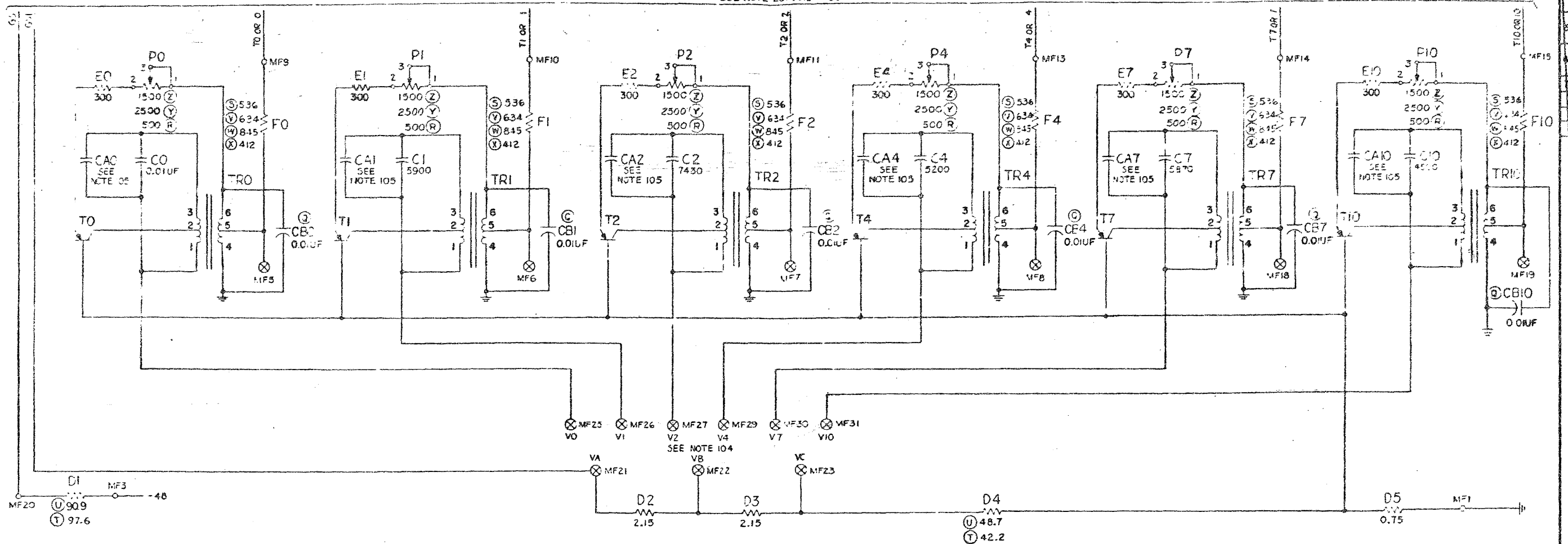


FS I MULTIFREQUENCY SIGNAL GENERATOR CKT

TO ASSOCIATED CIRCUIT
SEE NOTE 20 AND TABLE A



APP FIG. 1

CAPACITOR				POTENTIOMETER				RESISTOR				TRANSFORMER			TRANSISTOR (SEE NOTE 107)		
OPT	DESIG	LOC	CODE	DESIG	LOC	CODE	OPTION	OPT	DESIG	LOC	CODE	DESIG	LOC	CODE	DESIG	LOC	CODE
	C0	1B0	SEE NOTE 110	P0	1A0	KS-13790, L25, 1500	Z	T	D1	1E0	KS-8512, L178, 97.6	TR0	1C1	2531A	T0	1C0	(T) 12E
	C1	1B2		P1	1A2	KS-13790, L25, 1500	Y	U	D1	1E0	KS-8512, L178, 90.9	TR1	1C2	2531A	T1	1C1	
	C2	1B4		P2	1A4	KS-13790, L25, 1500	R		D2	1E4	449E, KS-20810, L1A, 2.15	TR2	1C4	2531B	T2	1C3	(U) 11A
	C4	1B5		P4	1A5	KS-13790, L25, 1500			D3	1E4	449E, KS-20810, L1A, 215	TR4	1C6	2531B	T4	1C5	
	C7	1B7		P7	1A7	KS-13790, L25, 1500			D4	1E6	KS-8512, L38, 42.2	TR7	1C7	2531C	T7	1C6	
	C10	1B9	SEE NOTES 105, 110	P10	1A9	KS-13790, L25, 1500			U	D4	KS-8512, L38, 48.7	TR10	1C9	2531C	T10	1C8	
	CA0	1B0							D5	1E6	449A, 227C, KS-14603, L3AD, 0.75						
	CA1	1B2							E0	1A0	KS-13490, L1, 500						
	CA2	1B3							E1	1A2							
	CA4	1B5							E2	1A3							
	CA7	1B7							E4	1A5							
	CA10	1B8	SEE NOTE 110						E7	1A6							
Q	CB0	1C1							E10	1A8							
Q	CB1	1C3															
Q	CB2	1C5							F0	1B1	(S) 445A, KS-20810, L1A, 536						
Q	CB4	1C6							F1	1B3	(V) 445A, KS-20810, L1A, 634						
Q	CB7	1C8							F2	1B5	(W) 445A, KS-20810, L1A, 845						
Q	CB10	1C9							F4	1B6	(X) 445A, KS-20810, L1A, 412						
									F7	1B8							
									F10	1B9							

CIRCUIT NOTES:

DESIG	FUSE AMP	POTENTIAL	ONE PER
	1-1/3	48V SIG	APP FIG. 1
		GRD	APP FIG. 1

BATTERY SYMBOL

-48

VOLTAGE RANGE

42.75-52.5V

[illegible][illegible]

104. CAUTION: TRANSISTORS MUST NOT BE REMOVED FROM OR REPLACED IN SOCKETS WHILE VOLTAGE IS CONNECTED TO THE VOLTAGE DIVIDER. BEFORE MAKING ANY TESTS ON THIS CIRCUIT WHEN IT IS CONNECTED TO ANOTHER CIRCUIT, TAKE THAT CIRCUIT OUT OF SERVICE AS REQUIRED.

A. THE FREQUENCIES OF OSCILLATORS SHOULD BE ADJUSTED TO $\pm 1\%$ RANGE UNDER FIELD TEST CONDITIONS.

<u>OSC NO.</u>	<u>FREQUENCY HZ</u>	<u>RANGE HZ</u>
0	700	693-707
1	900	891-909
2	1100	1085-1115
3	1300	1287-1313
4	1500	1485-1515
5	1700	1683-1717

3. ADJUSTMENT OF FREQUENCY GENERATOR OUTPUT LEVEL:

1. TAKE EQUIPMENT OUT OF SERVICE AS REQUIRED.
2. CONNECT TERMINAL MF20 TO TERMINAL MF21. (THIS PROVIDES A CLOSURE BETWEEN THE GS TO GS1 LEADS).
3. CONNECT A 250 OHM $\pm 1\%$ LOAD RESISTOR, INSULATED TO PREVENT SHORT, TO TERMINAL MF1 (GROUND) AND TO EACH OF THE FOLLOWING MF-TEST POINT TERMINALS LISTED (ONE AT A TIME), AND CONNECT A VACUUM TUBE VOM METER, VOLTCYMSI W/1000 OR EQUIVALENT, FROM THE SAME TEST TERMINAL TO MF-1 (GROUND). PERFORM VOLTAGE TESTS ON EACH OSC PLR SLIPS 6-8 FOLLOWING STEPS 4 AND 5.

104.
(CONT)

OSC NO.	FROM MF-TEST POINT TERMINAL	EACH TO MF-TERMINAL	POTENTIAL TESTER DESIG (STEP 6)
0	MF 5		P0
1	MF 5		P1
2	MF 7		P2
4	MF 8	MF 1	P4
7	MF 18		P7
10	MF 19		P10

4. WHERE THE TERMINALS LISTED IN THE LEFT COLUMN BELOW ARE NOT ALREADY CONNECTED TO ONE OF THE VA,VB, OR VC TERMINALS IN THE RIGHT COLUMN, CONNECT ALL THOSE ON THE LEFT TO THE VB,MF22 TERMINAL * FOR A MEDIUM VOLTAGE.

<u>V-DESIGNATION</u> <u>& MF-TERMINAL</u>	<u>V-DESIGNATION</u> <u>& MF-TERMINAL</u>
V0 MF25	(LOWERS VOLTAGE)
V1 MF26	VA MF21
V2 MF27	* VB MF22
V4 MF29	VC MF23
V7 MF30	(RAISES VOLTAGE)
V10 MF31	

5. IF NOT ALREADY CONNECTED, CONNECT GROUND TO TERMINAL MF1 AND CONNECT TERMINAL MF3 TO A NEGATIVE 48.5-52.5 VOLT POTENTIAL. THIS APPLIES POTENTIAL ACROSS THE VOLTAGE DIVIDER CONSISTING OF RESISTORS D1, D2, D3, D4, AND D5.

6. ADJUST POTENTIOMETERS P0-P10 LISTED IN THE RIGHT COLUMN OF TABLE OF TEST 3 SO THAT WITH THE 275 OHM LOAD RESISTOR, THE OUTPUT VOLTAGE IS 1.5 VOLTS FOR EACH OSCILLATOR.

7. MEASURE THE OUTPUT VOLTAGE AGAIN, SUBSTITUTING A $1100 \pm 1\%$ OHM LOAD RESISTOR, INSULATED TO PREVENT SHORTS FOR THE 275 OHM LOAD RESISTOR OF STEP 3, AND OBSERVE THE VOLTMETER INDICATIONS OF THE OUTPUTS ARE 0.15 VOLT OF EACH OTHER.

8. IF THE OUTPUTS ARE NOT WITHIN LIMITS, READJUST TAPS VA, VB, AND VC BY RAISING OR LOWERING THE VOLTAGE TO MEET THE REQUIREMENTS OF STEP 7 BY REMOVING THE LEAD ON TERMINAL MF22 AND CONNECTING IT TO THE VC TERMINAL MF23 TO RAISE THE VOLTAGE, OR TO THE VA TERMINAL MF22 TO LOWER THE VOLTAGE. CONTINUE THIS PROCEDURE AS REQUIRED, BY ADJUSTING THE TAPS VA, VB, AND VC UNTIL THE OUTPUTS ARE WITHIN THE 0.15 VOLTS OF EACH OTHER.

C. TEST MEASUREMENT OF THE FREQUENCY GENERATOR OUTPUT LEVEL

1. MEASURE THE OUTPUT VOLTAGE FOR EACH OSCILLATOR WITH THE 275 OHM LOAD RESISTOR CONNECTED TO THE OSCILLATOR OUTPUT FROM THE 1ST POINT. TERMINALS MF5, MF6, MF7, MF8, MF1E, OR MF19 OF EACH OSCILLATOR BEING TESTED TO GROUND (USING THE PROCEDURE OF TEST B3). THESE READINGS SHOULD BE 1.5 $\pm$ 0.25 VOLTS. IF NOT, ADJUST THE TAPS VA, VB, AND VC IN ACCORDANCE WITH THE ADJUSTMENT PROCEDURES (B6, B7, AND B8) UNTIL THE READINGS ARE WITHIN TOLERANCE.

105. FOR MANUFACTURE OR WHEN FIELD REPLACEMENTS OF TRANSFORMERS OR CAPACITORS OF THE FREQUENCY GENERATOR OF APP FIG. 1 ARE MADE:

A. THE INDIVIDUAL OSCILLATORS SHOULD BE ADJUSTED AS SPECIFIED IN NOTE 104.

B. THE FREQUENCY OF EACH OSCILLATOR SHOULD BE TESTED BY USING A LOAD RESISTOR OF 1100 OHMS CONNECTED BETWEEN THE OUTPUT TERMINAL (MF9, MF10, MF11, MF13, MF14 OR MF15 FOR OSCILLATOR 0-1, 2, 4, 7, OR 10 RESPECTIVELY) AND GROUND (MF1 TERMINAL). CONNECT EITHER A BERKLEY EPUT METER, OR A HÉWLETT PACKARD 521C METER, EITHER WITH A 10 SECOND GATE, OR A 72A FREQUENCY METER OR EQUIVALENT ACROSS THE LOAD RESISTOR (INSULATE AGAINST SHORTS). CONNECT TERMINAL MF20 TO MF21. THE FREQUENCY OF EACH OSCILLATOR SHOULD MEET THE LIMITS SPECIFIED IN THE FOLLOWING TABLE. TRIMMER CAPACITORS, DESIGNATED (CA-) CAN BE ADDED (IN PARALLEL TO THE IC) CAPACITORS TO LOWER THE FREQUENCY. THE APPROXIMATE CHANGE FOR EACH VALUE OF TRIMMER CAPACITOR IS GIVEN IN THE FOLLOWING TABLE.

105.
(CONT)

OUTPUT TERMINAL	OSCILLATOR NO. HZ	LIMITS HZ	FOR FREQUENCY		ADD TRIGGER (CAV) VALUE (PF) OF:
			TRIGGER, BEFORE LIMITS OF:		
MF9	3 700	698-705	705-708	100	
			708-712	196	
MF10	1 900	897-906	905-911	100	
			911-915	147	
			915-916	196	
MF11	2 1100	1097-1108	1108-1112	100	
			1112-1115	147	
			1115-1119	196	
			1119-1125	237	
MF13	4 1300	1295-1309	1309-1313	51.1	
			1313-1319	100	
			1319-1325	147	
			1325-1330	196	
			1330-1333	237	
MF14	7 1500	1495-1510	1510-1519	100	
			1519-1525	147	
			1525-1531	196	
			1531-1535	237	
MF15	10 1700	1695-1712	1712-1718	51.1	
			1718-1728	100	
			1728-1737	147	
			1737-1739	196	

106. IN EXISTING CIRCUITS IN WHICH THE ~~PA~~ POTENTIOMETERS ARE
(REF 1500 OHMS (Z OPTION)) THEY NEED ONLY BE REPLACED BY 2500
DISC) ~~OHM~~ POTENTIOMETERS (Y OPTION). IF SUFFICIENT REGULATION OF
THE OUTPUT CANNOT BE OBTAINED.

107. WHEN AN IIA TRANSISTOR IS REPLACED BY A I2E TRANSISTOR, ALL 6 IIA TRANSISTORS SHALL BE REPLACED. (D1) AND (D4) RESISTORS SHALL BE REPLACED REMOVING "U" OPTION AND INSTALLING "I" OPTION. IF IT IS DIFFICULT TO MEET THE 0.25 VOLT MAXIMUM DIFFERENCE REQUIREMENT SPECIFIED IN NOTE 104, THE ASSOCIATED POTENTIOMETER SHALL BE CHANGED FROM Y OPTION TO R OPTION.

108. IN CERTAIN OFFICES WHERE SOME TRUNKS OPERATE AT ODB TRMN
LEVEL T AND OTHERS AT -2DB TRMN LEVEL P AND WHERE, IN
ADDITION, HIGH LOSS TRUNKS ARE USED OUTGOING TO LA OR AM
OFFICES IT IS NECESSARY TO PROVIDE -4DB TONE LEVEL OPTION V,
RATHER THAN -8DBM TONE LEVEL OPTION W, UNLESS THE TELEPHONE COMPANY
SPECIFIES OTHERWISE THE -8DBM TONE LEVEL WILL BE PROVIDED.

109. WHEN A HIGH-FREQUENCY RINGING OCCURS IN THE OUTPUT OF AN INDIVIDUAL OSCILLATOR, OPTION Q SHOULD BE PROVIDED. THIS OPTION IS ALWAYS PROVIDED AFTER DATE OF INTRODUCTION INTO MANUFACTURE.

110. PRIOR TO ISSUE 10B, THE CAPACITORS

<u>DESIG</u>	<u>WFC. (MD)</u>	<u>CHANGED TO ON 1-8 (STD)</u>
C0	KS-13368, L14, L26 10,000	KS-16742, L14 10,000
C1	KS-13368, L13, L32 5,900	KS-16742, L32 5,900
C2	KS-13368, L13, L27 7,450	KS-16742, L32 7,450
C4	KS-13368, L13, L32 5,200	KS-16742, L32 5,170
E7	KS-13368, L13, L32 5,870	KS-16742, L32 5,800
C10	KS-13368, L13, L32 4,500	KS-16742, L32 4,460
	KS-14056, L1, L34 51	KS-16958, L34 51
(CAO, I,	KS-14056, L1, L34 100	KS-16958, L34 100
2,4,	KS-14056, L1, L34 150	KS-16958, L34 147
7,10)	KS-14056, L1, L34 200	KS-16958, L34 195
	KS-14056, L1, L34 240	KS-16958, L34 237
(CBO, I,		
2,4,	594G OQMF	KS-20977, L4 0.01MF
7,10)		

EQUIPMENT NOTES:

201. (A) WHERE POSSIBLE, MOUNT AND FUSE THE RF SIGNAL GENERATOR ON THE SAME FRAME AS ITS ASSOCIATED CIRCUIT. IF NECESSARY, MOUNT GENERATOR ON A RELAY RACK AND FUSE AT A FUSE PANEL WHICH MAY BE LOCATED ON THE RELAY RACK OR ON THE FRAME MOUNTING THE ASSOCIATED CIRCUIT OR ON THE FUSE BAY.
- (B) WHEN THE GENERATOR IS MOUNTED ON THE SAME FRAME AS ITS ASSOCIATED CIRCUIT, USE 24 GAUGE WIRE FOR ALL LEADS THAT STAY WITHIN THE FRAME.
- (C) ON ISSUE 100 OR LATER, IF THE GENERATOR MUST BE FUSED AT A DIFFERENT FRAME, THE BATTERY AND GROUND LEADS SHOULD BE RUN TOGETHER AS A TWISTED PAIR TO THE FUSE PANEL TO MINIMIZE NOISE PICKUP.
- (D) WHEN THE GENERATOR IS MOUNTED ON A RELAY RACK, KEEP CABLE RUN TO ASSOCIATED CIRCUIT TO NOT MORE THAN 20 FEET BETWEEN FRAMES.
(MFR
DISC)
(REPLACED BY NOTE 201E)
- (E) WHEN ANY OF THE FOLLOWING LEADS ARE RUN IN SWITCHBOARD CABLE, USE THE TYPE OF WIRE INDICATED FOR THE LENGTHS SHOWN IN THE TABLE:

LENGTH	LEADS	TYPE OF WIRE	REMARKS
0-100 FEET	0, 1, 2, 4, 7, 10 OR T0, T1, T2, T4, T7, T10	22 GAUGE PAIRED WIRE IN CABLE	USE ONE PAIR FOR EACH LEAD, GROUNDING ONE WIRE OF THE PAIR AT THE GENERATOR END ONLY
	BAT, GRD, GS, GSI		
100- 150 FEET	0, 1, 2, 4, 7, 10 OR T0, T1, T2, T4, T7, T10	22 GAUGE SHIELDED WIRE IN CABLE	EACH LEAD MUST BE SEPARATELY SHIELDED. EACH SHIELD MUST BE GROUNDED AT THE GENERATOR END ONLY
	BAT, GRD, GS, GSI	20 GAUGE PAIRED WIRE	

INFORMATION NOTES:

301. UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN
PICOFARADS (SAME AS FORMER MICRO MICRO FARADS), VALUES
PRECEDED BY THE SYMBOL + (PLUS) OR - (MINUS) ARE IN VOLTS.

ISSUE
13BMULTIFREQUENCY SIGNAL
GENERATOR CIRCUIT

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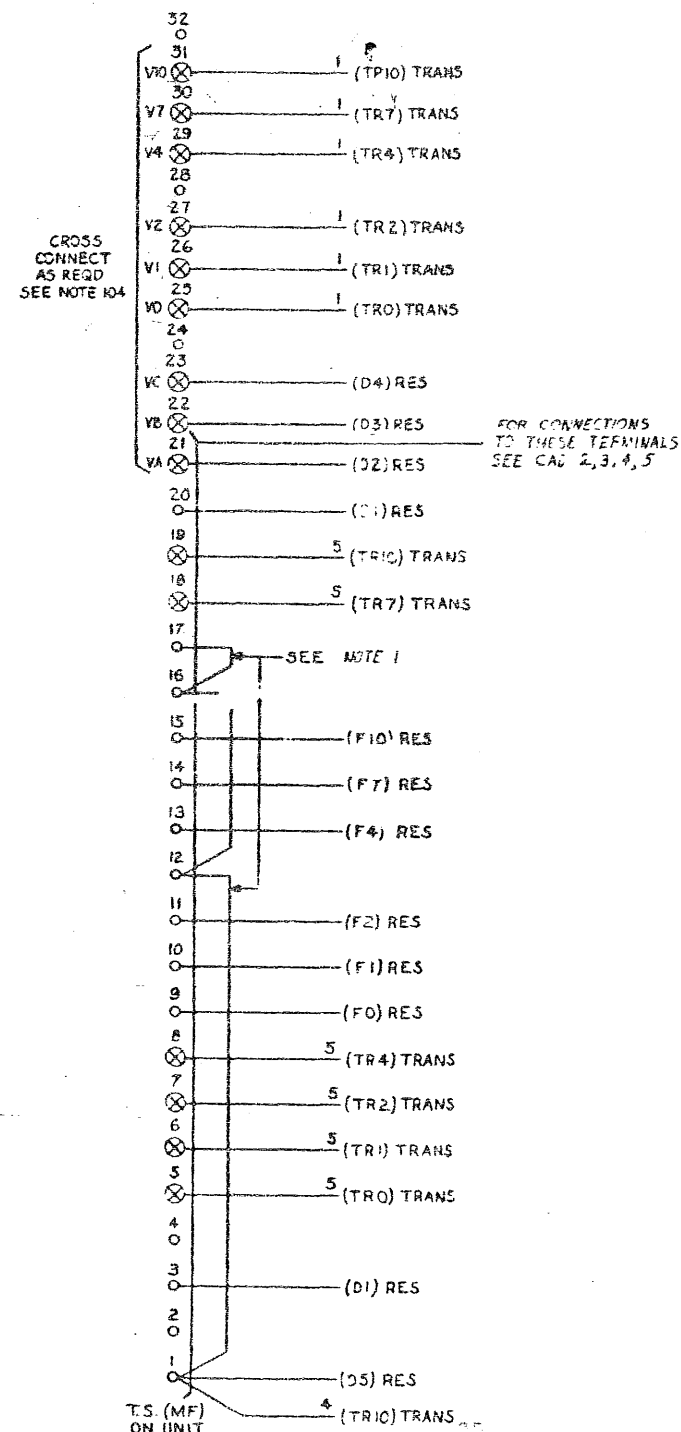
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CAD 1

(FOR APP FIG. 1)



NOTES:
1. THESE STRAPS ADDED ON ISSUE 100 TO PROVIDE FOR LONGER LENGTH OF OUTPUT LEADS.

CAD 2

(WIRING REQUIRED WHEN GENERATOR IS MOUNTED ON SAME FRAME AS ITS CONNECTING CIRCUIT)

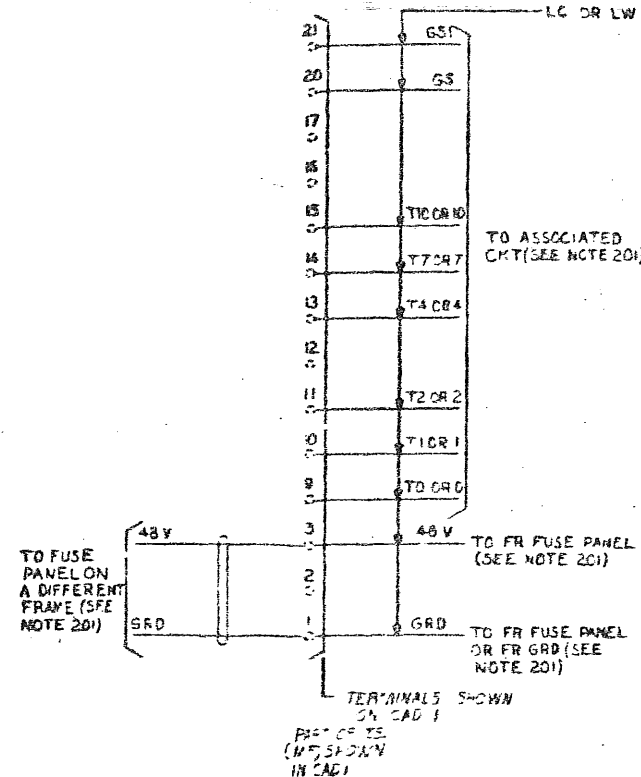


TABLE A

CONNECTING CKT	OPTION
AUTO. - FROM REG & SDR TEST, SDR TEST, REG TEST, OR PAD CKT AND OTHER TEST CKT USED TO TEST RF RECEIVERS	I
LINE CONCENTRATOR NO. 1A RF SIG CKT	
PULSE CONVR & REG AND RF PULSING CKT FOR SERV OBSERVING	
SERV OBSERVING CKT AND SERV OBSERVING TEST CKT	
CALLS WAITING CKT	II
RF OUTPULSING SDR & REG IN CROSSBAR TANDEN, AND SXS CMA OFFICES	
TOLL TESTBOARD NO. 17B, 7E, 18B AND 19A TOLL TEST UNIT NO. 5A	
CAMA POS, POS SEL, POS LOOP AND TRAFFIC SERV POS RF KEYSET CKT	
SWBD OPERATING AS TOLL SWITCHBOARDS ONLY	V
TRK TEST CKT IN CROSSBAR NO. 5 OPERATING BOTH CLASS 5 AND CLASS 4 OR HIGHER AND CROSSBAR TANDEN	
NO. 1 CROSSBAR ROTL OPERATING THROUGH OG TRUNKS TO A CLASS 5 AND A CLASS 4 OR HIGHER OFFICE	
TRK TEST CKT IN CROSSBAR NO. 5 OPERATING CLASS 5, CROSSBAR NO. 1, PANEL AND LOCAL SXS OFFICES	
ANTI OUTPULSER CKT	S
ANTI LINE VERIFICATION CKT	
MISC CKT FOR LINE MESSAGE REG RACK	
RF OUTPULSING SDR IN CROSSBAR NO. 1, PANEL, LOCAL SXS OFFICES, AND SXS COMMON CONTROL CKT	
IN-BAND CONTROL CKT	SEE NOTE 108
LOCAL TEST DESK OR CABINET NO. 3 OR 7X	
OUTPULSER IN SXS NO. 1 WITH AMA	
MANUAL OUTGOING TRK TEST FRAME TEST CKT FOR SXS OFFICE	
SWBD OPERATING AS DSA SWITCHBOARDS ONLY	SEE NOTE 108
AUTOMATIC OUTGOING TRUNK TEST FRAME FOR SXS OFFICE	
NO. 1 CROSSBAR ROTL OPERATING THROUGH OG TRUNKS TO A CLASS 5 OFFICE ONLY	
OGT INCPY FOR SXS OFFICE	
TRK TEST CKT IN TOLL 4A OR 4M OFFICES	SEE NOTE 108
RF OUTPULSING SDR & REG IN TOLL 4A OR 4M OFFICES	
TOLL SWBD NO. 5	
TOLL TESTBOARD NO. 17C AND 17D	
SWITCHBOARDS OPERATING AS COMBINED TOLL AND DSA SWITCHBOARDS	SEE NOTE 108

MULTIFREQUENCY SIGNAL GENERATOR CIRCUIT

2

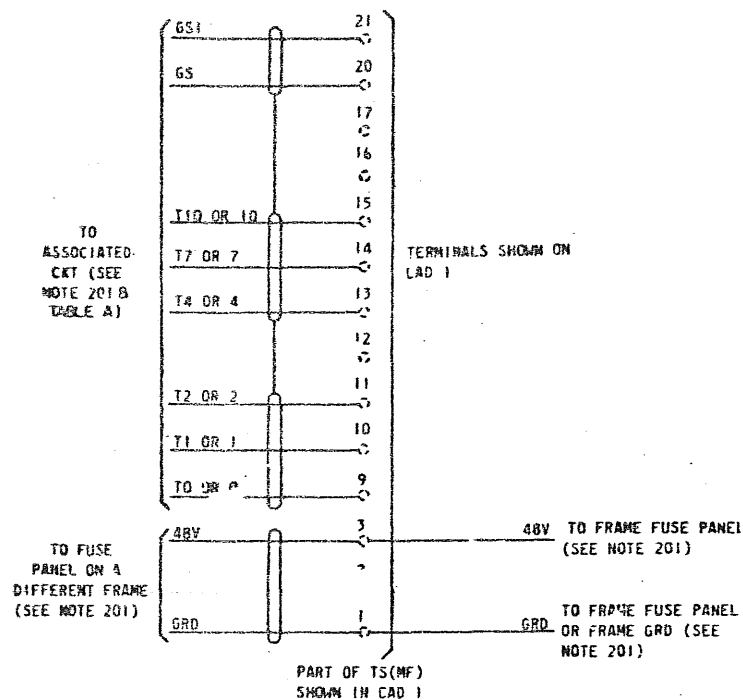
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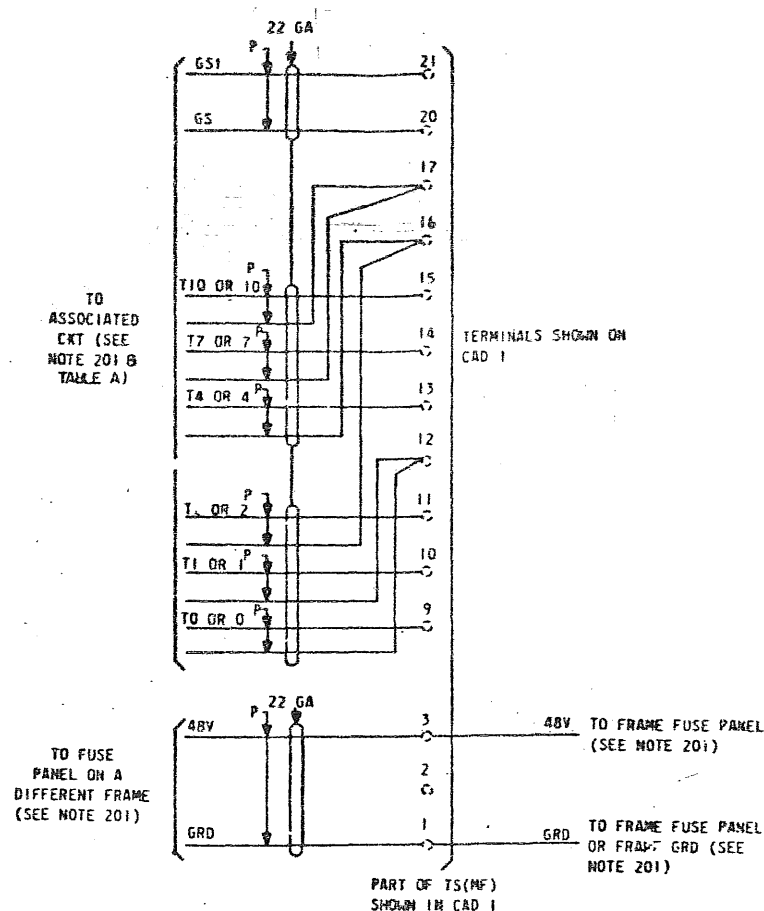
CAD 3 (MFR DISC)

(WIRING REQD WHEN GENERATOR IS ON DIFFERENT FRAME FROM ITS ASSOCIATED CIRCUIT AND OUTPUT LEADS ARE 20 FEET OR LESS)



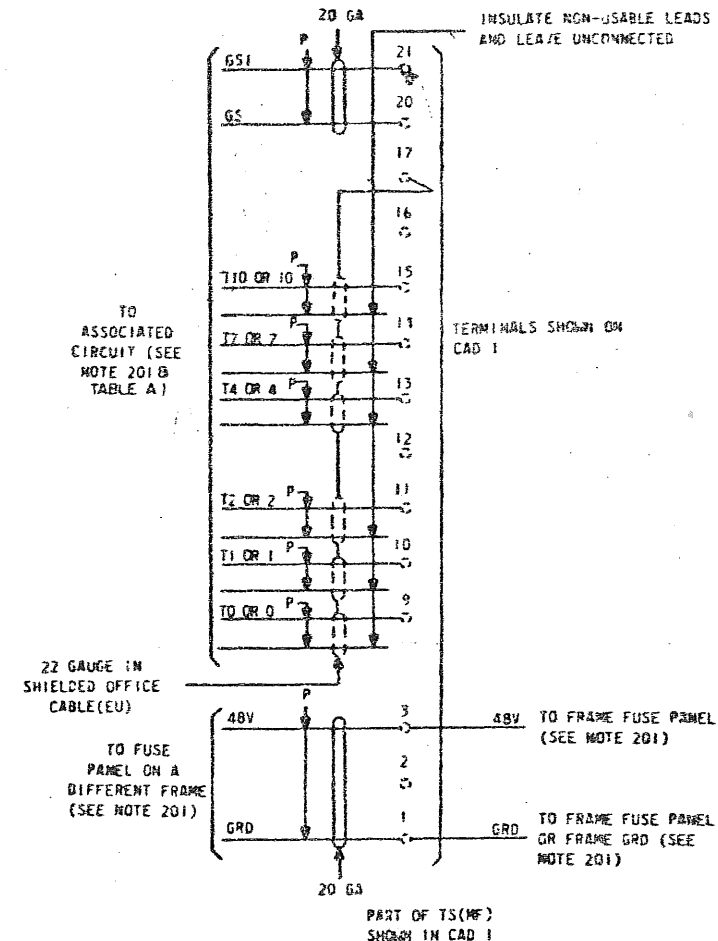
CAD 4

(WIRING REQUIRED WHEN GENERATOR IS ON DIFFERENT FRAME FROM ITS ASSOCIATED CIRCUIT AND OUTPUT LEADS ARE 100 FEET OR LESS)



CAD 5

(WIRING REQUIRED WHEN GENERATOR IS ON DIFFERENT FRAME FROM ITS ASSOCIATED CIRCUIT AND OUTPUT LEADS ARE BETWEEN 100 & 150 FEET)



MULTIFREQUENCY SIGNAL
GENERATOR CIRCUIT

2

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