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Colin Hinson
In the village of Blunham, Bedfordshire.

HANDBOOK No. 1129A

STR. 9X
44-Channel Conversion Kit

Standard Telephones and Cables Limited

MARCH 1960

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STR.9X 44 CHANNEL CONVERSION KIT

STANDARD TELEPHONES AND CABLES LIMITED
Radio Division,
Oakleigh Road, New Southgate, LONDON, N.11.

C O N T E N T S

DRAWINGS

ILLUSTRATIONS

STR.9X 44 CHANNEL CONVERSION KIT

GENERAL

The purpose of this kit is to allow, by a comparatively simple method, the conversion of an existing 10 channel equipment into a 44 channel equipment. It is applicable to the STR.9X, 9X1, 9X2 and 9X3 and also to their military equivalents including the TR.1985, 1986 and 1987. The kit is made up of a Selector and Automatic Tuning Unit, a Remote Control Unit, a replacement cover for the tuning mechanism and the necessary fixing screws and flexible couplings.

The conversion involves no aircraft cabling changes whatsoever and the transmitter/receiver unit has only one dimensional change; this is to the cover of the tuning mechanism, the new cover being $\frac{1}{2}$" deeper than the original. Crystals are identical in type and frequency with those already in use and the weight change (less crystals) as a result of the conversion is about 1 lb.

The new Remote Control is the same physical size as the old and screw fixing centres are identical. Illumination of the channel selector dials is provided for night operation.

The conversion, once carried out, provides completely automatic tuning of the transmitter and receiver stages, thus obviating the need for pre-tuning the equipment on the ground with the consequent possibility of human error. It is merely a matter of inserting a crystal - the automatic tuning unit does the rest.

1.0 MECHANICAL DESCRIPTION

The Selector and Automatic Tuning Unit fits into the position at present occupied by the 10 channel mechanism. It has the same fixing centres as this mechanism therefore no drilling or cutting is necessary. It is made up of two parts; the Mechanical Tuning Unit and the Electronic Tuning Unit.

In order to clarify this description, the three units comprising the conversion kit have been given a prefix number, the number appears on the schematics and is applied to the components.

Unit 7.	Tuning Unit (Electronic)	2-LRU.63A
Unit 8.	Tuning Unit (Mechanical)	2-LRU.62A
Unit 9.	Remote Control Unit	1-LRU.240A

Thus, relay RL6 in the Tuning Unit (Electronic) would be referred to as 7RL6, socket SK1 in the Tuning Unit (Mechanical) as 8SK1.

1.1 Mechanical Tuning Unit (8) Fig.3

The mechanical drive parts are mounted on a shaped passivated cadmium plated mounting plate and consist of a single cam driven tuning slider for rotating the two tuning condensers, the cam, (driven through a coupling from the already existing reduction mechanism on the rotary transformer) a microswitch 8SW1 and a 25 way D.B. type Cannon socket 8SK1. On the slide are mounted the pins to allow adjustment to the mechanical alignment of the two tuning condensers. Wired to the 25-way Cannon socket is a 12-way Plessey plug. This plug replaces the "controller" plug 5P7 mounted on the front of the transmitter/receiver unit. Once the mechanical tuning unit and new controller plug are fitted there are only ten electrical connections to be made in the equipment.

1.2 The Electronic Tuning Unit (7) See Fig.2

The mounting plate for the component parts of this unit is identical in size, shape and material as that for the mechanical tuning unit. The components mounted on the Electronic Tuning Unit can be divided into two groups, those associated with the oscillator and auto-tune circuits and those for the crystal selection circuits. The former is made up of valves and relays whilst the latter is relays and switches. The valves are an oscillator, an auto-tune amplifier and a neon stabiliser. The oscillator replaces the original oscillator/trebler 3V1 which is now used as a trebler only. The crystal selection switches are rotated by 7RS1, a rotary solenoid which is located on the mounting plate. The drive between 7RS1 and the switches is by a steel shaft. The drive is geared down to reduce the load on 7RS1 and increase its life. On the front of the Electronic Tuning Unit is mounted the crystal panel to hold the 44 crystals. These crystals may be of type 10XAJ (4044) or AU(4044). All connections from the Electronic Tuning Unit are terminated at a 25 way D.B. type Cannon Plug 7PL1 fixed to the mounting plate. This plug mates with the socket on the mechanical tuning unit thus allowing a quick breakdown for servicing.

1.3 Remote Control Unit (9) See Fig.1

This unit now houses two switches instead of one. The switches are concentrically mounted, the inner being a 10-way switch and the outer a 12-way switch. The dial of the inner switch is engraved with the figures 1-4 and "off". Stops are provided at the "4" and "off" positions. The dial of the outer switch is engraved with the letters A-L (excluding "I") and a mechanical stop is used at positions "A" and "L". Illumination of the two dials is provided by a single 2.5V, .5 Watt lamp 9LP1. The degree of illumination is continuously variable by adjustment of 9RV1.

2.0 ELECTRICAL OPERATION

This section will be divided into two parts, the switching circuits and the auto-tune circuits.

2.1 On/Off Switching (Figs.1,2,3 and 4)

The starting relay is, as before, 5RL1 in the main unit where one side of its operating coil is connected to 28 volts +, the other side is connected to 8SK1, Pin 13, the Cannon socket on the mechanical tuning unit. Here, it is bridged across to Pin 1 via 7PL1, Pins 13 and 1, the Cannon plug on the Electronic Tuning Unit. The circuit is then via 5P7, Pin A, through the controller cable to pin 'A' 9PL1 on the Remote Control Unit. Pin A is connected to 9SW2A/F, and when the switch is operated away from its "off" position a circuit is made to earth through 9LP1, the dial lamp and 9RV1 in parallel. Relay 5RL1 is thus energised and 28 volts is applied to the rotary transformer and voltage regulator making available L.T., H.T. and G.B. voltages to the required points.

The dial lamp in the "start" circuit is low voltage (2.5V .5W) so has no effect on Relay 5RL1 which will operate down to 20V.

2.2 Channel Changing (Figs.1,2,3,4,5)

Section 1.3 (Remote Control Unit) explained that two switches are now mounted on the Remote Control Unit, one (9SW2) having, in addition to "off", four positions and the other (9SW1), eleven positions. The former switch is for selecting one of four banks of eleven crystals and the latter is for selecting one of the bank of eleven crystals selected by the former. The five position switch will be referred to as the crystal "bank" selection switch and the 11 position switch as the crystal "position" selector switch. On Fig.1 9SW2A/F and 9SW2A/B are the wafers for the 5 position switch and 9SW1A/B, 9SW1B/F and 9SW1B/B the wafers for the 11 position switch.

2.3 Crystal Bank Selection (Figs. 4 and 5)

To select any one of the four banks of crystals three relays are used. They are 7RL5, 6 and 7. Their functions are:

7RL5 connects the grid and anode of the oscillator valve V3 to the contacts of either 7RL6 or 7RL7.

7RL6 completes the oscillator grid and anode circuits to either crystal bank 1 or 3.

7RL7 completes the oscillator grid and anode circuits to either crystal bank 2 or 4.

The operation of 7RL5, 6 and 7 is controlled by switch wafer 9SW2A/F on the remote control unit. Reference to Fig.2 shows that one side of the coils of these relays is connected to the 28 volt + line and the other sides connected to 9SW2A/F. This switch serves to earth, and therefore operate, either of the three relays depending on its position.

The four positions are:-

BANK 1 selected	7RL6 only operated.
" 2 "	7RL5 and 6 operated.
" 3 "	No relays operated.
" 4 "	7RL5 and 7 operated.

Figs. 4 and 5 illustrate the switch positions when banks 1 or 3 are selected.

2.4 Crystal Position Selection (Figs.1,2,3 and 6)

The crystal position selector switches are 7SW1 in the Electronic Tuning Unit and 9SW1 in the Remote Control Unit. 7SW1 in the tuning unit has nine wafers and is rotated by the rotary solenoid 7RS1. The operation of 7RS1 is controlled by the position of relay contacts 7RL4/1. Reference to Fig.1 shows that these contacts earth or open circuit one side of 7RS1, the other side of which is joined to 28 volts +. The coil of relay 7RL4 has on one side 28 volts +, the other side is connected to 7SW1A/B via 7SW2. (The purpose of 7SW2 will be explained later). From 7SW1A/B the circuit is then via one of the three lines 6, 7 or 8 to 5P7, thence to the remote control unit. Here it enters at either F, G or H and passes through the position selector switch 9SW1 to either J, K, L or M. From these points the circuit is via the remote control cable and 5P7 to 9, 10, 11 or 12 on the tuning unit and thence to 7SW1A/F, the wiper of which is connected to earth.

When 7RS1 has operated the switch wafers 7SW1A/B and 7SW1A/F to such a position that 7RL4 "finds" an earth via the remote control unit switches 7RL4 operates and open circuits the earth line to 7RS1. 7RS1 ceases to operate and in this condition the crystal selection switches (also driven by 7RS1) will have stopped at the position selected on the Remote Control Unit.

Reference to Fig.1 will show that one wafer of 9SW2, the "bank" selection switch, is in series with 9SW1. This is necessary to ensure that if 9SW2 only is operated, the circuit of 7RL4 is interrupted. (7RL4 must drop off when either switch is operated in order to trigger the auto-tune).

The switch 7SW2 in series with 7RL4 and 7SW1A/B is a micro switch and is operated by a "flat" on the driving spindle between 7RS1 and the switch wafers of 7SW1. The switch serves to ensure that the contacts and segments of 7SW1 are correctly aligned when 7RS1 stops.

3.0 AUTO TUNE OPERATION (Figs.1, 7, 8 and 9)

The function of the auto-tune circuits is to take information from 4V5 in the transmitter and turn it into such a form as to operate the magnetic clutch, thus starting and stopping the mechanical tuning system. The magnetic clutch operates in the same way as on the 10 channel equipment; i.e. energising the magnet coil starts the mechanical tuning and de-energising stops it.

When the auto-tune cycle commences, the tuning slider referred to in section 1.1 rotates the transmitter and receiver tuning condensers. This rotation persists until the circuits are tuned to resonance. In this condition a grid current peak will be present at 4V5. It is this information which is differentiated, amplified by 7V1, the auto-tune amplifier and operates 7RL1. This relay in turn de-energises the magnetic clutch coil, stopping its tuning mechanism.

3.1 The relays used in the auto-tune circuits are 7RL1,2,3 and 4 (one pair of the contacts of 7RL4 is used in the crystal position selector circuit, section 2.3). Their functions are as follows:-

7RL1. Each side stable Carpenter relay. Operated by the auto-tune amplifier valve. Obtains an earth from 7RL4/2 via 7RL3/1 and switches this earth to energise the magnetic clutch coil or short circuit the coil of 7RL2 (contacts 7RL1/1).

7RL2. Earths the P.T.T. line (contacts 7RL2/2) and switches H.T. to V2, the auto-tune stabiliser valve or to the transmitter and modulator output stages (contacts 7RL2/1).

7RL3. Switches 28V to the heater of 7TH1 and bias to the low resistance windings of 7RL1 or makes own hold circuit (contacts 7RL3/2). Obtains an earth from 7RL4/2 and switches this earth to 7V1 grid or to 7RL1/1 (contacts 7RL3/1).

7RL4. Switches an earth from 7V1 grid to 7RL3/1 (contacts 4/3).

3.2 To simplify the description of the auto-tune operation it will be explained in steps. The first is immediately after switching on (Fig.7). H.T. and L.T. voltages are applied to the required points and in particular 28 volts via 7PL1/17 to the following:-

(a) Heater of 7TH1, the thermal delay.

(b) One side of the coil of 7RL4.

(c) Via 7R12 to one side of the coil of 7RL2.

(d) One side of 7RS1.

(e) The two low resistance windings of 7RL1 via 7R15.

7RS1 rotates as explained in section 2.4 until the contacts 7RL4/1 and 7RL4/2 operate, the former to stop 7RS1, and the latter to remove the earth from the grid of 7V1. 7RL2 has operated, contacts 7RL2/1 connecting the H.T. supply to the stabiliser valve 7V2. Contacts 7RL2/2 earth the P.T.T. line and contacts 7RL1/1 are held firmly in the position shown to ensure that no spurious operation of the magnetic clutch can take place.

3.3 After 45 seconds, the heater of 7TH1 reaches a temperature sufficient to operate its contacts. The next step then takes place (Fig.8). 28 volts is applied to the coil of 7RL3, the other side of which is earthed via the "start" line, so 7RL3 operates. Contacts 7RL3/2 breaks the supply to the heater of 7TH1, transferring this supply to the coil of 7RL3 providing a holding voltage. (This is necessary as when 7TH1 heater cools its contacts will open circuit). The action of disconnecting 7TH1's heater also removes the bias to the low resistance windings of 7RL1 leaving this relay ready for operation by a pulse through its high resistance winding. Contacts 7RL3/1 removes the second earth from 7V1 grid and completes the earth circuit to the magnetic clutch coil. The clutch coil is energised and the transmitter/receiver commences to tune.

3.4 The final step in the tuning cycle now takes place as the transmitter/receiver approaches tune. During the cycle 7V1 is conducting. 7C2, 7R11 (Fig.2) serve to differentiate the waveform at the grid of 4V5 and apply the resultant voltage to the grid of 7V1. When 4V5 commences to pass grid current the differential is negative, causing 7V1 to stop conducting. In its conducting state the anode of 7V1 is at a potential of approximately 50V. When 7V1 ceases to conduct this potential rises to 150V. This results in 7C1 charging through 7MR2 and the high resistance winding of 7RL1. This pulse holds 7RL1 firmly in its present state. At the peak of the grid waveform the differential is zero and 7V1 conducts, discharging 7C1 through 7MR1 which energises 7RL1 in the opposite direction to that of the charging current. The contacts of 7RL1 now operate to the other side. This open circuits the earth line to the magnetic clutch, stopping the tuning mechanism and together with contacts 7RL4/2, 7RL3/1, short circuit the coil of 7RL2, causing it to fall off (Fig.9). The operation of 7RL2 removes

the H.T. supply from the auto-tune valve and re-applies it to the transmitter and modulator output stages (contacts 7RL2/1), whilst contacts 7RL2/2 remove the earth from the P.T.T. line. The tuning cycle is now completed.

3.5 Channel changing involves the operation of either 9SW1 or 9SW2 (Remote Control Unit switches) to another position. The operation of either of these switches breaks the earth line to 7RL4. (See Section 2.4). Contacts 7RL4/2 de-operate, removing the short circuit which they make, together with 7RL3/1 and 7RL1/1, across the coil of 7RL2 and at the same time earthing the grid of 7V1. 7RL2 operates. Contacts 7RL2/2 earth the P.T.T. line and contacts 7RL2/1 transfer the H.T. supply from the transmitter and modulator output stages to the auto-tune valve 7V1 via the stabiliser 7V2. Condenser 7C1 charges to its normal potential of 70V and in so doing operates 7RL1. Contacts 7RL1/1 operate to the other side and in this position are in series with the clutch line and contacts 7RL3/1. Meanwhile 7RS1 is rotating and stops when an earth is found to operate 7RL4 as described in Section 2.4. Contacts 7RL4/2 operate, disconnecting the earth line from the grid of 7V1 and connecting it to contacts 7RL3/1. This completes the earth line to the magnetic clutch coil and the transmitter/receiver commences to tune as in Section 3.4.

Operation of valves 4V5 and 7V1 during auto-tune cycle (Fig.10)

The potential in the grid circuit of valve 4V5 and at the grid and anode of 7V1 during any period of the tuning cycle may be seen by reference to Fig.10. Illustrated at (A) is the grid circuit potential of 4V5 whilst (B) and (C) shows the grid and anode potentials of 7V1.

As the transmitter approaches tune the voltage in the grid circuit rises. This voltage is differentiated and applied to the grid of 7V1 which has a short grid base and cuts off at about 2.5 volts. When 7V1 cuts off its anode potential rises from a normal 50 volts to 150 volts, charging 7C1 (Fig.1) through 7MR2 and the high resistance winding of 7RL1. Meanwhile the rate of increase with time of valve 4V5 grid voltage slows down. As this takes place the differentiated voltage at 7V1 grid becomes less negative. At the peak grid voltage of 4V5 the rate of increase is zero, therefore 7V1 grid voltage is zero and 7V1 conducts. The anode potential falls from 150V to normal (50V) allowing 7C1 to discharge through the high resistance winding of 7RL1 and 7MR1.

APPENDIX 1

SPARES LIST

TUNING UNIT (ELECTRONIC) 2-LRU.63A (Circuit Diagram Fig.2)

Capacitors

Component No.	Capacity	% Tol (±)	Working Voltage	S.T.C. Stock Number
7C1	2 mfd	-20 +50	150	474463
7C2	.04 mfd	25	150	473811
7C3	.3 mfd	-20 +50	150	479854
7C4	1000 pF	20	500	476043
7C5	1000 pF	20	500	476043
7C7	1000 pF	20	500	476043
7C8	1000 pF	20	500	476043
7C9	1000 pF	20	500	476043
7C6	100 pF	10	500	413332
7C10	1000 pF	20	500	476043
7C11	4700 pF	-20 +80	500	481347

Choke

Component No.	Type	S.T.C. Stock Number
7CH1		LP.133293

Microswitch

Component No.		S.T.C. Stock Number
7SW2		RL.7001-34A 396673

Plugs and Sockets

Component No.	Type	S.T.C. Stock Number
7PL1	25-way	365028
7SK1	2-way	LP.183252 complete with lead

Rectifiers

Component No.	Type	S.T.C. Stock Number
7MR1	Silicon Diode	422708
7MR2	Silicon Diode	422708
7MR3	Selenium	464604
7MR4	Selenium	464604
7MR5		422708
7MR6	CV.448	422581

Relays

Component No.	Type	S.T.C. Stock Number
7RL1	51A2/66	466206
7RL2	4189GC	462346
7RL3	4189GD	462347
7RL4	4189GD	462347
7RL5	4189GD	462347
7RL6	4189GD	462347
7RL7	4189GD	462347

Resistors

Component No.	Resistance Value (Ohms)	% Tol (±)	Rating Watts	S.T.C. Stock Number
7R1	6.8K	5	3	464800
7R2	220K	10	.25	458141
7R3	18K	10	.5	464955
7R4	100K	10	.5	464414
7R5	1M	10	.25	458167
7R6	1M	10	.25	458167
7R7	12K	10	.5	465035
7R8	10K	10	.5	464409
7R9	100	10	.5	464385
7R10	21	5	3	460655
7R11	470K	10	.25	458456
7R12	220	5	6	459985
7R13	100K	10	.25	458152
7R14	470	10	.25	460640
7R15	5.6K	10	.25	460645

Rotary Solenoids

Component No.	Type	S.T.C. Stock Number
RS1	RL.7101-34A	

Switches

Component No.	S.T.C. Type
7SW1A	LP.773755
7SW1B	LP.773754
7SW1C	LP.773754
7SW1D	LP.773751
7SW1E	LP.773751
7SW1F	LP.773753
7SW1G	LP.773753
7SW1H	LP.773752
7SW1J	LP.773752

Valves and Valve Holders

Valves				Valveholders
Component No.	Type Civil	Type Service	S.T.C. Stock Number	Type
7V1	6064	CV.4014	422369	B7G RL.7043-36
7V3	6064	CV.4014	422369	B7G RL.7043-36
7V2	-	CV.287	422128	B7G RL.7043-36
7TH1	S103/1K	-	422427	B7G RL.7043-36

TUNING UNIT (MECHANICAL) 2-LRU.62 (Circuit Diagram Fig.3)

Plugs and Sockets

Component No.	Type	S.T.C. Stock Number
8SK1	25-way	396350
8PL1	12-way	364156

Springs

Component No.	Type	S.T.C. Stock Number
	Part of Slide Assembly Slide Return Spring 1 Off	Det.14
	Part of Slide Assembly Receiver Lever Spring 1 Off	Det.28
	Part of Slide Assembly Transmitter Lever Spring 1 Off	Det.50

Switches

Component No.	Type	S.T.C. Stock Number
8SW1	Microswitch	395939

REMOTE CONTROL UNIT 1-LRU.240 (Circuit Diagram Fig.1)

Knobs

Component No.	Type	S.T.C. Stock Number
	Number Selection Lamp Dimmer	LP.775526 LP.719909

Lamps and Sockets

Component No.	Type	S.T.C. Stock Number
9LP1	Lamp 2.5V .5W	322377 (Socket LP.183328)

Plugs and Sockets

Component No.	Type	S.T.C. Stock Number
9PL1	12-way	364156

Resistors

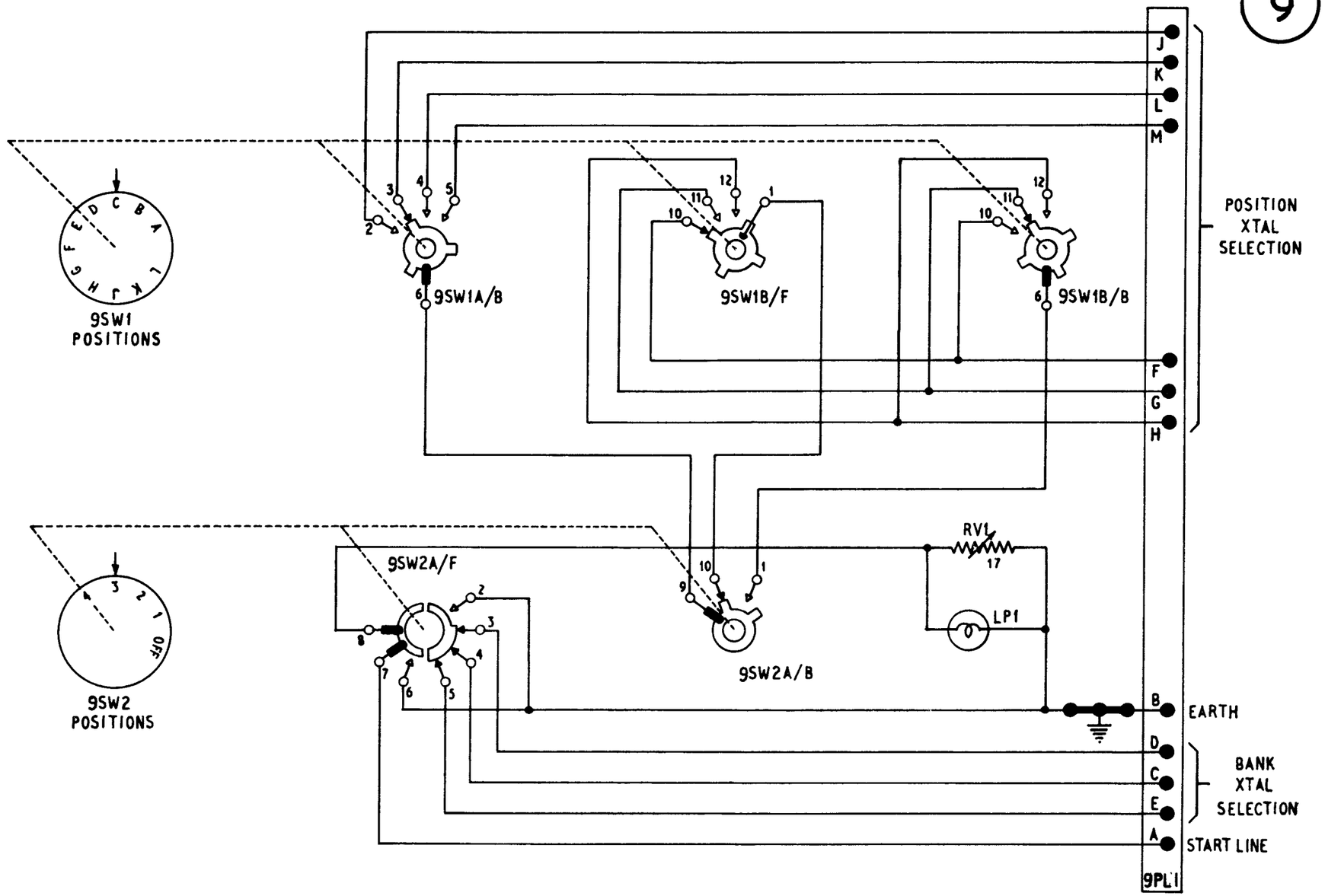
Component No.	Value Ohms	S.T.C. Stock Number
9RV1	17	364157

Springs

Component No.	Type	S.T.C. Stock Number
	Number Selection Letter Selection	LP.775525 LP.775524

Switches

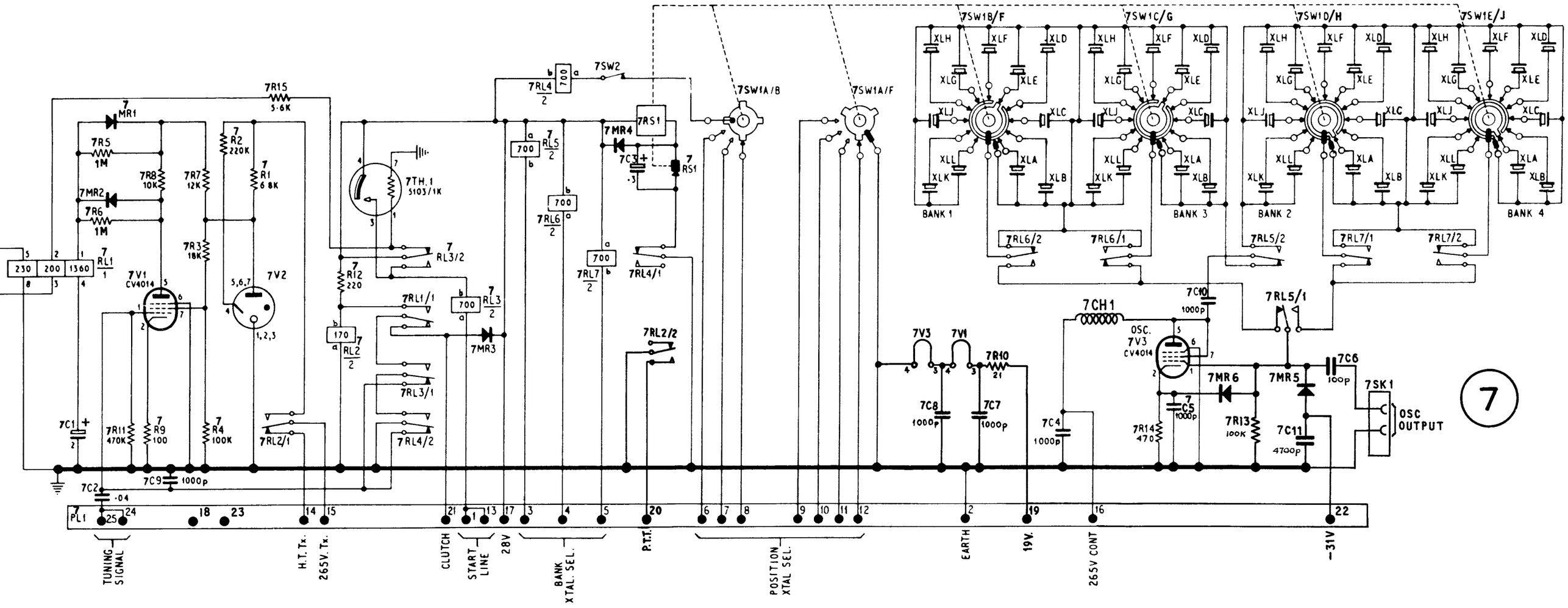
Component No.	S.T.C. Type
9SW1A 9SW1B 9SW2	LP.775535 LP.775536 LP.775537



CONTROL UNIT

1-LRU.240A

FIG. 1

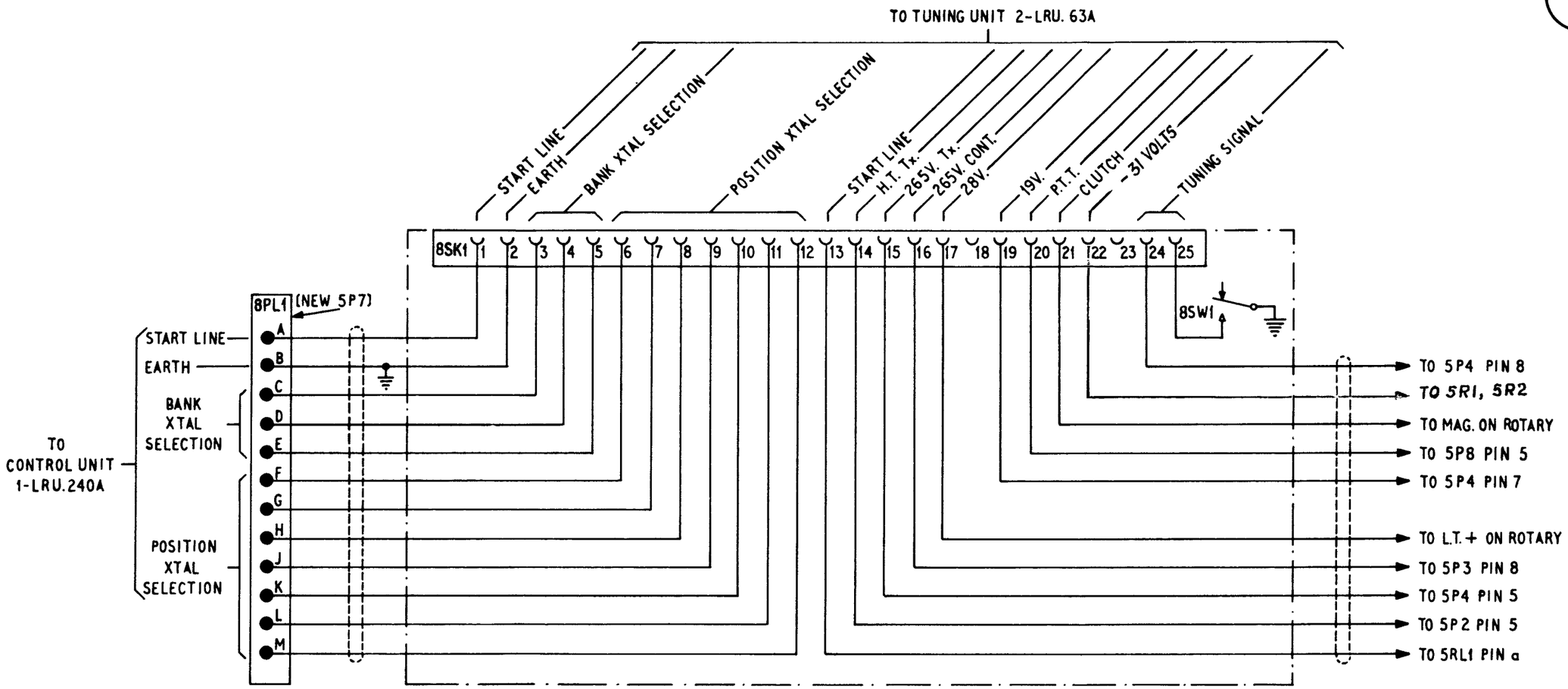


7

TUNING UNIT

2-LRU. 63A.

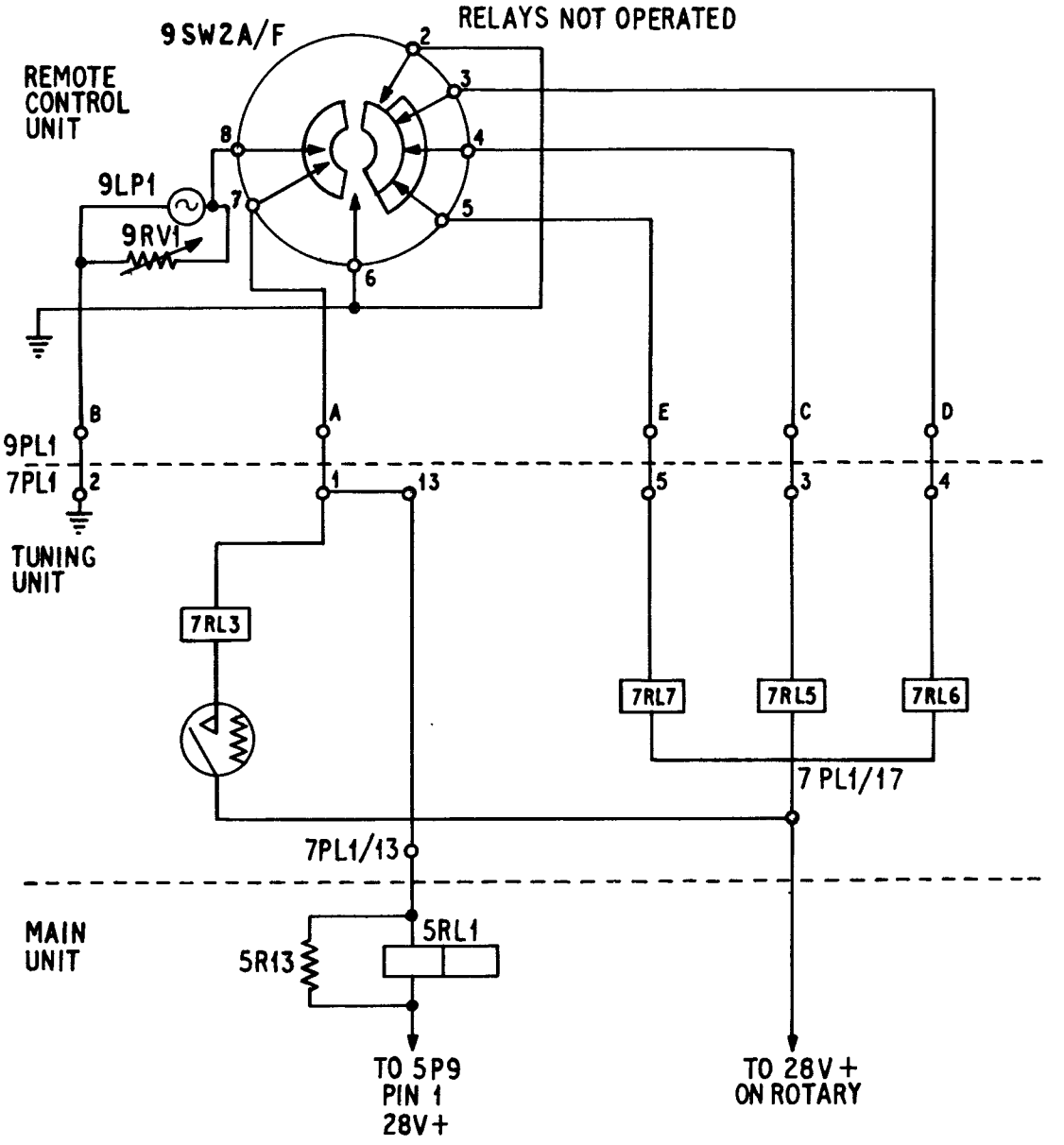
FIG. 2.



TUNING UNIT.
2-LRU.62A

FIG. 3

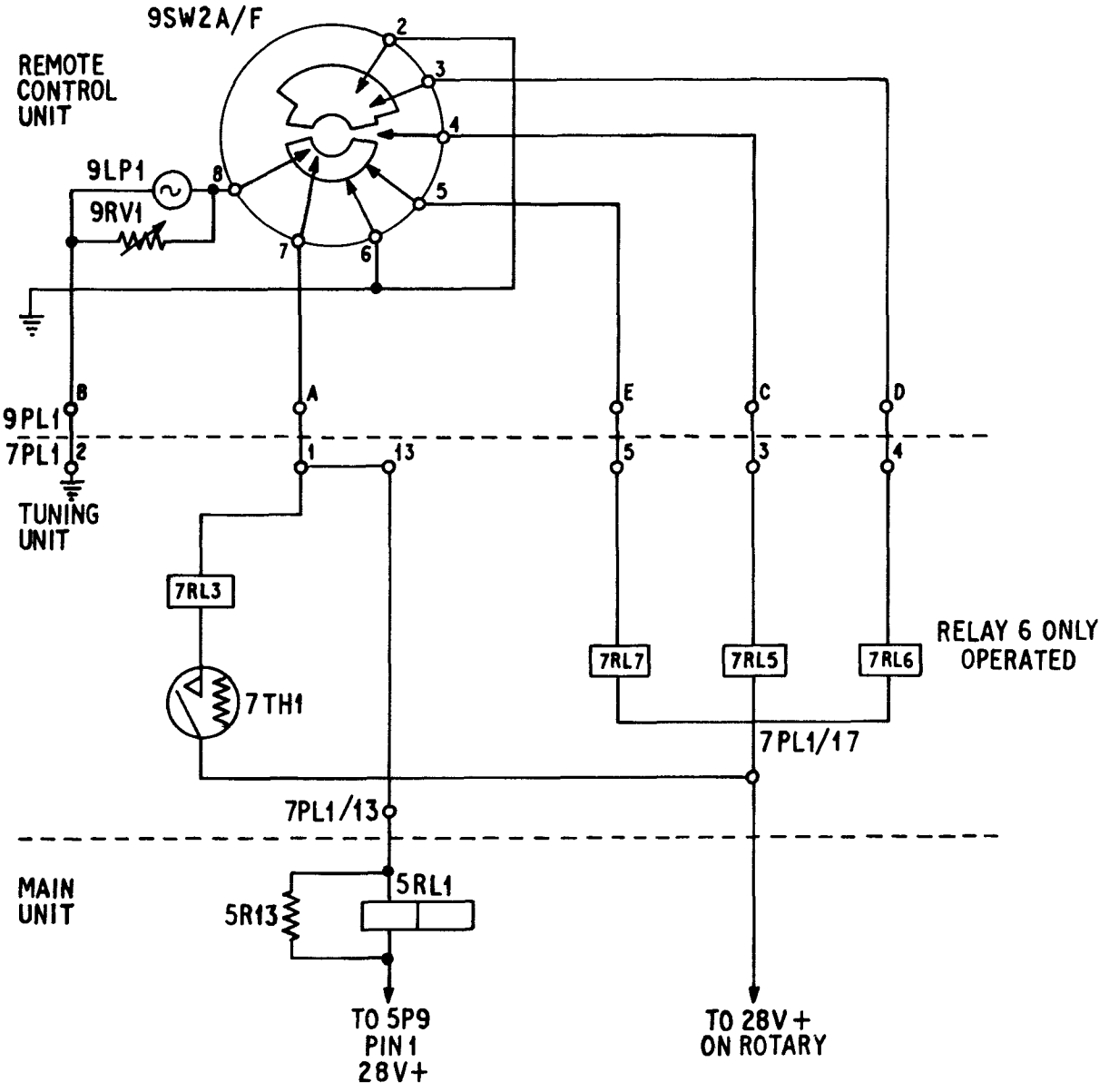
NUMBER RELAY OPERATION



BANK 3 SELECTED

FIG. 4

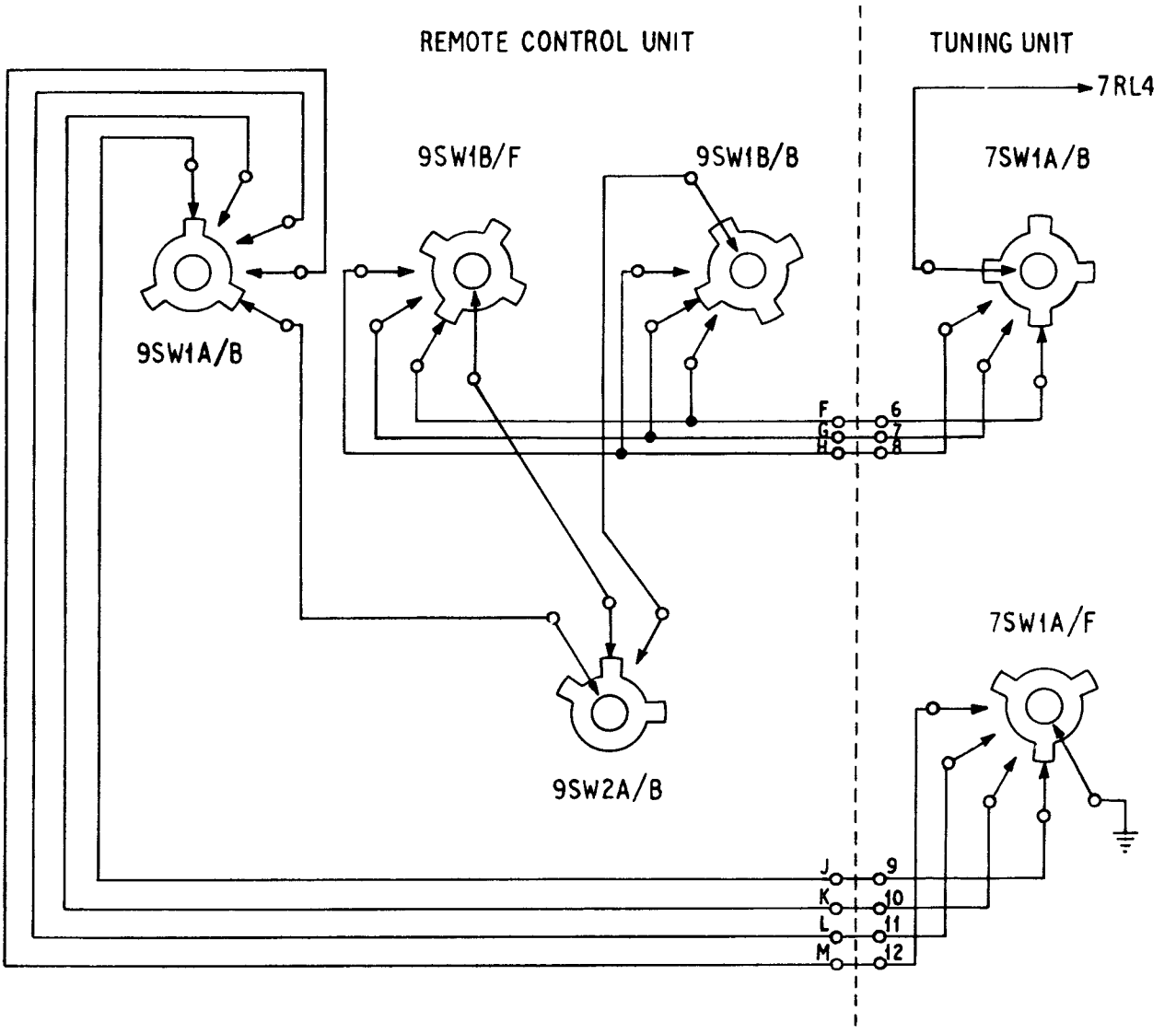
NUMBER RELAY OPERATION



BANK 1 SELECTED

FIG. 5

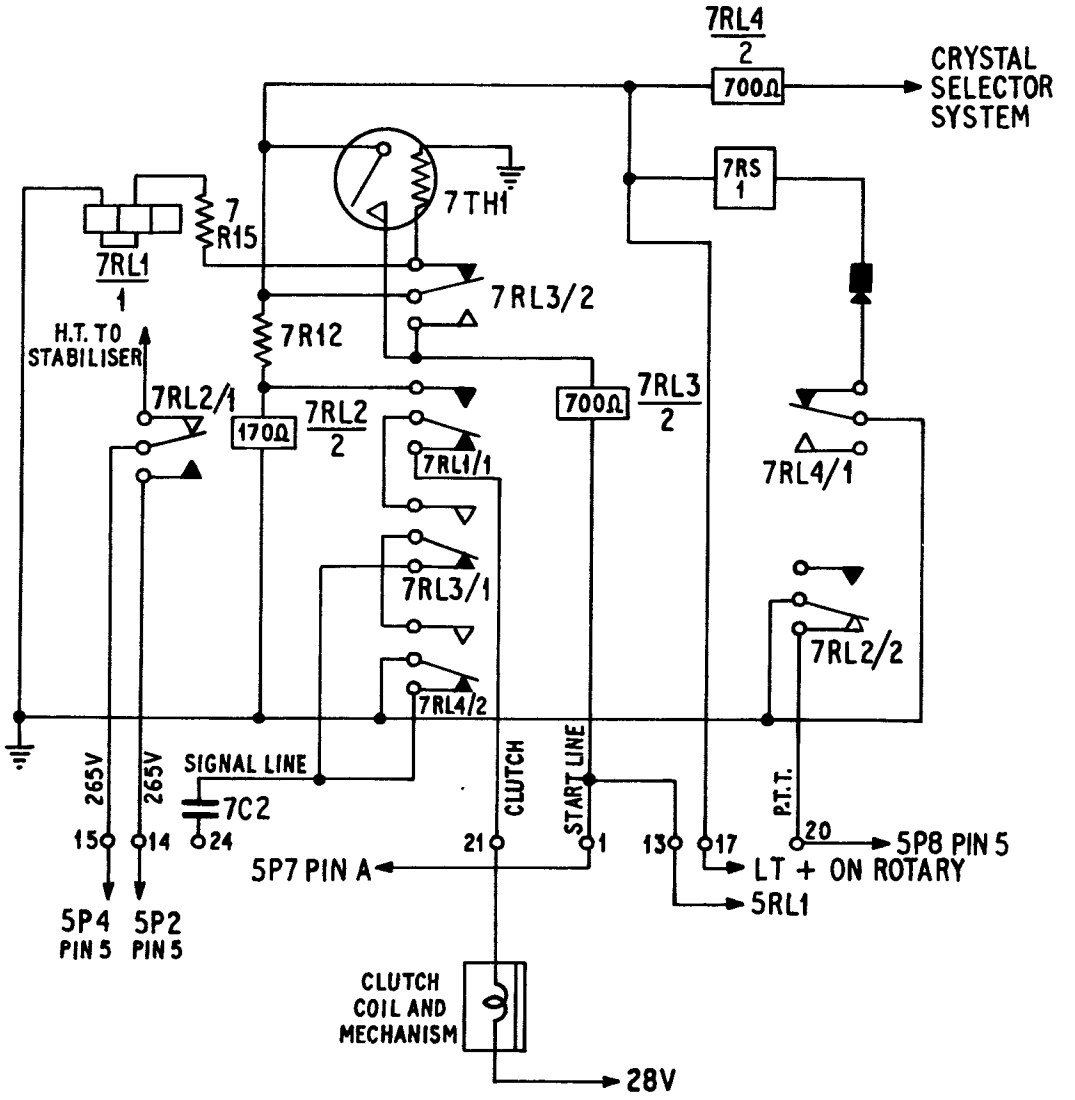
CRYSTAL SWITCHING



'F' SELECTED

FIG. 6

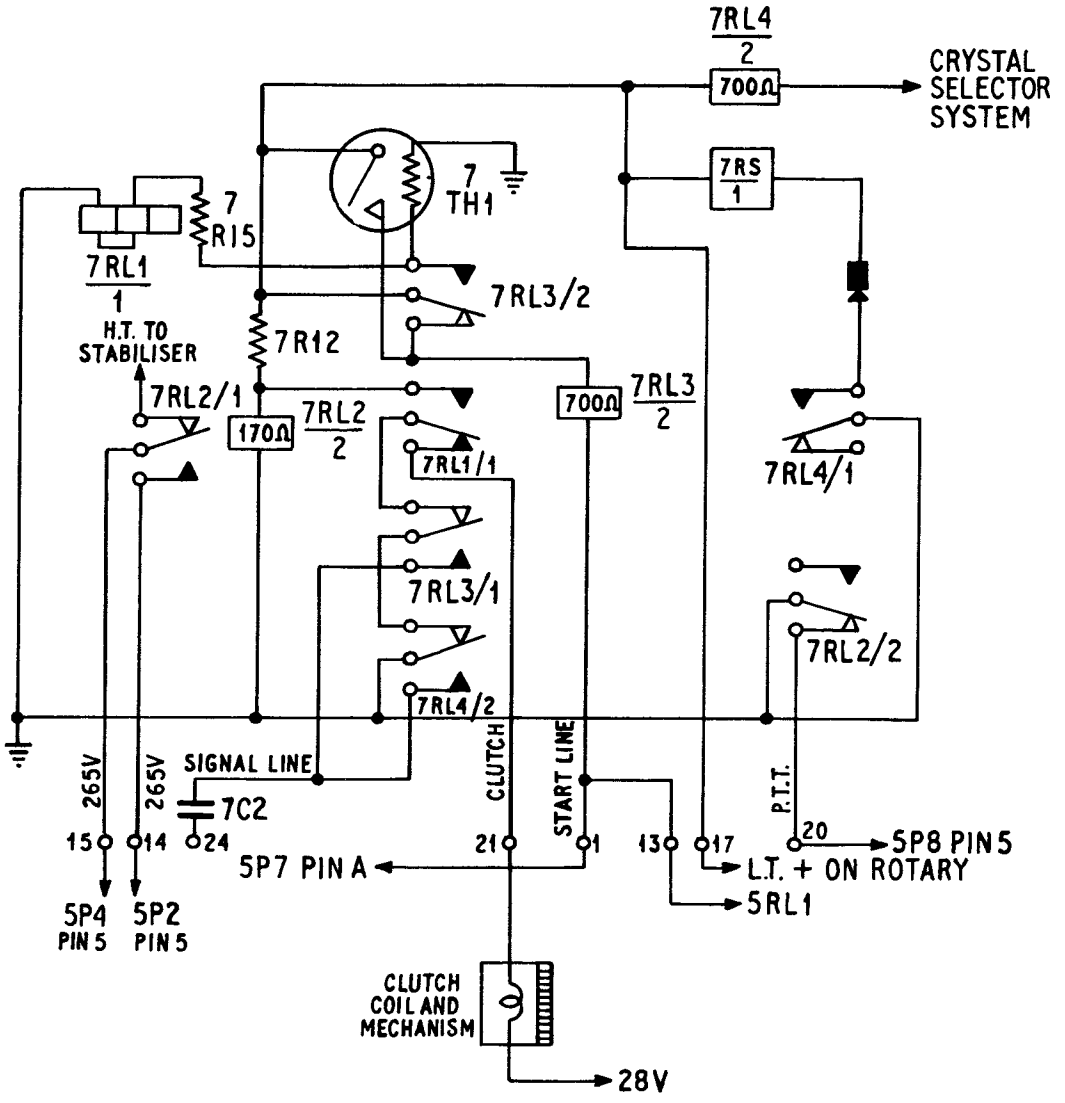
AUTO-TUNE RELAY OPERATION



EQUIPMENT 'ON' TH.1 NOT OPERATED

FIG.

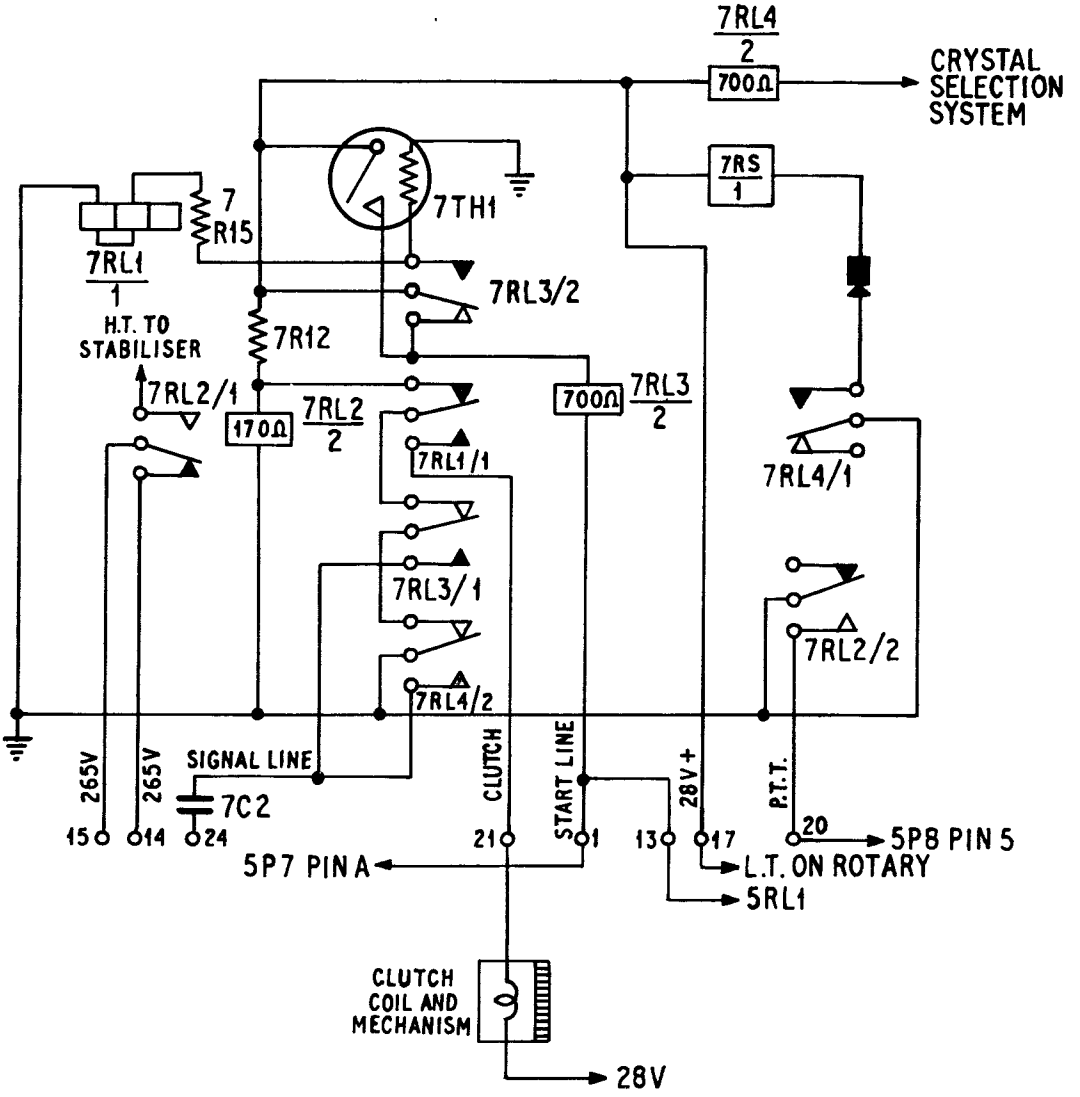
AUTO-TUNE RELAY OPERATION



EQUIPMENT 'ON' AND AUTO-TUNING

FIG. 8

AUTO-TUNE RELAY OPERATION



EQUIPMENT 'ON', AUTO TUNE CYCLE COMPLETED

FIG. 9

WAVEFORMS DURING AUTO-TUNE CYCLE

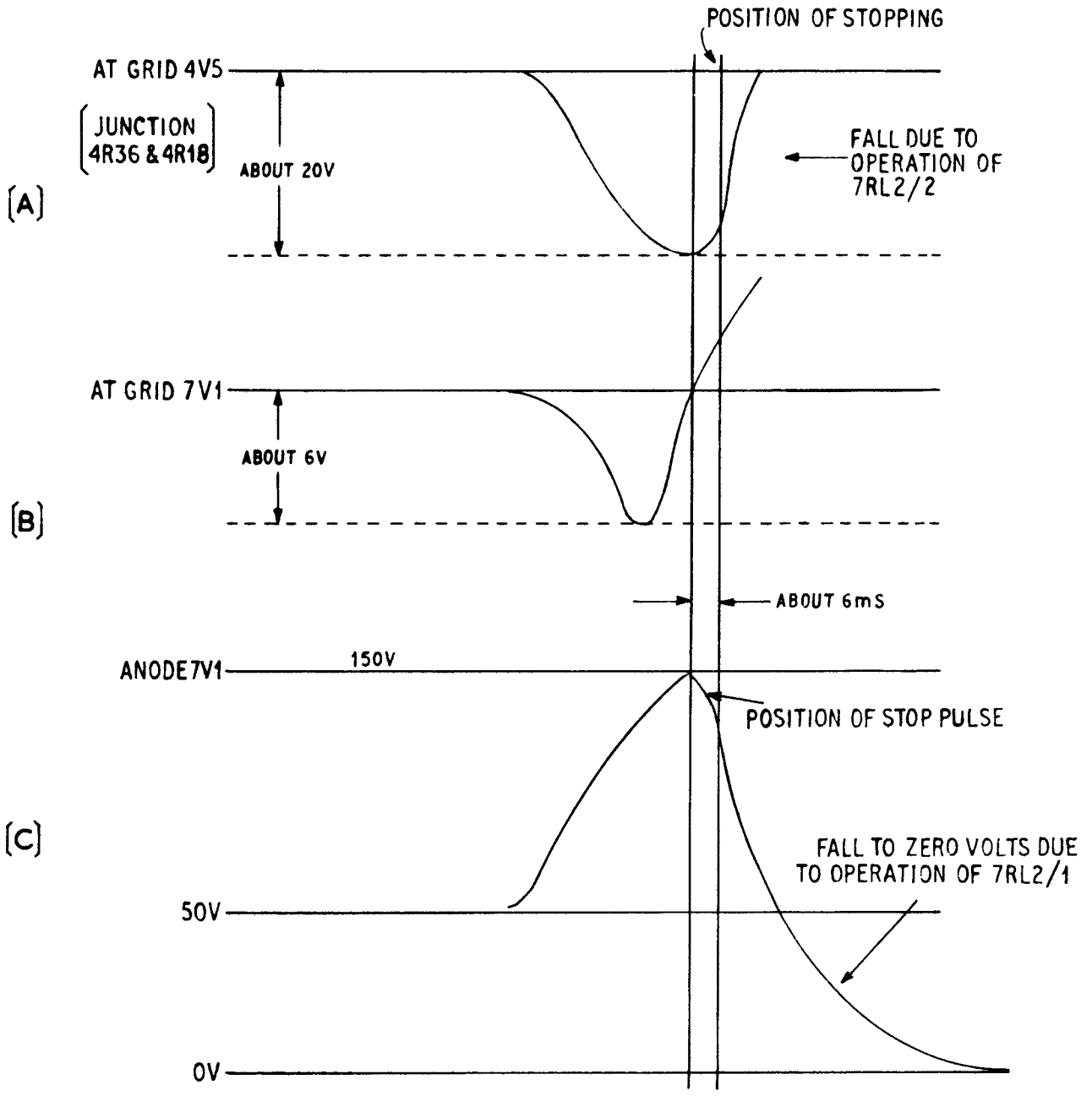
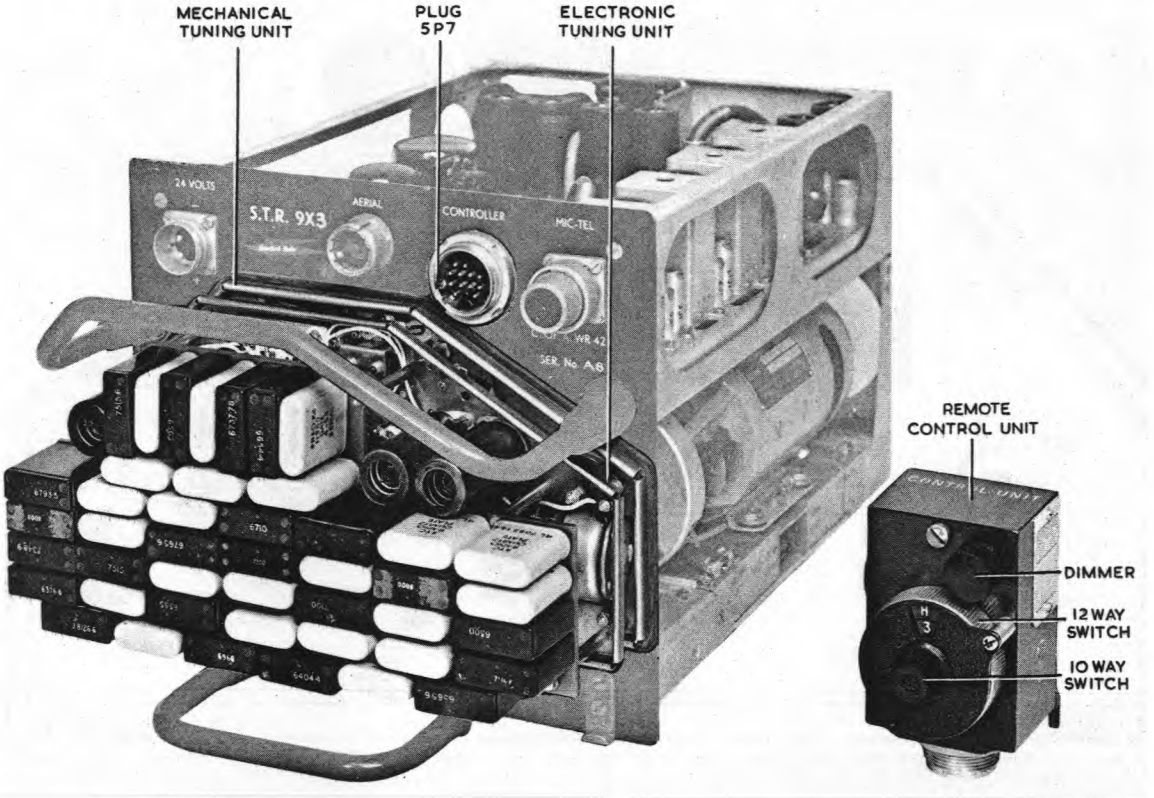
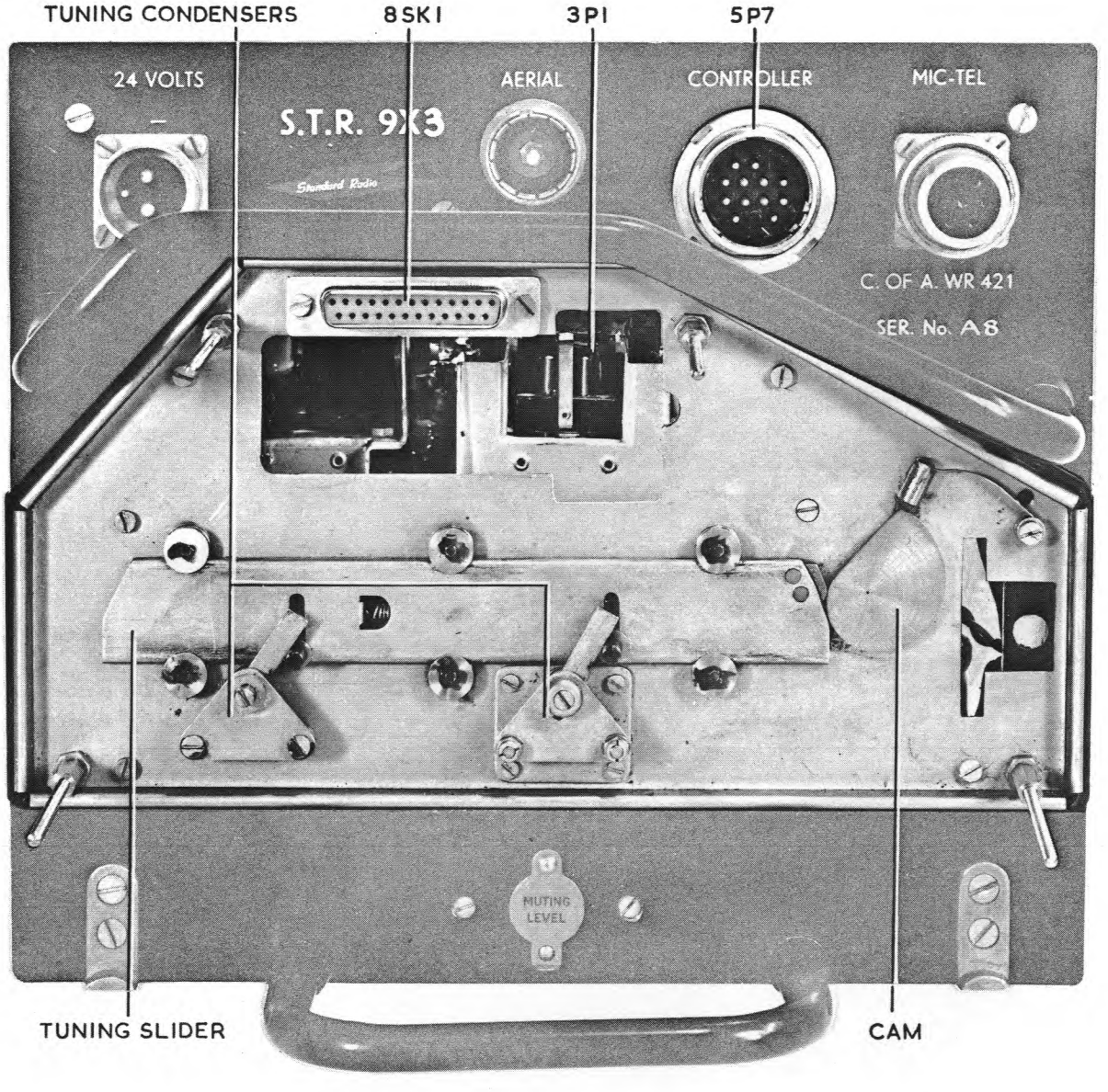


FIG. 10



CONVERSION KIT ASSEMBLED

PLATE 1



SLIDER AND CAM ASSEMBLY

PLATE 2

PART 2

A.1206 44-CHANNEL CONVERSION KIT

FITTING AND ALIGNMENT INSTRUCTIONS

C O N T E N T S

I L L U S T R A T I O N S

PART 2

44-CHANNEL CONVERSION

1.0 GENERAL

The equipment for conversion should be checked to confirm that it is serviceable and its performance is within the specification. It is not necessary to realign the transmitter output and penultimate stages, but the remainder of the transmitter unit and the receiver and I.F. unit should be realigned if out of specification.

To complete the conversion, proceed as follows:-

1.1 Main Unit

With the dust covers removed release the couplings and screws holding the transmitter, receiver, modulator, I.F. and rotary transformer units in the framework. Unplug the coaxial leads and remove the units from the framework.

Separate the transmitter and receiver units by releasing the spacers.

1.2 Transmitter Unit (See Fig. 2/1)

(a) Remove the existing resistor 4R18 (47K) and its continuation wire to the Junction with 4R17 on tag strip U9. The temporary removal of condenser 4C11 (300 pF) will allow access for this operation.

(b) Replace 4R18 with its counterpart (10K) and add resistor 4R36 (39K) and condenser 4C49 (1000 pF) soldering them to the insulator in positions shown in Fig. 2/1. The other end of condenser 4C49 should be soldered to the nearest earth point.

(c) Wire the junction of 4R18, 4R36 and 4C49 to socket 4J1 pin 8, tying the wire into the existing cable form.

(d) Remove the existing wire between 4V4 pin 1 and coil 4L3 and replace it with the Ferrite Bead Assembly. (This change does not apply to the STR.9X3, TR.1935 or TR.1986.)

(e) Mark the gang condenser quadrant in use by means of a scribe or paint mark on the tip of the slotted nut at the end of the condenser rotor shaft where it protrudes through the ball-race at the front end of the unit.

(f) Remove the gang condenser stop screw located at the bottom of the front bearing and fit the 8BA $\frac{1}{8}$" (3.175 mm) long screw supplied. Recode condenser assembly 41-LRU.24R.

(g) Delete the suffix letter of the unit code and substitute the appropriate new letter as follows:-

STR.9X	new	suffix	letter	"F"
9X1	"	"	"	"F"
9X2	"	"	"	"G"
9X3	"	"	"	"H"

1.3 Receiver Unit - See Figs.2/2 and 2/3

(a) Remove choke 3HFC1 and replace with a wire lead, remove condensers 3C5 (12 pF) and 3C6 (47 pF), replace 3C6 with the new condenser (1500 pF).

(b) Trace the lead from resistor 3R21 (Tag B/12) to socket 3J1 pin 8, remove from pin 8 and resolder to pin 7. In cases where the receiver has tags B/12, B/14 and B/17 commoned by one H.T. rail emanating from socket 3J1 pin 8, tag B/12 (feeding 3R21 and 3R7) should be disconnected from this H.T. line and re-connected to the H.T. line from 3J1 pin 7 by means of a short connection to tag B/6 (junction of 3C39 and 3R11).

(c) Mark the gang condenser in a similar manner to the transmitter unit and replace the existing stop screw with a $\frac{1}{8}$" (3.175 mm) long 8 BA screw provided. Recode condenser assembly 41-LRU.24M.

(d) Couple the transmitter and receiver units together and apply bakelite varnish to all fixing and stop screws.

(e) Delete the suffix letter of the unit code and substitute the new letter as follows:-

STR.9X	new	suffix	letter	"D"
9X1	"	"	"	"D"
9X2	"	"	"	"E"
9X3	"	"	"	"F"

1.4 Framework

(a) Cut off and mark the blue lead on plug 5P7 pin A. Cut off the other leads on this plug and remove the plug.

(b) Unsolder and remove the earth lead (slate) from plug 5P10 to the paxolin tag strip mounted on the back of the tuning unit. Unsolder and mark the yellow lead from the other tag.

(c) Undo the 4 BA nut fixing the twin feeder to the front panel (the twin feeder terminates on plug 3P2).

(d) Unsolder the blue and yellow leads from the tuning unit to the two tags mounted above choke 5CH5.

(e) Remove the six fixing screws and two nuts, and the power unit coupling and remove the mechanical tuning unit together with the couplings, switch 5S3 and leads. Remove the earth lead which went to plug 5P7 pin B.

(f) Unsolder the blue lead from resistor 5R12 (at the opposite end of 5R12's junction with 5C8 (0.5 uF) and from the tag strip mounted above 5CH5, remove the lead from the cable form. Remove 5R12.

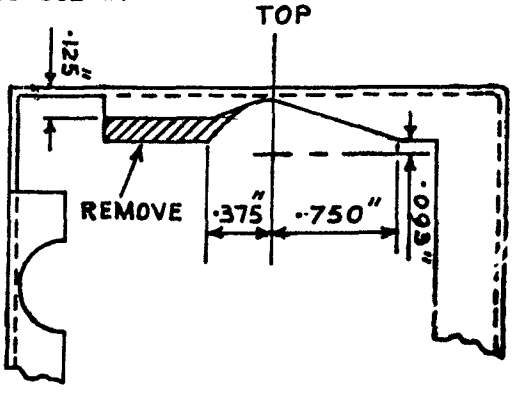
(g) Cut back the marked blue lead from 5P7 pin A (1.4(a)) and solder it to the vacant tag mounted above 5CH5.

(h) Remove the red/blue lead joining 5P2 pin 5 to 5P4 pin 5.

(i) Remove condensers 5C20A and 5C20B, each 1500 pF.

(j) Wire in the new condenser 1000 pF (CMF1) between 5P2 pin 3 and the nearest earth tag.

(k) It is necessary, for the correct seating of the mechanical tuning unit, to cut away .125" of the cross member flange behind the front panel (top left hand corner of the rotary transformer compartment) see below.



(l) Remove carrying handles and fit extension details and refit.

(m) Delete the suffix letter of the framework code and substitute the appropriate new letter as follows:-

STR.9X	new	suffix	letter	J
9X1	"	"	"	K
9X2	"	"	"	L
9X3	"	"	"	M
9X1(Engraved in English)				N

(n) Change the overall code to the new type as follows:-
(Front Panel)

STR.9X	new	type	number	STR.9Z
9X1	"	"	"	STR.9Z1
9X2	"	"	"	STR.9Z2
9X3	"	"	"	STR.9Z3

1.5 Assembly

(a) Replace the transmitter, receiver, modulator and I.F. units only, into the framework, screw up the fixings and couple up the coaxial leads.

(b) Set the gang condensers at minimum capacity on the marked quadrant (the direction of motion is anti-clockwise viewed from the front).

(c) The rubber gasket attached to the original tuning mechanism should now be transferred to the new unit and pressed well down into place.

(d) Feed the cableform from the 25 way socket on the mechanical tuning unit through the front panel cut-out.

(e) The tuning unit complete with the new condenser couplings should now be offered up to the front panel of the set taking care to ensure that each coupling engages with its corresponding shaft. The set screws in the couplings should be positioned so that they are available for screwdriver action from the top of the equipment when the unit is in position.

(f) Check that the gang condensers are still at minimum then tighten the fixings on the couplings.

(g) Screw up the six screws holding the unit to the front panel. Leaving the cam at its lowest lift position, check the slide for

freedom of movement. The movement must be free over the range of the cam - if it is not so, adjust by loosening and retightening the six fixing screws until it is free. Slowly rotate the cam in a clockwise direction. Observe any tendency for the gang condenser actuating arms to bind or retract. If either arm fails to retract, loosen the fixing screws in the bases of the transmitter and receiver unit and re-position them slightly in the fixing holes. Tighten up after the arms are seen to be free.

(h) Fix on and tighten the new plug 5P7. Fit the earth tag on to the 4 BA bolt located below plug 5P10. Solder the marked yellow lead (1.4(b)) on to the ceramic stand-off mounted on the 25-way socket fixing.

(i) Thread three flying leads No.13, 21 and 22 along the cableform towards plug 5P8 as shown in Plate 2/1 for leads 13 and 21, through the hole in the deck of the chassis feed leads 13 and 21 into the rotary transformer compartment and terminate on two insulated tags mounted above choke 5CH5, No.13 to the blue wire and No.21 to the yellow wire. Feed lead No.22 through the lower deck and terminate at the junction of 5R1 (390 ohms) and 5R2 (360 ohms). Tag strip Y terminal 6 and 7.

(j) Thread the remaining six leads along the cable form towards plug 5P9. Take these leads along the main cable form to the underside of the chassis and tie in.

Connect wire No.14 to pin 5 of 5P2 see Plate 2/2

Connect wire No.15 to pin 5 of 5P4

Connect wire No.19 to pin 7 of 5P4

Connect wire No.24 to pin 8 of 5P4

Connect wire No.16 to pin 8 of 5P3

Connect wire No.17 to LT+ connection to the Rotary Transformer.

(k) Remove the cover from the Reduction Gear Mechanism mounted on the

Rotary Transformer, unscrew and remove the Release L rer (see Fig.17 Handbook No.1048) and replace cover.

Fit the new rotary transformer coupling to the end of the cam operating shaft which should be positioned so that the cam follower is at its lowest point relevant to the cam. Re-fit the rotary transformer itself and align the flat on the drive mechanism shaft to engage the coupling. Tighten coupling screws and rock slightly to ensure that screws are right home.

Delete the unit code suffix letter and substitute the new letter - B, for all types.

(l) This completes the fitting of the mechanical tuning unit 2-LRU.62. All leads should be tied to the cableforms.

2.0 ELECTRONIC TUNING UNIT AND ALIGNMENT

2.1 At this stage the main equipment has been fitted with the mechanical Tuning Unit only. As it is necessary for alignment purposes to use both of the tuning units, jumper leads will be required, as quoted below.

2.2 Test Equipment Required

2.2.1 Kit Accessories

(a) Jumper Lead - 33-4770A.

(b) Jumper Lead - 33-4771A.

(c) B7G based Switch - 112-LRA.16A.

(d) Allen key LP.736787.

2.2.2 Normal Alignment Requirements

(a) Power Output Meter (R.F.) Termaline or equivalent.

(b) Power Output Meter (A.F.) Marconi TF.340 or equivalent.

(c) 0-1 mA Meter 75 ohm resistance (with lead and socket).

(d) Signal Generator Marconi TF.801 or equivalent.

(e) 5 Crystals:
1 - L.F. end of band
2 - L.F. end of band + 150 kc/s
3 - Mid Band Crystal
4 - H.F. end of band - 150 kc/s
5 - H.F. end of band

(f) Jumper leads for controller, power supplies and mic/tel

(g) Battery supplies: 28 volts at 10 amps.

2.3 Procedure

Connect up the set to the power supplies.

Connect the Mic/Tel socket to a press-to-talk switch (between pins 3 and 5). Connedt the audio power meter between pins 1 and 4. (1 is earth). Connect the electronic tuning unit 2-LRU.63A to the main equipment using the two jumper leads.

Remove TH1 from the electronic tuning unit and replace it with the B7G based switch. Plug in the crystals as follows:-

A1. L.F. end band crystal
B1. L.F. end band crystal plus 150 kc/s approx.
C1. Mid band crystal
D1. H.F. end band crystal - 150 kc/s approx.
E1. H.F. end band crystal

Connect the control unit 1-LRU.240A to the main equipment.

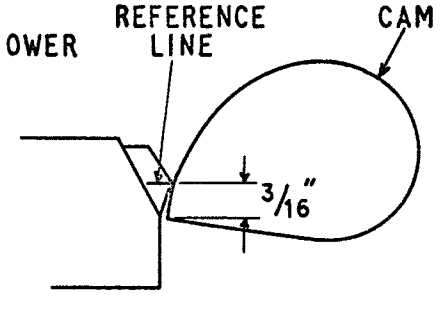
3.0 ALIGNMENT

3.1 Select A1 on the controller and allow the set to warm up for about 30 seconds. Move the cam in a clockwise direction until it is seen that the scribe mark on the cam follower is within 3/16ths of the highest lift point of the cam. (See Sketch A).

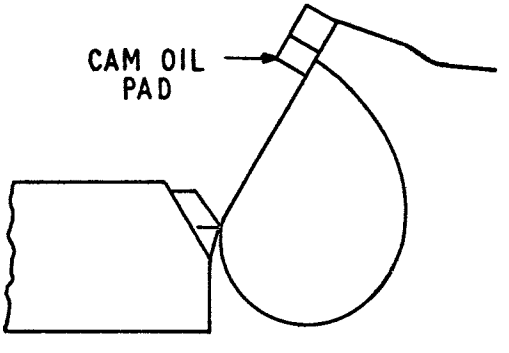
Plug the 0-1 mA meter into 3P1/2. Loosen the fixing screws on the tuning unit side of the receiver couplings. Tune the receiver in

a clockwise direction for a maximum meter reading at 3P1/2 by moving the coupling. If the receiver has been aligned correctly, maximum output at 3P1/2 will coincide with the gang condenser being exactly at maximum capacity (condenser vanes completely in mesh). If this condition is not obtained a check should be made to ascertain that the original quadrant is being used. (See Handbook Part 2 Paragraph 1-2e and 1.3c). Up to 1/32nd out of mesh can be tolerated but if it exceeds this amount the receiver should be re-aligned with the condenser set at maximum capacity. If two peaks of output at 3P1/2 are observed the setting should be confined to the first peak (moving anti-clockwise), but two peaks indicate that the receiver has not been correctly aligned and efforts to clear it by re-alignment operation will necessitate the removal of the Power Unit which must then be brought into circuit by means of jumper leads. In the interests of auto-tuning the drive from both the receiver and the transmitter must be "in step" throughout the band. It is imperative therefore that the foregoing instructions with those to follow are strictly adhered to.

Tighten the couplings. Select E1. Rotate the cam by hand in a clockwise direction until maximum output is obtained at 3P1/2. The tuning band is wide at this point and maximum drive should still be maintained when the highest lift point of the cam has taken up a position just clear of the oiling pad. (See Sketch B). This represents the correct stopping position for minimum gang capacity (top band frequency) and the cam should be set to this point if re-alignment is necessary. Select A1.



Sketch A



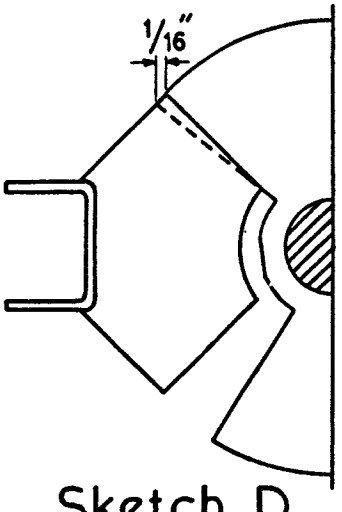
Sketch B

3.2 Rotate the cam in a clockwise direction until the drive at 3P1/2 has reached approximately .05 mA. Operate the arm attached to the gang spindle in a clockwise direction until maximum output at 3P1/2 is indicated. Note this maximum and continue rotating the cam until maximum drive previously noted is obtained. This procedure is to ensure that the cam is rotated to the correct tuning position.

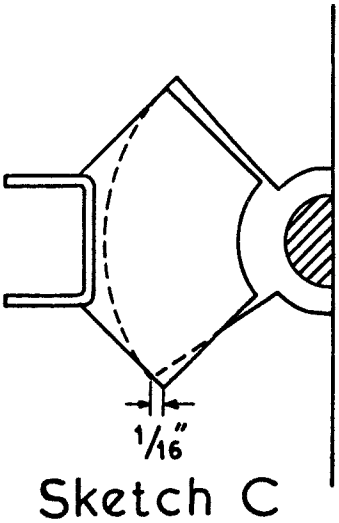
3.3 Transfer the 0.1 mA meter to 4P1/1, 4P1/2 and 4P1/3 on the transmitter and observe that drive current is present. Leave the meter connected across 4P1/4. Loosen the screws in the tuning unit side of the transmitter coupling and rotate the gang for maximum output at 4P1/4. This must coincide with the gang condenser taking up a position 1/16 inch from maximum capacity (see Sketch C). Tighten the coupling screws. If maximum output is not obtained with the condenser in this position the balanced modulator stages (4L2/4L3 only) should be re-aligned (tuning slugs at low end of band) to comply with this condition.

Transfer the 0.1 mA meter to 3P1/2 on the receiver. Select E.1. Rotate the cam in a clockwise direction and find maximum output position using the method described in paragraph 3.2 which should coincide with the cam taking up a position as shown in Sketch B.

Transfer the 0-1 mA meter to 4P1/4 and check that the transmitter gang has now taken up a position 1/16 inch from minimum capacity as indicated in Sketch D. Re-align if necessary using the trimmer condensers 4C14/4C18. Transfer the 0-1 mA meter to 3P1/2 on the receiver. (NOTE: It will now have become apparent to the operator that the object is to align the transmitter at the position stated to give maximum output at both ends of the band in parallel with maximum output at 3P1/2, but constant use should be made of the "feel" method described in Para. 3.2 to ensure that the tuning point on the receiver is not passed). Select A1. Rotate cam as described in Para.3.2. Transfer meter to 4P1/4 and repeat the alignment until parity at 4P1/4 at both ends of the band is met.



Sketch D



Sketch C

3.4 The above procedure should be used in exactly the same way for the alignment of the doubler stage (drive at 4P1/5) using maximum drive at 3P1/2 as the datum (not 4P1/4). The whole operation should be carried out very carefully and no attempt at this stage should be made to obtain power output. The correct functioning of the auto-tune unit is dependent to a large extent on the shape of the wave-form presented to it by the conditions at the grid of 4V5. Stages in the transmitter which fail to tune to resonance may give trouble.

3.5 Auto Tuning

Transfer the 0-1 mA meter to 3P1/2. Select A1. Press the B7G based switch. The equipment should tune to the low end of the band and stop. Select B1, C1, D1 and E1. The equipment should stop at each of these points in turn, but due to gang tracking errors it may fail to stop at one of them. The trouble will disappear after the final setting up operation which follows in paragraph 3.6.

3.6 Select C1 (press the B7G based switch after about 30 seconds if the equipment has been switched off). The equipment will auto-tune to the mid band frequency and stop. If it is failing to stop at this point select A1 or B1. Observe the maximum drive present at 3P1/2. If this is much lower than the known maximum, adjustment must be made in conjunction with other test points in the band to improve it. The object is to obtain as much drive as possible at 3P1/2 at each test position.

For the sake of clarity of procedure we will assume therefore that the equipment has auto-tuned to position C1 and stopped and that the drive at 3P1/2 is low. Steps should be taken to correct it irrespective of whether the receiver has stopped short of maximum output or passed through it. The procedure is as follows. Release the receiver tuning arm by loosening the Allen screws and make a very slight adjustment to the receiver gang condenser to improve the drive at 3P1/2. Do not increase it by more than about .05 mA at first without checking the 3P1/2 drive condition at the other test points where conditions may have worsened as a result of the adjustment just made. Tighten up the Allen screws. If the condition has worsened at B1 and A1 slacken the pin on the slide which moves the receiver gang condenser and tune the receiver for better conditions at 3P1/2 by moving the pin up or down in its slot. Only a slight improvement should be made, however, without again checking the 3P1/2 conditions at C1, D1, E1. Generally, it will be found advantageous to confine the pin adjustments to improving the drive conditions at the low end of the band. The drive condition at top end of the band should be confined to small adjustments to the angular rotation of the gang by loosening the Allen screws as mentioned above.

By the judicious manipulation of these two means of adjustment the operator should endeavour to obtain the best compromise drive condition

at 3P1/2 throughout the band. He will undoubtedly be faced with a situation where at one test position the receiver is seen to be stopping at a point which is past the maximum drive peak at 3P1/2 whereas at some other test point it is seen to be approaching the peak. The action in these sort of conditions is to endeavour to improve the position where the peak is being approached to the detriment of the position where the peak has been passed. In other words it is better for the receiver to have already tuned through the peak when stopped by the auto-tune unit, than to be stopped on the approaches to the peak. In some cases, however, it is almost impossible to prevent stopping on the approach side. When this happens the drive at 3P1/2 should be as high up the peak as possible, consistent with a fair amount of drive - (not less than .15 mA) at the point where the peak has been passed. If, due to the above adjustments, the stopping point at A1 is seen to be less than 1/32nd from the highest lift point on the operating cam lower the pin associated with the transmitter gang a few thousandths of an inch in order to advance the stopping pulse, so that the cam stops a fraction earlier.

3.7 When auto-tuning successfully throughout the band a check should be made of the receivers sensitivity.

If it is found that this is not within specified limits at some point in the band the operator must decide depending upon the existing drive at 3P1/2 and the auto-tune conditions whether to adjust the gang by loosening the Allen screws or make slight adjustments to the trimmers associated with the R.F. end of the receiver in order to improve the sensitivity at this point.

3.8 Power Output

Remove the signal generator and replace it with the Power Output Meter. Select E1. Press the Key and adjust trimmer 4C29 and 4C38 for maximum power output. Select A1. Tune 4L5 and 4C38 for maximum power output.

Select D1 and repeat the adjustments until 4C29 and 4L5 are on tune for both D1 and B1. Check whether 4C38 requires to be increased or decreased in capacity when changing from D1 to B1. If 4C38 requires to be increased when 4L6 should be adjusted by closing the turns to increase its inductance. If 4C38 requires to be decreased then 4L6 should be adjusted by opening the turns to decrease its inductance. This operation should be performed with care since the coil supports are fragile.

When the power output is at maximum at both ends of the band select C1.

If the power output at this point is low attempt to improve the

performance by adjustment of the position of 4L7. If no improvement is seen then 4C38 and 4C39 should be readjusted to obtain the best compromise of power output throughout the band.

Finally plug in as many crystals as possible within the tuning range of the equipment and check the power output at each position.

In some instances it will be observed that the equipment appears to have two different stopping points near the top end of the band depicting about half power output on the wrong position and full output at the right position. The condition can be confirmed by gently tapping the Carpenter Relay in the auto-tune unit which (if it has stopped in the wrong position will be seen to step on to the right one. If, however, the equipment completes a full auto-tune cycle it indicates that the position was in fact the right one. The symptoms are indicative that the micro-switch 8CW1 located near the rotary transformer coupling is operating too early and adjustments should be carried out as follows:-

Switch off the equipment and remove the jumper lead from the multi-pin Cannon socket at the equipment end. Connect an ohms meter between earth and pin 25 of the Cannon socket (extreme left hand socket on the bottom row). Rotate the cam in a clockwise direction when it will be seen that he meter reads a short circuit when the arm is at its highest lift point. This short circuit will clear when the highest lift point of the cam has reached a vertical position just short of the oiling pad. Continue rotating the cam until its highest lift point is about three quarters across the oiling pad.

Loosen the Allen screws in the trailing micro-switch cam (i.e. the one nearest the rotary transformer) and rotate it in an anti-clockwise direction until a short circuit is again recorded on the ohms meter. Lock the Allen screws. Check as follows:-

Continue rotating the cam at the front until it is seen that a short-circuit now appears at the highest lift point (slide fully extended) and disappears when the highest lift point of the cam is just short of clearing the oiling pad. If the re-adjustment has been taken too far the micro-switch will not open in time for auto-tuning at the top end of the band (E1) therefore an electrical test should be made as follows.

Remove the ohms meter and replace the jumper lead. Switch on and select E1. Connec the 0.1 mA meter across 4P1/5. Rotate the cam by hand very slowly towards the top end of the band. A reading will suddenly appear at 4P1/5. This indicates the point at which the micro-switch is now opening. Mark the main cam opposite the scribe mark on the slider. Press the B7G based switch and when the equipment has auto-tuned to E1 examine the distance now existing between the scribe mark and the mark previously made on the cam. It should not be less

than 1/32nd. If it is less than this or the equipment fails to stop at E1 then the micro-switch cam has been rotated too far.

4.0 FINAL ASSEMBLY AND PERFORMANCE CHECK

When all adjustments have been completed, switch off the equipment and lock all inductance trimmers. Fit the electronic tuning unit to the mechanical tuning unit after removing the jumper leads. Fit and tighten the four fixing nuts. Plug SK1 from the electronic unit into 3P2 on the receiver. Remove the B7G based switch and replace the thermal delay valve and can. Replace the dust covers switch on the equipment and check the performance of the receiver and transmitter throughout the band.

5.0 CONVERSION KIT CONTENTS

Part No.	Description	Qty.
2-LRU.62A	Tuning Unit	1
2-LRU.63A	Tuning Unit	1
1-LRU.240A	Control Unit	1
LP.773759	Cover Assembly	1
LP.124394	Washer, 6BA	4
LP.100875	Nut, 6BA	4
LP.124070	Screw, 6BA Ch.Hd.	6
LP.124092	Screw, 8BA Ch.Hd.	2
	Capacitor 1000P 350V RCL.130-71M	1
	Capacitor 1500P 350V RCL.130-71M	1
	Capacitor 1000P 750V CMF.1-K RCL.132H2	1
	Resistor 10K RC7J RCL.112	1
	Resistor 39K RC7J RCL.112	1
LP.777634	Coupling Trans-Receiver	2
LP.773764	Coupling Rotary	1
LP.773766	Spacer	4
	Nylon Tape $\frac{1}{2}$" Wide (Black)	4 ft.
LP.775541	Ferrite Bead	1
LP.775543	Spacer	1
	1/024 P.V.C. Wire (Red)	18 in.

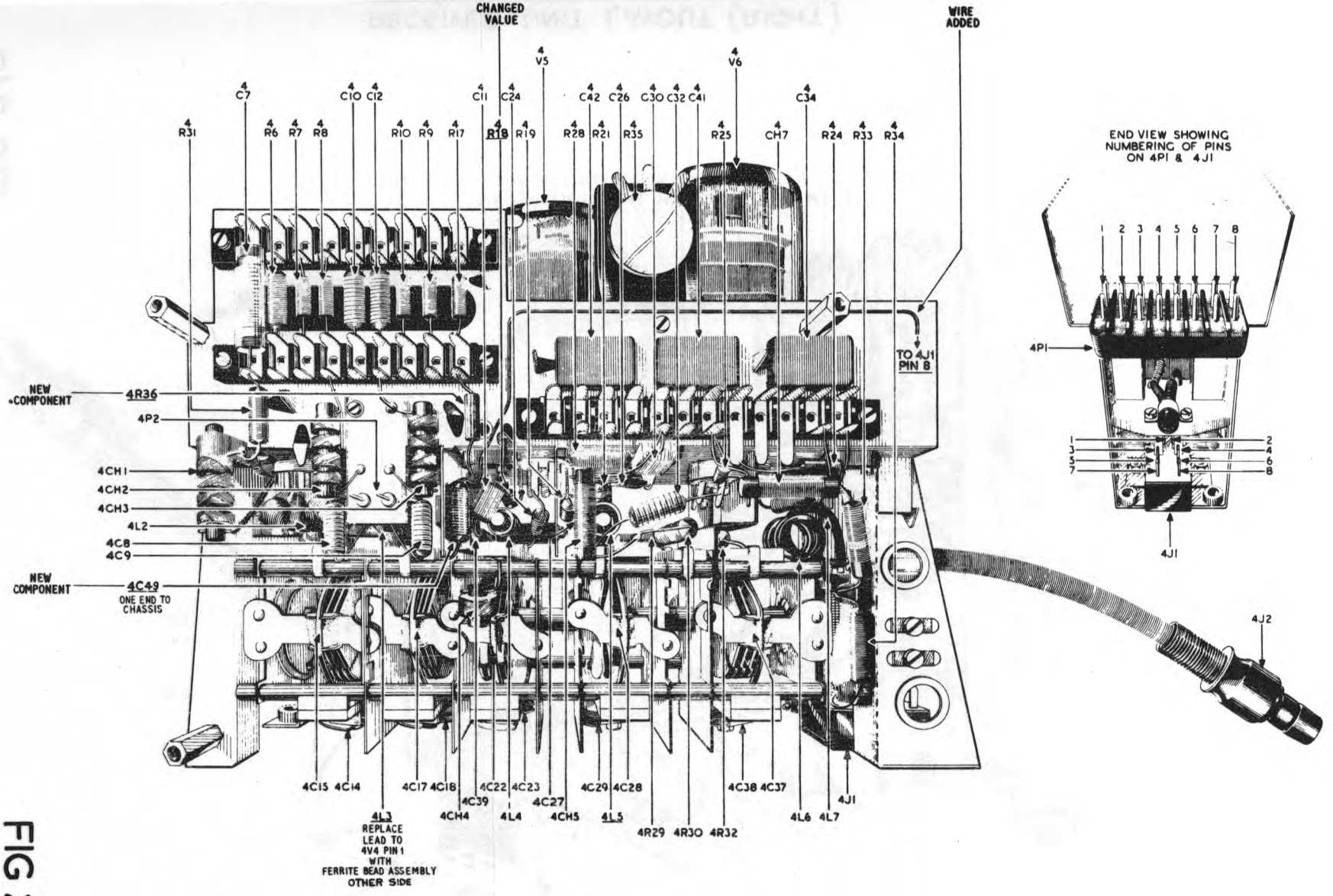
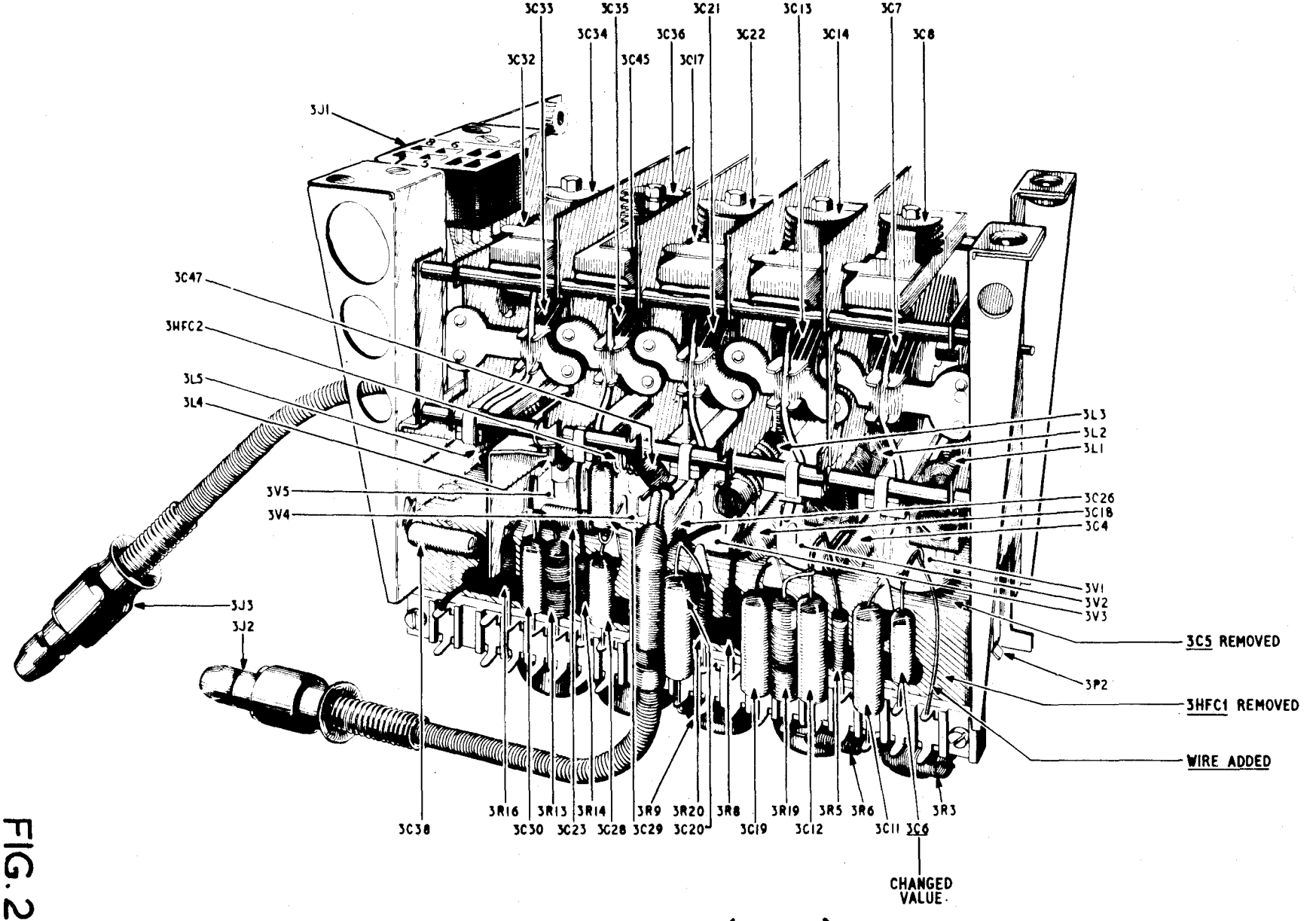
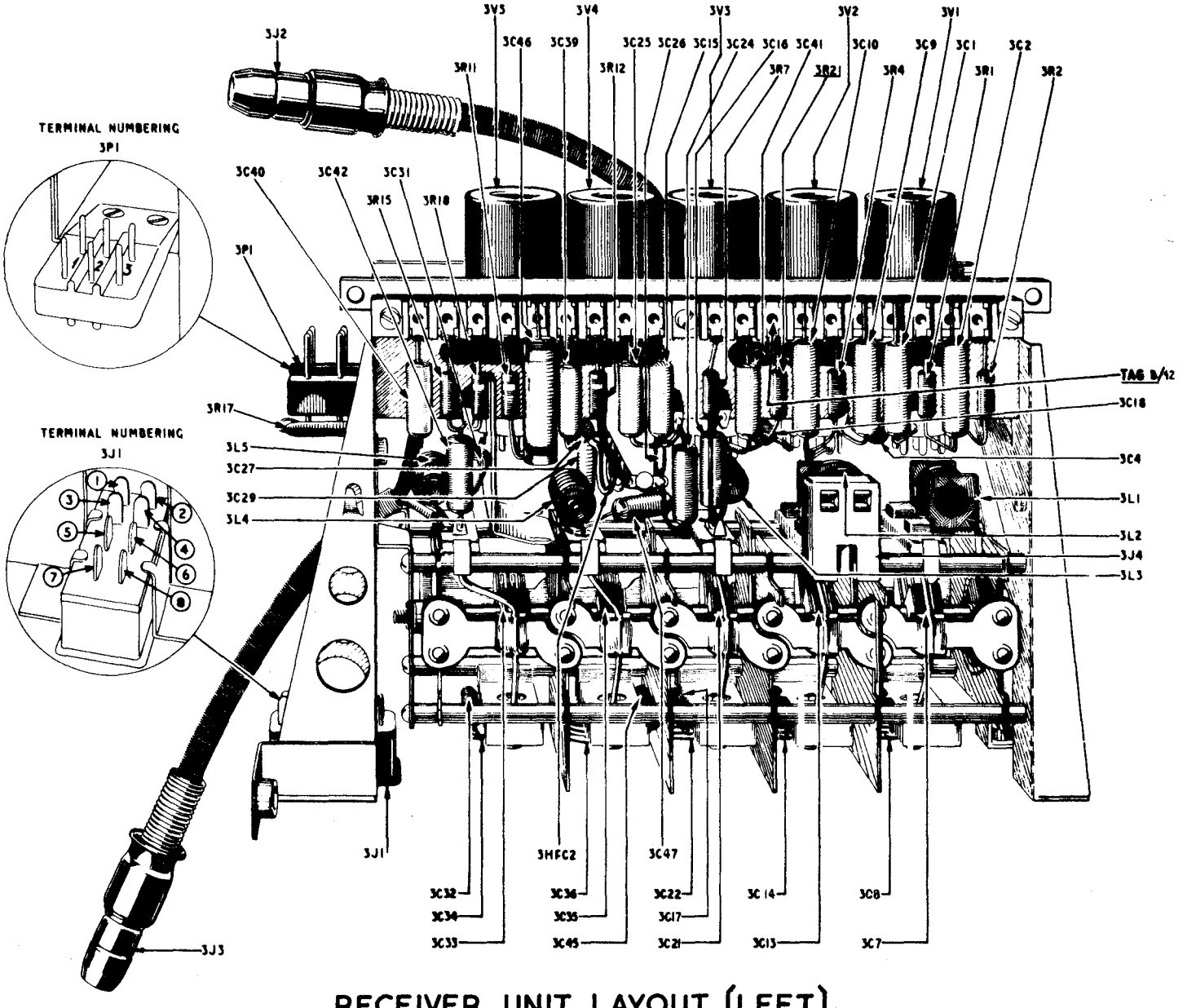

CHANGED VALUE
WIRE ADDED
4V5
4V6
4C7
4C10 4C12
4C11 4C24
4C42 4C26 4C30 4C32 4C41
4C34
4R31
4R6 4R7 4R8
4R10 4R9 4R17
4R18 4R19
4R28 4R21 4R35
4R25
4CH7
4R24 4R33 4R34
TO 4J1 PIN 8
NEW COMPONENT
4R36
4P2
4CH1
4CH2
4CH3
4L2
4C8
4C9
NEW COMPONENT
4C49
ONE END TO CHASSIS
4C15 4C14
4C17 4C18
4C22 4C23
4C39
4C27
4CH4
4L4
4CH5
4L5
4C29 4C28
4R29 4R30 4R32
4C38 4C37
4L6 4L7
4J1
4L3
REPLACE LEAD TO 4V4 PIN 1 WITH FERRITE BEAD ASSEMBLY OTHER SIDE
4J2
END VIEW SHOWING NUMBERING OF PINS ON 4P1 & 4J1
4P1
1 2 3 4 5 6 7 8
1 3 5 7
2 4 6 8
4J1

FIG 2/1



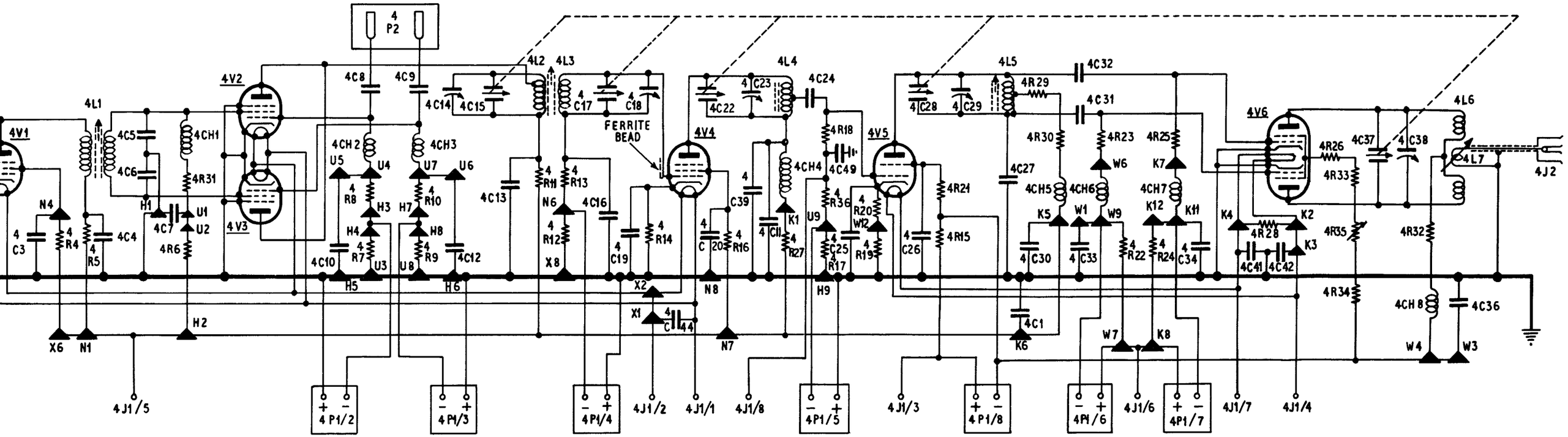
RECEIVER UNIT LAYOUT (RIGHT)

FIG. 2/2



RECEIVER UNIT LAYOUT (LEFT)

FIG. 2/3



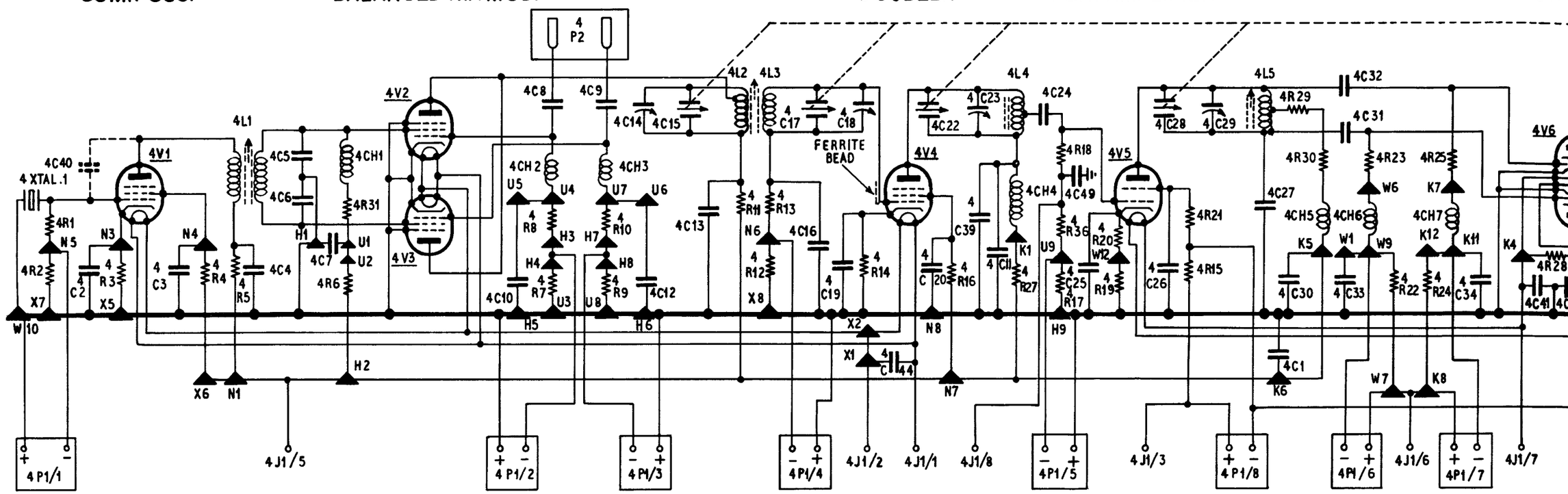
4C16 . . . . . 500 PFD	4C31 . . . . . 47 PFD	4R1 . . . . . 47,000 OHMS	4R16 . . . . . 33,000 OHMS	4R31 . . . . . 22,000 OHMS	4CH1 . . . . . 1350 μH	4V1 . . CV4063 (CV 136)
4C17 . . . . PART OF GANG	4C32 . . . . . 47 PFD	4R2 . . . . . 100 OHMS	4R17 . . . . . 680 OHMS	4R32 . . . . . 56 OHMS	4CH2 . . . . . 330 μH	4V2 . . CV4014 (CV 138)
4C18 . . . . . TRIMMER	4C33 . . . . . 500 PFD	4R3 . . . . . 560 OHMS	4R18 . . . . 10,000 OHMS	4R33 . . . 12,000 OHMS	4CH3 . . . . . 330 μH	4V3 . . CV4014 (CV 138)
4C19 . . . . . 500 PFD	4C34 . . . . . 500 PFD	4R4 . . . . . 68,000 OHMS	4R19 . . . . . 330 OHMS	4R34 . . . 10,000 OHMS	4CH4 . . . . . 62 μH	4V4 . . CV4063 (CV 136)
4C20 . . . . . 500 PFD	4C35 . . . . . NOT USED	4R5 . . . . . 3,300 OHMS	4R20 . . . . . 330 OHMS	4R35 . . . 10,000 OHMS	4CH5 . . . . . 13 μH	4V5 . . . . . CV309
4C21 . . . . . NOT USED	4C36 . . . . . 3000 PFD	4R6 . . . . . 33,000 OHMS	4R21 . . . . 56,000 OHMS	4R36 . . . 39,000 OHMS	4CH6 . . . . . 13 μH	4V6 . . CV4046 . CV415
4C22 . . . PART OF GANG	4C37 . . . PART OF GANG	4R7 . . . . . 100 OHMS	4R22 . . . . 680 OHMS		4CH7 . . . . . 13 μH	
4C23 . . . . . TRIMMER	4C38 . . . . . TRIMMER	4R8 . . . . . 10,000 OHMS	4R23 . . . . 47,000 OHMS		4CH8 . . . . . 13 μH	
4C24 . . . . . 47 PFD	4C39 . . . . . 300 PFD	4P9 . . . . . 100 OHMS	4R24 . . . . 680 OHMS	4L1 . . . . . H.F. TRANS'R		4P1 . . . . 8 PAIR TEST PLUG
4C25 . . . . . 47 PFD	4C40 CAPACITY BETWEEN VALVE HOLDER PINS	4R10 . . . 10,000 OHMS	4R25 . . . 47,000 OHMS	4L2 } BAND-PASS TRANS'R	FERRITE BEAD LP775541 (NOT USED ON S.T.R9X3)	4P2 . . . . . 2 PIN PLUG
4C26 . . . . . 100 PFD	4C41 . . . . . 500 PFD	4R11 . . . . . 2,200 OHMS	4R26 . . . . 12,000 OHMS	4L3 }		
4C27 . . . . . 10 PFD	4C42 . . . . . 500 PFD	4R12 . . . . . 680 OHMS	4R27 . . . . 3,900 OHMS	4L4 ANODE TUNING COIL		4J1 . . . . . 8 PIN SOCKET
4C28 . . . PART OF GANG	4C43 . . . . . NOT USED	4R13 . . . . . 68,000 OHMS	4R28 . . . . . 63 OHMS	4L5 ANODE TUNING COIL		4J2 . . . COAXIAL SOCKET
4C29 . . . . . TRIMMER	4C44 . . . . . 500 PFD	4R14 . . . . . 560 OHMS	4R29 . . . . . 330 OHMS	4L6 ANODE TUNING COIL		
4C30 . . . . . 500 PFD	4C49 . . . . . 1000 PFD	4R15 . . . . . 0·75 OHM	4R30 . . . . . 330 OHMS	4L7 . . . . . OUTPUT COIL	4XTAL1 . . . . . 4·86 MC/S	

7 & 4C48 NOT USED.

TO PAGE 68, H'B 1048A FOR COMPONENT DELETIONS, ADDITION AND CHANGES FOR STR9X1, 9X2 AND 9X3

TRANSMITTER UNIT

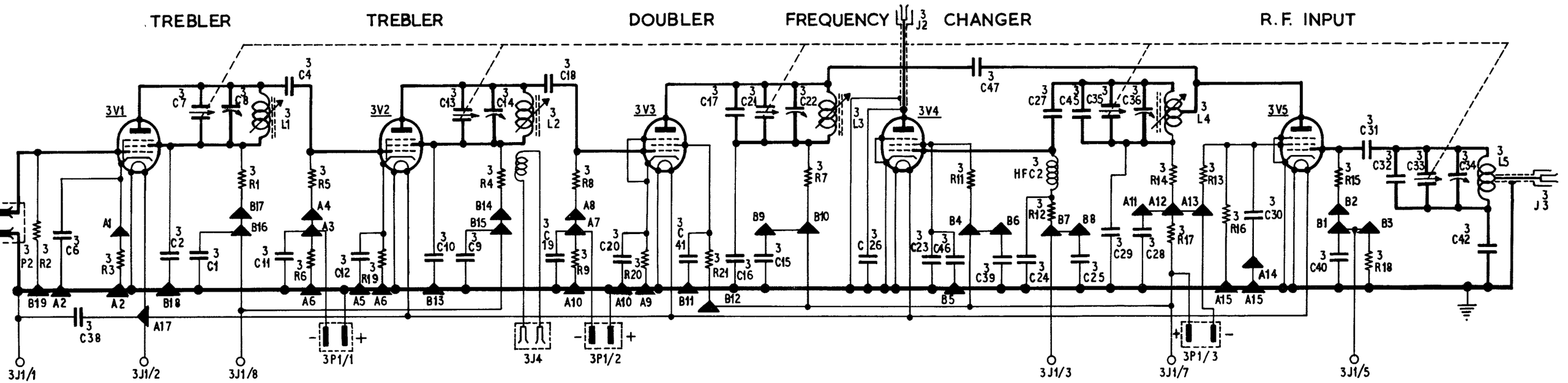
FIG. 2/4



4C1 . . . . 500 PFD	4C16 . . . . . 500 PFD	4C31 . . . . . 47 PFD	4R1 . . . . . 47,000 OHMS	4R16 . . . . . 33,000 OHMS	4R31 . . . . . 22,000 OHMS	4CH1 . . . . .
4C2 . . . . 1500 PFD	4C17 . . . . PART OF GANG	4C32 . . . . . 47 PFD	4R2 . . . . . 100 OHMS	4R17 . . . . . 680 OHMS	4R32 . . . . . 56 OHMS	4CH2 . . . . .
4C3 . . . . 1500 PFD	4C18 . . . . . TRIMMER	4C33 . . . . . 500 PFD	4R3 . . . . . 560 OHMS	4R18 . . . . 10,000 OHMS	4R33 . . . 12,000 OHMS	4CH3 . . . . .
4C4 . . . . 0·01 MFD	4C19 . . . . . 500 PFD	4C34 . . . . . 500 PFD	4R4 . . . . . 68,000 OHMS	4R19 . . . . . 330 OHMS	4R34 . . . 10,000 OHMS	4CH4 . . . . .
4C5 . . . . . 75 PFD	4C20 . . . . . 500 PFD	4C35 . . . . . NOT USED	4R5 . . . . . 3,300 OHMS	4R20 . . . . . 330 OHMS	4R35 . . . 10,000 OHMS	4CH5 . . . . .
4C6 . . . . . 75 PFD	4C21 . . . . . NOT USED	4C36 . . . . . 3000 PFD	4R6 . . . . . 33,000 OHMS	4R21 . . . . . 56,000 OHMS	4R36 . . . 39,000 OHMS	4CH6 . . . . .
4C7 . . . 0·01 MFD	4C22 . . . PART OF GANG	4C37 . . . PART OF GANG	4R7 . . . . . 100 OHMS	4R22 . . . . . 680 OHMS		4CH7 . . . . .
4C8 . . . . . 47 PFD	4C23 . . . . . TRIMMER	4C38 . . . . . TRIMMER	4R8 . . . . . 10,000 OHMS	4R23 . . . . 47,000 OHMS		4CH8 . . . . .
4C9 . . . . . 47 PFD	4C24 . . . . . 47 PFD	4C39 . . . . . 300 PFD	4P9 . . . . . 100 OHMS	4R24 . . . . . 680 OHMS		
4C10 . . . . 47 PFD	4C25 . . . . . 47 PFD	4C40 CAPACITY BETWEEN	4R10 . . . 10,000 OHMS	4R25 . . . . 47,000 OHMS	4L1 . . . . . H.F. TRANS'R	
4C11 . . . 300 PFD	4C26 . . . . . 100 PFD	VALVE HOLDER PINS	4R11 . . . . . 2,200 OHMS	4R26 . . . . . 12,000 OHMS	4L2 } BAND-PASS TRANS'R	FERRITE BEAD
4C12 . . . . 47 PFD	4C27 . . . . . 10 PFD	4C41 . . . . . 500 PFD	4R12 . . . . . 680 OHMS	4R27 . . . . . 3,900 OHMS	4L3 }	(NOT USED ON
4C13 . . . . 500 PFD	4C28 . . . PART OF GANG	4C42 . . . . . 500 PFD	4R13 . . . . . 68,000 OHMS	4R28 . . . . . 63 OHMS	4 L4 ANODE TUNING COIL	
4C14 . . . TRIMMER	4C29 . . . . . TRIMMER	4C43 . . . . . NOT USED	4R14 . . . . . 560 OHMS	4R29 . . . . . 330 OHMS	4 L5 ANODE TUNING COIL	
4C15 PART OF GANG	4C30 . . . . . 500 PFD	4C44 . . . . . 500 PFD	4R15 . . . . . 0·75 OHM	4R30 . . . . . 330 OHMS	4 L6 ANODE TUNING COIL	4XTAL1 . . . . .
		4C49 . . . . . 1000 PFD			4 L7 . . . . . OUTPUT COIL	

4C45, 4C46, 4C47 & 4C48 NOT USED.

NOTE: REFER TO PAGE 68, H'B 1048A FOR COMPONENT DELETIONS, ADDITION AND CHANGES FOR STR9X1, 9X2 AND 9X3

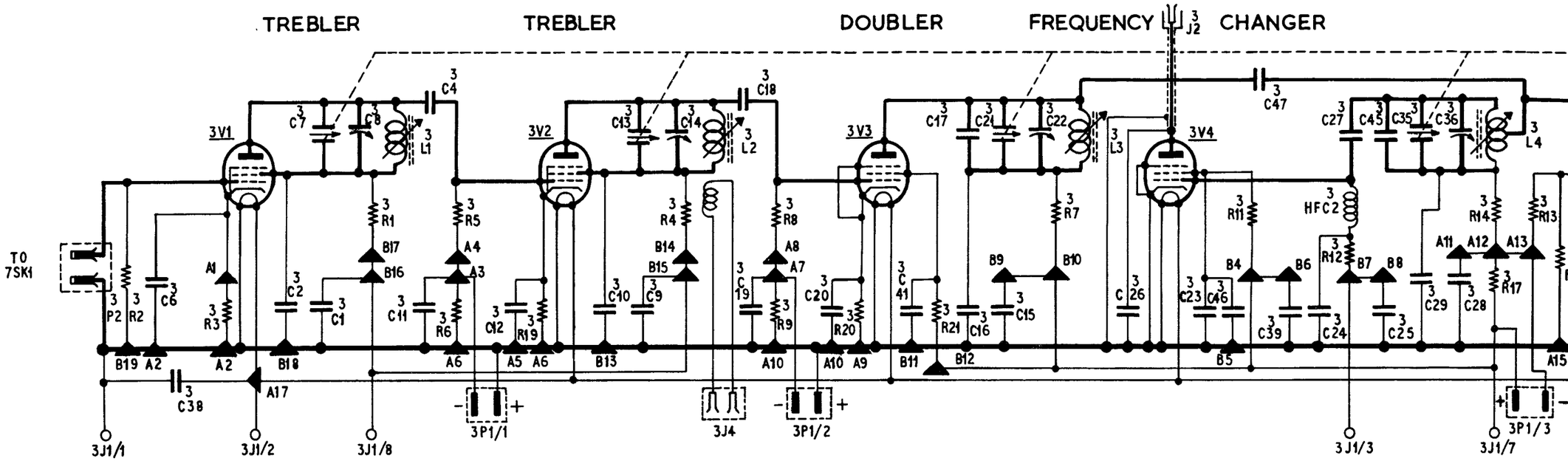


3C1 . . . . . 1,500 PFD	3C12 . . . . . 1,500 PFD	3C23 . . . . . 220 PFD	3C34 . . SPEC TRIMMER	3C47 . . . . . 5·6 PFD	3R11 . . . . 47,000 OHMS	3V1 . . CV4063 (CV 136)
3C2 . . . . . 1,500 PFD	3C13 . . . . . ★	3C24 . . . . . 220 PFD	3C35 . . . . . ★		3R12 . . . 100,000 OHMS	3V2 . . CV4063 (CV 136)
3C3 . . . . . NOT USED	3C14 . . . SPEC TRIMMER	3C25 . . . . . 220 PFD	3C36 . . SPEC TRIMMER	3R1 . . . . 1000 OHMS	3R13 . . . 47,000 OHMS	3V3 . . CV4014 (CV 138)
3C4 . . . . . 100 PFD	3C15 . . . . . 220 PFD	3C26 . . . . . 65 PFD	3C38 . . . . . 1,500 PFD	3R2 . . 100,000 OHMS	3R14 . . . 10,000 OHMS	3V4 . . CV4014 (CV 138)
3C5 . . . . . NOT USED	3C16 . . . . . 220 PFD	3C27 . . . . . 39 PFD	3C39 . . . . . 220 PFD	3R3 . . . . 2,200 OHMS	3R15 . . . . 1 MEGOHM	3V5 . . CV4014 (CV 138)
3C6 . . . . . 1500 PFD	3C17 . . . . . 1·5 PFD	3C28 . . . . . 220 PFD	3C40 . . . . . 220 PFD	3R4 . . . . 1,000 OHMS	3R16 . . . 68000 OHMS	
3C7 . . . . . ★	3C18 . . . . . 8·2 PFD	3C29 . . . . . 220 PFD	3C41 . . . . . 220 PFD	3R5 . . . 47,000 OHMS	3R17 . . . . . 8·3 OHMS	
3C8 . . . . SPEC TRIMMER	3C19 . . . . . 1500 PFD	3C30 . . . . . 220 PFD	3C42 . . . . . 47 PFD	3R6 . . . . 1000 OHMS	3R18 . . 100,000 OHMS	
3C9 . . . . . 1,500 PFD	3C20 . . . . . 1500 PFD	3C31 . . . . . 10 PFD	3C44 . . . . . NOT USED	3R7 . . . . 1,000 OHMS	3R19 . . . 3,300 OHMS	
3C10 . . . . . 1,500 PFD	3C21 . . . . . ★	3C32 . . . . . 3·3 PFD	3C45 . . . . . 1·5 PFD	3R8 . . 33,000 OHMS	3R20 . . . . 150 OHMS	★ . . . . . PART OF GANGED CONDENSER
3C11 . . . . . 1,500 PFD	3C22 . . . SPEC TRIMMER	3C33 . . . . . ★	3C46 . . . . . 0·01 MFD	3R9 . . . . 1,000 OHMS	3R21 . . . 47 000 OHMS	

NOTE: REFER TO PAGE 68, H'B1048A FOR COMPONENT DELETIONS, ADDITIONS AND CHANGES FOR STR9 X1, 9X2 AND 9X3.

RECEIVER UNIT

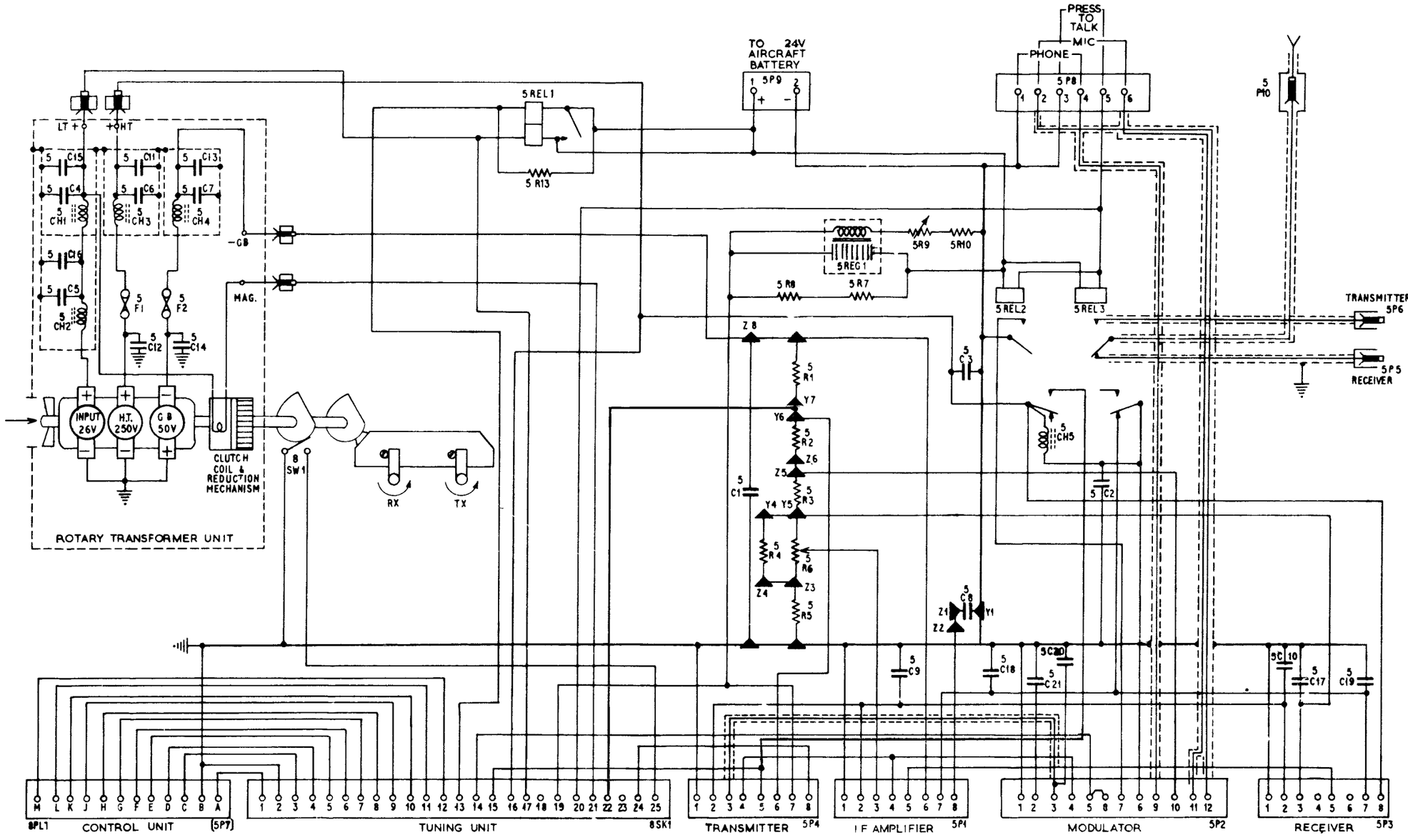
FIG. 2/5



3C1 . . . . . 1,500 PFD	3C12 . . . . . 1,500 PFD	3C23 . . . . . 220 PFD	3C34 . . SPEC TRIMMER	3C47 . . . . . 5·6 PFD	3R11 . . . . 47,000 OHMS	3V1 . . CV
3C2 . . . . . 1,500 PFD	3C13 . . . . . ★	3C24 . . . . . 220 PFD	3C35 . . . . . ★		3R12 . . . 100,000 OHMS	3V2 . . CV
3C3 . . . . . NOT USED	3C14 . . . SPEC TRIMMER	3C25 . . . . . 220 PFD	3C36 . . SPEC TRIMMER	3R1 . . . . . 1000 OHMS	3R13 . . . 47,000 OHMS	3V3 . . CV
3C4 . . . . . 100 PFD	3C15 . . . . . 220 PFD	3C26 . . . . . 65 PFD	3C38 . . . . . 1,500 PFD	3R2 . . . 100,000 OHMS	3R14 . . . 10,000 OHMS	3V4 . . CV
3C5 . . . . . NOT USED	3C16 . . . . . 220 PFD	3C27 . . . . . 39 PFD	3C39 . . . . . 220 PFD	3R3 . . . . 2,200 OHMS	3R15 . . . . . 1 MEGOHM	3V5 . . CV
3C6 . . . . . 1500 PFD	3C17 . . . . . 1·5 PFD	3C28 . . . . . 220 PFD	3C40 . . . . . 220 PFD	3R4 . . . . 1,000 OHMS	3R16 . . . 68000 OHMS	
3C7 . . . . . ★	3C18 . . . . . 8·2 PFD	3C29 . . . . . 220 PFD	3C41 . . . . . 220 PFD	3R5 . . . 47,000 OHMS	3R17 . . . . . 8·3 OHMS	
3C8 . . . . SPEC TRIMMER	3C19 . . . . . 1500 PFD	3C30 . . . . . 220 PFD	3C42 . . . . . 47 PFD	3R6 . . . . 1000 OHMS	3R18 . . 100,000 OHMS	
3C9 . . . . . 1,500 PFD	3C20 . . . . . 1500 PFD	3C31 . . . . . 10 PFD	3C44 . . . . . NOT USED	3R7 . . . . 1,000 OHMS	3R19 . . . 3,300 OHMS	
3C10 . . . . . 1500 PFD	3C21 . . . . . ★	3C32 . . . . . 3·3 PFD	3C45 . . . . . 1·5 PFD	3R8 . . . 33,000 OHMS	3R20 . . . . 150 OHMS	★ . . . .
3C11 . . . . . 1,500 PFD	3C22 . . SPEC TRIMMER	3C33 . . . . . ★	3C46 . . . . . 0·01 MFD	3R9 . . . . 1,000 OHMS	3R21 . . . 47 000 OHMS	GANG

NOTE: REFER TO PAGE 68, H'B1048A FOR COMPONENT DELETIONS, ADDITIONS AND CHANGES FOR STR9X1, 9X2 AND 9X3.

R



5C1	0·1 MFD	5C12	220 PFD	5R1	390 OHMS	5R12	NOT USED	5CH1	46 5μH
5C2	1 MFD	5C13	220 PFD	5R2	360 OHMS	5R13	120 OHMS	5CH2	46 5μH
5C3	1 MFD	5C14	220 PFD	5R3	160 OHMS			5CH3	1350μH
5C4	0·5MFD	5C15	220 PFD	5R4	47 OHMS			5CH4	1350μH
5C5	0·5MFD	5C16	220 PFD	5R5	27 OHMS			5CH5	3H
5C6	0·1 MFD	5C17	220 PFD	5R6	75 OHMS				
5C7	0·1 MFD	5C18	220 PFD	5R7	3 OHMS				
5C8	0·5 MFD	5C19	220 PFD	5R8	3 OHMS	5REL1	RELAY,1-N/C	5F1	250mA
5C9	0·01 MFD	5C20	1000 PFD	5R9	30 OHMS	5REL2	RELAY,1-N/O-1 C/O	5F2	250mA
5C10	0·01 MFD	5C21	1500 PFD	5R10	33 OHMS	8SW1	MECHANICAL N/O		
5C11	220 PFD			5R11	NOT USED			8SK1	25 WAY

5P1	8 WAY PLUG	
5P2	12 WAY PLUG	
5P3	8 WAY PLUG	
5P4	8 WAY PLUG	
5P5	CO-AXIAL PLUG	
5P6	CO-AXIAL PLUG	
(8PL1) 5P7	12 WAY PLUG	
5P8	6 WAY OFF SET PLUG	
5P9	2 WAY PLUG	
5P10	CO-AXIAL PLUG	

5REG1 CARBON PILE

CHASSIS ASSEMBLY

FIG. 2/6

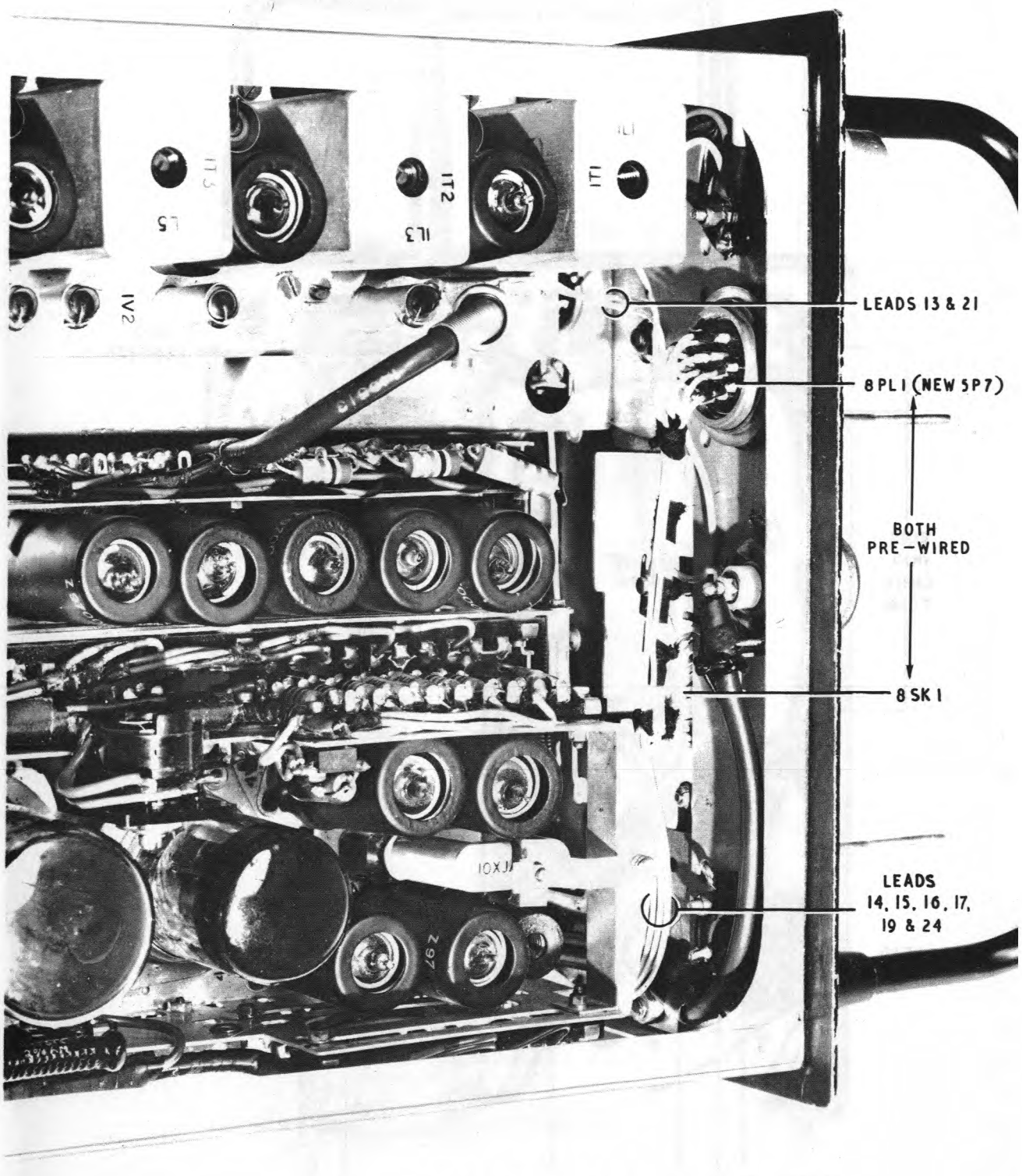
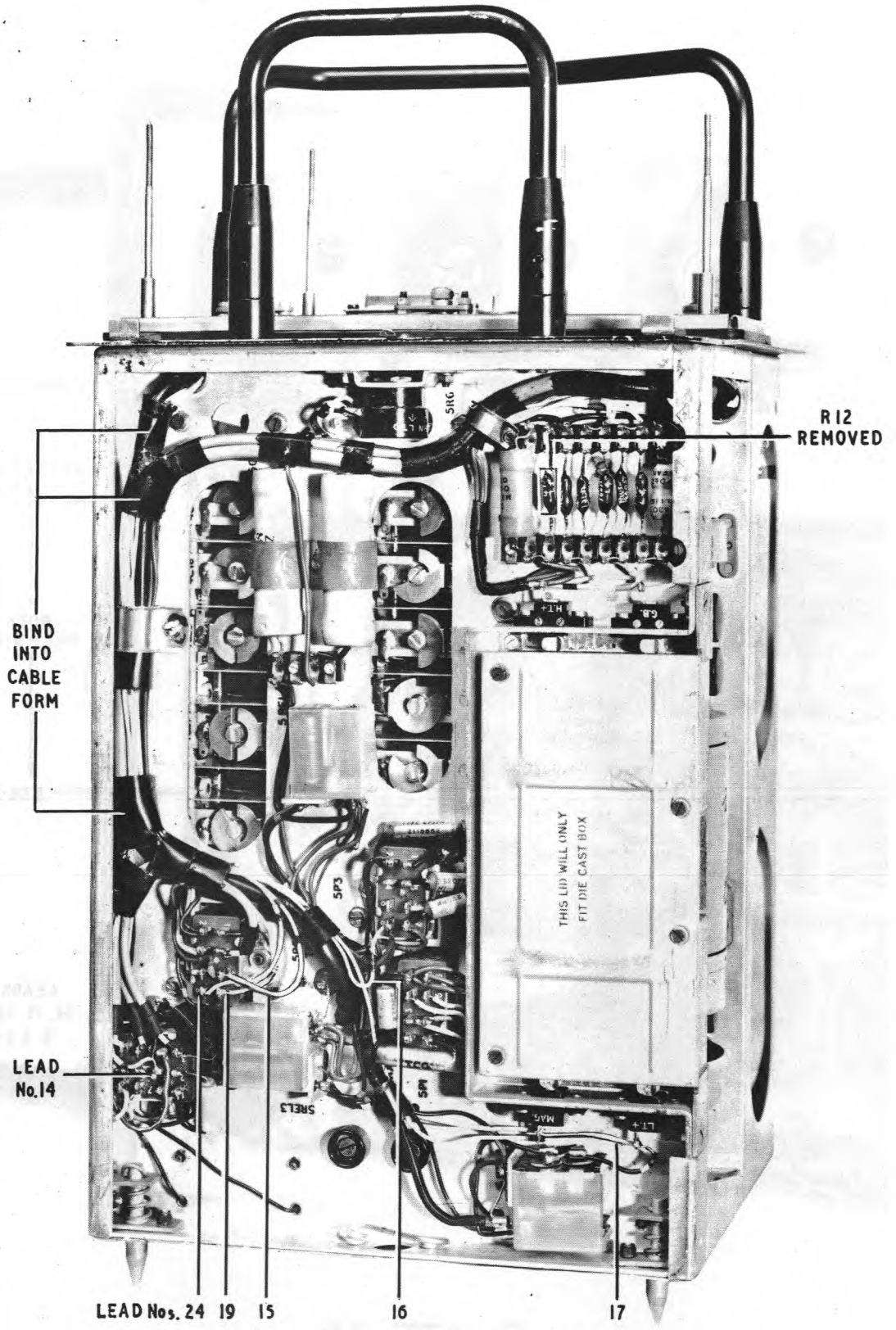

LEADS 13 & 21
8 PL 1 (NEW 5P7)
BOTH
PRE-WIRED
8 SK 1
LEADS
14, 15, 16, 17,
19 & 24

PLATE 2/1



UNDERSIDE SHOWING LEAD CONNECTIONS

PLATE 2/2