1675 VHF MOBILE RADIOTELEPHONE EQUIPMENT

1.0 GENERAL DESCRIPTION

The 1675 Mobile Radiotelephone equipment is a series of frequency modulated self contained transmitter-receiver units designed for operation as vehicular mounted equipment in the V.H.F. bands allocated for the Land Mobile service in Australia, i.e., 70-85 Mc/s or 156-174 Mc/s. Equipment is also available for extensions to existing systems in the range of 44-49 Mc/s.

The equipment is normally supplied pre-set to one frequency in one of the above bands. By the addition of a crystal switching kit, both the transmitter and receiver may be operated on two, three or four adjacent pre-set frequencies in one of the above bands.

Equipments are available for the alternate bands, these being designated as follows:-

Type of Equipment		Operates in
1675A	-	70-85 Mc/s Band
1675C	-	156-174 Mc/s Band
1675D	-	44-49 Mc/s range.

Thus, 1675A equipment is supplied for operation on a pre-set frequency (or adjacent frequencies) in the 70-85 Mc/s band.

The equipment is designed for simplex operation, the receiver being automatically made inoperative when the transmitter is operative and vice-versa.

A radical departure from equipments previously designed for mobile service has been made by the 1675 equipment in that the extensive transistorisation employed gives multiple benefits.

The receiver, power supply, and the audio and oscillator-phase-modulator stages of the transmitter are fully transistorised.

Only three electron tubes (valves) remain in the complete unit. These are the frequency multipliers, driver and R.F. Power Amplifier, all being in the transmitter.

The fully transistorised receiver is a double super-heterodyne type in which both heterodyn oscillators are separately crystal controlled.

The receiver employs an FM demodulator and automatic noise muting in the absence of signal.

Additionally, it incorporates a special filter circuit to limit the bandwidth of reception to 60 Kc/s channelling. An alternative filter is available for 30 Kc/s channelling.

Three watts of audio output power are applied to a high efficiency 4 inch loudspeaker normally mounted behind the grille of the front panel of the unit.

The transmitter is a crystal controlled phase modulated type using transformer coupled electron tubed frequency multipliers and push pull power output stage delivering R.F. power to the antenna.

All other stages of the transmitter are transistorised, these being the audio pre-amplifier, differentiator, deviation limiter, integrator amplifier, crystal oscillator, and phase modulator.

The deviation limiter prevents the transmitter from occupying an excessive bandwidth when high speech levels are encountered.

The power supply used is a high efficiency transistorised DC/DC converter which is automatically protected against secondary circuit overloads.

Alternative supplies are available for operation from 6 volt, 12 volt, or 24 volt accumulators.

Connection may be made to either positive earthed or negative earthed systems, merely by observing correct polarity of the battery input leads to the equipment.

Metering points are provided in the transmitter and receiver for alignment and tuning.

Indicator lamps are not provided as these would individually draw more current than the receiver in the absence of signal input.

Four controls are provided on the front panel as follows:-

Function Selector Switch:

This is a three position switch marked O-R-T implying OFF, Receive only or Standby for Transmission. In the Receive only (R) position, the receiver operating voltage is applied. In the Transmit (T) position the heaters of the three tubes are connected to the supply and after 20 seconds the tubes are heated, or in the Standby position, for transmission which occurs only when the microphone Press to Talk switch is depressed.

Channel Selector Switch:

On early equipments, the control knob for channel selection is supplied for all executions including single channel units. If a channel switching kit is added, this knob comes into effect to control the selection of the two, three, or four channels allocated. On later versions, the knob is supplied with the switch kit, and therefore only appears on multichannel units. A plug is normally fitted in place of this knob on single channel units.

Muting Control:

A third knob controls the range at which muting becomes effective. The muting system may be disabled by means of this control.

Volume Control:

This is a full range variable potentiometer which enables control of the audio output from the level of three watts down to zero and thus enables setting of any desired listening level in this range.

The units are therefore simple to operate and quality of voice transmission is such as to obtain highly reliable communication.

MECHANICAL CONSTRUCTION - MOBILE UNITS

The 1675 series of mobile units have been designed to satisfy the various requirements of operators of vehicular fleet communications systems, with particular attention to the elements of physical size, single unit construction, simplicity of installation and removal for maintenance checking and simplicity of connection and operation.

The transmitter-receiver unit with power supply is wholly contained within a small aluminium case of such dimensions as to permit easy installation under the instrument panel or dash of vehicles.

The unit consists of:

1. The chassis, upon which are mounted the conventional electron tubed stages of the transmitter, the separate transistorised DC/DC converter in its case, the printed wiring cards of the receiver sub-units, and the cast aluminium front panel. The front panel also supports the loud-speaker, the receiver audio power amplifier stage, the controls and the trim grille.

2. The cast aluminium case for housing the unit, and the mounting tray.

The cast aluminium unit case has two flanges each of which runs almost the whole length of the case along the upper edge of each side. The flanges are in effect support rails which slide into the unit mounting tray. The side edges of the mounting tray are folded down twice during manufacture to form a U section into which the case flanges slide.

The unit case is secured in position by means of two thumb screws at the front sides of the mounting tray and these thread into bosses, which have been formed in the case during manufacture.

The front panel and chassis is then held into the case by two set screws at the sides of the front panel. Thus either the complete unit (in case) on the chassis and front panel may be removed from the vehicle by removing two set screws.

Connectors for battery input supply, antenna, and microphone connection are accessible on the right hand side of the case viewing from the front.

These are the only connections to be made. Battery, aerial and microphone must be plugged in.

The whole unit is attached to the vehicle by four cheese head screws, nuts and fandisc washers through the mounting plate, which is preferably positioned horizontally.

Later executions of mounting tray have provision for attachment of shock mountings and U channels to take these. These items are available to separate order.

Hand Microphone:

The dynamic microphone supplied with this equipment is encased in a cast aluminium circular holder which fits comfortably in the hand when in use.

The "press to talk" button is positioned for easy manipulation and has sufficient spring tension to prevent accidental switching.

The whole microphone assembly has proven rugged and reliable in service.

A small plated hang-up bracket is supplied for fitting in a convenient position near the operator to hold the microphone when not in use.

Whip Antenna:

The mobile unit is normally supplied with a quarter wavelength whip antenna which has been designed for ease of fitting to a vehicle and to withstand the considerable shock encountered in striking overhanging objects. The whip is made of spring steel with a spiral spring base which allows maximum flexing and return to the normal vertical position. The whole is heavily cadmium plated for protection against weathering. This steel whip is screwed to a heavy brass boss which is insulated from the vehicle frame by a moulded bakelite lead through insulator. The whip assembly is held to the roof interior by a heavy steel clamp strap which also serves as the earth termination for the coaxial cable and the matching stub clamped to it.

The whip antenna is designed so that it may be mounted to the vehicle without direct access below the mounting point.

For 160 Mc/s operation, alternative stainless steel solid mounted whip antennae are available.

1675 VHF MOBILE RADIOTELEPHONE EQUIPMENT.

1.0 SPECIFICATIONS

1.1 General

Frequency Ranges:

Band A 70-85 Mc/s for Model 1675A
Band C 156-174 Mc/s for Model 1675C
Band D 44-49 Mc/s for Model 1675D for extensions to existing systems.

Number of Channels:

Available from the factory equipped for 1, 2, 3, or 4 channel operation.

Crystal switching is employed in channel selection.

All channels should be contained within a frequency spectrum as follows for the quoted degradation of performance.

40 Mc/s	Negligible	1 dB
Receiver	500 Kc/s	-
Transmitter	190 Kc/s	310 Kc/s
80 Mc/s		
Receiver	1 Mc/s	-
Transmitter	380 Kc/s	620 Kc/s
160 Mc/s		
Receiver	2 Mc/s	-
Transmitter	760 Kc/s	1.24 Mc/s

Channel Spacing:

1675 - 60 Kc/s
1675N - 30 Kc/s

Frequency Stability of Carrier:

Better than .002%

Operation:

Simplex operation.

Output and Input Impedance for Aerial connection:

50 to 70 ohms unbalanced, nominal.

Aerial: Normal - Standard whip aerial (70 ohms)
Coaxial dipole (70 ohms)

Special types (data on application)

Power Pack: Interchangeable transistorised DC to DC converter with inbuilt silicon rectifiers and smoothing circuits. Switching frequency is approximately 7.5 Kc/s nominal.

1.1 General contd.

Power Supply Voltage: Available for nominal voltages of 6, 12 and 24 volts. Guaranteed performance of Audio and RF outputs is based on these nominal voltages at the UNIT input terminals.

Power Supply Complement: Transistors 4 x ASZ17: 2 x OC80
Power Rectifiers 4 x OA210.

NOTE: In 24 Volt models, two ASZ15 replace the four ASZ17.

Current Consumption: (Average)

MOBILE UNIT	6V.	12V	24V
RECEIVER -			
Quiescent *	250 mA	70-80 mA	120 mA
-Full Audio Power output * *	800 mA	300 mA	200 mA
TRANSMITTER -			
Standby	2.45 A	1.17 A	.72 A
Transmit	15.2 A	7.57 A	4.0 A

* Receiver in standby condition ready to receive signal

* * Average current consumption on speech information.

Dimensions: Diecast aluminium case (excluding projections)
$10\frac{1}{2}$" wide x $8\frac{7}{8}$" deep x $4\frac{7}{8}$" high.

Weight: 18 lbs.

1.2 Receiver:

- Circuit: Fully transistorised double conversion superheterodyne employing two crystals as heterodyne oscillators.

- Crystal Tolerance: .002%

- Crystal Frequency: The crystal frequency is determined by the following formula -

Band A $fx = \frac{fs + 16.755}{2}$

Band C $fx = \frac{fs - 16.755}{3}$

where fs is the signal frequency in megacycles, and fx is the crystal frequency in megacycles.

Input Impedance: 50 to 70 ohms unbalanced.

Type of signal: Phase (FM)

Overall distortion: Not greater than 5%.

Sensitivity for 20 dB quieting:

Band A 70 - 85 Mc/s 0.6 uV/0.7 uV

Band C 156-174 Mc/s 0.8 uV/0.9 uV

For extensions only in Band D
44 - 49 Mc/s 0.6 uV/0.7 uV.

1.2 Receiver cont.

Signal to Noise Ratio at 1 uV Signal Input:	Band A 70 - 85 Mc/s 38 dB Band C 156-174 Mc/s 36 dB
Muting Level:	Threshold adjustable from 1.5 uV approximately to better than 0.5 uV.
Selectivity:	Type 1675 Response at ± 22.5 Kc/s - 3 dB Response at ± 60 Kc/s - 100 dB. Type 1675N (narrow channel filter) Response at ± 14 Kc/s - 3 dB Response at ± 30 Kc/s - 100 dB.

The I.F. cut off slope between -6 and -60 dB is 2.7 dB/Kc for type 1675 and 7.7 dB/Kc for type 1675N.

The I.F. form factor over the same range is 1.74 for the 1675 and 1.39 for the 1675N.

Audio Output Power:	3 watts standard.
Audio Volume Control:	Fully variable.
Transistor Complement:	1675A 3 x AF 114: 3 x AF 115: 5 x AF 116 7 x OC 75 : 2 x ASZ 16: 7 x OA 202 2 x OA 85 : 1 x OC 202: 1 x AFZ12 1 x OC 80 : 1 x OAZ 201: 1 x OAZ 202.

NOTE: In 1675C 160 Mc/s receivers one AF 114 is replaced by one AFZ 12.

1.3 Transmitter:

Crystal Multiplication:	36 times (3 x 3 x 2 x 2) Bands A, C and D.
Crystal Tolerance:	.002%
Modulation:	Phase modulation at crystal frequency.
Deviation:	Type 1675 ± 15 Kc/s determined by instantaneous "slope" limiter. Type 1675N capable of meeting any standard of ± 5, 7.5 or 10 Kc/s, controlled by continuously variable instantaneous slope limiter.
Audio Response:	± 2 dB from pure phase 300-3000 c/s.
Audio Distortion:	Less than 5% for A Band, for C Band and Less than 7.5% pure for 66% of maximum deviation standard at 1,000 c/s.
Noise Level:	Better than 45 dB below full modulation.

1.3 Transmitter cont.

Spurious Radiation:	Below - 80 dB relative to carrier.
Harmonic Radiation:	Below - 60 dB relative to carrier.
Output Impedance:	50 to 70 ohms unbalanced.
Power Output:	Mobile units. Not less than 25 watts or 10 watts for respective models, from nominal 6, 12 or 24 volt DC supply source.

Transistor and Valve Complement:

Type	No. Used.
OC75 Germanium PNP Transistor	3
AF115 Germanium PNP Transistor	2
OA202 Silicon diode	2
OA90 Germanium diode	1
12AT7 Valve twin triode	1
QQE02/5 Valve twin tetrode	1
QQE03/20 Valve twin tetrode	1

See technical description of transmitter for detailed functions.

FM1675 INSTALLATION PROCEDURES

Installation of Whip Aerials Type 1649/06, 1674/06, and 1675/06 in Holden Vehicles

1. Installation in Model FB Holdens

1.1 Remove the metal strip from above the left hand or near side front door and draw the trim away from the metal roof for a short distance.

1.2 Remove the left hand or near side sun visor. It will be noticed that the top of the box channel finishes at this point.

1.3 Drill a 1" diameter hole in the desired position in the roof of the vehicle, after checking the position of dome lights, channel sections or roof braces etc.

1.4 Feed the aerial coaxial cable through the 1" hole towards the nearside of the vehicle. The end of the cable should be located through the opening in the trim made above the near side door.

1.5 Feed the aerial coaxial cable along the top of the channel above the door towards the front of the vehicle until it is drawn past the finish of the top of this near side channel, i.e., at the sun visor mounting point.

Note: It is necessary to continue feeding this cable towards the offside or right hand side of the behicle until the antenna is in the correct mounting position, then the cable is returned to leave a loop of approximately 2" beyond the sun visor pivot pin to ensure that this pivot pin does not foul the coaxial cable.

1.6 Feed the balance of the cable back through the channel and feel for the end of the cable under the near side of the dash.

2. Installation in Models FC and FE Holdens

2.1 Remove the trim from above the near side or left hand front door as for model FB.

2.2 Drill 1" hole in desired position in roof as in 1.2.

2.3 Feed the aerial coaxial cable through this hole towards the near side of the vehicle.

2.4 An entrance into the box section channel will be found just forward of the first trim rib on the top of this channel.

2.5 Feed the aerial coaxial cable through this entrance and feel for the end of the cable under the near side of the dash.

GENERAL

Cable termination and plug fitting instructions are contained on the respective sheets attached.

1675 MOBILE RADIOTELEPHONE EQUIPMENT

TECHNICAL DESCRIPTION

Receiver Type 1675

The fully transistorised VHF receiver type 1675 is a double superheterodyne type in which the two heterodyne frequencies are derived from separate crystal locked oscillators.

The first IF amplifier operates at a frequency of 16.755 Mc/s which is converted in the second mixer by the second heterodyne oscillator (frequency 17.21 Mc/s) to the second intermediate frequency of 455 Kc/s.

Two stages of limiting are followed by a discriminator, feeding the audio stages.

A.M. Noise at the second Intermediate Frequency is detected by MR109 and the resulting audio noise is amplified and rectified in the muting stages thereby developing a control current which mutes the audio stages of the receiver.

The receiver operates from 12 volts D.C. supply in all applications.

NOTE: The whole of the receiver circuit including the positive and negative bus lines for 12 Volt D.C. supply and common cold connections for R.F. etc. is ISOLATED from the main chassis for D.C.

The receiver comprises a total of six interconnected printed wiring card assemblies, an I.F. filter assembly mounted in a sealed can, two 1st I.F. transformers, chassis mounted, and an audio power output amplifier assembly on a small sub chassis.

The advanced techniques employed in the design of this receiver demand an entirely different approach on the part of the serviceman. This is covered in the chapter on Servicing and Adjustments, and in the chapter on Transistor Technique.

The complement of the receiver is listed hereunder and this together with the detailed following circuit description should be read in conjunction with the respective overall circuit diagram SPD 1183, SPD 1185, etc.

Transistors and Diodes Complement

Type of Transistor or Diode		Designation	Function
RF Card Assembly			
AFZ 12	Germanium PNP Transistor	V102	R.F. amplifier
AF 114	" " "	V101	Crystal oscillator (1st heterodyne)
AF 114	" " "	V103	Harmonic amplifier
AF 114 or	" " "	V104 A Band	1st Mixer
AFZ 12	" " "	V104 C Band	1st Mixer
1st IF Card Assembly			
AF 115	Germanium PNP Transistor	V105	1st IF amplifier
AF 115	" " "	V106	2nd Mixer
AF 115	" " "	V107	Crystal oscillator (2nd heterodyne)
2nd IF Card Assembly			
AF 116	Germanium PNP Transistor	V108	Emitter follower IF impedance coupler.
AF 116	" " "	V109	2nd IF amplifier.
OA 85	Germanium Diode	MR101	Metering Diode.
AF 116	Germanium PNP Transistor	V110	2nd IF amplifier.
OA 202	Silicon Diode	MR102))	Serial Nos. 1000 - 1960.
OA 202	" "	MR103)	1st Limiter diodes
OA 85	Germanium Diode	MR102)	1st Limiter diodes
OA 85	" "	MR103)	Serial 1961 on.
AF 116	Germanium PNP Transistor	V111	1st Limiter stage amplifier.
OA 202	Silicon Diode	MR104)	2nd Limiter diodes
OA 202	" "	MR105)	
AF 116	Germanium PNP Transistor	V112	2nd Limiter stage amplifier.
OA 202	Silicon Diode	MR106)	Discriminator Diodes
OA 202	" "	MR107)	Serial 1000-1960
OA 79	Germanium Diode	MR106)	Discriminator Diodes
OA 79	" "	MR107)	Serial 1961 on.
Audio Stages Card Assembly			
OC 75	Germanium PNP Transistor	V113	Audio pre-amplifier.
OC 75	" " "	V115	Audio amplifier.
OC 75	" " "	V117	Audio driver amplifier.
Audio Power Amplifier Sub Chassis			
ASZ 16		V119)	Push pull audio output power amplifiers
ASZ 16		V120)	
Squelch or Muting Card Assembly			
OC 75	Germanium PNP Transistor	V114	Noise amplifier-muting.
OC 75	" " "	V116	Noise amplifier-muting.
OC 75	" " "	V118	Muting Noise-emitter following impedance coupling.
OA 202	Silicon Diode	MR108	Noise rectifier.
OC 202	Silicon Transistor	V121	Muting control switch.

Transistors and Diodes Complement. (Cont'ed.)

Type of Transistor or Diode	Designation	Function
Voltage Regulator (in Muting Detector card)		
OC80 Germanium PNP Transistor	V123	Current control
OAZ201 Silicon Zener diode	MR110	Regulator diode
OAZ202 Silicon Zener diode	MR111	Regulator diode
SQUELCH or MUTING DETECTOR Card Assembly.		
OA85 Germanium Diode	MR109	I.F. AM Noise Detector
OC75 Germanium PNP Transistor	V122	Noise amplifier

CIRCUIT DESCRIPTION

R.F. Section

The R.F. Unit assembly comprises the R.F. amplifier V102, the 1st Mixer V104, the channel determining 1st Crystal oscillator V101 and the harmonic amplifier V103.

This assembly is essentially a printed wiring card to which is attached a metal sub chassis which is used for mechanical mounting and positioning of coil assemblies, screening and shielding of stages, and as common earthing and bonding of R.F. returns.

The entire receiver circuit is isolated from the chassis and from the antenna for D.C. The antenna is coupled to a low impedance point of a coaxial tuned circuit formed by the coaxial stub and feed line from relay A1 to the RF unit, and capacitor C186 which resonates it.

The outer conductor of the aerial cable is bonded to the R.F. cold bus of the R.F. unit via C101 which is used only to isolate the DC component. The above tuned coaxial circuit is top coupled to the second tuned circuit L101, C102, C172 by capacitor C186.

The R.F. amplifier V102 is used with its base grounded for R.F. The aerial input tuned circuit is coupled to the emitter of V102 via C104 from a low impedance point on this input circuit as the emitter impedance is low.

The collector load of V102 is the first of three tuned circuits employed between the R.F. amplifier V102 and the first mixer V104.

C110 and the ferroxcube bead or sleeve FX provide RF decoupling for the collector load of V102.

The three tuned circuits L103/C109/C110, L104/C112, and L105/C114/C173 are coupled via C111 and C113. C111 and C113 may not be immediately apparent on physical inspection of the RF unit as these comprise a single turn of wire on L103 and L104.

V104 operates as a grounded base mixer. The emitter has a low impedance and is tapped down L105 to provide an optimum impedance match.

V101 is employed as a crystal oscillator in a relatively standard circuit the crystal being employed as the controlling element in the base-emitter circuit. The resonant collector circuit C105, L102 also provides a limited means of varying the crystal frequency to allow accurate netting. Netting receiver to transmitter of base or other mobiles is accomplished solely by this means.

The crystal oscillator collector output developed across L102, C105 is coupled via C108 to the emitter of V103 which is operating as a grounded base harmonic amplifier.

Harmonic output from V103 is tuned by L106, C115 in the collector circuit and inductively coupled to the 1st Mixer input L105 as these coils are wound on a common former. Additional capacitive top coupling is added by C184.

Output from the R.F. unit at the first I.F. (16.755 Mc/s) is developed in the primary of T101 the first I.F. transformer. This is mounted on the main chassis in standard manner.

The secondary of this double tuned 1st I.F. transformer is tapped at a low impedance point and the I.F. output is coupled to V105 on the 1st I.F. card assembly via C119.

First I.F. Card Assembly.

This card contains the first I.F. amplifier V 105, the second mixer V 106, and the second crystal locked heterodyne oscillator V 107.

The first I.F. transformer T 101 and T 102 are mounted on the main chassis in standard manner and three connections necessary are brought out from the card to the transformers.

C 119 couples the I.F. output from T 101 to the emitter of V 105 which is the first I.F. amplifier. R 110, R 111 together with R 109 set the base/emitter bias. The base is grounded for the Intermediate Frequency of 16.755 mc/s by C 122.

Output of V 105 is developed across the primary of T 102, the second double tuned first I.F. transformer.

The secondary of T 102 is tapped at a low impedance point to feed the emitter of V 106, the second mixer via C 125.

The second heterodyne oscillator is V 107, this being a Colpitts type crystal controlled at 17.21 mc/s by crystal X 102. This second crystal is factory fitted and soldered into the first I.F. card.

Trimmer C 130 effects minor adjustment to set the second mixer frequency accurately to 17.21 mc/s. Output from this oscillator is taken from the emitter and coupled via C 124 to the base of the second mixer V 106. Base bias of V 106 is determined by the divider R 119, R 117.

The collector output leaves the 1st I.F. card at this stage and is applied to the special I.F. filter unit FL 101 which selects the resulting 455 Kc/s second I.F. and rejects other products appearing at this collector.

I.F. FILTER UNIT FL 101.

Alternative filter units are employed for channel spacing of 60 Kc/s and for 30 Kc/s.

For 60 Kc/s spacing, Filter CZ 320.484.1 is used.

For 30 Kc/s spacing, Filter CZ 320.510 is used.

The filter unit provides the entire selectivity at the second Intermediate Frequency of 455 Kc/s. as it is followed by untuned Rc coupled amplifiers and Limiters.

Input and output of the filter are terminated by R 120 and R 123 (via C 132) respectively to minimise variables and to allow replacement of the filter without elaborate alignment procedure.

Each filter is factory aligned to full specification prior to release.

It is most important that this filter is not adjusted in any way other than in the factory setup. A turnover repair service is available through TCA Serive Departments at a reasonable flat rate.

Second I.F. Card Assembly.

The filter unit is followed by the second I.F. card assembly which contains the 2nd I.F. amplifier, first and second limiting diodes and amplifiers and the discriminator.

The second I.F. output (455 Kc/s) from the Filter unit is coupled to the base of V 108 on the second I.F. card via C 132. As mentioned earlier R 123 terminates the filter unit, however, the divider R 122, R 123 sets the base bias of V 108 in conjunction with R 125.

V 108 operates as an emitter follower having a very high input impedance with respect to the output of the filter or R 123, and is primarily used as an impedance coupler and isolates variables from the filter termination.

The low impedance output of V 108 (still second I.F. at 455 Kc/s) is coupled to the base of V 109 via C 134. V 109 is employed as I.F. amplifier and the amplified output developed across its collector load R 128 is coupled to V 110 base via C 136.

A portion of the output of V 109 is applied to MR 101 via 107 and this provides a D.C. feed via R 131 to metering point M 101 when signal inputs are present.

V 110 is the second I.F. amplifier at 455 Kc/s and its output feeds the first Limiter diodes MR 102 and MR 103 via C 140, R 137. These diodes constitude the variable bottom leg of a potential divider for applied I.F. R 137 being the top leg.

Limited output from these rectifiers MR 102 and MR 103 is amplified by the first limiter amplifier V 111, coupled to the second limiter diodes MR 104 and MR 105 and amplified by V 112.

Output from V 112 is coupled from its collector to T.103 the phase discriminator transformer, and diodes MR106 and MR107

The resultant audio output is fed from this card to the audio and muting cards.

Audio Card Assembly.

This card contains the audio pre-amplifier V 113, amplifier V 115, and amplifier driver V 117.

C 153 couples the audio output from the discriminator to the base of the first audio amplifier V 113. Output from the collector load of V 113 is coupled via C 170 to the Volume potentiometer R 161 external to the audio card on the unit front panel.

The variable audio output from this control is returned to the audio card via C158 and applied to the base of V 115. V 115 is the first of the three audio stages contained within the feedback loop C 175 , R 174 and is also the audio stage controlled by V 121 for muting the audio output. Note that R 171 in the emitter circuit of V 115 is not bonded to the cold audio bus but connected to the collector of V 121.

R 171 plus the collector/emitter path of V 121 then constitute the determining current control path for muting V 115 and also form the bottom leg of the audio feedback potential divider. R 170, C 159 provide emitter/ base bias for V 115.

Audio Card Assembly cont'ed.

Supply potentials to the first two audio stages are decoupled by R 177, C 152 to provide isolation from other circuits.

Audio output from V 115 is coupled to the base of V 117 via C 164. The operating bias of V 117 is set by the base potential divider R 178, R 179 and the emitter resistor R 181 by-passed by C 165.

The collector of V 117 leaves the audio stage card at this point and is connected to the primary of the driver transformer T 4 on the audio output stage sub chassis.

Audio Output Stage Sub-Chassis.

This stage comprises the driver transformer T 4, the push-pull audio output transistors V 119, V 120 (2 x ASZ 16).

Output transformer T 5 is mounted below on the main unit chassis and feeds audio power at voice coil impedance 3.5 ohms to the loudspeaker (Type 4 F Rola) on the front panel.

The driver transformer T 4 couples V 117 collector to push-pull bases of V 119, V 120. The feedback loop via C 175 is taken from one collector, that of V 120.

VOLTAGE REGULATOR AND SQUELCH DETECTOR CARD

Voltage Regulator.

This comprises transistor V123, R193 and Silicon Zener diodes MR 110 and MR 111.

The audio power amplifier D.C. supply is unregulated.

The D.C. supply to all other assemblies or cards is provided via V123 controlled transistor and is thereby regulated. Zener diodes MR 110 and MR 111 provide stable voltage control of the base potential of V123. If the 12 Volt supply increases, the collector-emitter resistance of V123 is increased to leave the output voltage relatively constant. Similarly, decreasing supply voltage decreases V123 resistance or increases conduction to leave the output voltage relatively constant.

SQUELCH DETECTOR.

In the absence of an input signal to the receiver, AM noise at I.F. is developed across R 146, the emitter resistor of V112, the second limiter.

This is coupled via C177 to the noise detector MR109, a D.C. resultant developed across the diode load R187, and demodulated by C178. The audio noise thus detected is then coupled to the base of V122 via C179.

output of noise from the collector load of V122 is shaped by C181, C182 and coupled to the muting control R163.

Muting Card Assembly.

The total noise is developed across R163. The variable arm of R163 controls the amount of noise coupled to the muting amplifiers V114 via C154. The components of this stage are chosen to produce a low gain at lower audio frequencies with rising gain at higher audio frequencies and with maximum gain at noise frequencies at the top end of the audio speech range. C154 and C157 are low values of capacity allowing maximum transfer of upper noise frequencies. C156 is a low value of emitter bypass allowing degeneration at lower audio frequencies.

The resultant output from V114 is a response sloping upward as frequency rises giving considerable amplification to noise frequencies above the speech range.

Similarly, V116 has an audio choke L108 as its collector load and a small value of output coupling capacitor C162. This provides a further rising characteristic at higher audio frequencies and the sum of the characteristics of both stages produces an overall rising response of many dB per octave producing a high degree of sensitivity to high noise frequencies while retaining a low order of sensitivity to audio frequencies in the speech range.

V118 is employed as an emitter follower to provide a relatively low impedance output of high frequency noise which is then rectified by MR108.

The noise applied to MR108 rectifier provides the control current for the base of V121 which in turn controls V115 and effectively mutes the audio stage in the presence of noise i.e. no signal condition of receiver.

When an R.F. signal is received, the reduction of noise output from V112 limiter removes the MR108 rectified control current causing the collector/emitter path of V121 to close or function, bringing V115 into action and allowing normal operation of the audio stages to amplify audio frequency signals received.

FM1675 VHF MOBILE RADIOTELEPHONE EQUIPMENT.

TECHNICAL DESCRIPTION.

Transmitter Type FM1675 25 Watt

Employing transistorised modulator exciter, electron tubed multipliers, final power amp.

Valve or Transistor Type	Designation	Function	Frequency Input	Frequency Output
OC75 Germanium PNP Transistor	V201	Audio preamplifier	audio	
OC75 Germanium PNP Transistor	V202	Audio differentiator	audio	
OA202 Silicon diode	MR201	Audio limiter	audio	
OA202 Silicon diode	MR202	Audio limiter	audio	
OC75 Germanium PNP Transistor	V203	Audio Integrator	audio	
AF115 Germanium PNP Transistor	V204	Crystal oscillator	Xtal =f	frequency f
OA90 Germanium diode	MR203	Reactance modulator		
AF115 Germanium PNP Transistor	V205	Phase modulator	f	f
½ 12AT7 Valve	V206A	Triode, Tripler	f	3f
½ 12AT7 Valve	V206B	Triode, Tripler	3f	9f
½ QQE02/5) Valve	V207	Tetrode, Doubler	9f	18f
½ QQE02/5) Valve	V207	Tetrode, Doubler	18f	36f
QQE03/20 Valve	V208	Twin Tetrode Push Pull Power Amplifier	36f	36f

Transmitter Type FM1675 10 watt (A and C Band)

as above, but V208 becomes

QQE03/12 Valve	V208	Twin tetrode Push pull power amplifier.	36f	36f

Audio Stages of Transmitter.

The entire audio complement of the transmitter is transistorised and the circuits are contained within one printed wiring card. Reference to the circuit diagram SPD 1183 or SPA 10140 will show that this card contains the audio preamplifier, differentiator, limiter, and integrator amplifier sections.

The audio section input is obtained from a moving iron or variable reluctance type microphone which gives about 10 millivolts output at 400 ohms impedance.

This input is coupled via C201 to the base of V 201 (OC 75 preamplifier), which amplifies the microphone signal to an acceptable level. This is followed by a differentiating amplifier V 202 (OC75) where C 204 is the differentiating capacitor. C 204 has a relatively high impedance to lower audio frequencies in the speech range and differentiation results in a signal having an emphasis at the higher audio frequencies of 6 db per octave.

The differentiated signal from V 202 is applied to a twin diode limiter employing two silicon diodes MR 201 and MR 202 (OA202) connected in opposing polarity. This limiter clips the signal if its level is beyond what has been predetermined as excessive by the characteristics of the diodes.

At low levels of input the limiter does not operate and the output from the limiter therefore still has a rising characteristic of 6 db per octave. At high levels of input limiting occurs and the differentiated signal from V 202 has its rising characteristic clipped back to a flat response with frequency.

The output of the limiter is then integrated by the integrator-amplifier circuit of V 203 (OC75). The integrating capacitor is C208 connected between the collector and base of T 203.

Integration provides a de-emphasis of 6 db per octave at the higher audio frequencies.

The output at the collector of V 203 for low input levels is therefore the 6db per octave pre-emphasis of the differentiator, unlimited, then 6 db per octave de-emphasised by the integrator resulting in a flat overall response.

The output at the collector of V 203 for high input levels is therefore the 6 db per octave pre-emphasis of the differentiator, limited and thereby removing the pre-emphasis, then 6 db per octave de-emphasised by the integrator resulting in a response having the higher audio frequencies attenuated at the rate of 6 db per octave with increasing frequency.

The output from V 203 is developed across its collector load potentiometer R 215 and which is employed as the pre-set deviation control.

The controllable audio output from R 215 is then coupled to the phase modulator via C 268 which blocks the DC component.

Crystal Oscillator.

The crystal oscillator and phase modulator circuits are fully transistorized and both contained on one printed wiring card.

The crystal oscillator is a fairly conventional circuit based on a parallel mode of operation, the crystal being in the collector/emitter circuit of V 204 (AF 115).

Fine adjustment of crystal frequency for accurate netting of transmitters is obtained by means of C 216, a variable trimmer capacitor in shunt with the crystal.

The output of the crystal oscillator is coupled to the phase modulator by a high value of resistance R 221. This provides isolation of the crystal oscillator from effects of varying impedances of the phase modulator.

Phase Modulator.

Audio output from the audio stages is controlled by the deviation level control potentiometer R 215.

From the potentiometer audio signals are coupled through C 268, which blocks the DC component and through L 202 RF choke to the junction of diode MR 203 (Type OA90) and C 217. These latter components are connected in series across the phase modulator resonant circuit comprising L 203, C 219, C 220.

At radio frequencies C 217, L 202, and C 218 are series connected across the phase modulator circuit and diode MR 203 is shunted across L 202, C 218.

Applied audio potentials to MR 203, which may be considered as a variable impedance, develop a potential across the diode which varies in sympathy with the applied audio. This varies the impedance of the diode at the audio rate causing a reactive component to vary the phase of potentials developed across the circuit L 203, C 219, C 220.

This creates a reactance modulation of the applied RF from the crystal oscillator in sympathy with the modulator input.

As the base impedance of V 205 circuit is relatively low, C 219, C 220 provide the low impedance connection from the phase modulator circuit to V 205 base. V 205 amplifies the voltage appearing across the phase modulator circuit. Base bias for V 205 is obtained from the divider R 223, R 224 and from the emitter components R 225, C 222.

As the collector impedance of V 205 is relatively low the collector is tapped down the primary of T 201 to provide optimum match.

T 201 is not mounted on the above crystal oscillator/phase modulator card but provides the coupling to the normally arranged chassis mounted tube complement of the transmitter. These following stages are the multiplier and power output stages.

Frequency Multiplier Stages.

A total frequency multiplication of 36 is obtained by using a 12AT7 double triode up to 9f (both half sections triple) and a twin tetrode (QQE02/5) to 18f and 36f (both half sections double).

The maximum use of double tuned coupling circuits is made in these multiplier stages resulting in elimination of spurious output signals.

Coupling into the first three stages is by means of double permeability tuned transformers with coupling at or just below critical.

The output of the phase modulator/amplifier is coupled to the grid of the first multiplier valve V 206A (½ 12AT7) through the double tuned transformer T 201.

Grid current metering for alignment of the phase modulator and T 201 is provided by the metering point M 201. Metering is effected by using a micrcammeter having 0 - 100 uA full scale deflection and an internal resistance of 3000 ohms.

The anode circuit of V 206A is tuned to the third harmonic of the input signal and this component is applied to the grid of V 206B the second (½ 12AT7) multiplier valve through double tuned circuit transformer T 202.

Grid metering of this stage is provided by metering point M 202.

The anode circuit of V 206B is again tuned to the third harmonic of the grid input signal and this component is applied to the grid of the QQE02/5 valve, V207A, third multiplier stage through the double tuned circuit transformer T 203.

Grid metering of this stage is provided at metering point M 203.

The QQE02/5 is a double tetrode valve in which the screen is common to both sections. The influence of the operating conditions of the first section of the valve on the second section due to the screen grid being series fed is minimised by careful choice of the screen feed resistor R 236.

The anode of the first section (V207A) is coupled to the grid of the second section through the anode circuit L 204, C 247 which is tuned to the second harmonic of the grid input signal, and grid condenser C 246.

Grid metering is available at metering point M 204.

The output of the second section of the QQE02/5 V 207 B is applied to the capacitively tuned circuit L 205, C 250 which is also tuned to the second harmonic of its grid input signal and sufficient power is available at the operating signal frequency to drive the Final Power Amplifier.

Circuit L 205, C 250 is link coupled by inductive link L 207, L 208 to the grid tuning circuit of the power amplifier which comprises the centre tapped secondary L 209 and split stator trimmer C 256 providing balanced output to the push-pull P.A. grids.

The link is tuned by means of trimmer C 253 in series with L 207 to increase the transfer of power from the driver anode circuit to the P.A. grid circuit.

All stages in the RF exciter operate from either grid leak bias or a combination of grid leak bias and cathode bias, and in the event of RF drive failure, all tubes are held within rated dissipation.

Power Amplifier

The valve used as power amplifier V208 is the VHF double tetrode type QQE03/12 or type QQE03/20 which require no neutralising. The circuit design is such that the amplifier is completely stable showing no sign of oscillation at fundamental or parasitic frequencies.

Power from the driver is coupled into the amplifier balanced grid circuit by link coupling as mentioned above.

The PA anode tuning is by means of a self supporting centre tapped inductance L210 and a split stator condenser, C261.

The output power developed in the anode circuit is coupled to the antenna by a link L211 at the centre of the tank coil which is matched to the load. Transfer to the antenna connection is via the antenna change-over relay contacts A1.

The PA grids are biassed from a combination of grid leak and fixed bias the latter being derived from the power supply as 30 volts negative. This fixed bias is adequate to maintain the anode dissipation of the valve within safe limits in the event of drive failure.

Metering of the PA grid circuit between test points M205 and M206 enables driver anode tuning and PA grid tuning together with coupling link adjustment.

Metering of the PA anode tuning is provided by test point M207 which comprises meter multiplier resistor R246 connected to R244 and R245 in parallel in the cathode circuit of V208. Anode current variation is read as cathode voltage variation across the metering resistors R244 and R245. Although this indication contains screen grid current, its content is relatively small and has little influence on the overall resultant.

Heater wiring of the valve complement of the 1675 transmitter is brought out to a 5 lug strip to enable interconnections to be made for parallel, series-parallel, and combination series, series-parallel, operation for operation from 6 volt, 12 volt or 24 volt sources of supply. See separate data section for voltage changeover.

Metering.

Using the standard 100 uA 3000 ohm test meter recommended for metering the 1675 equipment in conjunction with the various shunts in circuit the transmitter metering points give the following full scale meter readings. M 205 is measured with respect to M 206. All other points are with respect to chassis earth.

Test Point	Quantity Measured	Full Scale Deflection
M201	V206A grid current	120 uA or -26 volts at grid.
M202	V206B grid current	540 uA or -54 volts at grid.
M203	V207A grid current	750 uA or -75 volts at grid.
M 204	V207B grid current	2.1 mA or -172 volts at grid.
M205) M206)	V208 grid current (meter between these points)	4.5 mA or -45 volts at grid.
M207	V208 cathode current by cathode voltage.	250 mA/ +2.5 volts.

FM1675 VHF MOBILE RADIOTELEPHONE EQUIPMENT.
DC/DC CONVERTER TYPE 1675/500/12 (ALSO /6 AND/24)

1.0 GENERAL

The DC power supplies for the FM 1675 mobile and base station equipment are transistorised DC/DC Converters which obtain their primary power from a battery.

The DC/DC conversion process is established by the use of a saturating reactor type oscillator employing a pair of transistors as the gain elements. The output of this oscillator drives a relatively linear amplifier employing four transistors in push pull parallel.

Output from this amplifier is rectified and filtered to form the various supplies required for the transmitter, and in cases of other voltage inputs for the transistorised modulator/exciter or the transistorised receiver.

A feature of these supplies is their high overall efficiency and the fact that they close down to a very low current drain under such fault conditions as a short circuit.

2.0 DETAILED DESCRIPTION.

2.1 General

Physically the supply comprises a rectangular metal case, having a removable side cover plate, and in which is mounted a transformer case and component card assemblies.

A turret lug terminal strip is mounted at each end of the narrow mounting face of the supply case to enable input and output connections to be made directly to equipment on which the supply is mounted. Rivet nuts are permanently affixed to this face of the case to facilitate mounting.

The transformer case within the main supply case contains the oscillator transformer and the amplifier transformer potted in flexible epicote resin.

The component card assemblies mount the various RC filtering and shaping circuits, the silicon rectifiers, and the oscillator transistors.

The amplifier transistors (four) are mounted on the top of the main supply case which is used as the heat sink.

2.2 Theory of Operation
Type 1675/500/12 (i.e. 12 volt)

Refer to circuit diagram SPB 4588.

The battery supply (12 volts) is connected to terminals 5 and 6 these being positive and negative respectively independent of which pole of the battery is earthed.

The oscillator section comprises V1 and V2 which are OC80 transistors, transformer T1 and associated resistors R2, R3, R4, R1 and R9.

2.2 Theory of Operation cont'ed.

The push pull oscillator V1 and V2 has a high degree of positive feedback, this being applied to each base from the centre tapped feedback winding (terminals 10, 23, 14) on Transformer T 1.

DC power to initiate oscillation is provided at switch-on via C11, this being a short current pulse. Each transistor then receives a forward bias and the initial pulse is sufficient to cause conduction in one transistor. Normal assymetries in the active circuit elements dictate which of the two transistors conducts initially.

The rise of collector current in the conducting transistor induces a voltage in the feedback winding which is of such a polarity that inreasing collector current conduction occurs. Thus there is a regenerative switch on of this transistor and the collector current rises through the transformer primary to a level sufficient to cause saturation of transformer T1 core.

DC power is supplied to this pushpull oscillator during starting only via C11 then as output is developed in the amplifier transformer T2 winding 11, 12, output is rectified and returned to provide DC power input to sustain oscillation.

When core saturation of T1 is reached as above, the induced voltages collapse and the reversing field induces regenerative switch-on of the other transistor. This second transistor comes cut of cut off condition and begins to conduct causing the current in the feed back winding to almost instantaneously change polarity.

This drives this second transistor into full conduction and cuts off the first transistor. Since the transition from full conduction of one transistor to full conduction of the other is of extremely short duration the output wave form is very nearly rectangular.

The rectangular waveform output from the secondary of T1 is then applied via shaping networks C1, R5 and C2, R6 which are included to provide a high initial pulse of current to drive the bases of the push pull parallel amplifiers, transistors V3, V4 and V5, V6.

A rectangular waveform is produced at the primary of T2 which is a linear transformer coupling the rectangular output waveform from the amplifier to the rectifier filter combinations.

An additional winding on T2 provides output which is rectified to provide a DC loop which delivers DC to the oscillator to sustain oscillation.

The output wave form from transformer T2 is rectangular and has a fundamental frequency of approximately 7,500 cps.

The rectified rectangular pulses have an average value equal to the peak value and also equal to the RMS value. The rectifier combinations are as follows.

1. Half wave silicon rectifier (OA210) is used for the transmitter bias supply, i.e. 30 volts negative.

2. A voltage doubler employing two silicon rectifiers (2 x OA210) is employed for the transmitter multiplier driver supply, i.e., 250 volts positive.

2.2 Theory of Operation cont'ed.

3. A voltage doubler employing two silicon rectifiers (2 x OA210) is employed for the transmitter power amplifier supply. This delivers 250 volts positive which is seriesed with the multiplier-driver 250 volt supply to provide 500 volts positive.

Due to the high frequency of operation of this supply, filtering components are considerably reduced in size and value. However, a substantial input filter combination L1, C8, L2, provides isolation of the unit from the battery.

Operation of the voltage-doubler combinations is as follows:

Suppose that the instantaneous polarities of the transformer windings are such that the junction of the two rectifiers MR1 and MR 2 is positive. Current will flow through MR1 and charge C3. When the current is reversed during the next half cycle of the oscillator, the junction of C3 and C4 becomes positive, MR2 conducts and C4 is charged. Since C3 and C4 are in series and the voltage developed across them is additive, the DC voltage developed in total at the output of the rectifier - capacitor combination is double the AC voltage developed at the secondary of the transformer.

Although the power supply DC feed is filtered by L1, C8, L2 to provide isolation of supply components, an additional filter is included in the power supply to provide filtered DC at 12 volts potential for the transistorised receiver.

Other battery supply voltages namely 6 volts or 24 volts DC are catered for in the following way.

Type 1675/500/6 6 volt Supply.

The operation of this supply is similar to that outlined above with the exception that the filtered 12 volt DC outlet used to supply the transistorised receiver etc., is derived from rectified output of the DC loop winding on transformer T2. In all executions this of course provides the DC supply to the oscillator to sustain oscillation.

Type 1675/500/24 24 volt Supply

From the above it is obvious that the principle also applies in the 24 volts battery input models.

Using the power converter to convert the battery supply to 12 volts DC for transistorised assemblies is a most economical method due to the high efficiency of the converter.

2.3 Overload Characteristics

The result of increasing load on this type of power oscillator-amplifier is such that after exceeding maximum power output the oscillation level falls in amplitude and at the condition of short circuit on the output, the output voltage is zero and the input current falls to a very low level of approximately 10-20% of the normal full load input current.

TRANSISTOR FUNDAMENTALS

Before attempting to service transistorised equipment it is necessary to have an understanding of the transistor and how it works.

It is then relatively easy to absorb and apply the servicing technique which must be used with this equipment.

While it is obviously not within the scope of this handbook to impart this understanding, we list some notes for guidance and refer the reader to the many textbooks written on the subject. In particular, we recommend procurement of a copy of the small handbook "Using Transistors" by D.J.W. SJOBBEMA in the Popular Series of Philips Technical Library available from Branches of Philips Electrical Industries Pty. Limited.

The Transistor.

In 1947 two American physicists Bardeen and Brattain, both working in the Bell Telephone Company's Laboratories, demonstrated a crystal amplifier with three connections which was the point contact transistor.

Tremendous development and application of the transistor has occurred in the relatively short period since that date.

These devices depend for their operation on certain properties of semiconductors such as germanium and silicon.

Metals or conductors have free electrons the movement of which along the conductor under conditions of potential stress constitute an electric current.

Insulators have no free electrons and are non conductive.

Semi-conductors exhibit certain properties of conductors and insulators as they are between these groups. In semi-conductors, the valency bond between certain outer electrons and the atoms in the molecule can be broken by supplying energy from a power source.

By adding controlled impurities to purified germanium for example Arsenic or Indium, different types of semi-conductor Germanium are achieved.

Using Arsenic (a donor) excess electrons in the crystal lattice are created.

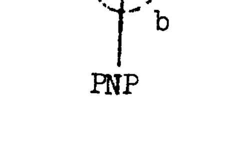
As the conductivity of this material is by negative electrons it is called N Type Germanium.

Using Indium (an acceptor) a shortage of electrons in the crystal lattice is created and this deficiency is in the form of positively charged holes. Conduction is therefore by a movement of positive holes and thus is called P Type Germanium.

A NPN Transistor operates by means of an electron current.

A PNP Transistor operates by means of a hole current.

The above statements are not strictly true but serve as a first basis for following operating theory.



PNP

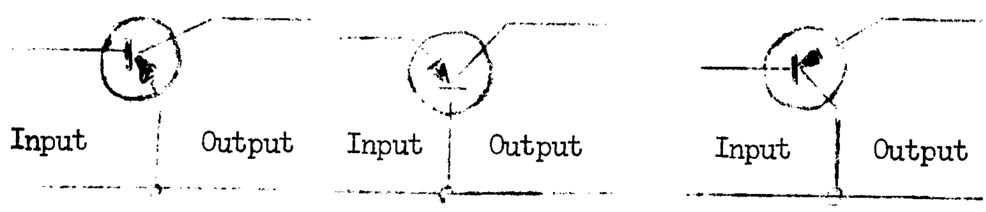
NPN

The diagrams used for these types are identical but for the direction of the arrow at the emitter.

This arrow therefore defines immediately which type of transistor is employed and which polarity the applied potentials will be.

The transistor, having three terminals, can be connected in three different ways for input/output connections.

These are:-



1. Common Emitter	2. Common Base	3. Common Collector
Equivalent valve circuits are		
1. Grounded Cathode	2. Grounded Grid	3. Grounded Anode or Cathode Follower.
Most commonly used	HF-VHF use etc.	Used for impedance transformation.
Highest power gain 40-50 dB	Power gain 30-40 dB	Power gain 10-16 dB
Relatively High Z input 400 - 2000 ohms	Low Z in 50 ohms	Very High Z in >20K ohms
Relatively Low Z output 40 - 100 K ohms	High Z out 500 K ohms	Low Z out approx. 1K ohm
Voltage gain reasonable.		Voltage gain less than unity.
Input/Output 180° out of phase.	Input/Output in phase.	Input/Output in phase.
α cutoff medium	α cutoff high	

From the brief notes above which service purely as reminders or guidance of sections of literature to follow up, you will see the pattern of usage for the three possible connections.

When referring to the transmitter receiver circuit diagrams such as SPD 1183 for the mobile, you will note that stages of the receiver at V.H.F. and H.F. employ grounded base connection (similar to grounded grid tube), stages at MF - IF and LF employ common emitter connection (similar to grounded cathode normal tube amplifiers), and in two cases i.e. V108 and V118 common collector operation is used as an impedance transformer (similar to cathode follower tube circuit).

We strongly recommend further reading on the various aspects of these points mentioned briefly in the foregoing in order to gain a fundamental background sufficient to enable satisfactory discrimination in fault finding etc.

Service Technique

Transistors are operationally very rugged devices. Provided that circuit design and operation is kept within the manufacturer's ratings and a number of precautions listed in the following are observed, the life expectancy of transistors and transistorised equipment is very long.

In service work, transistors are easily damaged.

The transistor comprises a PNP (or NPN) element which is housed in a glass bulb or metal cap to protect it from damage and moisture.

The housing is filled with silicon grease to conduct heat from the junction to further support the assembly in shock conditions and to prevent the ingress of moisture.

As the element or junction has its properties changed by the supply of only a small amount of energy from a battery, energy in the form of heat or light applied to the junction will also affect it. Electrical correction of effects of ambient temperature rise is generally incorporated in the circuit design. Metal heat sinks take away dissipated heat etc. Entry of light is excluded in metal cap housing,but in glass envelope construction the glass is painted black to exclude light.

Should the paint be scratched off AC light sources may cause hum or steady light sources may influence results. Paint over any scratches to prevent this.

As the transistor is so rugged and small it will withstand shock, vibration and other similar conditions better than an electron tube, and, in general, it is wired into circuits in similar manner to resistors and condensers.

In soldering technique (dealt with later) heat must be prevented from reaching the junction. Likewise, the application of excessive potentials or transient pulses during servicing may immediately destroy the transistor.

Servicing procedures and test equipments used with other types of electronic equipment generally apply to transistorised equipment, but a number of precautions must be followed.

Procedures used for thermionic valve equipment or connection and use of test and service equipment can introduce potentials and pulses which will destroy transistors and therefore the following must be observed.

1. Before doing any service work, connecting batteries or connecting any test device to the equipment, carry out a visual inspection of components and wiring. Look for broken leads, poor soldered joints, bent components shorting, solder pieces, wire pieces or dirt between wiring etc.

2. Ensure that potential differences do not exist between the equipment and test equipment, soldering irons, probes etc.

   Some test equipment operating from mains supply and employing line filtering may have AC potentials relative to ground of 30 to 80 volts. Earth this equipment separately to ensure removal of these potentials from test leads.

   This applies to signal generators, level meters, vacuum tube voltmeters and other similar equipment.

   Soldering irons must be checked as capacitive leakage can be disastrous even though the equipment being serviced is switched off. Special irons are recommended in the section "Servicing Printed Card Assemblies".

3. The practice of shorting out or bridging components in valve circuits together with prodding or probing while switched on must be discontinued. Damaging current surges can result.

   As transistors operate immediately the equipment is switched on, no time is lost by switching off to service or adjust.

4. Power transistors used in the audio output stage and in the power supply amplifier are mounted on heat sinks to carry heat away from the transistor. Where the transistor is insulated from the heat sink fibre and mica washers are used and these are coated with a thin film of silicone grease to assist heat transfer. Always examine micas when replacing transistors and measure insulation after reassembly to ensure that it is in order and no shorts occur.

5. Ohmmeters vary widely in operating potential and must be carefully checked before use (as explained later). High operating potential may break down the low voltage transistors, electrolytic capacitors (from 4 volt operation upwards), and both operating voltage and polarity should be checked.

6. Voltmeters should be high resistance (from 10,000 ohms to 40,000 ohms per volt).

Methods of Fault Finding (Receiver and Modulator)

The method preferred is to feed a signal into the aerial input from a signal generator and signal trace it through stages of the receiver. The input must be at a relatively high level for fault location of offering sections.

Similarly in the modulator stages of the transmitter, input from an audio generator is signal traced through the circuit.

It is wise to start with input/output or overall. Then divide the unit circuit into three sections such as VHF, I.F., Audio and check the intermediate points.

Having established the faulty section in this manner, divide its circuit into blocks of two or three and repeat.

To test the muting amplifier, a high frequency audio tone input may be used. Do not use too much level. Then signal trace this through the muting amplifier card.

A careful reading of the circuit description of the receiver stages will show possibilities of various techniques of signal tracing mainly limited by the service equipment available.

TRANSISTOR TECHNIQUE

SERVICING PRINTED WIRING CARDS.

Introduction.

Printed wiring cards obviously offer many advantages to the manufacturer and the user of the equipment in which they are incorporated.

The also offer advantages to the service technician, among these being the ease of removal of complete sections of circuitry for test, repair, or replacement.

While TCA do not include sections of printed circuits in VHF radiotelephone equipment at present, the extensive use of printed wiring boards or cards dictates a need to pass on to technicians not yet familiar with the process, the many notes of technique employed for service. These may also be found of interest to those technicians who have had some previous experience in other transistorised equipment.

Recommended Tools.

1. Ordinary soldering irons and scope irons may damage transistors and should not be used without special precautions. Use a low wattage soldering iron with a long thin tapering bit, (Pencil type irons preferred.) and adequately earthed.

   This may be a 10 watt or 20 watt low voltage iron with appropriate isolating transformer similar to the MICO type, or a 20 - 30 watt 240 volt type with special long thin bit. It is important to have low temperature soldering but with adequate heat to make good joints on fine components.

2. A knife having a thin pointed flexible blade.

3. A $\frac{1}{4}$ inch hard natural bristle brush, or a small wire bristle brush.

4. Solder, 16 S.W.G. 60/40 tin/lead, resin cored.

5. Small diagonal side cutters.

6. Small thin, long nosed pliers.

7. Strong sharp pointed tweezers.

8. Small narrow-pointed tinman's snips.

9. A magnifying glass or watchmaker's eyeglass to examine joints, foil of conductors etc.

10. A medium crochet needle or similar as a hook to check solder joints and anchoring of components.

NOTE: Test prods used with meters should have sharp points in order to penetrate any protective varnish which may have been applied during manufacture. Furthermore, as resistors used in transistorised circuits are generally low in value, any additional resistance introduced by dirty or blunt test prods may make a good resistor appear to be out of tolerance. Test prods should be insulated to within an $\frac{1}{8}$ of an inch of the point.

General.

Printed wiring boards and printed circuits are made by bonding a sheet of copper foil to one side of a laminated plastic board. An etching process removes the copper foil not required for the wiring or circuit and holes are punched in the board to take component leads. For some applications the copper foil side is dipped in molten solder making all solder joints at once, and coating the copper foil with solder thus increasing the current carrying capacity. In other applications, the components are individually soldered to the foil.

Too much heat during soldering will break the bond between the board and the foil.

Repair Technique.

Before doing any repairs or component changes on printed wiring boards, a careful visual inspection is always desirable.

Look for broken leads, poor soldered joints, external leads to card or board loose or fractured, solder or dirt between wiring foil, breaks or cracks in wiring foil, and similar faults.

Terminal voltages both at the battery or supply point and at individual transistors are the first step of measurements and produce a useful guide as to sectional faults to be found.

Do not use an ohmmeter to test transistors unless it has been established that it is of the low-current type for all ranges and has a terminal voltage of 3 volts or less. This type should not pass a current through the external circuit of greater than about one (1)mA. Check this by inserting a low resistance milliammeter in service with the ohmmeter leads and check all resistance ranges of the meter. If the ohmmeter draws any more than 1 mA on any range, that range can not be used safely with small transistors. Generally, multimeters having a sensitivity of 20,000 to 40,000 ohms per volt are found to be satisfactory on the "ohms" ranges but this is not always so.

Some V.T.V.M's are not satisfactory on their "ohms" ranges, and have such a high terminal voltage as to cause breakdown of a transistor.

Incorrect resistance or voltage readings found at transistor terminations are usually due to a faulty component other than the transistor. Before replacing any component the associated circuit should be checked to determine the faulty part.

When working on a panel every care should be taken to avoid damage to components mounted on the other side.

Unsoldered component leads should be drawn through the holes in the panel from the component side to avoid pulling the foil conductors away from the board. Avoid straining the panel. Flexing or bending the panel can cause conductors to become detached from the board or may crack them.

Check conductors for cracks when checking components. A component may be suspect due to a crack in the conductor having isolated the component.

If, after long service, the component boards become generally dirty they may be cleaned up using a small quantity of ight machine oil (such as a general purpose household oil). Do not leave any surplus oil on the card, however, as this collects dirt.

"Servisol" is a general purpose cleaning solvent for localised application with the reservation that great care must be taken that this solvent does not come into contact with enamelled copper wire and polystyrene e.g. in relay buffer blocks, key switches, wrapping of capacitors etc. If any of this is used in the service depot in normal work, care should be taken that it is not used indiscriminately.

"Turco-solv" is used where enamelled copper wire, electric motors, commutators etc. are present.

Component Location and Testing.

Within the handbook, layout diagrams for the various card assemblies are provided, These show the component positions together with the wiring layout.

As the component are on one side of the card and the wiring on the other, care must be taken in following the circuit. In some cases a bright light placed behind the board will produce the same view as that drawn and may prove of assistance.

Tests and measurements may be made on the component side of the board. This will prevent shorting wiring where several leads may cross the board in close proximity, and will prevent damaging the foil with test prods.

If it should be found necessary to disconnect a component for test purposes, it should be done at a point which would permit the maximum number of other components to be checked without further unsoldering.

Unsoldering and Resoldering Components.

1. Double ended components (small resistors, capacitors etc.). Heat the joint by applying the soldering iron to the connection on the wiring side of the board and when molten, brush away the solder with a wire brush. The iron should be removed while brushing away the solder.

Bend any leads so that they become perpendicular to the board by inserting a knife between the wiring foil and the lead. If necessary, apply the iron to the joint but do not overheat. Then pull the component away from the board to draw the lead through.

2. Transistors and Germanium Diodes.
Proceed as for 1. above but ensure that a heat shunt is used (i.e. the lead should be gripped in pliers before applying heat to the soldered joint). Failure to use a heat shunt allows the component to be heated to such a degree that excessive transistor noise or complete failure may result.

3. Single ended components (electrolytic capacitors etc.) or multi pin components.

Straighten any leads which are bent or twisted. Heat each tag in turn, gently pressing the component away from the tag being heated. Brush away the molten solder.

In this manner the component tags are gradually drawn through the panel until they are completely free.

Removing Components for Replacement.

Where components are obviously defective and require replacement, cut the connecting leads as far away from the board or as close to the component as possible. Capacitors or combination components with several contacts can be broken into separate pieces allowing each lead to be withdrawn separately.

Replacing Components.

Replacement components should be inspected and pretinned if necessary before fitting. If the original component has been removed thread the leads of the replacement through the holes and re solder them.

If the faulty component has been cut out, leaving the leads, it is possible to use these to mount the replacement. Cut back the lead to $\frac{1}{4}$" and bend in a small loop. The lead of the new component may then be threaded through the loop and soldered. Check during soldering that the original lead does not come loose at the printed wiring by gently pulling on the component in a direction away from the panel.

Any component which dissipates excessive heat should be mounted, using ceramic leads, with the body of the component at least $\frac{1}{2}$ inch away from the board.

If a thin layer of solder remains over the holes in the board, apply enough heat so that the layer of solder can be penetrated by the lead of the new component.

Repairing Damaged Wiring.

If a conductor has lifted away from the board, cut out the portion concerned and replace it with a length of tinned copper wire between two suitable junction points (e.g. points to which components are connected). The wire should be formed to take up a position and to follow the same path as the original printed conductor and should be fixed to the base using a suitable adhesive (such as Araldite epoxy resin glue). If a conductor has cracked or broken, the fracture can be bridged using tinned copper wire soldered in position. If protective varnish is not self fluxing, remove with wire brush or knife.

Repairing Printed Panels.

Provided a board is not extensively damaged, breaks or cracks can be repaired using a suitable adhesive (such as epoxy resin glue). When the adhesive has set a small hole (or several holes) can be drilled either side of the repair and a short piece of tinned copper wire passed through as a loop with the ends folded flat side by side against the panel. These ends should then be soldered together.

A small hole should be drilled at each end of a crack to prevent it extending.

Tracking Between Conductors.

If the insulation between conductors fails it is better to drill through it rather than to attempt to clean it off. This is rare in low voltage equipment.

1675 MOBILE RADIOTELEPHONE EQUIPMENT.
RECEIVER ALIGNMENT AND TEST.

Test Equipment

Suitable types of test equipment are listed below. Alternative equipment having similar characteristics may be used.

(1) Marconi Signal Generator FM/AM Type TF995 A2
(I.F. alignment may be effected with Philips Type GM 2883 or similar.)

(2) V.T.V.M. Philips GM 6009

alternatively AVO model 8 multimeter
alternatively Philips P 817.00 multimeter.

(3) Distortion and Noise Meter AWA 1A56068

alternatively multimeter as above with CR Oscilloscope if required.

(4) Audio oscillator Philips GM 2308

(5) Plastic tuning tool for R.F. alignment.
(Do not use metal. It is possible to cause accidental short circuit conditions with a metal trimmer, and transistor ratings may be exceeded.)

1675 MOBILE RADIOTELEPHONE EQUIPMENT

RECEIVER ALIGNMENT AND TEST.

Test Specification	FM1675A	FM1675C
Band covered	70-85 Mc/s	156 - 174 Mc/s
Quieting	20 dB at 0.6/0.7 uV input	20 dB at 0.8/0.9 uV.
Signal/Noise	38 dB at 1 uV input	36 dB at 1 uV input
Audio Output	3 watts. Input signal deviated 15 Kc at 1000 c/s.	

Overall distortion - not greater than 10%

Image rejection - 70 dB.

Battery consumption - (12V input)
Receiver only, muted, pre signal, approximately 80 milliamps.

$$\text{Crystal Frequency} = \frac{\text{Signal Frequency} + 16.755}{2}$$

Alignment Procedure

Preliminary

Examine mechanically.

Measure resistance from positive and negative supply points on RF unit card to the main chassis. This should be greater than 1 meg ohm.

Measure between the power supply negative and chassis. This should be greater than 100K ohms.

Connect the 12 Volt supply to the unit OBSERVE CORRECT POLARITY i.e., red to positive, black to negative.

Switch on receiver.

Measure D.C. supply voltage available at the R.F. card. This should be from 11.3 to 11.5 Volts.

Switch off receiver and wire a bridge or short circuit between the collector and emitter of the voltage regulator transistor (OC80) V123. This will protect the regulator transistor against an accidental short circuit between the positive and negative rails or bus lines of the receiver supply during alignment.

This bridge or short circuit applied to V123 must be removed after completion of alignment.

Rotate the squelch control to the fully clockwise position.

First I.F. Alignment

Adjust the output frequency of the signal generator to 16.755 megacycles. Feed output via 3.3 pf capacitor to the input of the first I.F. Transformer (T101). The connection to the first mixer collector should be removed.

Centre the signal generator on the discriminator centre. Metering of the discriminator may be effected by connecting VTVM or P817 multimeter on discriminator output i.e. at junction R152, C153 which is the audio lead coupling the second I.F. cards to the audio card.

First I.F. Alignment cont'ed.

Connect D & N meter if available or AVO 8 or P 817 multimeter across the loudspeaker voice coil , range AC Volts 0 - 2.5 or 3 V.

Tune bottom slug of last I.F. transformer (T102) for maximum quieting in output meter.

Proceed similarly with top slug of last I.F. transformer then the first I.F. transformer (T101) in similar order.

Typical quieting figure at this point is 20 dB for 6-10 uV input.

Replace connection between first mixer collector (V104) and first I.F. transformer (T101).

The correct tuning point in each case is the first tuning point indicated as the slug is screwed inwards from a position flush with the top of the coil former.

First Oscillator Alignment.

Turn volume control to minimum position. Insert AVO meter or P 817 in series with the battery lead (range 100 milliamps D.C.). Switch on and tune first Oscillator C 105 for maximum reading on meter. Variation will be slight (varying 2 to 3 milliamps approximately as the oscillator is tuned.) Back off from maximum slightly.

Switch receiver OFF and ON several times and check that oscillator starts on each occasion.

Oscillator operation may be checked by touching oscillator collector coil and noting rise in receiver current as finger is withdrawn from the coil.

R.F. Alignment.

Adjust frequency of Marconi signal generator to signal frequency. The R.F. output of the signal generator should be adjusted to provide some receiver quieting.

Tune the oscillator doubler C 115 and the first mixer input C 114 for maximum quieting.

Adjust generator frequency to achieve discriminator balance or centre.

Adjust output of signal generator for quieting of approximately 10 - 15 dB in audio meter or D & N meter.

Peak T101 for maximum quieting.

Tune C112, C109, and C102 for maximum quieting. Input to receiver for final alignment should be 0.5 uV.

The terminating unit for the TF995 signal generator or 6 dB pad should be inserted between generator output and receiver input during test. Input to the receiver should be taken from the 75 ohm outlet of the pad.

QUIETING

Rotate the muting or squelch control fully clockwise.

Check quieting at 0.6 uV input to receiver. This should be equal to or better than 20 dB (10:1).

Retune R.F. circuits for best quieting if necessary.

Signal/Noise Ratio.

Switch modulation switch to F.M. internal.

Adjust deviation to 15 Kc/s at 1,000 c.p.s.

Adjust generator to give 1 uV input to receiver.

Advance volume control to give an output of 1.8 Volts (A.C.) across voice coil of loudspeaker.

Check the signal/noise ratio on the output meter. This should be equal to or better than 38 dB.

Audio Output and Distortion.

Increase the signal generator output to give an input of 5 uV to the receiver.

Adjust the volume control for audio output of 3.25 volts across the loudspeaker voice coil with the signal deviated 15 Kc/s at 1000 c.p.s.

Check distortion (if using D & N meter, or view the wave form on a C.R.O.). This should be less than 10%. Average is approximately 5%.

Phase Correction Network

Frequency modulate the signal generator using an external audio generator such as a Philips GM 2308.

Set the audio frequency at 300 c.p.s., adjust the deviation to 15 Kc/s, and adjust the input to 5 uV.

Adjust the receiver volume control until a level of 1.8 volts is produced across the loudspeaker voice coil. (1 Watt).

Change the audio frequency to 1,000 c.p.s. The output level should drop 10.5 dB ± 3 dB.

Adjust volume control until a level of 1.8 volts is again produced across the loudspeaker voice coil at 1,000 c.p.s.

Change the audio frequency to 3, 000 c.p.s.

The output level should fall 9.5 dB ± 3 dB.

Squelch or Muting

Readjust the signal generator input to the receiver to 0.5 uV.

Switch off carrier.

Adjust the muting control to a point just past the point at which the receiver is muted.

Switch on the carrier, check deviation of 15 Kc/s at 1000 c.p.s. The muting should open and the 1,000 c.p.s. note should be audible. Reduce the signal generator output to 0.3 uV. The receiver muting should still open at this point.

Squelch or Muting cont'ed

Advance the squelch or muting control to the fully anti clockwise position.

Check the input signal level necessary to open the muting of the receiver.

This should not exceed 2 uV.

Average is approx. 1.25 uV.

Voltage Regulator

Remove the short circuit or bridge previously placed between the collector and emitter of V123 (OC 80).

Measure the D.C. input voltage at the R.F. unit card. (Do not short circuit the negative bus to chassis.)

This voltage should read 11.3 to 11.5 volts.

Check the quieting at 0.6 uV input.

Increase the supply voltage to 14 volts.

D.C. input voltage at the R.F. unit card should rise only 0.3 to 0.5 volts.

RECEIVER SENSITIVITY TESTS

The following notes on methods of measurement of the various circuits in the 1675 receiver are to be used as a general guide. The voltages, gains, etc. listed are those averaged after a number of sets have been tested. It is well to note that variations from these figures can be expected.

Sensitivity Test on RF Units

Connect the distortion and noise meter (0.1 megohm input) across discriminator output. The signal generator hot lead is connected via a 7500 pF condenser to V102 emitter. The cold end of signal generator is soldered directly above V102 to the RF chassis.

A signal to noise ratio of 27 dB should be obtained with one microvolt input (1000 c/s per second, 15 Kc/s deviation).

Sensitivity Test on the First Mixer (RF Unit)

Connect the distortion and noise meter as above. Connect the signal generator hot lead via the 7500 pf condenser to V104 emitter and the cold end is soldered to the RF chassis left corner.

A signal to noise ratio of 20 dB should be obtained with six microvolts input (1000 c/s per second, 15 Kc/s deviation).

First IF Sensitivity Test

The distortion and noise meter connected as above. Lift the yellow lead of Pin 2 on T101 and connect to the signal generator hot lead; cold end is connected via a short lead to Pin 3 of T102. Rest the output socket of the signal generator cable on mobile chassis near the first IF amplifier card.

A signal to noise ratio of 20 dB should be obtained with a 1.5 microvolt input level (1000 c/s per second, 15 Kc/s deviation).

Second Mixer Test

Distortion and noise meter as above. Lift the yellow lead of Pin 2, T102, and connect to the signal generator hot lead, the other conditions as above.

A signal to noise ratio of 20 dB should be obtained with 3.1 microvolts input (1000 c/s per second, 15 Kc/s deviation).

Second IF Sensitivity Test

A Including Second IF Filter

Connect the distortion and noise meter across the discriminator output using the 0.1 megohm range. Lift R120 cold end. Note noise reading on distortion and noise meter. Connect the signal generator (Philips GM 2883 or similar), hot end to R120 lifted end and cold end via 1 mF paper condenser on junction of R121 and C183.

Adjust frequency to 455 Kc/s and increase input to give 6 dB quieting; input level should be not more than 350 microvolts.

B Second IF Amplifier Card Only

Disconnect input leads from the second IF filter. Note noise reading on distortion and noise meter (meter connected across discriminator output), connect signal generator (Philips GM 2883 or similar) via 1 to 1 RF transformer to second IF amplifier card input terminals.

Increase signal generator input (at 455 Kc/s) to give 6 dB quieting; input level should be 25 to 35 microvolts.

Discriminator Sensitivity Test

A minimum RF input signal of 10 microvolts deviated at 15 Kc/s at 1000 cycles is applied to the aerial socket at signal frequency.

This should produce approximately 95 millivolts output at the discriminator output terminals.

AF Amplifier Sensitivity Test

A 1000 cycles per second signal of approximately 16 millivolts applied to the AF amplifier card input, produces one watt output across the speaker (volume control at maximum).

1675 MOBILE RADIOTELEPHONE EQUIPMENT
TRANSMITTER ALIGNMENT AND TEST

TEST EQUIPMENT.

Suitable types of test equipment are listed below but any test equipment having similar characteristics may be used.

(1) Meter 100uA F.S.D. 3,000 ohms with suitable test clips for connecting to metering points or alternatively a 6 position switch may be used in association with the meter and a number of clip leads to select the various points.

(2) Model 8 AVO meter.

(3) R.F. Power Meter.
75 ohm Marconi TF 1020A, Bird 50 ohm Termaline, etc.

(4) Modulation Monitor.
AWA Type IFA 51931, Lampkin etc.

(5) Audio Frequency Generator
Philips Type GM 2307

(6) Noise and Distortion Meter (if tests required)
AWA Type A51932 or Type 1A56068

(7) Audio Millivoltmeter
Philips GM 6005 or similar.
Alternatively, Resistance divider, calibrated, and less sensitive VTVM.

ALIGNMENT

(1) Plug in correct crystal and connect R.F. power meter to the antenna socket with a short coaxial cable. Connect battery cable to the connector on the equipment and to the battery terminals, observing correct polarity. Connect microphone to socket. Switch the equipment on.

(2) Connect the meter to M201 and meter the grid current of the first tripler V206 A. Tune the secondary of T201 (Top core) until a deflection is noted on the meter. Tune for maximum deflection and then tune the primary of T201 (bottom core) for maximum grid current. Tune the phase modulator coil L203 for maximum grid current. Return to the primary and secondary tuning adjustments and trim for maximum current.

(3) Connect the meter to M202 and meter the grid current of the second tripler V206 B. Tune the secondary of T202 (top core) until a deflection is noted on the meter. Tune for maximum and then tune the primary of T202 (bottom core) for maximum meter deflection. Retrim both primary and secondary to give maximum grid current.

(4) Connect the meter to M203 and meter the grid current of the first doubler. Tune the secondary of T203 (top core) until a deflection is noted on the meter. Tune for maximum and then tune the primary of T203 (bottom core) for maximum meter deflection. Retrim both primary and secondary to give maximum grid current.

(5) Connect the meter to M204 and meter the grid current of the second doubler. Tune the anode circuit of the first doubler L204 for maximum indication on the meter. This is a single tuned circuit and only one core has to be adjusted.

(6) The anode circuit of the second doubler is adjusted roughly by leaving the meter connected to M204. The anode tuning capacitor, C250, is rotated through resonance and the grid current meter will give a distinct kick downward. Tune carefully for minimum grid current.

(7) Connect the meter to M205 and M206 (observing correct polarity) and meter the grid current of the final P.A. V208. Tune the grid condenser C256 for maximum grid current. The grid current may not be the maximum obtainable, but immediately proceed with adjustment (8) to prevent overloading of the amplifier valve.

(8) Connect the meter to M207 and tune the anode circuit capacitor C261 for minimum cathode current.

(9) Reconnect the meter to M205 and M206 and adjust the link tuning capacitor C253 to give maximum grid current. Retrim C250 and C256 for optimum grid current.

(10) Reconnect the meter to M207 and tune C261 and adjust the coupling to L211 for maximum power output.

Alignment (Cont'ed)

The following table gives approximate figures for the various meter readings and may be taken typical.

	Metering Position		Typical Reading	Approx.F.S.D.
M201	Grid first tripler		42 uA	100 uA
M202	Grid second tripler		35 uA	0.4 mA
M203	Grid first doubler		28 uA	0.6 mA
M204	Grid second doubler		25 uA	2 mA
M205-206	Grid final P.A.		66 uA	5 mA
M207	Cathode final P.A.		40 uA	250 mA
	Power Output	Nominal		25 Watts.
or M207	Cathode final PA	Nominal	30 uA	250 mA

MODULATION MEASUREMENTS

(1) Initial Setting Up

For these checks the output of an audio oscillator is connected to the appropriate pins of the microphone input socket. It is necessary to use a single shielded lead for this connection and to make the appropriate connections it is preferable to terminate the shielded lead with a 5 pin microphone plug. This will also enable the P.T.T. connections to be brought out for ease of switching the transmitter on and off. With an audio oscillator having a 600 Ω output, a voltage divider Of 600 Ω plus 6 Ω will provide approximately the required output when the output of the oscillator is variable between .2 and 5 volts.

The modulation monitor should be provided with a coaxial input lead with a 1 or 2 turn pick up loop. The pick up loop may be coupled to the P.A. tank circuit, or, if the P.A. is not in operation, to the driver tank circuit L205/C250. The output of the monitor should be displayed on a C.R.O. and if desired, connected also to a Distortion and Noise meter. If a distortion and Noise meter is not used, an audio voltmeter should be connected across the output of the monitor for use in noise measurements. All modulation checks listed below are carried out with the R.F. section operating.

With the transmitter on, tune the Monitor to correct frequency. adjust input level and set for phase modulation.

(2) Setting of Maximum Deviation

With audio oscillator set to 1000 c/s adjust input level to 50 mV and adjust deviation to 17 Kc/s by means of potentiometer R215.

(3) Sensitivity

Reduce 1000 c/s input from audio oscillator from 50 mV to give 10 Kc/s deviation and check level which should be approximately 5 mV.

Modulation Measurements (Cont'ed)

(4) Distortion

Under the conditions of step (3) above check that C.R.O. display is smooth, approximately of sine wave form, or that distortion and noise is less than 5%.

(5) Noise

Increase 1000 c/s input from audio oscillator to give 15 Kc/s deviation and note level of audio output from modulation monitor. Reduce input from audio oscillator to zero and note level of output from monitor. This level should not exceed 0.5% of the level at full modulation. Due allowance must be made for noise inherent in the monitor.

(6) Frequency Response

This check must be carried out at a low audio input level to avoid limiting as this will produce an apparent drop in frequency response performance. An input level of 2 mV will be found to be suitable, and the deviation should be adjusted if necessary by the potentiometer R215 to give 10 Kc/s with a 1000 c/s input. Set frequency to 300 c/s and 3000 c/s in turn and note that deviation is not less than 2.4 Kc/s and 24 Kc/s respectively.

NOTE: It is not suggested that frequency response be measured using the audio output from the modulation monitor due to the poor response of the audio circuits of many monitors.

(7) Resetting of Maximum Deviation.

With audio oscillator set to 1000 c/s adjust input level to 50 mV and readjust deviation to 17 Kc/s by means of potentiometer R215.

FM1675 VHF RADIOTELEPHONE EQUIPMENT

RECEIVER VOLTAGE ANALYSIS

1. INSTRUMENTS USED

For the DC Voltage Analysis

Philips Multimeter Type P817.00 (40000 ohm/V) is used on 3V and 12V ranges.

For the AC Voltage Analysis (Audio and muting card levels, etc.)

Philips Type GM6009 (or GM6000) V.T.V.M. is used for 2nd Oscillator and 2nd Mixer base and Philips Type GM6012 Millivoltmeter for audio and muting card levels.

2. DC VOLTAGE ANALYSIS (Input at Battery plug 12.1V DC)

Voltages taken with respect to positive bus line (within approx. 10%)

RF Unit	Emitter	Base	Collector
V101 Osc.	2.0	2.1	11.1
V102 RF	5.7	6.0	11.3
V103 Harm. Amp.	0.2 Volts when aligned	0	10.9
V104 1 Mix	0.1 Volts when aligned	0	11.3
V105 1st IF	1.6	1.8	10.7
V106 2nd Mix	1.8	2.0	10.9
V107 2nd Osc.	1.6	1.9	10.1
2nd IF Card			
V108	4.0	4.2	8.7
V109	2.6	2.8	6.5
V110	2.4	2.6	6.8
V111	2.7	2.9	7.7
V112	2.9	3.1	10.1
Audio Card			
V113	0.75	0.8	7.6
V115	2.15	2.1	7.7
V117	1.5	1.6	9.3
Output Stage			
V119		0.1	12.0
V120		0.1	12.0
Muting Card			
V114	2.55	2.6	8.5
V116	1.8	1.9	11.2
V118	1.2	1.2	11.3
	decreases to 0.95	- increases to 3.8 when mute control fully anti-clockwise	

Muting Card	Emitter	Base	Collector
V121 (OC202)	0	-0.6V when mute control fully clockwise +1.4V when mute control fully anti-clockwise.	

*Note The above applies when mute feathering action is correct and sharply defined mute. Poorly defined muting point will be due to substantially reduced positive voltage, from reduced gain fault in earlier stages.

	Emitter	Base	Collector
V122	2.0	2.2	10.4
V123	11.3	10.8 to 11.0	12.1
Across MR111 OAZ202		5.8 to 6.0 Volts	
Across MR110 OAZ201		5.1 volts	

3. RF VOLTAGE

2nd Oscillator and Mixer base injection (measured with GM6009 with respect to positive bus line)

At Collector of V107	3.0V AC
At base of V106	0.18V AC

4. AC VOLTAGE ANALYSIS

Input 1 uV at Signal Frequency, 15 Kc/s deviation at 1000 c/s for audio stage levels.

Audio Levels (measured with GM6012 Millivoltmeter)

At input to audio card (output from discriminator)	
Serial 1000 - 1950	80 - 100 mV
Serial 1950 on	540 mV
At base of V113 (Serial 1000 - 1950)	10 mV
At base of V113 (Serial 1950 on)	65 mV
At Collector of V113	23 mV
At base of V115	12 mV
At Collector of V115	26 mV
At base of V117	26 mV
At Collector of V117 (Pri. of T4)	2.0 V
Base to Base V119 V120	0.8 V
At Collector of V119	5.4 V
At Collector of V120	5.4 V
Across Voice coil of loudspeaker	1.8 V (15 Kc/s at 1000 c/s)

Noise Levels through Squelch Detector and Muting Card

At feed lead from 2nd IF Card V112 emitter to R186 on Squelch Detector Card.		
Serial 1000 to 1950	280 mV	
Serial 1950 on (with [illegible] pf in place R186)	250 mV	
At junction R188/MR109 Noise detector	160 mV	
At base V122	0.8 mV	
	R163 Min	R163 Max
At Collector V122	5.5	6.5 mV
	0	4 mV
At base V114	3 mV	
At Collector V114	45 mV	
At base V116	35 mV	
At Collector V116	2.1 V	
At base V118	2.0 V	
At emitter V118	1.0 V	

FM1675 VHF RADIOTELEPHONE EQUIPMENT

TRANSMITTER VOLTAGE ANALYSIS

1. INSTRUMENTS USED

For the DC Voltage Analysis

Philips Multimeter type P817.00 (40,000 ohm/V) is used on appropriate ranges.

For the AC Voltage Analysis (Audio levels)

Philips GM 6012 Millivoltmeter (Input from GM 2308 Audio Generator or similar).

2. DC VOLTAGE ANALYSIS (Input at Battery plug 12.0V DC Switch ON)

Voltages taken with respect to chassis. (including audio pre-amp, crystal oscillator, and phase modulator transistorised cards).

Audio Modulator Card

		Emitter	Base	Collector
V201	OC75 preamp	3.3	3.8	6.0
V202	OC75 differentiator	2.1	2.3	5.1
V203	OC75 integrator	1.3	1.5	4.0

Crystal Oscillator Card

		Emitter	Base	Collector
V204	AF115 oscillator	1.5	1.1	9.8
V205	AF115 phase modulator	2.8	3.0	9.6

Electron Tubed Section of Transmitter

		Cathode	Screen		Anode
V206A	½12AT7 Tripler	1.4V			300V
V206B	½12AT7 Tripler	1.5V			300V
V207	QQE02/5 (Doubler	0	53V	(6)	280V
	(Doubler			(8)	255V
V208	QQE03/20 Power Amp.		240V		Do not measure

Measure anode supply voltage at junction L212/C262 - 560 Volts at 30 watts Power output.

Power Supply Voltages

From 500V nominal outlet	-	560V DC
From 250V nominal outlet	-	280V DC
From 30V nominal outlet	-	-30V DC

At junction of R249 (2.7K) and C269 (70μF), supply voltage to cards - 9.6 volts.

When crystal switching, this resistor R249 is reduced and -12 volts is supplied to cards.

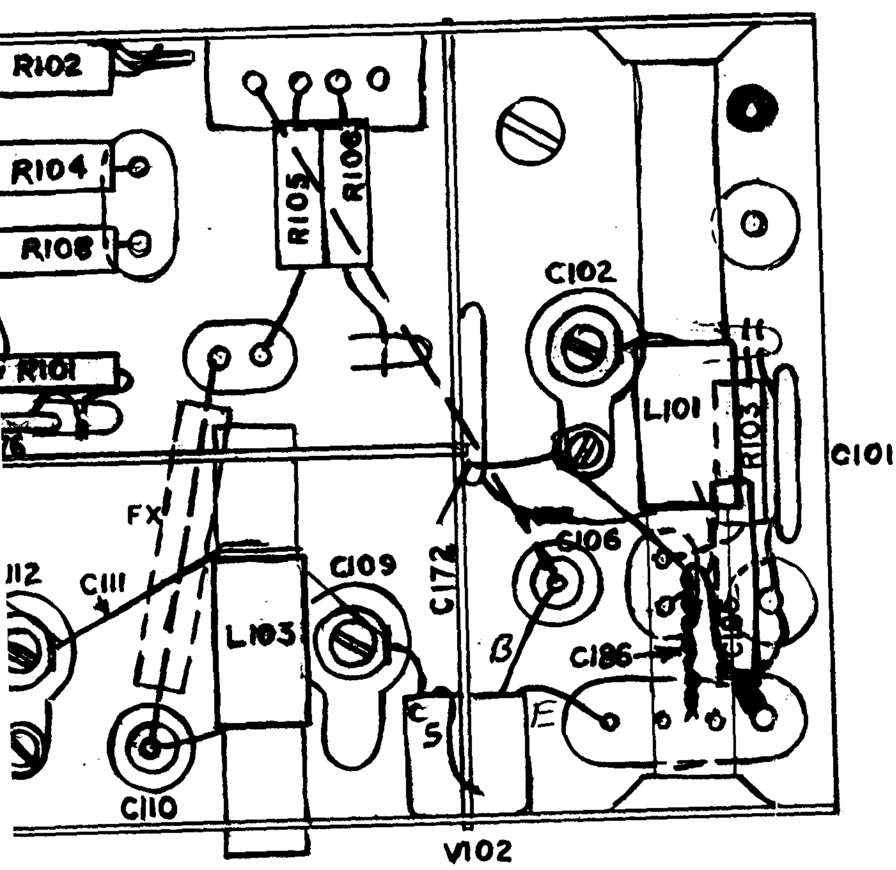
3. AC VOLTAGE ANALYSIS

Input from GM 2308 at microphone plug contacts 4 and 3 - 50 mV.

Audio Modulator Card

		Emitter	Base	Collector
V201	CC75 preamp.	33mV	50mV	1.6V
V202	CC75 differentiator	45mV	100mV	2.4V
V203	CC75 integrator	0.8mV	3.8mV	400mV

At tap of pot. R215 when set at 17 Kc/s deviation limit, approximately 90 mV (also at C268).



5 C186 REPOSITIONED SP1991
4 C185, C186 ADDED. L101 WAS T106 SP1954
3 C184 ADDED SP1952
2 C107 DELETED SP1949
1 C176 ADDED SP1923

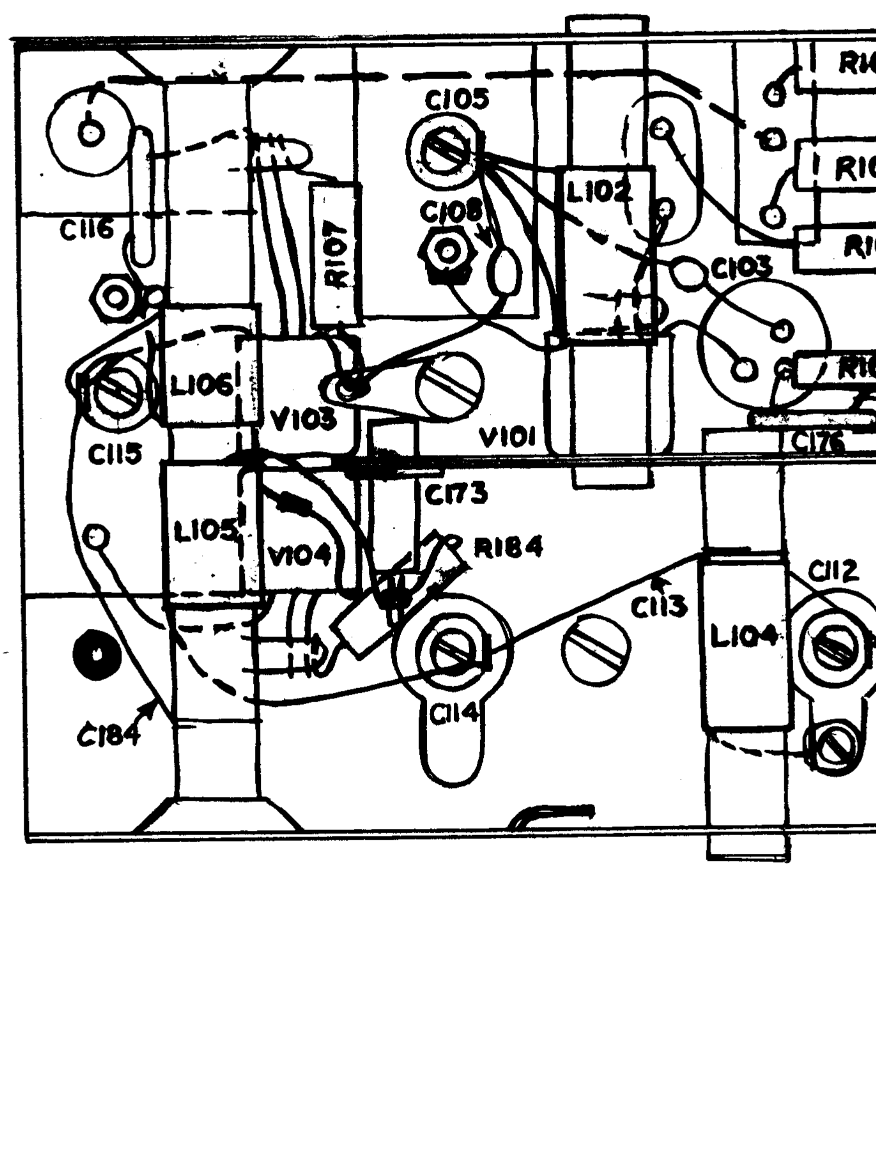
TYPE 1675
R.F. UNIT
COMPONENT LAYOUT
CR904 225.5

SPB 4716

DRAWN: A.T.
APPROVED:

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED.

FIRST AN



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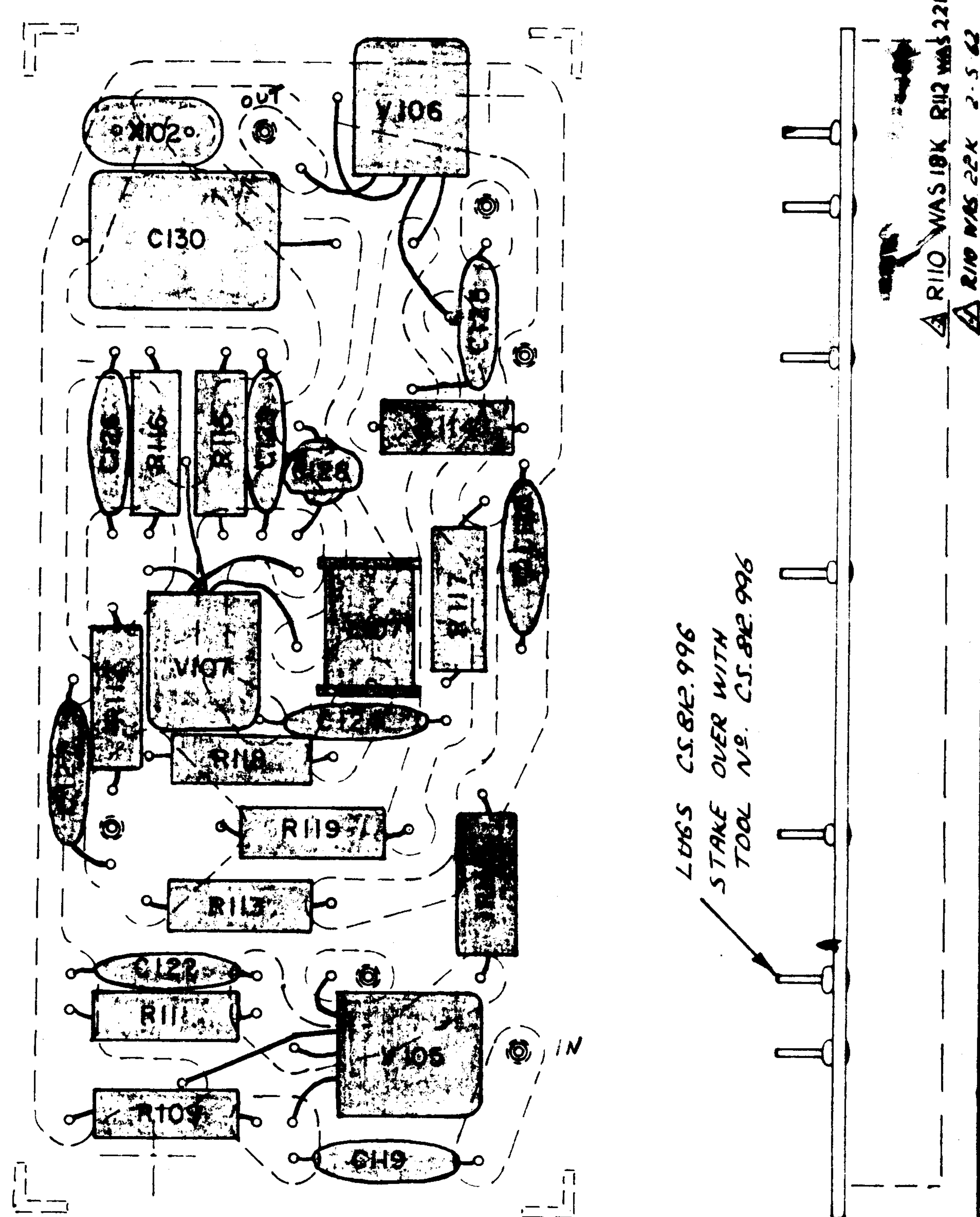


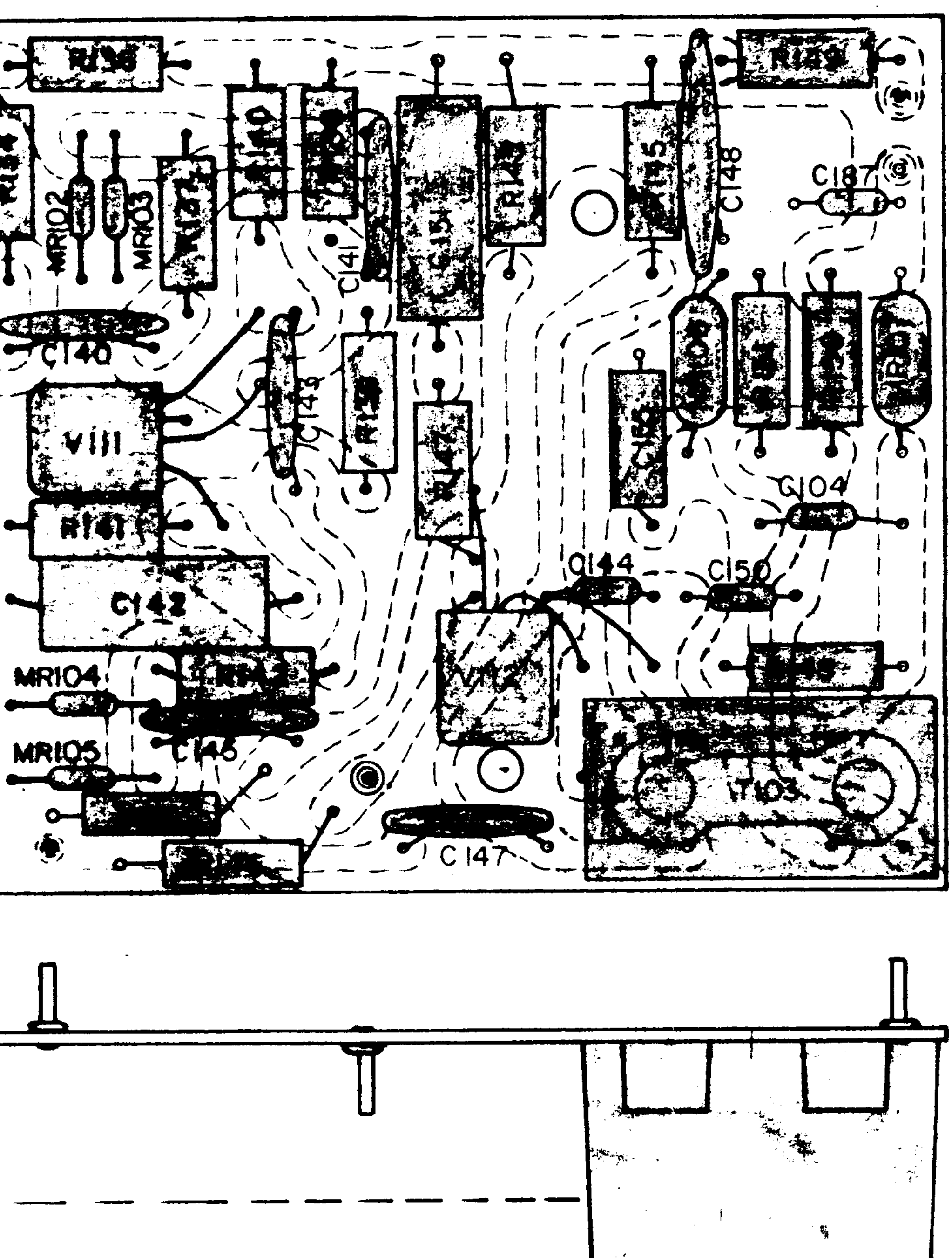
NOTE: R109 MUST BE POSITIONED SO THAT A 6BA SCREW WILL PASS THROUGH THE MOUNTING HOLE.

PRINTED CIRCUIT
CS.812.579 TA79

TYPE 1675
1st. I.F. AMPLIFIER
COMPONENT CARD CR904·157·2

DRAWN: B.N. APPROVED: SPA10252

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED

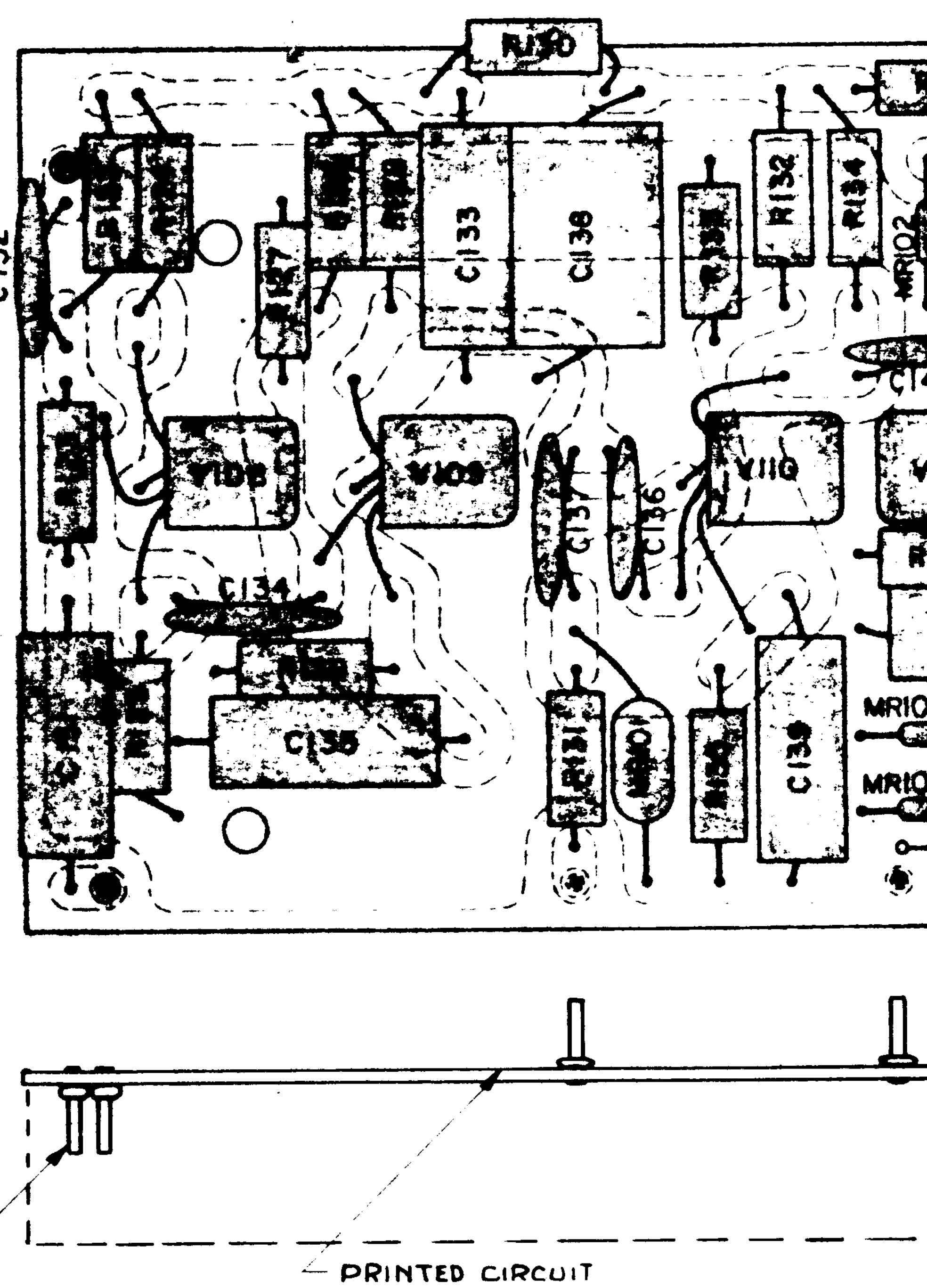


5 REVISED 10·9·62 SP 2064
4 REVISED 26·6·62 SP2039
3 REVISED T103 SP 1934
2 R126 CORRECTED SP1919
SP1903 27·7·61
1 COMPONENT No. CORRECTED

TYPE 1675.
2nd. I.F. AMPLIFIER
COMPONENT CARD CR 904·186·5

DRAWN: E.D.E. APPROVED: **SPB 4635**

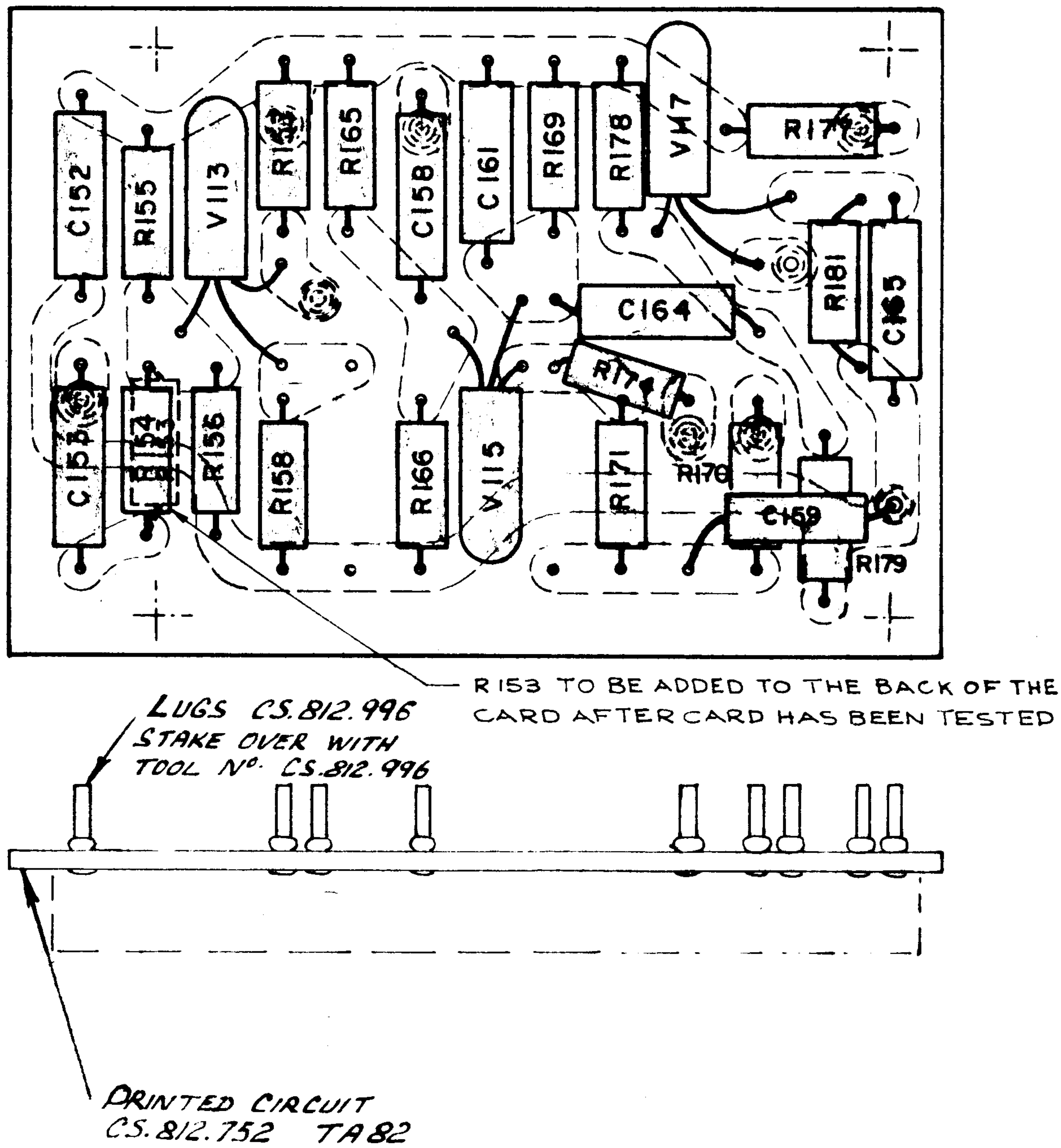
TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED



— PRINTED CIRCUIT
CS 812 582.3 TB 49.

— LUGS CS 812 996
STAKE OVER WITH
TOOL No. CS 812 996.

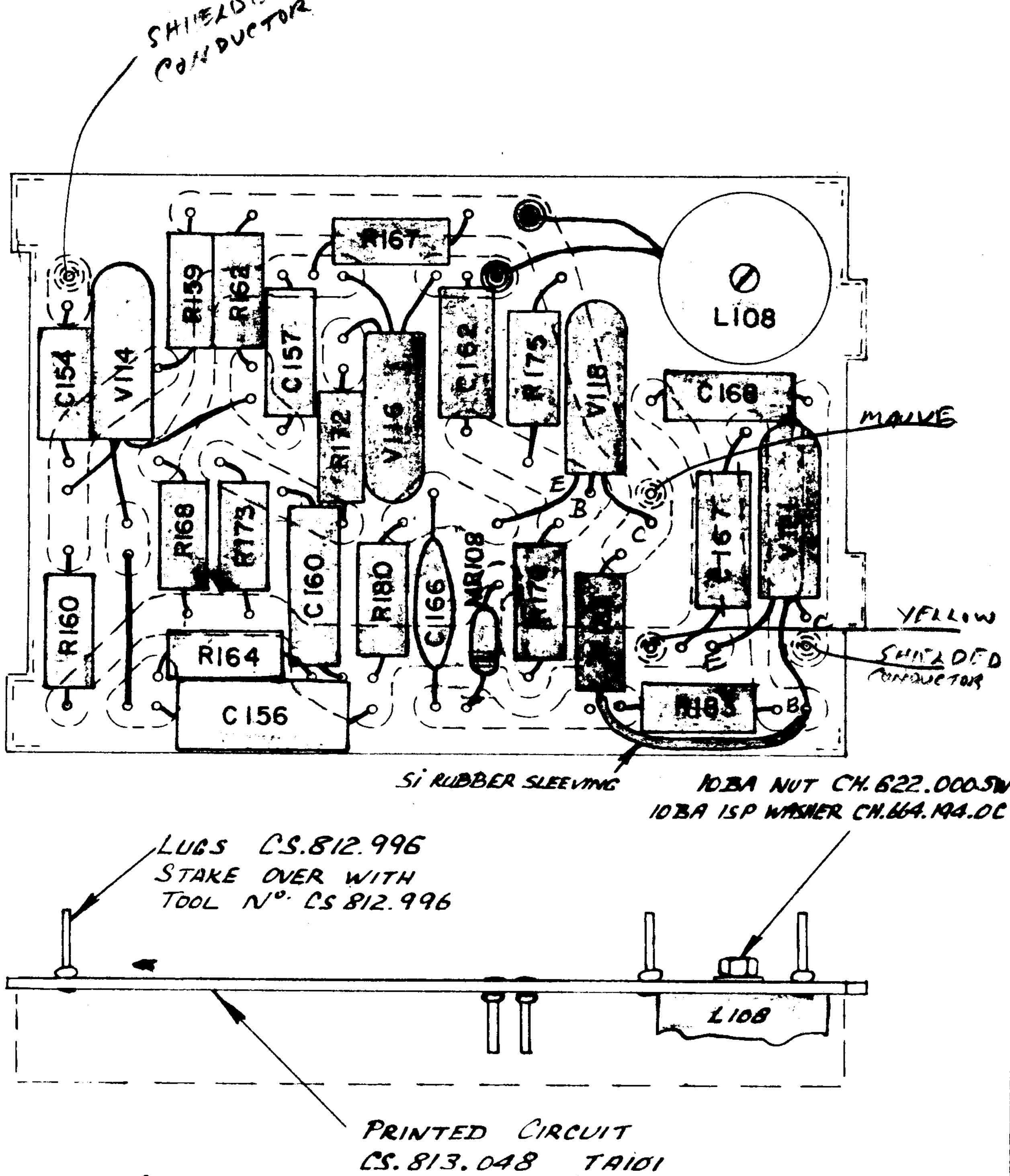
.6 R153 ADDED 14·11·62 SP2089
.5 CODE No RAISED 26·10·62 SP2085
.4 CODE No RAISED 2·10·62 SP2064 KH
.3 C155 DELETED 7·5·62
.2 C158 CHANGED FROM 1-4 TO 25 uf 1·5·62
.1 REVISED: SP1949



TYPE 1675
AUDIO
COMPONENT CARD CR 904·177·6

DRAWN: E.D.E. APPROVED: **SPA 10 136**

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED



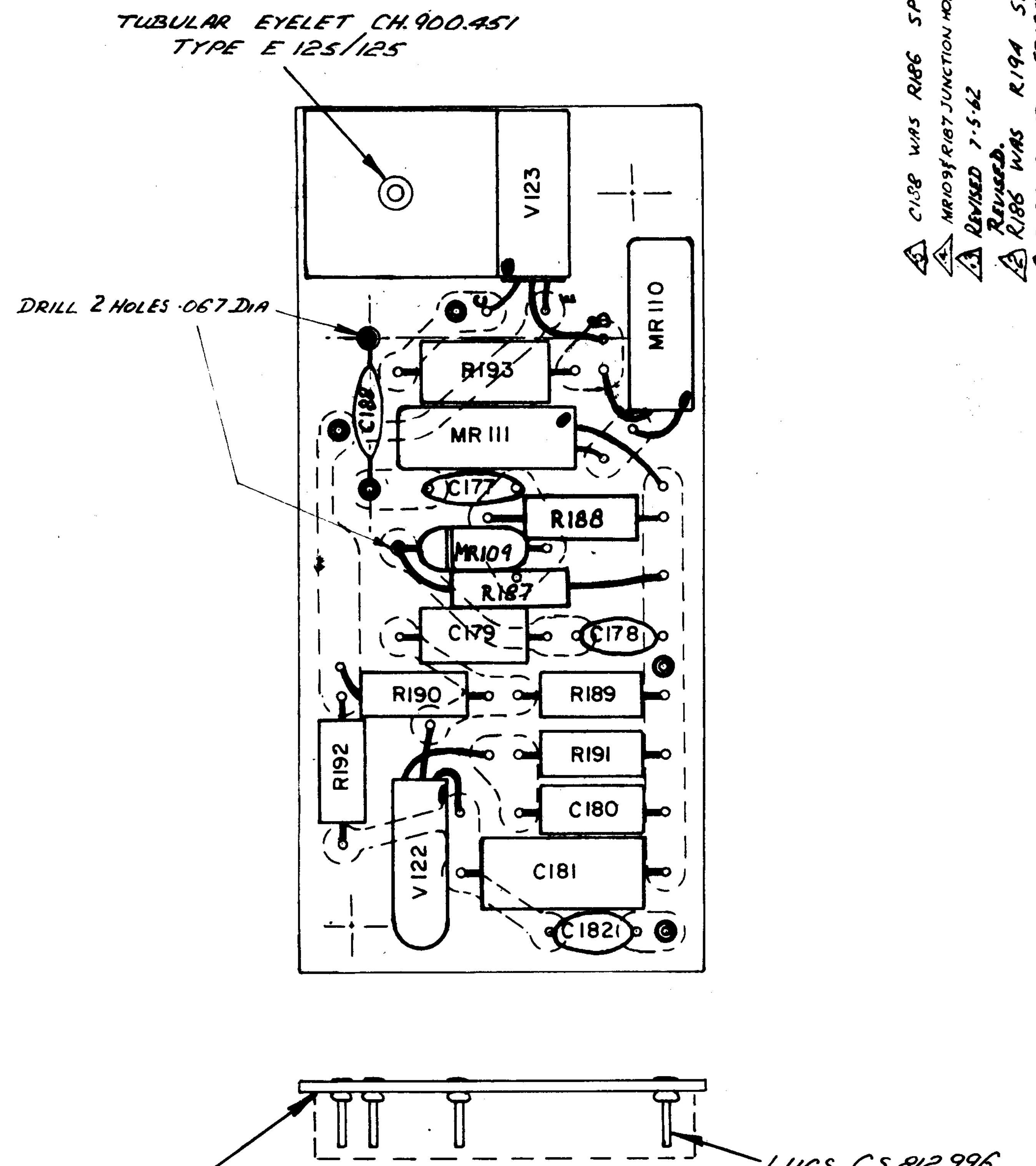
C166 WAS 6.4uF SP2120
REVISED SP1949
CODE RAISED ARM 20-7-62 SP2047
COMPONENT No's CORRECTED SP1803 27-2-61

TYPE 1675
SQUELCH UNIT
COMPONENT CARD CR.904.226.4

DRAWN: B.N. APPROVED: SPA10259

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED

5 C188 WAS R186 SP2120
4 MR109 & R187 JUNCTION HOLE ENLARGED SP2064
3 REVISED 7·5·62
2 REVISED. R186 WAS R194 SP1987
1 R194 ADDED SP1949

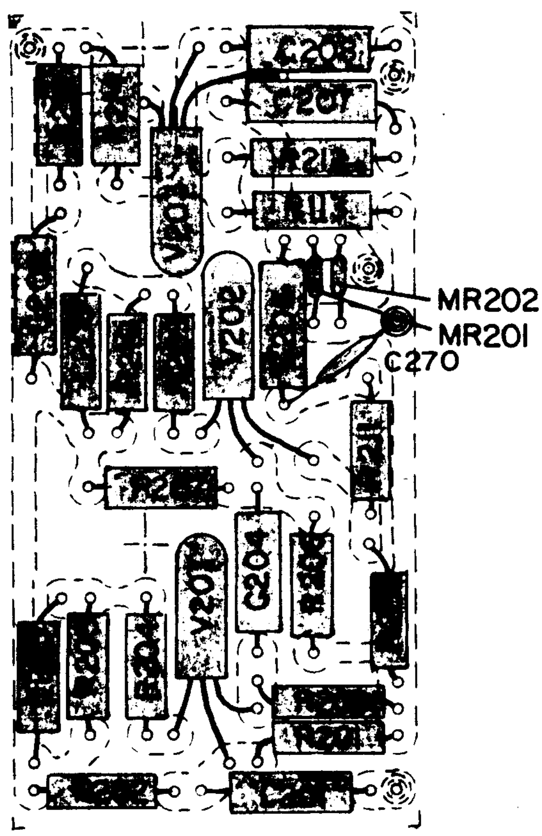


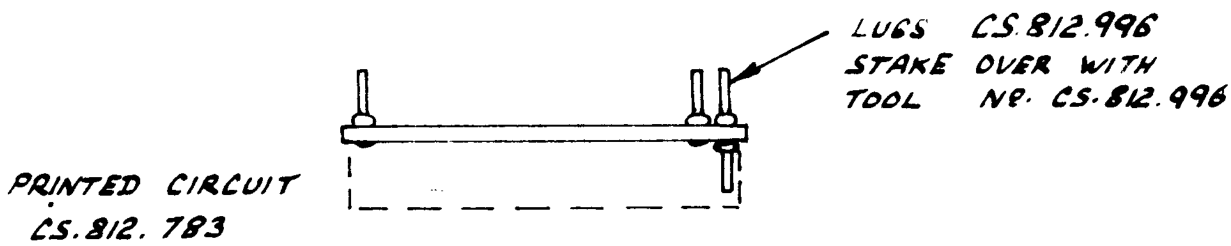
TYPE 1675
VOLTAGE REGULATOR & SQUELCH DETECTOR
COMPONENT CARD CR.904.299.5

DRAWN : B.N. APPROVED : SPA 10362

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED

3 C206 & C207 WERE DISCS. 7.5.63.
4 CAPACITOR C270 ADDED. SP2014
5 PIN CHANGED TO OPP. SIDE CARD



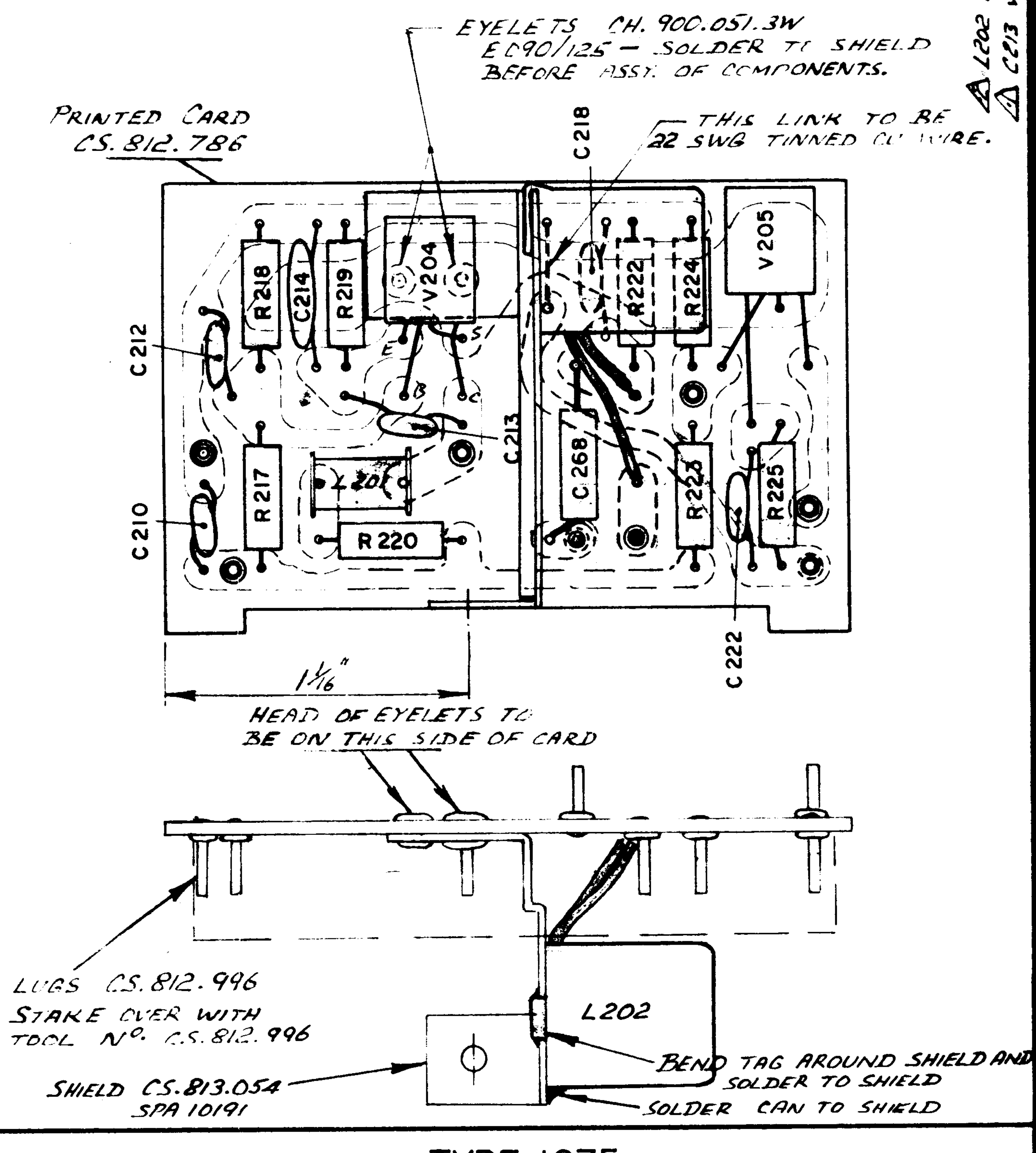


TYPE 1675
MOD. AMP.
COMPONENT CARD CR904.180.3

DRAWN: B.N. APPROVED: SPA10139

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED

△ L202 REPOSITIONED SPA52
△ C213 WAS 10 pF SP1919



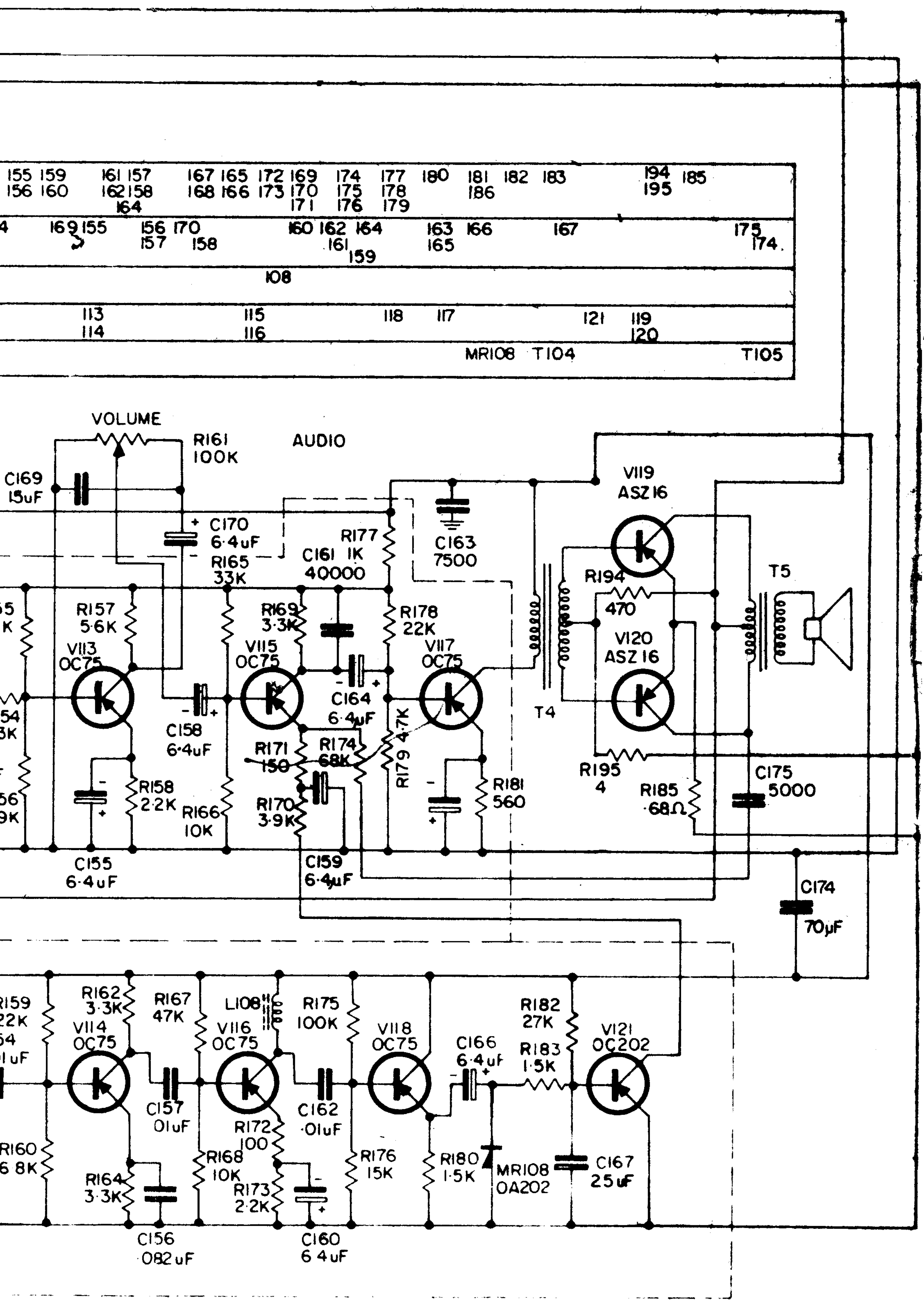
TYPE 1675

X-TAL OSCILLATOR & MODULATOR

COMPONENT CARD CR 904·179·2

DRAWN: E.D.E. APPROVED: JW SPA10138

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED



F.M. 1675A/25
TRANSMITTER / RECEIVER
CIRCUIT DIAGRAM
12V OPERATION

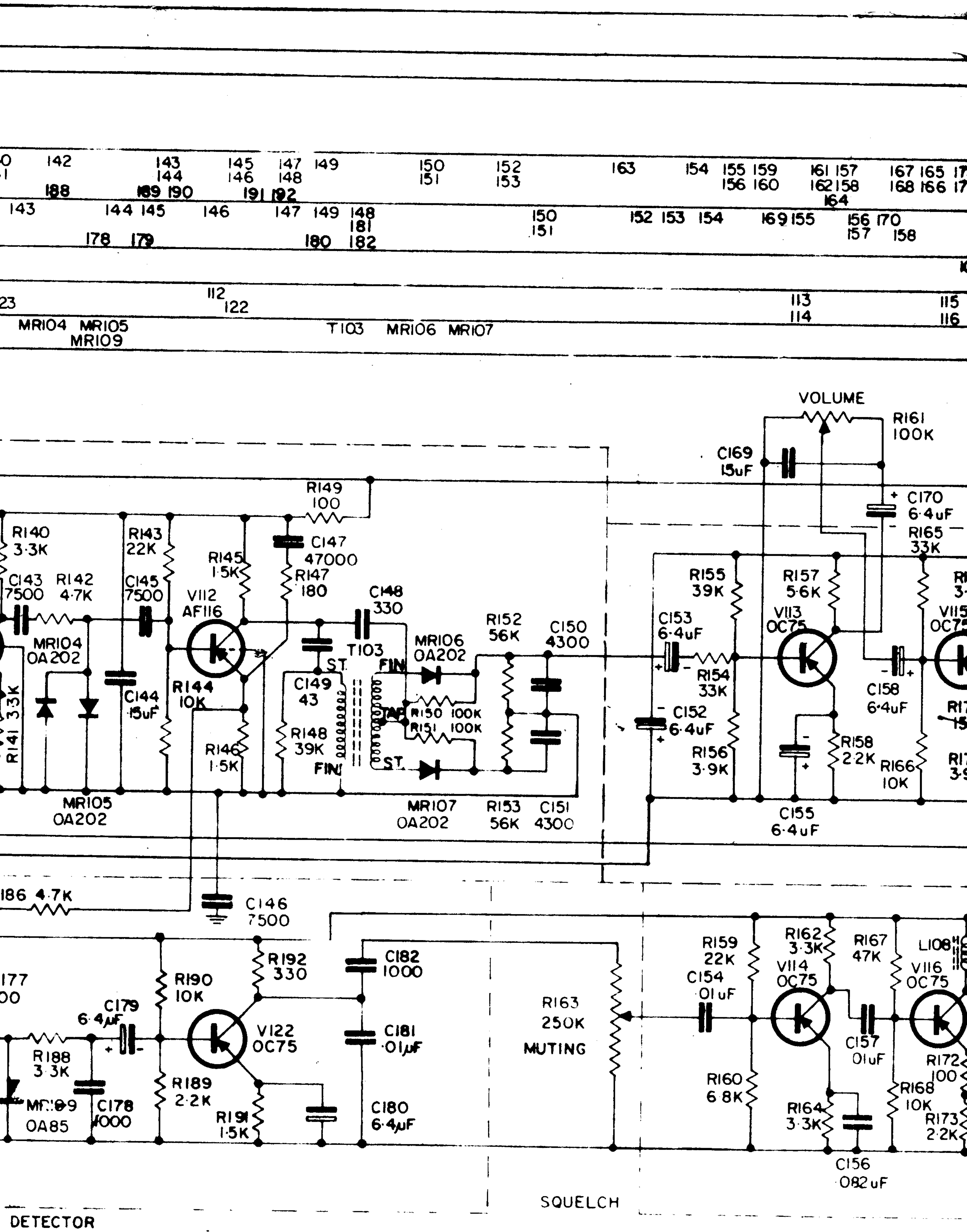
HANDBOOK MASTER
SERIAL Nos

DRAWN AT APPROVED

TELECOMMUNICATION CO...

ARM

SEE DRG Nº SPC1895
SEE DRG. Nº. SPC1896



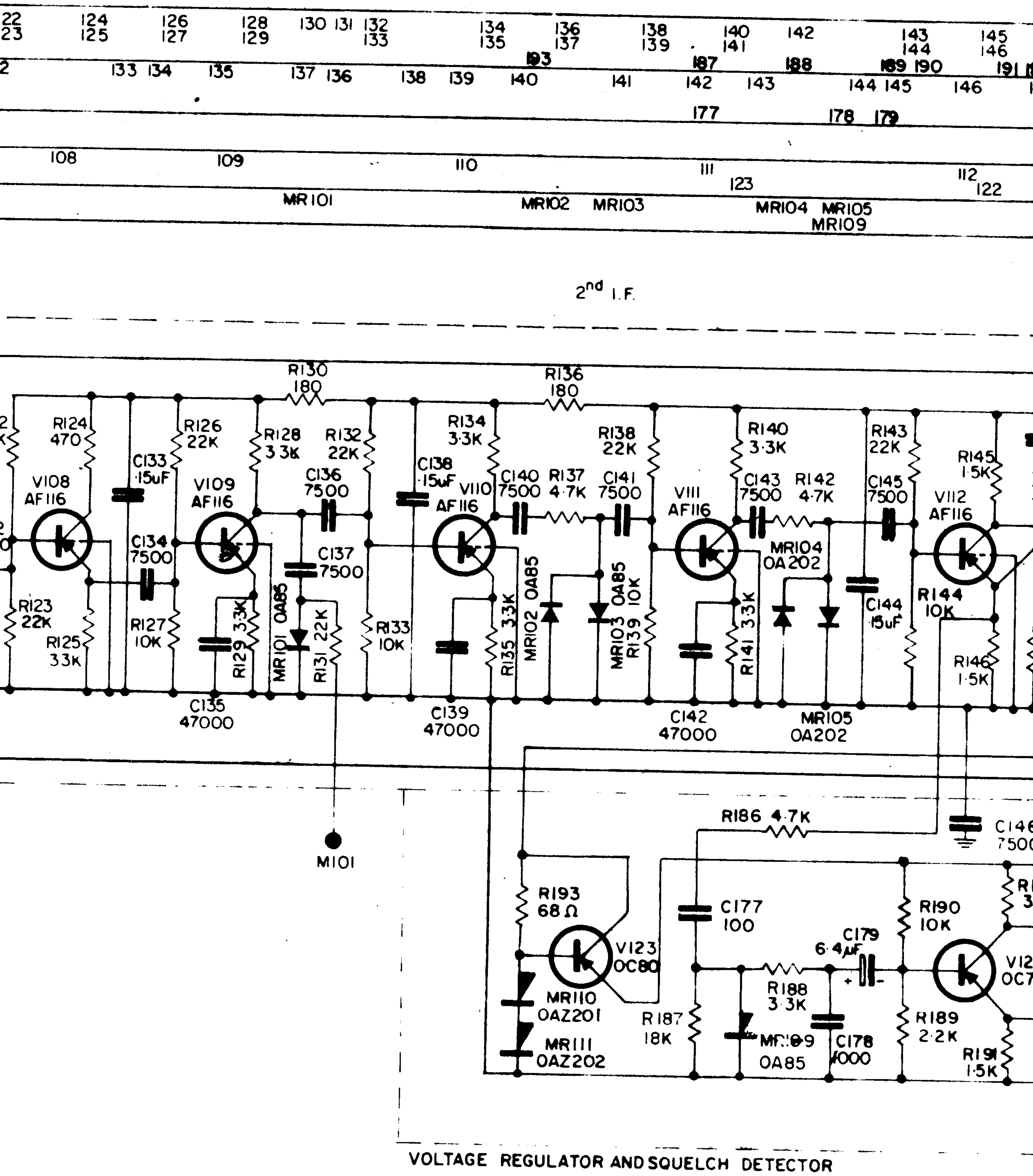
...TER CZ320.484·1 CIRCUIT DIAGRAM SPB4511
...LTER CZ320.510 CIRCUIT DIAGRAM SPB4722

ISSUE 10 AS AT 2-5-62 ARM

DRAWN

TELEC...

NOTE WIRING DETAILS FOR {6V OPERATION SEE DRG. Nº SPC1895
24V OPERATION SEE DRG. Nº. SPC1896}

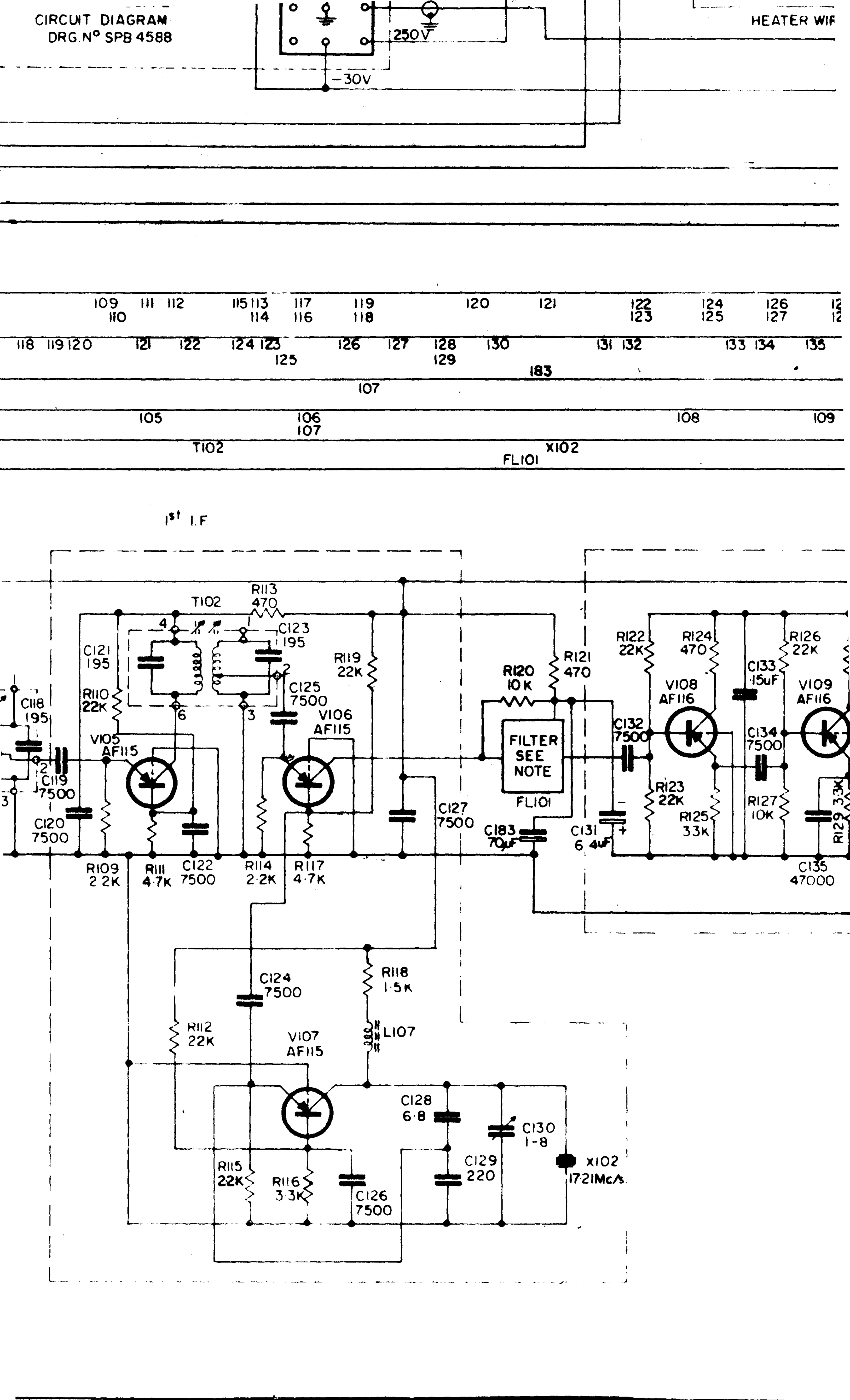


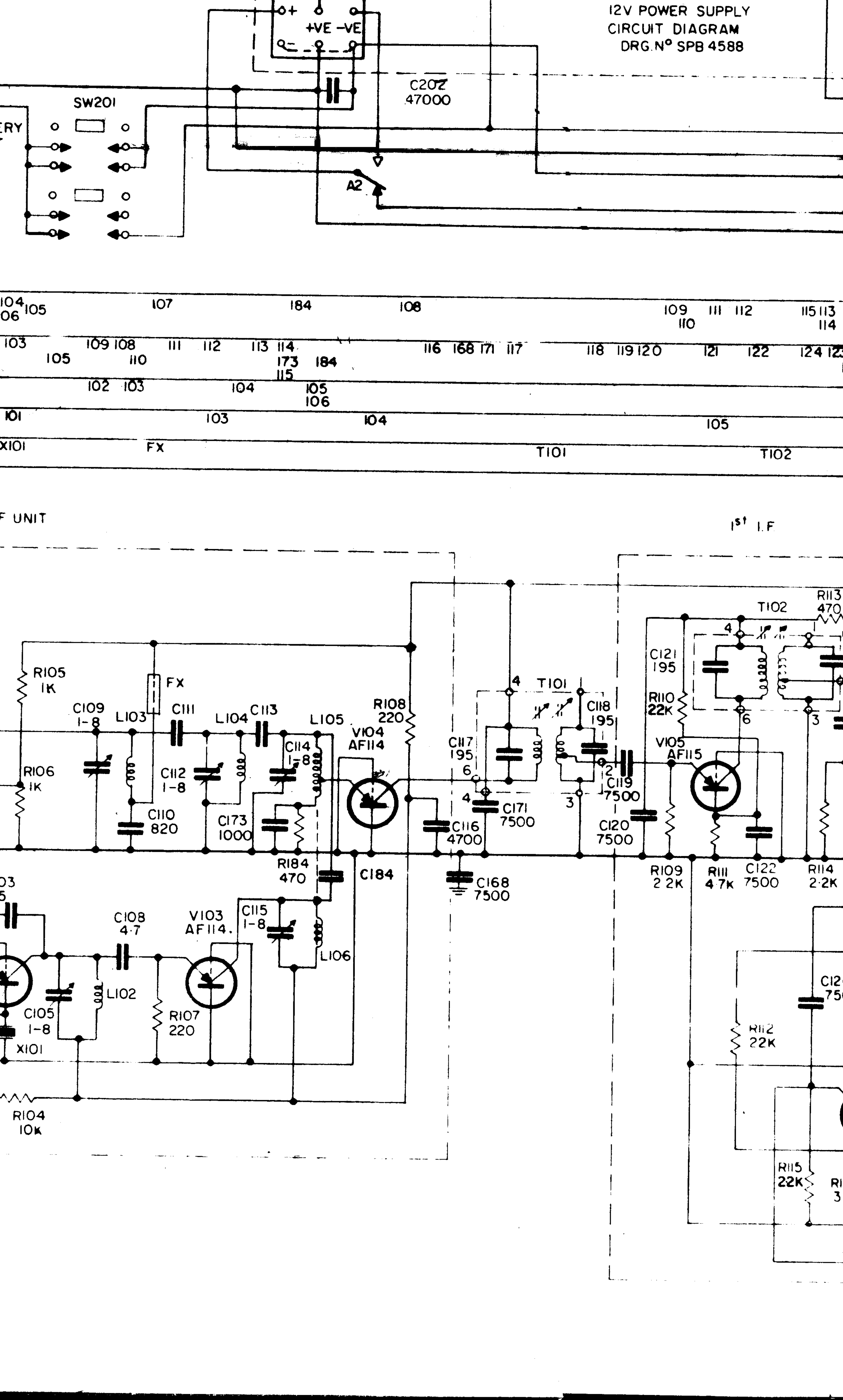
NOTE:

FOR 60Kc/s CHANNEL SPACING USE FILTER CZ320.484·1 CIRCUIT DIAGR

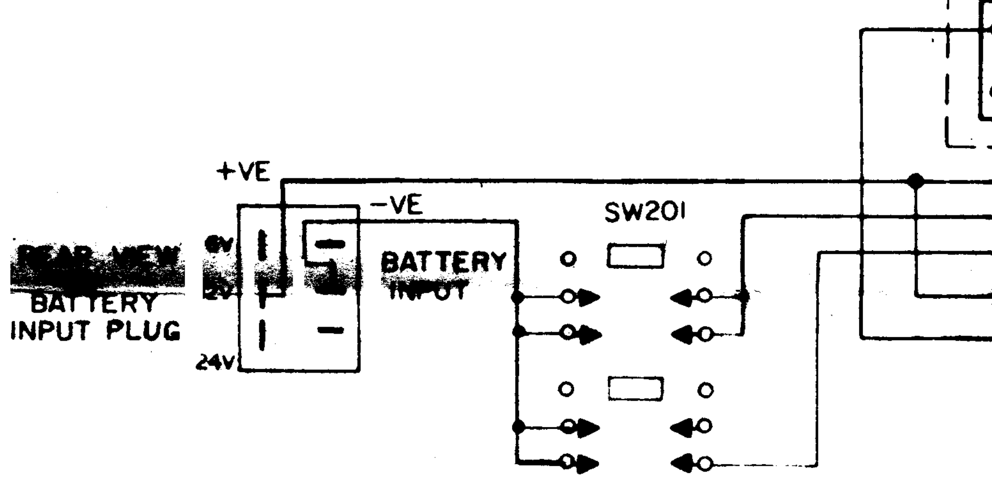
FOR 30Kc/s CHANNEL SPACING USE FILTER CZ320.510 CIRCUIT DIAGR

CIRCUIT DIAGRAM
DRG. N° SPB 4588



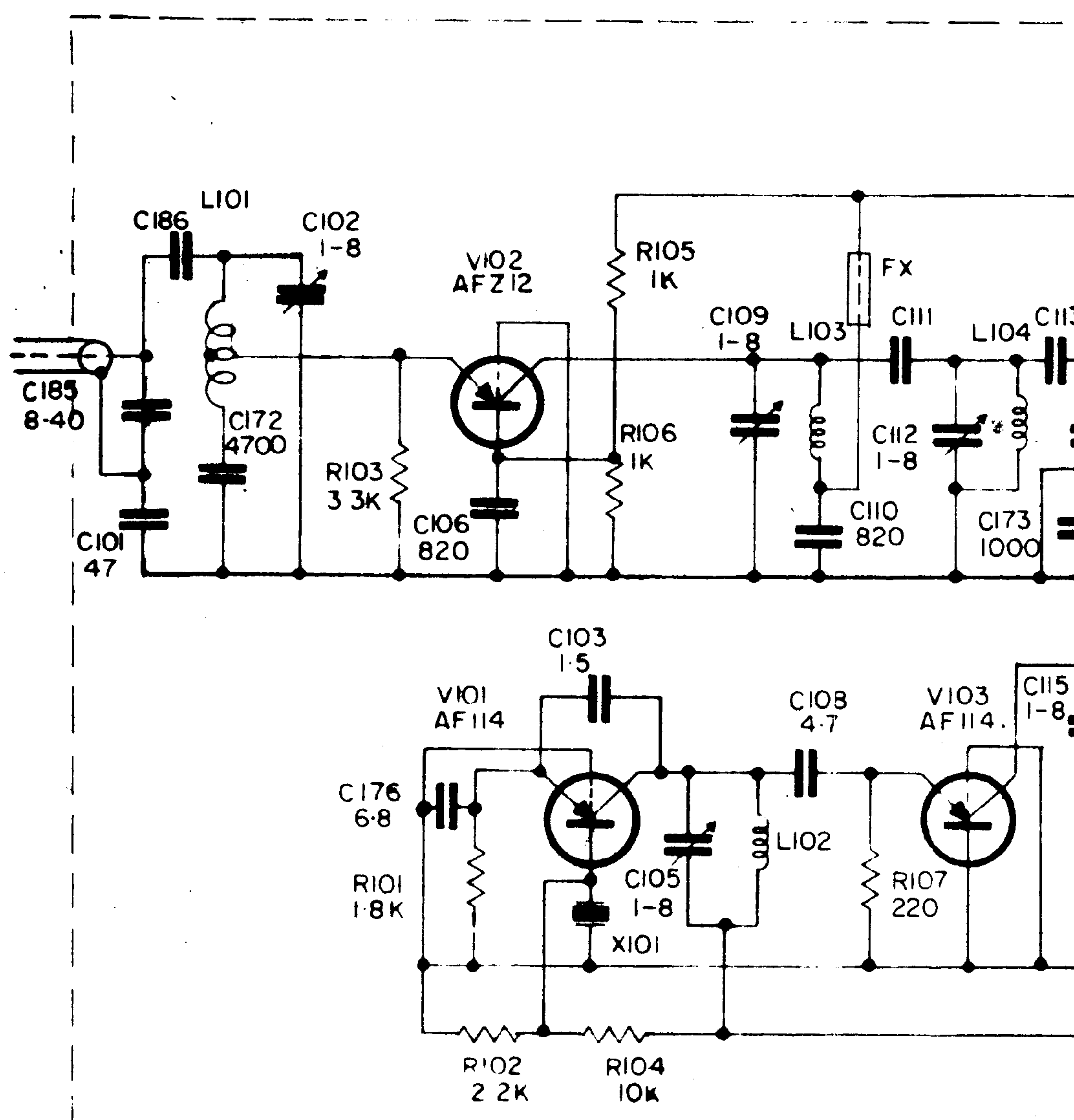


12V POWER SUPPLY
CIRCUIT DIAGRAM
DRG.Nº SPB 4588
+VE -VE
C202
47000
SW201
A2
F UNIT
1st I.F
R105
1K
R106
1K
C109
1-8
L103
FX
C111
L104
C113
L105
C114
1-8
C112
1-8
C110
820
C173
1000
R184
470
C184
V104
AF114
R108
220
C116
4700
C168
7500
C117
195
T101
C118
195
C171
7500
C119
7500
C120
7500
C121
195
R110
22K
V105
AF115
T102
R113
470
R109
2.2K
R111
4.7K
C122
7500
R114
2.2K
R112
22K
R115
22K
C108
4.7
V103
AF114.
C115
1-8
L106
C105
1-8
L102
R107
220
X101
R104
10K
T101
T102

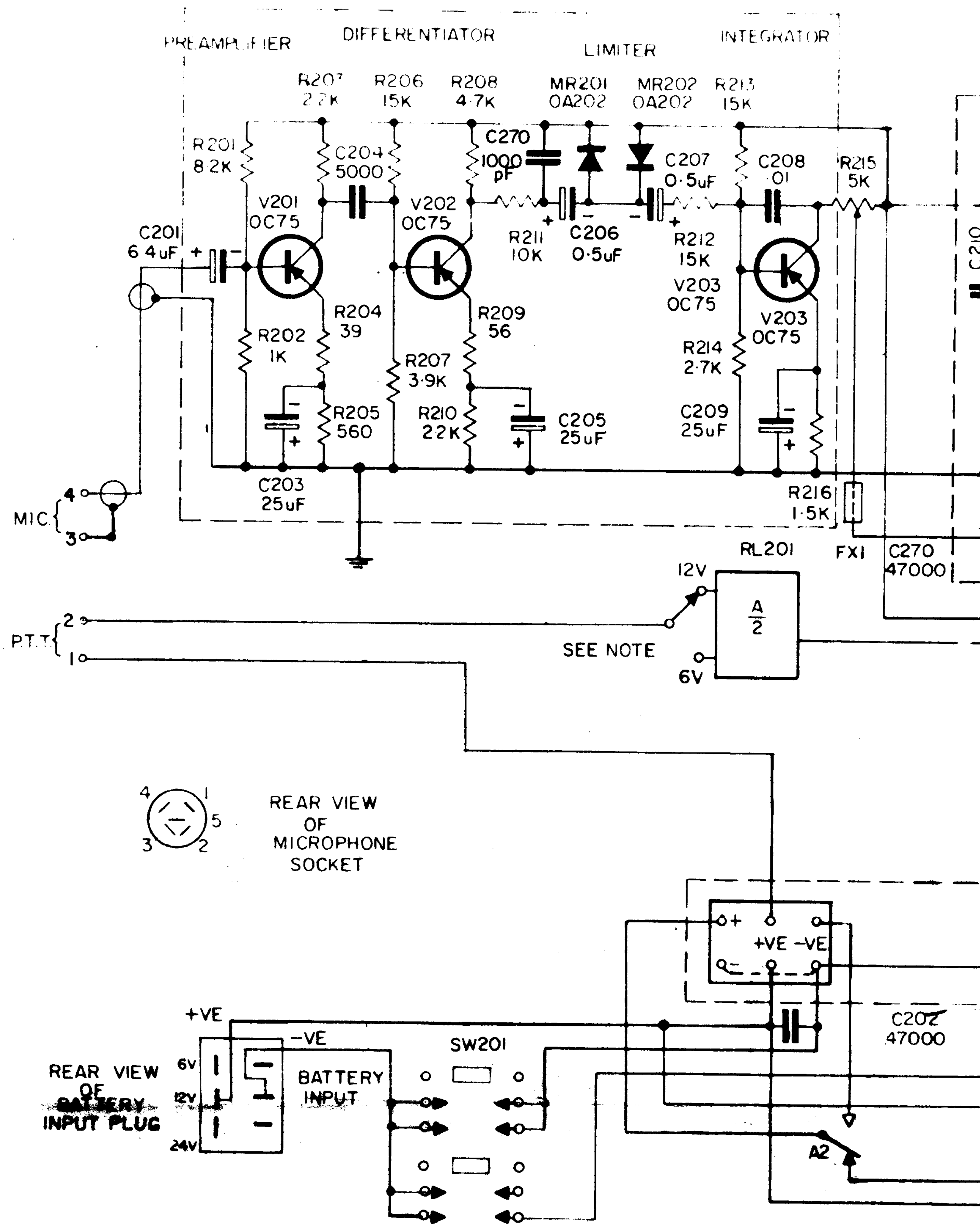


R	101 102 104 106 105 107
C	101 185 172 186 102 176 106 103 105 109 108 110 111 112 113
L	101 102 103 104
V	102 101 103
MISC.	X101 FX

RF UNIT

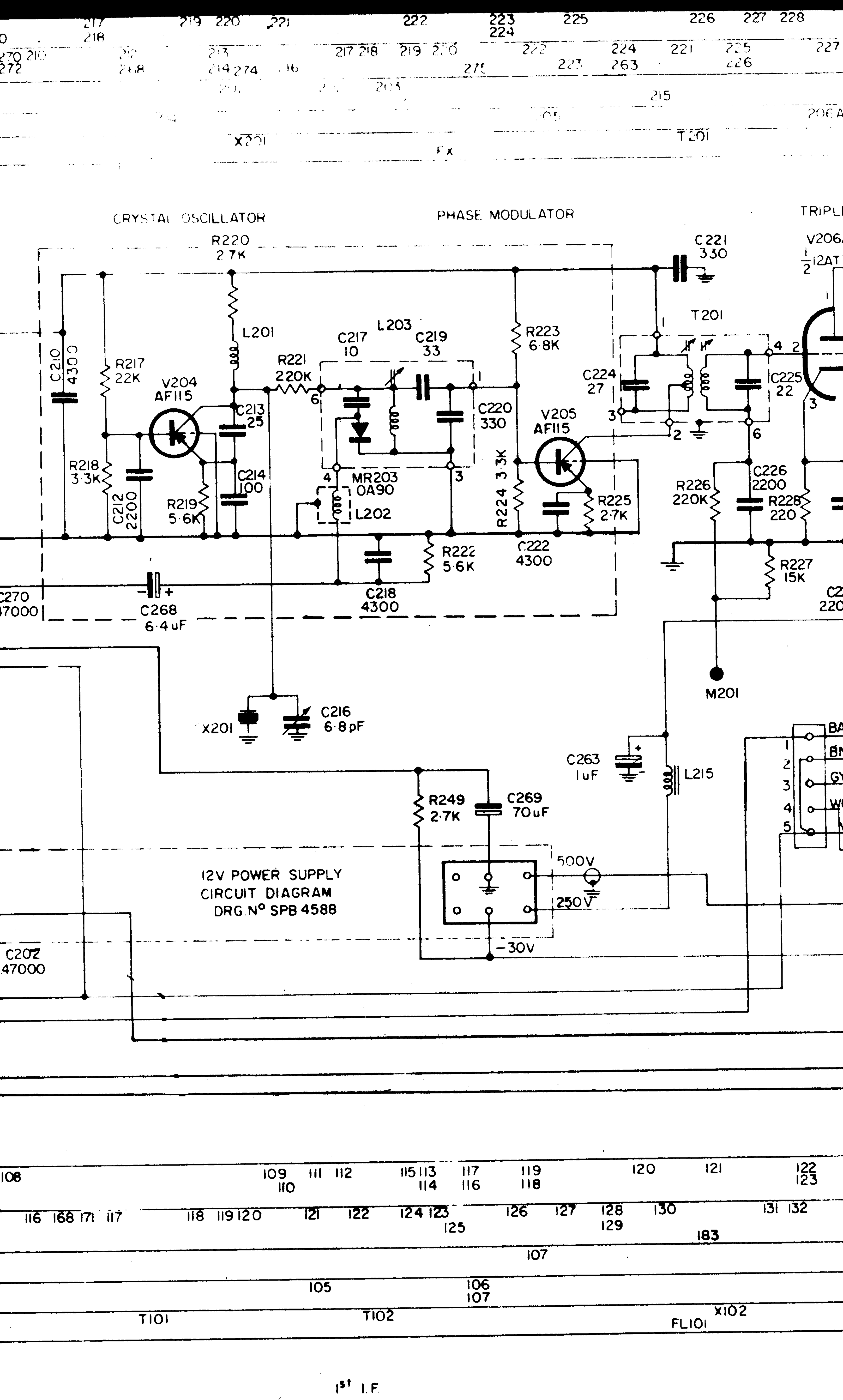


R	201 202 203 205 204 206 207 208 210 209 211 212 213 214 215 216 249 250
C	20 203 273 204 267 205 270 206 207 208 209 202 269 270 271 272 210
L	
V	201 202 203
MISC.	SW201 MR201 MR202 RL201 A2 FX

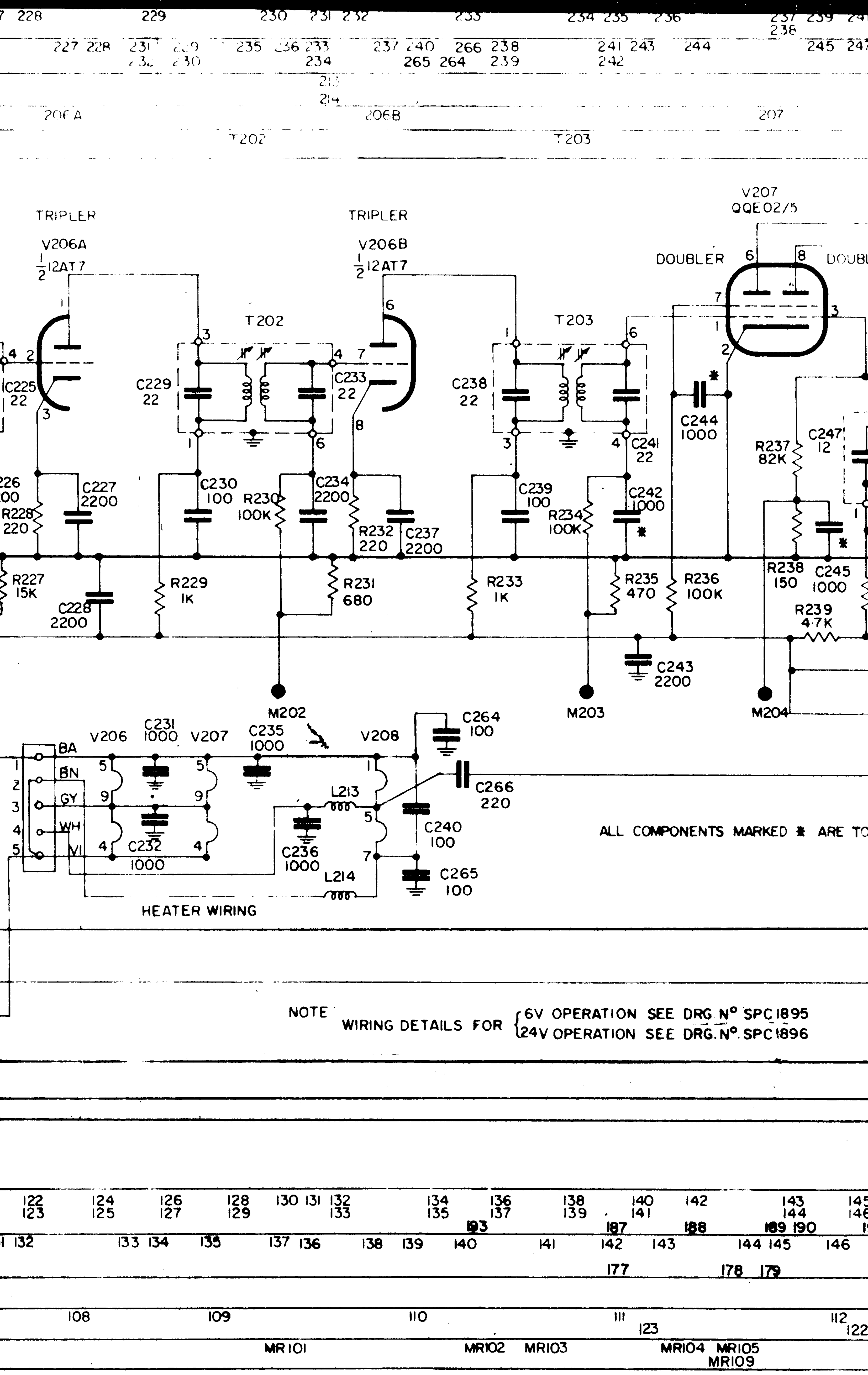


R	101 102 104 106 105 107 184 108
C	101 185 172 186 102 176 106 103 105 109 108 110 111 112 113 114 173 115 184 116 168
L	101 102 103 104 105 106
V	102 101 103 104
MISC	X101 FX

RF UNIT

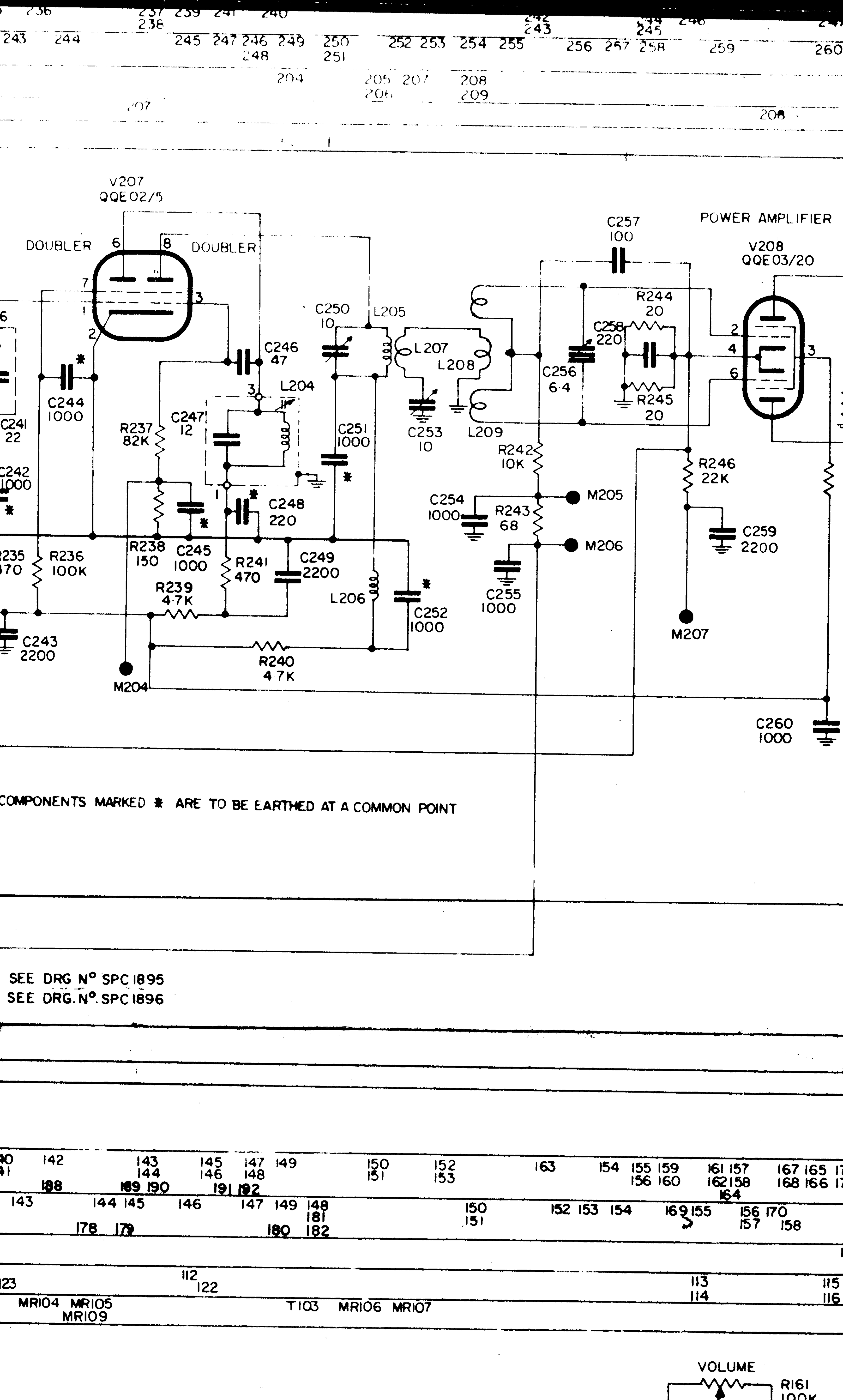


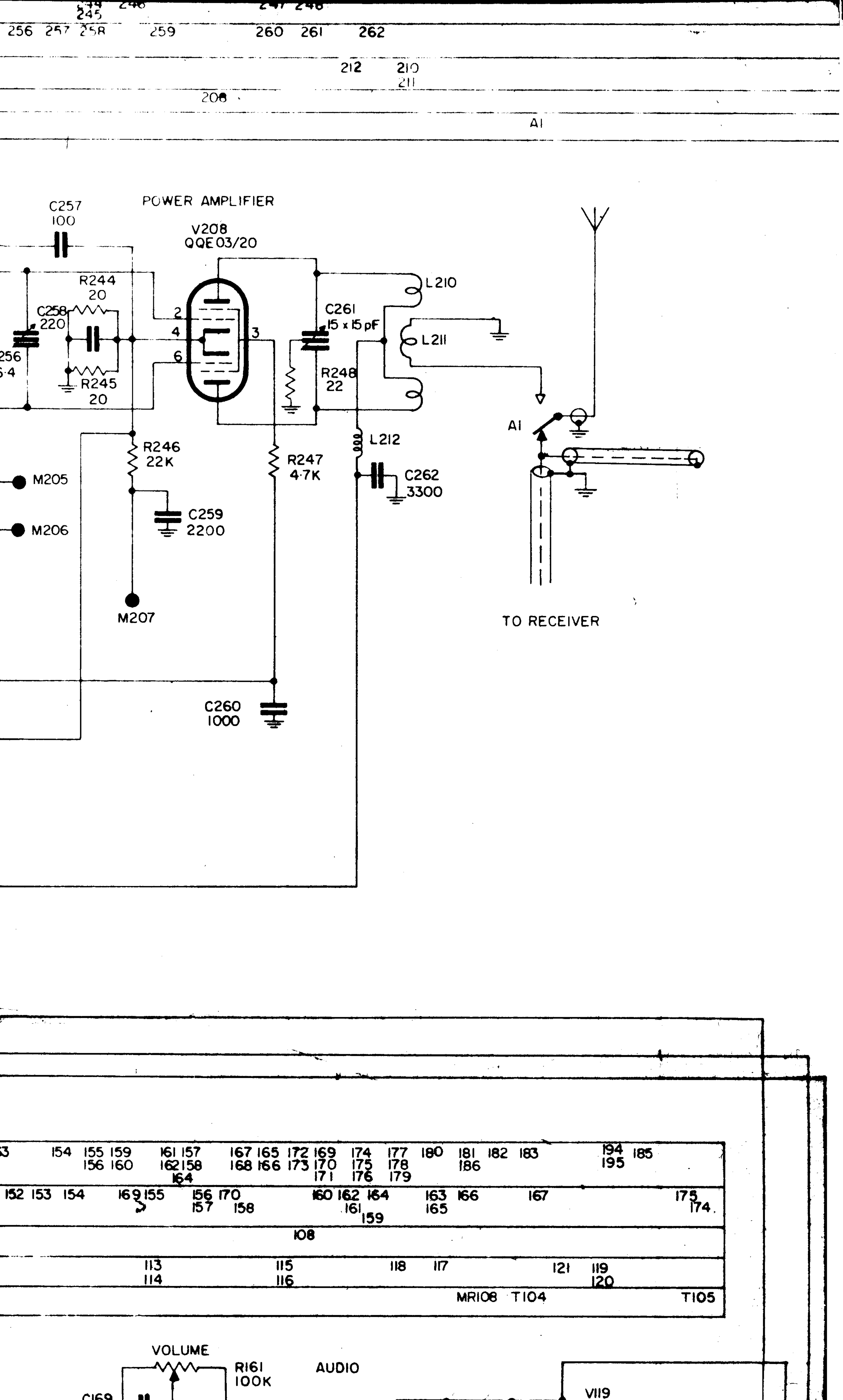
CRYSTAL OSCILLATOR
PHASE MODULATOR
TRIPL
R220 2.7K
C221 330
V206
½ 12AT
C210 4300
R217 22K
V204 AF115
L201
R221 220K
C217 10
L203
C219 33
R223 6.8K
T201
C224 27
C225 22
C213 25
C220 330
V205 AF115
R218 3.3K
C212 2200
C214 100
R219 5.6K
MR203 0A90
L202
R224 3.3K
R225 2.7K
R226 220K
C226 2200
R228 220
C222 4300
R222 5.6K
C218 4300
R227 15K
C270 47000
C268 6.4uF
M201
X201
C216 6.8pF
C263 1uF
L215
R249 2.7K
C269 70uF
12V POWER SUPPLY
CIRCUIT DIAGRAM
DRG.Nº SPB 4588
500V
250V
−30V
C202 47000
T101
T102
FL101
X102
1st I.F.



TRIPLER
V206A
1/2 12AT7
T202
C225 22
R226
R228 220
C227 2200
R227 15K
C228 2200
C229 22
C230 100
R229 1K
R230 100K
C233 22
C234 2200
R231 680
M202
TRIPLER
V206B
1/2 12AT7
R232 220
C237 2200
T203
C238 22
C239 100
R233 1K
R234 100K
C241 22
C242 1000
R235 470
M203
C243 2200
V207
QQE02/5
DOUBLER
C244 1000
R236 100K
R237 82K
C247 12
R238 150
C245 1000
R239 4·7K
M204
V206
C231 1000
V207
C235 1000
V208
C264 100
BA
BN
GY
WH
VI
C232 1000
L213
C236 1000
C240 100
C266 220
L214
C265 100
HEATER WIRING
ALL COMPONENTS MARKED * ARE TO
NOTE
WIRING DETAILS FOR 6V OPERATION SEE DRG Nº SPC 1895
24V OPERATION SEE DRG. Nº. SPC 1896
MR101
MR102
MR103
MR104
MR105
MR109

2^{nd} I.F.


V207
QQE02/5
DOUBLER
DOUBLER
POWER AMPLIFIER
V208
QQE03/20
C257
100
R244
20
C258
220
C256
6·4
R245
20
C250
10
L205
L207
L208
C246
47
L204
C247
12
R237
82K
C244
1000
C241
22
C242
1000
C251
1000
C253
10
L209
R242
10K
R246
22K
C254
1000
R243
68
M205
M206
C248
220
R238
150
C245
1000
R241
470
C249
2200
R235
470
R236
100K
R239
4·7K
L206
C252
1000
C255
1000
C259
2200
M207
C243
2200
R240
4·7K
M204
C260
1000
COMPONENTS MARKED * ARE TO BE EARTHED AT A COMMON POINT
SEE DRG Nº SPC 1895
SEE DRG. Nº. SPC 1896
MR104 MR105
MR109
T103 MR106 MR107
VOLUME
R161
100K



256 257 258 259 260 261 262
212 210 211
208
A1
POWER AMPLIFIER
C257 100
V208 QQE03/20
R244 20
C258 220
R245 20
C261 15 x 15 pF
R248 22
L210
L211
L212
C262 3300
A1
TO RECEIVER
R246 22K
R247 4.7K
M205
M206
C259 2200
M207
C260 1000
MR108 T104
T105
VOLUME
R161 100K
AUDIO
V119

GENERAL ASSEMBLY (MOBILE UNIT)

CODE NO.	POS.	DESCRIPTION	NO. USED	SUPPLIER	REMARKS
CH525.042.0C		Hammer Drive Screw	2		
CR901.415		Whip Antenna Assy (1649/06A)	1	TCA	SPB 2763
CR901.774		Knob Assembly	1	TCA	SPA 6797; SPL.SP.607
CR901.982		Knob Assembly	1	TCA	SPA 6797; SPL.SP.607
CR901.983		Knob Assembly	1	TCA	SPA 6797; SPL.SP.607
CR903.051		Knob Assembly	1	TCA	SPA 6797; SPL.SP.607
CR904.203.2		Transistor Mtg. Bracket Assy.	1	TCA	SPA 10163
CR904.204.5		Transistor Mtg. Bracket	1	TCA	SPA 10164
CR904.227.1		Mounting Tray Assy.	1	TCA	SPB 4713
CR904.377		Battery Connector Assy.	1	TCA	SPA 10263; SPL.SP.1087 (CR904.381 - 6V operation CR904.382 - 24V operation)
CR904.229		Microphone and Plug Assy.	1	TCA	SPA 10264; SPL.SP.1088
CR904.448		Chassis Assy.	1	TCA	SPD 1213
CS803.979.0H		Microphone Hang Up Bracket	1	TCA	SPA 5660
CS812.772.6		Case Casting	1	TCA	SPD 1128
CS812.774.2		Front Panel	1	TCA	SPC 1769
CS812.797		Locking Knob	1		SPC 3398
CS812.798		Collet	1		SPC 3399
CS812.799.1		Thumb Screw	4		SPZ 3400
CS812.831.3		Moulding	1		SPC 1807
CS812.997.1		Plug and Socket Mounting Bracket	1		SPA 10145
CS813.028.5		Bracket	1		SPA 10164
CS813.001		Insulation Strip	1		SPZ 3500
CS813.049		Chassis	1		SPD 1151
CS813.089		Knob Insert	1		SPA 6789
CS813.095		Locking Screw	1		SPZ 3538
CS813.113		Clamp	1		SPZ 3551
CS813.122		Plate	1		SPZ 3556
CS813.125		Insulation Strip	1		SPZ 3558

GEN..AL ASSEMBLY (MOBILE UNIT)

CODE NO.	POS.	DESCRIPTION	NO. USED	SUPPLIER	REMARKS
CS813.174		Label	1		TZ167
CS813.243.1		Clamp	1		SPA 10353
CS813.363		Coaxial Lead			
CZ201;214.1		Switch Assembly	1		SPL.SP.1080; SPB 4631
CZ281.223		Fuse $1\frac{1}{4}$" x $\frac{1}{4}$"	1		12 amps working
CZ365.434		Battery Plug (Male)	1		
CZ369.909		Coaxial Socket	1	Belling Lee	Type L604S
CZ370.513		Microphone Socket	1	McMurdo	Type 5QMS/C
CZ371.119		Clip Type Fuse Holder	1	Zephyr	Cat. No. 107
B.104.AF/2.6X5		Metric Screw	2		Required to Mount Haller Relay
NE 50962		Haller Relay	1		
56201		Transistor Mtg. Hardware	2	Philips	

FM1675 A. C AND D RECEIVER

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS			
CZ096.538	C101	47 pf Ceramic Disc	1	Ducon	CDS Style C 5%
C.004.AA/6E	C102	7 pf Ceramic Trimmer	1	Philips	
CZ096.005	C103	1.5 pf ± .5 pf Ceramic Bead	1	Ducon	Type CPT NPO A & C Bands only
CZ096.338	C103	.68 pf Ceramic Disc	1	Ducon	CDS P100 Style F D Band only
CZ096.534.AA	C104	33 pf Ceramic Disc	1	Ducon	Serial 1961 to 2999 Style A N750
C.004.AA/6E	C105	7 pf Ceramic Trimmer	1	Philips	
C309.BB/R820E	C106	820 pf Ceramic Lead Through	1	Philips	
B1.514.99	C107	500 pf Condenser	1	Ducon	Serial 1961 to 2999 Styroseal 100VW
CZ096.218	C108	4.7 pf ± .5 pf Ceramic Bead	1	Ducon	Type CBT NPO A & C Bands only
C004.AA/6E	C109	7 pf Ceramic Trimmer	1	Philips	
C309.BB/R820E	C110	820 pf Ceramic Lead Through	1	Philips	
	C111	Wire Condenser	1	TCA	
C004.AA/6E	C112	7 pf Ceramic Trimmer	1	Philips	
	C113	Wire Condenser	1	TCA	
C004.AA/6E	C114	7 pf Ceramic Trimmer	1	Philips	
C004.AA/6E	C115	7 pf Ceramic Trimmer	1	Philips	A & C Bands only
CZ097.507.AA	C115	7500 pf Ceramic GMV	1	Ducon	CDS Style C Curve Z D Band only
CZ097.546	C116	4700 pf Ceramic GMV	1	Ducon	Disc CDS Style B Curve Z
B1.664.27	C117	195 pf Ceramic Tubular	1		70 V.A.C. ± 2%
B1.664.27	C118	195 pf Ceramic Tubular	1		70 V.A.C. ± 2%
CZ097.507.AA	C119	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z
CZ097.507.AA	C120	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z
B1.664.27	C121	195 pf Ceramic Tubular	1		70 V.A.C. ± 2%
CZ097.507.AA	C122	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z
B1.664.27	C123	195 pf Ceramic Tubular	1		70 V.A.C. ± 2%
CZ097.507.AA	C124	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z
CZ097.507.AA	C125	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z
CZ097.507.AA	C126	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z
CZ097.507.AA	C127	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z
CZ096.206.AA	C128	6.8 pf Ceramic Disc	1	Ducon	CDS Style A P33 10%
CZ097.019	C129	220 pf Ceramic Disc	1	Ducon	CDS Style C N1500 10%
CZ107.522	C130	1.5 - 10 pf Air Trimmer	1	Wingrove and Rogers	Type 32 - 01

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS cont.			
C.426AM/F6.4	C131	6.4 uf Electrolytic	1	Philips	Insulated.
CA097.507.AA	C132	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z CDS
C296.AA/A150K	C133	.15 uf Polyester	1	Philips	125V
CZ097.507.AA	C134	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z CDS
C296.AA/A47K	C135	47000 pf Polyester	1	Philips	125V
CZ097.507.AA	C136	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z CDS
CZ097.507.AA	C137	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z CDS
C296.AA/A150K	C138	.15 uf Polyester	1	Philips	125V
C296.AA/A47K	C139	47000 pf Polyester	1	Philips	125V
CZ097.507.AA	C140	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z CDS
CZ097.507.AA	C141	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z CDS
C296.AA/A47K	C142	47000 pf Polyester	1	Philips	125V
CZ097.507.AA	C143	7500 pf Ceramic Disc	1	Ducon	GMV Style C Curve Z CDS
C296.AA/A150K	C144	.15 uf Polyester	1	Philips	125V (Serial 1000 to 1960)
CZ096.533.AA	C144	39 pf Ceramic Disc	1	Ducon	from Serial 1961 to 2999 Style A (N750)
CZ097.507.AA	C145	7500 pf Ceramic Disc	1	Ducon	GMV CDS Style C Curve Z
CZ097.507.AA	C146	7500 pf Ceramic Disc	1	Ducon	GMV CDS Style C Curve Z
C296.AA/A47K	C147	47000 pf Polyester	1	Philips	125V (Serial 1000 to 1960)
CZ097.907	C147	.1 uf Disc (Ceramic)	1	Ducon	from Serial 1961 to 2999 (Red Cap CDR 25 VW
CZ097.138	C148	330 pf Ceramic Disc	1	Ducon	CDS Style A Curve Y 20% (Serial 1000 to 1961)
CZ097.909	C148	.22 uf Disc	1	Ducon	Serial 1961 to 2999. Red Cap CDR 25VW
CZ096.538	C149	47 pf Ceramic Disc	1	Ducon	CDS Style C, 5% (Serial 1000 -1961)
B1.514.99	C149	500 pf Condenser	1	Ducon	from Serial 1961 to 2999 Styroseal 100 VW
CZ097.545	C150	4300 pf Ceramic Disc	1	Ducon	CDS Style B Curve Z (Serial 1000 to 1960)
CZ097.115.AA	C150	.001 uf Ceramic Disc	1	Ducon	Serial 1961 to 2999 StyleA Curve Y 10%
CZ097.545	C151	4300 pf Ceramic Disc	1	Ducon	CDS Style B Curve Z (Serial 1000 to 1960)
C296.AA/A47K	C151	.047 uf Polyester	1	Philips	Serial 1961 onwards. 125V
C426.AM/F6.4	C152	6.4 uf Electrolytic	1	Philips	25 VW, Insulated.
C426.AM/F6.4	C153	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
CZ074.400.EH	C154	0.01 uf Paper	1	AEE	200V 20% Type W99

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS Cont.			
C426.AM/F6.4	C155	6.4 uf Electrolytic	1	Philips	25VW Insulated.
CZ088.003.1	C155	270 pf	1	Ducon	Serial 1961 to 2999 Styroseal DFB10 (125 VW)
C296.AA/A82K	C156	.082 uf Polyester	1	Philips	125 V
CZ074.400.EH	C157	.01 uf Paper	1	AEE	200V 20% Type W99
C426.AM/F6.4	C158	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
C426.AM/F6.4	C159	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
C426.AM/F6.4	C160	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
CZ076.003	C161	.04 uf Paper Tubular	1	AEE	200V W99 Size A 10%
CZ074.400.EH	C162	.01 uf Paper Tubular	1	AEE	200V Type W99 20%
CZ097.507.AA	C163	7500 pf Ceramic Disc	1	Ducon	GMV CDS Style C Curve Z
C426.AM/F6.4	C164	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
C426.AM/F6.4	C165	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
C426.AM/F6.4	C166	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
C425.AL/F25	C167	25 uf Electrolytic	1	Ducon	25 VW
CZ097.507.AA	C168	7500 pf Ceramic Disc	1	Ducon	GMV CDS Style C Curve Z
C296.AA/A150K	C169	.15 uf Polyester	1	Philips	125V
C426.AM/F6.4	C170	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
CZ097.507.AA	C171	7500 pf Ceramic Disc	1	Ducon	GMV CDS Style C Curve Z
CZ097.546	C172	4700 pf Ceramic Disc	1	Ducon	GMV CDS Style B Curve Z
CZ097.135	C173	1000 pf Feed through Capacitor	1	Ducon	Type CAC 100 A & D Bands only
CZ100.139	C174	70 uf Electrolytic	1	Ducon	15 VW Type ES 1507
CZ074.403.EH	C175	.005 uf Capacitor	1	AEE	Type W99 Size A 20%
CZ096.206	C176	6.8 pf Ceramic Disc	1	Ducon	CDS Style A P33 ± 10% A & D Bands only
CZ096.500.D	C177	100 pf Ceramic Disc	1	Ducon	DS NK N750 Style C.
CZ097.020	C178	1000 pf Ceramic Disc	1	Ducon	GMV Style A
C426.AM/F6.4	C179	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
C426.AM/F6.4	C180	6.4 uf Electrolytic	1	Philips	25 VW Insulated.
CZ074.400.EH	C181	0.01 uf Tubular Paper	1	AEE	Type W99 Size A 20%
CZ097.020	C182	1000 pf Ceramic Disc	1	Ducon	GMV Style A Serial 1000 to 1961
CZ074.400.EH	C182	.01 uf Tubular Paper	1	AEE	Serial 1961 to 2999 (Type W99 Size A 20%)
CZ100.139	C183	70 uf Electrolytic	1	Ducon	15 VW Type ES 1507
	C184	Wire Conde er	1	TCA	
CZ115.701	C185	8-40 pf Wire Wound Ceramic Trimmer	1	Ducon	Type CWP A Band only
CZ097.545	C185	4300 pf Ceramic Disc	1	Ducon	GMV CDS Style B Curve Z C Band only

CODE NO.	POS	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS Cont.			
	C186	Wire Condenser	1	TCA	A Band only
CZ097.138	C187	330 pf Ceramic Disc	1	Ducon	from Serial 1961 to 2999 CDS Style A Curve Y 20%
		RESISTORS			
CZ002.723.CC	R101	1.8K ohms ½ watt Carbon	1	Morganite	10%
CZ002.713.CC	R102	2.2K ohms ½ watt Carbon	1	Morganite	10%
CZ002.720.CC	R103	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ002.710	R104	10K ohms ½ watt Carbon	1	IRC/Morganite	10%
CZ001.516.CC	R105	1K ohms ½ watt Carbon	1	Morganite	10% A & D Bands only
CZ001.520.CC	R105	820 ohms ½ watt Carbon	1	Morganite	10% C Band only
CZ001.516.CC	R106	1K ohms ½ watt Carbon	1	Morganite	10%
CZ001.519.CC	R107	220 ohms ½ watt Carbon	1	Morganite	10% A & C Bands only
CZ001.516.CC	R107	1K ohms ½ watt Carbon	1	Morganite	D Band only
CZ001.519.CC	R108	220 ohms ½ watt Carbon	1	Morganite	10%
CZ002.713.CC	R109	2.2K ohms ½ watt Carbon	1	Morganite	10%
CZ003.927	R110	22K ohms ½ watt Carbon	1	IRC/Morganite	10%
CZ002.715.CC	R111	4.7K ohms ½ watt Carbon	1	Morganite	10%
CZ003.927	R112	22K ohms ½ watt Carbon	1	IRC/Morganite	10%
CZ001.521.CC	R113	470 ohms ½ watt Carbon	1	Morganite	10%
CZ002.713.CC	R114	2.2K ohms ½ watt Carbon	1	Morganite	10%
CZ002.713.CC	R115	2.2K ohms ½ watt Carbon	1	Morganite	10%
CZ002.720.CC	R116	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ002.715.CC	R117	4.7K ohms ½ watt Carbon	1	Morganite	10%
CZ002.706.CC	R118	1.5K ohms ½ watt Carbon	1	Morganite	10%
CZ003.927	R119	22K ohms ½ watt Carbon	1	IRC/Morganite	10%
CZ002.710.CC	R120	10K ohms ½ watt Carbon	1	Morganite	10% Type A
CZ001.521.CC	R121	470 ohms ½ watt Carbon	1	Morganite	10% Type A
CZ003.927	R122	22K ohms ½ watt Carbon	1	IRC/Morganite	10%
CZ003.927	R123	22K ohms ½ watt Carbon	1	IRC/Morganite	10%
CZ011.521.CC	R124	470 ohms ½ watt Carbon	1	Morganite	10%
CZ002.720.CC	R125	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ003.927	R126	22K ohms ½ watt Carbon	1	IRC/Morganite	10%
CZ002.710.CC	R127	10K ohms ½ watt Carbon	1	Morganite	10%
CZ002.720.CC	R128	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ002.720.CC	R129	3.3K ohms ½ watt Carbon	1	Morganite	10%

RESISTORS Cont.

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER		REMARKS.
CZ001.518.CC	R130	180 ohms ½ watt Carbon	1	Morganite	10%	
CZ003.927	R131	22K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ003.927	R132	22K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ002.710.CC	R133	10K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.720.CC	R134	3.3K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.720.CC	R135	3.3K ohms ½ watt Carbon	1	Morganite	10%	
CZ001.518.CC	R136	180 ohms ½ watt Carbon	1	Morganite	10%	
CZ002.715.CC	R137	4.7K ohms ½ watt Carbon	1	Morganite	10%	
CZ003.927	R138	22K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ002.710.CC	R139	10K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.720.CC	R140	3.3K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.720.CC	R141	3.3K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.715.CC	R142	4.7K ohms ½ watt Carbon	1	Morganite	10%	
CZ003.927	R143	22K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ002.710.CC	R144	10K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.706.CC	R145	1.5K ohms ½ watt Carbon	1	Morganite	10%	Serial 1000 to 1960
CZ001.518.CC	R145	180 ohms ½ watt Carbon	1	Morganite	10%	Used in Serial 1961 to 2999
CZ002.706.CC	R146	1.5K ohms ½ watt Carbon	1	Morganite	10%	
CZ001.526.CC	R147	330 ohms ½ watt Carbon	1	Morganite	10%	Serial 1000 to 1960
CZ001.518.CC	R147	180 ohms ½ watt Carbon	1	Morganite	10%	Used in Serial 1961 to 2999
CZ003.920	R148	39K ohms ½ watt Carbon	1	IRC/Morganite	10%	Serial 1000 to 1960
CZ002.719.CC	R148	5.6K ohms ½ watt Carbon	1	Morganite	10%	Serial 1961 to 2999
CZ000.306.CC	R149	100 ohms ½ watt Carbon	1	Morganite	10%	
CZ003.910	R150	100K ohms ½ watt Carbon	1	IRC/Morganite	10%	Serial 1000 to 1960
CZ003.928	R150	33K ohms ½ watt Carbon	1	IRC/Morganite	10%	Serial 1961 to 2999
CZ003.910	R151	100K ohms ½ watt Carbon	1	IRC/Morganite	10%	Serial 1000 to 1960
CZ003.928	R151	33K ohms ½ watt Carbon	1	IRC/Morganite	10%	Serial 1961 to 2999
CZ003.922	R152	56K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ003.922	R153	56K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ003.928	R154	33K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ003.920	R155	39K ohms ½ watt Carbon	1	IRC/Morganite	10%	
CZ002.725.CC	R156	3.9K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.719.CC	R157	5.6K ohms ½ watt Carbon	1	Morganite	10%	
CZ002.713.CC	R158	2.2K ohms ½ watt Carbon	1	Morganite	10%	
CZ003.927	R159	22K ohms ½ watt Carbon	1	IRC/Morganite	10%	

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		RESISTORS Cont.			
CZ002.718.CC	R160	6.8K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ034.079	R161	25K ohm Potentiometer	1	Ducon	P.S.U. Curve C, Dims A = $\frac{3}{8}$ B = $\frac{7}{8}$, E = 5/16, F = 7/32.
CZ002.720.CC	R162	3.3K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ034.080	R163	25K ohm Potentiometer	1	Ducon	P.S.U. Curve A, Dims A = $\frac{3}{8}$, B = $\frac{3}{4}$, E = 5/16, F = 7/32.
CZ002.720.CC	R164	3.3K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ003.928	R165	33K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ002.710.CC	R166	10K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ003.908	R167	47K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ002.710.CC	R168	10K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.720.CC	R169	3.3K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.725.CC	R170	3.9K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ001.508.CC	R171	150 ohm $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ000.306.CC	R172	100 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.713.CC	R173	2.2K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ003.921	R174	68K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ003.910	R175	100K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ003.916	R176	15K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ001.516.CC	R177	1K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ003.927	R178	22K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ002.715.CC	R179	4.7K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.706.CC	R180	1.5K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ001.525.CC	R181	560 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ003.917	R182	27K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.706.CC	R183	1.5K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ001.521.CC	R184	470 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ008.539	R185	.68 ohms 2 watts wire wound	1	Ducon	Type 2WL Vitreous Enamelled 10%
CZ002.715.CC	R186	4.7K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ003.930	R187	18K ohms $\frac{1}{2}$ watt Carbon	1	IRC/Morganite	10%
CZ002.720.CC	R188	3.3K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10% Serial 1000 to 1960
CZ003.908	R188	47K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10% From Serial 1961 to 2999
CZ002.713.CC	R189	2.2K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.710.CC	R190	10K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.706.CC	R191	1.5K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		RESISTORS Cont.			
CZ001.519.CC	R192	220 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10% Serial 1000 - 1960
CZ001.525.CC	R192	560 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10% Serial No. 1961 to 2999
CZ000.318.CC	R193	68 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
CZ002.715.CC	R194	4.7K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%
B8.320.01A/4E	R195	4 ohms 1 watt NTC Disc.	1	Philips	10%) Added per C/N SP 1987
CZ001.521.CC	R196	470 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	10%)
		RECEIVER CARD ASSEMBLIES (COMPLETE)			
CR904.225.7		RF Unit			SPB 4701 A Band only
CR904.362.1		RF Unit			SPB 4869 C Band only
CR904.478		RF Unit			SPB 5014 D Band only
CR904.157		1st IF Assembly			SPA 10252
CR904.186.3		2nd IF Assembly			SPB 4635 Ser.No. 1000 - 1960
CR904.186.4		2nd IF Assembly			Serial No. 1961 to 2999
CR904.299.3		Voltage Regulator and Squelch Detector			SPA 10362
CR904.226.2		Squelch Unit Assembly			SPA 10259
CR904.177		Audio Unit Assembly			SPA 10136
		COILS AND CRYSTALS 1675A RECEIVER (A/10 and A/25 Units)			
CZ321.980.2	T101	1st IF Transformer	1	TCA	SPL.SP.1032; SPA 10162
CZ321.980.2	T102	1st IF Transformer	1	TCA	SPL.SP.1032; SPA 10162
CZ324.323.4	T103	Discriminator Transformer	1	TCA	SPL.SP.1074; SPB 4618 Serial 1000 to 1961
CZ320.738	T103	Discriminator Transformer			Serial Nos. 1961 onwards.
CZ345.078	T104	Driver Transformer	1	Rola	Type JDR22.1; Lead lengths 2", No impregnation
CZ349.527.1	T105	Output Transformer	1		

CODE NO.	POS	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS 1675A RECEIVER (A/10 and A/25 Units) Cont.			
CZ321.981.3	L101	Aerial Coil	1	TCA	SPL.SP.1083; SPA 10169
CZ321.983.1	L102	Crystal Oscillator Coil	1	TCA	SPL.SP.1083; SPA 10171
CZ321.982.2	L103	RF Coil	1	TCA	SPL.SP.1083; SPA 10170
CZ321.986.2	L104	RF Coil	1	TCA	SPL.SP.1083; SPA 10170
CZ321.984.2	L105, L106	Mixer Doubler Coil	1	TCA	SPL.SP.1083; SPA 10172
CZ324.321	L107	RF Choke Coil	1	TCA	SPL.SP.1066; SPA 10069
CZ334.502	L108	Choke Peaking	1	TCA	SPL.SP.1084; SPA 10202
CZ320.484.1	FL101	2nd IF Filter Assy. (60 Kc/s)	1	TCA	SPL.SP.1044; SPB 4512
CZ320.510.1	FL101	2nd IF Filter Assy. (30 Kc/s)	1	TCA	SPL.SP.1090; SPB 4723
	MR101(2 & 3)	OA85 Diodes	1	Philips	
	MR102-MR108	OA202 Diodes	7	Philips	MR102, MR103 - Changed to OA85 Diodes (6-2-62 SP 1983). Serial 1000 to 1961. Serial 1961 to 2999.
	MR106-MR107	OA79 Diodes	2	Philips	
	MR109	OA85 Diodes	1	Philips	
	MR110	OAZ201 Zener Diodes	1	Philips	
	MR111	OAZ202 Zener Diode	1	Philips	
	V101	AF114 Transistor	1	Philips	
	V102	AFZ12 Transistor	1	Philips	
	V103-V104	AF114 Transistors	2	Philips	
	V105-V107	AF115 Transistors	3	Philips	
	V108-V112	AF116 Transistors	5	Philips	
	V113-V118	OC75 Transistors	6	Philips	
	V119-V120	ASZ16 Transistors	2	Philips	
	V121	OC202 Transistor	1	Philips	
	V122	OC75 Transistor	1	Philips	
	V123	OC80 Transistor	1	Philips	
	X102	17.21 Mc/s Crystals	1	Philips/Pye	Style J SPZ 3312

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS 1675C (160 MC/S) RECEIVER (Used in C/10 and C/25 etc.)			
CZ321.980.2	T101	1st IF Transformer	1	TCA	SPL.SP.1082; SPA 10162.
CZ321.980.2	T102	Ist IF Transformer	1	TCA	SPL.SP.1082; SPA 10162
CZ324.323.3	T103	Discriminator Transformer	1	TCA	SPL.SP.1074; SPB 4618. Serial 1000 - 1961.
CZ320.738	T103	Discriminator Transformer			Serial 1961 onwards
CZ345.078	T104	Driver Transformer	1	Rola	Type JDR22.1, Lead lengths 2", No impregnation.
CZ349.527.1	T105	Output Transformer	1		
CZ321.995.1	T106	Aerial Transformer	1		SPL.SP.1125, SPA 10664.
CZ321.983.1	L102	Crystal Oscillator Coil	1	TCA	SPL.SP.1083; SPA 10171
CZ321.996	L103	RF Coil	1	TCA	SPL.SP.1125; SPA 10667
CZ321.997	L104	RF Coil	1	TCA	SPL.SP.1125; SPA 10667
CZ321.998	L105,L106	Mixer, Doubler Coil	1	TCA	SPL.SP.1125; SPA 10668
CZ324.321	L107	RF Choke	1	TCA	SPL.SP.1066; SPA 10069
CZ324.502	L108	Peaking Choke	1	TCA	SPL.SP.1084; SPA 10202
CZ320.510.1	FL101	2nd IF Filter (30 Kc/s)	1		SPL.SP.1090; SPB 4723
CZ320.484.3	FL101	2nd IF Filter (60 Kc/s)	1		SPL.SP.1044; SPB 4512
	MR101	OA85 Diode	1	Philips	
	MR102-MR108	OA202 Diodes	7	Philips	MR102, MR103 - Changed to OA85 Diodes (6-2-62 SP 1183)
	MR109	OA85 Diode	1	Philips	
	MR110	OAZ.201 Diode	1	Philips	
	MR111	OAZ.202 Diode	1	Philips	
	V101	AF114 Transistor	1	Philips	
	V102	AFZ12 Transistor	1	Philips	
	V103	AF114 Transistor	1	Philips	
	V104	AFZ12 Transistor	1	Philips	
	V105-V107	AF115 Transistor	3	Philips	
	V108-V112	AF116 Transistor	5	Philips	
	V113-V118	OC75 Transistors	6	Philips	
	V119-V120	ASZ16 Transistors	2	Philips	

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS 1675C (160 MC/S) RECEIVER (Used in C/10 and C/25 etc) Cont.			
	V121	OC202 Transistor	1	Philips	
	V122	OC75 Transistor	1	Philips	
	V123	OC80 Transistor	1	Philips	
	X102	17.21 Mc/s Crystal	1	Philips/Pye	
		COILS AND CRYSTALS 1675D RECEIVER			
CZ321.980.2	T101	1st IF Transformer	1	TCA	SPL.SP.1082; SPA 10162
CZ321.980.2	T102	1st IF Transformer	1	TCA	SPL.SP.1082; SPA 10162
CZ320.738	T103	Discriminator Transformer	1	TCA	
CZ345.078	T104	Driver Transformer	1	Rola	JDR22.1, Lead lengths 2", No impregnation.
CZ349.527.1	T105	Output Transformer	1	TCA	
CZ322.007	T106	Aerial Coil	1	TCA	SPA 10881
	L101	Not used			
	L102	Not used.			
CZ322.009	L103	RF Coil	1	TCA	SPA 10883
CZ322.010	L104	RF Coil	1	TCA	SPA 10883
CZ322.008	L105, L106	Mixer, Doubler Coil	1	TCA	SPA 10882
CZ324.321	L107	RF Choke	1	TCA	SPL.SP.1066, SPA 10069.
CZ334.502	L108	Peaking Choke	1	TCA	SPL.SP.1084; SPA 10202
CZ320.510.1	FL101	2nd IF Filter (30 Kc/s)	1	TCA	SPL.SP.1090; SPA 4723
CZ320.484.3	FL101	2nd IF Filter (60 Kc/s)	1	TCA	SPL.SP.1044; SPB 4512
	MR101	OA85 Diode	1	Philips	
	MR102-MR108	OA202 Diode	7	Philips	MR102, MR103 - Changed to OA85 Diodes (6-2-62 SP 1983)
	MR109	OA85 Diodes	1	Philips	
	MR110	OAZ201 Zener Diode	1	Philips	
	MR111	OAZ202 Zener Diode	1	Philips	

CODE NO.	POS	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS 1675D RECEIVER Cont.			
	V101	AF114 Transistor	1	Philips	
	V102	AFZ12 Transistor	1	Philips	
	V103	Not used			
	V104	AFZ12 Transistor	1	Philips	
	V105-V107	AF115 Transistor	3	Philips	
	V108-V112	AF116 Transistor	5	Philips	
	V113-V118	OC75 Transistors	6	Philips	
	V119-V120	ASZ16 Transistors	2	Philips	
	V121	OC202 Transistors	1	Philips	
	V122	OC75 Transistors	1	Philips	
	V123	OC80 Transistors	1	Philips	
	X102	17.21 Mc/s Crystal	1	Philips/Pye	Style J SPZ 3312
		RECEIVER GENERAL			
CR904.184.2		Lug Strip Assembly (12 Lug)	1		SPZ 3498
CS111.389		Chassis Lead Through	3	Ducon	Type S2354 G.
CS813.040		Audio Mounting Bracket	2		SPZ 3517
CS813.041		2nd IF Mounting Bracket	1		SPZ 3518
CZ161.007		Loudspeaker	1	Rola	4F Core F97
CZ370.113		Crystal Socket	2	Teletron	Type SC22LP

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS			
C426AM/F6.4	C201	6.4 uf Electrolytic	1	Philips	25VW Insulated
CZ097.901	C202	.047 uf Ceramic Thin Sheater	1	Simplex	33V Hi K Style A ± 20%
C280.AA/P47K	C202	.047 uf	1	Philips	30VW SP2039
C426.AM/B25	C203	25 uf Electrolytic	1	Philips	4VW Insulated
CZ074.008.EH	C204	.005 uf Paper Tubular	1	AEE	Type W99, Size A, 20% 200V
C426.AM/B25	C205	25 uf Electrolytic	1	Philips	4VW Insulated
C426.AM/F6.4	C206	6.4 uf Electrolytic	1	Philips	25VW Insulated) Change Note 1981 CZ097.908 Simplex Red Cap, 0.5 uf 25VW. Also C426.AN/G40, .5 uf .40VW, Philips +50%, -10%, 60° - 70°C
C426.AM/F6.4	C207	6.4 uf Electrolytic	1	Philips	25VW Insulated)
CZ074.400.EH	C208	.01 uf Paper Tubular	1	AEE	Type W99, Size A, 20% 200V
C426.AM/B25	C209	25 uf Electrolytic	1	Philips	4VW Insulated
CZ097.509	C210	4300 pf Ceramic Disc	1	Simplex	Type CDS Hi K Style B GMV .. Change Note 1885
	C211	Not used			1675A only
CZ097.115.AA	C211	.001 uf Ceramic Disc	1	Ducon	Style A 1675C only. Change Note 1987.
CZ096.530.AA	C211	12 pf Ceramic Disc	1	Ducon	NPO Style B 5% 1675D only
CZ097.528.AA	C212	2200 pf Ceramic Disc	1	Simplex	Type CDS Hi K Style A GMV
CZ096.559	C213	25 pf Ceramic Disc	1	Ducon	NPO Type CDS Size B ± 1 pf - Change Note 1919
CZ096.500.AA	C214	100 pf Ceramic Disc	1	Simplex	DS NK N750 Style C ± 5%
	C215	Not used			1675A
CZ097.022	C215	200 pf Ceramic Disc	1	Ducon	Style F Curve Y 1675C only - Change Note 1987.
CZ096.005	C215	1.5 pf Ceramic Disc	1	Ducon	NPO Style F ± ½ pf 1675D only
C004.AA/6E	C216	6.8 pf Variable Trimmer	1	Philips	Ceramic
CZ096.101.1AA	C217	10 pf	1	Simplex	NPO Style A 5% A & C Bands only
CZ096.542.AA	C217	27 pf Ceramic Disc	1	Ducon	Type CDS Style C 5% D Band only
CZ097.509	C218	4300 pf Ceramic Disc	1	Simplex	Type CDS Hi K Style B GMV - Change Note 1885

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS Cont.			
CZ096.534.1AA	C219	33 pf Ceramic Disc	1	Simplex	NPO Style C 5% - A & C Bands only
CZ064.510.8AA	C219	100 pf Mica Condenser	1	Ducon	Type MS 5% D Band only
CZ066.135.8AA	C220	330 pf Mica	1	Simplex	Type MS 5% A & C Bands only
CZ097.115.AA	C220	.001 uf Ceramic Disc	1	Ducon	Type CDS Style A Curve Y 10% - D Band only
CZ097.126.AA	C221	330 pf Ceramic Disc	1	Simplex	Type CDS Hi K Style A ± 20%
CZ097.509	C222	4300 pf Ceramic Disc	1	Simplex	Type CDS Hi K Style B GMV - Change Note 1885
CZ097.102.AD	C223	1000 pf Ceramic Tubular	1	UCC	CTH310 1675A/10 only
CZ096.215	C223	7.5 pf Ceramic Tubular	1	UCC	Type HVD1 10% D Band only
CZ096.542.AA	C224	27 pf Ceramic Disc	1	Simplex	Type DS NK NPO Style C 50% - A Band only
CZ096.567	C224	43 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% C Band only
CZ064.402.8	C224	Mica 87 pf	1	Ducon	Type MS 5% D Band only
CZ096.522.AA	C225	22 pf Ceramic Disc	1	Simplex	Type DS NK NPO Style C 5% - A Band only
CZ096.533.AA	C225	39 pf Ceramic Disc	1	Simplex	Type DS NK NPO Style C 5% - C Band only
CZ064.403.8	C225	Mica 82 pf	1	Ducon	Type MS 5% D Band only
CZ097.524.AD	C226	2200 pf Ceramic Tubular	1	UCC	CTH 310
CZ097.524.AD	C227	2200 pf Ceramic Tubular	1	UCC	CTH 310
CZ097.524.AD	C228	2200 pf Ceramic Tubular	1	UCC	CTH 310
CZ096.522.AA	C229	22 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% A Band only
CZ096.101.1AA	C229	10 pf Ceramic Disc	1	Simplex	DS NK NPO Style A 5% C Band only
CZ096.533.AA	C229	39 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% D Band only
CZ096.726.AD	C230	100 pf Ceramic Bead	1	UCC	SPG1 A & D Bands only
CZ097.102.AD	C230	1000 pf Ceramic Tubular	1	UCC	CTH 310 C Band only - Change Note SP1996
CZ097.102.AD	C231	1000 pf Ceramic Tubular	1	UCC	CTH310
CZ097.102.AD	C232	1000 pf Ceramic Tubular	1	UCC	CTH310
CZ096.522.AA	C233	22 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% A Band only
CZ096.101.1AA	C233	10 pf Ceramic Disc	1	Simplex	DS NK NPO Style A 5% C Band only
CZ096.533.AA	C233	39 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% D Band only
CZ097.524.AD	C234	2200 pf Ceramic Tubular	1	UCC	CTH310
CZ097.102.AD	C235	1000 pf Ceramic Tubular	1	UCC	CTH310
CZ097.102.AD	C236	1000 pf Ceramic Tubular	1	UCC	CTH310

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS Cont.			
CZ097.524.AD	C237	2200 pf Ceramic Tubular	1	UCC	CTH 310
CZ096.522.AA	C238	22 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% A Band only
CZ096.101.1AA	C238	10 pf Ceramic Disc	1	Simplex	DS NK NPO Style A 5% C Band only
CZ096.533.AA	C238	39 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% D Band only
CZ096.726.AD	C239	100 pf Ceramic Bead	1	UCC	SPG1 A & C Bands only
CZ097.115.AA	C239	1000 pf Ceramic Disc	1	Ducon	Type CDS Hi K Style A 10% D Band only
CZ096.726.AD	C240	100 pf Ceramic Bead	1	UCC	SPG1
CZ096.522.AA	C241	22 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% A Band only
CZ096.101.1AA	C241	10 pf Ceramic Disc	1	Simplex	DS NK NPO Style A 5% C Band only
CZ096.533.AA	C241	39 pf Ceramic Disc	1	Simplex	DS NK NPO Style C 5% D Band only
CZ097.102.AD	C242	1000 pf Ceramic Tubular	1	UCC	CTH 310
CZ097.524.AD	C243	2200 pf Ceramic Tubular	1	UCC	CTH 310
CZ097.102.AD	C244	1000 pf Ceramic Tubular	1	UCC	CTH 310 A & D Bands only
CZ096.726.AD	C244	100 pf Ceramic Bead	1	UCC	CTH 310 C Band only
CZ097.102.AD	C245	1000 pf Ceramic Tubular	1	UCC	CTH 310
CZ096.538.1AA	C246	47 pf Ceramic Disc	1	Simplex	DS NK N750 Style B 5%
CZ096.530.AA	C247	12 pf Ceramic Disc	1	Simplex	DS NK NPO Style B ± 1 pf A & C Bands only
CZ096.522.AA	C247	22 pf Ceramic Disc	1		D Band only
CZ097.128.AD	C248	220 pf Ceramic Bead	1	UCC	SPG1 A & D Bands only
CZ096.726.AD	C248	100 pf Ceramic Bead	1	UCC	SPG1 C Band only
CZ097.524.AD	C249	2200 pf Ceramic Tubular	1	UCC	CTH 310
82014B/10E	C250	10 pf Variable Trimmer	1	Philips	Locking
CZ097.102.AD	C251	1000 pf Ceramic Tubular	1	UCC	CTH 310 A & D Bands only
CZ096.726.AD	C251	100 pf Ceramic Bead	1	UCC	SPG1 Band C only
CZ097.102.AD	C252	1000 pf Ceramic Tubular	1	UCC	CTH 310
82014B/10E	C253	10 pf Variable Trimmer	1	Philips	Locking 1675A/25, C/25, D/25.
CZ097.102.AD	C253	1000 pf Ceramic Tubular	1	UCC	CTH 310 1675A/10
	C253	Not used			1675C/10
CZ097.102.AD	C254	1000 pf Ceramic Tubular	1	UCC	CTH 310
CZ097.102.AD	C255	1000 pf Ceramic Tubular	1	UCC	CTH 310
82016B/6E4	C256	6.4 pf Variable Butterfly	1	Philips	Locking
CZ096.726.AD	C257	100 pf Ceramic Bead	1	UCC	SPG1 1675A/25, C/25, D/25
CZ097.128.AD	C258	220 pf Ceramic Bead	1	UCC	SPG1 1675A/25 and D/25

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		CAPACITORS Cont.			
CZ096.726.AD	C258	100 pf Ceramic Bead	1	UCC	SPG1 1675C/25
CZ097.102.AD	C258	1000 pf Ccramic Tubular	1	UCC	CTH 310 1675A/10, C/10
CZ097.547	C259	2200 pf Ceramic Feed-thru	1	Simplex	Type CAC 100 Hi K GMV
CZ097.102.AD	C260	1000 pf Ceramic Tubular	1	UCC	CTH 310
CR904.182	C261	15 x 15 pf Variable Butterfly	1	Eddystone	SPZ 3495 1675 A/25, D/25 only
CR904.181	C261	8 x 8 pf Variable Butterfly	1		1675C/25 only
82016B/6E4	C261	6.4 pf Variable Butterfly	1	Philips	Locking 1675 A/10, C/10 only
CZ090.6 03.1	C262	3300 pf 1000 VW Tubular	1	Ducon	Styroseal DFB 1018 ± 20%
CZ099.305	C263	1 uf Electrolytic	1	Ducon	Type E60x 350VW
CZ096.726.AD	C264	100 pf Ceramic Bead	1	UCC	SPG1 A & D Bands only
CZ096.726.AD	C265	100 pf Ceramic Bead	1	UCC	SPG1 A & D Bands only
CZ097.128.AD	C266	220 pf Ceramic Bcad	1	UCC	SPG1 1675/25 A & D Bands only
CZ097.102.AD	C266	1000 pf Ceramic Tubular	1	UCC	CTH 310 1675A/10 only
CZ097.102.AD	C267	1000 pf 6eramic Tubular	1	UCC	CTH 310 1675A/10 only
CZ096.102.AA	C267	3.3 pf Ceramic Disc	1	Ducon	NPO Style A 5% D Band only
C426.AM/F6.4	C268	6.4.uf Electrolytic	1	Philips	4 VW Insulated
CZ100.139	C269	70 uf Electrolytic	1	Ducon	15 VW Type ES1507
CZ097.115.AA	C270	1000 pf Ceramic Disc	1		Type DS Hi K GMV Style A
		RESISTORS			
CZ002.717.CC	R201	8.2K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ001.516.CC	R202	1K ohm $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ002.713.CC	R203	2.2K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ000.313.CC	R204	39 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ001.525.CC	R205	560 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ003.916.CC	R206	15K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ002.725.CC	R207	3.9K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ002.715.CC	R208	4.7K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ000.315.CC	R209	56 ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ002.713.CC	R210	2.2K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ002.710.CC	R211	10K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ003.916.CC	R212	15K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ003.916.CC	R213	15K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%
CZ002.726.CC	R214	2.7K ohms $\frac{1}{2}$ watt Carbon	1	Morganite	Type AS 10%

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		RESISTORS			
CZ029.088.E	R215	5K ohms Carbon Potentiometer	1	IRC	Type EC, Tab Mounted, Linear ± 20%
CZ002.706.CC	R216	1.5K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ003.927.CC	R217	22K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ002.720.CC	R218	3.3K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ002.719.CC	R219	5.6K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ002.726.CC	R220	2.7K ohms ½ watt Carbon	1	Morganite	Type AS 10% A & C Bands only
CZ002.717.CC	R220	8.2K ohms ½ watt Carbon	1	Morganite	Type AS 10% D Band only
CZ005.114.CC	R221	220K ohms ½ watt Carbon	1	Morganite	Type T 10% A Band only
CZ003.910.CC	R221	100K ohms ½ watt Carbon	1	Morganite	Type T 10% C Band only
CZ005.116.CC	R221	270K ohms ½ watt Carbon	1	Morganite	Type AS 10% D Band only
CZ002.719.CC	R222	5.6K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ002.718.CC	R223	6.8K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ002.720.CC	R224	3.3K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ002.726.CC	R225	2.7K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ005.114.E	R226	220K ohms ½ watt Carbon	1	IRC	Type BTS 10%
CZ003.916.E	R227	15K ohms ½ watt Carbon	1	IRC	BTS 10%
CZ001.519.CC	R228	220 ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ001.516.CC	R229	1K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ003.910.E	R230	100K ohms ½ watt Carbon	1	IRC	Type BTS 10% A & D Bands only
CZ005.114.E	R230	220K ohms ½ watt Carbon	1	IRC	Type BTS 10% C Band only
CZ001.524.CC	R231	680 ohms ½ watt Carbon	1	Morganite	Type AS 10% A & D Bands only
CZ002.720.CC	R231	3.3K ohms ½ watt Carbon	1	Morganite	Type AS 10% C Band only
CZ001.519.CC	R232	220 ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ001.516.CC	R233	1K ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ003.910.E	R234	100K ohms ½ watt Carbon	1	IRC	Type BTS 10% A & D Bands only
CZ005.114.E	R234	220K ohms ½ watt Carbon	1	IRC	Type BTS 10% C Band only
CZ001.521.CC	R235	470 ohms ½ watt Carbon	1	Morganite	Type AS 10% A & D Bands only
CZ002.713.CC	R235	2.2K ohms ½ watt Carbon	1	Morganite	Type AS 10% C Band only
CZ004.007.E	R236	100K ohms 1 watt Carbon	1	IRC	Type BTA 10% A & D Bands only
CZ004.012.E	R236	47K ohms 1 watt Carbon	2 in //	IRC	Type BTA 10% C Band only
CZ003.929.E	R237	82K ohms ½ watt Carbon	1	IRC	Type BTS 10% A & D Bands only
CZ003.908.E	R237	47K ohms ½ watt Carbon	1	IRC	Type BTS 10% C Band only
CZ001.508.CC	R238	150 ohms ½ watt Carbon	1	Morganite	Type AS 10%

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		RESISTORS Cont.			
CZ002.816.CC	R239	4.7K ohms 1 watt Carbon	1	Morganite	Type AY 10% A & D Bands only
CZ002.817.CC	R239	1.8K ohms 1 watt Carbon	1	Morganite	Type AY 10% C Band only
CZ002.816.CC	R240	4.7K ohms 1 watt carbon	1	Morganite	Type AY 10% A & D Bands only
CZ002.817.CC	R240	1.8K ohms 1 watt Carbon	1	Morganite	Type AY 10% C Band only
CZ001.521.CC	R241	470 ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ002.809.E	R242	10K ohms 1 watt Carbon	1	IRC	Type BTA 10% 1675 A/25, C/25 and D/25.
CZ003.927.CC	R242	22K ohms ½ watt Carbon	1	Morganite	Type AS 10% 1675A/10 only
CZ003.928.CC	R242	33K ohms ½ watt Carbon	1	Morganite	Type AS 10% 1675C/10 only
CZ000.318.CC	R243	68 ohms ½ watt Carbon	1	Morganite	Type AS 10%
CZ000.003.CC	R244	20 ohms ½ watt Carbon	1	Morganite	Type AS9 ± 5% 1675A/25, C/25, and D/25 only.
CZ000.310.CC	R244	10 ohms ½ watt Carbon	1	Morganite	Type AS 10% 1675 A/10, C/10 only
CZ000.003.CC	R245	20 ohms ½ watt Carbon	1	Morganite	Type AS9 ± 5% 1675 A/25, C/25, D/25
CZ004.008.E	R245	15K ohms 1 watt Carbon	1	IRC	Type BTA 10% 1675A/10 only
CZ002.820.E	R245	3.9K ohms 1 watt Carbon	1	IRC	Type BTA 10% 1675C/10 only
CZ003.927.E	R246	22K ohms ½ watt Carbon	1	IRC	Type BTS 10%
CZ002.816.CC	R247	4.7K ohms 1 watt carbon	1	Morganite	Type AY 10% 1675A/25, C/25, D/25 only
CZ001.516.CC	R247	1K ohms ½ watt Carbon	1	Morganite	Type AS 10% 1675A/10 and C/10 only
CZ000.303.CC	R248	22 ohms ½ watt Carbon	1	Morganite	Type AS 10% 1675A/25 and D/25 only
CZ002.726.CC	R249	2.7K ohms ½ watt Carbon	1	Morganite	Type AS 10% A & D Bands only
CZ001.723.CC	R249	1.8K ohms ½ watt Carbon	1	Morganite	Type AS 10% C Band only
		TRANSMITTER CARD ASSEMBLIES (COMPLETE)			
CR904.179		Crystal Oscillator and Modulator			SPA 10138 A & C Bands only
CR904.515		Crystal Oscillator and Modulator			SPA 10934 D Band only
CR904.180.3		Modulation Amplifier Assembly			SPA 10139

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS 1675A/10 TRANSMITTER			
CZ321.974	T201	Coupling Transformer	1	TCA	SPL.SP.1078, SPA 10129
CZ321.363.1	T202	Coupling Transformer	1	TCA	SPL.SP.630, SPA 6939
CZ321.364.1	T203	Coupling Transformer	1	TCA	SPL.SP.631, SPA 6940
CZ324.321	L201	RF Choke 1.4 mH	1	TCA	SPL.SP.1066, SPA 10069
CR904.325	L202	RF Choke 1.4 mH	1	TCA	SPL.SP.1115, SPA 10626 (In Cu. Can)
CZ321.506.1	L203	Phase Modulator Coil	1	TCA	SPL.SP.1071, SPA 10098
CZ321.365.1	L204	RF Coupling Coil	1	TCA	SPL.SP.632, SPA 6941
CZ321.978	L205	Plate Coil	1	TCA	SPZ 3494
CZ321.352	L206	RF Choke	1	TCA	SPL.SP.627, SPZ 1202
	L207	Not used			
	L208	Not used			
CZ321.369	L209	Grid Coil	1	TCA	SPZ 1342
CZ321.374.2	L210	Plate Coil	1	TCA	SPZ 1347
CZ321.375.1	L211	Loading Coil	1	TCA	SPZ 1348
CZ321.352	L212	Choke	1	TCA	SPL.SP.627, SPZ 1202.
CZ321.367	L213	RF Choke	1	TCA	SPL.SP.633, SPZ 1312.
CZ321.367	L214	RF Choke	1	TCA	SPL.SP.633, SPZ 1312.
CZ321.971.1	L215	Choke	1	TCA	SPL.SP.1072, SPA 10105
	MR201	OA202 Silicon Diode	1	Philips	
	MR202	OA202 Silicon Diode	1	Philips	
	MR203	OA90 Diode	1	Philips	
	V201	OC75 Transistor	1	Philips	
	V202	OC75 Transistor	1	Philips	
	V203	OC75 Transistor	1	Philips	
	V204	AF115 Transistor	1	Philips	
	V205	AF115 Transistor	1	Philips	
	V206	12AT7			
	V207	QQE02/5			
	V208	QQE03/12			

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS 1675A/25 TRANSMITTER			
CZ321.974	T201	Coupling Transformer	1	TCA	SPL.SP.1078, SPA 10129
CZ321.363.1	T202	Coupling Transformer	1	TCA	SPL.SP.630, SPA 6939
CZ321.364.1	T203	Coupling Transformer	1	TCA	SPL.SP.631, SPA 6940
CZ324.321	L201	RF Choke 1.4 mH	1	TCA	SPL.SP.1066, SPA 10069
CR904.325	L202	RF Choke 1.4 mH	1	TCA	SPL.SP.1115, SPA 10626
CZ321.506.1	L203	Phase Modulator Coil	1	TCA	SPL.SP.1071, SPA 10098
CZ321.365.1	L204	RF Coupling Coil	1	TCA	SPL.SP.632, SPA 6941
CZ321.978	L205	Plate Coil	1	TCA	SPZ 3494
CZ321.352	L206	RF Choke	1	TCA	SPL.SP.627, SPZ 1202
CZ321.979	L207	Coupling Link	1	TCA	SPZ 3493
CZ321.373	L208	Coupling Link	1	TCA	SPZ 1346
CZ321.372.1	L209	Grid Coil	1	TCA	SPZ 1345
CZ321.374.2	L210	Plate Coil	1	TCA	SPZ 1347
CZ321.375.1	L211	Loading Coil	1	TCA	SPZ 1348
CZ321.352	L212	RF Choke	1	TCA	SPL.SP.627, SPZ 1202
CZ321.367	L213	RF Choke	1	TCA	SPL.SP.633, SPZ 1312
CZ321.367	L214	RF Choke	1	TCA	SPL.SP.633, SPZ 1312
CZ321.971.1	L215	Choke	1	TCA	SPL.SP.1072, SPA 10105
	MR201	OA202 Silicon Diode	1	Philips	
	MR202	OA202 Silicon Diode	1	Philips	
	MR203	OA90 Diode			
	V201	OC75 Transistor	1	Philips	
	V202	OC75 Transistor	1	Philips	
	V203	OC75 Transistor	1	Philips	
	V204	AF115 Transistor	1	Philips	
	V205	AF115 Transistor	1	Philips	
	V206	12AT7	1	Philips	
	V207	QQE02/5	1	Philips	
	V208	QQE03/20	1	Philips	

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS FM1675C/10 TRANSMITTER			
CZ321.973	T201	Coupling Transformer	1	TCA	SPL.SP.1079, SPA 10130
CZ321.357.1	T202	Coupling Transformer	1	TCA	SPL.SP.624, SPA 6887
CZ321.358.1	T203	Coupling Transformer	1	TCA	SPL.SP.625, SPA 6888
CZ324.321	L201	RF Choke 1.4 mH	1	TCA	SPL.SP.1066, SPA 10069
CR904.325	L202	RF Choke 1.4 mH	1	TCA	SPL.SP.1115, SPA 10626
CZ321.507	L203	Phase Modulator Coil	1	TCA	SPL.SP.1070, SPA 10099
CZ321.359.3	L204	RF Coupling Coil	1	TCA	SPL.SP.626, SPA 6889
CZ321.976	L205	Plate Coil	1	TCA	SPZ 3474
CZ321.353	L206	RF Choke	1	TCA	SPL.SP.628, SPZ1203
	L207	Not used.			
	L208	Not used.			
CZ321.383	L209	Grid Coil	1	TCA	SPZ 1356
CZ321.385.2	L210	Plate Coil	1	TCA	SPZ 1358
CZ321.975	L211	Loading Coil	1	TCA	SPZ 1359
CZ321.353	L212	RF Choke	1	TCA	SPL.SP.628, SPZ 1203
CZ321.353	L213	RF Choke	1	TCA	SPL.SP.628, SPZ 1203
CZ321.353	L214	RF Choke	1	TCA	SPL.SP.628, SPZ 1203
CZ321.971.1	L215	Choke	1	TCA	SPL.SP.1072, SPA 10105
	MR201	OA202 Silicon Diode	1	Philips	
	MR202	OA202 Silicon Diode	1	Philips	
	MR203	OA90 Diode			
	V201	OC75 Transistors	1	Philips	
	V202	OC75 Transistors	1	Philips	
	V203	OC75 Transistors	1	Philips	
	V204	AF115 Transistors	1	Philips	
	V205	AF115 Transistors	1	Philips	
	V206	12AT7 Valve	1	Philips	
	V207	QQE02/5 Valve	1	Philips	
	V208	QQE03/12 Valve	1	Philips	

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS FM1675C/25 TRANSMITTER			
CZ321.973	T201	Coupling Transformer	1	TCA	SPL.SP.1079; SPA 10130
CZ321.357.1	T202	Coupling Transformer	1	TCA	SPL SP.624; SPA 6887
CZ321.358.1	T203	Coupling Transformer	1	TCA	SPL.SP.625; SPA 6888
CZ324.321	L201	RF Choke 1.4 mH	1	TCA	SPL.SP.1066; SPA 10069
CR904.325	L202	RF Choke 1.4 mH	1	TCA	SPL.SP.1115; SPA 10626
CZ321.507	L203	Phase Modulator Coil	1	TCA	SPL.SP.1070; SPA 10099
CZ321.359.3	L204	RF Coupling Coil	1	TCA	SPL.SP. 626; SPA 6889
CZ321.976	L205	Plate Coil	1	TCA	SPZ 3474
CZ321.353	L206	RF Choke Coil	1	TCA	SPL.SP.628; SPZ 1203
CZ321.977	L207	Coupling Link	1	TCA	SPZ 3475
CZ321.383	L208	Coupling Link	1	TCA	SPZ 1356
CZ321.384.2	L209	Grid Coil	1	TCA	SPZ 1357
CZ321.385.2	L210	Plate Coil	1	TCA	SPZ 1358
CZ321.975	L211	Loading Coil	1	TCA	SPZ 1359
CZ321.353	L212	RF Choke	1	TCA	SPL.SP.628; SPZ 1203
CZ321.353	L213	RF Choke	1	TCA	SPL.SP.628; SPZ 1203
CZ321.353	L214	RF Choke	1	TCA	SPL.SP.628; SPZ 1203
CZ321.971.1	L215	Choke	1	TCA	SPL.SP.1072; SPA 10105
	MR201	CA202 Silicon Diode	1	Philips	
	MR202	OA202 Silicon Diode	1	Philips	
	MR203	OA90 Diode			
	V201	OC75 Transistor	1	Philips	
	V202	OC75 Transistor	1	Philips	
	V203	OC75 Transistor	1	Philips	
	V204	AF115 Transistor	1	Philips	
	V205	AF115 Transistor	1	Philips	
	V206	12AT7	1	Philips	
	V207	QQE02/5	1	Philips	
	V208	QQE03/20	1	Philips	
CS152.450	FX1	Ferroxcube Bead	1	Philips	GRD 3C1

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		COILS AND CRYSTALS FM1675D/25 TRANSMITTER (40 Mc/s)			
CZ322.011	T201	Coupling Transformer	1	TCA	SPL.SP.1170; SPA 10948
CZ321.906	T202	Coupling Transformer	1	TCA	SPL.SP.727; SPA 7778
CZ321.907	T203	Coupling Transformer	1	TCA	SPL.SP.728; SPA 7779
CZ324.321	L201	1.4 mH RF Choke	1	TCA	SPL.SP.1066; SPA 10069
CR904.325	L202	1.4 mH RF Choke	1	TCA	SPL.SP.1115; SPA 10626
CZ321.508	L203	Phase Modulator Coil	1	TCA	SPL.SP.1169; SPA 10947
CZ321.908	L204	RF Coupling Coil	1	TCA	SPL.SP.729; SPA 7780
CZ321.909	L205	Plate Coil	1	TCA	SPZ 2041
CZ321.352	L206	RF Choke	1	TCA	SPL.SP.627; SPZ 1202
CZ321.395	L207	Coupling Link	1	TCA	SPZ 1467
CZ321.910	L208) L209)	Coupling Link	1	TCA	SPL.SP.796; SPA [illegible]
CZ321.911	L210	Plate Coil	1	TCA	SPZ 2042
CZ321.912	L211	Loading Coil	1	TCA	SPZ 2040
CZ321.352	L212	RF Choke	1	TCA	SPL.SP.627; SPZ 1202
CZ321.367	L213	RF Choke	1	TCA	SPL.SP.633; SPZ 1312
CZ321.367	L214	RF Choke	1	TCA	SPL.SP.633; SPZ 1312
CZ321.971.1	L215	Choke	1	TCA	SPL.SP.1072; SPA 10105
	MR201	OA202 Silicon Diode	1	Philips	
	MR202	OA202 Silicon Diodes	1	Philips	
	MR203	OA90 Diode	1	Philips	
	V201	OC75 Transistor	1	Philips	
	V202	OC75 Transistor	1	Philips	
	V203	OC75 Transistor	1	Philips	
	V204	AF115 Transistor	1	Philips	
	V205	AF115 Transistor	1	Philips	
	V206	12AT7	1	Philips	
	V207	QQE02/5	1	Philips	
	V208	QQE03/20	1	Philips	

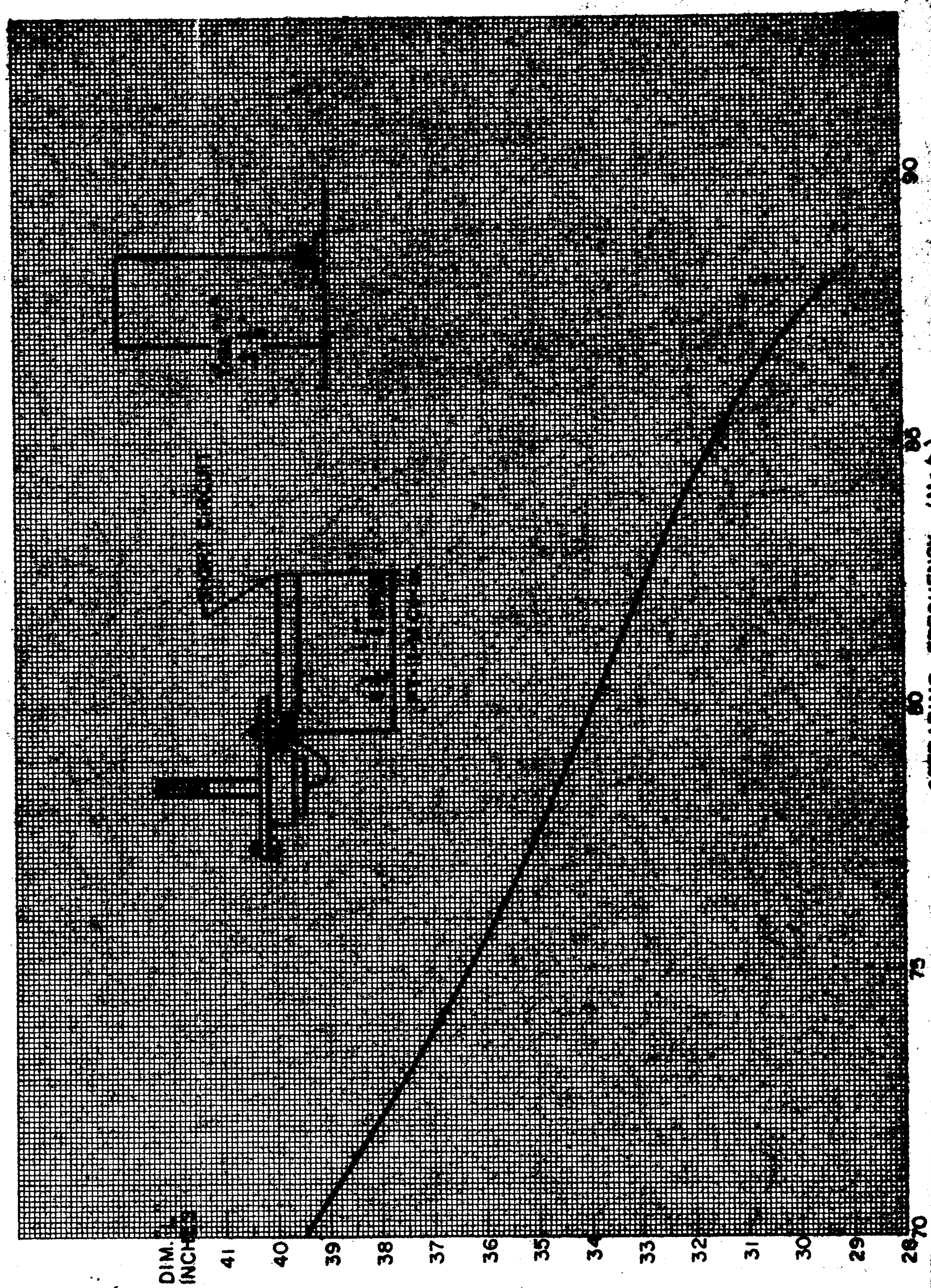
CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		TRANSMITTER (GENERAL)			
CR122.627		Valve Retainer B9A (12AT7)	1	Clix	Type SC9/6202 Length 15/16"
CR901.903.1		Anode Clip Assembly	2		SPA 6918
CR901.919		Retaining Strip	1		SPA 1667; SPL.SP.125
CR904.183.1		Lug Strip Assembly (3 lug)	1		SPZ 3497
CR904.185.1		Lug Strip Assembly (15 lug)	1		SPA 10207
CR904.187		Grid Tuning Bracket Assy.	1		SPA 10151
CR904.188.2		Cathode Bracket Assy.	1		SPA 10152
CR904.205.2		Lug Strip Assembly	1		SPA 10165
CR904.224.2		Lug Strip Assembly	1		SPZ 3548
CR904.443		Retaining Strip Assembly (QQE02/5)	1		SPZ 3714
CS152.450	FX1	Ferroxcube Bead GRD 3C1	1	Philips'	Length = 9mm, OD = 4 mm, ID = 2 mm, Type FX1
CS806.939		Plate Tuning Bracket	1		SPA 6914
CS806.941		Anode Lead	1		SPA 3658
CS806.944		Anode Lead Bracket	1		SPZ 1287
CS807.083.1		Anode Clip	1		SPZ 1377
CS807.235		Valve Retaining Spring	1		SPA 4456
CS813.104		Bracket (Mod. Amp.)	1		SPA 10242
CS813.170		Grid Screen	1		SPA 10153
CZ369.712		Valve Socket B9A PTFE (12AT7)	1	Clix	Type VH 499/901
CZ369.717		Valve Socket B9A PTFE (QQE02/5)	1	Clix	Type VH 499/905
CZ370.113		Crystal Socket	1	Teletron	Type SC22LP
		Ceramic Valve Socket (QQE03/20)	1		Type 40202

POWER SUPPLY 1675/500/12

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
C.425.AL/F25	C1	25 uf Electrolytic	1	Philips	25V
C.425.AL/F25	C2	25 uF Electrolytic	1	Philips	25V
CZ099.307.D	C3	2 uf Electrolytic	1	Ducon	200 VW
CZ099.307.D	C4	2 uf Electrolytic	1	Ducon	200 VW
CZ099.307.D	C5	2 uf Electrolytic	1	Ducon	200 VW
CZ099.307.D	C6	2 uf Electrolytic	1	Ducon	200 VW
CZ099.307.D	C7	2 uf Electrolytic	1	Ducon	200 VW
CZ099.503	C8	70 uf Electrolytic	1	Ducon	Type ES 15 VW
CZ099.901.10	C9	25 uf Electrolytic	1	Ducon	Type ES 2505 25 VW
CZ099.215	C10	10 ufElectrolytic	1	Ducon	Type ES 1203 15 VP
CZ099.215	C11	10 uf Electrolytic	1	Ducon	Type ES 1203 15 VP
CZ000.310.CC	R1	10 ohms ½ watt Carbon	1	Morganite	10%
CZ000.306.CH	R2	100 ohms ½ watt Carbon	1	Morganite	10%
CZ000.306.CH	R3	100 ohms ½ watt Carbon	1	Morganite	10%
CZ002.406.E	R4	1.2K ½ watt Carbon	1	IRC	Type BTS 5%
CZ008.160.CJ	R5	3.3 ohms 3W Wire Wound	1	Reco	Type AAV 2%
CZ008.160.CJ	R6	3.3 ohms 3 watt Wire Wound	1	Reco	Type AAV 2%
CZ002.816.E	R7	4.7K 1 watt Carbon	1	IRC	Type BTA 10%
CZ002.718.CC	R8	6.8K ½ watt Carbon	1	Morganite	
CZ008.538	R9	1.1 ohms 2 watt Wire Wound	1	Ducon	Type 2 WL 10%
		DIODES AND TRANSISTORS			
	MR1	OA210	1	Philips	
	MR2	OA210	1	Philips	
	MR3	OA210	1	Philips	
	MR4	OA210	1	Philips	
	MR5	OA210	1	Philips	
	MR6	OA210	1	Philips	
	V1	OC80	1	Philips	
	V2	OC80	1	Philips	

POWER SUPPLY 1675/500/12

CODE NO.	POS	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
		DIODES AND TRANSISTORS Cont.			
	V3	ASZ17	1	Philips	
	V4	ASZ17	1	Philips	
	V5	ASZ17	1	Philips	
	V6	ASZ17	1	Philips	
		TRANSFORMERS			
CZ349.519.1	T1-2	Transformer Assy.	1	TCA	SPB 4611; SPL.SP.1069
		CHOKES			
CZ321.972	L1	Choke	1	TCA	SPA 10106; SPL.SP.1073
CZ321.972	L2	Choke	1	TCA	SPA 10106; SPL.SP.1073
CS803.926		Spacer	2		SPA 168/6
CS812.917		Connection Strip	1		SPZ 3460
CS812.918		Connection Strip	2		SPZ 3461
CS812.919		Insulating Strip	1		SPZ 3462
CS812.920		Connection Strip	2		SPZ 3463
CS812.921		Cover	1		SPA 10103
56201		Set of Mounting Hardware	4	Philips	
CR904.151		Component Card Assy. "A" (Complete)	1	TCA	SPA 10101
CR904.152.1		Card Assy. (27 lug)	1	TCA	SPA 10102
CR904.153.3		Component Card Assy. "B" (Complete)	1	TCA	SPA 10104
CR904.155.1		Card Assy. (24 lug)	1	TCA	SPA 10107

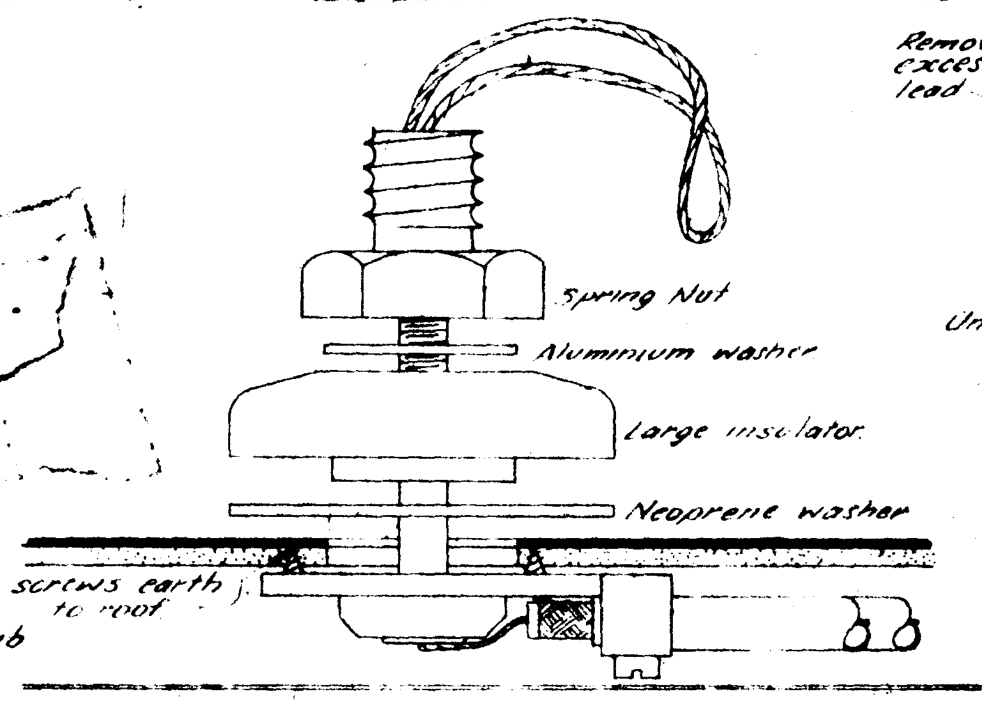


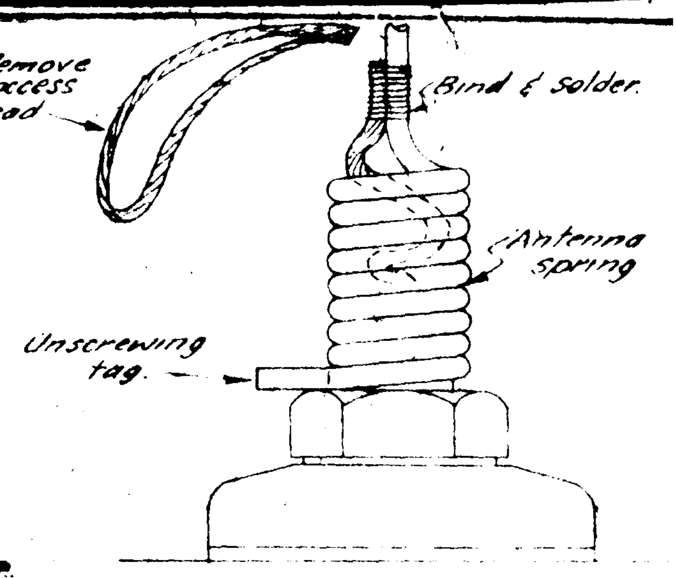
DRAWN E.D.E.	ORIGIN	SCALE	MODEL	1649/06A
CHECKED	APPROVED	DATE 27-7-60		

MOBILE WHIP ANTENNA

DRG. No. SPA 8052

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED





Check low resistance earth path between body of coaxial plug and car frame with ohm meter. This reading should be a short circuit; if not, remove antenna mount and clean anti drum compound from under roof.

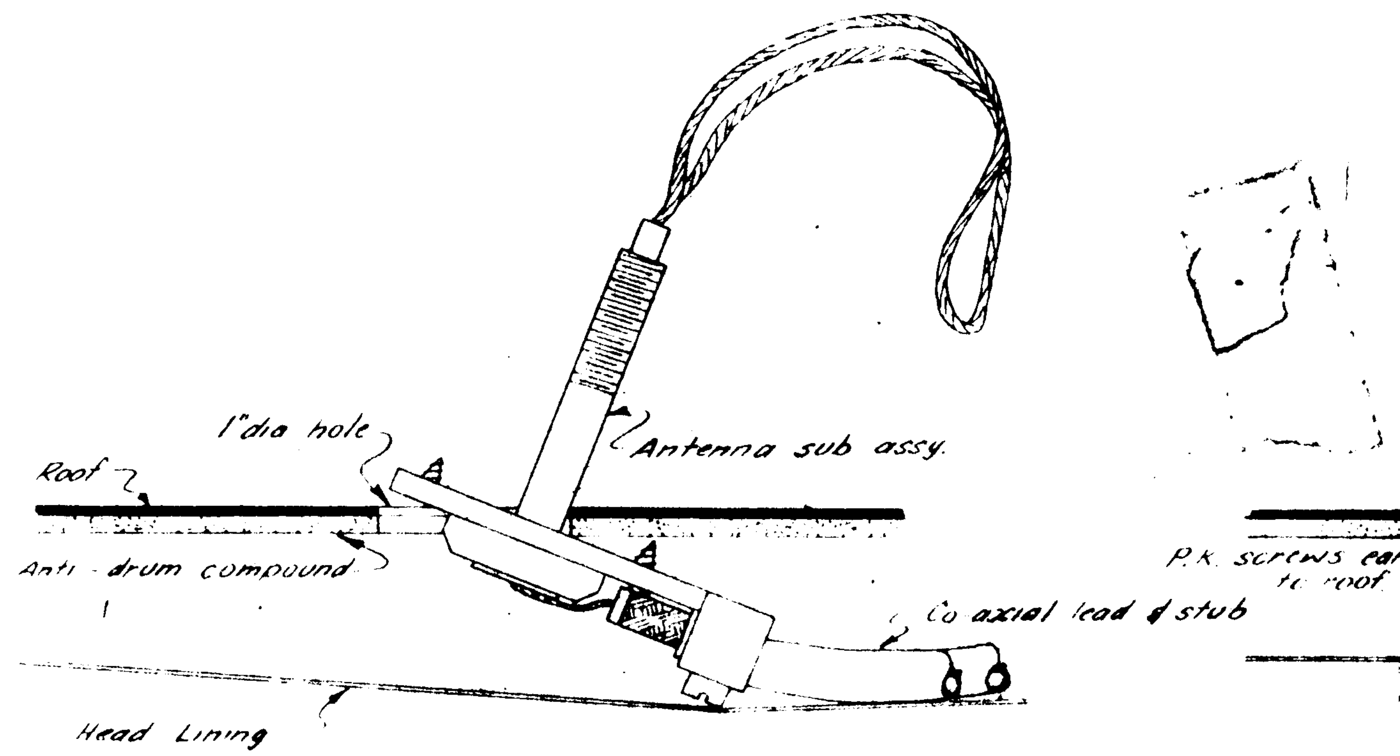
8. Pass flexible lead through antenna spring and assemble spring to nut.

9. Leaving approx. ½" free lead pushed back inside spring, bind to antenna at tinned area with fuse wire. Then solder. Cut off excess lead neatly above joint.

10. Cut whip aerial length using Antenna length chart.

MATERIAL			CODE No	
FINISH AND OR TREATMENT			SHEETS	SHEET No.
Tolerances unless indicated Otherwise Fractions			MODEL	DRAWING No.
DRAWN	ORIGIN	SCALE	[illegible]	SPB 245.1
CHECKED	APPROVED	DATE		
MOUNTING INSTRUCTIONS FOR WHIP ANTENNA TYPE [illegible]			ISSUE 1	

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED



1. Do not fit coaxial plug until antenna and cable have been installed.

2. Select centre of roof, ensuring that there are no metal cross members welded immediately below by feeling lining.

3. On this centre, cut a hole 1" dia. through metal and anti drum compound.

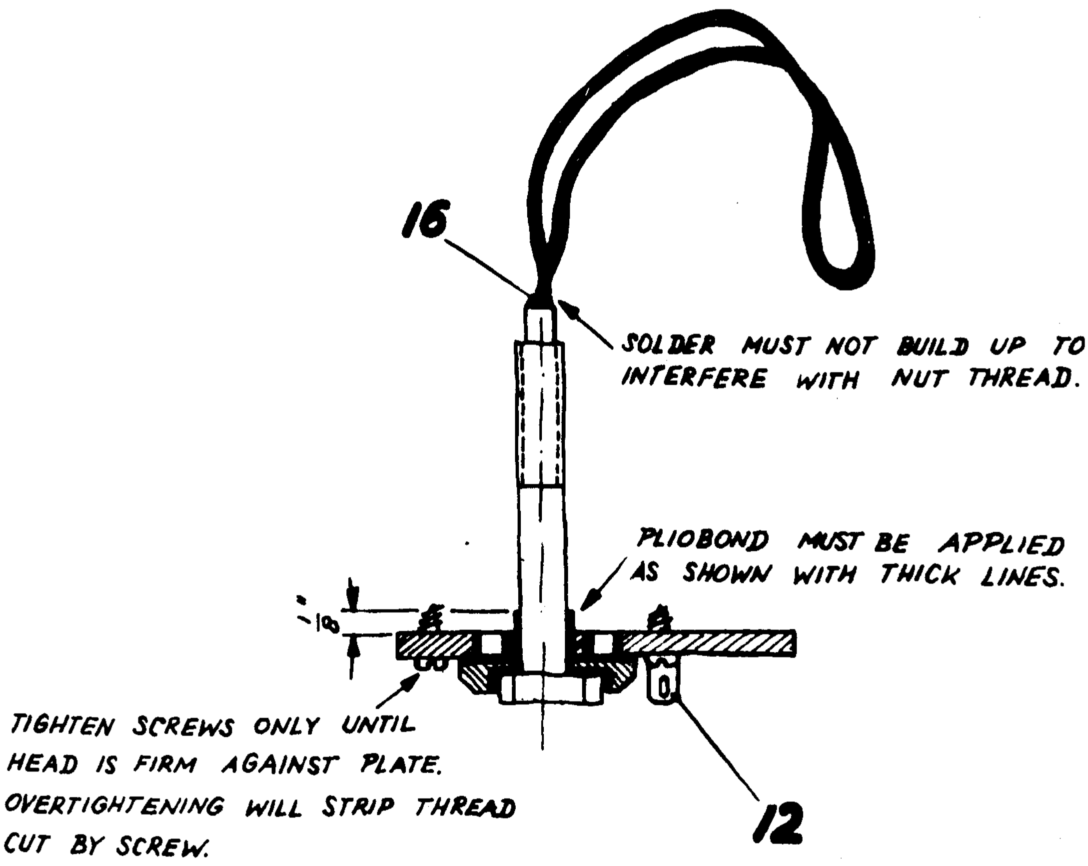
4. Feed free end of coaxial cable through hole from outside and guide between roof and lining towards installation of mobile unit (front or rear). For front installation, guide towards front window corner post and feed through to underneath of dash.

5. Pull cable through until antenna sub assy. and stub are ready to enter. Tilt cable clamp end of plate downwards towards front or rear and insert through hole. Holding 2" B.S.F. screw, straighten assy. inside lining and pull upwards when screw is in centre of mtg. hole. Place following items, in order, over screw:- neoprene washer, large insulator, aluminium washer and spring nut. Allow step on insulator to pass through holes in washer and roof. Screw nut down while maintaining pointed screw in contact with roof to prevent turning of assy. This nut <u>must not</u> be over tightened otherwise distortion of roof will take place.

6. Fit coaxial plug - see separate detail drawing.

Notes revised M.R. 15-12-58. REVISIONS

IGLE PROJECTION



QUANTITY 1	2	3	4	5	DESCRIPTION	CODE No.	DRG No.	ITEM
6"	6"				Fuse Wire	CB 039.758		21
	1				STUB	CZ 360.530	SPA5440	20
10ft	10ft				COAXIAL CABLE	CB 151.001		19
x	x				PLIOBOND	CE 307.57		17
x	x				SOLDER R.C.	CE 425.29		16
6"	6"				FLEXIBLE TWIST	CB 043.647		15
3	3				SELF TAPPING SCREW NO. 6 x 1/4"	CH 522.234.1C		14
1	1				COAXIAL PLUG	CZ 365.017		13
1	1				SOLDER LUG	CH 775.008.0M		12
1	1				SCREW 5 BA x 1/2" CH. HD.	CH 496.063.10W		11
1					STUB	CZ 360.518.2	SPA5440	10
1	1				CABLE CLAMP	CS 803.357	SPA5338	9
1	1				RECESSED INSULATOR	CS 803.228.1	SPA1939	8
1	1				CENTRE SCREW	CS 803.231	SPA4942	7
1	1				NEOPRENE WASHER	CS 803.271.1	SPA 927	6
1	1				ALUMINIUM WASHER	CS 803.270	SPA 927	5
1	1				CLAMP	CS 803.230.2	SPA4941	4
1	1				BASE INSULATOR	CS 803.226.1	SPA4937	3
1	1				ANTENNA BASE	CS 803.227	SPA4938	2
1	1				WHIP ANTENNA ELEMENT	CS 803.229.2	SPA4940	1

	1	2	3	4	5
Date	4.7.56				
Drawn	A.P.				
Checked					
Origin	D.T.				
Approved					

Tolerances as indicated
Otherwise:—
Fractions 1/32"

Scale —

FINISH —

MODEL 1649/06A

DRAWING No. SPB 2763

1	2	3	4	5
CR 901.415.2	CR902.815.1			

WHIP ANTENNA. ASSY.

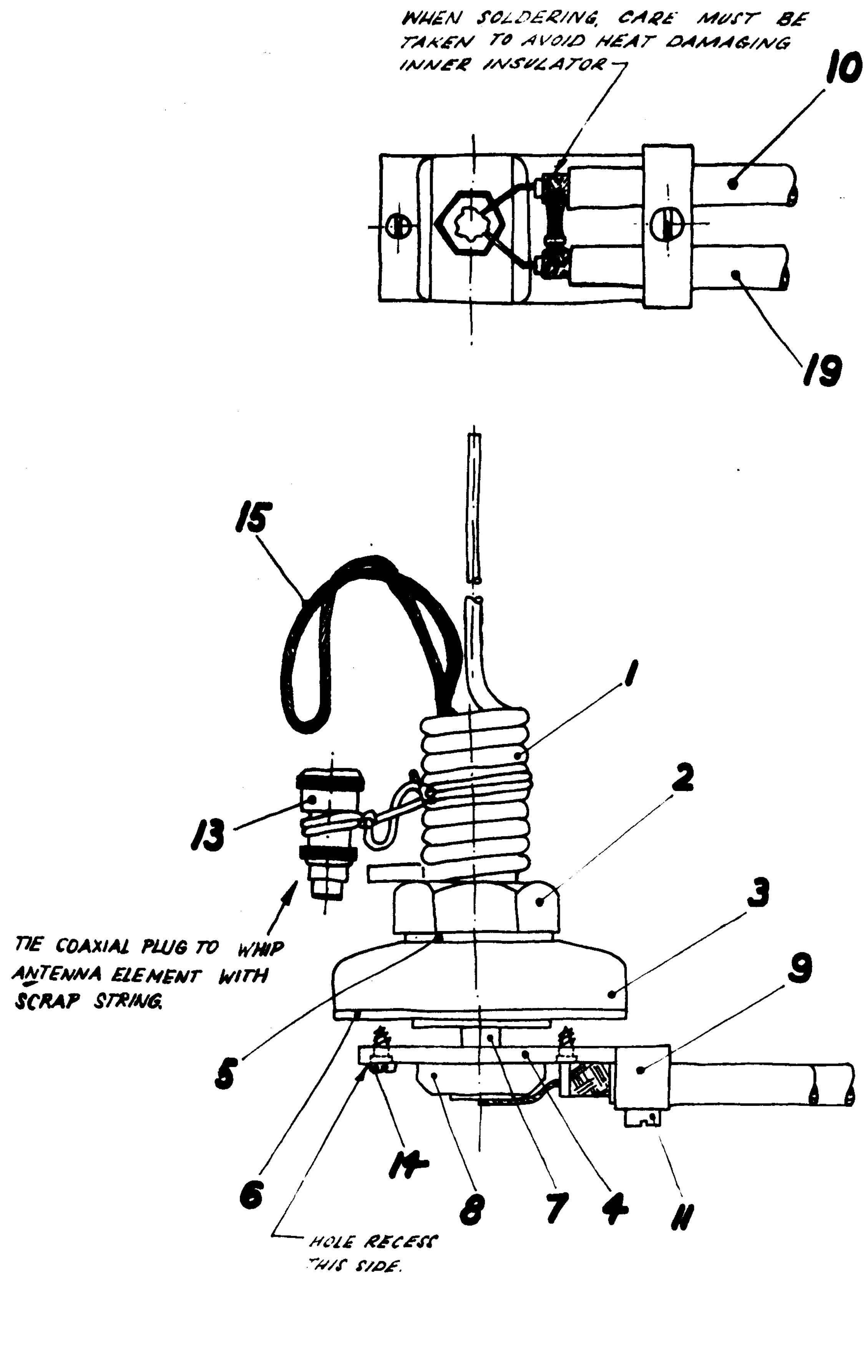
REFER TABLE

D AS PER
/ E.D.E.

S

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED

FIRST ANGLE PROJ



CODE No2 RAISED AS PER SP. 1960 5-12-61 E.D.E.

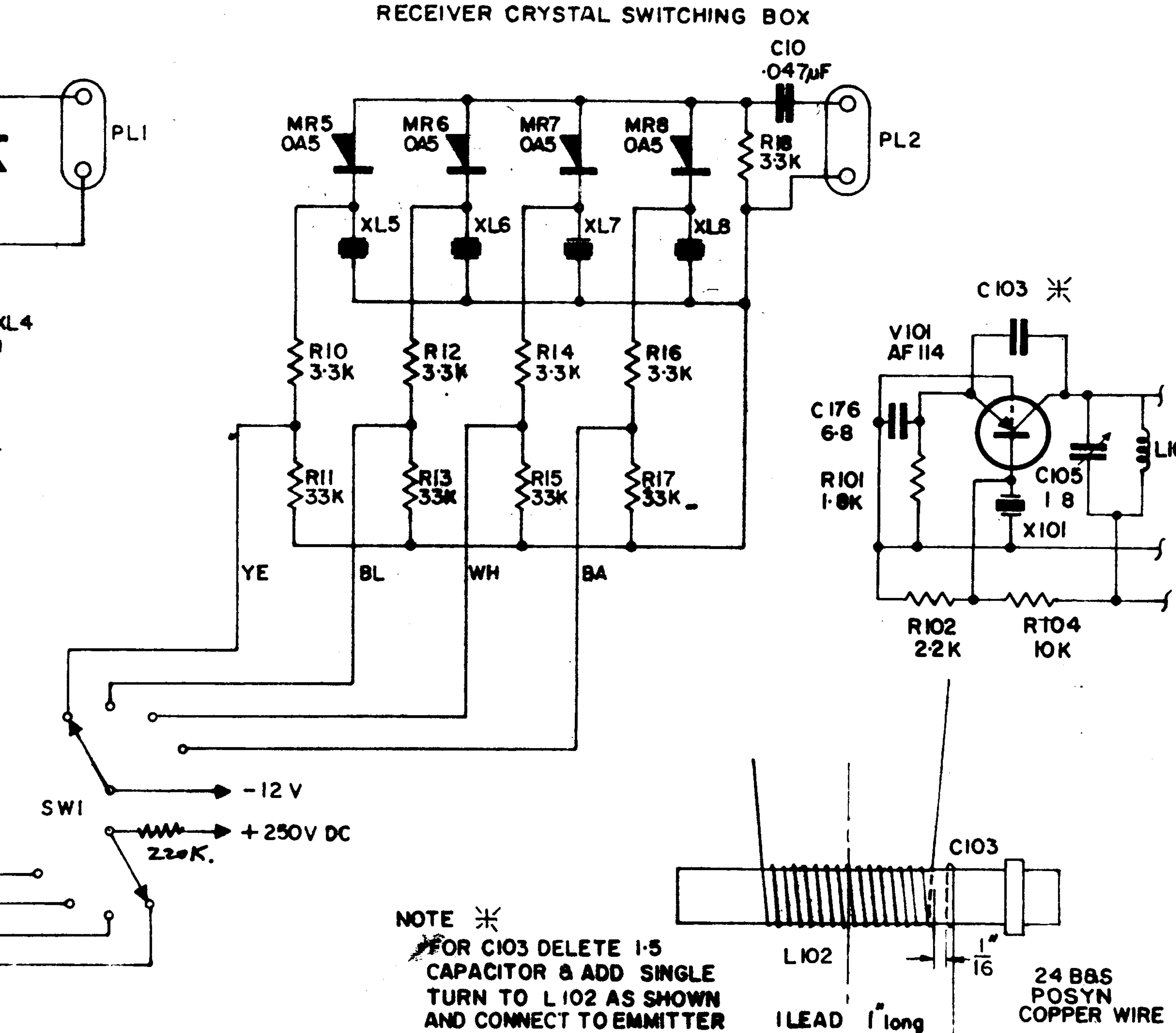
REVISIONS

1675 4-channel Crystal Switching Kit (A & C Bands Only)

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
C.004.AA/6E	C1	6.8 pf Ceramic Trimmer	1	Philips	
CZ.097.025	C2	.001 uF Ceramic Disc	1	Ducon	Type CDS 10% curve Y 500 V.W.
C.004.AA/6E	C3	6.8 pf Ceramic Trimmer	1	Philips	
C.004.AA/6E	C5	6.8 pf Ceramic Trimmer	1	Philips	
C.004.AA/6E	C7	6.8 pf Ceramic Trimmer	1	Philips	
CZ.097.115.AA	C9	1000 pf Ceramic Disc	1	Ducon	Type CDS, Hi K, Style A, curve Y 10%
CZ.097.901	C10	.047 uf Ceramic Thin Sheater	1	Simplex	Type CPT, 33V, Hi K +80%, -25%
C.302.AB/M12E	C11, C12, C13, C14,	12 pf Tubular Ceramic Capacitor	4	Philips	
CZ.005.119.CC	R1	150K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.119.CC	R2	150K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.122.CC	R3	330K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.119.CC	R4	150K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.122.CC	R5	330K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.119.CC	R6	150K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.122.CC	R7	330K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.119.CC	R8	150K ohms ½ watt Carbon	1	Morganite	10%
CZ.005.122.CC	R9	330K ohms ½ watt Carbon	1	Morganite	10%
CZ.002.720.CC	R10	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ.003.928.CC	R11	33 K ohms ½ watt Carbon	1	Morganite	10%
CZ.002.720.CC	R12	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ.003.928.CC	R13	33 K ohms ½ watt Carbon	1	Morganite	10%
CZ.002.720.CC	R14	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ.003.928.CC	R15	33K ohms ½ watt Carbon	1	Morganite	10%
CZ.002.720.CC	R16	3.3K ohms ½ watt Carbon	1	Morganite	10%
CZ.003.928.CC	R17	33K ohms ½ watt Carbon	1	Morganite	10%
CZ.002.720.CC	R18	3.3K ohms ½ watt Carbon	1	Morganite	10%

1675 4-channel Crystal Switching Kit (A & C Bands Only)

CODE NO.	POS.	DESCRIPTION	NO. OFF	SUPPLIER	REMARKS
	MR 1	OA5 Diode	1	Philips	
	MR2	OA5 Diode	1	Philips	
	MR3	OA5 Diode	1	Philips	
	MR4	OA5 Diode	1	Philips	
	MR5	OA5 Diode	1	Philips	
	MR6	OA5 Diode	1	Philips	
	MR7	OA5 Diode	1	Philips	
	MR8	OA5 Diode	1	Philips	
CZ.200.442.1	SW1	2 pole 4 position Switch	1	Jabel	SPZ 2924
CR.904.396		Receiver Crystal Assembly			
CZ.365.138	PL2	Crystal Base Plug	1	Pye	Type HC6U
CZ.370.113		Crystal Socket	4	Teletron	Type SC22LP
CR.904.394		Component Card Assembly	1		SPA 10721
		Component Layout			SPA 10716
CR.904.397		Transmitter Crystal Assembly			
CZ.365.138	PL1	Crystal Base Plug	1	Pye	Type HC6U
CZ.370.113		Crystal Socket	4	Teletron	Type SC22LP
CR.904.393		Component Card Assembly	1		SPA 10720
		Component Layout			SPA 10717
		Circuit Diagram			SPB 4882



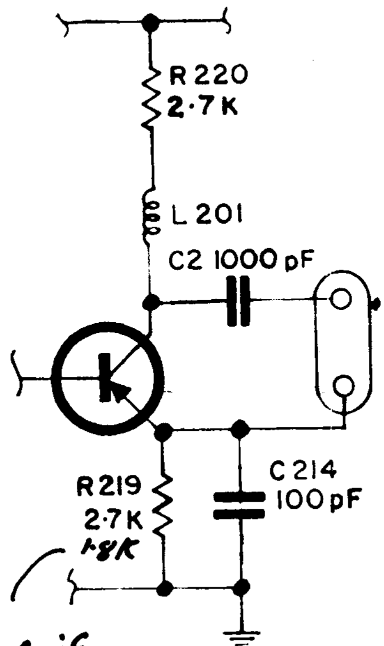
NOTE ⋇
FOR C103 DELETE 1·5 CAPACITOR & ADD SINGLE TURN TO L102 AS SHOWN AND CONNECT TO EMMITTER V101

SWITCHING BOX REVISED 28-11-62 V.H.
D TO CHANGE C103 8·8·62

TYPE 1675 A & C
MULTI-CHANNEL SWITCHING
CIRCUIT DIAGRAM

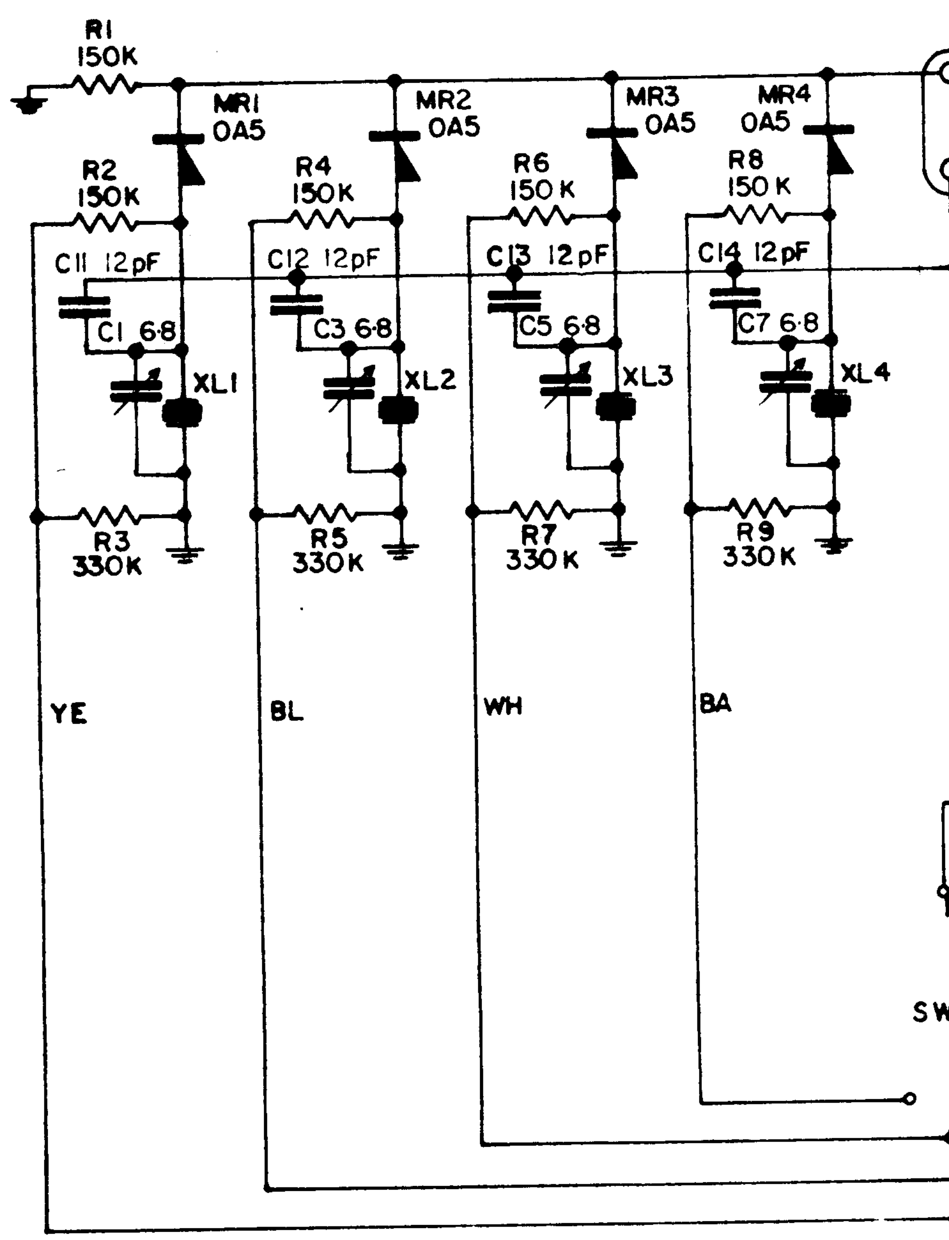
DRAWN: B.N. APPROVED: SPB 5157

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED



only if 220K in +250v lead doesnt ease starting.

TRANSMITTER CRYSTAL SWITCHING BOX



NOTE

TRANSMITTER 1675

C 213 DELETED A 2·7K 1/2W RESISTOR IS TO BE SUBSTITUTED FOR R219.
1000 pF CAPACITOR (C2) TO BE ADDED BETWEEN XTAL OSC CARD AND XTAL SOCKET, AS SHOWN.

1675A ONLY

A 1·8 KΩ HALF WATT RESISTOR IS TO BE SUBSTITUTED FOR R249, PRESENTLY A 2·7 KΩ HALF WATT RESISTOR.

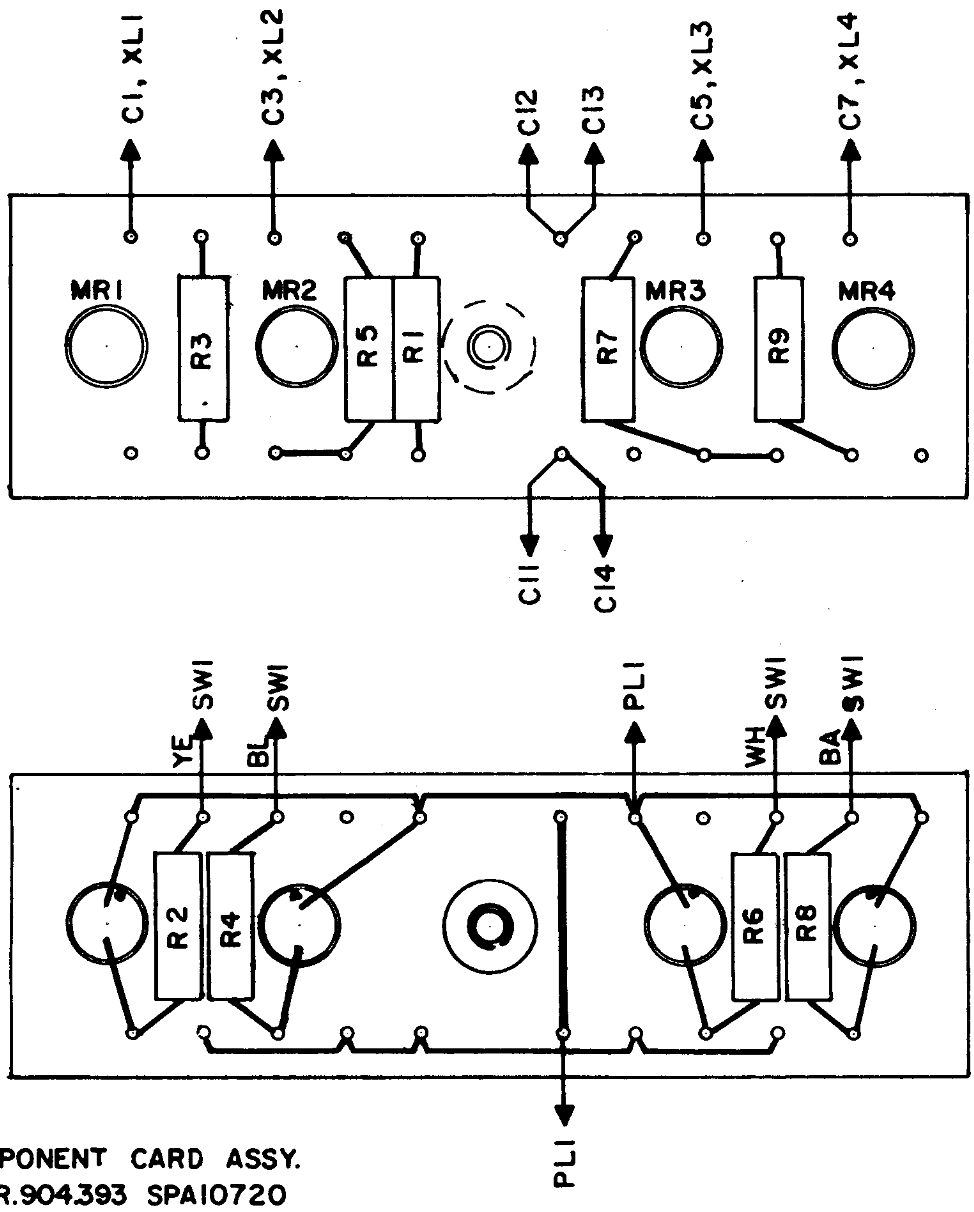
ISSUE 2 CRYSTAL SWITC
SP 2102 28-
ISSUE 1 NOTE ADDED TO

FIRST ANGLE PROJECTION

REVISIONS

ISSUE 1. SP1994 WIRING CORRECTED

ISSUE 2. C9 DELETED & WIRING CORRECTED SP 2102



COMPONENT CARD ASSY.
CR.904.393 SPA10720

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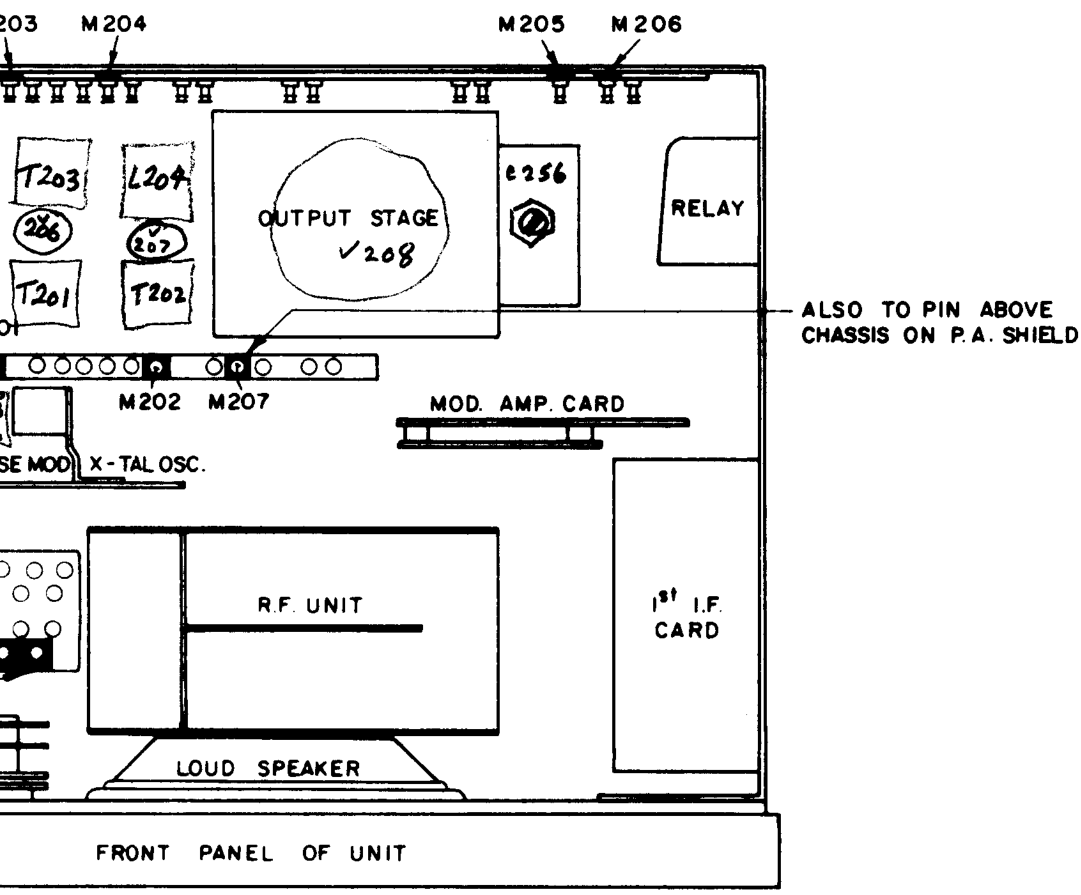
MATERIAL			CODE No.	
FINISH AND/OR TREATMENT			SHEETS	SHEET No.
Tolerances as indicated:—Otherwise Fractions 1/64"			MODEL	DRAWING No.
DRAWN B.N.	ORIGIN	SCALE	1675	SPA10717
CHECKED	APPROVED	DATE		
TRANSMITTER CRYSTAL SWITCHING ASSY. COMPONENT LAYOUT				

TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED

H&T 20085

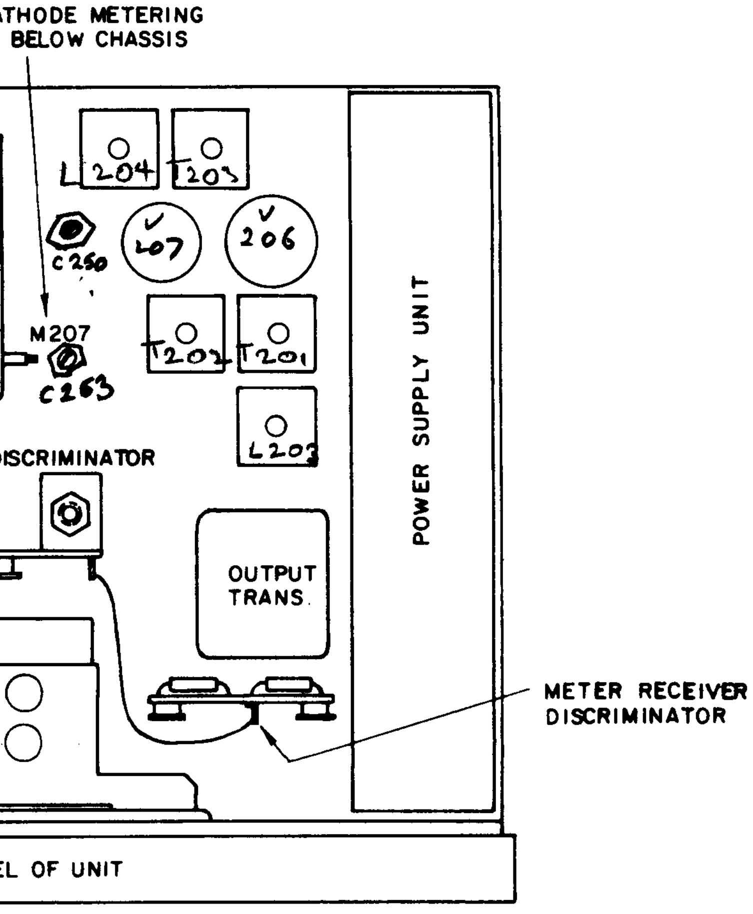


UNDER VIEW OF CHASSIS

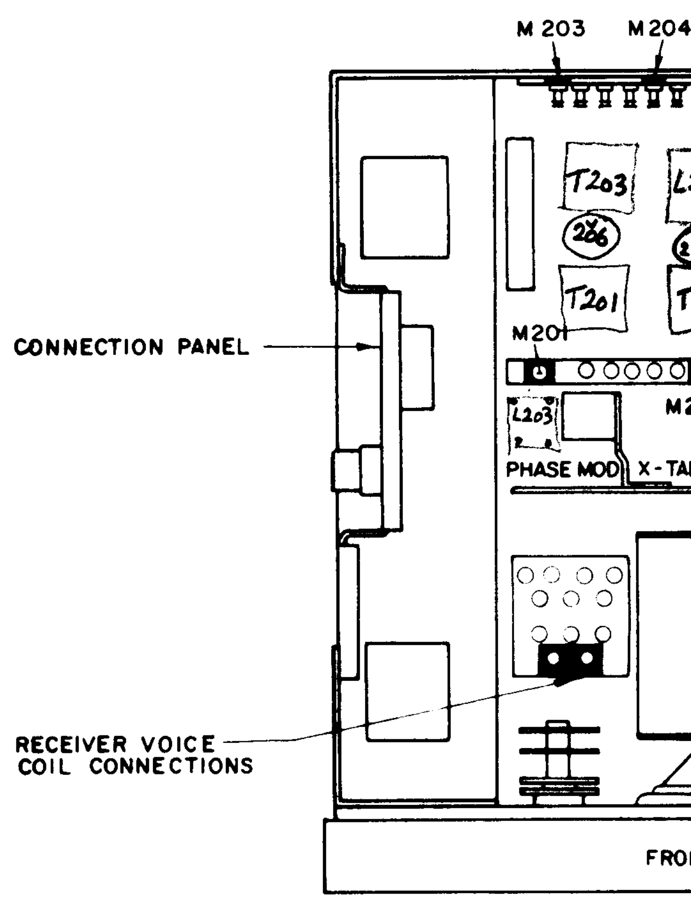
TYPE 1675
METERING & TEST POINT LAYOUT

DRAWN: E.D.E. APPROVED: **SPC 1989**

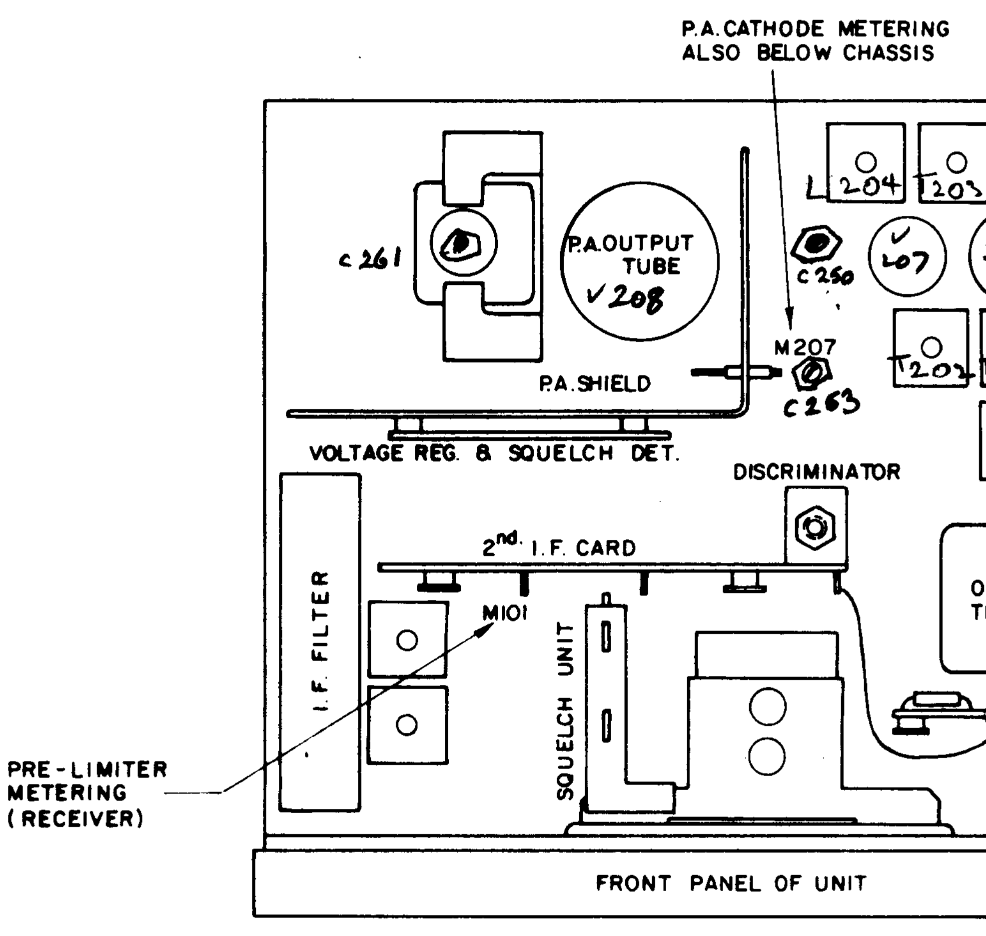
TELECOMMUNICATION COMPANY OF AUSTRALIA PTY. LIMITED



OF CHASSIS



UNDER



TOP VIEW OF CHASSIS