06751

INSTRUCTION MANUAL

FOR

MODE INDICATING DEVICE

MODEL MID-3

MADE IN CANADA

IN-10054

ISSUE DATE: February 1964

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S E C T I O N I

GENERAL DESCRIPTION

1. PURPOSE

The Mode Indicating Device Model MID-3 is a receiving system accessory designed to provide remote indicating and switching according to the type of radio signal being received. It will indicate either Single Sideband (where one specified sideband only is used for SSB) or Carrier Amplitude Modulation, when used in conjunction with two sideband adapters such as T.M.C. Model MSR-4.

2. DESCRIPTION OF UNIT

The Model MID-3 requires 5¼ inches of height and 7½ inches of depth in any standard 19 inch rack. It weighs 12 pounds, approximately. The equipment is designed for unattended service and is manufactured in accordance with JAN/MIL specifications wherever practicable.

The front panel controls are POWER ON/OFF switch, and GAIN, one control for each of two amplifier channels. Two indicating lamps for mode indication, a power indicating lamp and the main power indicating fuse are located on the front panel. A test jack is also provided for connection of a test meter while making adjustments.

The rear apron of the chassis is fitted with a power socket, a dual input jack (phone type), a terminal strip for auxiliary connections, and a pair of tip jacks to accept test meter probes.

The unit is designed for operation from either 115 or 230 VAC 50/60 cycles, single phase source.

S E C T I O N II

THEORY OF OPERATION

1. GENERAL

The Mode Indicating Device Model MID-3 consists essentially of a two-channel amplifier feeding into a differential amplifier stage. The output circuit of the differential amplifier is arranged to operate one of two primary relays depending on which channel carries the higher audio signal level. The primary relays are of a highly sensitive type fitted with single pole contacts only. Each of the primary relays, therefore, is connected to operate a secondary relay with a greater number of contracts for switching purposes. The energizing current required to operate the secondary relays is normally supplied from an external power source of 48 volts D.C.

The unit responds to input signals from two separate sources, the upper sideband signal and the lower sideband signal.

The unit, therefore, can only be used in conjunction with two sideband adapters.

The unit operates in the following manner:

(a) Absence of Received Signal.

The unit is designed so that when the same average audio level is present in both channels, the effect of one channel is balanced out by the effect of the other channel and no relays operate. When connected to the sideband converters, the noise input from one converter will usually be at the same level as the noise input from the other converter. Thus, the balancing feature makes it possible to discriminate against the effect of noise. Because the unit is highly

(a) Absence of Received Signal (Cont'd.)

sensitive, it may be found necessary to readjust for lower gain (while maintaining proper balance) to avoid false indication resulting from noise.

(b) Single Sideband (SSB).

The presence of a single sideband signal at the input to channel 1 results in the operation of primary relay K2 and secondary relay K_4 with the accompanying indication by the SSB light.

(c) Amplitude Modulation (AM).

The presence of an AM signal results in a sideband input from each sideband converter to the MID unit. However, as part of the system adjustments, the converter not utilized in the SSB mode of operation is adjusted to give an audio frequency tone in addition to the sideband signal. For example, when the upper sideband (USB) is used for SSB operation, one sideband converter is tuned to receive the SSB signal in the normal manner. The other sideband converter is then used to receive the lower sideband (LSB) of the AM signal. The converter receiving the LSB is tuned by means of the oscillator bandspread control to give an audio tone (500 cps would be suitable) in the presence of a carrier in addition to the LSB audio signal. Thus, the input from the LSB converter to channel 2 of the MID unit will have a higher audio level than the USB input to channel 1.

The higher audio level in channel 2 causes relays K1 and K3 to operate with the accompanying AM indication.

2. CIRCUIT ANALYSIS

The MID unit incorporates two channels, one for the LSB input and one for the USB input. The signal in each channel is amplified by a two stage audio amplifier using a twin triode. A potentiometer in the grid circuit of the second stage allows the gain of the amplifier to be adjusted. The signal output from the second stage is rectified in a voltage doubler circuit producing DC voltage across a 0.47 UFD capacitor. The DC voltage produced by each channel from its input signal is applied to the differential amplifier stage as a positive voltage.

The differential amplifier stage uses a twin triode with the two cathodes connected together and a single cathode resistor to ground. The plate resistor for each triode has the same value of resistance. With no signal input to the unit, the plate voltage of the two triodes should be very nearly equal. Referring to the two triode sections as V_A and V_B, the DC output from channel 2 is applied to the grid of V_A and the DC output from Channel 1 is applied to the grid of V_B. The energizing coil of each of the two primary relays is connected in series with a diode between the anode of V_A and the anode of V_B. The diode associated with K1 is connected to allow K1 to operate only when the voltage at the anode of V_B rises with respect to the voltage at the anode of V_A. This will occur when a positive voltage is applied to the grid of V_A. The diode associated with K2 is connected in the opposite direction. Therefore, K2 operates with a positive DC input to the grid of V_B.

Thus, relays K2 and K4 operate in response to signal input fed to channel 1; K1 and K3 operate in response to a signal level in channel 2 higher than the signal level in channel 1.

S E C T I O N III

1. INSTALLATION

(a) Unpacking

The unit is packed in an individual shipping container and should be carefully unpacked. A close visual inspection should be carried out to discover possible physical damage, especially to the relays, due to rough handling during shipment.

(b) Power Supply

The unit is wired in the factory for operation ffom 115 vòlts, 50/60 cycles, single phase. To operate the unit from a 230 volt source, change the wiring of the power transformer T1 according to schematic diagram CK-10440 (at rear of the handbook).

(c) Connections

Install unit in a standard 19" rack. Connect from the sideband converter receiving SSB to J6 of the MID and from the other sideband converter to J5 of the MID unit. The MID unit is designed to operate on the audio signal levels found at the detector stages of the sideband converters. Connections should be made with shielded cable and should be kept short to avoid adding undesirable capacitance to the sideband converter circuitry. Installation details depend on the particular receiving equipment with which the unit is to be used.

2. OPERATION

Switch power on and allow a warm-up period of 3 minutes or more.

2. OPERATION (Cont'd.)

Tune the receiver and sideband converters as indicated in the relevant handbooks. Make additional adjustments as required to suit the operating conditions as indicated in section II describing the theory of operation. Refer to schematic CK-10440 for terminal strip connections to the contacts of the relays. The schematic also indicates one possible application of the switching contacts for muting and signalling purposes.

SECTION IV: ELECTRICAL PARTS LIST MID-3

Ref. Symbol	Description	Function	TMC Part No.	
C1	CAPACITOR: fixed, ceramic, .01 uf ± 10% 600 VDCW	Coupling Capacitor V1	CC-10002-1	
C2	CAPACITOR: fixed, ceramic, .005 uf 600 VDCW	Audio Bypass Capacitor V1	CC-100-15	
C3	CAPACITOR: fixed, ceramic, .01 uf ± 10% 600 VDCW	Diode Rectifier Input Capacitor	CC-10002-1	
C4	CAPACITOR: fixed, tubular, .47 uf ± 10% 400 VDCW	Filter Capacitor	CN-10005-3	
C5	CAPACITOR: fixed, ceramic, .01 uf ± 10% 600 VDCW	Coupling Capacitor V2	CC-10002-1	
C6	CAPACITOR: fixed, ceramic, .005 uf 600 VDCW	Audio Bypass Capacitor, V1	CC-100-15	
C7	CAPACITOR: fixed, ceramic, .01 uf ± 10%, 600 VDCW	Diode Rectifier Input Capacitor	CC-10002-1	
C8	CAPACITOR: fixed, tubular, .47 uf ± 10%, 400 VDCW	Filter Capacitor	CN-10005-3	
C9	CAPACITOR: Electrolytic, tubular 8 uf, 150 VDCW	K4 time Delay Capacitor		Corn.-Dub. BBR8-150
C10	Not Used			
C11	CAPACITOR: fixed, mica, .01 uf ± 10%, 500 VDCW	Line Filter Capacitor	CM35B103K	
C12	CAPACITOR: fixed, mica, .01 uf ± 10%, 500 VDCW	Line Filter Capacitor	CM35B103K	
C13 A,B	CAPACITOR: electrolytic, plug-in type, 2 x 20 uf, 450 VDCW	P.S. Filter Capacitor	CE52F200R	

Ref. Symbol	DESCRIPTION	Function	TMC Part No.	
D1	DIODE: germanium	p/o Voltage Doubling Rectifier	1N-478	
D2	DIODE: germanium	p/o Voltage Doubling Rectifier	1N-478	
D3	DIODE: germanium	Relay Polarity Diode	1N-478	
D4	DIODE: germanium	Relay Polarity Diode	1N-478	
D5	DIODE: germanium	p/o Voltage Doubling Rectifier	1N-478	
D6	DIODE: germanium	p/o Voltage Doubling Rectifier	1N-478	
E1	TERMINAL BLOCK: barrier type: 8 terminals, screw & feed-thru solder lug type	Relay Contact Terminal Block	TM-100-8	
E2	TERMINAL STRIP: fanning, right angle spade lug type (supplied as loose item)	Fanning Strip for Terminal Block	TM-105-8-AR	
F1	FUSE: cartridge 0.25 amp, 250v, slow blow (1 spare)	Main Power Fuse	FU-102-.25	
I1	LAMP: incandescent, 2v, 60 ma T-3¼ clear bulb, bayonet base	SSB Indicator	BI-101-49	
I2	LAMP: incandescent, 2v, 60 ma T-3¼ clear bulb, bayonet base	AM Indicator	BI-101-49	
I3	LAMP: incandescent, 6-8v, 150 ma, T-3¼ clear bulb, bayonet base	Power Indicator	BI-101-47	

Ref. Symbol	Description	Function	TMC Part No.	
J1	TIP JACK: subminiature, teflon, press fit type	Balance Test Point with J2	JJ-219-3	
J2	TIP JACK: subminiature, teflon, press fit type	Use with J1	JJ-219-3	
J3	JACK: telephone, tip, ring, and sleeve	Balance Test Jack	JJ-033	
J4	RECEPTACLE: male, twistlock, 10 amp. 250v	Power Input Connector	JJ-100	
J5,J6	JACK: phone, dual	Signal Inputs	JJ-144	
K1	RELAY: sensitive, precision, SPDT, 10,000 ohm	AM Primary Relay	RL-10030	
K2	RELAY: sensitive precision, SPDT, 10,000 ohm	SSB Primary Relay	RL-10030	
K3	RELAY: octal base, polystyrene case, DPDT, 10,000 ohm	AM Switching Relay	RL-10031	
K4	RELAY: octal base, polystyrene case, DPDT, 10,000 ohm	SSB Switching Relay	RL-10031	
L1	REACTOR: fixed, 11.4 henries, 125ma dc, 250 ohm DC, 2500v RMS test	P.S. Filter Choke	TF-158	
R1	RESISTOR: fixed, composition 1 Megohm, ± 10% ½ watt	Grid Res., V1	RC20GF105K	
R2	RESISTOR: fixed, composition, 2,200 ohms, ± 10%, ½ watt	Cathode Bias Res., V1	RC20GF222K	

Ref. Symbol	Description	Function	TMC Part No.
R3	RESISTOR: fixed, composition, 2,200 ohms, ± 10%, ½ watt	Cathode, Bias Res., V1	RC20GF222K
R4	RESISTOR: variable, composition, 1 Megohm, ± 10%, 2 watt linear taper	Gain Control V1	RV4ATSA105A
R5	RESISTOR: fixed, composition, 220,000 ohms ± 10%, ½ watt	Plate Load Res., V1	RC20GF224K
R6	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, ½ watt	Plate Load Res., V1	RC20GF224K
R7	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, ½ watt	Grid Res., V3	RC20GF224K
R8	RESISTOR: fixed, composition, 1,000 ohms, ± 10%, ½ watt	Cathode Res., V3	RC20GF102K
R9	RESISTOR: fixed, composition, 27,000 ohms, ± 10%, 1 watt	Plate Load Res., V3	RC32GF273K
R10	RESISTOR: fixed, composition, 27,000 ohms, ± 10%, 1 watt	Plate Load Res., V3	RC32GF273K
R11	RESISTOR: fixed, composition, 220 ohms, ± 10%, ½ watt	K3 Series Res.	RC20GF221K
R12	RESISTOR: fixed, composition, 220 ohms, ± 10%, ½ watt	p/o K4 Time Delay Network	RC20GF221K
R13	RESISTOR: fixed, composition, 1 Megohm, ± 10%, ½ watt	Grid Res., V2	RC20GF105K
R14	RESISTOR: fixed, composition, 2,200 ohms, ± 10%, ½ watt	Cathode Bias Res., V2	RC20GF222K
R15	RESISTOR: fixed, composition, 2,200 ohms, ± 10%, ½ watt	Cathode Bias Res., V2	RC20GF222K

Ref. Symbol	Description	Function	TMC Part No.	
R16	RESISTOR: variable, composition, 1 Megohm, ± 10%, 2 watt Linear taper	Gain Control V2	RV4ATSA105A	
R17	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, ½ watt	Plate Load Res., V2	RC20GF224K	
R18	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, ½ watt	Plate Load Res., V2	RC20GF224K	
R19	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, ½ watt	Grid Res., V3	RC20GF224K	
R20	RESISTOR: fixed, composition, 15 ohms, ± 10%, ½ watt	I 1 Voltage Dropping Res.	RC20GF150K	
R21	RESISTOR: fixed, composition, 15 ohms, ± 10%, ½ watt	I 2 Voltage Dropping Res.	RC20GF150K	
R22	RESISTOR: fixed, composition, 1,200 ohms, ± 10%, 1 watt	P.S. Surge Limiting Res.	RC32GF122K	
R23	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1 watt	P.S. Bleeder Res.	RC32GF104K	
S1	SWITCH: toggle, DPST, 2 amp at 250v	Main Power switch	ST-22K	
T1	TRANSFORMER: power: primary- 110 or 220v, 50 to 60 cps; heater winding- 6.3v at 3 amp, centre tapped, high tension winding 250v-0-250v at 35 ma dc	Power Transformer	TF-126	
V1	TUBE: electron, twin triode 9 pin miniature	Audio Amplifier	12AX7	
V2	TUBE: electron, twin triode 9 pin miniature	Audio Amplifier	12AX7	

Ref. Symbol	Description	Function	TMC Part No.	
V3	TUBE: electron, twin triode, 9 pin miniature, 10,000 hour type	Differential Amplifier	6085	
V4	TUBE: electron, full wave rectifier, 7 pin miniature	Power Rect.	6X4	
W1	CABLE ASSEMBLY: power, 2 conductor, 6 ft. long, with integral male plug one end, and twist lock female plug on other end	A.C. Line Cord	CA-103-72	
XF1	HOLDER: fuse, indicating, neon lamp type	Fuse Holder	FH-104-3	
XI1	SOCKET: lamp, w/clear lens, for miniature bayonet base T-3¼ bulb	Socket for I 1	TS-106-2	
XI2	SOCKET: lamp, w/clear lens, for miniature bayonet base T-3¼ bulb	Socket for I 2	TS-106-2	
XI3	SOCKET: lamp, w/red lens for miniature bayonet base T-3¼ bulb	Socket for I 3	TS-106-1	
XK3	SOCKET: octal	Socket for Relay K3	TS-101-P01	
XK4	SOCKET: octal	Socket for Relay K4	TS-101-P01	
XV1	SOCKET: electron tube, 9 pin miniature	Socket for V1	TS-103-P01	
XV2	SOCKET: electron tube, 9 pin miniature	Socket for V2	TS-103-P01	
XV3	SOCKET: electron tube, 9 pin miniature	Socket for V3	TS-103-P01	
XV4	SOCKET: electron tube, 7 pin miniature	Socket for V4	TS-102-P01	

IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASE PROMPTLY.

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AN DEVIATIONS WILL BE CAUSE FOR REJECTI N. REMOVE ALL BURRS AND SHARP EDGES.

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

ISSUE	ITEM	CHANGED FROM	DATE	CN NO.	DRAFTS	CHECKER	ENG. APP.
A		T1 WAS T101 IN NOTE J5 & J6 LABELLED TITLE WAS M.I.O. 3 SPEC101 CHANNELS 1 & 2 REF ADDED PINS 7 OF V1 & V2 SHIELDED WIRE ADDED	4-7-64		RD		

LOCATED ON REAR CHASSIS

J1 ○

2 ○

+140 V

+140 V

V1 12AX7

PHONO J1K ON REAR CHASSIS

FROM MSR

C1 .01 MF 600V

C3 .01 MF 600V

D2 IN478

R1 1 MEG 1/2 W

R2 2.2K 1/2 W

R3 2.2K 1/2 W

R4 1 MEG VAR.

C2 .005 MF 600V

R5 220K 1/2 W

R6 220K 1/2 W

D1 IN478

C4 47 MF 400

CHANNEL "2"

+140 V

+140 V

V2 12AX7

PHONO J1K ON REAR CHASSIS

FROM MSR

C5 .01 MF 600V

C7 .01 MF 600V

D6 IN478

R13 1 MEG 1/2 W

R14 2.2K 1/2 W

R15 2.2K 1/2 W

R16 1 MEG VAR.

C6 .005 MF 600V

R17 220K 1/2 W

R18 220K 1/2 W

D5 IN478

+ 110 V

+ 110 V

V3
6085
1 6
2 7
3 8

D2
IN478

D1
IN478

C4
.47 MF
400V

R7
220K
½ W

R8
1K
½ W

K1

D3
IN478

R9
27K
1 W

R10
27K
1 W

R20
150Ω
½ W

D6
IN478

D5
IN478

C8
.47 MF
400V

R19
3.20K
½ W

R22
100K
1W

+285 V

C13 "B"
20 MF
450 V

L.1
11.4 H

+290 V

C13 "A"
20 MF
450 V

R.22
1.2K
1W

+30

REQ.	ITEM	PART NO.	DESCRIPTI N	SYMBOL

J3 LOCATED ON FRONT OF CHASSIS

NOTE: FOR 230V OPERATION;
(A) REMOVE JUMPERS 1-2 & 3-4 OF T1.
(B) ADD JUMPER BETWEEN 2 & 3 OF T1

K1

K2

AM

SSB

R12 220 Ω 1/2 W

R11 220 Ω 1/2 W

C9 8MF 150V

7 SSB K4 2

3 1 4 6 8 5

E1-1 -48V

E1-2

E1-3 SSB MUTE

R10 1/2 W

I1

7 A.M. K3 2

R1 15Ω 1/2 W

3 1 4 6 8 5

E1-5 +48V

E1-6 SIG

E1-7

I2

E1-8 AM MUTE

V4 6X4

+300V

2K

T1

S1

F1

C11 .01MF 500V

J4 - MATE WITH POWE CORD - WI

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL

J3 LOCATED ON FRONT OF CHASSIS

NOTE: FOR 230V OPERATION;
(A) REMOVE JUMPERS 1-2 & 3-4 OF T1.
(B) ADD JUMPER BETWEEN 2 & 3 OF T1

AM

SSB

R12 220 Ω 1/2 W

R11 220 Ω 1/2 W

C9 .8MF 150V

K1

7 SSB

2

3 1 4 6 8 5

E1-1 -48V

E1-2

E1-3 SSB MUTE

K3

7 A.M.

2

E1-5 +48V

E1-6 SIG.

E1-7

E1-8 AM MUTE

V4 X4

T1

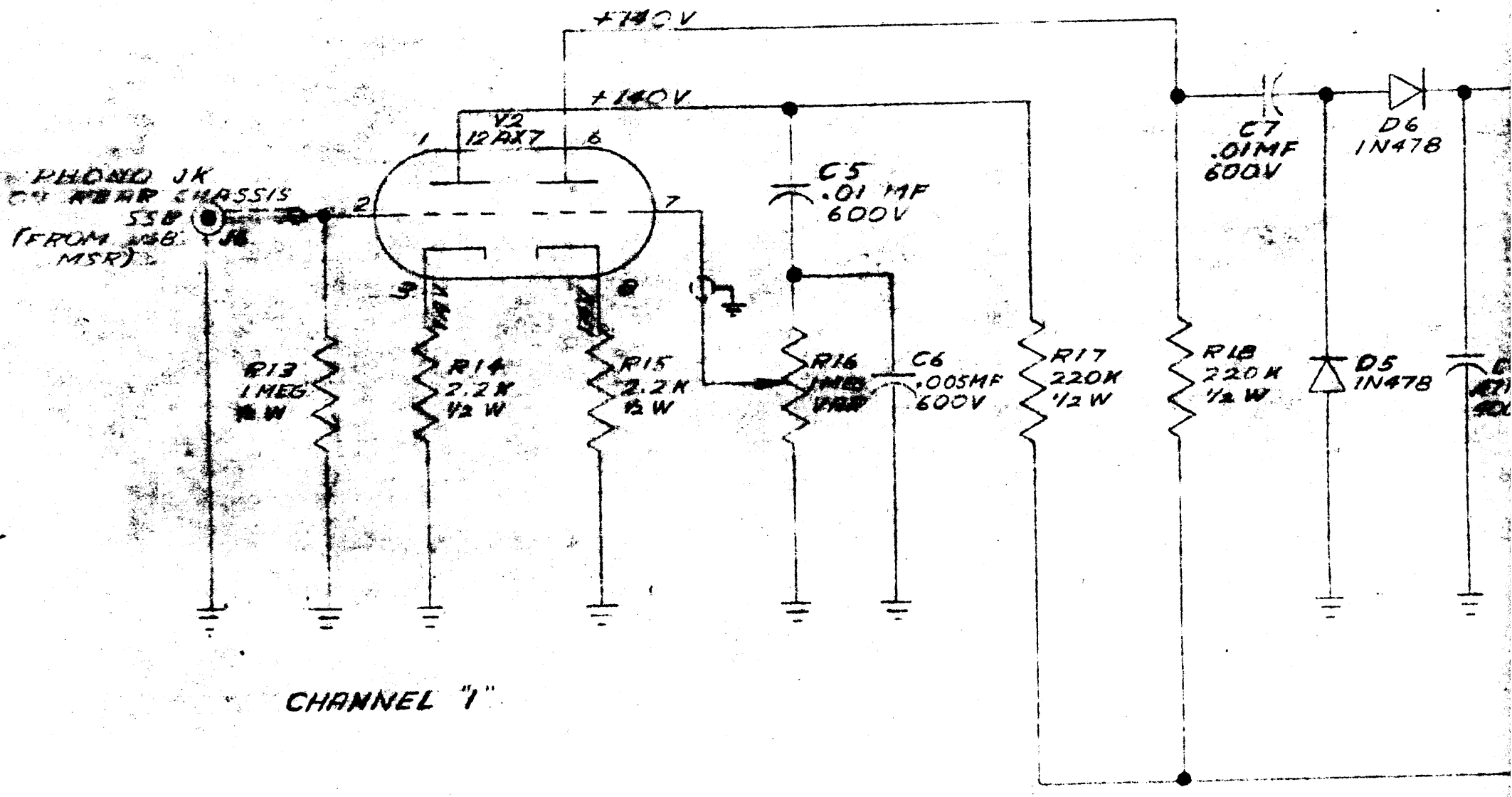
6 5 Y 6 7 3 2

S1

F1

C11 .01MF 500V

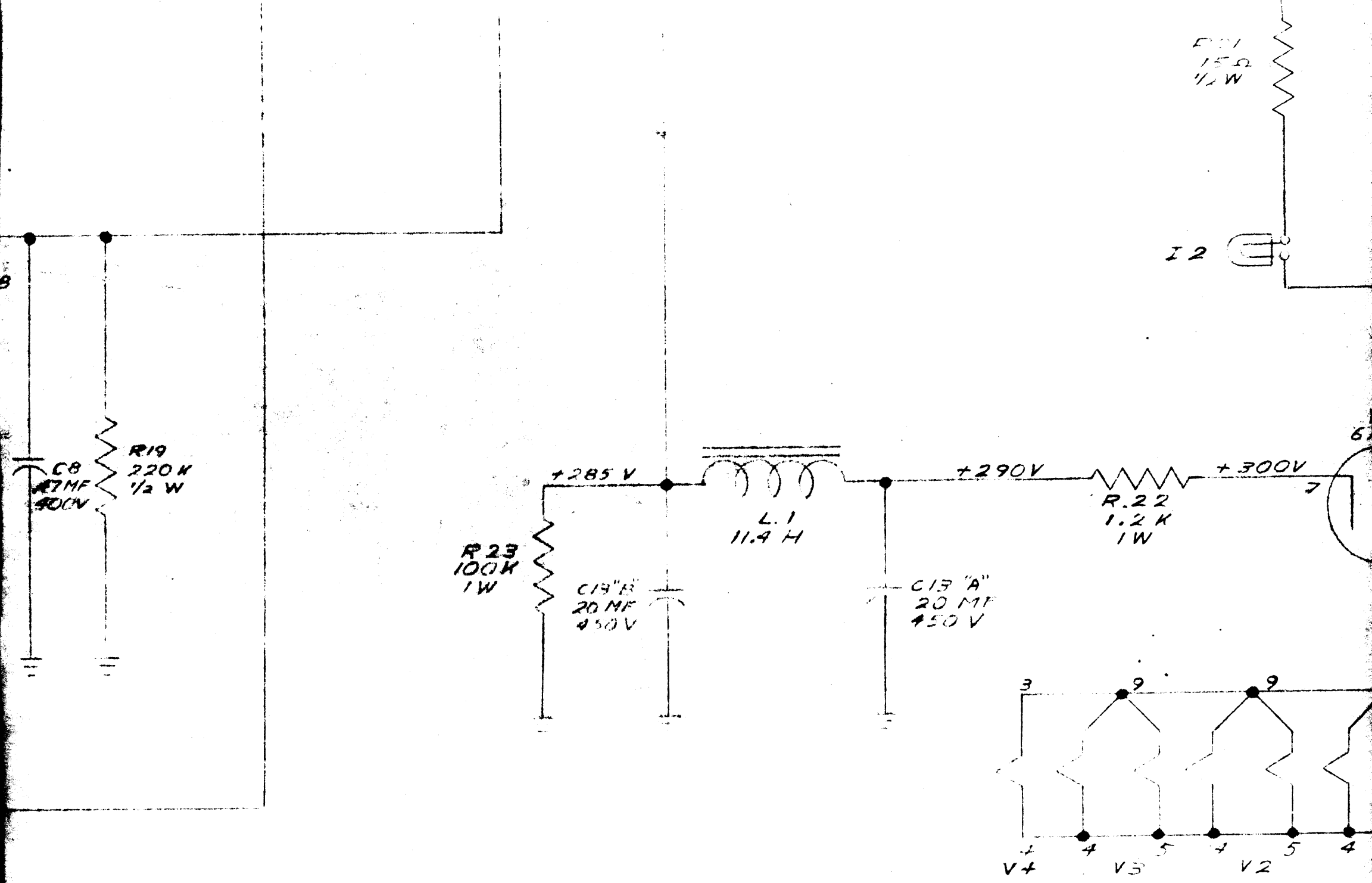
J4 - MATES WITH POWER CORD - W1



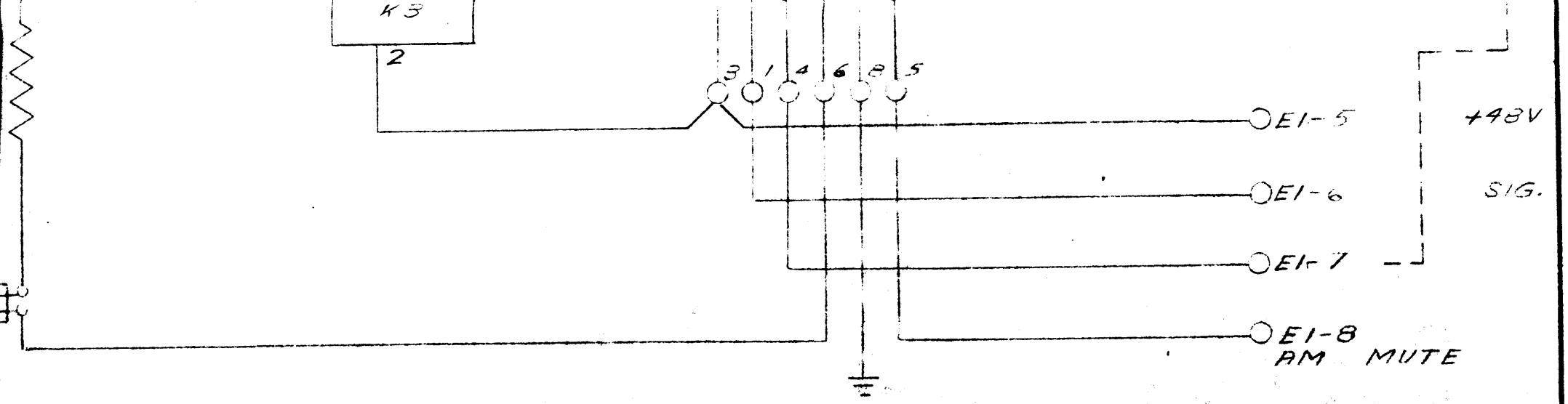
CHANNEL "1"

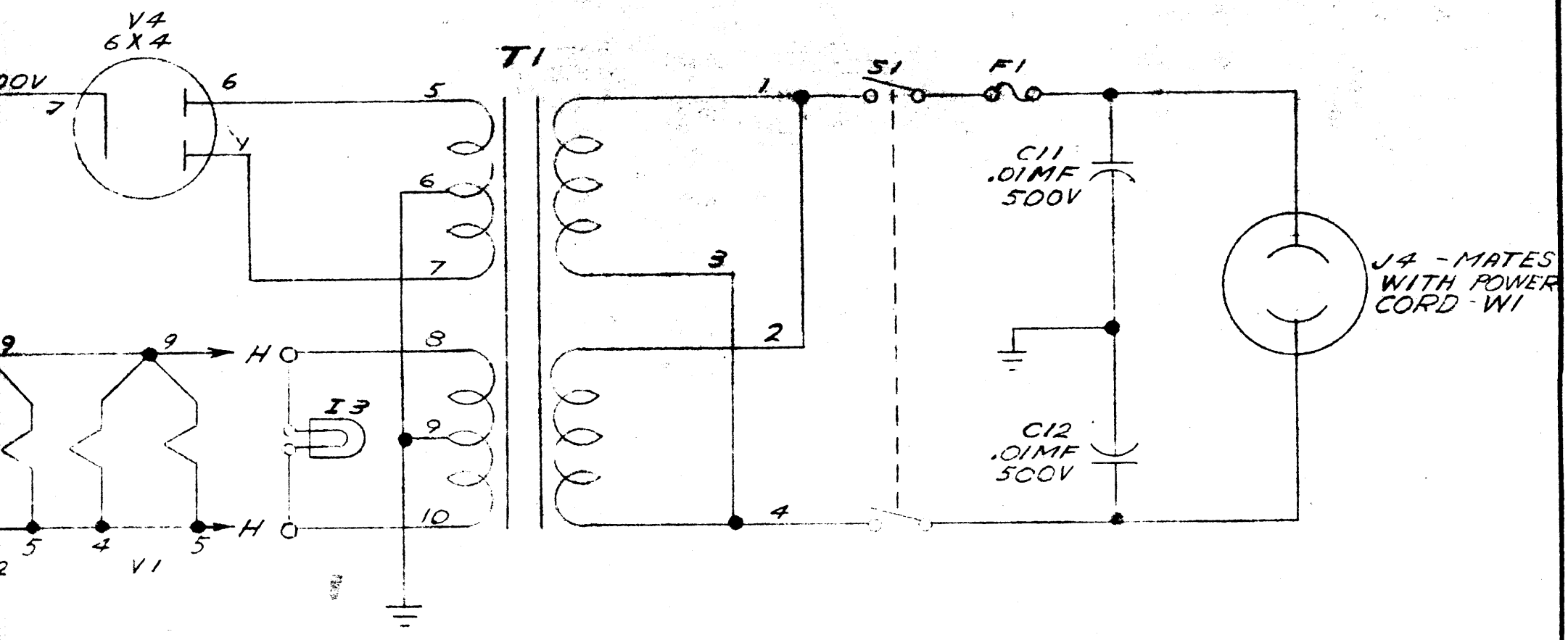
TOLERANCES		SCALE:
ALL OTHERS	DEC. DIM. ± FRAC. DIM. ± ANGULAR DIM. ±	DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED

FORM—139


C8
.47 MF
900V
R19
220K
1/2 W
+285 V
R23
100K
1W
C19 "B"
20 MF
450 V
L.1
11.4 H
C13 "A"
20 MF
450 V
+290V
R.22
1.2K
1W
+300V
I 2
3
9
9
4
4
5
4
5
4
V4
V3
V2

REFERENCE: B.





ICE: B.C. TELEPHONE CO.
NO. B.M. #ICK-10412

MODEL	PROJECT NO.	ASS'Y. NO.	DATE
USED ON			

STOCK SIZE	
MATERIAL	WEIGHT PER PC.
TYPE & TEMPER	
HEAT TREAT. SPEC.	
FINISH & SPEC. NO.	

TMC (Canada) LIMITED
OTTAWA ONTARIO

M.L.D. 3

SCHEMATIC

DRAWN	ELEC. DES. APP.	MECH. DES. APP.
R. Dan.		
CHECKED	FINAL APPROVAL	
A. H.		

CK-10440 A