin Number' are all shown.

The Terminal Assignment Diagram provides further assistance to the technician.

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. UHF signal generator. Good quality FM. Useable from 0.1µV (-127dBm) to 200mV (0dBm) pd. External sweep facilities an advantage (eg. HP 8640B, Boonton 102A/B).
8. UHF frequency counter accurate to within 2ppm.
9. Sweep generator with 10.7MHz markers (not necessary if item 7 will carry out this function).
10. Crystal reference oscillator 10.7MHz
11. Audio oscillator, 10Hz to 10kHz (eg. HP 204C/D)
12. Audio amplifier, with about 1.5 watts output, to drive a small speaker which can be coupled to the T496 microphone. An adaptor should be made which will hold the speaker and microphone close together.
13. AC millivoltmeter
14. Oscilloscope - good quality instrument usable to 10MHz.
15. Speaker 3 ohm voice coil
16. RF Power Attenuator, total attenuation 50dB
    (eg. Weinschel 40-20-33 30dB 150W, plus Coline 1200 25 20dB 1W).
17. RF diode probe (eg. Greenpar GE 88202)
18. Coaxial insert extractor tool (available from Tait Electronics Ltd).
19. Tait T281/2 bench service lead
20. Trimming tools:
    WT 9 Tait IPN 9360110
    WT 10 Tait IPN 9360111
    WT 11 Tait IPN 9360112

5.4.2 TUNING HINTS

1. The front panel 'on/off' switch removes power from the receiver and exciter PCBs only; the RF power amplifier assembly and the DC hash filter on the exciter PCB are not controlled by this switch.

2. 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.

3. When the coils on the exciter or receiver PCBs are being tuned, all adjustments must be made through the PCB (a non-metallic tuning tool is recommended).

4. When a multi-channel set is being tuned, follow the alignment procedures given in Sections 5.5 and 5.6, adjusting the tuning of each RF stage for the best compromise at the extremes of the frequency switching range.

5. Check for obvious mechanical faults in the printed circuit boards, chassis, controls, microphone etc.

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

5.4.3 REFERENCE FREQUENCY SELECTION

Selection of the correct reference frequency is most important. To calculate whether the correct reference frequency has been selected, complete the following steps:

1. Divide the transmit frequency by the reference frequency. The answer should be an integer value (i.e. a complete number, with no digits after the decimal point).

2. Divide the receive L.O. frequency (RF - IF) by the reference frequency. The answer should be an integer value.

If both of the above conditions are met for all frequencies desired, then the correct reference frequency has been selected.

If either of the above conditions is not met for all frequencies desired, the correct reference frequency should be selected from the chart below.

Reference Frequency	Crystal X401
10.0kHz	10.24MHz
12.5kHz	12.8MHz

5.4.4 CHANNEL PROGRAMMING

The Tait T490 Series of two way radios employs a 'synthesizer' for generation of the radio frequency carrier.

The carrier frequencies are generated by digital dividing techniques, each frequency having a corresponding divide number.

The digital number associated with each channel is stored within a plug in memory module. The digital numbers in the memory are selected by the channel selector switch and fed to the synthesizer, causing the required carrier frequency to be generated.

Thus, it can be seen that the method of altering the carrier frequency is to alter the divide number called from the memory. Obviously the required divide numbers must somehow be placed into the memory.

Two types of memory module for determining channel frequencies are available.

For up to 200 channels, an erasable EPROM memory module known as the TA-490 is used. The TA-490 is field programmed with a dedicated ancillary, the T400, which is briefly described in Section 5.4.4.1 and more fully in the TM-400 Service Manual and the abridged T400 User's Handbook. An alternative T601 programmer plus a T601/1 adaptor can be used. This method is briefly described in Section 5.4.4.1 and more fully in the T601 Service Manual.

For two way radios requiring only one or two channels and where low power consumption is necessary, a TA-490/2 diode memory module is available, the programming for which is described in Section 5.4.4.2.

5.4.4.1 TA-490

(a) USING THE T400

During the set-up procedure, the TA-490 memory module is removed from the two way radio and plugged into the T400 programmer. The T400 programmer is then plugged into the position vacated by the memory module.

When the T400 is connected to the two way radio it takes control of the synthesizer. The synthesizer can then be scanned through the RF band of interest and the digital numbers corresponding to the desired carrier frequencies entered into the two way radio memory.

The 'setting-up' procedure is divided into four steps:

Step 1: Involves setting the synthesizer reference oscillator on frequency (Section 5.5.2).

Step 2: Involves the trimming of the Voltage Controlled Oscillator (VCO) of the two way radio (Section 5.5.2).

Step 3: Involves setting up the T400 'Scratch Pad Memory', channel by channel and frequency by frequency. The setting up is then checked and, if necessary, the channels and frequencies can be edited.

The T400 'Scratch Pad Memory' is used to store frequency information where it may be easily altered. New information can be written directly over incorrect information. If the memory contents are not required, a memory location may be cleared by touching the 'Enter Vacancy' key.

The scratch pad permits alteration of the frequencies and channels prior to loading the two way radio memory module. It should be understood that once the two way radio memory module has been loaded with data, it must be erased under high intensity ultra violet light before being reloaded. (This precaution is not necessary when loading a previously vacant channel).

The scratch pad memory will retain information during 'power off' conditions.

Step 4: In this step the channel and frequency information written into the scratch pad is loaded into the two way radio memory module. When this procedure has been completed, a verifying sequence is carried out which culminates in the illumination of either:

the 'Pass' LED, indicating that the memory module is ready for use;

or

the 'Fail' LED, which indicates that the memory module has failed the loading procedure.

Locations previously entered 'Vacant' can be subsequently filled without erasing information previously loaded into other locations.

Full details of programming TA-490 memory modules using the T400 are given in the T400 Service Manual, TM-400.

(b) USING THE T601

During the set-up procedure, the T601 is fed channel information via its built in keypad. Unlike the T400 programmer, the T601 is not connected to and does not control the synthesizer in the two way radio.

The T601 must have the correct EPROM fitted to support TA-490 programming and an interface adaptor board to connect the TA-490 memory module to the T601. These two items comprise adaptor kit TA-601/1.

The T601 is microprocessor controlled and accepts commands via the integral numeric keypad. Prompts for user response are displayed on the built in liquid crystal display.

Once the radio has been characterised, channel data may be entered in the T601 in accordance with the prompts and appropriate responses as the frequencies required on the keypad.

The TA-490 memory module is then removed from the two way radio and connected via the TA-601/1 adaptor board to the T601, and channel information is transferred from the T601 on commands responding to prompts.

Full details of programming T490 memory modules using the T601 are given in the TM-601 Service Manual.

5.4.4.2 TA-490/2

The TA-490/2 diode memory module is programmed by cutting appropriate diodes from each of the four columns of diodes which make up the memory module (see Figures 4 and 5). It will be noted that the four columns are associated with Receive and Transmit for each of the two channels. The cut diodes are generally left in situ.

Table 1 shows how, when starting with A0, each successive diode influences the synthesizer frequency by a multiple of 10kHz or 12.5kHz in an ascending binary sequence. Note that it is sometimes possible to have two correct solutions for one particular frequency. Section 5.4.3 relates to the reference frequency or channel incremental frequency.

Table 1

10kHz	12.5kHz	Code
327.68	409.600	N9
163.84	204.800	N8
81.92	102.400	N7
40.96	51.200	N6
20.48	25.600	N5
10.42	12.800	N4
5.12	6.400	N3
2.56	3.200	N2
1.28	1.600	N1
0.64	0.800	N0
0.32	0.400	A5
0.16	0.200	A4
0.80	0.100	A3
0.40	0.500	A2
0.20	0.250	A1
0.10	0.125	A0

The following examples show a simple method of determining the correct diode programme.

Example 1

The receive frequency for channel 1 on the T496 is 469.2MHz and the channel increment is 12.5kHz. The oscillator injection frequency is on the low side.

$$f_{VCO} = f_{Rx} - f_{IF}$$
$$= 469.2 - 10.7$$
$$= 458.5\text{MHz}$$

Use the 12.5kHz column of Table 1 and make a series of subtractions as shown overleaf.

Frequency to be programmed	458.5
Subtract N9, being first tabulated frequency less than 458.5	409.6
Result of subtraction	48.9
Subtract N5, being first tabulated frequency less than 48.9	25.6
Result of subtraction	23.3
Subtract N4, being first tabulated frequency less than 23.3	12.8
	10.5
Subtract N3	6.4
	4.1
Subtract N2	3.2
	0.9
Subtract N0	0.8
	0.1
Subtract A3	0.1
Final subtraction, no remainder	0.0

The diodes to be cut are N9, N5, N4, N3, N2, N0 and A3 on the column representing channel 1 receive.

To check the programming, the sum of the extracted values should equal the required VCO frequency:

N9 + N5 + N4 + N3 + N2 + N0 + A3 = fVCO

409.6 + 25.6 + 12.8 + 6.4 + 3.2 + 0.8 + 0.1 = 458.5

458.5 + 10.7 = 469.2 = frequency of local oscillator

The transmit VCO frequency equals the frequency to be transmitted and is calculated in the same manner.

The second channel is programmed in the same way. If only one channel is required, the second channel should be programmed to the same frequencies as channel 1.

Once the correct diode programme has been calculated, remove the diode memory module TA-490/2 and cut the appropriate diodes. Figure 4 shows where to cut the diode leads and Figure 5 shows the encoding and position of each diode on the matrix PCB.

A connected diode pulls IC8 input low and deletes the frequency increment.

A cut diode allows IC8 input to go high and adds the frequency increment.

Figure 4

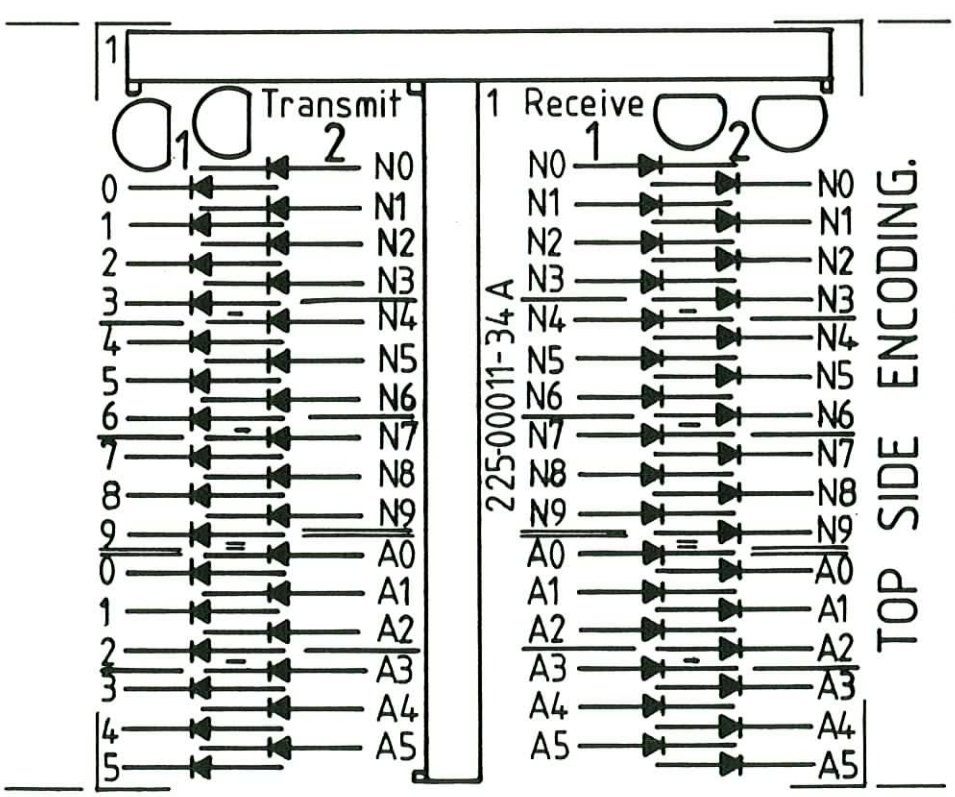


Figure 5 TA-490/2 PCB Encoding

Replace the TA-490/2 in the T496 two way radio.

5.5 TRANSMITTER ADJUSTMENTS

5.5.1 PRELIMINARY CURRENT CHECK

Ensure that the supply is off.

Connect the T281/2 service lead.

Plug a pre-programmed memory module (TA-490 or TA-490/2) onto the exciter PCB. (Refer to Section 5.4.4, Channel Programming.)

Set the supply to 13.8 volts.

Note: Always have set turned off when inserting or removing memory modules.

Turn the set on and check that the current drawn by set when muted is as follows for the EPROM being used:

NMOS EPROM I <400mA
CMOS EPROM I <250mA

5.5.2 RF ALIGNMENT

Set the front panel channel switch to the highest frequency channel.

Plug the frequency counter onto the reference oscillator test point (TP1) and adjust L402 for the correct frequency (to the nearest 100Hz); refer to Section 5.4.3.

Plug the frequency counter onto the VCO test plug (TP3) and a voltmeter onto TP2. Close the pressel and observe the frequency of the counter by alternately selecting the channel with the highest and lowest frequencies. Monitor the voltages on the voltmeter and adjust CV249 so that the corresponding loop voltages lie symmetrically between 2 and 6 volts.

Repeat the above step with the set on receive for the receive run up. Select the channel with the highest and lowest frequency (remembering the IF offset) and adjust CV445 so that the corresponding VCO loop voltages lie symmetrically between 2 and 6 volts.

With the counter connected to TP3, readjust L402 for the correct run up frequency.

Disconnect the counter.

Turn RV376 & RV377 fully clockwise.

Connect the set to a wattmeter, close the pressel, and adjust CV517 in the PA for maximum power out.

Adjust RV376 for 25 watts, and RV377 for 5 watts with lower power selected. Ensure that the current drawn for 25 watts RF output does not exceed 6.5 amps, and that the voltage at the set is 13.8V under full transmitter load.

Check for correct transmitter operation on all channels programmed.

5.5.3 MODULATION ADJUSTMENT

Connect the T496 antenna output through a 50dB RF power attenuator (see Section 5.4.1, item 16) to a modulation meter.

Connect the microphone to a tone box (see Section 5.4.1, item 12) or connect an audio oscillator to the microphone pads on the exciter.

Set RV347 for maximum deviation.

Set the oscillator to 1kHz sine wave.

Set the modulation meter to read '+' deviation.

SET THE CHANNEL SWITCH TO THE HIGHEST FREQUENCY CHANNEL.

Close the pressel and adjust the audio oscillator output level to produce +3kHz (or +1.5kHz) deviation.

Increase the audio input by 30dB and adjust RV347 to give a deviation of +5kHz (or +2.5kHz).

Slowly sweep the frequency of the audio oscillator between 300Hz and 3000Hz to find the frequency which produces maximum deviation, and readjust RV347 for a peak deviation of +5kHz (or +2.5kHz) at that frequency.

Reset the modulation meter to read '-'deviation.

Slowly sweep the audio frequency between 300Hz & 3000Hz; if the peak is found to exceed -5kHz (or -2.5kHz), readjust RV347 for a peak deviation of -5kHz (or -2.5kHz) at that frequency.

5.6 RECEIVER ALIGNMENT

5.6.1 GENERAL

Ensure that the VCO is adjusted as described in Section 5.5.2, paras 3 and 4.

Connect an EVM with RF diode probe to the 'source' of the mixer (Q102), and tune helical resonators L122 and L123 for maximum RF voltage (0.7 to 1.3V).

Adjust for approximately equal voltages when the channel switch is moved between the highest and lowest frequencies.

5.6.2 RF & IF ALIGNMENT

5.6.2.1 General

In this section two methods of IF alignment are described: Sinad alignment (Section 5.6.2.2) and Sweep alignment (Section 5.6.2.3). The 'sweep' alignment method requires the use of a signal generator with sweep facilities and an oscilloscope. This method is recommended when optimum IF pass-band response is required.

5.6.2.2 Sinad Alignment (RF & IF Sections)

Ensure that the VCO-injection signal is correctly aligned as described in Section 5.6.1 above.

Connect a Sinad meter (or distortion measuring set) to the audio output terminals.

Switch to the lowest frequency channel and set CV109 to the fully meshed position.

Set the signal generator on the receive frequency.

Set the signal generator for ±5kHz (or ±2.5kHz) deviation at 1kHz.

Set the signal generator output level to give a Sinad of about 12dB.

Tune L101, L102, L104, L105, L116, L117, L118, L201 and CV217 for best Sinad, progressively reducing the signal generator output level to keep the Sinad at about 12dB.

Repeat the tuning of all the above coils, and CV217.

Reduce the signal generator deviation to ±3kHz (or ±1.5kHz).

Unmesh CV109 until Sinad suddenly drops, then remesh until Sinad just stops rising. Adjust the signal generator level for 12dB Sinad, then increase the level 2dB. Unmesh CV109 until 12dB Sinad is once again obtained.

Note: CV109, with L106 & C104, forms a notch filter on the image frequency (F_c = -21.4MHz) and, if required, CV109 may be set for maximum rejection at that frequency. However, response at the image frequency will be within specifications if CV109 is tuned as above.

Switch to the highest frequency channel and check the RF signal level required for 12dB Sinad. If this level is greater than -118dBm, readjust L101, L102, L104, and L105 for equal sensitivity on the highest and lowest frequency channels.

Check that the output of the signal generator does not exceed -118dBm for 12dB Sinad on all channels.

Note: For operation over a 3MHz switching range, a degradation of 3dB may occur at band edges.

5.6.2.3 Sweep Alignment (IF Section Only)

Ensure that the VCO-injection and coils L122, L123, L101, L102, L104, L105 and CV217 are correctly aligned as in Section 5.6.2.2 above.

Externally modulate the UHF signal generator with a 10Hz signal; set the deviation to ±30kHz and the RF level to -100dBm.

Connect the AGC output (IC201 pin 13) to the oscilloscope 'Y' amp, with a DC load of 10k to -ve.

Connect the source of the 10Hz modulating signal to the 'X' amp.

Note: Both the 'X' and 'Y' amps should preferably be DC coupled.

Tune L116 and L117 for the maximum amplitude on the oscilloscope waveform.

Tune L118 and L201 alternately to obtain minimum ripple on the oscilloscope waveform, consistent with maintaining the output amplitude.

Repeat the IF tuning of L116, L117, L118 and L201 to obtain a symmetrical response with minimum ripple, while maintaining output amplitude.

Disconnect the external modulation and the oscilloscope.

5.6.3 NOISE BLANKER ADJUSTMENT

Ensure that the RF & IF stages have been correctly aligned as in Section 5.6.2 above.

Set the UHF signal generator to deliver an 'on channel' unmodulated signal.

Connect the signal generator to the receiver input.

Connect an EVM (10V DC range) to pin 5 of IC102.

Tune L125 & L127 for maximum on the EVM.

Typical amplifier noise sensitivity is between 10 and 20µV for a 0.5 volt DC rise in voltage at pin 5 of IC102.

Connect an ignition noise simulator to the receiver input.

Listen to the receiver output and check the operation of the noise blanker by temporarily short circuiting Q111 base-emitter circuit, thus disabling the noise blanker.

The noise blanker should give a marked reduction in noise over a wide range of noise input amplitudes.

5.6.4 SQUELCH - NOISE AMP ADJUSTMENT

Plug the aerial coax onto a 50 ohm load, then measure the voltage on pin 5 of IC202 with a high impedance multimeter (½ a meg ohm or more) and adjust RV245 to read 4 volts.

Check that the fine squelch opens between 6-12dB Sinad.

5.7 FAULT FINDING

5.7.1 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.

Unless otherwise specified, tests are for a set with a 15kHz bandwidth on receive and ±5kHz deviation on transmit. For sets with 7.5kHz IF bandwidth, use ±2.5kHz as maximum deviation and refer to Specifications (Section 1.2) for performance limits.

5.7.2 RECEIVER PERFORMANCE TESTS

5.7.2.1 Squelch

(a) TO CHECK THE SQUELCH OPERATION

Connect a Sinad meter across the speaker terminals.

Connect a UHF signal generator to the aerial input terminal.

Set the signal generator output level to zero and the modulation to ±5kHz (or ±2.5kHz) 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 12dB Sinad.

(b) TO CHECK THE SQUELCH RATIO

Set the signal generator output level to -107dBm (1µV), modulated to ±5kHz (or ±2.5kHz) deviation at 1kHz.

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

Turn the squelch control fully anticlockwise.

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.

(c) TO CHECK THE HIGH LEVEL FAST SQUELCH

Connect a UHF signal generator to the aerial input socket, with the output set to -100dBm modulated to ±5kHz (or ±2.5kHz) deviation at 1kHz.

Listen to the receiver audio output.

Turn the signal generator RF off.

Adjust the squelch control to just close.

Turn the signal generator RF on (-100dB) (squelch should open).

Turn the signal generator RF off. The noise tail should be about 100mS, before the squelch closes.

Turn the signal generator RF on again, this time with an RF level of -80dBm.

Turn the signal generator RF off. There should be no noticeable squelch tail.

5.7.2.2 To Check The Audio Output Level

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

Connect a UHF signal generator to the aerial input socket, with the output set to -107dBm (1μV) modulated to ±5kHz (or ±2.5kHz) deviation at 1kHz.

Set the volume control to just below the onset of clipping.

The receiver output should be 3 watts (3 volts across 3 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%.

5.7.2.3 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, tune the signal generator for a zero beat and then uncouple the reference oscillator).

Set the signal generator deviation to 60% system deviation at 1kHz.

Note: It is important that the modulating frequency is within 5Hz of 1kHz.

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 -118dBm and is typically -120dBm.

5.7.2.4 To Check The Signal+Noise To Noise Ratio

Set up the signal generator and mV/meter as in Section 5.7.2.1 (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 34dB for 15kHz B/W or 28dB for 7.5kHz B/W sets.

5.7.2.5 To Check The Ultimate Signal To Noise Ratio

Note 1: Carry out the following check only after the alignment has been completed.

Note 2: 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 (or ±2.5kHz) 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, or 50dB with a crystal in the quad detector. (A low reading could be caused by a faulty IC201 or a noisy VCO).

5.7.3 TRANSMITTER PERFORMANCE TESTS

5.7.3.1 Audio Processor

(a) TO CHECK THE LIMITER CIRCUIT

Connect an oscilloscope to monitor the waveform at pin 1 of IC302a.

Provide an audio signal to the audio processor as in Section 5.5.3.

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 AGC OPERATION

Set up the audio signal as described above in Section 5.7.3.1 (a).

Set the oscilloscope to monitor the waveform at pin 14 of IC302d.

Connect an EVM to the base of Q303.

Increase the output level of the signal generator to 10dB above the limiting level [Section 5.7.3.1 (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 significantly.

The EVM should show a 'positive DC' reading.

(c) TO CHECK THE GAIN OF THE AUDIO PROCESSOR

Connect the T496 antenna output to a modulation meter as in Section 5.5.3.

Provide an audio signal to the audio processor as in Section 5.5.3.

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

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

Check the deviation control, RV347, as in Section 5.5.3.

Slowly increase the output level of the audio signal generator until a deviation of ±3kHz or (±1.5kHz) is reached.

Check that the mV/meter reads approximately 3mV p-p.

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

5.7.3.2 Modulation Characteristics

(a) GENERAL

To determine the overall characteristics as a function of deviation versus modulation frequency:

Connect the T496 antenna output to a modulation meter as in Section 5.5.3.

Provide an audio signal to the audio processor as in Section 5.5.3.

Connect an oscilloscope to pin 1 of IC302a.

Set the frequency of the audio signal generator to 3kHz.

Check the level at which limiting begins [Section 5.7.3.1 (a)].

(b) TO CHECK THE ABOVE LIMITING RESPONSE

Increase the audio signal generator output level to 20dB above the limiting level [Section 5.7.3.1 (a)].

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

Note the deviation on the modulation meter.

Below 3kHz the deviation should be within 2dB of maximum.

Above 3kHz the deviation should decrease at approximately 30dB/octave.

Refer to Section 1.2, Specifications, for limits.

(c) TO CHECK THE BELOW LIMITING RESPONSE

Decrease the audio signal generator output level to 10dB below the limiting level [see Section 5.7.3.1 (a)].

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

Note the reading on the modulation meter.

Below 3kHz the deviation should decrease at the rate of 6dB/octave.

Above 3kHz the deviation rate of decrease should be approximately 30dB/octave.

See Section 1.2, Specifications, for limits.

5.7.3.3 To Check The RF Power Control Circuit

Connect an RF power meter to the transmitter output.

Close the PTT switch.

Ensure that the transmitter is correctly tuned (see Section 5.5).

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 volts the RF power output should be more than 12.5 watts.

5.7.3.4 To Check The Transmission Timer

Connect an RF power meter to the transmitter output.

Close the PTT switch.

Check that the T496 reverts to 'receive' after one minute of transmission time.

If the transmission time is not within ±50% of one minute, reset the transmission time accurately by changing the value of either C363 (47µF) and/or R362 (1M5).

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

5.7.3.5 To Check The VCO Control Range

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

Short the middle pin on TP2 to the +ve and -ve (the two outer pins of TP2) alternately.

The frequency shift should be more than 9MHz on transmit, and more than 3MHz on receive.

5.7.3.6 To Check The Loop Filter Speed Up & Out Of Lock Crow Bar Circuits

Two methods may be used:

(a) Where two or more transmit frequencies are programmed, close the PTT switch then switch quickly from one channel to the other.

The transmit LED should blink off for less than 40ms.

(b) If only one channel is programmed, note how long it takes for the transmit LED to light when the PTT switch is closed. It should be less than 40ms.

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.

The parts list printed below is for all versions of the T496. Different versions have different sub-groups. Check the version of your T496 (printed on a label on the back of the set). To find the correct part refer to the sub-groups listed for your version of the T496. The same circuit reference may be listed in more than one sub-group, but it will only be correct in the sub-group listed for your version.

VERSION	SUB-GROUPS
1. T496/400450BT00:	
B496X	T496 Ex/Rx PCB Basic Parts
C496/400-470	T496 VCO 400-470MHz
B496/HL 400-450	T496 Helical Resonator 400-450MHz
B490/FP PCB	T490 Series Front Panel PCB Assembly
C496/FP	T496 Front Panel
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/400-450 PA	T196 PA 400-450MHz
B490/MECH	T490 Series Mechanical Parts
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/LONG	T490 Series Long Chassis
2. T496/400450BTS0:	
B496X	T496 Ex/Rx PCB Basic Parts
C496/400-470	T496 VCO 400-470MHz
B496/HL 400-450	T496 Helical Resonator 400-450MHz
B490/FP PCB	T490 Series Front Panel PCB Assembly
C496/FP	T496 Front Panel
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/400-450 PA	T196 PA 400-450MHz
B490/MECH	T490 Series Mechanical Parts
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/SHORT	T490 Series Short Chassis

3. T496/420470BT00:

B496X	T496 Ex/Rx Basic Parts
C496/400-470	T496 VCO 400-470-MHz
B496/HL 420-470	T496 Helical Resonator 420-470MHz
C496/FP	T496 Front Panel
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/420-470 PA	T196 PA 420-470MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/LONG	T490 Series Long Chassis

4. T496/420470BTS0:

B496X	T496 Ex/Rx Basic Parts
C496/400-470	T496 VCO 400-470MHz
B496/HL 420-470	T496 Helical Resonator 420-470MHz
C496/FP	T496 Front Panel
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/420-470 PA	T196 PA 420-470MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/SHORT	T490 Series Short Chassis

5. T496/450500BT00:

B496X	T496 Ex/Rx Basic Parts
C496/450-520	T496 VCO 450-520
B496/HL 450-500	T496 Helical Resonator 450-500MHz
C496/FP	T496 Front Panel
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/450-500 PA	T196 PA 450-500MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/LONG	T490 Series Long Chassis

6. T496/450500BTS0:

B496X	T496 Ex/Rx Basic Parts
C496/450-520	T496 VCO 450-520
B496/HL 450-500	T496 Helical Resonator 450-500MHz
C496/FP	T496 Front Panel
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/450-500 PA	T196 PA 450-500MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/SHORT	T490 Series Short Chassis

7. T496/470520BTSO:

B496X	T496 Ex/Rx Basic Parts
C496/450-520	T496 VCO 450-520MHz
B496/HL 470-520	T496 Helical Resonator 470-520MHz
C496/FP	T496 Front Panel
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/470-520 PA	T196 PA 470-520MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/SHORT	T490 Series Short Chassis

8. T496/400450USA:

B496X	T496 Ex/Rx Basic Parts
C496/400-470	T496 VCO 400-470MHz
B496/HL 400-450	T496 Helical Resonator 400-450MHz
C496/FP	T496 Front Panel
C496/USA/2	Add to T496 for USA Loband Set
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/400-450 PA	T196 PA 400-450MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/SHORT	T490 Series Short Chassis
B/TA-088	TA-088 Crystal Heater Parts

9. T496/USA:

B496X	T496 Ex/Rx Basic Parts
C496/450-520	T496 VCO 450-520
B496/HL 450-500	T496 Helical Resonator 450-500MHz
C496/FP	T496 Front Panel
C496/USA	T496 USA Parts Required for USA
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/450-500 PA	T196 PA 450-500MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/SHORT	T490 Series Short Chassis
B/TA-088	TA-088 Crystal Heater Parts

10. T496/420470BH00:

B496X	T496 Ex/Rx Basic Parts
C496/400-470	T496 VCO 400-470MHz
B496/HL 420-470	T496 Helical Resonator 420-470MHz
C496/FP	T496 Front Panel
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/420-470 PA	T196 PA 420-470MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/LONG	T490 Series Long Chassis
B/TA-490/100	Parts for 100 Channel Conversion Kit

11. T496/420470BHS0:

B496X	T496 Ex/Rx Basic Parts
C496/400-470	T496 VCO 400-470MHz
B496/HL 420-470	T496 Helical Resonator 420-470MHz
C496/FP	T496 Front Panel
B490/FP PCB	T490 Series Front Panel PCB Assembly
B490/MECH	T490 Series Mechanical
C496/PA	Add to B196/PA for T496 PA
B196/PA	T196 PA Basic Parts
C196/420-470 PA	T196 PA 420-470MHz
B/TA-490	T490 Series Memory Module
C490/15 IFBW	T490 Series 15kHz IF Bandwidth Parts
C490/SHORT	T490 Series Short Chassis
B/TA-490/100	Parts for 100 Channel Conversion Kit

6.2 B496X T496 EX/RX BASIC PARTS

6.2.1 TRANSISTORS

INTERNAL PART NO.	QTY/SET	DESCRIPTION	REFERENCE		CH/N
000 000 10 60	2	BC327 TRANSISTOR	Q308, Q309		
000 000 10 66	1	BC337 TRANSISTOR	Q206		
000 000 11 10	14	BC548B TRANSISTOR	Q109, Q203, Q204, Q207 Q302, Q303, Q305, Q306 Q310, Q313, Q314, Q402 Q405, Q408		
000 000 11 30	7	BC557B TRANSISTOR	Q110, Q205 Q311, Q403, Q404, Q409 Q410		
000 000 11 70	2	BD136 TRANSISTOR	Q307, Q315		
000 000 20 11	2	BF494 TRANSISTOR	Q201, Q202		
000 000 22 55	3	2N5484 TRANSISTOR	Q301, Q401, Q407		85/02-025
000 000 31 75	4	3SK87K TRANSISTOR	Q105 Q412, Q413, Q415		
000 000 31 90	1	MPSH11 TRANSISTOR	Q111		
000 000 32 47	1	MRF559, BLU98, MRF581, SD1359, TRF559	Q416		
000 000 32 56	1	MRF630 TRANSISTOR	Q417		
000 000 33 10	2	J310 TRANSISTOR	Q411, Q414		89/11-523

6.2.2 DIODES

001 000 12 00	J6	1N4148 DIODE	D107, D202, D203, D204 D206 D301, D302, D303, D304 D306, D307, D308, D402 D403, D404, D410	
001 000 12 53	2	BB405 VARICAP DIODE	D405, D407	
001 000 15 12	1	BZX79/5V6 ZENER	D401	

6.2.3 INTEGRATED CIRCUITS

002 000 10 21	1	CA3089 INT CCT	IC201	
002 000 13 30	1	MC1330P INT CCT	IC102	
002 000 13 50	1	MC1350P INT CCT	IC101	
002 000 14 00	1	TBA810S INT CCT	IC203	
002 000 14 40	2	MLM324P INT CCT	IC202, IC302	

0 0 2 0 0 0 1 5 0 0	1	4011B INT CCT	Ic 303	
0 0 2 0 0 0 1 5 7 0	1	4066B INT CCT	Ic 402	
0 0 2 0 0 0 1 5 9 0	1	LM317 INT CCT	Ic 301	
0 0 2 0 0 0 1 7 4 5	1	SP8718 INT CCT	Ic 403	
0 0 2 0 0 0 1 7 6 0	1	MC 145152 INT CCT	Ic 401	

6.2.4 CAPACITORS

0 1 1 0 1 1 8 0 0 1	1	1P8 CAP NPO ±0.25P 50/63V CERAMIC	C446	
0 1 1 0 1 2 2 0 0 1	3	2P2 CAP NPO ±0.25P 50/63V CERAMIC	C214, C456, C457	85/2-027
0 1 1 0 1 2 7 0 0 1	1	2P7 CAP NPO ±0.25P 50/63V CERAMIC	C444	
0 1 1 0 1 3 3 0 0 1	1	3P3 CAP NPO ±0.5P 50/63V CERAMIC	C430	85/2-027
0 1 1 0 1 3 9 0 0 1	1	3P9 CAP NPO ±0.5P 50/63V CERAMIC	C462	
0 1 1 0 1 4 7 0 0 1	2	4P7 CAP NPO ±0.5P 50/63V CERAMIC	C145, C463,	85/2-027
0 1 1 0 1 6 8 0 0 1	3	6P8 CAP NPO ±0.5P 50/63V CERAMIC	C431, C447, C473	85/2-027
0 1 1 0 1 8 2 0 0 1	3	8P2 CAP NPO ±0.5P 50/63V CERAMIC	C133, C348, C455	
0 1 1 0 2 1 0 0 0 1	2	10P CAP NPO ±0.5P 50/63V CERAMIC	C433, C450	
0 1 1 0 2 1 8 0 0 6	1	18P CAP N750 5% 50/63V CERAMIC	C407	
0 1 1 0 2 2 7 0 0 1	4	27P CAP N150 5% 50/63V CERAMIC	C427, C432, C443, C448	
0 1 1 0 2 2 7 0 0 8	2	27P CAP 5% 50V 7.5 LEAD SPACING	C312, C313	85/5-173
0 1 1 0 2 3 9 0 0 1	1	39P CAP N150 5% 50/63V CERAMIC	C132	
0 1 1 0 2 3 9 0 0 6	1	39P CAP N750 5% 50/63V CERAMIC	C405	
0 1 1 0 2 4 7 0 0 1	4	47P CAP N150 5% 50/63V CERAMIC	C245, C246, C340, C349	
0 1 1 0 2 5 6 0 0 1	1	56P CAP N150 5% 50/63V CERAMIC	C209	
0 1 1 0 3 1 0 0 0 1	7	100P CAP N150 5% 50/63V CERAMIC	C181, C187, C188, C267, C332, C333, C410	
0 1 1 0 3 2 2 0 0 1	1	220P CAP N750 10% 50/63V CERAMIC	C334	
0 1 1 0 3 4 7 0 0 1	2	470P CAP T/C B 10% 63V CERAMIC	C184, C186	
0 1 1 0 4 1 0 0 0 1	19	1n CAP T/C B 10% 63V CERAMIC	C140, C141, C142, C171, C178, C215, C235, C241, C242, C268, C327, C360, C361, C362, C372, C409, C435, C438, C449,	85/5-173 85/6-209

T496 Parts List

0 1 1 0 4 4 7 0 0 3	46	4n7 CAP T/C B 10% 50V CERAMIC	C112, C144, C170, C172 C173, C174, C175, C177 C180, C183, C190, C201 C202, C203, C204, C206 C207, C208, C212, C213 C216, C234, C243, C259 C261, C291 C301, C302, C305, C307 C321, C326, C329, C335 C342, C346, C370, C371 C373, C374, C376, C412 C460, C465, C424, C442	85/5-173 86/2-029
0 1 5 0 1 7 0 0 0 1	1	6P8/7P CAP N150 ±0.5P 50V CHIP 3.2×1.6mm	CC468	
0 1 5 0 2 1 8 0 0 1	2	18P CAP N150 5% 50V CHIP 3.2×1.6mm	CC464, CC469	86/5-102
0 1 5 0 3 1 0 0 0 1	2	100P CAP N150 50V CHIP 3.2×1.6mm	CC311, CC315	85/5-173
0 1 5 0 4 1 0 0 0 4	6	1n CAP T/C B 10% 50V CHIP 3.2×1.6mm	CC436, CC437, CC143 CC461, , CC472, CC454	86/4-075
0 1 5 0 5 4 7 0 0 2	3	47n CAP 50V CHIP 3.2×1.6mm	CC401, CC453, CC467	86/4-073
0 2 0 0 7 1 0 0 0 2	9	1µ CAP 50V ELECTRO 5×11mm VERT	C244, C269 C320, C324, C330, C343 C364, C379, C466	
0 2 0 0 8 1 0 0 0 3	16	10µ CAP 50V ELECTRO 5×11mm VERT	C182, C233, C265, C290 C292 C308, C310, C311, C322 C328, C341, C375, C420 C421, C423, C441	
0 2 0 0 8 4 7 0 0 2	7	47µ CAP 16V ELECTRO 6×11mm VERT	C176, C211, C264, C270 C306, C363, C402	
0 2 0 0 9 2 2 0 0 1	2	220µ CAP 16V ELECTRO 10×12.5mm VERT	C263, C271	
0 2 0 0 9 4 7 0 0 2	1	470µ CAP 16V ELECTRO 10×20mm VERT	C303	
0 2 2 0 4 4 7 0 0 1	1	4n7 CAP 50V MYLAR VERT	C417	
0 2 2 0 5 1 0 0 0 1	9	10n CAP 50V MYLAR VERT	C232, C266 C325, C339, C345, C422 C426, C434, C440	
0 2 2 0 5 2 2 0 0 1	1	22n CAP 50V MYLAR VERT	C411	
0 2 2 0 5 4 7 0 0 1	11	47n CAP 50V MYLAR VERT	C179, C185, C205, C210 C231, C247, C260, C262 C309, C347, C416	
0 2 2 0 6 1 0 0 0 1	1	100n CAP 50V MYLAR VERT	C236	
0 2 2 0 7 1 0 0 0 2	1	1µ CAP 50V MYLAR VERT	C415	
0 2 8 0 1 7 0 0 0 2	2	2/7P TRIM CAP NP0 TOP ADJUST BLUE	CV429, CV445	
0 2 8 0 2 2 0 0 0 2	1	4/20P TRIM CAP N470 TOP ADJUST PINK	CV217	

6.2.5 RESISTORS

030 012 200	2	2E2 RESISTOR 5% C/F 7×2·5mm	R278 R430
030 024 700	14	47E RESISTOR 5% C/F 7×2·5mm	R120, R122, R124, R172 R183, R212, R280 R370, R374, R446, R472, R474, R476, R480
030 031 000	8	100E RESISTOR 5% C/F 7×2·5mm	R112, R207, R274, R275 R375, R434, R445, R461
030 032 200	2	220E RESISTOR 5% C/F 7×2·5mm	R448, R464
030 033 300	11	330E RESISTOR 5% C/F 7×2·5mm	R104, R115, R173, R176 R205, R206, R211 R301, R382, R471 R473
030 036 800	3	680E RESISTOR 5% C/F 7×2·5mm	R256 R305, R321
030 041 000	21	1K RESISTOR 5% C/F 7×2·5mm	R177, R181, R186, R208 R244, R260, R261, R276 R302, R303, R320, R338 R360, R361, R416, R418 R424, R433, R470, R475 R479
030 04			
030 041 800	2	1K8 RESISTOR 5% C/F 7×2·5mm	R306, R443
030 042 200	17	2K2 RESISTOR 5% C/F 7×2·5mm	R178, R201, R204, R209 R210, R215, R216 R307, R324, R327, R333 R336, R368, R369, R378 R380, R417,
030 043 300	8	3K3 RESISTOR 5% C/F 7×2·5mm	R179, R258 R322, R379, R436, R439 R444, R462,
030 044 700	18	4K7 RESISTOR 5% C/F 7×2·5mm	R182, R185, R203, R259 R279, R294, R297 R373, R381, R421, R423 R427, R429, R432, R437 R452, R466 R457
030 046 800	4	6K8 RESISTOR 5% C/F 7×2·5mm	R252 R335, R402, R404
030 048 200	1	8K2 RESISTOR 5% C/F 7×2·5mm	R342
030 051 000	32	10K RESISTOR 5% C/F 7×2·5mm	R123, R174, R175, R187 R202, R235, R241, R247 R250, R272, R293 R341, R343, R344, R348 R365, R366, R401, R403 R405 — R412, R415, R419 R420, R422, R425
030 051 200	2	12K RESISTOR 5% C/F 7×2·5mm	R440, R449

0300515000	2	15K RESISTOR 5% C/F 7×2.5mm	R243 R345	
0300522000	17	22K RESISTOR 5% C/F 7×2.5mm	R121, R171, R184, R233 R273, R290, R295 R325, R328, R330, R426 R428, R438, R441, R442 R447, R463,	
0300539000	3	39K RESISTOR 5% C/F 7×2.5mm	R337, R346, R435	
0300547000	3	47K RESISTOR 5% C/F 7×2.5mm	R249, R292, R296	
0300568000	4	68K RESISTOR 5% C/F 7×2.5mm	R242 R304, R323, R363	
0300610000	6	100K RESISTOR 5% C/F 7×2.5mm	R451, R453, R456, R458 R465, R467	
0300633000	4	330K RESISTOR 5% C/F 7×2.5mm	R255, R291 R329, R364	
0300647000	9	470K RESISTOR 5% C/F 7×2.5mm	R231, R232, R251, R254 R326, R331, R334, R372 R414	
0300710000	5	1M RESISTOR 5% C/F 7×2.5mm	R234, R246, R253 R367, R431	
0300722030	1	2M2 RESISTOR 5% C/F 7×2.5mm	R362	96/8233
0360247001	1	47E RESISTOR 5% 3.2×1.6mm CHIP M/F	RC450	99/5-173
0420347001	1	470E PRE-SET RES 10mm FLAT CARBON	RV245	
0420422001	3	2K2 PRE-SET RES. 10mm FLAT CARBON	RV347, RV376, RV377	
0450222001	1	22E NTC RESISTOR 5mm DISC 0.5W	R248	

6.2.6 COILS

0500001602	1	COIL TAIT No 602	L201
0500001617	1	COIL TAIT No 617	L402
0500001619	2	COIL TAIT No 619	L125, L127
0500001621	1	COIL TAIT No 621	L203
0500001624	3	COIL TAIT No 624	L116, L117, L118
0520812315	1	COIL A/W 1.5T/2.3mm HOR	L423
0520813015	1	COIL A/W 1.5T/3mm HOR	L418
0520814015	1	COIL A/W 1.5T/4mm HOR	L417

056 000 021 01	6	FXD IND TYPE 101 1.5μH	L206 L302, L305, L306, L307 , L425	
056 000 021 02	8	FXD IND TYPE 102 100μH	L119, L126, L128, L129 L202, L204 L401, L405	
056 000 021 04	10	FXD IND TYPE 104 330mH	L120, L121 L312, L406, L408, L409 L412, L414, L422, L403	
056 000 021 06	1	FXD IND TYPE 106 2mH	L301	
065 000 010 01	1	FERRITE BEAD 3B	L424	
065 000 010 07	3	FERRITE BEAD 5x2x4mm 483 RED		85/5-173
200 000 601 05	0.05gm	WIRE 1/0.5mm TCW	25mm	
201 000 301 02	40mm	WIRE REMIT 7/0.2 PVC RED	STRIPPED 5mm AT EACH END	85/5-173
201 000 301 03	40mm	WIRE REMIT 7/0.2 PVC ORANGE	STRIPPED 5mm AT EACH END	85/5-173
201 000 301 04	40mm	WIRE REMIT 7/0.2 PVC YELLOW	STRIPPED 5mm AT EACH END	85/5-173
206 000 101 11	350mm	COAXIAL CABLE RG316-U		
220 001 078	1	PRINTED CIRCUIT BOARD T496 RX/EX		85/5-173

6.2.7 PCB MISCELLANEOUS

240 000 205 9	3	PLUG 3 WAY 1 ROW HEADER PCB MTG	
240 000 206 0	2	PLUG 18 WAY 1 ROW HEADER PCB MTG.	
274 000 100 7	1	CRYSTAL 12.8MHz TE9	X2
276 000 102 0	1	CRYSTAL FILTER 15KHz BW 2 POLE (10F15A)	XF201
276 000 102 2	1	CRYSTAL FILTER 15KHz BW 8 POLE	XF101
303 005 000 8	3	EARTHING CONTACT A4M796	
303 005 004 8	2	HINGE CLIP A4M915	
			85/6-198
319 000 111 09	1	SHIELD, VCO LID A3M1655	
319 000 111 1	1	STRESS STRIP, LEFT, T496 PCB. A4M1682	
319 000 111 2	1	STRESS STRIP, RIGHT, T496 PCB A4M1683	
319 000 111 8	1	SHIELD, VCO BOX A4M1779 A3M1654	
345 000 400 6	1	SCREW M3x8mm PAN POZI ST BZ	MTG Q315
349 000 201 1	4	SCREW M3x 10mm PAN POZI ST TAPTITE	VCO SHIELD MTG
352 000 100 8	1	NUT M3 HEX	MTG Q315
353 000 100 10	1	WASHER M3 FLAT BZ DD6-75 A4M1215	MTG Q315
353 000 100 12	1	WASHER M3 SPRING	MTG Q315
356 000 100 2 B	.081	HARWIN TRACK PINS	
356 000 103 1	1	PIN 19mm AES BRONZE WITH HEAD	
362 000 100 6	1	MICA INSULATOR	MTG Q315
365 000 113	1	LABEL 'TEST REPORT INSIDE' A4A367	
400 000 202 0 05	30mm	SLEEVING 1.5mm SILICON RUBBER	3x10mm - TO COVER JOINS ON REGULATOR LEADS

6.3 C496/400-470 T496 VCO 400-470MHz

011015600 01	1	5P6 CAP NPO ±0.5P 50/63V CERAMIC	C428	
051000005 06	2	COIL No 506, (25mm SEMI RIGID COAX)	L407, L413	
052081304 5	2	COIL A/W 4.5T/3mm HOR	L410, L415	

6.4 C496/450-520 T496 VCO 450-520MHz

011014700 01	1	4P7 CAP NPO ±0.5P 50/63V CERAMIC	C428	
051000005 07	2	COIL No 507 (18mm SIMI RGID COAX)	L407, L413	
052081303 5	1	COIL A/W 3.5T/3mm HOR.	L410	
052081352 5	1	COIL A/W 2.5T/3.5mm HOR	L415	

6.5 B496/HL 400-450 HELICAL RESONATOR 400-450MHz PARTS

000000321 5	1	BFR91A TRANSISTOR	Q101	
000000330 9	1	JF1033-5 TRANSISTOR	Q102	15/2-027
001000120 0	1	1N4148 DIODE	D108	
011012200 01	1	2P2 CAP NPO 63V ±0.25P	C103	
011031000 01	1	100P CAP N150 63V 5%	C102	
011041000 01	4	1n CAP T/C B 63V 10%	C101, C105, C108, C110.	
028021000 02	1	2/10P TRIM CAP	CV109	
029023300 02	1	33P CAP CAGE MICA UNELCO 3H5	C104	
030031000 0	1	100E RESISTOR 7x2.5mm 5% C/F	R108	
030036800 0	1	680E RESISTOR 7x2.5mm 5% C/F	R107	
030041000 0	1	1K RESISTOR 7x2.5mm 5% C/F	R102	
030041500 0	1	1K5 RESISTOR 7x2.5mm 5% C/F	R103	
030046800 0	1	6K8 RESISTOR 7x2.5mm 5% C/F	R101	
051000003 65	1	COIL A/W TAIT 365 2.5T/3mm	L106	
051000003 69	3	COIL A/W TAIT 369 5.25T	L102, L105, L123	
051000003 70	1	COIL A/W TAIT 370 5T	L122	
051000003 84	1	COIL A/W TAIT 384 5.25T	L104	
051000003 86	1	COIL A/W TAIT 386 5.25T	L101	
056000021 04	1	FXD IND TAIT TYPE 104 330nH.	L103	

061000102	6	FORMER PTFE A4M765	
066000102	6	TUNING SLUG BRASS A4M764	
225000111 7	1	PCB HELICAL RF & MIX	83/5-715
308000104 4	1	HOUSING HELICAL RESONATOR	A2M1551 83/5-727
352000105 0	6	NUT 1/4" UNF, TRIMMER SCREW NUT	
400000211 02	18mm	PTFE 1mm EXTRUDED TUBING	

6.6 B496/HL 420-470 HELICAL RESONATOR 420-470MHz PARTS

000000321 5	1	BFR91A TRANSISTOR	Q101
000000331 09	1	JFJ1033 TRANSISTOR	Q102 85/2-027
001000122 00	1	1N4148 DIODE	D108
011012201 01	1	2P2 CAP NP0 63V ±0.25P	C103
011031001 01	1	100P CAP N150 63V 5%	C102
011041001 01	4	1n CAP T/C B 63V 10%	C101, C105, C108, C110
028021000 02	1	2/10P TRIM CAP	CV109
029023300 02	1	33P CAP. CASE MICA UNELCO 3HS	C104
030031000 00	1	100E RESISTOR 7x2.5mm 5% C/F	R108
030036800 00	1	680E RESISTOR 7x2.5mm 5% C/F	R107
030041000 00	1	1K RESISTOR 7x2.5mm 5% C/F	R102
030041500 00	1	1K5 RESISTOR 7x2.5mm 5% C/F	R103
030046800 00	1	6K8 RESISTOR 7x2.5mm 5% C/F	R101
051000036 5	1	COIL A/W TAIT No 365 2.5T/3mm	L106
051000037 0	1	COIL A/W TAIT No 370 4.6T/8mm	L122
051000047 9	1	COIL A/W TAIT No 479 5T/8mm	L101
051000048 0	3	COIL A/W TAIT No 080 5T/8mm	L102, L105, L123
051000048 1	1	COIL A/W TAIT No 481 5T/8mm	L104
056000211 04	1	FXD IND TAIT TYPE 104 330mH.	L103
061000102 0	6	FORMER PTFE A4M765	
066000102 0	6	TUNING SLUG BRASS A4M764	
225000111 7	1	PCB HELICAL RF & MIX 400-520MHz	83/5-715
308000104 4	1	HOUSING HELICAL RESONATOR	A2M1551 83/5-727
352000105 0	6	NUT 1/4" UNF, TRIMMER SCREW NUT	
400000211 02	18mm	PTFE 1mm EXTRUDED TUBING	

6.7 B496/HL 450-500 HELICAL RESONATOR 450-500MHz PARTS

000 000 32 15	1	BFR91A TRANSISTOR	Q101	
000 000 33 09	1	JE1033-5 TRANSISTOR	Q102	85/2-027
001 000 12 00	1	1N4148 DIODE	D108	
011 012 20 01	1	2P2 CAP NPO 63V ±0.25P	C103	
011 031 00 01	1	100P CAP N150 63V 5%	C102	
011 041 00 01	4	1n CAP T/C B 63V 10%	C101, C105, C108, C110	
028 021 00 02	1	2/10P TRIM CAP	CV109	
029 023 30 02	1	33P CAP CASE MICA UNELCO 3HS	C104	
030 031 00 00	1	100E RESISTOR 7x2.5mm 5% C/F	R108	
030 036 80 00	1	680E RESISTOR 7x2.5mm 5% C/F	R107	
030 041 00 00	1	1K RESISTOR 7x2.5mm 5% C/F	R102	
030 041 50 00	1	1K5 RESISTOR 7x2.5mm 5% C/F	R103	
030 046 80 00	1	6K8 RESISTOR 7x2.5mm 5% C/F	R101	
051 000 03 65	1	COIL A/W TRIT No 365 2.5T/3mm	L106	
051 000 03 71	1	COIL A/W TRIT No 371 4.4T/8mm	L122	
051 000 03 72	3	COIL A/W TRIT No 372 4.6T/8mm	L102, L105, L123	
051 000 03 85	1	COIL A/W TRIT No 385 4.6T/8mm	L104	
051 000 03 87	1	COIL A/W TRIT No 387 4.6T/8mm	L101	
056 000 21 04	1	FXD IND TRIT TYPE 104 330mH.	L103	
061 000 10 20	6	FORMER PTFE A4M765		
066 000 10 20	6	TUNING SLUG BRASS A4M764		
225 000 11 17	1	PCB HELICAL RF & MIX 400-520MHz		83/5-712
308 000 10 44	1	HOUSING, HELICAL RESONATOR	A2M1551	83/5-727
352 000 10 50	6	NUT 1/4" UNF, TRIMMER SCREW NUT		
400 000 21 02	18mm	PTFE 1mm EXTRUDED TUBING		

6.8 B496/HL 470-520 HELICAL RESONATOR 470-520MHz PARTS

000 000 32 15	1	BFR91A TRANSISTOR	Q101	
000 000 33 09	1	JE1033-5 TRANSISTOR	Q102	85/2-029
001 000 12 00	1	1N4148 DIODE	D108	
011 012 20 01	1	2P2 CAP NPO 63V ±0.25P	C103	
011 031 00 01	1	100P CAP N150 63V 5%	C102	
011 041 00 01	4	1n CAP T/C B 63V 10%	C101, C105, C108, C110	

028021000 2	1	2/10P TRIM CAP	CV109	
029023300 2	1	33P CAP CASE MICA UNELCO 3HS	C104	
030031000 0	1	100E RESISTOR 7×2.5mm 5% C/F	R108	
030036800 0	1	680E RESISTOR 7×2.5mm 5% C/F	R107	
030041000 0	1	1K RESISTOR 7×2.5mm 5% C/F	R102	
030041500 0	1	1K5 RESISTOR 7×2.5mm 5% C/F	R103	
030046800 0	1	6K8 RESISTOR 7×2.5mm 5% C/F	R101	
051000003 6 5	1	COIL A/W TAIT No 365 2.5T/3mm	L106	
051000004 7 5	1	COIL A/W TAIT No 475 4.5T	L101	
051000004 7 6	3	COIL A/W TAIT No 476 4.5T	L102, L105, L123	
051000004 7 7	1	COIL A/W TAIT No 477 4.5T	L104	
051000004 7 8	1	COIL A/W TAIT No 478 4.5T	L122	
056000021 0 4	1	FXD IND TAIT TYPE 104 330nH	L103	
061000102 0	6	FORMER PTFE A4M765		
066000102 0	6	TUNING SLUG BRASS A4M764		
225000111 7	1	PCB HELICAL RF & MIX 400-520MHz		83/5-715
308000104 4	1	HOUSING, HELICAL RESONATOR	A2M1551	83/5-727
352000105 0	6	NUT 1/4" UNF, TRIMMER SCREW NUT		
400000021 0 2	18mm	PTFE 1mm EXTRUDED TUBING		

6.9 B196/PA T196 (T496) PA BASIC PARTS

6.9.1 TRANSISTORS

000000227 5 C/N 02/066	SD1433 TRANSISTOR	Q501	1	
000000326 5 C/N 1926	MRF 646 TRANSISTOR (FLANGE MTG)	Q502	1	

6.9.2 DIODES

001000116 0	SR2607 DIODE	D504	1
001000125 0	UM9401 PIN DIODE	D501, D502	2
001000134 5 83/6-782	1S597/2 DIODE	D503	1

6.9.3 CAPACITORS

0110050001		0.5P CAP P100 50V ± .25P (CGRACON E50SJAK0R5C)	C521	1
	85/02-027			
0110410001		1n CAP T/C B 10% 63V	C515, C519	2
0110447003	84/04-162	4n7 CAP T/C B 10% 50V CER	C508, C518	2
0110470002		4n7 CAP T/C B 10% 63V PLT		
0120410001	84/08-377	1n CAP FEED THRU LESS LEAD CERAMIC	C529A, B, C	3
0150322001	C/N 2143	220P CAP NPO 10% 50V CER CHIP (PH 2222·852·13221)	, C524, C522	2
0150322002	83/8-889	220P CAP NPO 5% 100V 3·2×2·5mm CHIP	C516	1
0150410001		1n CAP 200V CER CHIP MUR HDC 85	C526	1
0200710002		1μ CAP 50V ELECTRO VERT	C509	1
0280210002		2/10P TRIM CAP MATSUSHITA ECV-1TY10P17	CV517	1
0290156002		5P6 CAP CASE MICA UNELCO 3HS-0006	C502	1
0290168001		6P8 CAP CASE MICA UNELCO T102	C523	1
0290182001		8P2 CAP CASE MICA UNELCO T102	C525, C528	2
0290191001		9P1 CAP CASE MICA UNELCO T102	C527	1
0290210002	C/N 1926	10P CAP CASE MICA UNELCO 3HS-0006	C503, C511A(SIT)	2
0290233002	C/N 02/066	33P CAP CASE MICA UNELCO 3HS-0006	C510, C511	2
0290310002		100P CAP CASE MICA UNELCO 3HS-0006	C506, C507, C512	3

6.9.4 RESISTORS

0300310000		100E RESISTOR 7×2.5mm 5% C/F	R501	1
0300333001		330E " 10×4mm 5% C/F	R502	1
0300410000	83/07-797	1K " 7×2.5mm 5% C/F	R504	1
0300515001		15K " 10×4mm 5% C/F	R503	1
0510000602	85/5-166	SOLDER SPRING	SLIDE OVER COMPONENT LEGS OF R504, C521 & D503.	1

6.9.5 COILS

0520823015		COIL A/W 1·5T/3mm VERT	L527	1
0520823035		COIL A/W 3·5T/3mm VERT	L508	1
0560002104	C/N 1618	IND FXD TYPE 104 0·33μH	L518	1
0510002002		COIL 10mm LINK (0·8mm WIRE)	L513, L503	2
0520823055		COIL A/W 5·5T/3mm VERT	L505	1
0510001012	C/N 1618	COIL A/W 1·5T/3mm HOR	L519, L520, L524	3

0	5	6	0	0	0	2	1	0	1	84/06-279		INDUCTOR FXD TYPE 101 1·5μH	L516, L529	1
0	6	5	0	0	0	1	0	0	4	84/06-279		FERRITE BEAD 4x2x5mm NEOSID F8	L506, L507, L511, L512	7
0	6	5	0	0	0	1	0	1	0	84/6-279		FERRITE BEAD 5x2x10mm 4S3 RED		2

6.9.6 PCB MISCELLANEOUS

2	2	0	0	0	0	1	0	2	8			T196 PA PAINTED CCT BOARD		1
2	0	0	0	0	0	1	0	5	0	C/N 1770		PVC TUBING 5mm		5mm
2	4	0	0	0	0	1	0	4	1			PLUG DAM 11W1P CINCH/CANNON		1
2	0	0	0	0	0	1	0	0	4	C/N 2163A		TINNED COPPER WIRE 0.4mm		0·11gm
2	4	0	0	0	1	0	0	4	1			COAX INSERT DM53740/5		1
3	0	2	0	0	0	5	1	8	0	84/06-279		BRACKET FEED THRU R/T J/P A2M1732		1
3	0	8	0	0	1	3	0	6	0	85/03-093		HEATSINK DIECAST A1M1685		1
3	1	6	0	0	8	5	0	1	5			PIN LOCATING A4M775		2
3	1	9	0	0	3	0	0	3	3	C/N 02/066		SPACER T196 A4M1339		1
3	1	9	0	0	0	1	0	0	5			SHIELD A2M777		1
3	4	9	0	0	0	2	0	3	0	85/03-093		SCREW M3x6mm PAN POZI TAPTITE		5
3	4	9	0	0	0	2	0	0	9	85/03-093		SCREW 4-40x3/8 PAN POZI TAPTITE	PCB MTG, TRANSISTOR MTG	2
3	4	9	0	0	0	2	0	3	2	85/03-093		SCREW M3x8mm PAN POZI TAPTITE		2
3	5	2	0	0	0	1	0	4	3			NUT LOCATING PIN A4M793	LOCATING PINS	2
3	5	3	0	0	0	1	0	1	2	83/05-726		WASHER M3 SPRING	" "	2
3	5	6	0	0	0	1	0	2	6	82/04-145		HARWIN TRACK PINS		28
3	6	0	0	0	0	1	0	2	1			GROMMET RUBBER 1/4x1/2 (RUBBERCRAFT 314/3)		2
3	5	8	0	0	0	1	0	2	0	C/N 2163A		RIVET 10x5x8mm SS M690/8		1
4	0	0	0	0	0	1	0	5	0	85/02-042		5mm PVC SLEEVE		25mm
4	0	0	0	0	0	2	1	0	0	C/N 2163A		PTFE EXTRUDED TUBING 1·6mm x 13mm		1

6.10 C196/400-450 PA

0	1	1	0	1	1	5	0	0	1			CAP 1P5 P100 63V	C528A, C527A	2
0	2	9	0	2	1	0	0	0	2			10P CAP CASE MICA UNELCO 3HS-0006	C520, C510A, (MOUNTED ON TOP OF C510, C511)	2
0	2	9	0	2	3	3	0	0	2	C/N 02/066		33P CAP CASE MICA UNELCO 3HS	C513, C514, C505	3
0	5	1	0	0	0	2	1	1	8	C/N 1929		COIL A/W 2·5T/3·8mm VERT	L525, L526	2
0	5	2	0	8	2	3	0	5	5			COIL A/W 5·5T/3mm VERT	L510	1
0	2	9	0	2	1	8	0	0	2	C/N 02/066		18P CAP CASE MICA UNELCO 3HS-0006	L505A	1
0	2	9	0	2	3	9	0	0	2	C/N 02/066		39P CAP CASE MICA UNELCO 3HS-0006	L504	1

6.11 C196/420-470 PA

0	2	9	0	1	4	7	0	0	2		1	4P7 CAP CASE MICA UNELCO 3HS	C510A	
0	2	9	0	2	1	0	0	0	2		1	10P CAP CASE MICA UNELCO 3HS	C520	
0	2	9	0	2	3	3	0	0	2		2	33P CAP CASE MICA UNELCO 3HS	C513, C514	
0	2	9	0	2	3	9	0	0	2		2	39P CAP CASE MICA UNELCO 3HS	C504, C505	
0	5	2	0	8	2	3	5	2	5		2	COIL A/W 2·5T/3·5mm VERT	L525, L526	
0	5	2	0	8	2	3	0	3	5		1	COIL A/W 3·5T/3mm VERT	L510	

6.12 C196/450-500 PA

029023300 2		33P CAP CASE MICA UNELCO 3HS	C513, C514, C505	3
029023900 2	c/N 02/666	39P CAP CASE MICA UNELCO 3HS	C504	1
052082303 5		COIL A/W 3.5T/3mm VERT	L510	1
052082352 5		COIL A/W 2.5T/3.5mm VERT	L525, L526	2

6.13 C196/470-520 PA

029022200 2	1	22P CAP CASE MICA UNELCO 3HS-0006	C505		02/666
029022700 2	2	27P CAP CASE MICA UNELCO 3HS-0006	C513, C514		
029023900 2	1	39P CAP CASE MICA UNELCO 3HS-0006	C504		02/666
052082352 5	2	COIL A/W 2.5T/3.5mm VERT	L525, L526		
052082303 5	1	COIL A/W 3.5T/3mm VERT	L510		

6.14 C496/PA

052081401 5	1	COIL A/W 1.5T/4.0mm HOR 0.8mm	L501A		

6.15 B/TA-490 T490 SERIES TA-490 MEMORY MODULE

		A4C421 PIN IDENTIFICATION		
		A2C416 CCT DIAGRAM		
				83/2-593
002000180 1	2	2716 INT CCT UV EPROM CMOS		86/4-088
011041000 1	2	1m CAP T/C B 63V 10%		
030051000 0	2	10K RESISTOR 7×2.5mm 5% C/F		83/2-593
034061004 0	3	RES 100K×4 SIL 5% CERMET		83/2-593
225000110 7	1	PRINTED CCT BOARD TA-490		
240040206 0	2	SKT 18 WAY 1 ROW PCB MTG. (MOLEX)		
				83/2-593
365000112 6	1	LABEL TA-490 TX CONTENTS A4A300		83/8-859
365000112 7	1	LABEL TA-490 RX CONTENTS A4A301		83/8-859
365000113 8	1	LABEL STATIC WARNING YELLOW A4A315	(OUTSIDE OF FOIL WRAPPING).	83/11-1058
365000115 4	1	LABEL QUIKSTIK RW1556/2	REFER TO TI-247A FOR FITTING INSTRUCTIONS.	84/6-282

6.16 B/TA-490/2 TA-490/2 PARTS

		CCT DIAGRAM A3C462	
		TI-247A · MEMORY MODULE PROGRAMING	
000000110 4	4	BC548B TRANSISTOR	Q1, Q2, Q3, Q4
001000120 0	64	1N4148 DIODE	D1 – D64
225000113 4	1	PRINTED CCT BOARD TA-490/2	
240040206 0	2	SKT 18 WAY 1 ROW PCB MTG MOLEX	
365000115 4	1	LABEL QUIKSTIK RW1556/2	REFER TO TI-247A FOR PROGRAMING INSTRUCTIONS

6.17 B/TA-490/100 T490 SERIES 100 CHANNEL KIT

200 0001 005	0.1 gm	WIRE 1/0.5 TINNED COPPER	1 x 35mm LINK, 1 x 30mm LINK
205 0002 004	1	JUMPER STRIP 9 WIRES x 34mm PVC	9 WIRES 34mm's LONG
234 0001 026	1	PUSH BUTTON CODE SW	
400 0020 01	35mm	0.7mm SILICON SLEEVING	1 x 25mm, 1 x 10mm
365 0001 154	1	LABEL QUIKSTIK RW1556/2	
399 0010 69	1	PLASTIC BAG 75 x 100mm	

6.18 B490/FP PCB T490 SERIES FRONT PANEL PCB ASSEMBLY

008 0001 013	1	TLR 124 LED RED	
008 0001 013	1	TLY 124 LED YELLOW	
008 0001 015	1	TLG 124 LED GREEN	
030 0410 00	2	1K RESISTOR 7x2.5mm 5% C/F	
040 0510 004	1	10K LOG POT DPST SW	VOL
040 0510 006	1	10K LOG POT LESS SW	SQUELCH
205 0002 005	1	FLEXIBLE JUMPER STRIP 9 WIRES x 45mm PVC	
220 0001 075	1	PRINTED CCT BOARD	
~~234 0001 024~~	~~1~~	~~SWITCH PUSH BUTTON CODE ILLUMINATED~~	~~CH SELECT~~
~~234 0020 244~~	~~1 PR~~	~~SIDE COVERS FOR SMC SW (SMC-P/x)~~	
~~234 0020 25~~	~~1~~	~~SW DUMMY HOUSING~~	
240 0020 49	1	PLUG PCB 20WAY (2x10)	
303 0050 008	2	EARTHING SPRING CONTACT A4M796	
356 0010 26	38	HARWIN TRACK PINS	
200 0010 05	235mm	TINNED COPPER WIRE 0.5mm	115mm (5 x 20mm & 1 x 15mm) LINKS 30mm (1 x 30mm) SWITCH 40mm (1 x 40mm) SWITCH 50mm (1 x 50mm) VOLUME/MUTE
400 0020 01	20mm	SLEEVING 0.7mm SILICON RUBBER	(2 x 10mm & 2 x 5mm)

6.19 C496/FP T496 FRONT PANEL

316 0006 297	1	FRONT PANEL T496 A3A287 A3M1628	

6.20 C490/5 T490 5kHz CH INCREMENT

011 0233 001	1	33 P CAP N750 5% 50/63V CERAMIC	C405
274 0010 08	1	CRYSTAL 10.24MHz SPEC TE9	X401

6.21 C490/12.5 T490 12.5kHz CH INCREMENT

011 022 7006	1	27P CAP N750 5% 50/63V CERAMIC	C405
274 0001007	1	CRYSTAL 12.8MHz SPEC TE9	X401

6.22 C490/7.5 IFBW T490 12.5kHz CHANNEL PARTS

011 0347002	1	470P CAP T/C B 63V 10%	C235
276 0001032	1	XTAL FILTER 10.7MHz 7.5kHz (10F7.5D)	XF101

6.23 C490/15 IFBW T490 15kHz CHANNEL PARTS

011 0410001	1	1n CAP T/C B 63V 10%	C235
276 0001022	1	XTAL FILTER 10.7MHz 15kHz (10F15D)	XF101

6.24 C490/LONG T490 LONG CHASSIS

205 0001015	305 mm	20 CORE FLAT CABLE	LOOM DETAIL DWG A2M1665
240 0402040	2	16 WAY PCB CONNECTOR	
240 0402043	1	20 WAY RIBBON SKT	
303 0011126	2	CHASSIS SIDE PLATE, LONG A2M901	
316 0087042	3	DIECAST PILLAR A2M908	
319 0020066	1	SLEEVE, LONG. A1M778	
349 0002003	9	SCREW 4-40 x 1/8 PAN POZI TAPTITE	

6.25 C490/SHORT T490 SHORT CHASSIS

205 0001015	305 mm	20 CORE FLAT CABLE	
240 0402040	2	16 WAY PCB CONNECTOR	
240 0402043	1	20 WAY RIBBON SKT	
303 0011153	2	CHASSIS SIDE PLATE SHORT A2M902	
319 0020067	1	SLEEVE, SHORT A2M1718	

6.26 C490/RVSN T490 HOOK SWITCH REVERSION

000 0001110	1	BC548B TRANSISTOR	Q481
000 0001130	2	BC557B TRANSISTOR	Q480, Q482
030 0410000	2	1K RESISTOR 7x2.5mm 5% C/F	R481, R485
030 0422200	1	2K2 RESISTOR 7x2.5mm 5% C/F	R484
030 0510000	2	10K RESISTOR 7x2.5mm 5% C/F	R480, R486
030 0522200	1	22K RESISTOR 7x2.5mm 5% C/F	R483
030 0547000	1	47K RESISTOR 7x2.5mm 5% C/F	R482

6.27 C490/PTD T490 POWER TURN DOWN

0 0 0 0 0 0 1 1 1 0	1	BC548B TRANSISTOR	Q491	
0 0 0 0 0 0 1 1 3 0	1	BC557B TRANSISTOR	Q490	
0 0 1 0 0 0 1 2 5 0	1	UM9401 PIN DIODE	(IN PA)	
0 0 1 0 0 0 1 2 6 8	2	MA47600 PIN DIODE	D490, D491	
0 1 1 0 4 1 0 0 0 1	2	1n CAP T/C B 63V	C490, C491	
0 1 1 0 4 4 7 0 0 3	2	4n7 CAP T/C B 50V	C492, C493	83/11-1038
0 3 0 0 3 3 3 0 0 0	2	330E RESISTOR 7x2.5mm 5% C/F	R492, R490	
0 3 0 0 4 2 2 0 0 0	2	2K2 RESISTOR 7x2.5mm 5% C/F	R491, R494	
0 3 0 0 5 1 0 0 0 0	1	10K RESISTOR 7x2.5mm 5% C/F	R493	
0 5 6 0 0 0 2 1 0 0	2	FXD IND TYPE 100 3.3µH	L490, L491	

6.28 C490/USA T490 USA

3 6 5 0 0 0 1 1 6 3	1	LABEL T496 FCC ID. A4A343	ATTACH LABEL TO LEFT END OF HEATSINK.	

6.29 C490/USA/2 T490 USA LO BAND SET

3 6 5 0 0 0 1 2 2 9	1	LABEL T496/400450USA FCC ID A4A426		

6.30 B490/MECH T490 SERIES MECHANICAL COMPONENTS

2 3 4 0 0 0 1 0 2 6	1	PUSH BUTTON CODE SWITCH, REAR MTG	CHANNEL SELECT	83/3-608
2 3 4 0 0 0 2 0 2 6	1 PR	SIDE COVERS FOR REAR MTG CODE SWITCH		83/3-608
2 3 4 0 0 0 2 0 2 7	1	SWITCH DUMMY CODE REAR MTG		83/3-608
2 5 2 0 0 0 1 0 1 2	1	MICROPHONE 600Ω WITH HANGER CONNECTION		
3 0 2 0 0 0 5 1 6 9	2	BRACKET SWITCH MTG A4M1553	(TO SUPPORT PCB INTO CHASSIS SIDE)	83/4-666
3 0 3 0 0 1 1 1 5 3	2	CHASSIS SIDE PLATE (SHORT) A2M902	(TO BE USED WITH EXTERN HINGE)	
3 0 3 0 0 5 0 0 4 6	2	CLAMP, HINGE CLIP RETAINING A4M914		
3 0 5 0 0 0 1 0 1 8	1	ESCUTCHEON PLASTIC A5M582/3		83/2-584
3 1 1 0 0 0 1 0 0 6	2	KNOB (MARKED) A2M1568	SQUELCH, VOLUME	83/11-1055
3 1 6 0 0 8 7 0 4 2	4	PILLARS A2M908		
				84/4-178
				84/4-178
3 1 9 0 0 2 0 0 4 1	1	SLEEVE (SHORT) A2M936		
3 4 5 0 0 0 4 0 0 6	1	SCREW M3x8mm PAN POZI ST BZ	IC301 MTG (REGULATOR)	
3 4 5 0 0 0 4 0 0 9	6	SCREW M3x6mm CSK POZI ST BZ	SLEEVE	
3 4 5 0 0 0 4 0 1 5	4	SCREW M3x12mm CSK POZI ST BZ	SIDE PLATES TO ESCUTCHEON	84/4-178

T496 Parts List

347 000 1 0 01	2	SCREW 6-32 UNC x 3/8 BUTTON HD BLACK	FRONT PANEL	
349 000 2 0 03	12	SCREW 4-40 x 1/8 PAN POZI TAPTITE	PILLAR MTG 8, PCB MTG 4,	
349 000 2 0 30	4	SCREW M3 x 6mm PAN POZI TAPTITE	SIDE PLATES TO PA	RC/12-380
352 000 1 0 08	1	NUT M3 COLD FORM	IC301 MTG.	
353 000 1 0 10	1	WASHER M3 FLAT	IC 301 MTG.	
353 000 1 0 12	1	WASHER M3 SPRING	IC 301 MTG.	
354 000 1 0 33	6	M3 PEM FASTENER	ISSUED TO MANUFACTURER OF SIDE PLATES.	
354 000 1 0 34	2	M4 PEM FASTENER	INSTALLATION INSTRUCTIONS A4M305	
357 000 1 0 02	2	SPIRE CLIPS, KNOB RETAINING.		RC/11-339 83/11-1055
~~357 000 1 0 37~~	1	CLIP COAX RESTRAINT A4M1635	MAKE FROM 0.9mm TCW	83/10-981
360 000 1 0 15	1	SNUB BUSH HGYCO	MIC CORD.	
362 000 1 0 05	1	MICA INSULATOR A4M930	IC301	
362 000 1 0 13	1	BUSH, INSULATING A4M930	IC 301	
051 000 6 0 1	1	COAX RESTRAINT A4M1635		83/5-161
365 000 1 0 31	1	LABEL REMOVEABLE		
~~365 000 1 0 32~~	~~1~~	~~LABEL DESIGN MARK~~		
399 000 1 0 10	1	RUBBER BAND	MIC BAG.	
365 001 1 3 8	1	LABEL STATIC WARNING YELLOW A4A315	FIX TO BLANK SECTION OF PCB BOTTOM	82/11-1055
365 001 1 5 4	1	LABEL QUIKSTIK RW1556/2		84/4-362
369 000 2 0 37	16mm	4016 SECTCH MT TAPE 12x0.8	2 x 8mm FOR GAPS FRNT PNL & SW.	83/5-573
410 000 1 0 54	1	2 WAY RADIO EXPORT PACK		87/3-76

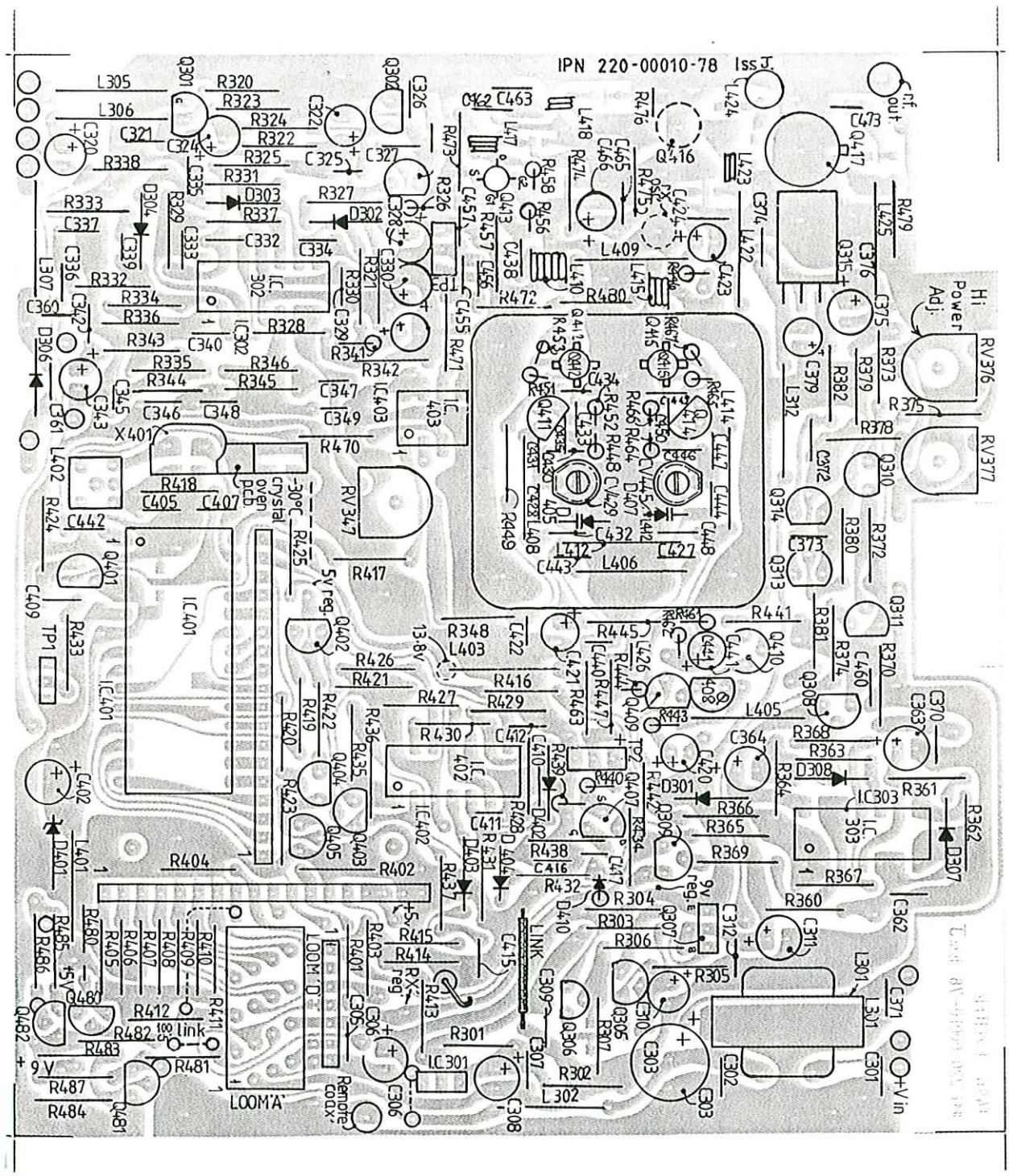


Diagram 1 T496 Exciter PCB Encoding

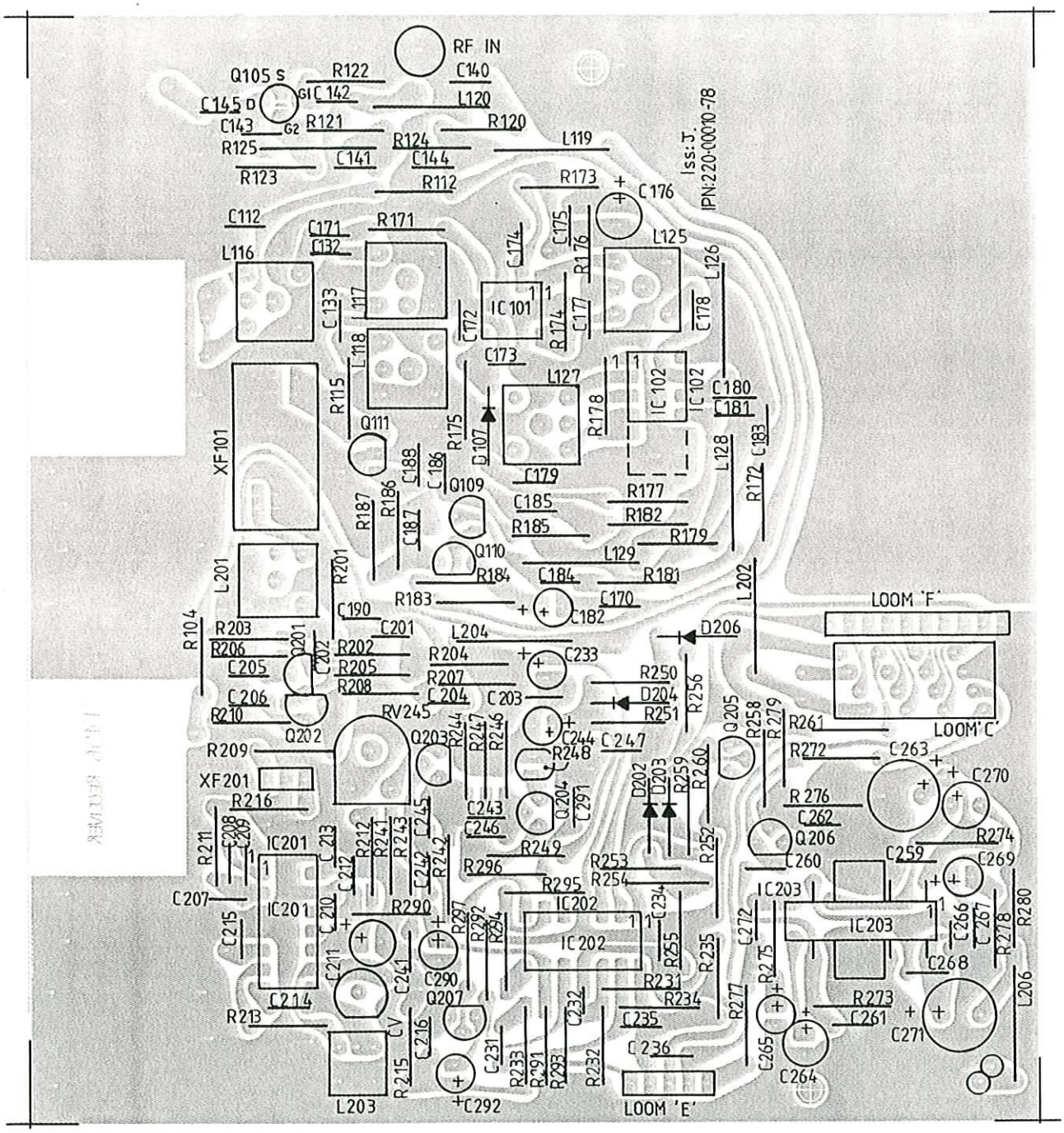


Diagram 2 T496 Receiver PCB Encoding

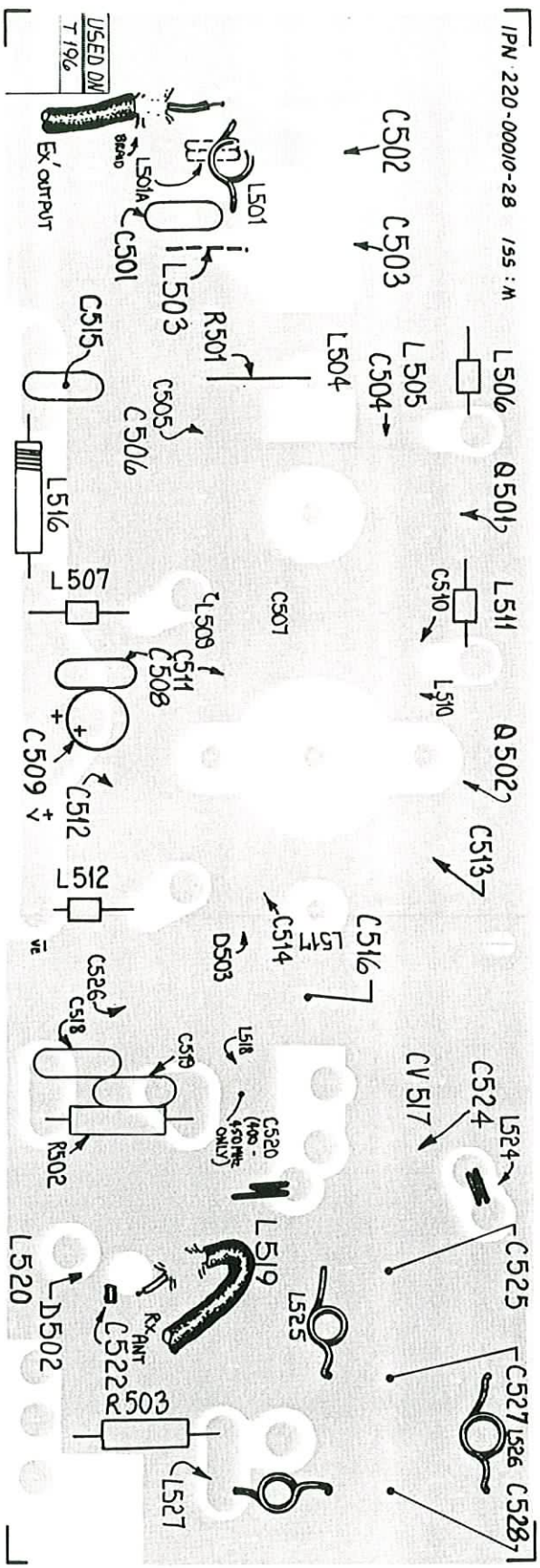


Diagram 3 T496 Power Amplifier PCB Encoding

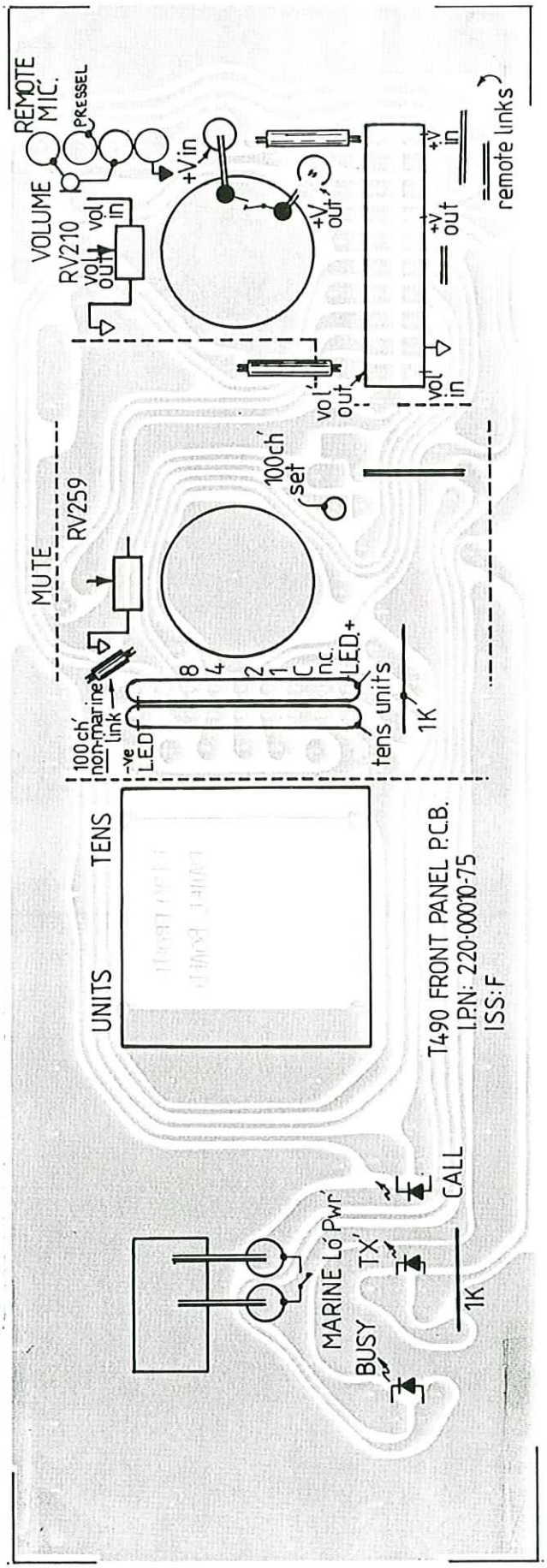
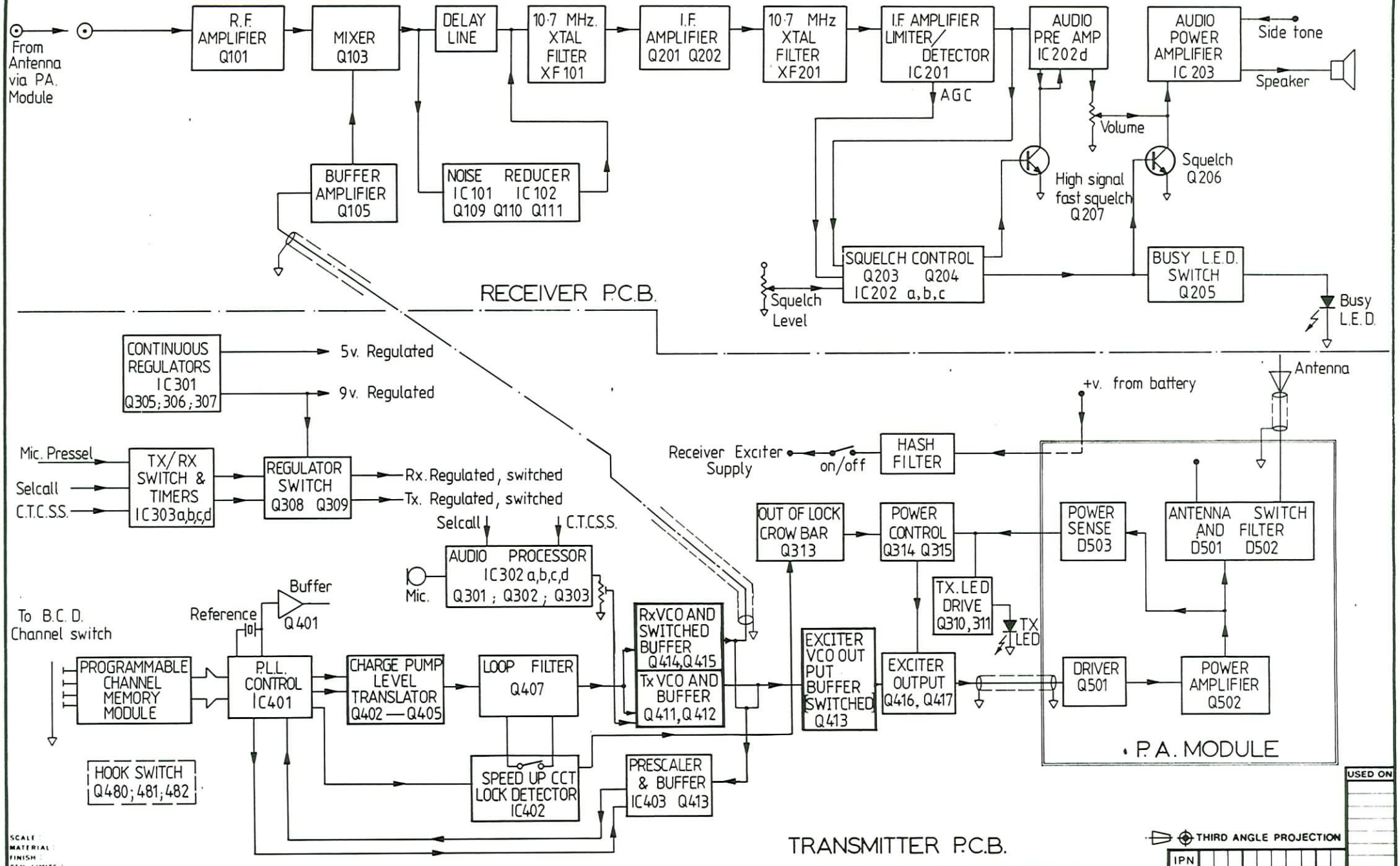


Diagram 4 T496 Front Panel PCB Encoding



SCALE :
MATERIAL :
FINISH :
GEN. LIMITS :

ISSUE	AMENDMENTS	DRN.	CHKD	APVD	DATE
A		WW			11/7/91
B	Ch/N 84/10 - 478	A.G.			5.8.92

ISSUE	AMENDMENTS	DRN.	CHKD	APVD	DATE

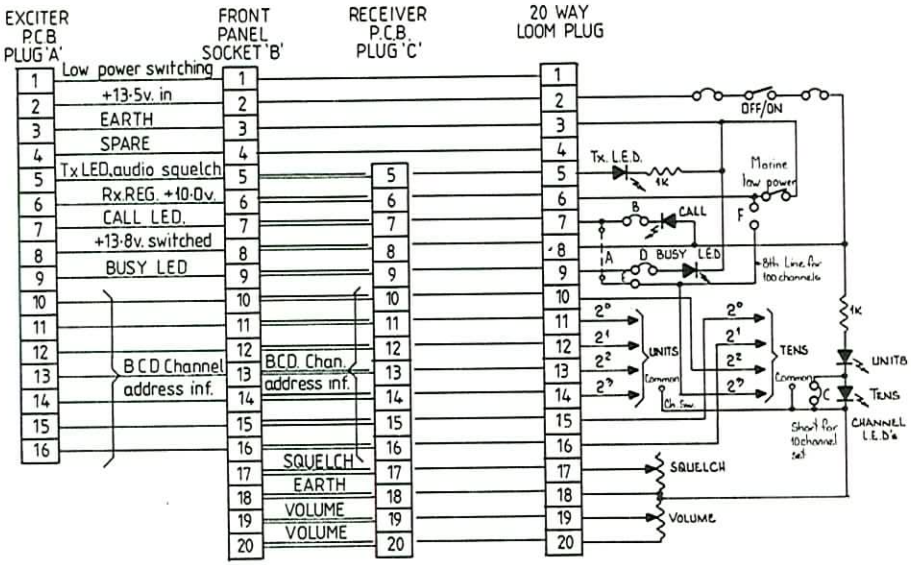
BLOCK DIAGRAM T496

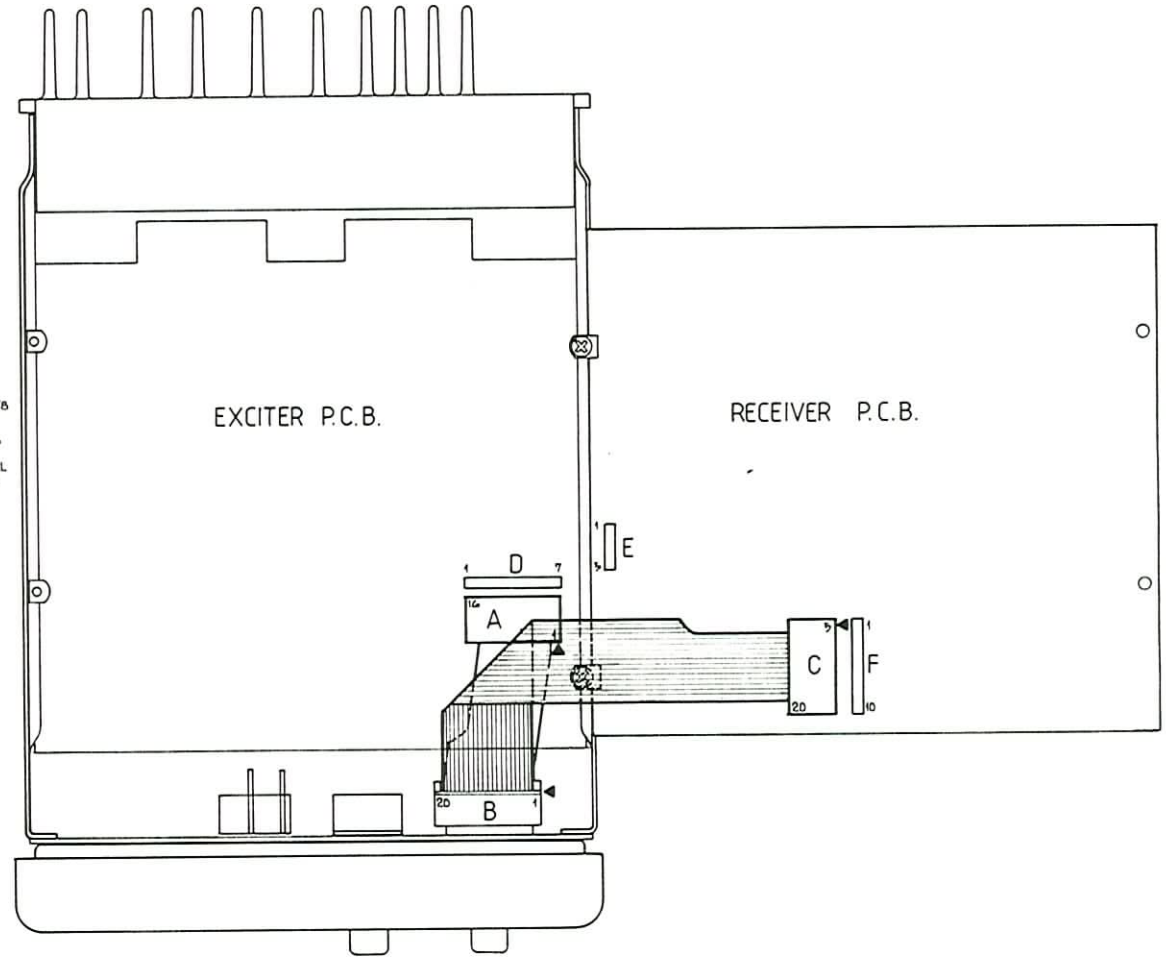
TAIT ELECTRONICS Ltd.
Christchurch New Zealand

DRAWING NUMBER A2C514

ISSUE A B

DO NOT SCALE OFF DRAWING





D

1	Tx. Lock out
2	Tens 2^2 BCD. address
3	Tx Reg.
4	Rx.Reg.
5	Tx.Reg.
6	Spare
7	Earth

E

1	Detector output
2	C.T.C.S.S. filter in
3	Earth
4	C.T.C.S.S. filter out
5	Audio input

F

1	Squelch control	
2	Call L.E.D.	
3	2^0	UNITS
4	2^1	UNITS
5	2^2	BCD Channel address information
6	2^3	BCD Channel address information
7	2^0	TENS
8	2^1	TENS
9	Squelch in	
10	Earth	

USED ON

THIRD ANGLE PROJECTION

IPN

SCALE :
MATERIAL :
FINISH :
GEN. LIMITS :

ISSUE	AMENDMENTS	DRN.	CHKD	APVD	DATE
A	ORIGINAL	W.W.			
B	CH/M 86/03 061	D.R.			

ISSUE	AMENDMENTS	DRN.	CHKD	APVD	DATE

TERMINAL ASSIGNMENT DIAGRAM
T496; T498; T499

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Christchurch New Zealand

DRAWING NUMBER A2M 1578

ISSUE A B