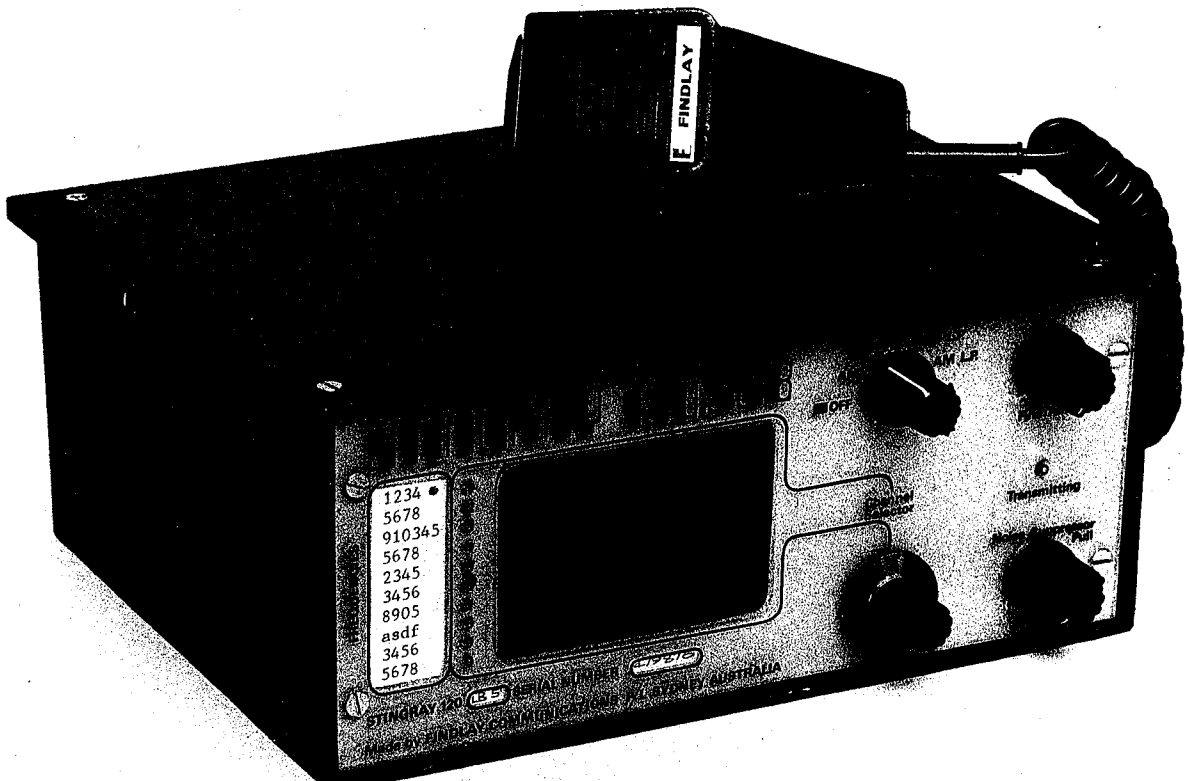
FINDLAY COMMUNICATIONS
PTY. LTD.

Electronic and Communication Engineers

STINGRAY 120

Instruction Manual



1.1 P.M.G. TYPE APPROVAL

1.1.1

The Stingray 120 is fully approved by the P.M.G's Department for use in both the land based and maritime HF communication networks throughout Australia.

SPECIFICATION	P.M.G. APPROVED CERTIFICATE NO.
RB211B	211B111
RB211C	211C214
RB211D	211D312
RB209	209031
RB209/0	209-0-012

N.B. It is compulsory to use the Stingray Automatic ATu 120-1 in conjunction with the transceiver when the unit is to operate in an RB211 service.

1.1.2. Specification RB211B

for

Single Frequency Simplex M.F. and H.F. Single Sideband Suppressed Carrier Radiotelephony Equipment for use in the International Maritime Mobile Radiotelephone Service.

Scope of the Specification RB211B

This specification sets out technical requirements for medium and high frequency single sideband suppressed carrier and compatible double sideband equipment considered by the Postmaster-General's Department to be suitable for installation aboard any vessel which is required to fit such apparatus under the laws of any State of the Commonwealth.

1.1.3 Specification RB211D

for

Two Frequency Simplex and Duplex M.F. and H.F. Single Sideband Radiotelephony Equipment for use in the ship/shore Radiotelephone Subscribers Service.

Scope of the Specification RB211D

This specification sets out technical requirements for two

/frequency....

1.1.3 contd/.....

frequency simplex and/or duplex medium and high frequency single sideband suppressed carrier and compatible double sideband equipment licensed by the Postmaster-General's Department for operation in the ship/shore radiotelephone subscribers service.

1.1.4 Specification RB211C

for

Single Frequency Simplex M.F. and H.F. Single Sideband Suppressed Carrier Radiotelephony Equipment Employed in Voluntarily Fitted Small Ship Radiotelephone Services

Scope of the Specification RB211C

This specification sets out minimum technical requirements for medium and high frequency single sideband suppressed carrier and compatible double sideband equipment considered by the Department to be suitable for installation aboard voluntarily fitted ships.

Equipment which has been issued with a type approval certificate under specifications RB.211B or RB.211D may be accepted for installation in vessels in the category of this specification (RB.211C).

1.2 TECHNICAL SPECIFICATIONS -STINGRAY 120

1.2.1 TRANSMITTER

Power Output — A3J-Minimum of 100 watts PEP
A3H-50 watts carrier power
Low power- 10 watts PEP nominal

No. Channels — 10 channel single frequency Simplex or up to 5 dual frequency Simplex channels.

Frequency Range — 2 to 13 MHz

Indicators — Visual indication is provided for power output and selection of 2182 KHz

Carrier Suppression — Greater than 40 db

Unwanted Sideband Suppression — Better than 40 dB

Spurious Outputs — 40 dB below PEP

Automatic Level Control. — RF output variation of less than 1 dB for 20dB excessive input level

1.2.1 cont'd/.....

Residual Noise — At least 50 dB below PEP

Audio Response — ± 7.5 dB of 6dB per octave rising from 350Hz to 2700Hz

Stability — ± 50 Hz in the temperature range of 0°C - 60°C with ± 10% supply variation.

Load Protection — Owing to unique power amplifier design no protection is required for load mis-match. The Stingray 120 will deliver full rated PEP into either open or short circuited loads.

Supply Protection — The Stingray 120 is fully protected against reverse polarity supply and will operate normally with ± 25% of nominal 12.5V DC input

Temperature — The Stingray 120 will operate normally in the temperature range of -5°C to +70°C.

Power Requirement — 12.6V DC nominal 10 amps PEAK 6 amps average.

1.2.2 RECEIVER

Input Impedance — As per transmitter

Power Output — 3 watts maximum
2 watts at less than 5% THD

Channels — As per transmitter

Sensitivity — A3J - 0.35uV $\frac{10 \text{ db } S+N}{N}$

A3H - 1.0uV 50% modulation 1KHz $\frac{10 \text{db } S+N}{N}$

Selectivity — A3J 2.5Hz - 6db
6.0KHz - 70db

A3H 6.0KHz - 6db
30.0KHz - 65db

A.G.C. — Less than 10db audio increase for 80db increase in input level above 5uV.

Spurious Responses — Greater than 60 db

Image Response — Greater than 50 db

1.2.2. cont'd/.....

Blocking In excess of 80 db at ± 20 KHz

Cross Modulation In excess of 80db at ± 20 KHz

Intermodulation 65db above 0.35 uV

Audio Frequency Response ± 3db, 300Hz to 2500Hz

Clarifier Range ± 150 Hz nominal (less on RB209)

Stability ± 50Hz 0°C - 60°C ± 10% supply variation

Temperature Range As per transmitter

SPECIFICATION - STINGRAY 120

The Stingray 120 is the most compact, whilst at the same time most powerful, Single Sideband transceiver yet approved to P.M.G. Specification (RB211 & RB209) containing the following unique features:

1. DIRECT 12.5V DC operation

2. Full 10 channel capability including as standard the facility for split frequency operation

3. An output power in excess of 100 watts P.E.P. (typically 120 watts) at ALL operating frequencies and into all loads from 10 ohm reactive through to 50 ohm resistive.

4. Owing to its extremely small physical size of 9" x 3¾" x 7¾" deep, the Stingray 120 may be unobtrusively housed in the smallest of marine craft whilst the solid cast aluminium construction is ideally suitable to the tough marine environment encountered by ocean going vessels.

ACCESSORIES AND OPTIONS

1. A.T.U.
ATU 120-1 is normally supplied with the Stingray 120 (compulsory for RB211)

2. Noise Blanker
A full IF impulse noise blanker is available as an an option.

3. BROADCAST TUNER
A broadcast tuner option is available as a plug in accessory.

4. Public Address
Public Address facility is included as standard requiring only the connection of an extension speaker.

5. Remote Control Limited
Remote control of speech and PTT facility.

6. Full Remote Control
The Stingray 120 is capable of full remote control of

a. Power on/off
b. A3J/A3H selection
c. Channel selection
d. Speech circuits
e. Low/High power selection

N.B. Owing to all Solid State switching the Stingray 120 is capable of being programmed for automatic selection of Mode and output power on any or all channels.

1.3 STINGRAY 120 - CRYSTAL SPECIFICATIONS

All Crystals

Mode	=	Parallel
Calibration Capacity	=	30 Pf Parallel
Temperature Stability	=	± 50 Hz 5°C - 55°C
	=	± 60 Hz 0°C - 5°C
	=	± 60 Hz 55°C - 60°C

CHANNEL CRYSTAL = Channel Frequency + 1650 kHz

Example Channel Frequency= 2524 kHz
Channel Crystal = 2524 kHz + 1650kHz = 4174 kHz

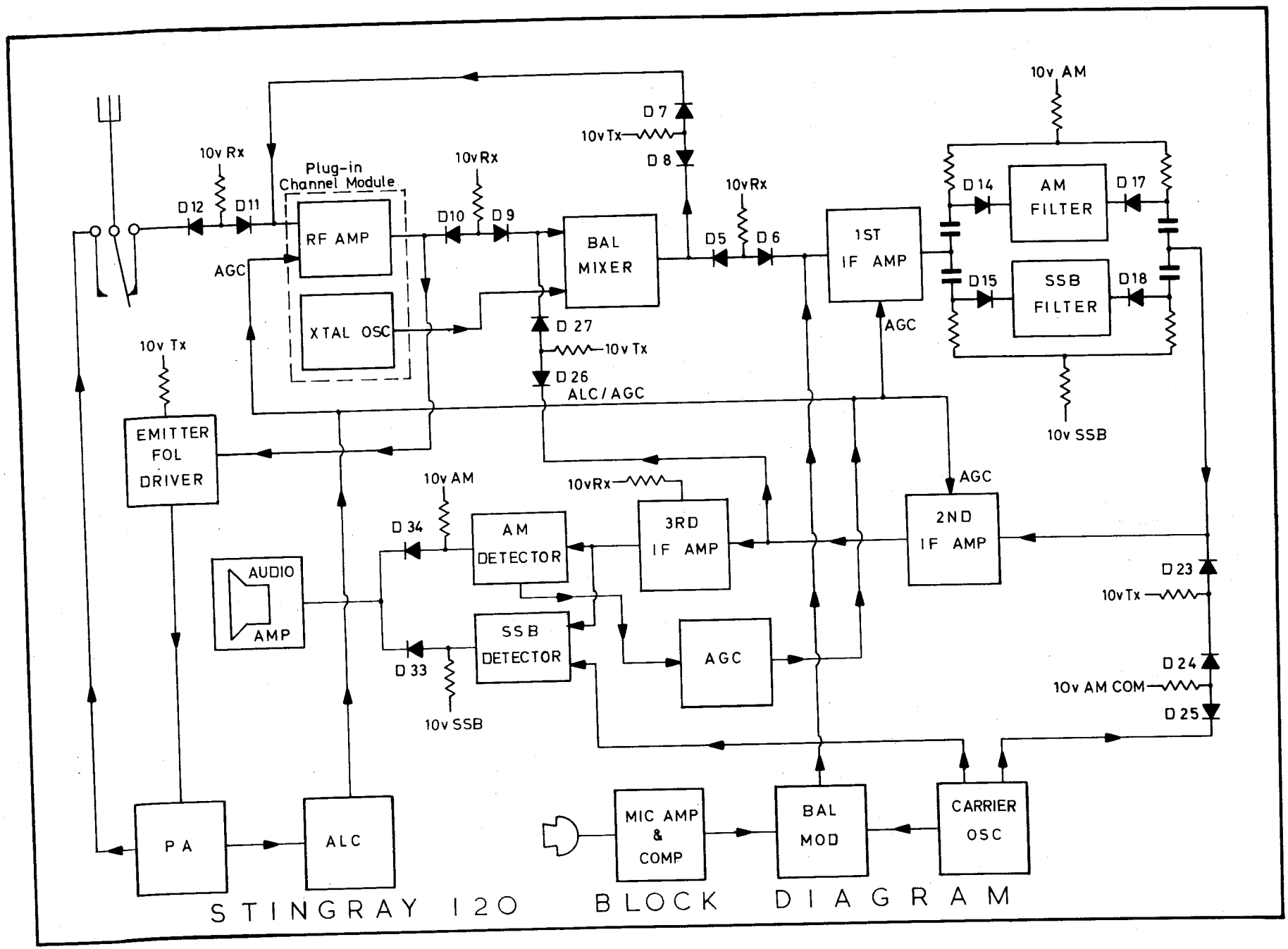
Frequency	Manufacturer	Code
Carrier Crystal 1650 kHz	Hi-Q	LGE
Channel Freq (Channel 2-3 MHz Frequency + 1650kHz)	Hi-Q A.W.A.	LGE UFFS

1.3 cont'd/....

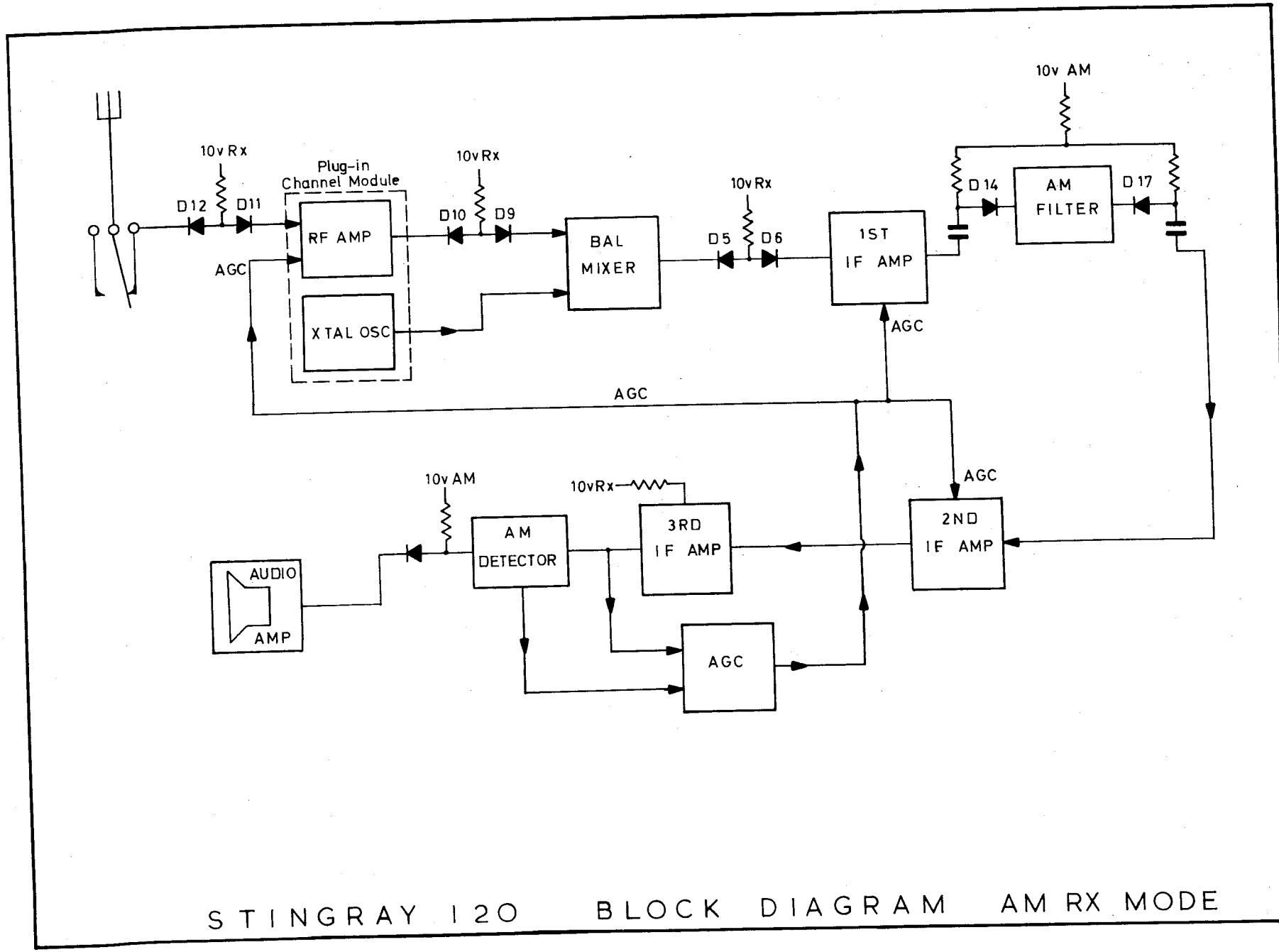
	Frequency	Manufacturer	Code
Channel Freq 3-7 MHz	(Channel Frequency + 1650kHz)	Hi-Q "	Delta GE UFFS
Channel Freq 7-13 MHz	"	Hi-Q A.W.A.	Delta GE UFFS(Special)
SSB Crystal Filter	1650kHz	Hi-Q	QF1B65
AM Crystal Filter	1650kHz	Hi-Q	QF1A65
LSB Crystal Filter	1650kHz	Hi-Q	QF1F65

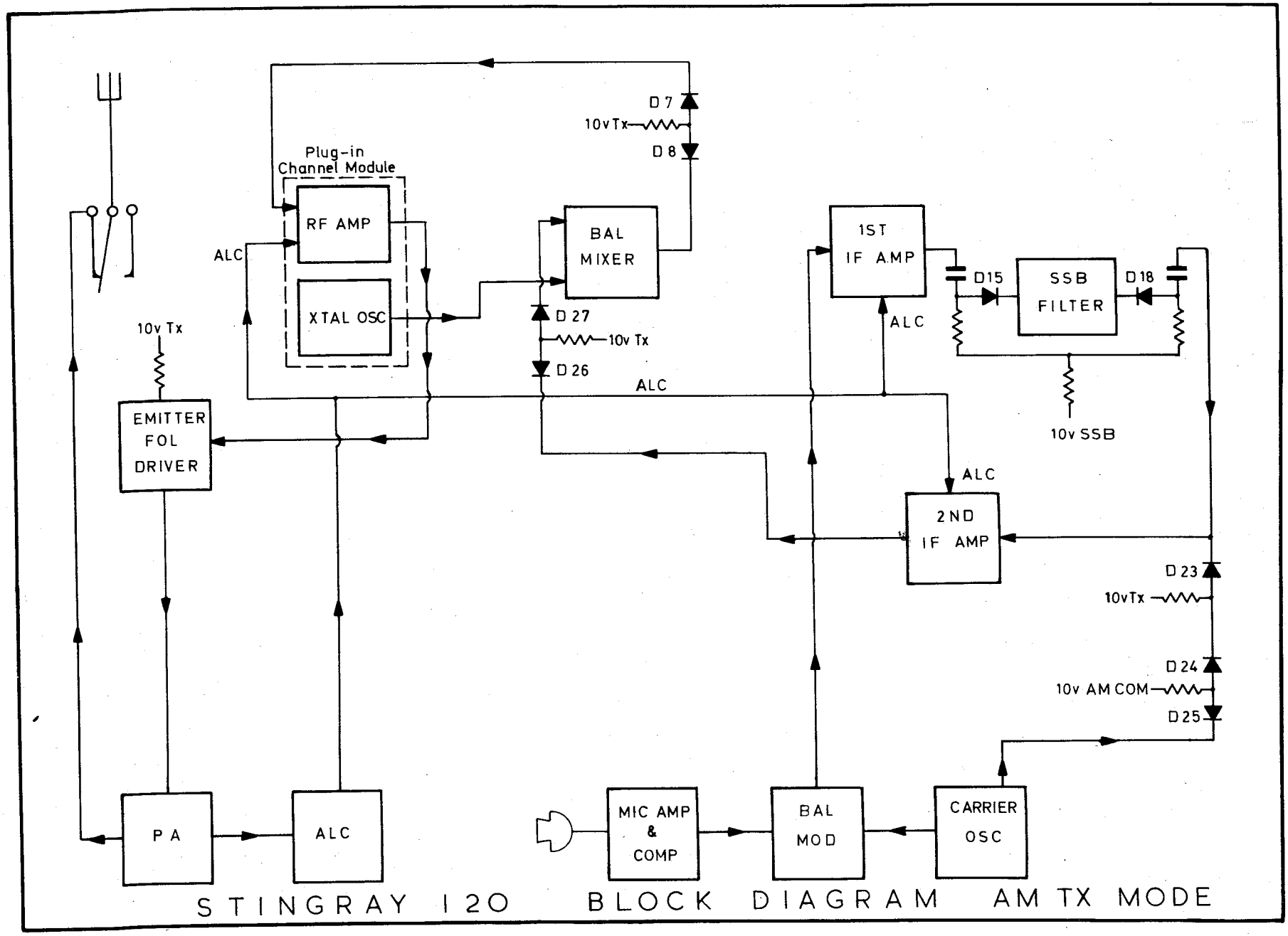
1.4 SYDNEY AREA CRYSTALS FOR STINGRAY 120A- CHECK WITH OVERSEAS TELECOMMUNICATIONS FOR FURTHER INFORMATION

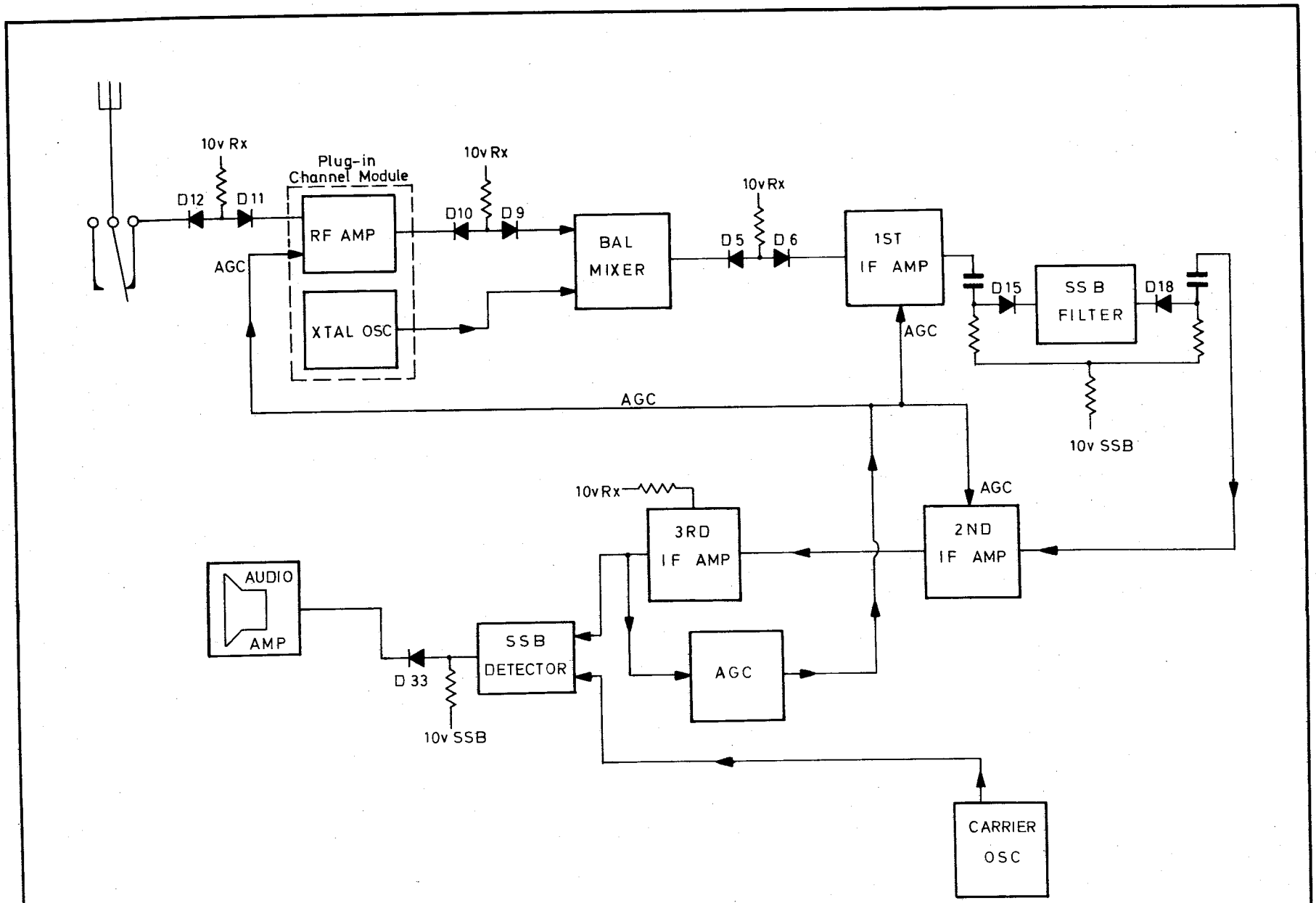
CHANNEL	CRYSTAL FREQUENCY	APPLICATION
2112 kHz	3762 kHz	Prof.Fishing
2182 kHz	3832 kHz	International Distress
2201 kHz	3851 kHz	Sydney Radio
2284 kHz	3934 kHz	Pleasure Craft
2524 kHz	4174 kHz	Pleasure Craft
4095 kHz	5745 kHz	Prof. Fishing) Pleasure Craft) Emergency)
4136.3 kHz	5786.3 kHz	Sydney Radio
4072.4 Tx) 4371.0 Rx)	5722.4 6021	(Primary Radio- (telephone,Sydney (Radio
4091.6 Tx) 4390.2 Rx)	5741.6 6040.2	(Secondary Radio- (telephone,Sydney (Radio
4620	6270	Prof. Fishing
6204	7854	Sydney Radio



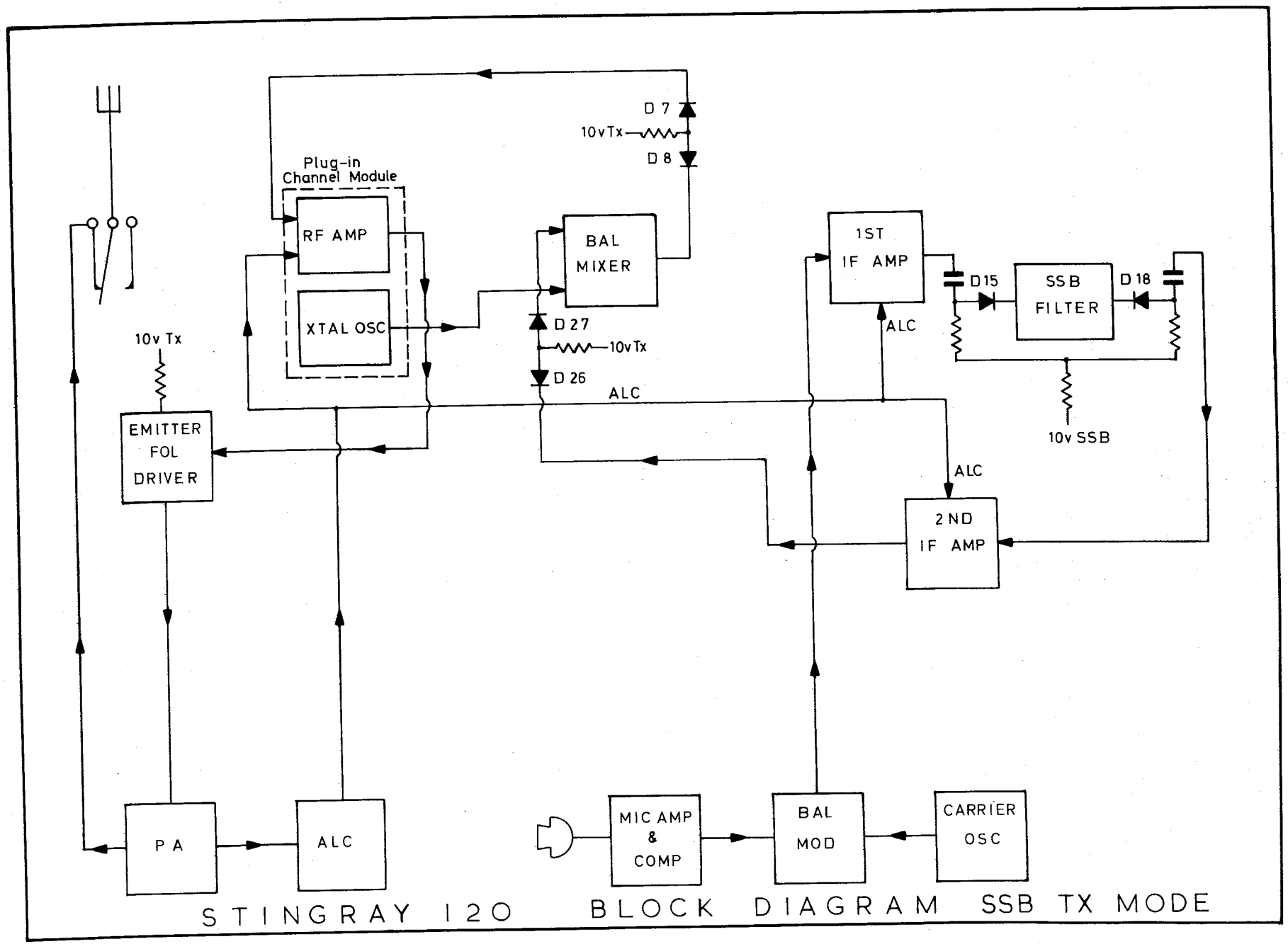
STINGRAY 120 BLOCK DIAGRAM

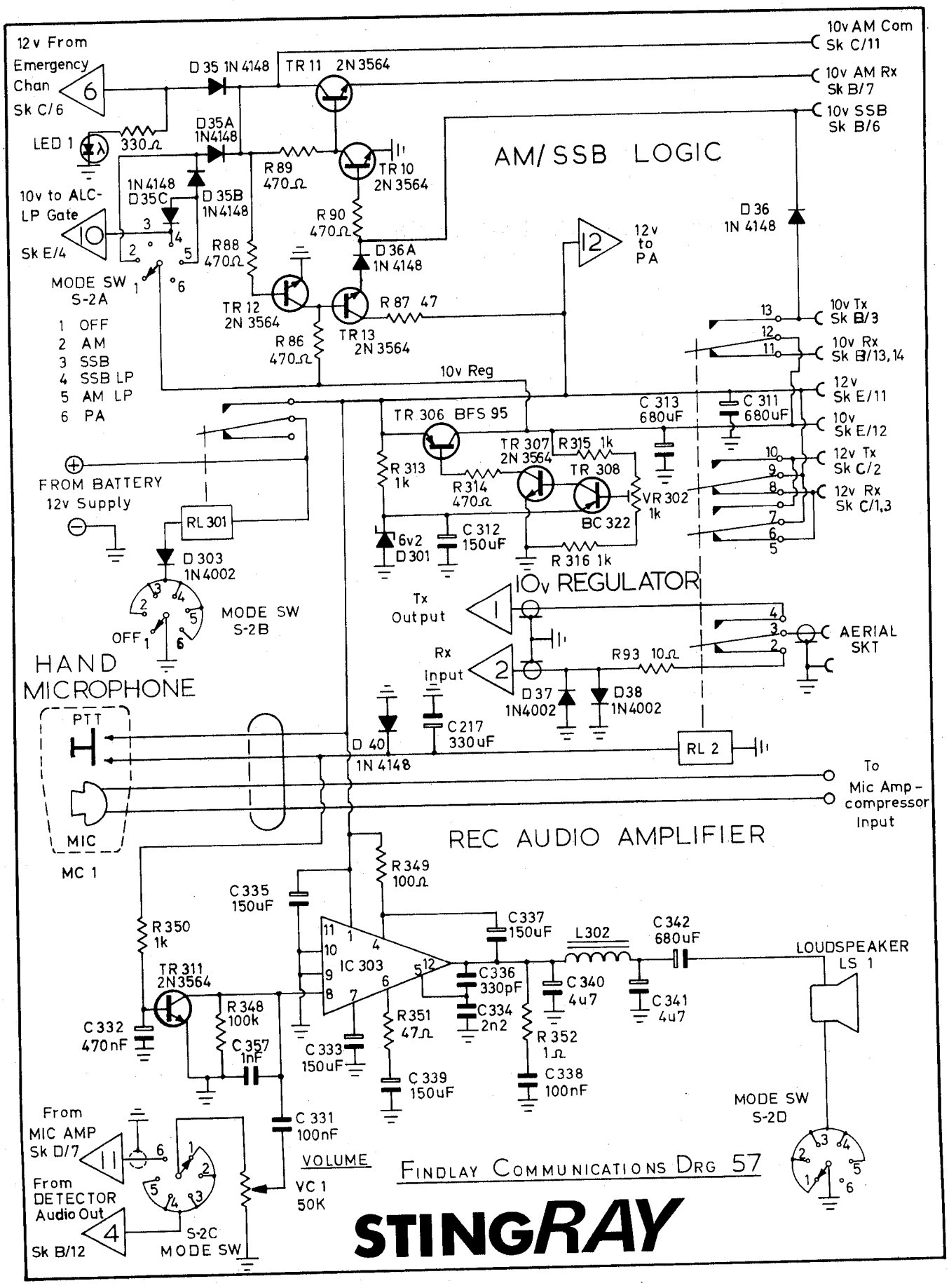

10v AM
10v Rx
Plug-in
Channel Module
10v Rx
10v Rx
D12
D11
D10
D9
D5
D6
D14
D17
RF AMP
XTAL OSC
BAL
MIXER
1ST
IF AMP
AM
FILTER
AGC
AGC
AGC
AGC
10v AM
10vRx
AM
DETECTOR
3RD
IF AMP
2ND
IF AMP
AUDIO
AMP
AGC
STINGRAY 120 BLOCK DIAGRAM AM RX MODE

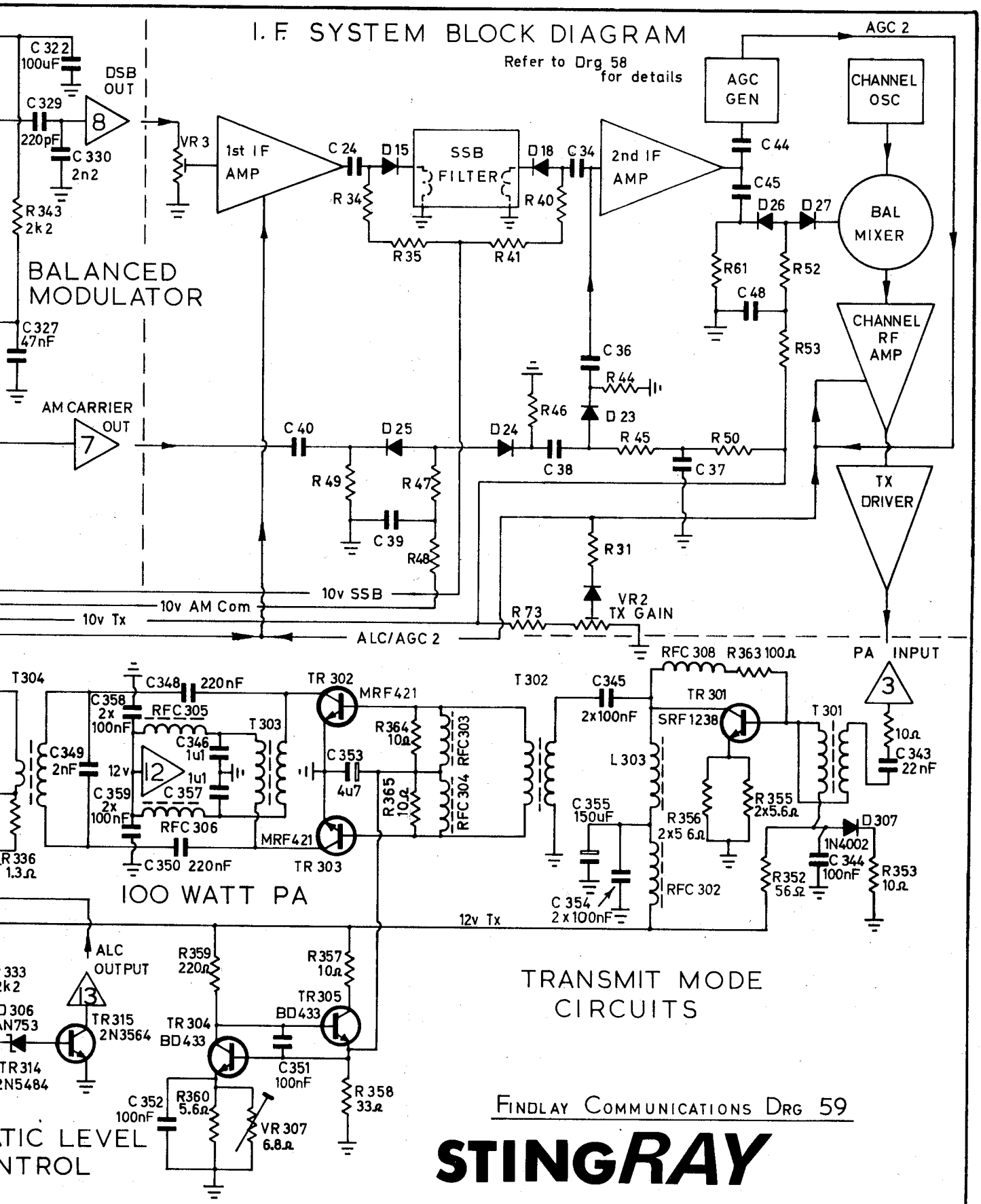

D 7
10v Tx
D 8
Plug-in
Channel Module
RF AMP
XTAL OSC
ALC
BAL
MIXER
D 27
10v Tx
D 26
1ST
IF AMP
D15
SSB
FILTER
D18
ALC
10v SSB
10v Tx
EMITTER
FOL
DRIVER
ALC
ALC
2 ND
IF AMP
D 23
10vTx
D 24
10v AM COM
D 25
P A
ALC
MIC AMP
&
COMP
BAL
MOD
CARRIER
OSC
STINGRAY 120 BLOCK DIAGRAM AM TX MODE

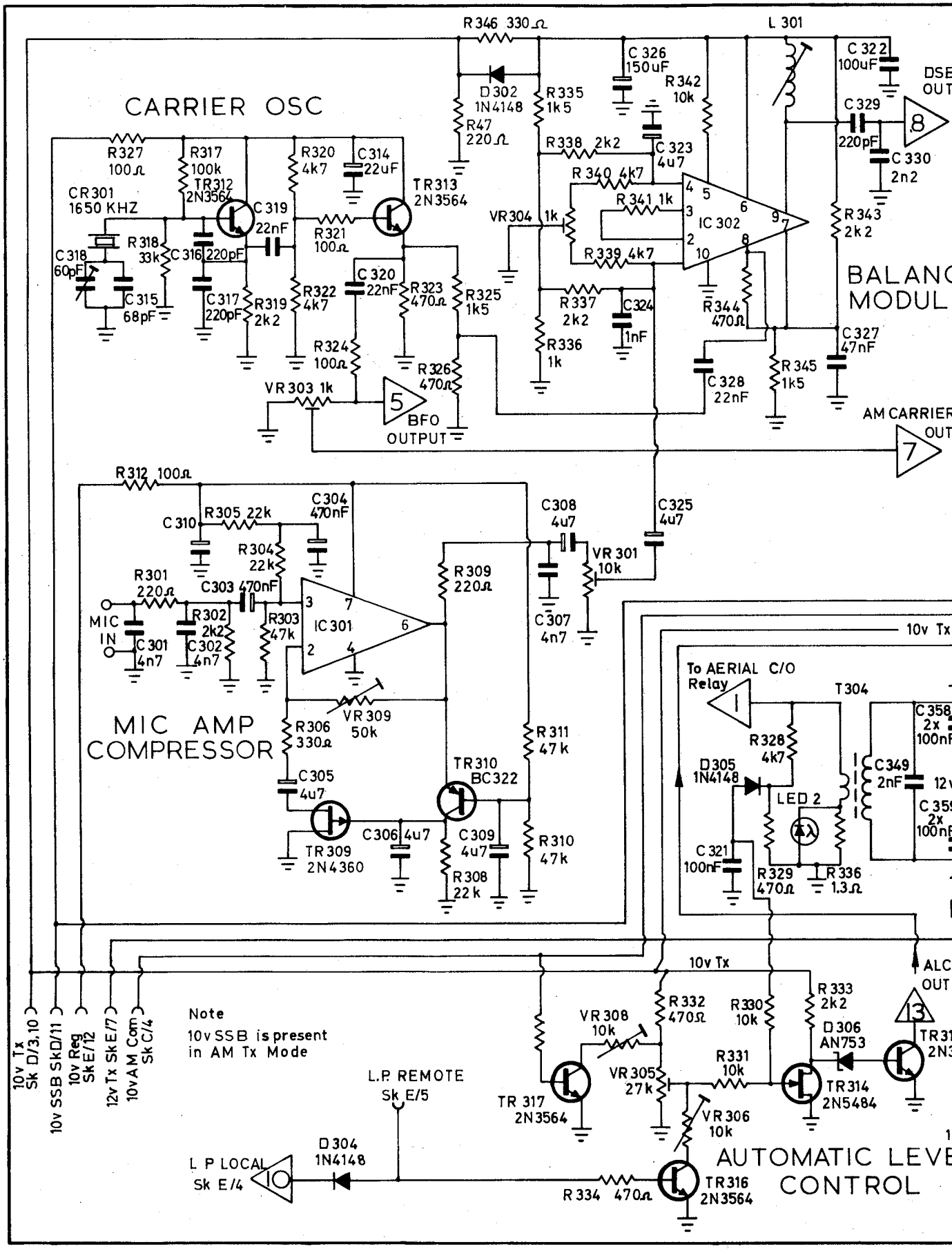


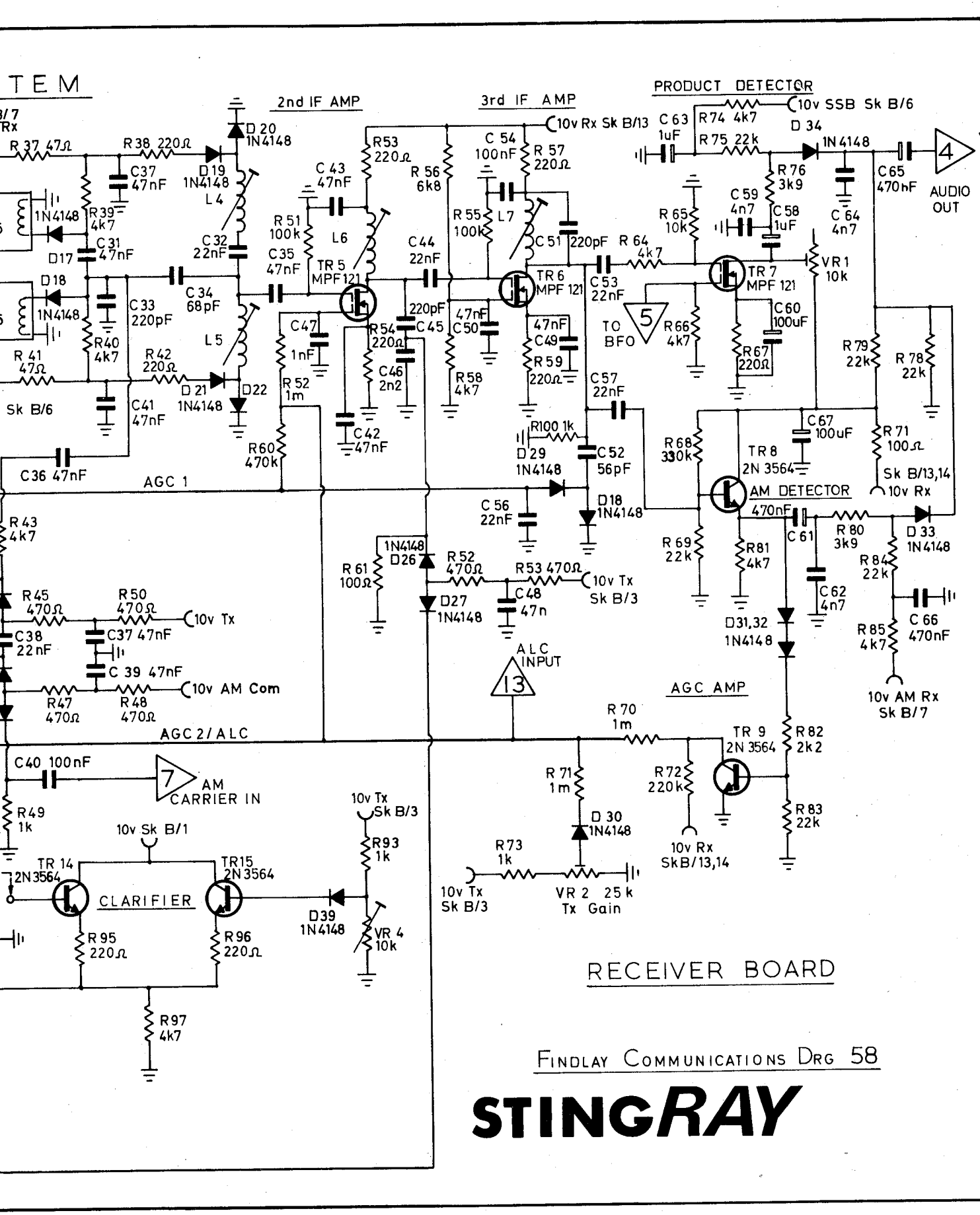
STINGRAY 120 BLOCK DIAGRAM SSB RX MODE

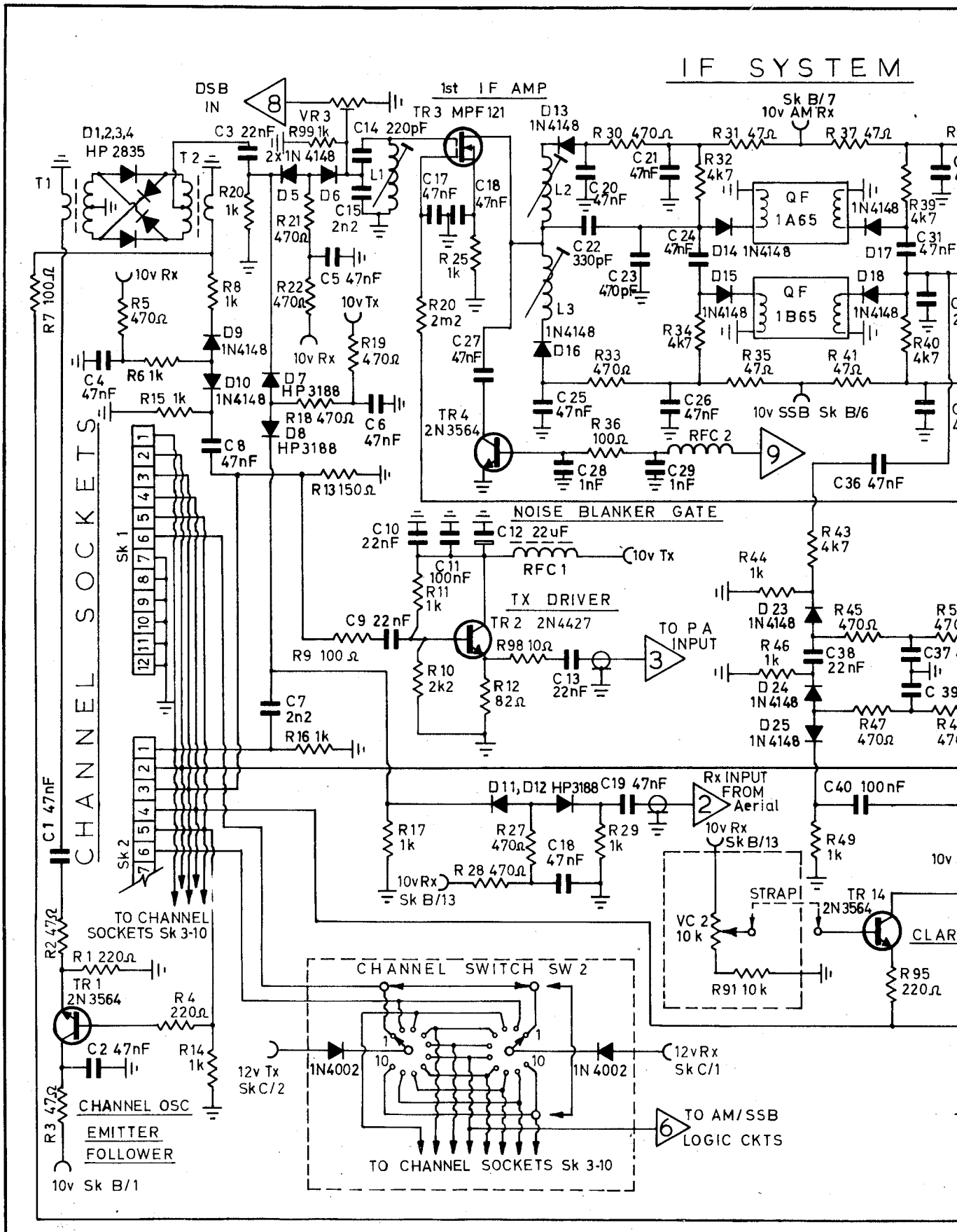

D 7
10v Tx
D 8
Plug-in
Channel Module
RF AMP
XTAL OSC
BAL
MIXER
1ST
IF AMP
D15
SSB
FILTER
D 18
10v Tx
D 27
10v Tx
D 26
ALC
ALC
10v SSB
EMITTER
FOL
DRIVER
ALC
2 ND
IF AMP
P A
ALC
MIC AMP
&
COMP
BAL
MOD
CARRIER
OSC
STINGRAY 120 BLOCK DIAGRAM SSB TX MODE

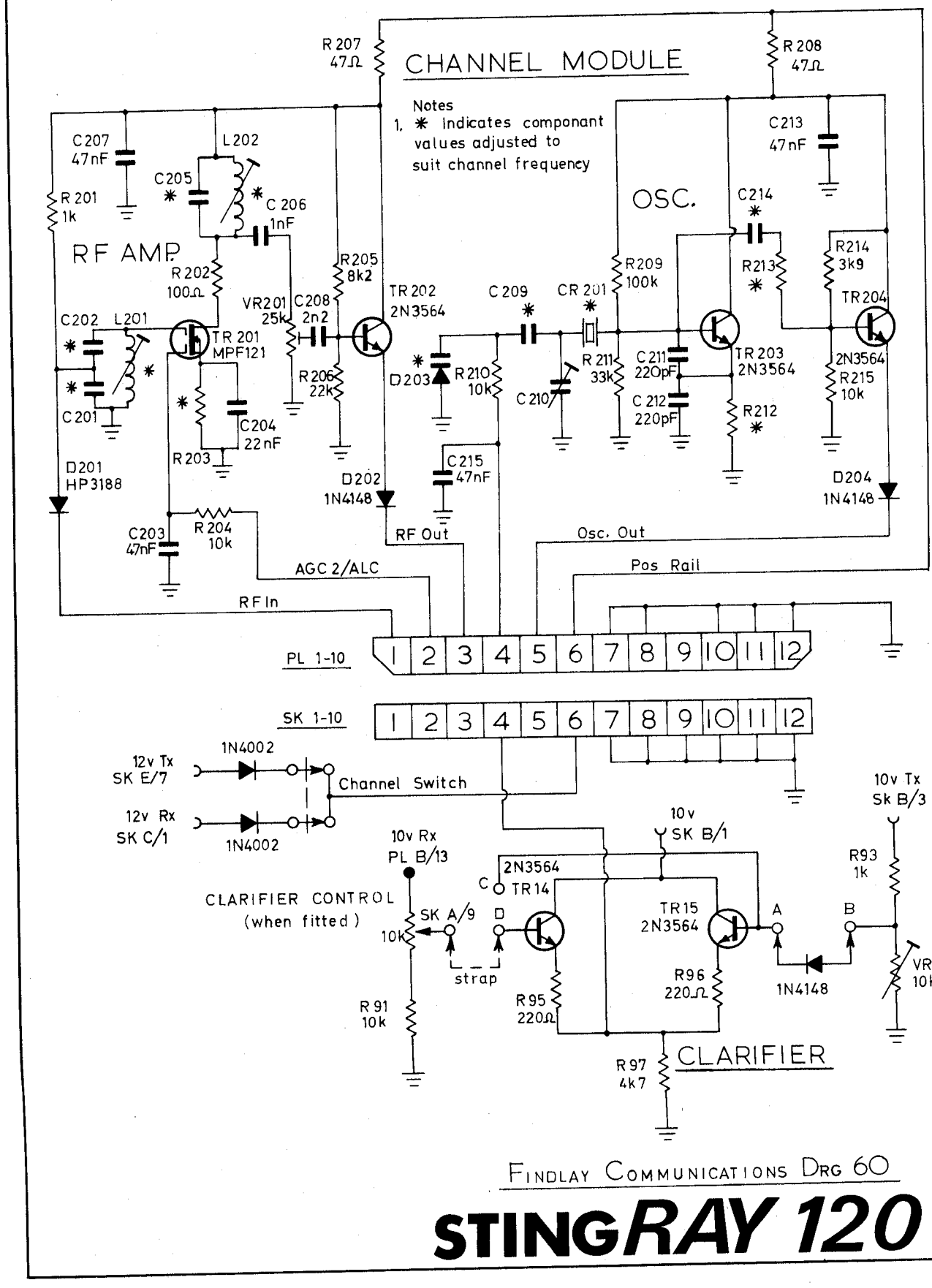

12v From Emergency Chan Sk C/6
D 35 1N 4148
TR 11 2N3564
10v AM Com Sk C/11
10v AM Rx Sk B/7
10v SSB Sk B/6
AM/SSB LOGIC
LED 1
330Ω
D35A 1N4148
R 89 470Ω
TR 10 2N3564
10v to ALC-LP Gate Sk E/4
1N4148 D35C
D 35B 1N4148
R 90 470Ω
D 36 1N 4148
R88 470Ω
D 36A 1N 4148
12v to PA
MODE SW S-2A
1 OFF
2 AM
3 SSB
4 SSB LP
5 AM LP
6 PA
TR 12 2N 3564
TR 13 2N 3564
R 87 47
R 86 470Ω
10v Tx Sk B/3
10v Rx Sk B/13,14
10v Reg
12v Sk E/11
10v Sk E/12
12v Tx Sk C/2
12v Rx Sk C/1,3
TR 306 BFS 95
C 313 680uF
C 311 680uF
TR 307 2N 3564
R315 1k
TR 308
R 313 1k
R314 470Ω
VR 302 1k
BC 322
FROM BATTERY 12v Supply
RL 301
6v2 D 301
C 312 150uF
R 316 1k
D 303 1N4002
10v REGULATOR
MODE SW S-2B
OFF
Tx Output
Rx Input
AERIAL SKT
R93 10Ω
D 37 1N4002
D38 1N4002
HAND MICROPHONE
PTT
MIC
MC 1
D 40 1N 4148
C217 330uF
RL 2
To Mic Amp - compressor Input
REC AUDIO AMPLIFIER
R 349 100Ω
C335 150uF
R 350 1k
C337 150uF
L302
C 342 680uF
LOUDSPEAKER LS 1
TR 311 2N3564
IC 303
C336 330pF
C334 2n2
C 340 4u7
C 341 4u7
R 352 1Ω
C 338 100nF
R348 100k
C 332 470nF
C 357 1nF
C 333 150uF
R351 47Ω
C 339 150uF
From MIC AMP Sk D/7
From DETECTOR Audio Out
Sk B/12
S-2C MODE SW
C 331 100nF
VOLUME
VC 1 50K
MODE SW S-2D
FINDLAY COMMUNICATIONS DRG 57
STINGRAY


I. F. SYSTEM BLOCK DIAGRAM
Refer to Drg 58 for details
AGC 2
AGC GEN
CHANNEL OSC
C 322 100uF
DSB OUT
C 329 220pF
C 330 2n2
R 343 2k2
VR 3
1st I F AMP
C 24
D 15
SSB FILTER
D 18
C 34
2nd IF AMP
R 34
R 40
R 35
R 41
C 44
C45
D 26
D 27
BAL MIXER
R61
R52
C 48
R53
CHANNEL RF AMP
BALANCED MODULATOR
C327 47nF
C 36
R 44
R46
D 23
AM CARRIER OUT
C 40
D 25
D 24
R 45
R 50
C 38
C 37
R 49
R 47
C 39
R48
TX DRIVER
R 31
10v SSB
VR2 TX GAIN
10v AM Com
10v Tx
R 73
ALC/AGC 2
RFC 308 R363 100Ω
PA INPUT
T304
C348 220nF
TR 302 MRF421
T 302
C345 2x100nF
TR 301 SRF1238
T 301
C358 2x 100nF
RFC 305
T 303
C346 1u1
C349 2nF
12v
C353 4u7
R364 10Ω
RFC 303
RFC 304
L 303
10Ω
C 343 22nF
C 359 2x 100nF
C 357 1u1
R365 10Ω
C 355 150uF
R 355 2x5.6Ω
R 356 2x5 6Ω
D 307 1N4002
C 344 100nF
R353 10Ω
RFC 306
MRF421
TR 303
C 350 220nF
R 336 1.3Ω
100 WATT PA
R352 56Ω
RFC 302
C 354 2 x 100nF
12v Tx
ALC OUTPUT
R359 220Ω
R357 10Ω
TR305 BD433
TR315 2N3564
TR 304 BD433
C351 100nF
R 358 33Ω
C 352 100nF
R360 5.6Ω
VR 307 6.8Ω
TRANSMIT MODE CIRCUITS
FINDLAY COMMUNICATIONS DRG 59
STINGRAY


CARRIER OSC
CR301 1650 KHZ
R327 100Ω
R317 100k
TR312 2N3564
R320 4k7
C314 22uF
TR313 2N3564
C319 22nF
R321 100Ω
R318 33k
C316 220pF
C318 60pF
C315 68pF
C317 220pF
R319 2k2
R322 4k7
C320 22nF
R323 470Ω
R325 1k5
R324 100Ω
R326 470Ω
VR303 1k
5 BFO OUTPUT
R346 330Ω
D302 1N4148
R47 220Ω
R335 1k5
C326 150uF
R342 10k
R338 2k2
C323 4u7
R340 4k7
R341 1k
VR304 1k
IC 302
R339 4k7
R337 2k2
C324 1nF
R336 1k
R344 470Ω
C328 22nF
R345 1k5
L 301
C322 100uF
DSE OUT
C329 220pF
C330 2n2
R343 2k2
BALANC MODUL
C327 47nF
AM CARRIER OUT
7
R312 100Ω
C310
R305 22k
C304 470nF
R304 22k
R301 220Ω
C303 470nF
MIC IN
C301 4n7
R302 2k2
C302 4n7
R303 47k
IC 301
MIC AMP COMPRESSOR
VR309 50k
R306 330Ω
C305 4u7
TR309 2N4360
C306 4u7
TR310 BC322
C309 4u7
R308 22k
R309 220Ω
R311 47k
R310 47k
C308 4u7
VR301 10k
C307 4n7
C325 4u7
10v Tx
To AERIAL C/O Relay
1
T304
R328 4k7
D305 1N4148
LED 2
C321 100nF
R329 470Ω
R336 1.3Ω
C349 2nF
C358 2x 100nF
C359 2x 100nF
12v
10v Tx
ALC OUT
13
R332 470Ω
R330 10k
R333 2k2
D306 AN753
VR308 10k
VR305 27k
R331 10k
TR 317 2N3564
TR314 2N5484
VR306 10k
TR316 2N3564
R334 470Ω
L.P REMOTE Sk E/5
D304 1N4148
L P LOCAL Sk E/4
10
AUTOMATIC LEVE CONTROL
Note
10v SSB is present in AM Tx Mode
10v Tx Sk D/3,10
10v SSB Sk D/11
10v Reg Sk E/12
12v Tx Sk E/7
10v AM Com Sk C/4

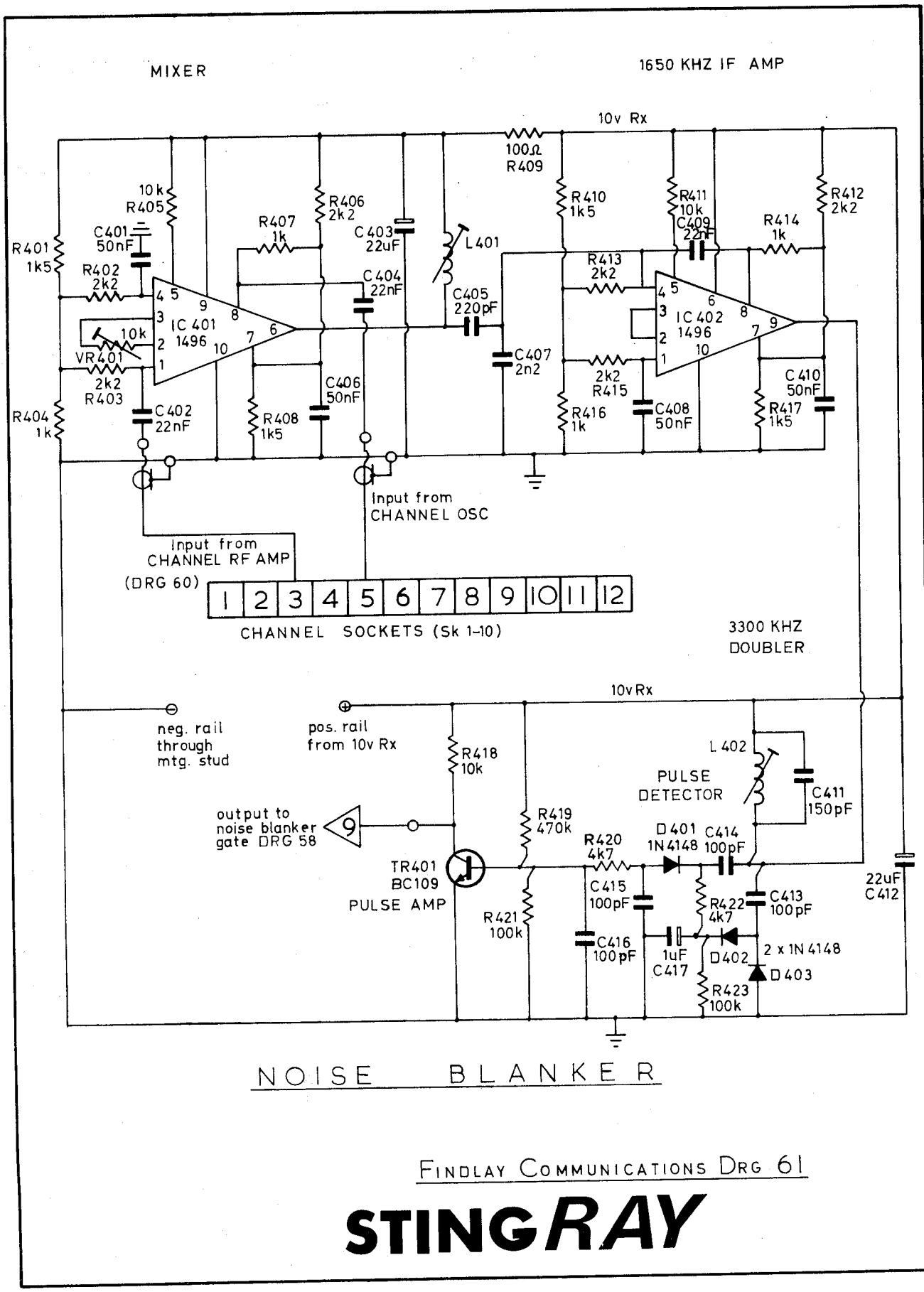

TEM
2nd IF AMP
3rd IF AMP
PRODUCT DETECTOR
10v SSB Sk B/6
10v Rx Sk B/13
D 20 1N4148
D19 1N4148
L4
L5
L6
L7
TR 5 MPF 121
TR 6 MPF 121
TR 7 MPF 121
TR 8 2N 3564
AM DETECTOR
AUDIO OUT
TO BFO
AGC 1
AGC 2/ALC
AGC AMP
ALC INPUT
10v Tx
10v AM Com
10v AM Rx Sk B/7
Sk B/13,14 10v Rx
AM CARRIER IN
CLARIFIER
TR 14 2N3564
TR15 2N3564
TR 9 2N 3564
D31,32 1N4148
D 30 1N4148
D39 1N4148
VR 1 10k
VR 4 10k
R 73 1k
VR 2 25 k Tx Gain
RECEIVER BOARD
FINDLAY COMMUNICATIONS DRG 58
STINGRAY


IF SYSTEM
DSB IN
8
VR3
R99 1k
C3 22nF
C14 220pF
1st IF AMP
TR3 MPF121
D13 1N4148
Sk B/7
10v AM Rx
R30 470Ω
R31 47Ω
R37 47Ω
D1,2,3,4 HP 2835
T1
T2
2x 1N 4148
D5
D6
C15 2n2
L1
C17 47nF
C18 47nF
R25 1k
R20 2m2
C27 47nF
L2
C20 47nF
C21 47nF
R32 4k7
QF 1A65
1N4148
R39 4k7
C24 47nF
D14 1N4148
C31 47nF
D17
C22 330pF
C23 470pF
L3
D15
QF 1B65
D18
1N4148
R34 4k7
R40 4k7
D16
R33 470Ω
R35 47Ω
R41 47Ω
C25 47nF
C26 47nF
10v SSB Sk B/6
TR4 2N3564
R36 100Ω
RFC 2
9
C28 1nF
C29 1nF
C36 47nF
R7 100Ω
10v Rx
R5 470Ω
R8 1k
D9 1N4148
C4 47nF
R6 1k
D10 1N4148
R15 1k
C8 47nF
R22 470Ω
C5 47nF
10v Rx
10v Tx
R19 470Ω
D7 HP 3188
R18 470Ω
D8 HP3188
C6 47nF
R13 150Ω
CHANNEL SOCKETS
Sk 1
Sk 2
NOISE BLANKER GATE
C10 22nF
C12 22uF
RFC 1
10v Tx
C11 100nF
R11 1k
TX DRIVER
TR 2 2N4427
C9 22nF
R9 100Ω
R10 2k2
R12 82Ω
R98 10Ω
C13 22nF
TO P A INPUT
3
R43 4k7
R44 1k
D23 1N4148
R45 470Ω
R46 1k
C38 22nF
D24 1N4148
D25 1N4148
R47 470Ω
C7 2n2
R16 1k
C1 47nF
D11, D12 HP3188
C19 47nF
Rx INPUT FROM Aerial
2
C40 100nF
R17 1k
R27 470Ω
C18 47nF
R29 1k
10v Rx
Sk B/13
R28 470Ω
10v Rx
Sk B/13
R49 1k
STRAP
VC 2 10k
R91 10k
TR 14 2N3564
CLAR
R95 220Ω
TO CHANNEL SOCKETS Sk 3-10
R2 47Ω
R1 220Ω
TR 1 2N3564
R4 220Ω
C2 47nF
R14 1k
R3 47Ω
CHANNEL OSC
EMITTER FOLLOWER
10v Sk B/1
CHANNEL SWITCH SW 2
12v Tx Sk C/2
1N4002
1N 4002
12v Rx Sk C/1
TO CHANNEL SOCKETS Sk 3-10
6
TO AM/SSB LOGIC CKTS



FINDLAY COMMUNICATIONS DRG 60

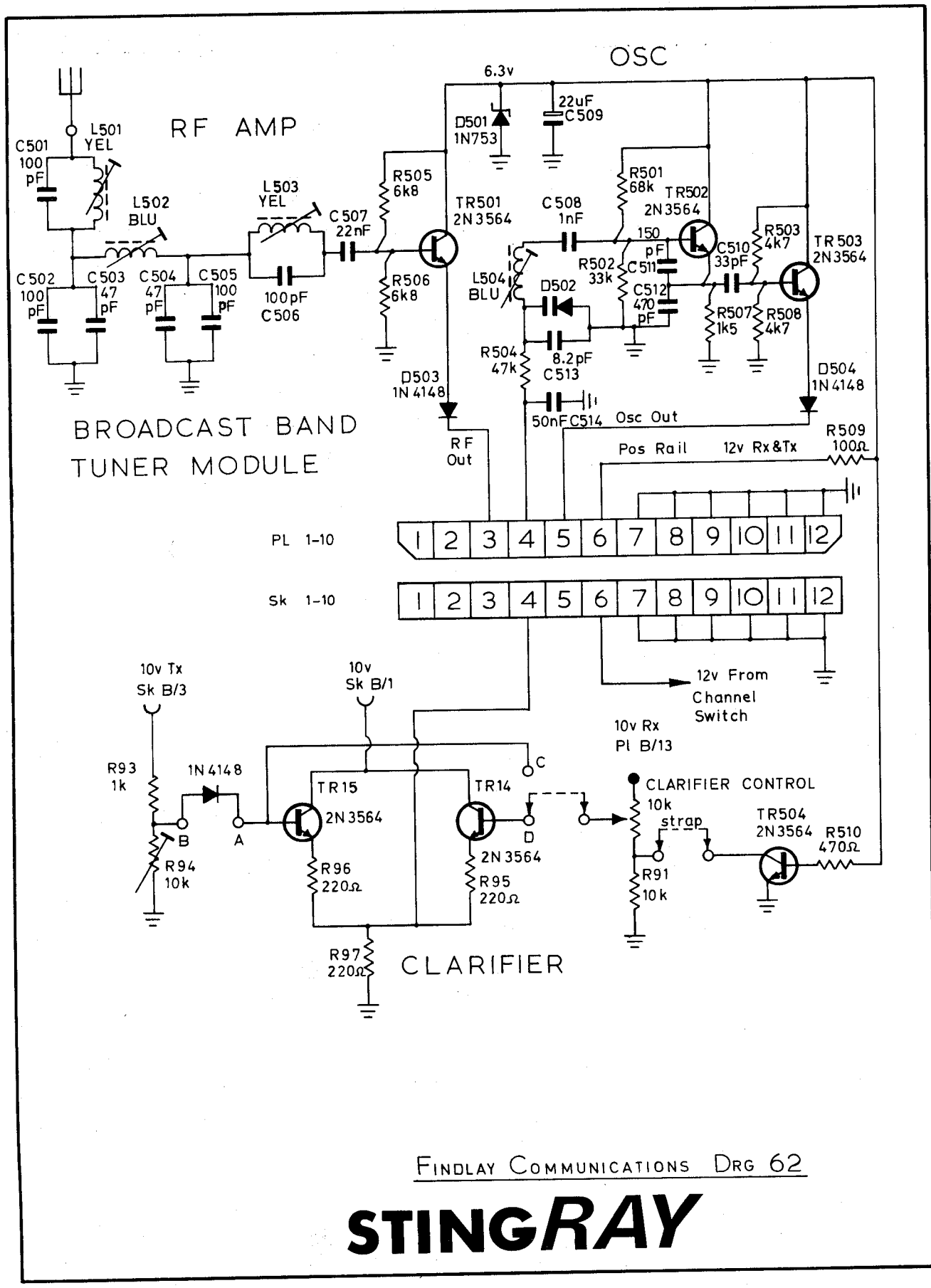
STINGRAY 120



NOISE BLANKER

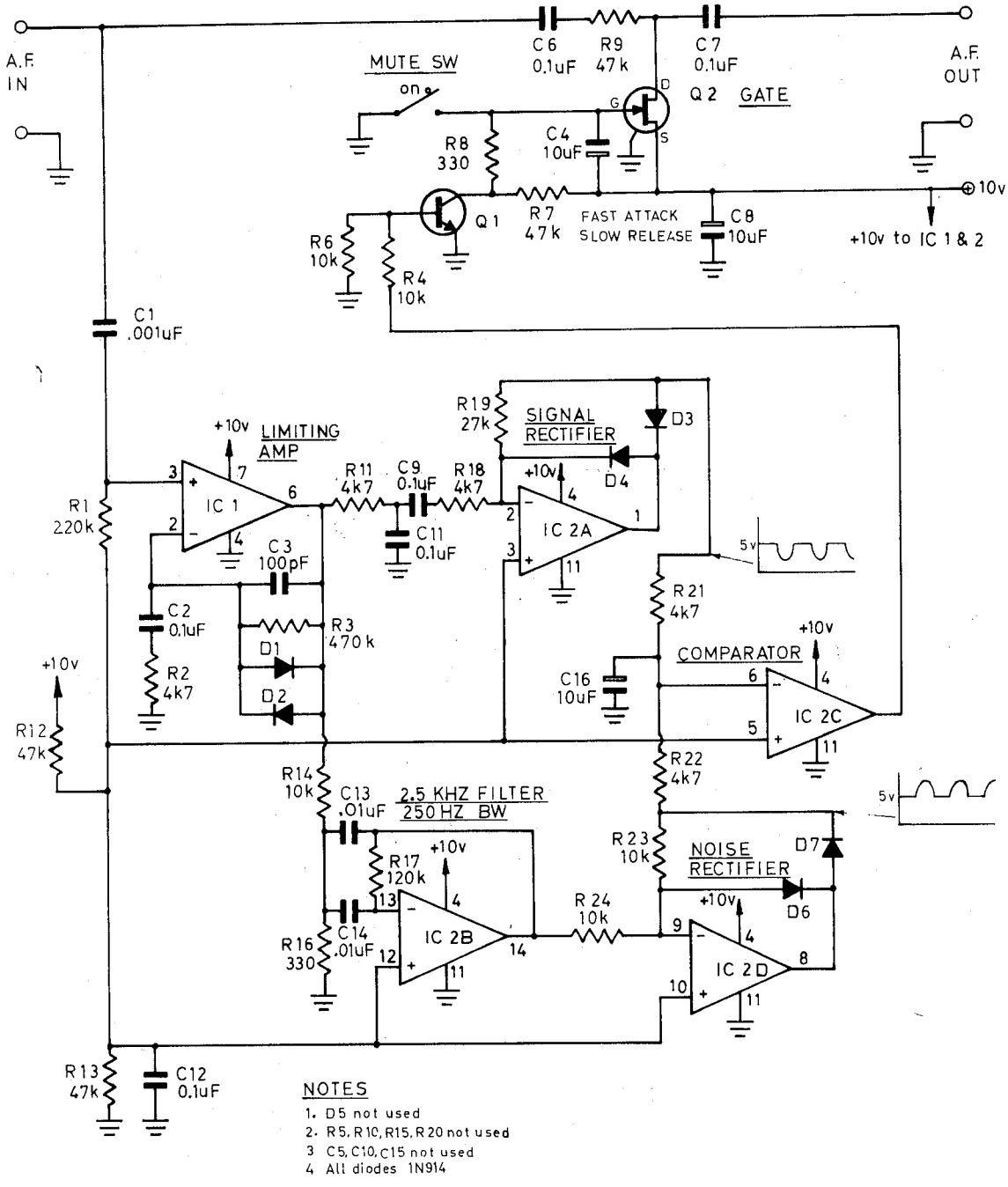
FINDLAY COMMUNICATIONS DRG 61

STINGRAY



FINDLAY COMMUNICATIONS DRG 62

STINGRAY



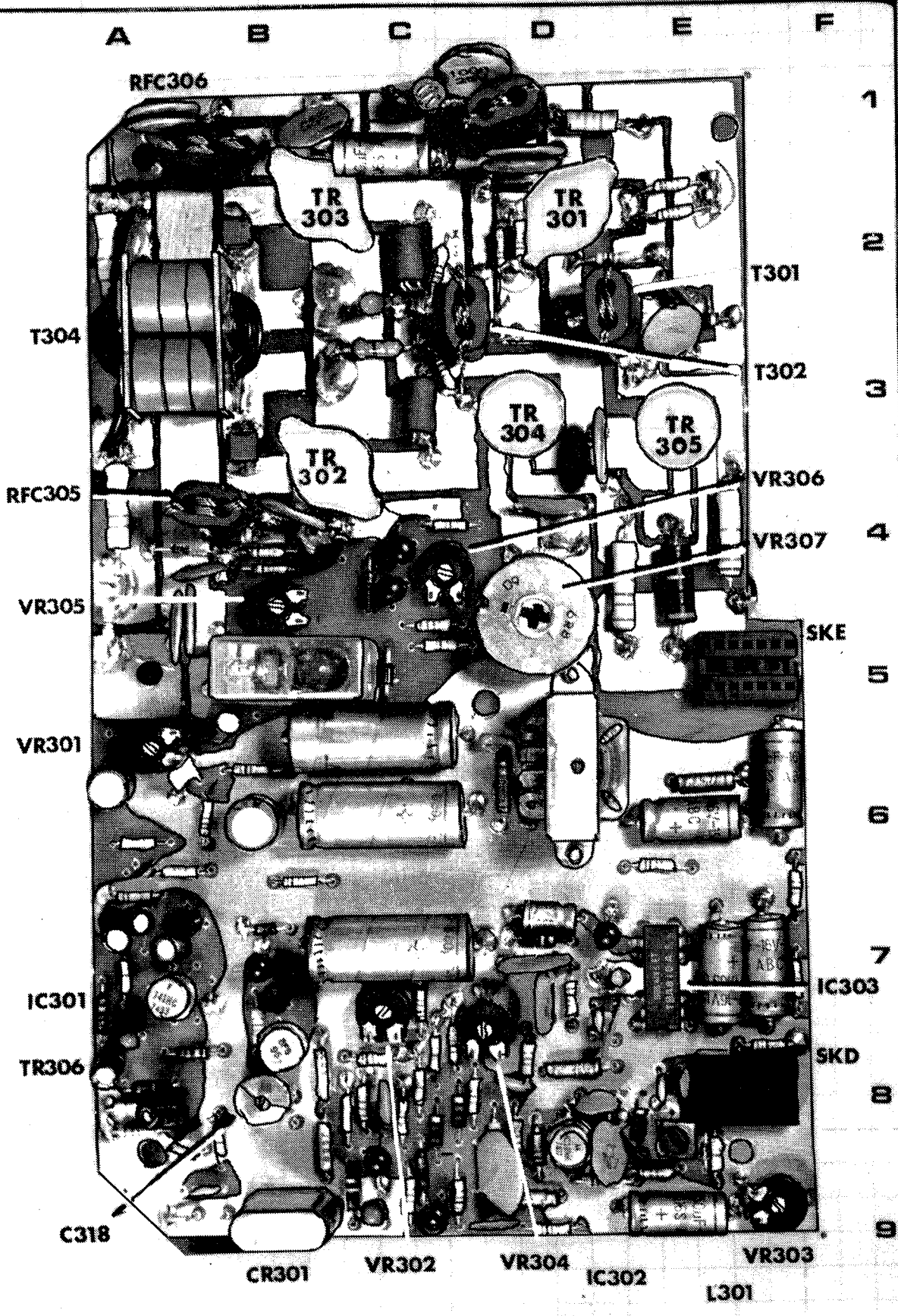
NOTES

1. D5 not used
2. R5, R10, R15, R20 not used
3. C5, C10, C15 not used
4. All diodes 1N914

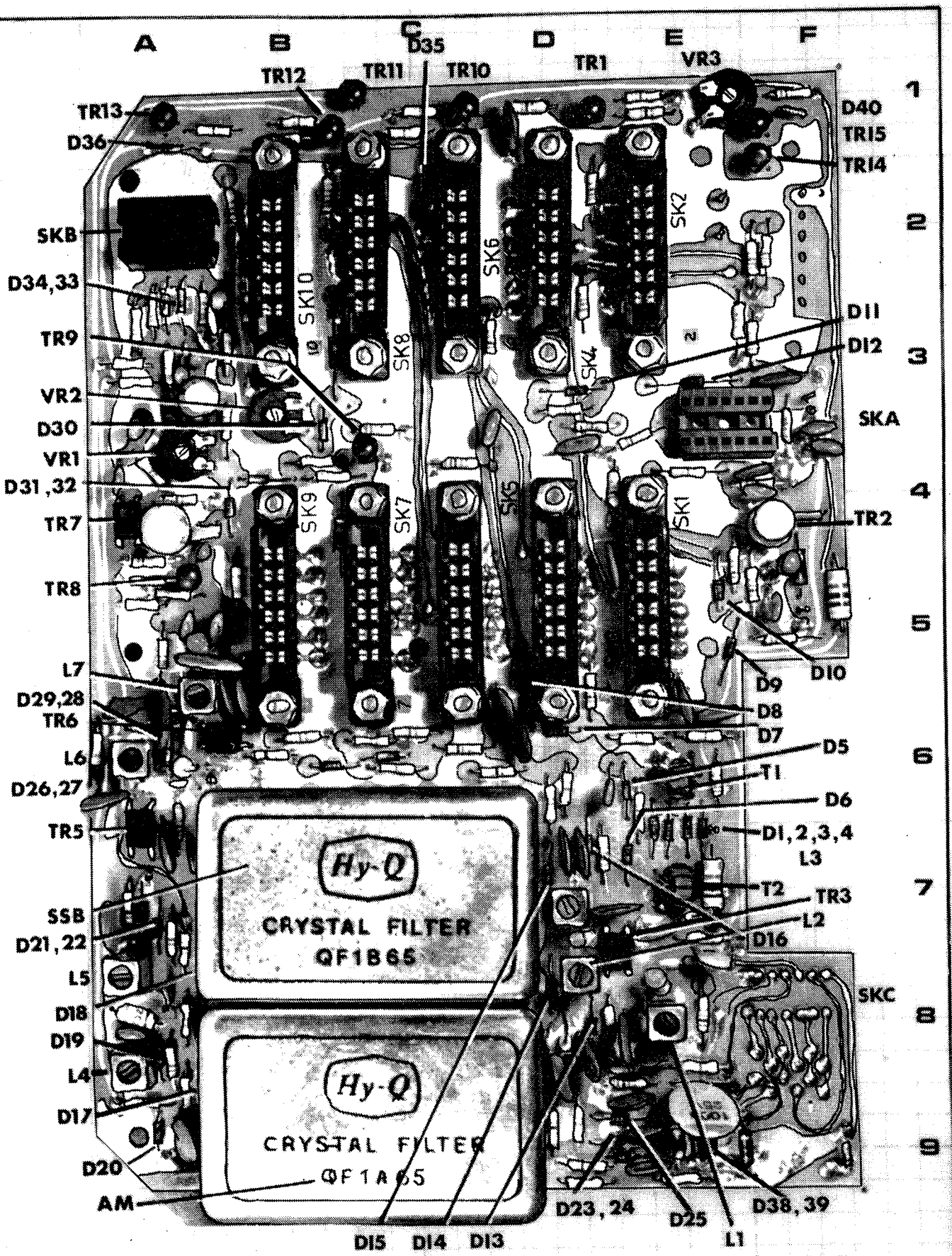
MUTE CIRCUIT

FINDLAY COMMUNICATIONS DRG 63

STINGRAY 120

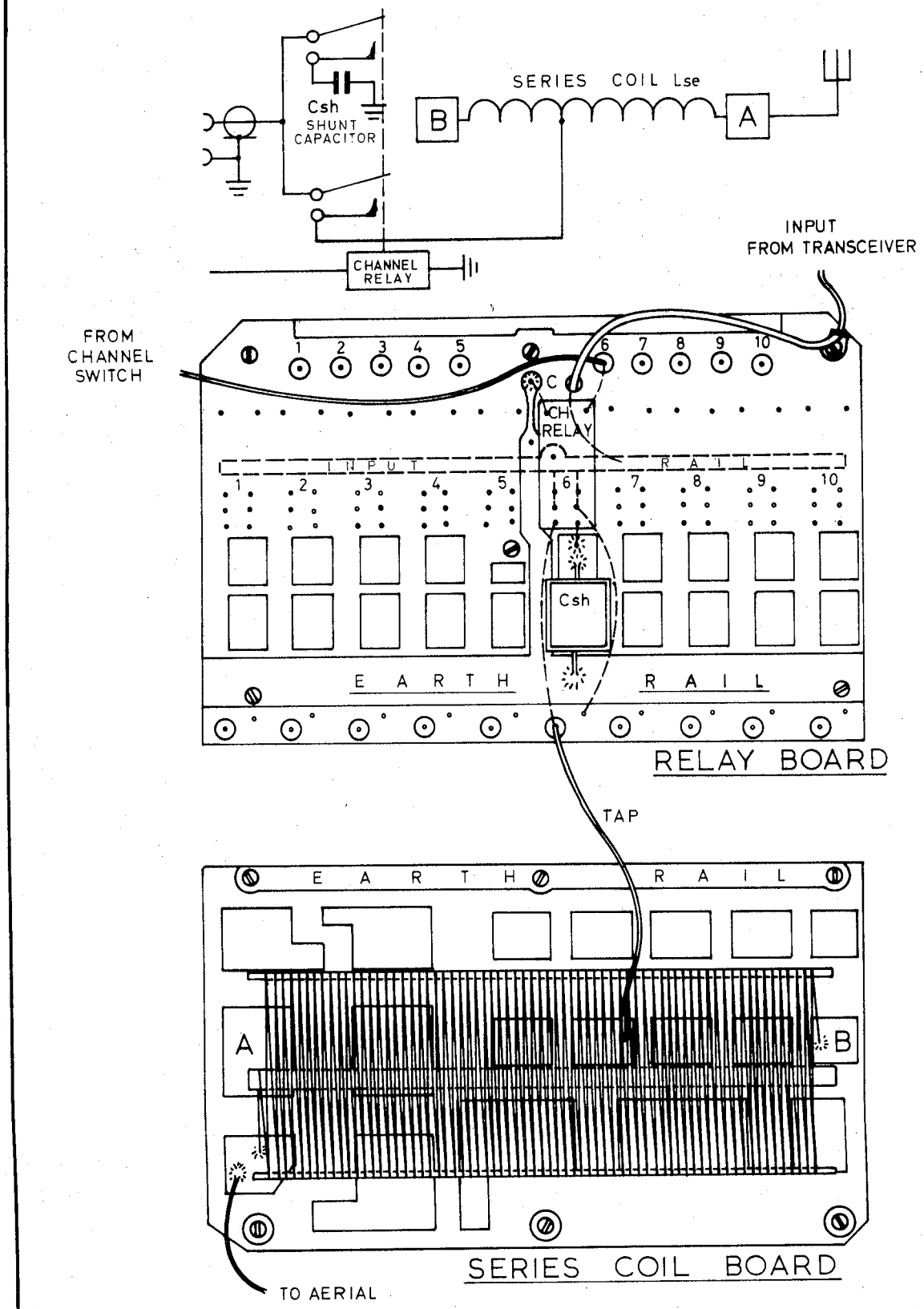


FINDLAY COMMUNICATIONS PTY LTD STINGRAY 120
POWER AMP. BOARD

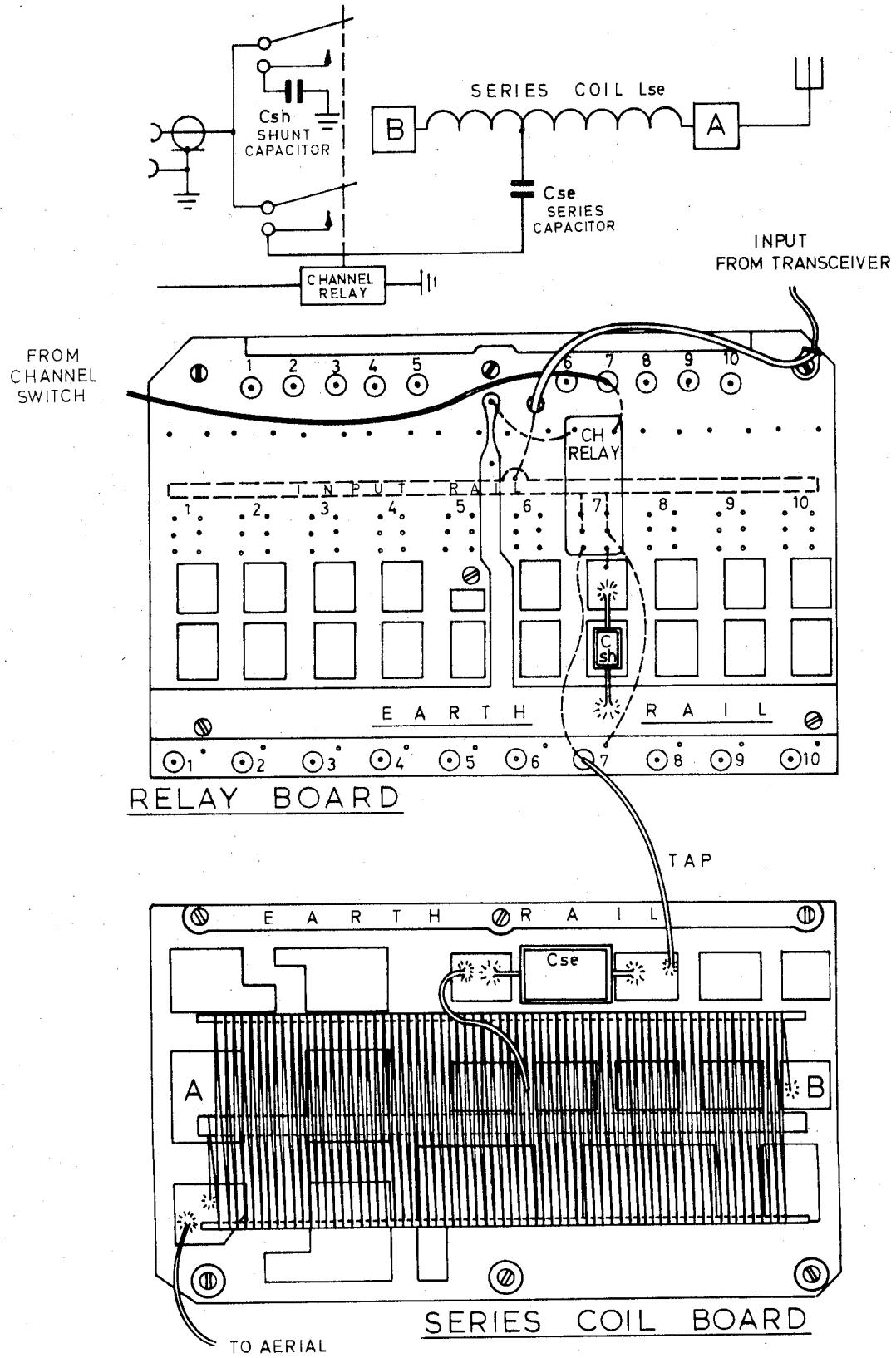


FINDLAY COMMUNICATIONS PTY LTD STINGRAY 120A FILTER BOARD

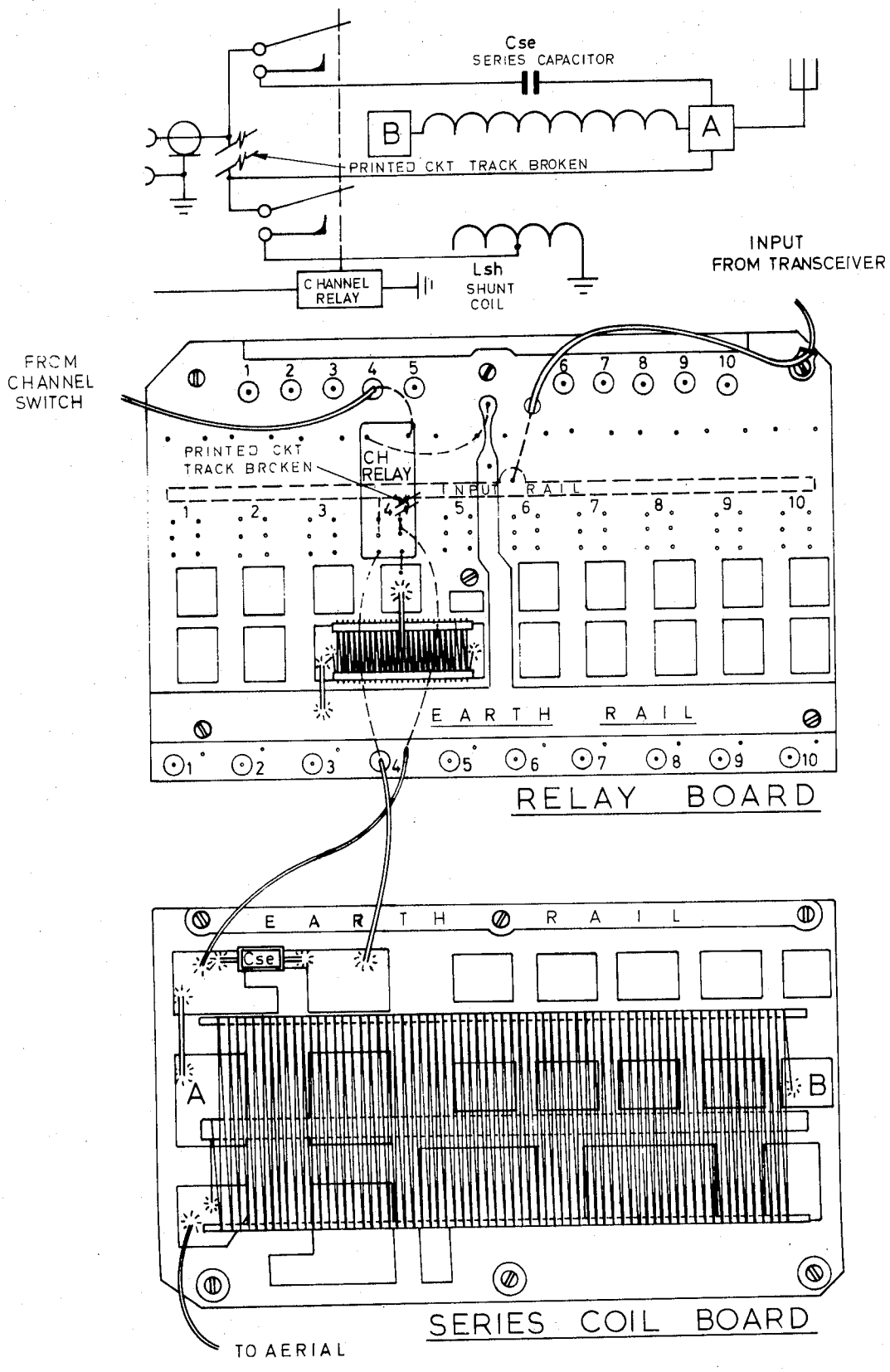
EXAMPLE A


Csh
SHUNT CAPACITOR
SERIES COIL Lse
B
A
CHANNEL RELAY
INPUT FROM TRANSCEIVER
FROM CHANNEL SWITCH
1 2 3 4 5 6 7 8 9 10
C
CH RELAY
INPUT RAIL
Csh
EARTH RAIL
RELAY BOARD
TAP
EARTH RAIL
A
B
SERIES COIL BOARD
TO AERIAL

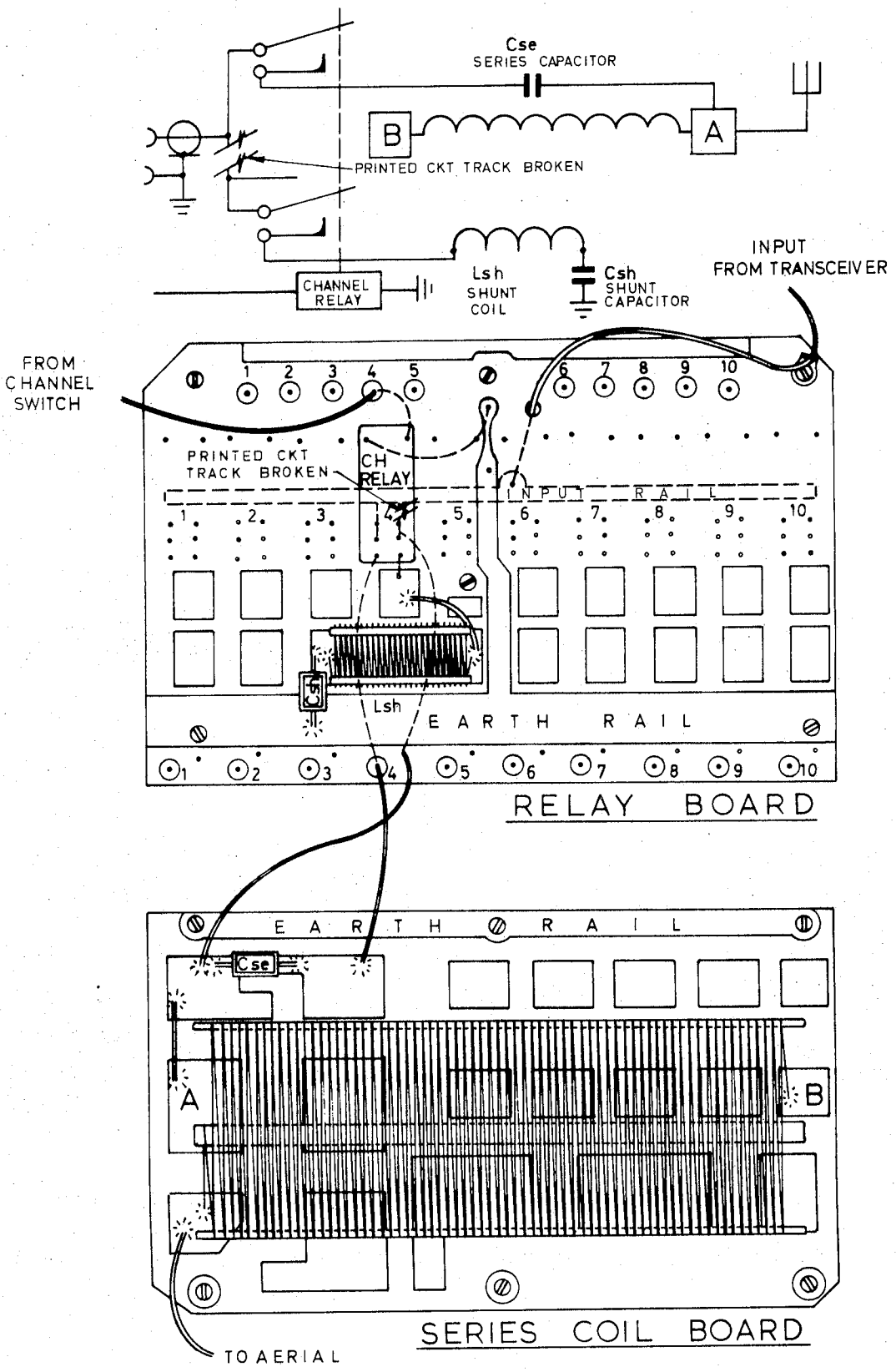
EXAMPLE B


SERIES COIL Lse
B
A
Csh
SHUNT
CAPACITOR
Cse
SERIES
CAPACITOR
CHANNEL
RELAY
INPUT
FROM TRANSCEIVER
FROM
CHANNEL
SWITCH
1 2 3 4 5 6 7 8 9 10
CH
RELAY
INPUT RAIL
1 2 3 4 5 6 7 8 9 10
C
sh
EARTH RAIL
1 2 3 4 5 6 7 8 9 10
RELAY BOARD
TAP
EARTH RAIL
Cse
A
B
TO AERIAL
SERIES COIL BOARD

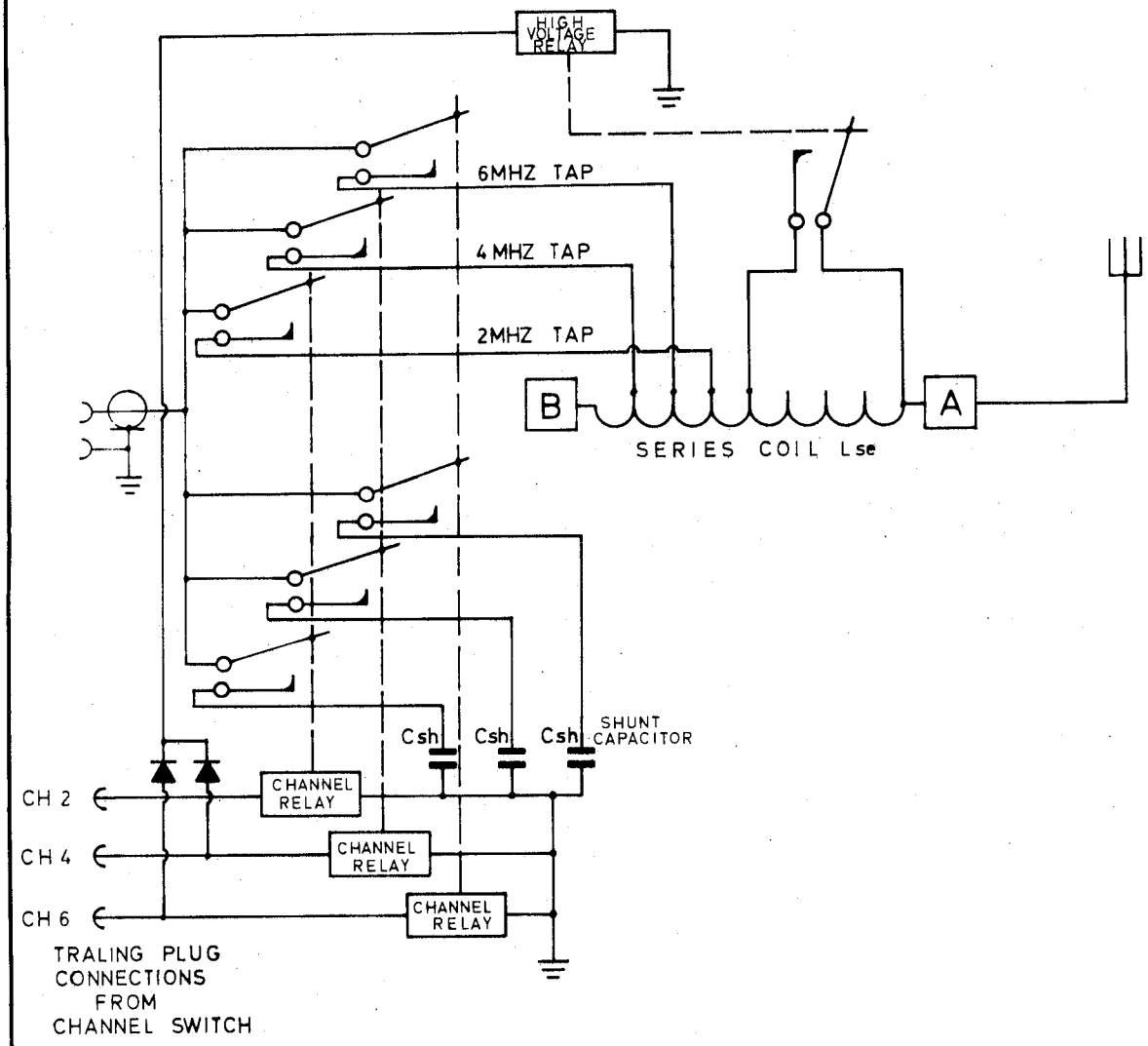
EXAMPLE C


Cse
SERIES CAPACITOR
B
A
PRINTED CKT TRACK BROKEN
CHANNEL RELAY
Lsh
SHUNT COIL
INPUT FROM TRANSCEIVER
FROM CHANNEL SWITCH
PRINTED CKT TRACK BROKEN
CH RELAY
INPUT RAIL
EARTH RAIL
RELAY BOARD
EARTH RAIL
Cse
A
B
SERIES COIL BOARD
TO AERIAL

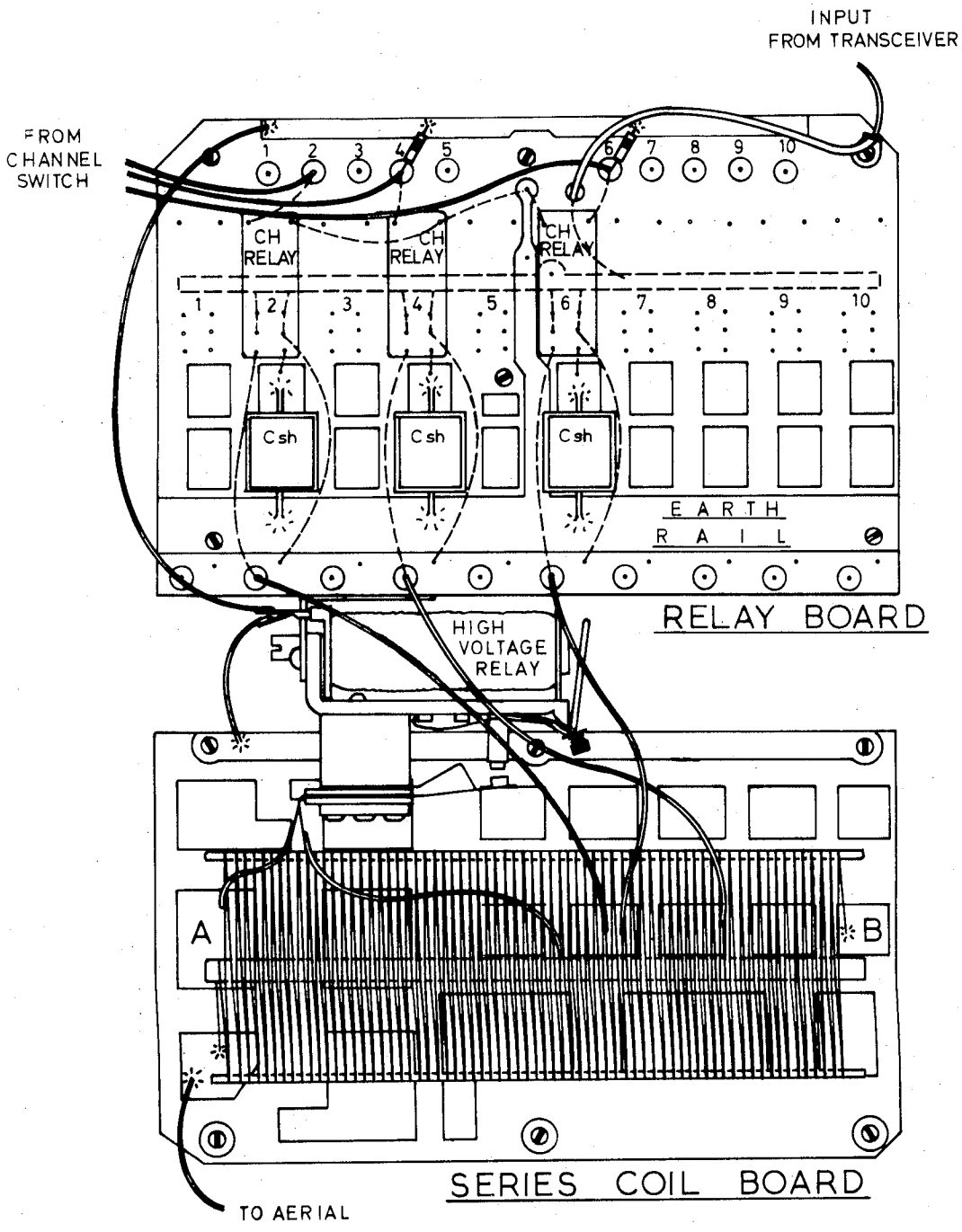
EXAMPLE D

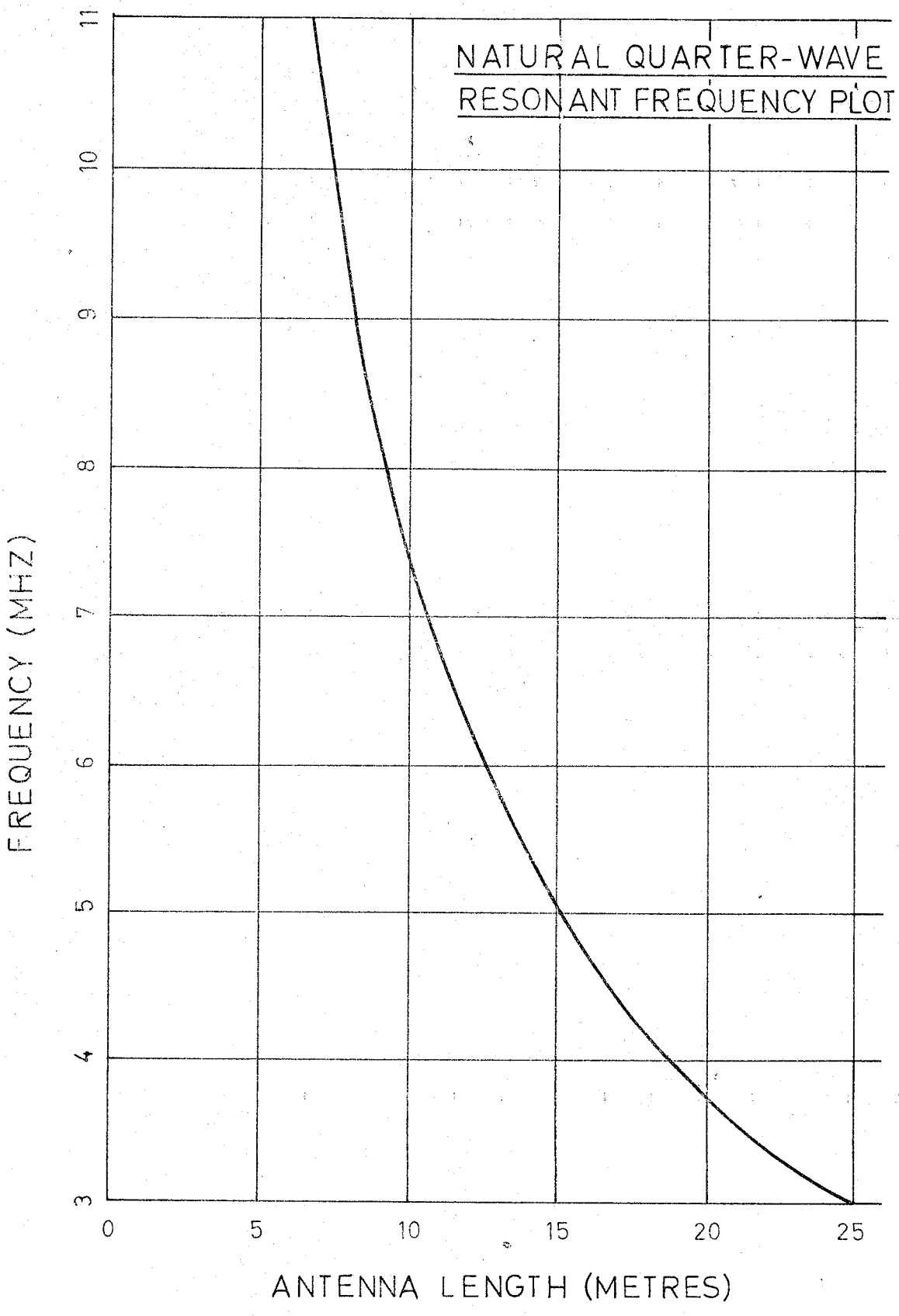

Cse
SERIES CAPACITOR
B
A
PRINTED CKT TRACK BROKEN
CHANNEL RELAY
Lsh
SHUNT COIL
Csh
SHUNT CAPACITOR
INPUT FROM TRANSCEIVER
FROM CHANNEL SWITCH
1 2 3 4 5 6 7 8 9 10
PRINTED CKT TRACK BROKEN
CH RELAY
INPUT RAIL
Lsh
EARTH RAIL
RELAY BOARD
EARTH RAIL
Cse
A
B
SERIES COIL BOARD
TO AERIAL

EXAMPLE E


HIGH VOLTAGE RELAY
6MHZ TAP
4 MHZ TAP
2MHZ TAP
B
A
SERIES COIL Lse
Csh
Csh
Csh
SHUNT CAPACITOR
CH 2
CH 4
CH 6
CHANNEL RELAY
CHANNEL RELAY
CHANNEL RELAY
TRALING PLUG CONNECTIONS FROM CHANNEL SWITCH

EXAMPLE E


INPUT
FROM TRANSCEIVER
FROM
CHANNEL
SWITCH
1
2
3
4
5
6
7
8
9
10
CH
RELAY
CH
RELAY
CH
RELAY
Csh
Csh
Csh
EARTH
RAIL
RELAY BOARD
HIGH
VOLTAGE
RELAY
A
B
SERIES COIL BOARD
TO AERIAL


NATURAL QUARTER-WAVE
RESONANT FREQUENCY PLOT
FREQUENCY (MHZ)
11
10
9
8
7
6
5
4
3
0
5
10
15
20
25
ANTENNA LENGTH (METRES)

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
R1	220 ohm ¼w	ELCOMA	2322-211-13221	E1
R2	47 ohm "	"	" " -13479	E1
R3	47 ohm "	"	" " -13479	D1
R4	220 ohm "	"	" " -13221	D2
R5	470 ohm "	"	" " -13471	E4
R6	1K ohm "	"	" " -13102	E5
R7	100 ohm "	"	" " -13101	C6
R8	1K ohm "	"	" " -13102	E6
R9	100 ohm "	"	" " -13101	E5
R10	2K2ohm "	"	" " -13222	F3
R11	1K ohm "	"	" " -13102	F5
R12	82 ohm "	"	" " -13829	E4
R13	150 ohm "	"	" " -13151	D3
R14	1K ohm "	"	" " -13102	B2
R15	1K ohm "	"	" " -13102	D4
R16	1K ohm "	"	" " -13102	D3
R17	1K ohm "	"	" " -13102	C4
R18	470 ohm "	"	" " -13471	D6
R19	470 ohm "	"	" " -13471	E6
R20	2M2 ohm "	"	" " -13102	E7
R21	470 ohm "	"	" " -13471	E6
R22	470 ohm "	"	" " -13471	E6
R23	1K ohm "	"	" " -13102	
R24	470 ohm "	"	" " -13471	
R25	1K ohm "	"	" " -13102	D8
R26	2M2 ohm "	"	" " -12225	
R27	470 ohm "	"	" " -13471	D3
R28	470 ohm "	"	" " -13471	D3
R29	1K ohm "	"	" " -13102	F3
R30	470 ohm "	"	" " -13471	D9

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
R31	47 ohm ¼w	ELCOMA	2322-211-13479	D9
R32	4K7 ohm "	"	" " -13472	D8
R33	470 ohm "	"	" " -13471	D6
R34	4K7 ohm "	"	" " -13472	D6
R35	47 ohm "	"	" " -13479	D6
R36	100 ohm "	"	" " -13101	E7
R37	47 ohm "	"	" " -13479	A9
R38	220 ohm "	"	" " -13221	A8
R39	4K7 ohm "	"	" " -13472	A9
R40	4K7 ohm "	"	" " -13472	A8
R41	47 ohm "	"	" " -13479	A7
R42	220 ohm "	"	" " -13221	A7
R43	4K7 ohm "	"	" " -13472	D9
R44	1K ohm "	"	" " -13102	D9
R45	470 ohm "	"	" " -13471	E9
R46	1K ohm "	"	" " -13102	E9
R47	470 ohm "	"	" " -13471	E8
R48	470 ohm "	"	" " -13471	E8
R49	1K ohm "	"	" " -13102	D8
R50	470 ohm "	"	" " -13471	E9
R51	100 Kohm "	"	" " -13104	A7
R52	1.0Mohm "	"	" " -13105	A6
R53	220 ohm "	"	" " -13221	A5
R54	220 ohm "	"	" " -13221	A7
R55	100 K ohm "	"	" " -13104	B6
R56	6K8 ohm "	"	" " -13682	A6
R57	220 ohm "	"	" " -13221	A5
R58	4K7 ohm "	"	" " -13472	C6
R59	220 ohm "	"	" " -13221	B6
R60	470 Kohm "	"	" " -13474	A6

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
R61	100 ohm ¼w	ELCOMA	2322-211-13101	B6
R62	470 ohm "	"	" " -13471	
R63	470 ohm "	"	" " -13471	
R64	4K7 ohm "	"	" " -13472	A5
R65	10K ohm "	"	" " -13103	A4
R66	4K7 ohm "	"	" " -13472	A4
R67	220 ohm "	"	" " -13221	A4
R68	330K ohm "	"	" " -13334	B5
R69	22K ohm "	"	" " -13223	A5
R70	1.0M ohm "	"	" " -13105	B4
R71	100 ohm "	"	" " -13105	B4
R72	220K ohm "	"	" " -13224	B4
R73	1.0K ohm "	"	" " -13102	B2
R74	4K7 ohm "	"	" " -13472	A3
R75	22K ohm "	"	" " -13223	A3
R76	3K9 ohm "	"	" " -13392	A3
R77	100 ohm "	"	" " -13101	
R78	22K ohm "	"	" " -13223	B3
R79	22K ohm "	"	" " -13223	A3
R80	3K9 ohm "	"	" " -13392	A3
R81	4K7 ohm "	"	" " -13472	A4
R82	2K2 ohm "	"	" " -13222	B4
R83	22K ohm "	"	" " -13223	C4
R84	22K ohm "	"	" " -13223	A3
R85	4K7 ohm "	"	" " -13472	A3
R86	470 ohm "	"	" " -13471	B1
R87	47 ohm "	"	" " -13479	B1
R88	470 ohm "	"	" " -13471	B1
R89	470 ohm "	"	" " -13471	C1
R90	470 ohm "	"	" " -13471	C1

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
R91	10K ohm ¼w	ELCOMA	2322-211-13103	E4
R92	10K ohm "	"	" " -13109	
R93	1K ohm "	"	" " -13102	F1
R95	220 ohm "	"	" " -13221	F2
R96	220 ohm "	"	" " -13221	F2
R97	4K7 ohm "	"	" " -13472	E3
R98	10 ohm "	"	" " -13109	F5

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
R201	1K ohm ¼w	ELCOMA	2322-211-	13102
R202	100 ohm "	"	" "	-13101
R203	220 ohm "	"	" "	-13221
R204	10K ohm "	"	" "	-13103
R205	See channel information			
R206	See channel information			
R207	47 ohm ¼w	ELCOMA	" "	-13479
R208	47 ohm "	"	" "	-13479
R209	See channel information			
R210	10K ohm ¼w	ELCOMA	" "	-13103
R211	See channel information			
R212	See channel information			
R213	See channel information			
R214	10K ohm ¼w	ELCOMA	" "	-13103
R215	10K ohm "	"	" "	-13103

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
R301	220 ohm ¼w	ELCOMA	2322-211-13221	A9
R302	2K2 ohm "	"	" " -13222	A8
R303	47K ohm "	"	" " -13473	A8
R304	22K ohm "	"	" " -13223	A8
R305	22K ohm "	"	" " -13223	A7
R306	330 ohm "	"	" " -13331	A7
R307	68K ohm "	"	" " -13683	
R308	22K ohm "	"	" " -13223	
R309	220 ohm "	"	" " -13221	A6
R310	47K ohm "	"	" " -13473	A6
R311	47K ohm "	"	" " -13473	A6
R312	100 ohm "	"	" " -13101	B6
R313	1K ohm "	"	" " -13102	B7
R314	470 ohm "	"	" " -13471	B8
R315	1K ohm "	"	" " -13471	C7
R316	1K ohm "	"	" " -13471	C8
R317	100K ohm "	"	" " -13104	B9
R318	33K ohm "	"	" " -13333	B8
R319	2K2 ohm "	"	" " -13222	B8
R320	4K7 ohm "	"	" " -13472	C9
R321	100 ohm "	"	" " -13101	C9
R322	4K7 ohm "	"	" " -13472	C8
R323	470 ohm "	"	" " -13471	C8
R324	100 ohm "	"	" " -13101	D9
R325	1K5 ohm "	"	" " -13152	C8
R326	470 ohm "	"	" " -13471	C8
R327	100 ohm "	"	" " -13101	C9
R328	4K7 ohm 1 watt	"	2322-101-63472	A4
R329	470 ohm ¼w	"	2322-211-13471	A5
R330	10K ohm "	"	" " -13103	B4

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
R331	10K ohm ¼w	ELCOMA	2322-211-13103	B4
R332	470 ohm "	"	" " -13102	C5
R333	2K2 ohm "	"	" " -13222	C5
R334	470 ohm "	"	" " -13471	C4
R335	1K5 ohm "	"	" " -13152	C8
R336	1K ohm "	"	" " -13102	C8
R337	2K2 ohm "	"	" " -13222	D8
R338	2K2 ohm "	"	" " -13222	D8
R339	4K7 ohm "	"	" " -13472	C8
R340	4K7 ohm "	"	" " -13472	D8
R341	1K ohm "	"	" " -13102	D8
R342	10K ohm "	"	" " -13103	E9
R343	2K2 ohm "	"	" " -13222	E9
R344	470 ohm "	"	" " -13471	D8
R345	1K5 ohm "	"	" " -13152	E8
R346	330 ohm "	"	" " -13331	E9
R347	220 ohm "	"	" " -13221	F8
R348	100K ohm "	"	" " -13104	D7
R349	100 ohm "	"	" " -13101	F7
R350	1K ohm "	"	" " -13102	E6
R351	47 ohm "	"	" " -13569	F6
R352	1 ohm "	"	" " -13108	D7
R352A	56 ohm "	"	" " -	E4
R353	10 ohm "	"	" " -13109	E2
R354	56 ohm 1watt	"	2322-101-63569	
R355	2x5.6 ohm ¼w	"	2x 2322-211-13568	E2
R356	2x5.7 ohm "	"	2x 2322-211-13568	D2
R357	10 ohm 1watt	"	2322-101-63109	E4
R358	33 ohm ½watt	"	2322-212-13339	C3
R359	220 ohm 1watt	"	2322-101-63221	D4
R360	5.6 ohm ¼w	"	2322-211-13568	D4

PART NO.	DESCRIPTION		MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION.
R361	100 ohm	$\frac{1}{4}$w	ELCOMA	2322-211-13101	
R362	33 ohm	"	"	" " -13339	
R363	100 ohm	"	"	" " -13101	E2
R364	10 ohm	"	"	" " -13109	C2
R365	10 ohm	"	"	" " -13109	C3

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
C1	.047uf Disc	DUCON		E6
C2	.047uf Disc	"		D1
C3	.022uf Disc	"		D6
C4	.047uf Disc	"		F4
C5	.047uf Disc	"		D6
C6	.047uf Disc	"		E6
C7	.022uf Disc	"		D4
C8	.047uf Disc	"		E4
C9	.022uf Disc	"		F5
C10	.022uf Disc	"		F4
C11	.022uf Disc	"		F4
C12	22uf Tant	"		F5
C13	.022uf Disc	"		F4
C14	220Pf Styroseal	ELCOMA	2222-427-22201	E8
C15	2200pf Disc	"	2222-630-02222	E8
C16	.047uf Disc	DUCON		
C17	.047uf Disc	"		E8
C18	.047uf Disc	"		D8
C19	.047uf Disc	"		F3
C20	.047uf Disc	"		D8
C21	.047uf Disc	"		D8
C22	330Pf Styroseal	ELCOMA	2222-426-23301	D7
C23	470Pf Styroseal	"	2222-426-24701	D8
C24	.047uf Disc	DUCON		D7
C25	.047uf Disc	"		D7
C26	.047uf Disc	"		D6
C27	.047uf Disc	"		D7
C28	.001uf Disc	"		E7
C29	.001uf Disc	"		E7
C30	.047uf Disc	"		

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATI
C31	.047uf Disc	DUCON		A8
C32	.022uf Disc	"		A8
C33	220Pf Styroseal	ELCOMA	2222-427-22205	A8
C34	68Pf Disc	"		A8
C35	.047uf Disc	DUCON		A8
C36	.047uf Disc	"		A9
C37	.047uf Disc	"		E9
C38	.047uf Disc	"		E9
C39	.047uf Disc	"		E9
C40	o.luf Disc	"		E9
C41	.047uf Disc	"		A9
C42	.047uf Disc	"		A7
C43	.047uf Disc	"		A6
C44	.022uf Disc	"		B6
C45	220Pf Styroseal	ELCOMA	2222-427-22205	A6
C46	.0022uf Disc	"	2222-630-02222	A6
C47	.00luf Disc	DUCON		A7
C48	.047uf Disc	"		E7
C49	.047uf Disc	"		B6
C50	.047uf Disc	"		B6
C51	220Pf Styroseal	ELCOMA	2222-427-22205	A5
C52	56Pf Disc	"		A6
C53	.022uf Disc	DUCON		B5
C54	0.luf Disc	"		B5
C55	.047uf Disc	"		A6
C56	.022uf Disc	"		
C57	.022uf Disc	"		B5
C58	luf Elect.16VS.E.	ELCOMA		A4
C59	4700pf Disc	"		A4
C60	100uf Elect 16VSE	"		A4

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER's PART NO.	LOCATION
C61	1 uf Elect 16v SE	Elcoma		B4
C62	4700pf Disc	"		B4
C63	1 uf	"		A3
C64	4700pf Disc	"	2222-630-03472	B3
C65	luf Elect 16V SE	"		B3
C66	luf " " "	"		B3
C67	47 uf Elect 16v SE	"		B3

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATIO
C201	See channel information			
C202	" " "			
C203	.047uf Disc 50v	DUCON		
C204	.047uf Disc 50v	"		
C205	See channel information			
C206	.001 Disc 50v	ELCOMA		
C207	.047uf Disc 50v	"		
C208	.001 Disc 50v	"		
C209	See channel information			
C210	" " "			
C211	220Pf Styroseal	"	2222-427-22201	
C212	220Pf Styroseal	"	2222-427-22201	
C213	.047uf 50v Disc	"		
C214	See channel information			
C215	.047uf 50v Disc	"		
C216	.047uf 50v Disc	"		

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
C301	4700pf Disc 50v	ELCOMA	2222-630-03472	B9
C302	4700pf Disc 50	"	" " "	B8
C303	0.47uf Elect.16vSE	"	2222-015-	B8
C304	0.47uf Elect.16vSE	"	" "	A8
C305	4.7uf Elect.16vSE	"	" "	A7
C306	4.7uf Elect.16vSE	"	" "	B7
C307	4700pf Disc 50v	"	2222-630-03472	B6
C308	4.7uf Elect.16vSE	"	2222-015	B5
C309	4.7uf Elect.16vSE	"	" "	A7
C310	47uf Elect 10v SE	"	" "	A6
C311	680uf Elect DE	"	" "	C7
C312	150uf 16v Elect.DE	"	" "	B6
C313	680uf Elect DE	"	" "	C6
C314	22uf Tant	DUCON		B9
C315				
C316	220Pf Styroseal	ELCOMA	2222-427-22201	B9
C317	220Pf Styroseal	"	" " "	B8
C318	60Pf Trimmer	"	2222-808-9150	B8
C319	.022uf DC 50v	DUCON		C8
C320	.022uf DC 50v	"		D9
C321	.1uf DC 50v	"		B4
C322	150uf DC 50v	"		E9
C323	4.7uf Elect.10v DE	ELCOMA	2222-015	D9
C324	.001uf DC 50v	"		D8
C325	4.7uf Elect 10v DE	"	2222-015	D8
C326	150uf Elect.16v DE	"	2222-016-15151	E9
C327	.047uf DC 50v	"		E9
C328	.022uf DC 50v	"		D8
C329	220Pf DC NPO	"	2222-427-22201	E8
C330	2200Pf DC NPO	"	2222-630-02222	E8

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
C331	.1uf DC 50v	ELCOMA		D7
C332	0.47ufElect DE	"	2222-015	D7
C333	150uf 16v elect DE	"	" "	E6
C334	2200pfDC50v	"	2222-630-02222	D7
C335	150uf Elect 16v DE	"	2222-015	F7
C336	330Pf DC 50v	"	2222-426-23301	D7
C337	150uf Elect 16v DE	"	2222-015	E7
C338	.1uf DC 50v	DUCON		D7
C339	150uf Elect 16v DE	ELCOMA	2222-015	E6
C340	4.7uf Elect 16v DE	"	" "	E6
C341	4.7uf Elect 16v DE	"	" "	D6
C342	680uf Elect 16v DE	"	" "	C5
C343	.022uf DC 50v	DUCON		E2
C344	.1uf DC 50v	"		E3
C345	2x0.1uf DC 50v	"		D1
C346	.1uf	"		B4
C347	.1uf	"		B1
C348	0.22uf Chip	VITRAMON	550/3399/05	B2
C349	2000Pf	"	VY94C202J	B3
C350	.22uf	"	550/3399/05	B3
C351	.1uf DC 50v	DUCON		D3
C352	.1uf DC 50v	"		D4
C353	4.7uf TANT	"		C2
C354	2x .1uf	"		D1
C355	150uf Elect 16v DE	ELCOMA		C1
C356	Select on test.			
C357	.001 uf			
C358	2x .1 uf			A1
C359	2x .1 uf			B5

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.		LOCATION
VR1	10K TAB	PIHER	PT10V	10K	A4
VR2	25K TAB	"	"	27K	B4
VR94	10K	"	"	10K	E1
VR201	27K TAB	"	"	27K	Channel card
VR3	10K	"	"	10K	F8

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.		LOCATION
VR301	10K TAB	PIHER	PT10V	10K	A5
VR302	1K TAB	"	"	1K	C8
VR303	1K TAB	"	"	"	F9
VR304	1K TAB	"	"	"	D8
VR305	27K TAB	"	"	27K	B5
VR306	10K TAB	"	"	10K	C4
VR307	6.8 ohm Wire Wound	ELCOMA	2322-011-02688		D5

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
D1	HP2835 Hot Corr	HEWLETT PACKARD	HP2835	E7
D2	" " "	" "	"	E7
D3	" " "	" "	"	E7
D4	" " "	" "	"	E7
D5	IN4148	FAIRCHILD	IN4148	E7
D6	IN4148	"	"	E7
D7	HP3188	HEWLETT PACKARD	HP3188	D6
D8	HP3188	" "	HP3188	D6
D9	IN4148	FAIRCHILD	IN4148	E5
D10	"	"	"	E5
D11	HP3188	HEWLETT PACKARD	HP3188	D3
D12	"	" "	"	E3
D13	IN4148	FAIRCHILD	IN4148	D8
D14	"	"	"	D8
D15	"	"	"	D7
D16	"	"	"	D7
D17	"	"	"	A9
D18	"	"	"	A8
D19	"	"	"	A9
D20	"	"	"	A9
D21	"	"	"	A8
D22	"	"	"	A8
D23	"	"	"	E9
D24	"	"	"	E9
D25	"	"	"	E9
D26	"	"	"	C6
D27	"	"	"	C6
D28	"	"	"	A6
D29	"	"	"	A6
D30	"	"	"	B3

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
D31	IN4148	FAIRCHILD	IN4148	B4
D32	"	"	"	B4
D33	"	"	"	A3
D34	"	"	"	A3
D35	"	"	"	C2
D36	"	"	"	
D37	IN4002	"	IN4002	E9
D38	"	"	"	E9
D39	IN4148	"	IN4148	F1
D40	"	"	"	F9

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
D201	HP3188	HEWLETT PACKARD	HP3188	
D202	IN4148	FAIRCHILD	IN4148	
D203	MV109	MOTOROLA	MV109	
D204	IN4148	FAIRCHILD	IN4148	

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
D301	IN753	FAIRCHILD	IN753	B7
D302	IN4148	"	IN4148	E8
D303	IN4002	"	IN4002	E5
D304	IN4148	"	IN4148	F5
D305	"	"	"	A4
D306	IN753	"	IN753	C4
D307	IN4002	"	IN4002	E2

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
TR1	2N3564	FAIRCHILD	2N3564	D1
TR2	2N4427	MOTOROLA	2N4427	F4
TR3	MPF121	"	MPF121	D8
TR4	2N3564	FAIRCHILD	2N3564	E7
TR5	MPF121	MOTOROLA	MPF121	A7
TR6	"	"	"	B6
TR7	"	"	"	A4
TR8	2N3564	FAIRCHILD	2N3564	B5
TR9	"	"	"	C4
TR10	"	"	"	C1
TR11	"	"	"	C1
TR12	"	"	"	B1
TR13	"	"	"	A1
TR14	"	"	"	F1
TR15	"	"	"	F1

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION.
IC301	UA741	FAIRCHILD	UA741	A7
IC302	MC1496	MOTOROLA	MC1496	D8
IC303	TBA810 AS	MOTOROLA	TBA810 AS	E7

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
QF1	AM FILTER	HY "Q" (AM)	QF1A65	C9
QF2	SSB FILTER	" " (SSB)	QF1B65	C7

Xt CH		HY "Q"		Channel Bd.
Xt301	1650 KHz LGE	"	1650 KHz LGE	B9

T1	BAL.MIXER FORMER	NEOSID	4326R/1/F14AEC	E6
T2	" " "	"	" " "	E7
T301	PA Input "	ELCOMA	4312-020-31520	D2
T302	PA Interstage"	"	" " "	C3
T303	PA Combiner "	NEOSID	.245x1¼ F14	B3
T304	PA Output "	"	" " "	A3

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
L1	1F	NEOSID	TYPE F	
L2	F+R	"	"	
L3	F+R	"	"	
L4	F+R	"	"	
L5	F+R	"	"	
L6	1F	"	"	
L7	1F	"	"	
L201		NEOSID	2500/5/+W	
L202		"	"	
L301	1F	NEOSID	TYPE F	
L302	LPF Ex 8A15	TRANSCAP	32/93	
L303	PA DRIVER			

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
RFC1	10uh	CAMBION	550/3640/45/02	
RFC2	10uh	"	" " " "	

RFC301				
RFC302				
RFC303	3B Series Box Choke		4312-020-36640	
RFC304	Series Box Choke		4312-020-36640	
RFC305	Parallel Former		" " "	
RFC306	3B Parallel Former		4312-020-31520	
			" " "	
RFC308	1.8uh	CAMBION	550/3640/27/02	

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
SKA	14PinDIP Skt	AMPHENOL	1COTY	
SKB	" "	"		
SKC	" "	"		
SKD	" "	"		
SKE	" "	"		
SK RL	Relay Skt	KEYSWITCH		
SK RC	11 Pin RATU SKT	DUCON	1151/10-11w	
SK 1	6 way D.Sided PCB SKT	AMPHENOL	225-20621-404	
SK 2	" " " " " "	"		
SK3	" " " " " "	"		
SK4	" " " " " "	"		
SK5	" " " " " "	"		
SK6	" " " " " "	"		
SK7	" " " " " "	"		
SK8	" " " " " "	"		
SK9	" " " " " "	"		
SK10	" " " " " "	"		
SK11	" " " " " "	"		
SK12	BNC Socket	AMPHENOL	31-2221	
PL A	14Pin DIP Plug + Cable	AMPEX	14-024-106	
PL B	14Pin DIP Plug	CAMBION	702-3725-01-03	
PL C	" " "	"		
PL D	" " "	"		
PL E	" " "	"		
PL M				
RL 1	4Pole C/o Relay	KEYSWITCH	SM4P12V21/4/75	
RL 301	1Pole C/c Relay	ASS.CONTROLS	E3201-12VDC	

PART NO.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
PCB				
120-1-2	Double Sided Filter PCB	CAPRICORNIA	120-1-2	
120-2-2	Double Sided Module PCB	"	120-2-2	
120-3-1	Double Sided P.A. PCB	"	120-3-1	
VC1	50K Log Pot SPST P/Pull Sw.	ELCOMA	2322-355-727-29	
VC2	10K Lin Pot	DUCON		
SW 1	2 Pole 12 Pos	A.W.V.	A2 Sec DS1 x 12	
SW 2	4 Pole 6 Pos	"	A2 Sec DS 2 x 6	
LED 1	M655	Motorola	M655	
LED 2	M655	"	"	
LS 1	Loud Speaker	Plessey Rola	C53G00	
MC 1	Microphone	ZEPHER	25E Zepher	
CS 1	Case			
KN 1	Ch. Knob	EIMA	(023-352 knob	
KN 2	Vol Knob	"	(040-302 cap	
KN 3	Clar. Knob	"	(044-302 nut cover	
KN 4	Mode. Knob	"		
FP 1	Front Panel	CUMMINGS ENG.		
PCB	PA Txtr PCB	CAPRICORNIA	PA Tx PCB	
120-4-1	Low Pass Filter PCB	"	120-4-1	

DESCRIPTION	MANUFACTURER	MANUFACTURER'S PART NO.	LOCATION
Screws 4BA x 3/8" C.S.Pltd.	AMMSON		
Screws 4BA x 3/8" R.H.	"		
Screws 9BA x ½" R.H.	"		
Screws 4G Self Tappers (2)	"		
Pop Rivets Standard	"	CB3-2	
Pop Rivets Copper	"	CB-4-2	
Wiring Loom	FINDLAY COM.		
12 Core Inst.Cable	BLY'S IND.	12/aW01/01	
Grommet M13(2)	HAMMOND BROS	M13	
Filter Cover	GILCO	Filter Cover	
Speaker Grill	CUMMINGS ENG.		
Mounting Rack	"	"	
1/8" x¼" Whit (8)	AMMSON TRADING		
5/32 x 3/8" Whit (4)	"	"	
1/8" x ½" Whit (5)	"	"	
1/8" Nuts (5)	"	"	
1/8" Star Washers(5)	"	"	
5/32" Nuts			
5/32" Star Washer			
Tag Strips (2)	WATKIN WYNNE		
TO5 Heatsink			
Cable Clamps	UTILUX	H1033	
Cable Clamp	"	H1034	
Solder Lug	"	H281	

S T I N G R A Y 120

ANTENNA TUNING UNIT

Installation Procedure

INSTALLATION OF ANTENNA TUNING UNIT

The Stingray ATU 120-1 is designed to match the 50 ohm output of the transceiver into various antennae ranging from 3 metre whips to wire antennae, such as backstays on yachts, up to 20 metres long.

When correctly set up using the configurations on the following pages it will enable the Stingray 120 to be matched into a single antenna of various frequencies which could be up to 3 octaves apart.

It should be noted that the Stingray 120 has a broadband PA stage and a VSWR meter should be used only with the transceiver in the low power position where the harmonic content is lowest. It would be normal to obtain a VSWR read of 1:1.5 on low power yet high as 3:1 on high power as most VSWR meters are more sensitive to harmonics to which the antenna is not tuned.

EXAMPLE A:

This configuration is used when the aerial is less than a quarter wave length (see natural quarter wave graph Fig. F).

eg. 2-8 Mhz for 3 metre whip
2-6 Mhz for 10 metre antenna
2-4 Mhz for 12 metre antenna

Approximate values for C_{sh} are:

2-3 Mhz	1700-3000 pf
3-4 Mhz	1000-2500 pf
4-5 Mhz	700-1500 pf
5-6 Mhz	400-1000 pf
6-7 Mhz	200- 800 pf

It is usually found that channels close together, eg. 2182, 2201, 2284, it is possible to use only one C_{sh} by parelleling the connections for C_{sh} on the given relay positions.

N.B. Due to the extremely high voltages encountered when loading low frequencies into short aerials, it is important to use a configuration E, when either or both 4 and 6 Mhz channels are loaded in conjunction with a 2Mhz channel. (You will note from the drawing that this involves a special relay. The relay is normally available from stock).

EXAMPLE B

This configuration is used when the antenna length is between a quarter and three eight wave length, eg. 6-7Mhz for a 12 metre antenna, 5-6Mhz for a 14 metre antenna.

Approximate value of C_{sh} is 100-500 pf and C_{se} 50-400 pf.

EXAMPLES C AND D

The configurations are used when the antenna is considerably longer than a quarter wave length.

In both cases it is necessary to cut the track as shown on the bottom of the relay printed wiring board.

Configuration C approximately 10-14 Mhz
D approximately 14-17 Mhz

C_{se} 50-250pf 10-12 metre antenna

C_{sh} 50-150pf 10-12 metre antenna

EXAMPLE E

This configuration is used when higher frequency channels (eg. 4Mhz or 6Mhz), are tuned together with 2Mhz channel into an antenna which is much shorter than a quarter wave length a 2Mhz.

To avoid damage to the 4 and/or 6Mhz relays, (taps close to antenna and of the L_{se}) the high voltage relay is energised for 4 and/or 6 Mhz operation

shorting out approximately half of the L_{se}. This places the 4 and 6 Mhz taps towards the lower voltage, 50 ohm input end of L_{se} and away from the high voltages at position A.

GENERAL COMMENTS.

There are so many possible ways of setting up the 120-1 antenna tuning unit, taking into account the type of boat and the type of antenna, that it is not possible to be comprehensive in this summary.

Special changes may be needed to meet particular circumstances: Example A. used with longer antennae may result in high voltages at B end of the L_{se}.

A permanent strap should be run from the B end of the coil to the 50 ohm input terminal so that the unused portion of the coil is shorted through the relay contact in each case.