

This document was generated by me, Colin Hinson, from a Crown copyright document held at R.A.F. Henlow Signals Museum. It is presented here (for free) under the Open Government Licence (O.G.L.) and this version of the document is my copyright (along with the Crown Copyright) in much the same way as a photograph would be.

The document should have been downloaded from my website <https://blunham.com/Radar>, if you downloaded it from elsewhere, please let me know (particularly if you were charged for it). You can contact me via my Genuki email page:

<https://www.genuki.org.uk/big/eng/YKS/various?recipient=colin>

**You may not copy the file for onward transmission of the data nor attempt to make monetary gain by the use of these files. If you want someone else to have a copy of the file, point them at the website. It should be noted that most of the pages are identifiable as having been processed by me.**

---

I put a lot of time into producing these files which is why you are met with the above when you open the file.

In order to generate this file, I need to:

1. Scan the pages (Epson 15000 A3 scanner)
2. Split the photographs out from the text only pages
3. Run my own software to split double pages and remove any edge marks such as punch holes
4. Run my own software to clean up the pages
5. Run my own software to set the pages to a given size and align the text correctly.
6. Run Omnipage (Ultimate) on all the pages to OCR them.
7. Generate a searchable Acrobat pdf file.

Hopefully after all that, I end up with a presentable file, though I can't guarantee there aren't errors in the OCR. If you find missing pages, pages in the wrong order, anything else wrong with the file or simply want to make a comment, please drop me a line (see above).

It is my hope that you find the file of use to you personally – I know that I would have liked to have found some of these files years ago – they would have saved me a lot of time !

Colin Hinson

In the village of Blunham, Bedfordshire.

# **Please note:**

**This document contains bookmarks. These are not normally displayed if you view the document on line. I would therefore recommend that you download the file and view it using Adobe Acrobat.**

**Colin Hinson 18/10/2019**

*70-10-10-10-10*

LINE TRANSMISSION  
EQUIPMENT

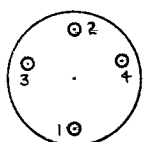
DIAGRAMS  
AND  
INSTRUCTIONS

SCHOOL OF SIGNALS

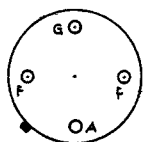
92-7471 Wt. T1854/YB271 200 Pairs 1/45 TS&Co.

SCHOOL OF SIGNALS  
 DRAWN BY W/H/F/16/9/43  
 CHECKED BY 328

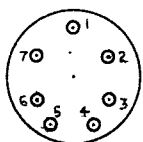
ISVC NO	PO NO	MAKERS NO	ISVC NO	PO NO	MAKERS NO	ISVC NO	PO NO	MAKERS NO	ISVC NO	PO NO	MAKERS NO
	VT81	4022B		VT82			VT108		AR11	VT75A	4019B
8cct Mk I			8cct Mk I			8cct Mk I			6chan dx 8cct Mk I		
AR12	VT73A	4020A	AR13	VT88	4022AR			4019A	AR7		HL133 Modified
3 Chan Dx 6 Chan Dx 1+3			3 Chan Dx 6 Chan Dx 1+3			1+3			S+Sx		
ARP9		7DB	ARP10	VT114	PENA4	ARP11	VT113	TSP4.	6VGG	VT196	6VGG
S+Sx			1+4 Mk I Rep CT No 1 Mk I			1+4 Mk I Rep CT No 1 Mk I TMS No 1 Mk I			S+Dx 1+1 No 26 SET		
ARP34 (VR53)	VT180	EF39	VR56	VT201	EF36	ARP38	VT149	KTZ 73 Modified	VT52	VT181	EL32
8cct Mk II U.S. VF No 3 Rep VF No 1			1+4 Mk II No 26 SET			Rep 2cct 1+1			No 26 SET		
IC5G		IC5G	6J5	VT154	6J5	ATS 25	VT199	807	ARP35 (VR91)		EF50
1+3			No 26 SET			No 26 SET			1+4 Mk II Rep CT No 1 Mk II Rep CT No 2		
ARP36 (VR65)	VT200	SP41			4045A		VT122	4046A			4328A
TMS No 1 Mk II			1+3			1+3			1+3		



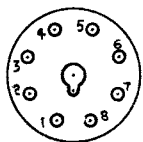
BRITISH 4-PIN



S.T.C. BAYONET THRUST



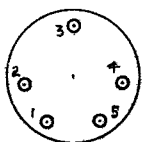
BRITISH 7-PIN



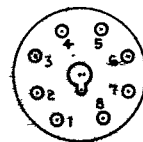
INTERNATIONAL OCTAL



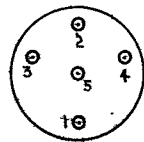
BRITISH 9-PIN GLASS TYPE



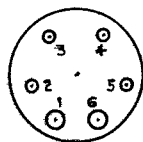
AMERICAN MED 5-PIN TYPE



MAZDA OCTAL



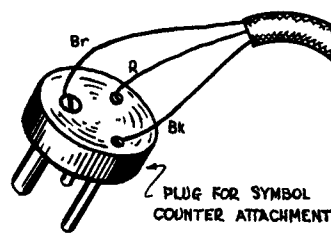
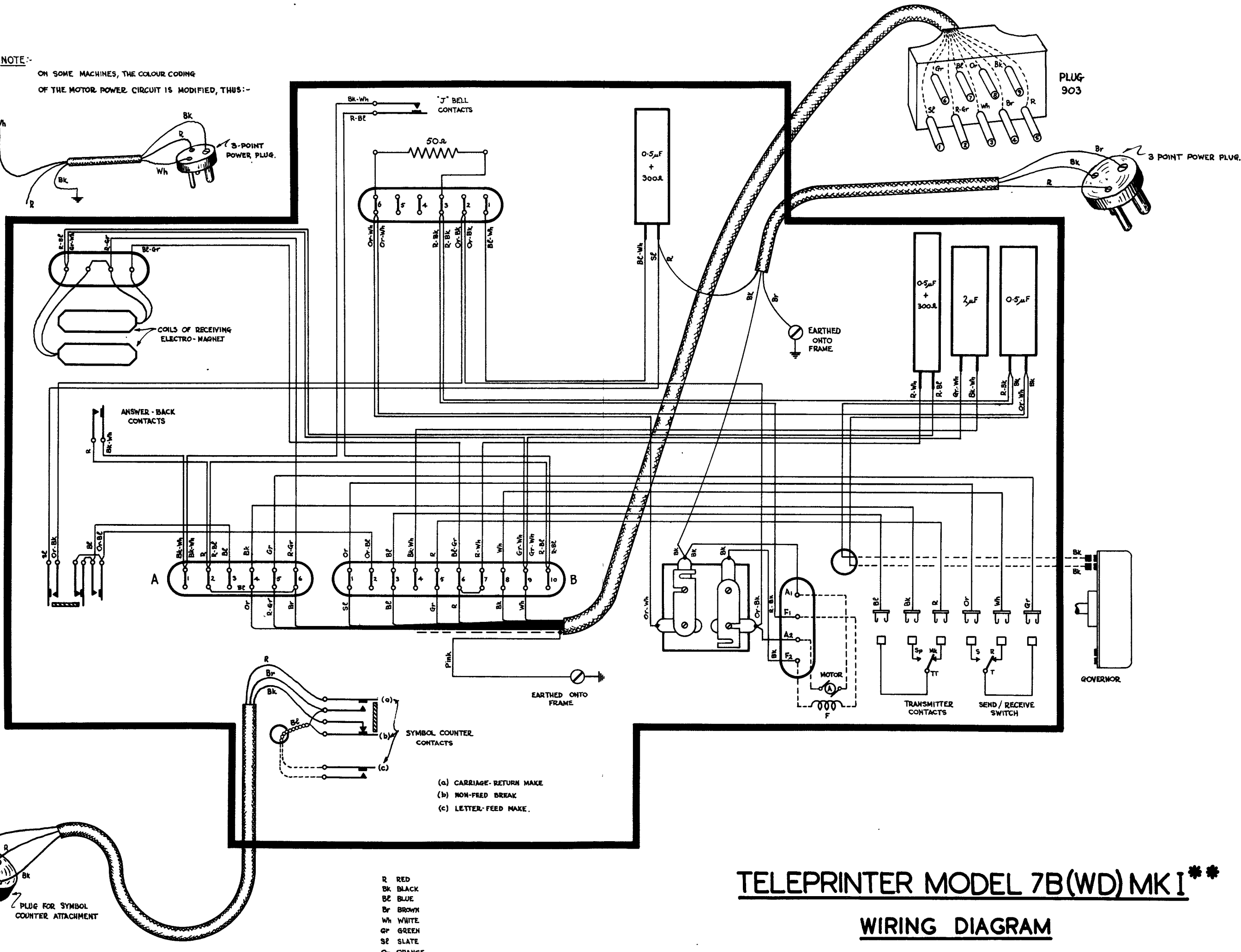
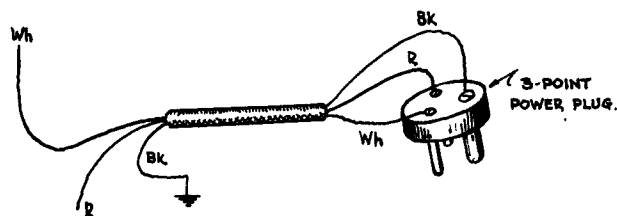
BRITISH 5-PIN



AMERICAN UX 6-PIN BASE

NOTE:-

ON SOME MACHINES, THE COLOUR CODING OF THE MOTOR POWER CIRCUIT IS MODIFIED, THIS:-



PLUG FOR SYMBOL COUNTER ATTACHMENT

- R RED
- BK BLACK
- BC BLUE
- BR BROWN
- WH WHITE
- GR GREEN
- SL SLATE
- OR ORANGE

- (a) CARRIAGE-RETURN MAKE
- (b) NON-FEED BREAK
- (c) LETTER-FEED MAKE.

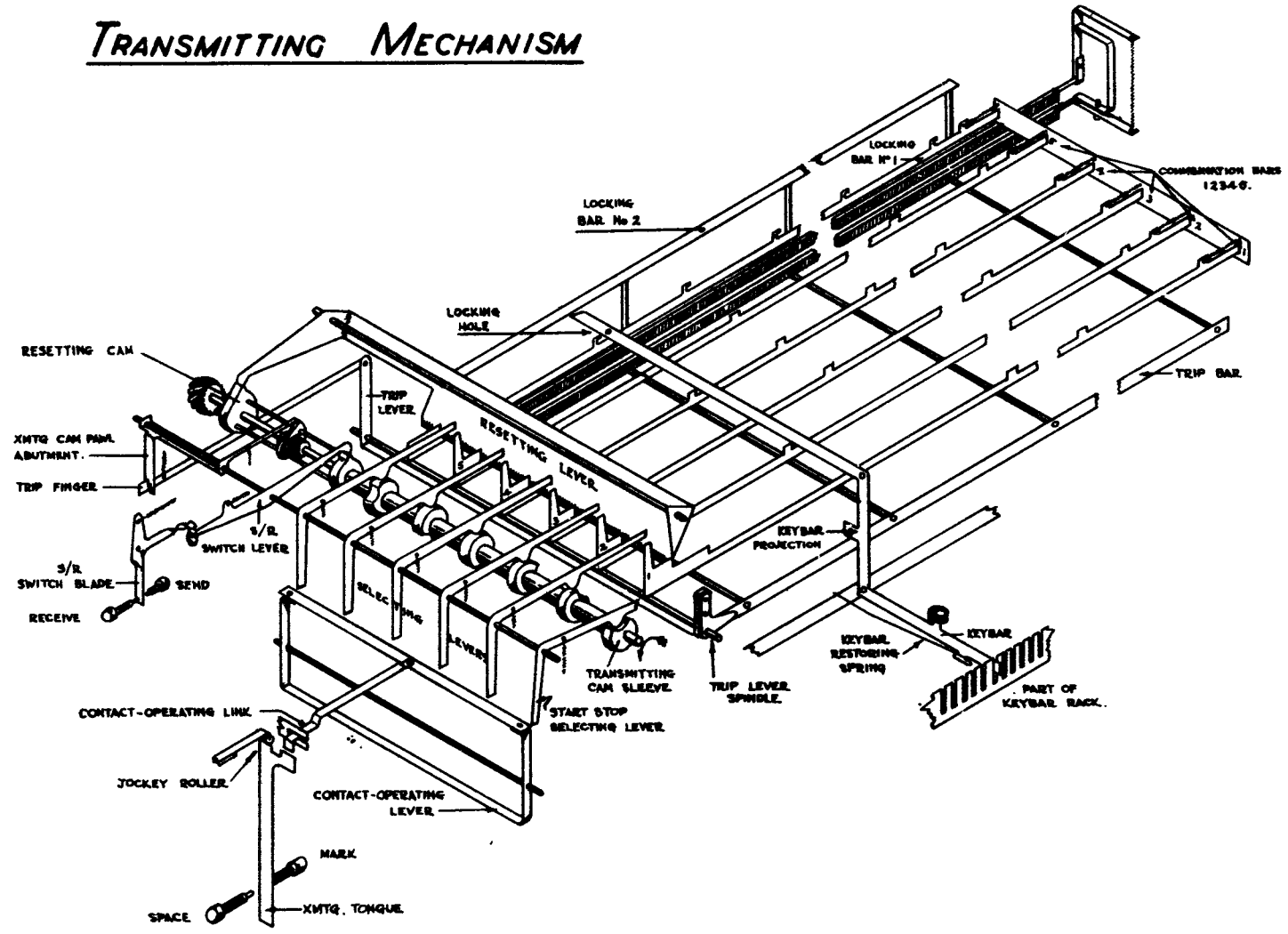
TELEPRINTER MODEL 7B(WD) MK I\*\*

WIRING DIAGRAM

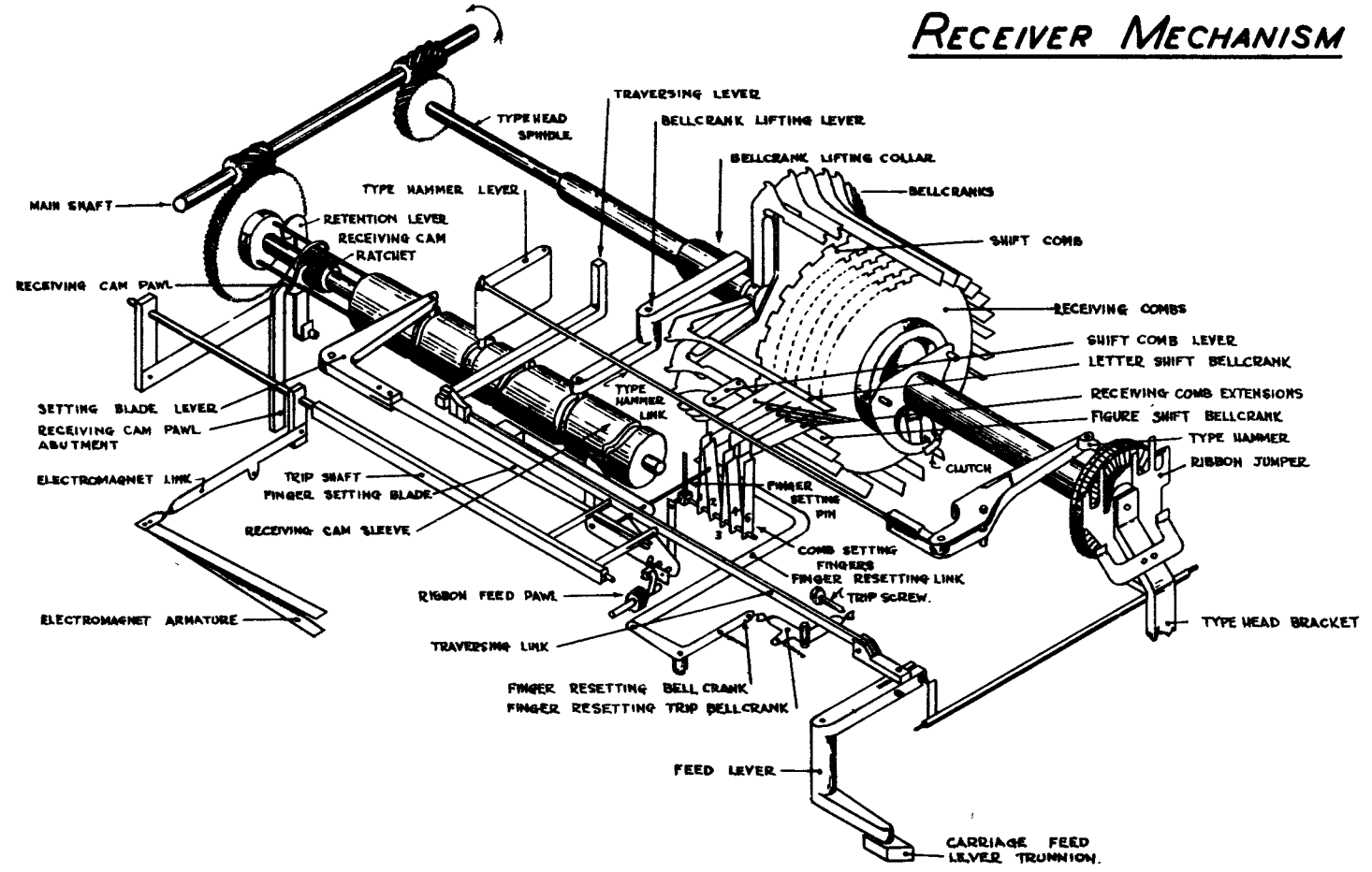
VIEW OF WIRING ON BASEPLATE SEEN FROM UNDERNEATH

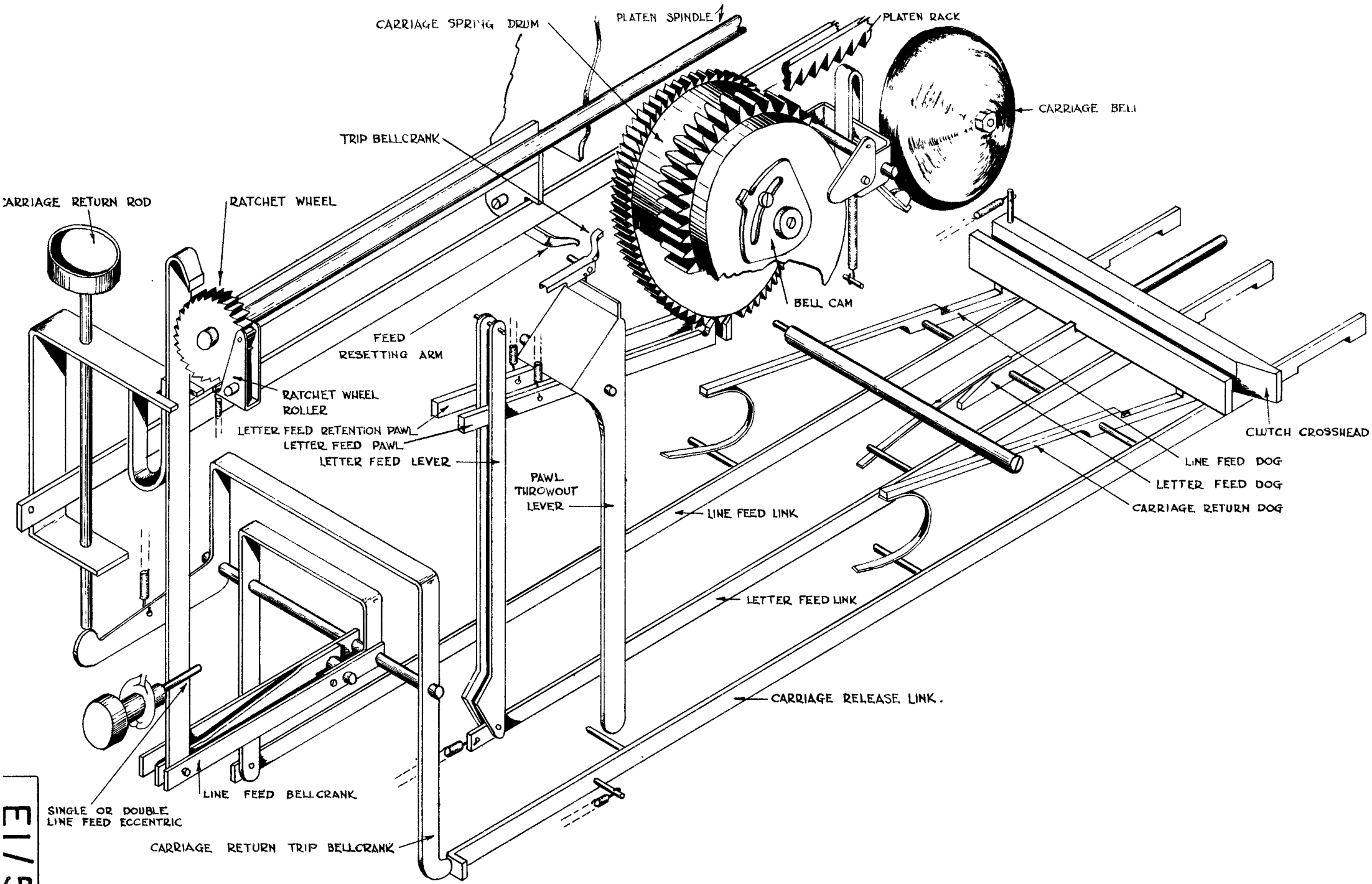
SCHOOL OF SIGNALS  
 DRAWN BY - ENG - G MAR 44  
 CHECKED BY - J. H. P.

# TRANSMITTING MECHANISM



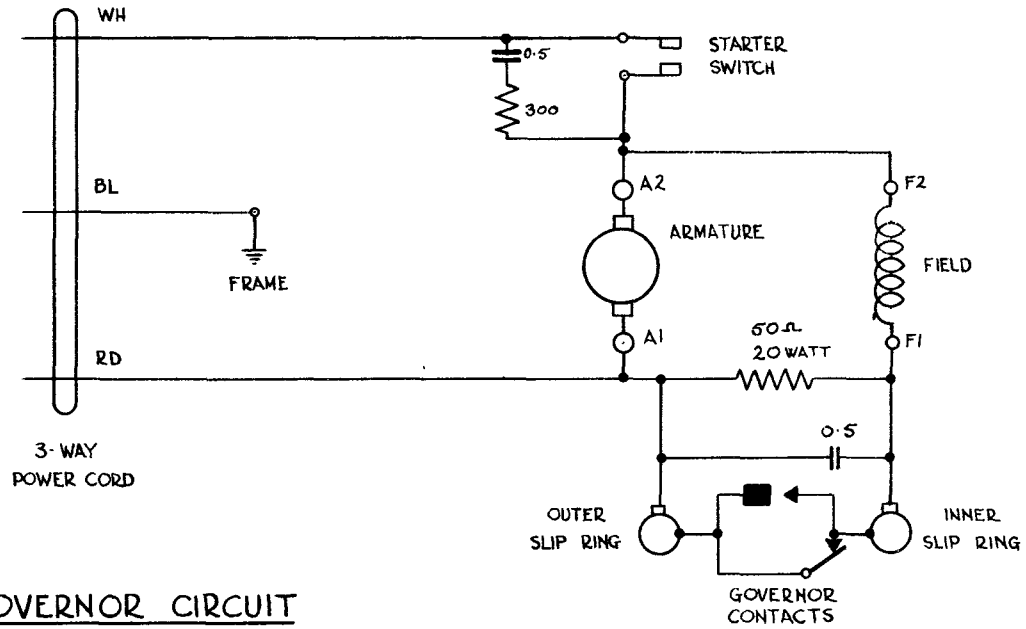
# RECEIVER MECHANISM



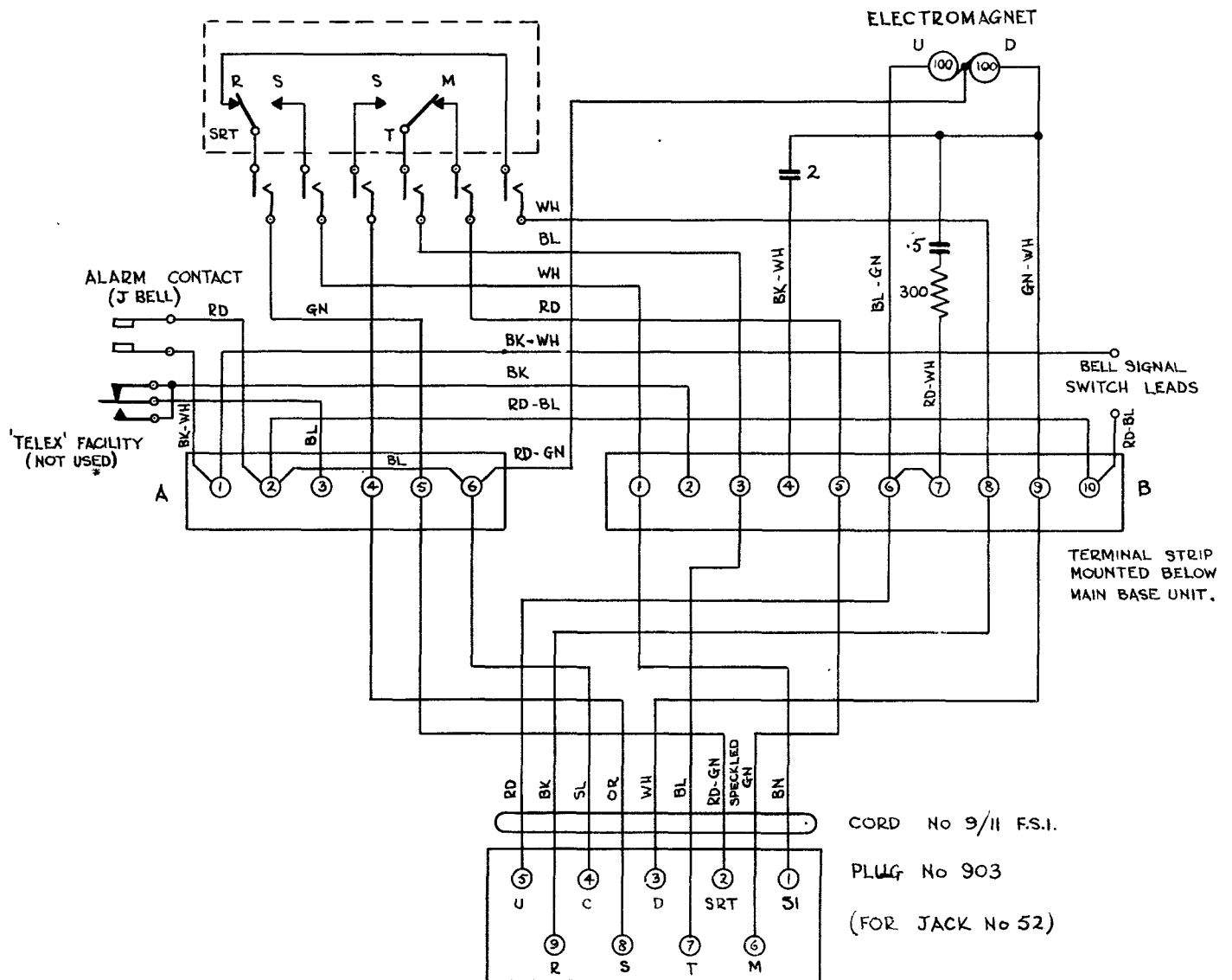


**TELEPRINTER 7B - PAGE ATTACHMENT UNIT**

E115

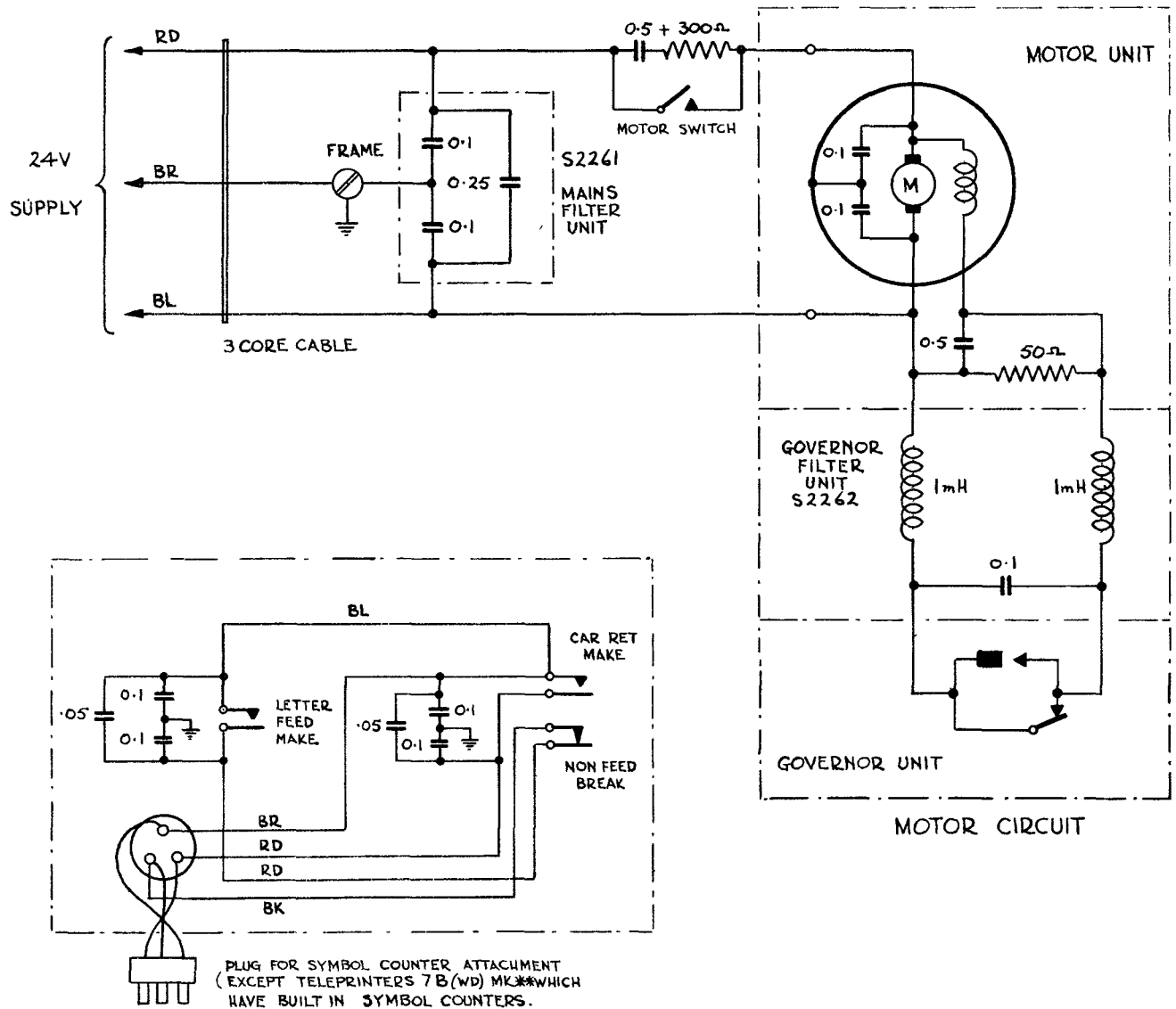
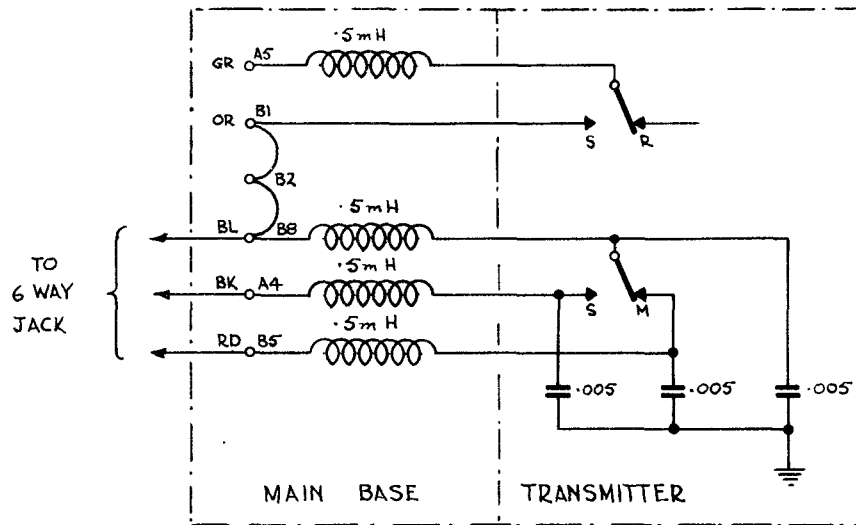


MOTOR & GOVERNOR CIRCUIT



CORD No 9/11 F.S.I.  
 PLUG No 903  
 (FOR JACK No 52)





# TELEPRINTER 7B (WD) RADIO INTERFERENCE SUPPRESSION

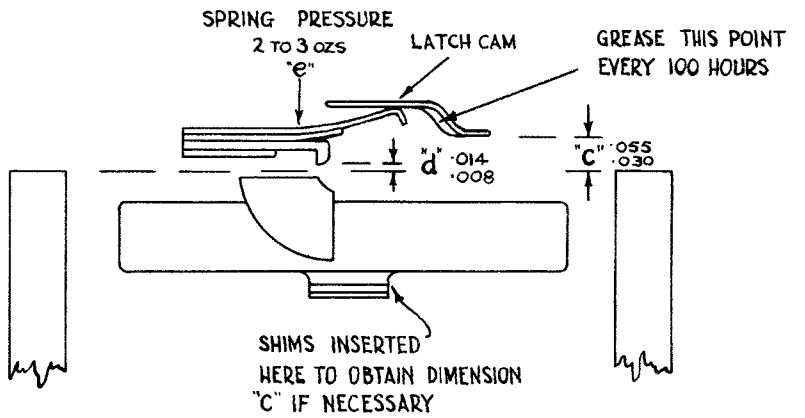


FIG. 1.

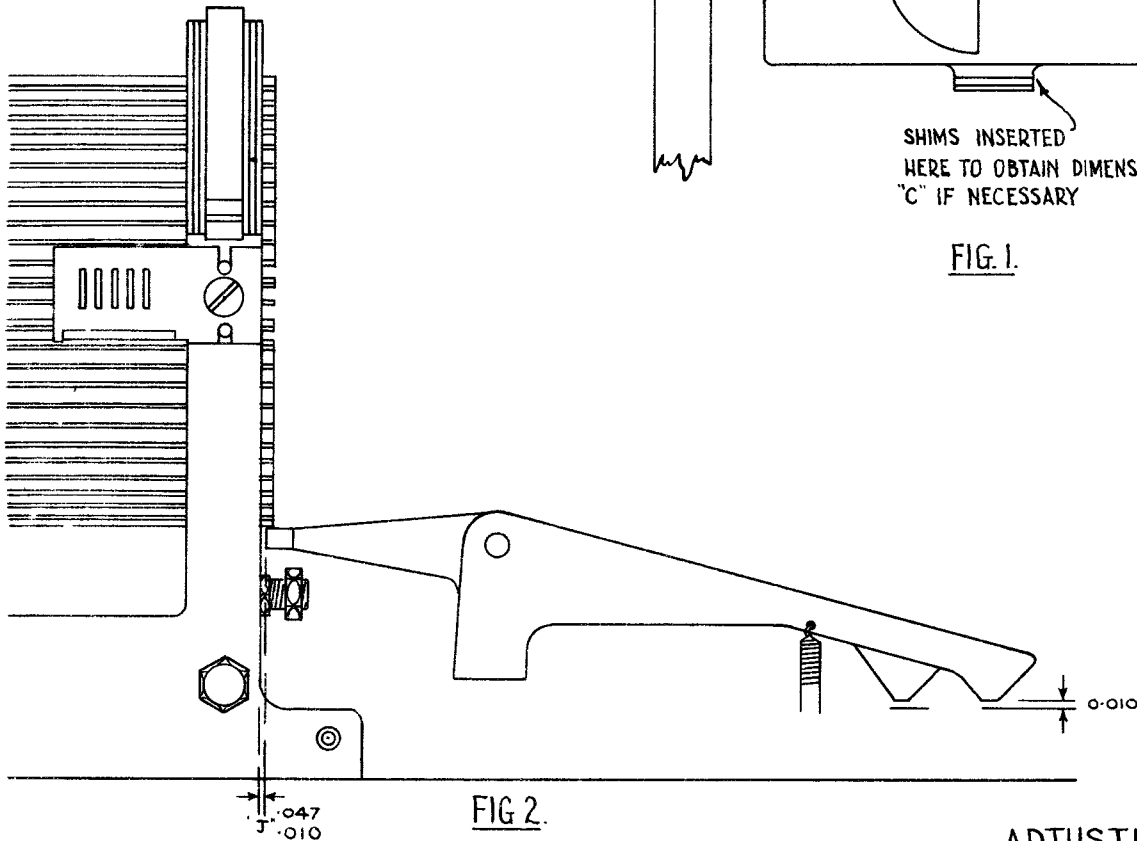


FIG. 2.

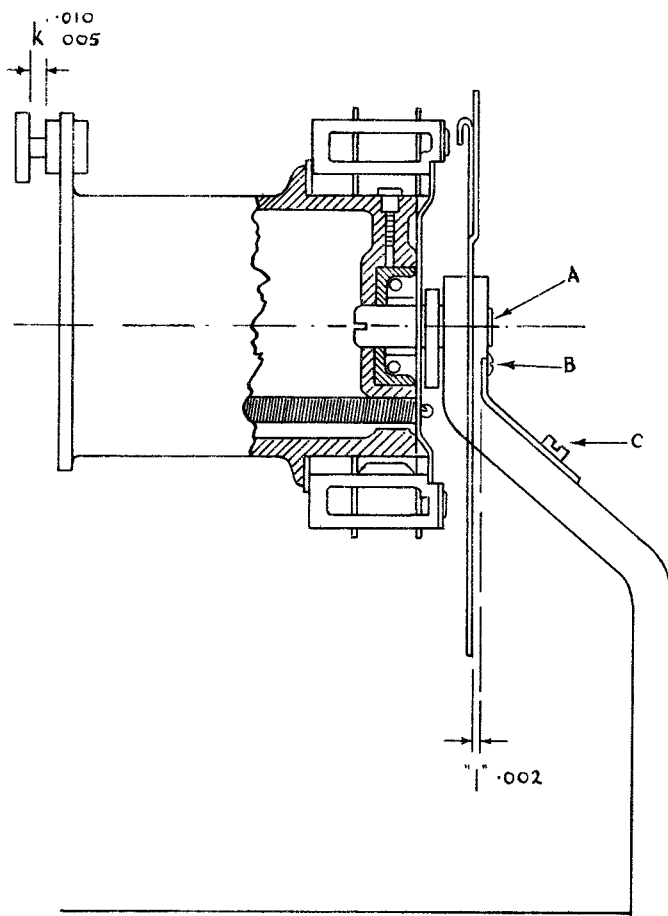


FIG. 3

### ADJUSTMENTS

FIRST CHECK THAT ALL ABUTMENT SCREW FACES ARE IN CONTACT. ABUTMENT SCREW ADJUSTMENTS **MUST NOT** BE ALTERED (EXCEPT THAT ON THE ANSWER-BACK UNIT. SEE ADJUSTMENT NO 39)

1. ADJUST END PLAY ON RECEIVE CAM SLEEVE TO 0.0015" (JUST FREE). CLAMP BEARING SCREWS **VERY TIGHTLY**. THIS ADJUSTMENT IS VERY IMPORTANT AND SHOULD BE CHECKED CAREFULLY.
2. OBTAIN DIMENSIONS "c" AND "d" (FIG 1) BY INSERTING SHIMS.
3. WITH TYPEHEAD UNLATCHED AND POSITIONED AS IN FIG 1, CORRECT LATCH SPRING PRESSURES BY SLIGHTLY SETTING LATCH SPRING EXTENSION.
4. ALLOW CONTROL LEVERS TO REST AGAINST THEIR BELLCRANKS (FIG 2). THE SHOES SHOULD REST CENTRALLY ON THEIR BELLCRANKS AND SATISFY DIMENSION "j". THE CONTROL LEVERS SHOULD CLEAR THEIR FEED DOGS BY AT LEAST 0.010" IN THE UNOPERATED CONDITION.
5. ADJUST DIMENSION "k" BY SCREW A. CLAMP BY SCREW B. (FIG 3)
6. SEE THAT TYPE BARS MOVE FREELY IN THEIR GUIDES AND THAT THEY ARE RETURNED TO THE NORMAL REST POSITION BY RETAINING PLATE AND SPRINGS.
7. CHECK THAT BLANK TYPES ARE INSERTED IN APPROPRIATE POSITIONS IN TYPE HEAD.
8. ADJUST RIBBON JUMPER STEADY PLATE (FIG 3) TO SATISFY DIMENSION "l" USING SCREWS C. REPLACE RIBBON JUMPER IF THIS IS BENT

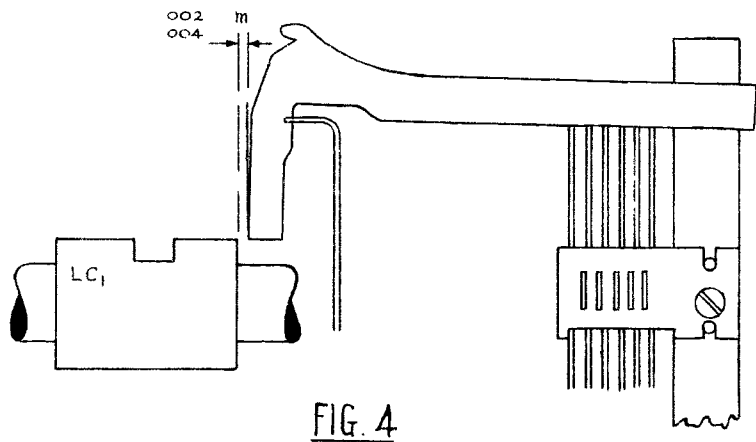


FIG. 4

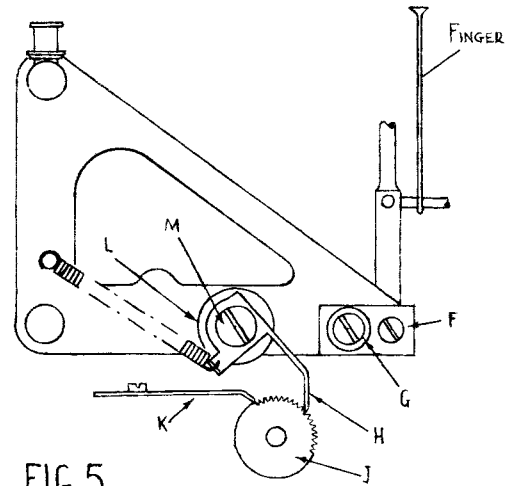


FIG. 5

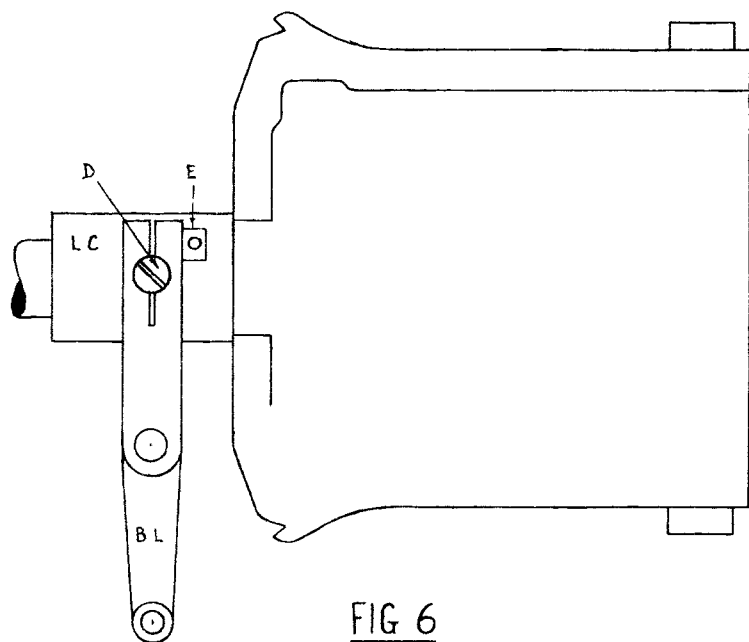


FIG. 6

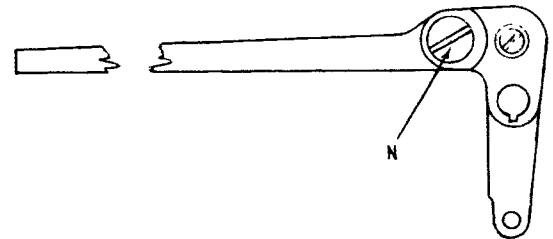


FIG. 8

### ADJUSTMENTS

- 9 CHECK THAT RECEIVE CAM PAWLS ARE CLEAN & MOVE FREELY AND THAT THE PAWL SPRINGS ARE NOT BENT.
- 10 BELLCRANK LIFT (FIGS 4 & 6). ALLOW N BELLCRANK TO FALL (-++-) & ADJUST DIMENSION "m" BY ROTATING ECCENTRIC 'D'. RECLAMP TIGHTLY BY SCREW E
- 11 CHECK THAT THE BELLCRANKS MOVE FREELY IN THE RACKS. LIFTING TENSION AT TYPEHEAD END SHOULD BE  $1\frac{1}{2}$ - $1\frac{3}{4}$ oz.
- 12 TURN CAM UNTIL FINGERS ARE FULLY LIFTED BELLCRANKS SHOULD BE CENTRALLY ABOVE NOTCHES IN COMBS. TO ADJUST, WITHDRAW FINGERS & USE ECCENTRIC F (FIG 5). CLAMP BY SCREW G RAISE FINGERS AGAIN TO CHECK THE ADJUSTMENT.
- 13 PUSH FINGERS TO MARK " (FIG 10) CLEARANCE UNDER COMB EXTENSIONS SHOULD BE 0.005" ADJUST BY ECCENTRIC & LOCKNUT P (FIG 7)
- 14 CHECK THAT FINGER SPRINGS ARE IN PAIRS AT LEFT OF FINGERS AND THAT COVER PLATE IS NOT FOULING REPLACE DAMAGED SPRINGS. CENTRE OF SPRING PLACED WITH ENDS ON FLAT SURFACE SHOULD BE RAISED  $\frac{1}{16}$ "- $\frac{3}{32}$ ". PRESSURE REQUIRED TO DEPRESS CENTRE TO  $\frac{1}{32}$ " OF SURFACE SHOULD BE 8-10oz.
- 15 ADJUST RIBBON FEED PAWL, H (FIG 5), TO FEED RATCHET J APPROX  $1\frac{1}{4}$  TEETH (ALLOWING RETENTION PAWL K TO TAKE UP ONE TOOTH) USING ECCENTRIC L. CLAMP BY SCREW M.
- 16 ADJUST HORIZONTAL MOVEMENT OF FINGER SETTING BLADE BY SCREW N (FIG 8) TO SATISFY DIMENSION "q" (FIG 7). CLAMP VERY TIGHTLY AND CHECK THE ADJUSTMENT CAREFULLY.

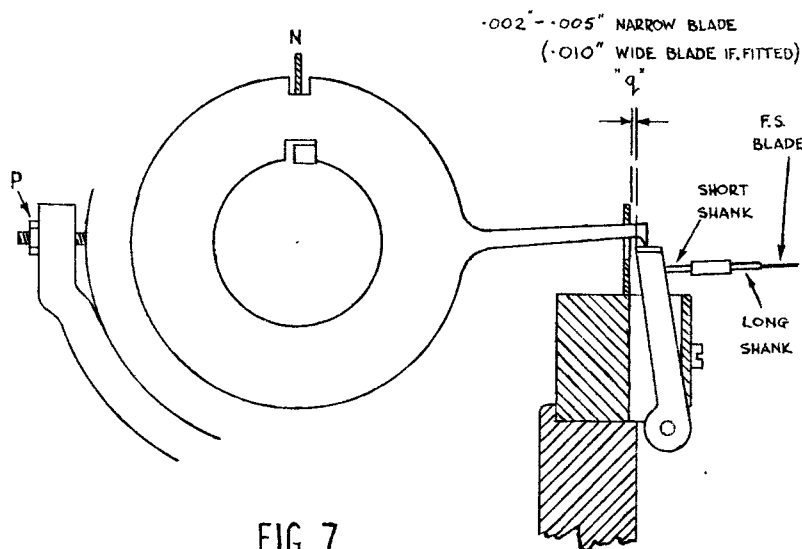


FIG. 7

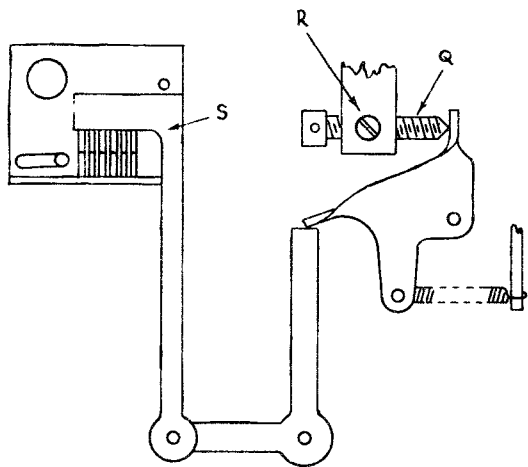


FIG. 9

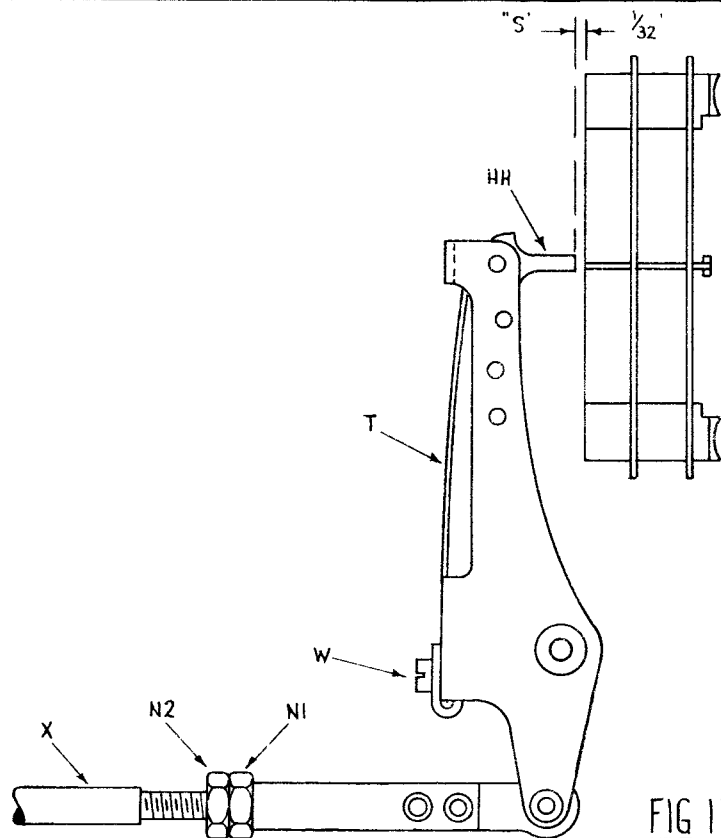


FIG. 11

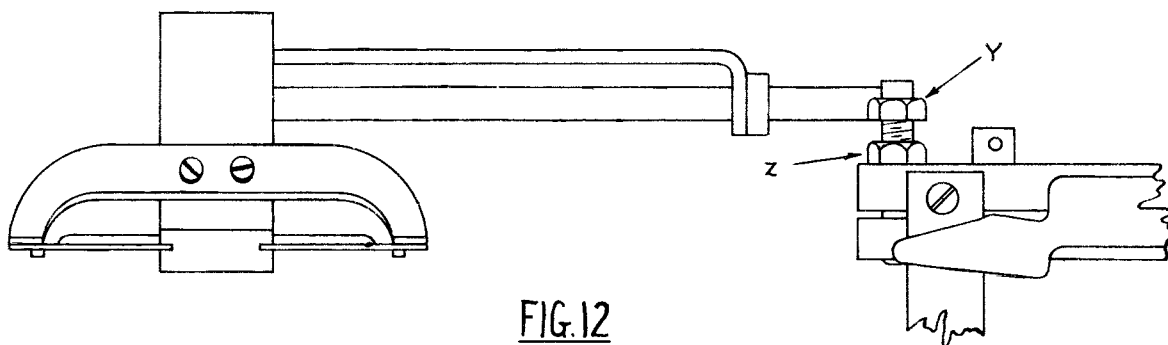


FIG. 12

### ADJUSTMENTS

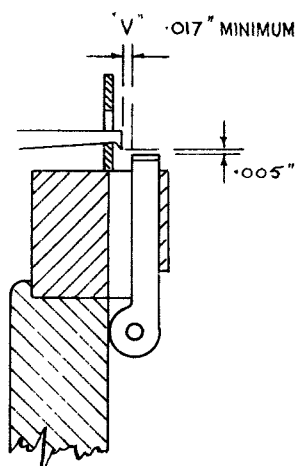
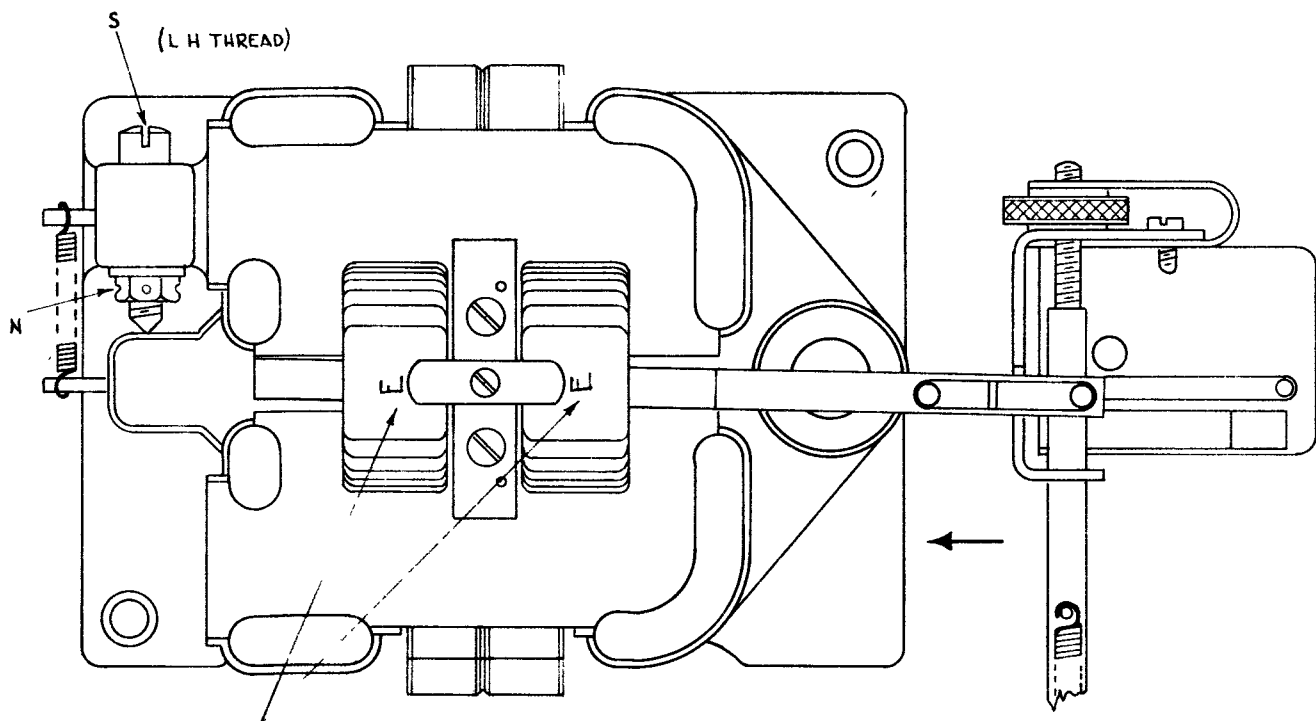


FIG. 10

- 17 SET UP AN "ALL MARKING" CONDITION ON THE FINGERS AND NOTE THAT FINGER SETTING PIN IS CENTRAL AGAINST EACH FINGER IN TURN AT THE "HALF SET" POSITION. ADJUST IF NECESSARY BY MOVING THE PINSRING CLAMPING BLOCK. RECLAMP BLOCK TIGHTLY AND CHECK THAT PIN IS NOT FOULING.
18. WHEN FINGERS ARE RESET BY THE LINK S (FIG 9) THE DIMENSION "V" (FIG 10) SHOULD BE SATISFIED. ADJUST BY TRIP SCREW Q, CLAMPING BY SCREW R. FINGER SHOULD THEN HAVE A FURTHER MOVEMENT OF 0.005".
- 19 SELECT LTR. SHIFT COMBINATION (++++); THEN "N" (--+-) ON FINGERS: TURN CAM UNTIL "N" BELLCRANK FALLS. LATCH CLUTCH ON THIS BELLCRANK. ADJUST DIMENSION "S" (FIG 11) USING NUTS N1 AND N2. LOCK NUTS TOGETHER.
- 20 REMOVE TYPE HAMMER AND ADJUST SHOCK ABSORBER SPRING AS FOLLOWS: SCREW IN THE ROD X UNTIL SPRING IN SHACKLE IS TIGHT. THEN SLACKEN APPROX. ONE TURN. AFFIX ONE OR TWO WEIGHTS TO TYPEHAMMER AS LOADING, IF 4 (OR MORE) PLY PAPER IS USED.
- 21 ADJUST THE HEIGHT OF THE RIBBON BY SCREW Y (FIG 12) UNTIL TOP EDGES OF TYPE PAD AND RIBBON ARE LEVEL, WHEN THE TYPE STRIKES THE RIBBON. CLAMP BY LOCK-NUT Z.



THE COILS MUST ALWAYS BE REPLACED SO THAT THE LETTER 'E' IS AS SHOWN OR SO THAT THE RED LEADS ARE ON THE LEFT WHEN VIEWED IN THE DIRECTION OF THE ARROW.

FIG. 13

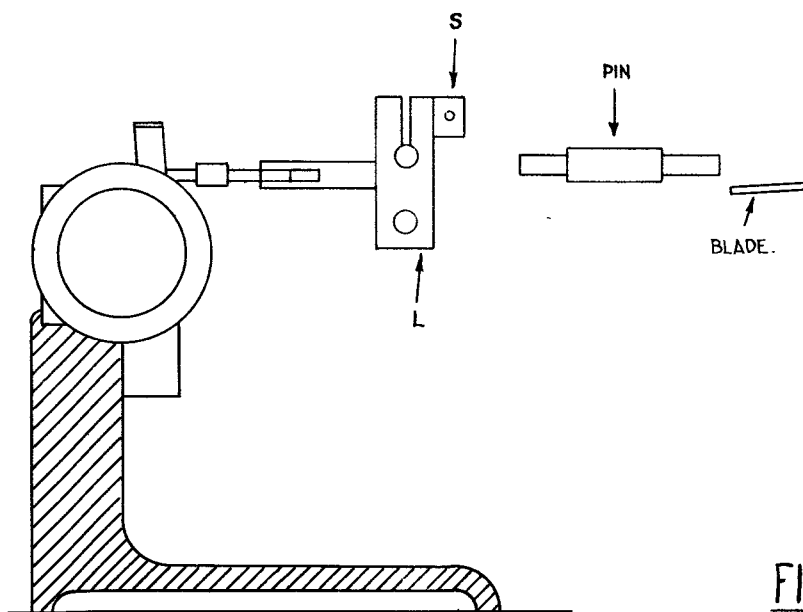


FIG. 14

### ADJUSTMENTS

22. REMOVE BOTH INK RIBBON SPOOLS & SEE THAT EACH FEED CHANGE ROD FALLS FREELY INTO CONTACT WITH FEED CHANGE SPINDLE. WHEN BOBBIN SPINDLES ARE TURNED BY HAND, RIBBON DRIVING SHAFT SHOULD ALTERNATE BETWEEN ITS TWO POSITIONS DUE TO BOTH RODS HAVING FALLEN. IF FAULTY, CHECK FOR CLEANLINESS, WEAR AT LOWER ENDS, BENT RODS OR STIFFNESS OF THE CHANGE ROD BELLCRANKS.
23. WHEN THE OPERATING MAGNET LINK IS DISCONNECTED, EQUAL FORCES SHOULD BE REQUIRED TO MOVE THE MAGNET ARMATURE AWAY FROM EACH STOP IN TURN. ADJUST BY SCREW S. CLAMP BY NUT N (FIG. 13)
24. WHEN THERE IS NO CURRENT FLOWING IN THE ELECTRO-MAGNET WINDINGS & WITH THE ELECTRO-MAGNET LINK REMOVED, THE FORCES REQUIRED (WHEN APPLIED JUST IN FRONT OF ARMATURE STOP PLATE) TO MOVE ARMATURE FROM SIDE TO SIDE, SHOULD BE EQUAL & BETWEEN 8 & 12 OZS. THESE FORCES ARE ALTERABLE ONLY BY REPLACING OR REMAGNETIZING PM'S. ARMATURE TRAVEL BETWEEN STOPS SHOULD BE 0.022" TO 0.025".
25. TO ADJUST THE FINGER SETTING BLADE (VERTICAL MOVEMENT) TURN THE RECEIVE CAM SLEEVE UNTIL THE BLADE JUST TOUCHES THE PIN OPPOSITE THE THIRD FINGER (MARKING). MOVE THE TRIPSHAFT LEVER L UNTIL THE BLADE STRIKES THE PIN CENTRALLY. CLAMP BY SCREW S (FIG 14). WHEN THIS ADJUSTMENT IS ALTERED No 27 MUST ALSO BE CORRECTED. CHECK THE ADJUSTMENT (No 25) CAREFULLY.

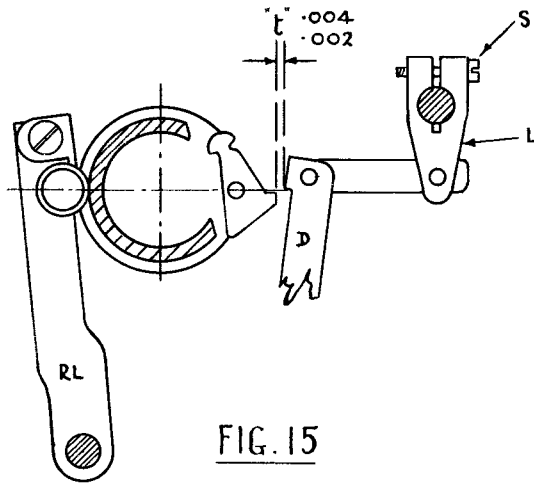


FIG. 15

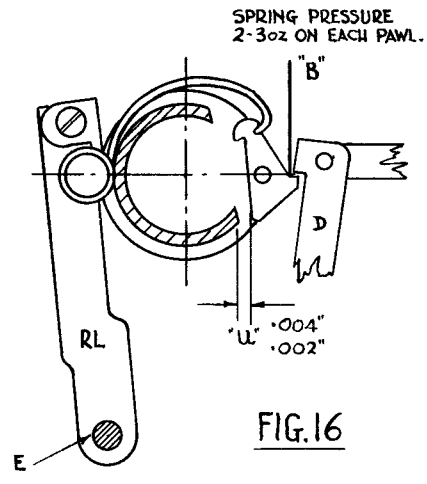


FIG. 16

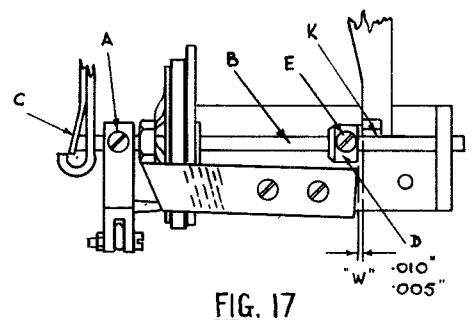


FIG. 17

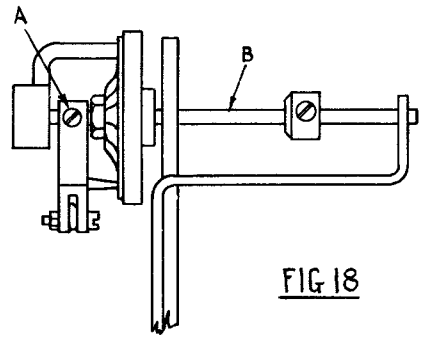


FIG. 18

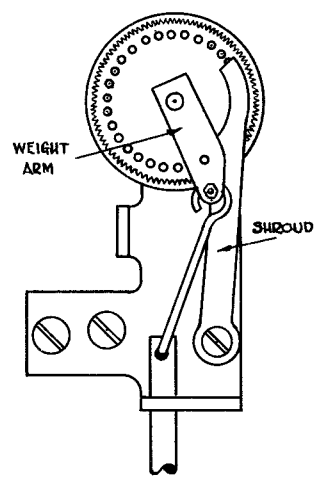


FIG. 19

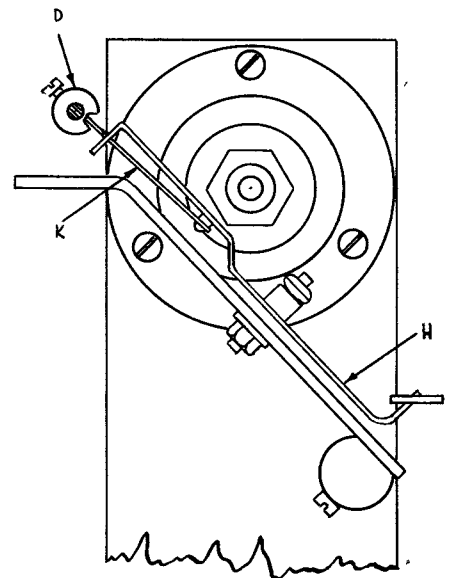
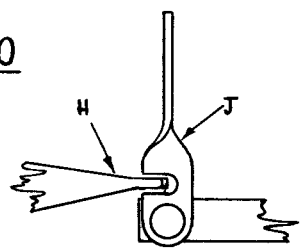


FIG. 20



ADJUSTMENTS.

26. ATTACH ELECTROMAGNET LINK TO THE ARMATURE & CHECK THAT EQUAL FORCES ARE REQUIRED TO MOVE THE ARMATURE FROM SIDE TO SIDE. IF F.S. BLADE IS EXERTING UNEQUAL REACTIONS ON ARMATURE, PUT A "SET" (NOT A TWIST) IN THE BLADE TO COUNTERACT THIS.
27. AT "MARK" THE DETENT SHOULD ARREST THE PAWLS. AT "SPACE" DIMENSION "t" SHOULD BE SATISFIED. ADJUST BY MOVING THE TRIPSHAFT LEVER L, CLAMPING WITH SCREW S (FIG. 15)
28. TURN THE CAM SLEEVE UNTIL THE RETENTION ROLLER BOTTOMS IN ITS HOLLOW & THE DETENT ENGAGES THE PAWLS. (FIG. 16). FORCE "B" & DIMENSION "u" MUST BE SATISFIED BY ADJUSTING ECCENTRIC E. LOCK BY NUT PROVIDED.
29. STARTER SWITCH CONTROL UNIT:- WITH WEIGHT-ARM PIN FULLY ENGAGED IN A HOLE & THE ARMATURE AT "MARK" (FIG. 17) ADJUST THE SCREW E SO THAT THE SPINDLE B JUST TOUCHES THE SPRING C (FIGS 17 AND 18).
30. ADJUST THE COLLAR D BY SCREW E (FIG. 17) TO SATISFY DIMENSION "w" WITH ARMATURE AT "MARK"
31. WHEN THE WEIGHT ARM IS IN ITS LOWEST POSITION (FIG. 19) THE PIN SHOULD CLEAR THE SHROUD, BUT IT SHOULD NOT GO BEYOND BOTTOM DEAD CENTRE.
32. CHECK THAT WHEN WEIGHT-ARM IS IN ITS LOWEST POSITION, THE SPRING K (FIGS 17 AND 20) WILL MOVE IN THE SLOT OF COLLAR D. ADJUST BY PUTTING A SET IN THE LEVER H (FIG. 20). THE WEIGHT ARM PIN MUST FALL CLEAR OF THE SHROUD.

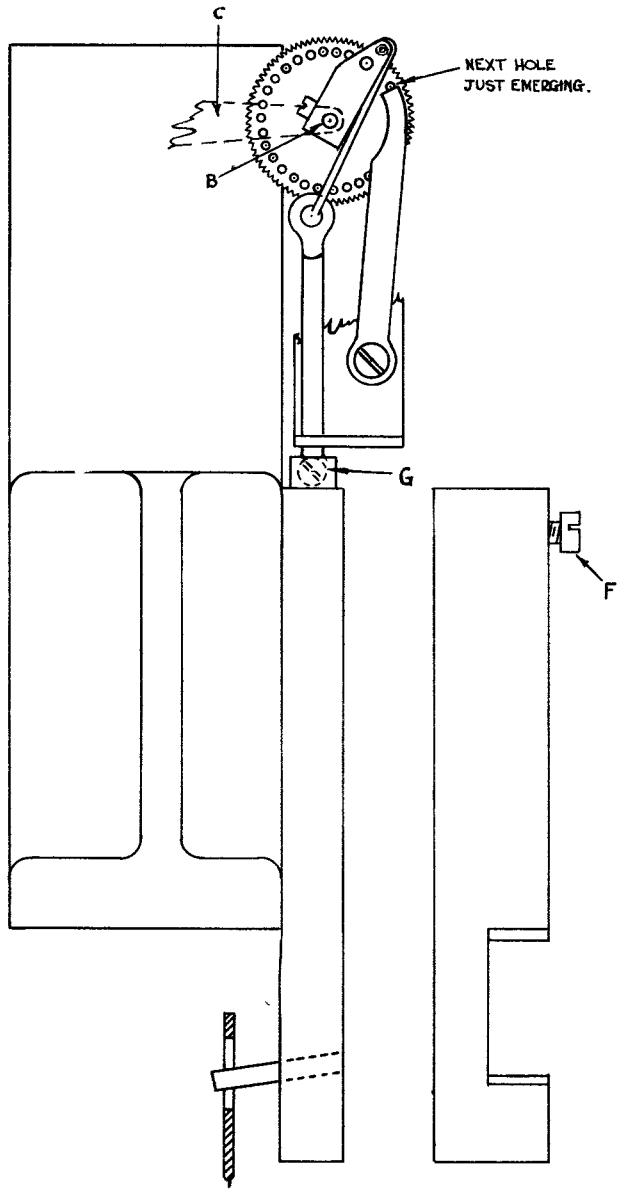


FIG. 21

## ADJUSTMENTS

33. WHEN THE WEIGHT-ARM IS IN ITS HIGHEST POSITION THE PIN SHOULD BE CLEAR OF THE SHROUD & THE NEXT HOLE SHOULD BE JUST EMERGING FROM BEHIND THE SHROUD AS THE MOTOR IS SWITCHED OFF. (FIG 21). WEIGHT-ARM PIN MUST FALL CLEAR OF THE SHROUD AT THE BOTTOM.
34. THE FORCE REQUIRED WHEN APPLIED TO THE END OF THE SPINDLE B (FIG 21) TO TRIP THE STARTER AFTER THE AUTOMATIC STOP HAS FUNCTIONED SHOULD NOT EXCEED 3 oz. WITH SPRING C IN, & 1 oz WITH THE SPRING REMOVED.
35. CHECK THAT THE TRANSMITTER DRIVE PAWLS ARE CLEAN & MOVE FREELY, & THAT THE PAWL SPRINGS ARE NOT BENT. REPLACE WHERE NECESSARY.
36. TURN THE TRANSMITTING CAM UNTIL THE PAWLS F ARE ARRESTED BY THE DETENT E (FIG 22) & ADJUST DIMENSION "b" (KEY BAR DEPRESSED) BY ECCENTRIC C. LOCK BY SCREW B.
37. WITH THE MOTOR RUNNING DEPRESS ANY KEY & ADJUST DIMENSION "C" (FIG.23) BY POSITIONING RESET LEVER H (FIG 22) WITH ECCENTRIC SPINDLE J. LOCK BY SCREW G.
38. ADJUST LOCKING BAR No2 TO OPERATE CORRECTLY BY ALTERING THE POSITION OF ITS CLAMPING SCREW.
39. IF NEW WARDS HAVE BEEN FITTED TO THE ANSWER BACK DRUM, CHECK DIMENSION "h" (FIG 24) FOR EACH WARD. ADJUST BY ALTERING THE ABUTMENT SCREW & SLIDING THE UNIT, WHILST LEVER V IS DISENGAGED FROM SPROCKET WHEEL W. THIS IS THE ONLY ABUTMENT ON THE MACHINE WHICH MAY BE ALTERED. READJUST THE END-BEARING SCREW Z ACCORDINGLY.

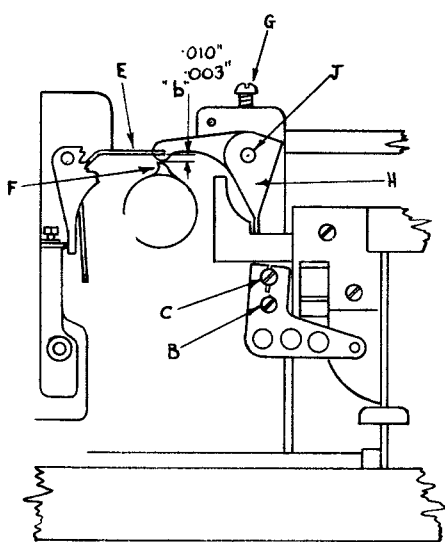


FIG. 22

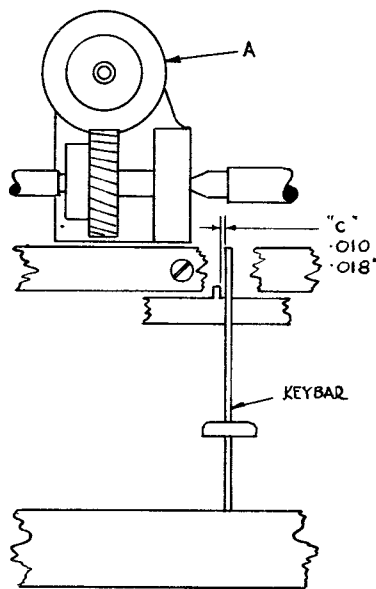


FIG. 23

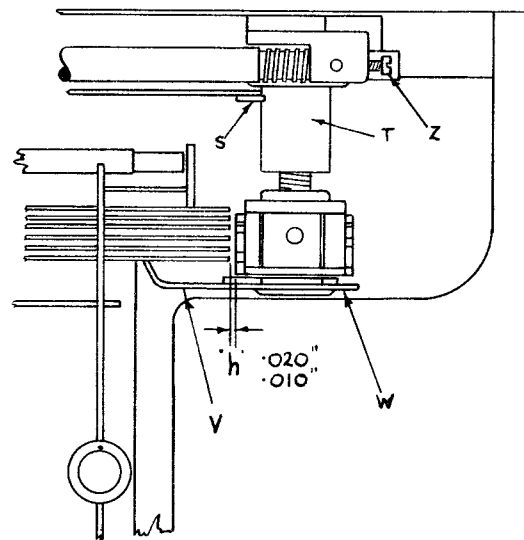


FIG. 24.

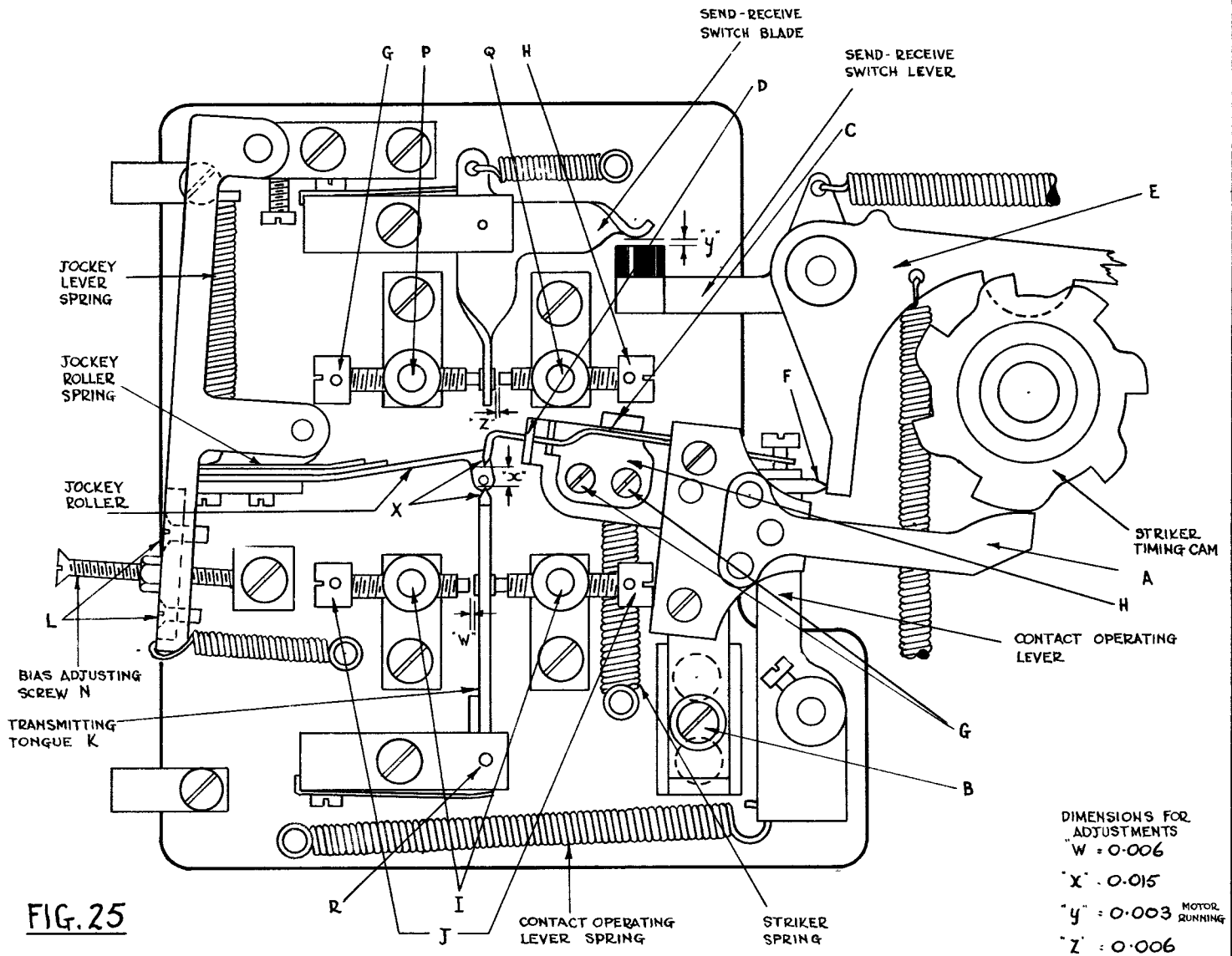


FIG. 25

### ADJUSTMENTS

- EXAMINE PARTS FOR WEAR AND DAMAGE, PARTICULARLY THE STRIKER & TRANSMITTING TONGUE, KNIFE EDGES AND THE TRANSMITTING TONGUE PIVOT R. REPLACE WHERE NECESSARY.
40. DEPRESS ANY KEY & TURN MACHINE BY HAND UNTIL THE STRIKER TIMING LEVER A IS AT THE TOP OF THE CAM & THE KNIFE-EDGES X ARE IN LINE. ADJUST DIMENSION "X" BY SCREW B WITH THE STRIKER C HELD AGAINST THE TOP EDGE OF THE SLOT IN THE STRIKER LEVER D.
  41. DEPRESS "LTR SHIFT" KEY & TURN UNTIL TWO ADJACENT SELECTING LEVERS E (PREFERABLY 1st & 2nd) ARE IN THE SAME POSITION & TOUCHING THE INSULATED EDGE F. INSERT A 0.015" FEELER BETWEEN THE SELECTING LEVERS AND THE INSULATED EDGE; SLACKEN THE SCREWS G & ADJUST THE STOPPLATE H TO BEAR AGAINST RH EDGE OF THE SLOT IN THE STRIKER. RETIGHTEN THE SCREWS G.
  42. SLACKEN THE SCREWS I & TIGHTEN THE SCREWS J UNTIL THE TRANSMITTING TONGUE K IS IN LINE WITH THE KNIFE-EDGE OF THE STRIKER C. SLACKEN SCREWS J 0.003" EACH TO SATISFY DIMENSION "W". IF THE STRIKER DOES NOT FALL EQUALLY EACH SIDE OF THE TONGUE, CHECK THIS ADJUSTMENT.
  43. SLACKEN SCREWS L. ADJUST SCREW N UNTIL EQUAL FORCES OF 2.0-5.0 oz MOVE THE TONGUE K FROM SIDE TO SIDE (MEASURED AT THE KNIFE-EDGE). RETIGHTEN THE SCREWS L.
  44. WITH THE MOTOR RUNNING, ADJUST CONTACT G TO SATISFY DIMENSION "Y" & CLAMP BY SCREW P.
  45. ADJUST CONTACT H TO SATISFY DIMENSION Z AND CLAMP BY SCREW Q



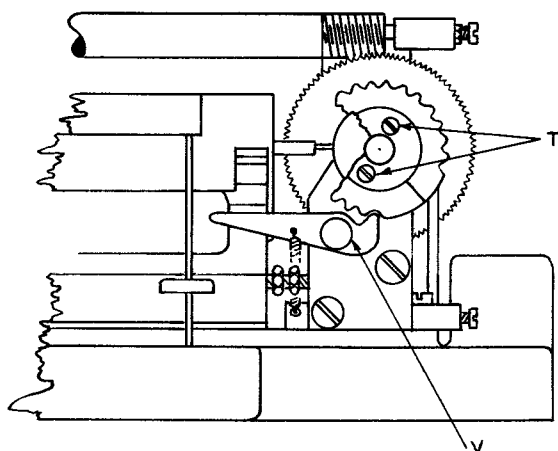


FIG 26

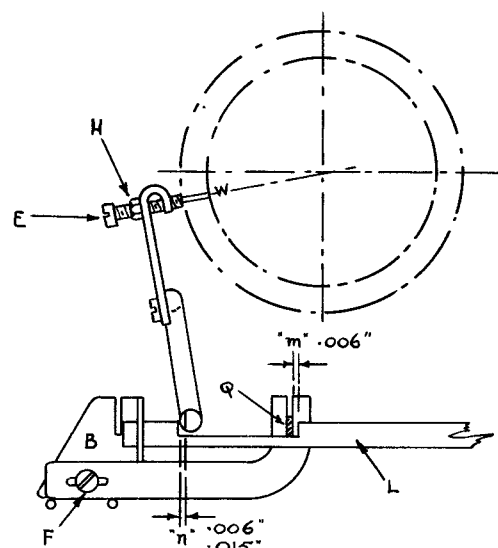


FIG 27

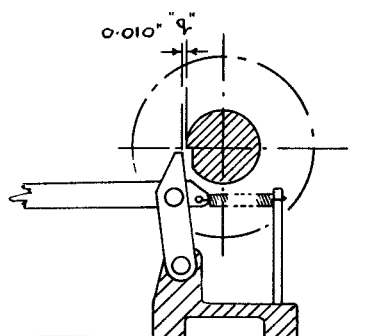


FIG 28

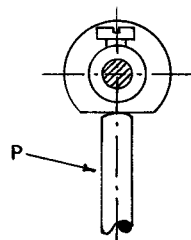


FIG 29

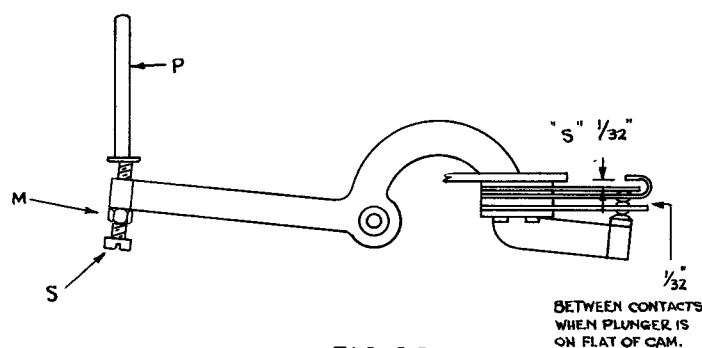


FIG 30

### ADJUSTMENTS

46. WITH THE KEYBOARD NORMAL, RELEASE THE ANSWER-BACK DETENT MANUALLY. TURN THE MACHINE BY HAND & ENSURE THAT THE COMB-BARS CANNOT SLIP OVER OR UNDER THE WARDS OF THE ANSWER-BACK UNIT. CORRECT THE ADJUSTMENT BY HOLDING THE LEVER V IN A NOTCH & CLAMP THE DRUM CORRECTLY BY SCREWS T (FIG 26)
47. WHEN "D" KEY IS DEPRESSED THE KEYBAR EXTENSION Q (FIG 27) SHOULD SATISFY DIMENSION "m". ADJUST BY SLIDING THE GUIDE B, CLAMP BY SCREW F. TO REDUCE ANY FRICTION IN THE GUIDE, PUT A SET IN THE KEYBAR EXTENSION Q AS REQUIRED.
48. ALLOW THE ANSWER-BACK BELL CRANK W (FIG 27) TO FALL. ADJUST THE SCREW E TO SATISFY DIMENSION "q" (FIG 28) LOCK BY NUT H. WHEN THE "D" KEY IS NORMAL, DIMENSION "n" (FIG 27) SHOULD BE SATISFIED.
49. ROTATE THE ANSWER-BACK DRUM UNTIL THE PLUNGER P (FIG 29) IS FULLY DEPRESSED. CHECK THAT THE ALARM CONTACTS ARE CLOSED & THAT ADJUSTMENT "s" (FIG 30) (UNDERNEATH MAIN BASE) IS CORRECT.
50. WITH THE ANSWER-BACK DRUM NORMAL, THE PLUNGER P (FIG 29) SHOULD BE IN ITS HIGHEST POSITION. ADJUST SCREW S (FIG 30) UNTIL CLEARANCE BETWEEN ALARM CONTACTS IS 1/32" LOCK BY NUT M.

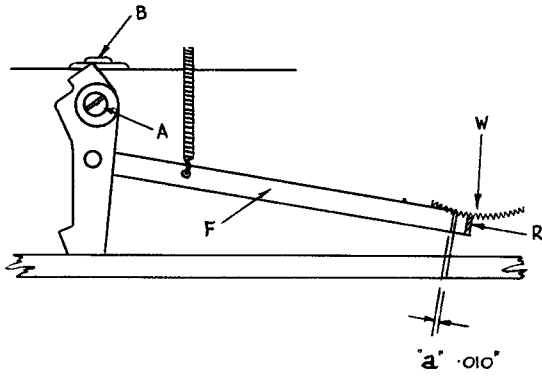


FIG. 31.

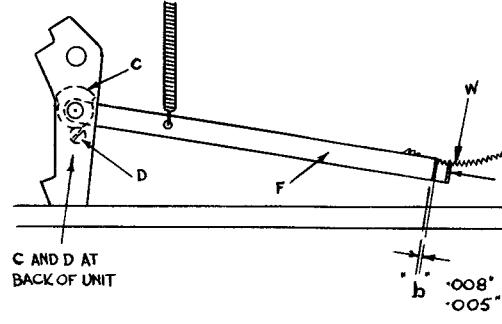


FIG 32

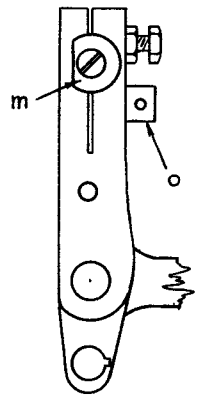


FIG. 35

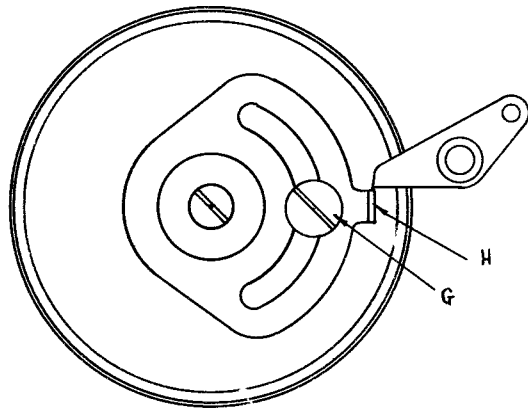


FIG. 33

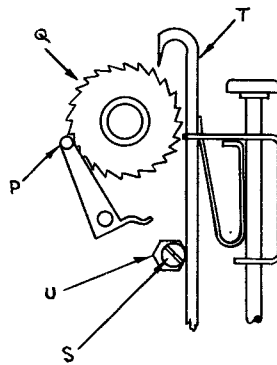


FIG. 36

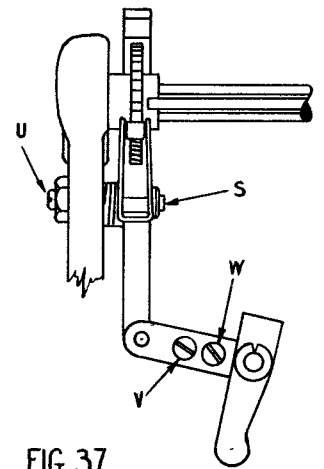


FIG. 37

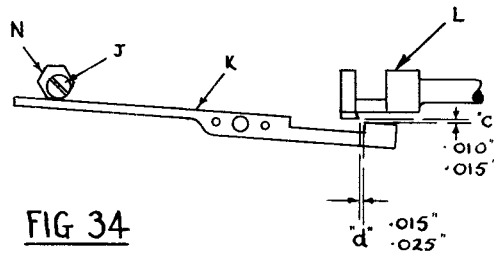


FIG 34

### ADJUSTMENTS

REMOVE THE PAPER CARRIAGE UNIT FROM THE MACHINE:

51. PUSH THE CARRIAGE TO ITS EXTREME RH POSITION & ADJUST THE CARRIAGE FEED PAWL .010" FROM THE NEXT TOOTH OF THE RATCHET USING ECCENTRIC A. (DIMENSION "a" FIG 31). LOCK BY SCREW B.

52. FEED THE CARRIAGE A FEW SPACES TO THE LEFT. THEN ADJUST ECCENTRIC C SO THAT, WITH THE RETENTION PAWL R ENGAGED WITH RATCHET W, THERE SHOULD BE .005"-.008" BETWEEN THE FEED PAWL & THE NEXT TOOTH (DIMENSION "b" FIG 32). LOCK BY SCREW D (BACK OF UNIT)

REPLACE THE PAPER CARRIAGE ON THE MACHINE.

53. SLACKEN SCREW G AND ADJUST TRIGGER PLATE H (FIG 33) SO THAT THE BELL RINGS 55 CHARACTERS FROM THE BEGINNING OF THE LINE. RETIGHTEN SCREW G.

54. ADJUST THE CLEARANCE BETWEEN THE COLUMN & CARRIAGE RETURN DOGS K & THE CROSSHEAD L TO SATISFY DIMENSION "C" USING ECCENTRIC J. (FIG 34.) CLAMP BY NUT N. CHECK THAT THE ECCENTRIC J IS NOT FOULED WHEN THE CARRIAGE RETURN CONTROL LEVER OPERATES.

55. TURN THE MACHINE BY HAND UNTIL THE TRAVERSING LINK IS FARTHEST FROM THE CARRIAGE. THEN DIMENSION "d" (FIG 34) MAY BE ADJUSTED BY ECCENTRIC M (FIG 35) ON THE FEED LEVER, CLAMP BY SCREW O.

56. ENGAGE THE JOCKEY ROLLER P IN THE RATCHET WHEEL Q SO THAT IT BEDS RIGHT HOME. (FIG 36). ADJUST THE FEED PAWL T SO THAT WHEN DEPRESSED IT SLIDES DOWN THE INCLINED FACE AT THE BACK OF THE TOOTH SO THAT THE PAWL IS MOVED AWAY FROM THE CENTRE OF THE RATCHET WHEEL. USE ECCENTRIC S. LOCK BY NUT U.

57. RETURN THE FEED PAWL T TO NORMAL. ENGAGE THE LINE FEED DOG WITH THE CROSSHEAD & TURN THE MACHINE BY HAND UNTIL THE FEED PAWL IS AT THE BOTTOM OF ITS STROKE. THE RATCHET WHEEL Q SHOULD NOW HAVE REVOLVED ONE TOOTH & THE JOCKEY ROLLER SHOULD AGAIN BED HOME. ADJUST, WITH THE FEED PAWL AT THE BOTTOM OF ITS STROKE, BY MOVING ECCENTRIC V (FIG 37) UNTIL THE ROLLER BEDS HOME. RECLAMP BY NUT & BOLT W. SWITCH TO DOUBLE LINE FEED & CHECK THE OPERATION.

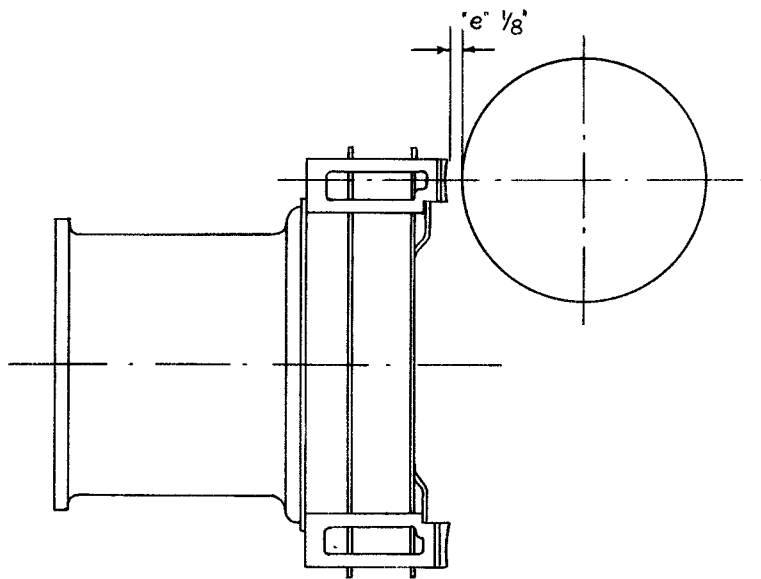


FIG. 38

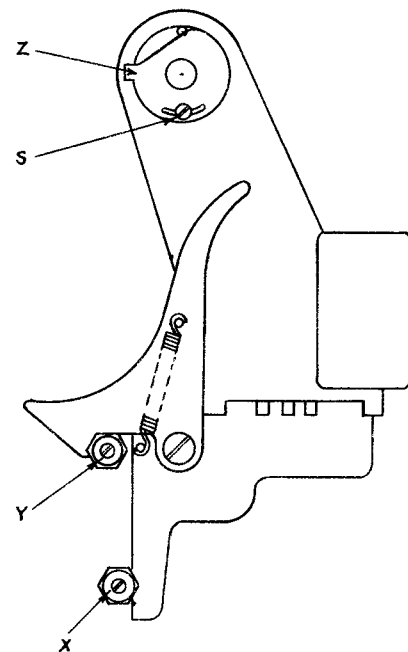


FIG. 39

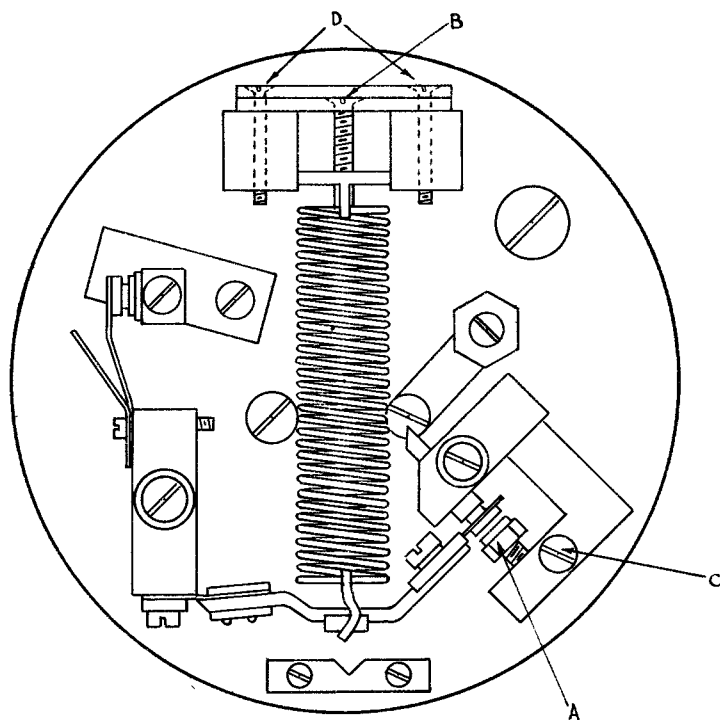
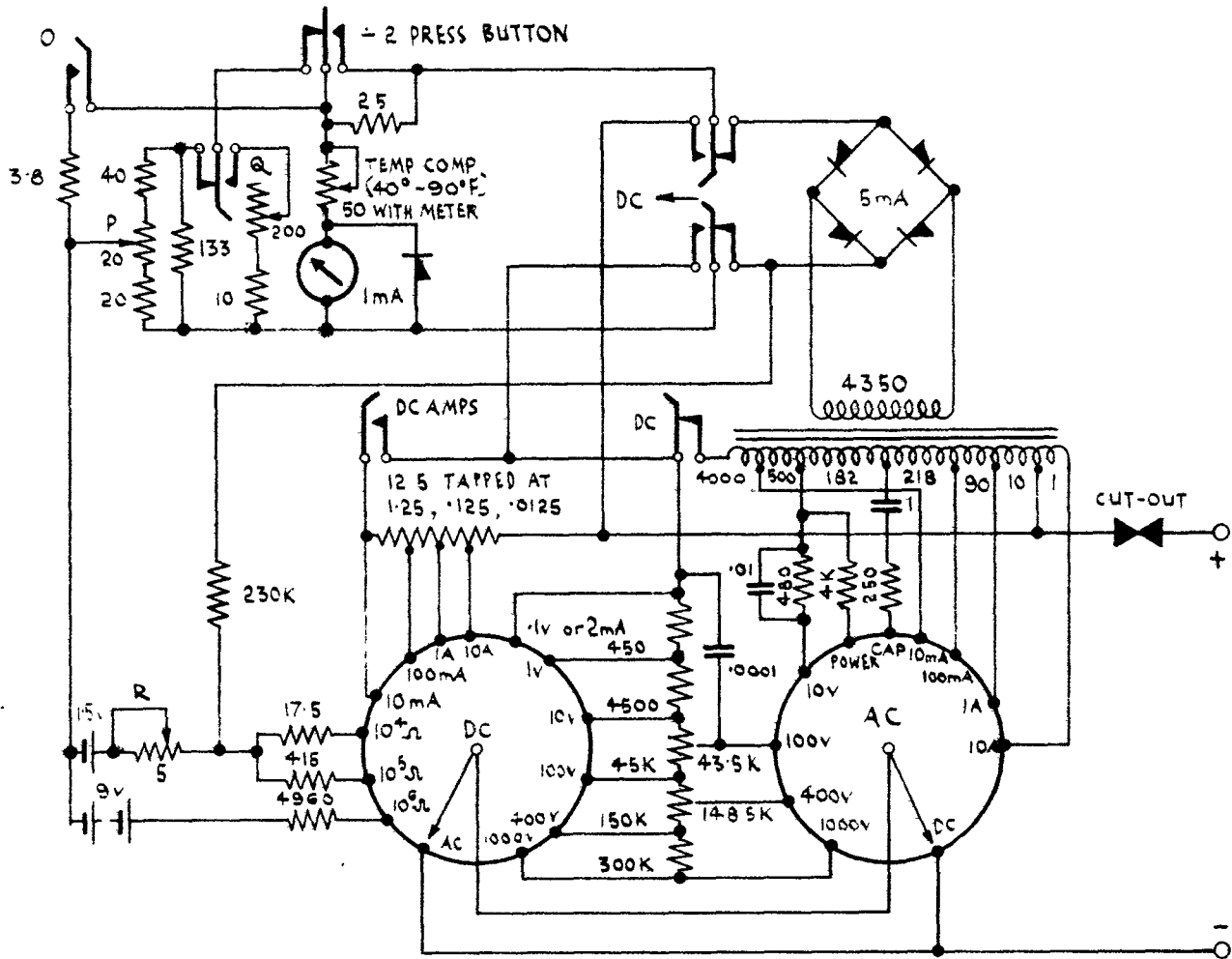


FIG. 40

## ADJUSTMENTS

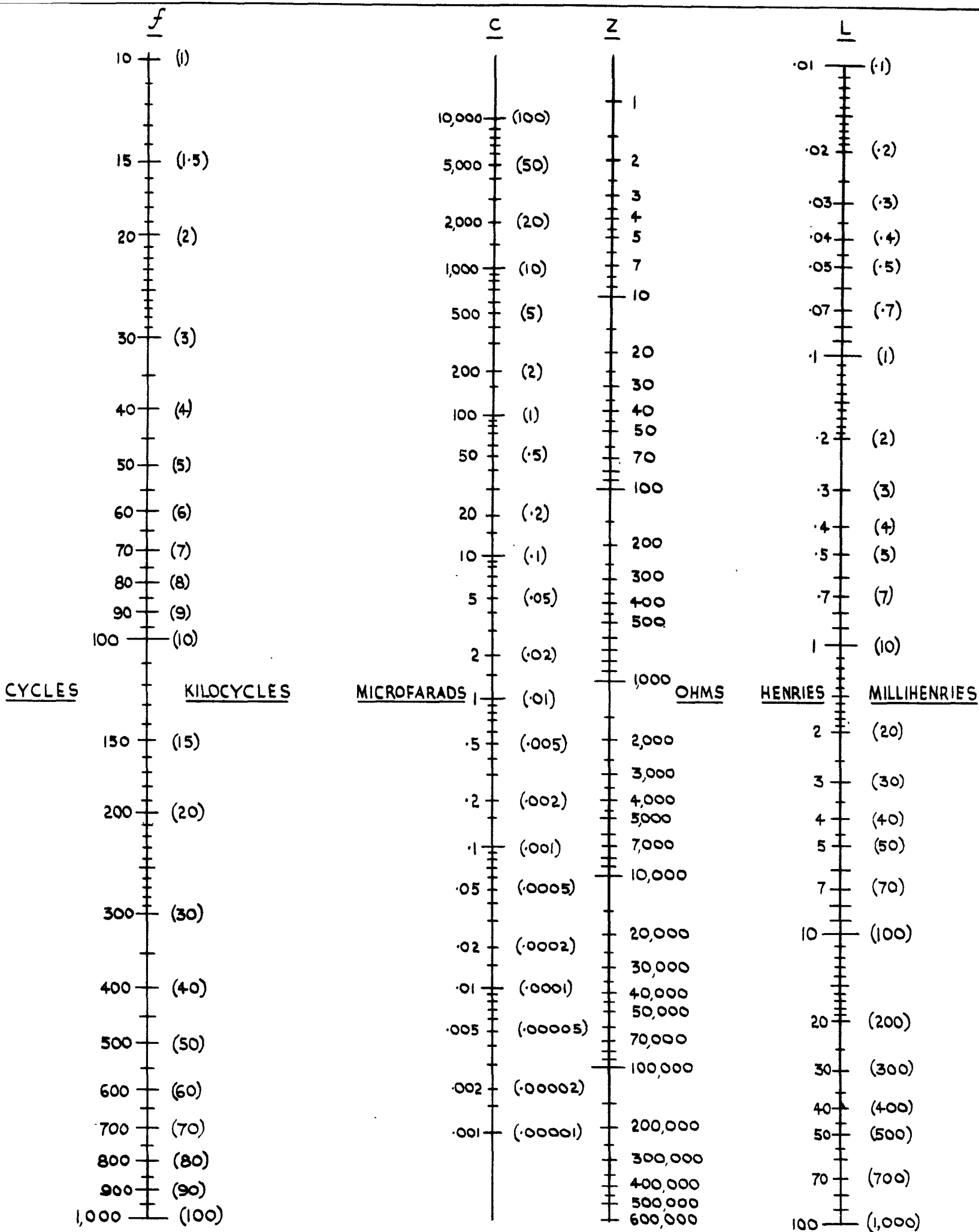
58. WHEN THE PAPER CARRIAGE IS LATCHED IN POSITION IT SHOULD NOT UNLATCH UNDER PRESSURE AT R.H. END WITHOUT THE LATCH FIRST HAVING BEEN DISENGAGED. DIMENSION "e" (FIG. 38) SHOULD BE CORRECT. ADJUST BY THIS ECCENTRIC & CLAMP SCREW X (FIG. 39). THEN ADJUST THE UPPER SLEEVE UNTIL THE LATCH FUNCTIONS CORRECTLY, LOCKING BY SCREW Y.
59. ADJUST THE CARRIAGE AIR PISTON BY MOVING THE VALVE PLATE Z UNTIL THE CARRIAGE RETURN IS DAMPED SATISFACTORILY. LOCK BY SCREW S. THE PLATEN KNOB MUST BE REMOVED TO GAIN ACCESS TO SCREW S. THE PISTON MUST BE KEPT FREE FROM OIL AND GREASE.
60. THE CHARIOT RAIL MUST BE ADJUSTED SO THAT, AFTER SLACKENING ITS FIXING SCREWS, THE CHARIOT IS FREE IN ALL POSITIONS WITHOUT UNDUE SHAKE. WHEN THE CARRIAGE IS AT THE EXTREME R.H. END THE FLAT SPRING ON THE CHARIOT SHOULD BE LIGHTLY IN CONTACT WITH THE CHARIOT RAIL.
61. WHEN THE MACHINE IS IDLE FOR LONG PERIODS, RELIEVE THE PRESSURE ON THE PLATEN OR IRREGULARITIES WILL FORM ON THE SURFACE GIVING RISE TO FAULTY PAPER FEED.
62. THE GOVERNOR BRUSHES SHOULD BE SET SO THAT, WHEN NEW, THE TIP OF THE BACK OF THE BRUSH SPRING IS 1" FROM THE MOTOR SUPPORT PLATE, AS THE BRUSHES WEAR, PUT A SLIGHT SET IN THE SPRINGS TO MAINTAIN THE BRUSH PRESSURE. CHECK THAT THE GOVERNOR IS PUSHED RIGHT HOME ON THE MOTOR SPINDLE.

CHECK THE MOTOR SPEED USING THE STROBOSCOPE (642-9RPM) & ADJUST BY CONTACT SCREW A (FIG. 40) & GOVERNOR SPRING TENSION SCREW B. CLAMP BY SCREWS C & D RESPECTIVELY.



## AVOMETER MODEL 7

D.C. CURRENT		D.C. VOLTAGE		A.C. CURRENT		A.C. VOLTAGE	
RANGE	RESISTANCE	RANGE	RESISTANCE	RANGE	IMPEDANCE	RANGE	IMPEDANCE
0-1 mA } 0-2 mA } 0-5 mA } 0-10 mA }	50 ohms 10 ohms	0-50mV } (1mA range) 0-100mV } (2mA range) 0-0.5V } 0-1V } 0-5V } 0-10V } 0-50V } 0-100V } 0-200V } 0-400V } 0-500V } 0-1000V }	50 ohms 500 ohms 5K 50K 200K 500K	0-5mA } 0-10mA } 0-50mA } 0-100mA } 0-500mA } 0-1 Amp } 0-5 Amps } 0-10 Amps }	2.65 ohms .0265 .000265 .0000265	0-5V } 0-10V } 0-50V } 0-100V } 0-200V } 0-400V } 0-500V } 0-1000 }	500 ohms 50K 200K 500K
<b>CAPACITY</b>			<b>POWER</b> (In 4000 ohms)		<b>DECIBELS</b> (Reference 50mW)		
0-20 μF - First Indication			.01 μF		-10 to +15		
<b>RANGE</b>			<b>FIRST INDICATION</b>		'O' OPERATES ON 10K RANGE 'P' and 'R' ARE ZERO ADJUSTERS FOR 10K and 100K RANGES 'Q' IS ZERO ADJUSTER FOR 1M, 10M, 40M, AND CAPACITY RANGES		
0-10K			.5 ohm } Using internal 1½ v.				
0-100K			5 ohms }				
0-1M			50 ohms } Using internal 9v.				
0-10M			500 ohms }				
0-40M			2000 ohms }				



# RESONANCE & IMPEDANCE — AUDIO FREQUENCIES

SCHOOL OF SIGNALS  
 DRAWN BY W.H.F. 24.8.43  
 CHECKED BY S.H.S.

ADJUST THESE SPRINGS TO  
 BREAK FIRST

ADJUST SWITCHING LEVER TO  
 REST ON TOP OF SET IN SPRING  
 WHEN NORMAL (MIN. CONTACT  
 SEPARATION 10 MILS.)

APPROX 2 MILS HERE WHEN  
 DIAL IS OFF-NORMAL.

GOVERNOR CUP

IMPULSE WHEEL

EXAMINE FOR RUST OR WEAR

BEND WINGS TO ADJUST SPEED  
 INCREASE -INWARD: DECREASE -OUTWARD

SLIPPING CAM SHOULD RESIST PRESSURE  
 OF 60 GRMS APPLIED TANGENTIALLY  
 AT ① BUT WILL SLIP AT PRESSURE OF  
 80 GRMS.

FINGER STOP

GOVERNOR END PLAY  
 10 MILS  $\pm$  3 MILS.

EXAMINE FOR RUST  
 OR WEAR

SPRING SET ASSEMBLY

ADJUST BUFFER SPRING TO HAVE  
 CLEARANCE OF 6 MILS  $\pm$  1 MIL AT ④

RESIST 20 GRMS LIFT AT 30 GRMS  
 APPLIED AT ③ WITH DIAL AT NORMAL

SPRING WASHER ADJUSTED TO  
 TENSION SLIPPING CAM

RESIST 5 GRMS LIFT WITH 10 GRMS  
 APPLIED AT ②

SWITCHING LEVER

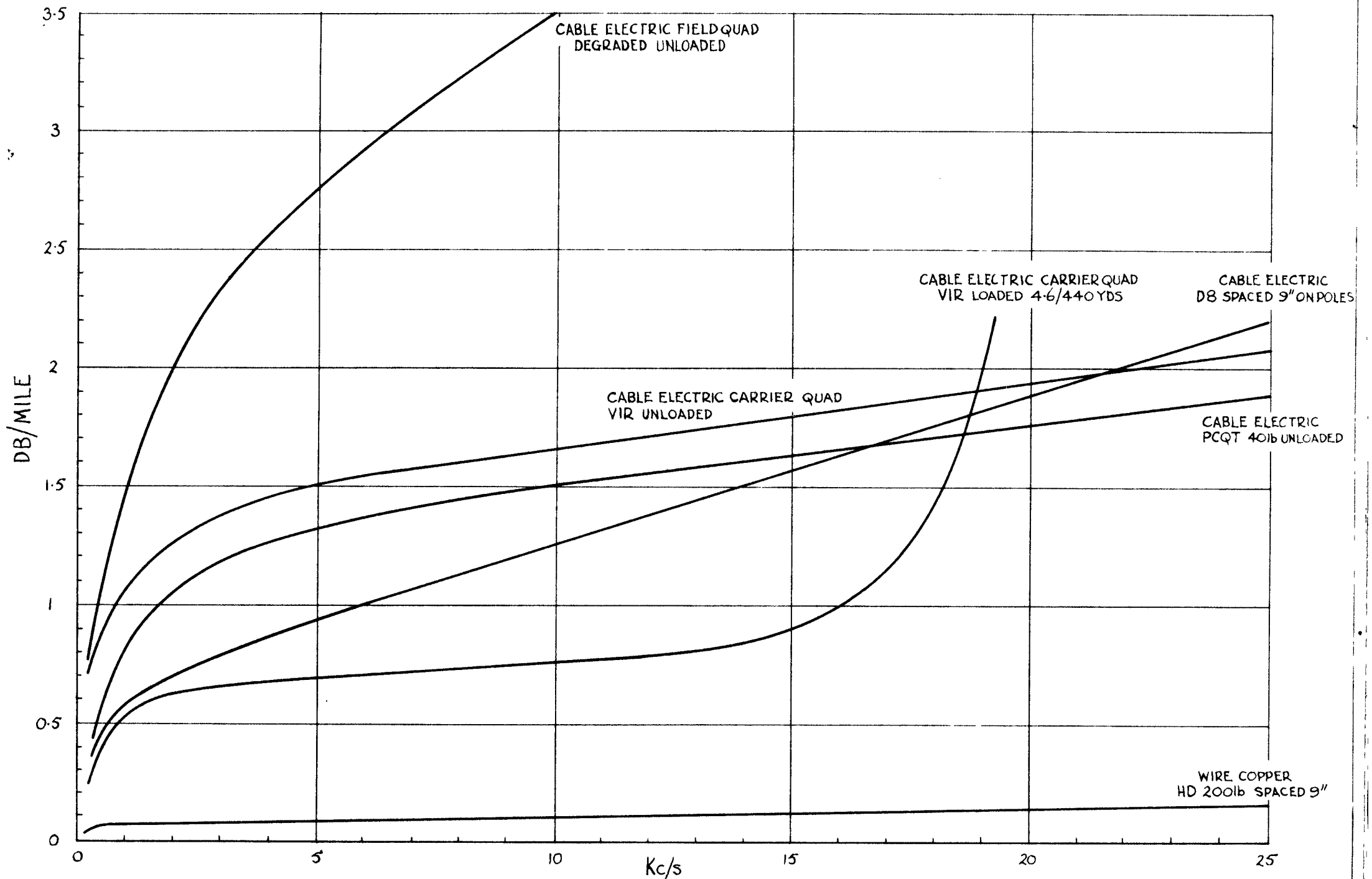
14 MILS MIN. WHEN IMPULSE LEVER IS  
 RESTING IN IMPULSE RECESS OF  
 SLIPPING CAM

CORNER OF TOOTH SHOULD BE SHEWING  
 IN THE CORNER OF THE IMPULSING RECESS  
 OF SLIPPING CAM. BEND PROJECTING  
 TONGUE OF SLIPPING CAM INWARDSTO  
 ADJUST

FORKED STOP

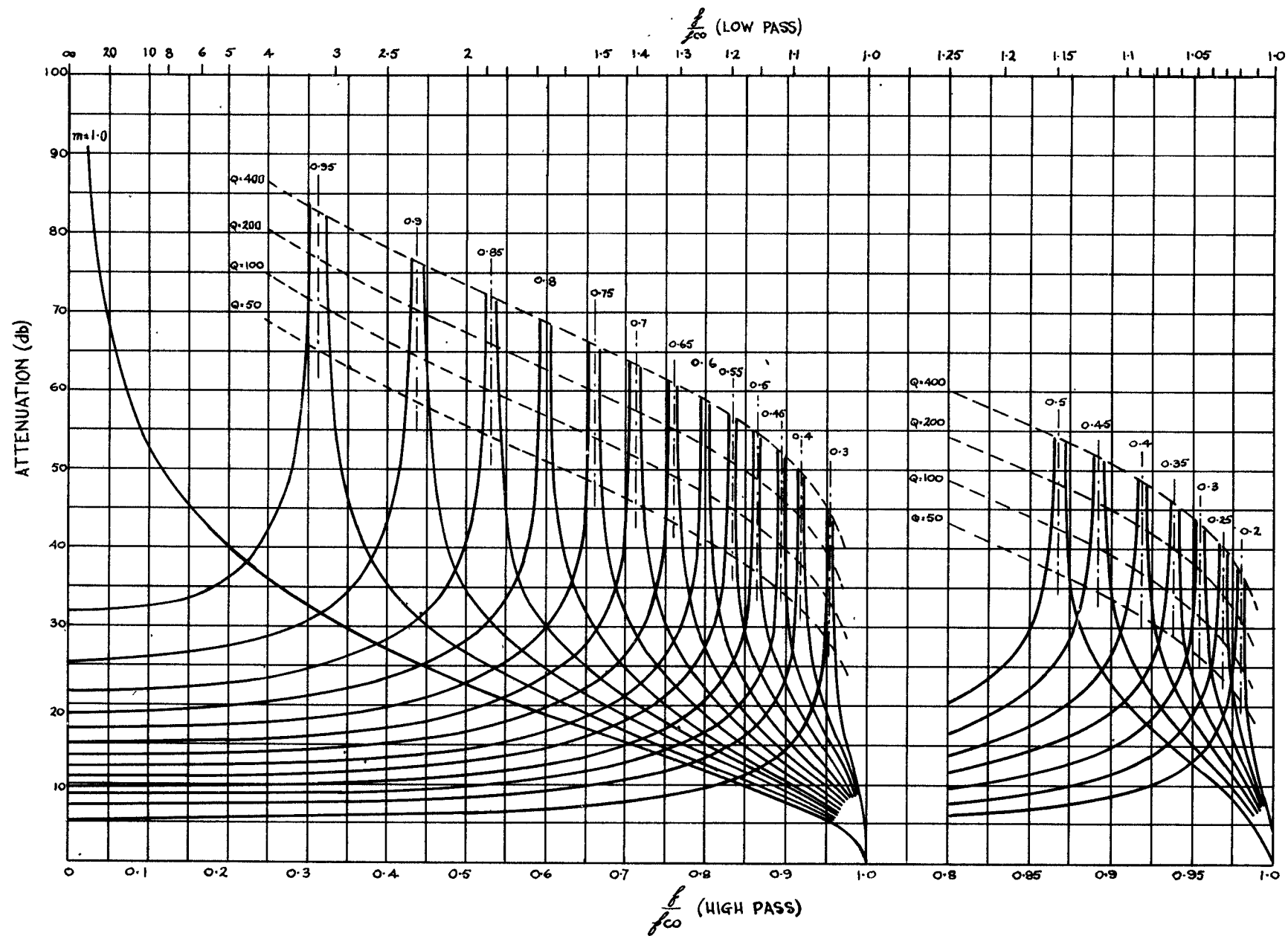
GOVERNOR PIVOT BEARING

# AUTO DIAL



CABLE CHARACTERISTICS

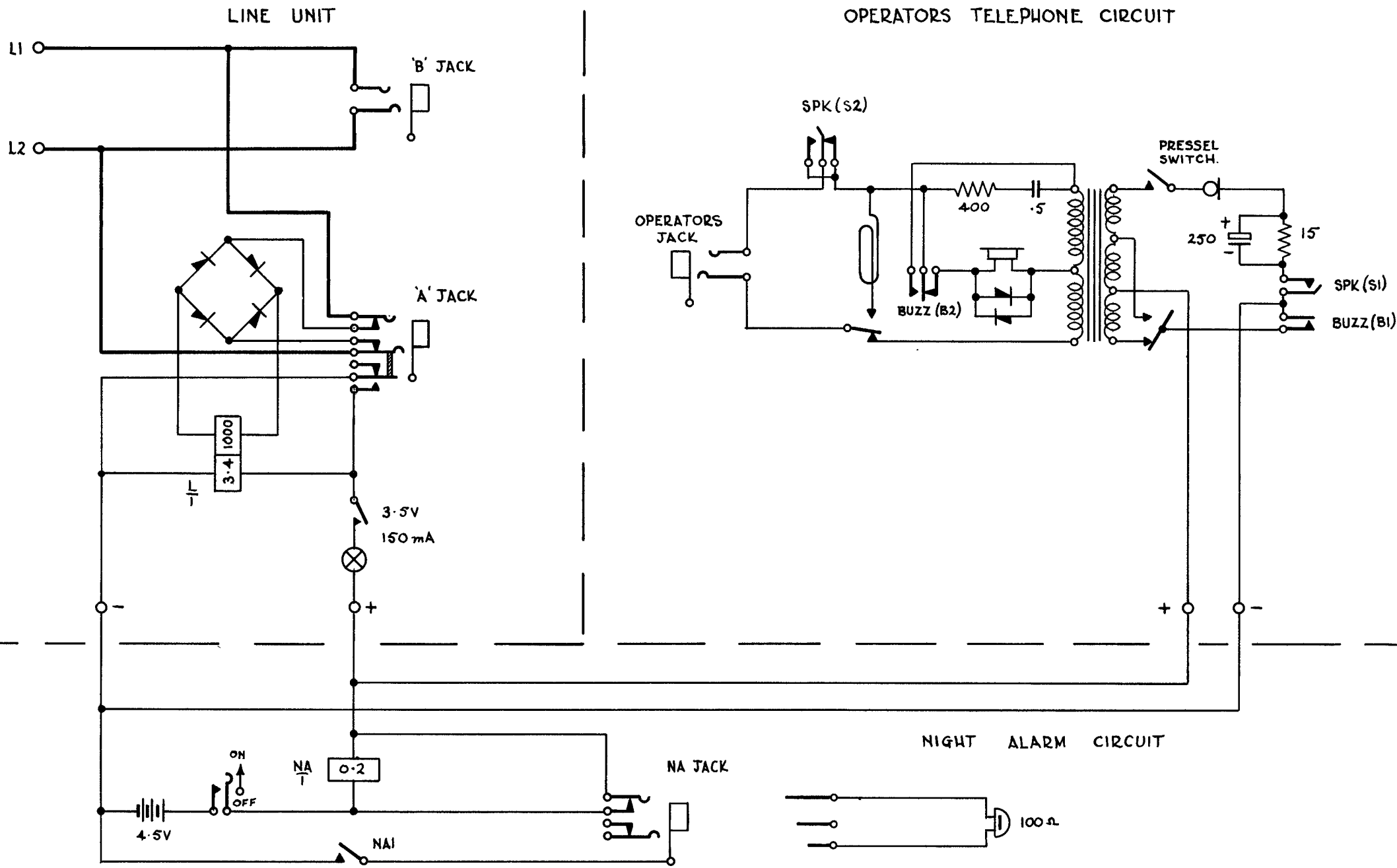
50112



FILTER · ATTENUATION CURVES

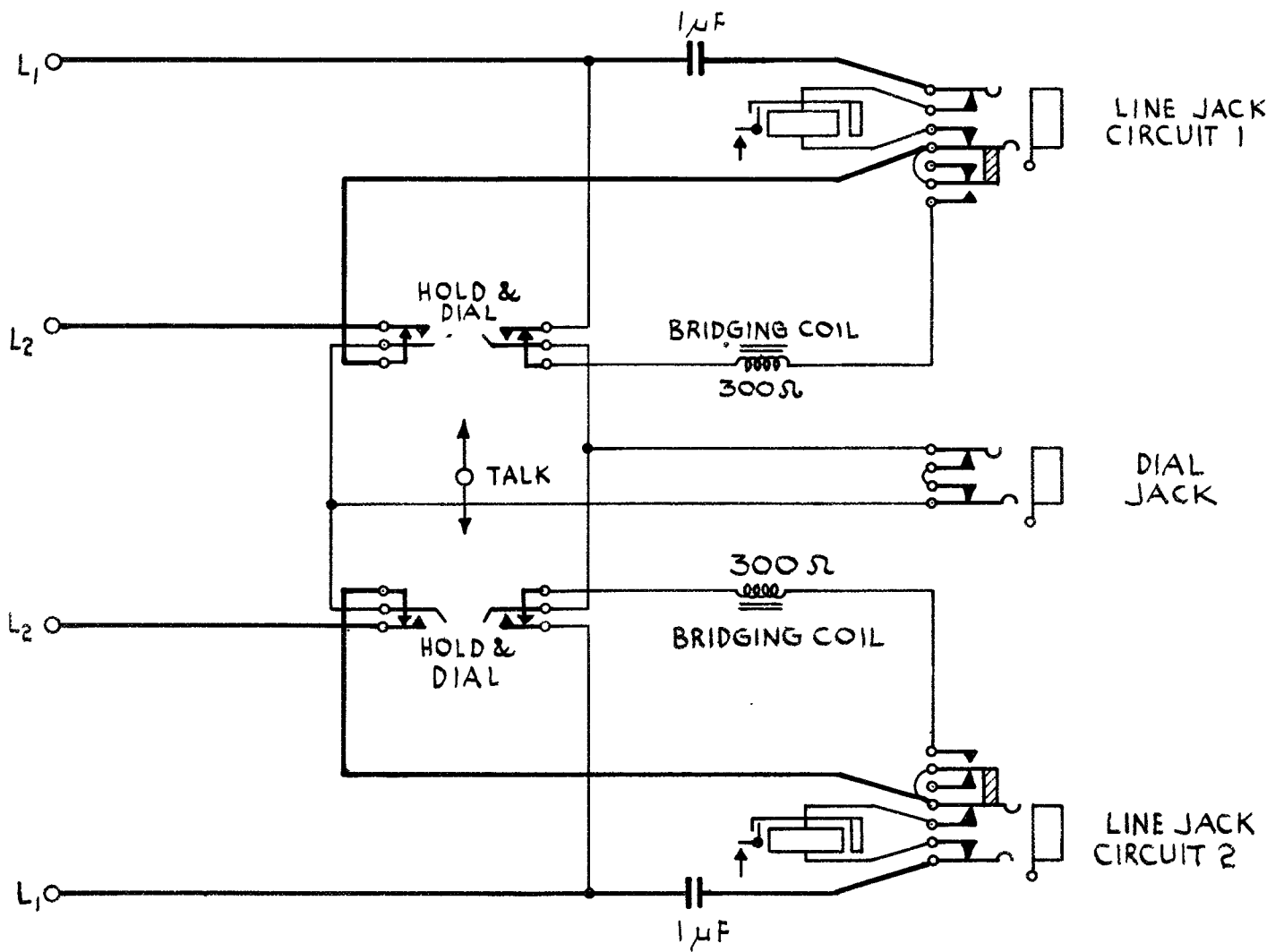
FE1/25



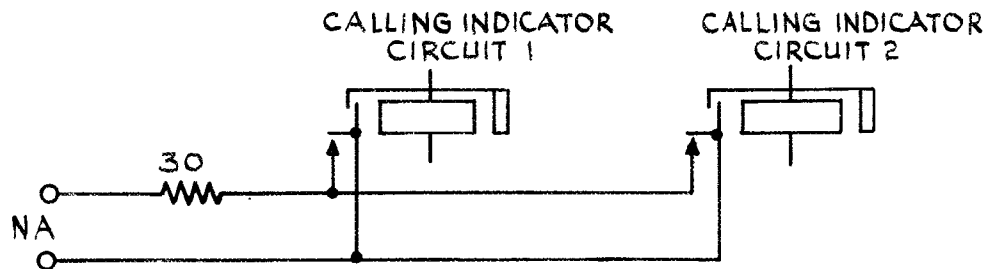


**SWITCHBOARD U.C. 10 LINE**

F1127



LINE CIRCUITS

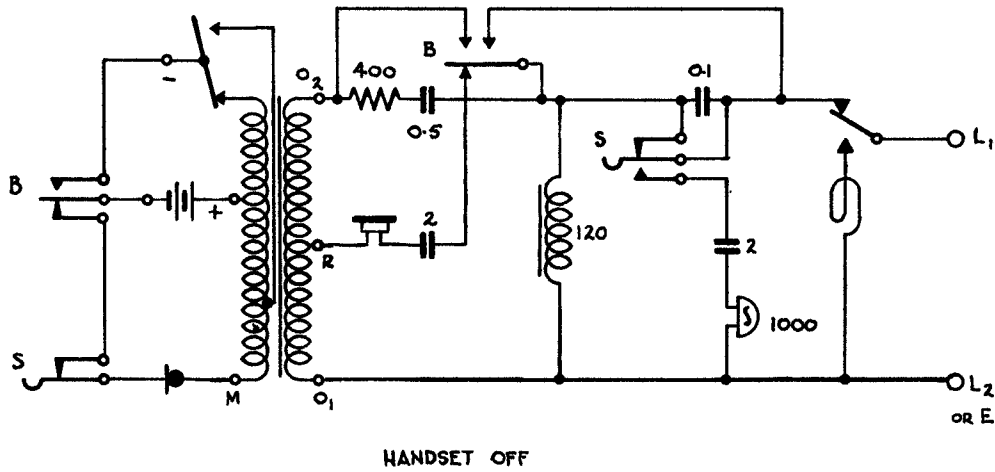


NIGHT ALARM CIRCUIT

U.C. 10 LINE  
CIVIL LINE UNIT

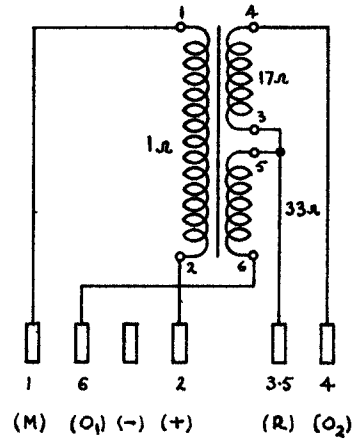
27 FEB 45 RNB

### TELEPHONE SETS 'F' MK I

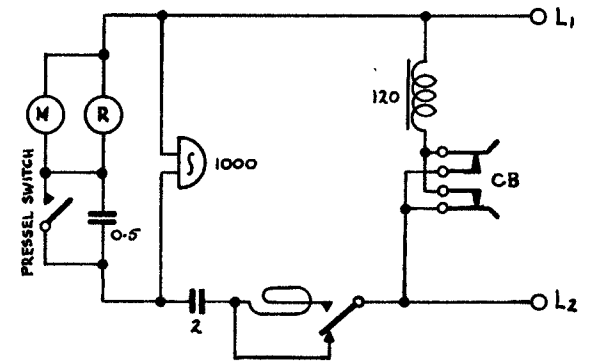


HANDSET OFF

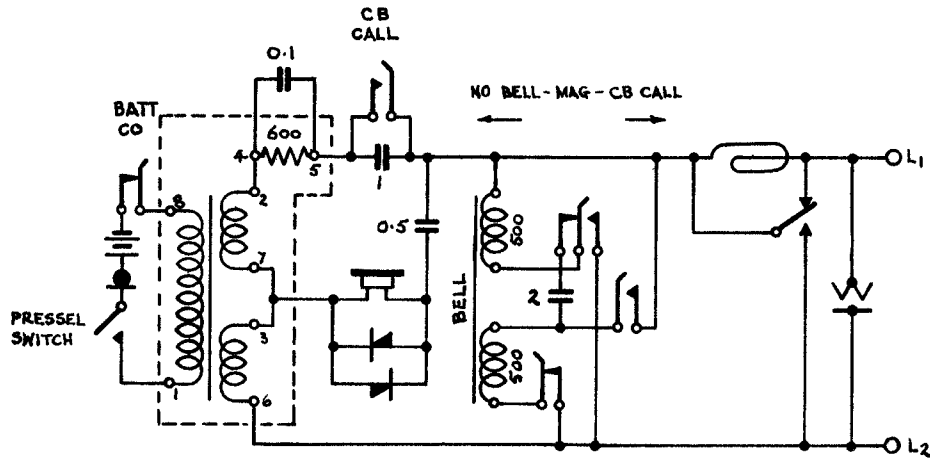
### COILS INDUCTION No 21 (MOUNTED)



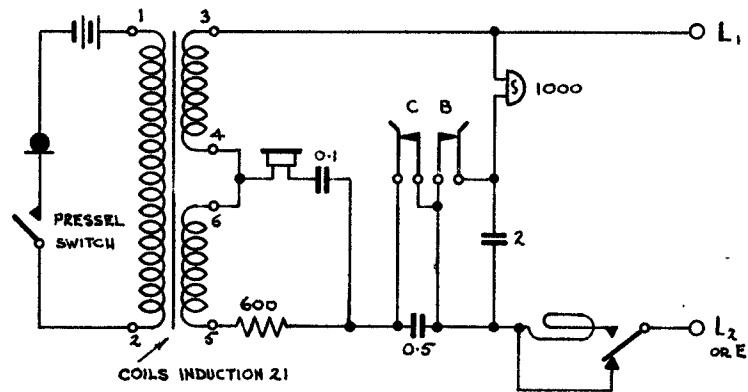
### TELEPHONE SETS 'H' MK III



### TELEPHONE SETS 'T'

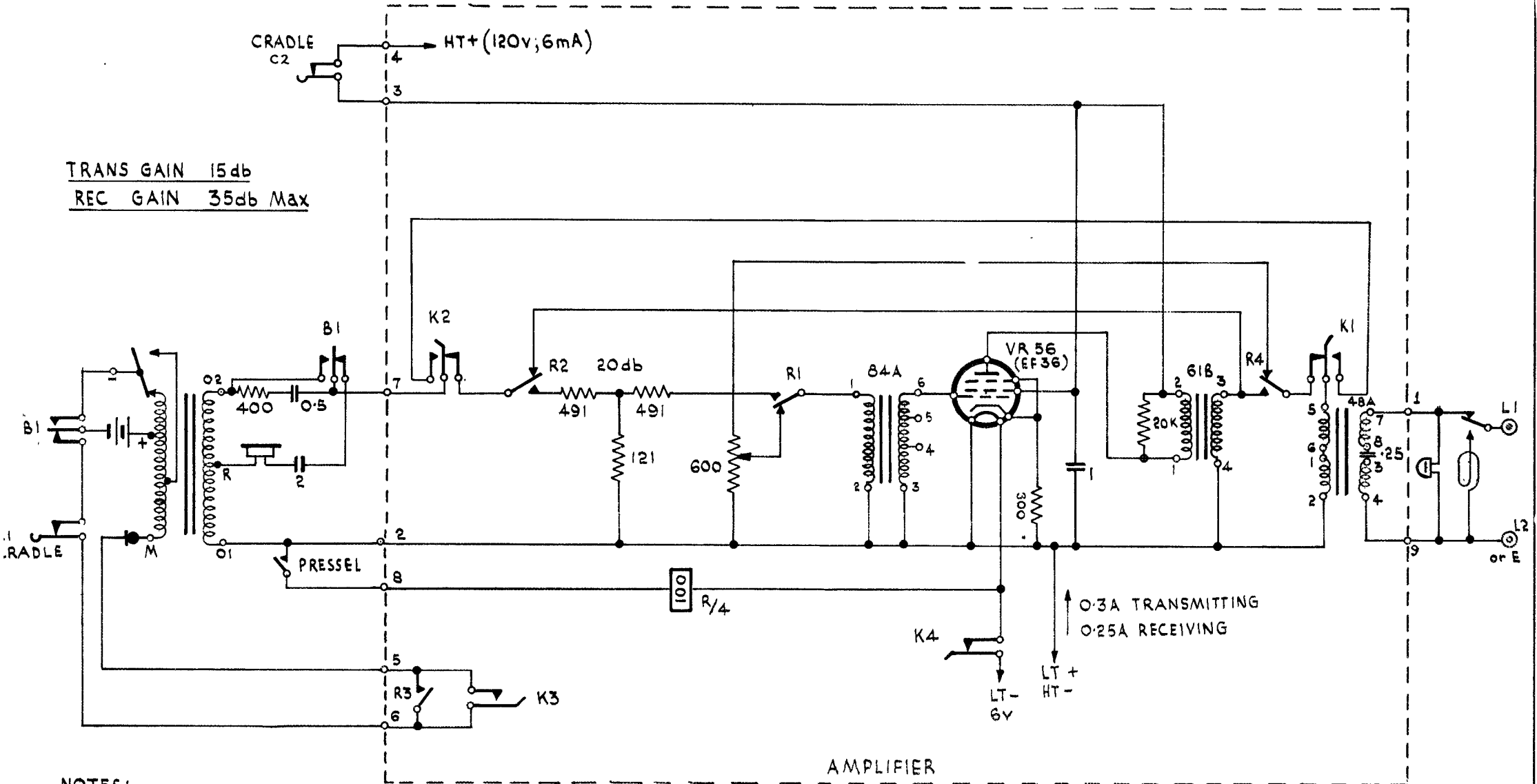


### TELEPHONE SETS 'L'



COILS INDUCTION 21

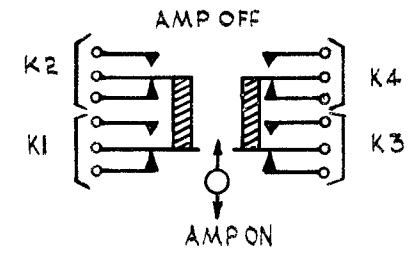
E 1 / 30



TRANS GAIN 15db  
 REC GAIN 35db Max

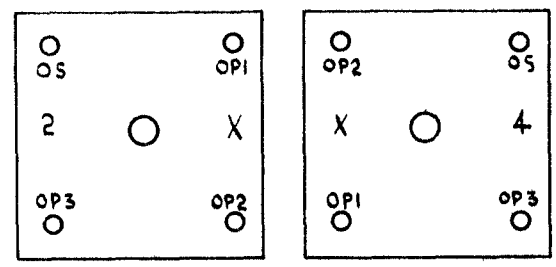
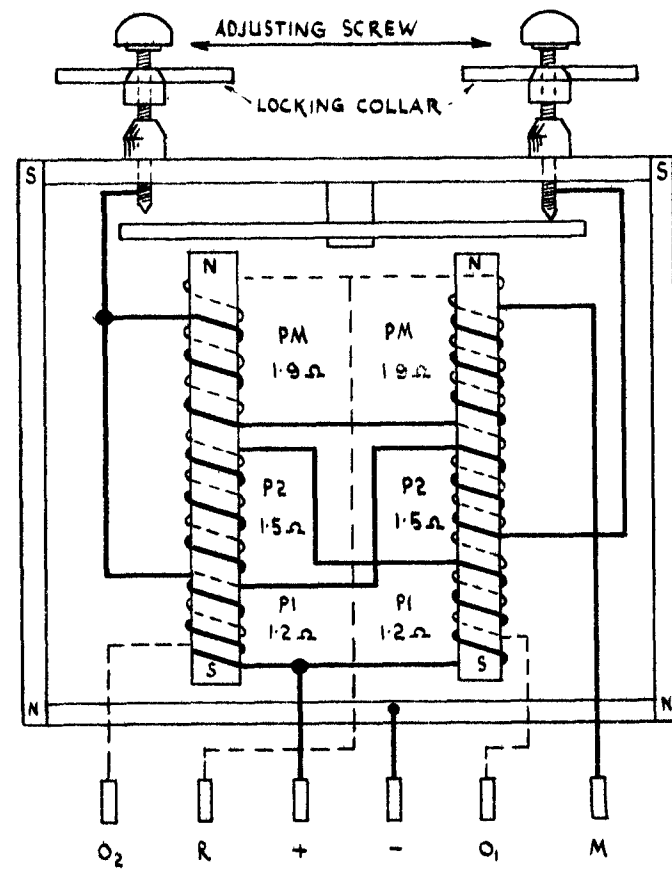
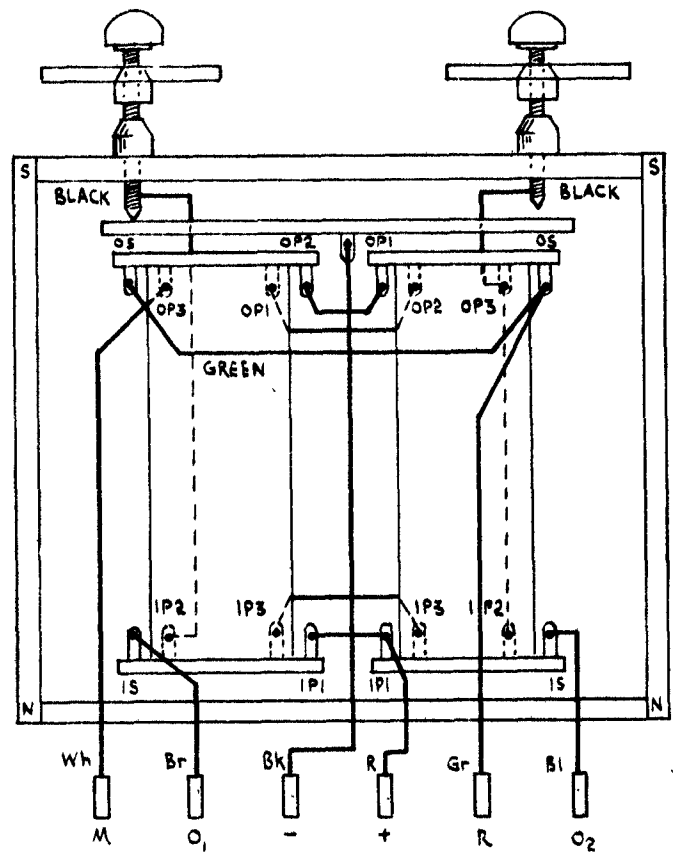
0.3A TRANSMITTING  
 0.25A RECEIVING

- NOTES:
1. REPLACING HANDSET SWITCHES OFF HT.
  2. TO SWITCH OFF L.T. THROW KEY TO 'AMP OUT'.
  3. SHOWN WITH HANDSET OFF.

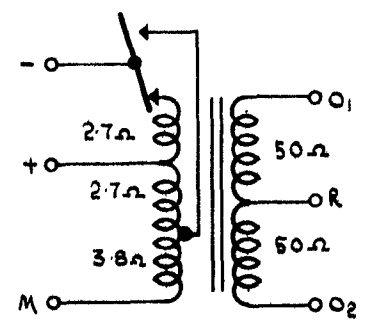


TELE 'F' HIGH POWER

F1/31



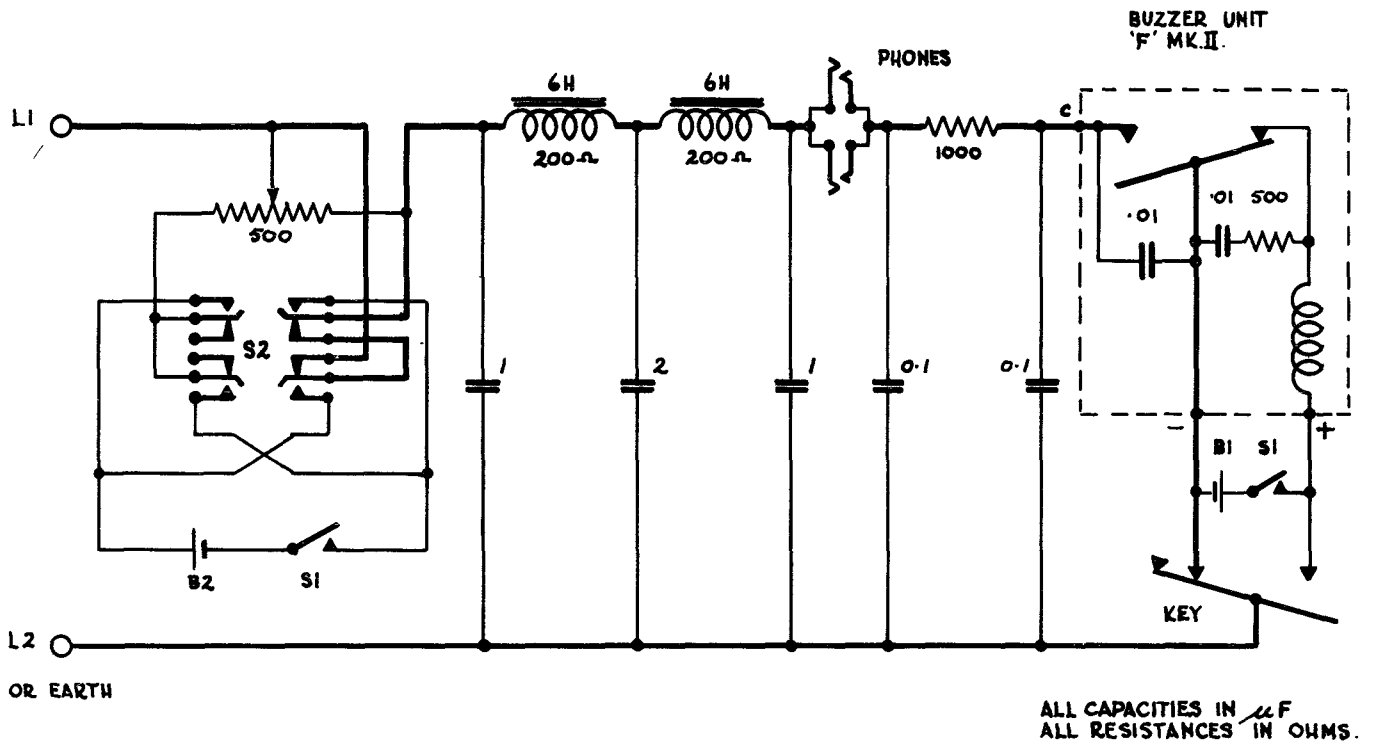
UPPER COIL CHEEK MARKINGS



**BUZZER UNIT 'T' MKI - PRACTICAL DETAILS**

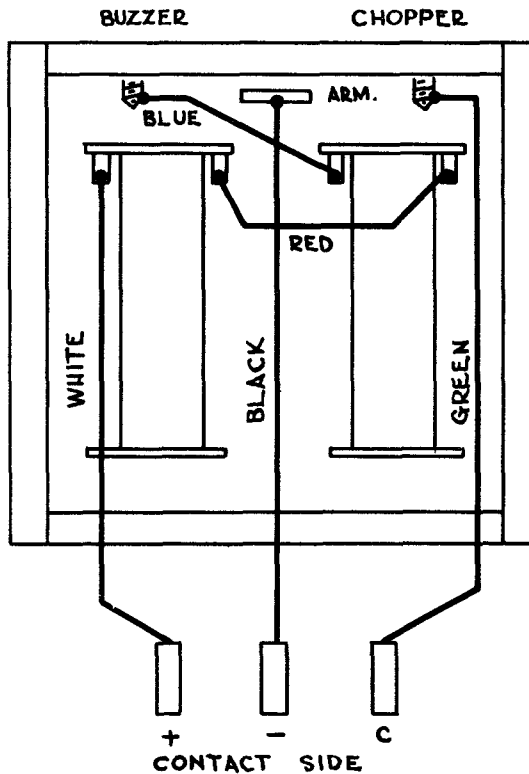
F1132

SCHOOL SIGNALS  
 DRAWN BY-RNB-15 OCT43  
 CHECKED BY- J. H. P.

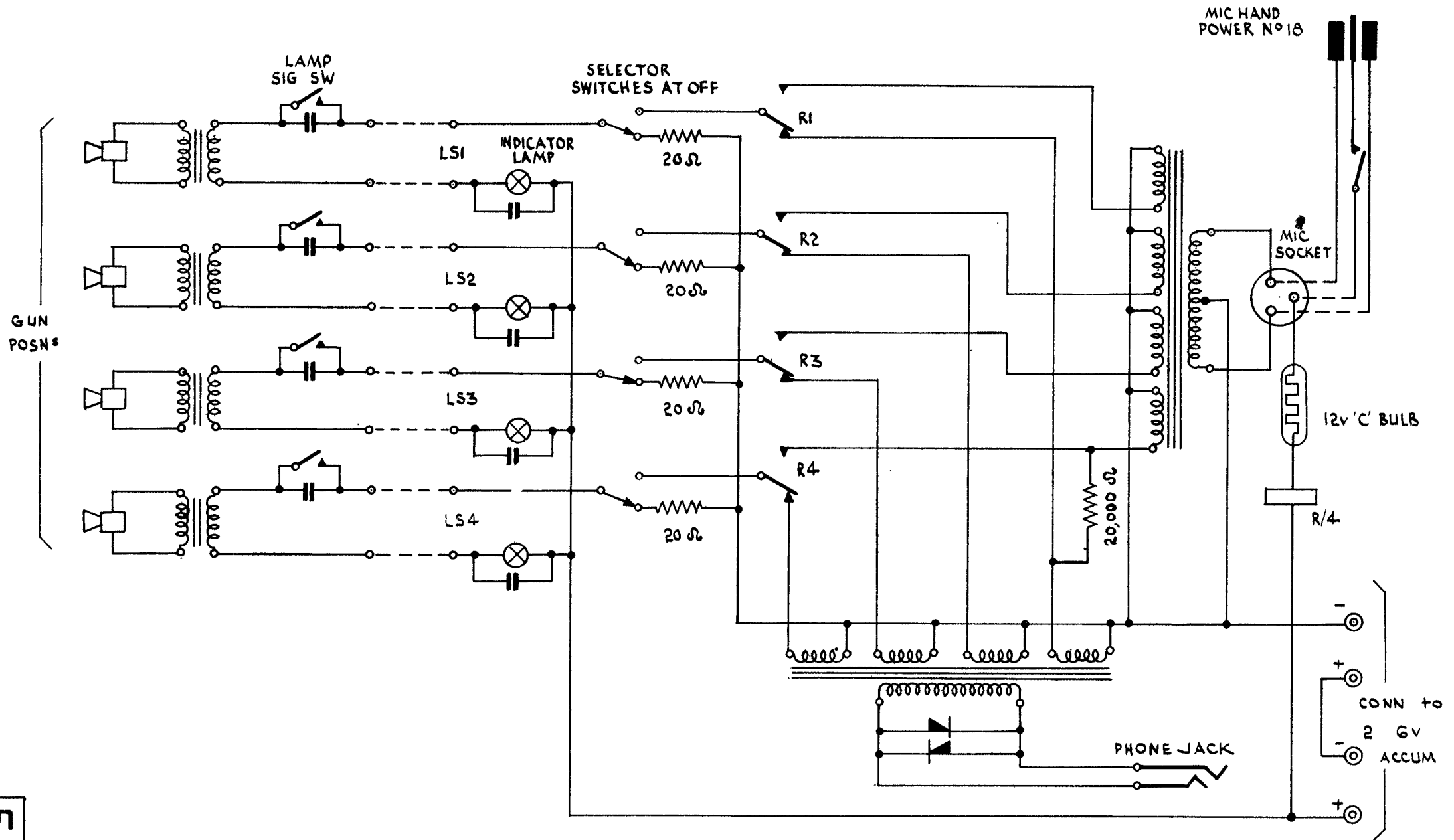


## FULLERPHONE MK IV \*

LEADS TO CONTACTS AND  
 ARMATURE ARE TAKEN  
 ROUND REAR OF UNIT

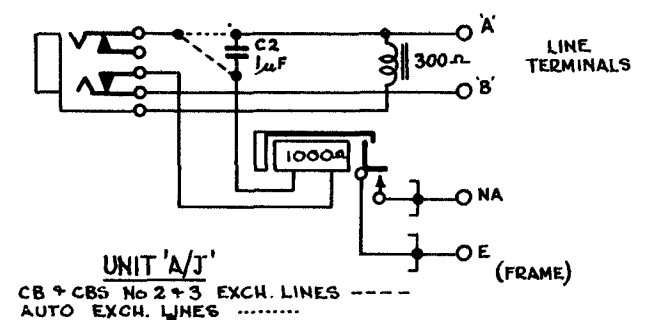
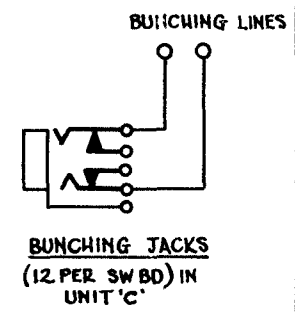
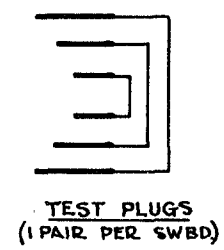
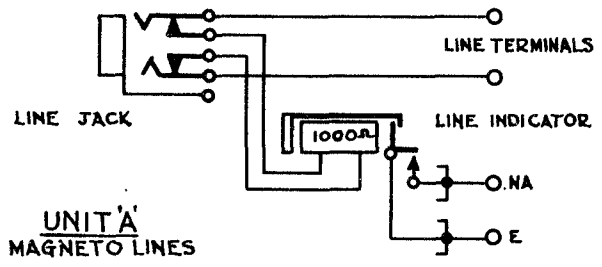


## Details of BUZZER UNIT 'F' MK II

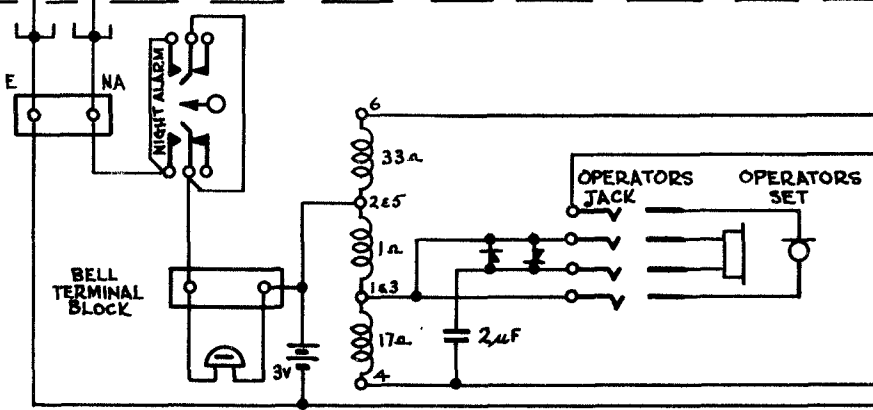
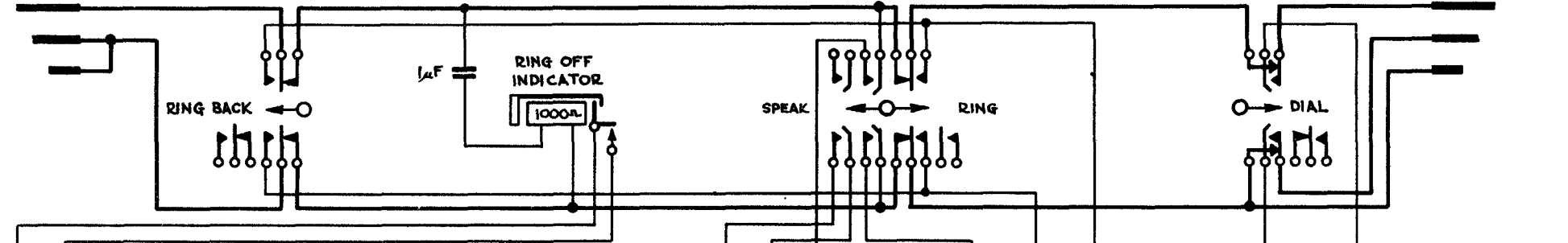


# TELEPHONES LOUDSPEAKING No 2

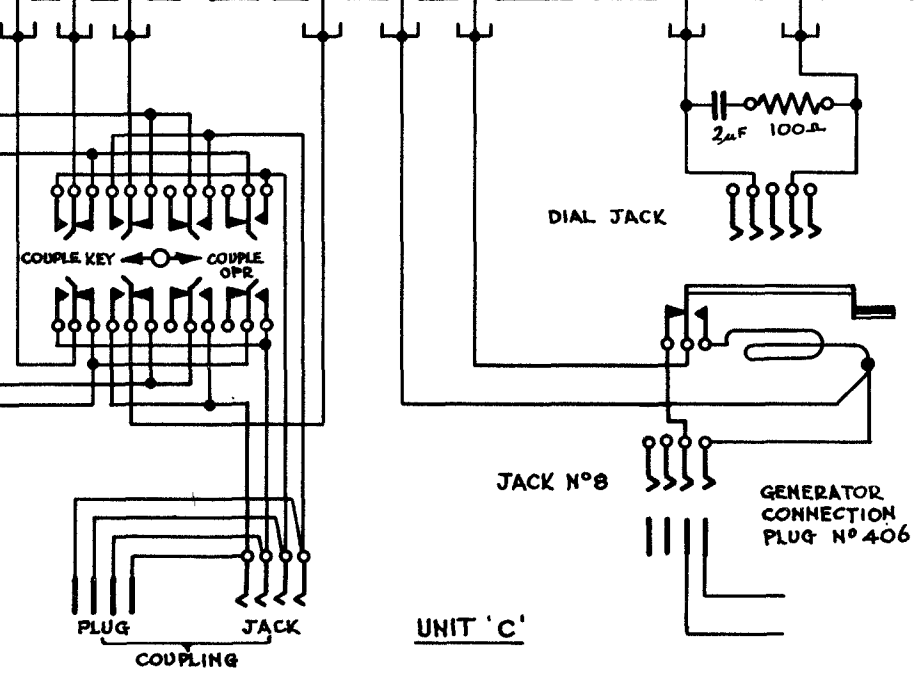
E1/38



'ANS' PLUG CORD CIRCUIT (12 PER SWBD) 'CALL' PLUG



OPERATORS CIRCUIT (1 PER SWBD)

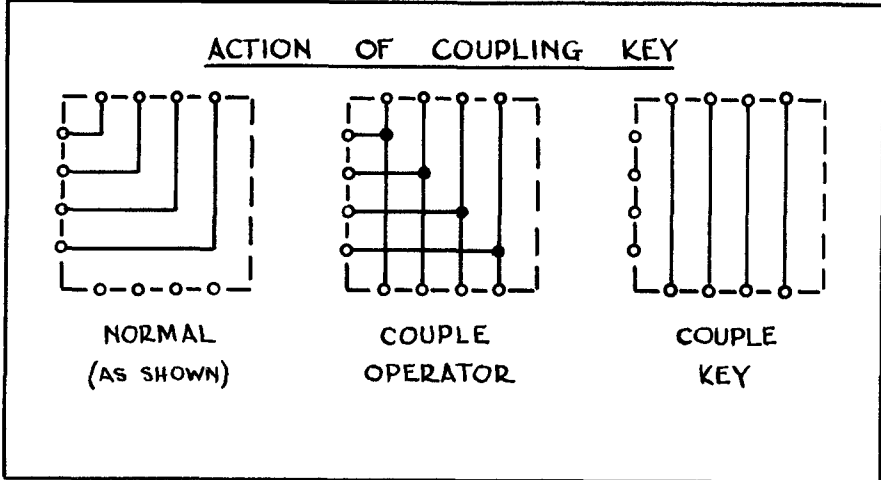
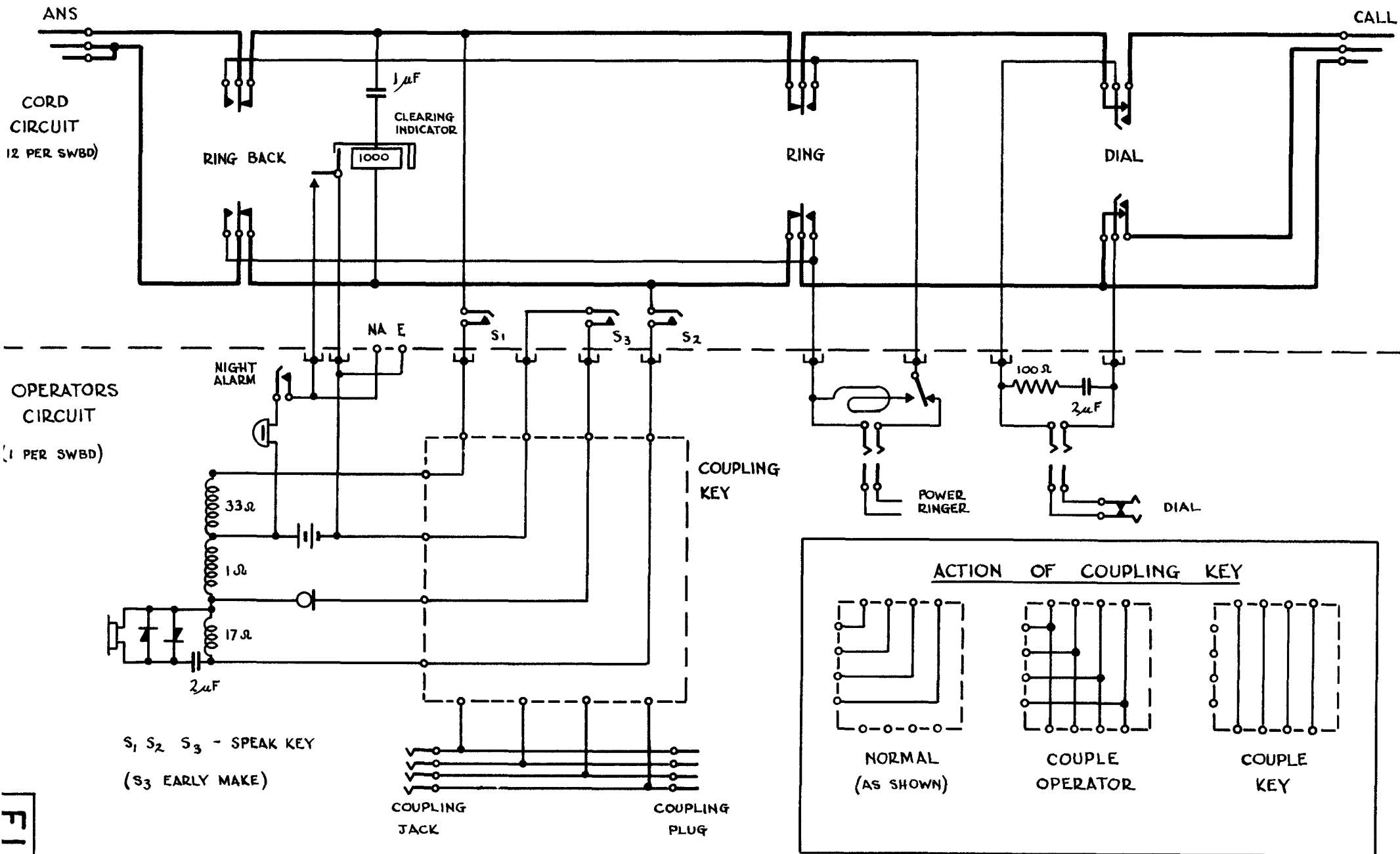


UNIT 'C'

SWITCHBOARD F & F MK I & MK I\*

E1/40





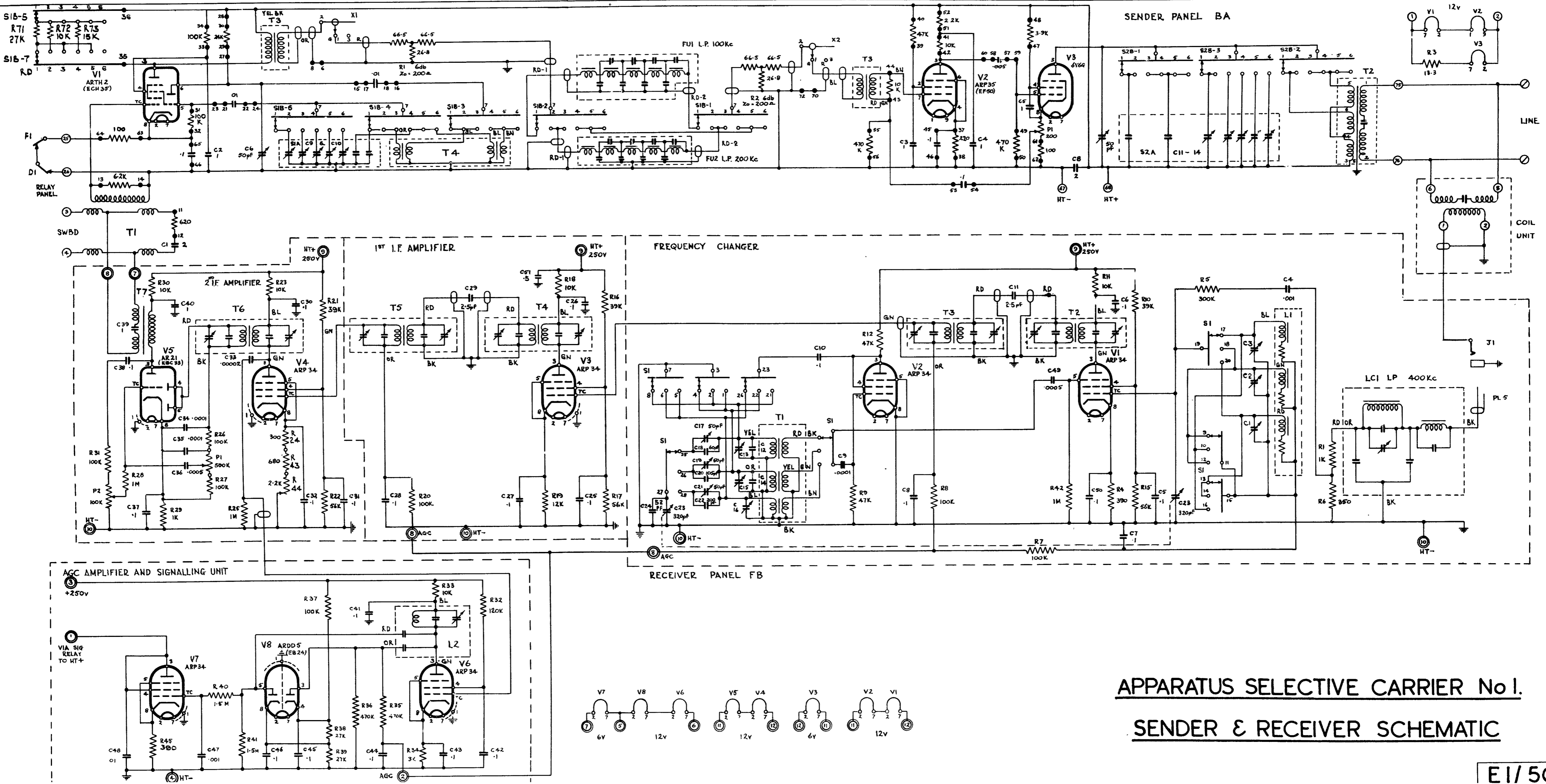
# SWITCHBOARD F & F MKI & MKI<sup>®</sup> SCHEMATIC - SIMPLIFIED

F1/41

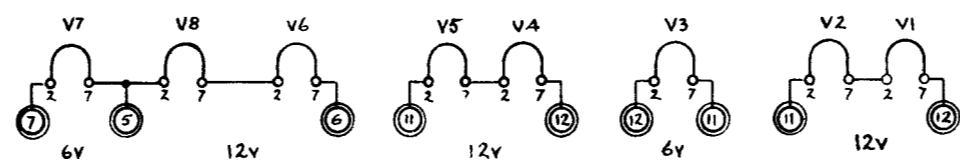
SCHOOL OF SIGNALS  
DRAWN BY: R.M. B. 1/4/46  
CHECKED BY: G.V.B.

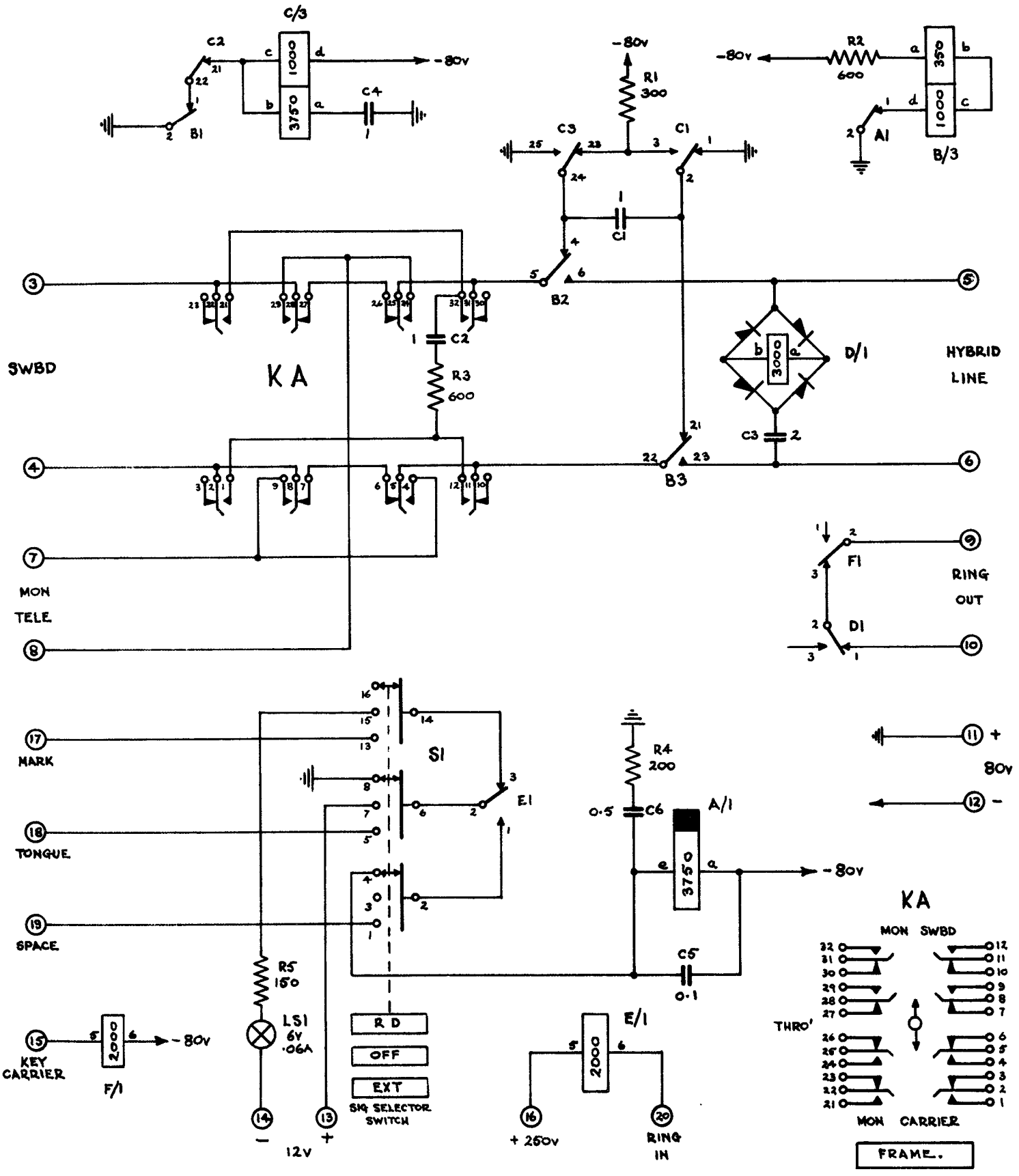
FOLD HERE

FOLD HERE



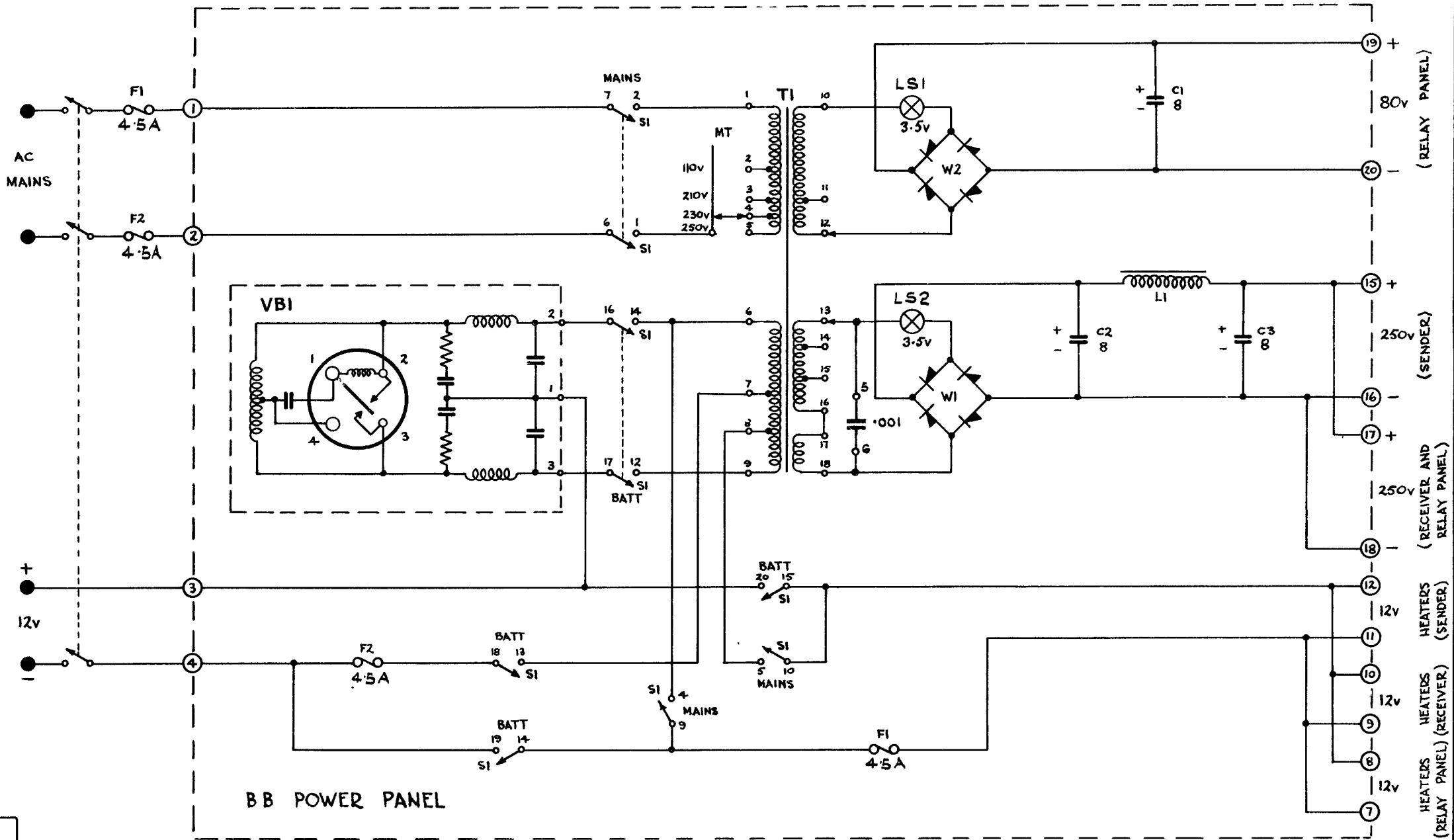
**APPARATUS SELECTIVE CARRIER No 1.**  
**SENDER & RECEIVER SCHEMATIC**





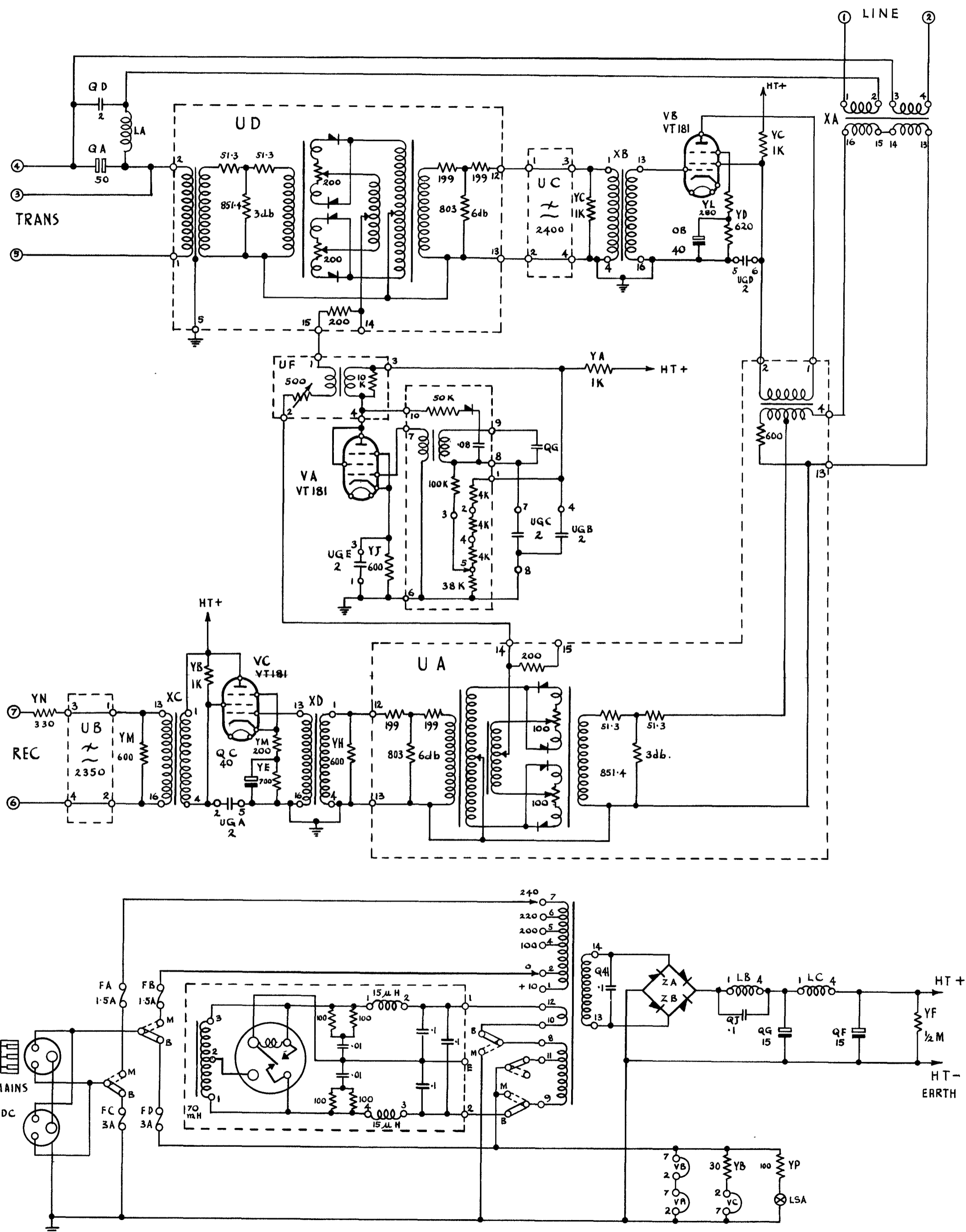
# APPARATUS SELECTIVE CARRIER No 1 RELAY PANEL

14987/P.L.H./4.45.



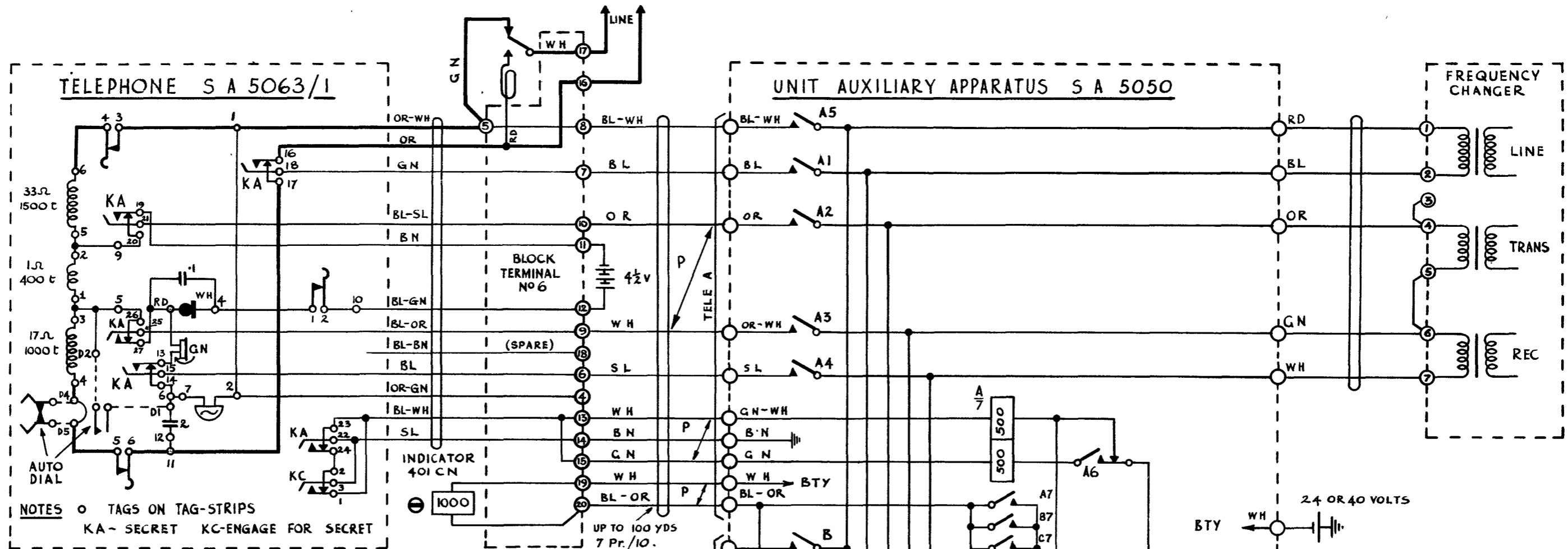
APPARATUS SELECTIVE CARRIER No 1 - POWER PANEL

F1/52

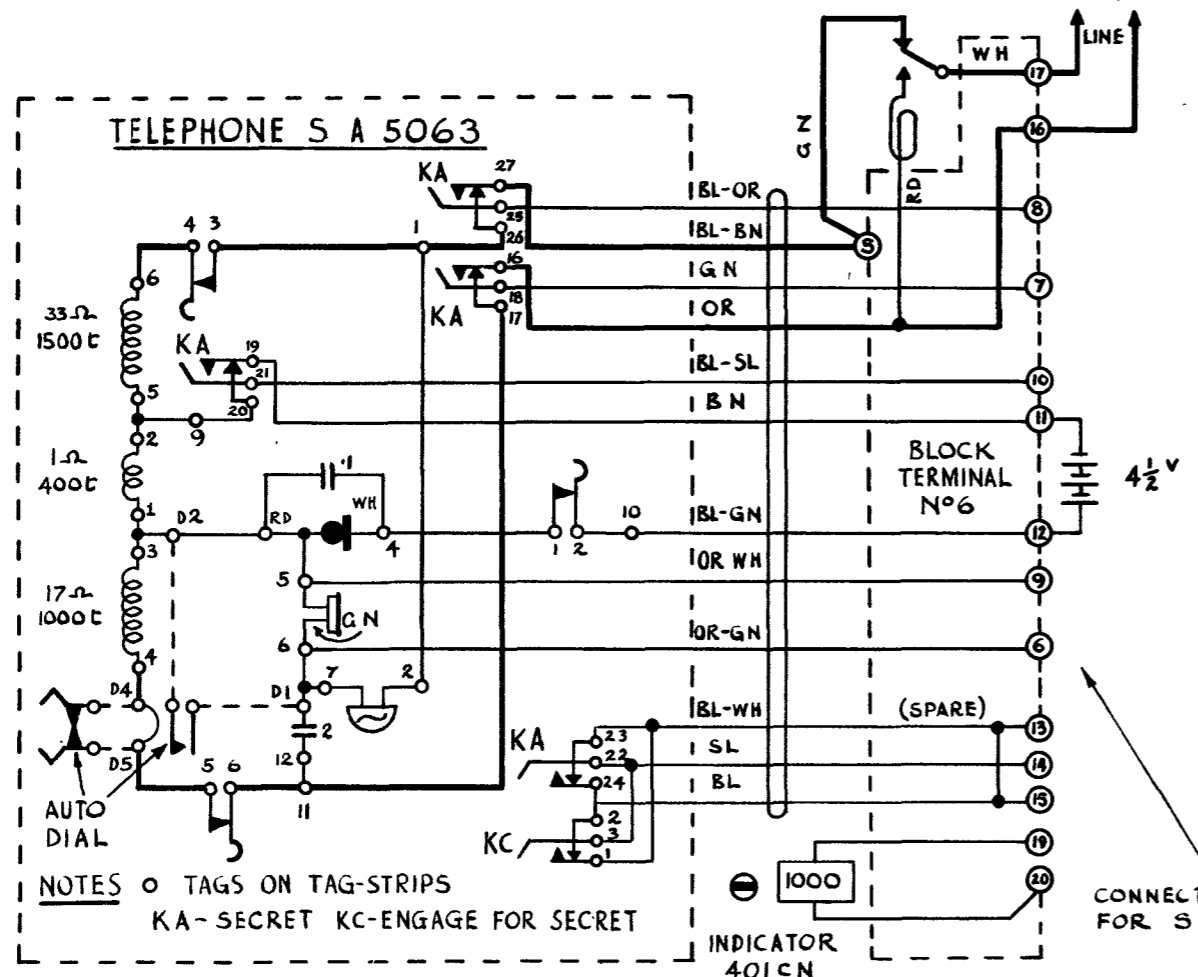


FIGURE

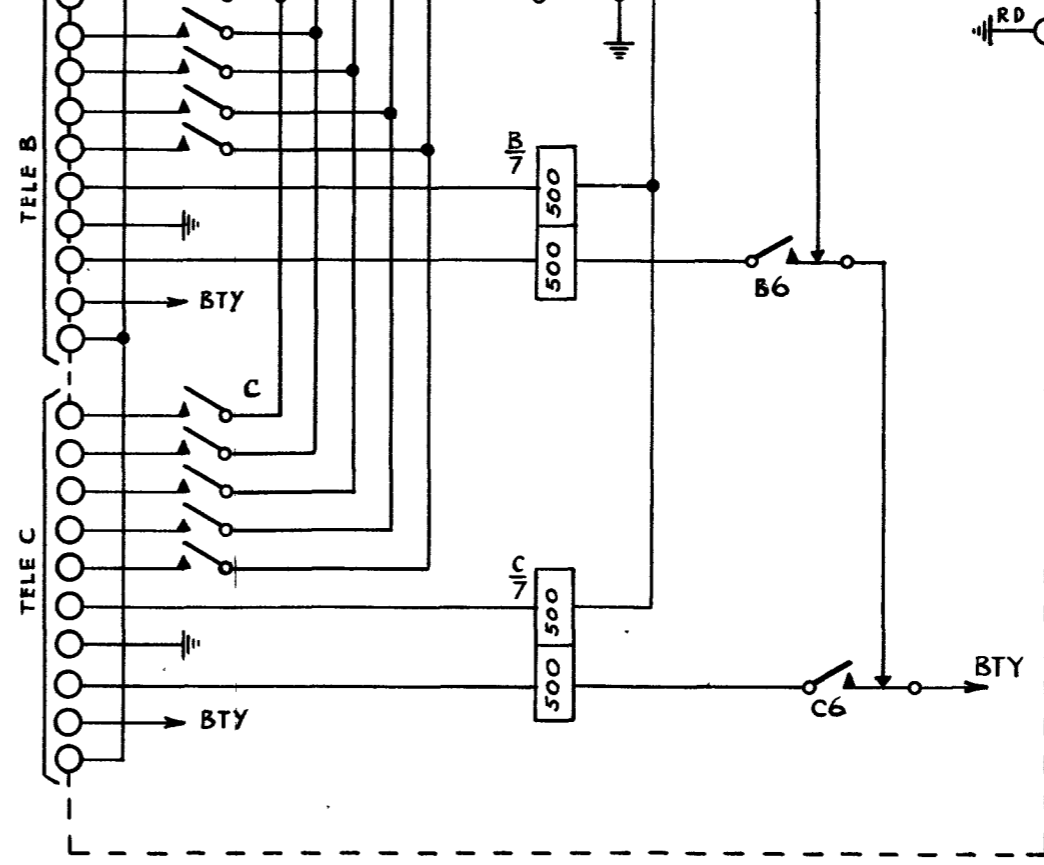
**FREQUENCY CHANGER**



NOTES ○ TAGS ON TAG-STRIPS  
KA - SECRET KC-ENGAGE FOR SECRET



NOTES ○ TAGS ON TAG-STRIPS  
KA - SECRET KC-ENGAGE FOR SECRET



CONNECTIONS AS FOR S A 5063/1

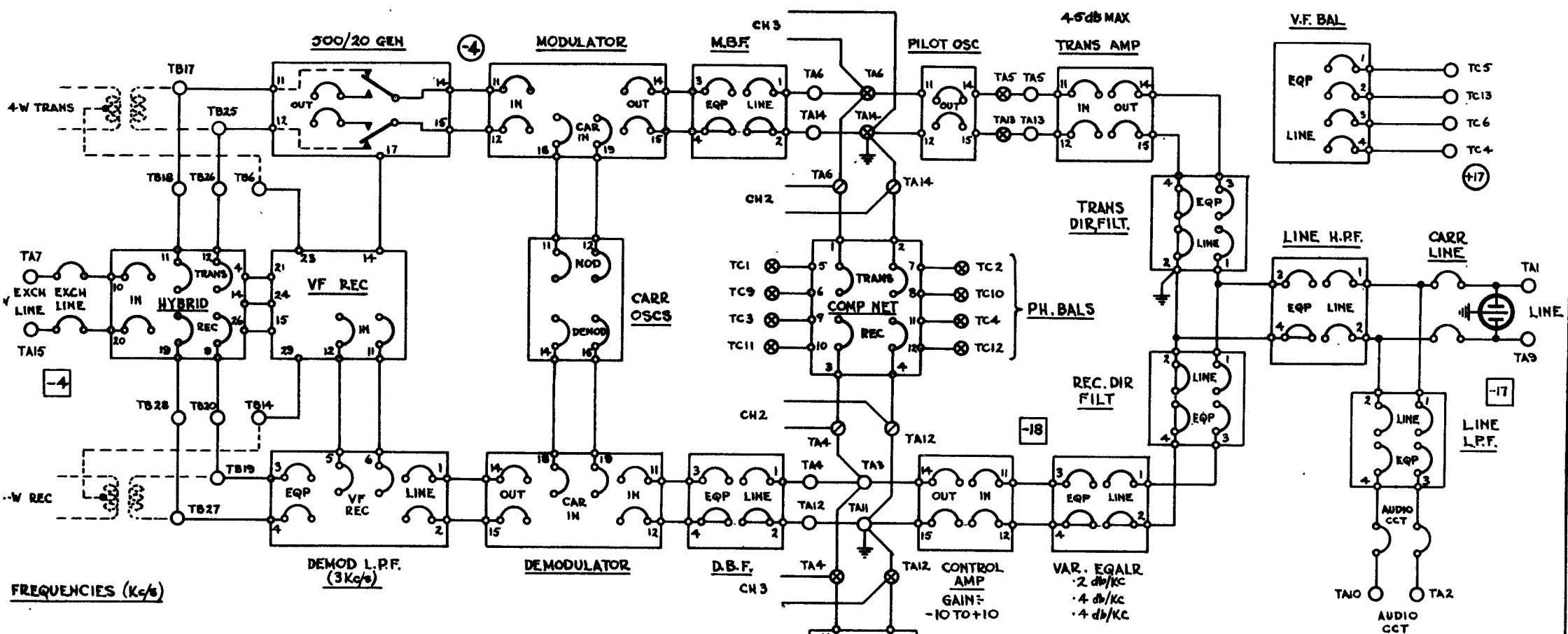
**PARALLELING.**  
SA 5063 IS NOT SUITABLE.  
WITH SA 5063/1, CORRESPONDING TAGS ON THE TWO BTN<sup>OS</sup> SHOULD BE WIRED IN PARALLEL, WITH THE EXCEPTION OF TAG 17 ON THE EXTENSION TELE, WHICH SHOULD BE WIRED TO TAG 8 ON THE MAIN TELE. A SEPERATE SPEAKING BATTERY MUST BE PROVIDED FOR EACH PHONE.

**WORKING DIRECT.**  
WHEN SHARING IS NOT REQUIRED, THE CORD FROM THE FREQUENCY CHANGER SHOULD BE CONNECTED TO THE BT N<sup>O</sup> 6 OF THE TELE AS FOLLOWS :-

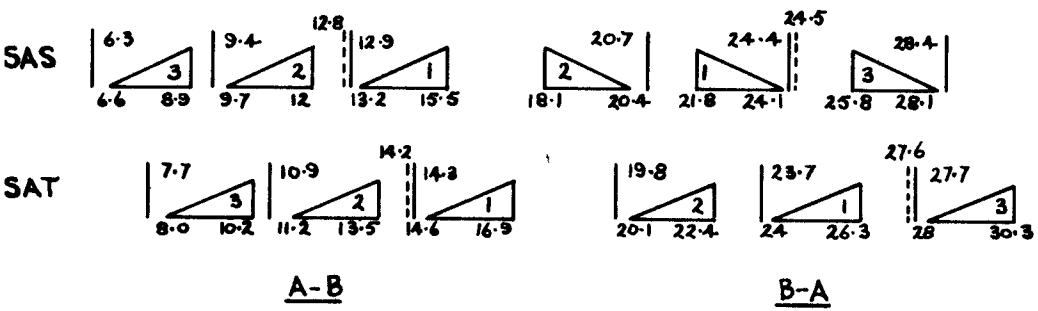
- RD TO TAG 8
- BL - 7
- OR - 10
- GN - 9
- WH - 6

LINE AND BATTERY CONNECTIONS ARE UNCHANGED.

**SHARING EQUIPMENT**



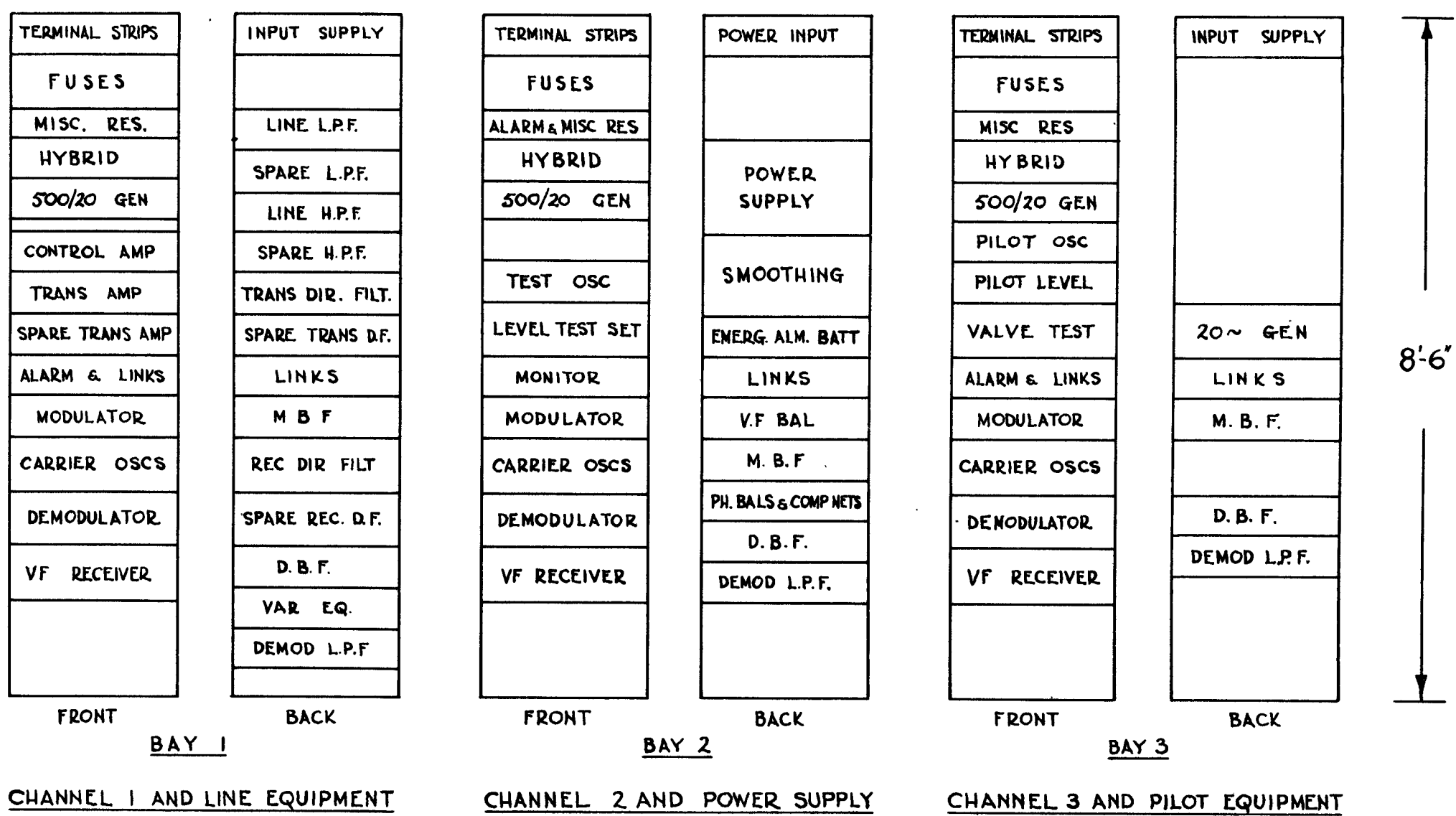
FREQUENCIES (Kc/s)



CARRIER FREQ      ○ TAGS ON BAY 1  
 " " " "      ⊙ " " BAY 2  
 PILOT FREQ      ⊗ " " BAY 3

A.C.T 1+3 TYPES SAS & SAT - BLOCK DIAGRAM

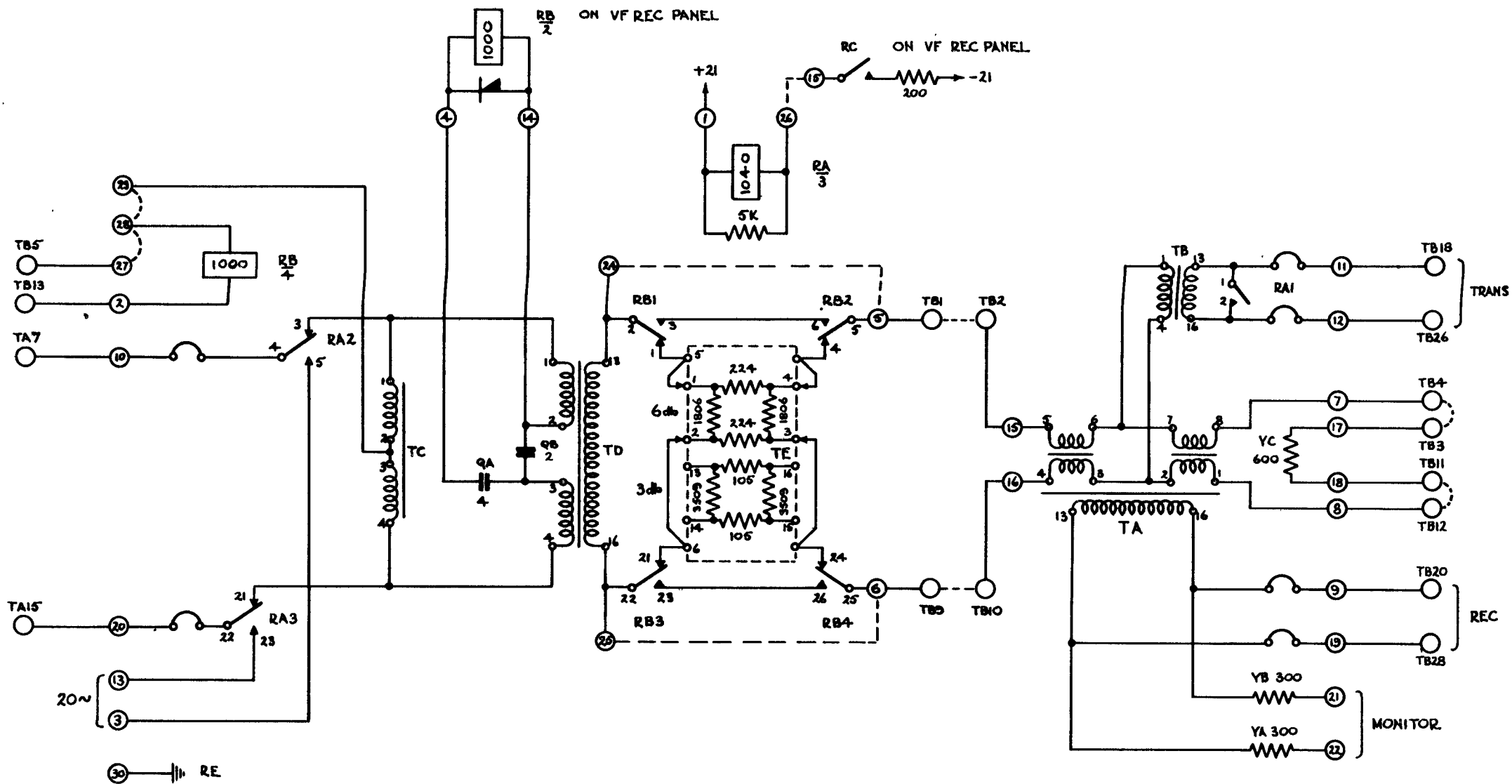
E1170



# A.C.T 1+3 TYPES SAS & SAT - BAY LAYOUT

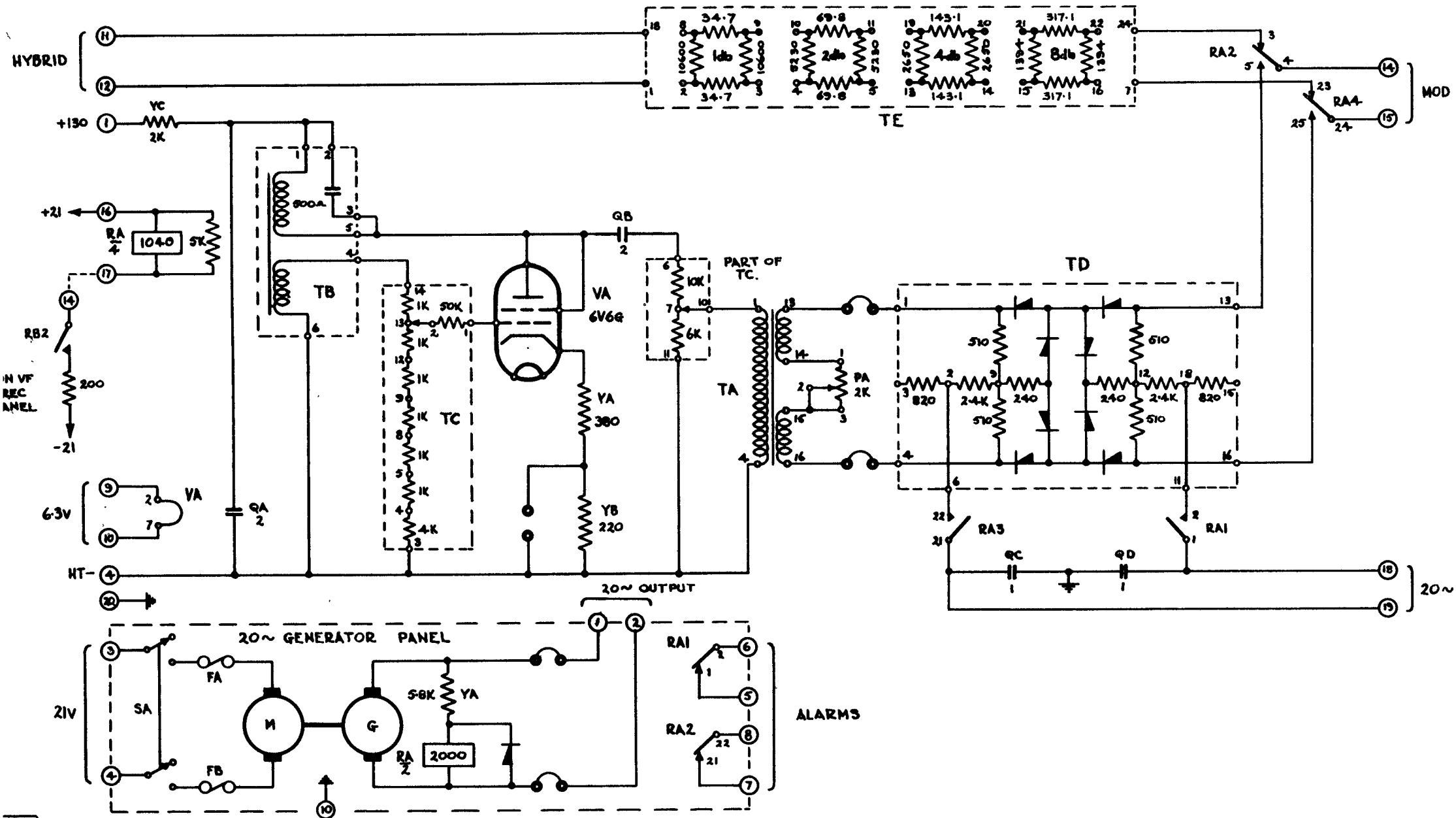
1171





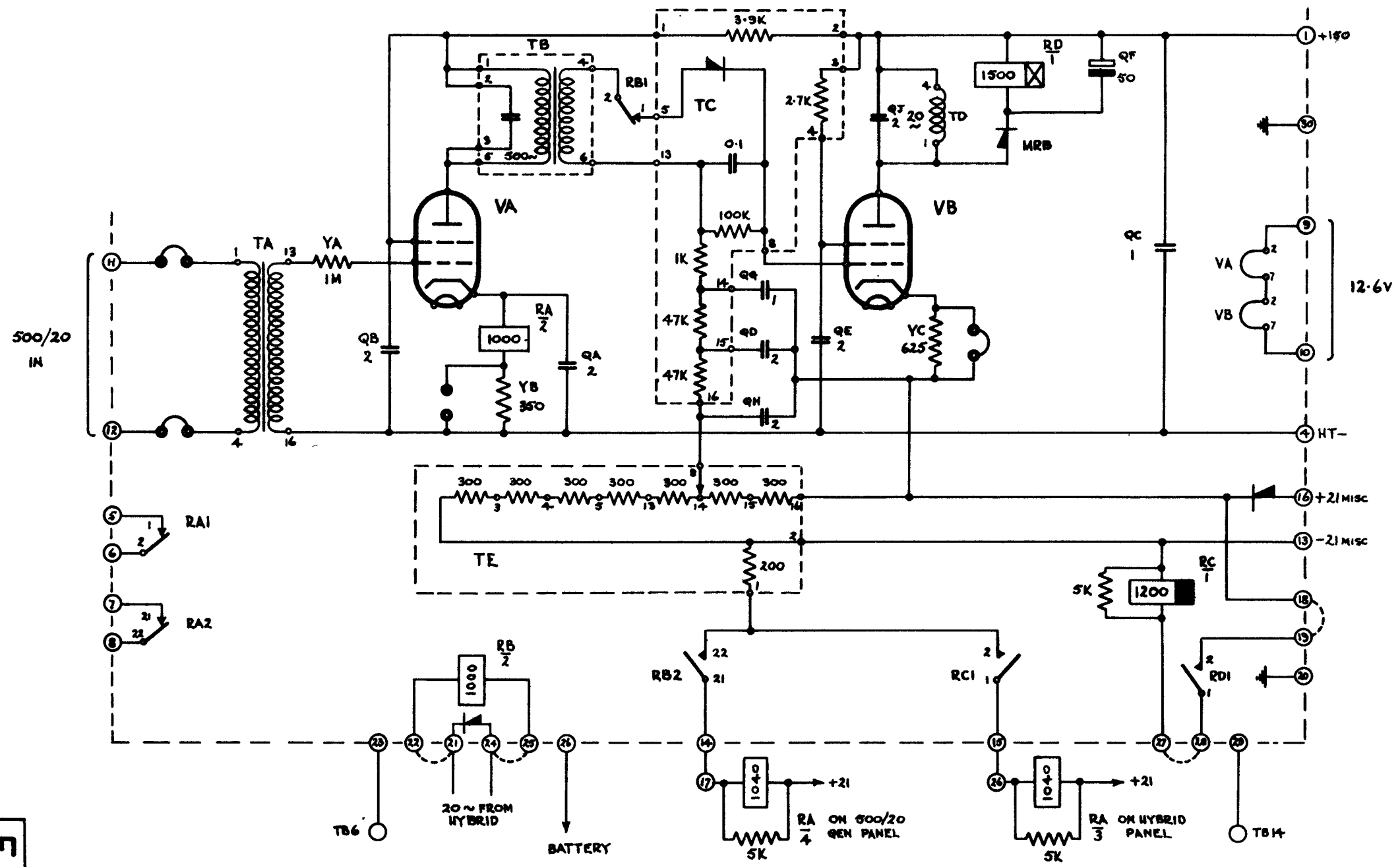
A.C.T. I+3 TYPES SAS & SAT — HYBRID

51173



A.C.T 1 + 3 TYPES SAS & SAT - 500/20 GENERATOR

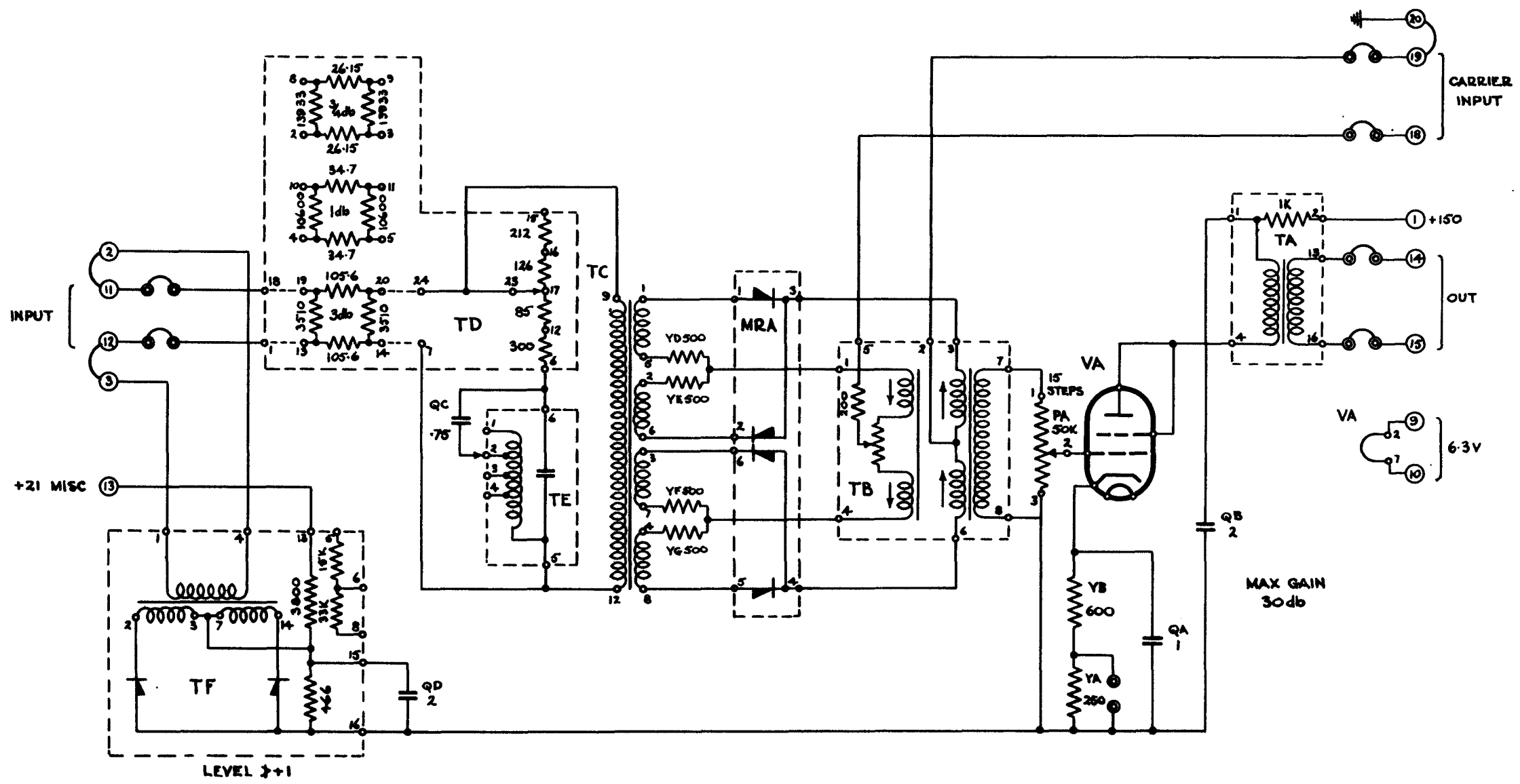
E1/73



A.C.T 1+3 TYPES SAS & SAT - SIGNALLING RECEIVER

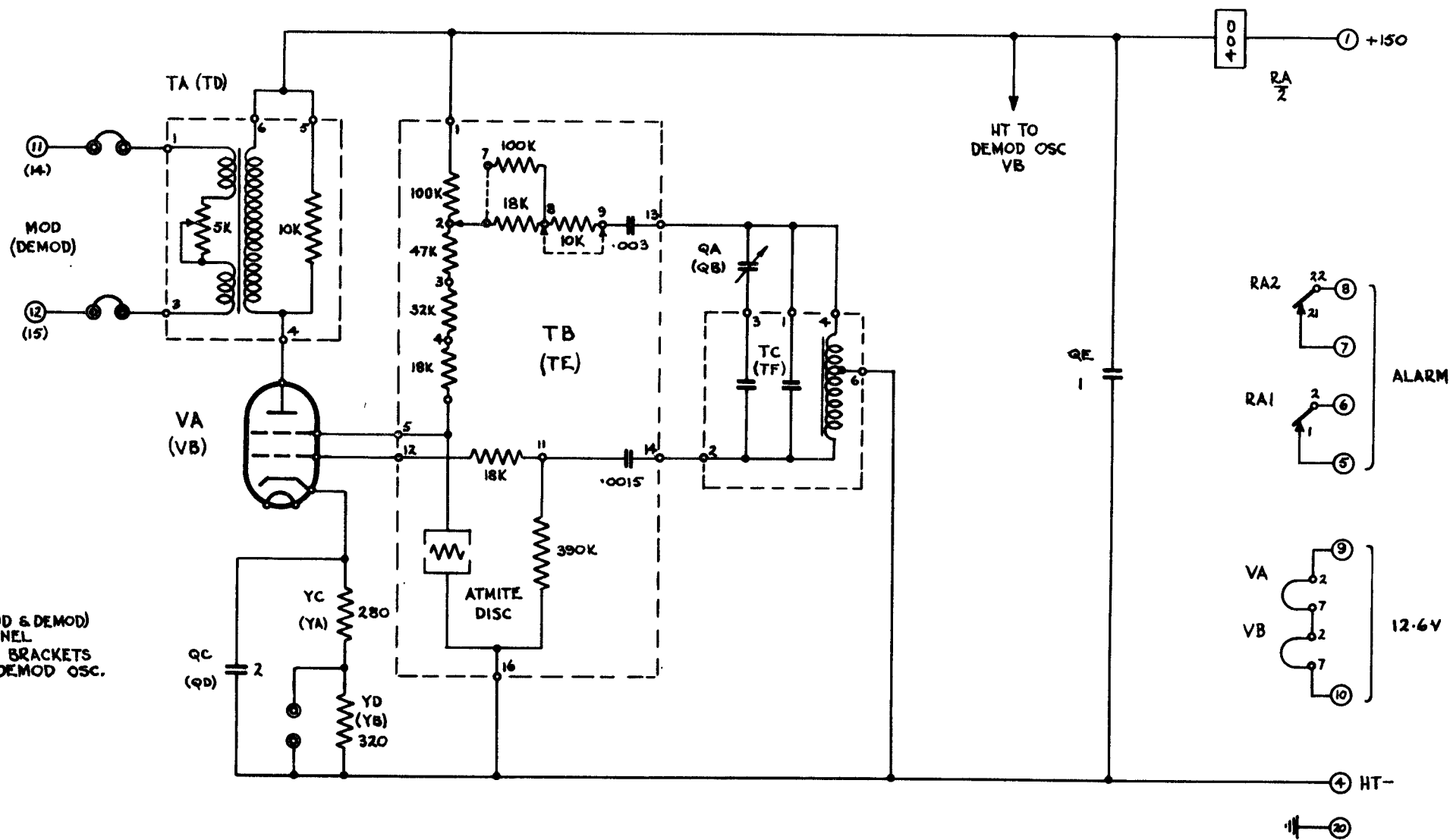
E117A

13103/P.L.H./1144.



A.C.T 1 + 3 TYPES SAS & SAT - MODULATOR & LIMITER

51175

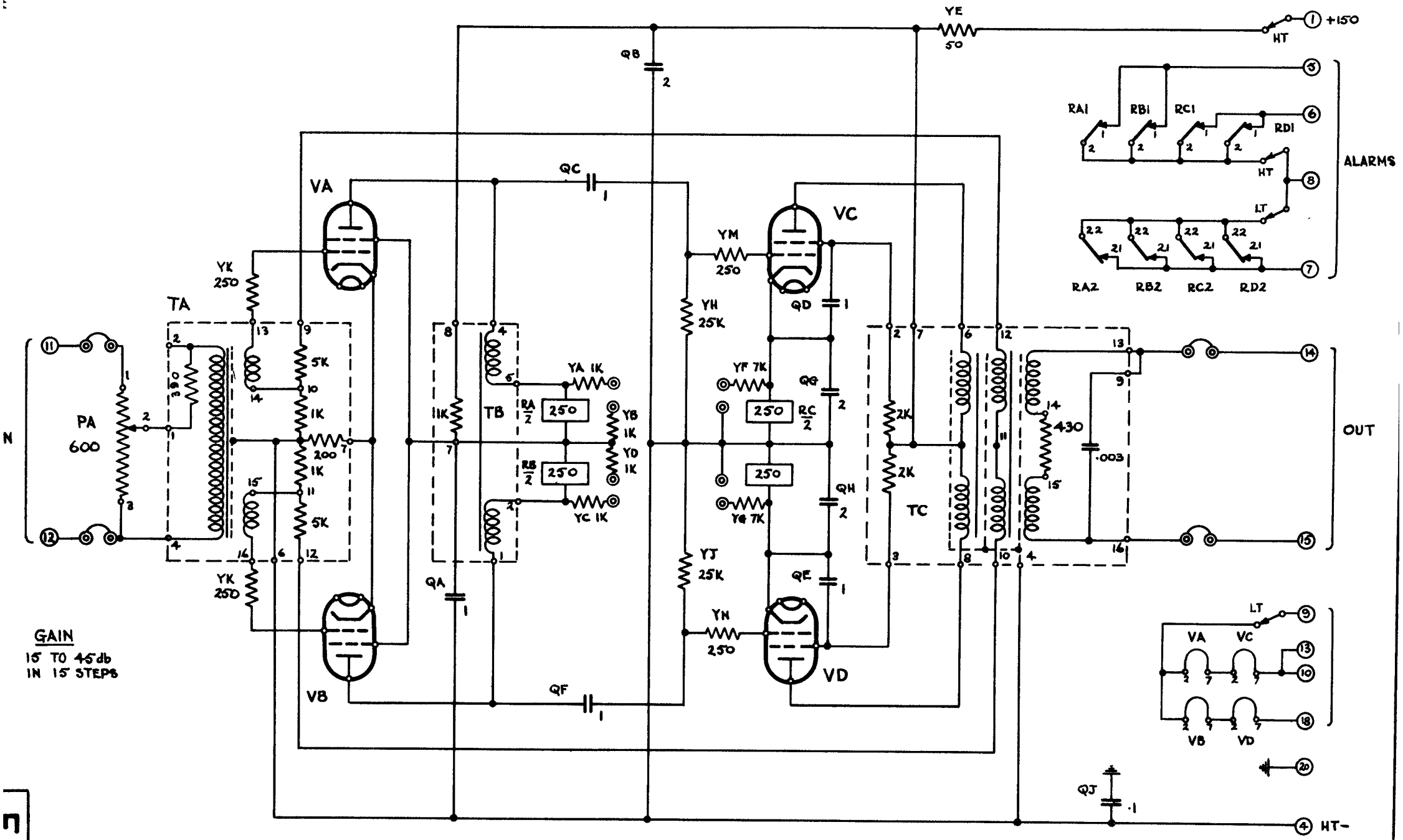


NOTE.  
 2 OSC'S (MOD & DEMOD)  
 ON EACH PANEL  
 FIGURES IN BRACKETS  
 REFER TO DEMOD OSC.

A.C.T 1 + 3 TYPES SAS & SAT - CHANNEL OSCILLATORS

F1176

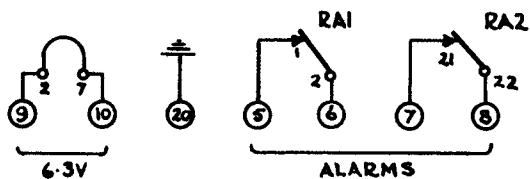
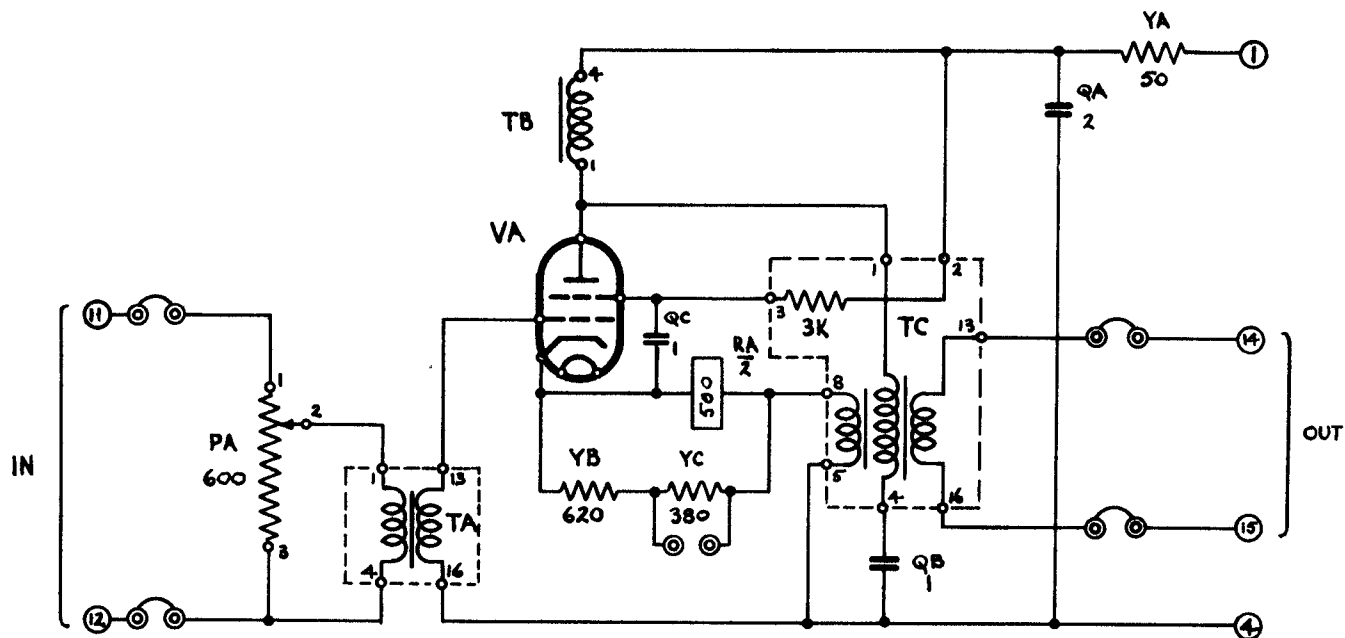
77 11/ 2 4 9/20/46



**GAIN**  
 15 TO 45db  
 IN 15 STEPS

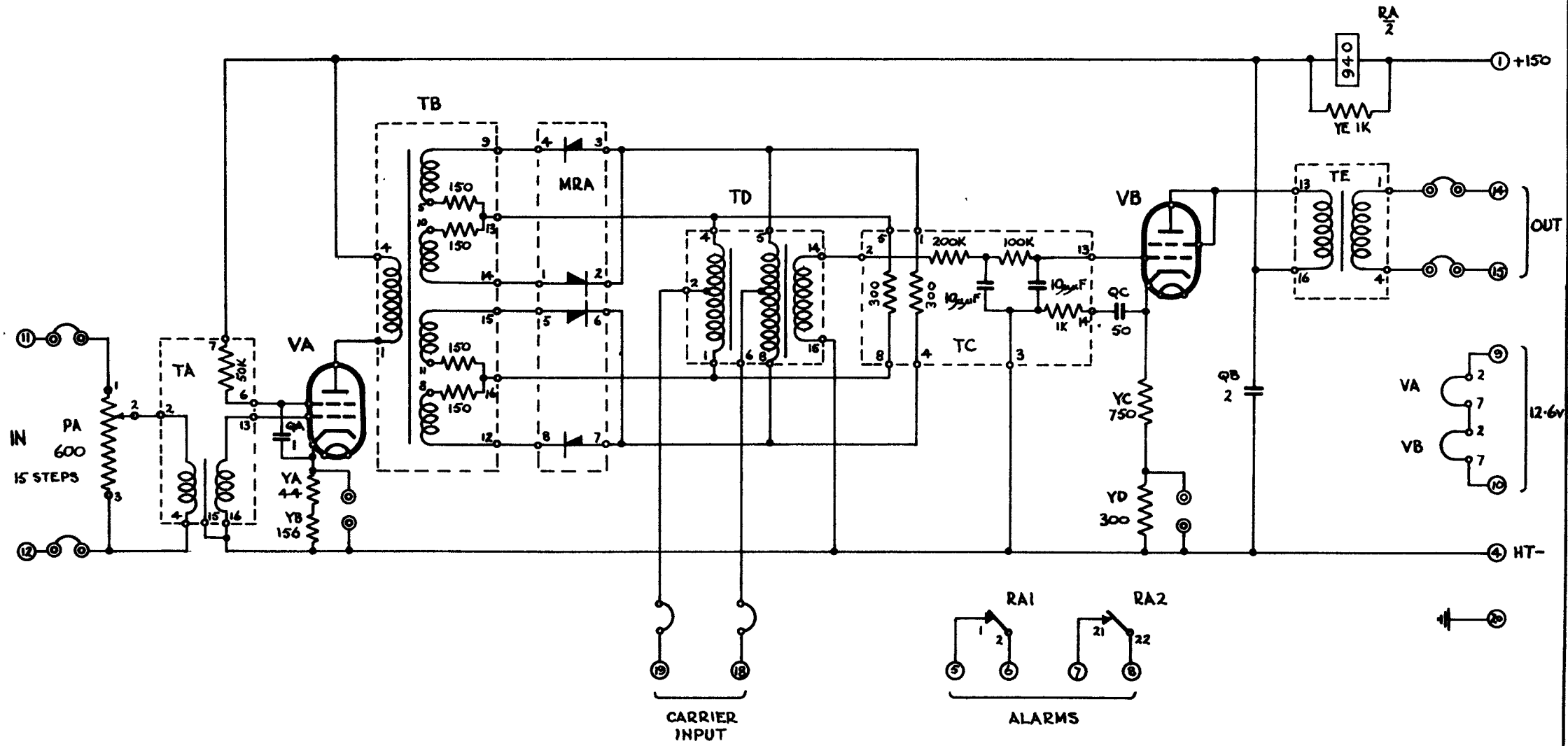
**A.C.T 1 + 3 TYPES SAS & SAT - TRANSMIT AMPLIFIER**

E1177



GAIN  
 +10 TO -10  
 IN 20 STEPS OF 1db

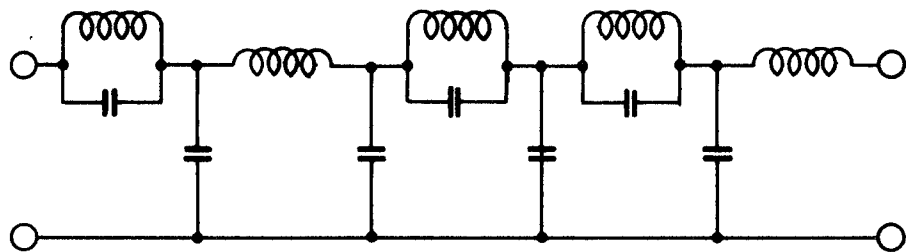
A.C.T 1+3 TYPES SAS & SAT - CONTROL AMPLIFIER



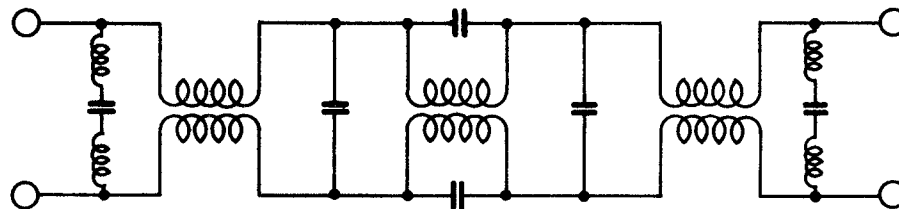
A.C.T 1+3 TYPES SAS & SAT - DEMODULATOR

5  
4  
3  
2  
1

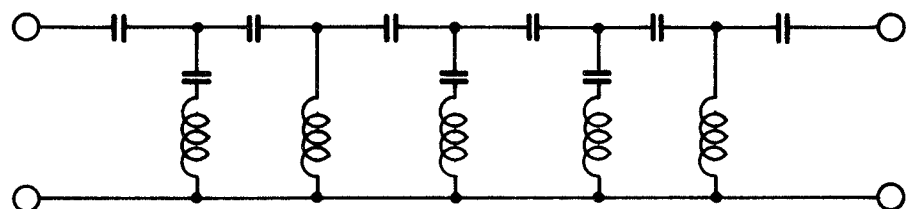




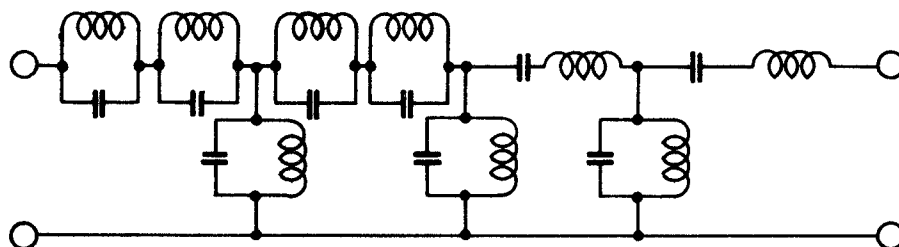
LOW PASS DIRECTIONAL FILTER



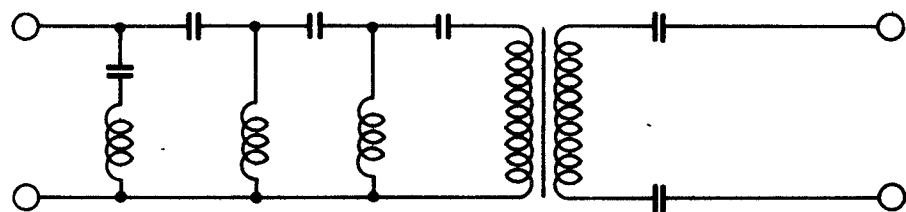
DEMOD LOW PASS FILTER



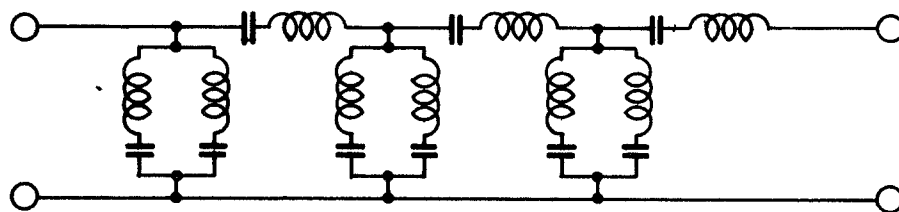
HIGH PASS DIRECTIONAL FILTER



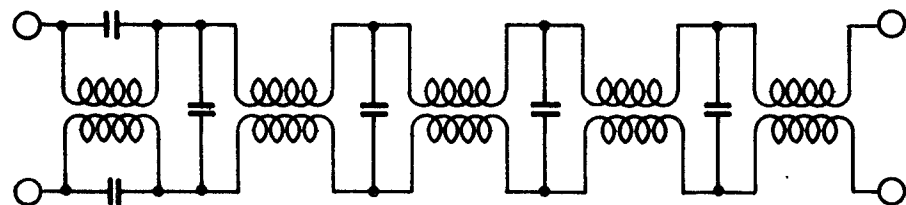
BAND PASS FILTERS  
 6.35 - 9.00 kc/s      9.45 - 12.45 kc/s      12.95 - 15.95 kc/s



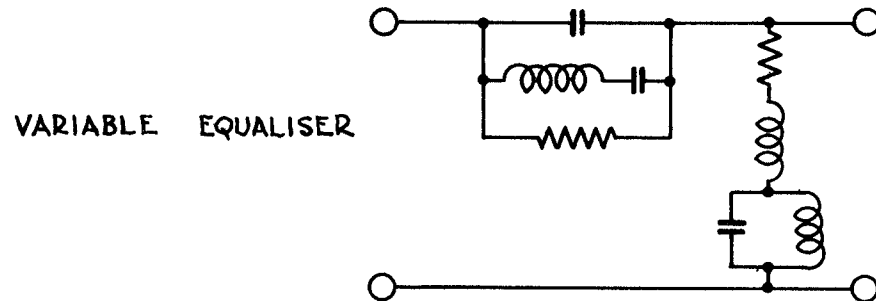
LINE HIGH PASS FILTER



BAND PASS FILTERS  
 17.65 - 20.65 kc/s      21.35 - 24.35 kc/s      25.35 - 28.35 kc/s



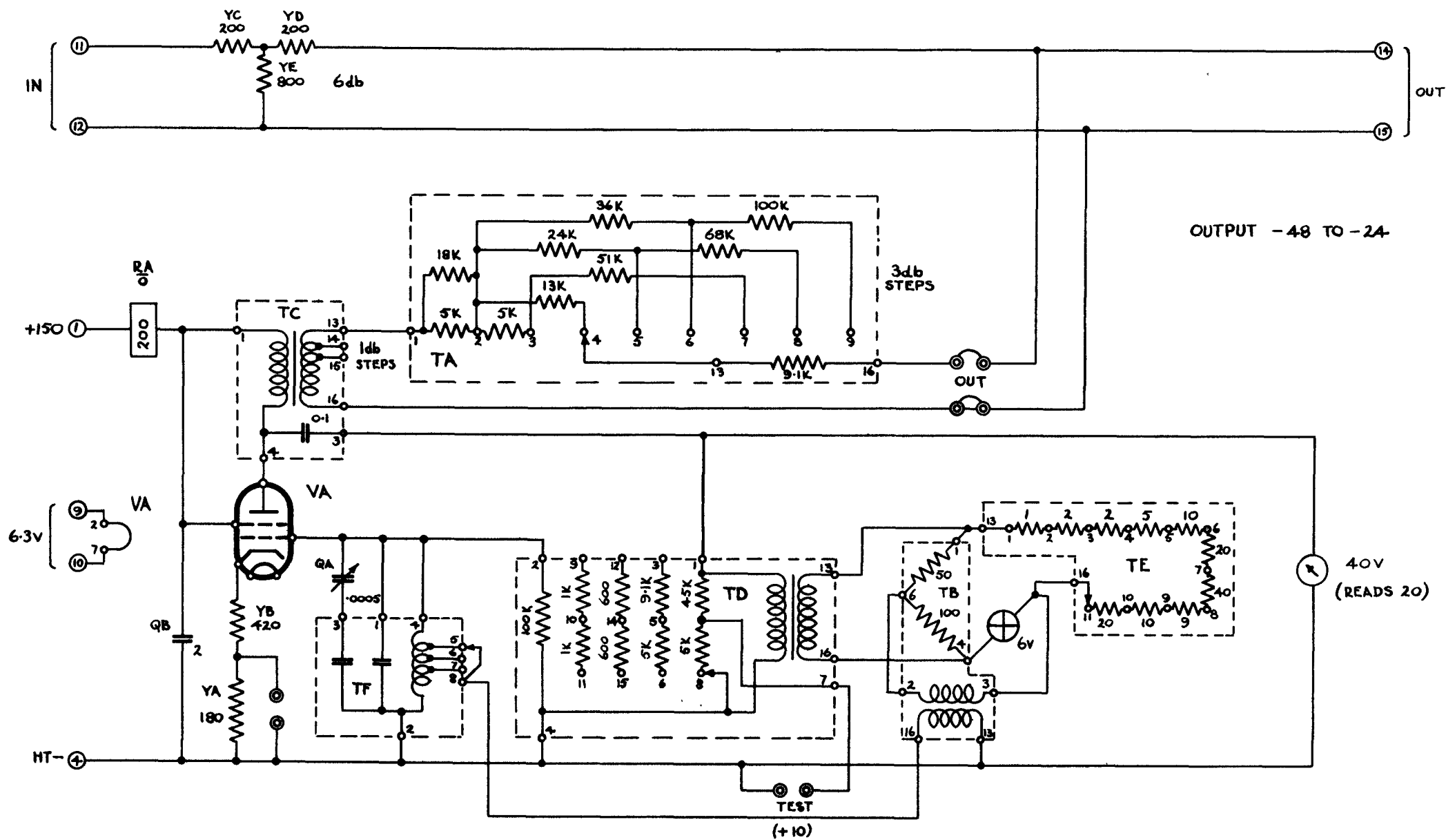
LINE LOW PASS FILTER



VARIABLE EQUALISER

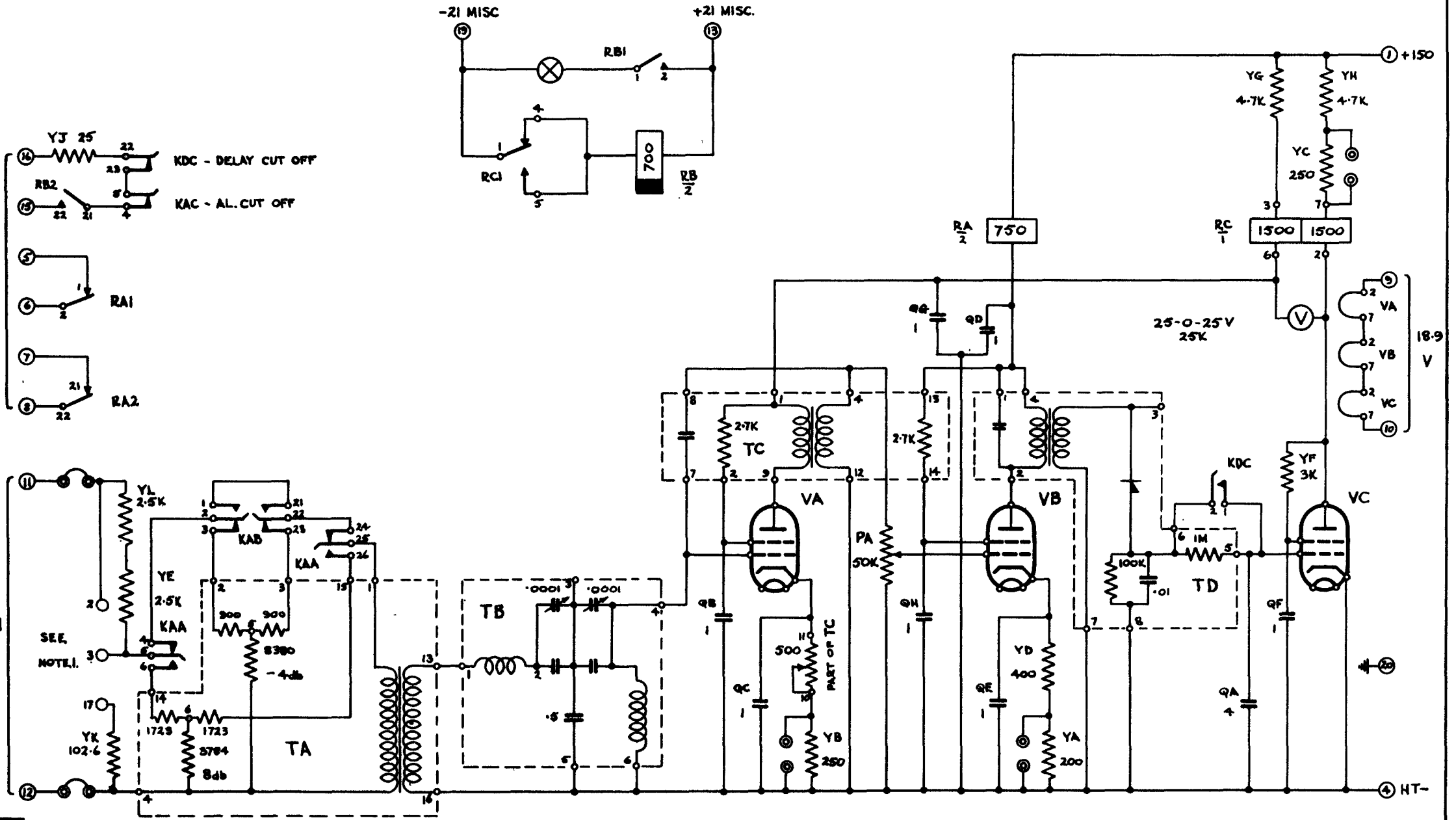
A.C.T 1+3 TYPES SAS & SAT - FILTERS

E1/RN



A.C.T 1 + 3 TYPES SAS & SAT - PILOT OSCILLATOR

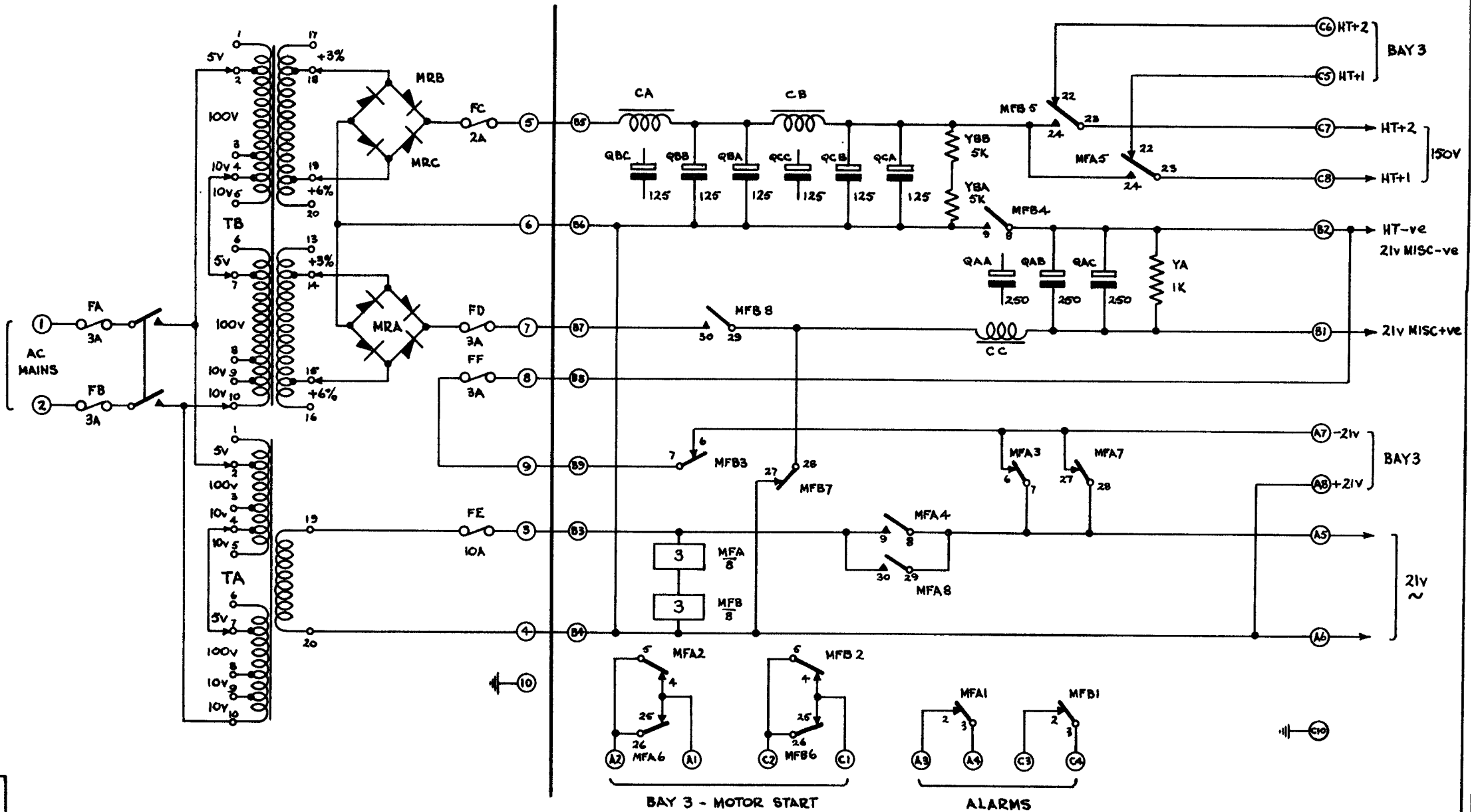
F1/R1



NOTE 1 :- STRAP 3-2 ON TERMINAL EQUIPMENT  
 3-17 • REPEATER

# A.C.T 1+3 TYPES SAS & SAT - PILOT INDICATOR

11/10

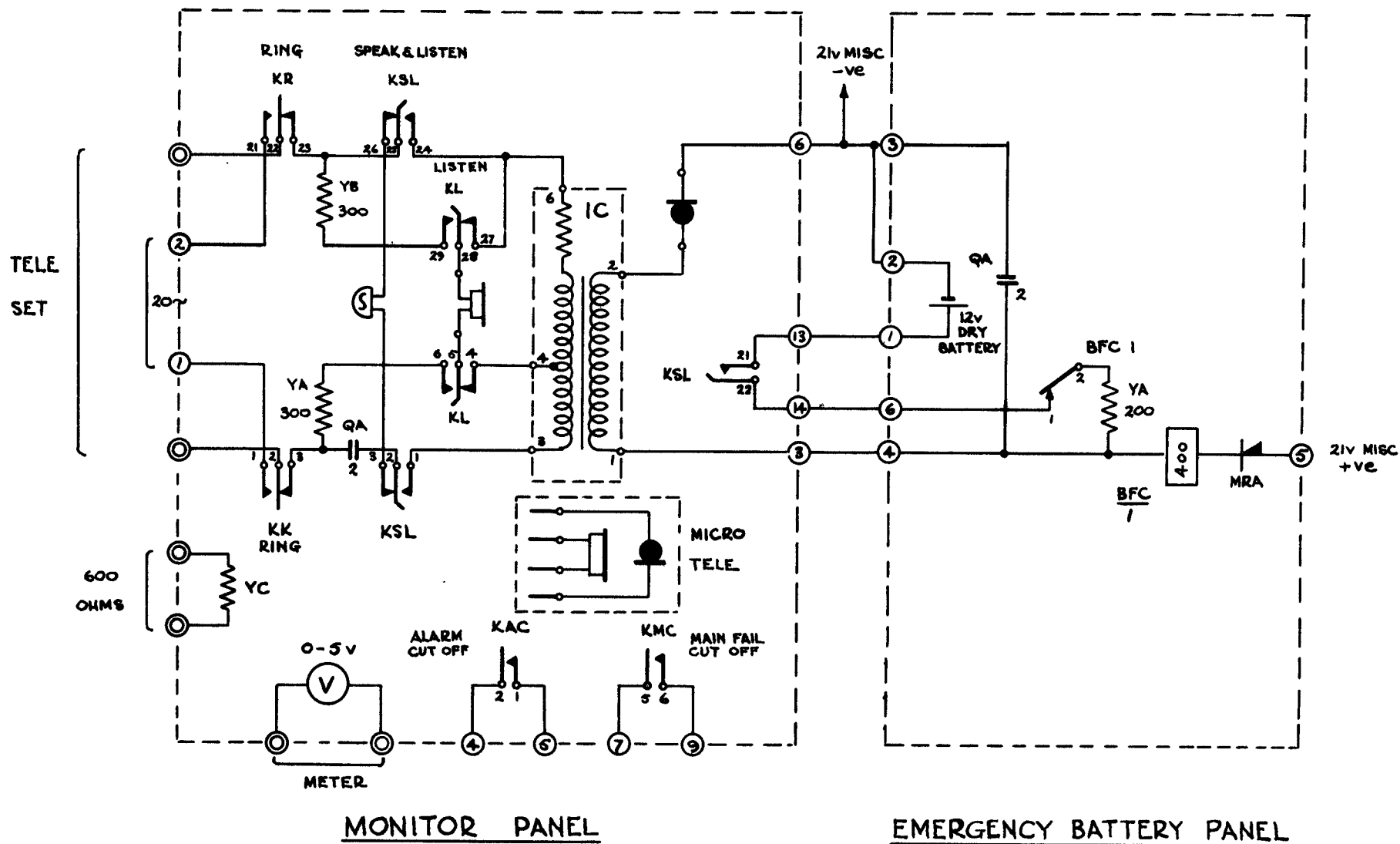


POWER SUPPLY

SMOOTHING

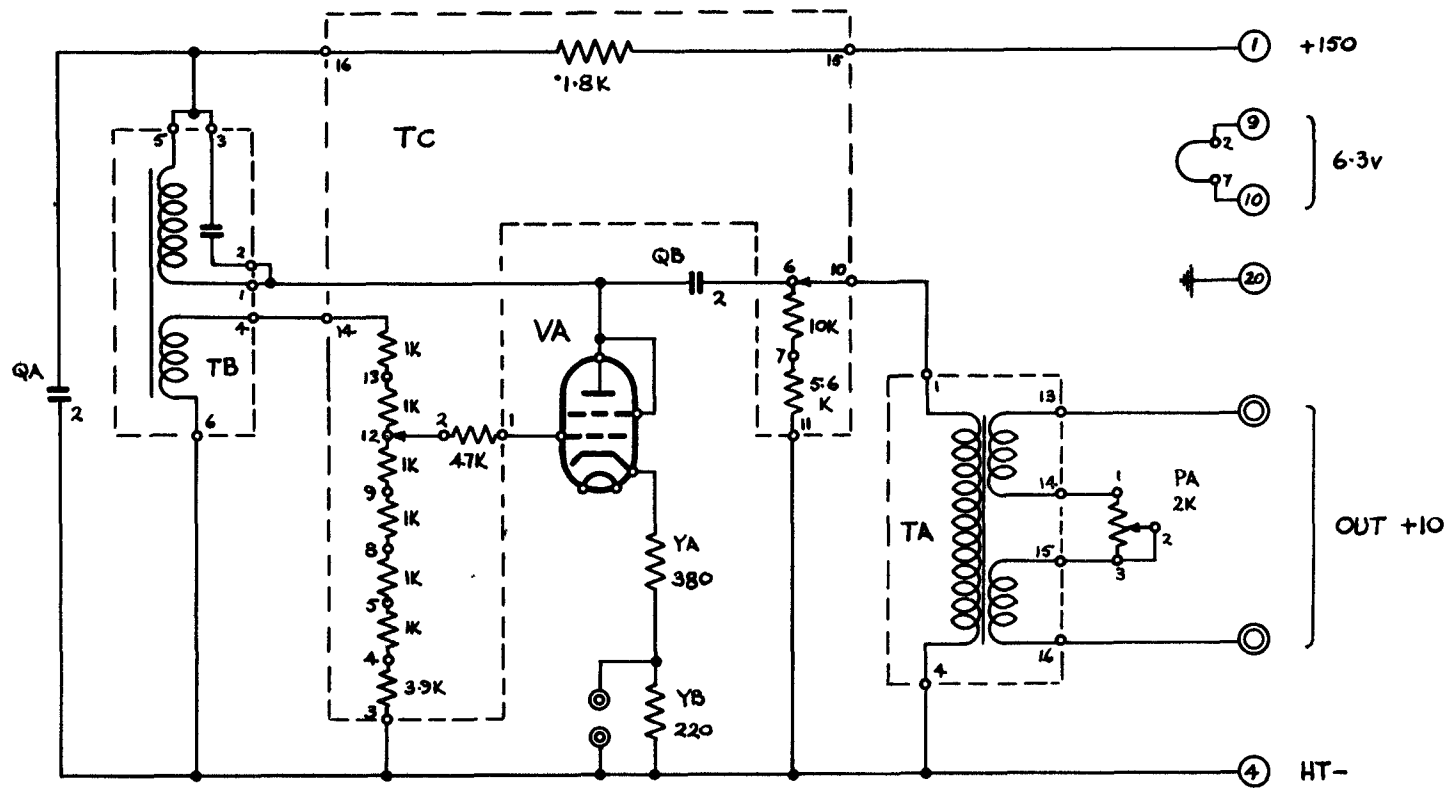
A.C.T 1 + 3 TYPES SAS & SAT

E1/R2



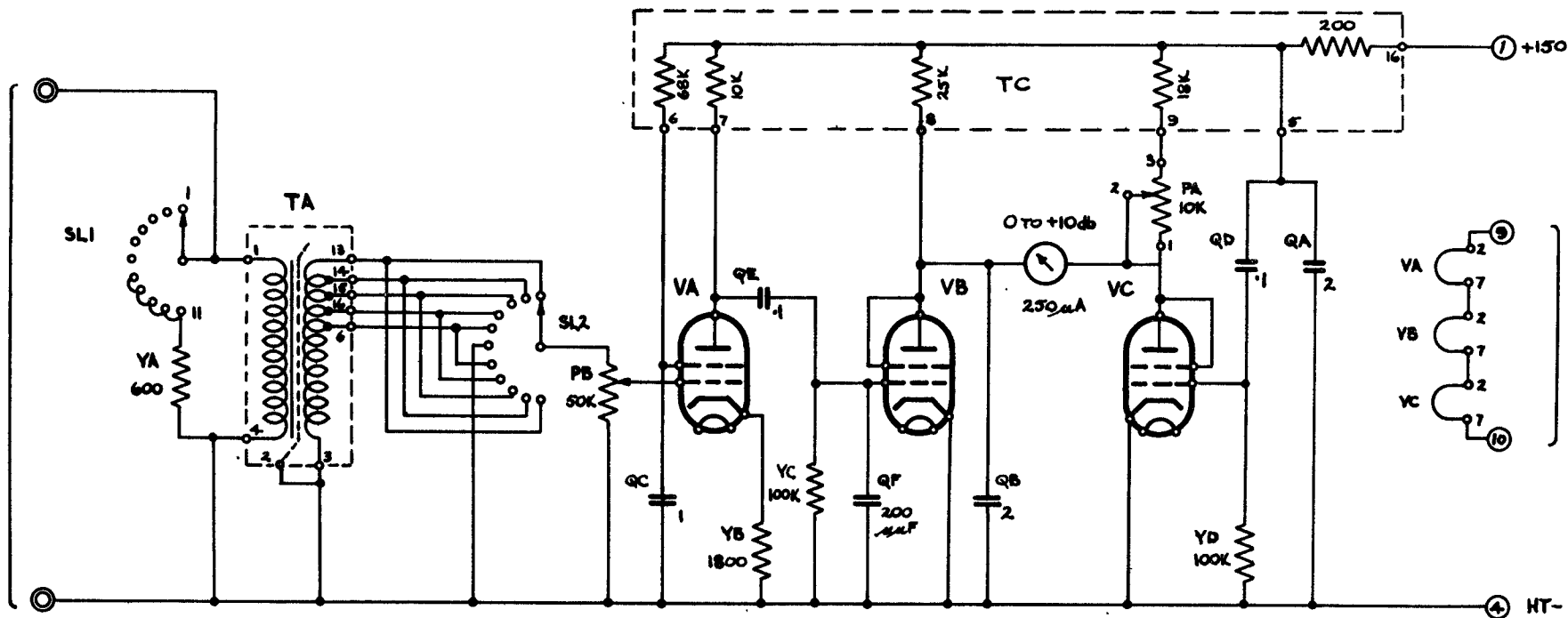
A.C.T 1+3 TYPES SAS & SAT

MONITOR & EMERGENCY BATTERY PANELS

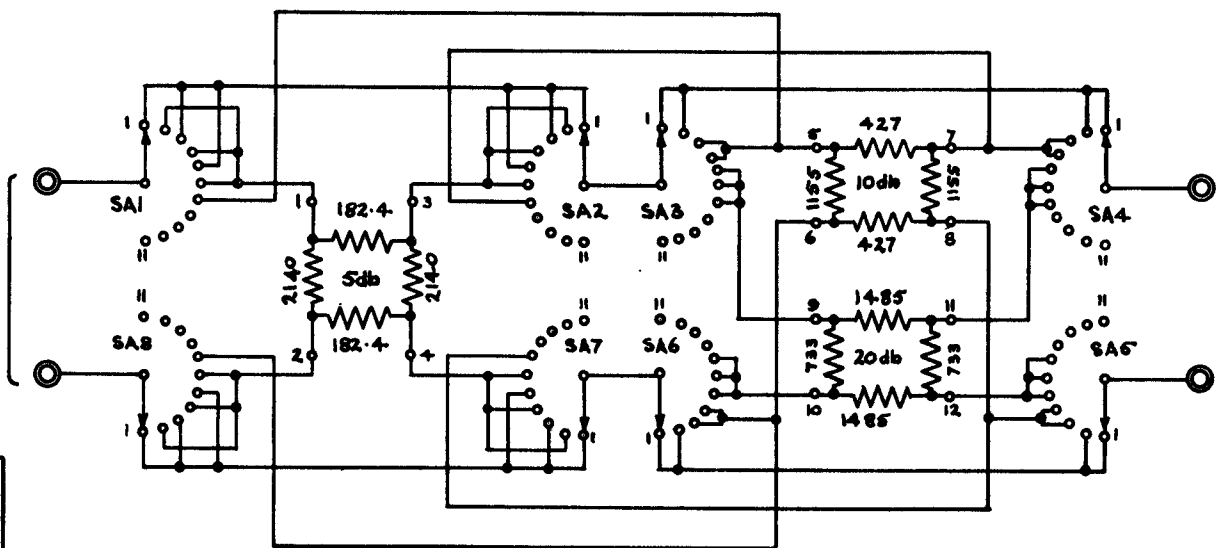


A.C.T 1 + 3 TYPES SAS & SAT - 800~ TEST OSCILLATOR

201102

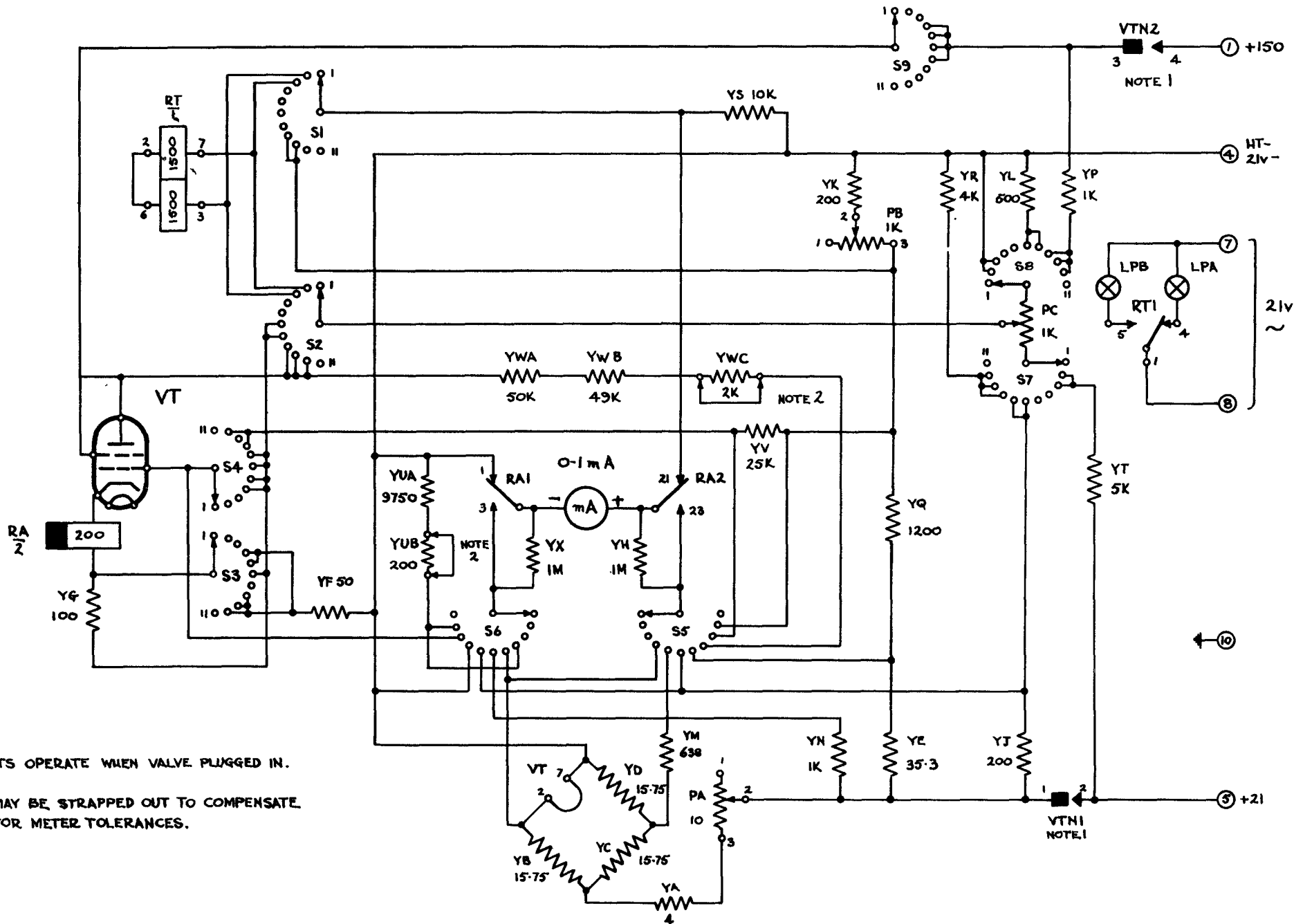


POSN	db	
1	-20	LEVEL
2	-10	
3	0	
4	+10	
5	+20	
6	SET ZERO	LOSS
7	+20	
8	+10	
9	0	
10	-10	
11	-20	



POSN.	ATT. db
1	0
2	5
3	10
4	15
5	20
6	25
7	30

A.C.T. 1+3 TYPES SAS & SAT - LEVEL TEST SET

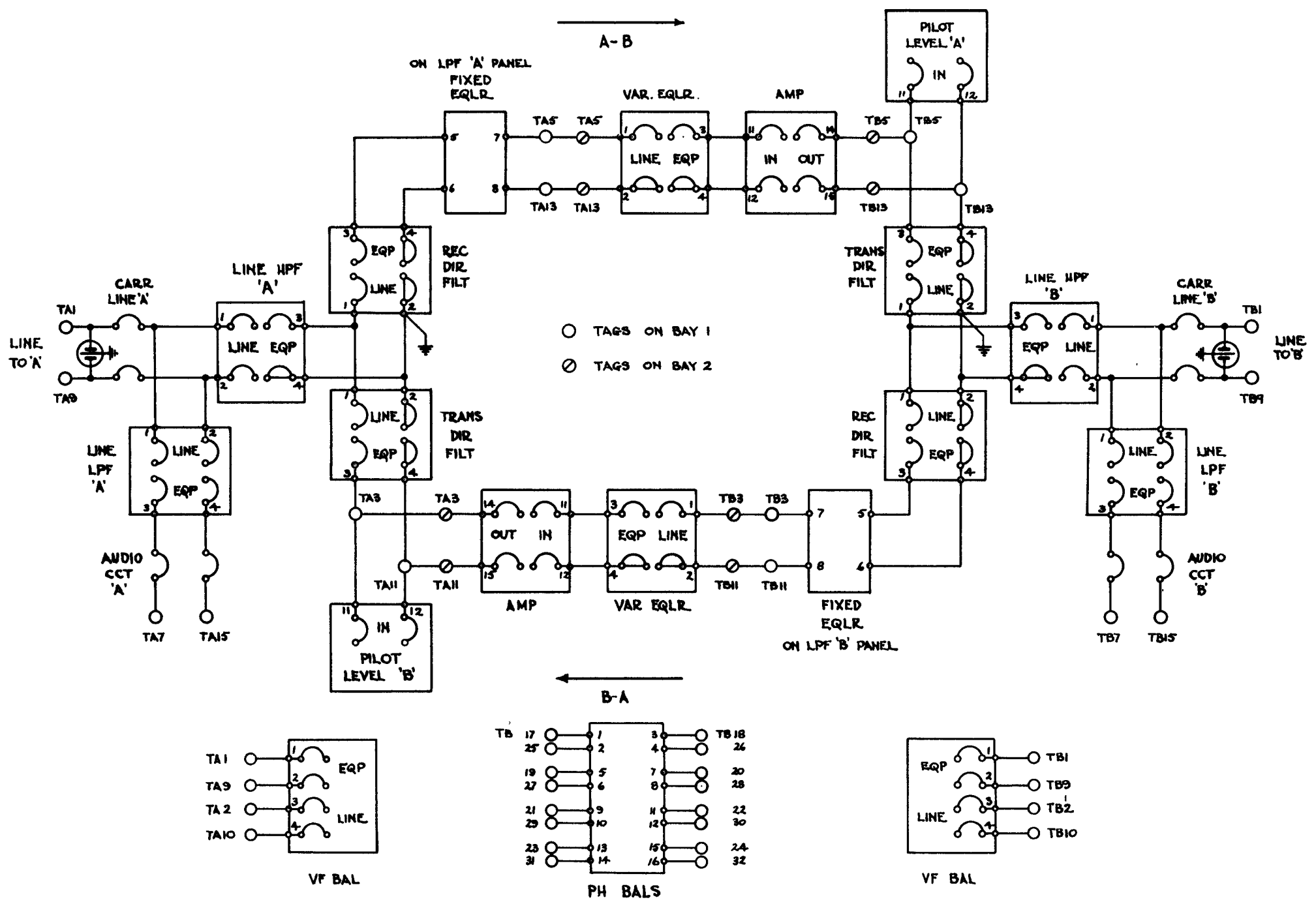


NOTES

1. VTN CONTACTS OPERATE WHEN VALVE PLUGGED IN.
2. YUB YWC MAY BE STRAPPED OUT TO COMPENSATE FOR METER TOLERANCES.

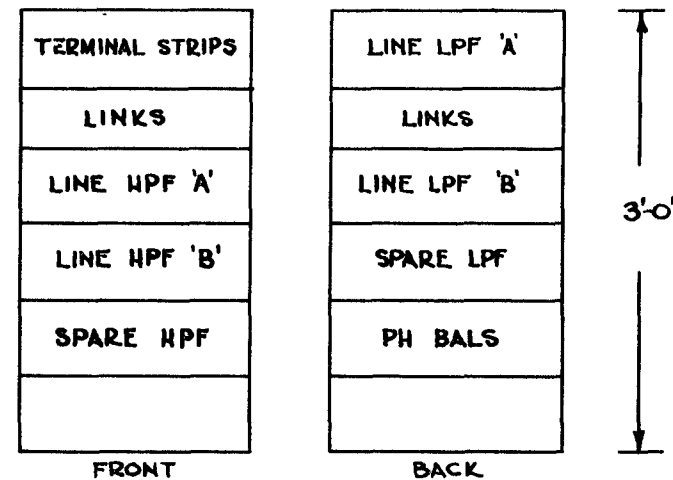
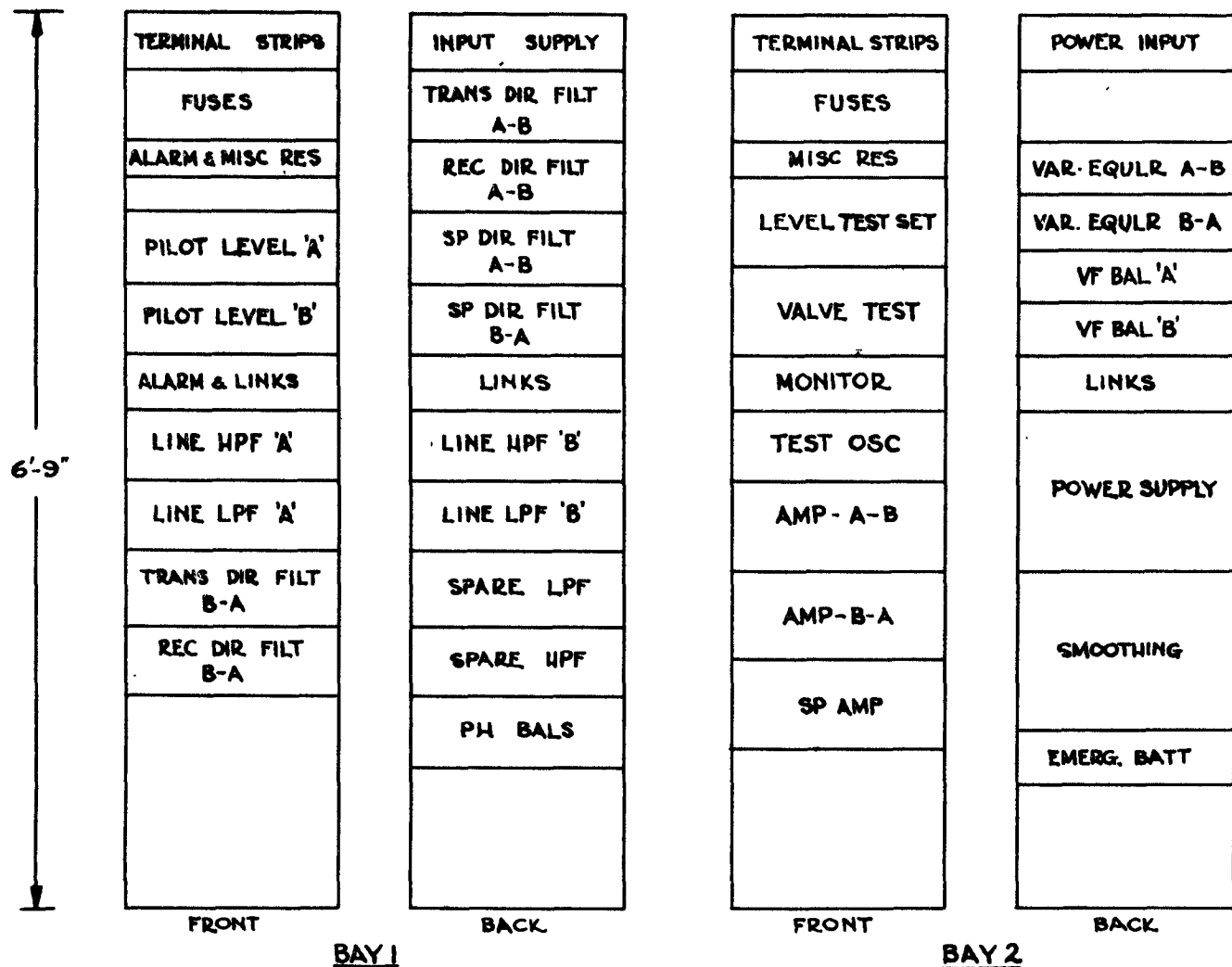
**A.C.T. 1+3 TYPES SAS & SAT - VALVE & RELAY TEST**





**REPEATER CT 1+3 TYPES SAS & SAT — BLOCK DIAGRAM**

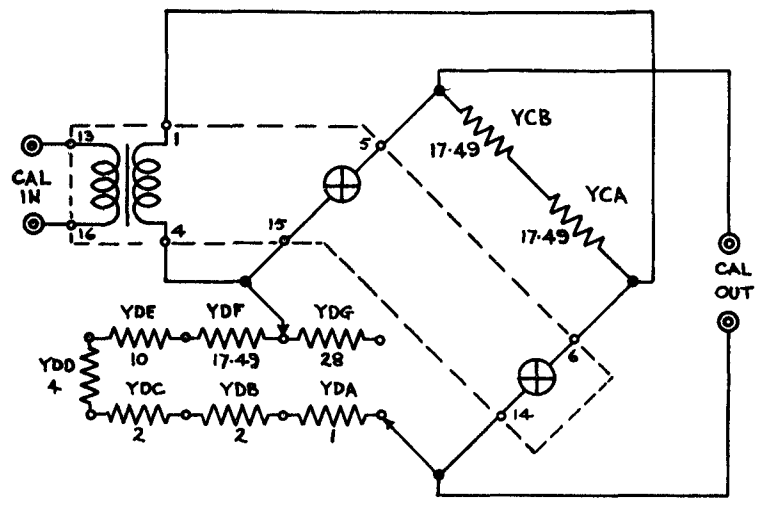
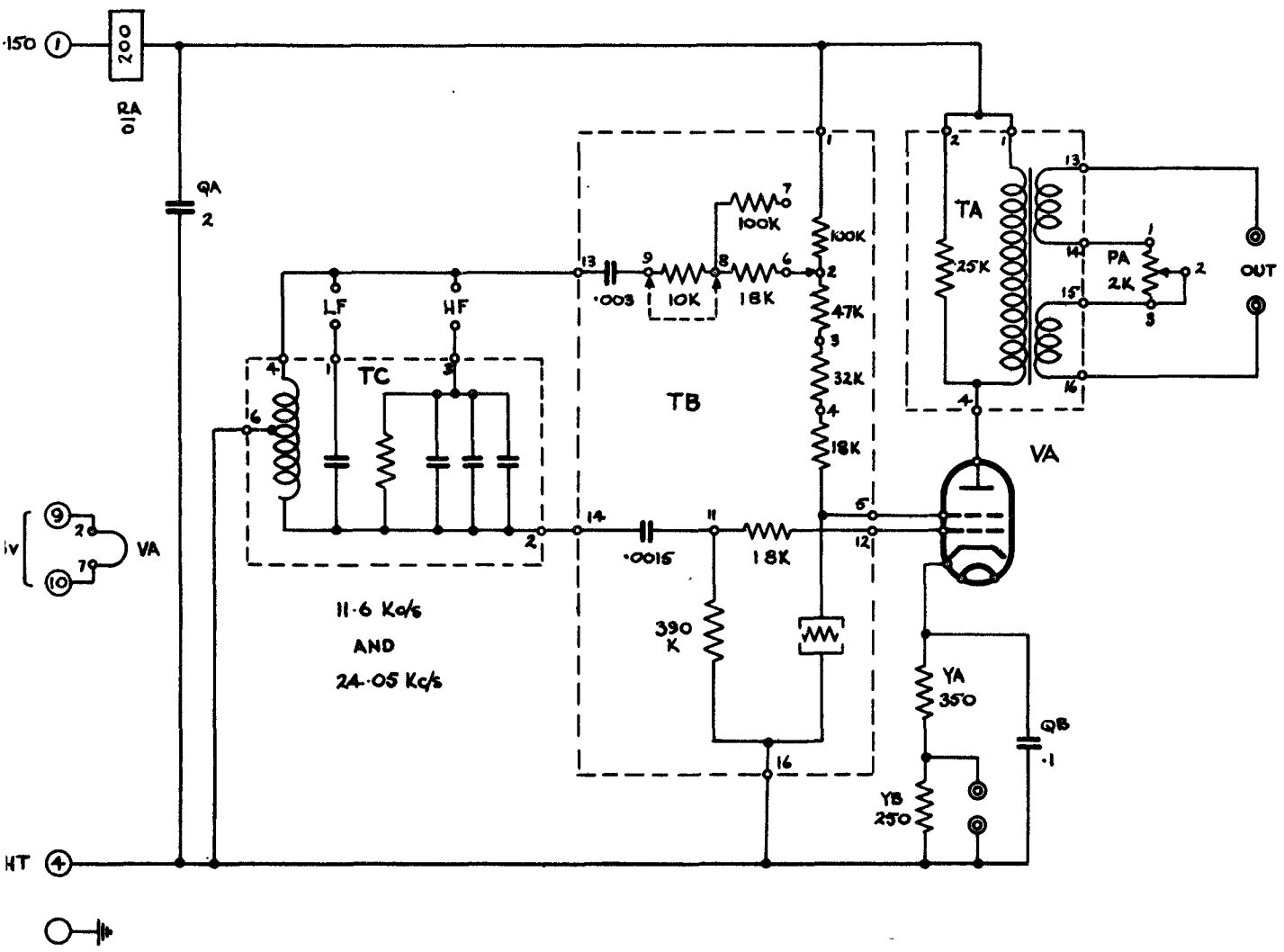
E 1105



REPEATER

BY-PASS EQUIPMENT

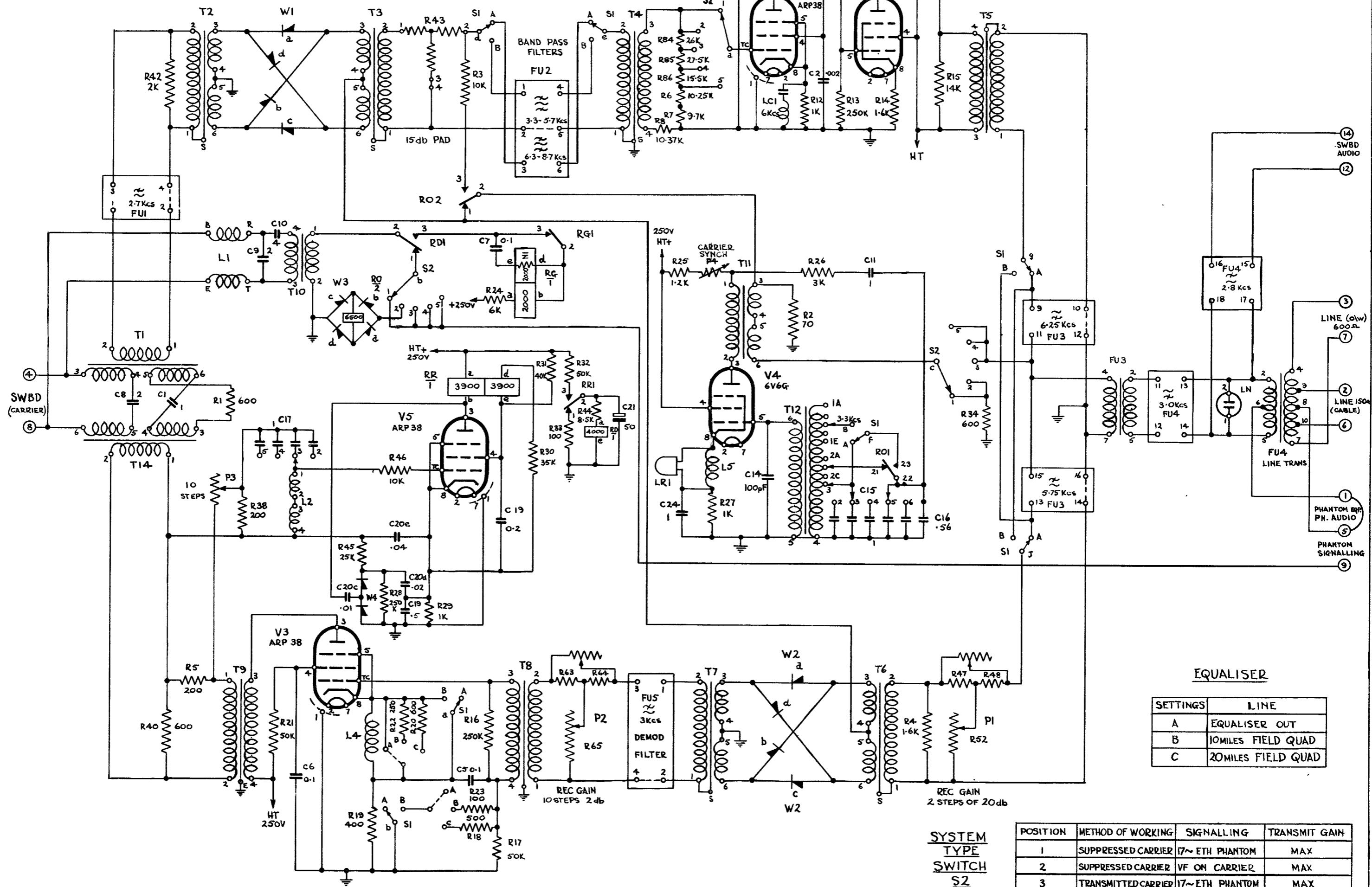
REPEATER CT 1+3 TYPES SAS & SAT — BAY LAYOUT



BALANCES FOR +10 IN 600 ohms

REPEATER CT 1+3 TYPES SAS & SAT  
2 FREQ TEST OSC AND BRIDGE

11/103



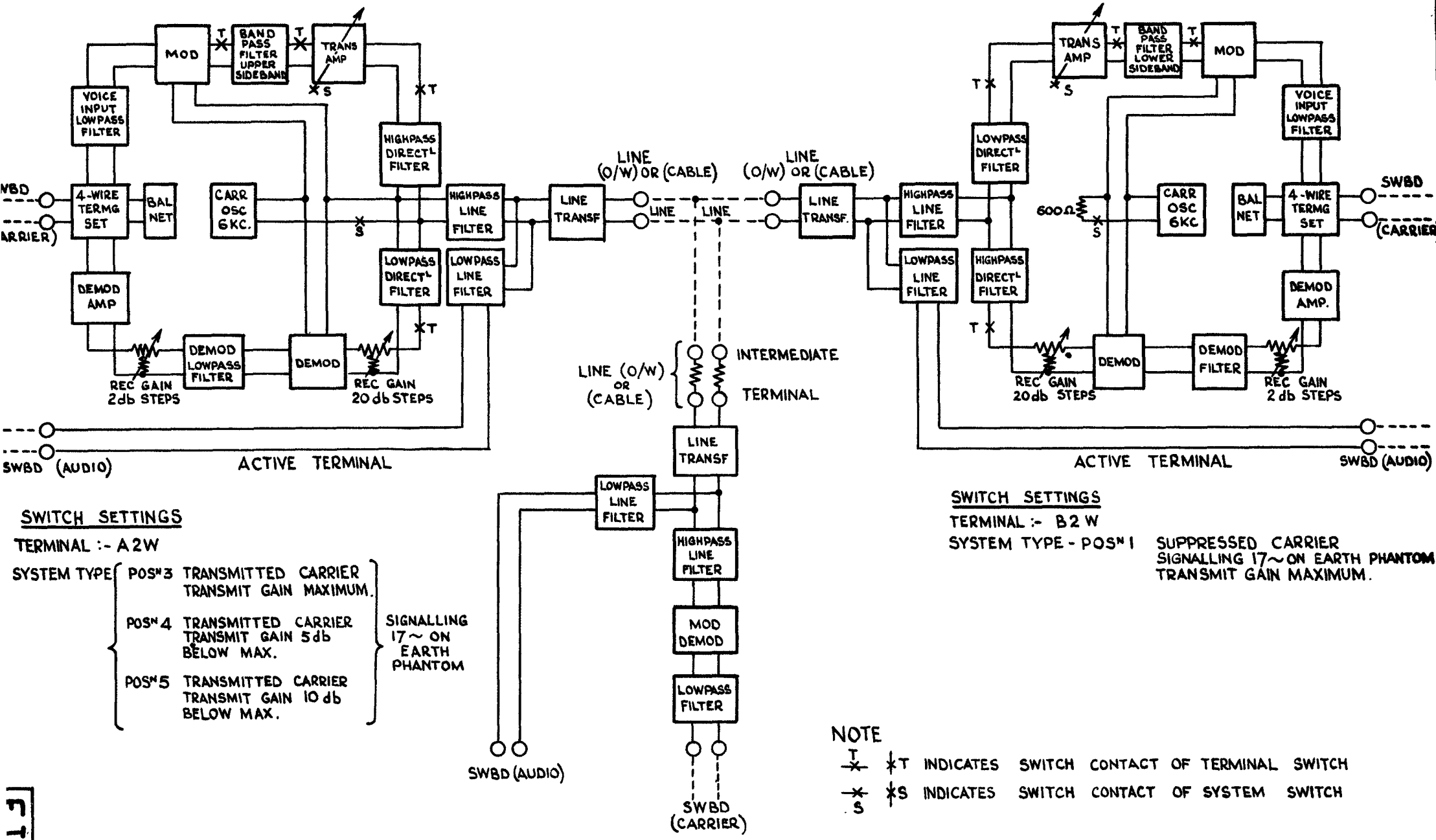
**EQUALISER**

SETTINGS	LINE
A	EQUALISER OUT
B	10MILES FIELD QUAD
C	20MILES FIELD QUAD

POSITION	METHOD OF WORKING	SIGNALLING	TRANSMIT GAIN
1	SUPPRESSED CARRIER	17~ ETH PHANTOM	MAX
2	SUPPRESSED CARRIER	VF ON CARRIER	MAX
3	TRANSMITTED CARRIER	17~ ETH PHANTOM	MAX
4	TRANSMITTED CARRIER	17~ ETH PHANTOM	5db BELOW MAX
5	TRANSMITTED CARRIER	17~ ETH PHANTOM	10db BELOW MAX

**ACT 1+1 ACTIVE TERMINAL - SCHEMATIC E1/101**

SYSTEM TYPE SWITCH S2



**SWITCH SETTINGS**

TERMINAL :- A 2W

- |             |   |  |  |
|-------------|---|--|--|
| SYSTEM TYPE | } | POS <sup>n</sup> 3 TRANSMITTED CARRIER<br>TRANSMIT GAIN MAXIMUM.           | } SIGNALLING<br>17~ ON<br>EARTH<br>PHANTOM |
|             |   | POS <sup>n</sup> 4 TRANSMITTED CARRIER<br>TRANSMIT GAIN 5db<br>BELOW MAX.  |  |
|             |   | POS <sup>n</sup> 5 TRANSMITTED CARRIER<br>TRANSMIT GAIN 10db<br>BELOW MAX. |  |

**SWITCH SETTINGS**

TERMINAL :- B 2W

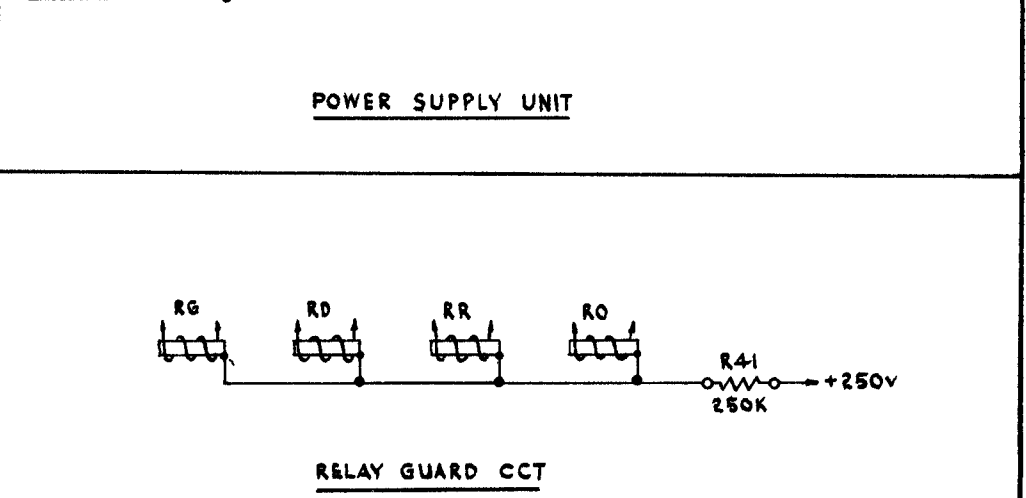
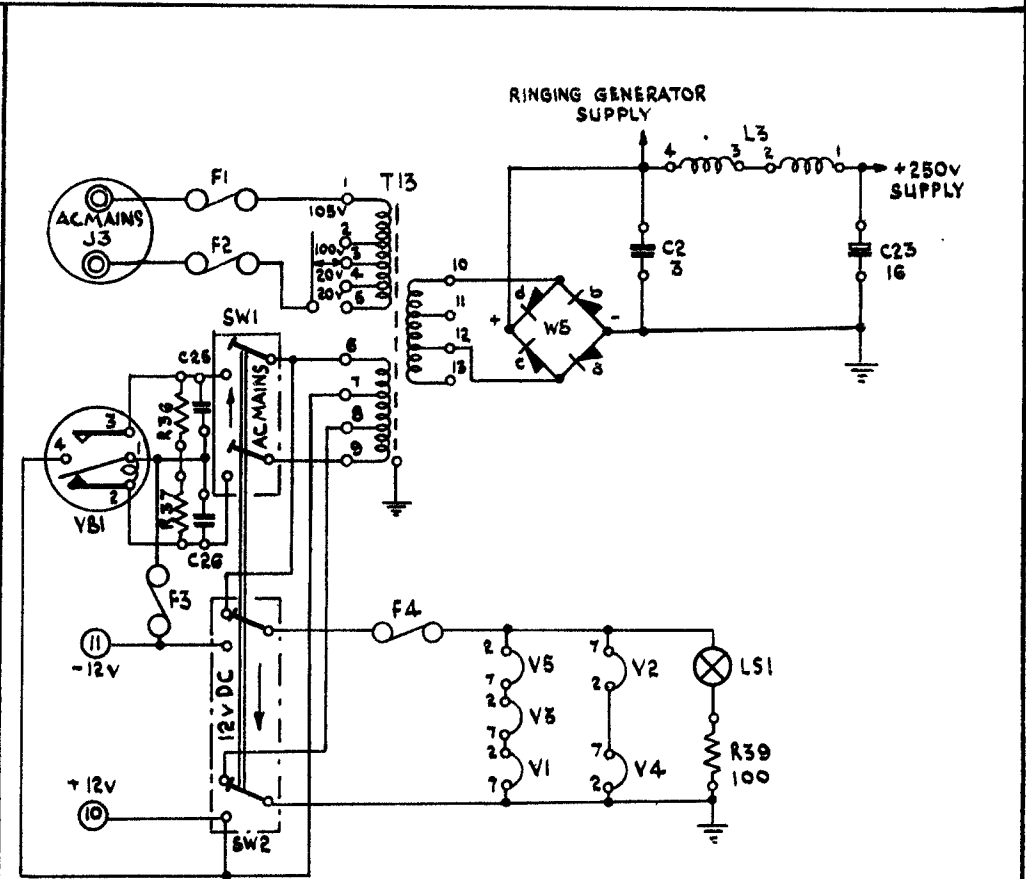
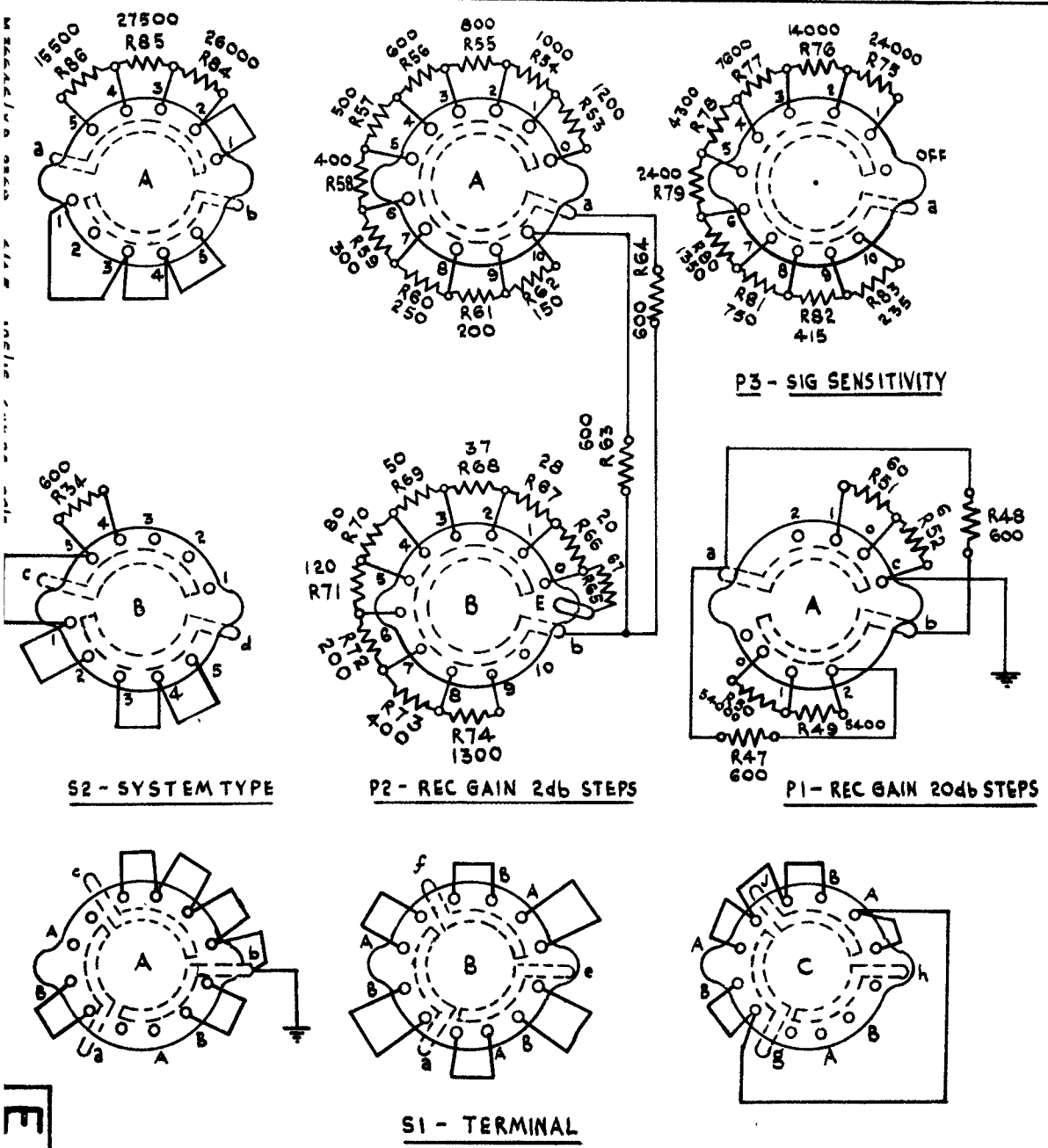
SYSTEM TYPE - POS<sup>n</sup> 1 SUPPRESSED CARRIER  
SIGNALLING 17~ ON EARTH PHANTOM  
TRANSMIT GAIN MAXIMUM.

**NOTE**

- $\overline{\text{T}}$   $\overline{\text{X}}$  INDICATES SWITCH CONTACT OF TERMINAL SWITCH
- $\overline{\text{S}}$   $\overline{\text{X}}$  INDICATES SWITCH CONTACT OF SYSTEM SWITCH

**APPARATUS CARRIER TELEPHONE 1+1 - 2 Wire Working**

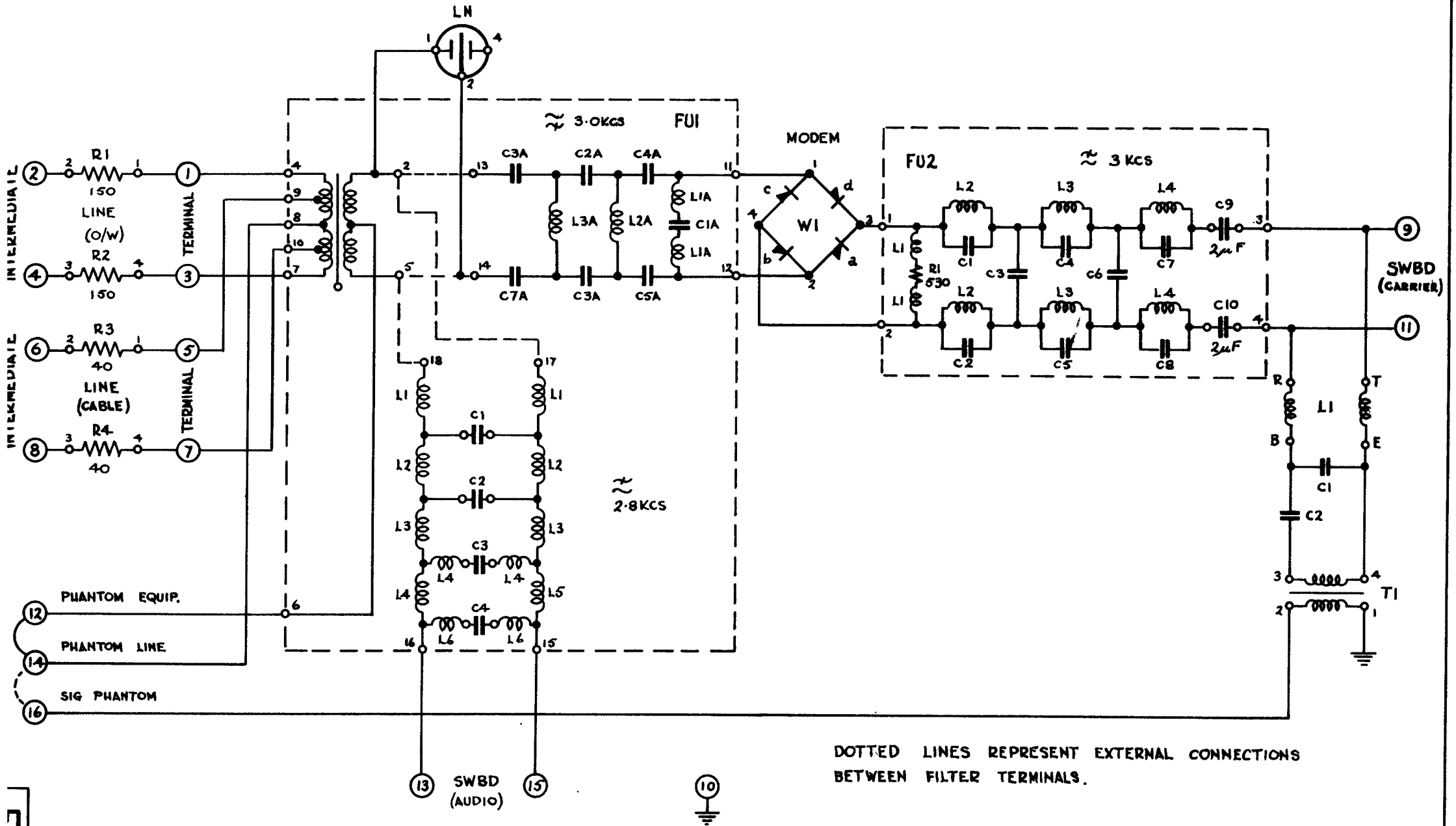
5/1/13



E1/103

**APPARATUS CARRIER TELEPHONE 1+1 - ACTIVE TERMINAL**

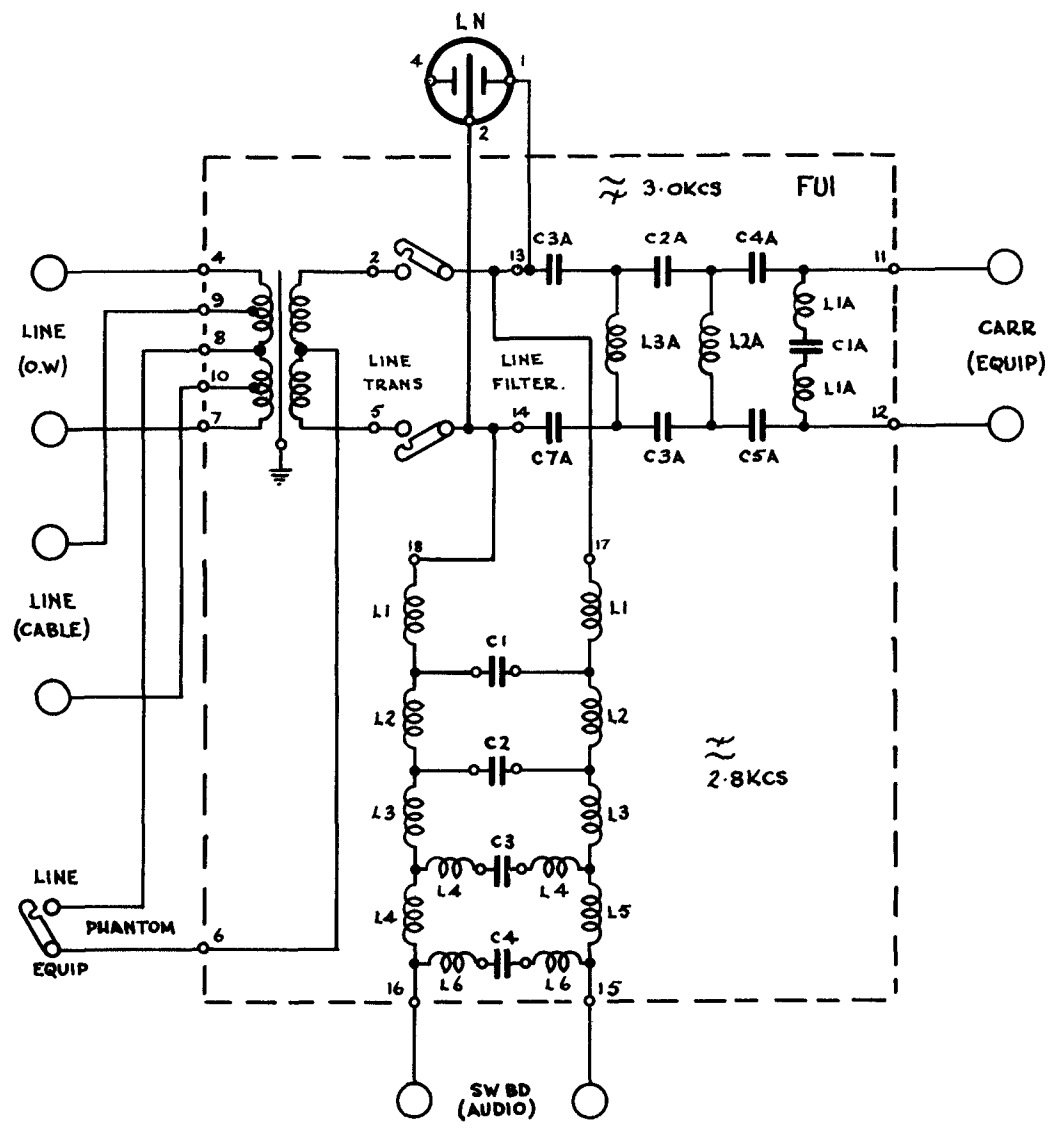
14877/P.L.R./245



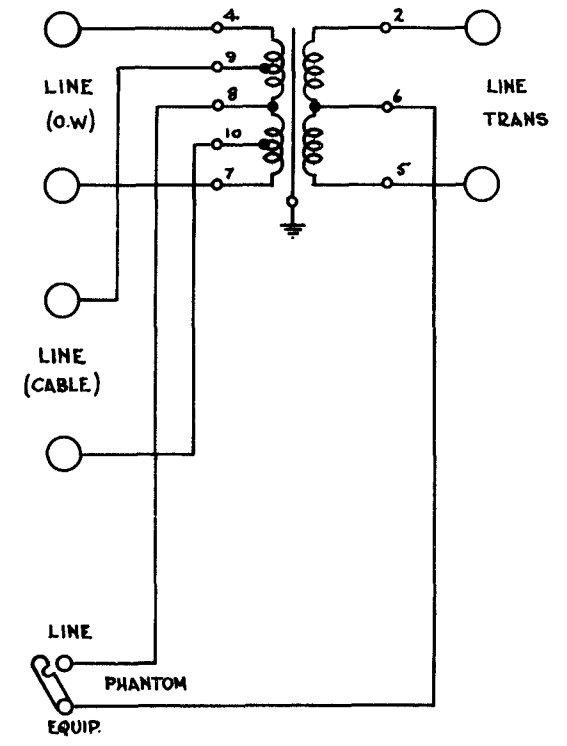
APPARATUS CARRIER TELEPHONE-1 + 1 - INERT TERMINAL - SCHEMATIC

C I I I I

14377/P.L.H./2.45



LINE FILTER CIRCUIT



PHANTOM BALANCE CIRCUIT.

A.C.T. 1+1 BALANCE & BY-PASS FILTER UNIT

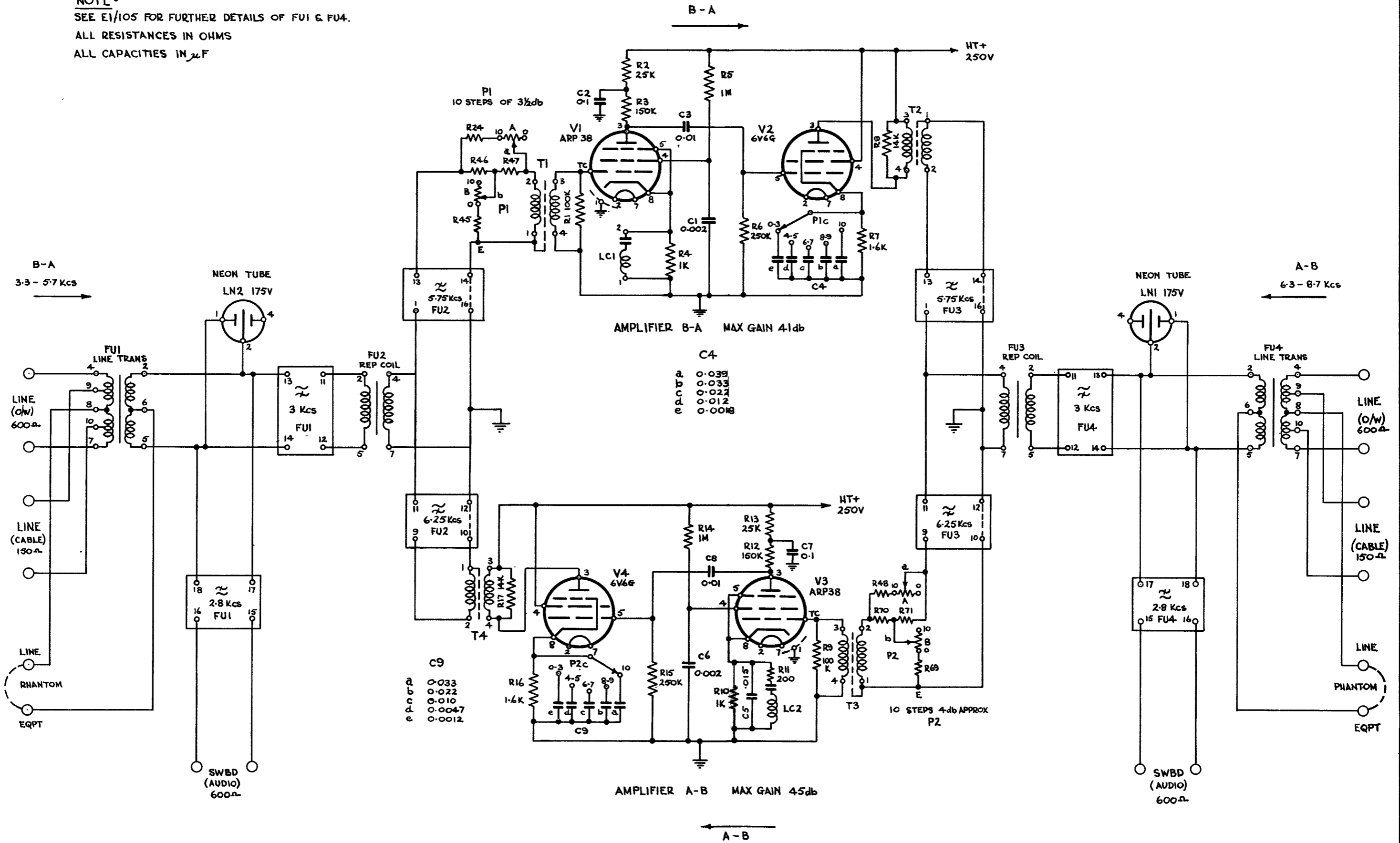


**NOTE**

SEE E1/105 FOR FURTHER DETAILS OF FU1 & FU4.

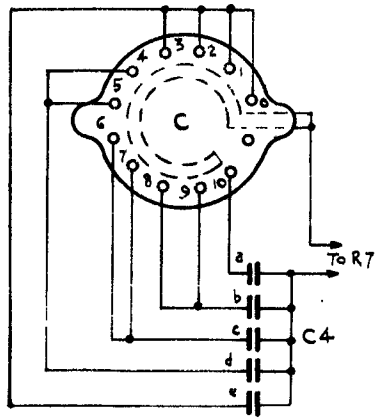
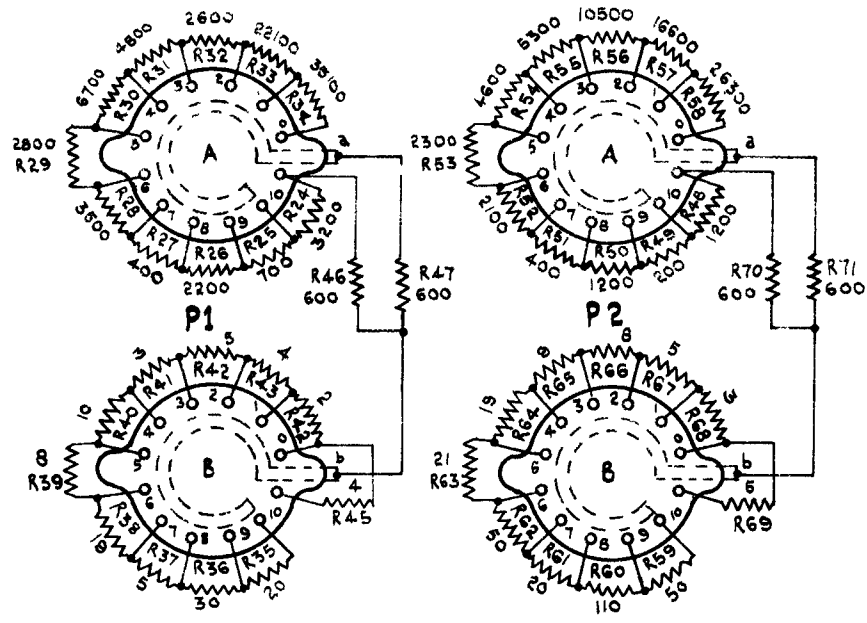
ALL RESISTANCES IN OHMS

ALL CAPACITIES IN  $\mu$ F

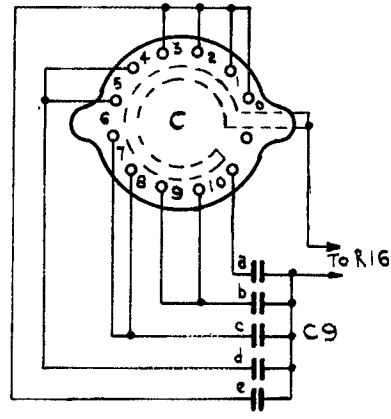


**REPEATER CARRIER TELEPHONE 1 + 1**

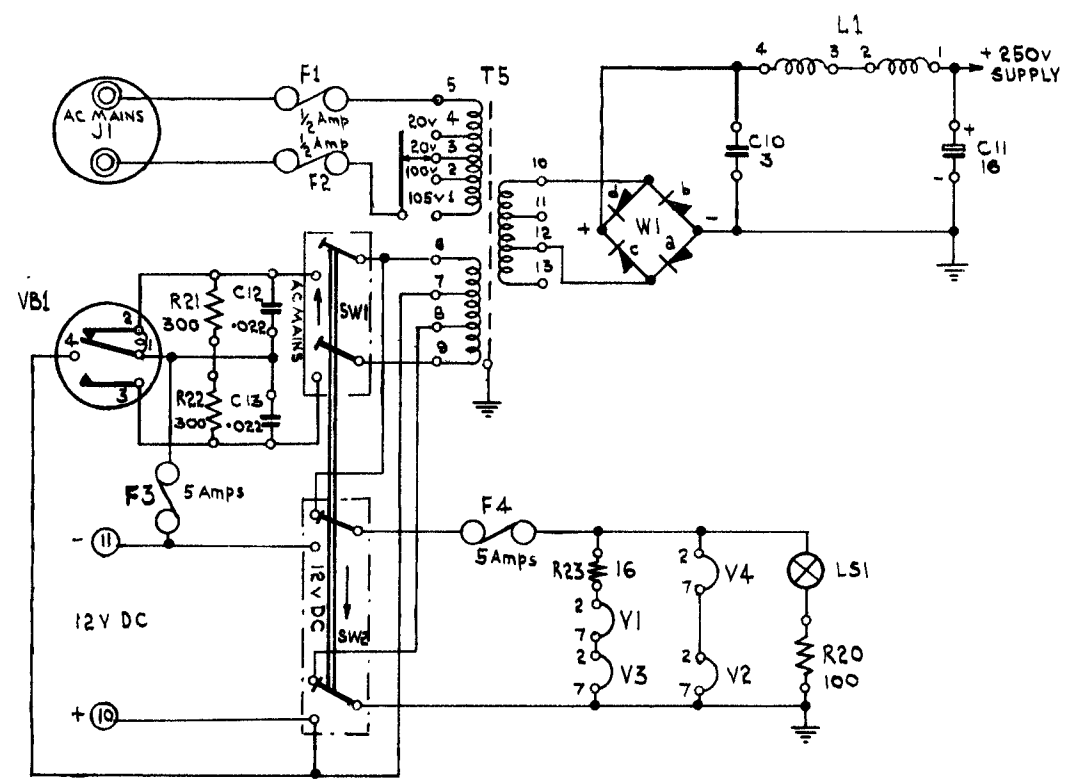
14377/P.L.H./2/45



- C4**
- a = 0.039
  - b = 0.053
  - c = 0.022
  - d = 0.012
  - e = 0.0018



- C9**
- a = 0.033
  - b = 0.022
  - c = 0.01
  - d = 0.0047
  - e = 0.0012



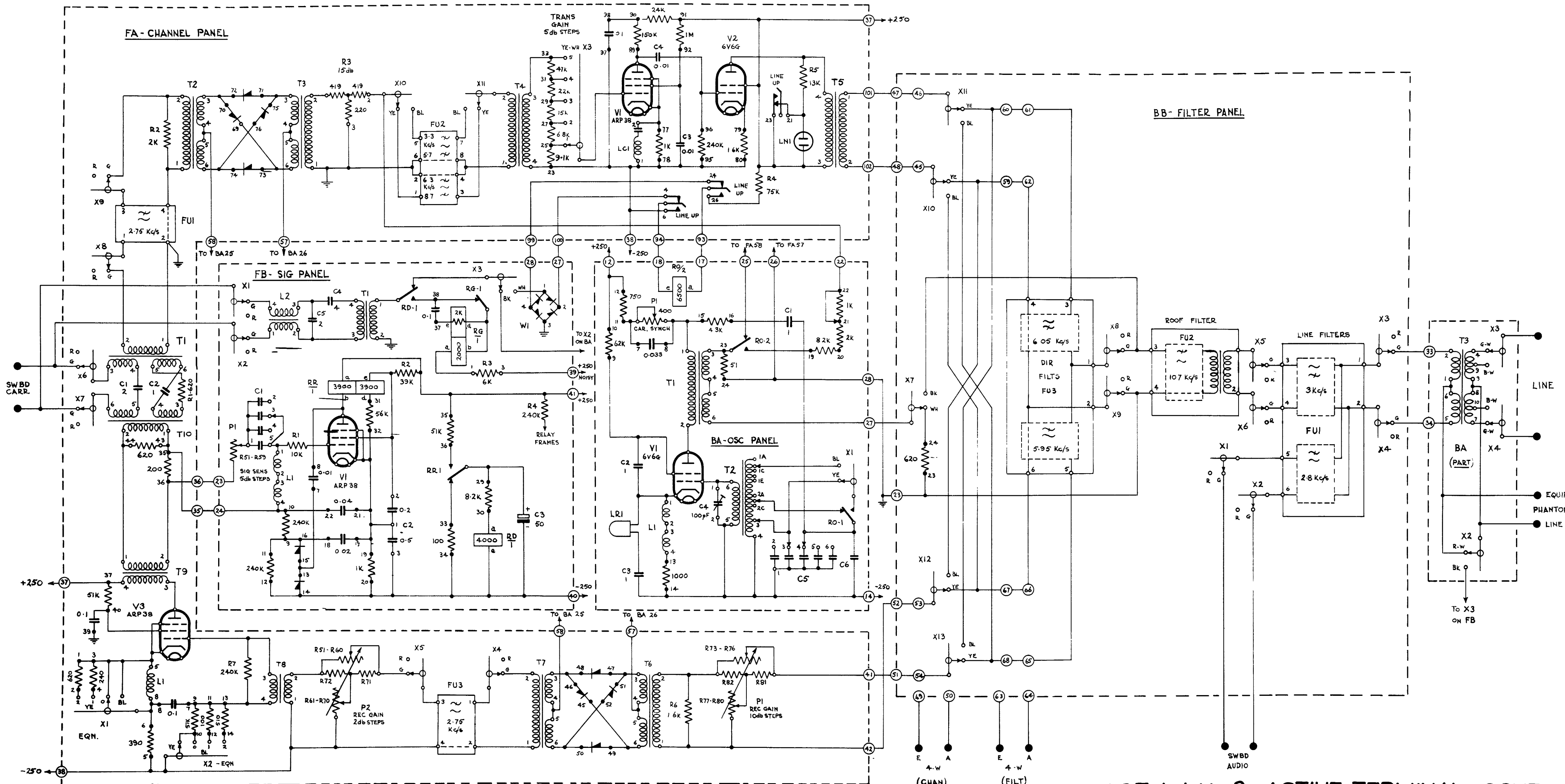
POWER SUPPLY CIRCUIT

REPEATER CARRIER TELEPHONE 1+1

SCHOOL OF SIGNALS  
DRAWN BY: RMB-23 FEB 1945  
CHECKED BY: J. H. P.

FOLD HERE

FOLD HERE

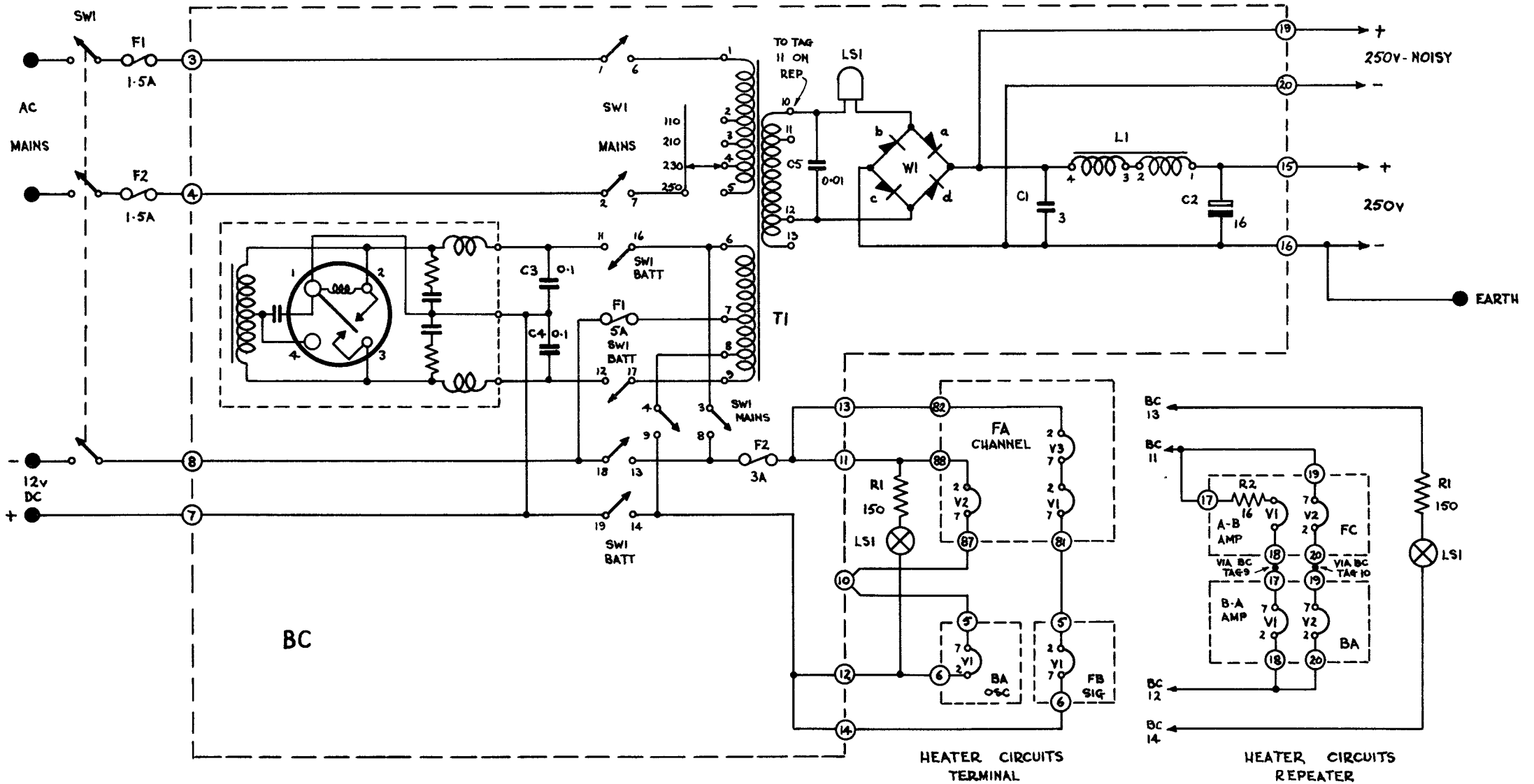


Note: - FOR CLARITY, SOME TAGS HAVE BEEN SHOWN TWICE ON THIS DIAGRAM.

# ACT 1+1 No 2 ACTIVE TERMINAL - SCHEMATIC

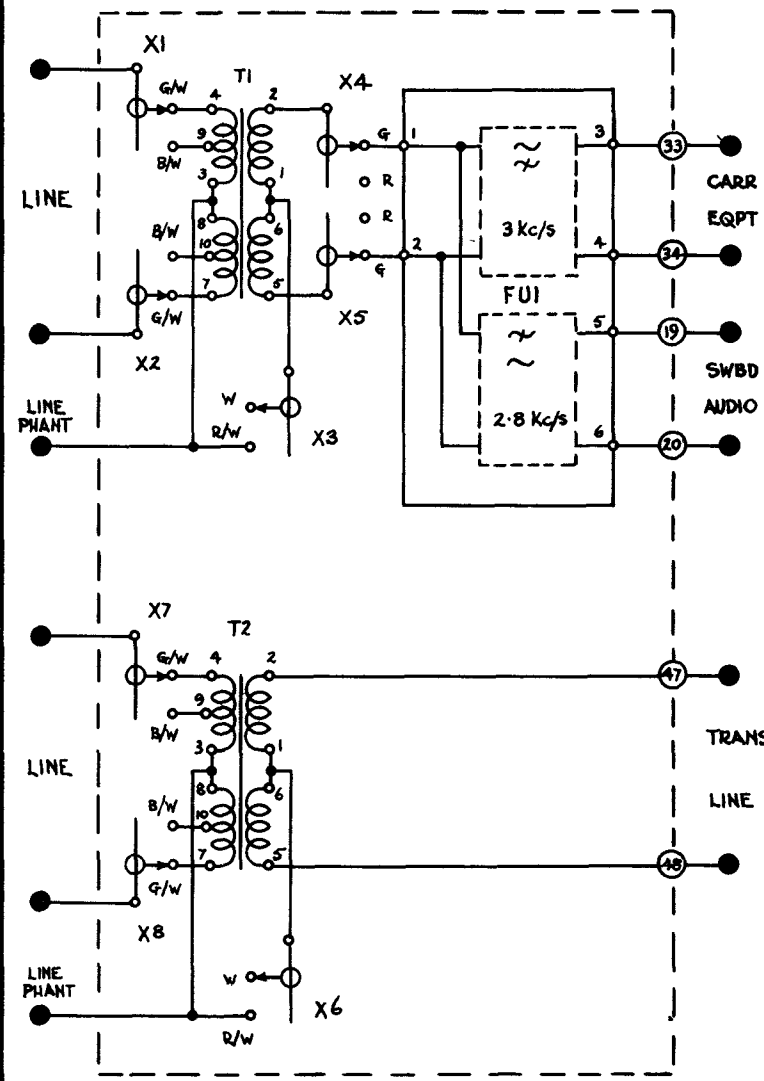
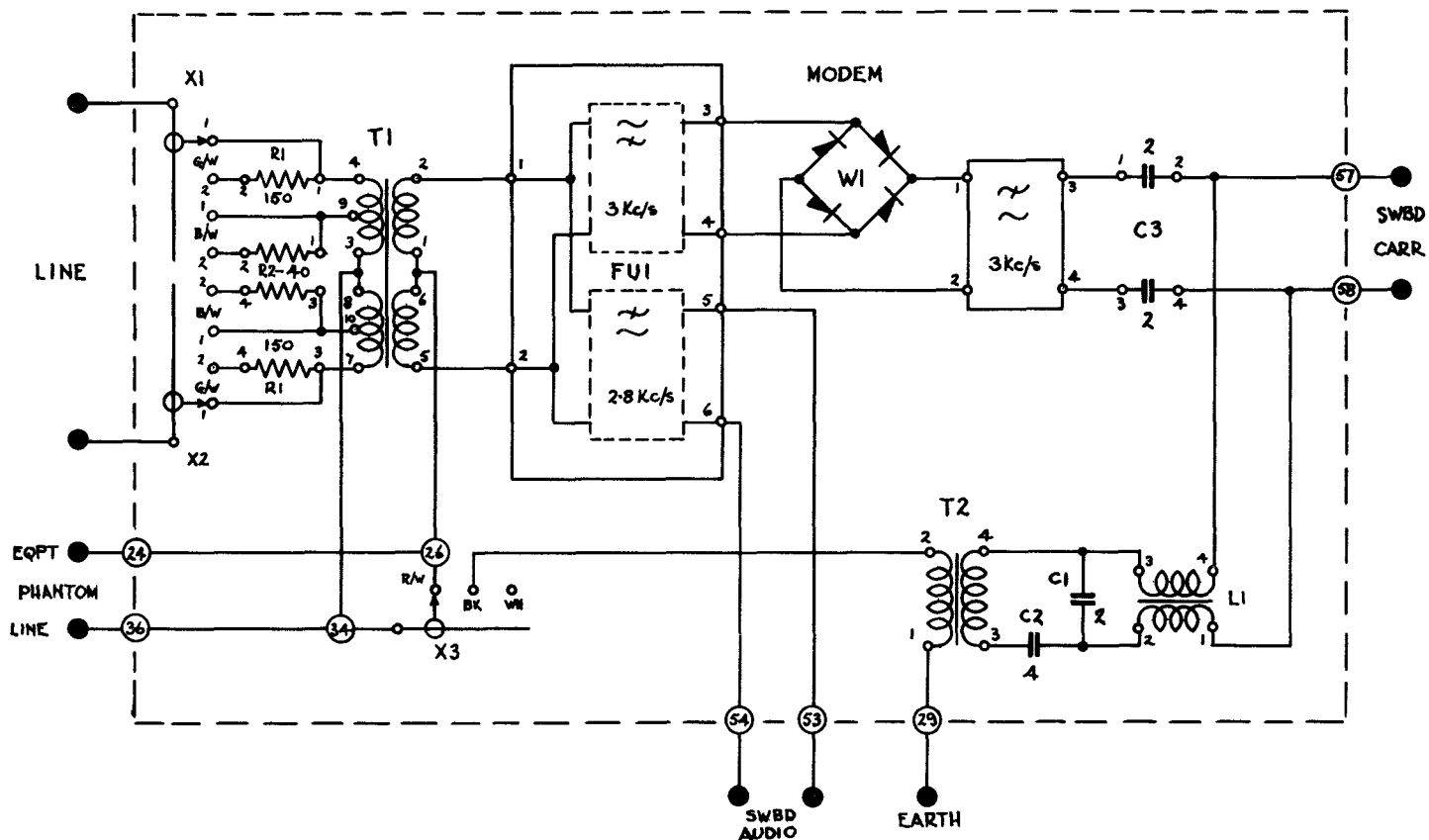
F1/110

15212/P.L.H./S.45.  
7 MARCH 1945 - RMB



ACT 1+1 No2 ACTIVE TERMINAL & REPEATER — POWER PANEL

E1/111

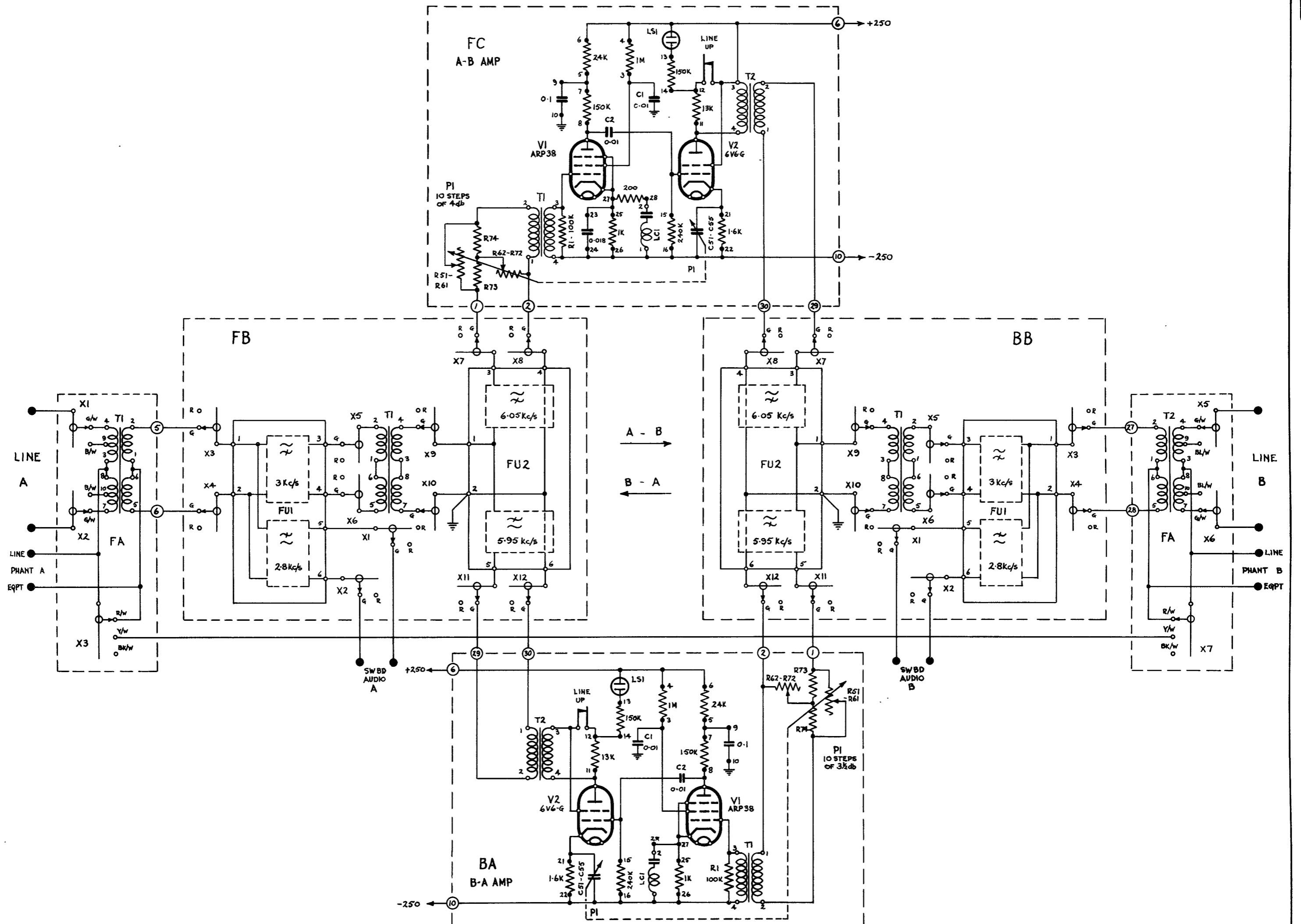


THE COMPLETE UNIT CONSISTS OF 2 PANELS AS ABOVE.

E1/112

ACT 1+1 No2 - INERT TERMINAL

FILTER BALANCE AND BY-PASS No2B

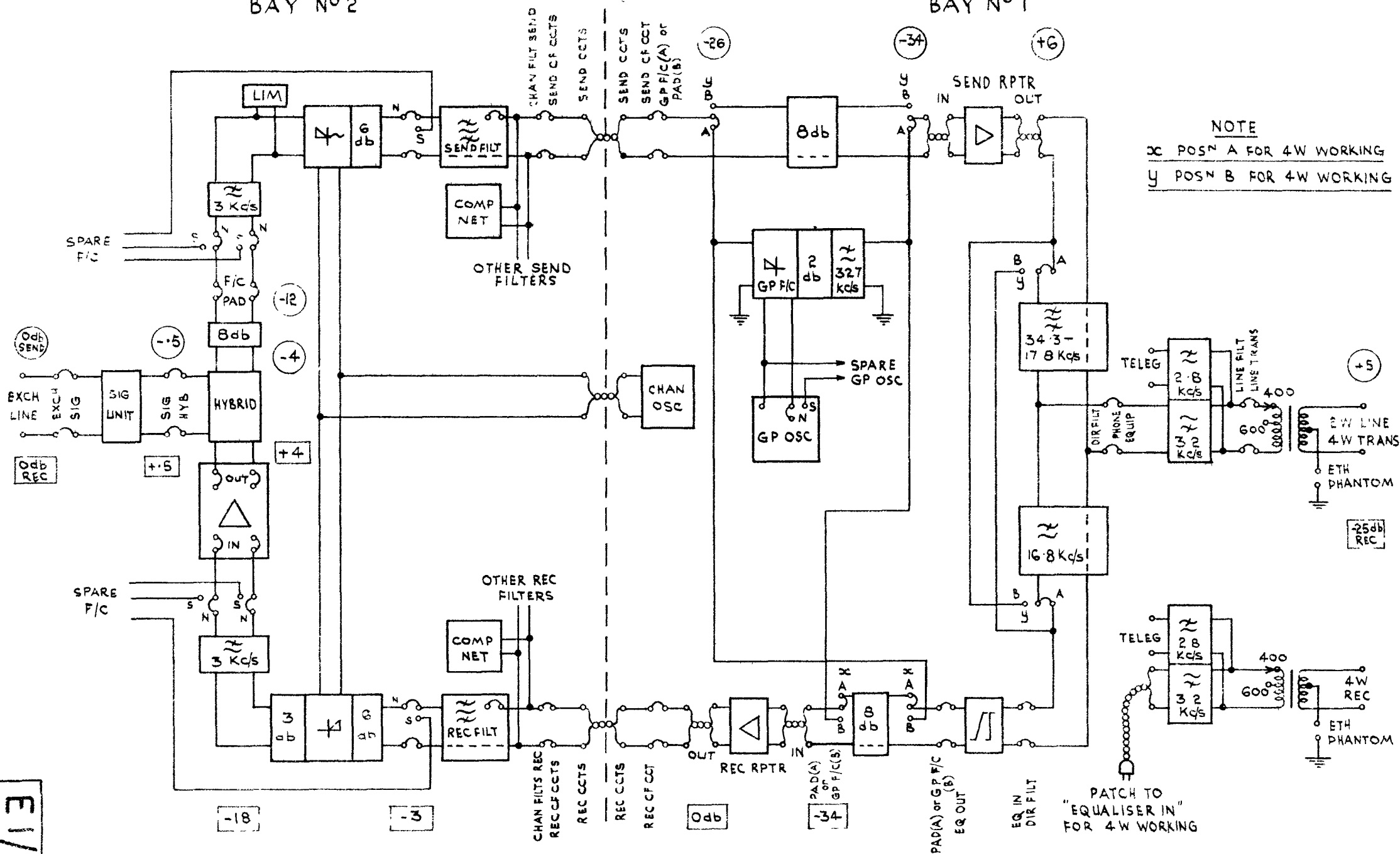


REPEATER CT 1+1 2 WIRE No2

F1/113

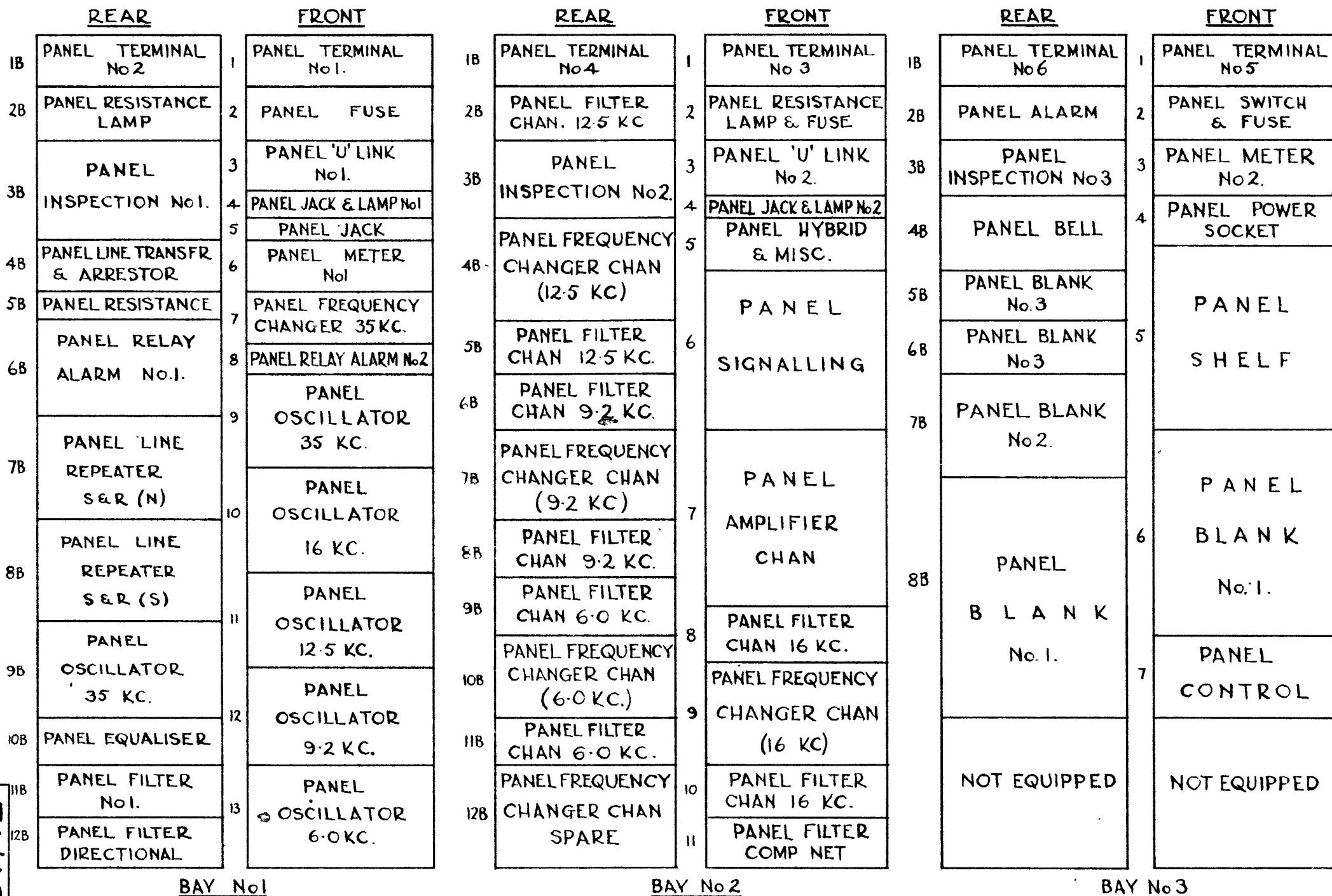
BAY N° 2

BAY N° 1



APPARATUS CARRIER TELEPHONE 1+4MKI - BLOCK SCHEMATIC

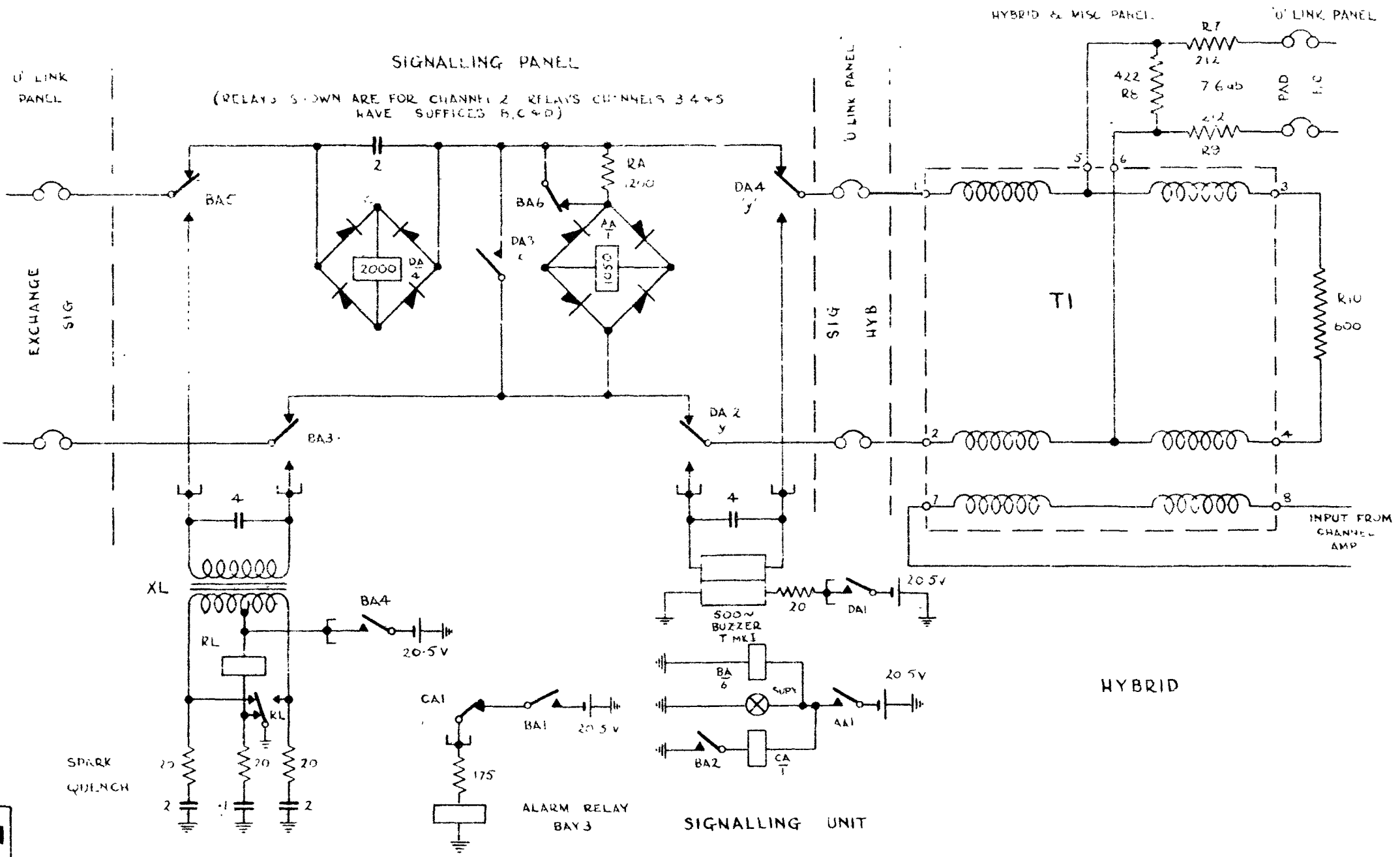
E1/120



E1/121

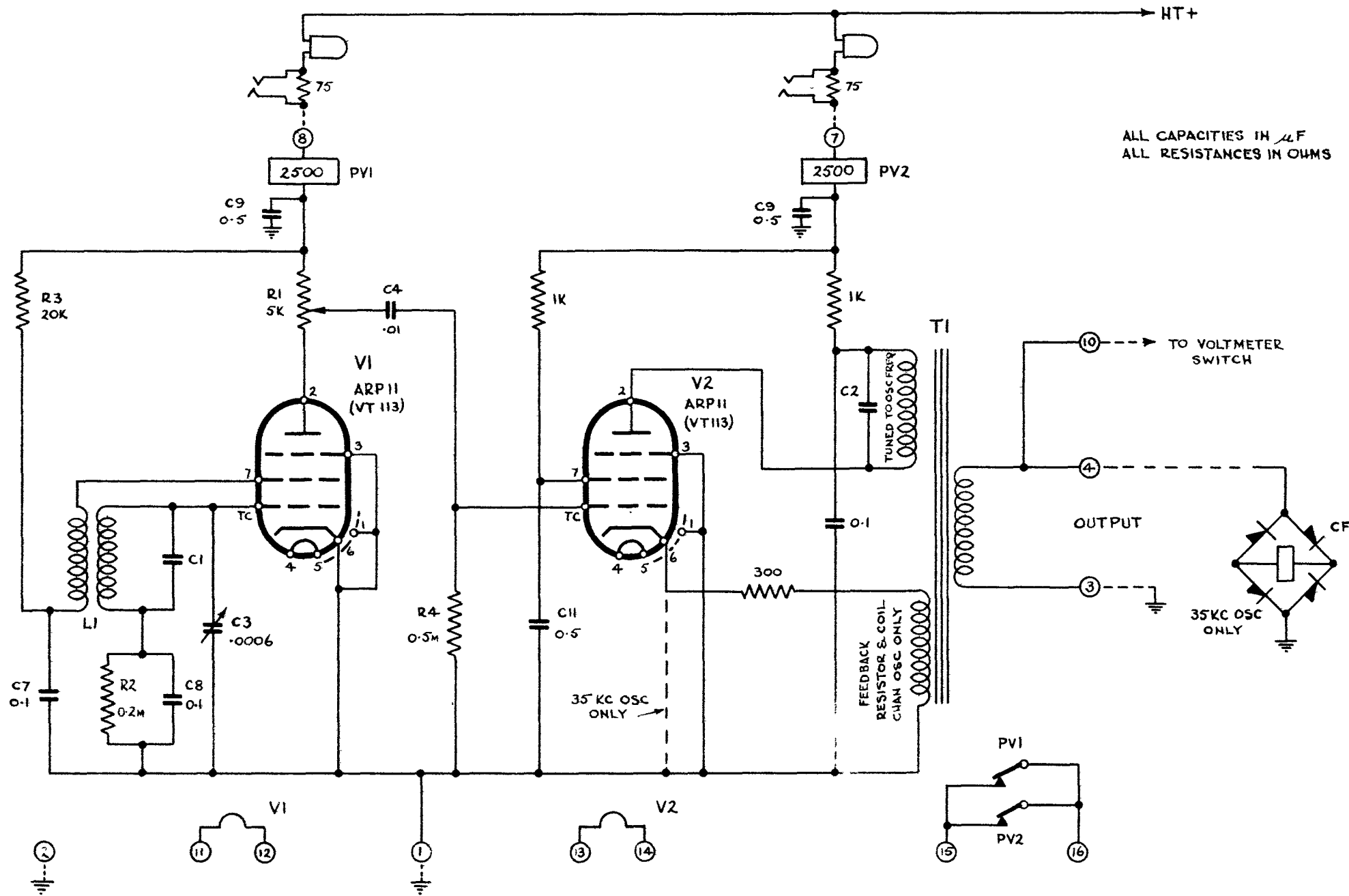
BAY No 1
BAY No 2
BAY No 3  
**APPARATUS CARRIER TELEPHONE 1+4 MKI - PANEL LAYOUT**





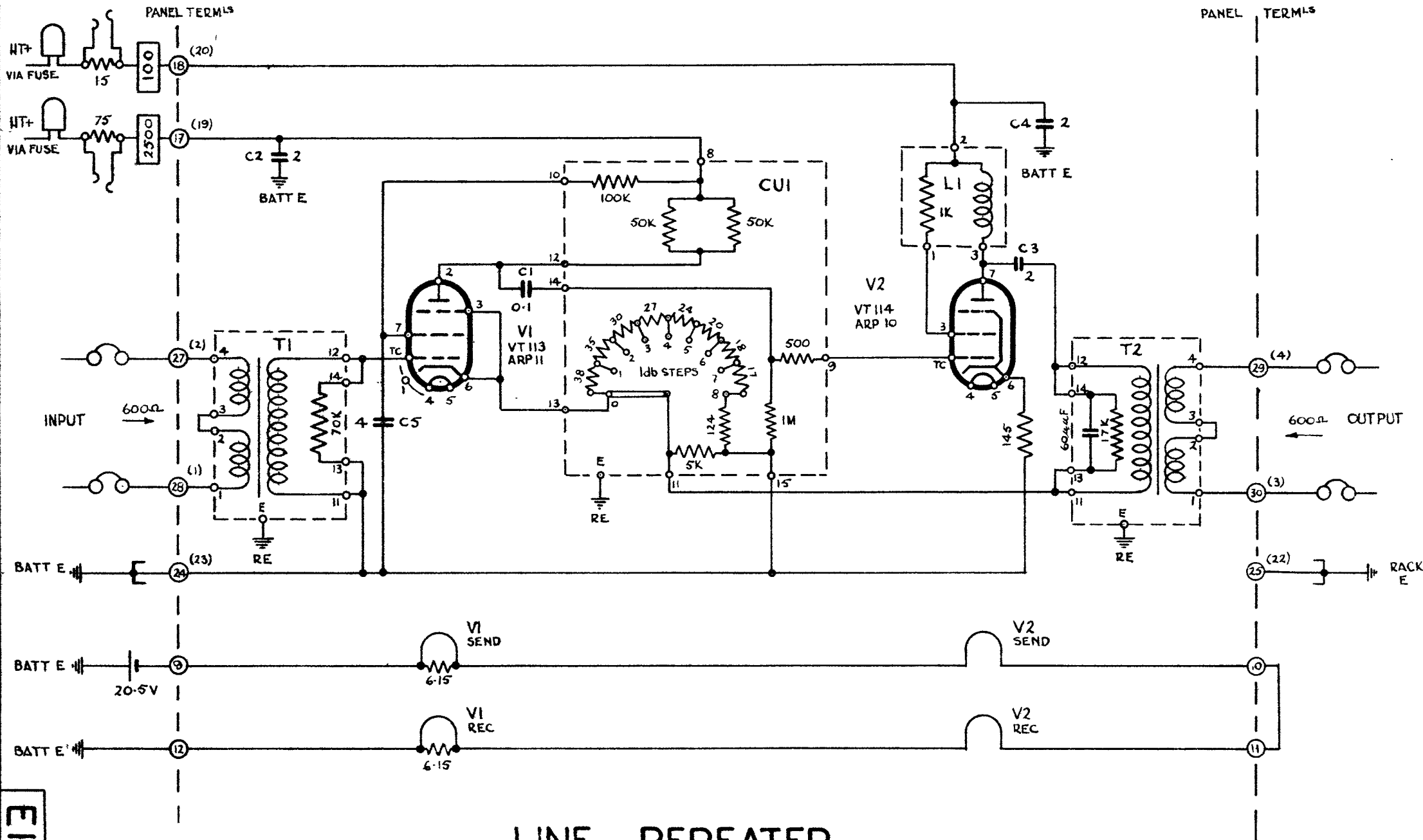
**APPARATUS CARRIER TELEPHONE 1+4 MKI**  
**SIGNALLING UNIT AND HYBRID**

E1/122



E1/123

APPARATUS CARRIER TELEPHONE 1-4 MKI - OSCILLATOR



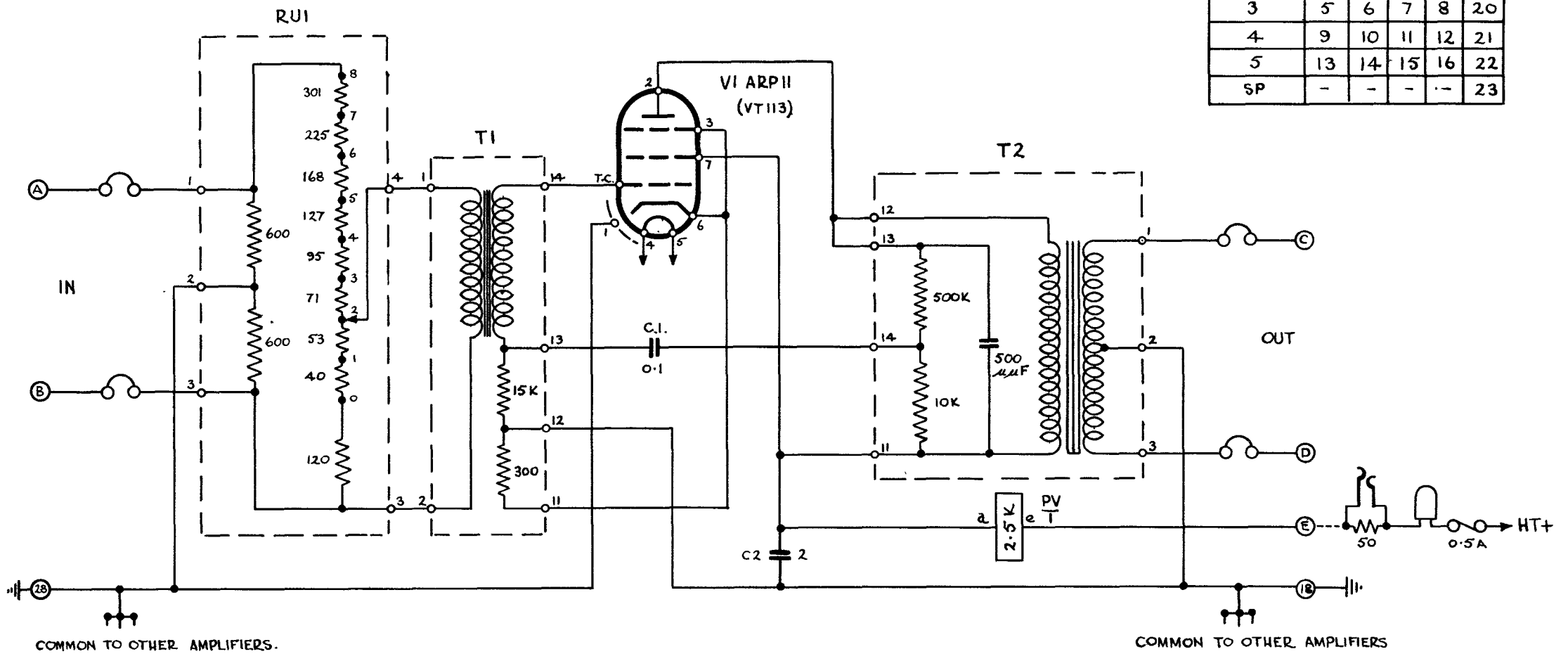
LINE REPEATER

A.C.T. 1+4 MK I - REPEATER C.T. No 1 MK I

E1/124

AMPLIFIER CONNECTIONS

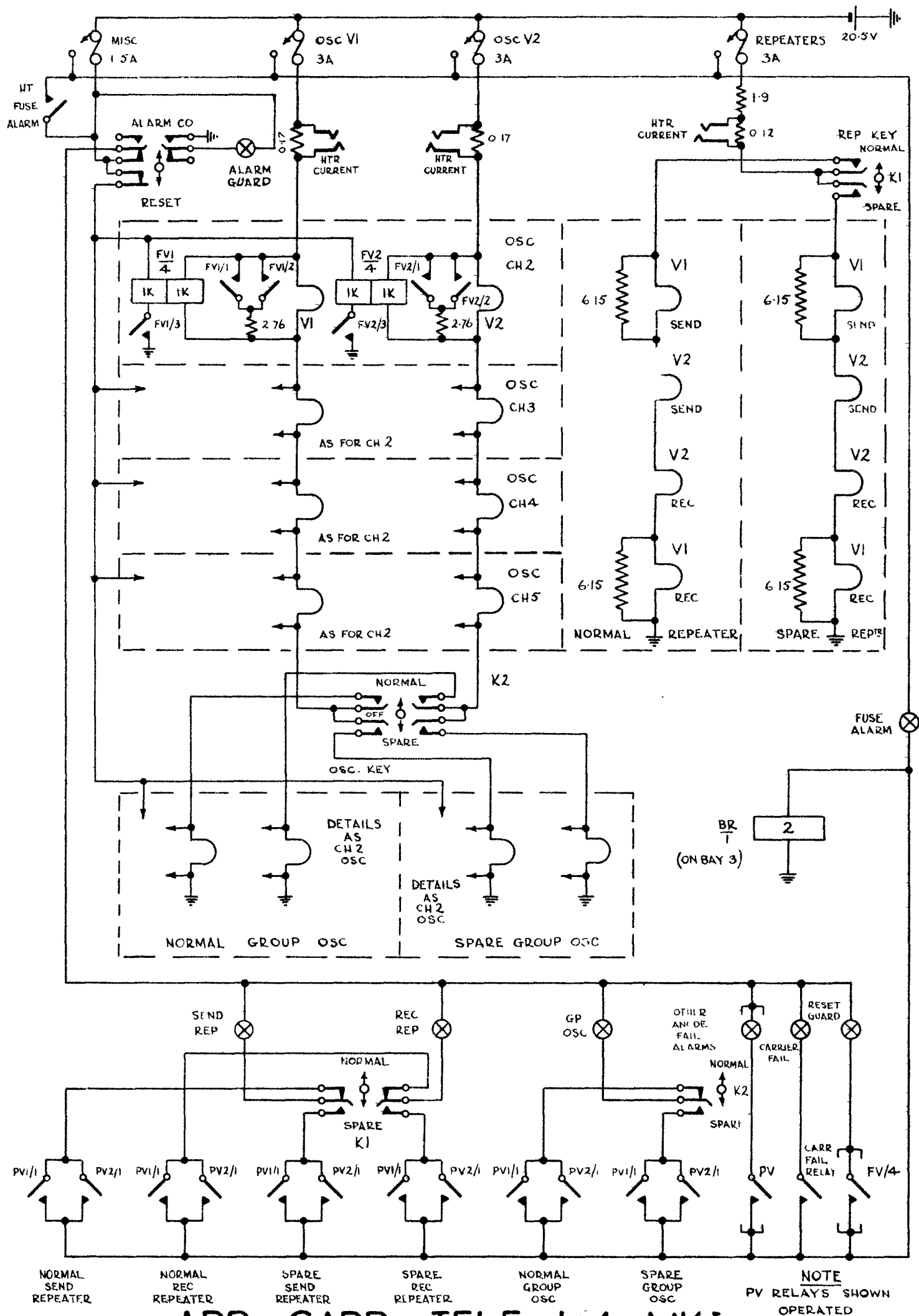
AMPLER	A	B	C	D	E
2	1	2	3	4	19
3	5	6	7	8	20
4	9	10	11	12	21
5	13	14	15	16	22
SP	-	-	-	-	23



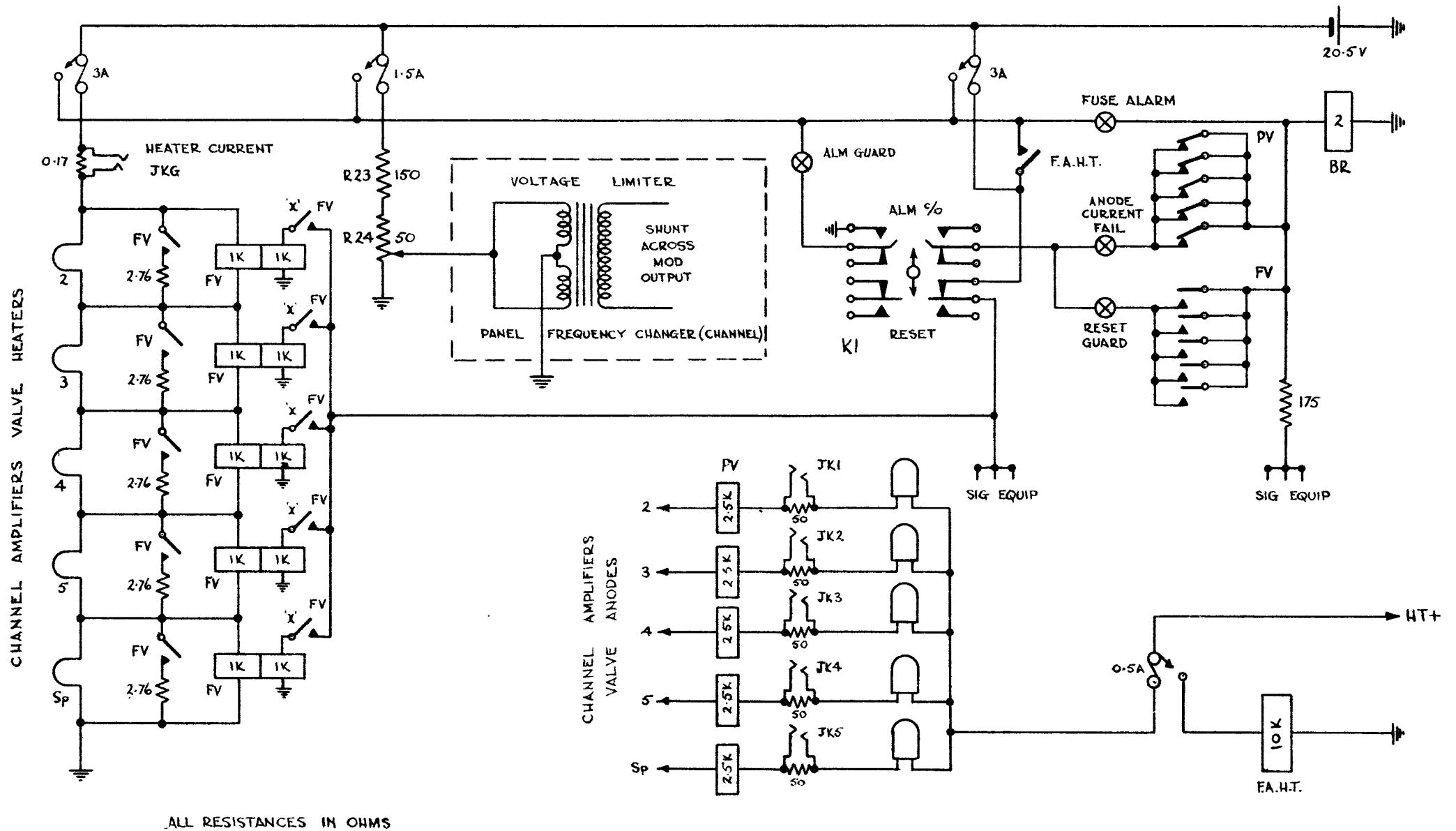
ALL CAPACITIES IN  $\mu$ F  
 ALL RESISTANCES IN OHMS

APPARATUS CARRIER TELEPHONE 1+4 MKI-CHANNEL AMPLIFIER

E1/125



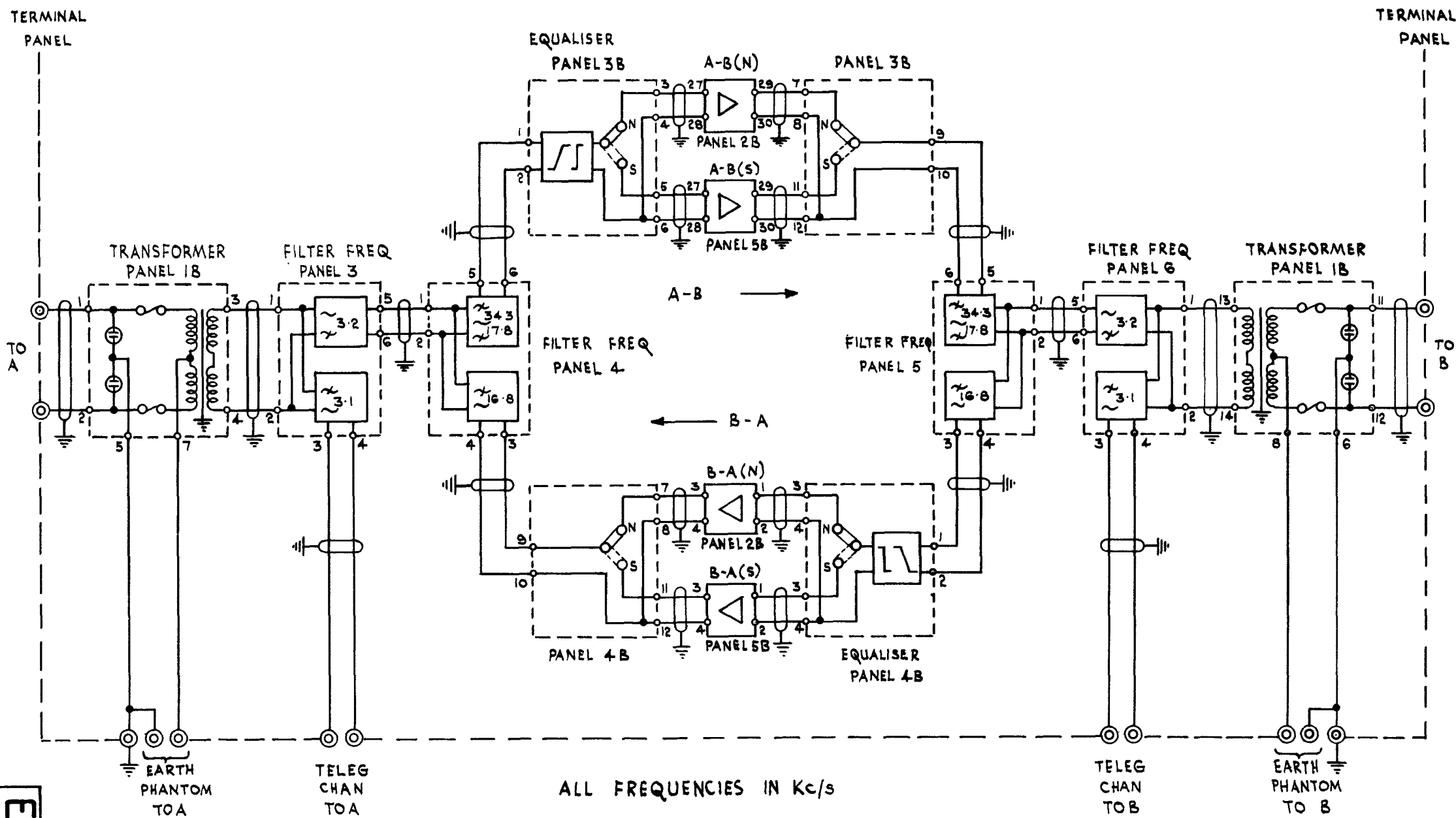
**APP CARR TELE 1+4 MKI**  
**SUPPLY AND ALARMS - BAY No 1** E11/126



**APPARATUS CARRIER TELEPHONE 1+4 MKI**  
**SUPPLY & ALARMS BAY No2**

E1/127

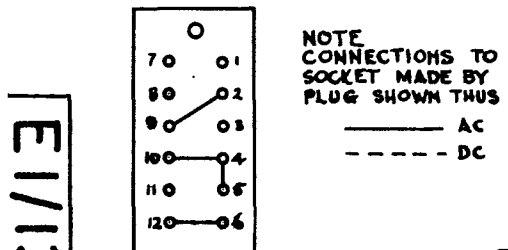
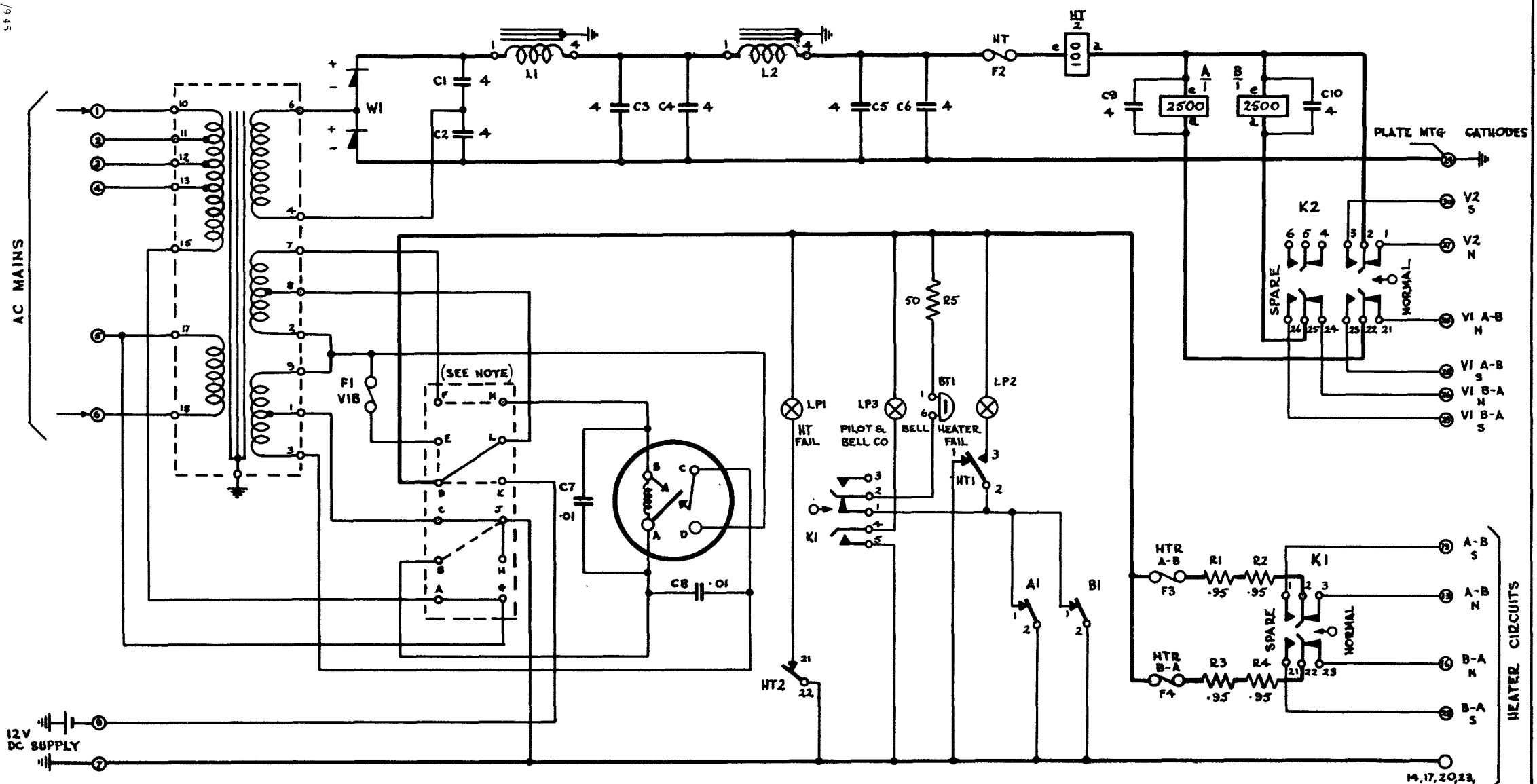
15973/P.L.N./945



E/1/36

REPEATER CARRIER TELEPHONE No 1 - BLOCK SCHEMATIC

158973/Rev. H / 9 45



NOTE  
 CONNECTIONS TO  
 SOCKET MADE BY  
 PLUG SHOWN THUS  
 ——— AC  
 - - - - DC

ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu$ F

E1/137

INSIDE VIEW OF PLUG

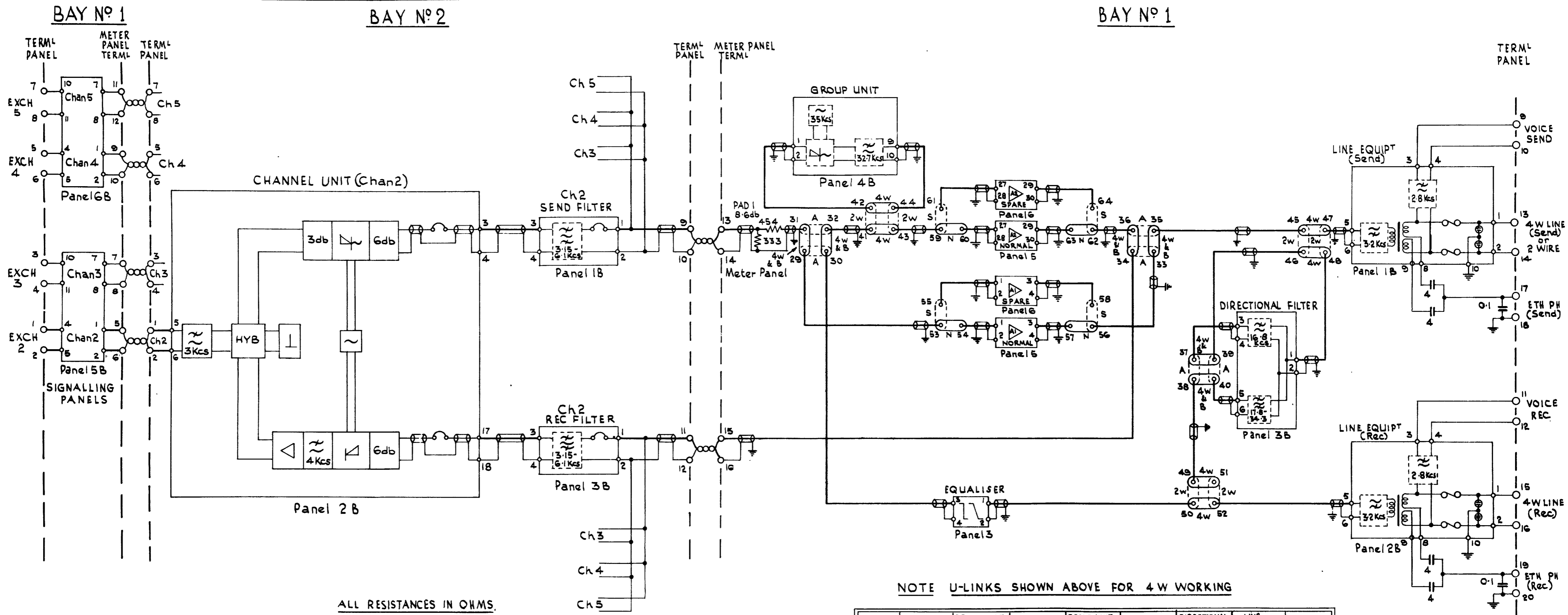
# REPEATER CARRIER TELEPHONE No. 1 - POWER SUPPLY

14, 17, 20, 23



SCHOOL OF SIGNALS  
D. R. ANNAN W. H. H. P.  
CHECKED BY J. H. P.

FOLD HERE



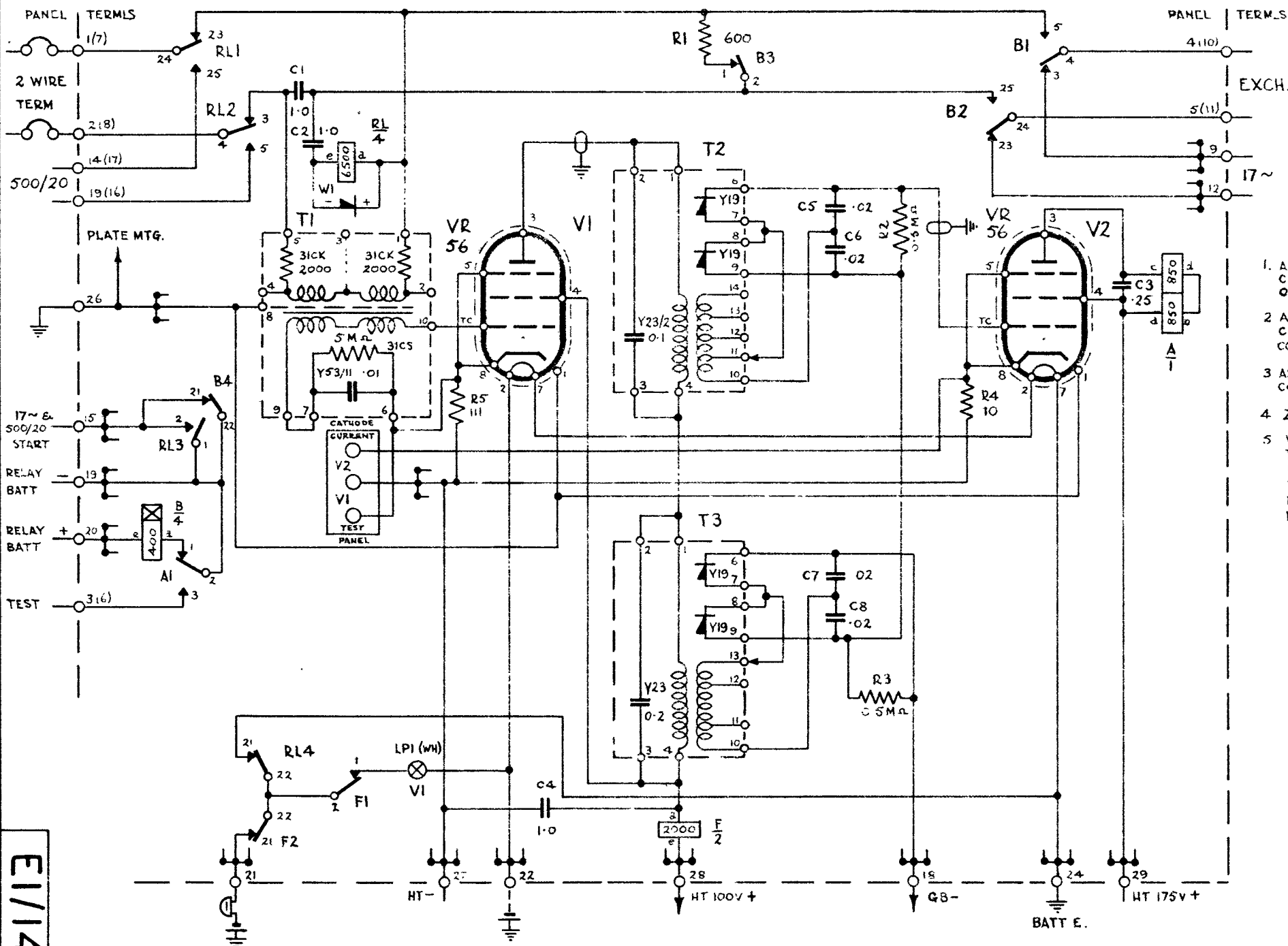
ALL RESISTANCES IN OHMS.  
ALL CAPACITIES IN  $\mu$ F.

**A.C.T. I + 4 MK II**  
**BLOCK**  
**SCHEMATIC**

CHAN	OSC FREQ	GP OSC 35 Kcs		GP OSC 33.8 Kcs	
		B-A	A-B	B-A	A-B
CHAN 2	6.0 Kcs	3.15-6.1	28.9-31.85	3.15-6.1	27.7-30.65
CHAN 3	9.2 Kcs	6.3-9.3	25.7-28.7	6.3-9.3	24.5-27.5
CHAN 4	12.5 Kcs	9.65-12.6	22.4-25.35	9.65-12.6	21.2-24.15
CHAN 5	16.0 Kcs	13.15-16.1	21.85-18.9	13.15-16.1	17.7-20.65

NOTE U-LINKS SHOWN ABOVE FOR 4 W WORKING

	PAD	GROUP UNIT MODULATOR	REPEATER	GROUP UNIT DEMODULATOR	EQUALISER	DIRECTIONAL FILTER	LINE EQUIPMENT	
To Chan Filt	8.6 db		A2				LINE EQPT	VOICE LINE SEND
			A1				LINE EQPT	LINE SEND
			4 WIRE WORKING					LINE VOICE
To Chan Filt	8.6 db		A2				LINE EQPT	VOICE LINE
			A1					LINE
			'A' STATION 2 WIRE WORKING					
To Chan Filt	8.6 db		A2				LINE EQPT	VOICE LINE
			A1					LINE
			'B' STATION 2 WIRE WORKING					



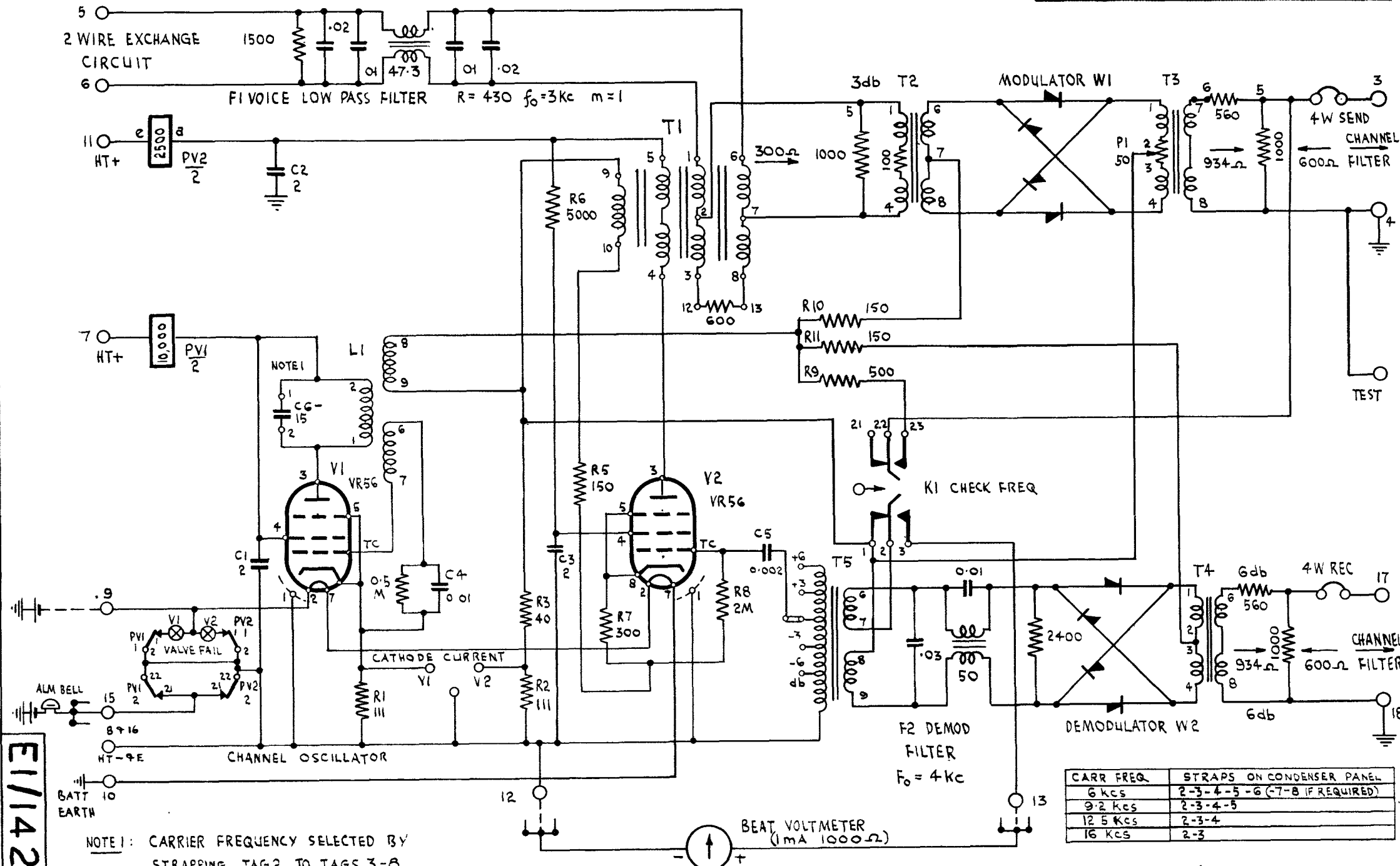
**NOTES**

1. ALL RESISTANCES IN  $\Omega$  & ALL CAPACITIES IN  $\mu F$  UNLESS OTHERWISE STATED.
2. A PANEL SIGNALLING Y33 GR.P III. CONSISTS OF 2 OF FIG.1. BUT WITH COMMON TERMINALS AS INDICATED
3. ALL CASE EARTH TAGS TO BE CONNECTED TO PLATE EARTH
4.  $Z_0 = 600 \Omega$
5. WHERE PANEL TERMS ARE SHOWN THUS -1(7), THE FIRST FIGURE REFERS TO THE LEFT HAND RECEIVER AND THE SECOND FIGURE (IN BRACKETS) TO THE RIGHT HAND RECEIVER.

**I+4 MK II SIGNALLING UNIT**

E1/141

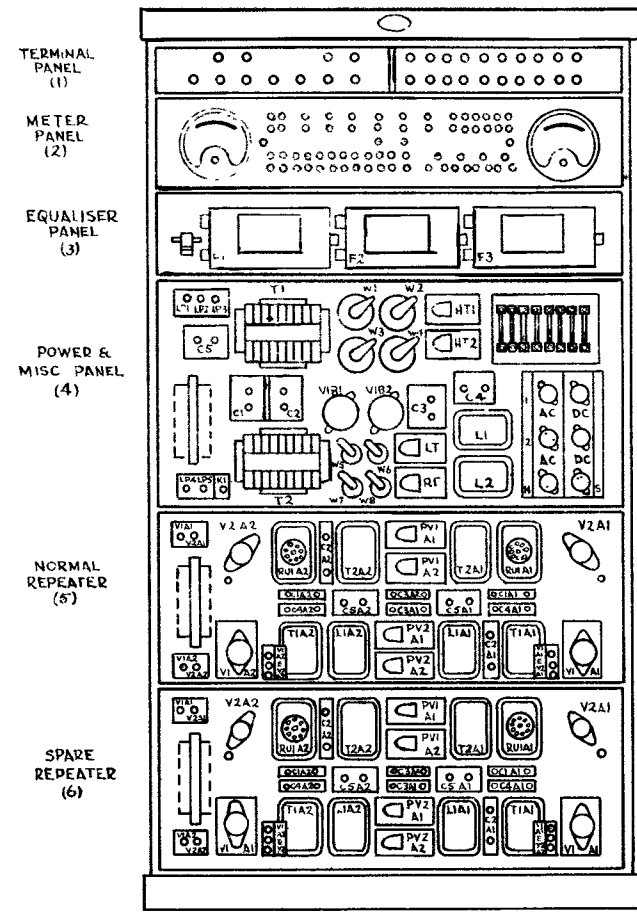
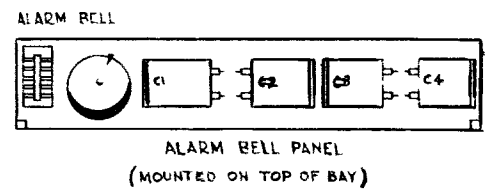
# APPARATUS TERMINAL CARRIER TELEPHONE 1+4 MKII - CHANNEL UNIT PANEL



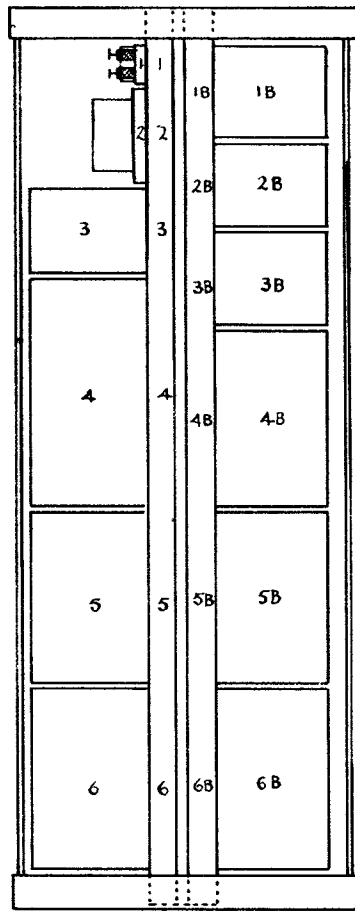
CARR FREQ	STRAPS ON CONDENSER PANEL
6 KCS	2-3-4-5-6 (-7-8 IF REQUIRED)
9.2 Kcs	2-3-4-5
12.5 Kcs	2-3-4
16 KCS	2-3

(AMENDED 12 JAN 44. W.H.F.)

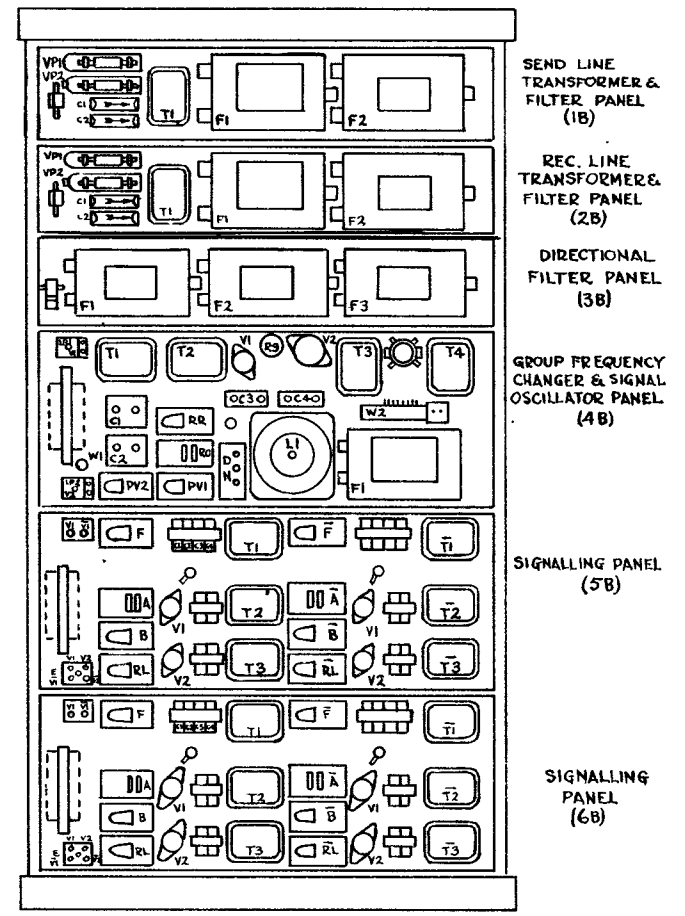
E11142



FRONT VIEW.



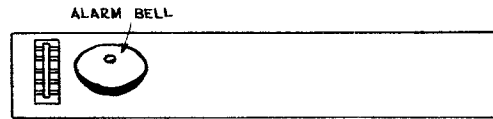
SIDE VIEW



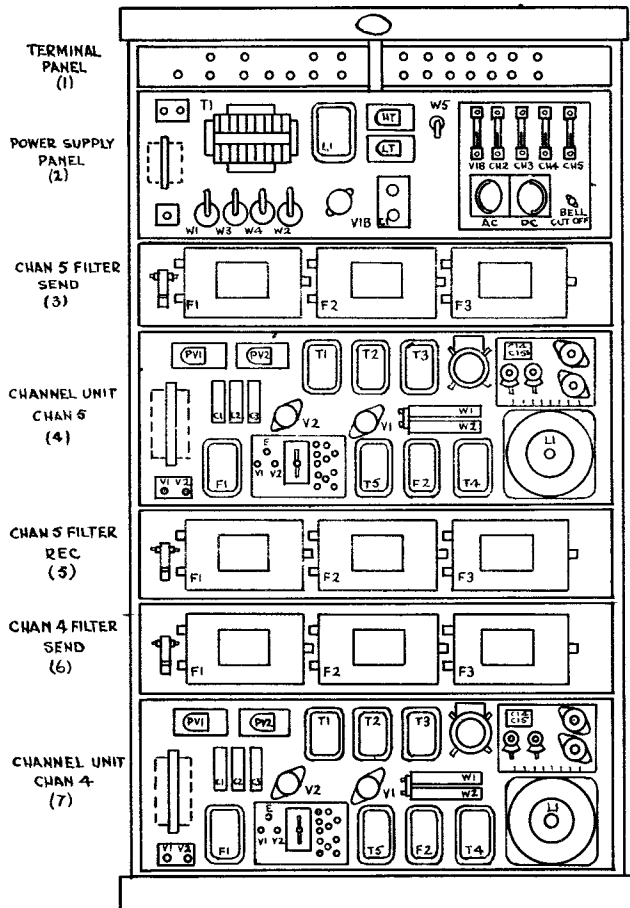
REAR VIEW

E1/143

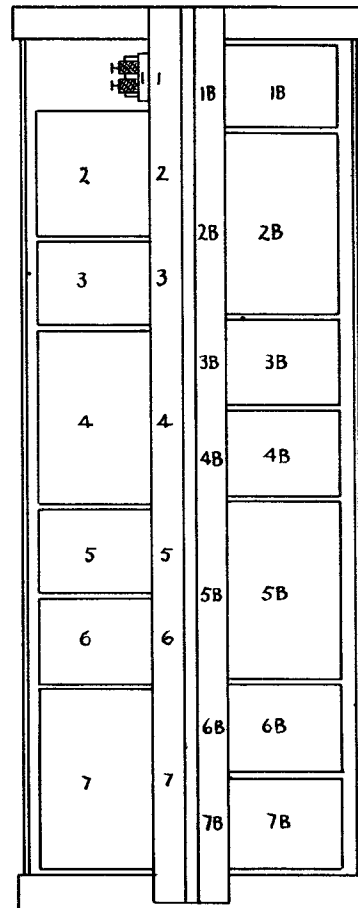
A.C.T. 1+4 Mk II BAY No 1



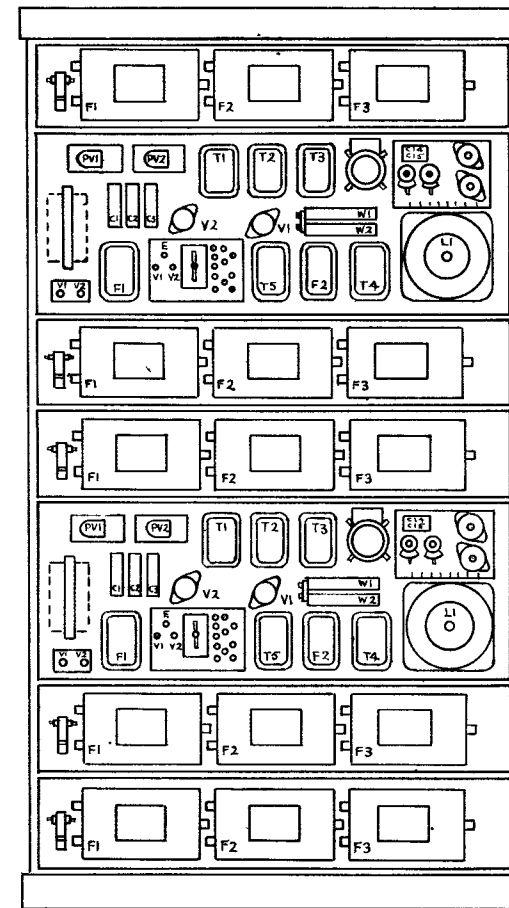
ALARM BELL PANEL  
 (MOUNTED ON TOP OF BAY)



FRONT VIEW



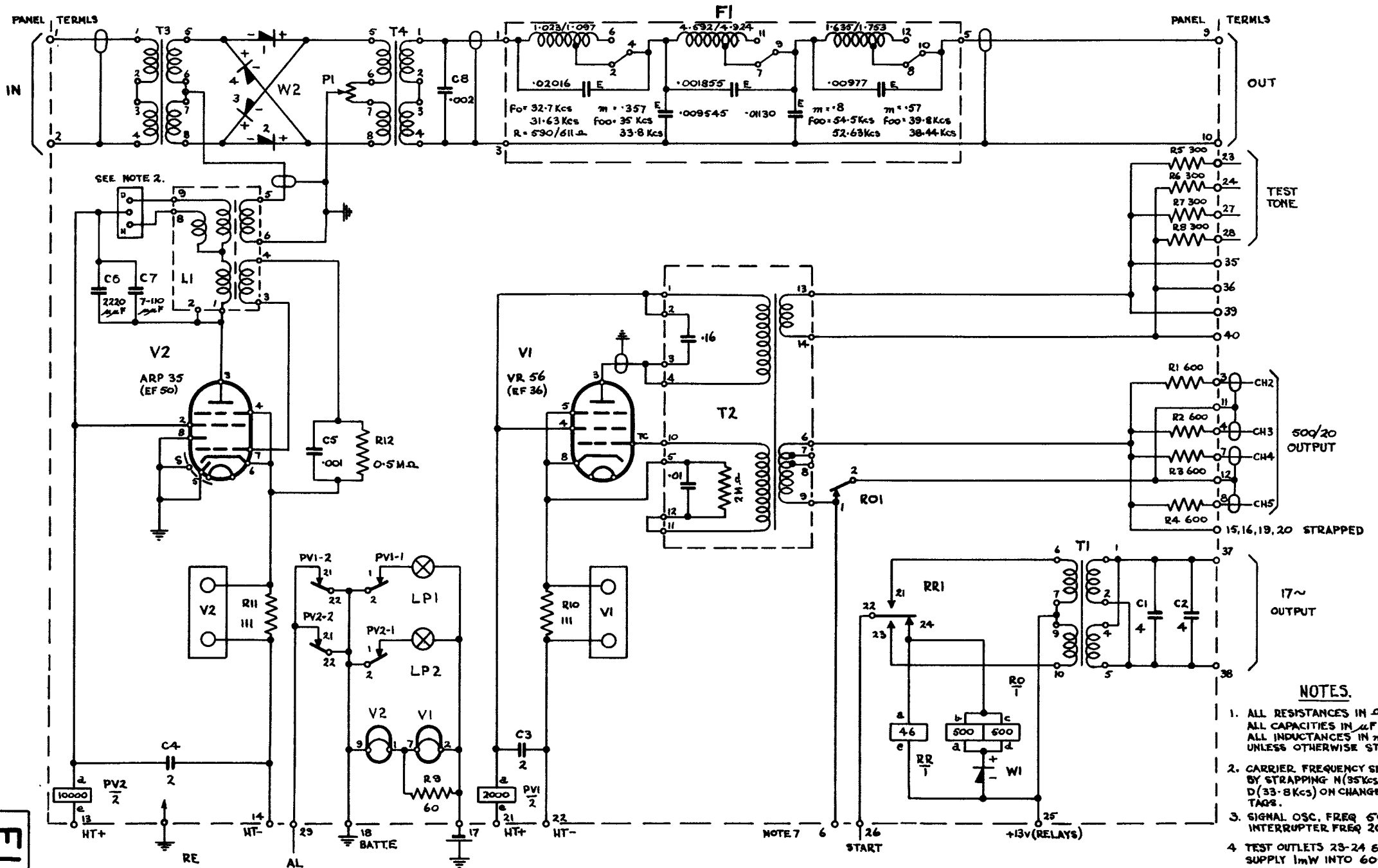
SIDE VIEW



REAR VIEW

E1/144

A.C.T. 1+4 Mk II BAY No. 2



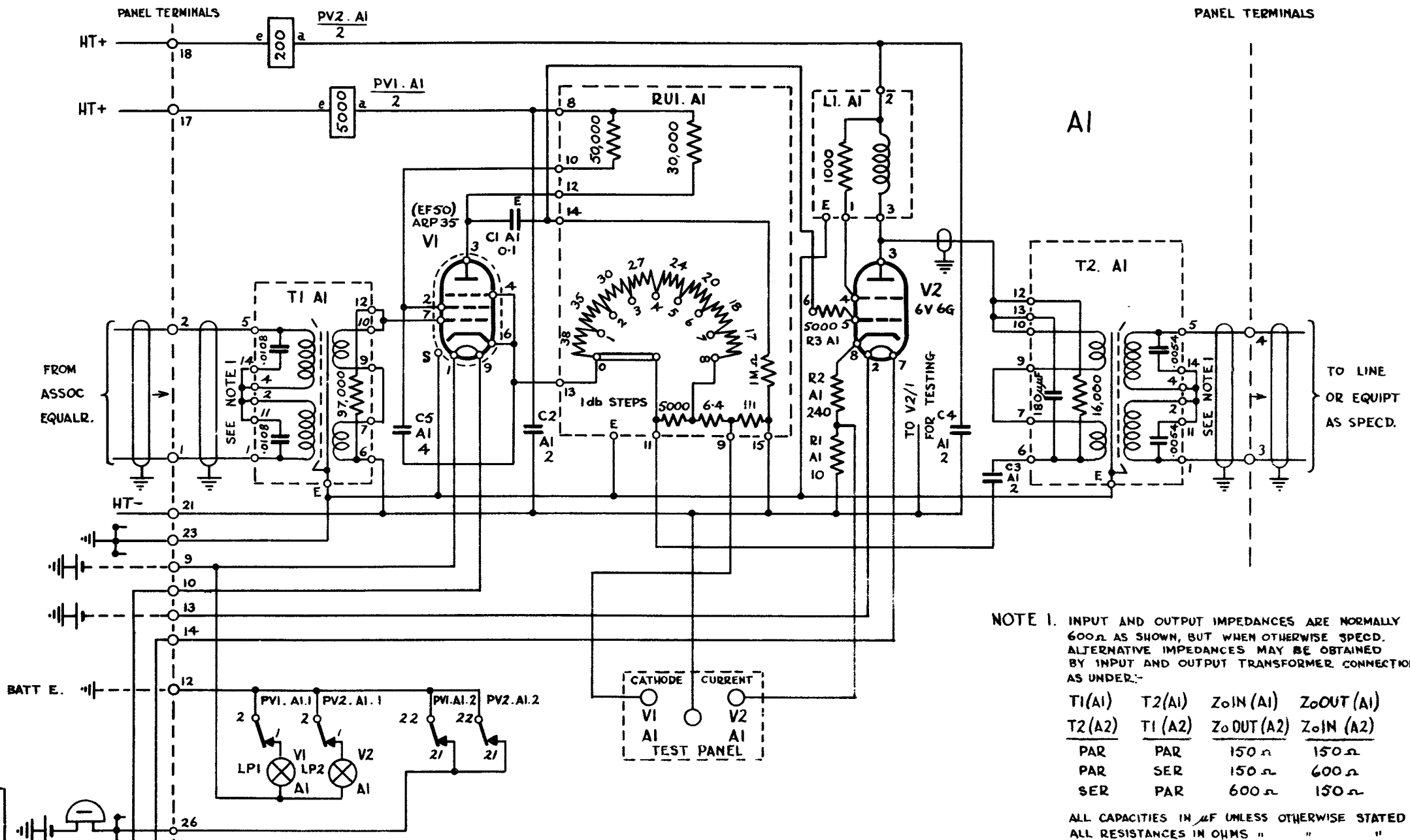
**NOTES.**

1. ALL RESISTANCES IN  $\Omega$   
 ALL CAPACITIES IN  $\mu F$   
 ALL INDUCTANCES IN mH  
 UNLESS OTHERWISE STATED.
2. CARRIER FREQUENCY SELECTED  
 BY STRAPPING N (35 Kcs) OR  
 D (33.8 Kcs) ON CHANGE OVER  
 TAGS.
3. SIGNAL OSC. FREQ 500 ~  
 INTERRUPTER FREQ 20-25 ~
4. TEST OUTLETS 23-24 & 27-28  
 SUPPLY 1mW INTO 600  $\Omega$ .
5. 500 ~ SUPPLY TERMLS. EACH DESIGNED  
 TO SUPPLY 1mW INTO 600  $\Omega$  OR -5 &  
 -7db REL TO 1mW BY USING TAPS 7 & 8  
 RESPECTIVELY ON TRANSFORMER T2.
6. ALL CASE EARTH TAGS TO BE CONNECTED  
 TO PLATE EARTH

NOTE 7.  
 FOR UNINTERRUPTED 500 ~  
 SUPPLY TO PANELS SIGNALING  
 STRAP TERMINALS 6 & 11.

# 1+4 Mk II GROUP MODULATOR AND 500 ~ OSCILLATOR PANEL

E1/145



NOTE 1. INPUT AND OUTPUT IMPEDANCES ARE NORMALLY 600Ω AS SHOWN, BUT WHEN OTHERWISE SPEC'D. ALTERNATIVE IMPEDANCES MAY BE OBTAINED BY INPUT AND OUTPUT TRANSFORMER CONNECTIONS AS UNDER:-

T1(A1)	T2(A1)	ZoIN (A1)	ZoOUT (A1)
T2(A2)	T1 (A2)	ZoOUT (A2)	ZoIN (A2)
PAR	PAR	150 Ω	150 Ω
PAR	SER	150 Ω	600 Ω
SER	PAR	600 Ω	150 Ω

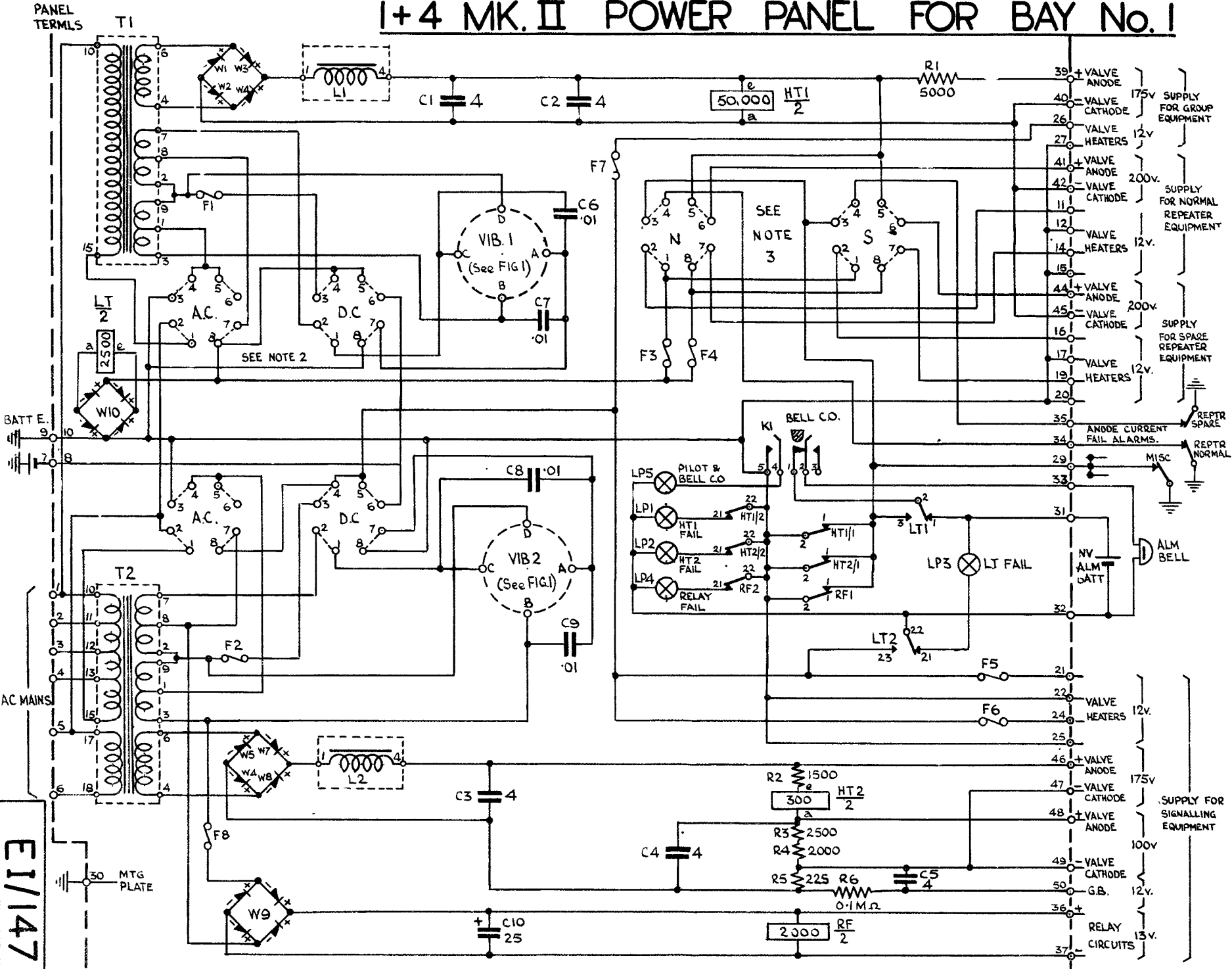
ALL CAPACITIES IN μF UNLESS OTHERWISE STATED  
 ALL RESISTANCES IN OHMS " " "

REPEATER A.T. C.T. 1+4 Mk II  
 REPEATER C.T. No1 Mk II  
 REPEATER C.T. No2

E1/146

E VIA V1 A2 E VIA V2 A2

# I+4 MK. II POWER PANEL FOR BAY No. 1

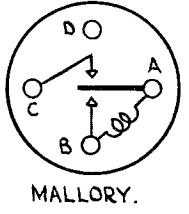
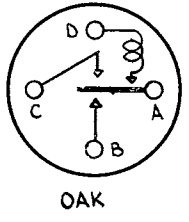


**NOTE 1.** ALL RESISTANCES IN  $\Omega$  & ALL CAPACITIES IN  $\mu F$  UNLESS OTHERWISE STATED

**NOTE 2.** EITHER A.C. OR D.C. CONNECTIONS ARE MADE BY PLUG Y22 GROUP

**NOTE 3.** EITHER NORMAL OR SPARE REPEATER IS CONNECTED BY PLUG Y22 GROUP I.

**NOTE 4.** ALL CASE EARTH TAGS TO BE CONNECTED TO PLATE EARTH.

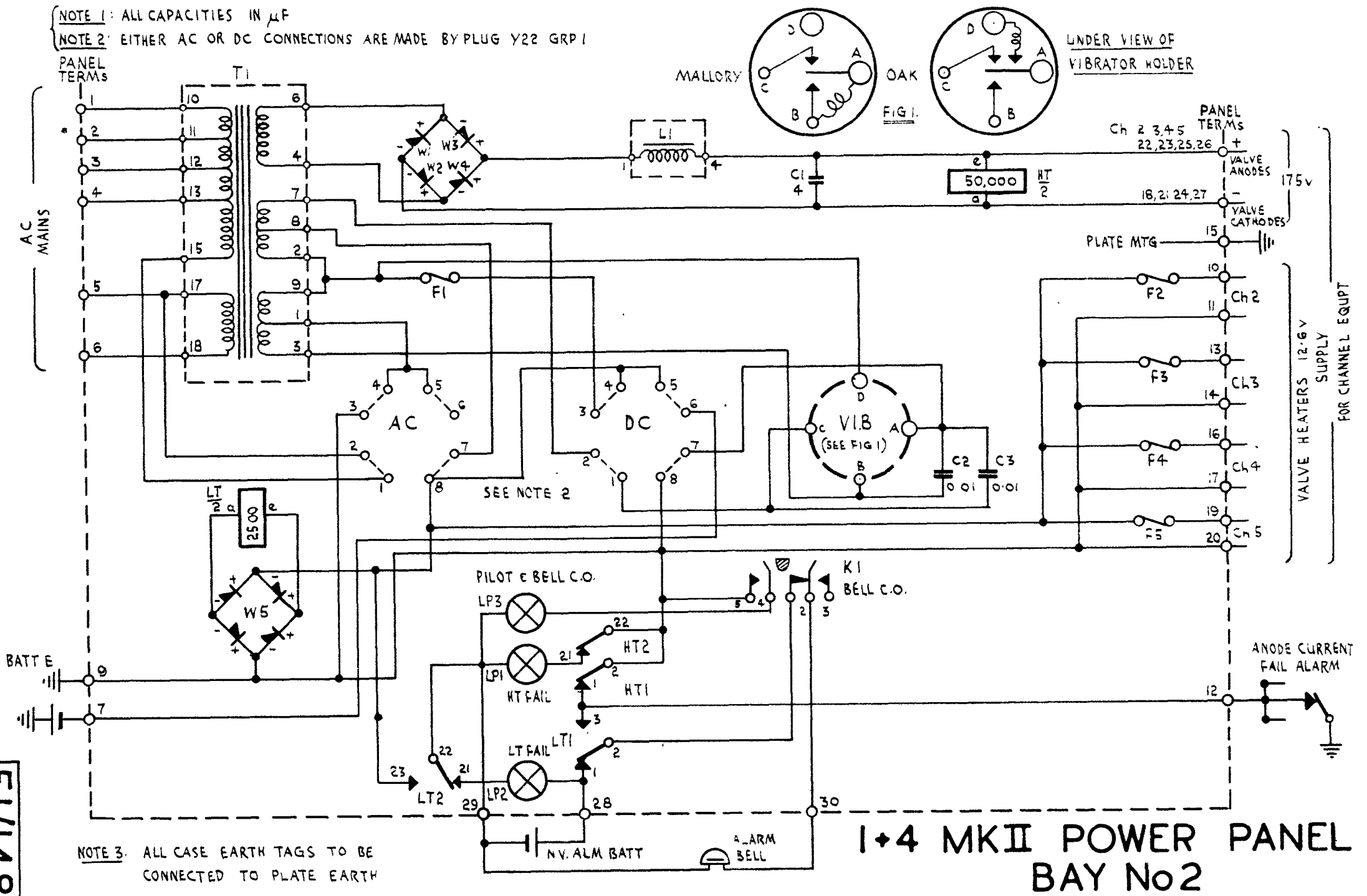


UNDER VIEW OF VIBRATOR HOLDER FIG. I

E1/147



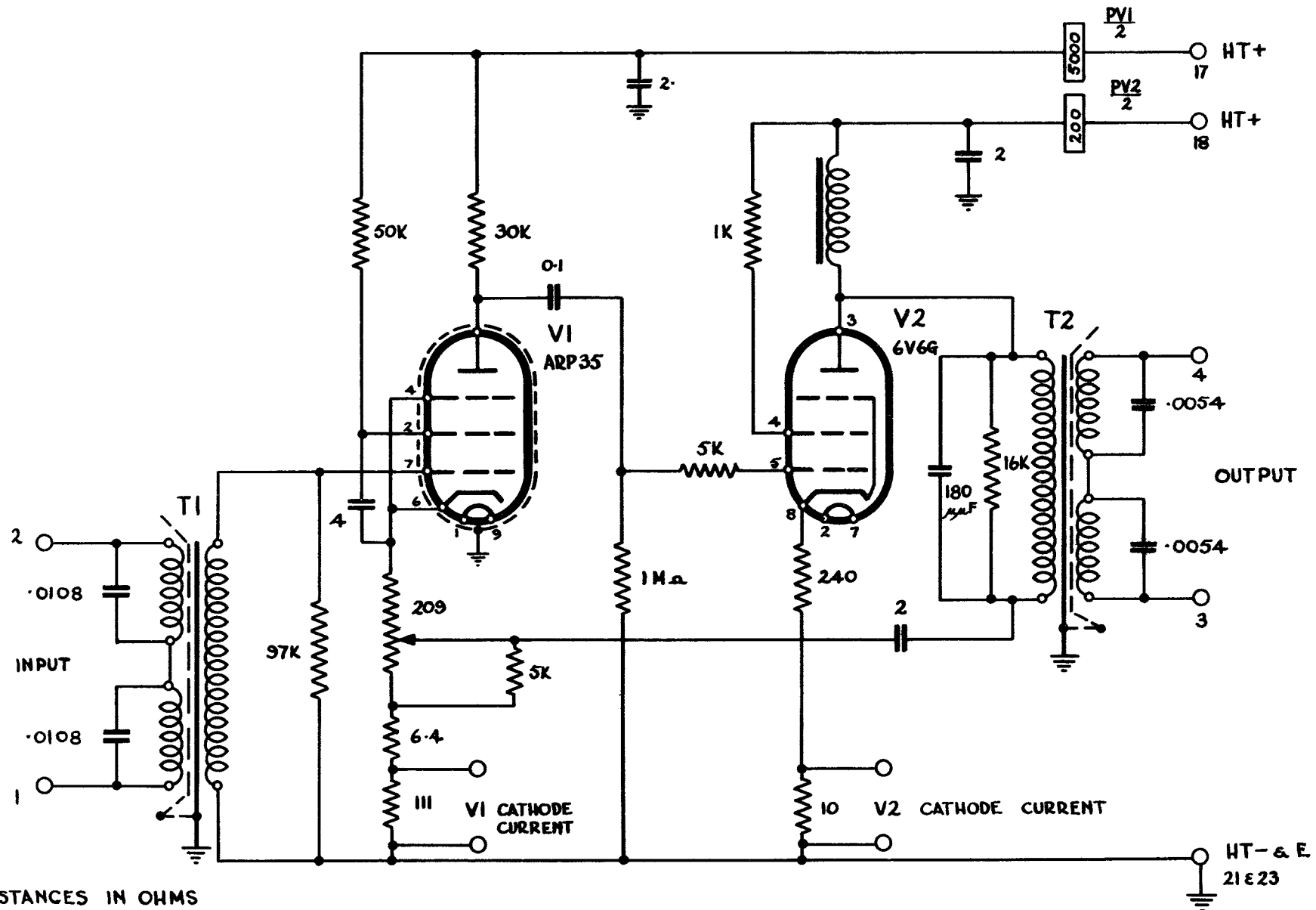
NOTE 1: ALL CAPACITIES IN  $\mu F$   
NOTE 2: EITHER AC OR DC CONNECTIONS ARE MADE BY PLUG Y22 GRP 1



NOTE 3: ALL CASE EARTH TAGS TO BE CONNECTED TO PLATE EARTH

# 1+4 MKII POWER PANEL BAY No 2

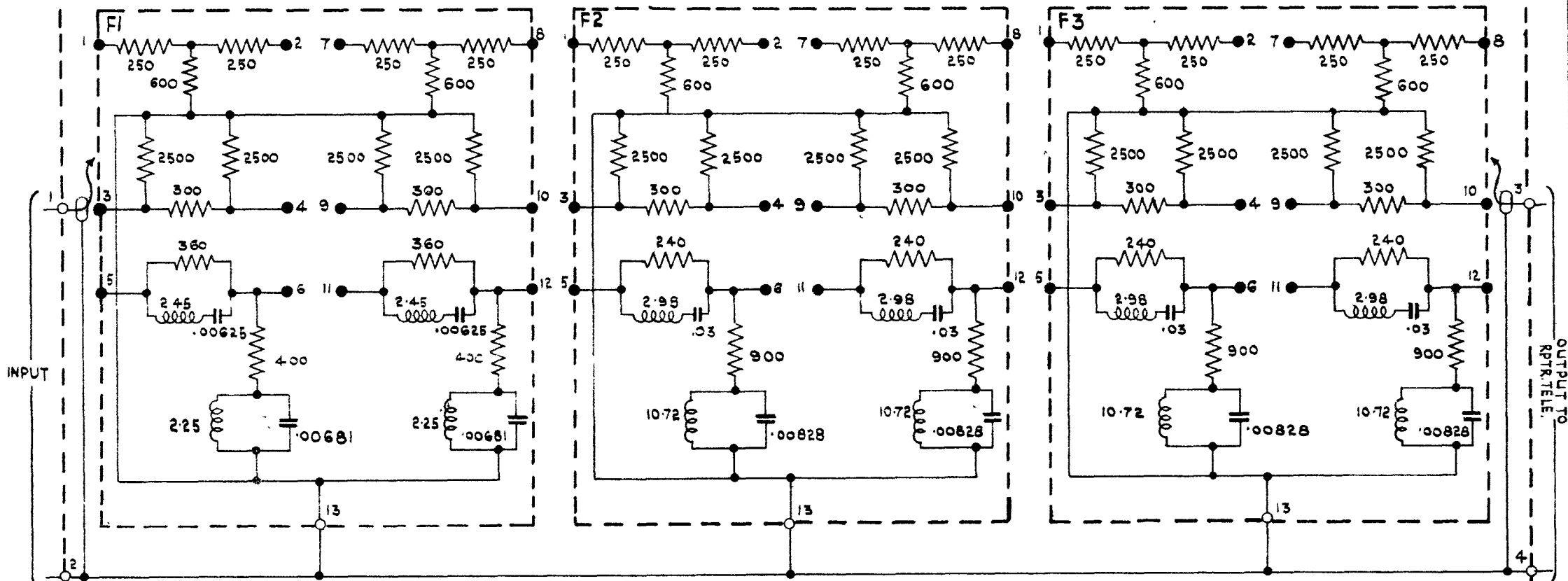
E1/148



ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu$ F  
 SEE E1/146 FOR FULL CIRCUIT

E1/149

# APPARATUS CARRIER TELEPHONE 1+4 Mk II REPEATER (Simplified)



PAD BETWEEN	F1	F2	F3
1 - 2	7.66db	7.66db	7.66db
3 - 4	4.26 "	4.26 "	4.26 "
7 - 8	7.66 "	7.66 "	7.66 "
9 - 10	4.26 "	4.26 "	4.26 "

600Ω INSERTION LOSS OF ±0.25db

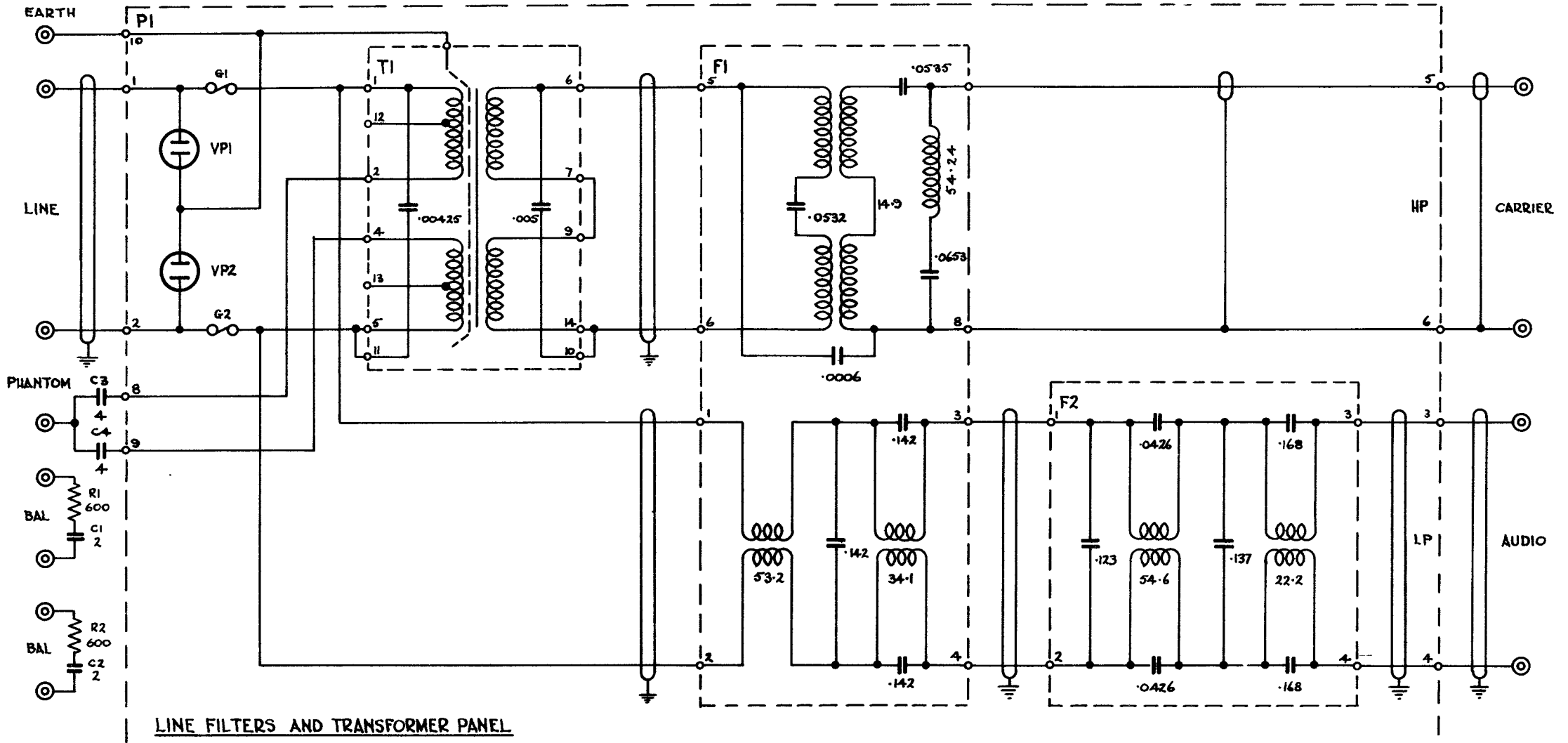
EACH SECTION OF EQUALISATION

KC	F1	F2	F3
35	0.8		
30	2.6		
20	5.8		
16		.25	.25
14		.85	.85
12		1.73	1.73
10	7.5	2.6	2.6
8		3.36	3.36
6		3.92	3.92
5	7.8		
4		4.24	4.24
2		4.5	4.5

ALL RESISTANCE ± 2½ %  
 ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN μF  
 ALL INDUCTANCES IN mH

A.C.T. 1+4 MK II  
EQUALISER PANEL

E1/150



LINE FILTERS AND TRANSFORMER PANEL

NOTE 1. BALANCE AND BY-PASS FILTER UNIT No 1 CONSISTS OF TWO OF ABOVE.

NOTE 2. ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN μF  
 ALL INDUCTANCES IN mH

NOTE 3.  $Z_0$  600 Ω  
 $f_0$  (LP) = 2.8 Kcs  
 $f_0$  (HP) = 3.2 Kcs

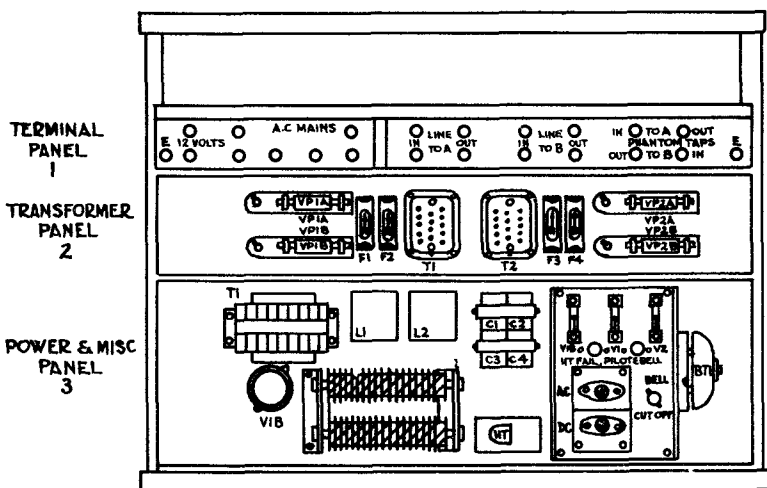
EI/151

# BALANCE AND BY-PASS FILTER UNIT No 1

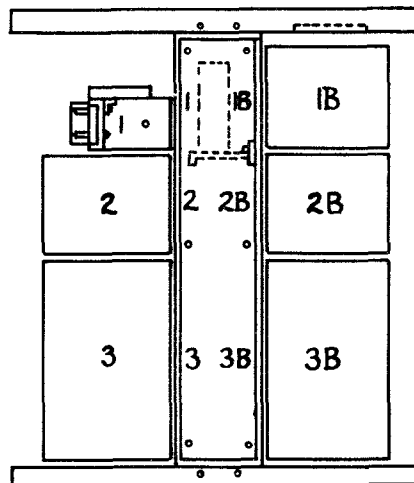
15973/P.L.H./9.45



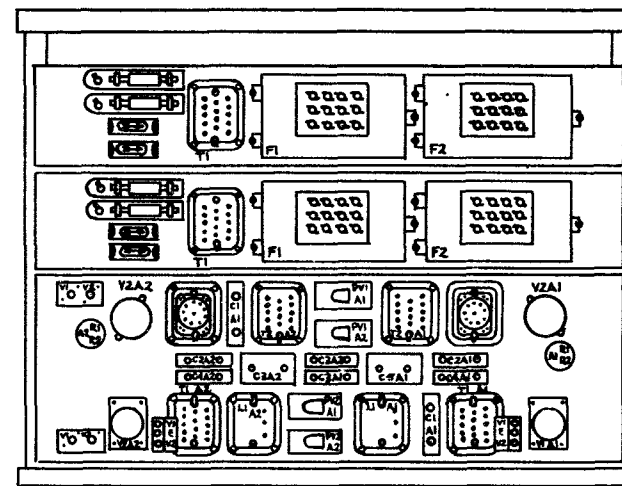
BAY EQUIPMENT



FRONT VIEW



END VIEW

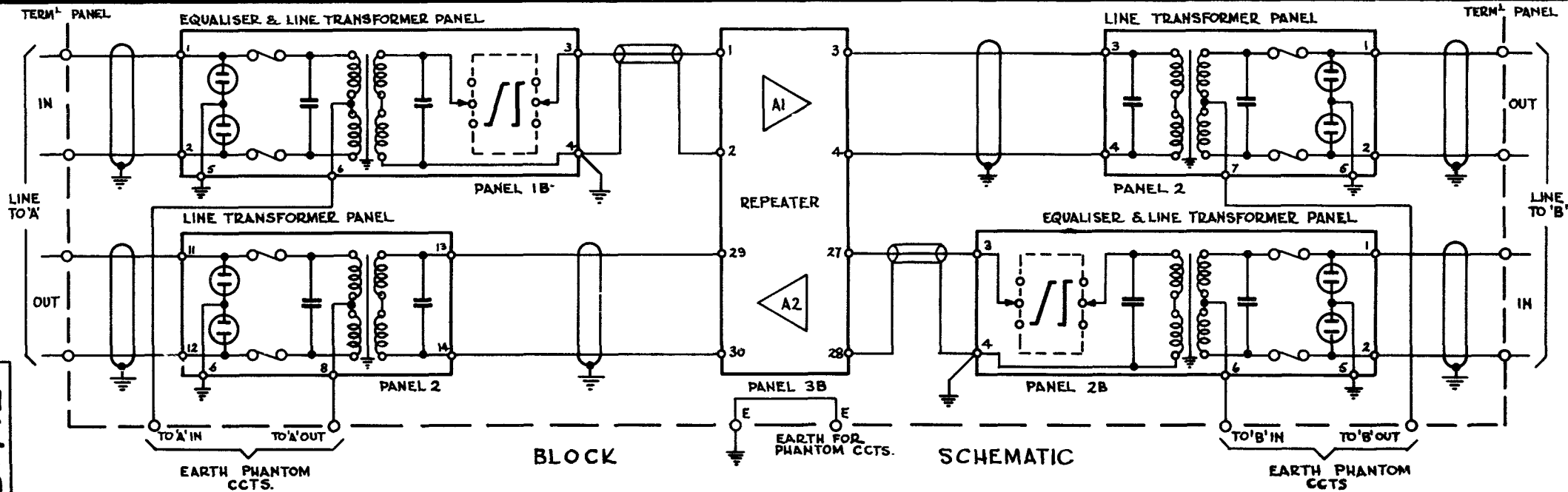


REAR VIEW

EQUALISER PANEL  
B-A  
1B

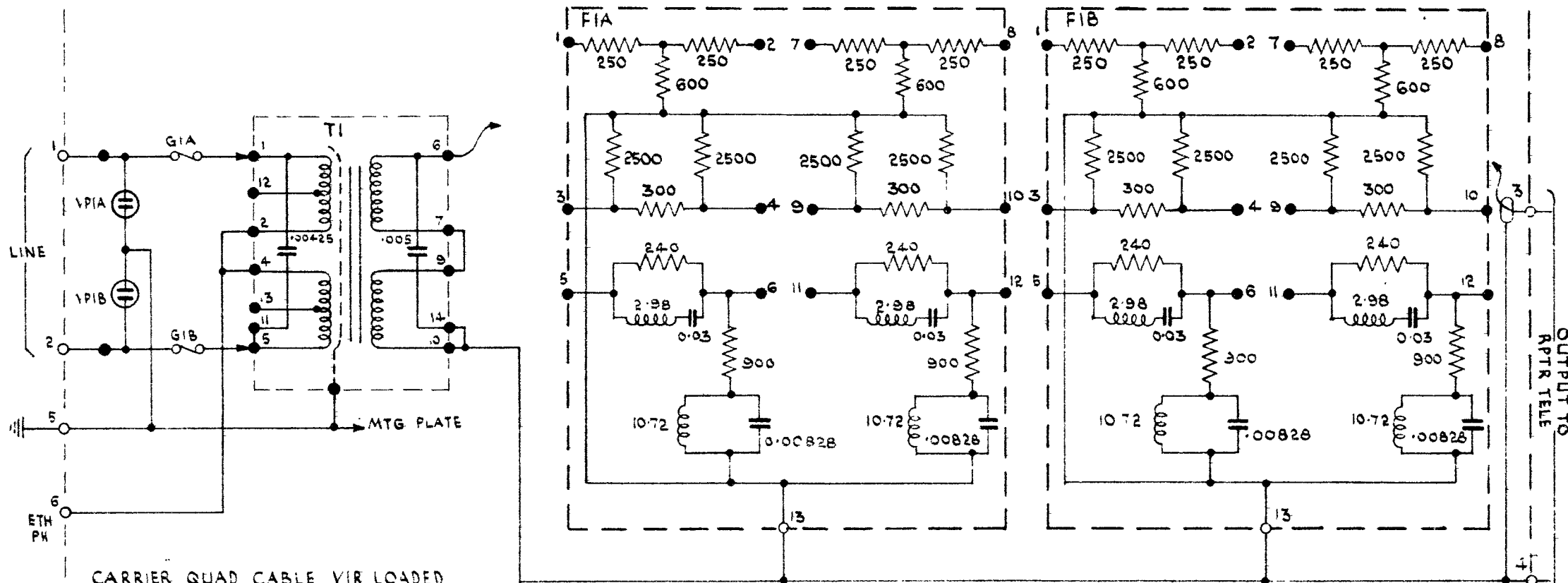
EQUALISER PANEL  
A-B  
2B

REPEATER  
3B



REPEATER CARRIER TELEPHONE No 2

EI/154



CARRIER QUAD CABLE VIR LOADED  
 4.6mk, 440 yds use 12-13 T<sub>1</sub>

CARRIER QUAD CABLE TYPE 'P' LOADED  
 4.6mk, 440 yds use 1-5 T<sub>1</sub>

600 Ω INSERTION LOSS OF EACH SECTION OF EQUALISATION ± .25db								
KC	16	14	.2	10	8	6	4	2
LOSS	.25	.85	1.73	2.6	3.36	3.92	4.24	4.5

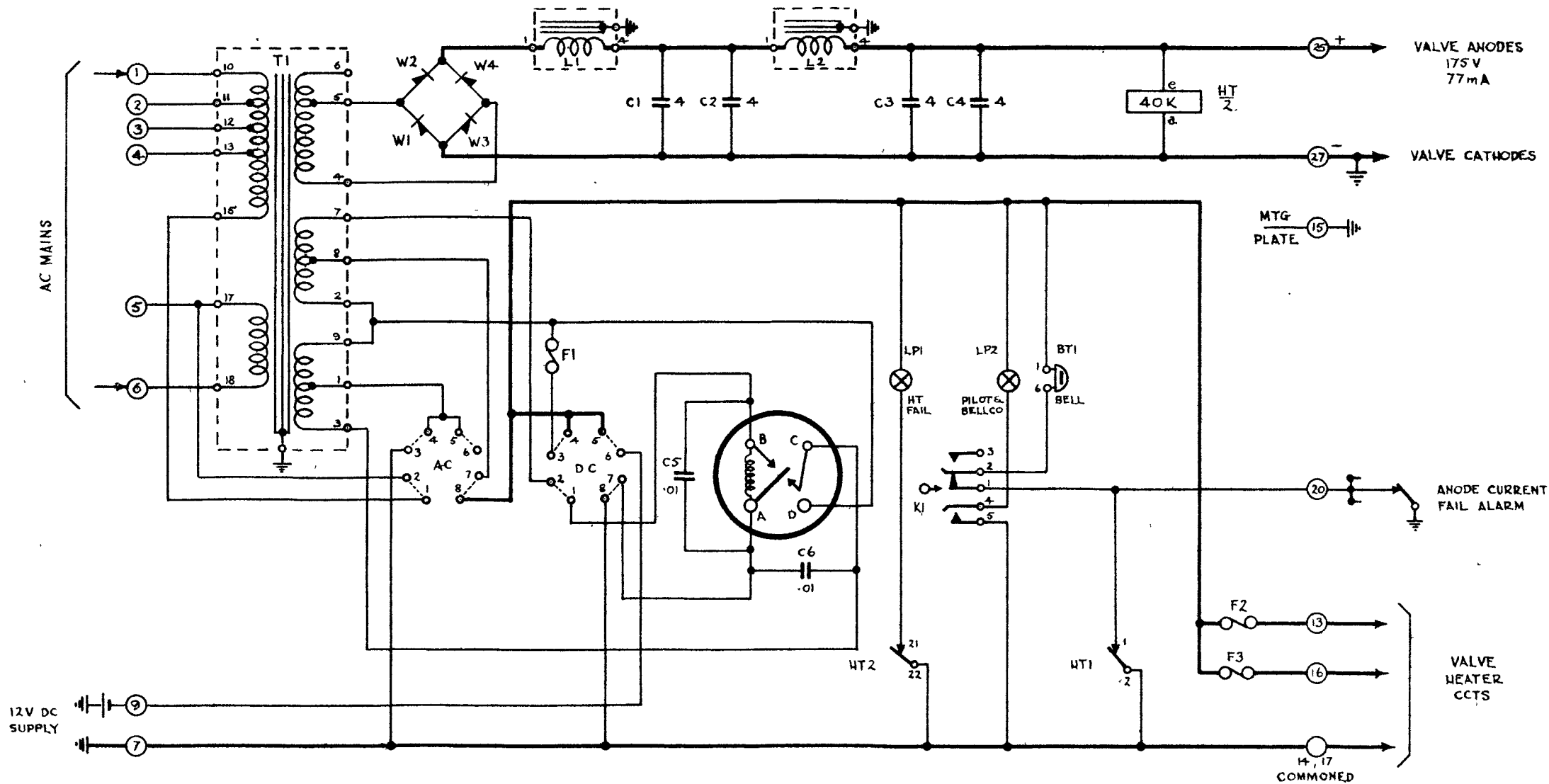
ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN μF  
 ALL INDUCTANCES IN mH  
 $Z_0 = 600 \Omega$

PAD BETWEEN	FIA	FIB
1-2	7.66db	7.66db
3-4	4.26 "	4.26 "
7-8	7.66 "	7.66 "
9-10	4.26 "	4.26 "

## REPEATER CARRIER TELEPHONE No 2 —

## EQUALISER & LINE TRANSFORMER PANEL

E1/155



ALL RESISTANCES IN OHMS  
ALL CAPACITIES IN  $\mu F$

# REPEATER CARRIER TELEPHONE No 2 — POWER SUPPLY

E1/156

# A.C.T. 1+3 TYPES SOS-3-F AND SOT-3-F BAY LAYOUT — TERMINAL EQUIPMENT

SCHOOL OF SIGNALS  
DRAWN BY: BNB-12 JAN 44  
CHECKED BY: JHP

## PILOT AND LINE FILTER BAY

BUS - BARS	BUS - BARS
TERMINAL STRIPS	LINE PROTECTOR PANEL
FUSE, RESIS. & BALLAST LAMP PANEL.	
ALARM RELAYS	
PILOT ALARM PANEL	
PILOT INDICATOR PANEL	H.P. FILTER 2 3000~
	L.P. FILTER 2 3000~
	PH. BAL. & B. PH. BAL COILS
PILOT OSCILLATOR	'U' - LINKS
	SPARE TRANSMIT DIRECTIONAL FILTER
SPARE AMPLIFIER	SPARE RECEIVE DIRECTIONAL FILTER

FRONT

REAR

## AMPLIFIER BAY

BUS - BARS	BUS - BARS
TERMINAL STRIPS	FIL. SUPPLY PANEL
FUSE & LAMP PANEL	TRANSMIT DIRECTIONAL FILTER
RESIS. & BALLAST LAMP PANEL	
FIL. SUPPLY PANEL	
ALARM RELAY PANEL	
	RECEIVE DIRECTIONAL FILTER
20~ FAIL ALARM	
20~ SUPPLY PANEL	COIL PANEL
	FIXED EQUALISER
T.M.S.	VARIABLE EQUALISER
'U' - LINKS	'U' - LINKS
VOLTMETERS	AMM. & MILLIAMMETERS.
AMM. & MILLIAMMETERS.	
MON. PANEL	RINGER TEST
	INT. PANEL
RECEIVE AMPLIFIER	RINGER OSCILLATOR
	RINGER 1.
TRANSMIT AMPLIFIER	RINGER 2.
	RINGER 3.
GRID BATTERY	RINGER SPARE

FRONT

REAR

## CHANNEL BAY

BUS - BARS	BUS - BARS
TERMINAL STRIPS	
FUSE PANEL	H.P. FILTER SPARE 3000~
RESIS. & BALLAST LAMP PANEL	L.P. FILTER SPARE 3000~
FIL. SUPPLY PANEL.	
ALARM RELAY PANEL	H.P. FILTER 1. 3000~
S.W. BD. TERM. 1.	L.P. FILTER 1. 3000~
SW. BD. TERM. 2.	
SW. BD. TERM. 3.	M. B. F. 1.
4-W TERM SETS	CHANNEL PANEL 1 MOD & DEMOD
COMP. FILT.	'U' LINKS
DEM. AMPL. 1.	
'U' LINKS	D. B. F. 1
2-4 WIRE SW PANEL	
DEM. AMPL. 2	M. B. F. 2
DEM. AMPL. 3	CHANNEL PANEL 2 MOD & DEMOD
MOD & DEMOD OSC. 1	D. B. F. 2
	M. B. F. 3
MOD & DEMOD OSC. 2.	CHANNEL PANEL 3 MOD & DEMOD
	D. B. F. 3
MOD & DEMOD OSC. 3.	

FRONT

REAR

OVERALL HEIGHT 8'6"

E1/158



FILTER BAY

TERMINAL PANEL	HP FILTER SPARE 3000~
LINE PROTECTOR PANEL	L.P. FILTER SPARE 3000~
'U' LINKS PH. BAL. & CARR. TRANS COILS	
H.P. FILTER 1. 3000~	H.P. FILTER 2. 3000~
L.P. FILTER 1. 3000~	L.P. FILTER 2. 3000~

FRONT                      REAR  
 OVERALL HEIGHT 2'-7½"

BY-PASS EQUIPMENT

A.C.T. 1+3 TYPES SOS-3-F  
& SOT-3-F

BAY LAYOUT

REPEATER & BY-PASS  
EQUIPMENT

E1/159

PILOT AND LINE FILTER BAY.

BUS - BARS	BUS - BARS
TERMINAL STRIPS	LINE PROTECTOR PANEL
FUSE, RESIS. & BALLAST LAMP PANEL	
ALARM RELAY PANEL	
	H.P. FILTER SPARE 3000~
	L.P. FILTER SPARE 3000~
	H.P. FILTER 1. 3000~
A - B PILOT INDICATOR	L.P. FILTER 1. 3000~
	PH. BAL. & BAL. PH. BAL.
B - A PILOT INDICATOR	'U' - LINKS
	H.P. FILTER 2. 3000~
SPARE A-B DIRECTIONAL FILTER	L.P. FILTER 2. 3000~
	H.P. FILTER 3 3000~
SPARE B-A DIRECTIONAL FILTER	L.P. FILTER 3 3000~
	H.P. FILTER 4 3000~
	L.P. FILTER 4 3000~

FRONT

REAR

REPEATER

FRONT  
EQUIPMENT

OVERALL HEIGHT 8'-6"

AMPLIFIER BAY

BUS - BARS	BUS - BARS
TERMINAL STRIPS	
FUSE PANEL	
RESIS. & BAL LAMP PANEL	
SUP & ALARM RELAY PANEL	A-B IN FILTER
SPARE AMPLIFIER	B-A OUT FILTER
T.M.S.	COIL PANEL
SEND UNIT	A-B FIXED EQUALISER
VOLTMETER AMM. & MILLIAMMETERS	
'U' - LINKS	'U' - LINKS
7 FREQ TEST OSC.	A-B. VAR. EQUALISER .2+.4+.4 db/KC
A-B AMPLIFIER	B-A VAR EQUALISER .2+.4+.4 db/KC
	B-A FIXED EQUALISER
	COIL PANEL
B - A AMPLIFIER	A-B OUT FILTER
GRID BATTERY	B-A IN FILTER

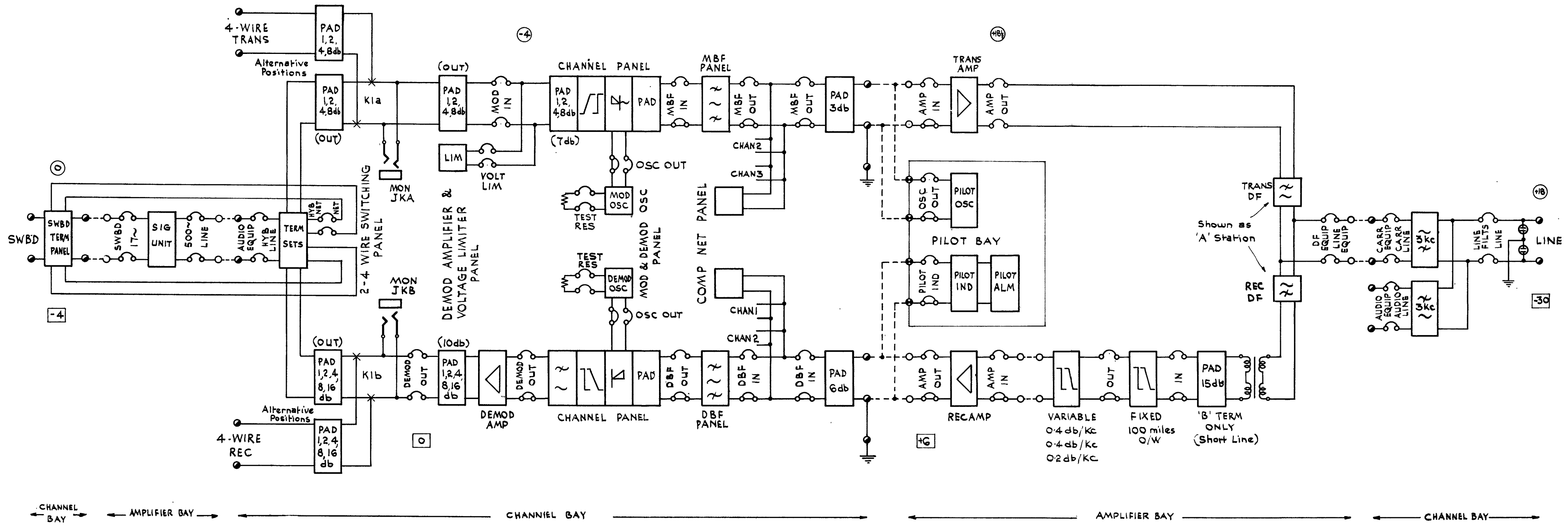
FRONT

REAR

SCHOOL OF SIGNALS  
DRAWN BY M. J. STANLEY  
CHECKED BY J. H. P.

FOLD HERE

FOLD HERE



AMPLIFIER GAINS

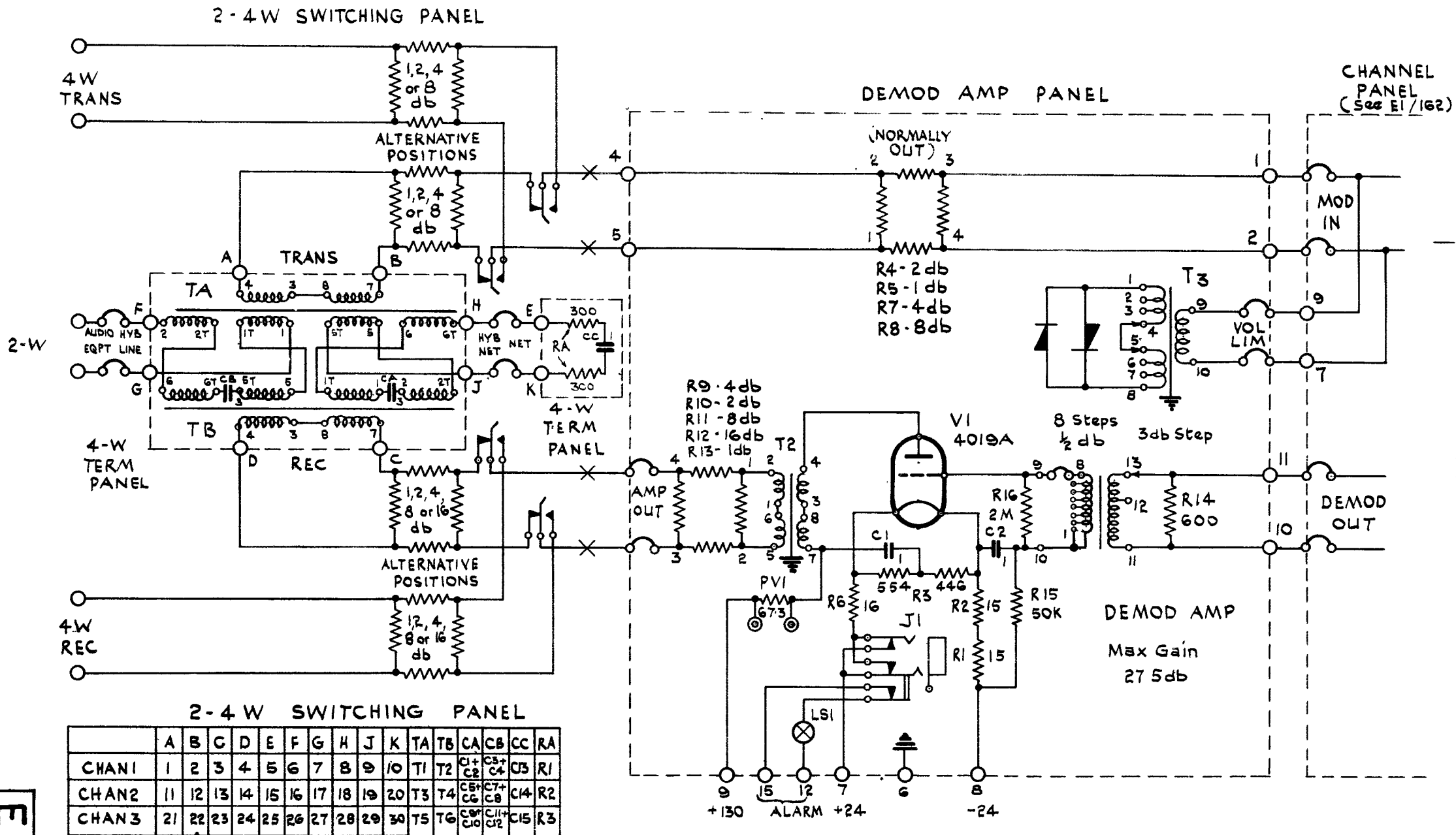
TRANS & REC AMPS    Max 50 db  
                                  PADS 5, 10, 10 db  
                                  14 Steps 1 db

DEMOM AMP            Max 27½ db  
                                  8 Steps ½ db  
                                  Tap 3 db

FREQUENCY ALLOCATION				
SYSTEM	DIRECTION	CHANNEL No.	CARRIER(Kc)	SIDE BAND RANGE(Kc)
SOS-3	A-B (USB)	1	12.9	13.2 - 15.5
		2	9.4	9.7 - 12.0
		3	6.3	6.6 - 8.9
	B-A (LSB)	1	24.4	21.8 - 24.1
		2	20.7	18.1 - 20.4
		3	28.4	25.8 - 28.1
SOT-3	A-B (USB)	1	14.3	14.6 - 16.9
		2	10.9	11.2 - 13.5
		3	7.7	8.0 - 10.3
	B-A (USB)	1	23.7	24.0 - 26.3
		2	19.8	20.1 - 22.4
		3	27.7	28.0 - 30.3

- TERMINALS ON AMPLIFIER BAY
- TERMINALS ON CHANNEL BAY
- TERMINALS ON PILOT BAY

A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
BLOCK DIAGRAM



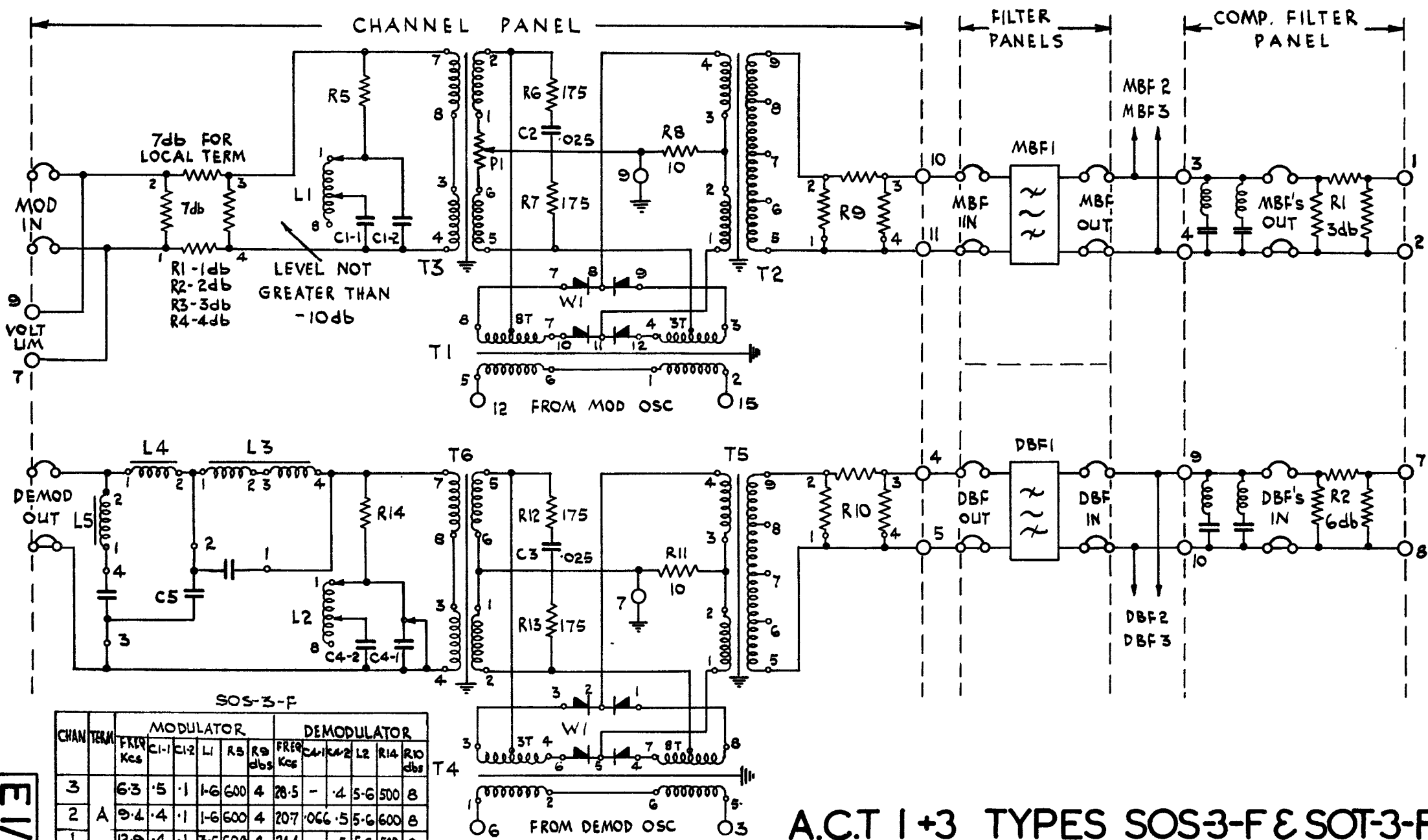
**2-4 W SWITCHING PANEL**

	A	B	G	D	E	F	G	H	J	K	TA	TB	CA	CB	CC	RA
CHAN1	1	2	3	4	5	6	7	8	9	10	T1	T2	C1+ C2	C3+ C4	C5	R1
CHAN2	11	12	13	14	15	16	17	18	19	20	T3	T4	C6+ C7	C8+ C9	C10	R2
CHAN3	21	22	23	24	25	26	27	28	29	30	T5	T6	C11+ C12	C13+ C14	C15	R3

TAG NUMBERS ON 4-W TERM PANEL

**A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
 HYBRID & DEMOD AMPLIFIER**

EI/161

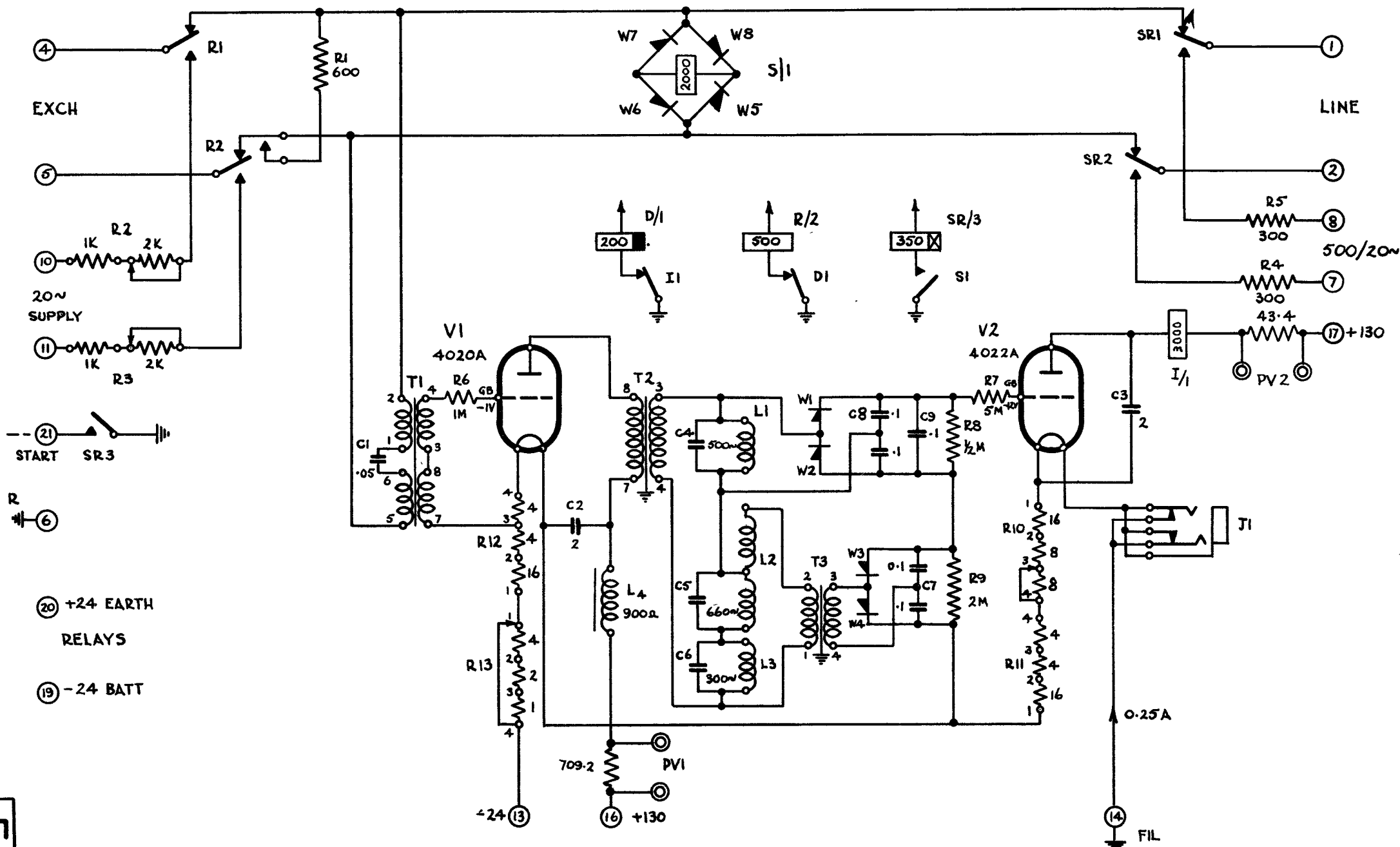


CHAN	TERM	MODULATOR					DEMODULATOR						
		FREQ Kcs	C1-1	C1-2	L1	R3 dbs	FREQ Kcs	C4-1	C4-2	L2	R14 dbs	R10 dbs	
3	A	6.3	.5	.1	1-6	600	4	28.5	-	.4	5-6	500	8
2		9.4	.4	.1	1-6	600	4	20.7	.066	.5	5-6	600	8
1		12.9	.4	.1	3-6	600	4	24.4	-	.5	5-6	500	8
2	B	20.7	.5	.1	5-6	500	3	9.4	.066	.5	4-6	600	10
1		24.4	.6	-	3-6	450	2	12.9	-	.5	3-6	600	10
3		28.4	.5	-	3-6	500	1	6.3	-	.7	4-6	500	8

E/162

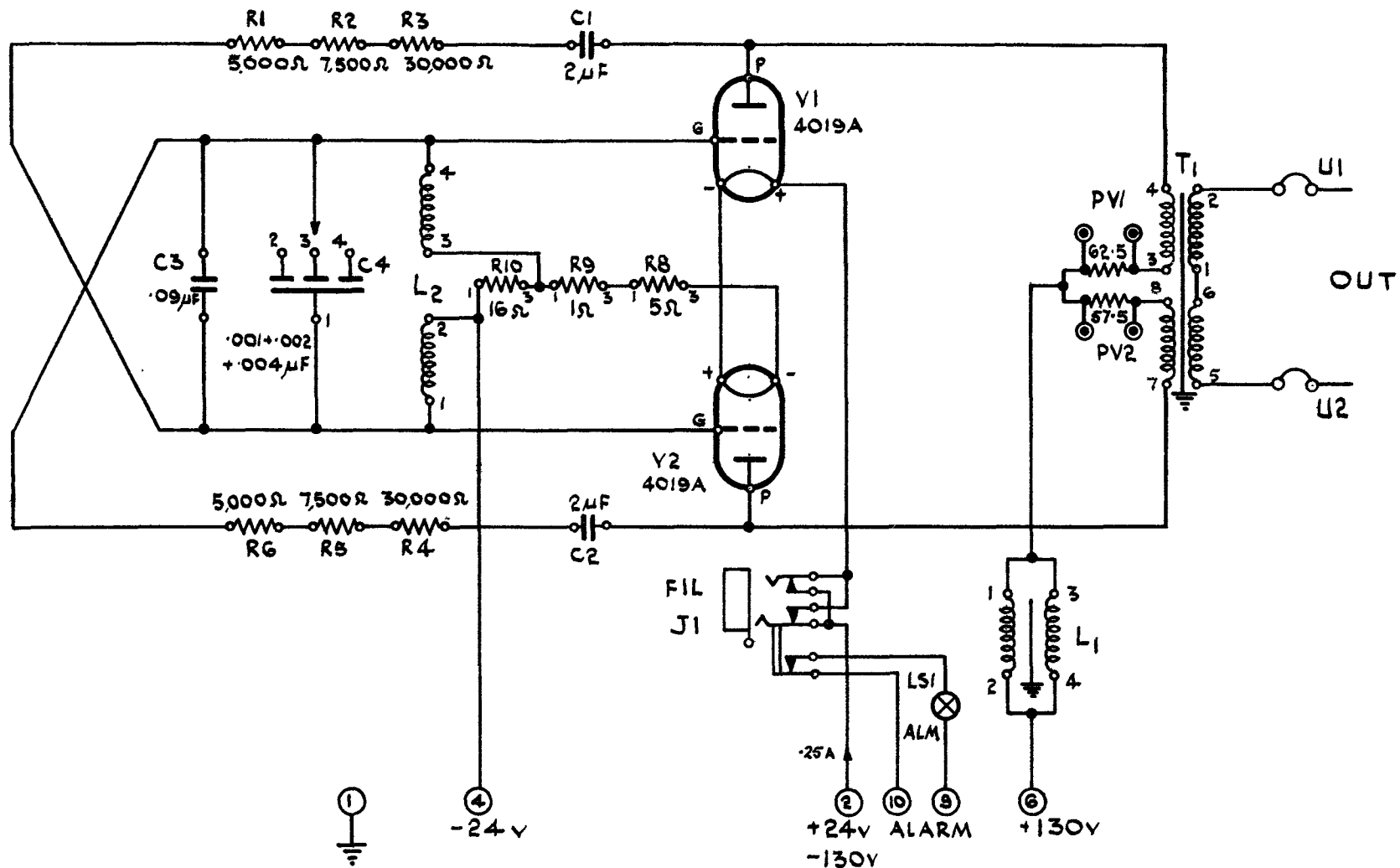
**A.C.T 1+3 TYPES SOS-3-F & SOT-3-F**

**CHANNEL PANEL & FILTERS**



A.C.T. 1+3 TYPES SOS-3-F AND SOT-3-F  
SIGNALLING UNIT (RINGER)

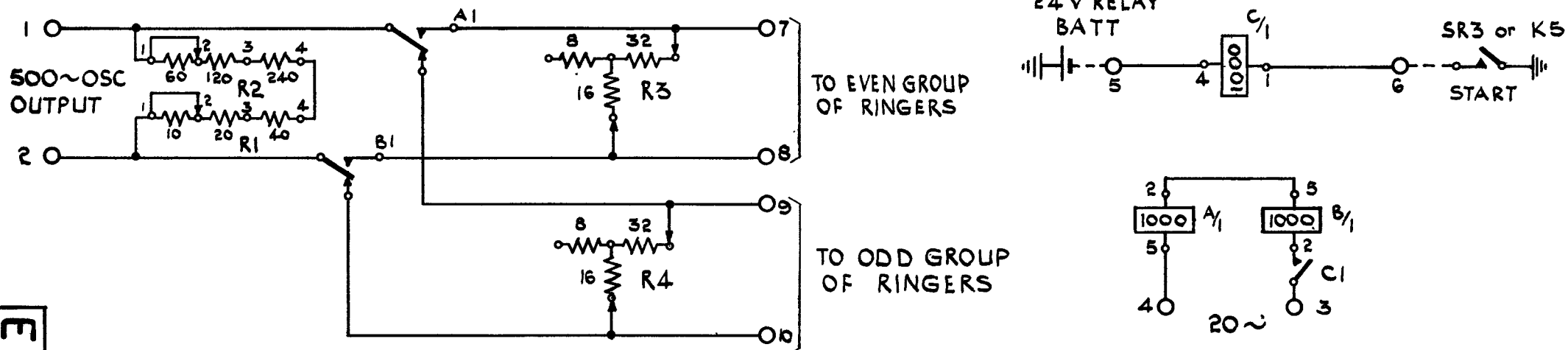
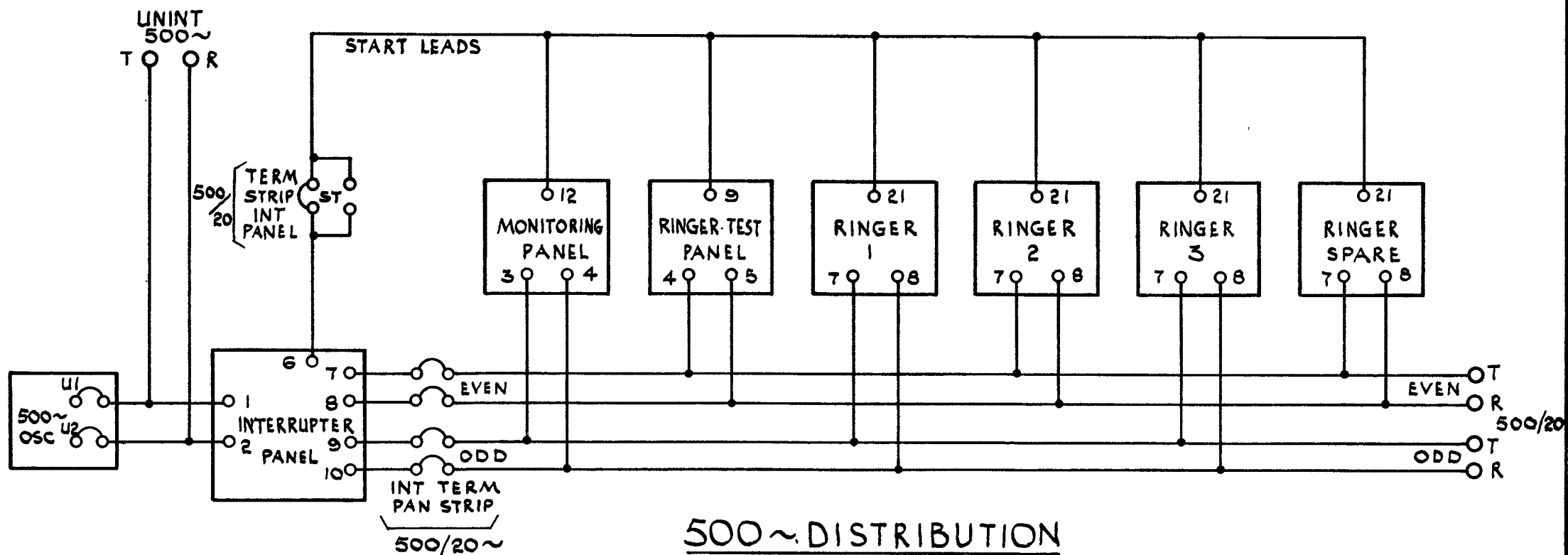
E1/163



A.C.T. 1 + 3 TYPES SOS-3-F & SOT-3-F

500~ OSCILLATOR

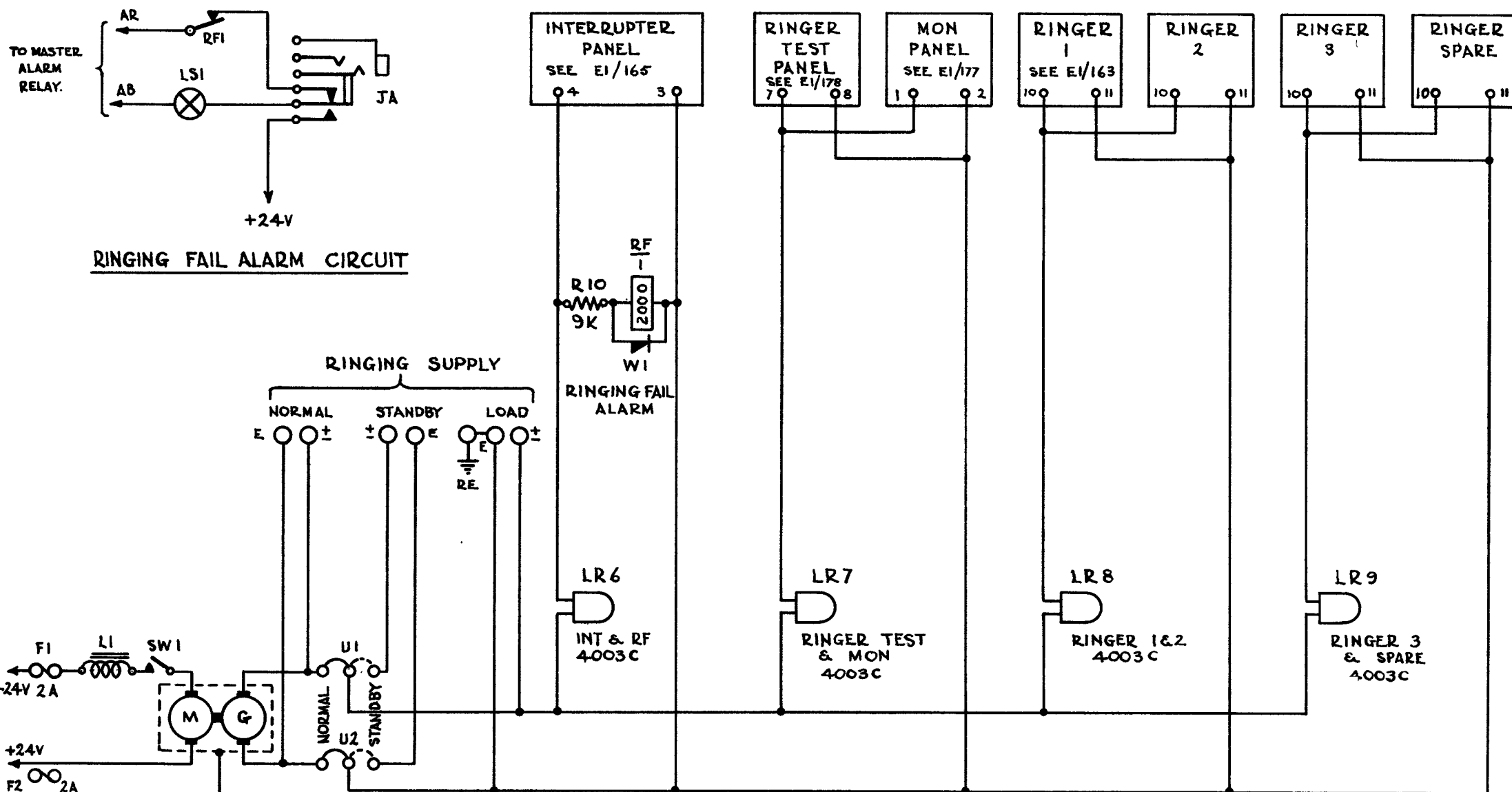
E1/164



INTERRUPTER PANEL

A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F

E1/165

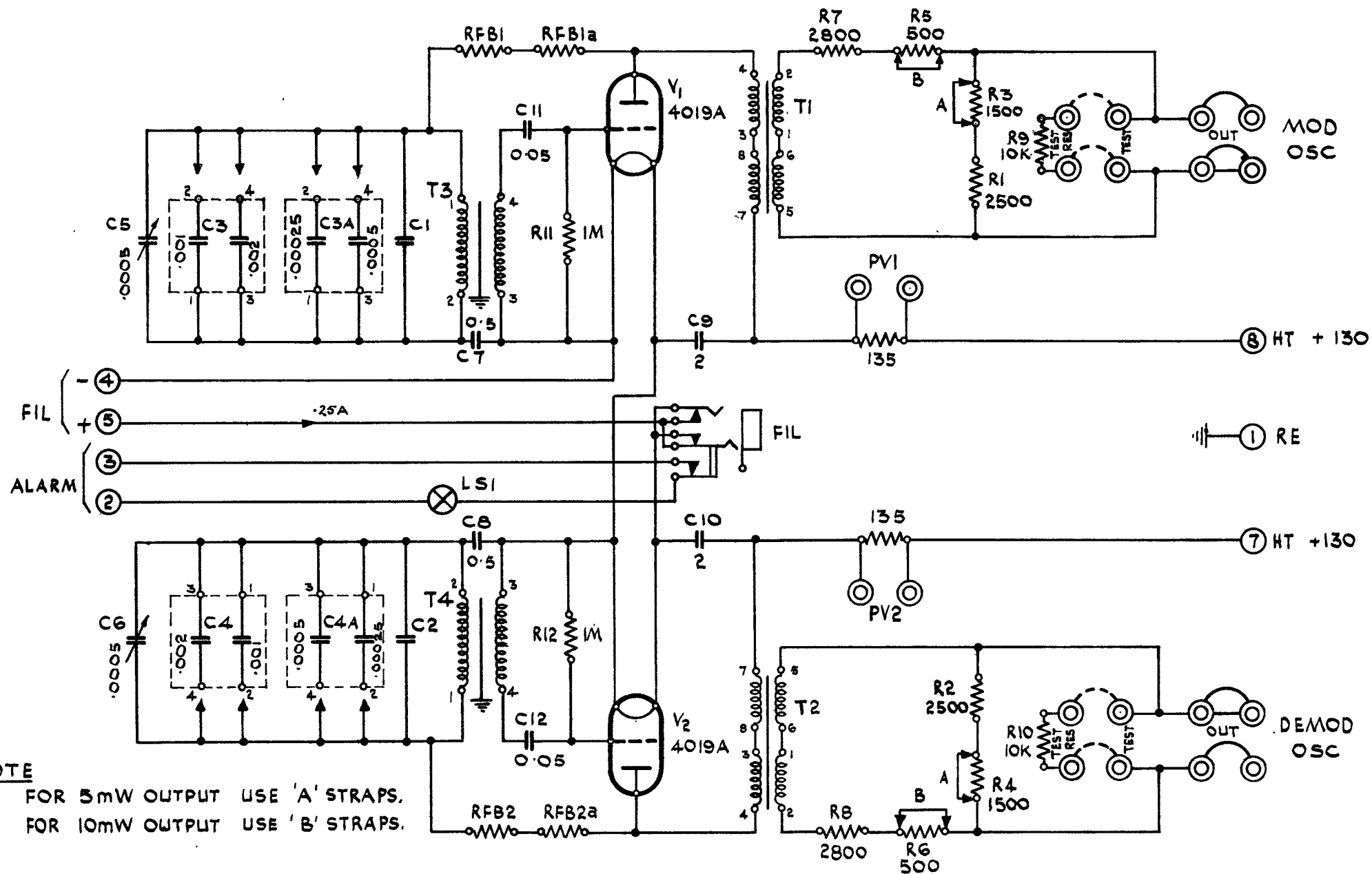


E1/166

20~ RINGING MACHINE.

**A.C.T. 1+3 TYPES SOS - 3 - F AND SOT - 3 - F**



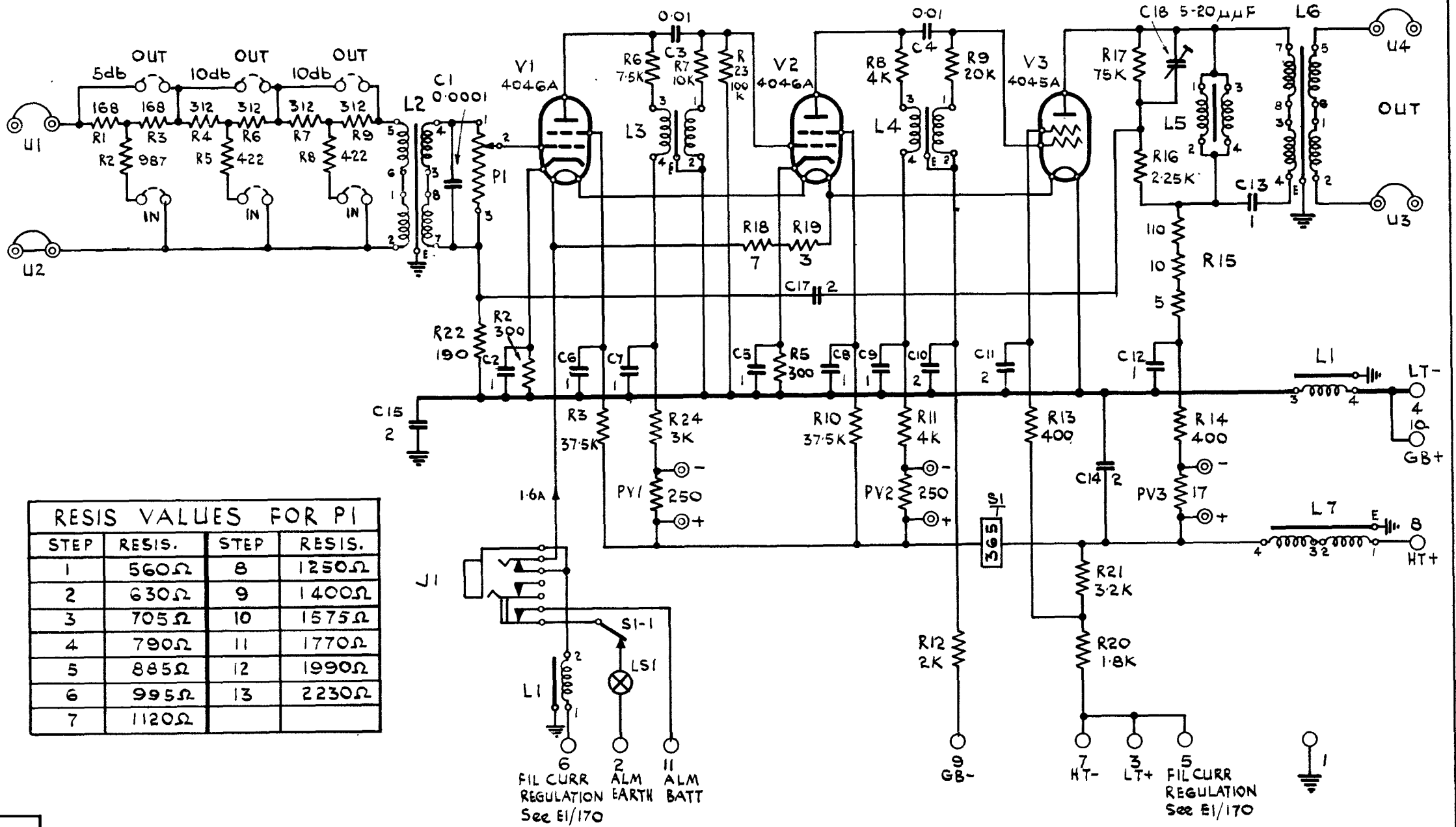


NOTE  
 FOR 5mW OUTPUT USE 'A' STRAPS.  
 FOR 10mW OUTPUT USE 'B' STRAPS.

A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F

CHANNEL OSCILLATOR

E1/167

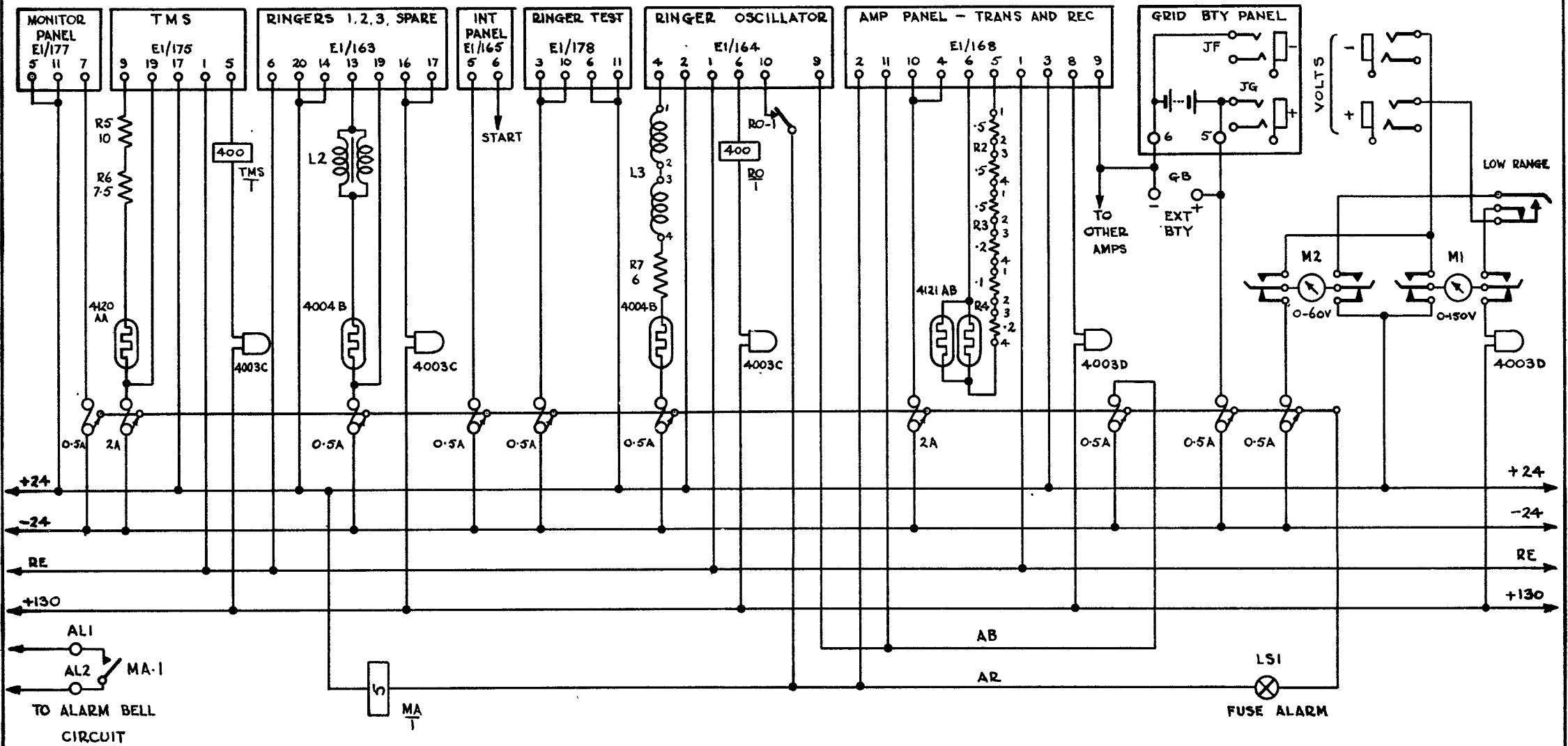


RESIS VALUES FOR P1

STEP	RESIS.	STEP	RESIS.
1	560Ω	8	1250Ω
2	630Ω	9	1400Ω
3	705Ω	10	1575Ω
4	790Ω	11	1770Ω
5	885Ω	12	1990Ω
6	995Ω	13	2230Ω
7	1120Ω		

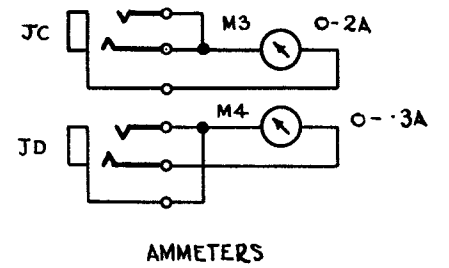
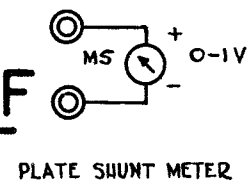
EI/168

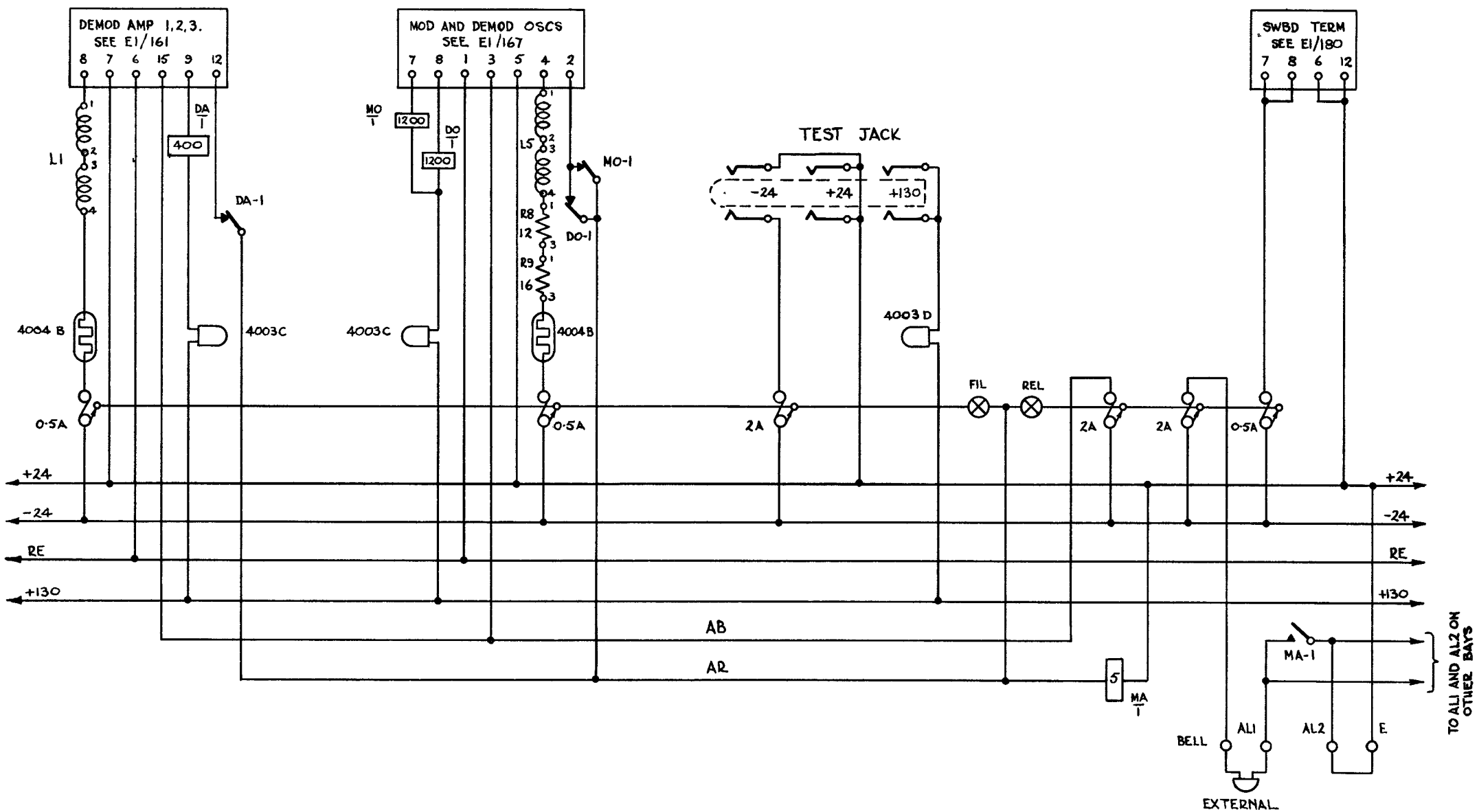
A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
LINE AMPLIFIER



E1/169

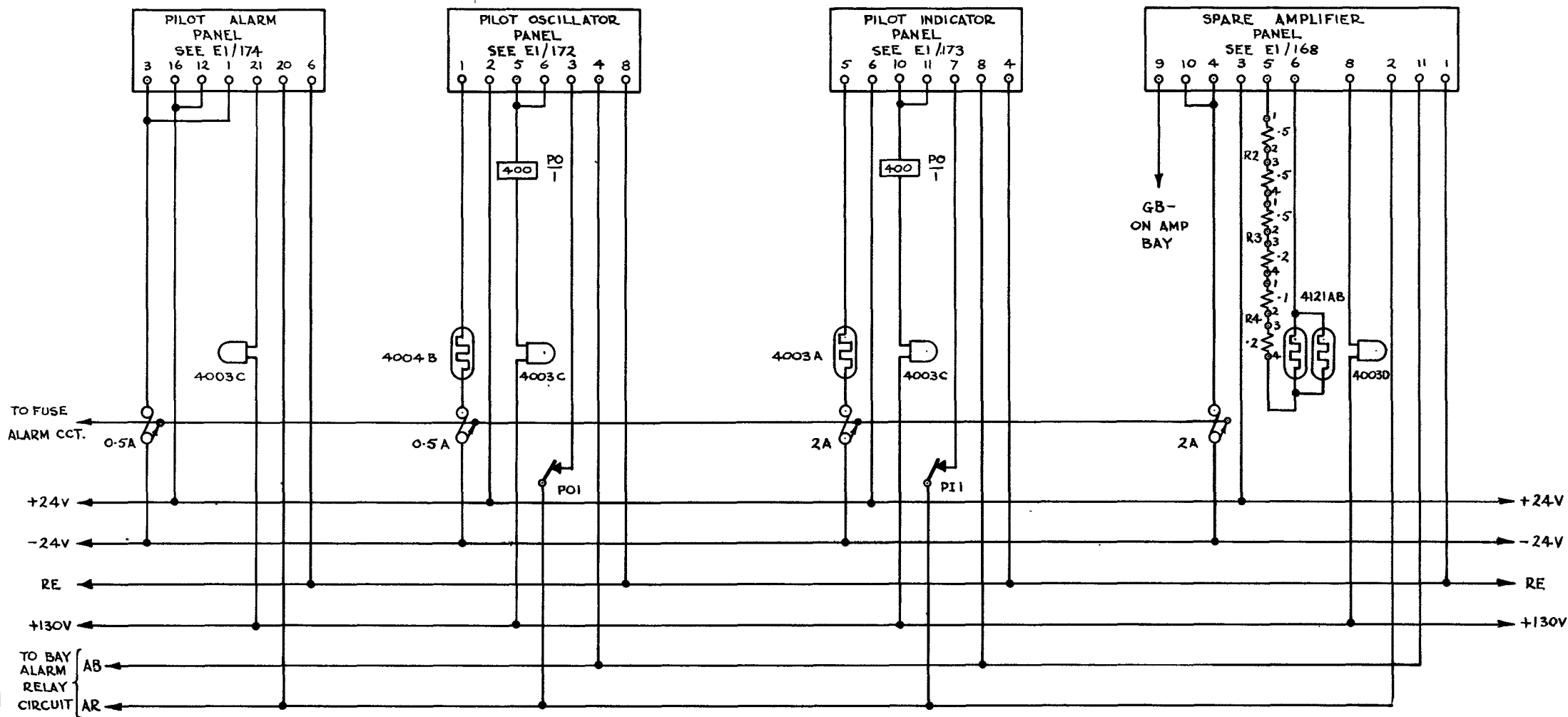
A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
AMPLIFIER BAY - POWER SUPPLY





A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
CHANNEL BAY - POWER SUPPLY

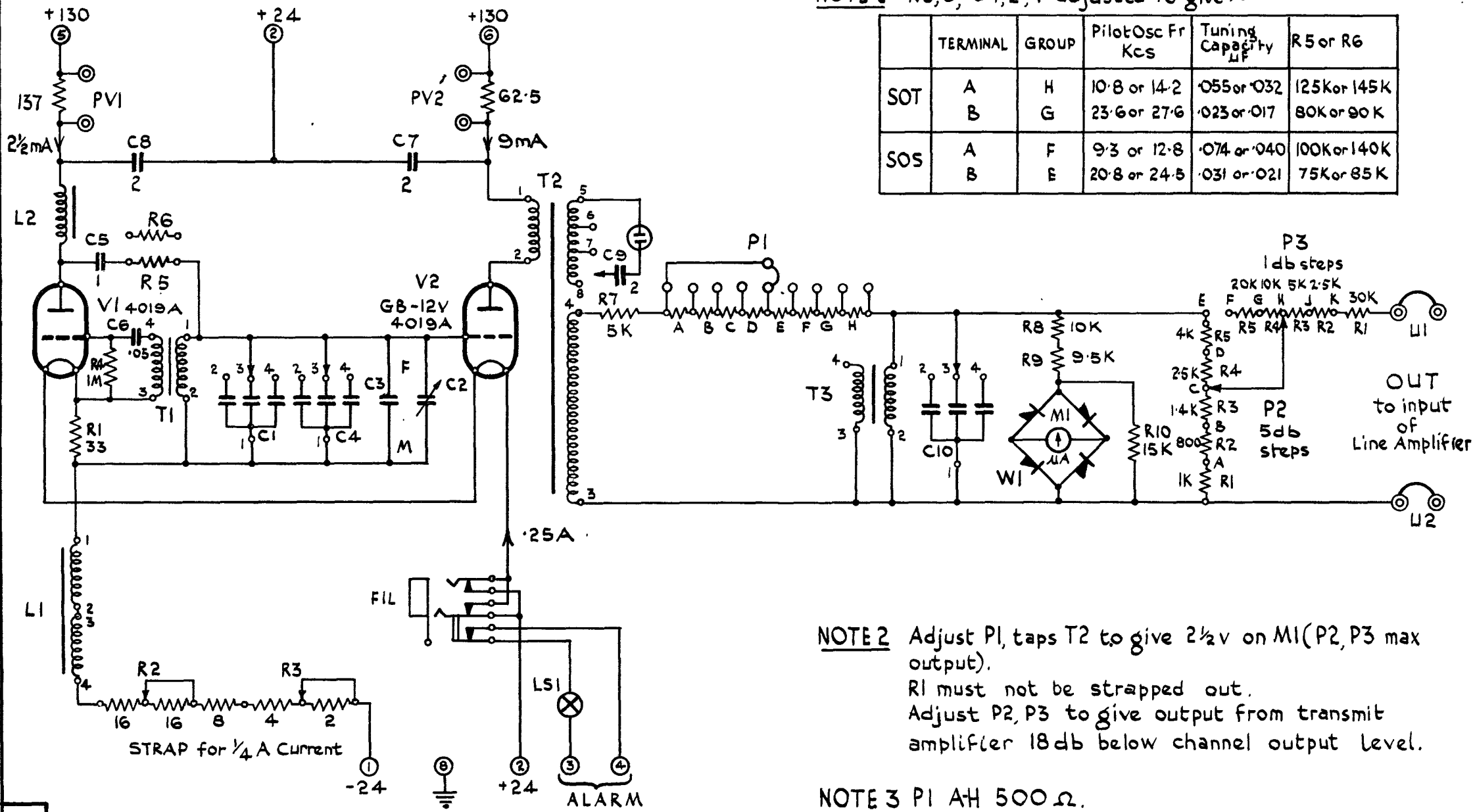
E1/170



E1/171

A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F

PILOT BAY — SUPPLY



NOTE 1 R5,6, C1,2,4 adjusted to give:-

	TERMINAL	GROUP	Pilot Osc Fr Kcs	Tuning Capacity $\mu$ F	R5 or R6
SOT	A	H	10.8 or 14.2	.055 or .032	125K or 145K
	B	G	23.6 or 27.6	.023 or .017	80K or 90K
SOS	A	F	9.3 or 12.8	.074 or .040	100K or 140K
	B	E	20.8 or 24.5	.031 or .021	75K or 85K

NOTE 2 Adjust P1, taps T2 to give 2½v on M1 (P2, P3 max output).  
 R1 must not be strapped out.  
 Adjust P2, P3 to give output from transmit amplifier 18db below channel output level.

NOTE 3 P1 AH 500  $\Omega$ .

AC.T 1+3 TYPES SOS-3-F & SOT-3-F  
PILOT OSCILLATOR

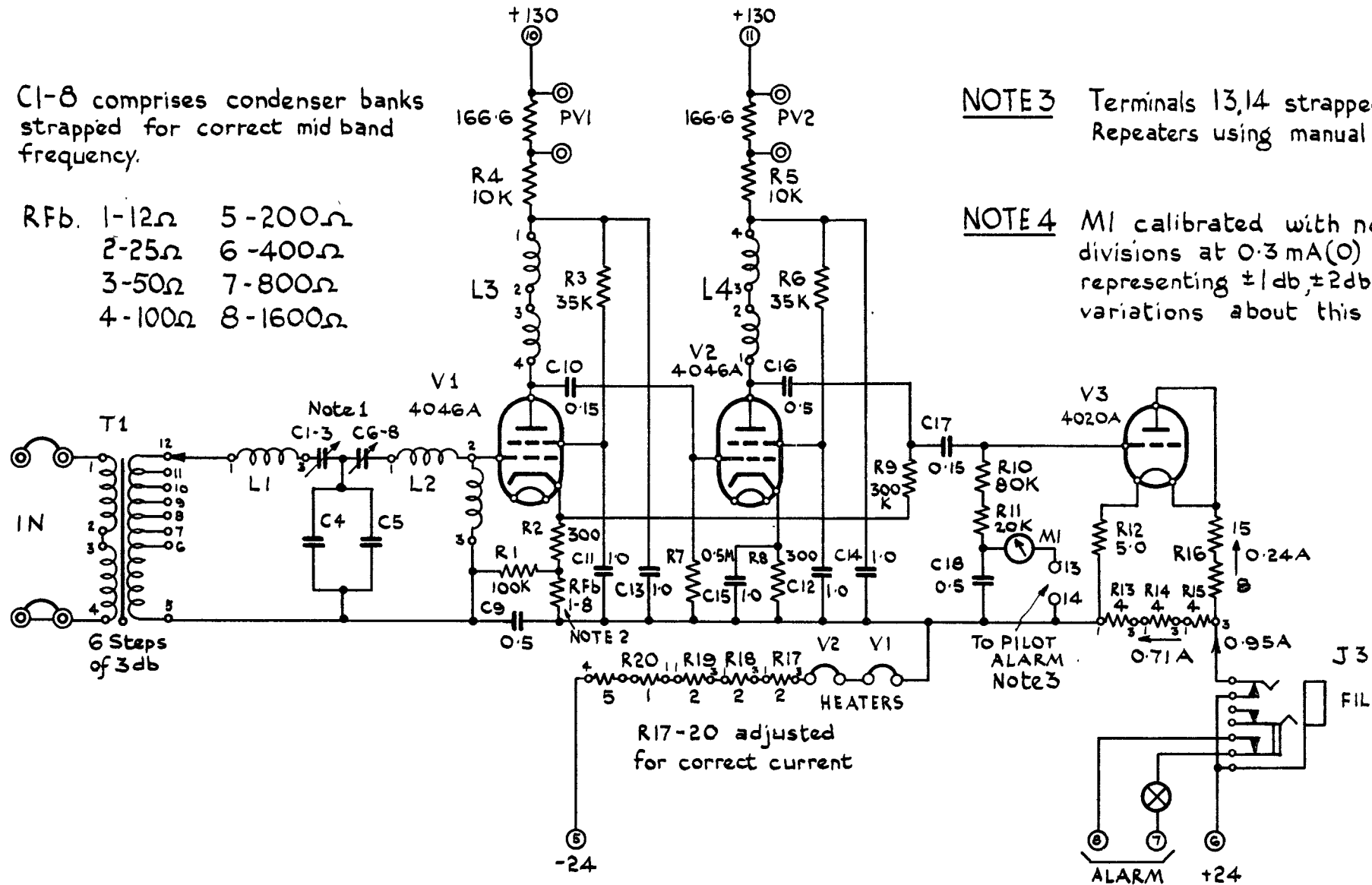
E1/172

**NOTE 1** C1-8 comprises condenser banks strapped for correct mid band frequency.

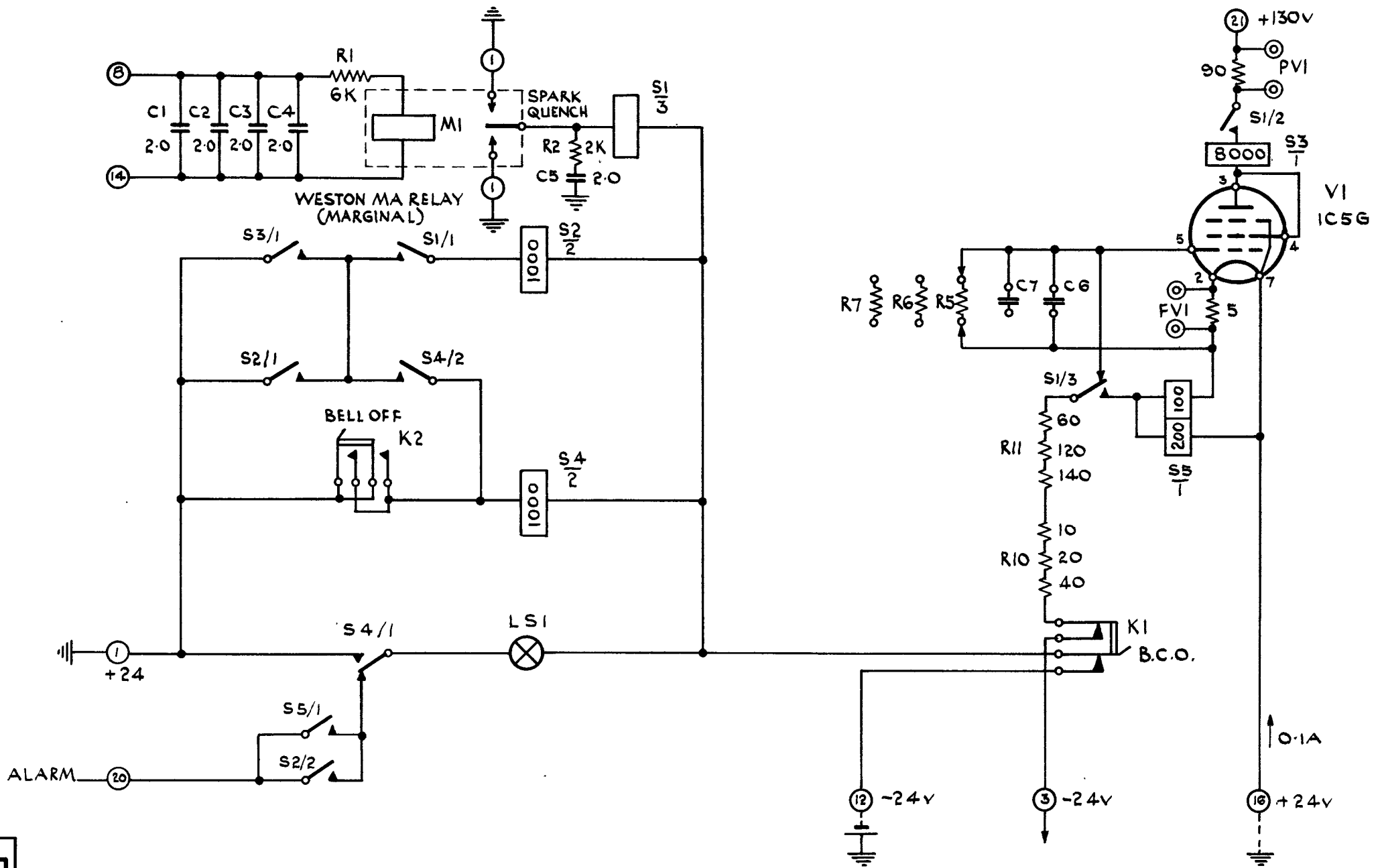
**NOTE 2** Rfb. 1-12Ω 5-200Ω  
 2-25Ω 6-400Ω  
 3-50Ω 7-800Ω  
 4-100Ω 8-1600Ω

**NOTE 3** Terminals 13,14 strapped at Repeaters using manual pilot control.

**NOTE 4** M1 calibrated with normal scale divisions at 0.3 mA(O) and values representing ±1db, ±2db level variations about this point.



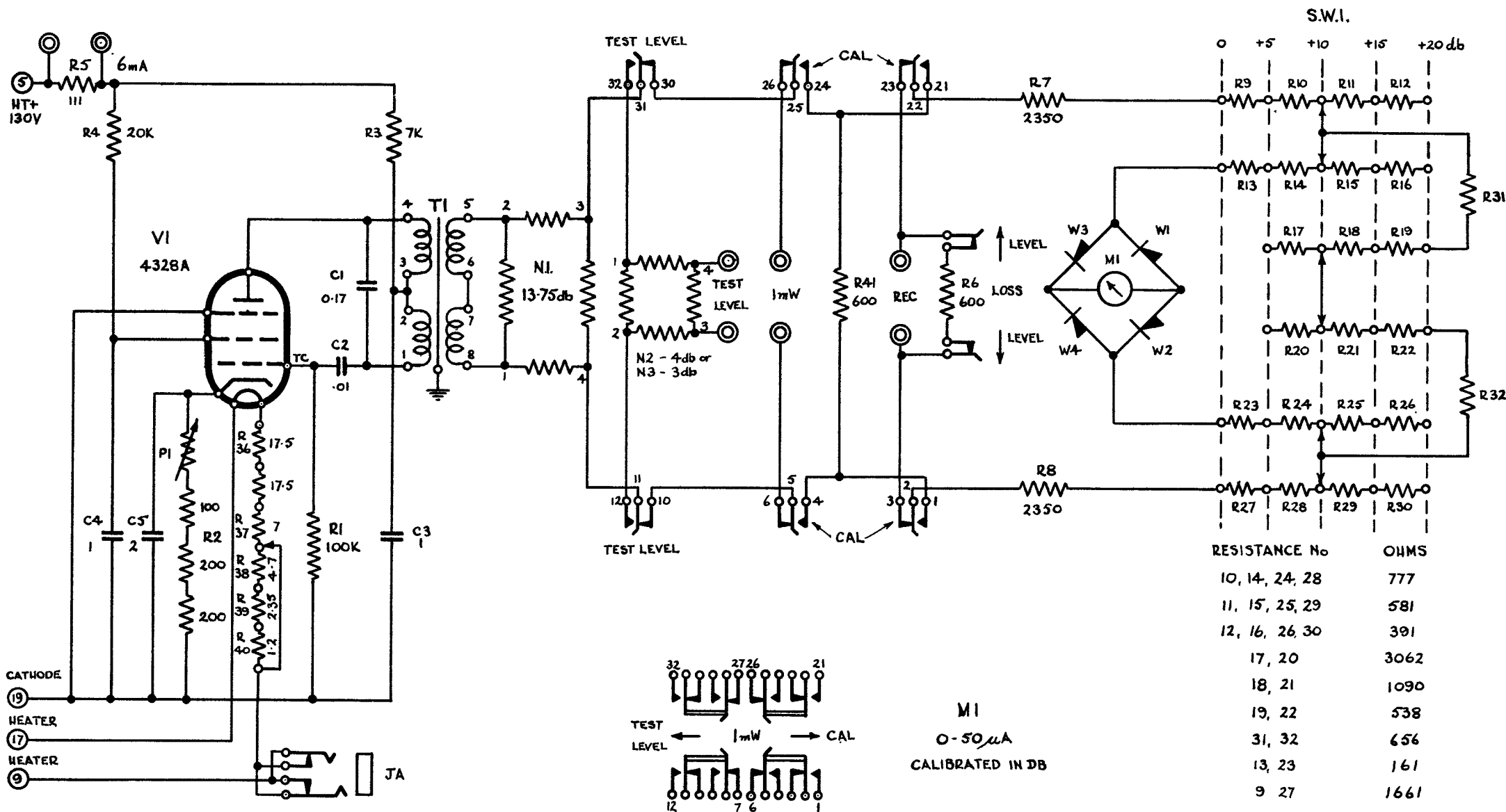
A.C.T. 1 +3 TYPES SOS-3-F & SOT-3-F  
PILOT INDICATOR



A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
PILOT ALARM

E1/174

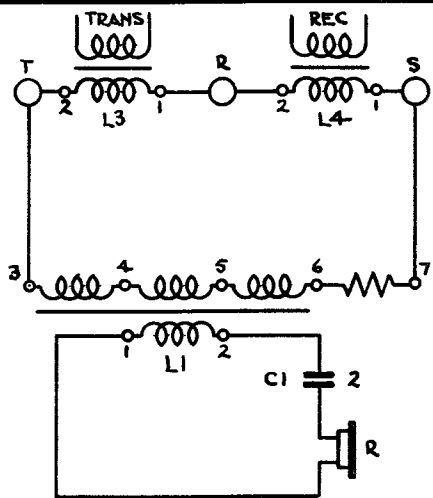




E1/175

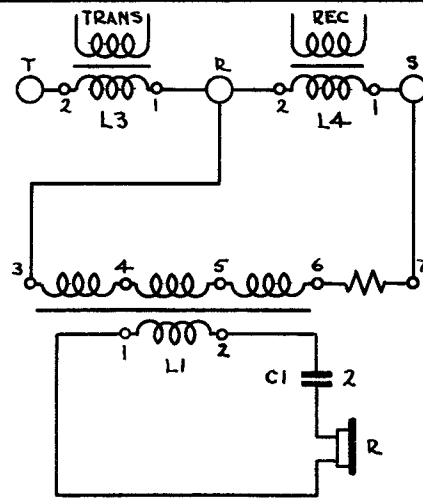
A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F - 800 $\sim$  OSCILLATOR & TMS

FIG 1.



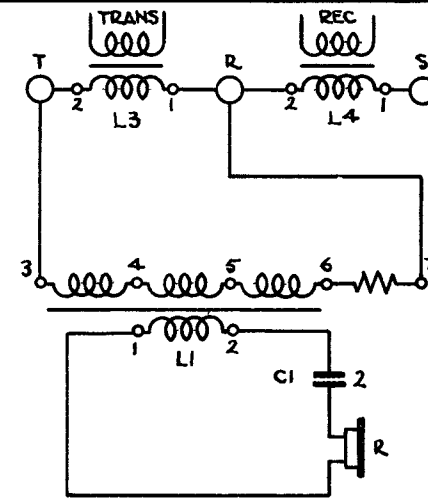
ALL KEYS NORMAL

FIG 2



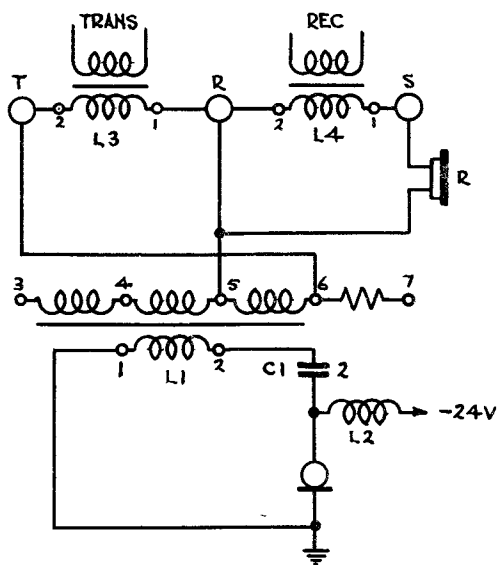
K2 TO MON REC

FIG 3.



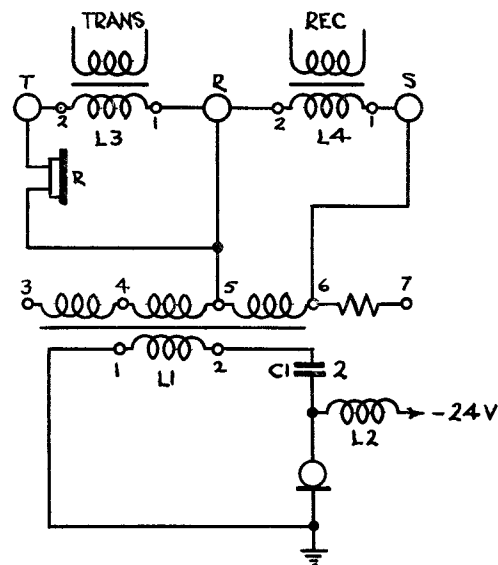
K2 TO MON TRANS

FIG 4



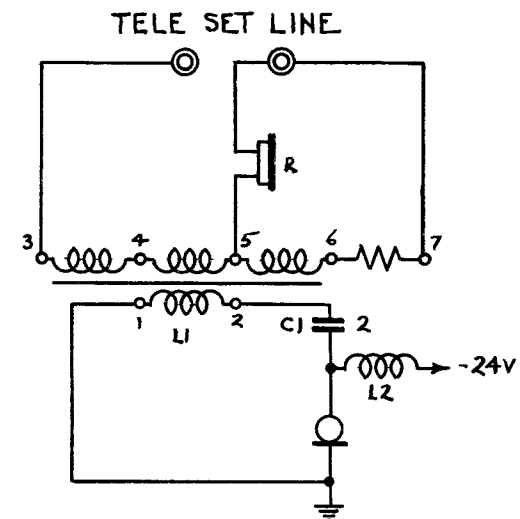
K2 TO MON REC, K3, K3A TO TALK CHAN.

FIG 5



K2 TO MON TRANS, K3, K3A TO TALK CHAN.

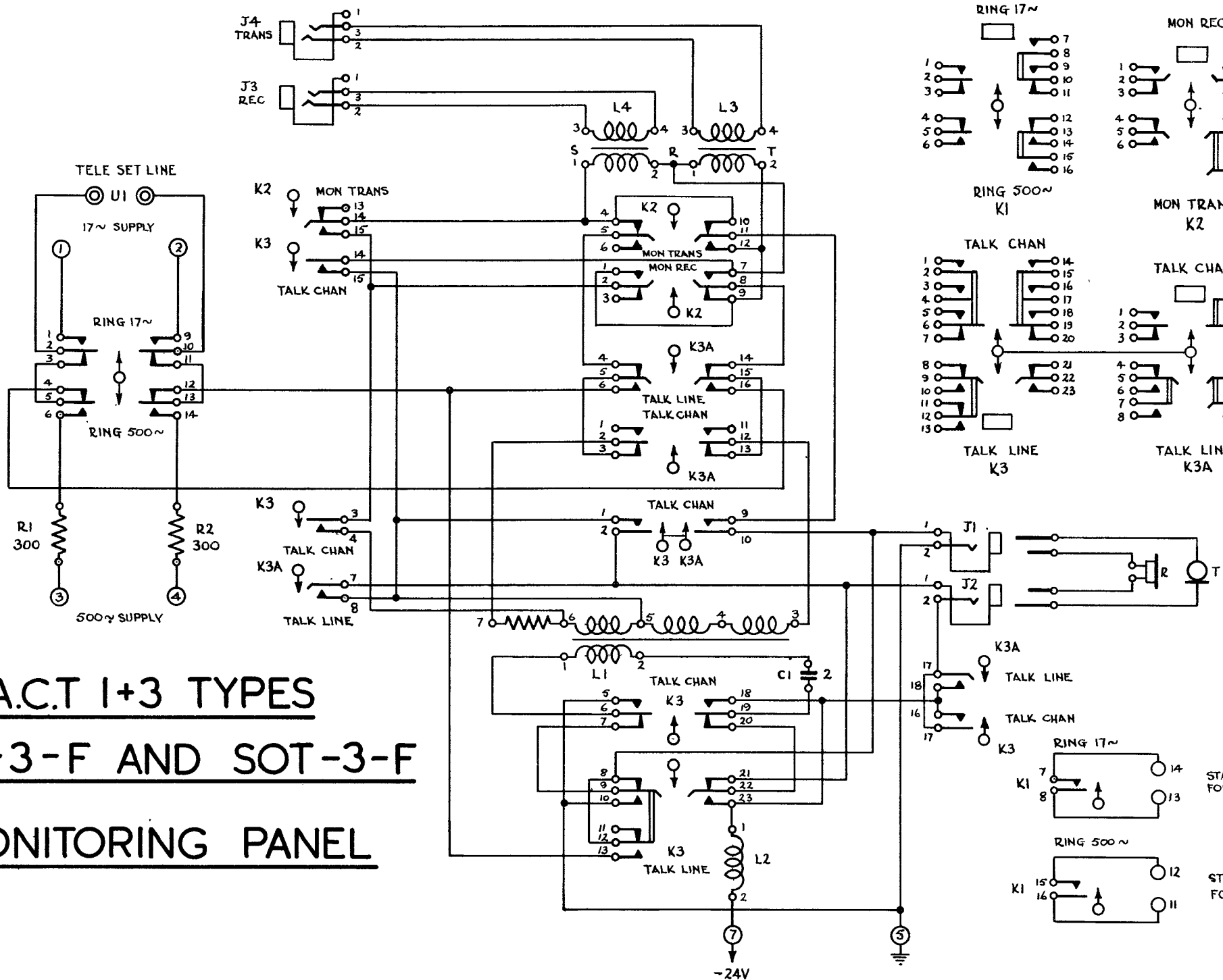
FIG 6



K3, K3A, TALK LINE

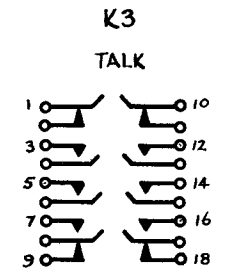
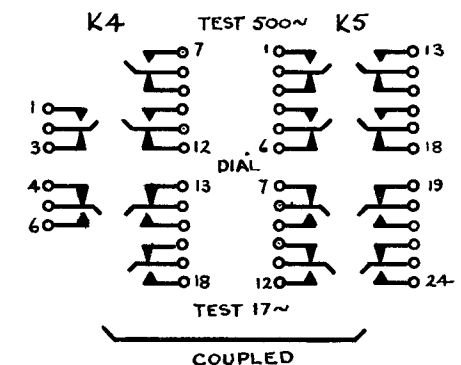
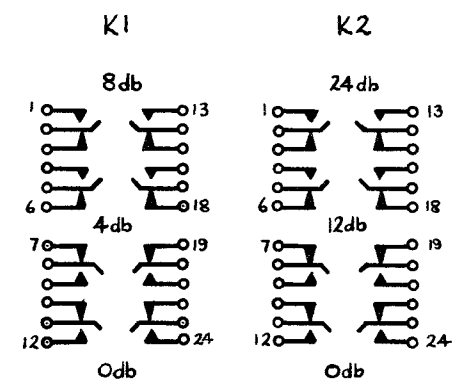
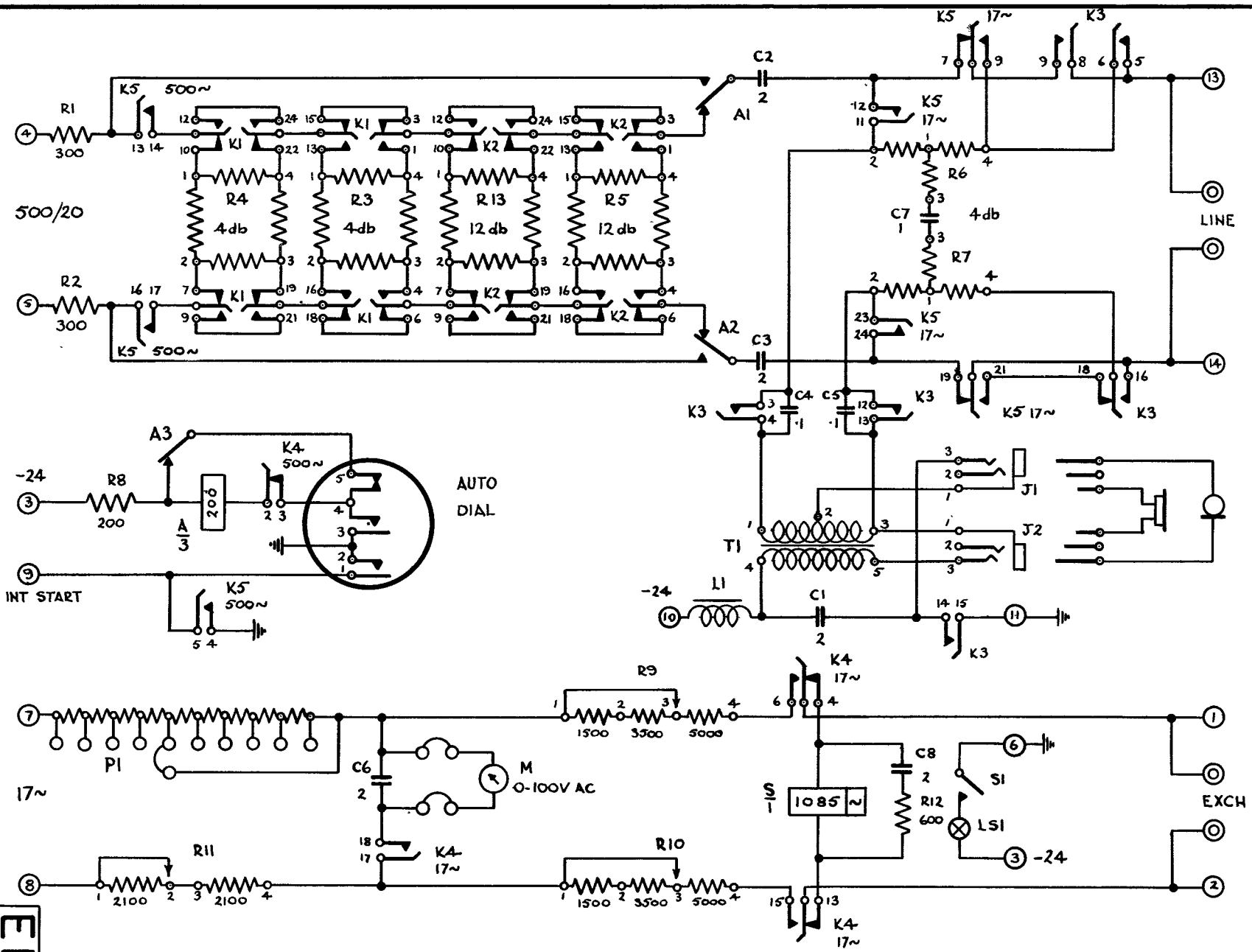
A.C.T. 1+3 TYPES SOS-3-F AND SOT-3-F  
 MONITORING PANEL - FACILITIES

E1/176



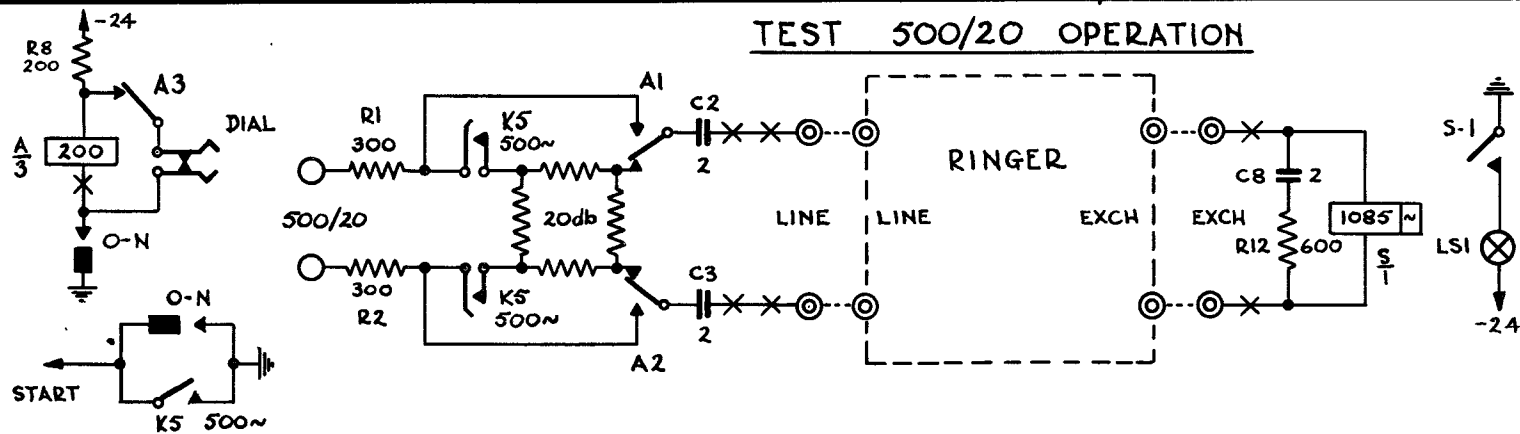
**A.C.T 1+3 TYPES**  
**SOS-3-F AND SOT-3-F**  
**MONITORING PANEL**

E11177



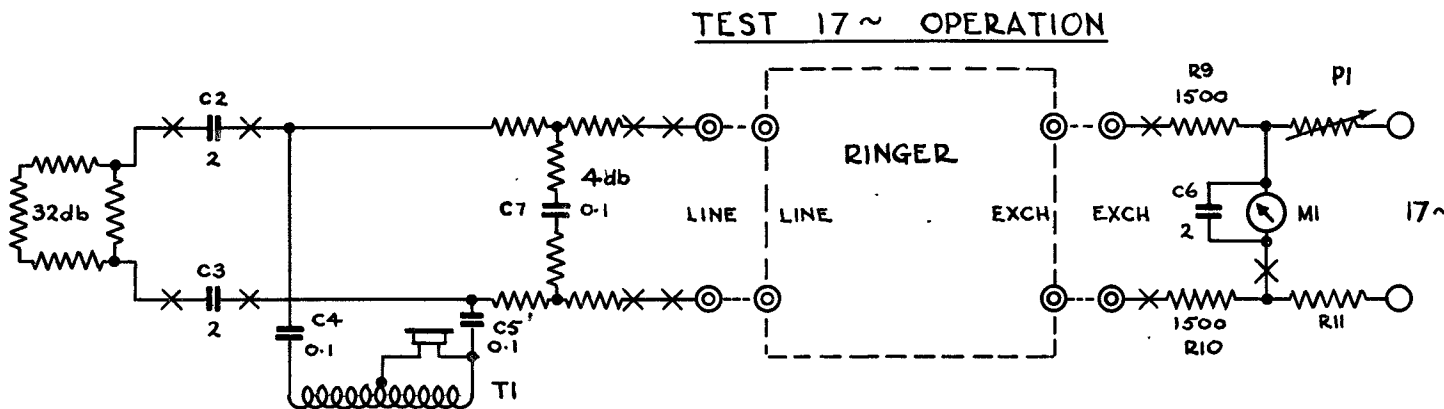
E1/178

**A.C.T. 1+3 TYPES SOS-3-F AND SOT-3-F  
 RINGER TEST PANEL**

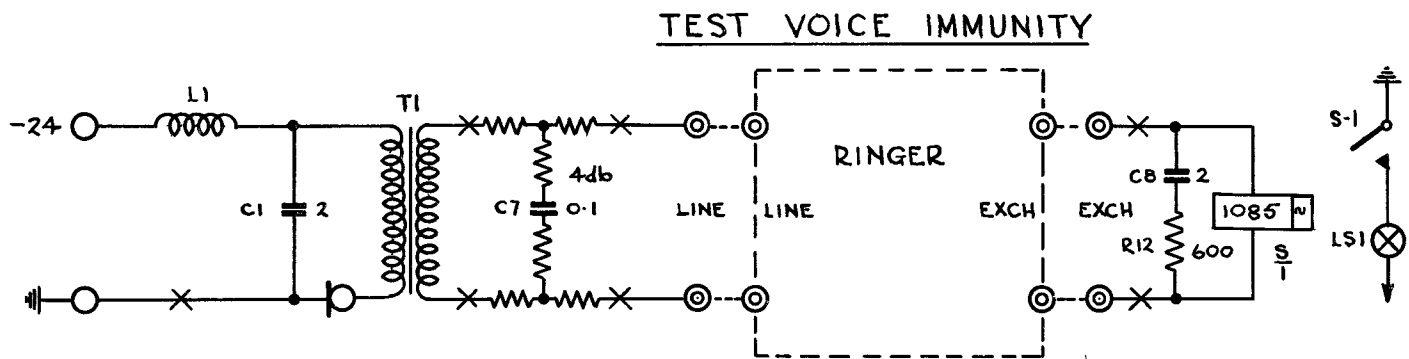


**TEST 1**  
 K4, K5 TO 500~  
 R3-13 TO 20db  
 LAMP SHOULD GLOW

**TEST 2.**  
 K4, K5 NORMAL  
 DIAL 4 LAMP SHOULD NOT GLOW  
 DIAL 8 LAMP SHOULD GLOW



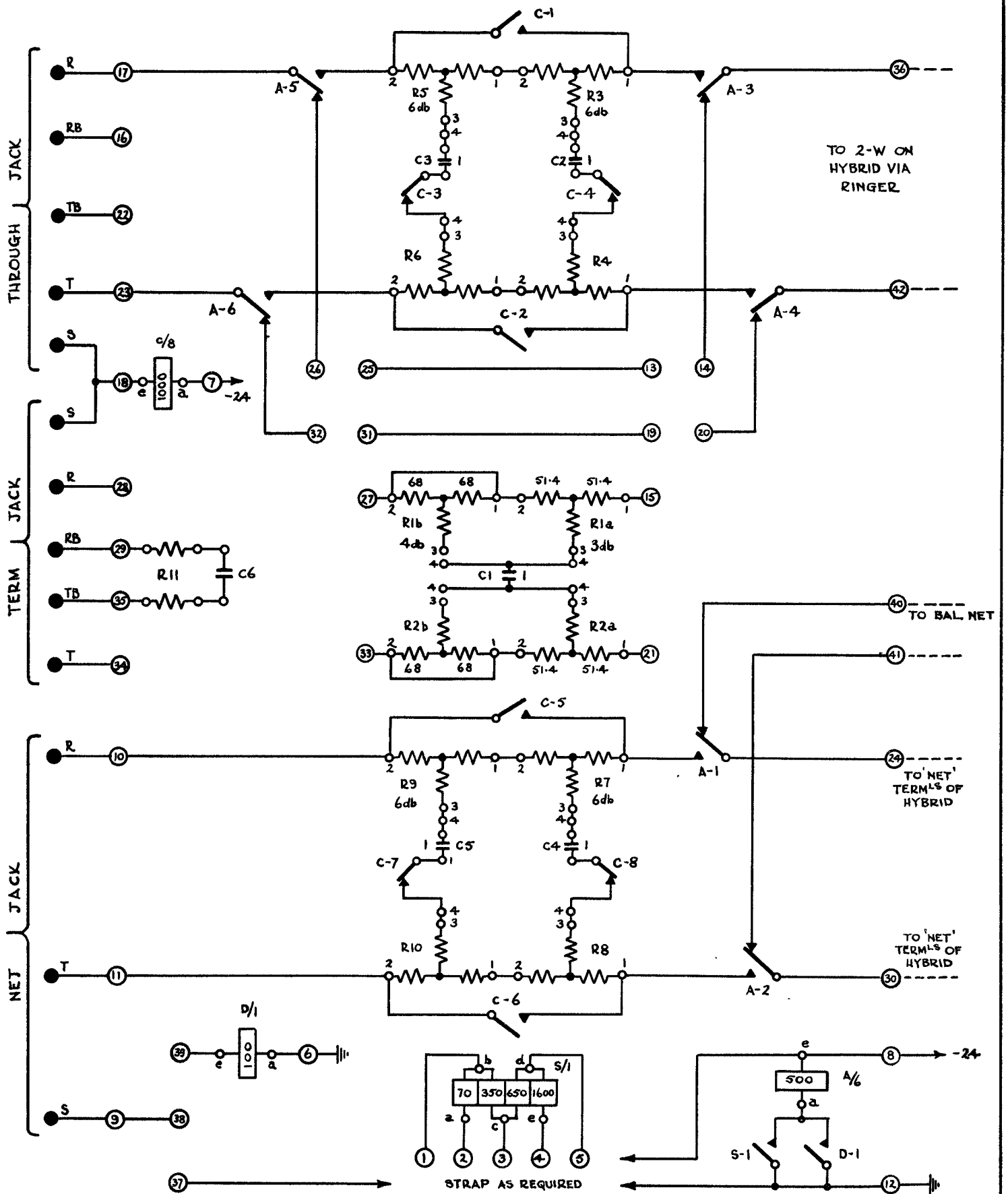
**TEST 3.**  
 PLUG TELE SET J1, J2  
 K4, K5 TO 17~  
 PI ADJUSTED FOR 60 V ON MI  
 500/20 SHOULD BE HEARD IN TELE



**TEST 4**  
 K4, K5 NORMAL  
 OPERATE K3  
 SPEECH SHOULD NOT  
 OPERATE RINGER

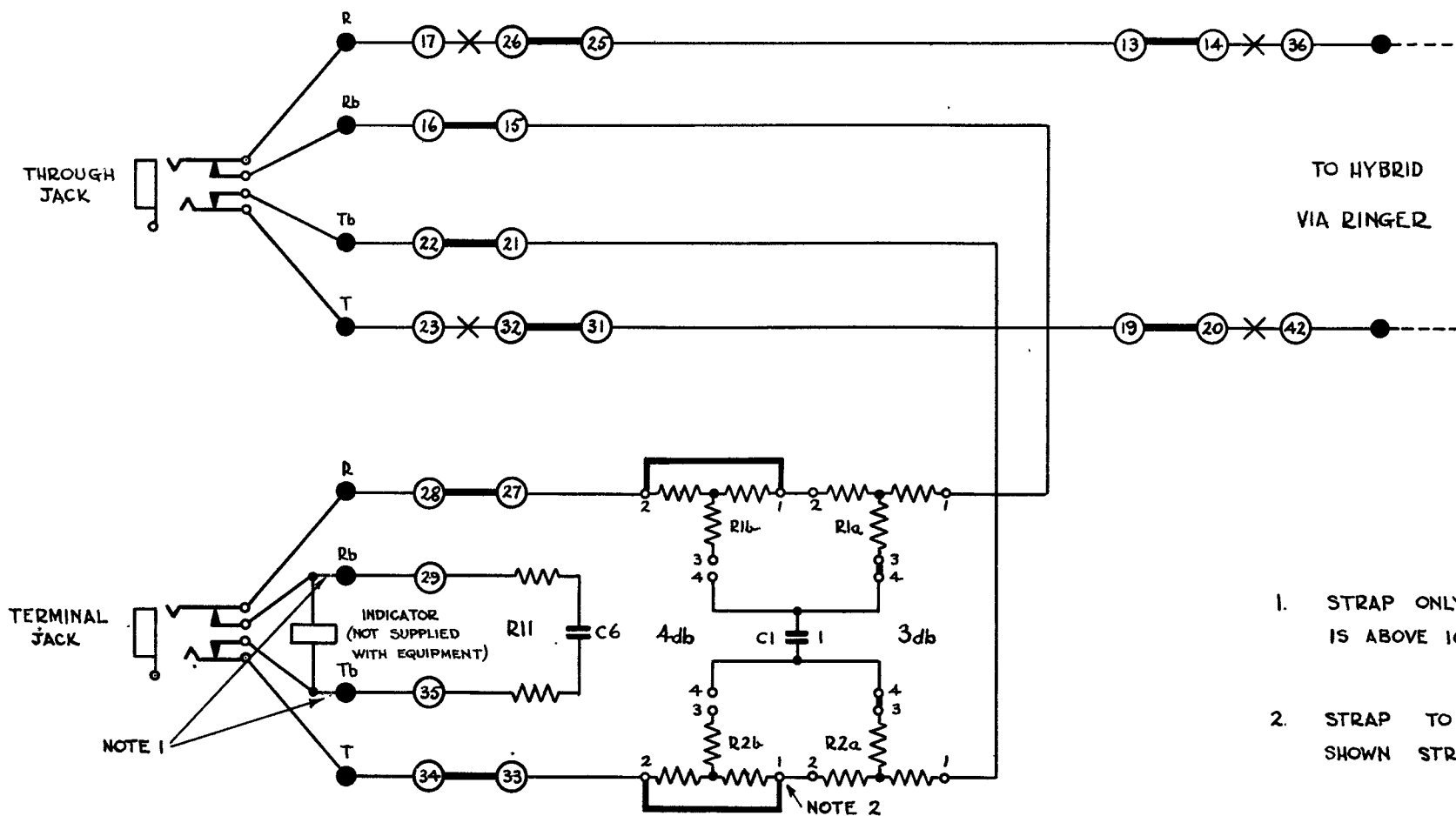
**NOTE**  
 \* DENOTES CLOSED KEY CONTACT.

## A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F RINGER TEST PANEL — SIMPLIFIED



**ATTENUATOR PADS** IN - STRAP 3 TO 4 ON EACH HALF  
OUT - STRAP 1 TO 2 ON EACH HALF  
ALL PADS ARE SHOWN IN EXCEPT 4db PAD (R1b, R2b)

# A.C.T. 1+3 TYPES SOS-3-F AND SOT-3-F SWITCHBOARD TERMINATING PANEL



TO HYBRID  
 VIA RINGER

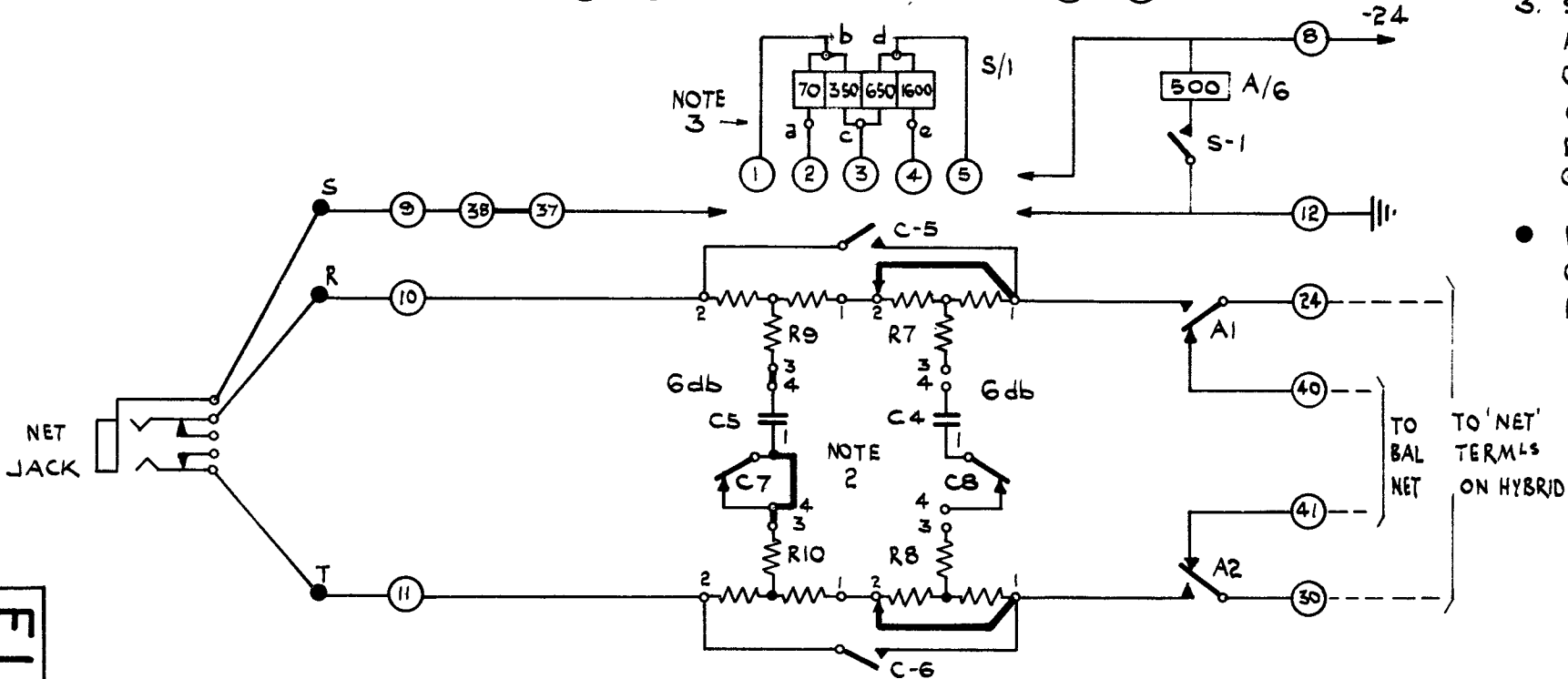
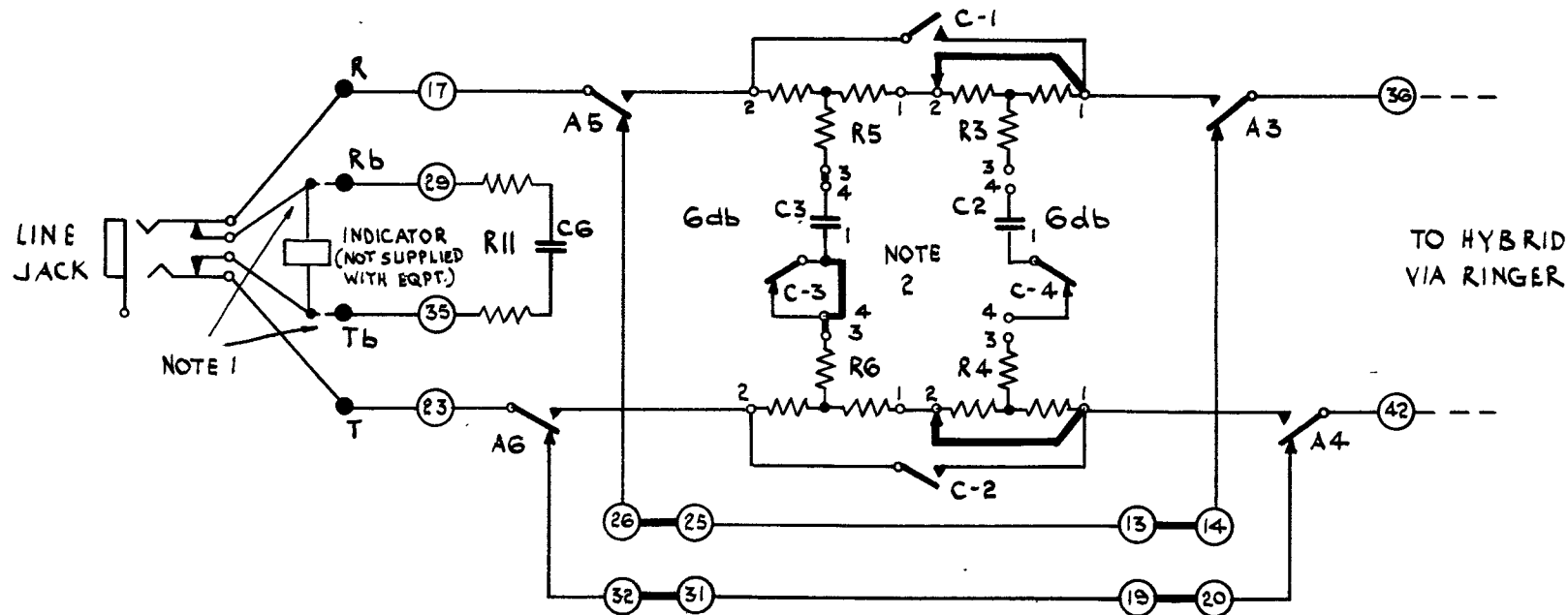
**NOTES**

1. STRAP ONLY IF IMPEDANCE OF INDICATOR IS ABOVE 1000Ω AT 800~
2. STRAP TO EITHER 3 OR 4-db. SHOWN STRAPPED TO 3db
3. JACKS AND INDICATORS ARE ON SWITCHBOARD AND ARE NOT PROVIDED WITH EQUIPMENT.

● INDICATES TAG AT TOP OF CHANNEL BAY  
 HEAVY LINES INDICATE STRAPS TO BE WIRED BY INSTALLER.

EI/181

**A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F SWITCHBOARD TERMINATING PANEL — CONNECTIONS FOR PAD SWITCHING**



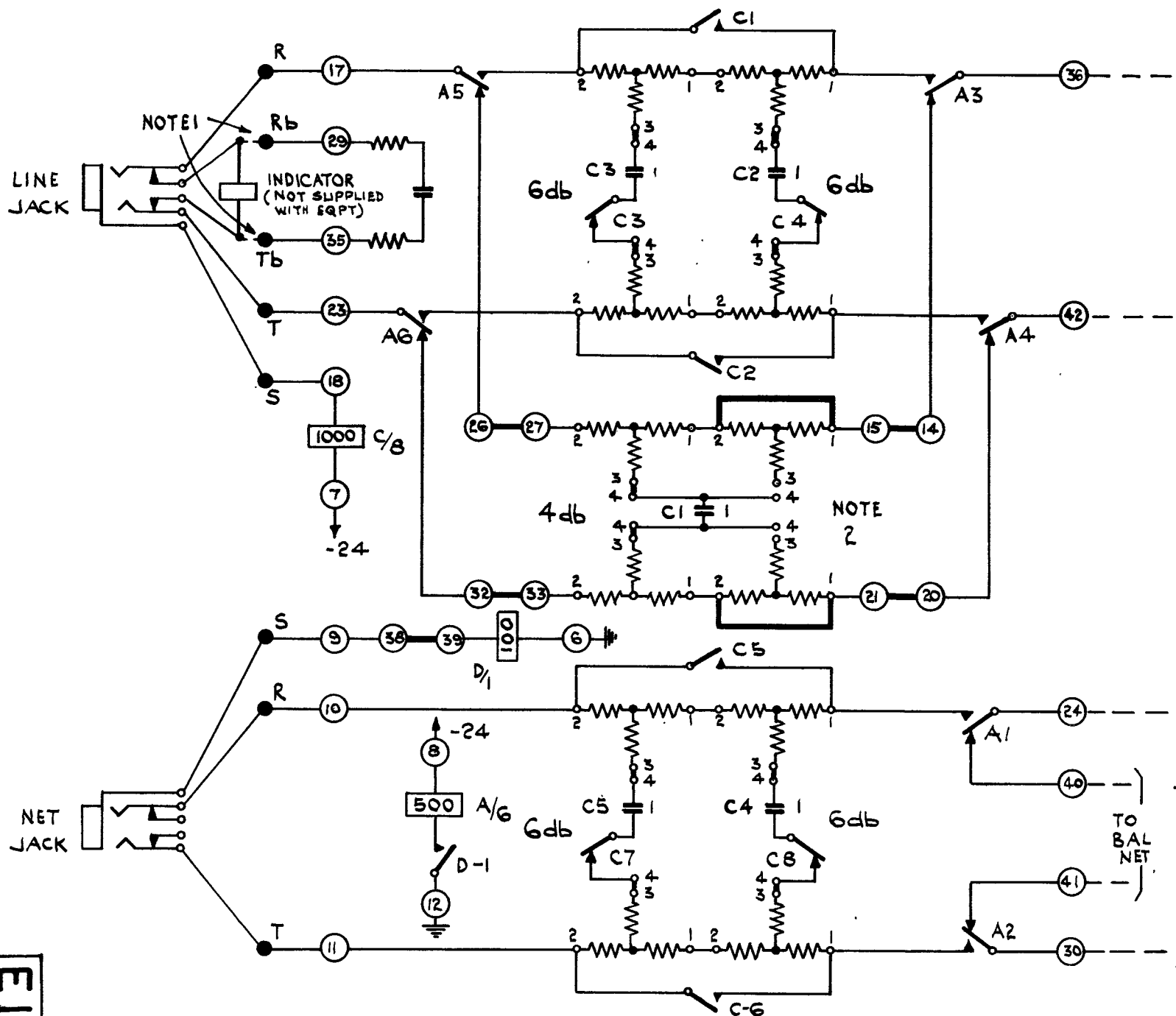
NOTES

1. STRAP ONLY IF IMPEDANCE OF INDICATOR IS ABOVE 1000 Ω AT 800 ~.
  2. STRAP OUT R3, 4, 7, 8, AND CONTACTS C3 C7.
  3. STRAP FOR REQUIRED POLARITY AND RESISTANCE. WHERE CORD CCT. REPEATER HAS AUTOMATIC GAIN CONTROL, ADJUST RESISTANCE TO OBTAIN REQUIRED GAIN.
- INDICATES TAG AT TOP OF CHANNEL BAY. HEAVY LINES INDICATE STRAPS TO BE WIRED BY INSTALLER.

**A.C.T. 1 +3 TYPES SOS-3-F & SOT-3-F-SWITCHBOARD TERMINATING PANEL-Connections for Cord Cct. Repeater with Tail Eating.**

E1/182



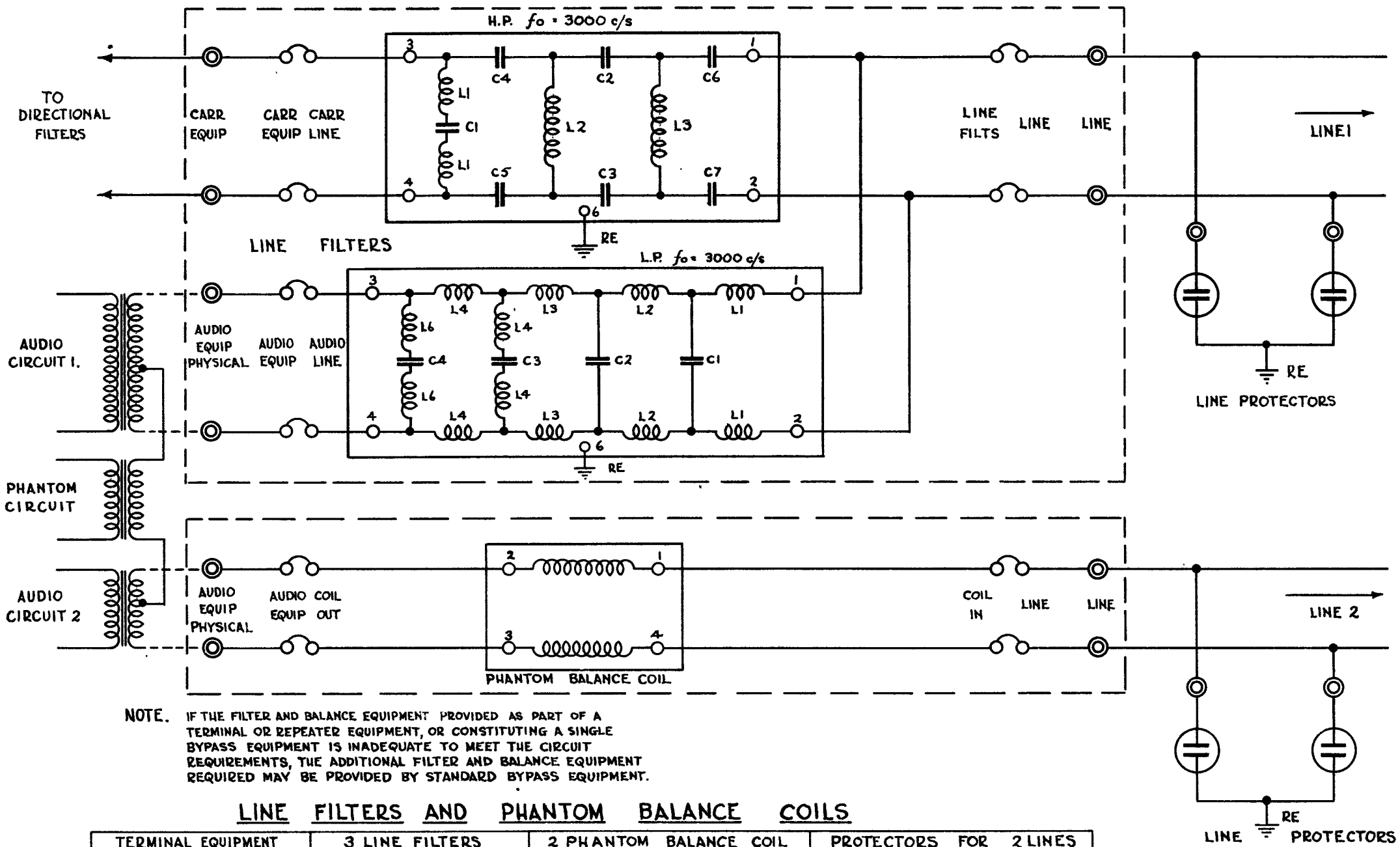


NOTES

- 1 STRAP ONLY IF IMPEDANCE OF INDICATOR IS ABOVE 1000Ω AT 800~
- 2 STRAP TO 4db.
- INDICATES TAG AT TOP OF CHANNEL BAY
- HEAVY LINES INDICATE STRAPS TO BE WIRED BY INSTALLER.

E1/183

A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F - SWITCHBOARD TERMINATING PANEL - CONNECTIONS FOR INDIAN CIRCUITS.



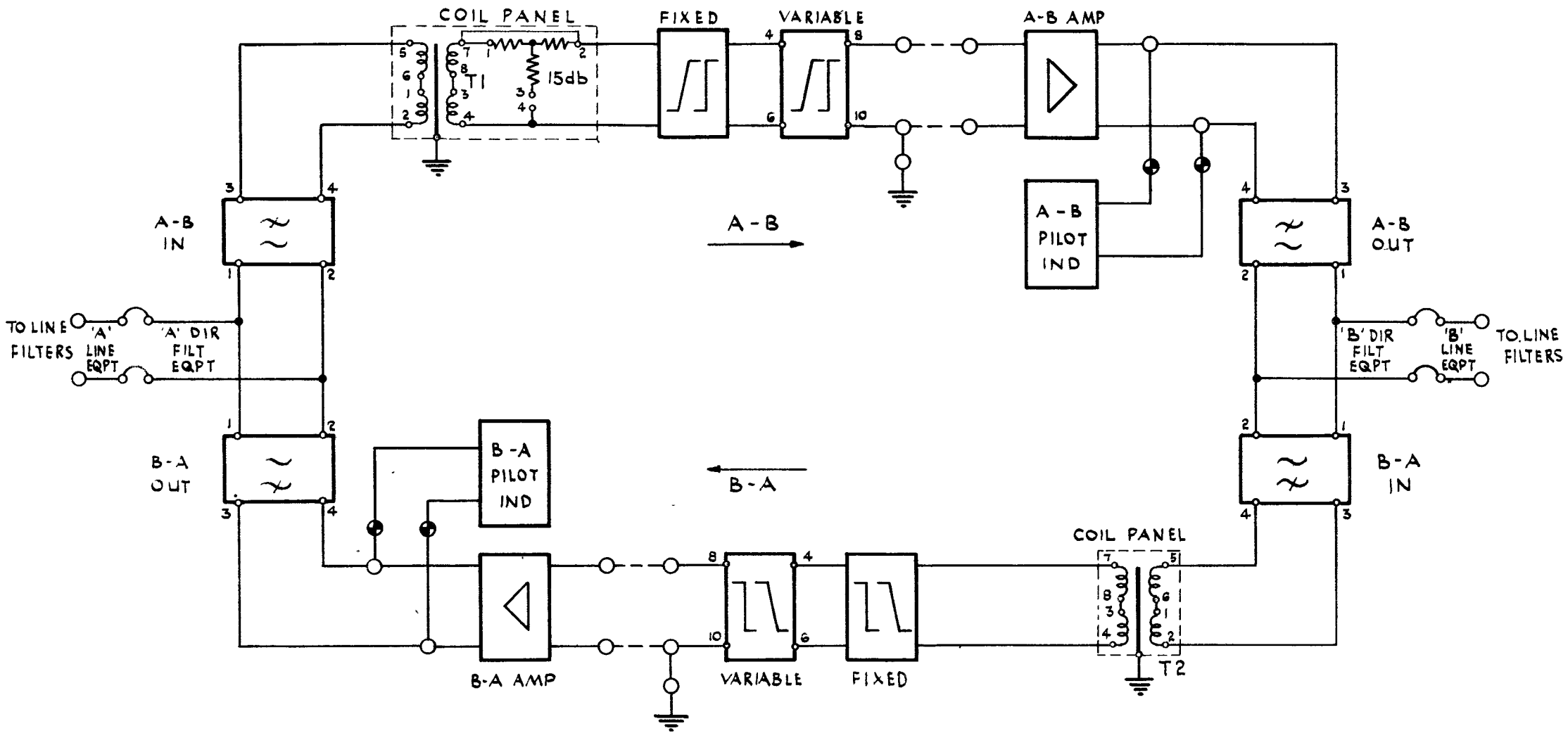
LINE FILTERS AND PHANTOM BALANCE COILS

TERMINAL EQUIPMENT	3 LINE FILTERS	2 PHANTOM BALANCE COIL	PROTECTORS FOR 2 LINES
REPEATER EQUIPMENT	5 LINE FILTERS	4 PHANTOM BALANCE COIL	PROTECTORS FOR 4 LINES

F1/184

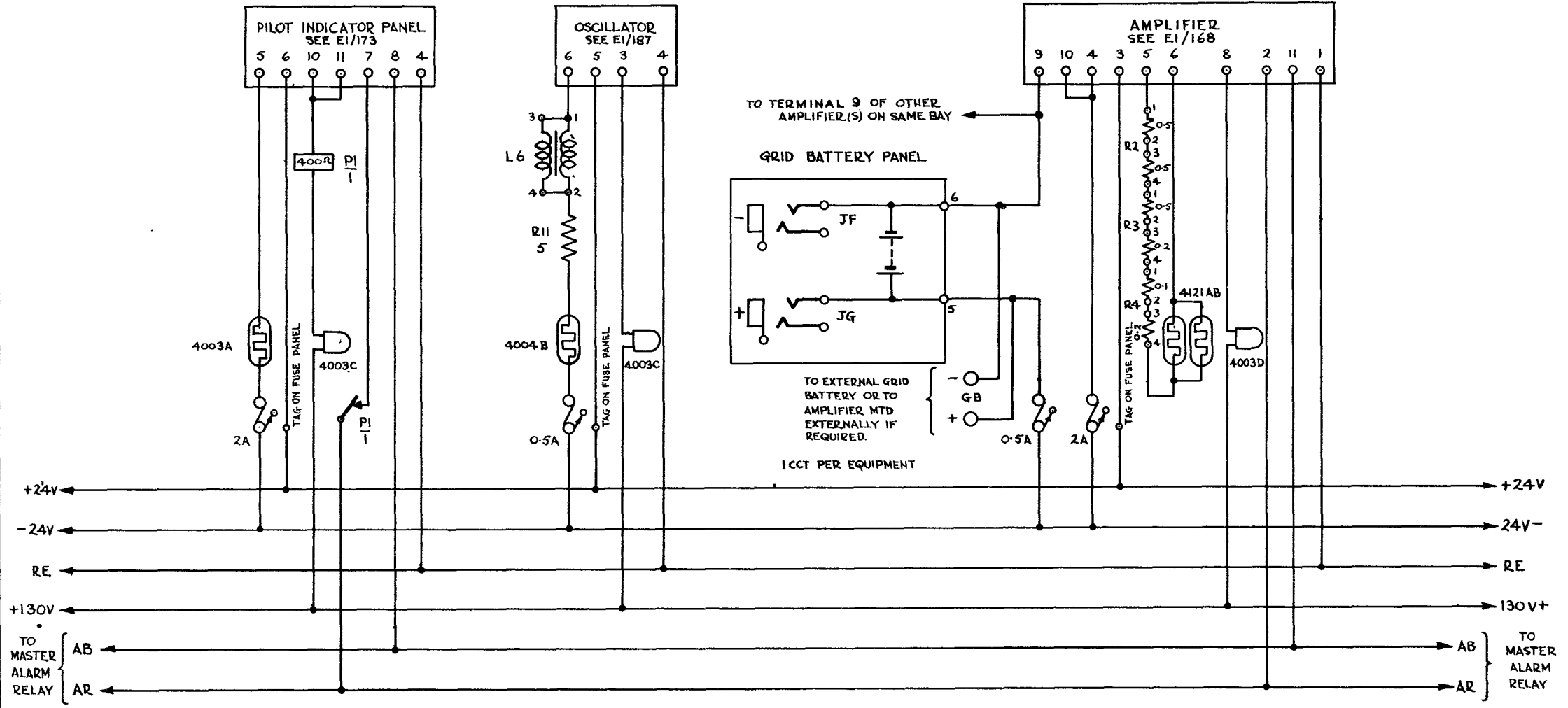
THREE CHANNEL CARRIER TELEPHONE SYSTEMS TYPES

SOT-3-F  
 SOS-3-F



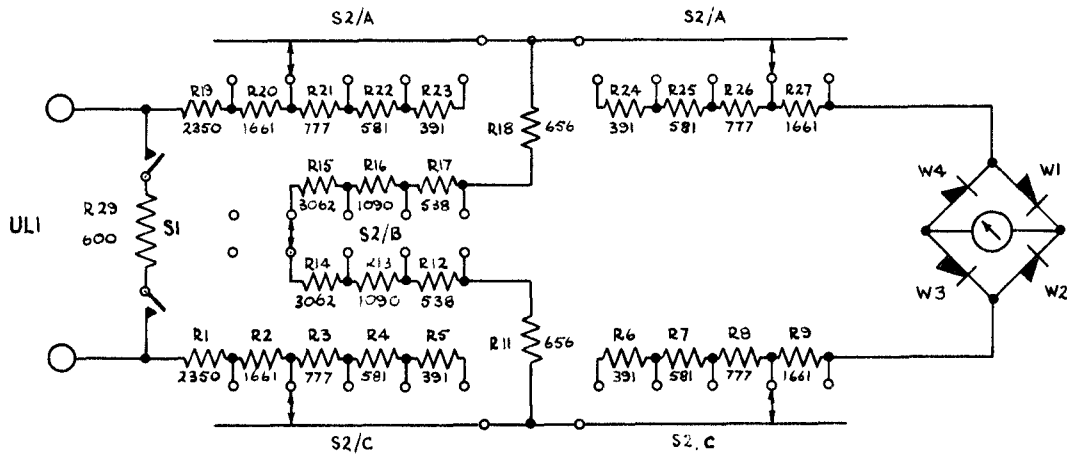
REPEATER C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
BLOCK SCHEMATIC

E1/185



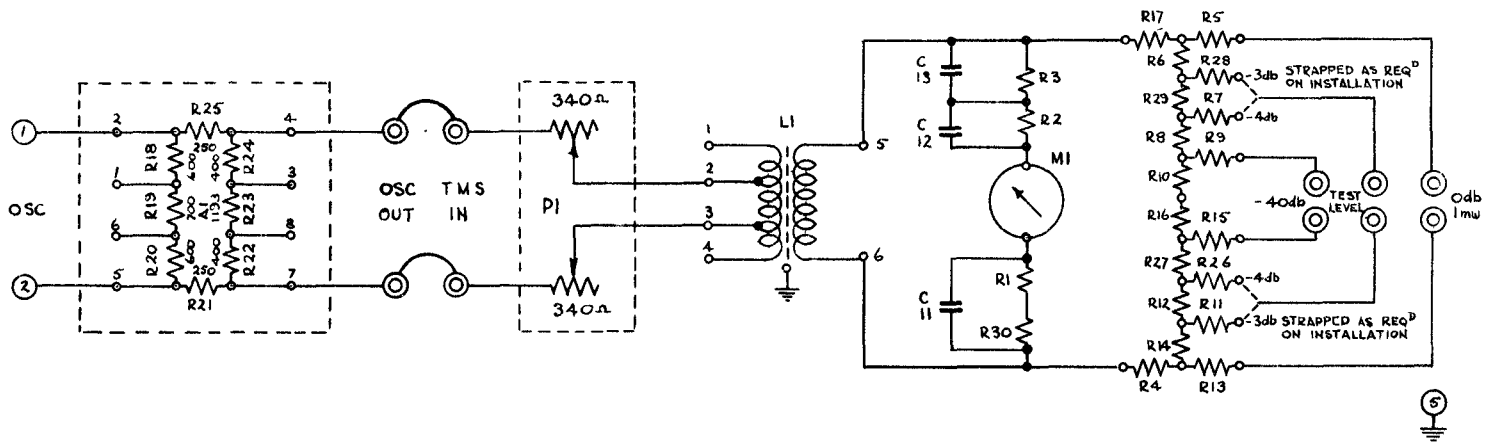
REPEATER C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
POWER SUPPLY

E1/186

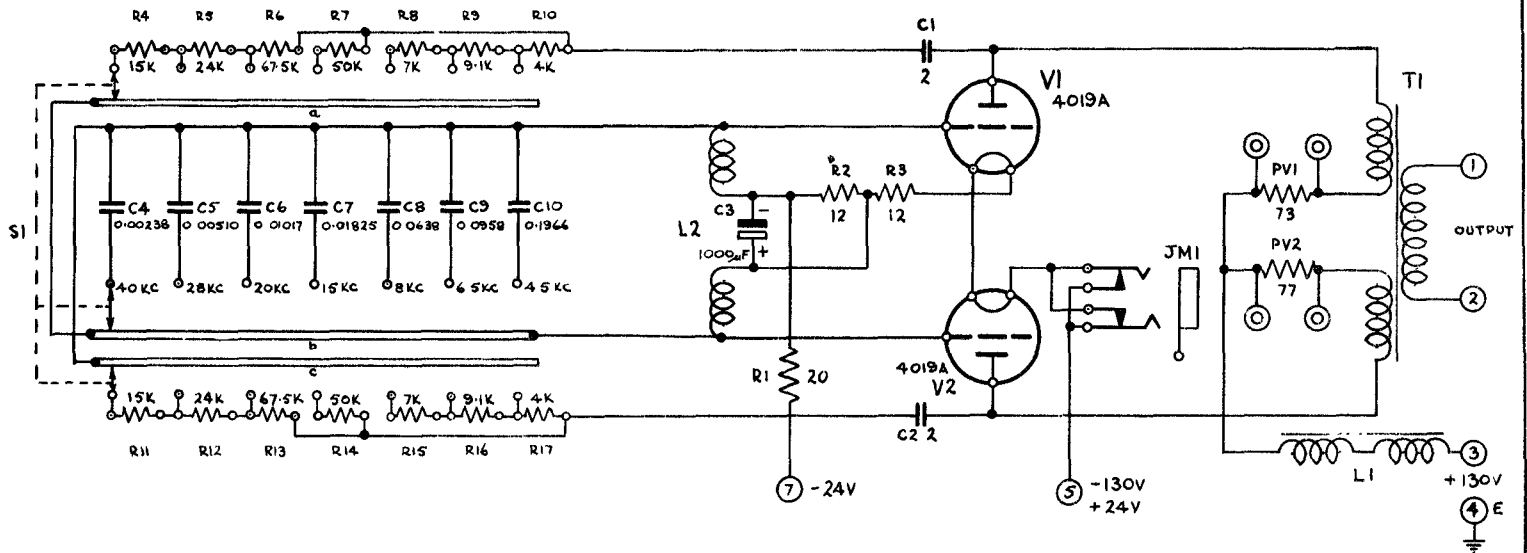


T.M.S.

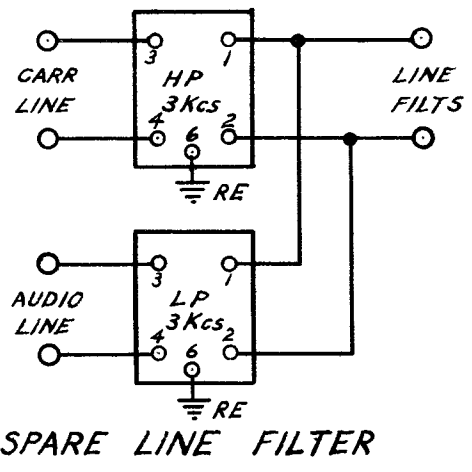
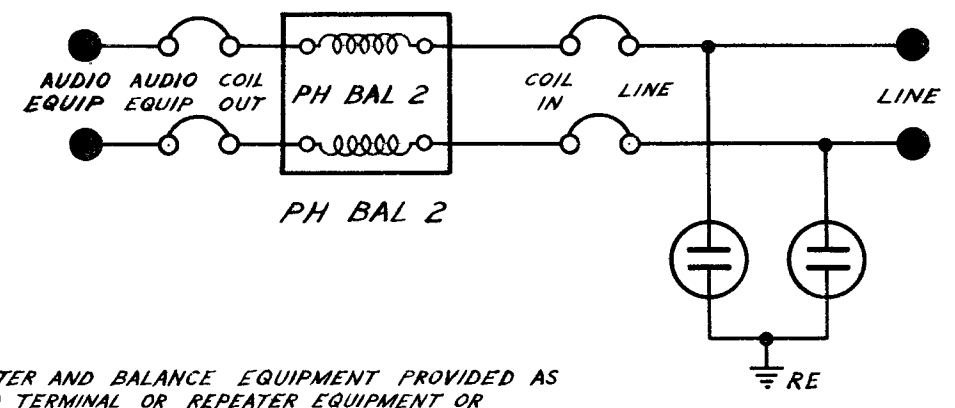
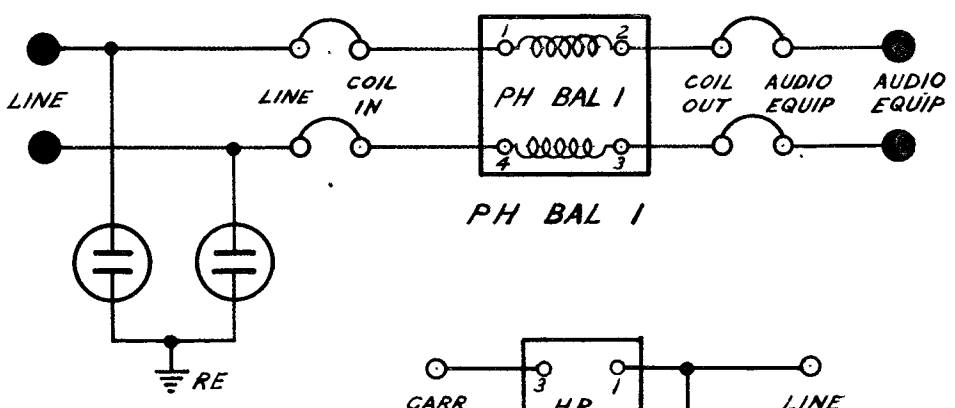
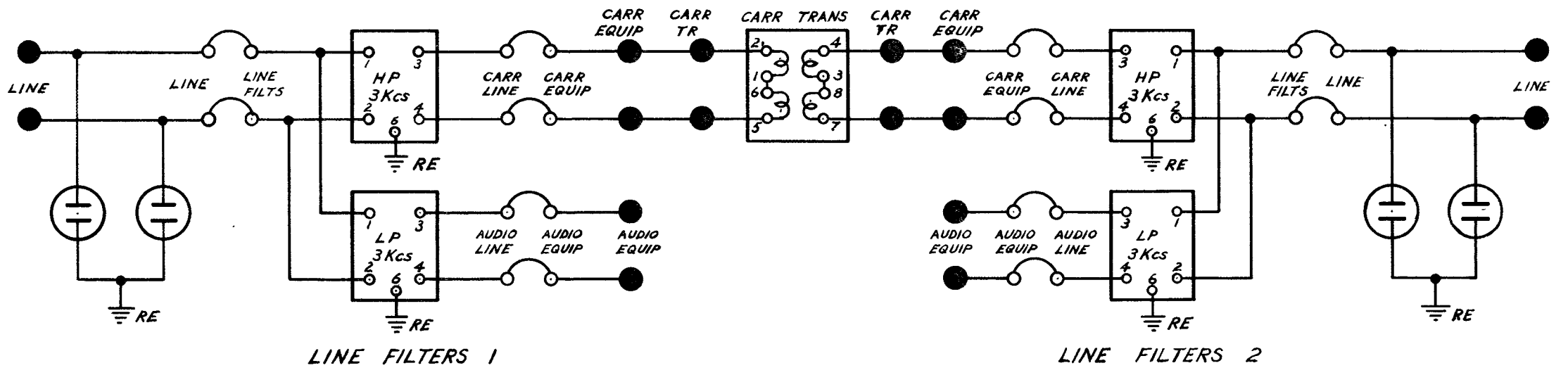
SENDING UNIT



74121 TYPE OSCILLATOR.



3 CHANNEL CARRIER TELEPHONE SYSTEMS  
 TYPES SOS-3-F & SOT-3-F  
 REPEATER - TESTING EQUIPMENT



**NOTES**

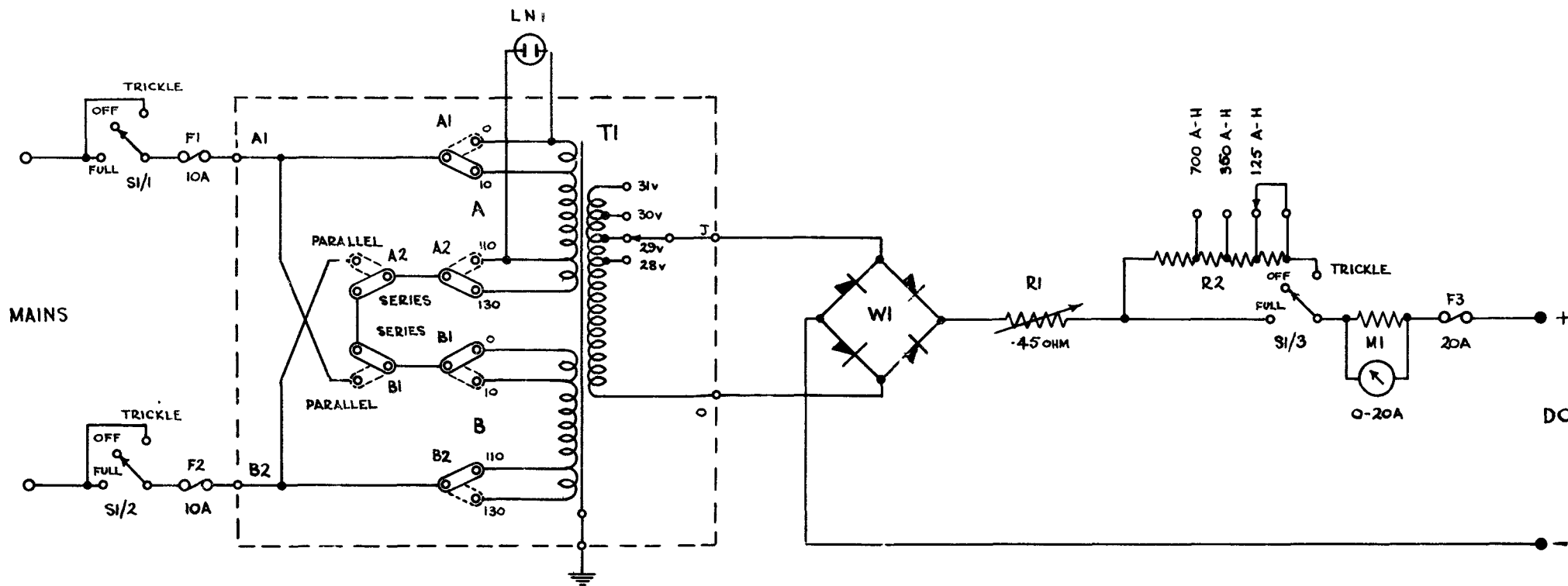
1. IF THE FILTER AND BALANCE EQUIPMENT PROVIDED AS PART OF A TERMINAL OR REPEATER EQUIPMENT OR CONSTITUTING A SINGLE BYPASS EQUIPMENT IS INADEQUATE TO MEET THE CIRCUIT REQUIREMENTS, THE ADDITIONAL FILTER AND BALANCE EQUIPMENT REQUIRED MAY BE PROVIDED BY STANDARD BYPASS EQUIPMENTS.
2. ● SCREW TERMINAL ON BYPASS BAY.

**BYPASS EQUIPMENT**

**3 CHANNEL CARRIER TELEPHONE SYSTEMS TYPES SOS-3-F & SOT-3-F**

E1/188

15973/e.l.h./945

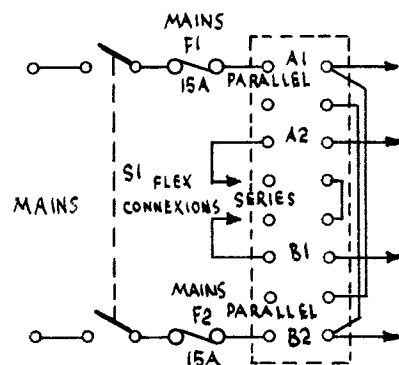
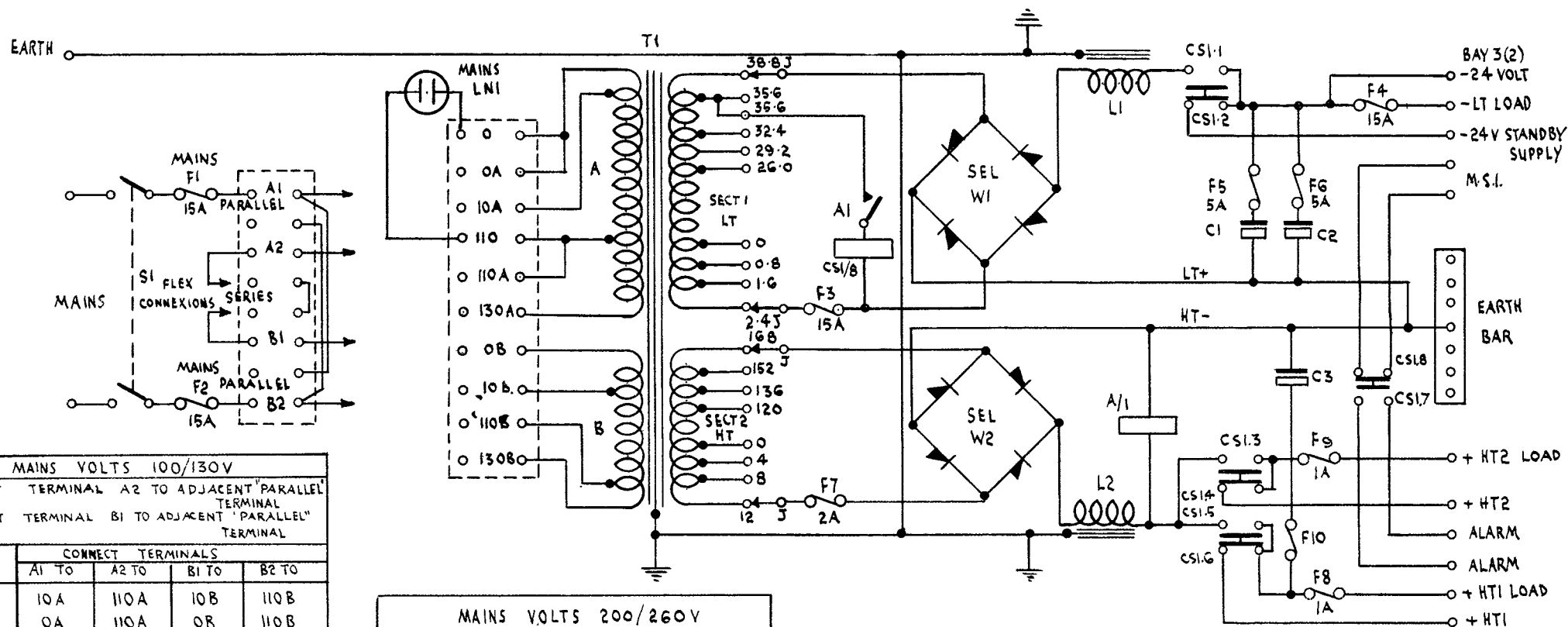


MAINS VOLTS 200/260 VOLTS				
CONNECT TERM <sup>L</sup> A2 TO ADJACENT SERIES TERM <sup>L</sup>				
" " B1 " " " "				
MAINS VOLTS	CONNECT TERMINALS			
	A1 TO	A2 TO	B1 TO	B2 TO
200	10A	110A	10B	110B
210	0A	"	"	"
220	"	"	0B	"
230	10A	130A	0B	"
240	"	"	10B	130B
250	0A	"	10B	"
260	"	"	0B	"

MAINS VOLTS 100/130 VOLTS				
CONNECT TERM <sup>L</sup> A2 TO ADJACENT PARALLEL TERM <sup>L</sup>				
" " B1 " " " "				
MAINS VOLTS	CONNECT TERMINALS			
	A1 TO	A2 TO	B1 TO	B2 TO
100	10A	110A	10B	110B
110	0A	110A	0B	110B
120	10A	130A	10B	130B
130	0A	130A	0B	130B

A.C.T. 1+3 TYPES SOS-3-F & SOT-3-F  
BATTERY CHARGER 24 VOLTS 10 AMP No 1

E1/189



MAINS VOLTS 100/130V

CONNECT TERMINAL A2 TO ADJACENT "PARALLEL" TERMINAL

CONNECT TERMINAL B1 TO ADJACENT "PARALLEL" TERMINAL

MAINS VOLTS	CONNECT TERMINALS			
	A1 TO	A2 TO	B1 TO	B2 TO
100	10A	110A	10B	110B
110	0A	110A	0B	110B
120	10A	130A	10B	130B
130	0A	130A	0B	130B

MAINS VOLTS 200/260V

CONNECT TERMINAL A2 TO ADJACENT "SERIES" TERMINAL

CONNECT TERMINAL B1 TO ADJACENT "SERIES" TERMINAL

MAINS VOLTS	CONNECT TERMINALS			
	A1 TO	A2 TO	B1 TO	B2 TO
200	10A	110A	10B	110B
210	0A	110A	10B	110B
220	0A	110A	0B	110B
230	0A	130A	10B	110B
240	0A	130A	0B	110B
250	0A	130A	10B	130B
260	0A	130A	0B	130B

LT OUTPUT

ADJUST SECONDARY VOLTAGE

SECONDARY CONNECTIONS MADE

SECONDARY	TERMINALS	TERMINALS
26 VOLTS	0 AND 26	
29.2	0 " 29.2	
32.4	0 " 32.4	
35.6	0 " 35.6	
38.8	0 " 38.8	
40.8	0.8 " 0.26 ETC	
41.6	1.6 " 2.6 "	
42.4	2.4 " 26 "	

- T1 TRANSFORMER 1KVA 100/130V or 200/260V, 40/60~ WITH 2 SECONDARIES
- L1 SMOOTHING CHOKE 500 VA 10mH AT 11AMPS DC WITH RESISTANCE > 0.1Ω
- L2 " " 100 VA 500mH AT 0.6AMPS " " 3.8Ω
- CS1/8 CHANGE OVER SWITCH TYPE F SIZE 2B TO OPERATE ON 35/38V 50~ 8 CONTACTS CHANGE OVER CONTACTOR
- S1 SWITCH SR 225 MAINS ON/OFF
- LNI NEON LAMP 110V SIGNAL LAMP
- C1 } 2500μF 50DC TYPE 3030
- C2 }
- C3 500μF 250V DC TYPE 3030
- A/1 RELAY No 4661 MBB
- F1, F2 } FUSE 15334-MM FUSE WIRE RATED TO CARRY 15AMPS
- F3, F4 }
- F7 " " " " " " 2 AMPS
- F8-9 " " " " " " 1 AMP
- F5, 6 " 5341 FW " " " " 5AMPS
- F10 " " " " " " 1AMP
- W1 RECTIFIER UNITS 2-D112-3-2A WIRED AS B112-3-2A
- W2 " " 2-D6T-10-1ETF WIRED AS B67-10-1ETF

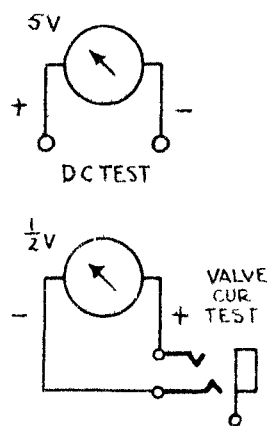
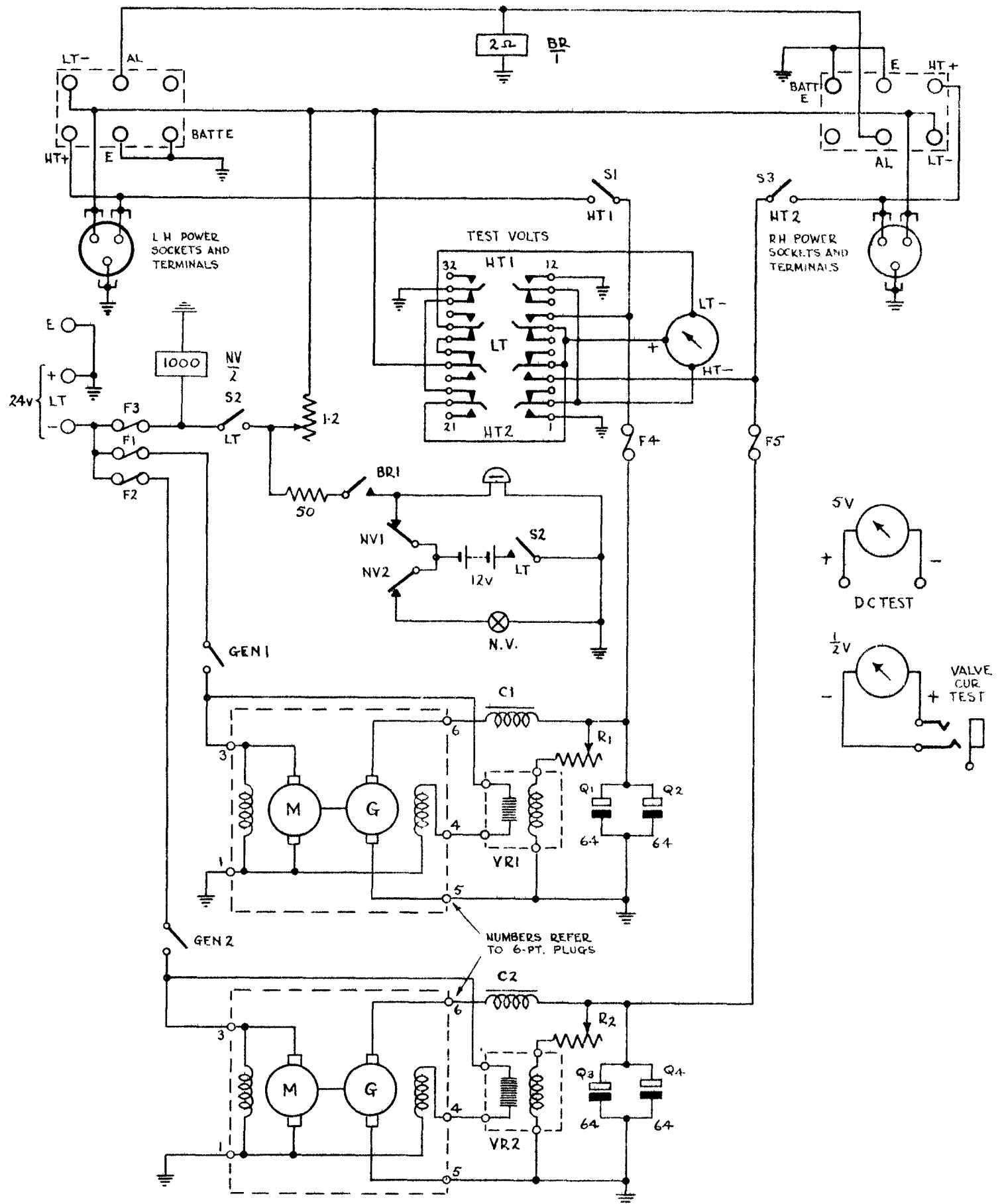
SET JUMPER LEADS ON PRIMARY T1 TO SUIT MAINS INPUT VOLTAGE. FOR VOLTAGE RANGE 100/130 VOLTS TERMINAL CONNECTIONS TO WINDINGS A & B MUST BE IN ACCORDANCE WITH TABLE ABOVE

# THREE CHANNEL CARRIER TELEPHONE SYSTEMS TYPES SOS-3-F & SOT-3-F — SUPPLY UNIT RECTIFIER No 11

E1/190

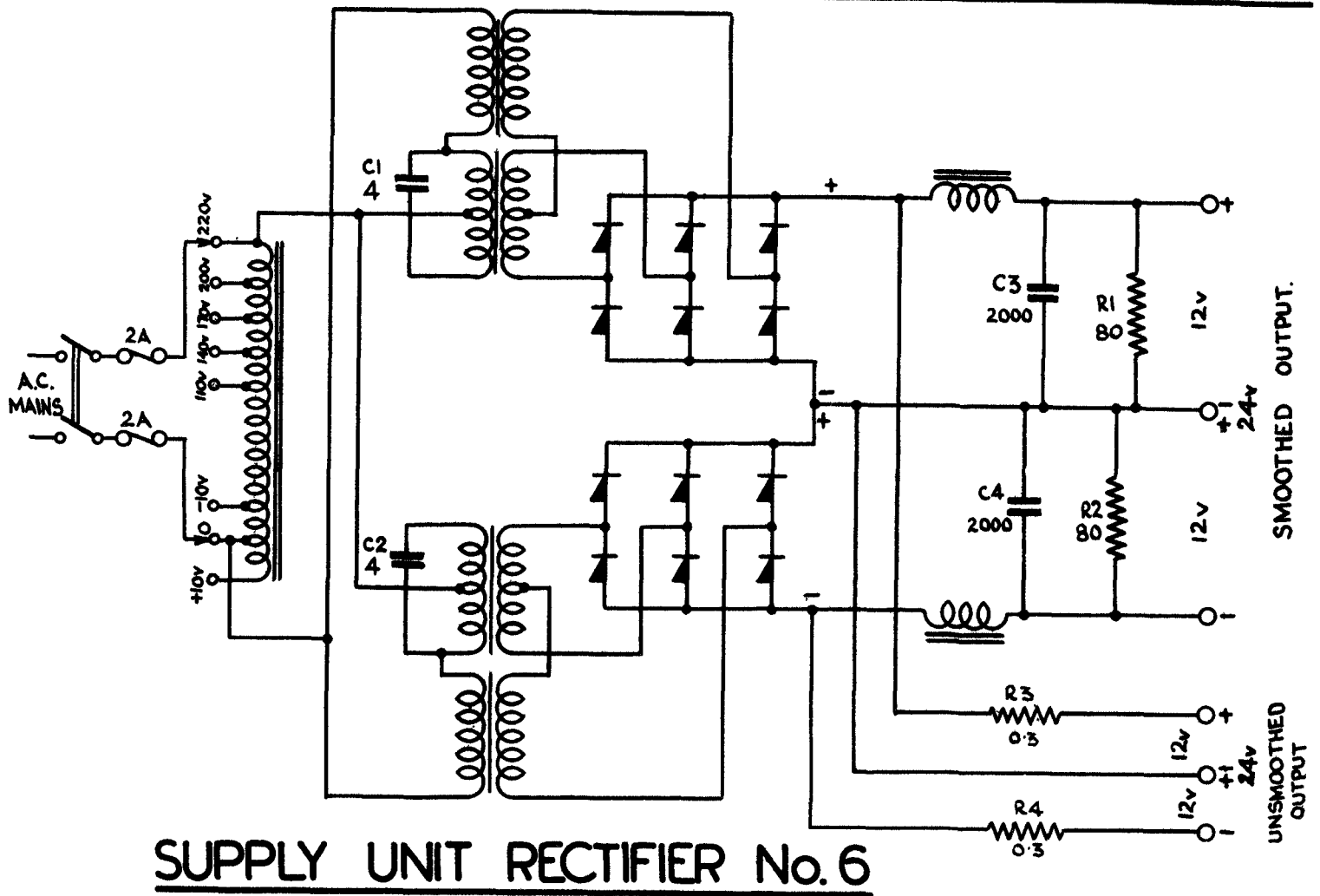


DRAWN BY RNB 4 FEB 44  
 CHECKED BY JRP

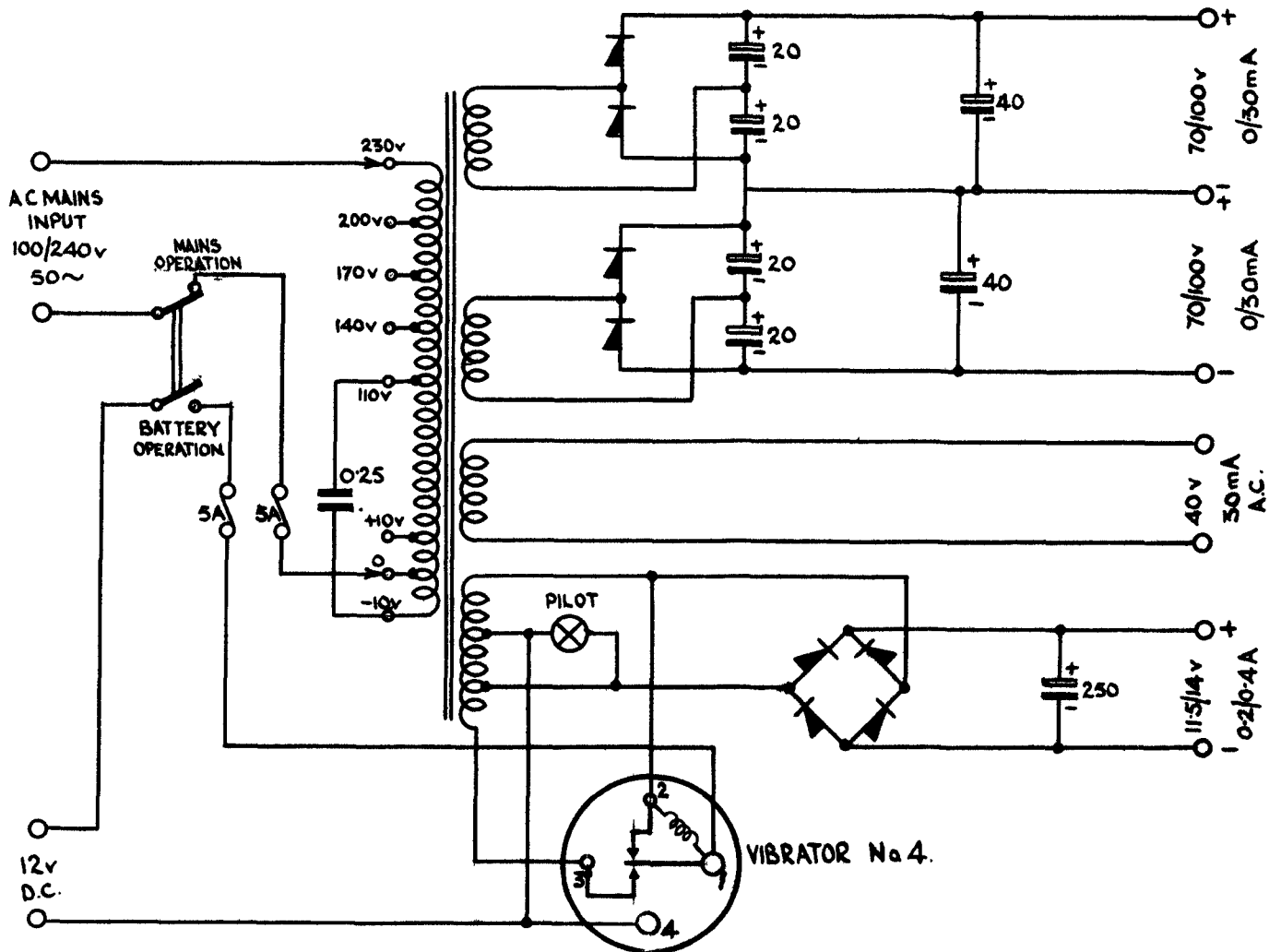


**POWER BAY No3**

EI/200



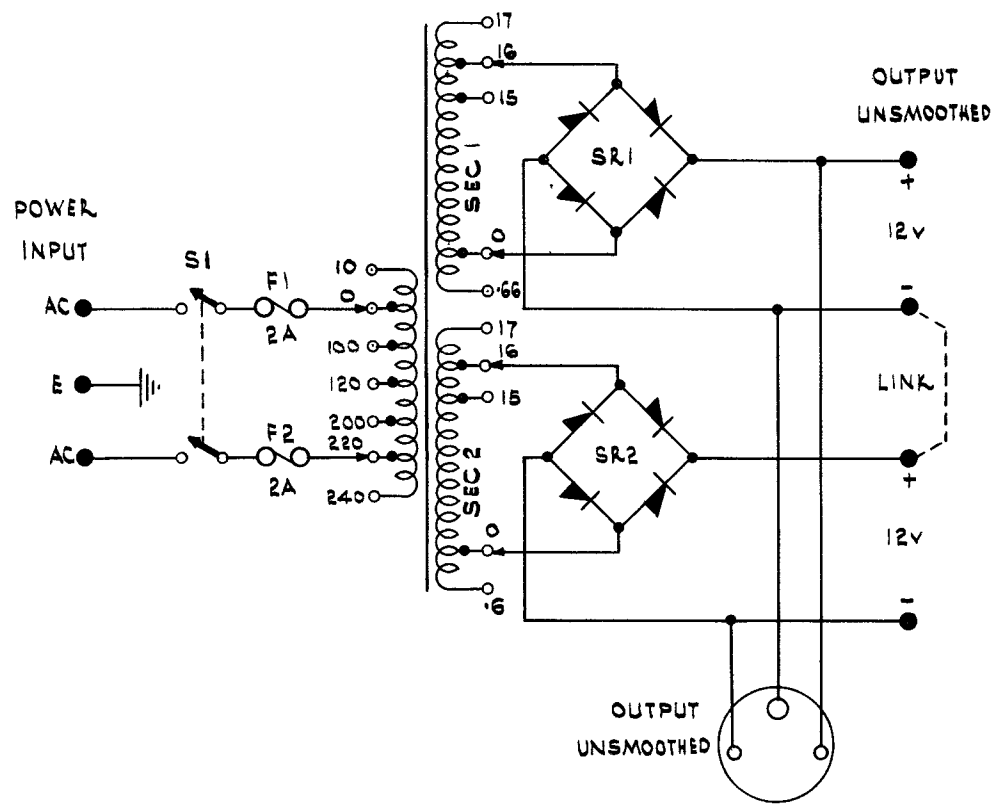
**SUPPLY UNIT RECTIFIER No. 6**



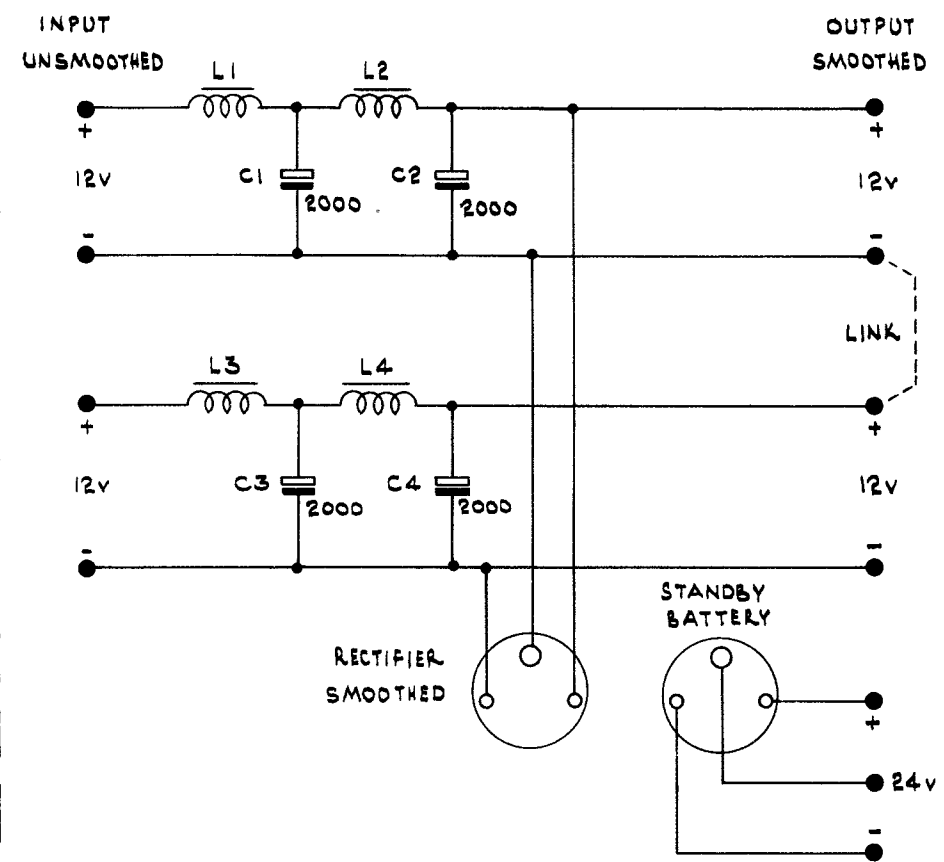
**SUPPLY UNIT RECTIFIER No. 7**

EI/201

CC-484/716



SUPPLY UNIT RECTIFIER No 13



SMOOTHING UNIT No 1

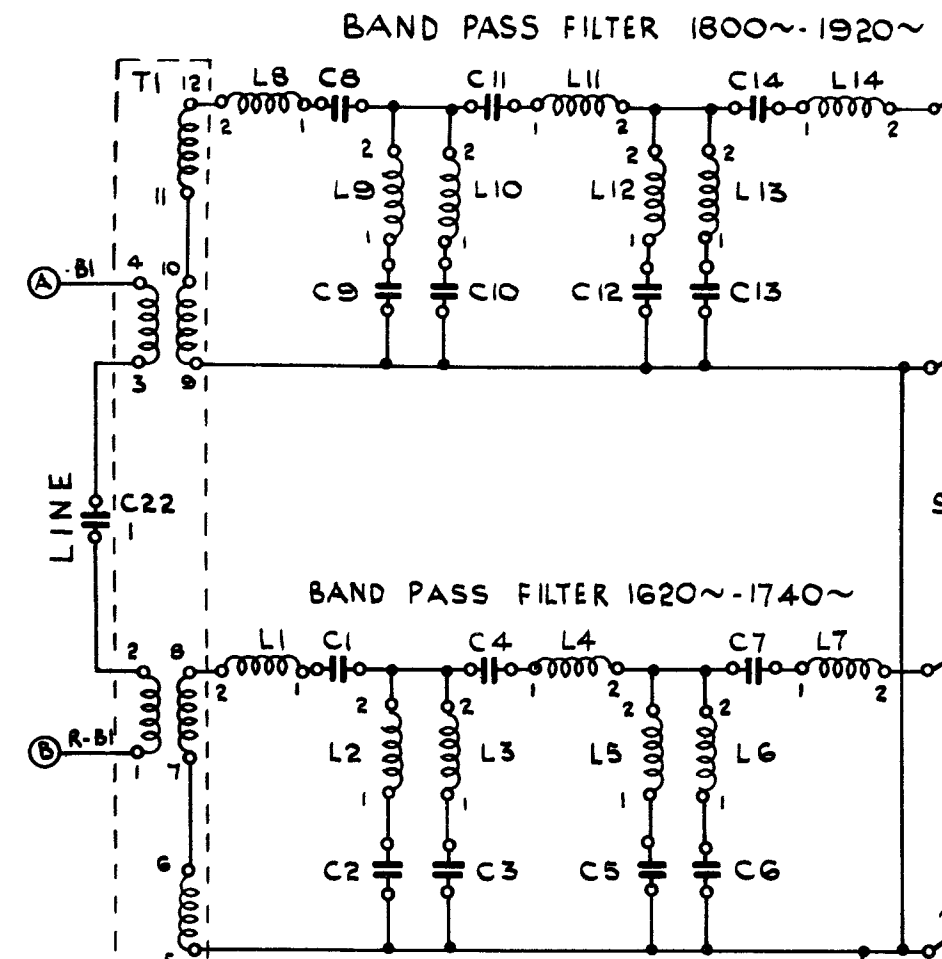
E1/202

SCHOOL OF SIGNALS  
DRAWN BY W.H.P. 13 MAR 44  
CHECKED BY J.H.P.

FOLD HERE

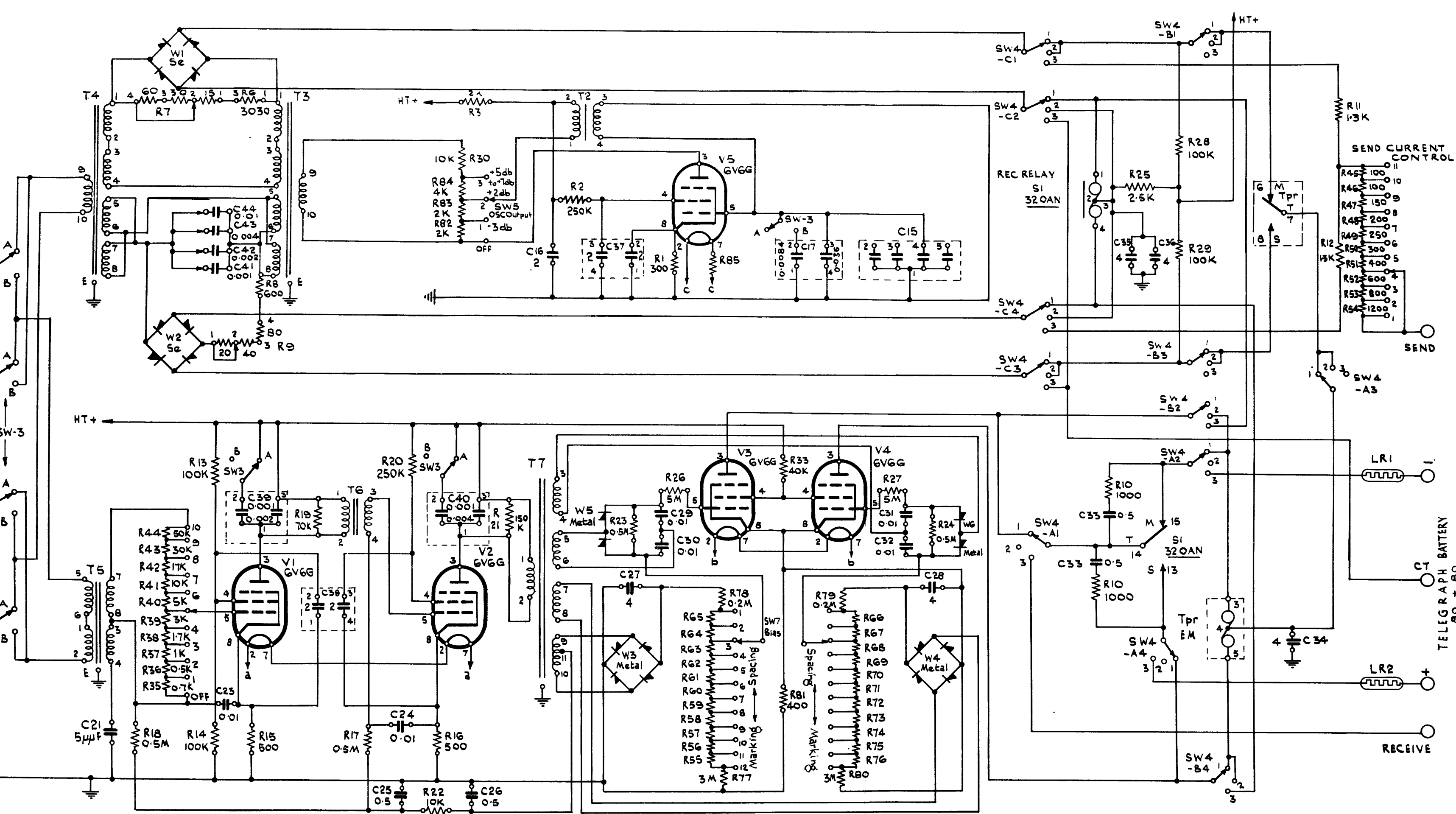
FOLD HERE

**NOTE**  
ALL RESISTANCES IN OHMS &  
ALL CAPACITIES IN  $\mu$ F



**NOTE**  
SW4 3 POSITION SWITCH  
POSITION 1 LOCAL RECORD WORKING  
POSITION 2 BLIND DUPLEX WORKING  
POSITION 3 DC EXTENSION WORKING  
R55-76 .... 200K EACH  
UNIT MAY BE USED ON 'A' OR 'B' TERMINAL  
BY THROWING SW3 TO POSN A OR POSN B

POSN A	SEND	REC
POSN B	1860~	1680~
	1680~	1860~

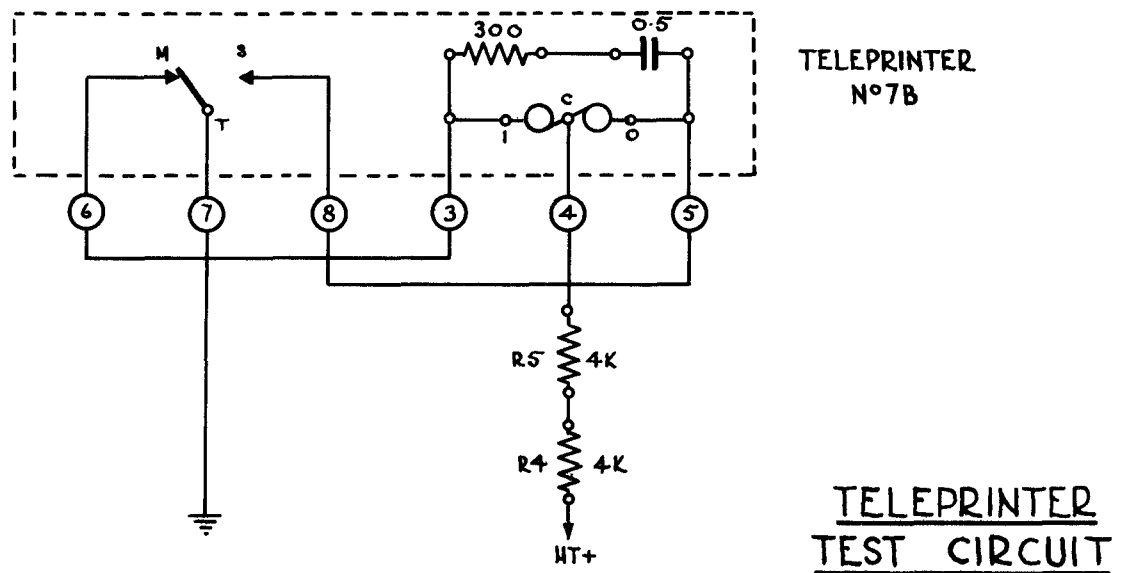
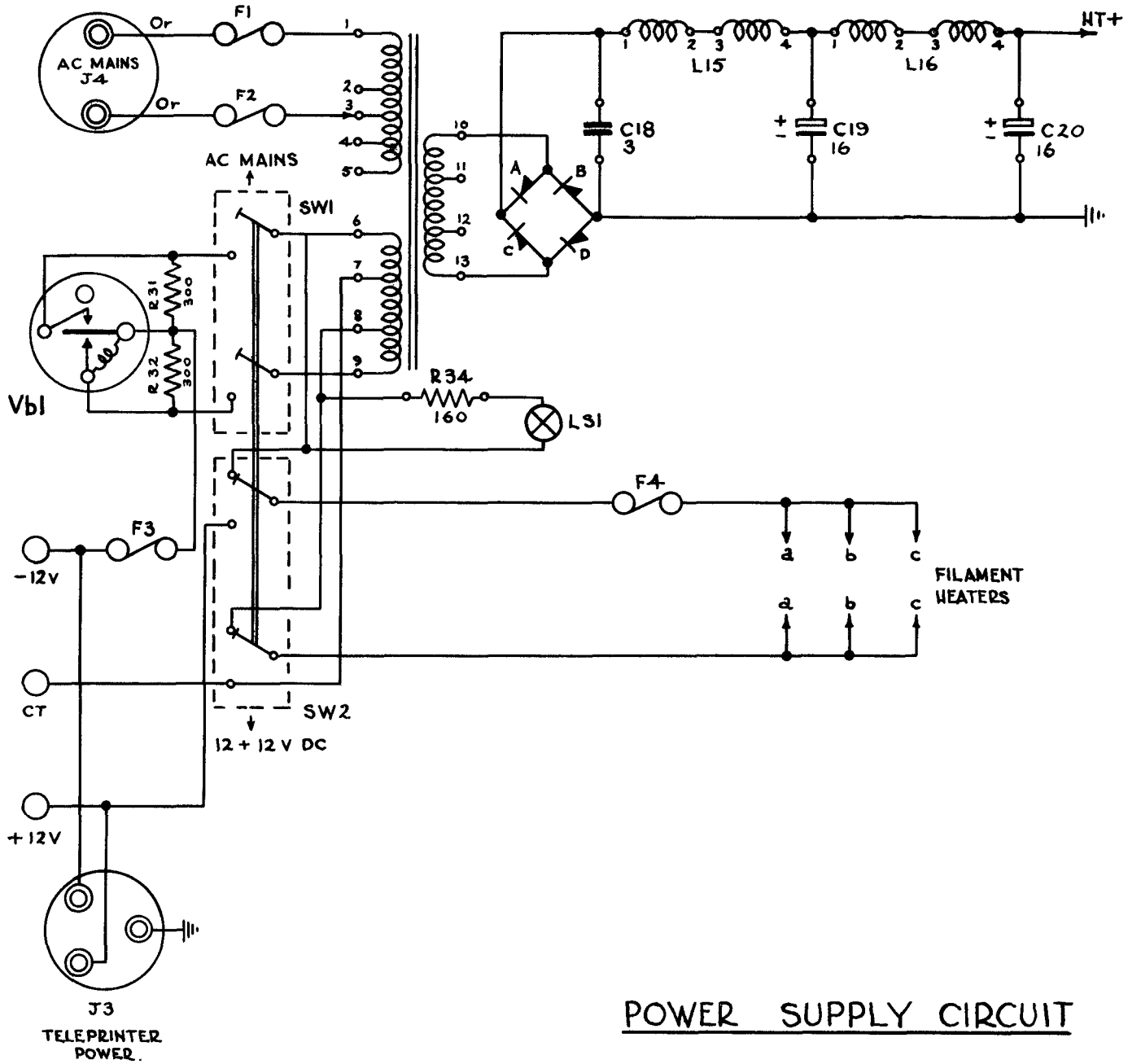


**APPARATUS V.F. TELEGRAPH S+D**

**— SCHEMATIC**

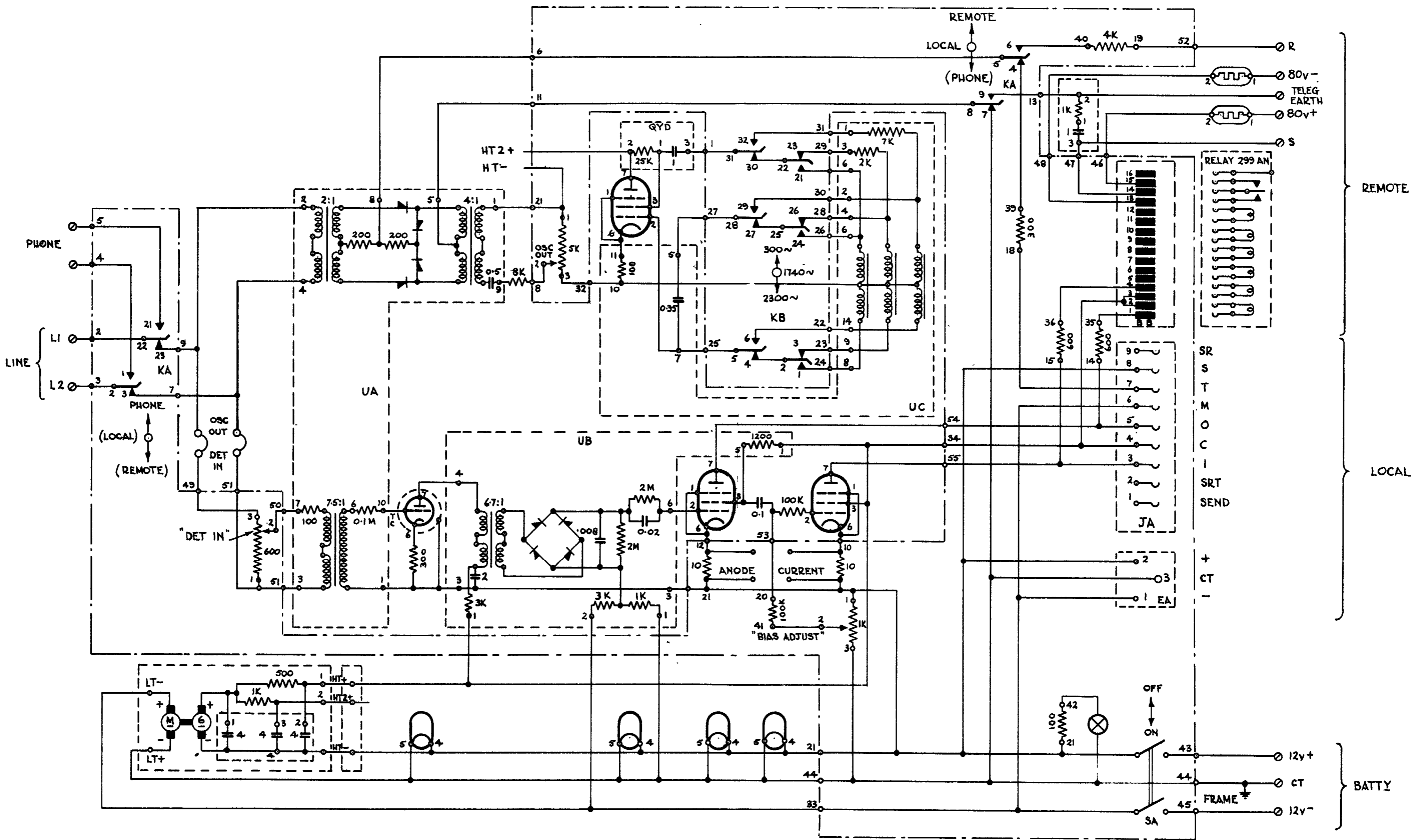
14087/2-2-44/14.44

SCHOOL OF SIGNALS  
 DRAWN BY: RNB-21 DEC-43  
 CHECKED BY: [Signature]



APPARATUS VF TELEGRAPH S + D  
POWER SUPPLY & TEST CIRCUIT

EI/205

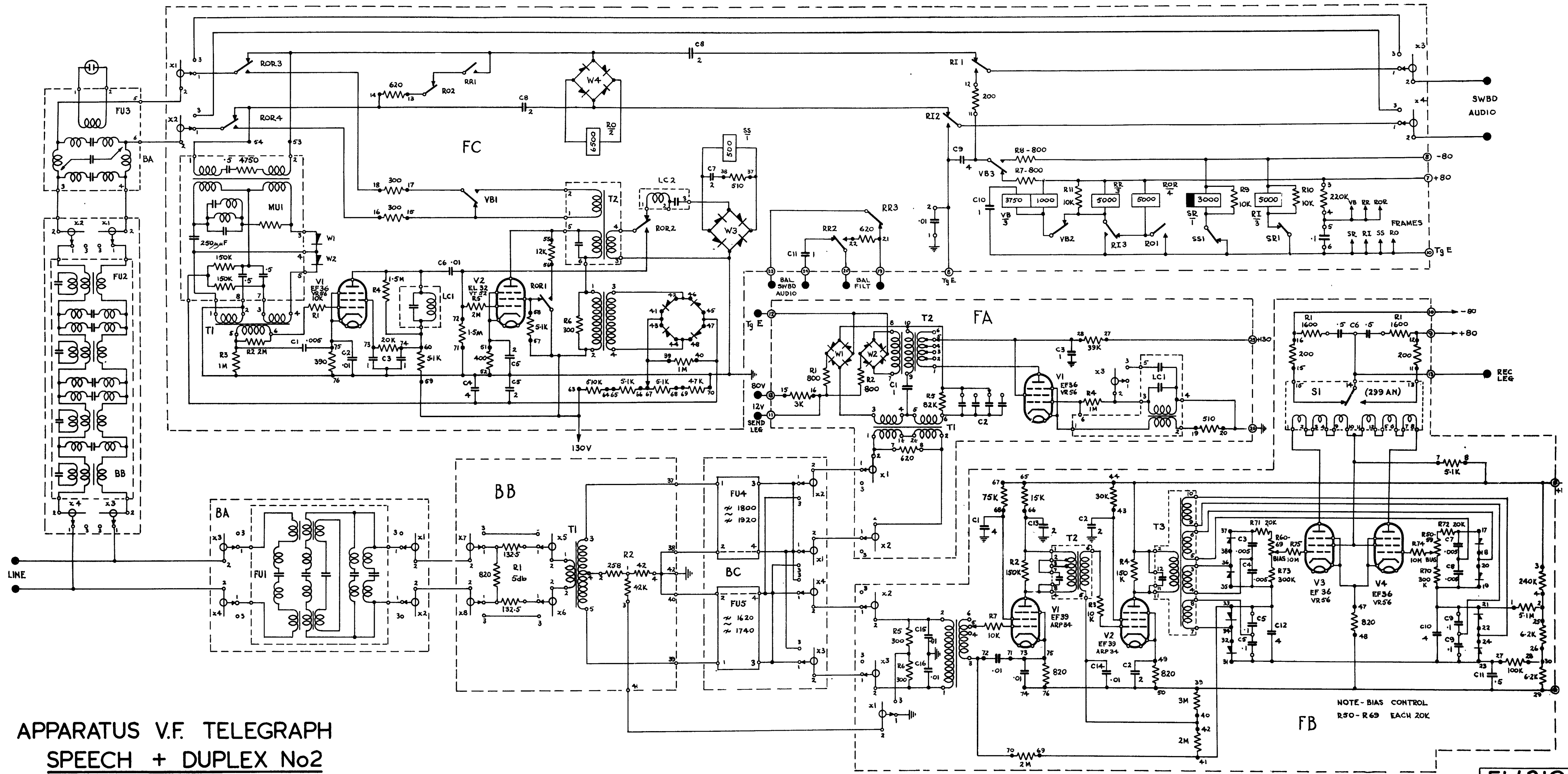


APPARATUS V.F. TELEGRAPH-  
SPEECH + SIMPLEX. No. 3.

SCHOOL OF SIGNALS  
DRAWN BY: RNB-3744  
CHECKED BY: J.H.P.

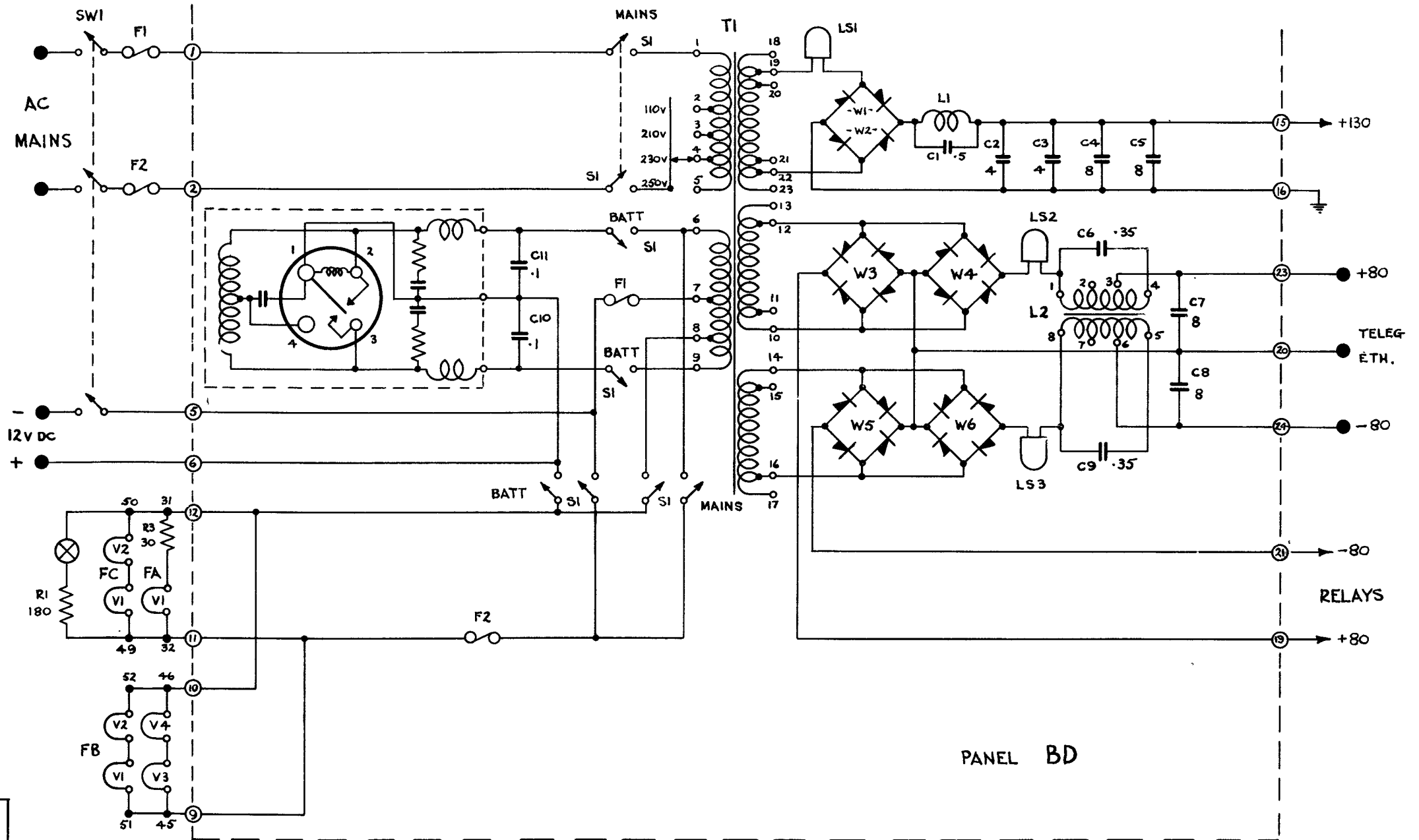
FOLD HERE

FOLD HERE



APPARATUS V.F. TELEGRAPH  
SPEECH + DUPLEX No2

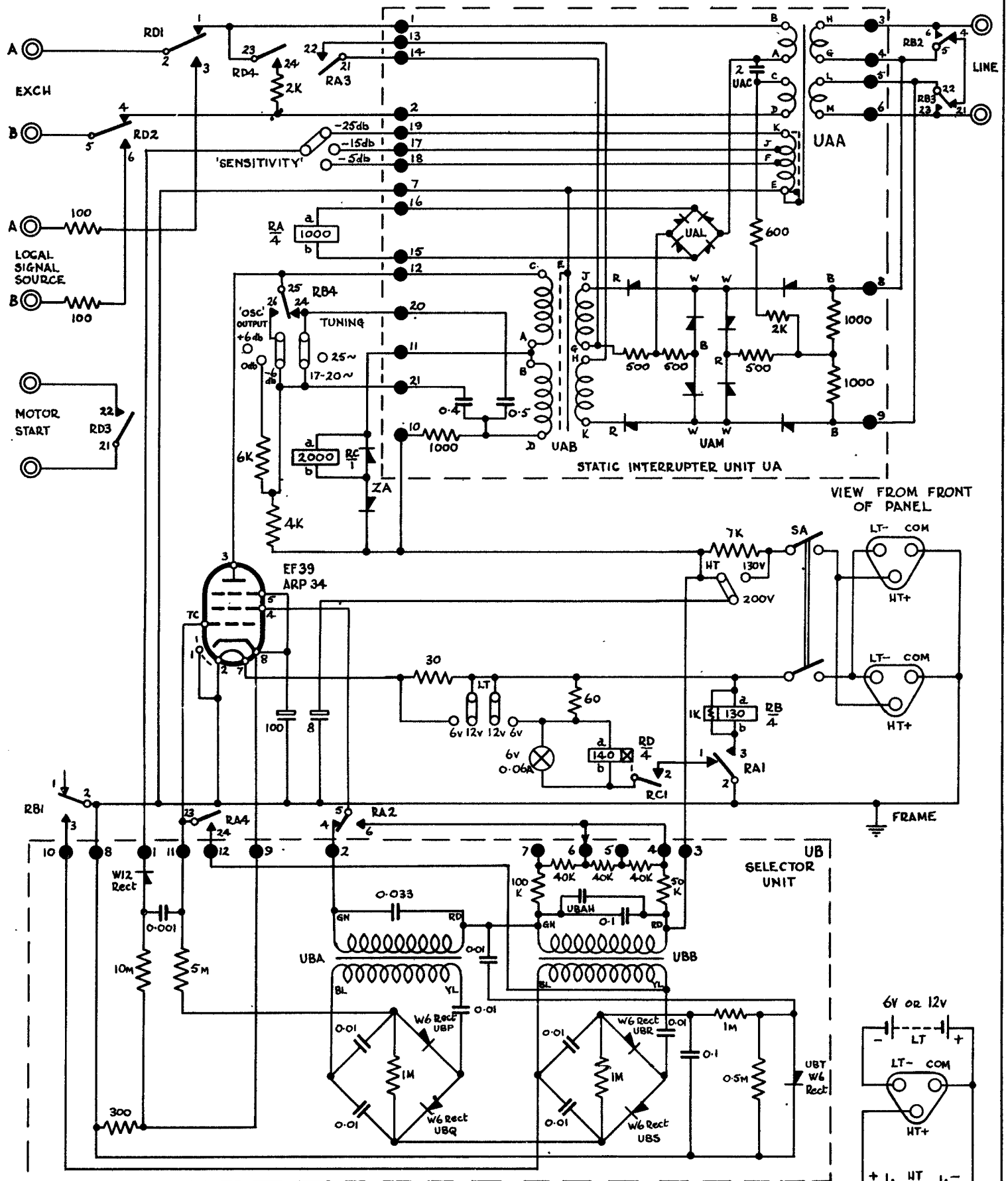
NOTE - BIAS CONTROL  
R50 - R69 EACH 20K



APPARATUS V.F. TELEGRAPH SPEECH + DUPLEX - POWER SUPPLY

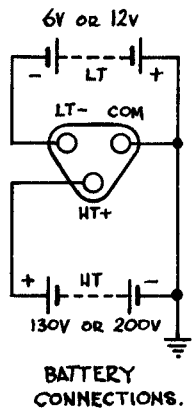
E1/211





NOTE.  
 UBAH COND VALUE SELECTED  
 ON TEST.  
 ALL RESISTANCES IN OHMS.  
 ALL CAPACITIES IN  $\mu$ F

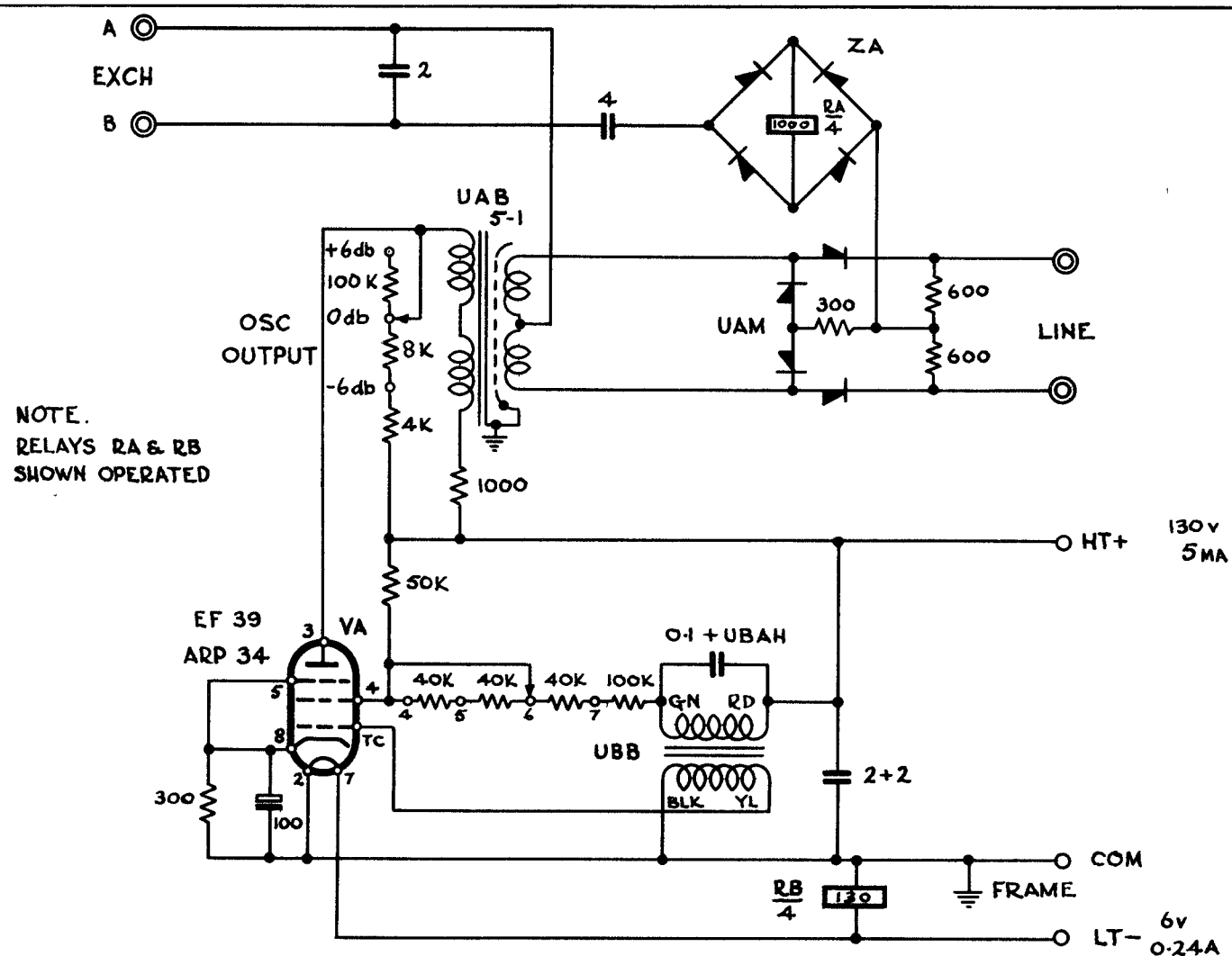
● INDICATES TMLs ON UNITS.  
 ○ INDICATES TMLs ON FRONT PANEL.



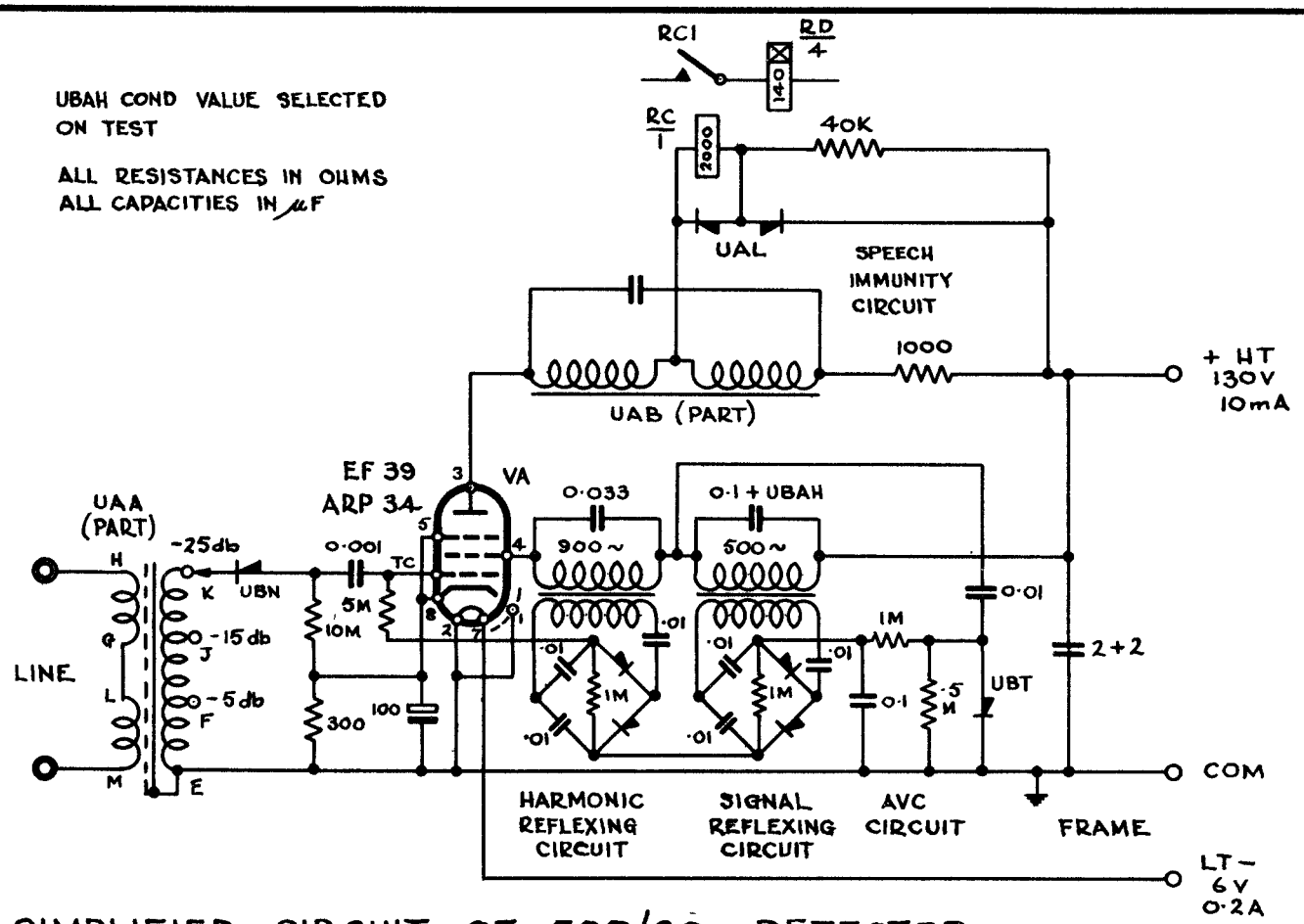
# UNIT SIGNALLING V.F. No 3 MK I

EI/216

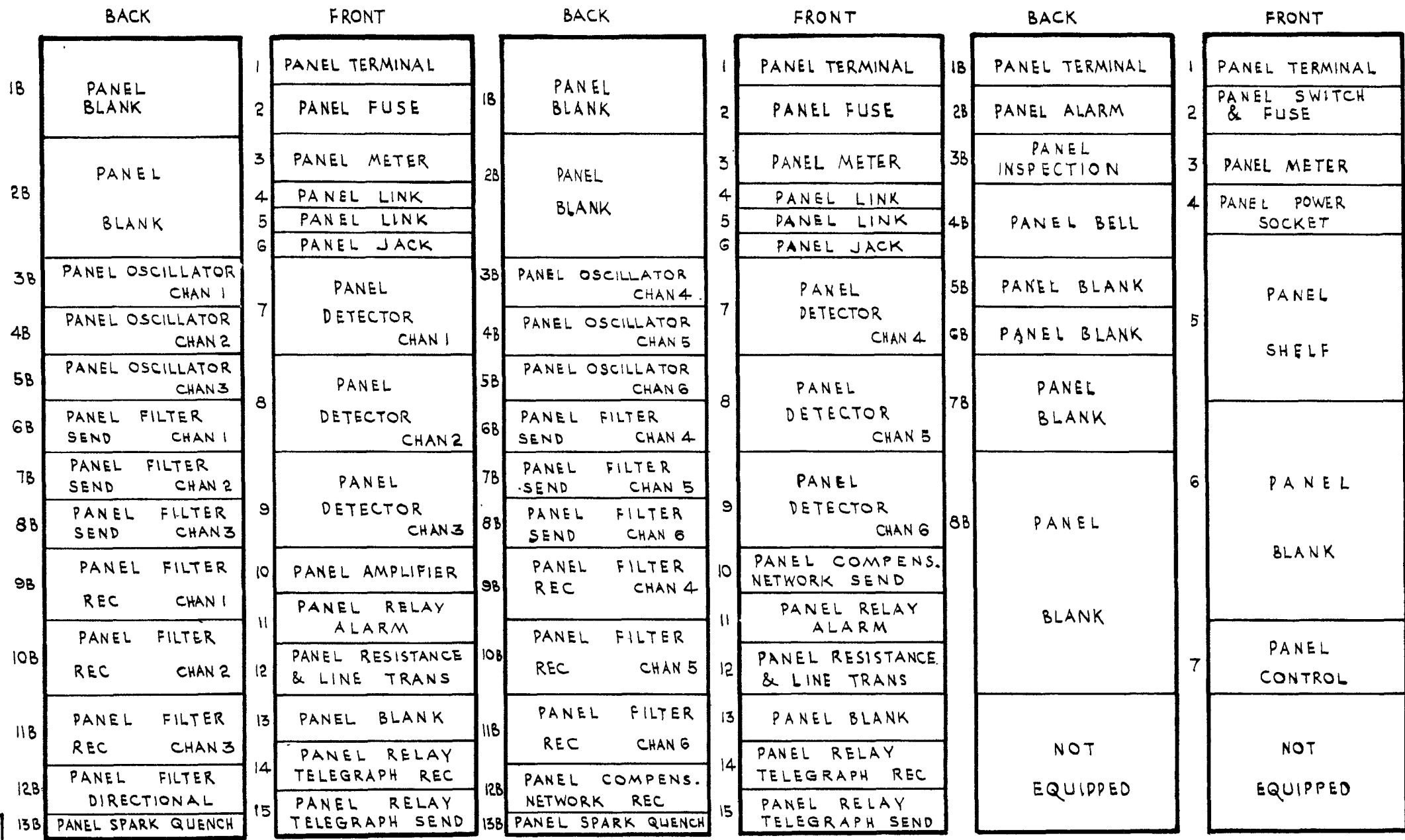
SCHOOL OF SIGNALS  
 DRAWN BY R.H.B-22 DECS  
 CHECKED BY: *[Signature]*



SIMPLIFIED CIRCUIT OF 500/20~ GENERATOR



SIMPLIFIED CIRCUIT OF 500/20~ DETECTOR



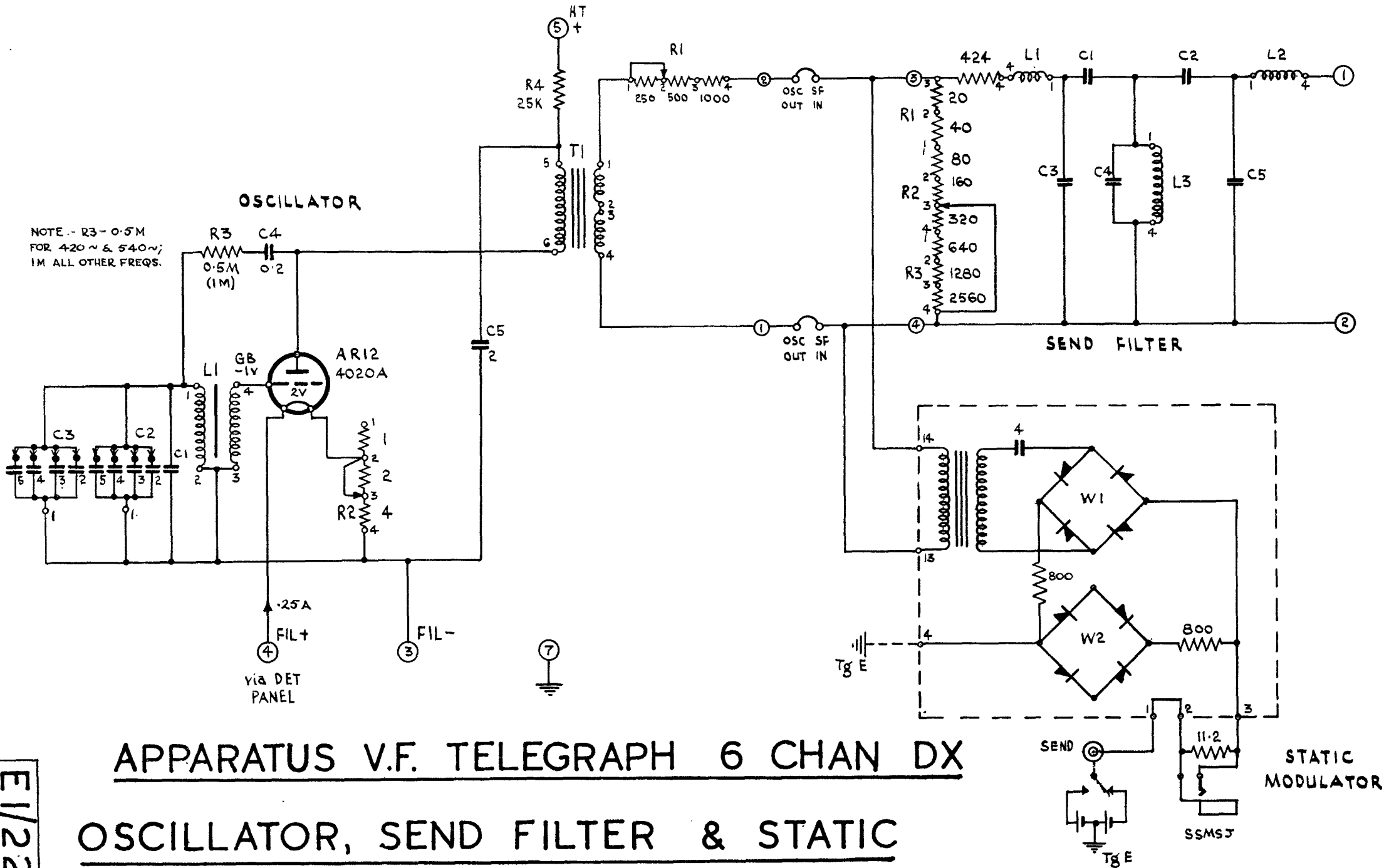
BAY No 1

BAY No 2

BAY No 3

# Apparatus V.F. Telegraph 6 Chan Dx — BAYS LAYOUT

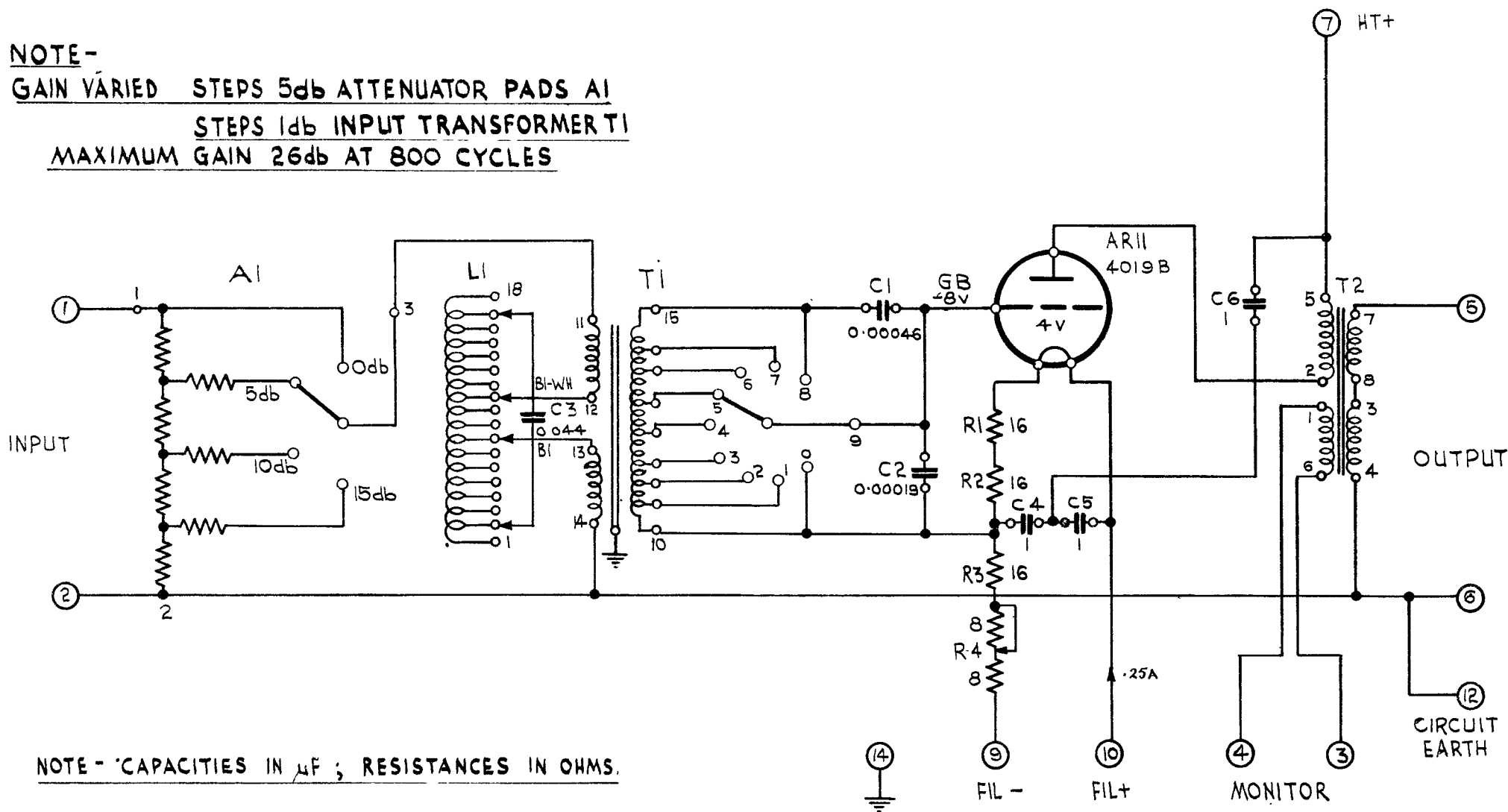
E1/223



APPARATUS V.F. TELEGRAPH 6 CHAN DX  
OSCILLATOR, SEND FILTER & STATIC  
MODULATOR

EI/224

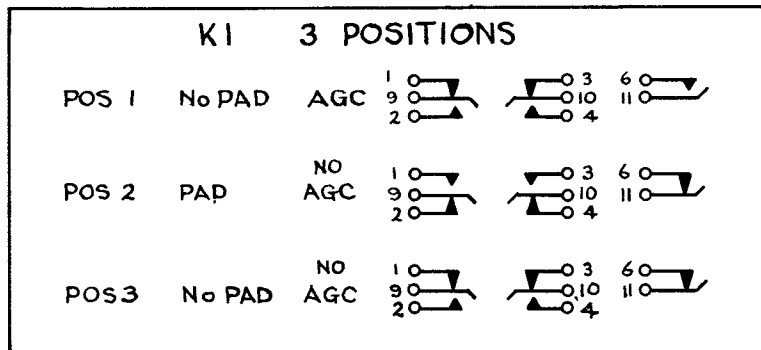
**NOTE -**  
GAIN VARIED STEPS 5db ATTENUATOR PADS A1  
STEPS 1db INPUT TRANSFORMER T1  
MAXIMUM GAIN 26db AT 800 CYCLES



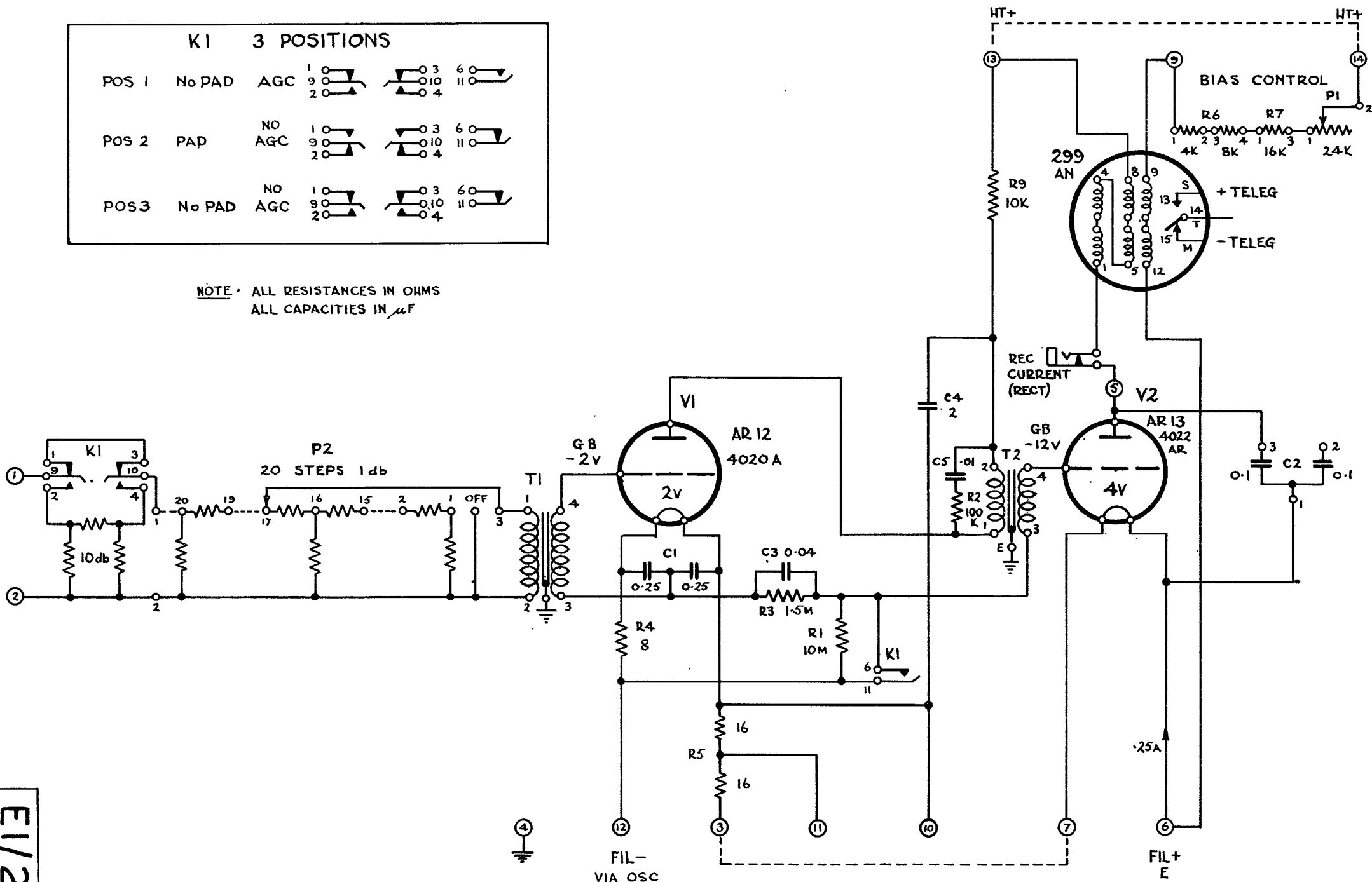
NOTE - CAPACITIES IN  $\mu F$  ; RESISTANCES IN OHMS.

APPARATUS V.F. TELEGRAPH 6 CHAN DX - AMPLIFIER

EI/225



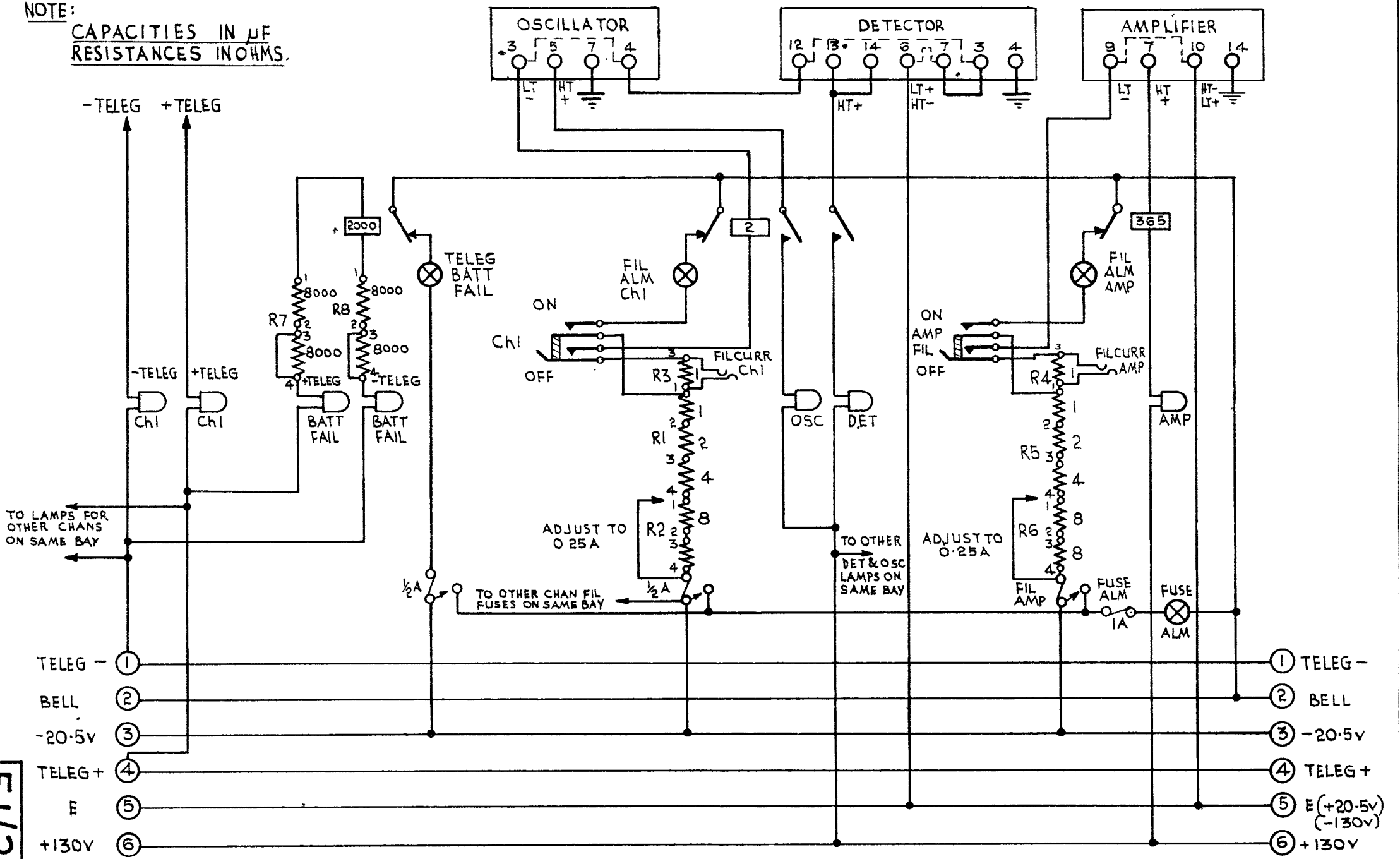
NOTE - ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu F$



E1/226

APPARATUS V.F. TELEGRAPH 6 CHAN DX - DETECTOR

NOTE:  
 CAPACITIES IN  $\mu$ F  
 RESISTANCES IN OHMS.

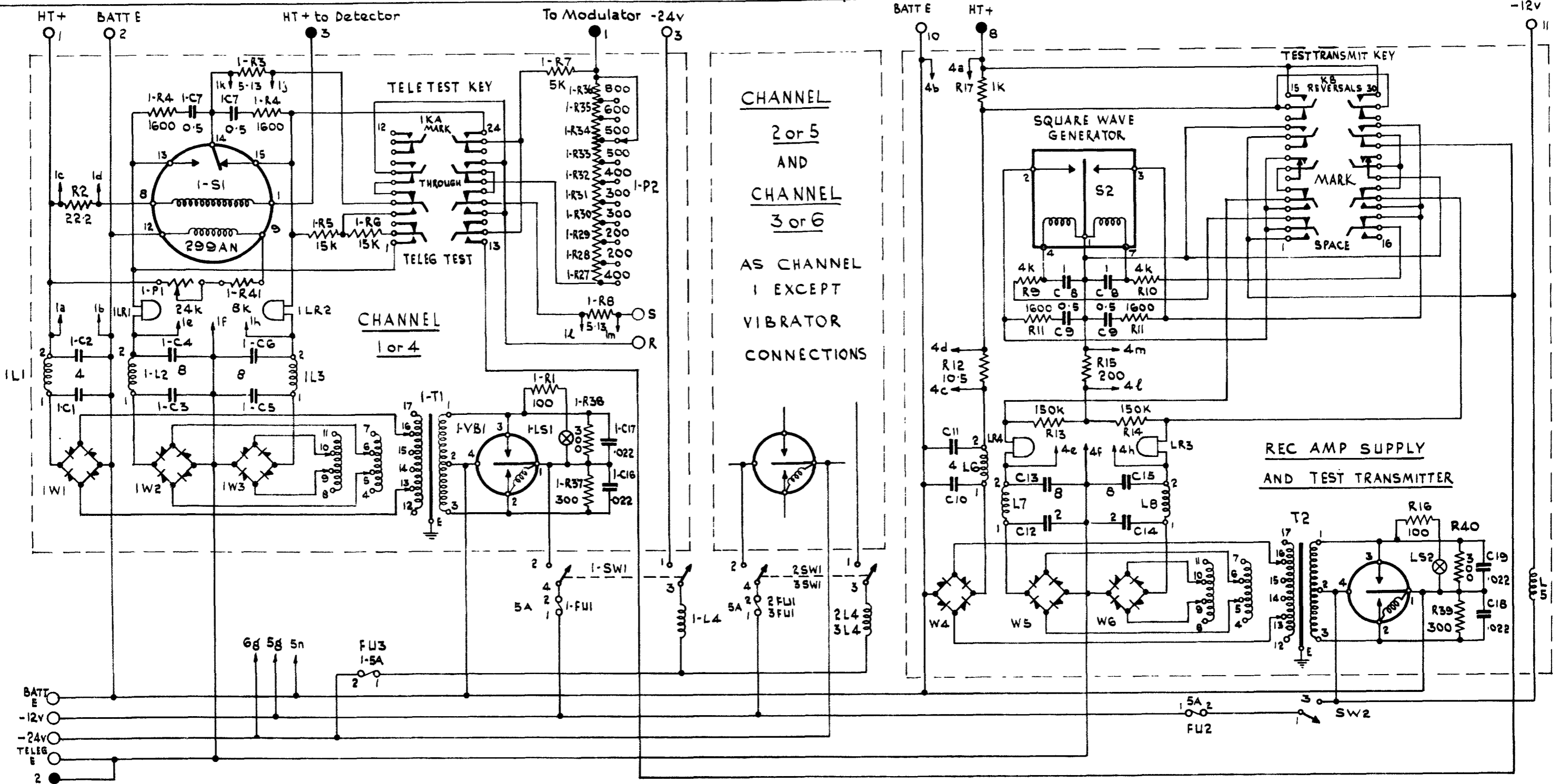


E1/227

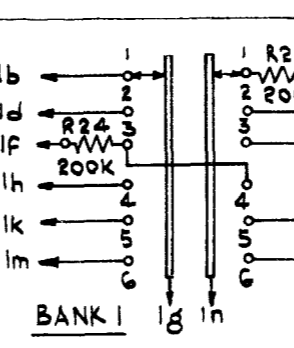
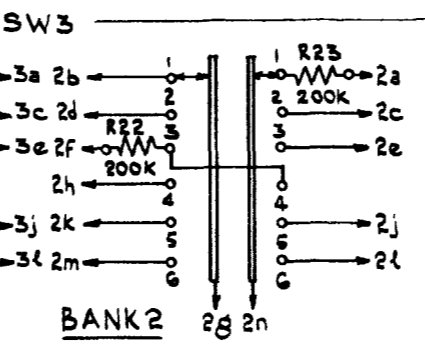
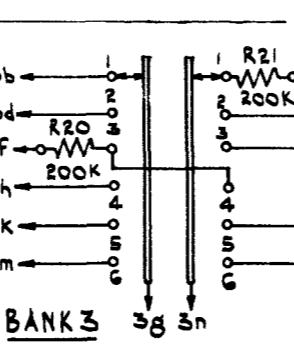
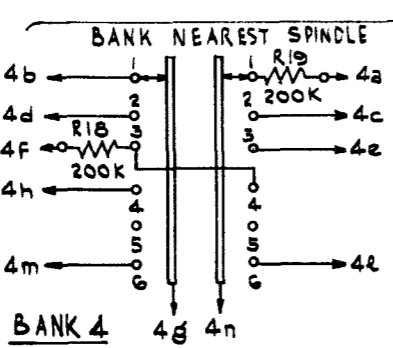
Apparatus V.F. Telegraph 6 Chan Dx - SUPPLY & ALARMS

SCHOOL OF SIGNALS  
DRAWN BY W.H.F. 24.10.54  
CHECKED BY T.K.P.

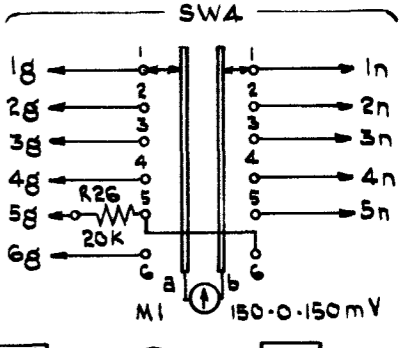
FOLD HERE



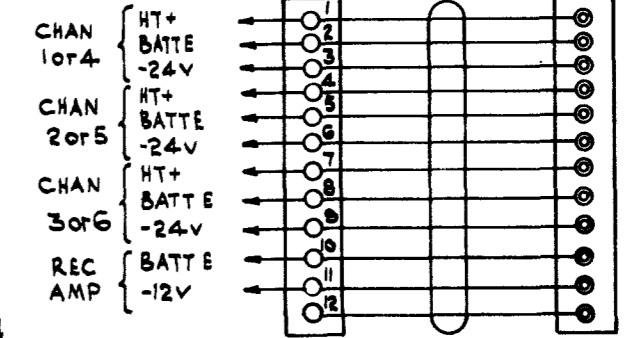
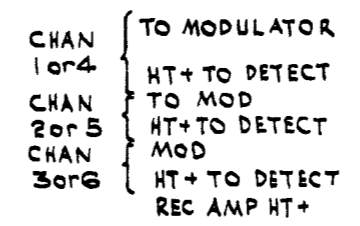
SWITCH NAME
HT
PLATE CURR
TELEG BATT+80
TELEG BATT-80
REC LEG
S.LEG & T.TRANS



SWITCH NAME
CH1
CH2
CH3
REC AMP & TTR
BATT +12V
BATT -12V



○ CONNECTION TO 12-WAY CORD AND PLUG.  
● CONNECTION TO 12-WAY JACK.  
ALL RESISTANCES IN OHMS, CAPACITIES IN μF.



# APPARATUS VF TELEGRAPH 3 CHANNEL

## DUPLEX - RELAY UNIT

51/221



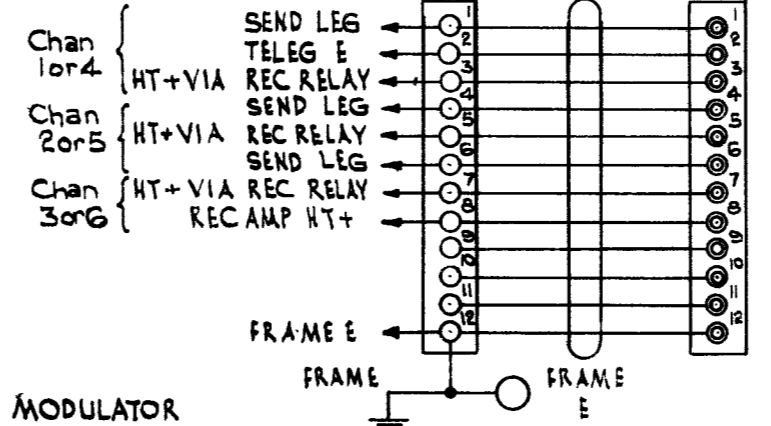
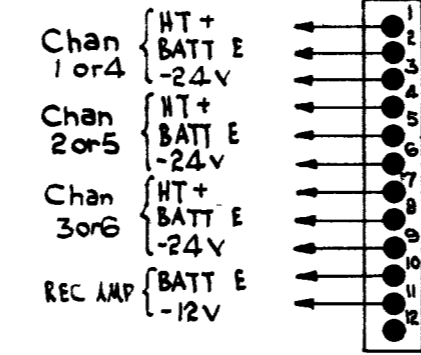
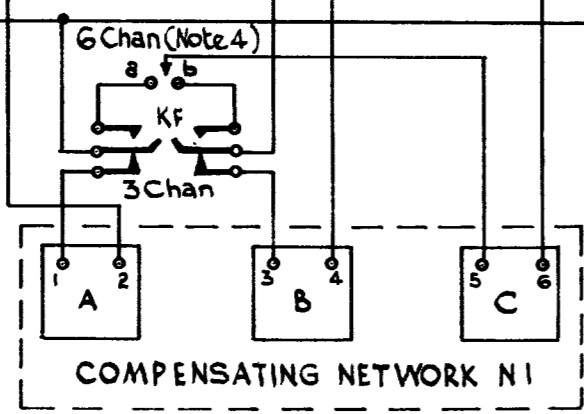
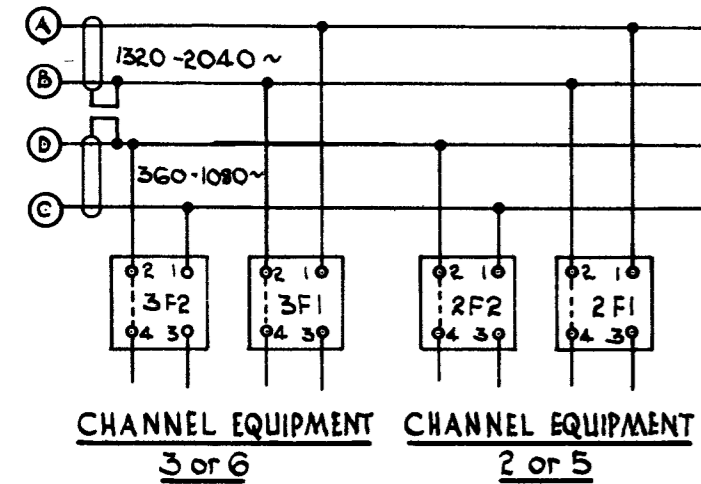
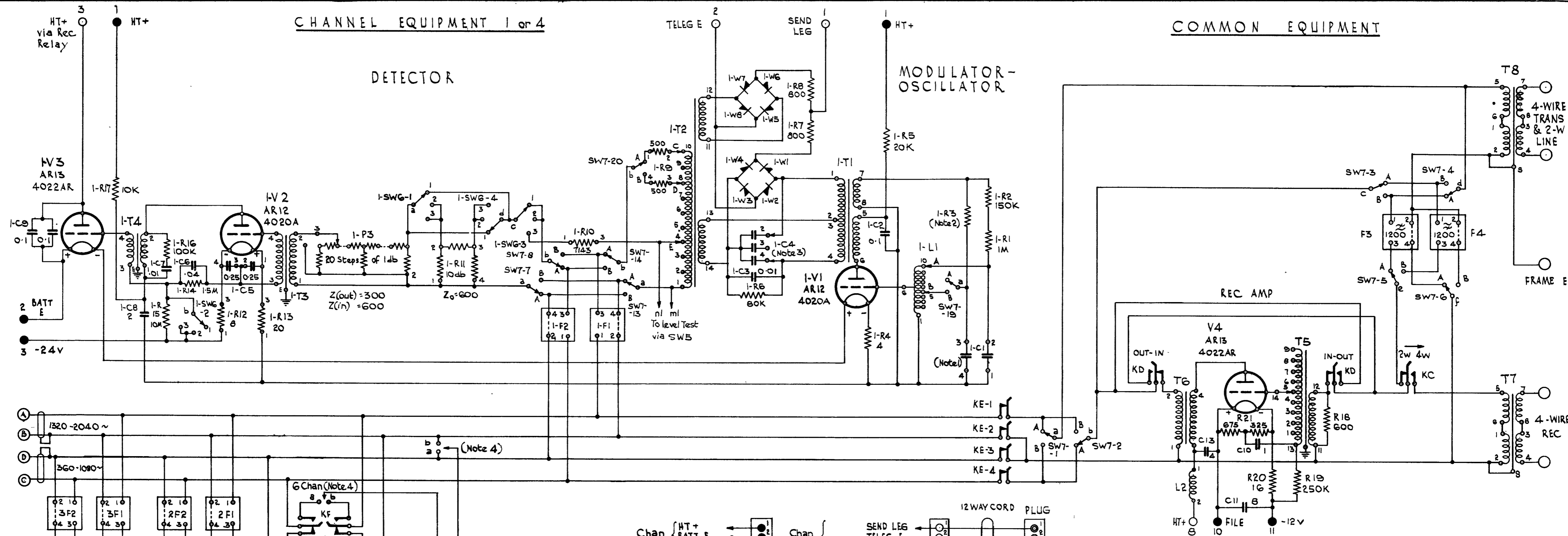
SCHOOL OF SIGNALS  
DRAWN BY W. J. H. 100  
CHECKED BY J. H. 100

CHANNEL EQUIPMENT 1 or 4

COMMON EQUIPMENT

DETECTOR

MODULATOR-OSCILLATOR



NOTE 1  
 $1-C1 = 0.1587 = 0.3549$   
 $2-C1 = 0.01801 = 0.2058$   
 $3-C1 = 0.02082 = 0.1209$   
 $1-C1 = 0.02141 = 0.08274$   
 $2-C1 = 0.02829 = 0.05177$   
 $3-C1 = 0.03257 = 0.02957$  } GP 2

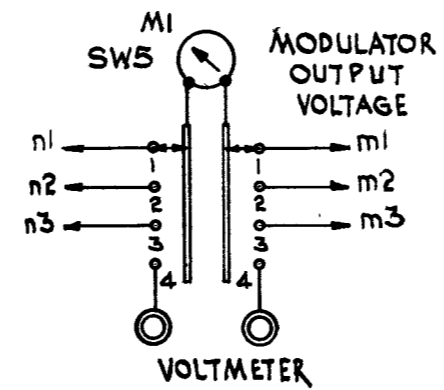
NOTE 2  
 $1-R3 = 0.75M, 2-R3 = 1.5M, 3-R3 = 2.5M$  (GP 1)  
 $1-R3 = 4M, 2-R3 = 6.5M, 3-R3 = 10M$  (GP 2)

NOTE 3  
 $1-C4 \ 1-2 = 0.0014$   
 $1-C4 \ 1-3 = 0.0028$   
 $1-C4 \ 1-4 = 0.0056$

NOTE 4 STRAPPED TO a FOR GP.1  
 STRAPPED TO b FOR GP.2

CH	A-B	B-A	GP
1	1980	420	2
2	1860	540	
3	1740	660	
4	1620	780	1
5	1500	900	
6	1380	1020	

SWITCH NAME
Chan 1
Chan 2
Chan 3
EXT

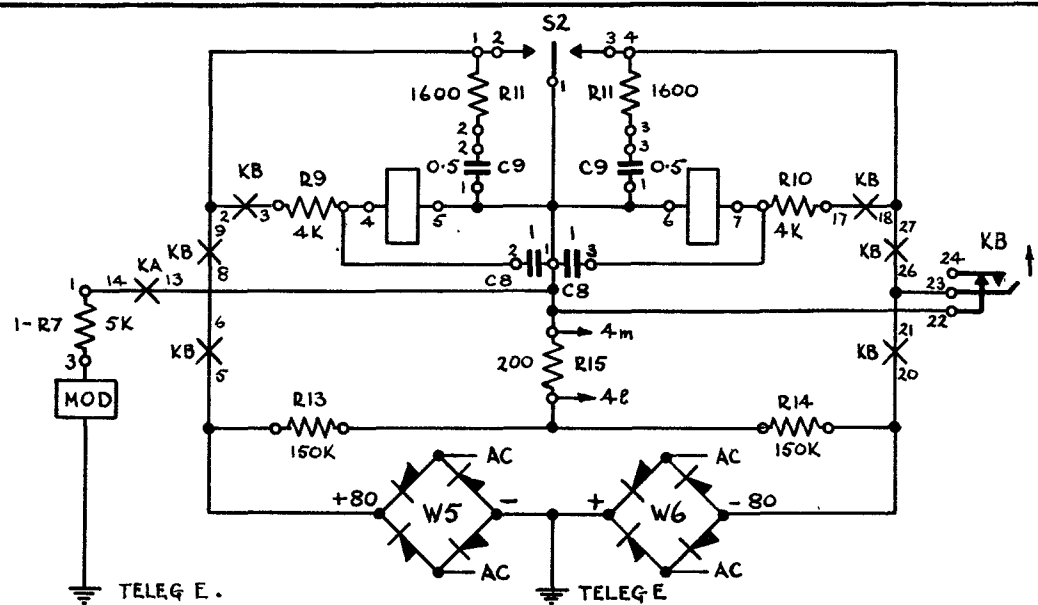


ALL RESISTANCES IN OHMS.  
 ALL CAPACITIES IN  $\mu F$ .

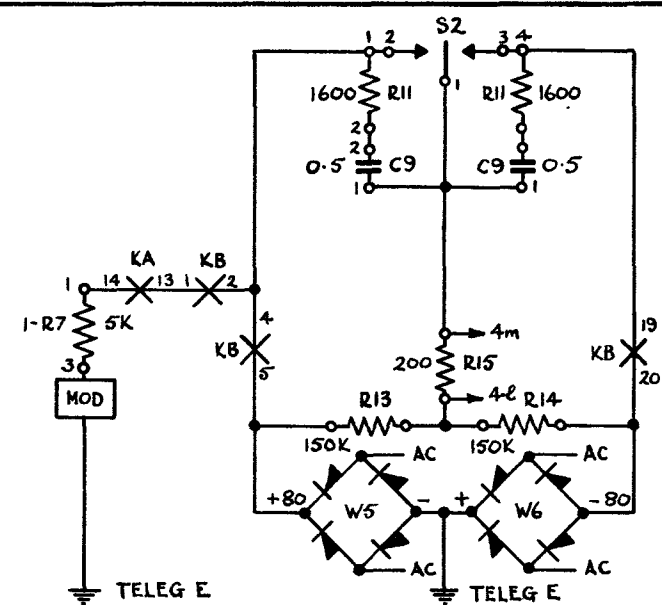
- TERMINAL ON PLATE IN FRONT OF UNIT T.S.I.
- CONNECTION TO 12-WAY CORD.
- CONNECTION TO 12-WAY JACK.
- ⊙ METER TERMINALS ON FRONT PLATE.

APPARATUS VF TELEGRAPH 3 CHANNEL  
 DUPLEX-VALVE UNIT

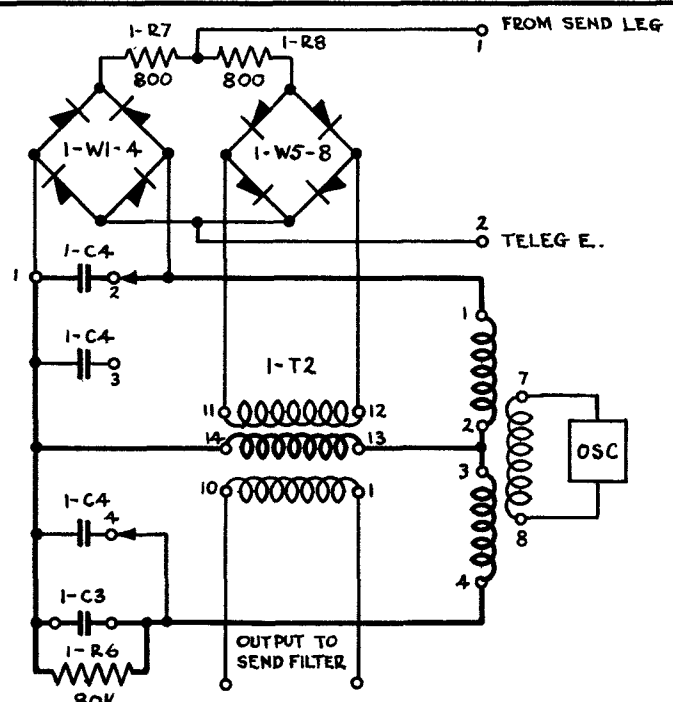
M36646/V.P.2369. 6/45 125/15 Q.H.M.53 55/9.



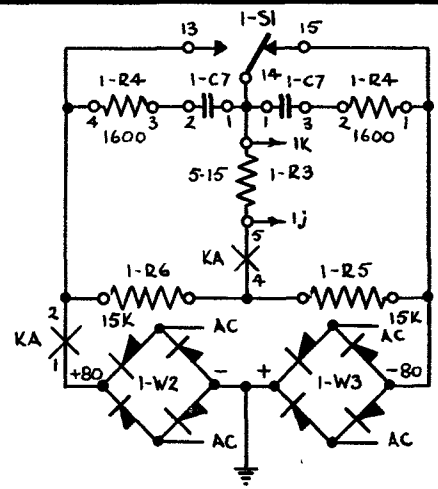
SIMPLIFIED SCHEMATIC KA AT TELE TEST KB AT REVERSALS



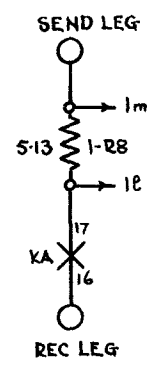
KA AT TELE TEST KB AT SPACE



SIMPLIFIED SCHEMATIC OF MODULATOR



KA AT TELE TEST



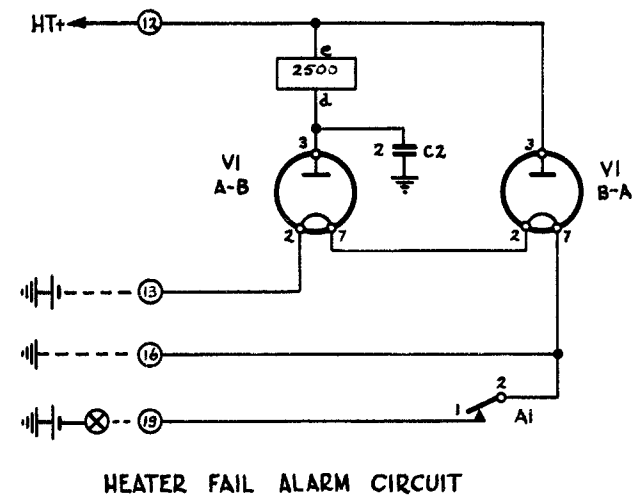
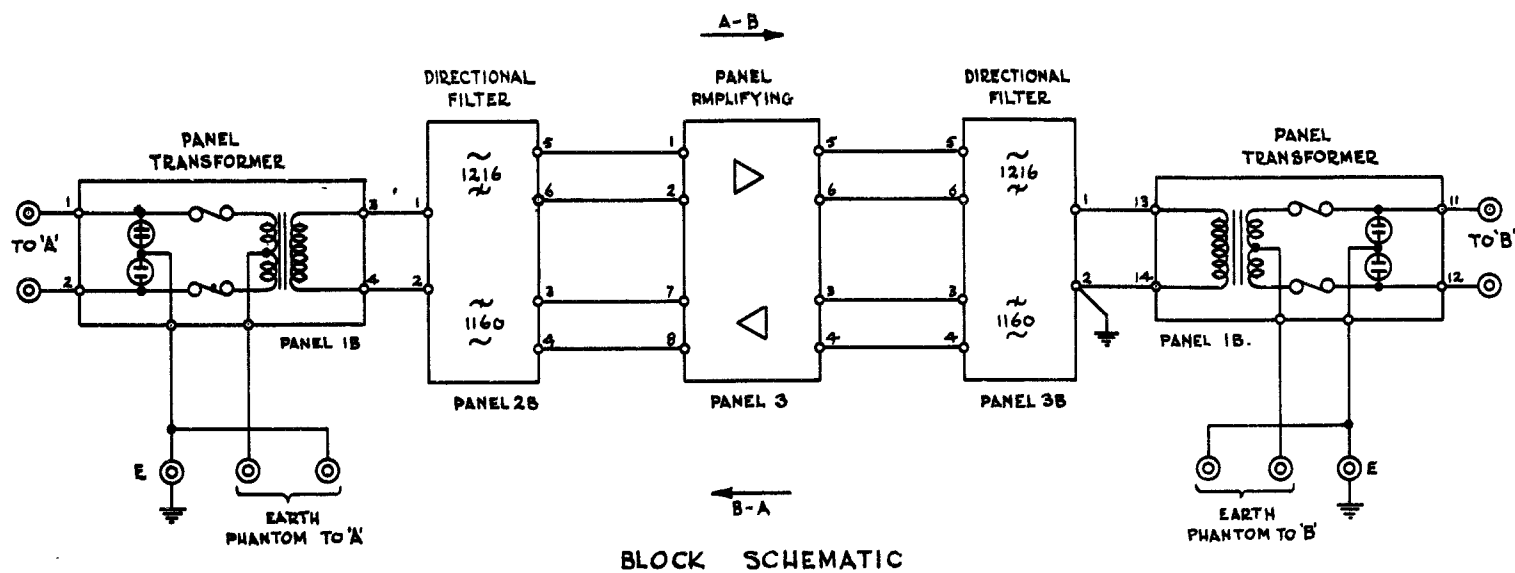
**NOTES**  
 ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu$ F

3  
 KA  
 4

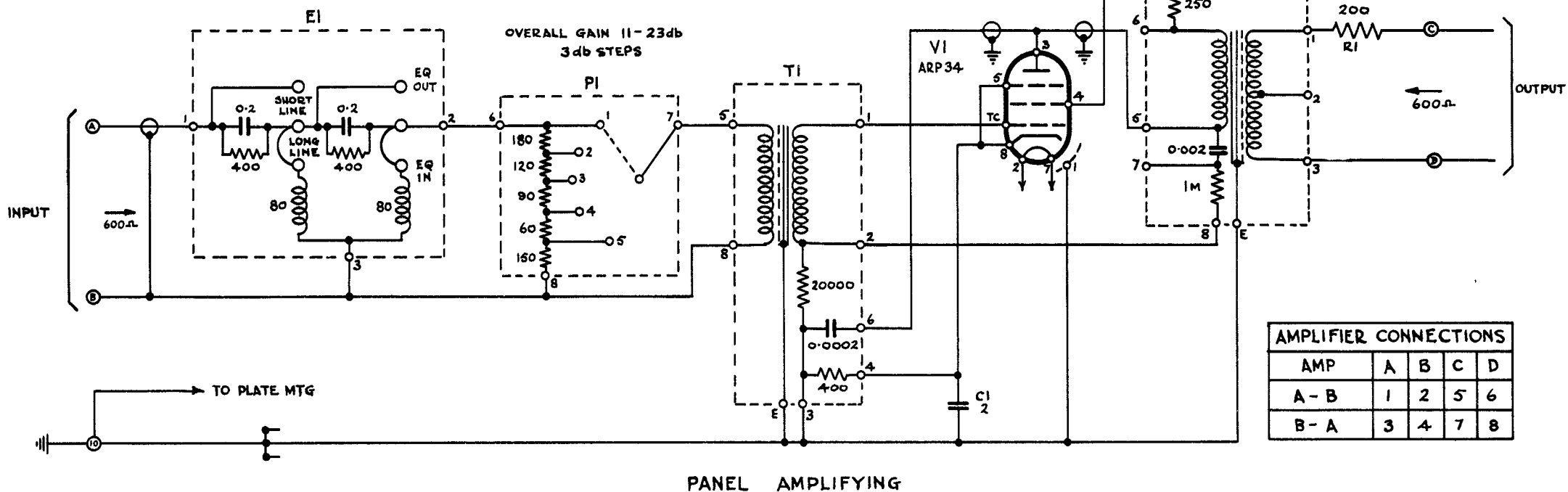
DENOTES CONTACTS 3 & 4 OF KEY KA CLOSED IN CONDITION SHOWN

E1/234

APP V.F. TELEG 3 CHANNEL DUPLEX - SIMPLIFIED SCHEMATICS



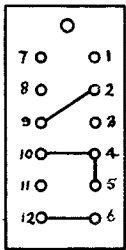
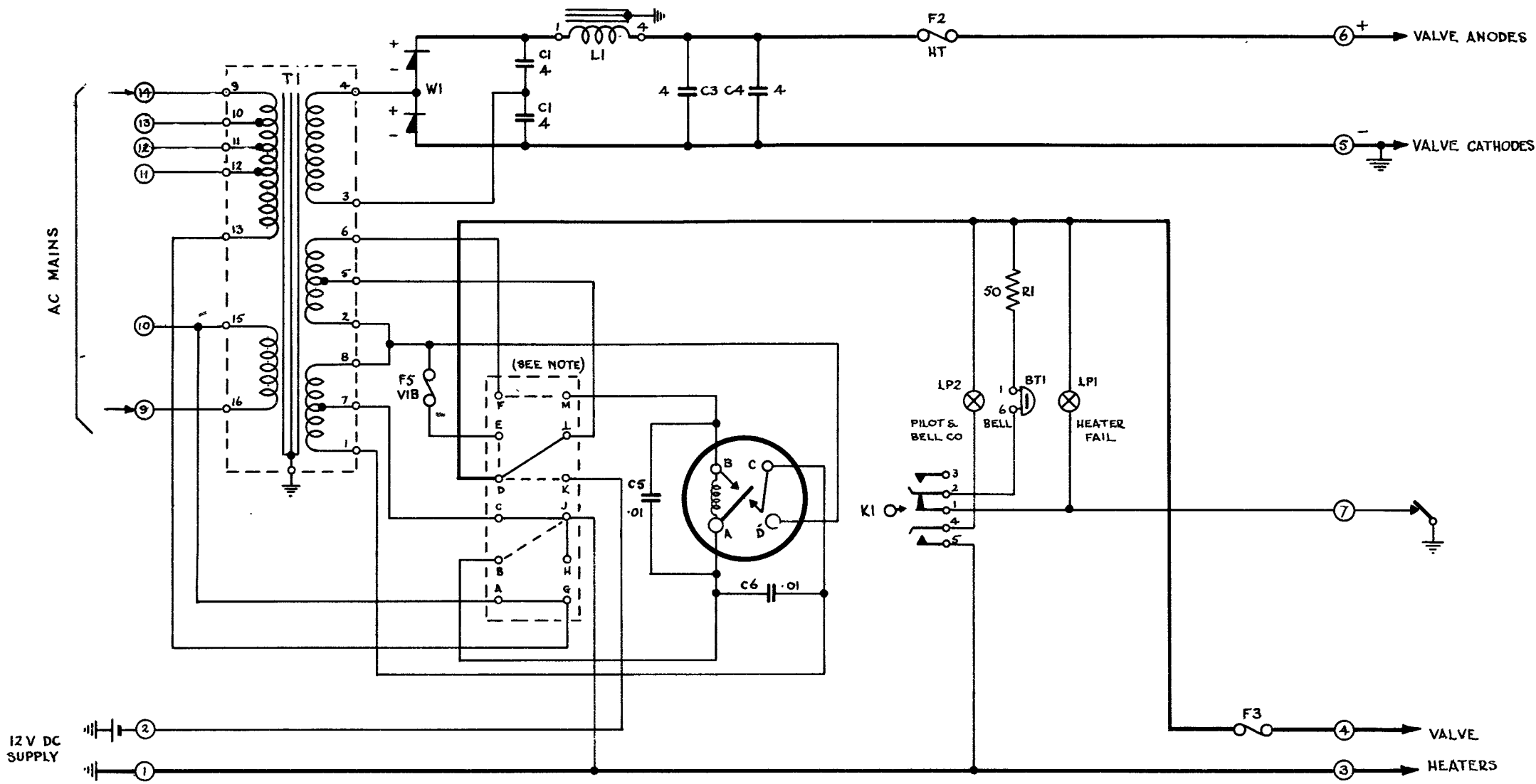
EQUALISATION 1 SECTION 9 MILES 40LB RC.QT CABLE  
 2 SECTION 18 MILES 40LB RC.QT CABLE



AMPLIFIER CONNECTIONS				
AMP	A	B	C	D
A - B	1	2	5	6
B - A	3	4	7	8

E1/237

# REPEATER V.F. TELEGRAPH No 1



NOTE  
 CONNECTIONS TO  
 SOCKET MADE BY  
 PLUG SHOWN THUS  
 ——— AC  
 - - - - DC

ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu$ F

REPEATER V.F. TELEGRAPH No. 1 - POWER SUPPLY

E1/238

INSIDE VIEW OF PLUG.

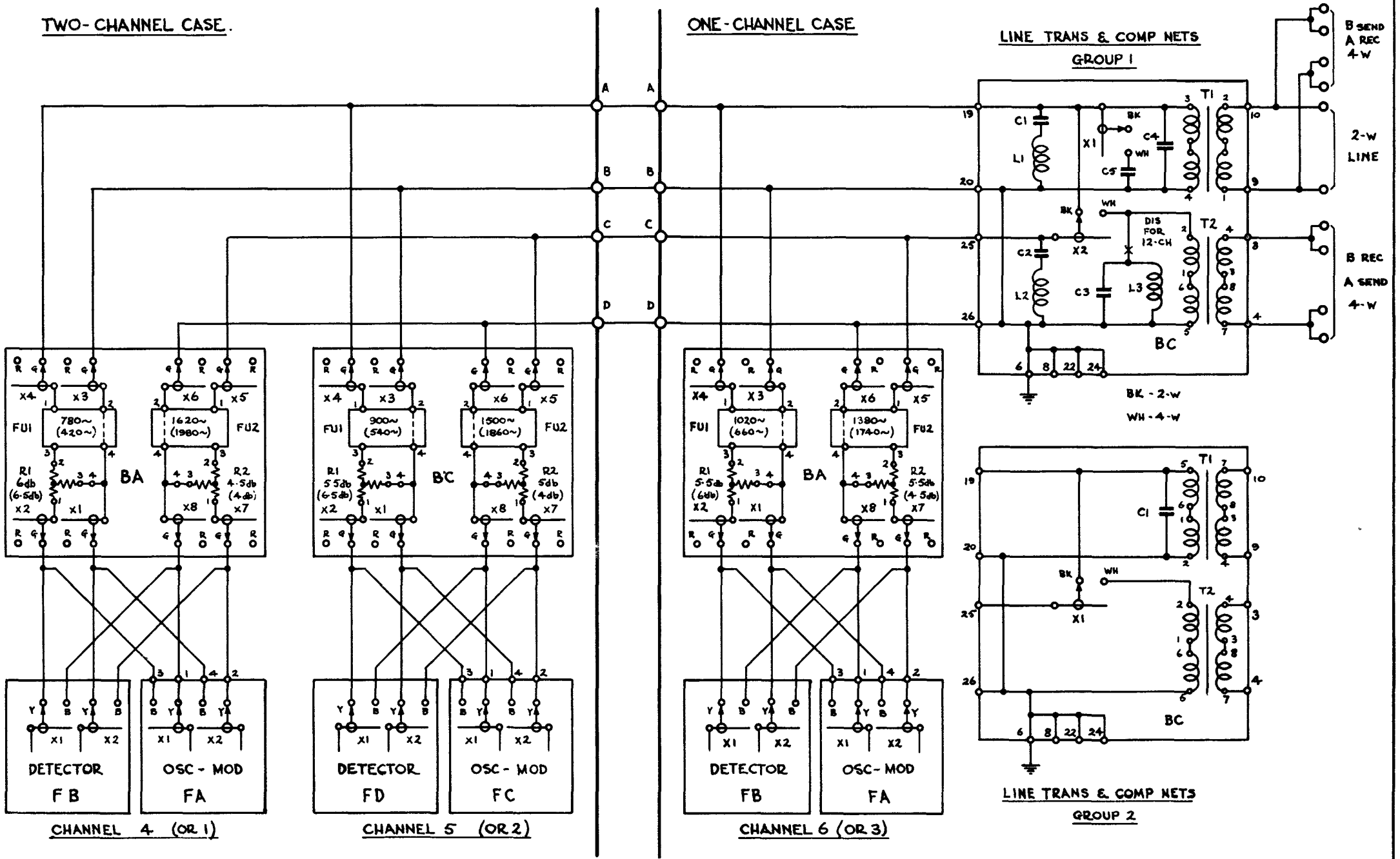
RHC.S. 12 APR 45  
AMENDED

15212/P.L.H./5.45.

SCHOOL OF SIGNALS  
DRAWN BY R.H.B. 8 FEB 45  
CHECKED BY J.H.P.

TWO-CHANNEL CASE.

ONE-CHANNEL CASE



B SEND  
A REC  
4-w  
  
2-w  
LINE  
  
B REC  
A SEND  
4-w

LINE TRANS & COMP NETS  
GROUP 1

LINE TRANS & COMP NETS  
GROUP 2

FIGS IN BRACKETS REFER TO GP 2.

APP VF TELEG 3-CHAN DX No 2  
BLOCK DIAGRAM

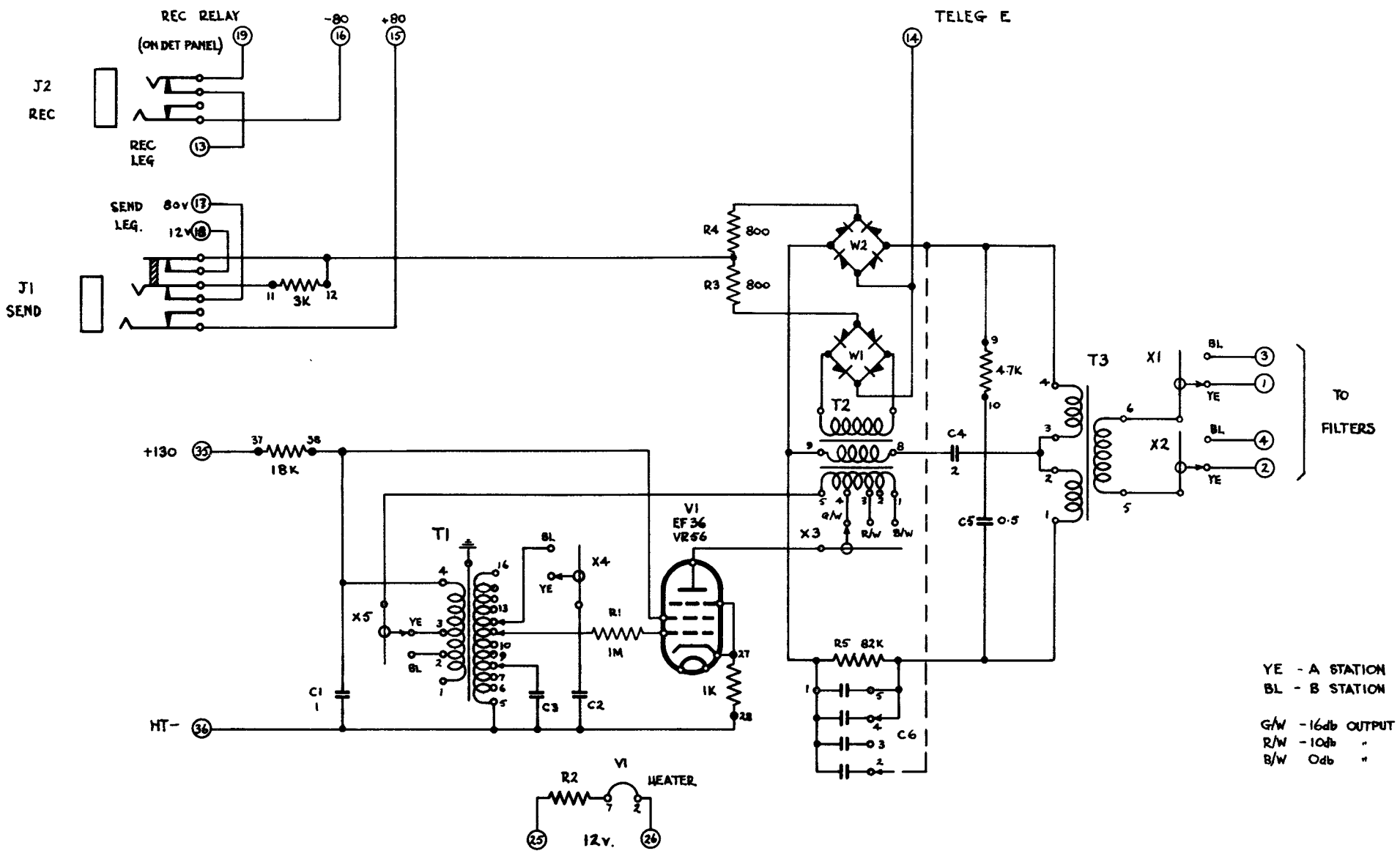
Y - A STATION  
B - B STATION

E1/240

CHC 6-12 APR 45  
 AMENDED  
 6 MARCH 1945 RNB  
 AMENDED

15212/P.L.H / 5 45.

SCHOOL OF SIGNALS  
 DRAWN BY: RNB-9 FEB 45  
 CHECKED BY: J.K.P.



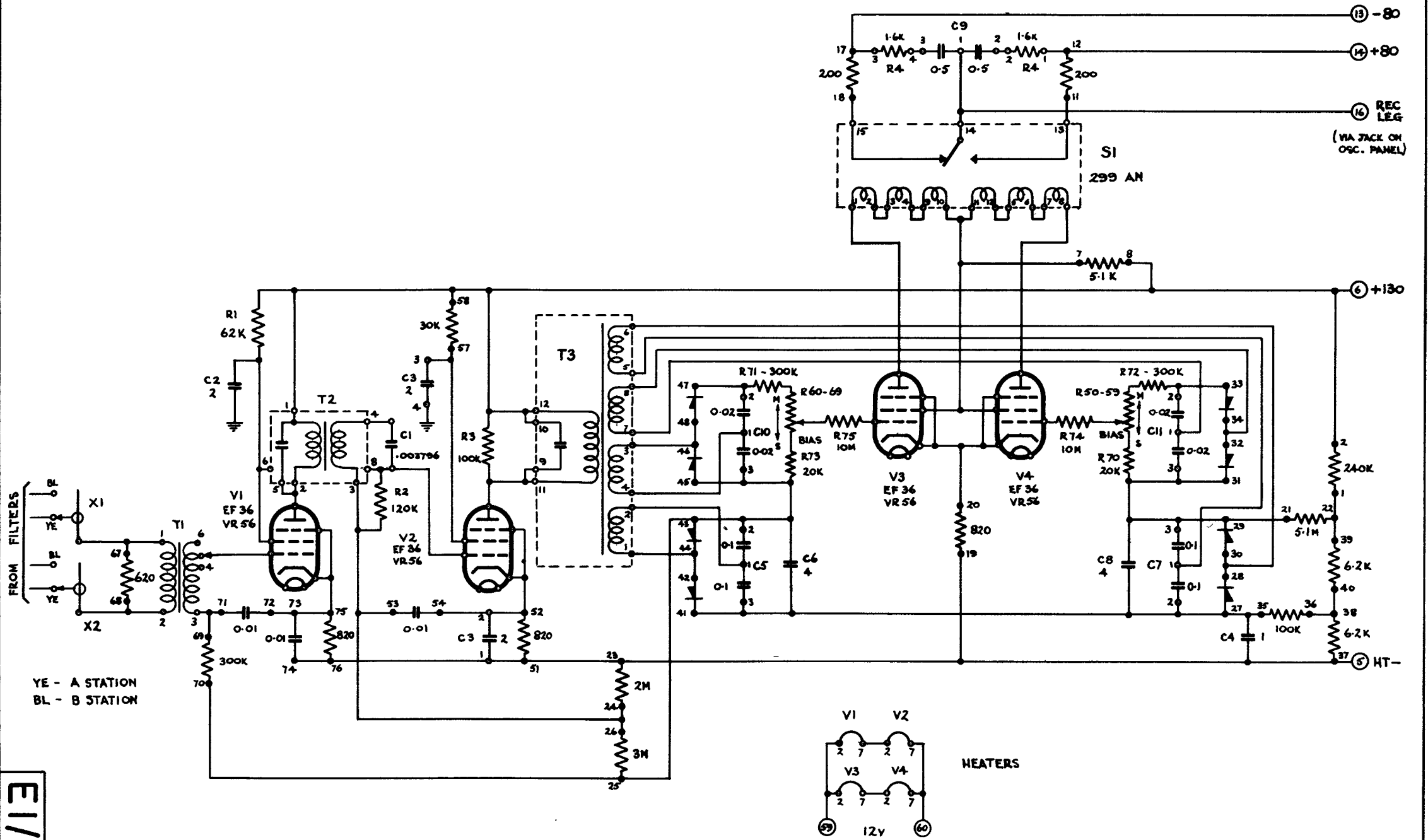
## APPARATUS VF TELEGRAPH 3-CH DX No2 OSCILLATOR-MODULATOR

E1/241

6 MARCH 1946 RNB  
AMENDED

15212/P.L.H./5.45.

SCHOOL OF SIGNALS  
DRAWN BY RNS-13 FEB 46  
CHECKED BY J.K.P

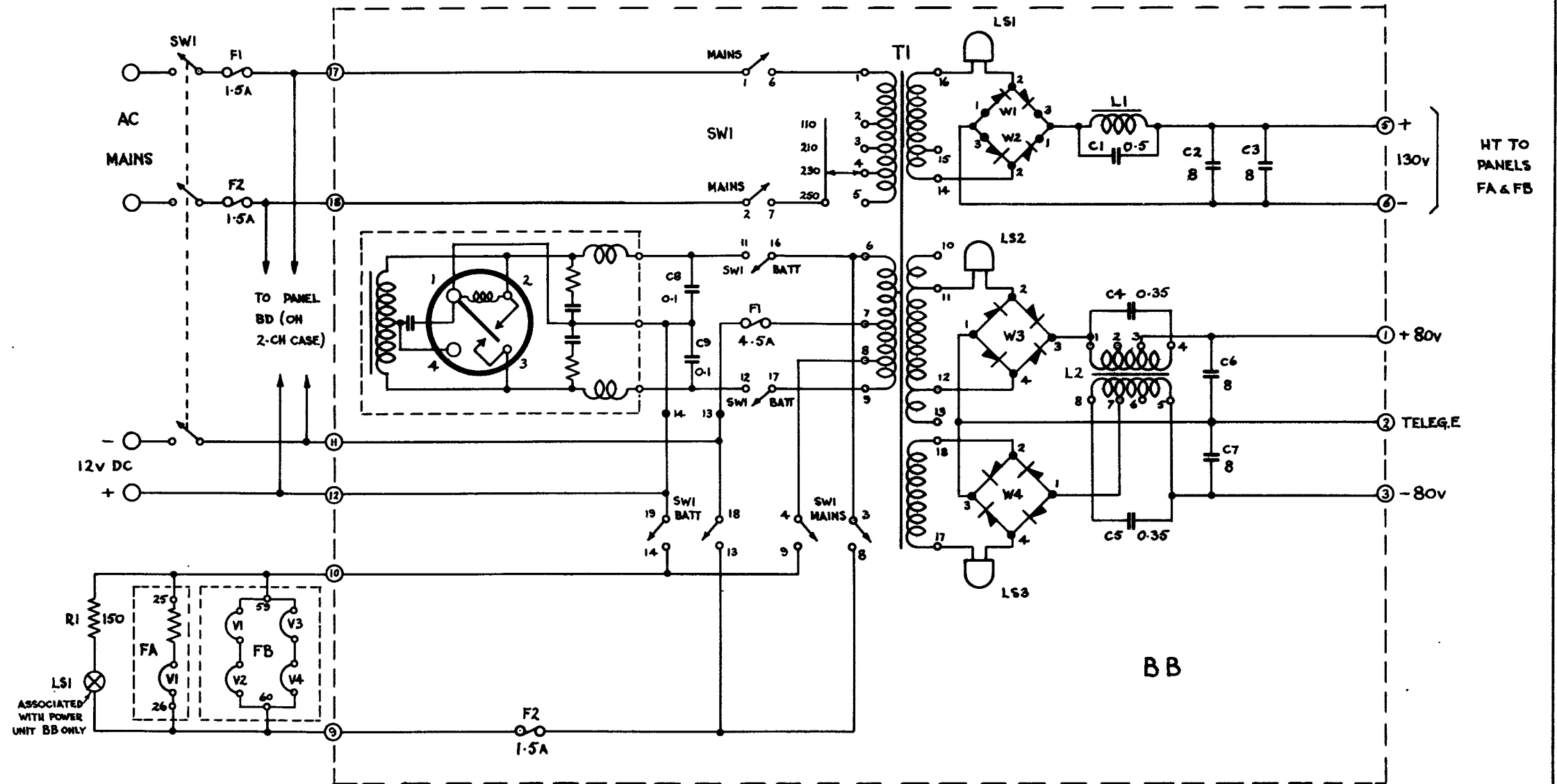


# APPARATUS VF TELEGRAPH 3-CH DX No 2 - DETECTOR

E1/242

15212/P.L.H./5.45.  
 6 MARCH 1945 RNB  
 AMENDED

SCHOOL OF SIGNALS  
 DRAWN BY: RNB 14 FEB 45  
 CHECKED BY: J.H.B



APPARATUS VF TELEGRAPH 3-CH DX No2  
POWER UNIT

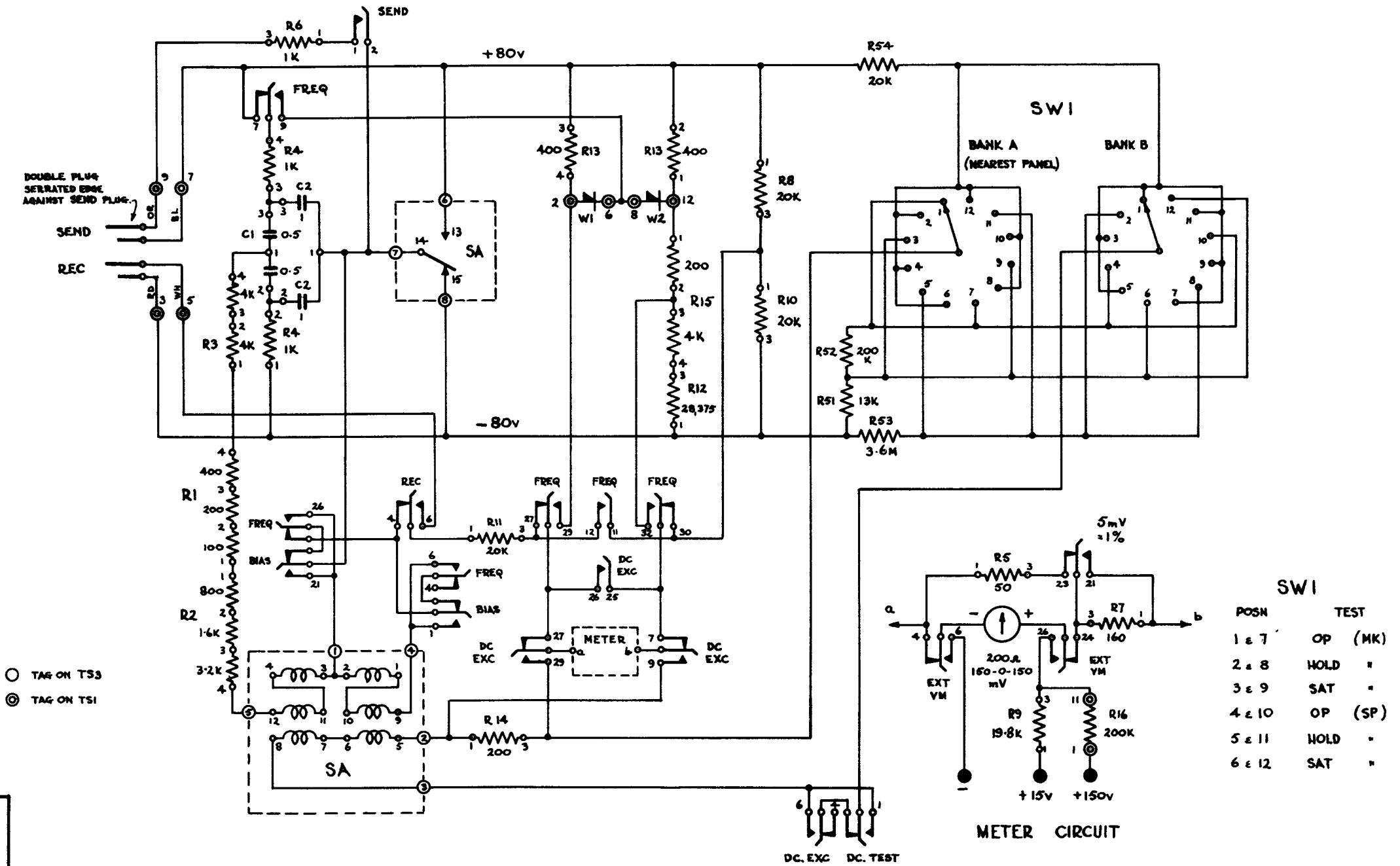
E1/243



6 MARCH 1945 RNB  
AMENDED

15212/P.L.H./5.45.

SCHOOL OF SIGNALS  
DRAWN BY RNB 15 FEB 43  
CHECKED BY J.H.R.



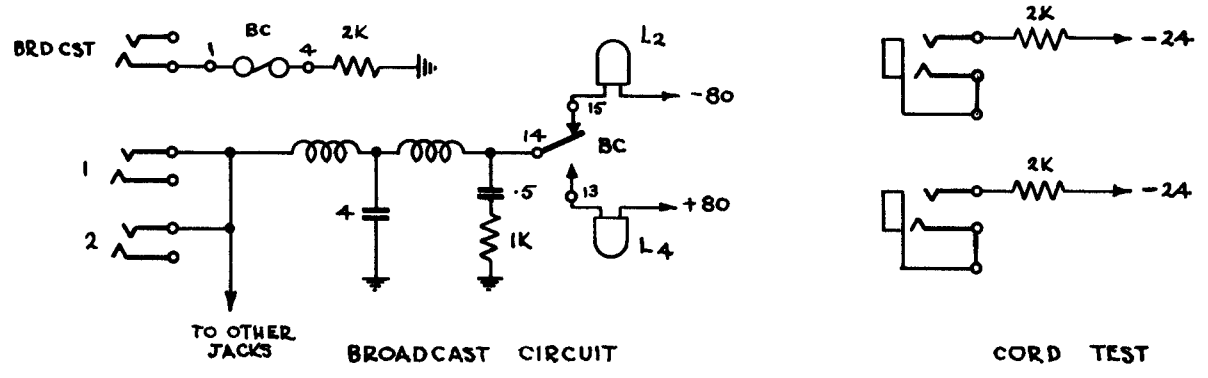
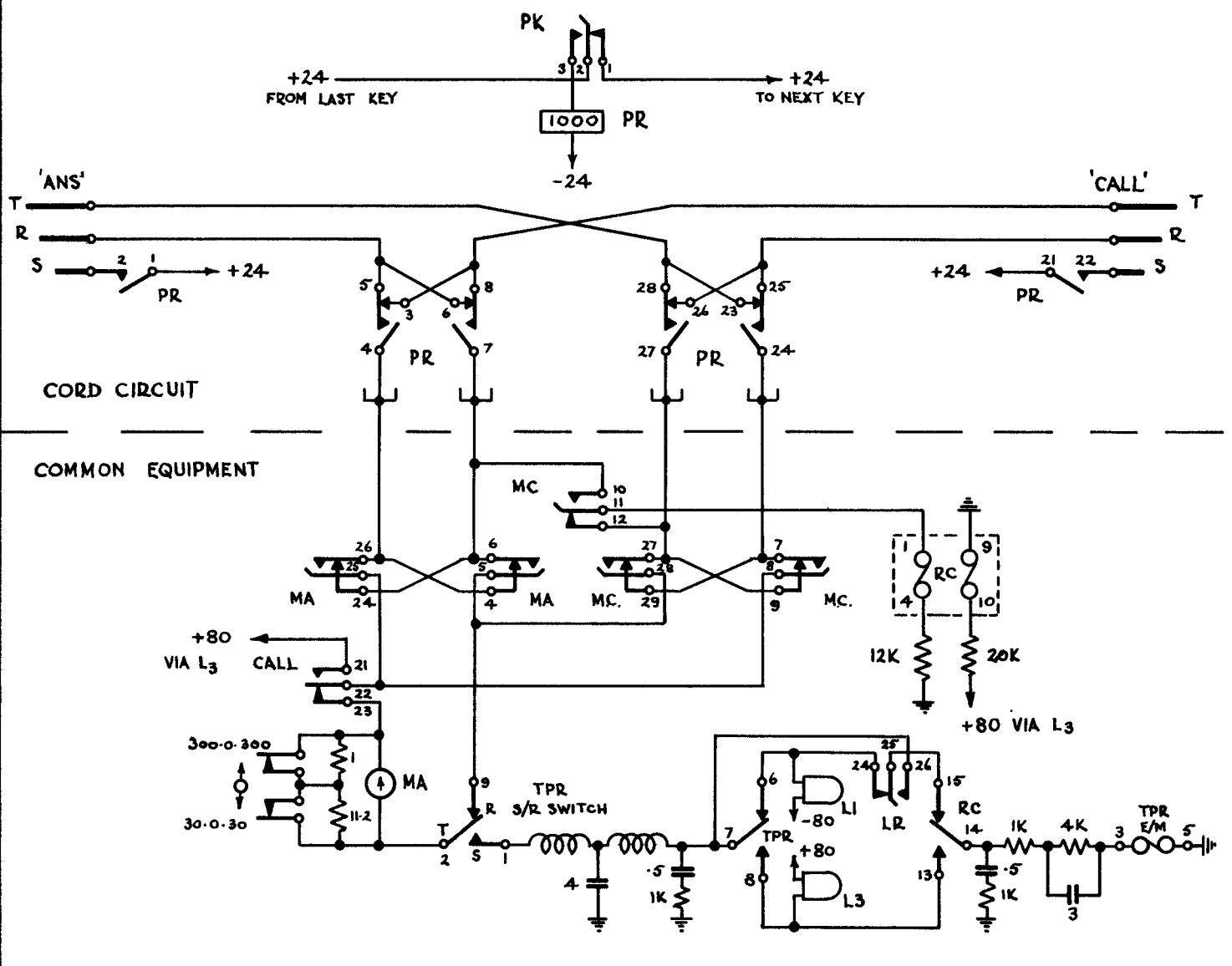
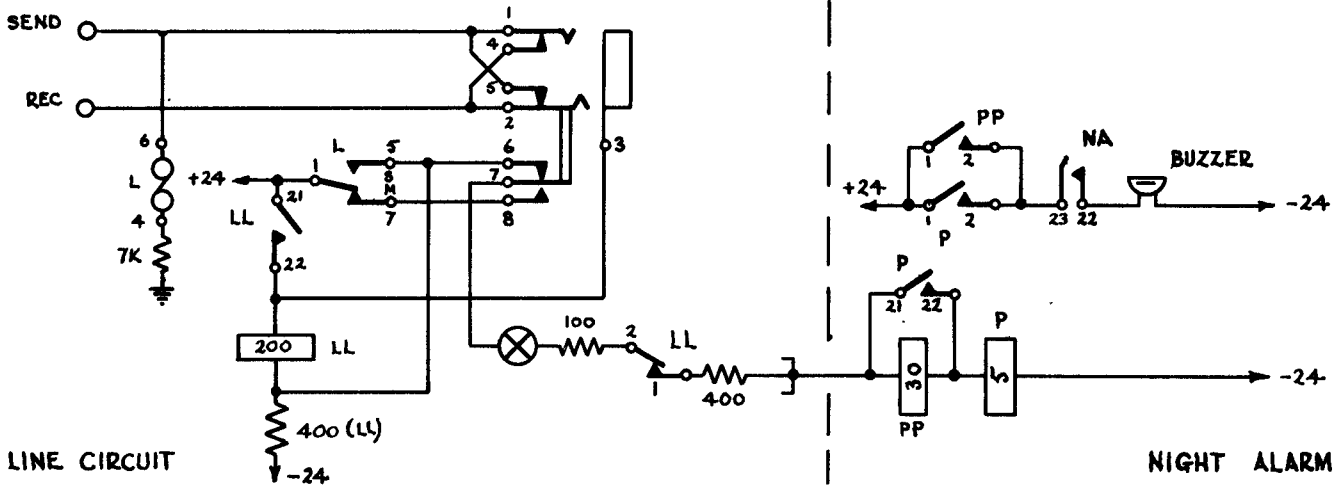
SW1

POSN	TEST
1 & 7	OP (MK)
2 & 8	HOLD "
3 & 9	SAT "
4 & 10	OP (SP)
5 & 11	HOLD "
6 & 12	SAT "

E1/244

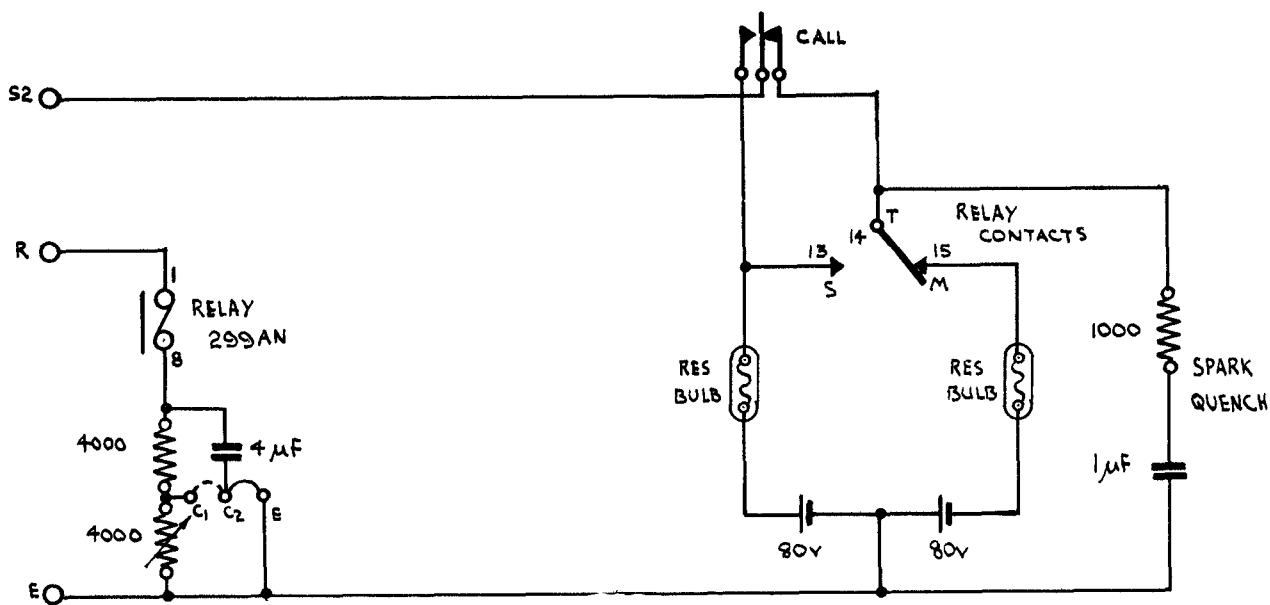
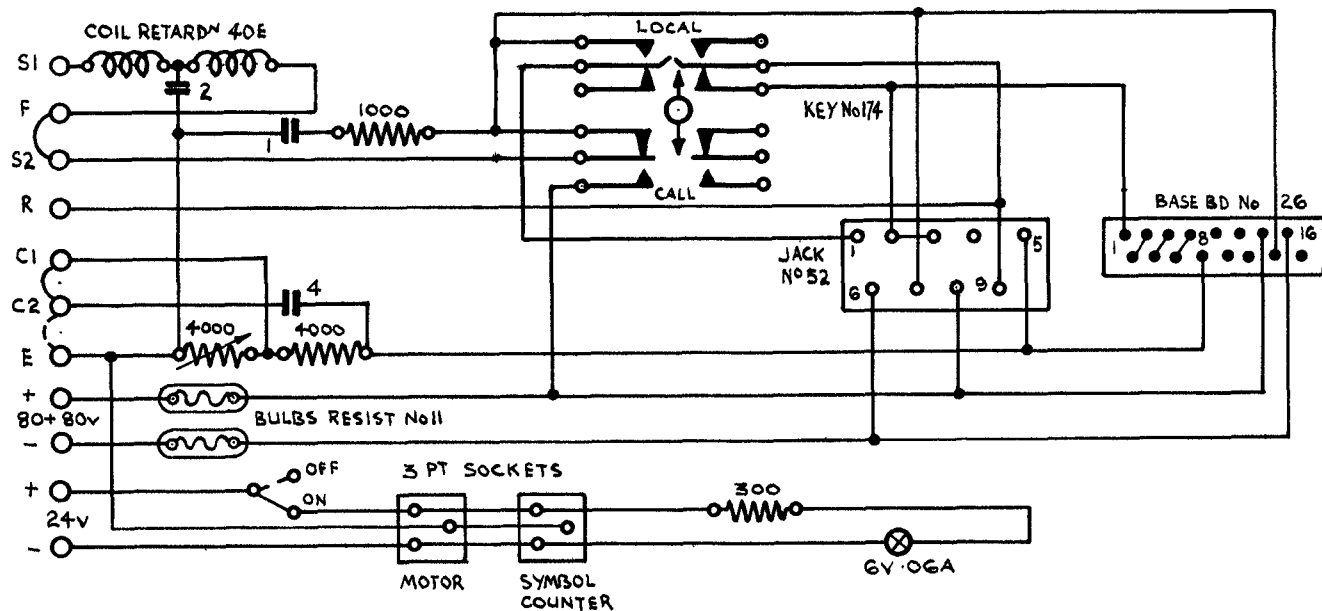
APPARATUS VF TELEGRAPH 3-CH DX No2 — RELAY TEST PANEL

SCHOOL OF SIGNALS  
 DRAWN BY: RNB-20 DEC-43  
 CHECKED BY: S.F.F.

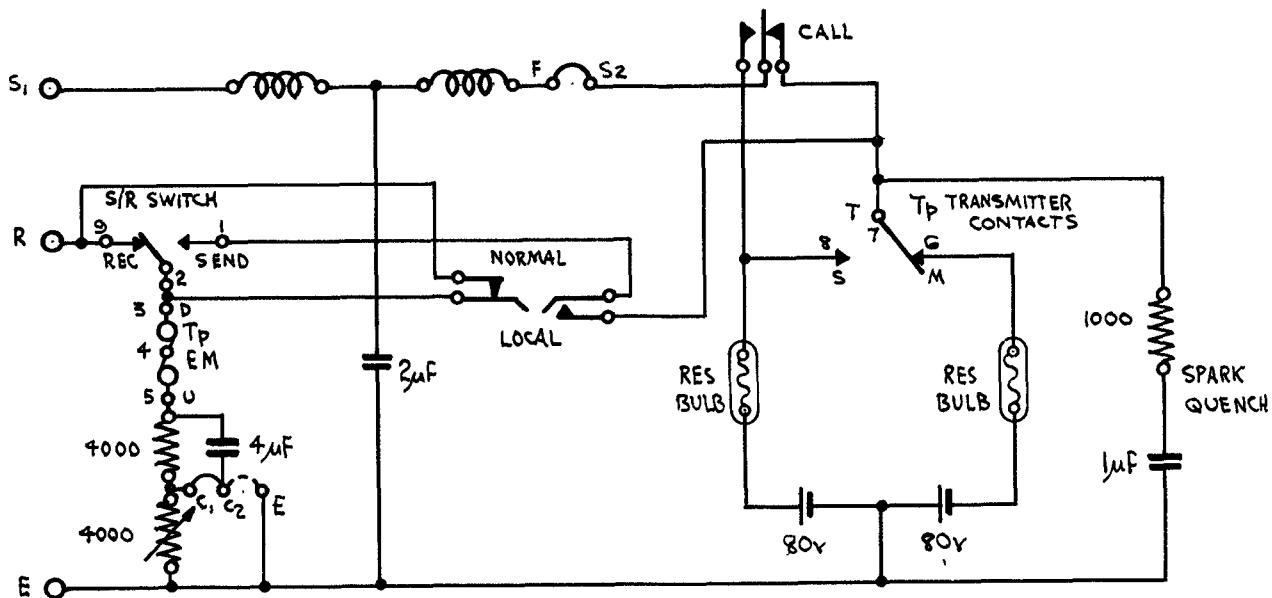


**TELEPRINTER SWITCHBOARD - 15 LINE** E1/250

14987/P.L.H./4.45.



UNIT WHEN USED AS A RELAY UNIT



UNIT WHEN USED AS A TERMINAL UNIT

# TELEPRINTER TERMINAL UNIT (80+80v)

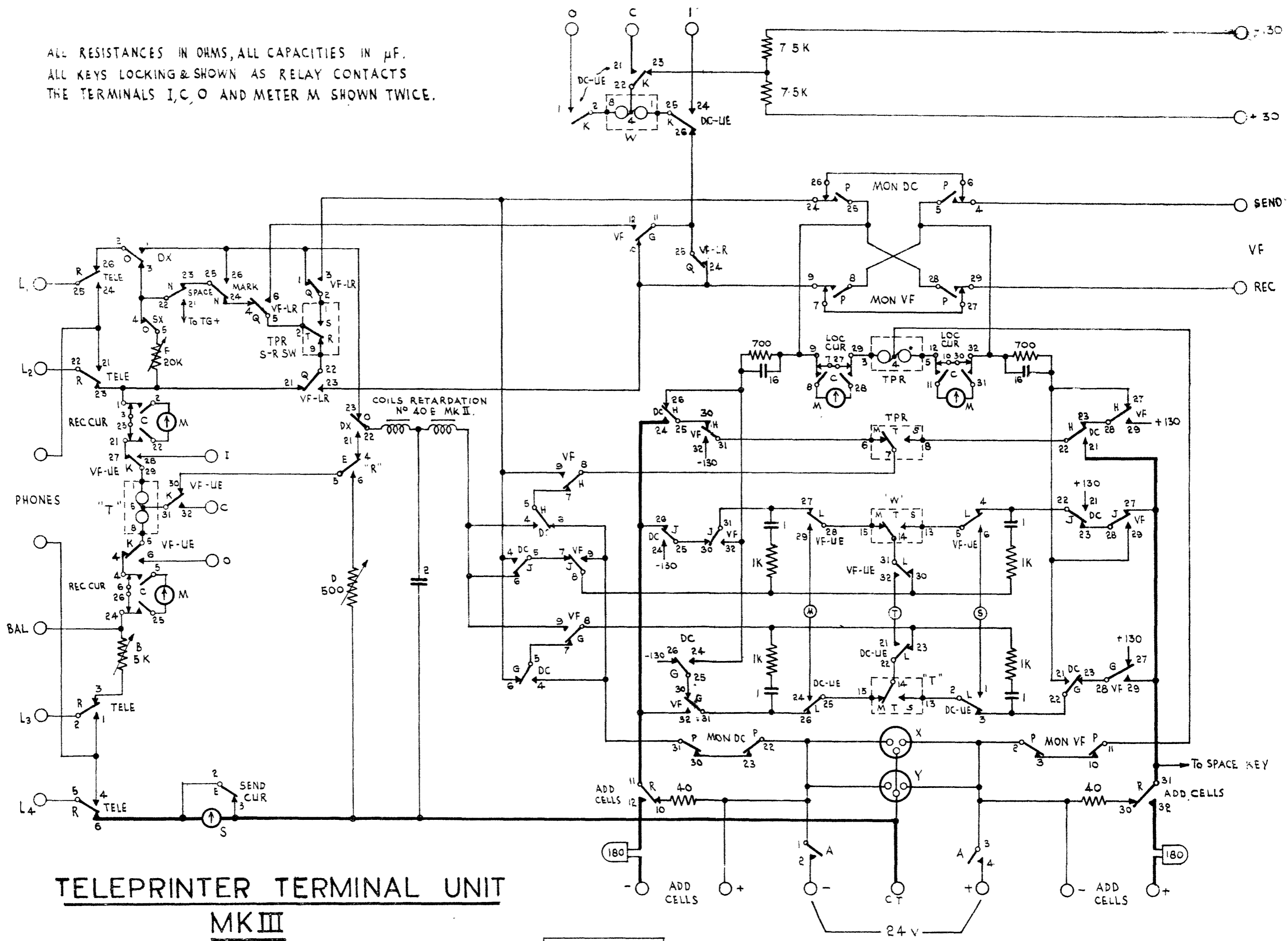
SCHOOL OF SIGNALS  
 DRAWN BY W/1F-27-743  
 CHECKED BY J.M.E.

EI/255

SCHOOL OF ENGINEERING  
 DRAWN BY: WHI 26/1/43  
 CHECKED BY: T.H.C.

ALL RESISTANCES IN OHMS, ALL CAPACITIES IN  $\mu\text{F}$ .  
 ALL KEYS LOCKING & SHOWN AS RELAY CONTACTS  
 THE TERMINALS I, C, O AND METER M SHOWN TWICE.

FOLD HERE



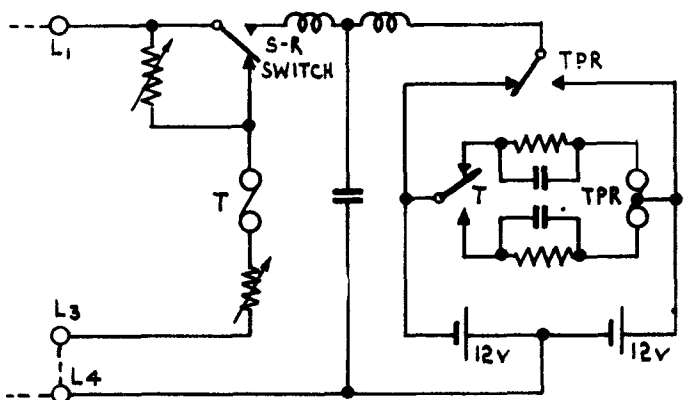
**TELEPRINTER TERMINAL UNIT**  
**MK III**

F1/260

15873/P.L.R./9.45

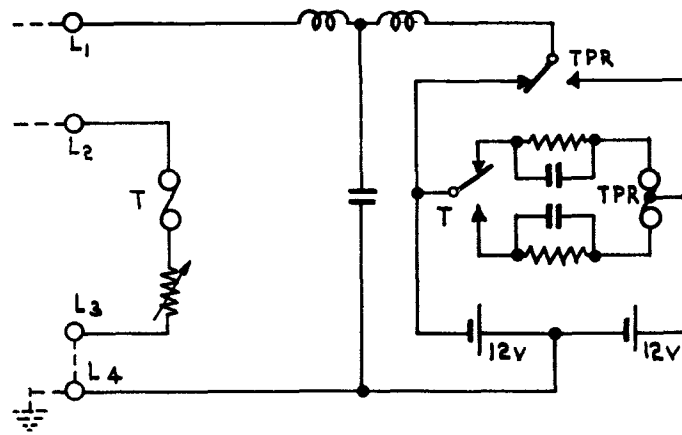
**SWITCHED SIMPLEX**

SWITCH TO "FROM DC"



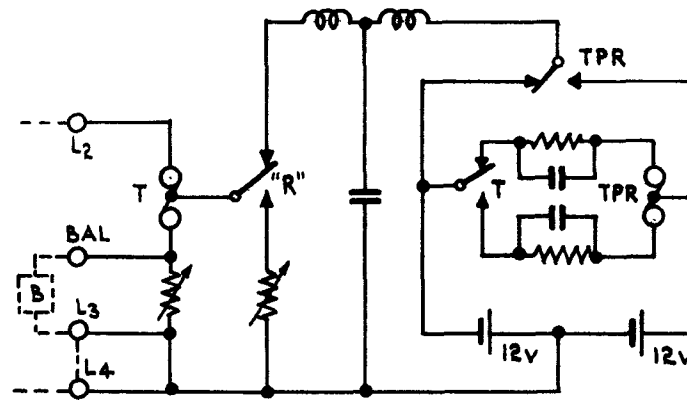
**2-LINE SIMPLEX, EARTH RETURN**

SWITCH TO "FROM DC", "SX", "SEND MARK"

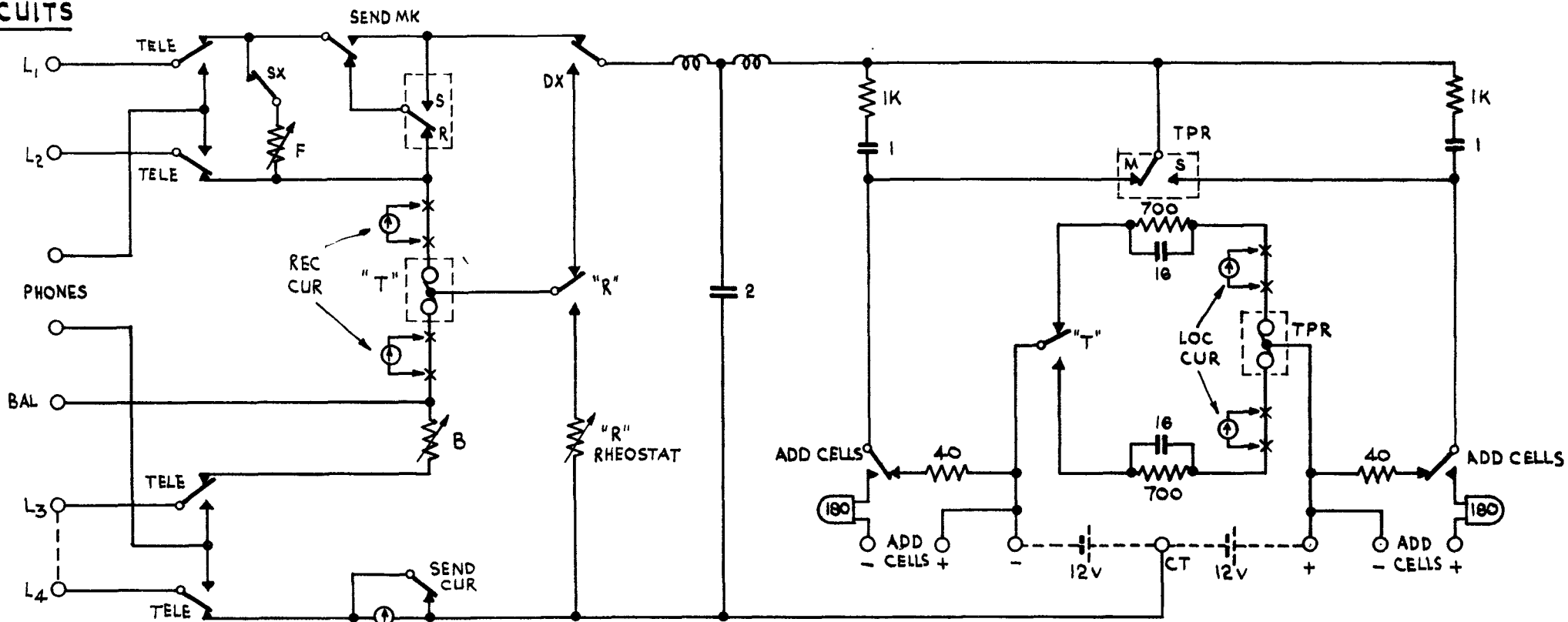


**DUPLEX AND HALF-DUPLEX**

SWITCH TO "FROM DC", "DX" FOR DX  
 "FROM DC", "DX" "R" FOR HALF DX



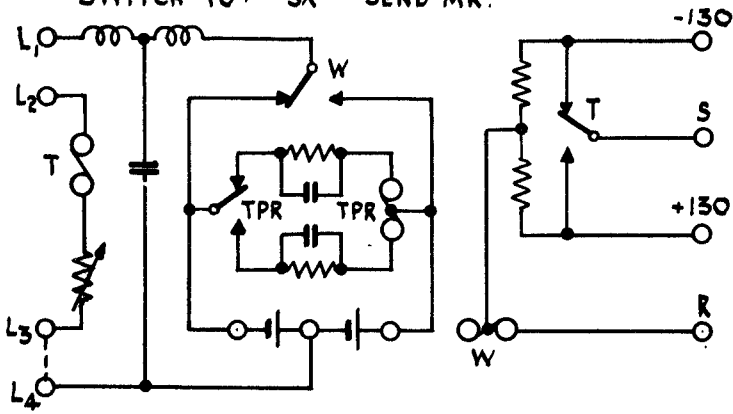
**DC. CIRCUITS**



E1/261

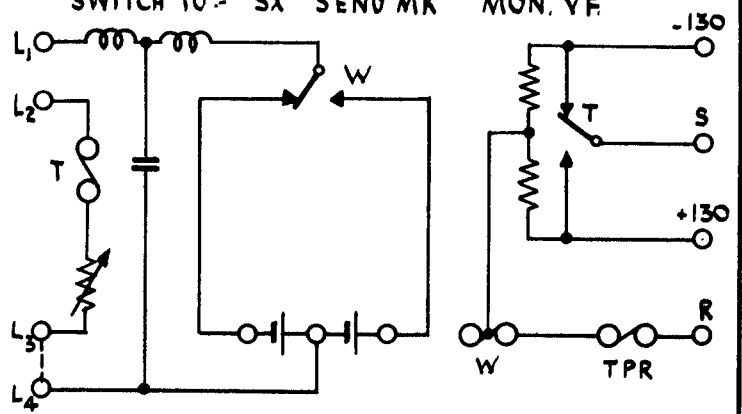
### VF - DC THROUGH WORKING

SWITCH TO:- "SX" "SEND MK"



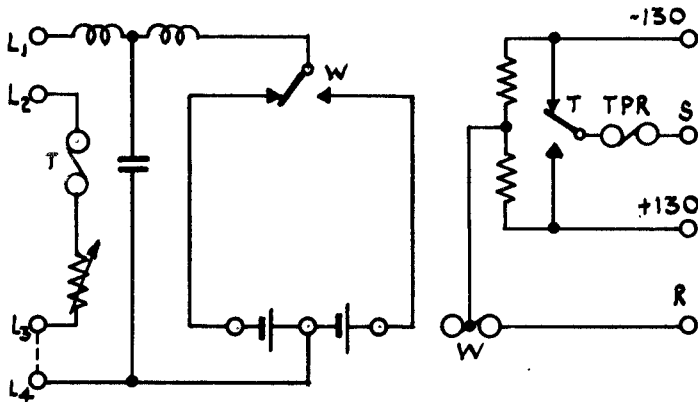
### MONITOR VF

SWITCH TO:- "SX" SEND MK" "MON. VF"



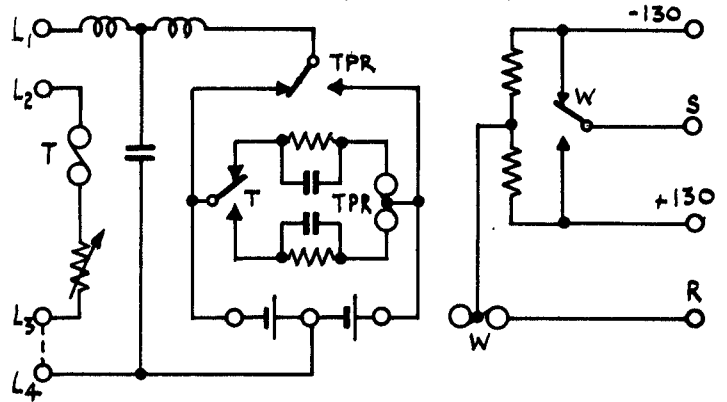
### MONITOR DC

SWITCH TO:- "SX", "SEND MK", "MON DC"



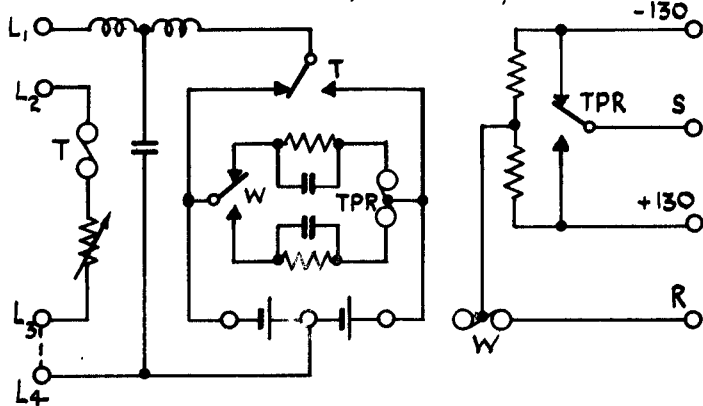
### WORK DC

SWITCH TO:- "SX", "SEND MK", "FROM DC."



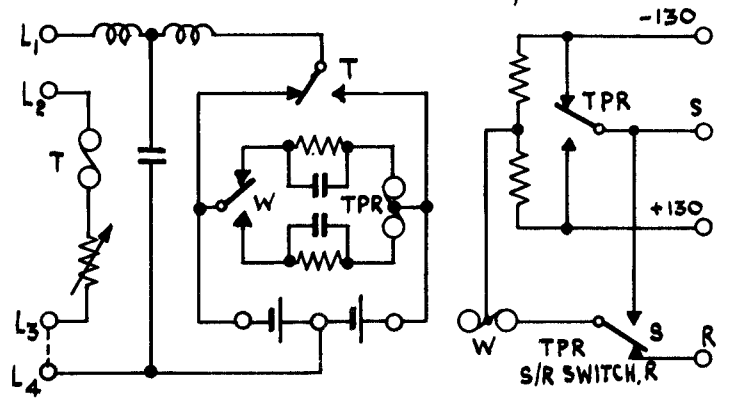
### WORK VF

SWITCH TO:- "SX", "SEND MK", "FROM VF."



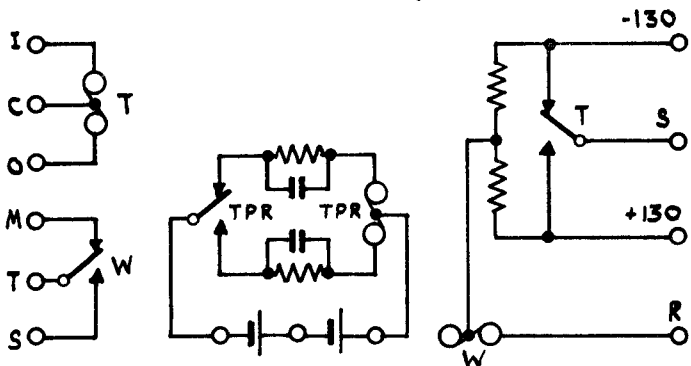
### WORK VF WITH LR

SWITCH TO:- "SX", "SEND MK", "FROM VF", "VF LOC. REC."



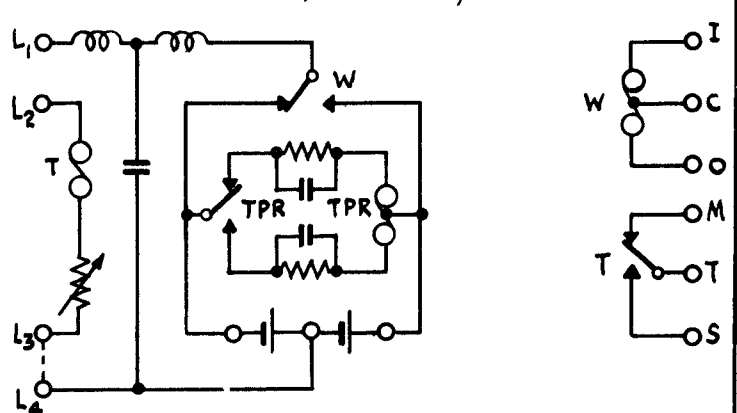
### VF UNIVERSAL EXTENSION

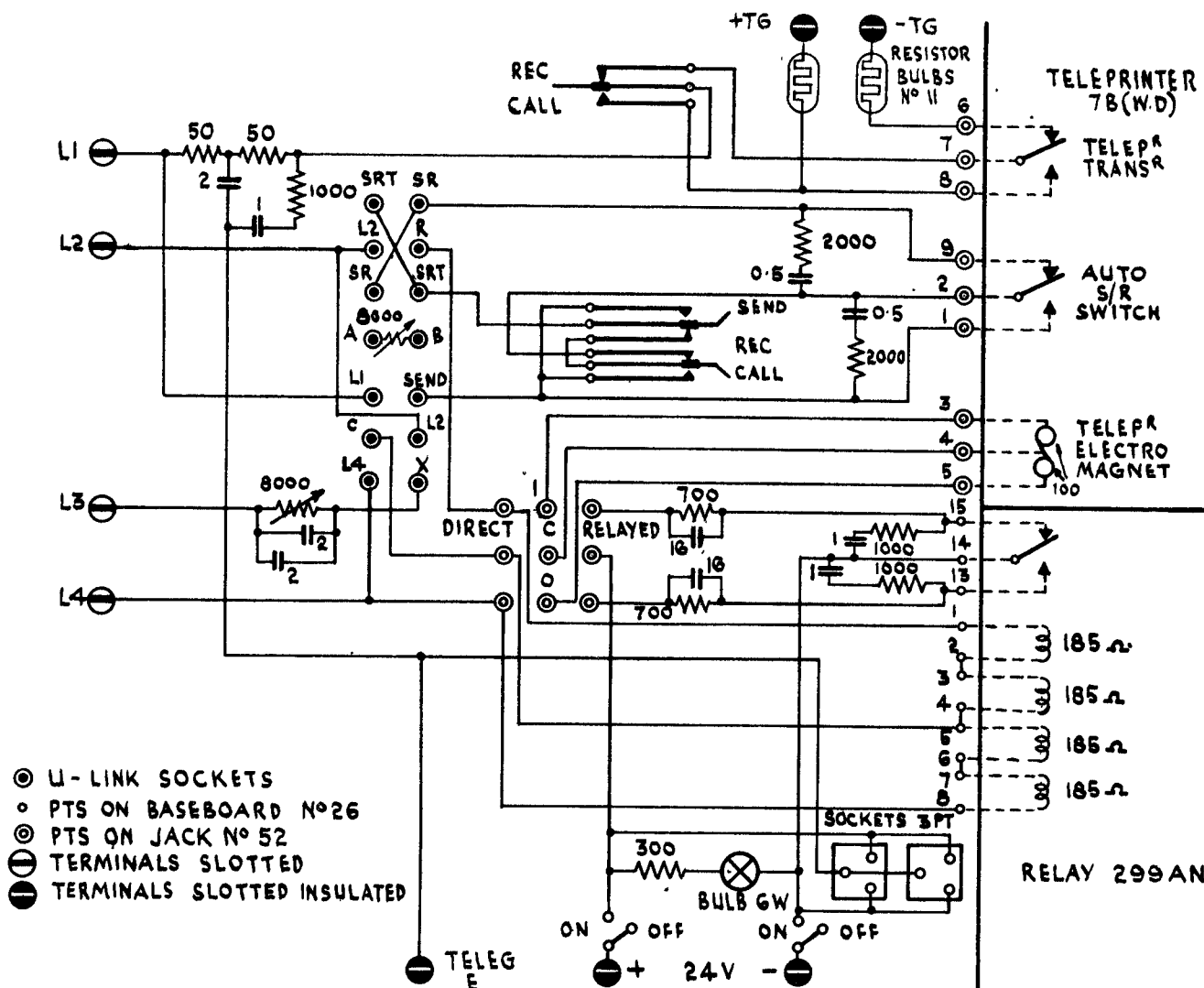
SWITCH TO:- "VF - UN EXTN."



### DC UNIVERSAL EXTENSION

SWITCH TO:- "SX", "SEND MK", "DC-UN EXTN."





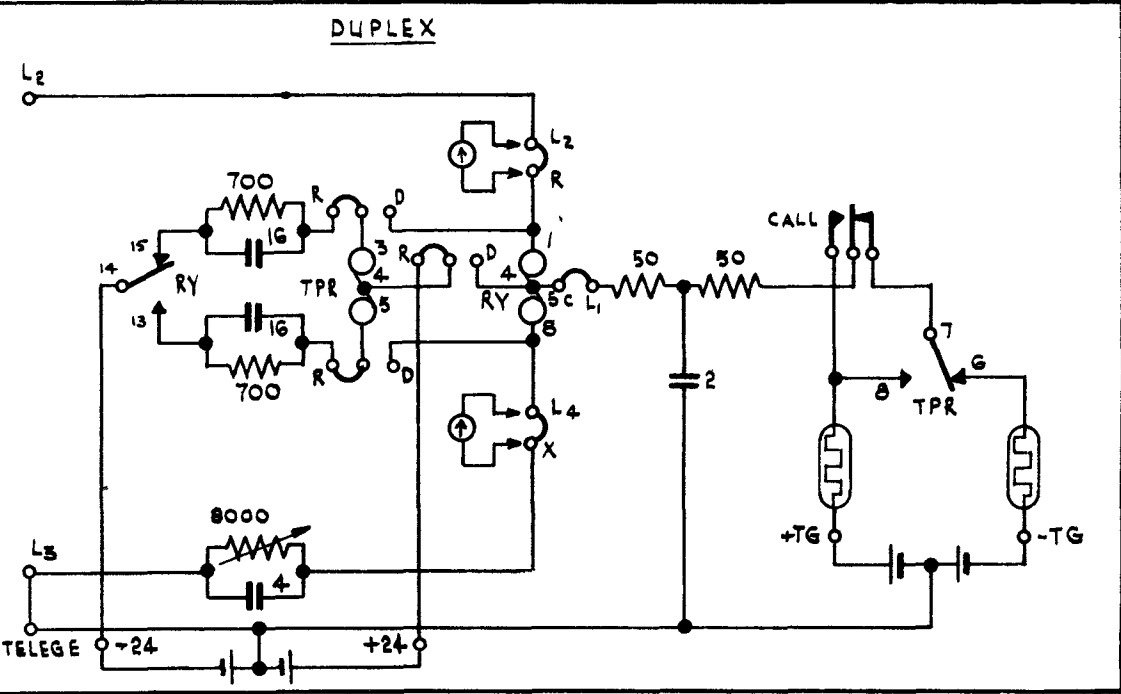
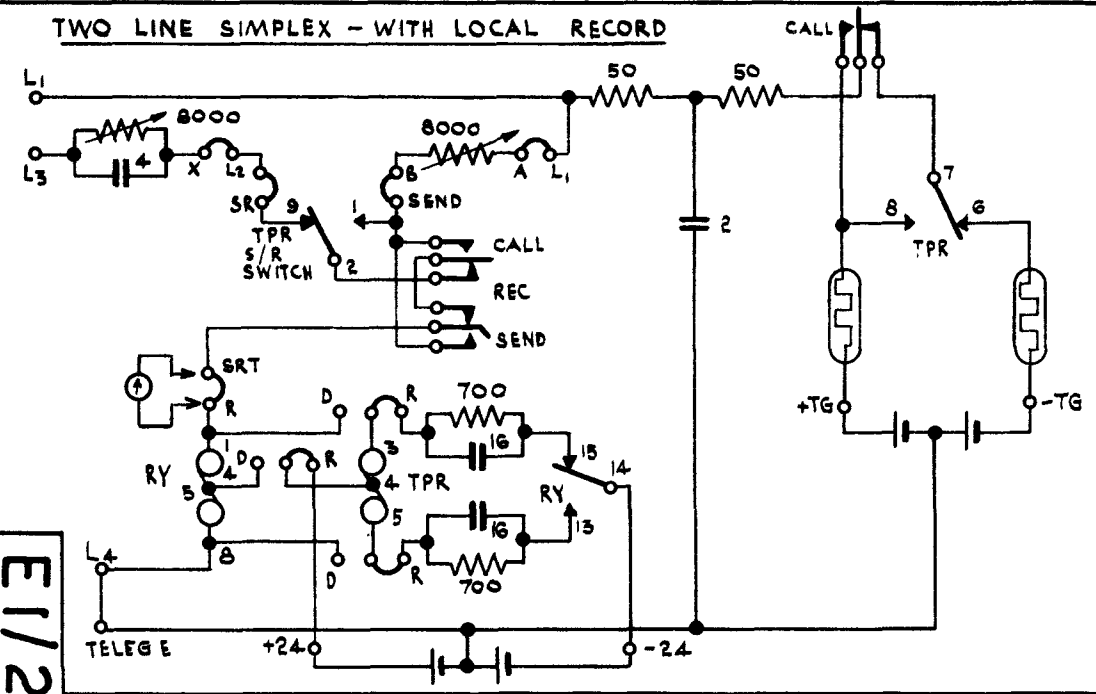
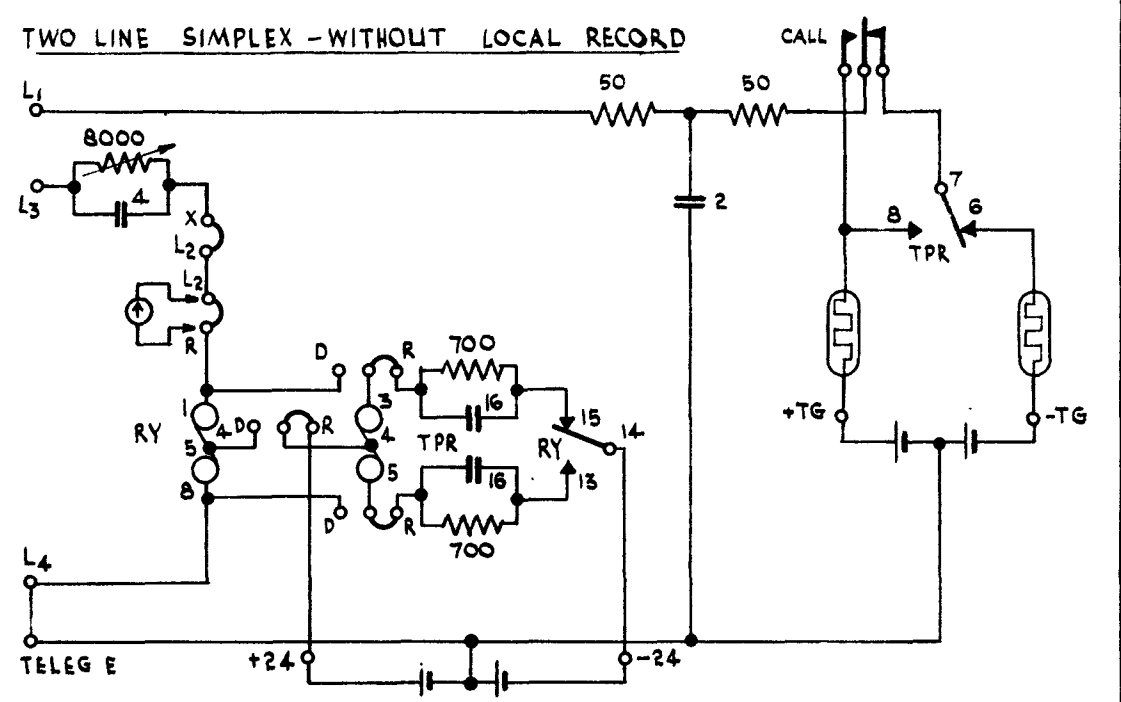
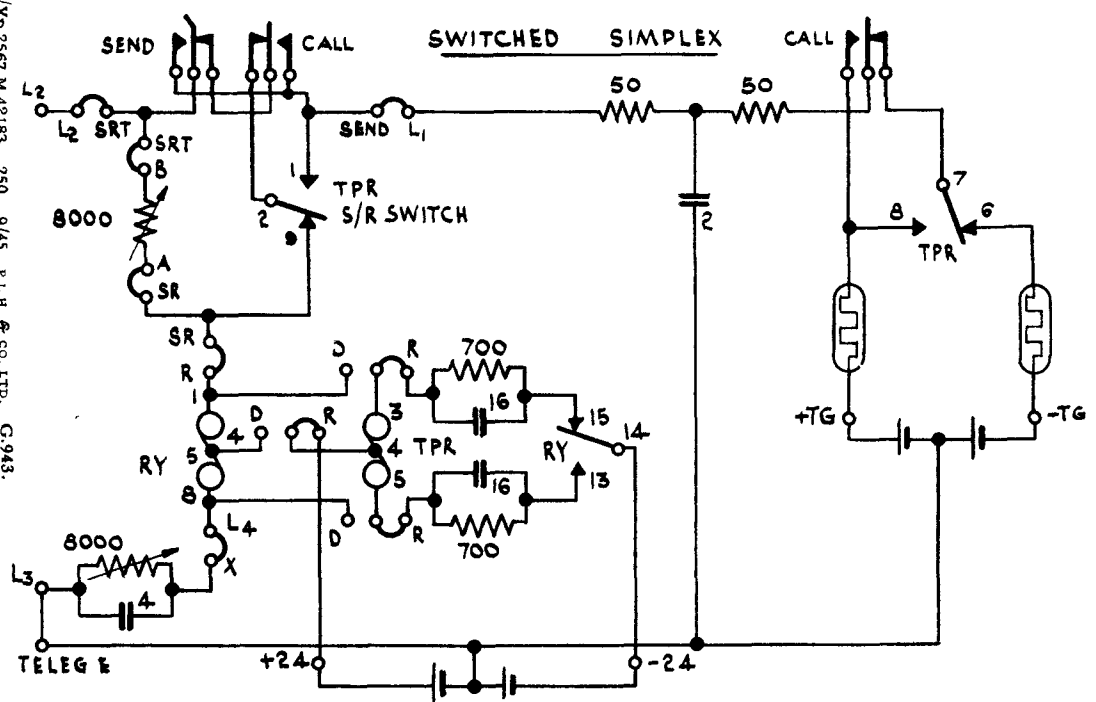
1. INSERT U-LINKS, CONNECT LINES AND STRAP "TELEG E" AS SHOWN ON ADJOINING TABLE, ACCORDING TO FACILITY REQD.
2. INSERT 3 U-LINKS INTO "DIRECT" OR "RELAYED" POSITIONS AS REQUIRED. (A RELAY 299 AN IS CARRIED IN REAR COMPARTMENT OF BOX AND SHOULD BE PLUGGED INTO FRONT JACK FOR USE.)
3. SCREW RESISTORS BULB NO 11 INTO SOCKETS ON FRONT PANEL.
4. CONNECT +24V AND -24V TERMINALS TO 24 VOLT 3 AMP DC SUPPLY (eg 100/125 A.H. BATTERY).
5. CONNECT +TG, -TG AND TELEG TO +24V, -24V AND CENTRE TAP OF 24V SUPPLY RESPECTIVELY. ALTERNATIVELY, WHERE TELEGRAPH VOLTAGE GREATER THAN 12+12 IS REQUIRED, CONNECT +TG, -TG, TELEG E, TO SUITABLE CENTRE TAPPED SUPPLY.
6. INSERT 9 POINT AND 3 POINT PLUGS OF "TELEPRINTER 7B(WD)" (AND 3 POINT PLUG OF SYMBOL COUNTING ATTACHMENT IF WORKING WITHOUT LOCAL RECORD) INTO SOCKETS PROVIDED.
7. TO ADJUST "RECEIVE" CURRENT:- RECEIVE "MARK" FROM DISTANT END AND MEASURE CURRENT AT U-LINK SOCKETS INDICATED IN TABLE. ADJUST "RECEIVE" RESISTANCE TO GIVE NOT MORE THAN 10mA OR 30mA FOR RELAYED OR DIRECT OPERATION RESPECTIVELY.
8. TO ADJUST "LEAK" CURRENT:- THROW "SEND-REC" KEY TO "SEND" THUS SENDING "MARK". ADJUST "LEAK" RESISTANCE AS IN 7 ABOVE. RESTORE "SEND-REC" KEY TO NORMAL.
9. THROW "ON-OFF" SWITCH TO "ON", THUS STARTING TELEPRINTER MOTOR.
10. CHECK TELEPRINTER OPERATION IN BOTH DIRECTIONS.

FACILITIES	SWITCHED SIMPLEX	TWO LINE SIMPLEX		DUPLEX
		WITH LOCAL RECORD	WITHOUT LOCAL RECORD	
"U" LINK POSNS	SRT SR	○ ○	○ ○	○ ○
	L2 R	○ ○	○ ○	○ ○
	SR SRT	○ ○	○ ○	○ ○
	A B	○ ○	○ ○	○ ○
	L1 SEND	○ ○	○ ○	○ ○
	C L2	○ ○	○ ○	○ ○
L4 X	○ ○	○ ○	○ ○	○ ○
LINE TERML'S USED	L2 L3	(S) (R) L1 L3 L4	(S) (R) L1 L3 L4	L2 L3
TELEG E STRAP TO	L3	L4	L4	L3
MEASURE REC & LEAK CURRENT AT	L4 - X	R - SRT	R - L2	R-L2 (LINE) L4-X (BAL)

# TELEPRINTER TERMINAL UNIT MK IV

E1/273

(1597a) W/L T. 8954/P. 2567 M. 42183 250. 9/45 P.L.H. & CO. LTD. G. 943.



E1/276

TELEPRINTER TERMINAL UNIT MKIV - CIRCUITS



FRONT

PANEL TERMINAL YI
SMOOTHING PANEL
FUSE PANEL
FUSE PANEL
PANEL TEST 80 SOCKET
JACK & LAMP PANEL
UNIT SIGNALLING 3A 1
2
3
4
5

REAR

CONNECTION STRIPS
RELAY PANEL
UNIT SIGNALLING 3A 6
7
8
RESISTOR PANEL
500/24 DISTRIBUTION PANEL
24 ~ INTERRUPTER PANEL
500 ~ OSC 16 LU 46A
500 ~ OSC 16 LU 46A
24 ~ GENERATOR PANEL

FRONT

PANEL TERMINAL YI
SMOOTHING PANEL
FUSE PANEL
PANEL TEST 80 SOCKET
PANEL TEST 80 SOCKET
JACK & LAMP PANEL
UNIT AMP COVER MOUNTING
UNIT AMPLIFYING 20 A 1
2
3
4
5
6
7
8
UNIT AMP COVER MOUNTING
UNIT TERMINATING NO 6 A 1 2
3 4

REAR

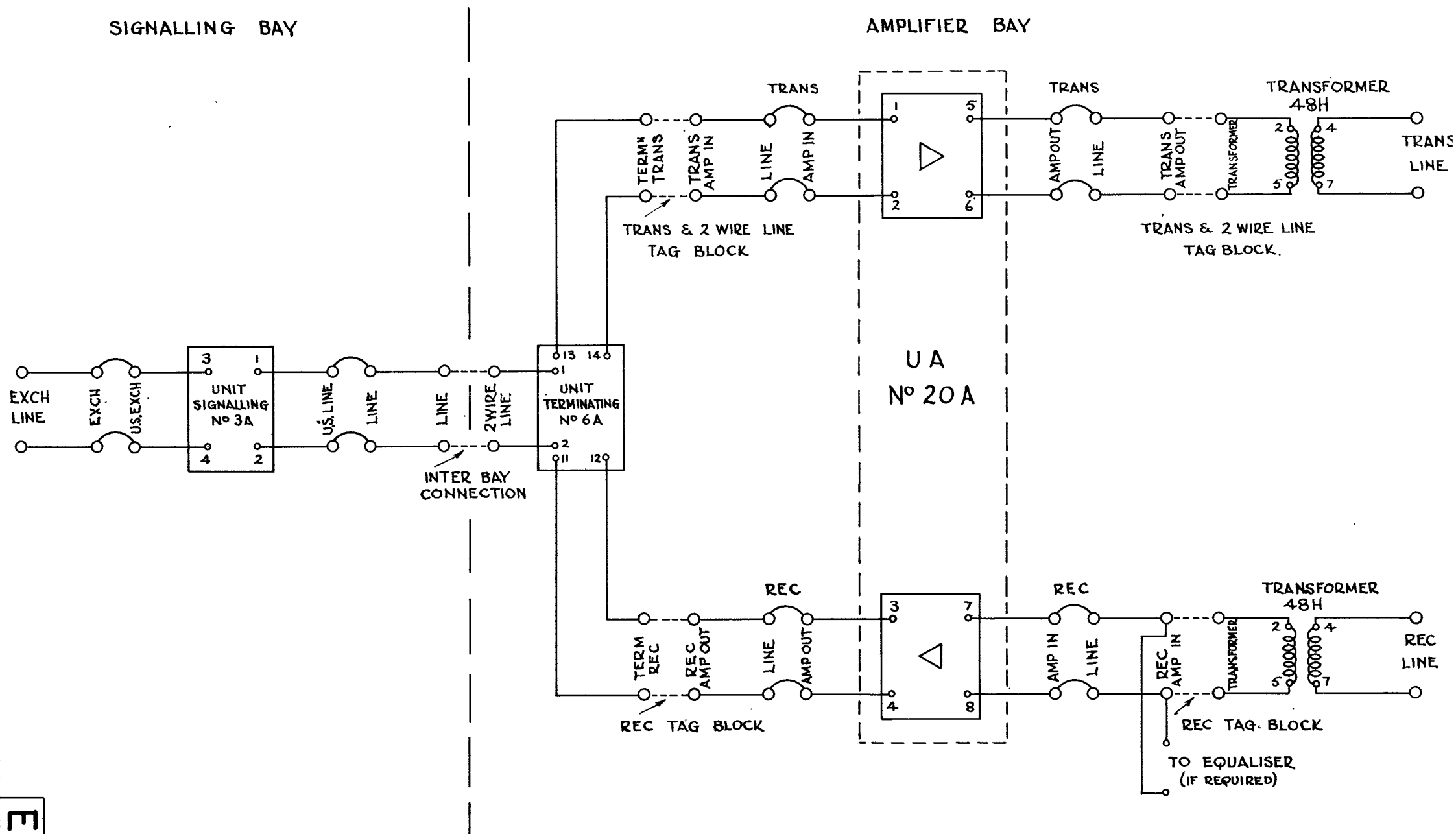
CONNECTION STRIPS
LINE TRANSFORMERS
" "
EQUALISERS
"
DUMMY
UNIT AMP COVER MOUNTING
UNIT AMPLIFYING 20A 1 (Rear)
2 "
3 "
4 "
5 "
6 "
7 "
8 "
UNIT AMP COVER MOUNTING
UNIT TERMINATING NO 6 A 5. 6
7 8

SIGNALLING BAY LAYOUT

AMPLIFIER BAY LAYOUT

REPEATER TELEPHONE 8 CCT. MKI - PANEL LAYOUT

E1/302



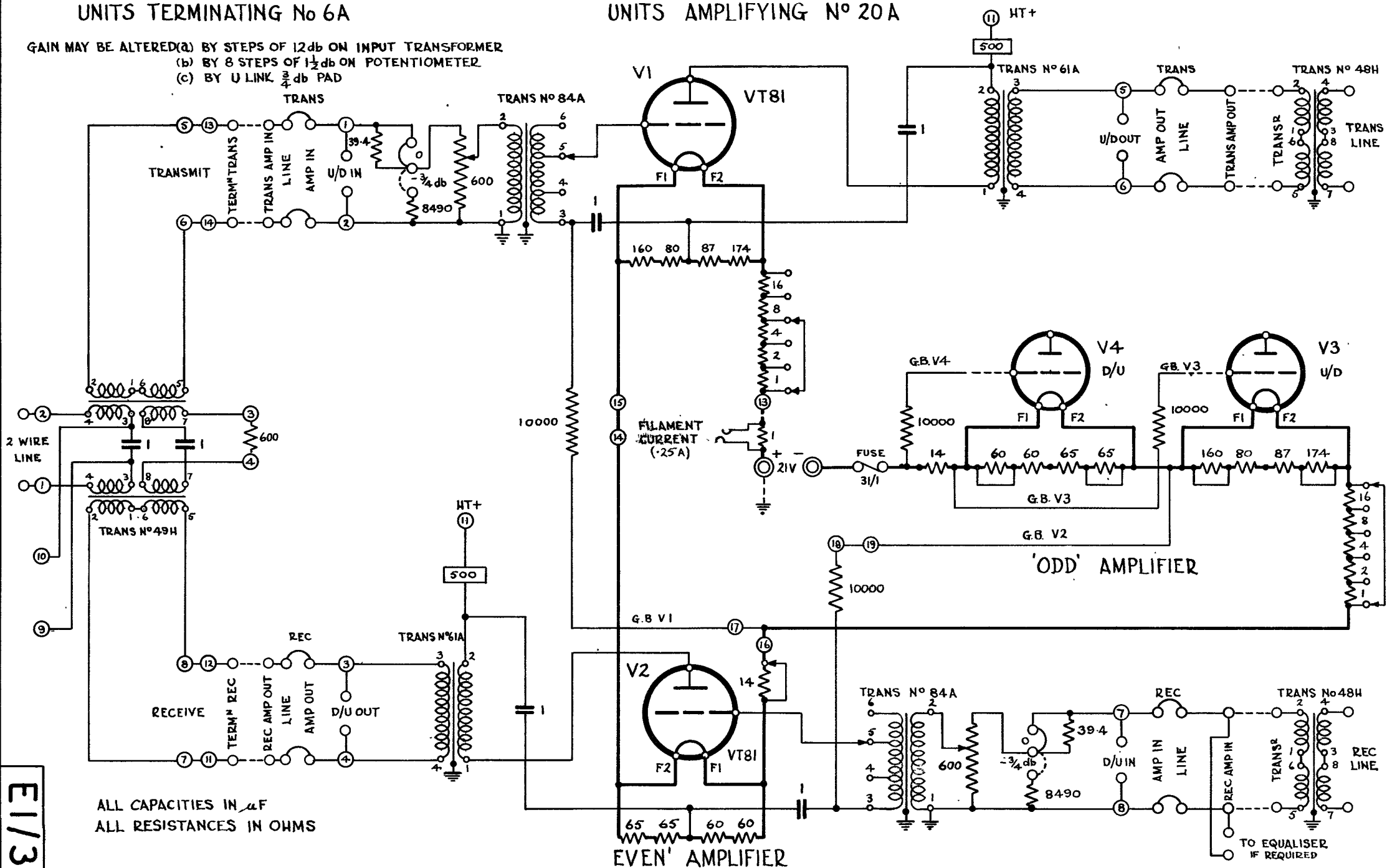
REPEATER TELEPHONE 8 CCT. MKI - BLOCK SCHEMATIC

E1/303

UNITS TERMINATING No 6A

UNITS AMPLIFYING No 20A

GAIN MAY BE ALTERED (a) BY STEPS OF 12db ON INPUT TRANSFORMER  
 (b) BY 8 STEPS OF 1½db ON POTENTIOMETER  
 (c) BY U LINK ¾db PAD

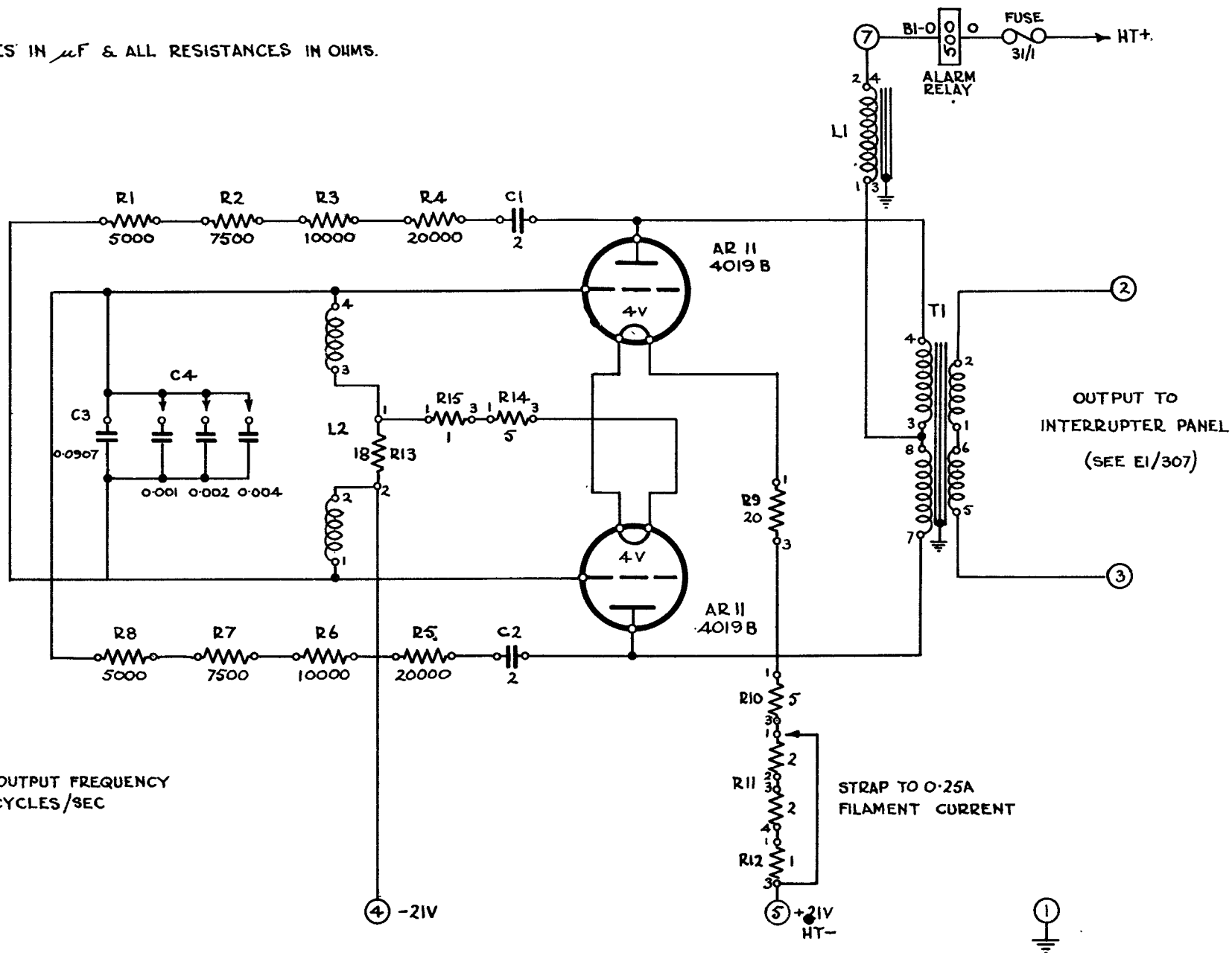


ALL CAPACITIES IN µF  
 ALL RESISTANCES IN OHMS

**REPEATER TELEPHONE 8 CCT MK1 - AMPLIFIER BAY**

E1/304

NOTE.. ALL CAPACITIES IN  $\mu\text{F}$  & ALL RESISTANCES IN OHMS.

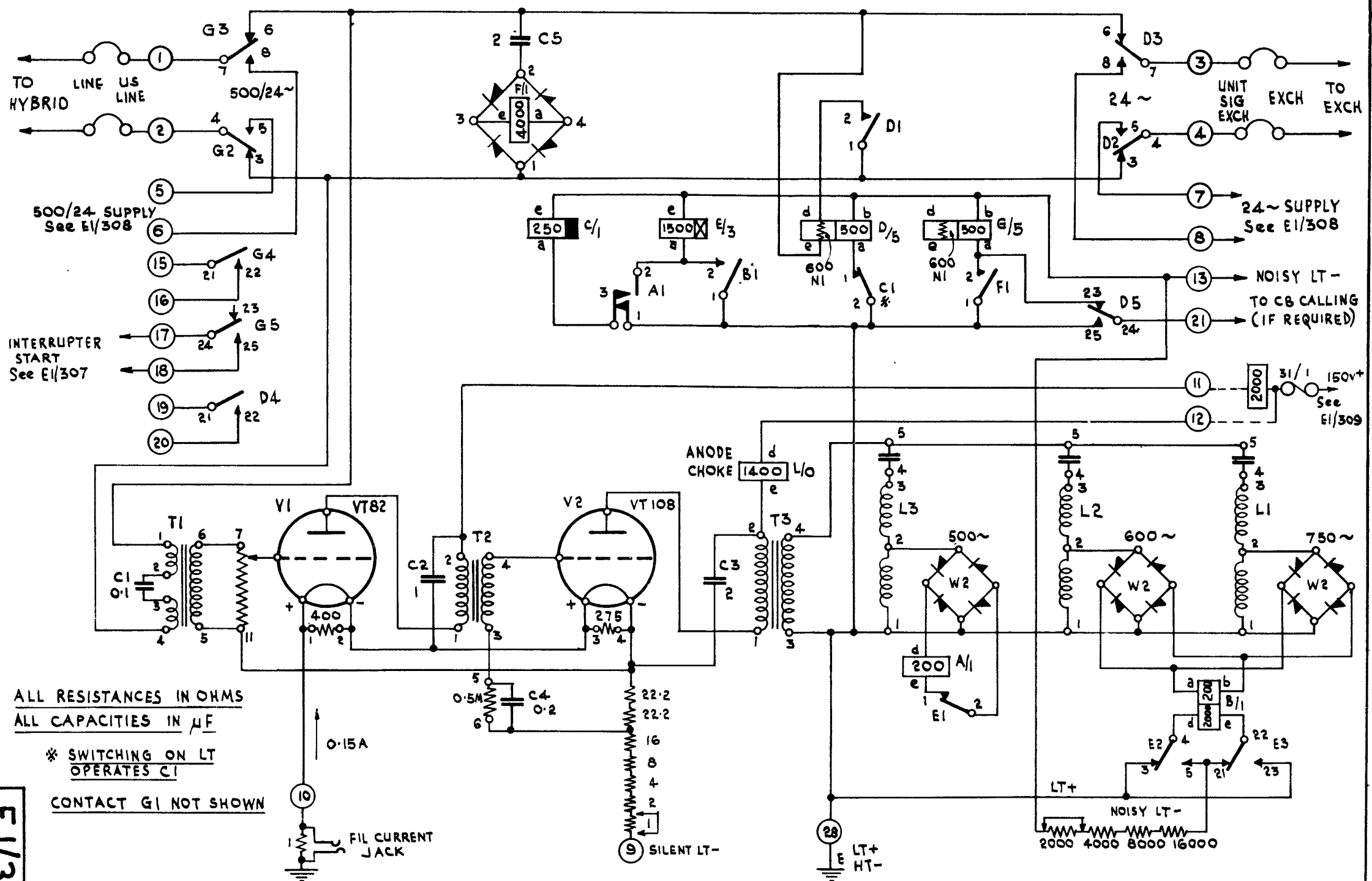


ADJUST C4 SO THAT OUTPUT FREQUENCY IS  $500 \pm 5$  CYCLES/SEC

REPEATER, TELEPHONE 8 CCT MKI - 500 ~ OSCILLATOR

E1/305

15953/4-T.H./9.15.



ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu$ F

\* SWITCHING ON LT OPERATES C1

CONTACT G1 NOT SHOWN

0.15A  
 FIL CURRENT JACK

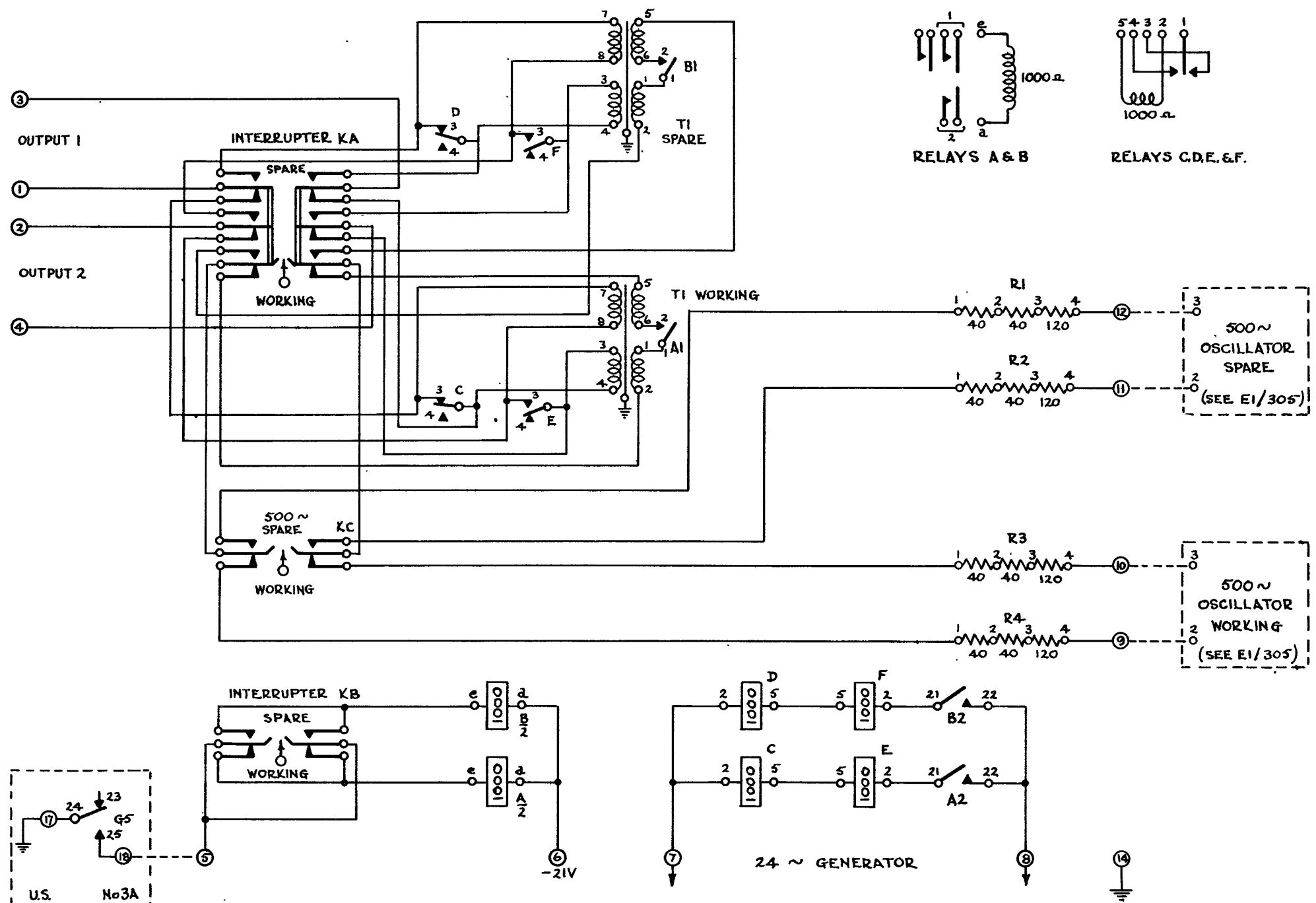
SILENT LT-

LT+ HT-

NOISY LT-  
 2000 4000 8000 16000

E1/306

REPEATER TELEPHONE 8 CCT MKI - UNIT SIGNALLING No 3A

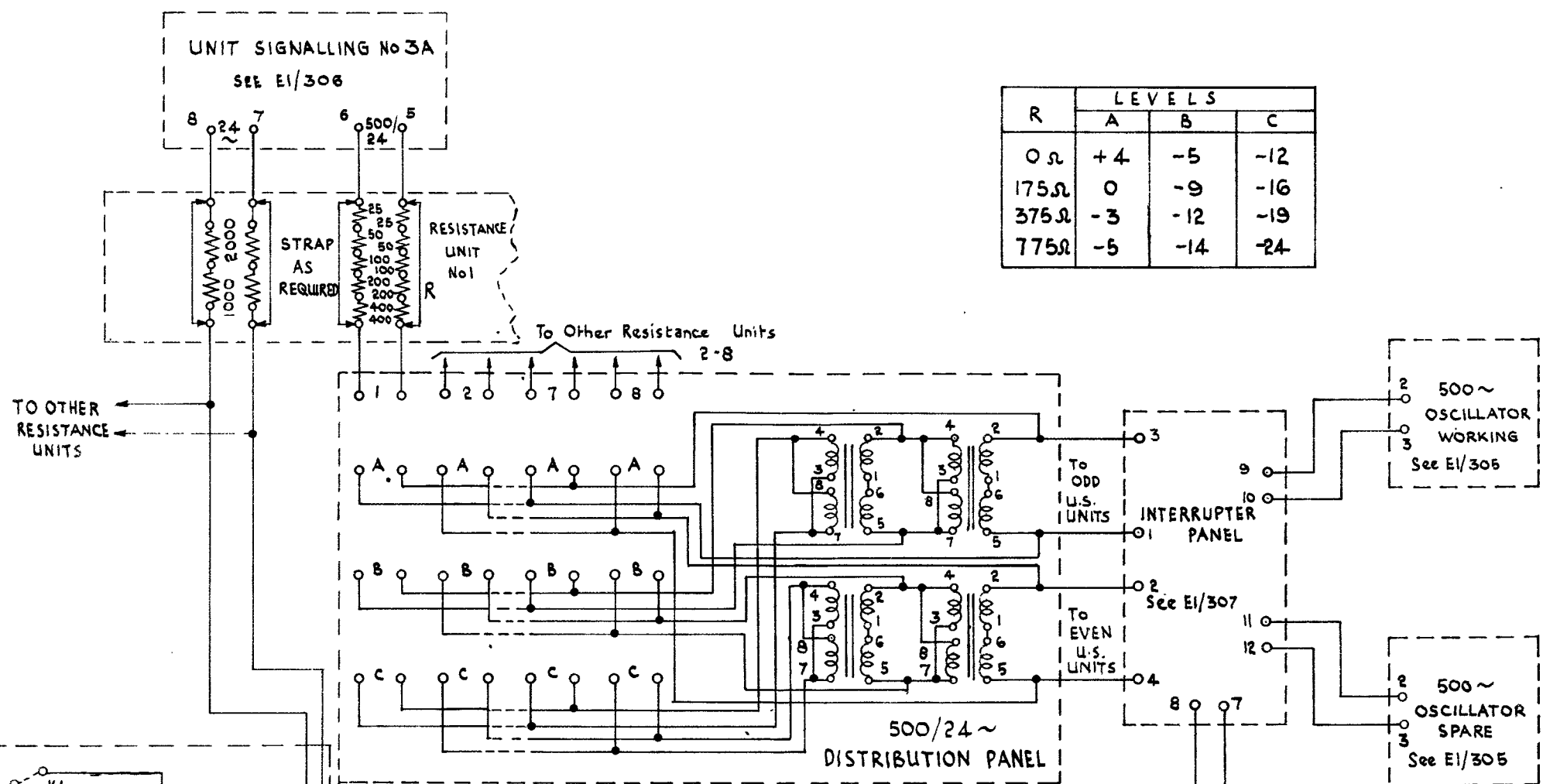


NOTE :- KA, KB & KC COUPLED

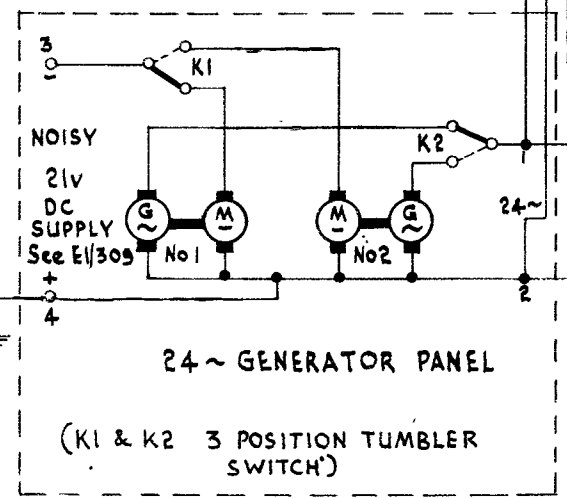
E1/307

REPEATER TELEPHONE 8 CCT. MK I

INTERRUPTER PANEL

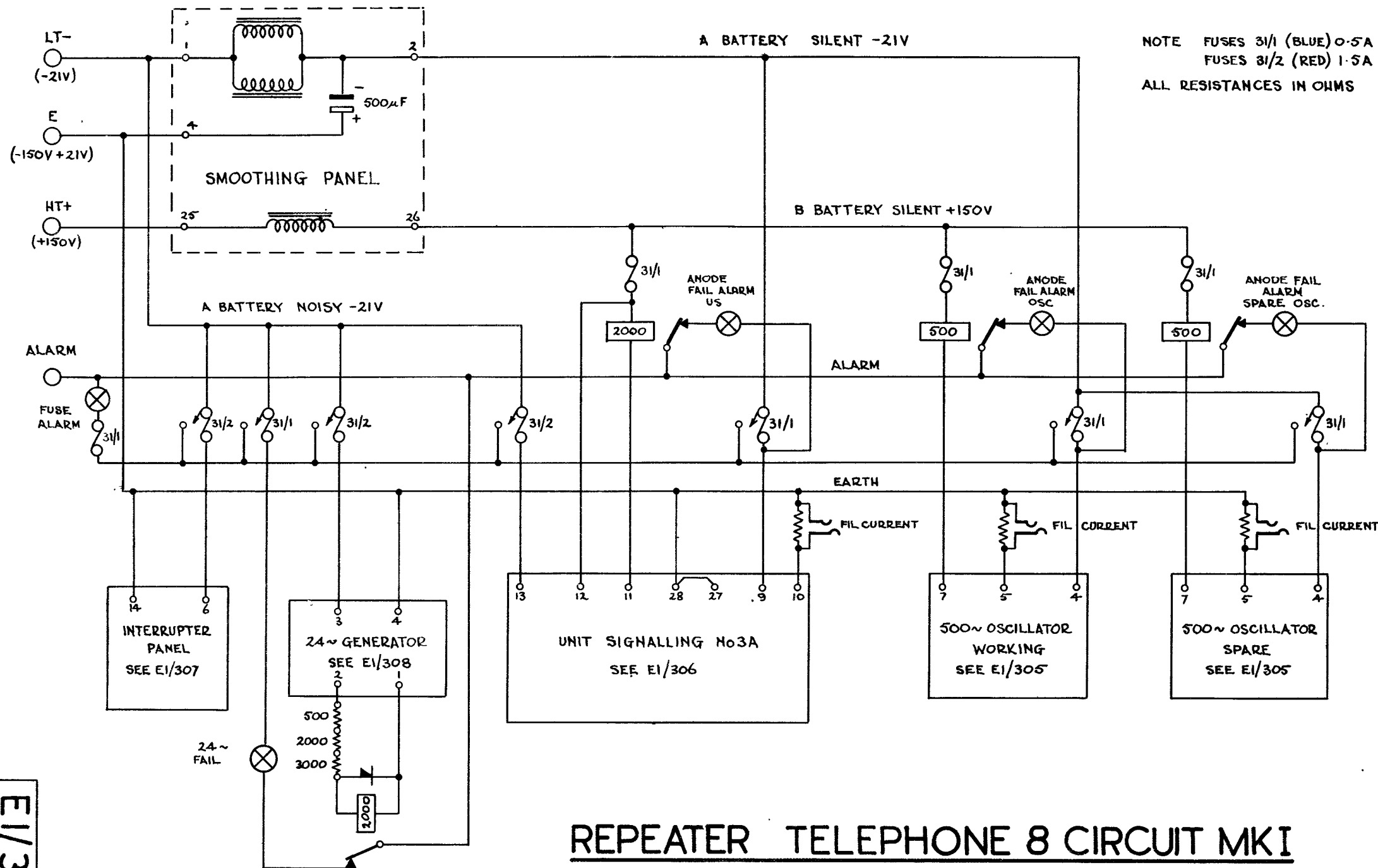


R	LEVELS		
	A	B	C
0 Ω	+4	-5	-12
175 Ω	0	-9	-16
375 Ω	-3	-12	-19
775 Ω	-5	-14	-24



**REPEATER TELEPHONE 8 CCT MK I**  
**500 ~ DISTRIBUTION**

E1/308

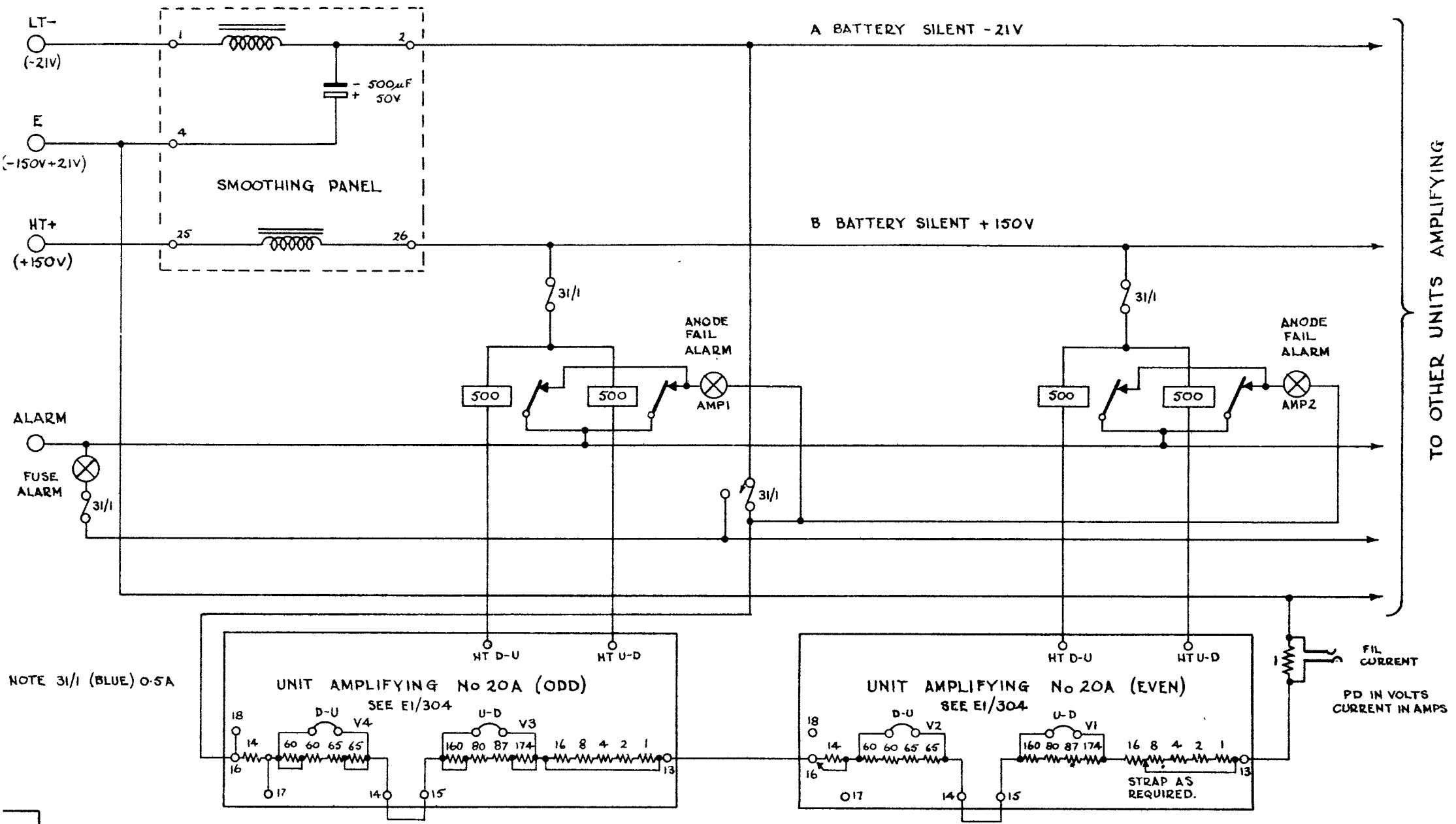


NOTE FUSES 31/1 (BLUE) 0.5A  
 FUSES 31/2 (RED) 1.5A  
 ALL RESISTANCES IN OHMS

**REPEATER TELEPHONE 8 CIRCUIT MK I**  
**SIGNALLING BAY - SUPPLY & ALARMS**

EI/309





E1/310

REPEATER TELEPHONE 8 CCT MKI  
AMPLIFIER BAY - SUPPLY & ALARMS

45073/P L.H. 19 45

### SCHEMATIC OF SINGLE AMPLIFIER

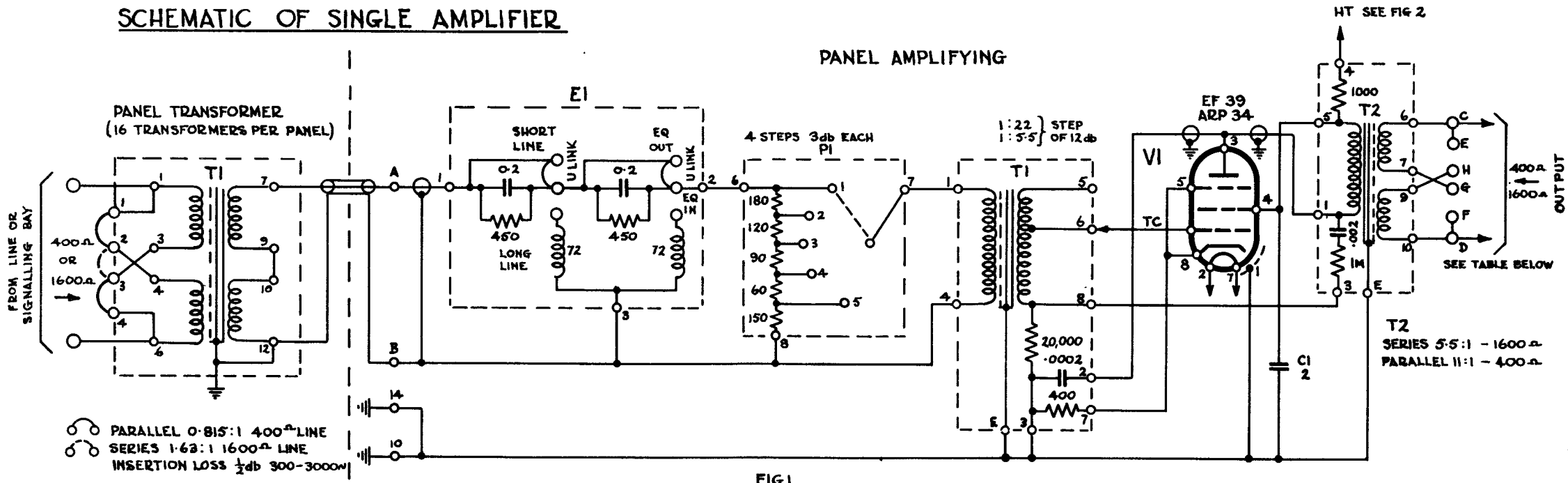


FIG 1

### LT & HT CONNECTIONS FOR 4 AMPLIFIERS

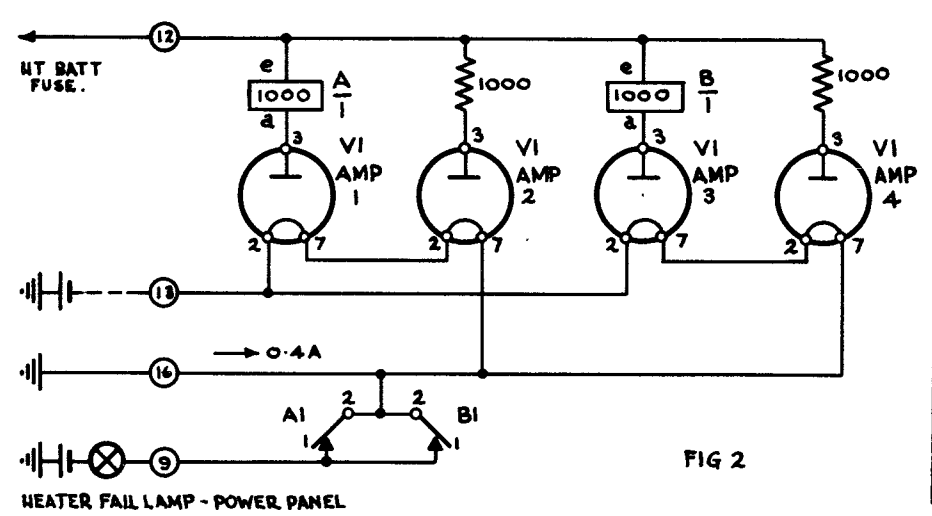
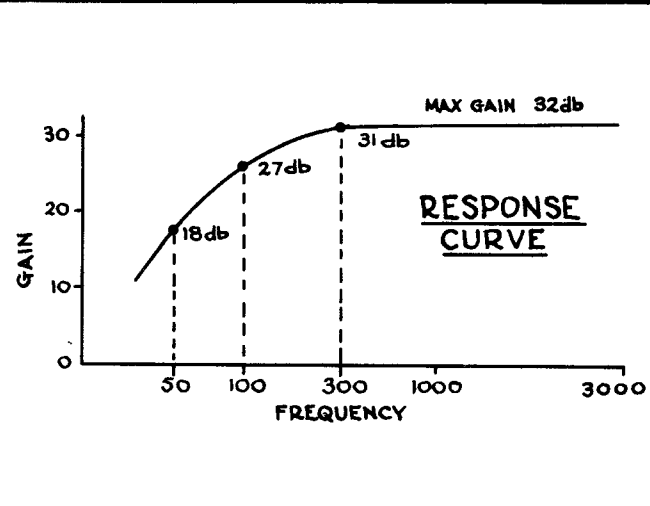


FIG 2



### EQUALISER E1

FREQUENCY	300	800	1500	3000
LOSS 1 SECTION	10-1db	6-2db	3-1db	1-1db
LOSS 2 SECTION	20-2db	12-5db	6-2db	2-1db

WITH ONE U LINK IN "EQ OUT" OTHER U LINK CAN ONLY BE PLACED IN "SHORT LINE"

AMPLIFIER CONNECTION								
AMP	A	B	C	D	E	F	G	H
1	1	2	17	18	25	28	27	26
2	3	4	19	20	29	32	31	30
3	5	6	21	22	33	36	35	34
4	7	8	23	24	37	40	39	38

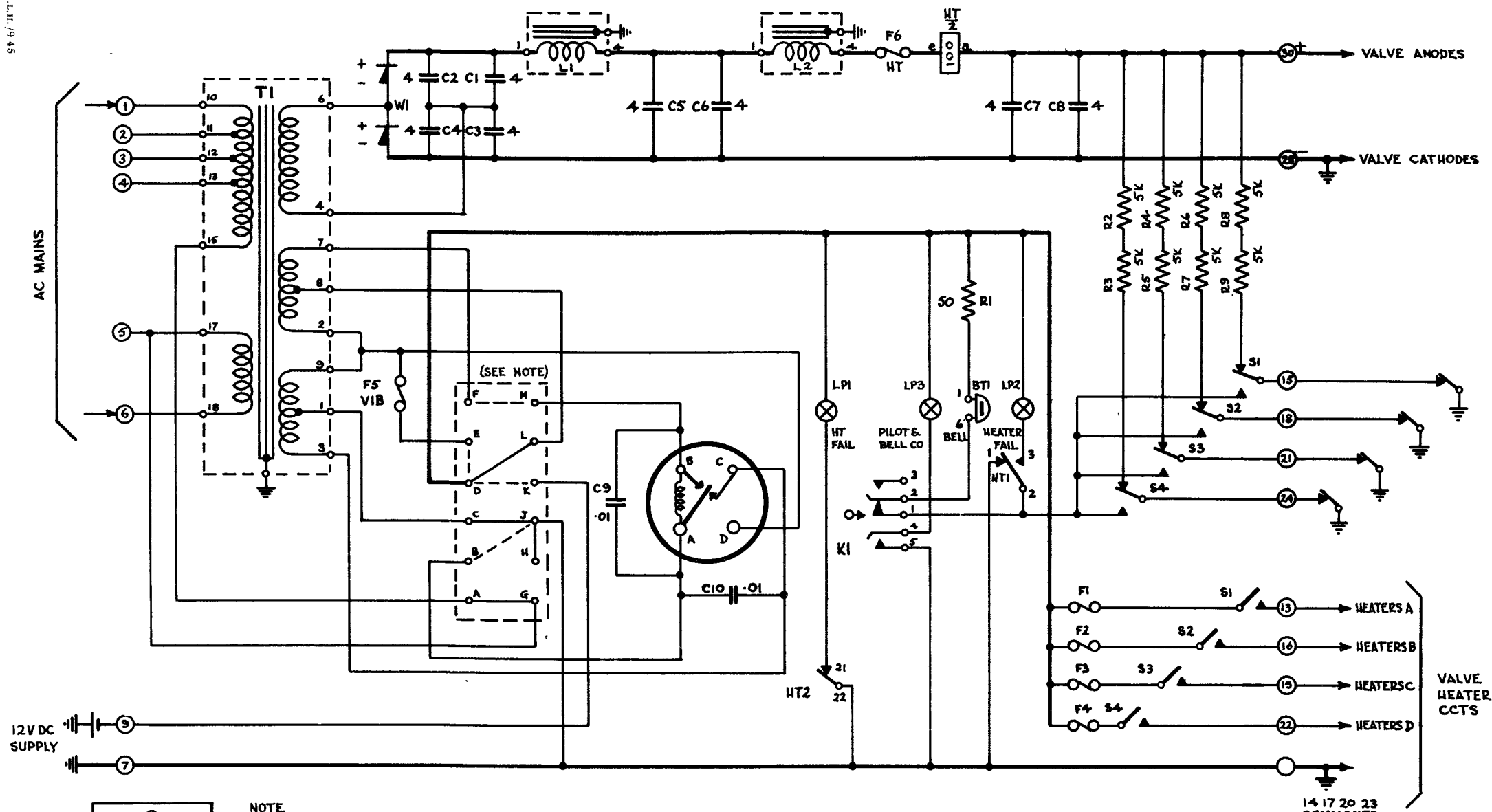
ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN μF  
 ALL INDUCTANCES IN mH

GAIN VARIABLE IN STEPS 3db OVER RANGE 8-32db.

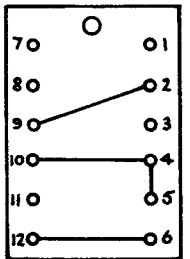
E1/313

# REPEATER TELEPHONE 8 CIRCUIT MK II - PANEL AMPLIFYING

15973/P.L.H./9 45



12V DC SUPPLY



NOTE  
 CONNECTIONS TO SOCKET MADE BY PLUG SHOWN THUS  
 ——— AC  
 - - - DC

ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu$ F  
 S1-S4 SHOWN IN THE 'SWITCHED OFF' POSITION.

# REPEATER TELEPHONE 8 CIRCUIT MARK II

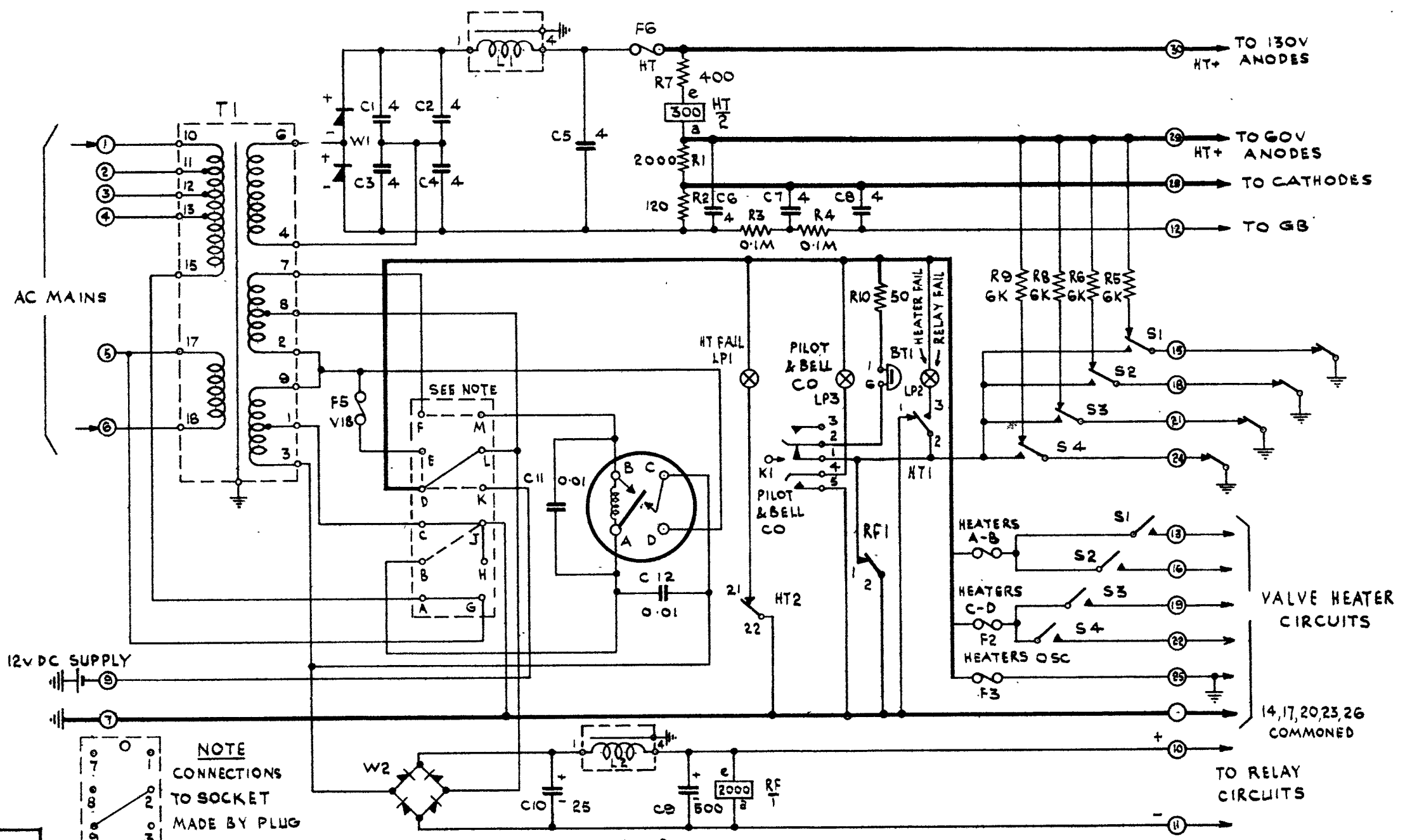
## AMPLIFIER RACK - POWER SUPPLY

VALVE HEATER CCTS

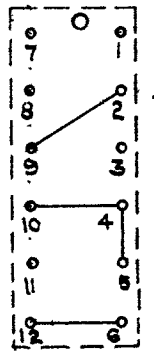
14 17 20 23 COMMONED

EI/314

INSIDE VIEW OF PLUG.



**NOTE**  
 CONNECTIONS  
 TO SOCKET  
 MADE BY PLUG  
 SHOWN THUS  
 ——— AC  
 - - - DC



S1-S4 SHOWN WITH HANDLE UP

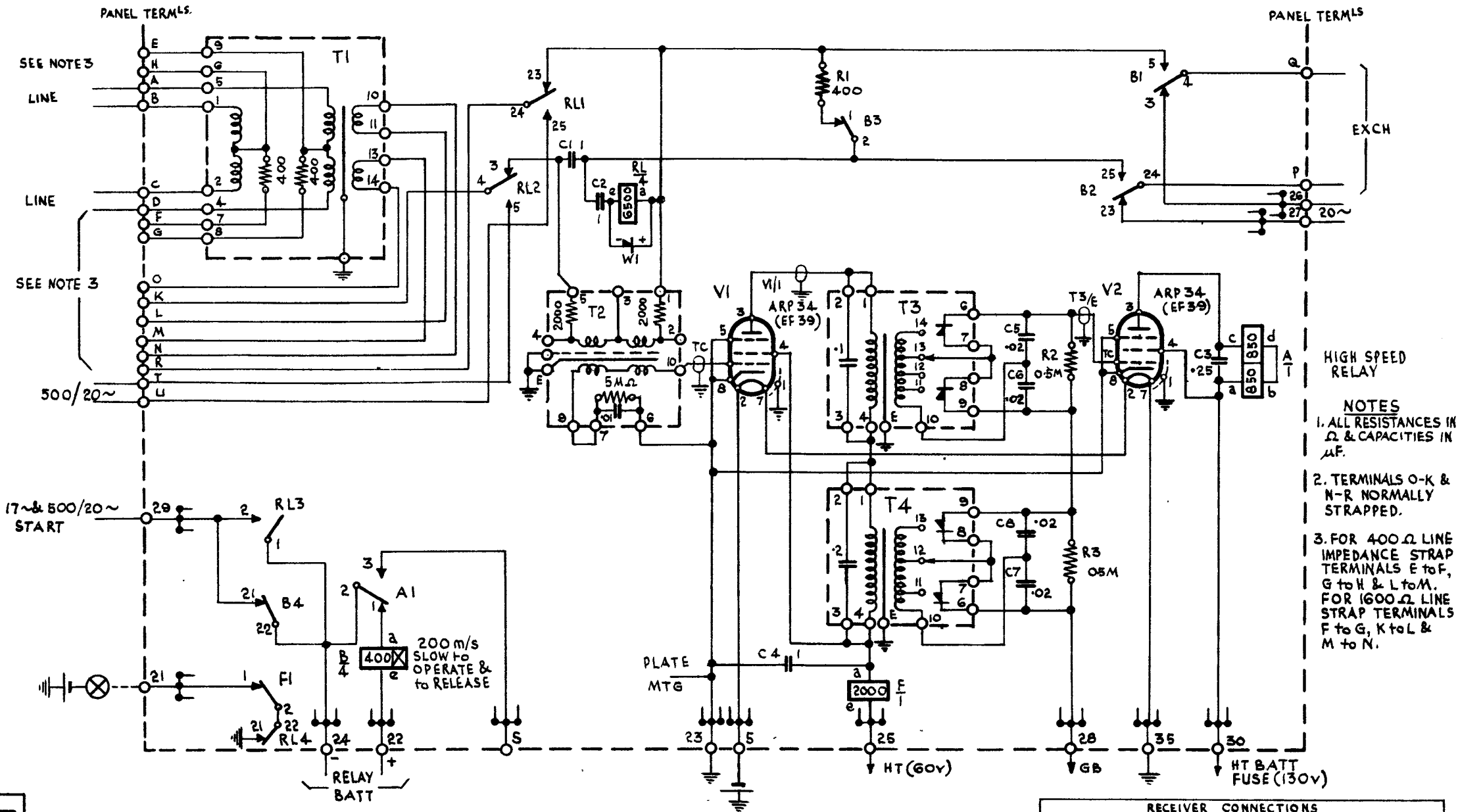
# REPEATERS TELEPHONE 8 CIRCUIT MKII SIGNALLING RACK - POWER SUPPLY

E1/315

INSIDE VIEW OF  
 PLUG.

IAUG 45, SW33.  
 AMENDED

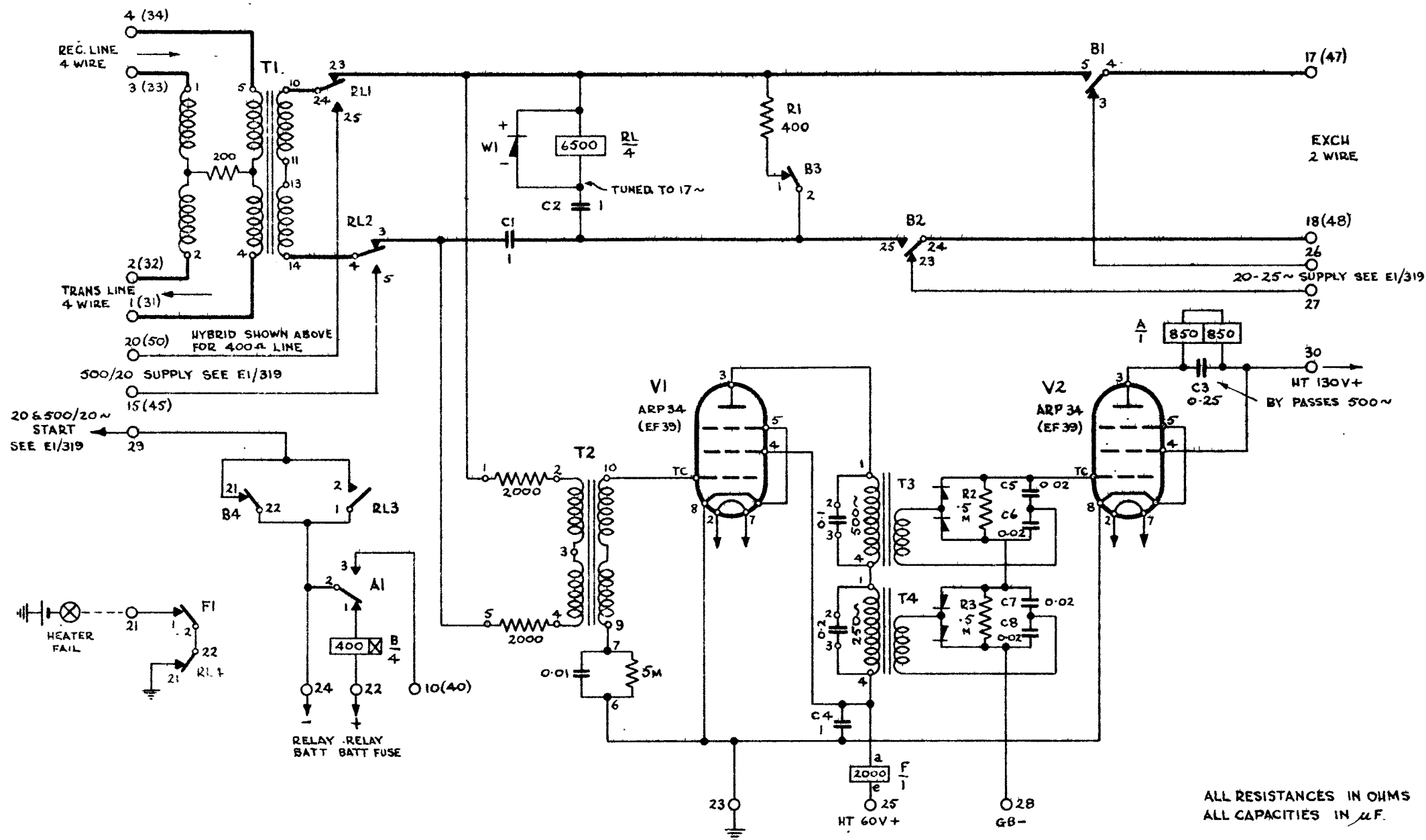
15973/P.L.H./8.45.



- NOTES**
1. ALL RESISTANCES IN  $\Omega$  & CAPACITIES IN  $\mu F$ .
  2. TERMINALS O-K & N-R NORMALLY STRAPPED.
  3. FOR 400  $\Omega$  LINE IMPEDANCE STRAP TERMINALS E to F, G to H & L to M. FOR 1600  $\Omega$  LINE STRAP TERMINALS F to G, K to L & M to N.

**REPEATER TELEPHONE 8 CIRCUIT MKII**  
**SIGNALLING PANEL (SCHEMATIC) One signalling unit only shown.**

E1/316

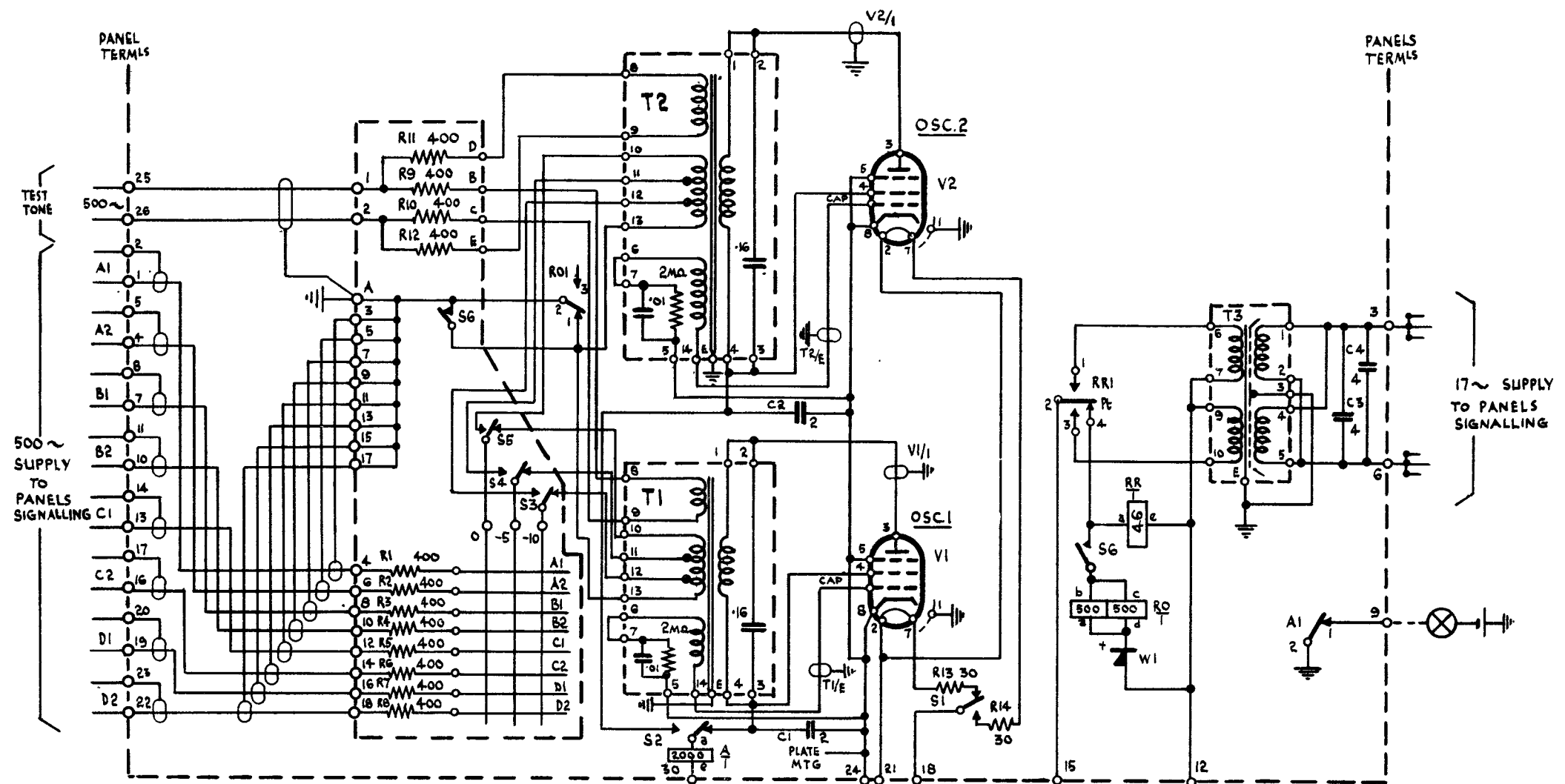


**REPEATER TELEPHONE 8 CIRCUIT MK II**  
**HYBRID & SIGNALLING PANEL SCHEMATIC SIMPLIFIED**

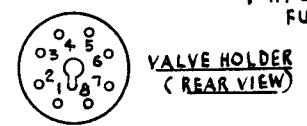
E1/317

IAWG 45, 3 WFS.  
 AMENDED

15973/P L.H./9/45



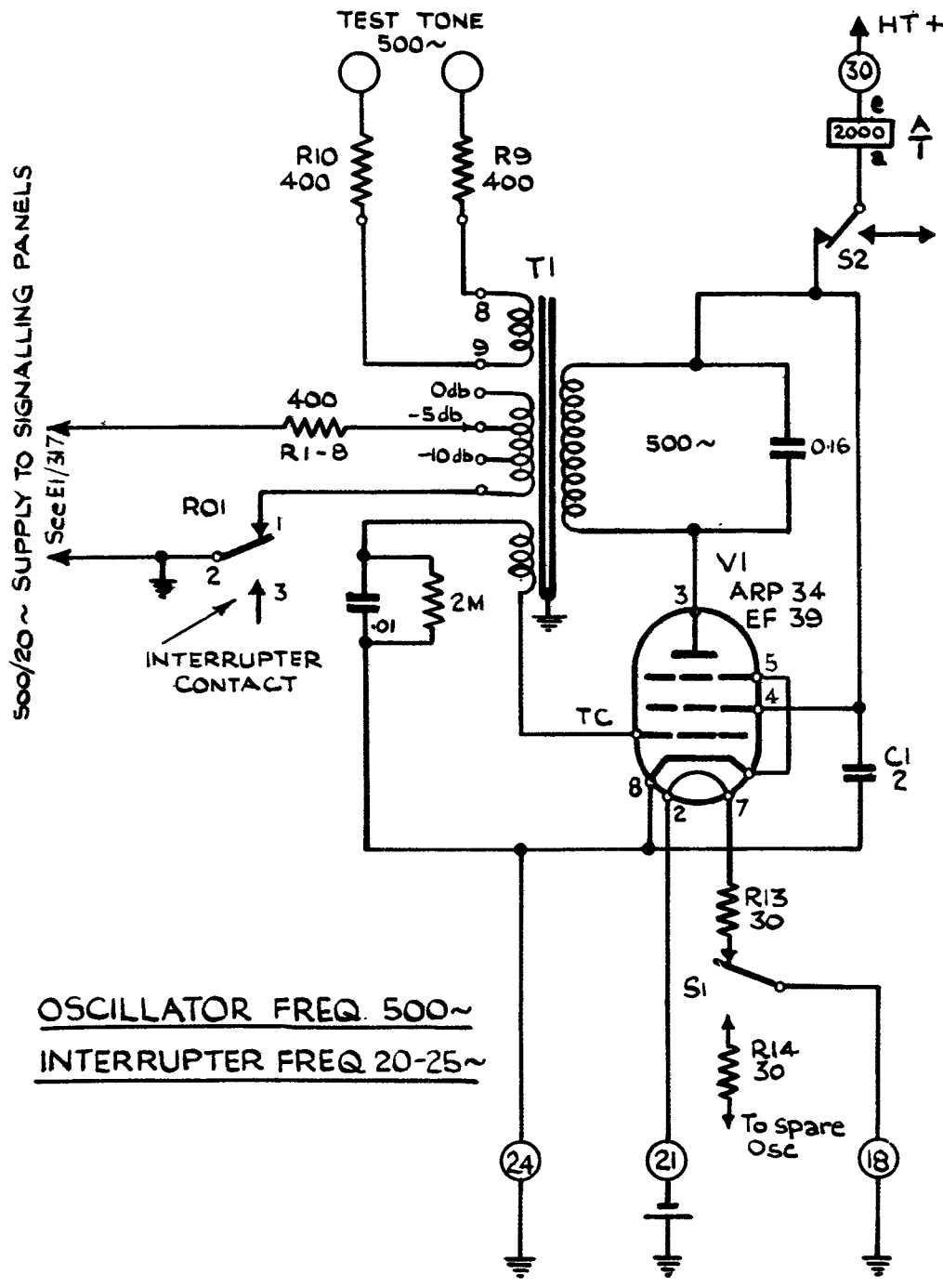
- NOTES:**
1. S1-S5 ARE GANGED & SHOWN IN POSITION MARKED "OSC.1"
  2. S6 IS SHOWN WITH HANDLE UP
- ALL CAPACITIES IN  $\mu$ F UNLESS OTHERWISE STATED
- OSCILLATOR FREQUENCY 500~.
- INTERRUPTER FREQUENCY 20-25~.



E1/318

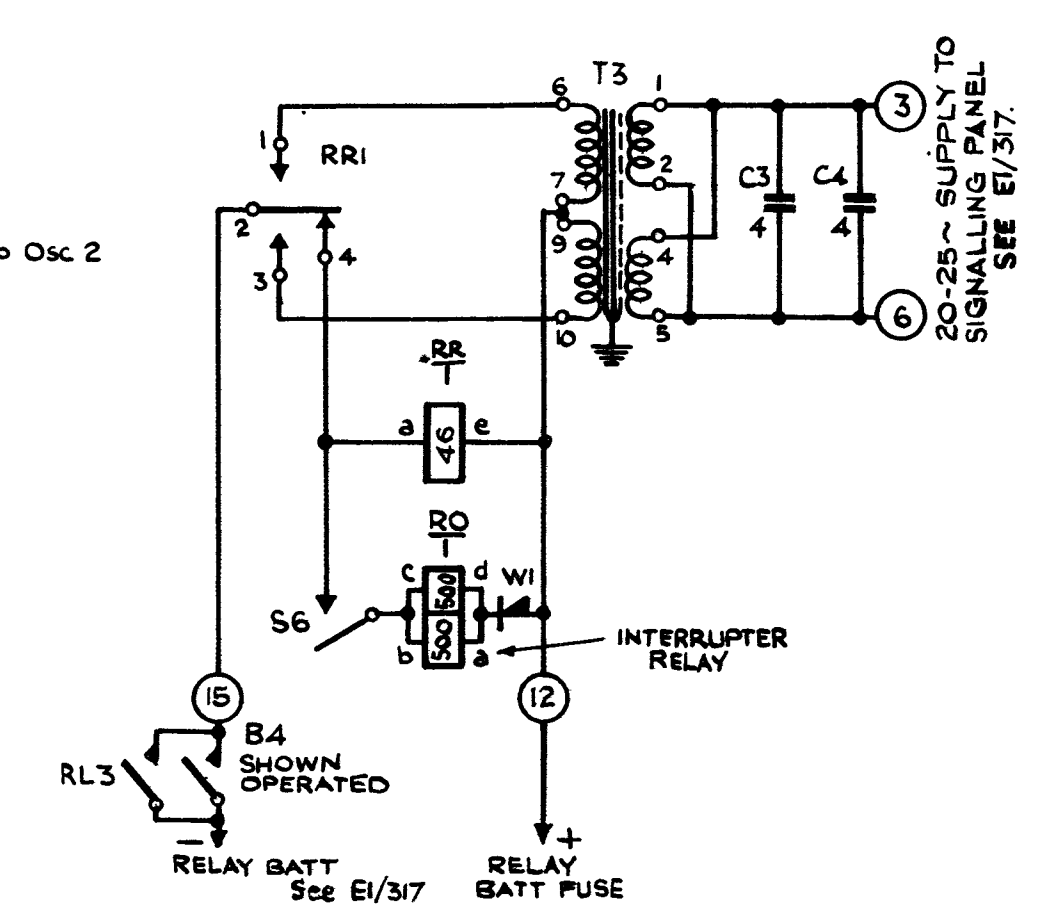
# REPEATER TELEPHONE 8 CIRCUIT MKII OSCILLATOR - SCHEMATIC

LAUG 45. 3 WTS.  
 AMENDED  
 15973 P. 1 R. 9.45.



500/20 ~ SUPPLY TO SIGNALLING PANELS  
 See E1/317

OSCILLATOR FREQ. 500~  
INTERRUPTER FREQ. 20-25~



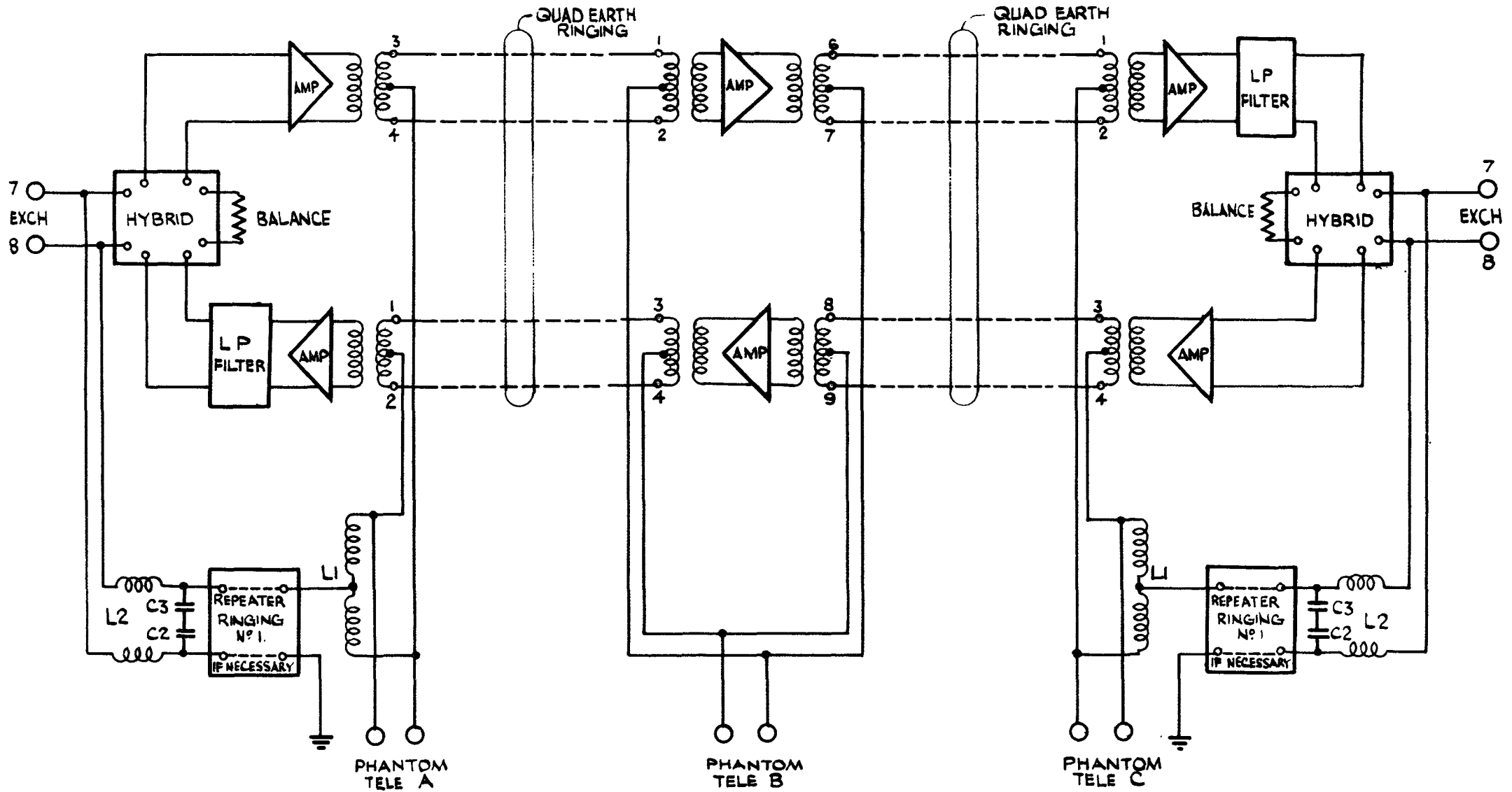
20-25 ~ SUPPLY TO  
 SIGNALLING PANEL  
 SEE E1/317.

NOTE ALL CAPACITIES IN  $\mu$ F & ALL RESISTANCES IN OHMS.

**REPEATER TELEPHONE 8 CIRCUIT MK II.**  
**Interrupter Panel Schematic Simplified.**  
(Only one oscillator shown.)

**E1/319**





2 CIRCUIT REPEATER  
2-4 WIRE

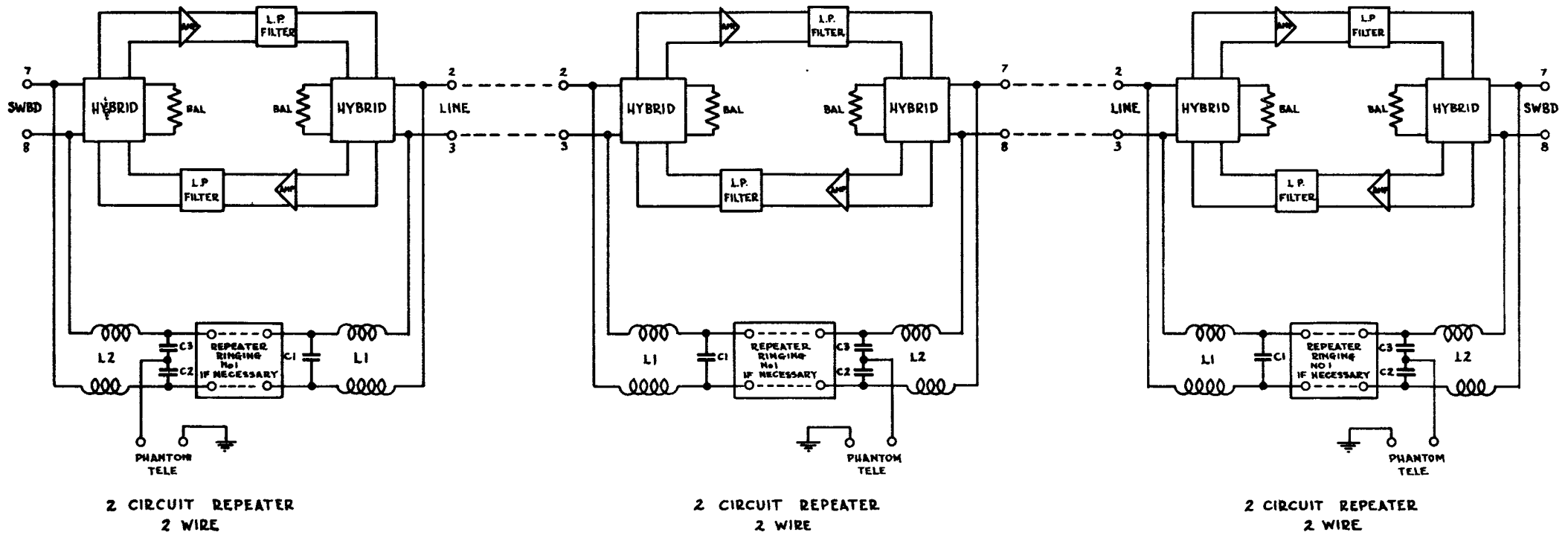
2 CIRCUIT REPEATER  
4 WIRE

2 CIRCUIT REPEATER  
2-4 WIRE

# REPEATER TELEPHONE 2 CIRCUIT SIGNALLING SYSTEM 4 WIRE WORKING

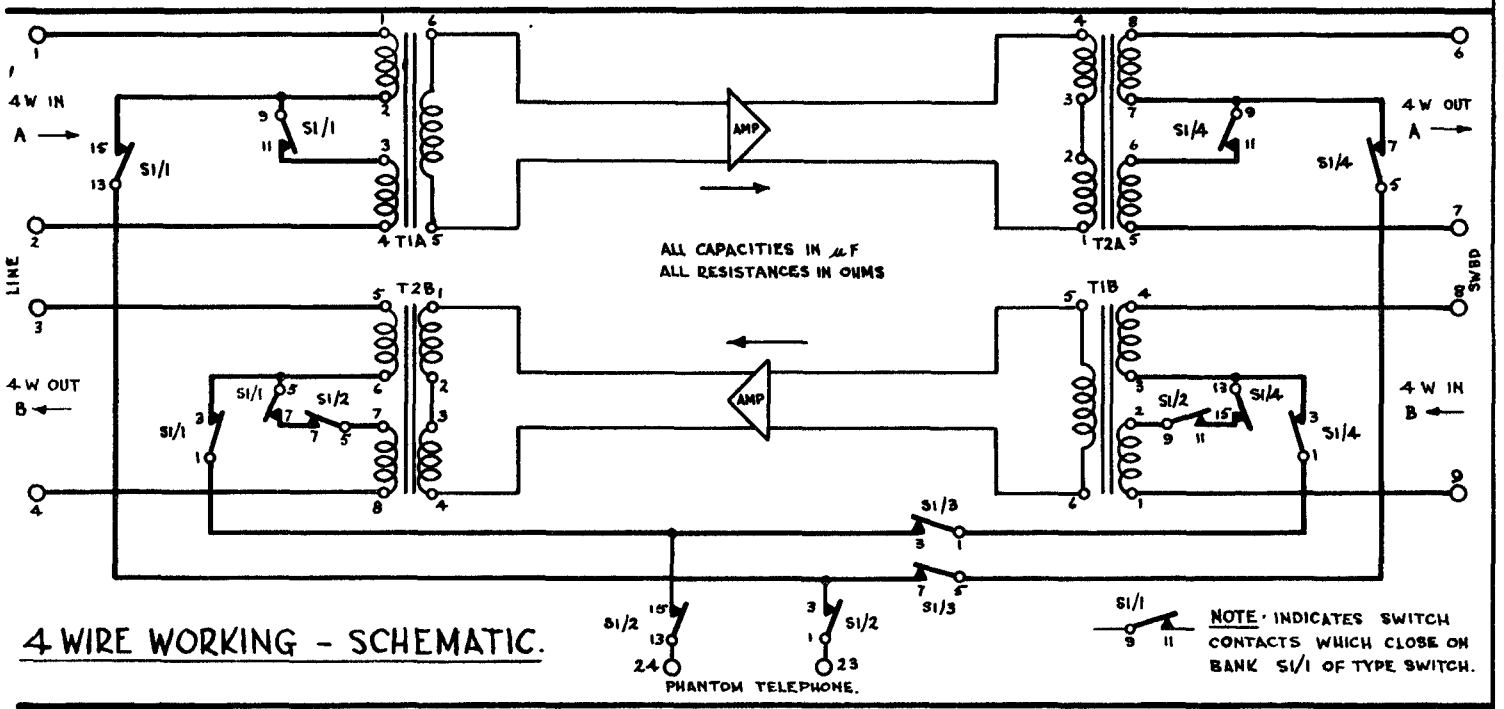
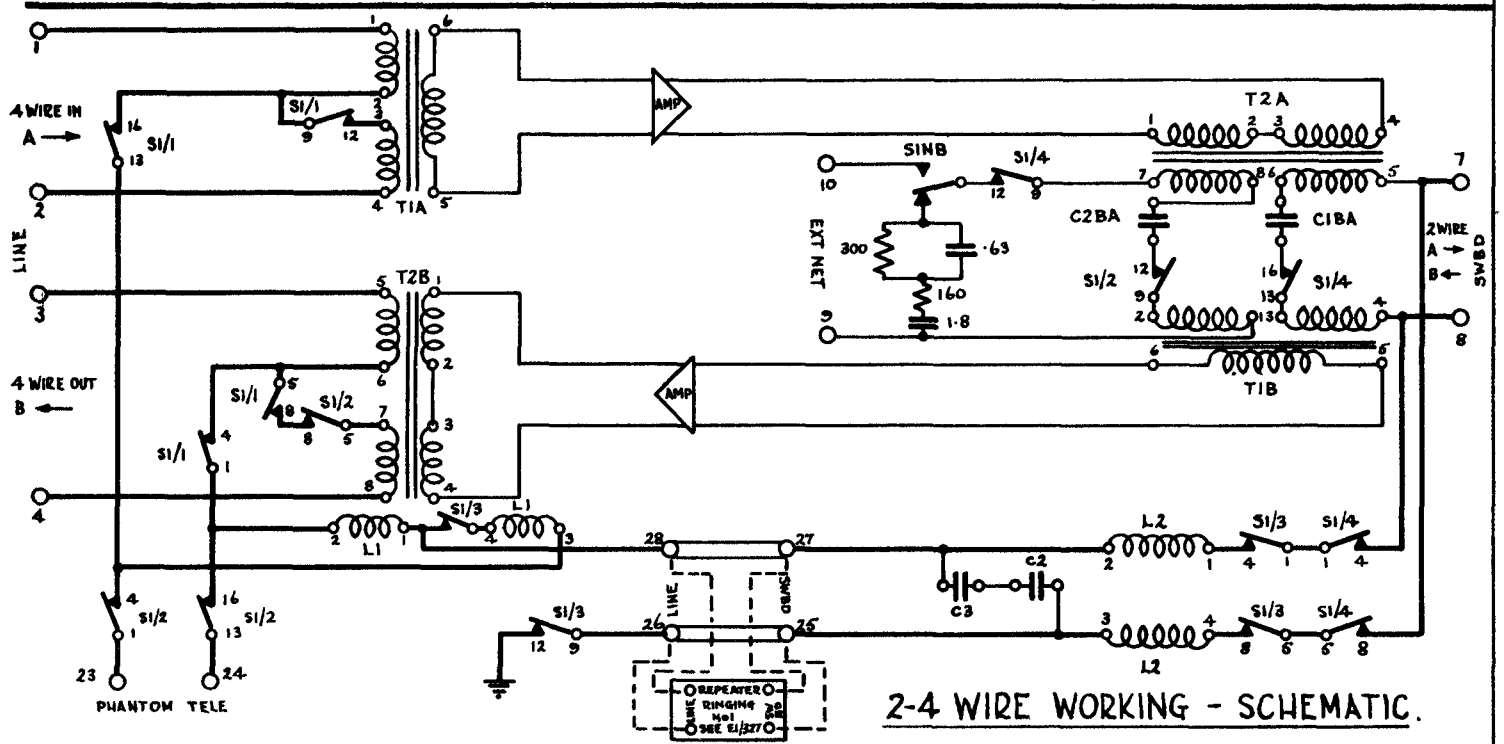
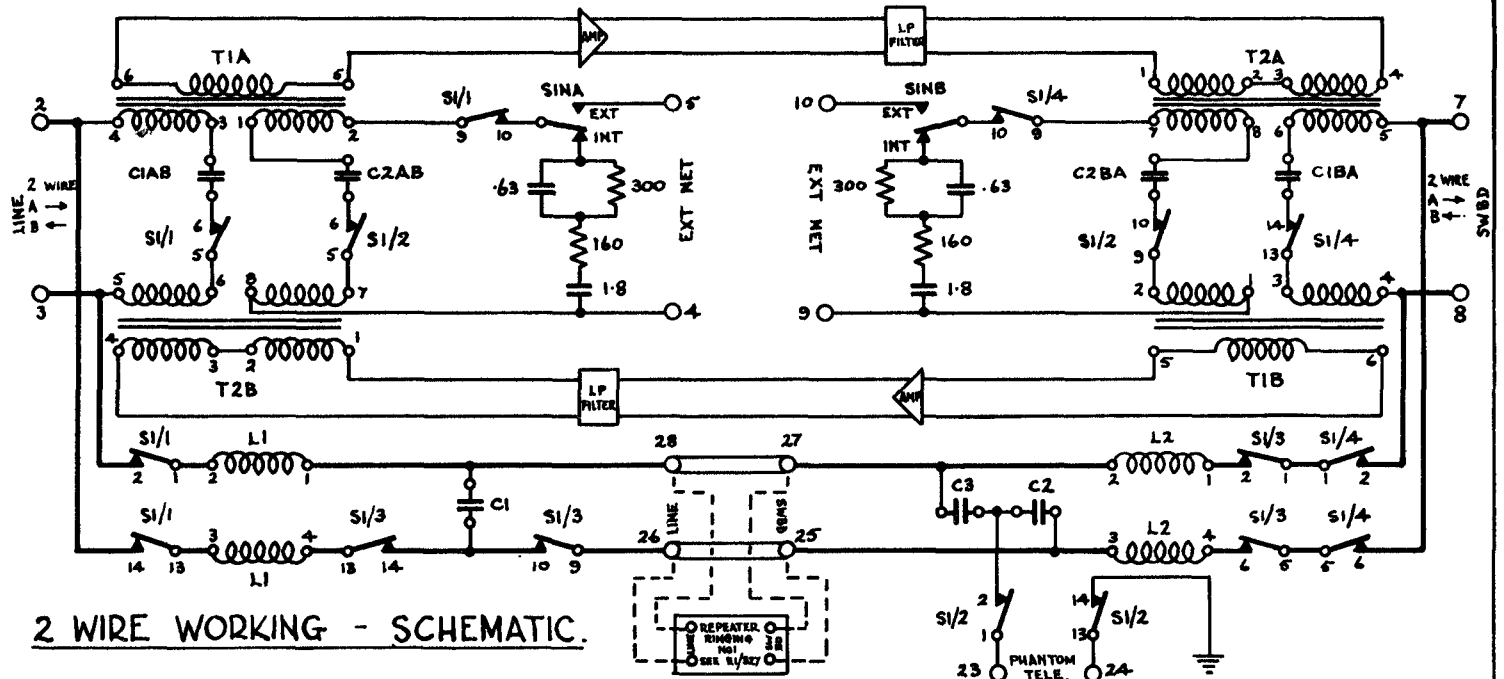
E1/321

NOTE - SPEECH IMPOSSIBLE OVER PHANTOM TELEPHONE  
 CIRCUIT IF REPEATER RINGING NO1 INCLUDED  
 IN CIRCUIT.



REPEATER TELEPHONE 2 CIRCUIT  
SIGNALLING SYSTEM — 2 wire working

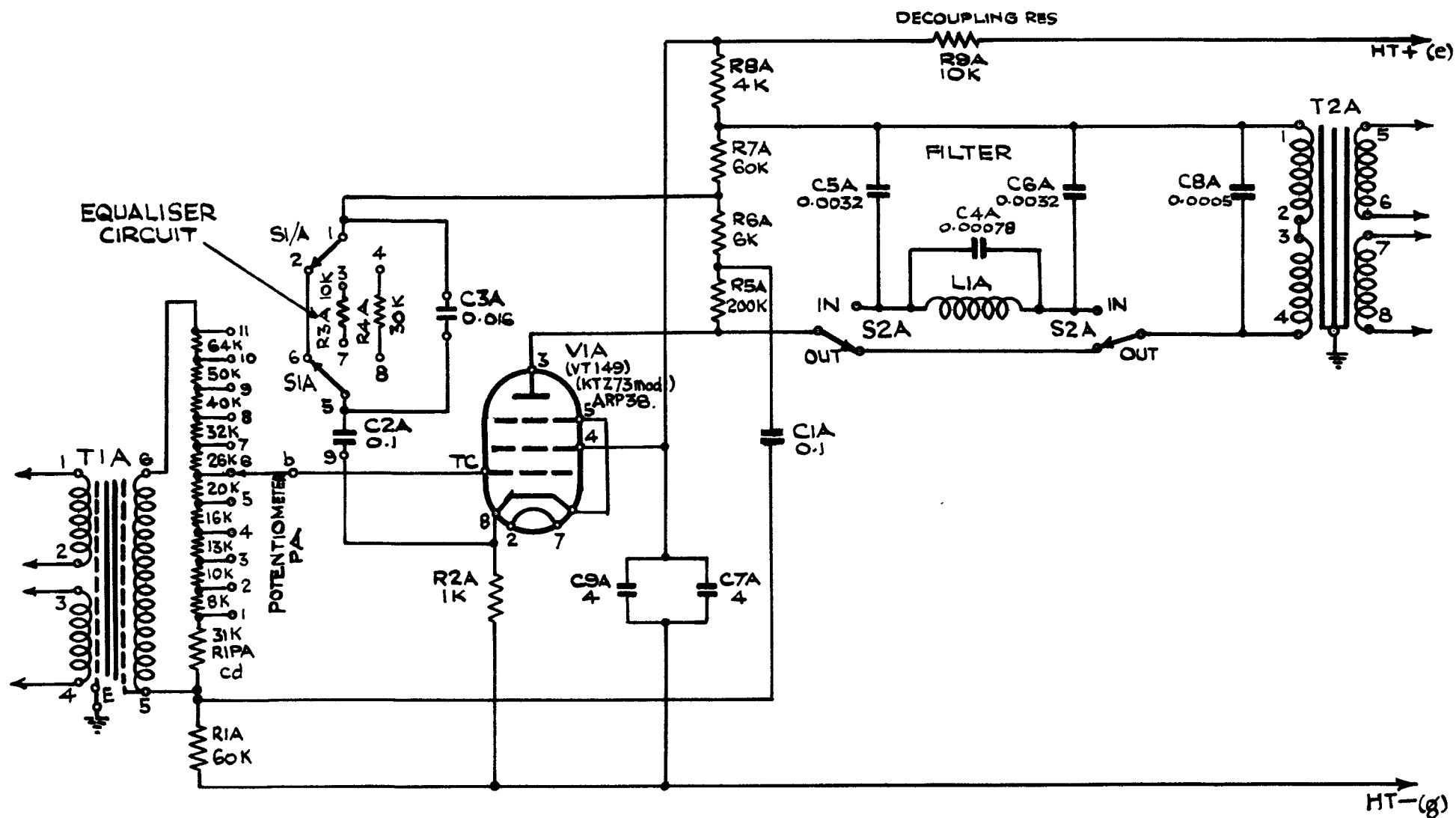
E1/322



# REPEATER TELEPHONE 2 CIRCUIT

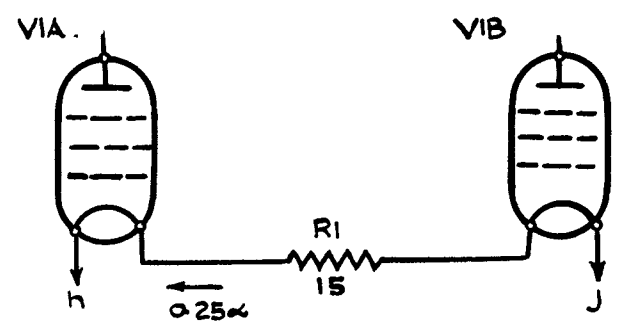
EI/323

14377/P.L.N./2.45



## REPEATER TELEPHONE 2 CIRCUIT AMPLIFIER      Schematic Simplified.

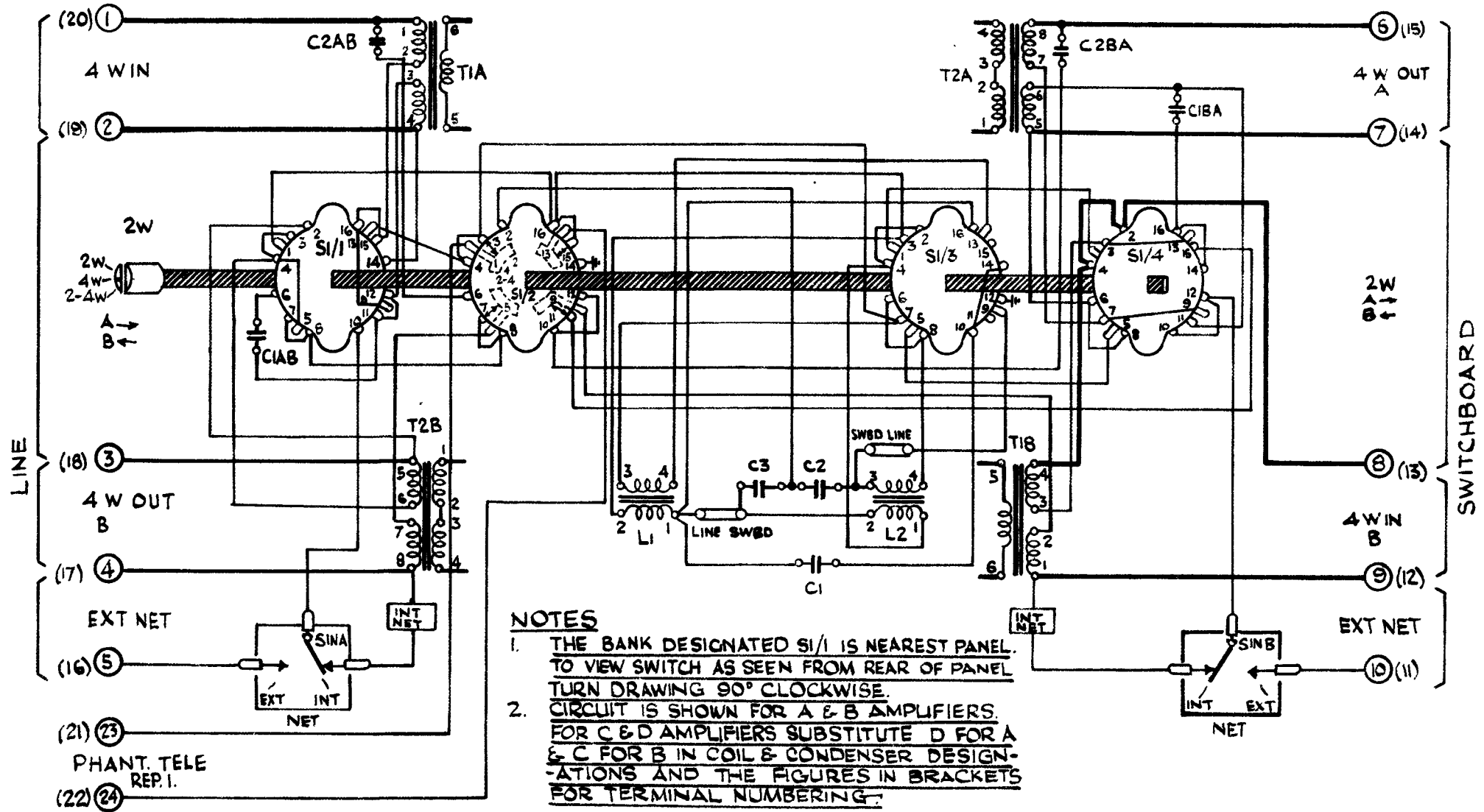
NOTE. ALL RESISTANCES IN OHMS &  
ALL CAPACITIES IN  $\mu$ F<sup>s</sup>



E1/324

SEE E1/326

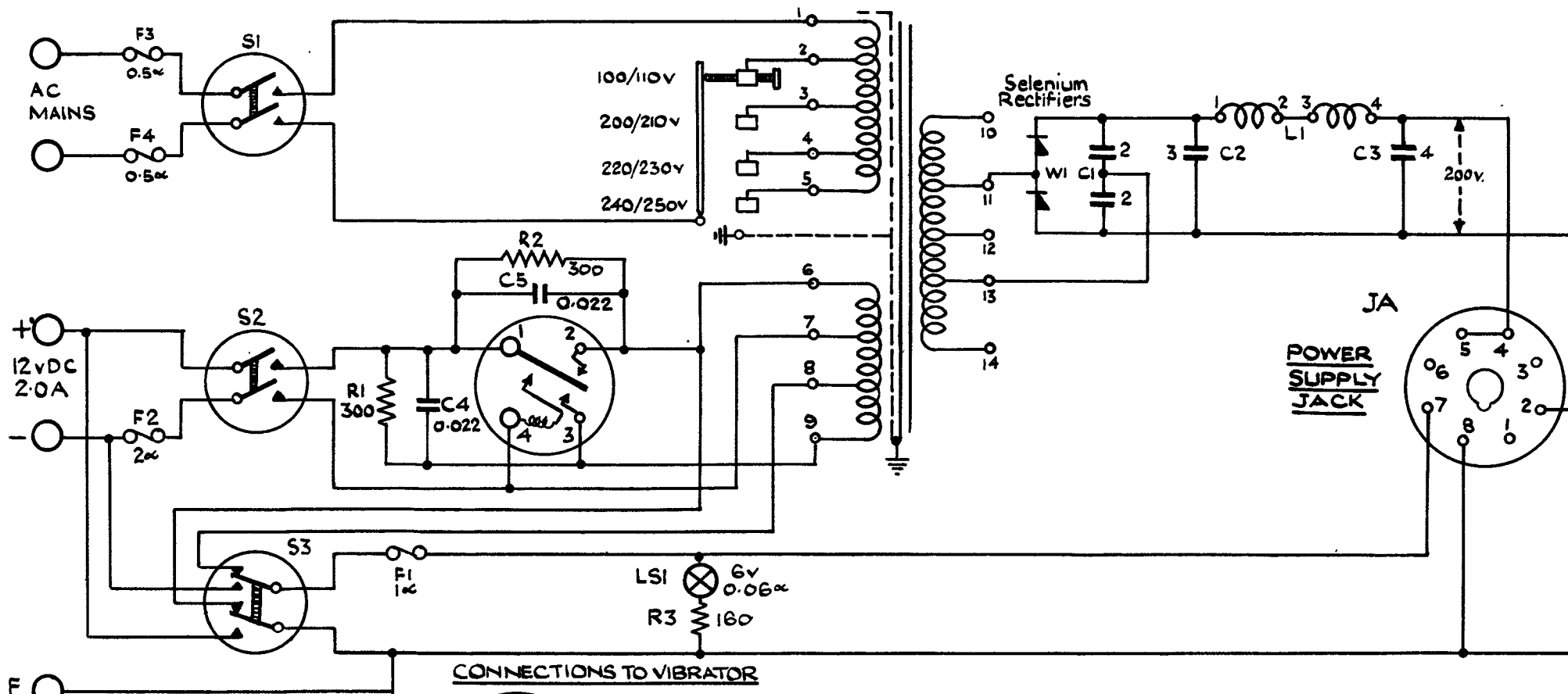
(14877) Wt. T 20817/VP 2076/M27810. 125 2/45. P.A.M. & Co. LTD. G.943.



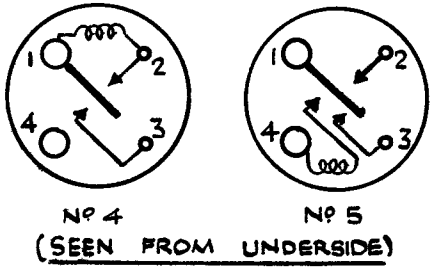
**REPEATER TELEPHONE 2 CIRCUIT.**  
Pictorial Schematic      Switching Circuits.  
A & B Amplifiers shown in 4 - W Condition

E1/325

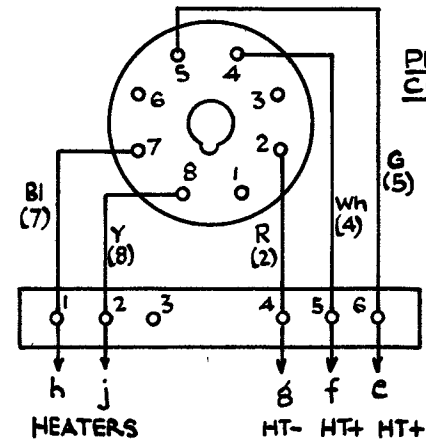
M 36646/VP. 2369. 6/45. 125/15 G.H.N. & S. 55/3



CONNECTIONS TO VIBRATOR



PLUG AND CORD CONNECTIONS TO JA

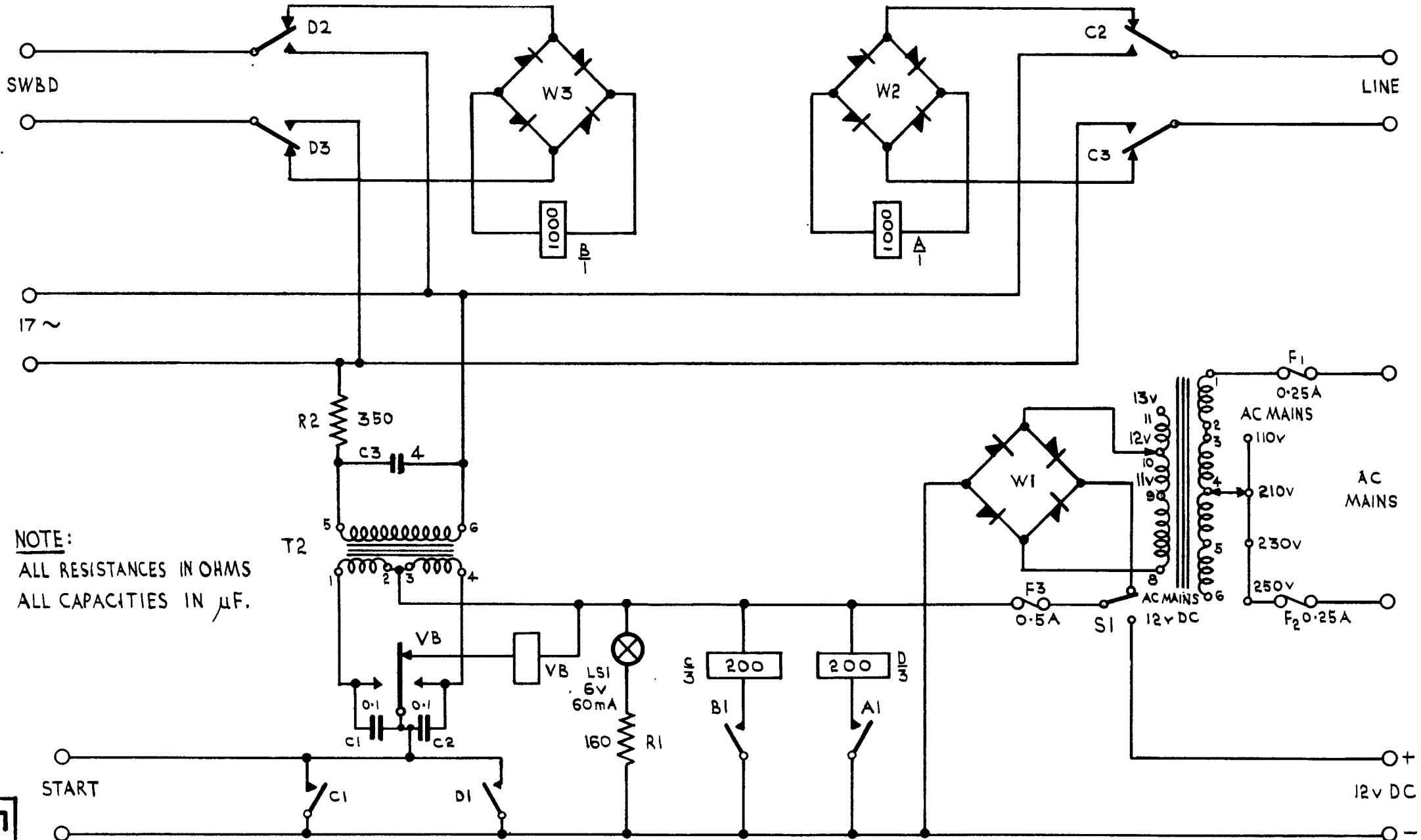


NOTE  
MAINS BATTERY SWITCH  
 (COIN SLOT OPERATED)  
3 POSITIONS  
 1. OFF  
 2. MAINS S1 OPERATES  
 3. BATTERY S2 & S3 OPERATES  
 ALL RESISTANCES IN OHMS &  
 ALL CAPACITIES IN  $\mu$ F'S

REPEATERS TELEPHONE 2 CIRCUIT  
POWER SUPPLY. Schematic Simplified.

E1/326

15973/P.L.H./A.45

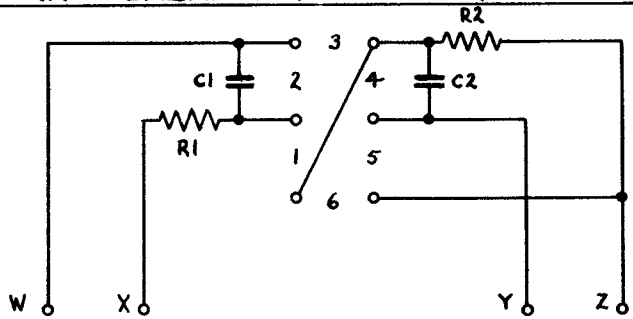


NOTE:  
 ALL RESISTANCES IN OHMS  
 ALL CAPACITIES IN  $\mu$ F.

E1/327

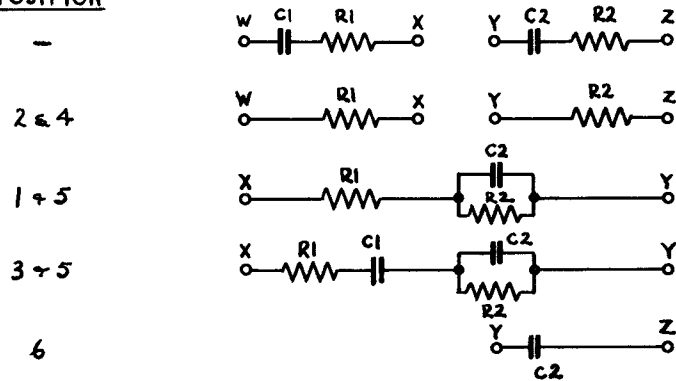
REPEATER TELEPHONE 2 CIRCUIT - REPEATER  
 RINGING No 1 - SCHEMATIC

### NETWORK BALANCING UNIVERSAL No2

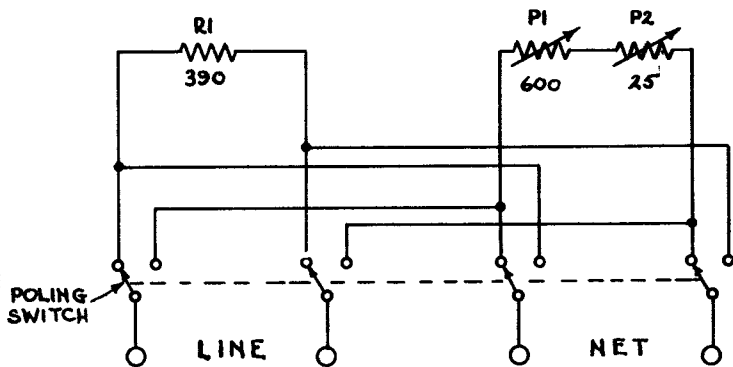


U - LINK  
POSITION

NETWORKS



### TESTER LINE BALANCING No2



NOTE :- THE COMPLETE EQUIPMENT CONSISTS OF TWO NETWORKS AND ONE TESTER.

TYPE OF LINE	4-(OR 3) ELEMENT NETWORK				2 ELEMENT NETWORK		RESIS. NETWORK
	R1 ohms	C1 $\mu$ F	R2 ohms	C2 $\mu$ F	R1 ohms	C1 $\mu$ F	R1 ohms.
QH. 70lb Cd-CU	720	1.4	530	1	800	0.5	930
O.H. 100lb COPPER	693	1.47	555	1.09	760	0.935	800
O.H. 150lb COPPER	655	2.75	474	1.82	720	1.15	750
O.H. 200lb COPPER	635	4.0	700	2.4	690	1.39	700
O.H. 300lb COPPER	622	-	1217	2.74	650	1.92	650
QH. 100lb G.I.	1020	0.41	868	0.11	1600	0.25	1760
QH. 150lb G.I.	900	0.64	811	0.1	1500	0.30	1500
D8 TWISTED	350	1.25	530	0.5	400	0.6	550
D8 SPACED 9"	1080	.3	1600	.2	1300	0.17	1600
FIELD QUAD, UNLOADED	160	1.8	300	0.63	280	0.66	300
FIELD QUAD, LOADED 88mH/MILE	-	-	-	-	-	-	1080
40lb. PCQT UNLOADED	280	1.5	400	0.8	300	.95	-
40lb. PCQT LOADED 88mH/2000y	-	-	-	-	-	-	1130
CARRIER QUAD TYPE 'P' LOADED 4.6 mH/440yds	628	1.25	150	1.2	-	-	400
7 PR V.I.R. UNLOADED	170	175	315	0.7	-	-	-

NOTES

1. ADJUST R1
2. ADJUST C2
3. ADJUST R2
4. ADJUST C1

## NETWORKS BALANCING & TESTING

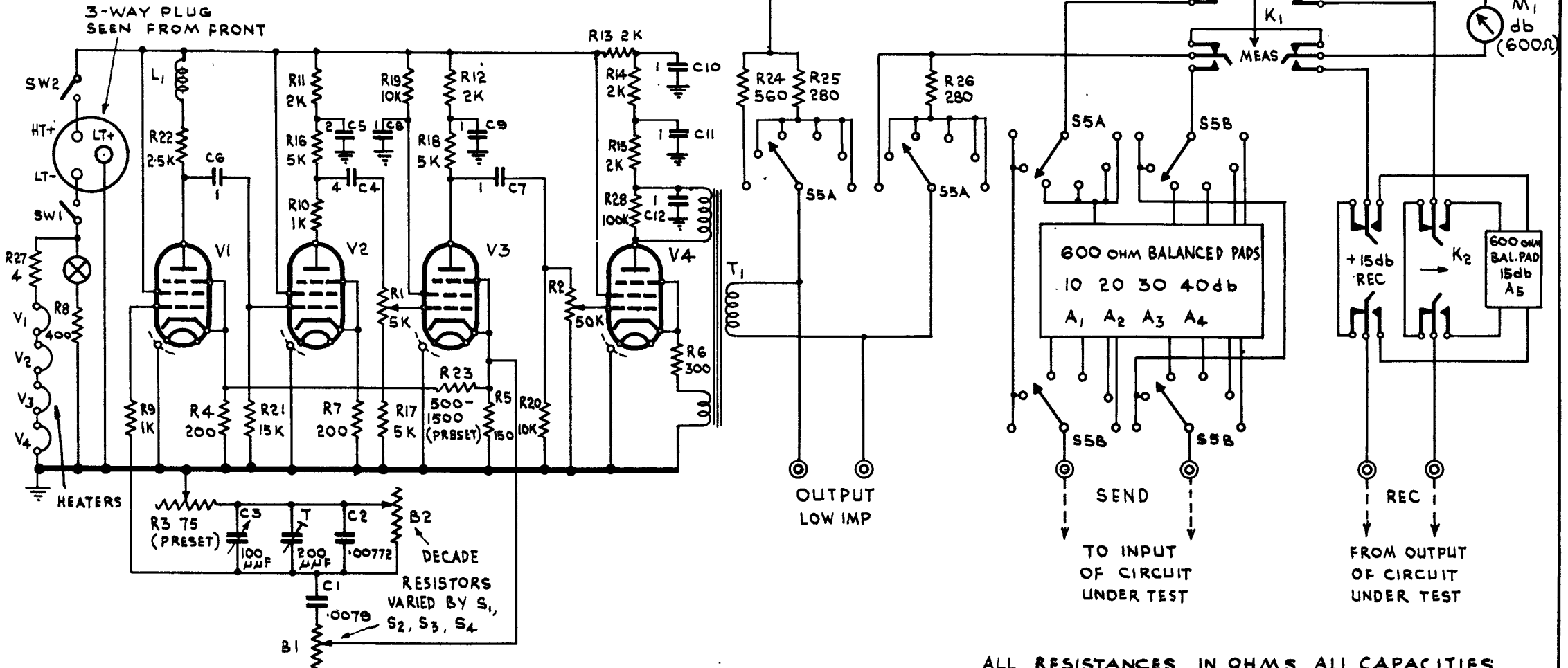
E1/328



OSCILLATOR CIRCUIT

OUTPUT STAGE

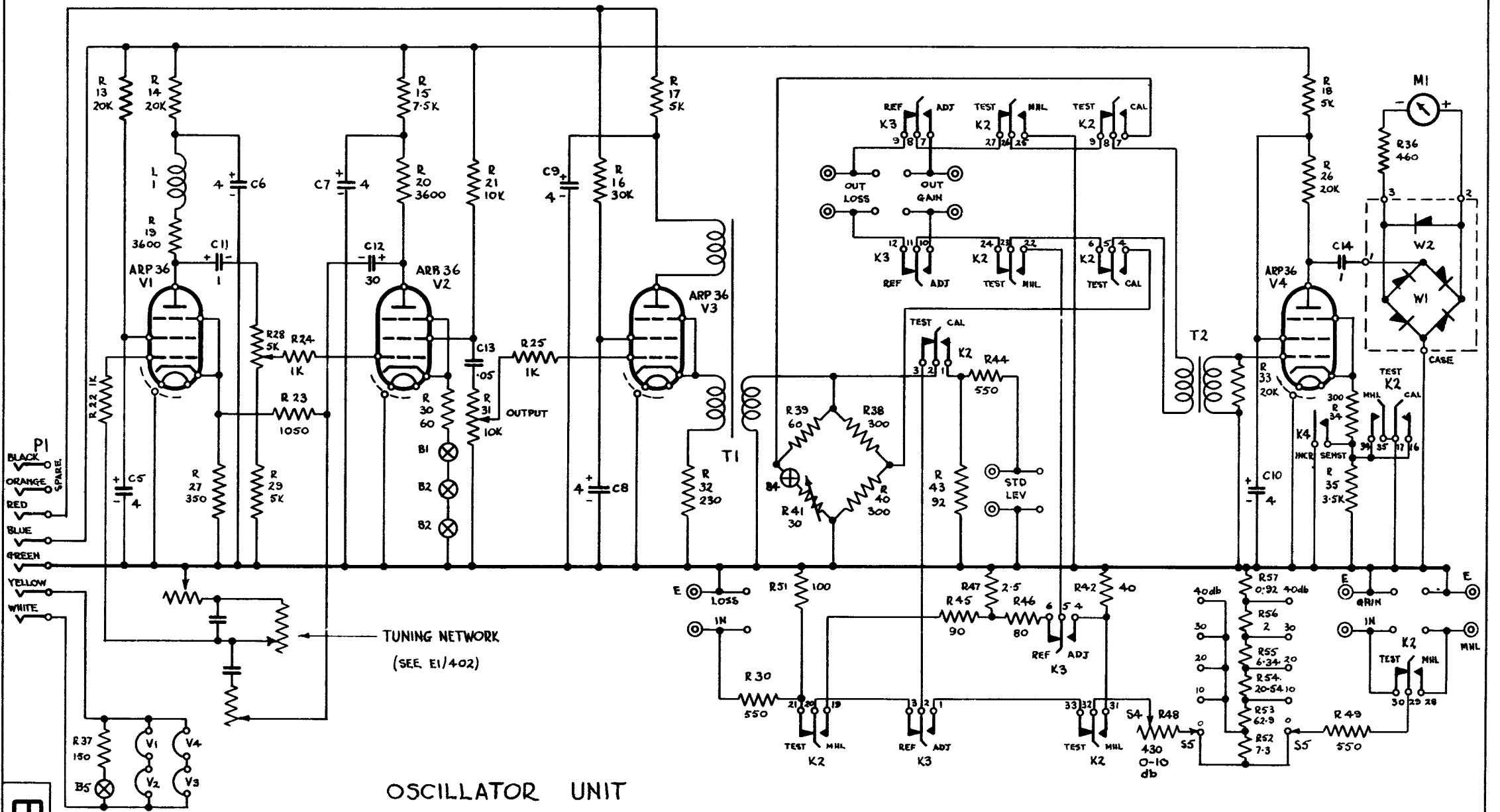
TRANSMISSION MEASURING SET



ALL RESISTANCES IN OHMS, ALL CAPACITIES  
 IN  $\mu$ F UNLESS OTHERWISE SHOWN.  
 ALL VALVES ARP II.

TESTER T.M.S. No I MK I

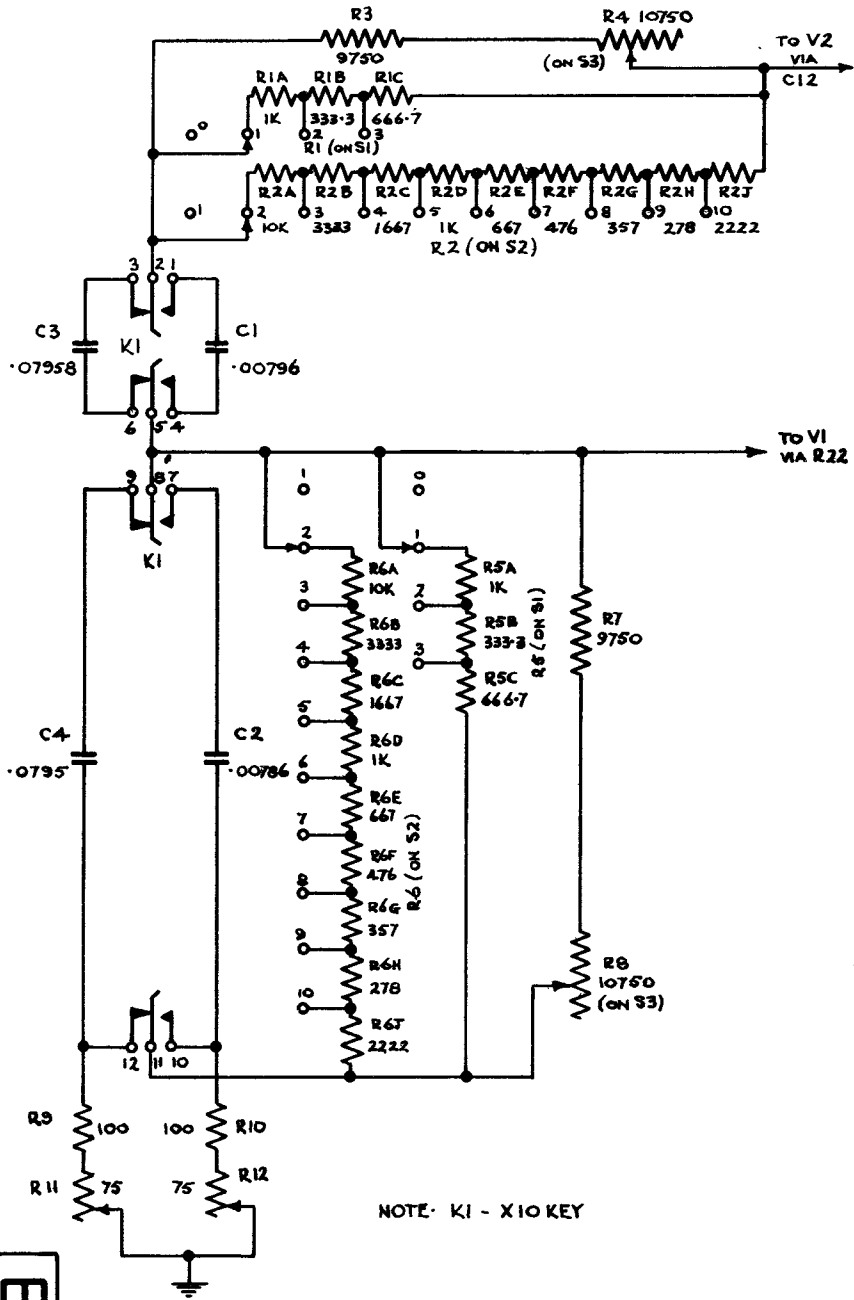
E1/400



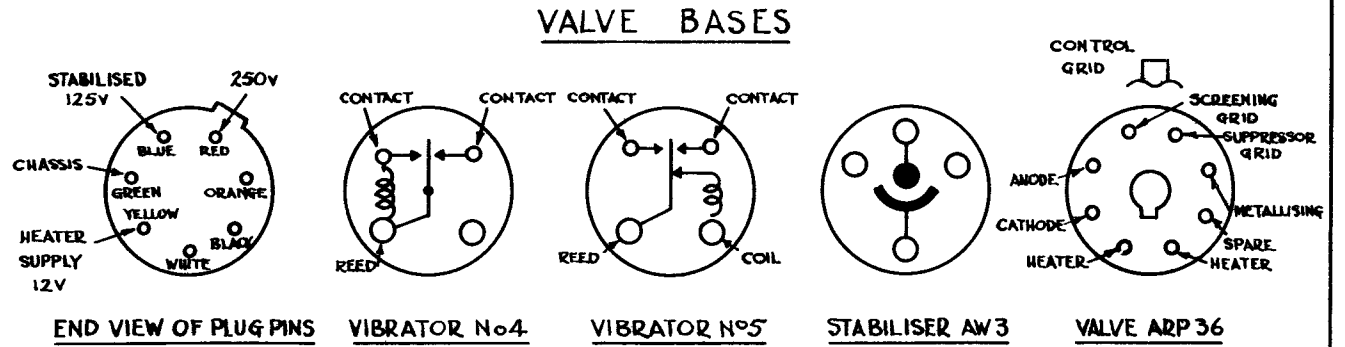
OSCILLATOR UNIT

# TESTER T.M.S. No. 1 MK II

E1/401



OSCILLATOR TUNING NETWORK



VALVE BASES

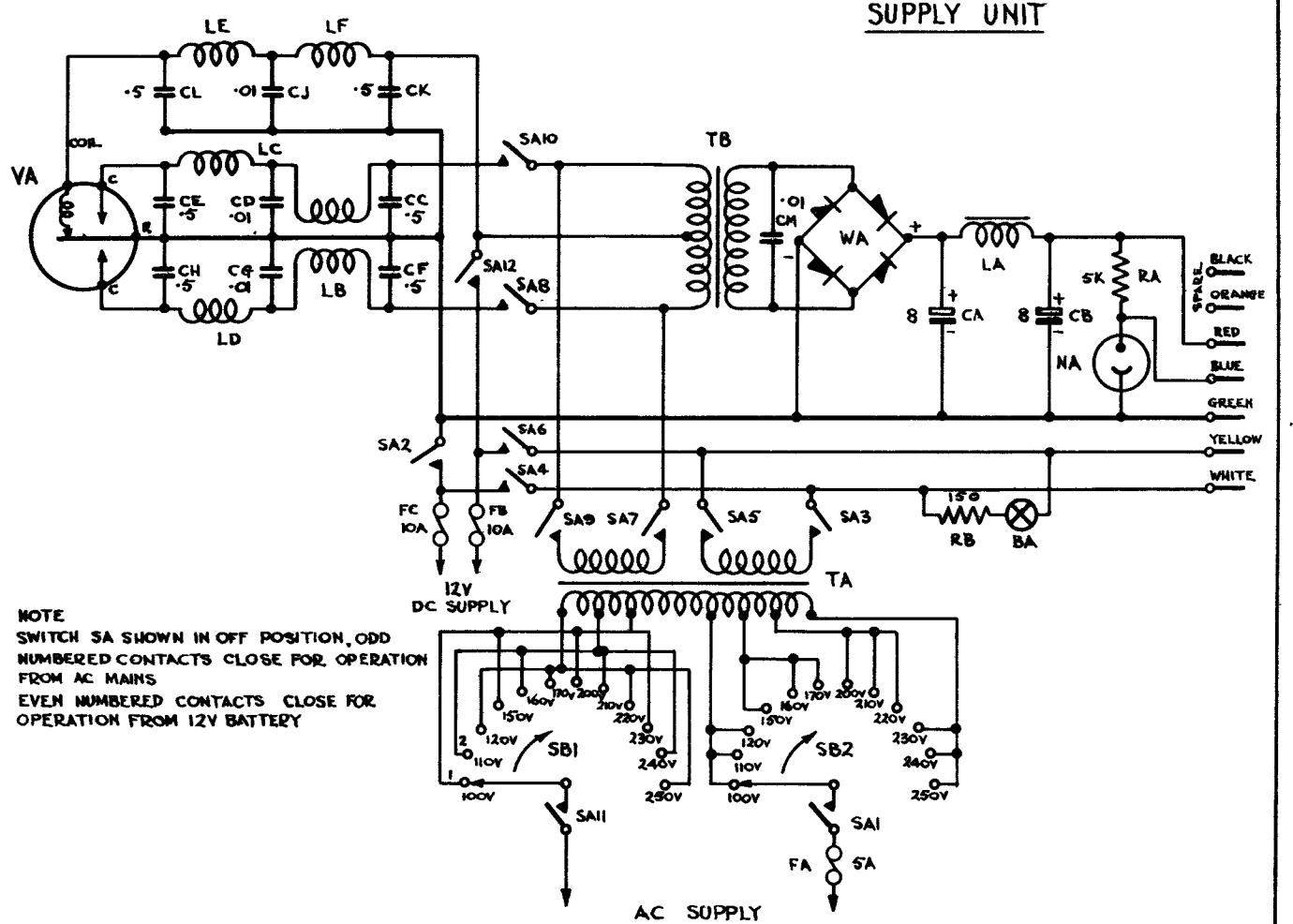
END VIEW OF PLUG PINS

VIBRATOR No 4

VIBRATOR No 5

STABILISER AW3

VALVE ARP 36



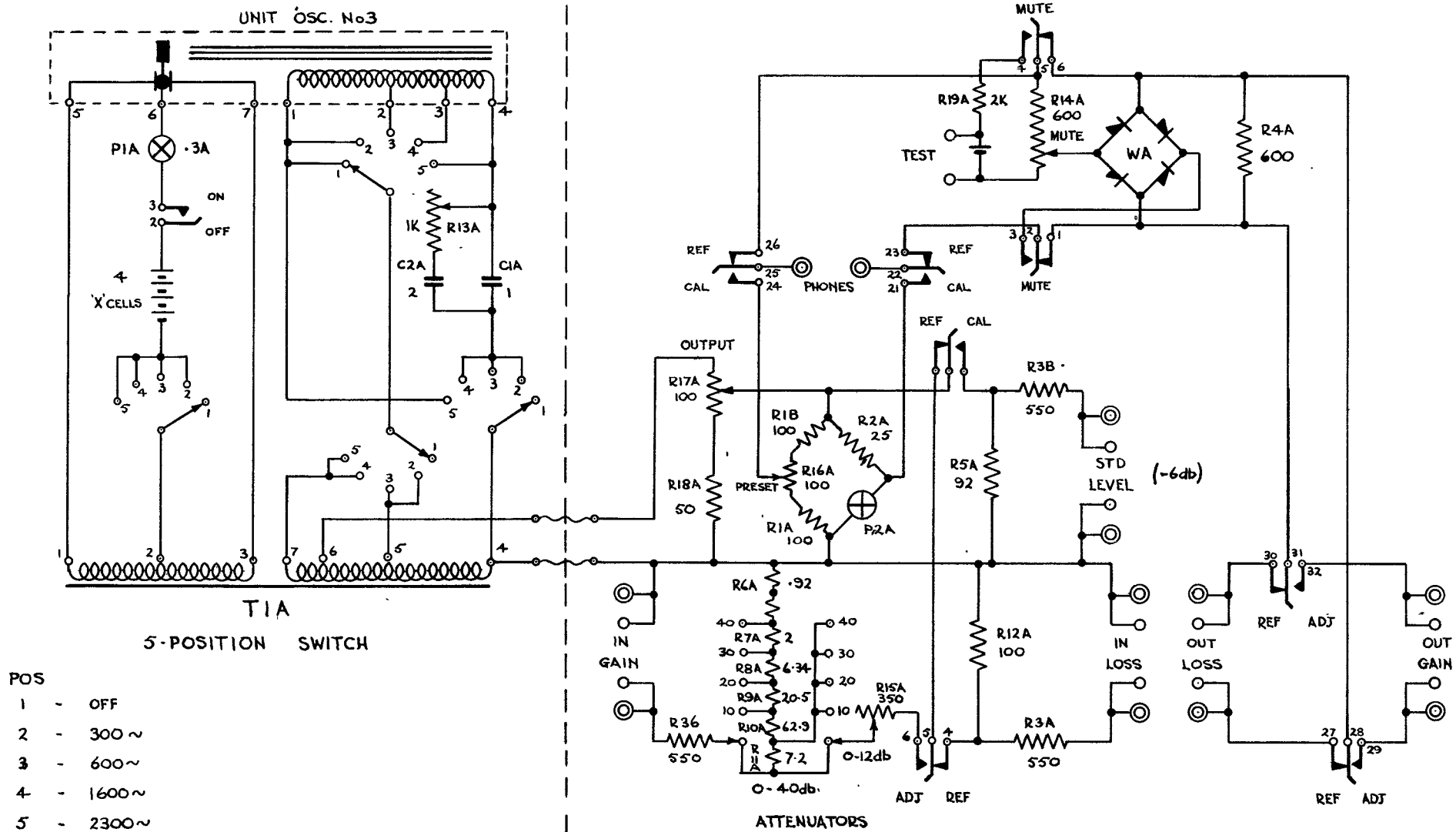
SUPPLY UNIT

NOTE  
SWITCH SA SHOWN IN OFF POSITION, ODD  
NUMBERED CONTACTS CLOSE FOR OPERATION  
FROM AC MAINS  
EVEN NUMBERED CONTACTS CLOSE FOR  
OPERATION FROM 12V BATTERY

E1/402

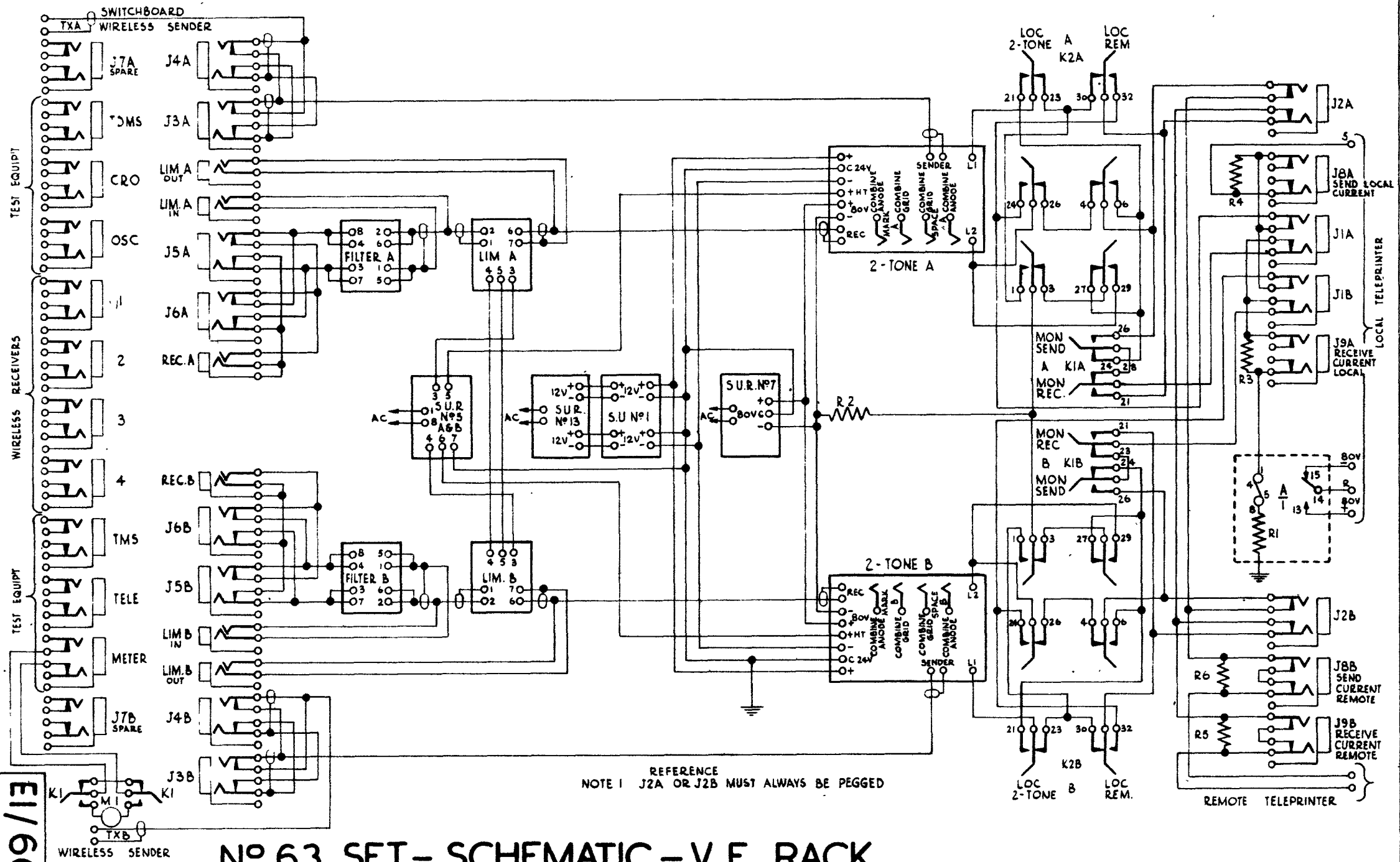
TESTER T.M.S No I MK II

PANEL OSCILLATOR No2



T. M. S. No.3

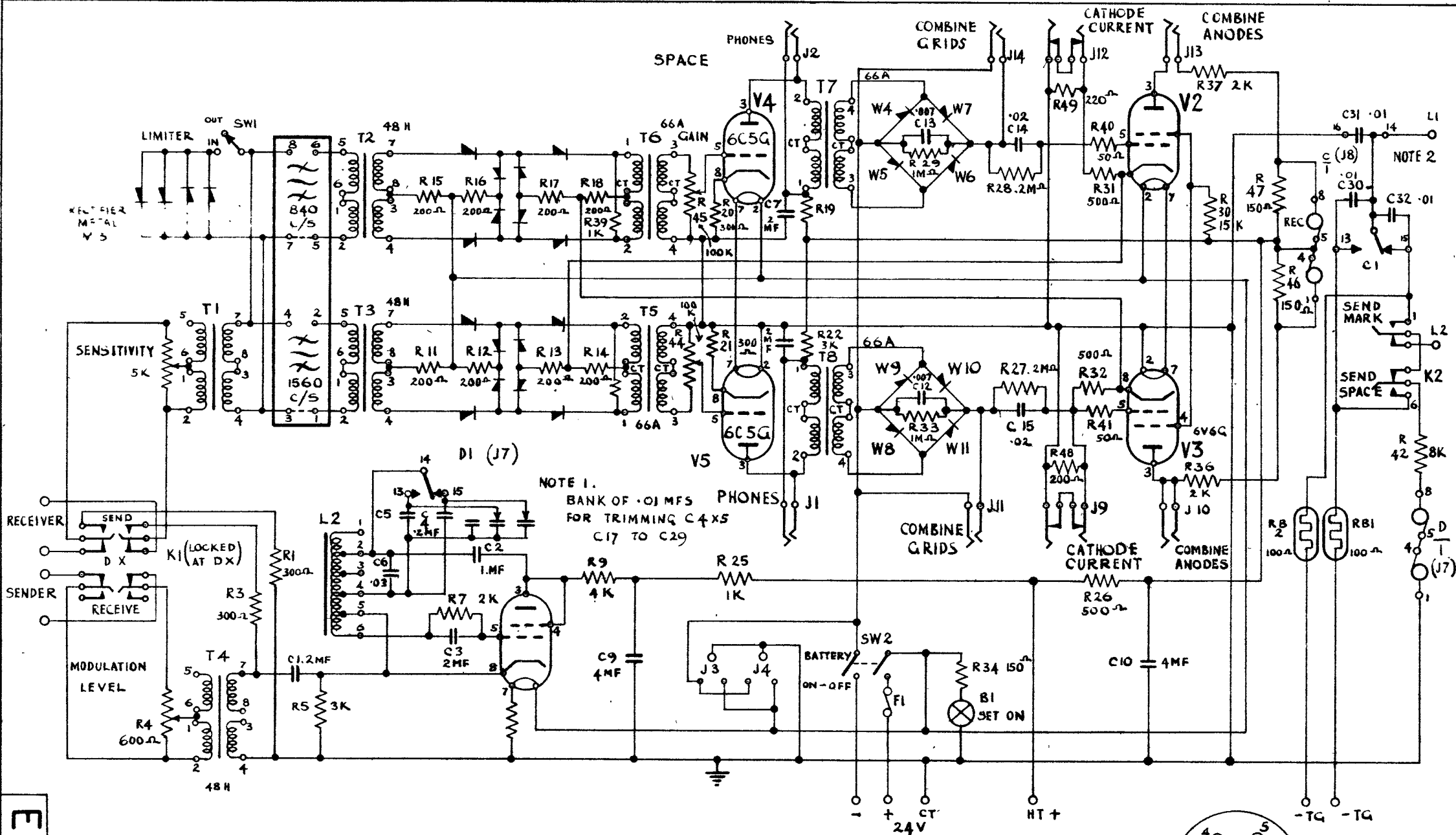
E1/405



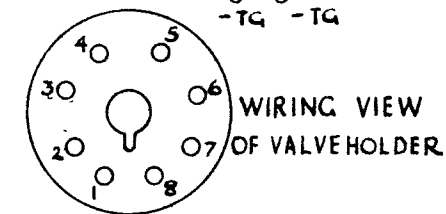
REFERENCE  
 NOTE 1 J2A OR J2B MUST ALWAYS BE PEGGED

**№ 63 SET.- SCHEMATIC.- V. F. RACK.**

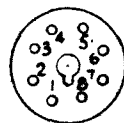
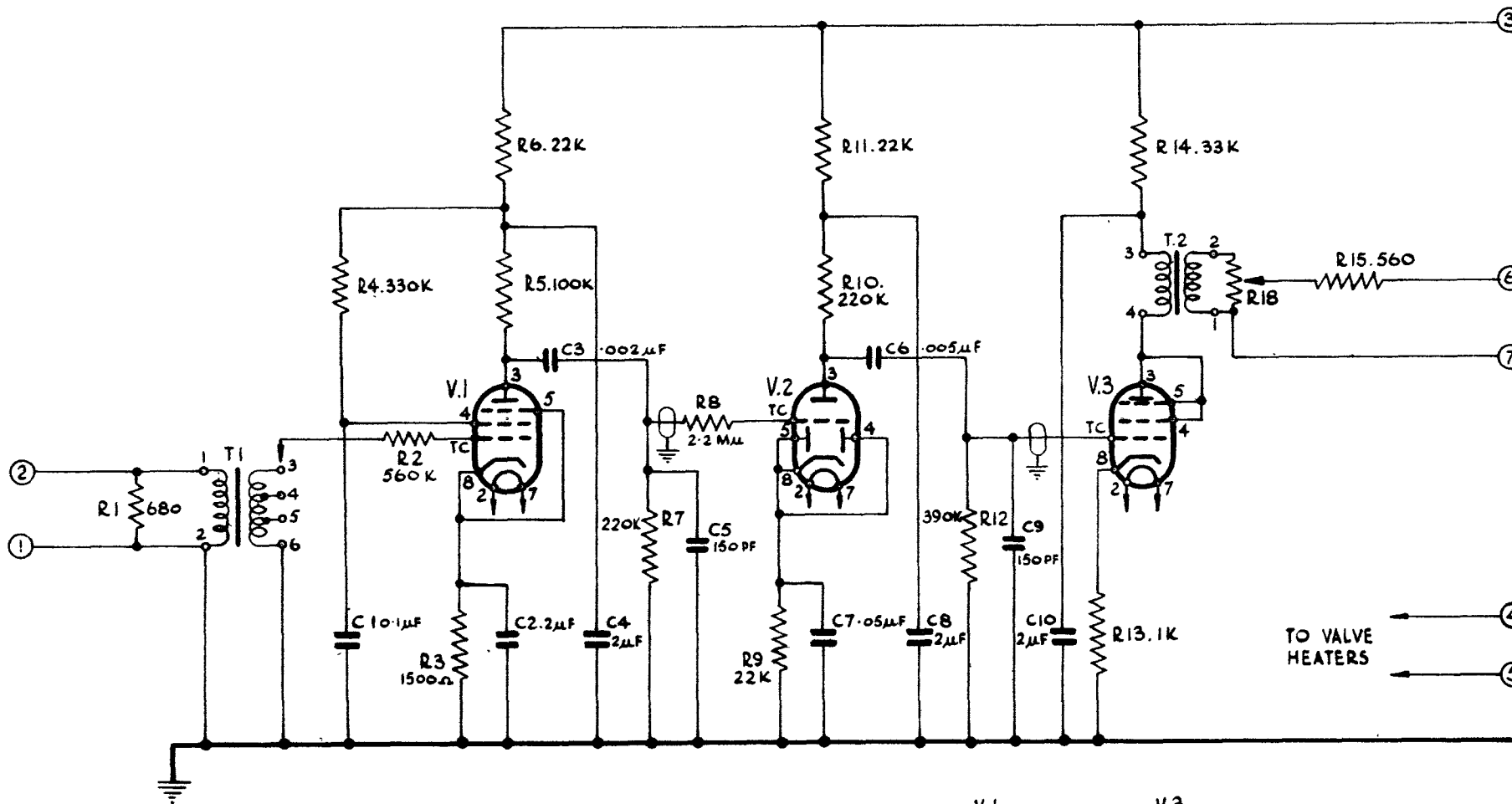
E1/600



**APPARATUS TELEG. 2-TONE N°4. CIRCUIT DIAGRAM.**



E1/601



WIRING VIEW  
 OF VALVE HOLDER.

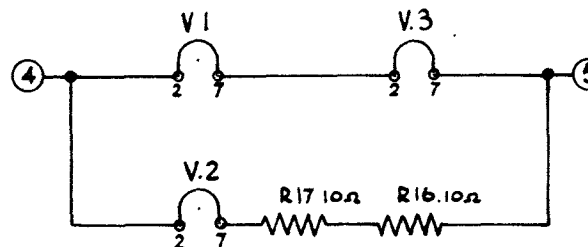
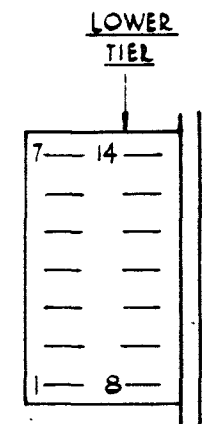


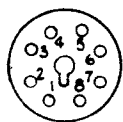
DIAGRAM OF HEATER CONNECTIONS.

# LIMITER

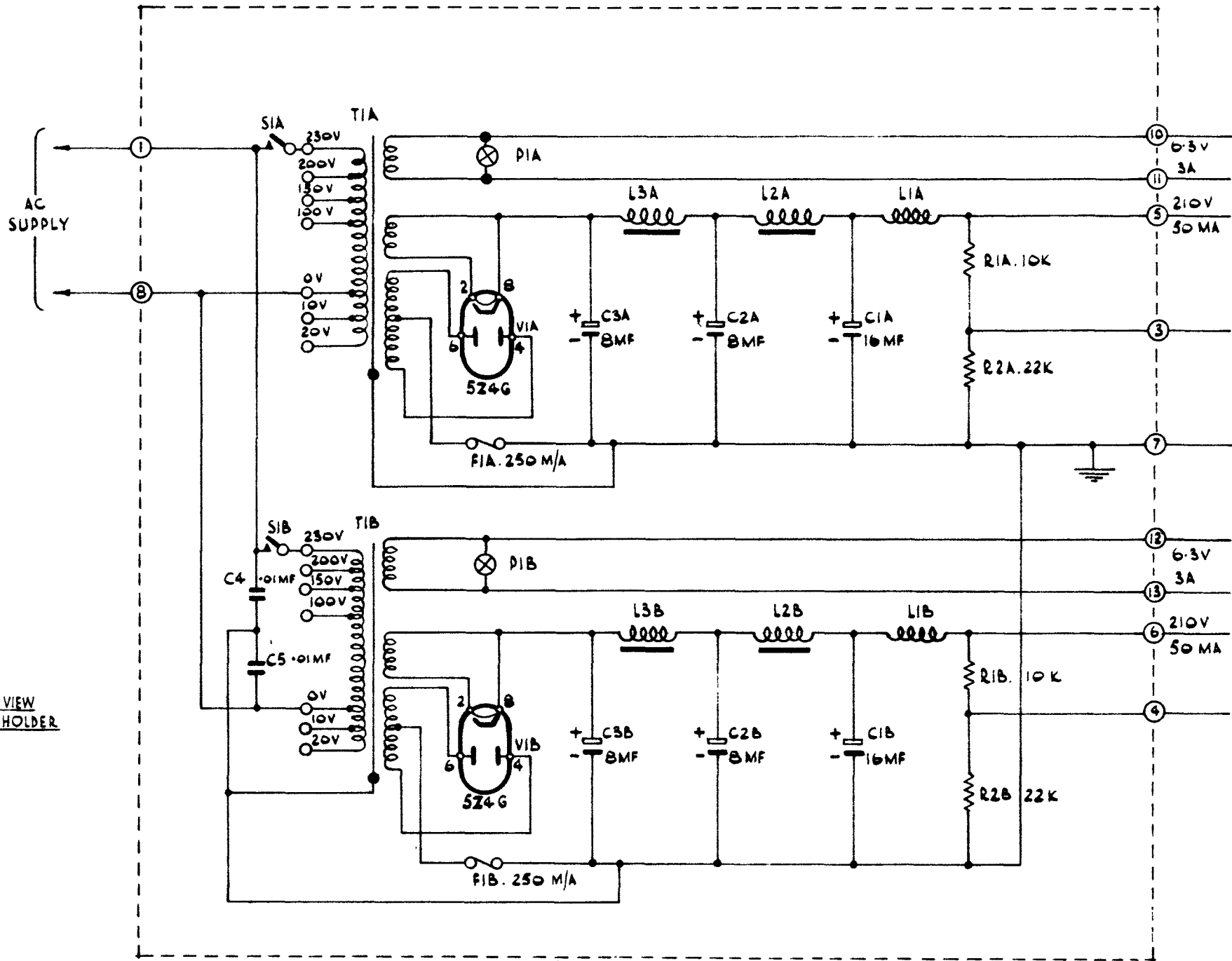
E1/602



NUMBERING OF STRIP TERM.



WIRING VIEW OF VALVE HOLDER



PANELS POWER UNIT N° 1 — CIRCUIT DIAGRAM

EI/603



APPARATUS CARRIER TELEPHONE 1 + 3 TYPES SAS AND SAT.

GENERAL DESCRIPTION

PURPOSE AND FACILITIES.

Provides three high-grade carrier telephone channels in addition to the audio channel over open-wire lines. Will work to corresponding SOS or SOT system, giving the same facilities. A Pilot channel is provided.

DIMENSIONS. Each terminal - 3 bays 8'6" x 1'8 1/2" x 1'3 1/2"  
+ Bay, Power, No. 3.

WEIGHT. About 18 cwt each terminal unpacked.  
About 2 tons packed, including spares.

POWER SUPPLY. DC:- 21 volts at 7 amps and 130 volts at .5 amp  
OR AC mains, 320 watts.

RANGE. Max 34 db at 30 Kc/s for zero circuit.

SYSTEMS. 2-W working only.

REPEATER CARRIER TELEPHONE 1 + 3 TYPES SAS AND SAT

GENERAL DESCRIPTION

PURPOSE AND FACILITIES.

Repeaters the carrier channels of the ACT 1 + 3.

DIMENSIONS. 2 Bays, 6'9" x 1'8 1/2" x 1'3 1/2"  
+ Bay, Power, No. 3.

WEIGHT. About 12 cwt unpacked.  
About 1 ton packed, including spares.

POWER SUPPLY. DC:- 21 volts at 4.5 amps, 130 volts at .35 amps  
OR AC:- 230 watts.

RANGE. 34 db at 30 Kc/s.

TESTING OUT

1. Assemble bays, insert interbay connectors and power leads. Connect Power Bay No. 3 as emergency supply. Adjust transformer tappings to suit mains voltage.
2. Connect RACK EARTH and BATTERY EARTH (+24 v on Power Bay No. 3) to a good earth.
3. Insert meters, alarm and protector lamps, and fuses.
4. Insert U-links across sockets marked with a white line.
5. Insert valves in correct order, as packed.
6. Switch on NORMAL TRANS AMP and 20 c/s GENERATOR. Throw ALARM C O key on Pilot Indicator Panel.
7. Switch on mains supply - all filament alarm lamps should light and bell ring. Operation of ALARM C O key on Bay 2 should disconnect bell.
8. Measure supply voltages on load, working from mains and battery:-
 

HT	150	+ 9 volts
LT	21	+ 1.2 "
MISC	21	+ 1.2 "
9. Measure valve cathode currents by connecting 5 v DC meter to each pair of test sockets in turn. Readings should be 50+15 except carrier oscillators (50+25) and VB in VF RECEIVERS (not less than 10).  
Note that where patching cords are used the serrated edge should be to the top or to the left.
10. Check output of Pilot Osc; meter should be at red mark (50). Adjust resistances RE 13 - 16 if necessary.
11. Calibrate LEVEL TEST SET (LTS). With switch at SET ZERO adjust zero control until meter reads SET ZERO. Switch to LEVEL 0 db; connect LTS sockets on Pilot Osc to LTS. Adjust LTS CALIBRATE control with screw-driver until meter reads +10 db.
12. Adjust Test Osc output to read +10 db LOSS on LTS.
13. Adjust channel Modulator Osc frequencies:-  
Patch Osc MOD sockets to Control Amp IN, adjust Control Amp OUT to 0 db.  
Patch Control Amp OUT to MBF r.h. EQP sockets, r.h. LINE sockets to Trans Amp IN. Set Trans Amp gain at suitable value (15 - 21 db). Measure Trans Amp OUT on LTS and note reading. Patch out MBF by removing cords from EQP and LINE sockets and holding plugs in contact. Note reading on LTS. Difference between readings = loss in MBF. Adjust Osc freq until this agrees with value specified on filter can. Repeat on other chs.

SCHOOL OF SIGNALS  
DATE 10 FEB. 1945  
CHECKED BY J.H.P.

14. Adjust ch Osc outputs; LEVEL across output should be  $+6 \pm .3$  db for mod oscs and  $+8.2 \pm .3$  db for demod oscs, with U-links in place.
15. Adjust Pilot Osc freq. As in 13, but as Pilot Osc output is small, spare Trans Amp must be used instead of Control Amp to obtain 0 db. The filter used is the one adjacent to the Pilot freq. The loss through it should exceed the loss at carrier freq by the amount stated on the Pilot Osc tuning unit; adjust Pilot freq until this figure is obtained. Restore connections, set Trans Amp to normal posn (40 db).
16. Adjust Pilot Level. This will normally be zero at lower CARRIER LINE sockets. Adjust by altering the tappings on TA or TC on Pilot Osc Panel.
17. Check carrier leak. Remove Pilot Osc OUT U-links; SET mod gain controls for chs 2 and 3 at OFF, and for ch 1 at 18. Measure output at CARRIER LINE. Adjust CARRIER leak pot for minimum reading - should not be greater than -10 db. Repeat for other chs.
18. Check normal and spare Trans Amp gain at lowest and highest carrier freqs. Patch from carrier osc output (with U-links in place) to ATTENUATOR IN. Adjust attenuator to give output of -17 db approx. Patch ATT OUT to Trans Amp IN, set amp gain at 40. Measure Amp OUT. Gain should be  $40 \pm 2$  db. Repeat with gain control at 21.
19. Check Control Amp gain at one freq with input level of about -15 db and with gain set at +10, 0, -10 db.
20. Check transmit levels on each ch. Set Trans Amp at 40, disconnect Pilot Osc. Patch TEST OSC OUT through 10 db to lower EXCH LINE sockets on ch 1. Adjust mod gain control for output to LINE of  $+17 \pm .5$  db. Check signalling output: connect Tele set to EXCH LINE lower sockets, ch 1, Ring on channel, adjust PA on 500/20 generator for output to CARRIER LINE of  $+12 \pm .5$  db. Repeat on chs 2 and 3.

#### LINING UP

1. Set all demod gain controls OFF. Set Control Amp at 0. Disconnect Pilot Osc. Insert 600 ohm plugs in all lower EXCH LINE sockets.
2. Check Demod Osc freqs. A station patches 800 a/s at 0 db into EXCH LINE lower sockets, ch 1, and sends both sidebands to line by strapping out MBF. B station receives both sidebands by strapping out DBF and setting demod gain control at suitable posn. B station listens across EXCH LINE, ch 1, and adjusts demod osc for zero beat. Restore MBF and DBF connections. B station then open circuits EXCH LINE; received 800 c/s passes through unbalanced hybrid and is sent back to A. A station listens across MON sockets, ch 1, and adjusts demod osc for zero beat. Repeat for chs 2 and 3.
3. Check receive levels. A station sends 800 c/s at 0 db on each ch in turn. B station measures level at Control Amp OUT and adjusts EQUALISER to give control amp output at same level on all chs. B station then adjusts each demod gain control to give overall circuit to EXCH LINE of -3 db. Repeat in opposite direction.
4. Test speech and ringing in each direction.
5. Line up Pilot Channel: A station inserts Pilot Osc OUT U-links, and switches all mod gain controls OFF. B station:- throw DELAY C 0 key on Pilot Level Indicator Panel, with TEST key normal. Patch DC meter to VA sockets, adjust pot on TC for mid-scale reading (this applies to early equipments only). Adjust PA with screw-driver to give a reading on Pilot meter, adjust condensers on TB for maximum reading. Readjust PA for mid-scale reading and lock. Restore Delay C 0 key and check that relay is in central position. Throw TEST key to HIGH and LOW - Lamp should light and bell ring after delay of about 6 seconds; adjust relay if necessary. Repeat in opposite direction. Restore all connections to normal.

#### LINING UP THROUGH INTERMEDIATE REPEATER

1. A station sends 800 c/s at 0 db on each ch in turn, repeater adjusts gain and equalisation for output to LINE of  $+17 \pm .5$  db. B station then adjusts receive levels. Repeat in opposite direction.
2. Line up Pilot Indicators on repeaters as for terminals.

OPERATION OF VALVE AND RELAY TEST PANEL

Facilities provided for adjustment of telegraph type relay on Pilot Level Indicator, and for testing characteristics of 6V6 valves.

1. Relay Tests. Posn 1. Relay may be adjusted mechanically - no current in coils. Lamps light when contacts make.  
Posn 2. Current flows through relay windings and meter in series - 1 mA full scale deflection. Armature moves to right. Current controlled by SET ZERO control.  
Posn 3. As 2, but current flows in opposite direction.
2. Valve current tests.  
Posn 4. Insert valve, adjust HEATER VOLTS for reading of 6.3 on meter, allowing time for valve to warm up.  
Posn 5. Meter reading indicates heater current: e.g. a reading of .53 corresponds to a heater current of .453.  
Valves divided into groups for wiring in series:-  
I - current .42 to .44 (meter reads .2 to .4)  
II - current .44 to .46 (meter reads .4 to .6)  
III - current .46 to .48 (meter reads .6 to .8)  
Valves outside these limits should not be used:
3. Mutual Conductance.  
Posn 6. Set meter to zero with SET ZERO control.  
Posn 7. Set meter to zero with MUTUAL CONDUCTANCE control.  
Control reads mutual conductance of valve.
4. Grid Current.  
Posn.8. Set meter to .8 with SET ZERO control.  
Posn 9. Set meter to .04 with MUTUAL CONDUCTANCE.  
Repeat 8 and 9 alternatively until readings are obtained without further adjustment.  
Posn 10. Meter reads voltage required for 40 microamps grid current.  
Valves used in the Trans Amp should have a mutual conductance of at least 3.2, and require at least 6.6 volts for 40 uA grid current.

REPEATER:- TWO - FREQUENCY TEST OSCILLATOR

Calibration of output.

1. Insert U-link in LF or HF as required.
2. Connect Osc OUT to CAL IN, CAL OUT to Trans Amp IN. Connect Trans Amp OUT to LTS, adjust gain for convenient reading on LTS. Adjust Oscillator output by PA until LTS reading is a min. Voltage across CAL IN is now 2.45 (i.e. +10 db).
3. Remove LTS from Amp OUT, check set zero. Patch across CAL IN, with switch at LEVEL 0 db. Adjust LTS calibrate control for reading of +10 db. LTS is now calibrated.
4. As the impedance of the CAL IN sockets is not necessarily 600 ohms, the oscillator will not give +10 db into 600 ohms. After calibrating the LTS, therefore, the oscillator output should be readjusted to give +10 db into the LTS, set at LOSS,

APPARATUS CARRIER TELEPHONE 1+1

GENERAL DESCRIPTION

SCHOOL OF SIGNALS  
DATE 15 APRIL 1944  
CHECKED BY J.H.P.

**I. Active Terminal.**

PURPOSE AND FACILITIES. One physical and one carrier telephone circuit over one pair of open wire (600 ohms) or unloaded cable (150 ohms).  
DIMENSIONS. 22½" x 15½" x 11½".  
WEIGHT. 100 lbs.  
POWER SUPPLY. 12 V. D.C. or A.C. mains, 30 watts.  
RANGE. Zero circuit, active to active, over 50 db at 9 kc/s.  
Equivalent to about 20 miles field quad.  
Equalisation:- 0, 10, or 20 miles unloaded field quad.  
FREQUENCIES. Audio channel up to 2,800 c/s.  
Carrier channel 300 - 2,600 c/s.  
Carrier frequency 6,000 c/s.  
A to B uses USB; B to A uses LSB.  
SIGNALLING. Audio channel - 17 c/s.  
Carrier channel - 17 c/s earth phantom or VF ringing.

**II. Inert Terminal.**

PURPOSE AND FACILITIES. One physical and one carrier channel to active terminal or terminals; requires no power supply.  
DIMENSIONS. 15" x 11" x 10½".  
WEIGHT. 50 lbs.  
POWER SUPPLY. Nil.  
RANGE. Zero circuit to active terminal over 15 db.  
Equivalent to about 7 miles field quad.  
FREQUENCIES. As above. Active terminal transmits carrier.  
SIGNALLING. Audio channel - 17 c/s.  
Carrier channel - 17 c/s earth phantom.

**III. Repeater C.T. 1 + 1**

PURPOSE AND FACILITIES. Repeater the carrier channel of the 1 + 1.  
DIMENSIONS. 22½" x 15½" x 11½".  
WEIGHT. 95 lbs.  
POWER SUPPLY. 12 V. D.C. or A.C. mains, 30 watts.  
RANGE. About 18 miles of field quad. 45 db gain.  
Equalisation:- varies automatically with gain.

TESTING OUT

1. Check valves:- V1, V3, V5 - ARP 38 (modified VT 149, KTZ 73).  
V2, V4 - 6V6G. LRI - 230 V. 15 watt 1 amp.
2. Check fuses:- F1, F2 - ½ Amp. F3, F4 - 2 Amp.  
Check tappings on mains transformer.  
Test on A.C. and D.C. - red lamp should light and ringing vibrator operate for about 30 secs. after switching on.
3. If a TMS No.2 is available, check output levels. With zero level test tone fed into SWBD CARRIER terminals, and system switch in position 1 and 2, TRANS reading should be +17 to +21 at O.W. terminals, and +15 to +19 at CABLE terminals, for A or B station.  
Check signalling output in pos.2 - about 5 db above channel.  
TRANS reading of transmitted carrier in pos. 3, 4, 5 - should be +22 to +25 at O.W. terminals.
4. If a TMS No.1 is available, the receive side may be checked by feeding in at -30 to the O.W. terminals at some frequency within the band. With both receive amps at max. gain, level at SWBD CARRIER terminals should be about zero.

LINING UP

1. Determine what system is to be used.  
NOTE:  
(a) Pos.2 cannot be used when working to an Inert Terminal.  
(b) Unless pos.2 is being used, PH. LINE must be strapped to PH.SIG. and a good earth provided. Working active to active, pos.2 is the most satisfactory, and the phantom circuit may be extended to the audio channel by strapping PH. LINE to PH. EQUIP.
2. **Active to active** - Set equaliser, station and type switches as required, connect line to appropriate terminals. Adjust rec. gain for satisfactory speech in both directions; should be at least two steps below singing point. If a TMS is available, line up to 5 db overall.  
If working in pos.2, adjust SIG SENSITIVITY to the lowest position giving consistent operation.
3. **Active to inert** - Set up active as A station. Adjust overall level, active to inert, using system type switch pos. 3, 4 or 5. Overall level, inert to active, can be adjusted by rec. amp. gain control. Note that no adjustments can be made at the inert terminal.
4. **Active to active with intermediate inert** - Active terminal nearer to inert should be set up as an A station having system type switch pos. 3, 4 or 5. Other active terminal B station pos. 1.
5. **Active to active, using intermediate repeater** - Ensure that lines are connected to A and B terminals as indicated on repeater terminals. Set repeater gains to compensate for loss in previous section of line. Line up active to active as in 2.

APPARATUS CARRIER TELEPHONE 1 + 4 MK I.

GENERAL DESCRIPTION.

PURPOSE AND FACILITIES.

Provides one physical and four carrier channels over air-line or carrier quad cable. Ringing provided on each channel.

DIMENSIONS. 3 bays, each 5'6" x 1'8 $\frac{1}{2}$ " x 1'4".

WEIGHT. 12 cwt.

POWER SUPPLY. 24 volts, 9 $\frac{1}{2}$  amps.

RANGE. 35 db. Equivalent to about 100 miles of 70 lb cadmium-copper air-line (2-W working); or 40 miles of carrier quad (4-W working).

FREQUENCIES. As for Mk II. Audio channel up to 2.8 kc/s.

Carrier channels .3 to 2.8 kc/s.

Carrier frequencies:- ch 2, 6 kc/s; ch 3, 9.2 kc/s; ch 4, 12.5 kc/s;  
group f/c, 35 kc/s.

SYSTEMS. 2 or 4-W working; A or B station.

TESTING OUT.

1. Check fuses, alarm lamps, and resistor bulbs.
2. Check valves:- all ARP 11 (VT 113) except RH valve in repeater panel, which is an ARP 10 (VT 114).
3. Insert U-links, including small U-links in modulators and filters and on NORMAL GROUP OSC PANEL.  
Insert interbay power-connectors and matching cords - serrated edge to top.  
Patch in NORMAL or SPARE repeaters as required.
4. Throw OSCILLATOR and REPEATER keys to NORMAL.
5. Connect power supplies, adjust LT to 20.5 volts, HT to 150 volts.
6. Test heater and anode currents:- should all read .2 to .3 on meter.
7. Test alarm circuits by switching off HT; all fail lamps should come up.  
Check that ALARM CO key cuts off alarms and lights alarm guard lamp.
8. Adjust OSC outputs:- should be 1.5 to 2 volts. Test spare group osc.
9. Check buzzer output from signalling units; should be at least +18 db when relay D is operated.
10. Test signalling units in pairs:- connect SIG (ch 2) to PAD (ch 3), check ringing through from EXCH sockets on chs 2 and 3. (Buzzer output through hybrid and pad will be +8 to +9, which is the level at which the signalling units should operate).
11. Check carrier frequencies against TMS 1; this may be done by beating the two frequencies directly, or by using a frequency changer.
12. Check carrier leak:- set up as A station 2-W working with send rep at max gain. Measure level at send rep out with no incoming signal - should not be above -9. Adjust channel and group carrier leak pots in turn for min reading.
13. Check send side:- set up as in 12, send in at zero level at 1600 ~ on each channel in turn; output at 2-W line should be +5 +1 db.
14. Check output to line when ringing over one channel: adjust LIMITER to give +15 db.
15. Check rec side with TMS 1:- send in at -25 at some frequency within channel band, adjust rec rep out to 0 db; adjust ch amp to give -4 db at EXCH sockets.

LINING UP.

1. Set up for 2 or 4-W working, A or B station as required.
2. Obtain zero level at 1600 ~ from distant end on each ch in turn; adjust rec rep gain and equalisation for rec rep output of 0  $\pm$   $\frac{1}{2}$  db on each ch.
3. Adjust ch amp gain to give output of -4 at EXCH sockets.
4. Repeat in opposite direction.
5. Test stability with EXCH connection open and short circuit. Reduce gains if necessary.
6. Test ringing in each direction: adjust A relays if necessary.
7. Check synchronisation of channel and group carrier frequencies:- send each osc output direct to line. Receiving end amplifies incoming carrier and beats against local oscillator.
8. Test speech in each direction.

SCHOOL OF SIGNALS  
DATE - 31 AUG 1944  
CHECKED BY - J.H.B.

SCHOOL OF SIGNALS  
 DATE - 5 JULY 1944  
 CHECKED BY - J.H.P.

APPARATUS CARRIER TELEPHONE 1 + 4 MK II.

GENERAL DESCRIPTION.

- PURPOSE AND FACILITIES. One physical and four carrier channels over air-line or carrier quad.
- DIMENSIONS. 2 bays in cases, each 38" x 24" x 20".
- WEIGHT. 3½ cwt each bay including case.
- POWER SUPPLY. 12 V DC, 11 Amps; or AC mains, 180 watts - total.
- RANGE. 40 db max, equivalent to about 130 miles of 70lb cd cu. Range on carrier quad about 50 miles - 4-wire working.
- FREQUENCIES. Audio ch up to 2.8 kc/s. Carrier chs .3 to 2.8 kc/s. Carrier frequencies:- Ch 2 - 6 kc/s; Ch 3 - 9.2 kc/s; Ch 4 - 12.5 kc/s; Ch 5 - 16 kc/s; group - 35 or 33.8 kc/s.
- SYSTEMS. 2 or 4-wire working; A or B station. 500/20 signalling on carrier chs. Audio ch not amplified.

TESTING OUT.

1. Check that the three vibrators (No 4 or No 5) are in position.
2. Check alarm and protector lamps; check valves.
3. Check fuses - all 3 Amp (black).
4. Connect up power supplies, test out on AC and DC. All alarms should come up for a short period except spare repeater. Switch to spare repeater and test again. Check that the BELL CO key disconnects bell and lights appropriate lamp.
5. Check supply voltages, using DC meter and special cord; this gives a full-scale deflection on 200 volts. Readings should be ±10%. First number given is positive.

DC SUPPLIES

Tag No.	Voltage.	Reading.	Supply.
Bay 1, panel 4:-			
36 - 37	13	.065	Relays
39 - 40	180	.9	HT to Group Oscillator.
41 - 42	200	1.0	HT to Normal Repeater.
44 - 45	200	1.0	HT to Spare Repeater.
46 - 47	175	.875	HT to 500~ Oscillator.
48 - 49	100	.5	HT to Signalling Units.
Bay 2, panel 2:-			
22 - 18	175	.875	HT to Channel Unit 2.
23 - 21	175	.875	HT to Channel Unit 3.
25 - 24	175	.875	HT to Channel Unit 4.
26 - 27	175	.875	HT to Channel Unit 5.

AC or DC HEATER SUPPLIES. 12 VOLTS. Use Avometer

Bay 1, panel 4:-		Bay 2, panel 2:-	
Tag No.	Supply.	Tag No.	Supply.
12 - 11, 15 - 14	Normal Rep.	11 - 10	Channel Unit 2.
17 - 16, 20 - 19	Spare Rep.	14 - 13	Channel Unit 3.
22 - 21, 25 - 24	Sig.Units.	17 - 16	Channel Unit 4.
27 - 26	Group Eqpt.	20 - 19	Channel Unit 5.

6. Check alarm circuits by removing valves in turn.
7. Connect EARTH terminal to a good earth.
8. Insert interbay connectors - RED WIRES TO TOP.
9. Check all U-links on both bays.

10. VALVE CATHODE CURRENTS. Should be  $\pm 10\%$  on DC meter.

Circuit	Valve.	Current-mA.	Reading.
Normal and spare Repeaters	V1	4.2	.42
	V2	32	.32
Group Equipment	V1	4.4	.44
	V2	3.3	.33
Sig. Units, quiet	V1	6.5	.65
	V2	0	0
- - signal	V1	2.9	.29 approx
	V2	14	.14 approx
Channel Units	V1	3.6	.36
	V2	7.8	.78

11. Check operation of 500~ oscillator by listening across each pair of sockets. Verify with DB-meter that level is zero.
12. Check gain of normal and spare repeaters:- connect 500~ to input through 15 and 30 db pads; output should be about -2 on step 8. Each step reduces gain by one db.  
 NOTE. All amplifiers and pads are unbalanced; e.g. the input to the normal A1 amp is between A1 IN (N) and any E socket, and the output between A1 OUT (N) and any E socket. Ensure that the bottom sockets on the pads are connected to E.
13. Check the SEND circuit on each channel:- set up for 4-wire working, A1 amp step 1. Remove all CH FILTER U-links except Ch 2. Throw CHECK FREQ key - output from A1 amp should be +15 to +20. Repeat for Chs 3, 4, 5.
14. Test carrier leak:- set up for 4-wire working, A1 amp step 1. Remove all CH FILTER U-links except Ch 2, CHECK FREQ key normal. Connect A1 OUT to A2 IN through 15 db pad, connect db-meter to A2 OUT. With amp gains at any convenient position adjust CARRIER LEAK POT for min reading on meter. Repeat for Chs 3, 4, 5.
15. Adjust group carrier leak:- set up as A station, 2-wire working. Remove all CH FILTER U-links, connect A2 OUT to A1 IN, A1 OUT to db-meter. With amp gains at any convenient position, adjust group CARRIER LEAK POT for min reading on meter.
16. Check operation of signalling units:- connect back to back through 15 db pad, using interbay connector sockets on Bay 1. Test 17~ ringing each way between EXCH LINES.
17. Check output to line:- set up as A station, 2-wire working, A2 amp step 8, all CH FILTER U-links in position. Connect db-meter to LINE SEND terminals, should read about +5 when zero level 500~ is sent into any CH Unit (via interbay connectors).
18. Check overall performance:- set up for 4-wire working, A1 and A2 amps step 1. Strap out EQUALISER, set all ch amps to step 3. Insert 15 and 30 db pads between SEND CF CCTS, bay 1 and bay 2; connect LINE SEND to LINE REC. Listen across EXCH LINE of each Ch - no singing should be heard. Remove 15 db pad, leaving 30 db in circuit; singing should be heard on all channels.

LINING UP.

1. Determine what system is to be used - insert U-links as required.
2. For 4-W working set A1 and A2 to step 1. For 2-W working set A1 to step 1, A2 to step 8. Set all Ch Amps to step 3. Adjust send amp gain to give +4 to +6 to line for zero level input on any one channel.
3. Connect up lines. Adjust rec amp gain:- output should be -3 to -5 when zero level is sent into any one Ch at the distant end. Adjust amp gain and equalisation to obtain this level. Repeat in opposite direction.
4. Check synchronisation of carrier freqs:-  
 2-W working. Connect DC meter at each station to CHECK FREQ sockets. Both stations throw CHECK FREQ key Ch 2. A station adjusts Ch osc for zero beat on meter. B station then adjusts group osc for zero beat on meter. Repeat on Chs 3, 4, 5, except that no further adjustment of group osc will be necessary.  
 4-W working. As above, but as the group freq changer is not in circuit only one station need adjust osc freq.
5. Adjust each Ch amp to give an overall circuit of -4 to -7 db.
6. Test speech and ringing in each direction on all channels.

APPARATUS V F TELEGRAPH 6 CHANNEL DUPLEX.

GENERAL DESCRIPTION.

SCHOOL OF SIGNALS  
DATE: 31 AUG 1944  
CHECKED BY: J.H.P.

PURPOSE AND FACILITIES.

Provides six duplex telegraph channels over an audio telephone circuit.

DIMENSIONS.

3 bays, each 5'6" x 1'8½" x 1'4".

WEIGHT.

11½ cwt including power bay and spares.

POWER SUPPLY.

24 volts DC, 5 amps, + 2½ amps on 130 volt working.

RANGE.

About 30 db.

FREQUENCIES.

CH	1	2	3	4	5	6
A - B	1980	1860	1740	1620	1500	1380
B - A	420	540	660	780	900	1020

SYSTEMS.

VF side - 2 or 4-W working. Terminals are either A or B stations and cannot be changed.

DC side - either 2-line Sx. earth return, with external 80+80 supply; or 130 volt working using existing HT supply and junction boxes or TTU's Mk. III.

TESTING OUT.

1. Check fuses, alarm lamps, and resistor bulbs.
2. Insert valves:- Detector panel - 4022AR on left, 4020A on right.  
Amplifier panel - 4019B.  
Oscillators - 4020A.
3. Insert static modulators and 299AN relays (relays on top).
4. Strap for 80+80 or 130 volt working as required. Connect telegraph supply.
5. Insert interbay connectors and U-links.
6. Connect up 24 volt supply; adjust LT to 20.5 v. and HT to 130 v.
7. Measure filament currents:- patch SIDE METER into fil cur jacks. Should be 250 ma +10.
8. Test alarm circuits by removing valves.
9. Set all detector keys to pos 2, gain controls OFF, BIAS to pos 10.
10. See that all rec relays are on SPACE contacts.
11. Test continuity of DC circuits:- insert U-link between SEND and REC sockets, ch 1. Measure SEND and REC side currents with SIDE meter - should be 9 to 20 mA to left in each case. Move relay tongue to MARK contact - meter should read to right. Operate MARK-SPACE key with meter in SEND side - should read 20 mA each way.
12. Check modulator:- connect phones to SF OUT, operate MARK-SPACE key. Tone should be heard on MARK and no tone on SPACE. With U-link between SEND and REC sockets, move relay tongue from SPACE to MARK and listen for tone.
13. Check detectors:- connect SF OUT to DET IN, key to MARK, meter to read RECT CURRENT: Adjust gain control for 6 mA current. Operate key to MARK and SPACE and see that relay follows correctly.
14. Check oscillator frequencies against TMS 1; should be within 5 cycles.
15. Check OSC OUT:- should be +3 to +6 db.
16. Check SEND FILTER OUT:- should be -8 to -10 db.
17. Measure REC. AMP gain - should be max 25 ±2 db. Check operation of gain controls.

LINING UP.

1. Set up for 2 or 4-Wire working as required.
2. Obtain MARK from distant end on each channel in turn, and adjust REC AMP GAIN and EQUALISATION for Amp output of -15 db. on each channel.
3. Obtain MARK on all channels. Adjust DET GAIN for 3 mA RECT CURRENT with key in pos 2. Turn to pos 1 - current should rise to 5 - 8 mA. Repeat for all channels.
4. Insert U-link SEND to REC sockets of ch 1, obtain reversals from distant end. Adjust BIAS POT for central reading of SEND SIDE current.
5. Line up in opposite direction.
6. Connect teleprinters and test out.



SCHOOL OF SIGNALS  
 DATE 30 MAY 44  
 CHECKED BY J.H.P.

APPARATUS V.F. TELEGRAPH 3 CH DX

GENERAL DESCRIPTION

PURPOSE AND FACILITIES.

Provides a three-channel duplex telegraph system over a 2- or 4-wire audio circuit. Groups 1 and 2 can be worked together to provide a six-channel system. Designed for teleprinter but can be used for any D.C. telegraph system (e.g. High-speed morse) up to a maximum of 80 bauds.

CONSTRUCTION.

Two units to each terminal (Group 1 or Group 2):-  
 Valve unit:- contains V.F. circuits and filters.  
 Relay unit:- contains power supplies and relays.  
 Connected together by two 12-way cords.

DIMENSIONS.

21 $\frac{3}{4}$ " x 25 $\frac{1}{4}$ " x 12 $\frac{3}{4}$ " each unit.

WEIGHT.

160 lbs each unit.

POWER SUPPLY.

24 volts D.C. centre-tapped, 2.5 amps.

RANGE.

40 db at 2,000 cps.

FREQUENCIES.

GROUP	CHANNEL	FREQUENCIES	
		A-B	B-A
2	1	1980	420
	2	1860	540
	3	1740	660
1	4	1620	780
	5	1500	900
	6	1380	1020

NOTE:- The 3-ch Dx and 6-ch Dx use the same frequencies and can work to each other.

SYSTEMS.

D.C. side:- 2 line Sx earth return, 80+80.

V.F. side:- 2- or 4-wire; 3-channel or 6-channel.

NOTE:- The 3-ch Dx does not provide 80+80 for send leg.

TESTING OUT

1. Check relay adjustments.
2. Check valves:- V1 V2 - AR12 (4020A); V3 V4 - AR13 (4022AR).
3. Check resistance bulbs in relay unit.
4. Check fuses:- 1-FU1 2-FU1 3-FU1 FU2 - 5 amp. FU3 - 1.5 amp.
5. Switch on, test voltages with SUPPLIES METER:-
 

Battery voltages	12	(12 volts)
Channel H.T.	135±10	(135 volts)
Rec Amp H.T.	120±10	(120 volts)
Telegraph	95±10	(95 volts)
Rec Amp plate current	70±30	(4-10 mA)
6. Test out TEST TRANSMITTER. Meter switches to 'S LEG & T TRANS' and 'REC AMP & T TRANS'. T TRANS key to REVERSALS - meter vibrates about zero.
7. Test modulator output voltage on MARK with LEVEL METER - 1.05 + .3V.
8. Test detector sensitivity. TELE TEST key at MARK; DETECTOR TEST switch at TEST; meter reading CHANNEL PLATE CURRENT; DETECTOR GAIN POT should be 4 to 12 when meter reads 60±10. 5 steps increase - meter should read 120.
9. Test channel unit. Meter to REC LEG; TELE TEST key to TELE TEST; T TRANS key to MARK:- meter reads 50 to right, tone to line. T TRANS key to SPACE:- meter reads 50 to left, no tone to line. T TRANS key to REVS:- meter vibrates, and is adjusted to zero by BIAS POT. Interrupted tone to line.

E1/230/A

10. Test REC AMP. Set up as 4-wire station, REC AMP 'IN'. Send MARK on any channel, loop SEND LINE to REC LINE. Listen across terminals A-B and C-D. If A station, tone on C-D should be louder and adjustable by REC AMP GAIN CONTROL. On B station A-B and C-D interchange their functions.

SETTING UP.

1. Remove echo suppressors, V.F. signalling units, etc. from line.
2. If a carrier circuit is to be used, check synchronisation of frequencies.
3. Connect teleprinter and TTU to the appropriate channel. Adjust SEND LEG CURRENT until meter reads 50 to 100 (5-10mA). Adjust REC LEG CURRENT at TTU.  
TELE TEST key to MARK - teleprinter should get local record.
4. Set all system and station keys to the appropriate positions.  
For 6-ch working, interconnect the A B C D terminals of each Group.  
Set BIAS POTS to pos 10; REC AMP GAIN to pos 3.
5. Line up each channel. DETECTOR TEST switch at ADJUST. DOWN station sends MARK. UP station adjusts DET GAIN POT for PLATE CURRENT reading of 60 (3mA). If GAIN POT is at extreme position, readjust REC AMP GAIN. Set DET TEST switch to WORKING - PLATE CURRENT increases to about 80. DOWN station sends REVERSALS. UP station reads REC LEG CURRENT with TELE TEST key in TELE TEST; adjust BIAS POT until meter vibrates about zero. Record all settings and readings. Repeat in opposite direction.
6. Test out circuit from teleprinter to teleprinter.

REPEATER V.F. TELEGRAPH No. 1

GENERAL DESCRIPTION

PURPOSE AND FACILITIES.

	Repeater the 3 or 6-channel V.F. system working 2-wire.
DIMENSIONS.	25 $\frac{1}{2}$ " x 20" x 16".
WEIGHT.	135 lbs.
POWER SUPPLY.	12 volts D.C. or A.C. mains, 12 watts.
RANGE.	23 db maximum gain. Equalisation for 9 or 18 miles PCQT cable.

REPEATER TELEPHONE 8-CIRCUIT MK. I.

GENERAL DESCRIPTION.

PURPOSE AND FACILITIES.

Provides eight four-wire repeatered circuits with 500/24 ringing. Designed primarily for loaded 14/40 PQQT cable.

DIMENSIONS.

3 bays, each 5'6" x 1'8 $\frac{1}{2}$ " x 1'4".

WEIGHT.

About 10 cwt.

POWER SUPPLY.

24 volts, 10 amps.

RANGE.

Max amp gain 31 db; 4 db loss in hybrid and signalling unit. No equalisation provided.

SYSTEMS.

4-W or 2-W. One bay contains the signalling units, the other contains the amplifiers and hybrids. For 4-W working the signalling bay would not be required.

2-W impedance 600 ohms: 4-W impedance 1100 ohms.

TESTING OUT.

1. Insert fuses:- Power Bay, Generators 10 amp, eqpt 5 amp.  
Amp Bay, all .5 amp.  
Sig Bay, upper panel all .5 amp; lower panel all 1.5 amp except Ring Fail (.5 amp).
2. Insert lamps, 24 v. no. 2 in all sockets.
3. Insert valves:- Amplifiers, VT 81.  
Sig units, VT 82 in L.H.S., VT 108 in R.H.S.  
Oscillators, VT 75A.
4. Connect power supply and switch on. Adjust LT to 21 v; HT to 150 v.
5. Check filament currents:- Amplifiers and oscillators, .24 to .26 on meter.  
Signalling units, .14 to .16 on meter.
6. Check operation of normal and spare 24~ generators.
7. Check gains of amplifiers at 1600~ ; should be 27 db, 2-4W.
8. Adjust 500/24 supplies to each signalling unit:- the level should be approximately the same as speech level at the 2-W line. Adjust by tappings on Distribution and Resistance panels.
9. Test out circuits in pairs:- set amp gains at zero (transformer tap 4, pot step 6); connect two circuits together at 4-W side; test speech and ringing in each direction.
10. Adjust signalling unit gain if necessary by input transformer taps.

LINING UP.

1. Terminal stations adjust gain of send amp to give output to line of about +10 db for zero level input at 2-W termination.
2. Intermediate stations adjust gains for outputs of about +10 db.
3. Terminal station at distant end adjusts gain of rec amp for required overall circuit. If 2-W terminations are short a -4 db circuit should be quite stable.
4. Open and short circuit both 2-W terminations; if circuit sings, reduce gains in each direction.
5. Test ringing in each direction and adjust gain of signalling units if necessary.

SCHOOL OF SIGNALS  
DATE: 31 AUG 44  
CHECKED BY: J.N.P

SCHOOL OF SIGNALS  
DATE: 30-JULY-1944  
CHECKED BY: J.H.P.

REPEATER TELEPHONE 8-CIRCUIT MK II.

GENERAL DESCRIPTION.

PURPOSE AND FACILITIES.

Provides eight four-wire repeatered circuits with 500/20 ringing. Designed primarily for 14/40 FCQT cable, loaded or unloaded. Amplifier bay alone may be used as a four-wire repeater.

DIMENSIONS.

2 bays, each in boxes 2'4" x 2'1" x 1'8".

WEIGHT.

2 cwt each bay including box.

POWER SUPPLY.

12 volts DC, 5 amps; or AC mains, 60 watts, each bay.

RANGE.

Max amp gain 32 db. 4 db loss in signalling bay due to hybrid and signalling unit. Range about 26 miles of unloaded 14/40, or 160 miles loaded. Equalisation for 0, 13, or 26 miles of unloaded cable.

SYSTEMS.

2-4W (both bays used); or 4-W (amp bay only).

Impedance on 2-W side - 400 ohms.

Impedance on 4-W side - 400 ohms (unloaded cable), or 1600 ohms (loaded cable).

TESTING OUT.

1. Check valves - all ARP 34 (EF 39); check vibrators.
2. Check fuses - all 3 amp.
3. Strap for 400 or 1600 ohms impedance as required. Note that for each circuit there are six points where strappings have to be made:- two on the hybrid, two amplifier output transformers, and two line transformers.
4. Connect power supplies, test out on AC and DC, with all amplifiers and signalling units switched on. HT fail lamp should come up for a short period, then the HTR fail; this should go out when all valves have warmed up. Check that the CUT-OFF keys disconnect bells and light appropriate alarm lamps. Alarms can be tested by removing fuses in turn.
5. Check HT voltages. Should read  $130 \pm 15v.$  between tags 28-30 on power supply panels of each bay. Also  $60 \pm 10v.$  between tags 28-29 on power supply panel on signalling bay. Check relay supply - should be 13v. between tags 10-11 on power supply panel on signalling bay.
6. Check heater supplies on each power panel - should be 12v. AC or DC between earth (tag 28) and tags 13, 16, 19, 22 on each bay, and also between tag 28 and tag 25 on signalling bay.
7. Check 500 ~ test tone by listening across terminals, and verify with db-meter that level is zero. Switch to SPARE OSC and check again.
8. Check hybrids and operation of signalling units:- Connect 4-W TRANS and 4-W REC of A1 to 4-W REC and 4-W TRANS of A2 on signalling bay, test speech and ringing in each direction. Repeat for other pairs of units. If no speech is heard, reverse connections to one pair of 4-W line terminals.
9. Check gain of all amplifiers and effect of gain control.

LINING UP.

1. Connect together amplifier and signalling bays.
2. Connect up 2 and 4-W lines, and earth.
3. Set amp gains at min. Adjust equalisers to compensate for previous section of line. Disconnect grid cap of V1 in Sig. Units.
4. Send zero level at one 2-W termination, adjust gain of terminal send amp to give output to line of +10 db. Check that output when ringing not greater than +10 db.
5. Intermediate repeaters in turn adjust gain to obtain output of +10 db.
6. Distant terminal repeater adjusts rec amp gain to obtain required overall level - about -4 db. will give a stable circuit if the 2-W extensions are short.
7. Repeat in opposite direction.
8. Test circuit for stability by open-circuiting 2-W extns.
9. Test speech and ringing in each direction, reconnecting grid caps on sig. units.
10. Draw circuit diagram to show levels and amplifier gains along circuit.

15572/P.L.N./7.45.

REPEATER TELEPHONE 2-CIRCUIT NO. 1.

SCHOOL OF SIGNALS  
DATE: 31 AUG 1944  
CHECKED BY: JHP

PURPOSE AND FACILITIES.

Designed for use on field cables, giving two repeatered circuits, each of which may be either 2-W or 4-W. Contains internal balance network for field quad, but an external network may be used. 17~ ringing is by-passed, and can be repeatered by means of Repeater Ringing No. 1.

DIMENSIONS.

19 $\frac{1}{2}$ " x 16 $\frac{1}{2}$ " x 11".

WEIGHT.

80 lbs.

POWER SUPPLY.

AC mains, 25 watts; or 12 V DC, 1.4 Amps.

RANGE.

34 db each amplifier, reduced in 11 steps of 2 db.

4 db loss in each hybrid.

2,200~ low-pass filter used on 2-W working.

Max output +18 db.

Equalisation:- flat, 7 $\frac{1}{2}$ , or 15 miles of field quad in positions 0,  $\frac{1}{2}$ , 1 respectively.

SYSTEMS.

Each circuit may be 2-W, 2-4W, or 4-W working.

Phantom telephone provided in each case (cannot be used for Fullerphone).

2-W impedance - 400 ohms. 4-W impedance - 800 ohms.

TESTING OUT.

1. Check that the four ARP38 valves are in position. In emergencies ARP 34 (EF 39) or VR 56 (EF 36) valves may be used, with a 3 db drop in gain and a max output of 12 db.
2. Check fuses:- 1 amp in heater supply - F1.  
2 amp in battery supply - F2.  
 $\frac{1}{2}$  amp in mains supply - F3 and F4.
3. Connect up power supplies, test out on AC and DC; lamp should light in each case.
4. Test amplifier gains:- A amp - switch to 4-W; equaliser 0; gain step 1; filter OUT. Connect amplifier output to input through 27 db attenuator provided; connect watch receiver across circuit. Increase amp gain - should sing between steps 6 and 9. If not, try reversing connections to one side of the attenuator. Repeat for amps B, C, D.
5. Test 2-W switching:- switch to 2-W; filter IN; equaliser 0; net INT; gains step 1. Disconnect grid leak of B amp and earth grid. Connect together 2-W LINE and SWBD of circuit under test through 18 db attenuator provided; connect watch receiver across circuit. Increase A amp gain - should sing between steps 6 and 9. Connections to one side of the attenuator may have to be reversed. Repeat for amps B, C, D.
6. Test 2-4W switching - this may be omitted if tests 4 and 5 are satisfactory. A amp - switch to 2-4W; filter OUT; equaliser 0; net to INT; gain step 1. Connect together 4-W IN A and 2-W A-B SWBD through 27 db attenuator; connect watch receiver across circuit. Increase A amp gain - should sing between steps 9 and 11; connections to one side of the attenuator may have to be reversed. Repeat for amps B, C, D.

LINING UP: 4-WIRE CIRCUIT.

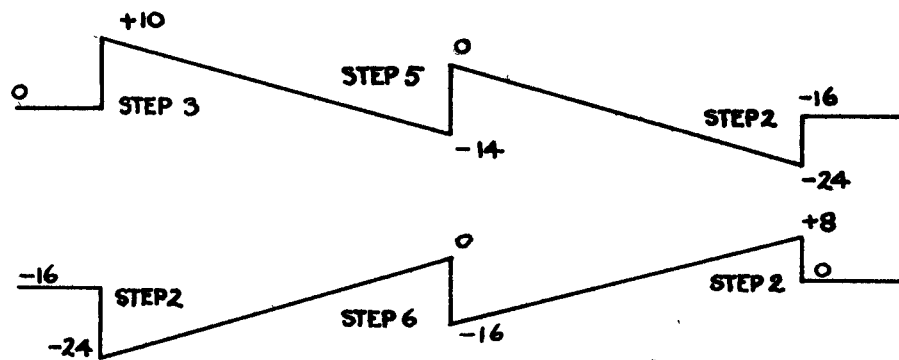
1. Terminal stations:- switch to 2-4W; filter OUT; equaliser as required; net to INT unless using ext net for 2-W extn. Connect up 2-W and 4-W lines, earth and phantom tele. Test out phantom circuit. Set send amp to give output to line of about +10 db. Note that if the 2-W extn is short, this will be on step 1. Set rec amp step 1.
2. Intermediate stations:- switch to 4-W; filter OUT; equaliser as required. Connect 4-W lines, earth and phantom tele. Set each amp gain provisionally at a few db below the loss in the previous section of line.
3. Line up first in the U-D direction, the UP station giving orders over phantom circuit. UP station speaks continuously on 2-W extn; first intermediate station connects watch receiver across output of U-D amp, and adjusts gain for good speech (about +10 db). Other intermediate stations repeat in turn. DOWN station adjusts rec amp for an overall circuit of about -4 db. Repeat in D-U direction.
4. Test that circuit is quite stable with 2-W extns open or short circuited. If a TMS is available it may be used to adjust levels to correct values.
5. A circuit or level diagram should be drawn to show the levels and gains along the circuit.

11/44 (15572) Wt. T.3121/P.2369/M.3677. 125. 7/45. P.L.H. & CO. LTD. G.943.

LINING UP: 2-WIRE CIRCUIT.

1. Switch to 2-W; filter IN; equaliser as required; net to INT for quad, EXT if external balance is to be used. Set gains to step 1; connect lines and test out phantom circuit.
2. Line up intermediate repeater:- open-circuit line at both distant terminations, connect watch receiver across circuit. Increase both gains together to one step below singing point. Short-circuit distant ends - reduce gain if singing occurs.
3. Line up terminal repeaters:- when intermediate repeater has lined up, connect line and open-circuit 2-W extn. Increase both gains together to one step below singing point. Test for stability on short-circuit. Connect 2-W extn.
4. Rearrangement of gains:- if send amp gain at any terminal is above step 3, distortion may occur. To prevent this, reduce gain of send amp and increase gain of rec amp by the same amount, compensating for this by similar alterations at the next repeater.
5. A circuit or level diagram should be drawn.

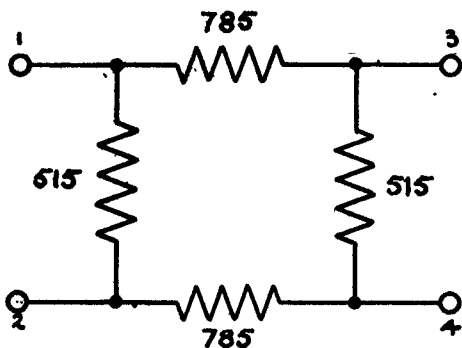
LEVEL DIAGRAM



USE OF NETWORKS BALANCING AND TESTING.

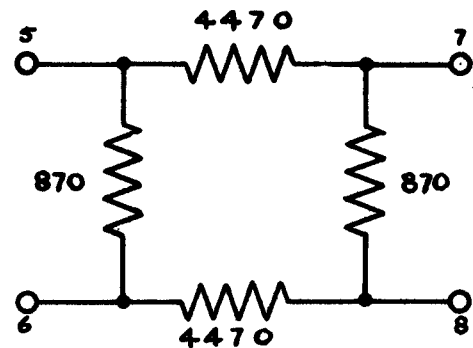
1. Switch to 2-W; filter IN; equaliser as required; net to EXT; gains to max.
2. Connect line to be balanced to 2-W LINE; connect balance network to LINE NET. Connect TESTER LINE BALANCING to other hybrid - LINE to 2-W SWBD, NET to SWBD NET. Connect watch receiver across circuit.
3. Adjust potentiometers on TESTER until singing just occurs.
4. Adjust balancing network until singing stops.
5. Repeat 3 and 4 until any change in balance network makes singing worse.
6. The same process will have to be repeated if the line on the SWBD side is to be balanced.

ATTENUATORS.



2 - W

$Z_0 = 400 \Omega \alpha = 18 \text{db}$



4 - W

$Z_0 = 800 \Omega \alpha = 27.5 \text{db}$