Eddystone S680X Communications Receiver

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Underside View of Chassis

An overview of the Band Change Switch

By Andy Davies
GWØJXM

Circuits

I've been repairing an Eddystone S680X Receiver and I found the original circuit that I had a little fragile and a little bit difficult to work with as some of the numbers and details are missing where the page has been folded. As I intend to keep the radio I thought I'd invest a bit of time redrawing the circuit and this has been a useful exercise in getting familiar with the circuit. Having used the circuit that I retraced for a little while I realised that I was writing additional information on the circuit, things like valve pin numbers etc and I figured that if that helped me then I believe it would also help others.

Originally I made the circuit fit onto two A4 sheets (UK standard paper size) and again having used the circuit I thought that it would be more use to me in a slightly larger scale so I've reshuffled the circuit so as to make it very easy to print as four A4 sheets and glue them together side by side. I've allowed for a generous overlap so you should find it a simple matter of trimming the edges to get rid of any excess and the drawing can then be folded down to A4 size for storage.

I have included a copy of the full circuit reduced down to a single sheet and this may be helpful should you want to view the whole circuit in one piece on the computer screen rather that have to print out the four page version. In both cases they are the same circuit although I have rearranged the position of some of the components so that they are in a more logical position. I've created the circuit in Adobe Photoshop and I've made a little video on YouTube about how I went about this*1

Parts List

I haven't compared the whole of the circuit of my radio with the drawing but I think it is generally the same. I haven't found any resistors or capacitors that are not as specified on the drawing, other than R69 which, although on the original circuit wasn't listed on the parts list, but there are some very obvious differences. Remember that my radio is an S680X and the drawing is designated as a 680X.

In my radio, the S680X, there is only one mains fuse and it has a double pole mains switch where as the 680X drawing shows two mains fuses and a single pole mains switch.

Component Identification

The other difference is that the 'Standby' switch in my radio is positioned immediately after the Smoothing choke Ch1 and before C115 whereas on the circuit diagram the standby switch is positioned after C115.

A point to note is that if you open circuit the 'Standby' switch and then unplug the radio one or more of the capacitors, C114 and/or C115 depending on which circuit you have, will remained charged for a little while. I know this as I made that mistake and it got me.

Test Point Voltages

I've included a sheet of Test Point Voltage Values; remember that values are for test equipment with, by today's standards, fairly low sensitivity. On the manufacturer's original list you may notice that there are two C-'s and two E-'s.

I've made provision to identify them by the valve pin numbers as they could have different values whereas the likelihood of the other duplicated test points having different values is unlikely. For instance test points Z and A- are hard wired together.

Underside View of Chassis

The underside view of the chassis is based on a photograph of my radio and I have orientated this with the knobs towards the operator which is the way I do things as opposed to the manufacture's original which has the radio facing away from the operator.

Overview of the Band Change Switch

In this section I show how the Band Change switch is configured and hopefully make it a little easier to understand how it operates.

Video*1

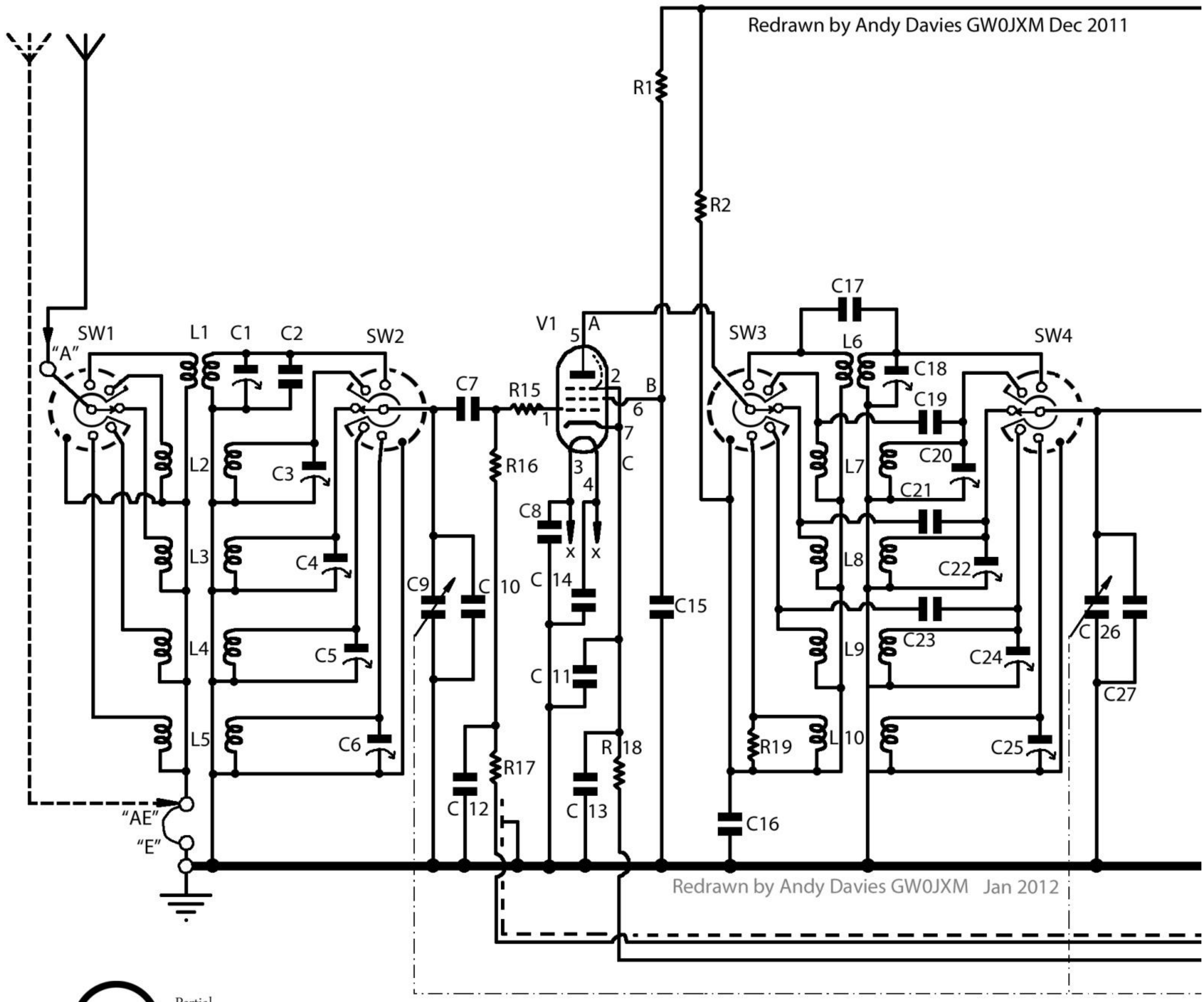
I have made several videos of the work I have done so far on the radio and if you search YouTube for my call sign 'gw0jxm' (the third character is a zero) or search for Eddystone S680X you should find them.

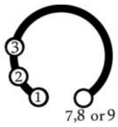
I'm not a 'Radio Expert' just a keen amateur, I've taken reasonable care in preparing this information,

I hope that you find it helpful.

Andy Davies
GWØJXM

V1 = 1st R.F Amp





Partial
Pin view of
Valves.

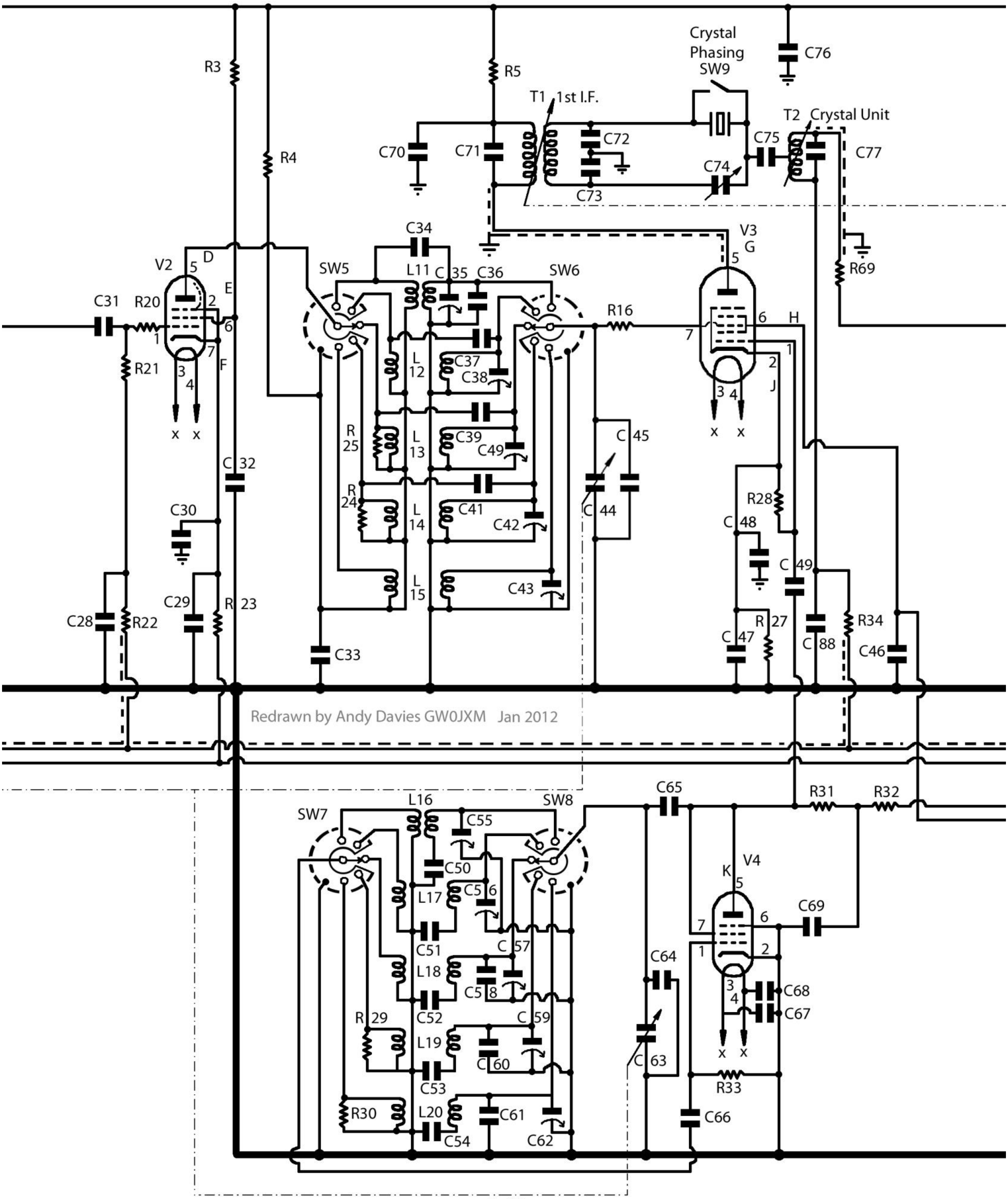
EDDYSTONE 680X RECEIVER

VALVE TYPE	VALVE NUMBER	PIN NUMBERS 1	2	3	4	5	6	7	8	9	VALVE SERIES	SERVICE NUMBERS
6BA6	V1, 2, 5, 6, 12	G1	G3,S	H	H	A	G2	K	-	-	B7G	CV454
6BE6	V3	G1	K, G5	H	H	A	G2, G4	G3	-	-	B7G	CV453
8D5 (6BR7)	V8, 9	-	G1	K	H	H	S	A	G2	G3	B9A	CV2135
6AM6 (Z77)	V4	G1	K	H	H	A	G3, S	G2	-	-	B7G	CV138
6AM5 (EL91)	V10, 11	G1	K, G3	H	H	A	-	G2	-	-	B7G	CV136
5Z4G	V14	-	H	-	A2	-	A1	-	K, H	-	OCTAL	CV1863
VR150/30	V15	-	K	-	-	A	-	-	-	-	OCTAL	CV216
6AL5 (D77)	V7, 13	K1	A2	H	H	K2	S	A1	-	-	B7G	CV140

V2 = 2nd R.F Amp

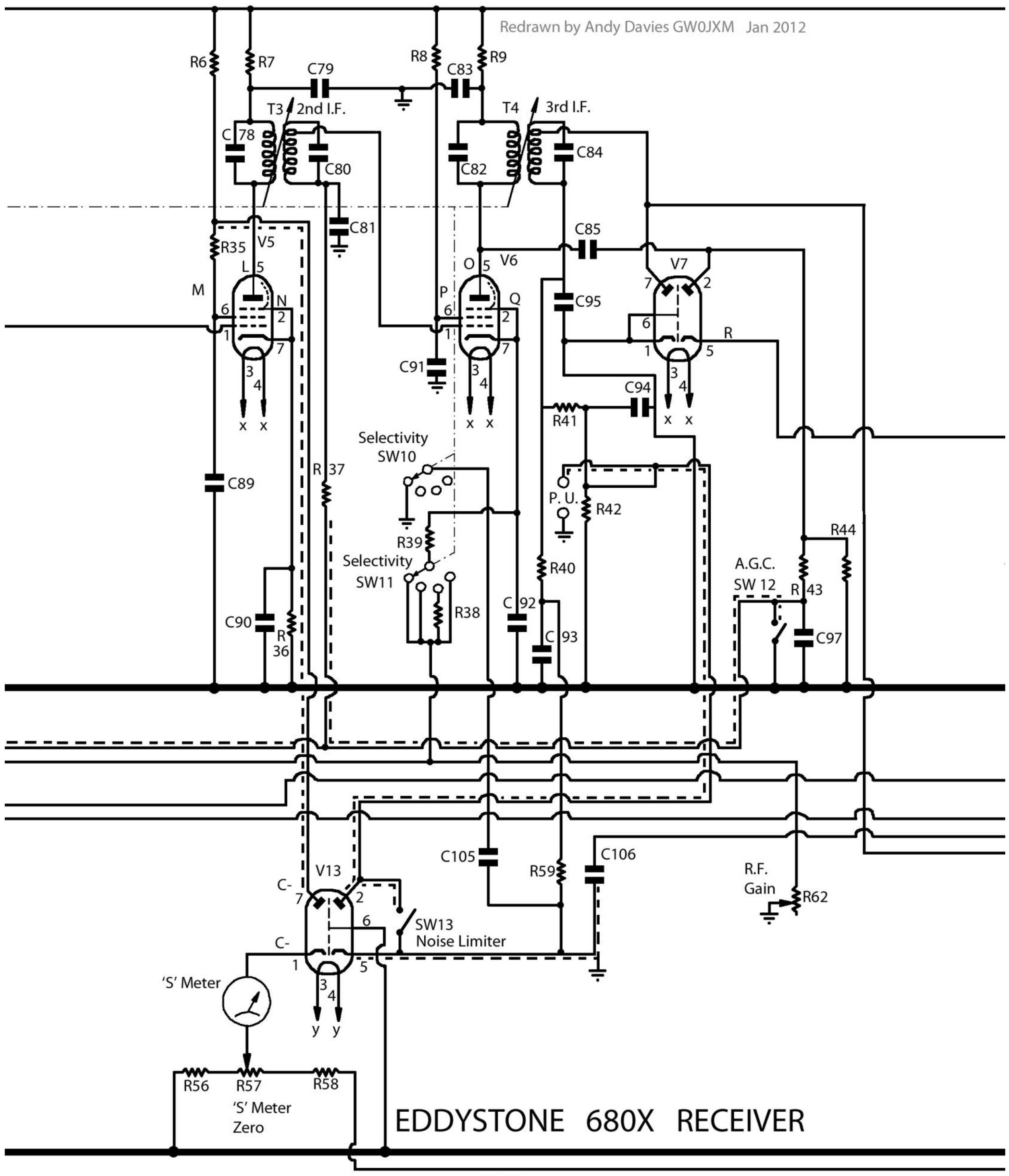
V3 = Frequency Changer

V4 = H.F. Oscillator



V5 = 1st I.F. Amp V6 = 2nd I.F. Amp V7 = Demodulator & A.G.C.

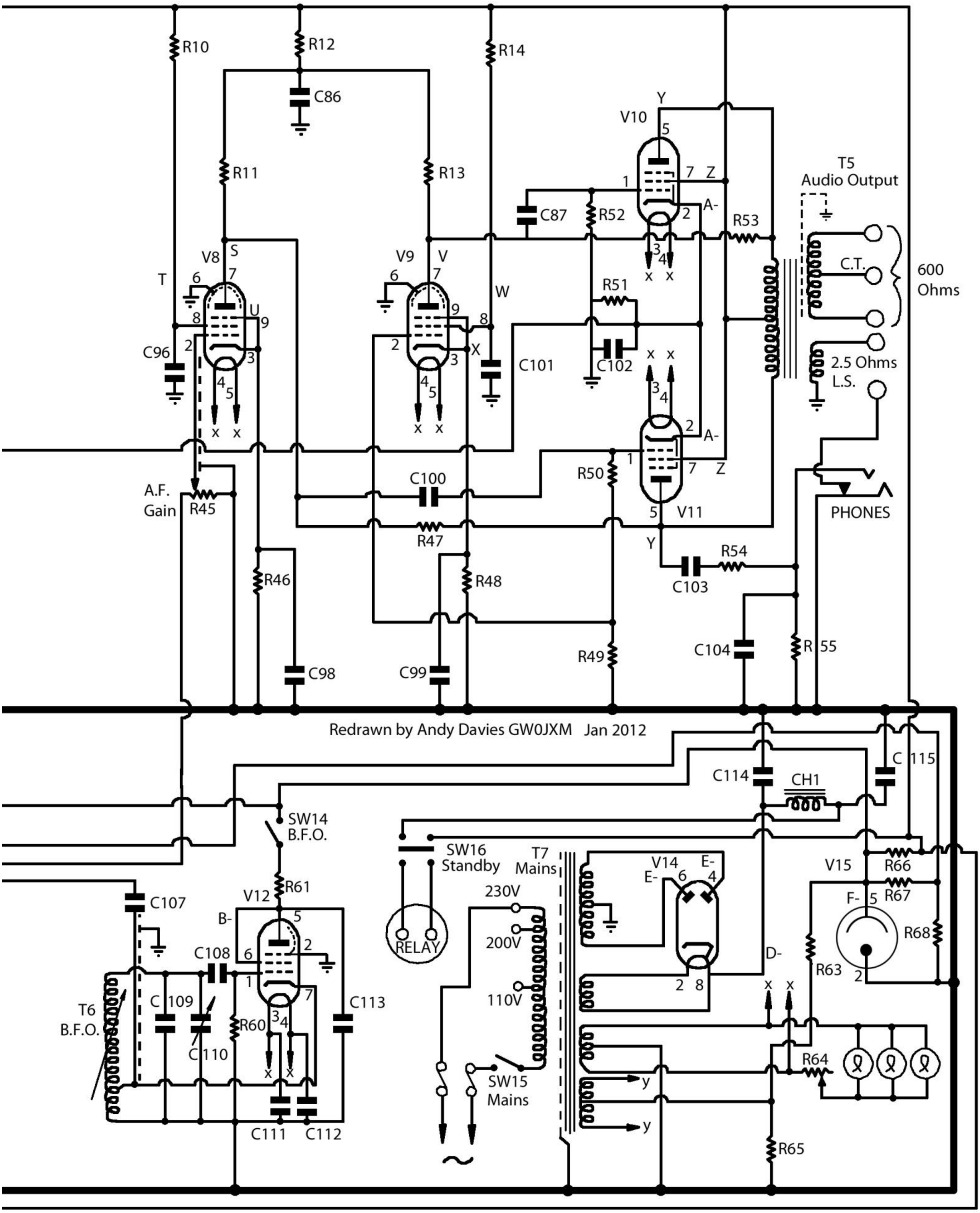
V13 = Noise Limiter & 'S' Meter



EDDYSTONE 680X RECEIVER

V8 = Audio Amp V9 = Phase Splitter V10 & V11 = Push Pull Output

V12 = B.F.O. V14 = Rectifier V15 = Voltage Stabilizer



 EDDYSTONE 680X RECEIVER

EDDYSTONE 680X COMPONENTS LIST

CAPACITORS											
	C1	3 – 23 pF	Air Trimmer		C40	3 – 23 pF	Air Trimmer		C79	0.1 uF	Tub. Paper
	C2	10 pF	Silvered Mica		C41	3 pF	Silvered Mica		C80	400 pF	Silvered Mica +/- 2%
	C3	3 – 23 pF	Air Trimmer		C42	3 – 23 pF	Air Trimmer		C81	0.01 uF	Tub. Paper
	C4	3 – 23 pF	Air Trimmer		C43	3 – 23 pF	Air Trimmer		C82	100 pF	Silvered Mica +- 2%
	C5	3 – 23 pF	Air Trimmer		C44	10 – 367.75 pF	F.C. Tuning		C83	0.1 uF	Tub. Paper
	C6	3 – 23 pF	Air Trimmer		C45	25 pF	Silvered Mica +/- 5%		C84	400 pF	Silvered Mica +/- 2%
	C7	100 pF	Silvered Mica		C46	0.1 uF	Tub. Paper		C85	10 pF	Silvered Mica
	C8	0.0005 uF	Moulded Mica		C47	0.1 uF	Tub. Paper		C86	8 uF	Tub. Elect. 350v DC Wkg
	C9	10 – 367.75 pF	1st RF Tuning		C48	0.01 uF	Tub. Paper		C87	0.01 uF	Moulded Mica
	C10	25 pF	Silvered Mica +/- 5%		C49	10 pF	Ceramic		C88	0.01 uF	Tub. Paper
	C11	0.01 uF	Tub. Paper		C50	7000 pF	Silvered Mica +/- 1%		C89	0.1 uF	Tub. Paper
	C12	0.01 uF	Tub. Paper		C51	3625 pF	Silvered Mica +/- 1%		C90	0.1 uF	Tub. Paper
	C13	0.1 uF	Tub. Paper		C52	1625 pF	Silvered Mica +/- 1%		C91	0.1 uF	Tub. Paper
	C14	0.0005 uF	Moulded Mica		C53	900 pF	Silvered Mica +/- 1%		C92	0.1 uF	Tub. Paper
	C15	0.1 uF	Tub. Paper		C54	440 pF	Silvered Mica +/- 1%		C93	0.1 uF	Tub. Paper
	C16	0.1 uF	Tub. Paper		C55	3 – 23 pF	Air Trimmer		C94	100 pF	Silvered Mica
	C17	20 pF	Silvered Mica		C56	3 – 23 pF	Air Trimmer		C95	100 pF	Silvered Mica
	C18	3 – 23 pF	Air Trimmer		C57	3 – 23 pF	Air Trimmer		C96	0.5 uF	Tub. Paper 200v DC Wkg
	C19	6 pF	Silvered Mica		C58	10 pF	Silvered Mica		C97	0.01 uF	Tub. Paper
	C20	3 – 23 pF	Air Trimmer		C59	3 – 23 pF	Air Trimmer		C98	30 uF	Tub. Elect. 15v DC Wkg
	C21	3 pF	Silvered Mica		C60	20 pF	Silvered Mica		C99	30 uF	Tub. Elect. 15v DC Wkg
	C22	3 – 23 pF	Air Trimmer		C61	20 pF	Silvered Mica		C100	0.01 uF	Moulded Mica
	C23	3 pF	Silvered Mica		C62	3 – 23 pF	Air Trimmer		C101	0.5 uF	Tub. Paper 200v DC Wkg
	C24	3 – 23 pF	Air Trimmer		C63	10 – 367.75 pF	Osc. Tuning		C102	30 uF	Tub. Paper 15v DC Wkg
	C25	3 – 23 pF	Air Trimmer		C64	12 pF	Ceramic		C103	0.002 uF	Moulded Mica
	C26	10 – 367.75 pF	2nd RF Tuning		C65	200 pF	Ceramic		C104	0.1 uF	Tub. Paper
	C27	25 pF	Silvered Mica +/- 5%		C66	50 pf	Silvered Mica		C105	0.002 uF	Moulded Mica
	C28	0.01 uF	Tub. Paper		C67	0.0005 uF	Moulded Mica		C106	0.01 uF	Moulded Mica
	C29	0.1 uF	Tub. Paper		C68	0.0005 uF	Moulded Mica		C107	8 pF	Silvered Mica
	C30	0.01 uF	Tub. Paper		C69	0.1 uF	Tub. Paper		C108	100 pF	Silvered Mica
	C31	100 pF	Silvered Mica		C70	0.1 uF	Tub. Paper		C109	100 pF	Silvered Mica
	C32	0.1 uF	Tub. Paper		C71	400 pF	Silvered Mica +/- 2%		C110	-	B.F.O. Pitch Capacitor
	C33	0.1 uF	Tub. Paper		C72	800 pF	Silvered Mica +/- 2%		C111	0.01 uF	Tub. Paper
	C34	20 pF	Silvered Mica		C73	800 pF	Silvered Mica +/- 2%		C112	0.01 uF	Tub. Paper
	C35	3 – 23 pF	Air Trimmer		C74	-	Crystal Phasing capacitor		C113	0.01 uF	Tub. Paper
	C36	3 pF	Silvered Mica		C75	20 pF	Silvered Mica		C114	16 uF	Tub. Elect. 450v DC Wkg
	C37	6 pF	Silvered Mica		C76	0.01 uF	Moulded Mica		C115	40 uF	Tub. Elect. 350v DC Wkg
	C38	3 – 23 pF	Air Trimmer		C77	500 pF	Silvered Mica +/- 2%		-	-	-
	C39	3 pF	Silvered Mica		C78	400 pF	Silvered Mica +/- 2%		-	-	-

EDDYSTONE 680X COMPONENTS LIST

RESISTORS											
	R1	33K	1W		R24	150R	0.5W		R47	3M +/- 5%	0.5W
	R2	1K	0.5W		R25	1K5	0.5W		R48	1K5	0.5W
	R3	33K	1W		R26	12R	0.5W		R49	6K8 +/- 5%	0.5W
	R4	1K	0.5W		R27	150R	0.5W		R50	470K	0.5W
	R5	1K	0.5W		R28	100K	0.5W		R51	620R +/- 5% 1W	0.5W
	R6	15K	0.5W		R29	2K2	0.5W		R52	470K	0.5W
	R7	1K	0.5W		R30	2K2	0.5W		R53	3M +/- 5%	0.5W
	R8	33K	1W		R31	10K	0.5W		R54	100K	0.5W
	R9	1K	0.5W		R32	1K	0.5W		R55	2K2	0.5W
	R10	1M	0.5W		R33	22K	0.5W		R56	27K	1W
	R11	270K	0.5W		R34	470K	0.5W		R57	5K Pot	-
	R12	10K	0.5W		R35	15K	0.5W		R58	10K	0.5W
	R13	270K	0.5W		R36	68R +/- 5%	0.5W		R59	2M	0.5W
	R14	1M	0.5W		R37	470K	0.5W		R60	47K	0.5W
	R15	12R	0.5W		R38	560R	0.5W		R61	10K	0.5W
	R16	470K	0.5W		R39	68R +/- 5%	0.5W		R62	10K Pot	-
	R17	470K	0.5W		R40	1M	0.5W		R63	270K	0.5W
	R18	68R +/- 5%	0.5W		R41	100K +/- 5%	0.5W		R64	5R Pot	-
	R19	150R	0.5W		R42	100K +/- 5%	0.5W		R65	6K8	0.5W
	R20	12R	0.5W		R43	470K	0.5W		R66	2K7	WIRE WOUND
	R21	470K	0.5W		R44	1M	0.5W		R67	4K7	0.5W
	R22	470K	0.5W		R45	500K Pot	-		R68	22K	1W
	R23	68R +/- 5%	0.5W		R46	1K5	0.5W		R69	12R	0.5W

Eddystone 680X

Transformers and Choke

T1 1st I.F.	**T2** Crystal Unit	**T3** 2nd I.F.	**T4** 3rd I.F.
T5 Audio Output	**T6** B.F.O.	**T7** Mains	**Ch.1** Soothing

Switches

SW.1 Pri 1st R.F.	**SW.2** Sec 1st R.F.	**SW. 3** Pri 2nd R.F.	**SW.4** Sec R.F.
SW.5 Pri Frequency Changer	**SW.6** Sec Frequency Changer	**SW.7** Pri Oscillator	**SW.8** Sec Oscillator
SW.9 Crystal Phasing	**Sw. 10** Selectivity Max - Min	**Sw. 11** Selectivity Max - Min	**SW.12** A.G.C. Off/On
SW.13 Noise Limiter Off/On	**SW.14** B.F.O. Off/On	**SW.15** Mains Off/On	**SW.16** Standby

Coils

L1 Range 1 1st R.F.	**L2** Range 1 1st R.F.	**L3** Range 1 1st R.F.	**L4** Range 1 1st R.F.
L5 Range 1 1st R.F.	**L6** Range 1 2nd R.F.	**L7** Range 2 2nd R.F.	**L8** Range 3 2nd R.F.
L9 Range 4 2nd R.F.	**L10** Range 5 2nd R.F	**L11** Range 1 F.C.	**L12** Range 2 F.C.
L13 Range 3 F.C.	**L14** Range 4 F.C.	**L15** Range 5 F.C.	**L16** Range 1 Osc
L17 Range 2 Osc	**L18** Range 3 Osc	**L19** Range4 Osc	**L20** Range 5 Osc

Valves

V1,2	R.F. Amplifier	6BA6	**V3**	Frequency Changer	6BE6
V4	H.F. Oscillator	6AM6/Z77	**V5,6**	I.F. Amplifier	6BA6
V7	Demodulator /A.G.C.	6AL5/D77	**V8**	Audio Amplifier	8D5/6BR7
V9	Phase Splitter	8D5/6BR7	**V10, 11**	Push Pull Output	6AM5/EL91
V12	B.F.O.	6BA6	**V13**	Noise Limiter/ 'S' Meter	6AL5/D77
V14	Power Rectifier	5Z4G	**V15**	Voltage Stabiliser	VR150/30

Eddystone 680X

Test Point Voltage Values

Two different sets of voltages are given for two different meter sensitivities an Avo and a Weston meter.

These values are taken with reference to the chassis.

1) Receiver set to 1000 Kc/s on Range 5
2) Aerial shorted out.
3) The RF control set to maximum.
4) AF gain Control set to minimum

A tolerance of +/- 5% can be accommodated.

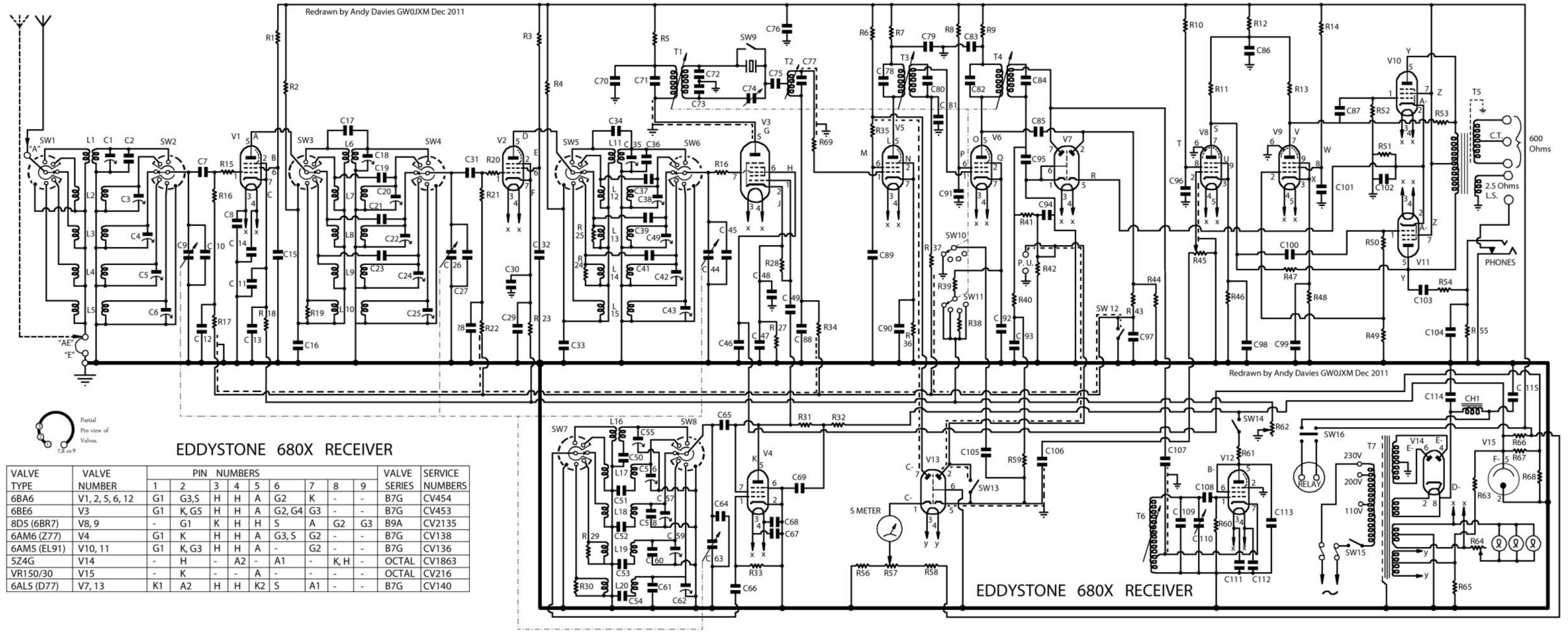
There is no test point 'I'

Test Point	AVO	1,000 O.P.V	Your reading	Test Point	AVO *See note	Weston 1,000 O.P.V.	Your reading
A	205 V	218 V		U	0.7 V	0.8 V	
B	80 V	84 V		V	18 V	22 V	
C	0.8 V	1 V		W	15 V	22 V	
D	210 V	218 V		X	0.8 V	0.8 V	
E	80 V	83 V		Y	218 V	220 V	
F	1 V	1.9 V		Z	220 V	225 V	
G	212 V	220 V		A-	11.5 V	11.5 V	
H	100 V	100 V		B-	85 V	85 V	
J	1.1 V	1.2 V		C- pin 1 V13	142 V	150 V	
K	85 V	100 V		C- pin 7 V13	142 V	150 V	
L	206 V	206 V		D-	252 V	260 V	
M	88 V	93 V		E- pin 6 V14	240 V **AC**	245 V **AC**	
N	1 V	1 V		E- pin 4 V14	240 V **AC**	245 V **AC**	
O	206 V	210 V		F-	150 V	150 V	
P	75 V	80 V		Heaters xx	6.3 AC		
Q	1 V	1 V		Heaters yy	6.3 AC		
R	11.5 V	11.5 V					
S	20 V	25 V		Total HT Current: 110 mA			
T	18 V	25 V		Mains Voltage			

*Note, these values have been copied from an original copy of the general instruction manual and it's been suggested to me that 'AVO' refers to an AVO 7 which has a sensitivity of 500 ohms per volt. By the way an AVO 8 has a sensitivity of 20,000 ohms per volt and of course a 21st century digital meter has a much higher sensitivity of 1to 20 M ohms. Andy Davies gw0jxm Dec 2011

Date of test

Notes

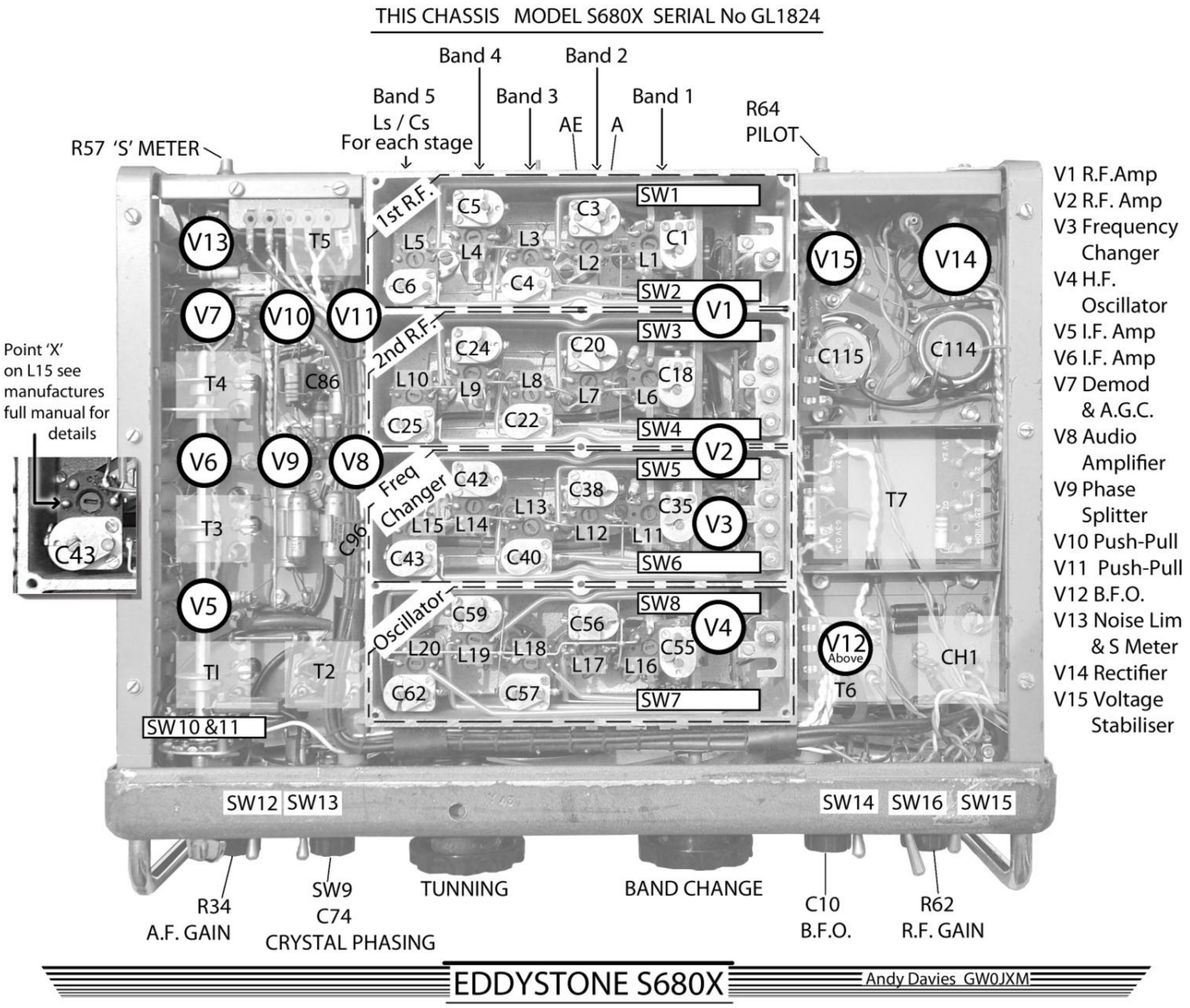


7,8 or 9

Partial Pin view of Valves.

EDDYSTONE 680X RECEIVER

VALVE TYPE	VALVE NUMBER	PIN NUMBERS 1	2	3	4	5	6	7	8	9	VALVE SERIES	SERVICE NUMBERS
6BA6	V1, 2, 5, 6, 12	G1	G3,S	H	H	A	G2	K	-	-	B7G	CV454
6BE6	V3	G1	K, G5	H	H	A	G2, G4	G3	-	-	B7G	CV453
8D5 (6BR7)	V8, 9	-	G1	K	H	H	S	A	G2	G3	B9A	CV2135
6AM6 (Z77)	V4	G1	K	H	H	A	G3, S	G2	-	-	B7G	CV138
6AM5 (EL91)	V10, 11	G1	K, G3	H	H	A	-	G2	-	-	B7G	CV136
5Z4G	V14	-	H	-	A2	-	A1	-	K, H	-	OCTAL	CV1863
VR150/30	V15	-	K	-	-	A	-	-	-	-	OCTAL	CV216
6AL5 (D77)	V7, 13	K1	A2	H	H	K2	S	A1	-	-	B7G	CV140

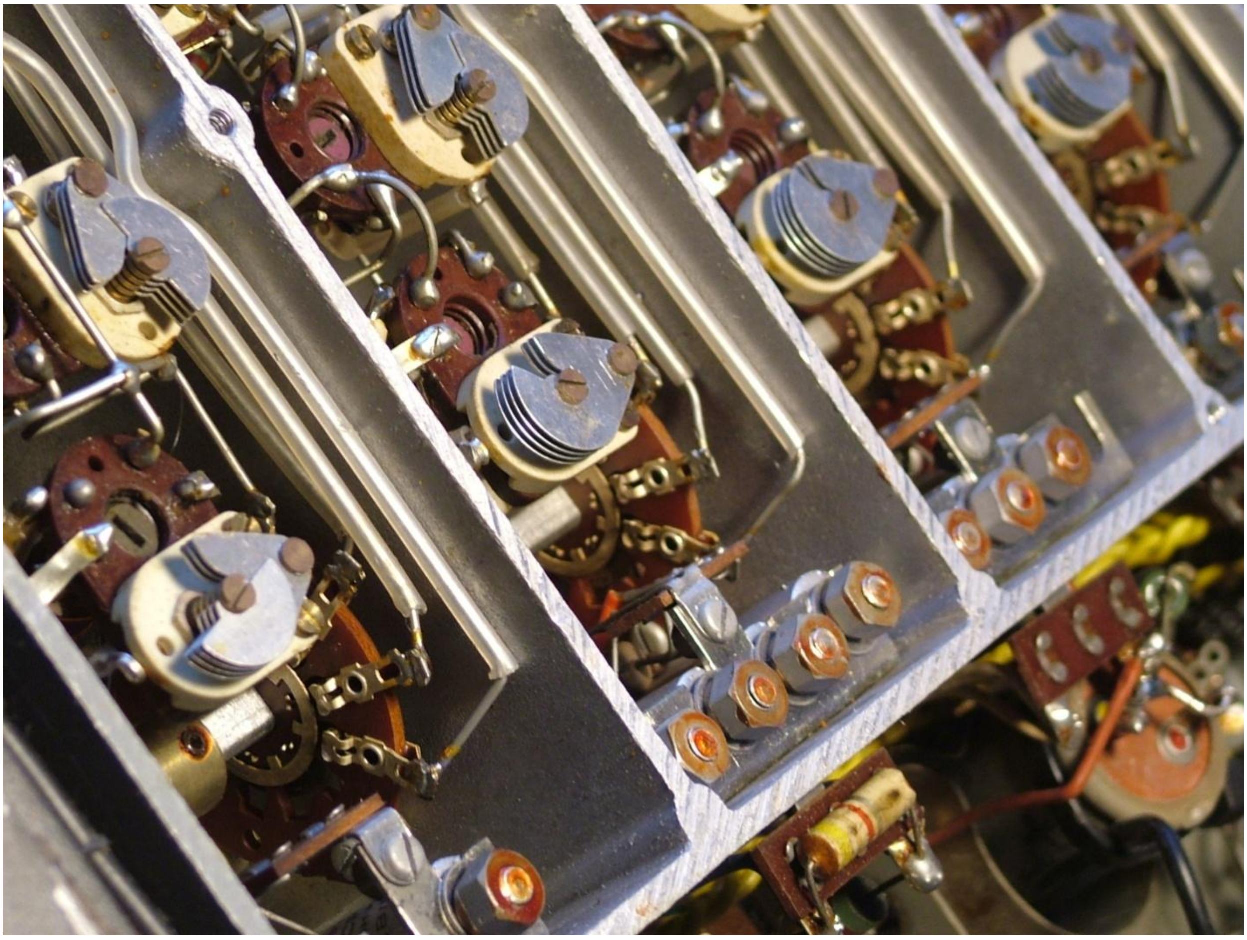


The above photograph is of my own radio and it's an S680X. The circuit diagrams in this document is based on a circuit that I had with my radio and that is the same circuit diagram as the one for the 680X on the Eddystone User Group web site (as of December 2011) You can tell the original Eddystone drawing that I have redrawn as it has 2 off C37's associated with switch 6 and the parts list doesn't identify R69 (which in my radio is a 12 ohms ½ watt resistor)

I have only done a partial component identification showing some of the major components as a guide to finding ones way around the radio chassis but it should help.

You can find the manufacturer's original information at the Eddystone User Groups web site.

Eddystone S680X communications receiver.
Band change switch



An overview of the band change switch

By Andy Davies
GWØJXM

*Special note. This information is based on an Eddystone S680X serial No GL1824 with the component identification taken from a circuit diagram with an unspecified issue number for a 680X from the Eddystone user group website. 8th December 2011

Eddystone S680X Communications Receiver.

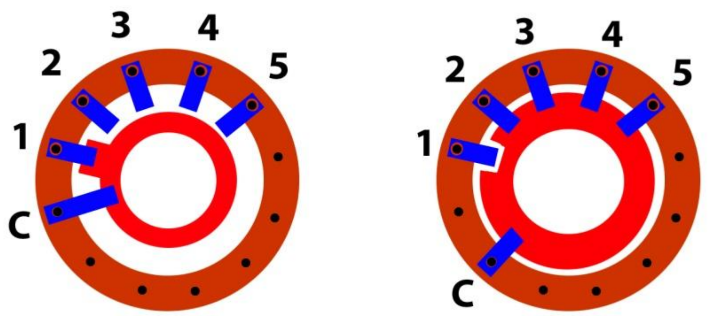
Band Change Switch

I think that the most daunting thing in the receiver is the band change switch and I figure the sooner I get to grips with it or I should say 'them' the better. At first sight it looks horrendously complicated but when you get in close they're really not at all complicated.

The band change switch comprises of eight identical, five position, double pole wafer switches. So although the band change switch is referred to as switches '1 to 8' it would have been better to refer to it as switches '1 to 16' Each switch has two different moving ring contact arrangement on either side.

Each wafer switch of course has a side that faces the front of the radio and I'll refer to that as the 'f' side and the side facing the back of the radio I'll refer to as the 'b' side.

The 'f' sides of each of the switches are simple single-pole five-way selector switches and they look like the switch on the left in the image below, it has one closed contact and 4 open contacts. 'C' of course denotes the common contact.



front facing 'f' ring contact

back facing 'b' ring contact

As viewed from the front of the radio with the radio upside-down

The inner ring is the moving contact on both sides of the switch; they are of course 'ganged' together to move as one but they are insulated from one another.

Terminal 1 of side 'f' is connected to terminal 1 of side 'b' and terminal 2 of side 'f' is connected to terminal 2 of side 'b' and so on. The 'f' and 'b' ring contacts each have their own common terminals.

Remember that in the image to the left you are seeing the 'b' side of the switch as if you were looking through the 'f' side from the front of the radio.

All eight (16) band change switches are mechanically coupled by a common shaft and they are identical.

The 'b' side of the switch comprises of another five-way switch but this one, instead of selecting one of the five poles, it grounds or decouples each of the four poles that are not selected by the 'f' switch, it has one open contact position and four closed contacts.

The switch is shown in the number one position i.e. fully anticlockwise, (30Mhz)

All of the eight wafer switches used for band selection are of the same construction.

Eddystone S680X Communications Receiver

Band Change Switch.

The forward facing contacts

The band change switches select the inductively coupled tuned circuits for four sections of the radio.

1) The first R.F. stage. 2) The second R.F. stage.
3) The frequency changer. 4) The Oscillator.

Each of the four sections above, are controlled by two of the wafer switches and once you understand the operation of one section you'll see that, in terms of wiring, the switching of all four sections are practically identical.

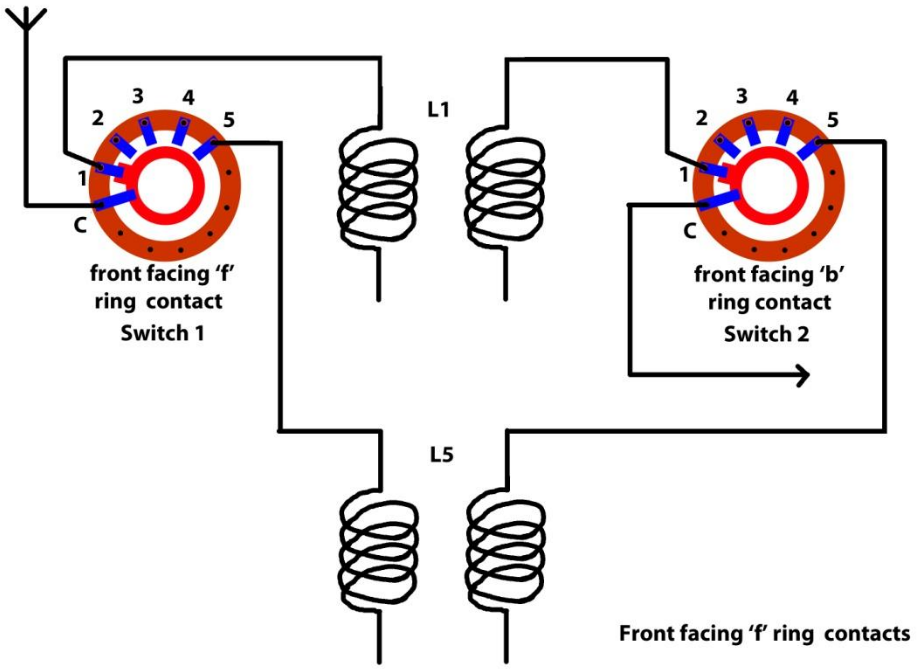
In each section the common terminal of one of the 'f' side contacts of one switch connects to one end of the primary of the chosen coil (tuned circuit).

So, in the first R.F. section the common terminal of the 'f' side of the first switch (shown below on the left) connects to the primary of the chosen tuned circuit.

The common terminal of the 'f' side of the second switch in that section (shown below on the right) connects to one end of the secondary of the chosen tuned circuit.

Only coils L1 and L5 are shown but L2 connects to switch position 2 in each case and L3 connects to position 3 etc.

In each section the coil with the lowest identification number connects to switch position 1, with the next highest being connected to switch position number 2 etc.



Note that in each section the highest frequency's coils are positioned nearest to the wafer switch.

The 30MHz coils are connected to the switch with strip rather than wire.

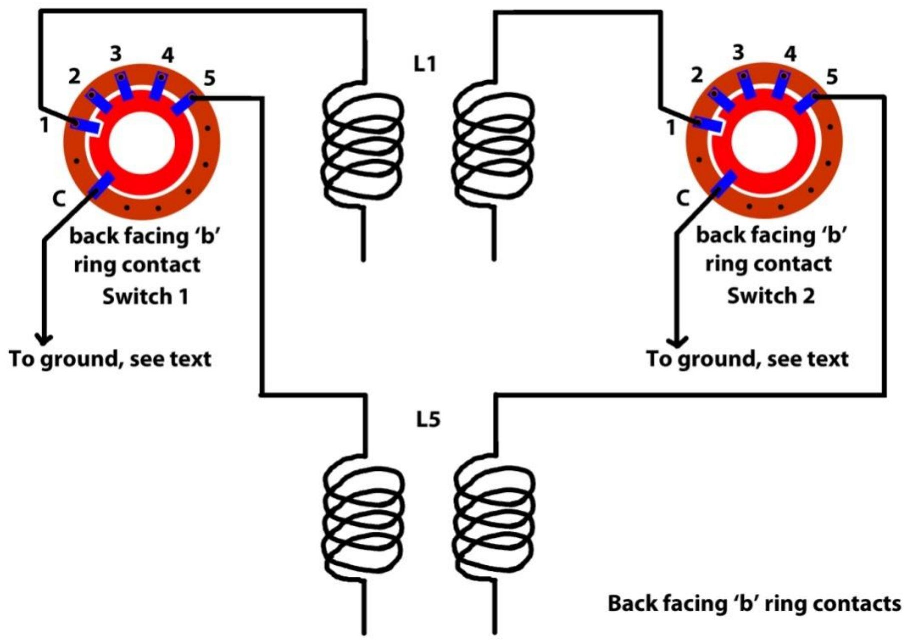
Eddystone S680X Communications Receiver

Band Change Switch.

The backward facing contacts

The common contacts of the 'b' sides of all eight band change switches are connected to ground, either directly or via a capacitor. There's an exception with Switch 1.
The common contact of Switch 1 may be connected to ground via the 'AE'-'A' link on the back of the radio otherwise it is connected to one side of the dipole aerial. See a full circuit diagram of the radio for details.
Whereas both 'f' sides of each switch selects the required coil to be connected into the circuit, both of the 'b' sides of each switch in each section 'de-select' the coils that are chosen by the 'f' side. Any coil that is not 'de-selected' is grounded or decoupled, either directly or via a capacitor to the chassis.

Again only L1 and L5 are shown below but L2 connects to position 2 of the switch and L3 to position 3 etc.
In each tuning section the lowest numbered coil connects to contact 1 of that sections switch, with the next higher numbered coil connecting to contact 2 and so on.



Remember that in the image you are seeing above the 'b' side of the switches are seen as if you were looking through the 'f' side from the front of the radio.

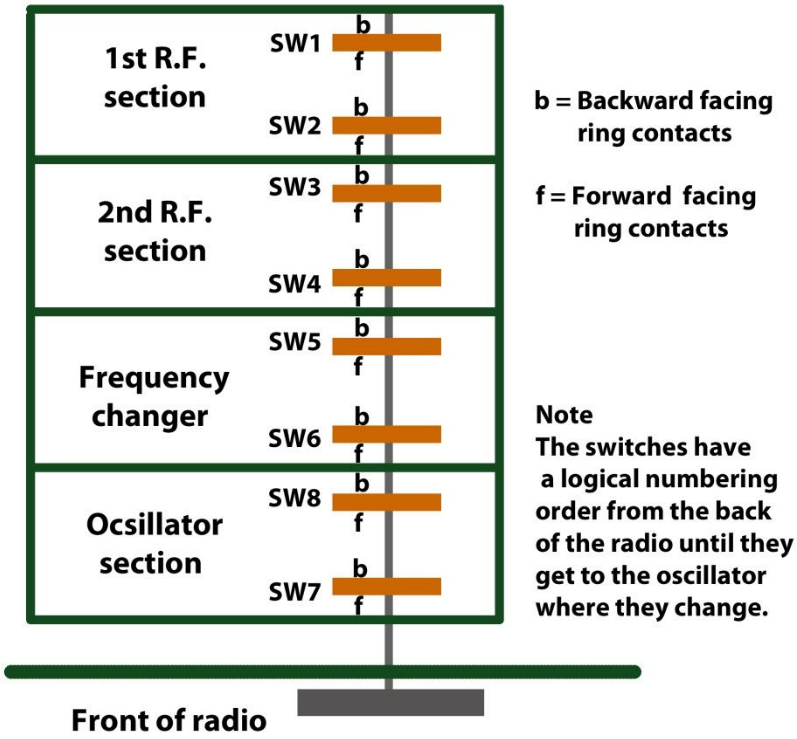
Note that the common terminal 'C' for the 'f' and the 'b' sides of the switch are **not** the same terminal, they are separated by one index position.

So, in a nutshell, in all cases the front facing contacts select the required coil, the back facing contacts de-select that coil from being grounded.

Eddystone S680X Communications Receiver

Band Change Switch.

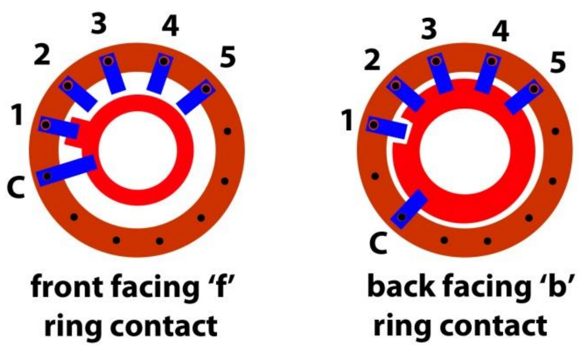
Under view of the tuning section showing the band change switch locations.



Underside view of the of the tuning section

The front facing contacts select the required coil, the back facing contacts de-select that coil from being grounded.

All eight of the wafer switches of the band change are identical. Switch position 1 = band 1 Switch position 2 = band 2 etc.



As viewed from the front of the radio with the radio upside-down

Band 1	30	to	12.3 MHz
Band 2	12.5	to	5.3 MHz
Band 3	5.7	to	2.5 MHz
Band 4	2.5	to	1.11 MHz
Band 5	1120	to	480 kHz

*Special note. This information is based on an Eddystone S680X serial No GL1824 with the component identification taken from a circuit diagram with an unspecified issue number from the Eddystone user group website.

Created by Andy Davies GWØJXM 8th December 2011