Publication Number: 2107TIS2

Issue Date: October 1991

Technical Manual

for

Tone Intelligence System

Model TIS-2

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Mamaroneck, New York 10543-0142 U.S.A.

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COMMUNICATIONS ENGINEERS

SECTION I

GENERAL DESCRIPTION

The TMC F/S and Tone Intelligence System, Model TIS-2, is a two-channel system for use on wire lines, radio or microwave links. The system comprises a Model TTU-1 CW channel at 1500 c/s, a Model TTU-2 frequency shift channel with ± 425 cycles shift centred at 2550 c/s, a power supply Model TST-2 and a tone transmit filter panel Model TTF-2.

Design features such as master power supply, plug-in tone transmitter units, master filter panel from which filters can be easily removed, provide ease of maintenance.

The system is designed to be used with any type of terminal equipment which provides intelligence in an on/off keyed form. In the TTU-1 this on/off keyed information is converted into a keyed tone of 1500 c/s. The frequency determining element in the TTU-1 is a self-contained, encapsulated, extremely stable plug-in device. Electronically, the Model TTU-1 converts on/off current or contact pulses into equivalent tones. The resultant envelope is free from transients, and the steepness of the original modulating rectangular pulse is retained.

The TTU-2 provides a frequency shift of 2975 cycles in mark condition to 2125 cycles in space condition. The frequency shift is achieved by mixing the output of a crystal oscillator, which oscillates at 197.45 kc/s, with the output of a 200 kc/s reactance push-pull oscillator. The 200 kc/s oven has a fast heating characteristic in order that the frequency may be stable within approximately 30 minutes after a cold start.

The outputs from the TTU-1 and TTU-2 are combined in the TTF-2 into a single composite for transmission and to give a 600 ohm output either balanced or unbalanced.

SECTION II

THEORY OF OPERATION

THEORY OF OPERATION:

A. Model TST-2 Tone System Transmitter (Power Supply)

1. General

The Model TST-2 supplies power to one tone transmit unit. Model TTU-1 and one F/S Transmit Unit, Model TTU-2. Two ON/OFF switches on the front panel supply filament voltage to each TTU individually, thus the unit which is not in use may be turned off.

2. High Voltage Supply (V101)

V101 provides power for the amplifier of the Models TTU and employs full wave rectification with choke input filter.

3. Regulated Voltage Supply (V102)

V102 provides regulated voltage to the oscillator and keyer stages of the Models TTU and to the reactance tube of the Model TTU-2.

B. Model TTU-1 (Tone Transmit Unit)

1. Oscillator (V201)

This is an extremely stable push-pull audio oscillator with frequency determined by a plug-in network. In addition the trimmer C203 provides precise frequency adjustment, in this case 1500 c/s. The balanced output is fed directly to the push-pull output amplifier V202.

2. Output Amplifier (V202)

V202 is a push-pull audio amplifier with an accurate balance obtained by means of the balance control R208. The output is obtained through a transformer to match 600 ohm lines and is controlled through a modified L-Pad which is in series with the line.

3. Keyer (V203)

This stage accepts three types of "ON/OFF" pulses: positive, negative and contact keying. The keyer signal biases the keyer stage permitting the output amplifier to conduct and amplify the oscillator signal.

C. Model TTU-2 (F/S Tone Transmit Unit

1. 200 Kc/s Oscillator (V101)

V101 is a push-pull modified Colpitts oscillator operating at 200 kc/s. The major parts of it's tank circuit are temperature compensated and in addition located within a temperatur stablised oven. In addition the plate voltage is stablised. The air trimmer C126 provides precise frequency adjustment.

2. Reactance Tube (V104)

The reactance tube is a push-pull balanced circuit and receives the modulating intelligence at the grid of section I. It changes the reactance across the 200 kc/s oscillator tank, and therefore shifts the frequency of the 200 kc/s oscillator in accordance with its intelligence.

3. Crystal Oscillator and Buffer (V105)

One section of V105 is used as a modified "Pierce" crystal controlled oscillator at 197.450 kc/s. The second stage is used as a cathode follower buffer. Both sections use stablized plate voltage.

4. Mixer (V102 and V103)

V102 and V103 together operate as a balanced mixer to add the crystal frequency of 197.45 kc/s and the 200 kc/s from the reactance tube oscillator. The plates of V102 and V103 are coupled to a low pass filter FX101 through transformer T101. The output level can be adjusted by means of R135.

5. Keyer Tube (V106)

The keyer tube V106 generates the actual internal keying voltage from positive and negative current and contact keying. For any type of keying the tube impresses a controlled voltage on the reactance tube ensuring consistent shift.

D. Model TTF-2 (Tone Transmit Filter)

1. General

The purpose of this unit is to ensure that any harmonics are suppressed in the event of malfunction of a tone transmit unit and also to combine the outputs. The composite signal is fed to a resistive pad permitting balanced or unbalanced output to a 600 ohm line.

SECTION III

INSTALLATION AND OPERATION

1. INSTALLATION

A. Power Requirements

The Model TIS-2 leaves the factory wired for 110V, 50/60 cycles, unless specifically ordered for 220V, 50/60 cycles in which case the equipment will be clearly tagged.

B. Location

Whenever practical the equipment should be kept close together to avoid excessively long interconnecting cables. The TIS-2 requires a total of nine inches of rack space.

C. Electrical Connections

The electrical connections required are listed below and should be performed step-by-step referring to the schematic diagrams as indicated to aid in this operation.

1. TTU-1

(a) Connect jumpers to E202 of the Model TTU-1 for proper mode of operation as indicated on the schematic diagram.

(b) Connect the source of intelligence at E201 terminal 4 and 5.

(c) Connect terminals 1 and 2 of E201, TTU-1 to E303 terminal 5 and 6 of TTF-2.

(d) The 600 ohm output terminals are 1 and 4 of E301.

NOTE: The output should be d.c. isolated. Either line of the balanced output may be grounded for unbalanced operation. Refer to schematic diagram CK-10300A.

2. TTU-2

(a) Connect jumpers to E101 of the Model TTU-2 for proper mode of keying in accordance with the schematic diagram.

(b) Connect the source of intelligence at E101 terminal 3 and 4.

(c) Connect terminals 1 and 2 of E101 of TTU-2 to E303 terminal 1 and 2 of TTF-2.

(d) Connect the output terminals 1 and 4 of E301. Terminal 4 of E301 should be grounded for unbalanced operation. Refer to schematic diagram CK-10325.

2. OPERATION

A. Description of Controls

The Model TIS-2 has the following controls:-

(a) POWER ON switch, one for each channel, located on the front of the Model TST-2.

(b) OUTPUT control for Model TTU-1 and Model TTU-2, located on the rear of each unit.

(c) LINE CURRENT control for Model TTU-1 and Model TTU-2, located on the rear of each unit.

(d) FREQUENCY SHIFT amplitude control for Model TTU-2, located on top of the chassis.

(e) 200 Kc/s oscillator frequency adjustment for Model TTU-2 located at the front of the unit.

B. Operation of Model TTU-1

(a) Turn on power at the front panel.

(b) In the "MARK" condition set the line current for not less than 25 ma. Where contact keying is used the LINE CURRENT control should be set at full CW position.

(c) Plug a dbm meter or an AC voltmeter into the phone jack of channel #3 of the Model TTF-2 and set the output to a level of 0.25 by adjusting the OUTPUT control located at the back of the Model TTU-1.

C. Operation of Model TTU-2

(a) Turn on power at the front panel.

(b) In the "MARK" condition set the line current for less than 25 ma in the Model TTU-2. Where contact keying is used the LINE CURRENT control should be set at full CW position.

(c) Before adjusting the centre frequency or shift the Model TTU-2 should be allowed at least one half hour to stabilize. The unit is adjusted during manufacture, to a "MARK" frequency of 2975 c/s and a shift of 850 c/s. For setting up a different frequency shift follow the procedure mentioned below:-

1. Set the mark frequency by means of C126 to 2975 c/s.

2. Set your frequency shift to the desired value by means of R119.

3. Reset your mark frequency by means of C126 to 2975 c/s.

4. Repeat steps 1, 2 until you have the desired frequency shift and a mark frequency of 2975 c/s.

(d) Plug a dbm meter or an c.c. voltmeter into the phone jack of channel #1 of the Model TTF-2 and set the output to a level of 0.25 by adjusting the OUTPUT control located at the back of the Model TTU-2.

SECTION IV

TECHNICAL SPECIFICATIONS

TONE TRANSMIT UNIT, MODEL TTU-1

Keying Speeds:	Up to 500 w.p.m.
Keying Inputs:	(a) Polar or neutral either side grounded. (b) Contact keying to ground.
Input Impedance:	330 to 2800 ohms, adjustable.
Tone Carrier Frequency:	1500 c/s.
Frequency Stability:	Virtually no drift over normal operating condition.
Output Level:	Continuously adjustable from 0 volts to 1 volt.
Controls:	(a) Output control. (b) Input loop control.

FREQUENCY SHIFT TRANSMIT UNIT, MODEL TTU-2

Frequency Shift:	0 to 1000 cycles.
Keying Speeds:	Up to 1000 w.p.m.
Keying Inputs:	(a) Polar or neutral either side grounded. (b) Contact Keying to ground.
Input Impedance:	330 to 2800 ohms, adjustable.
Frequency Stability:	(a) 10 c/s for ambient temperature change of 0 to 50° C. (b) 10 c/s for line voltage change of 10%. (c) No drift for input signal variations of plus 25 volts to plus 150 volts (mark frequency).
Output Level:	Continuously adjustable from 0 volts to 25 volts.
Controls:	(a) Output control. (b) Input loop control. (c) Frequency shift control.

TRANSMIT FILTER PANEL, MODEL TTF-2

CHANNEL 3

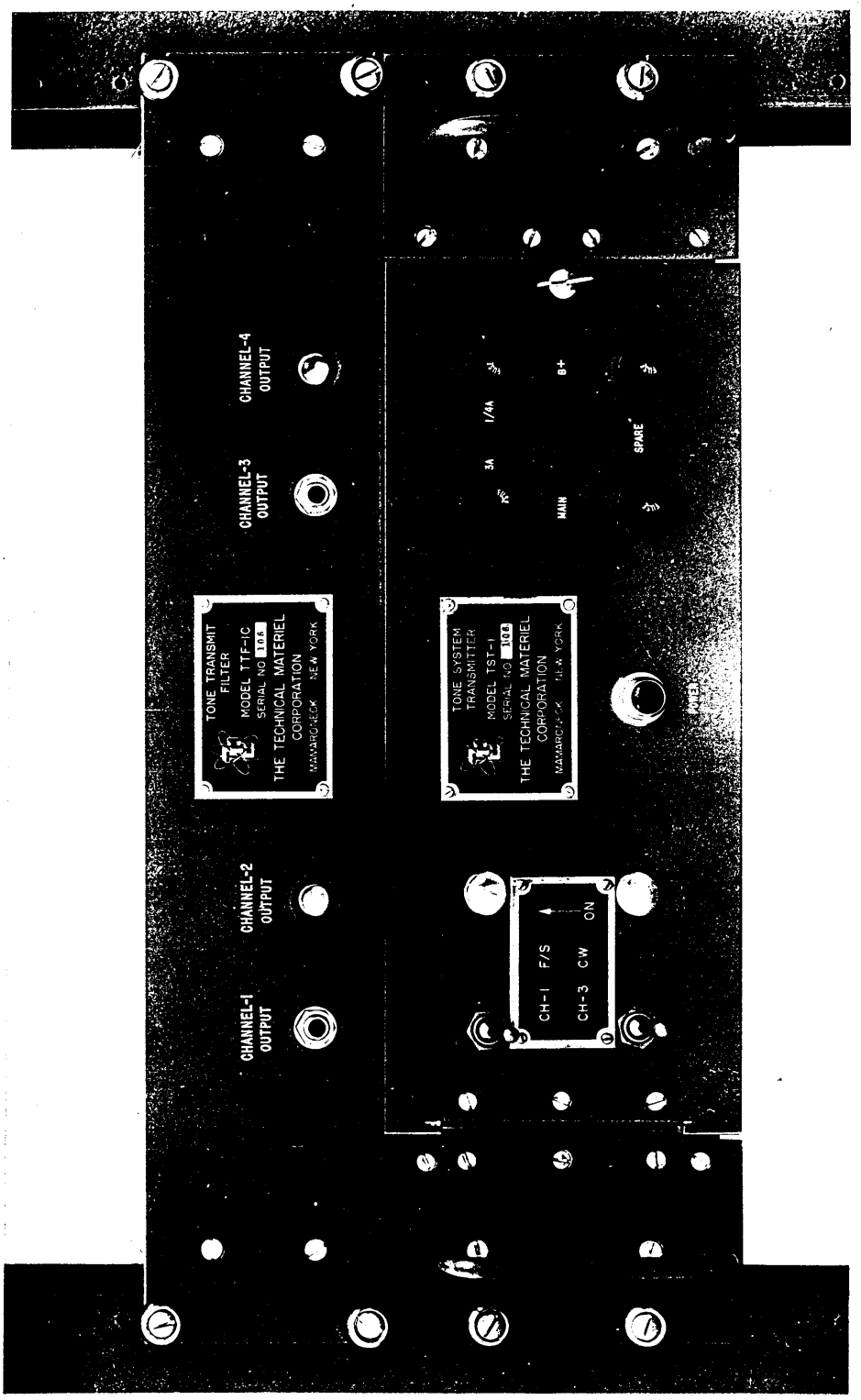
Tone Carrier Frequency:	1500 c/s.
Keying Speed:	60 w.p.m.

CHANNEL 1

Centre Frequency:	2550 c/s.
Frequency Shift:	± 425 c/s.
Line Terminations:	Both channels are matched through a resistive pad into a 600 ohm balanced or unbalanced line.
Dimensions:	3-1/2 inches high x 10 inches deep x 19 inches wide.
Weight:	8 pounds net.

TONE SYSTEM TRANSMITTER, MODEL TST-2 (POWER SUPPLY)

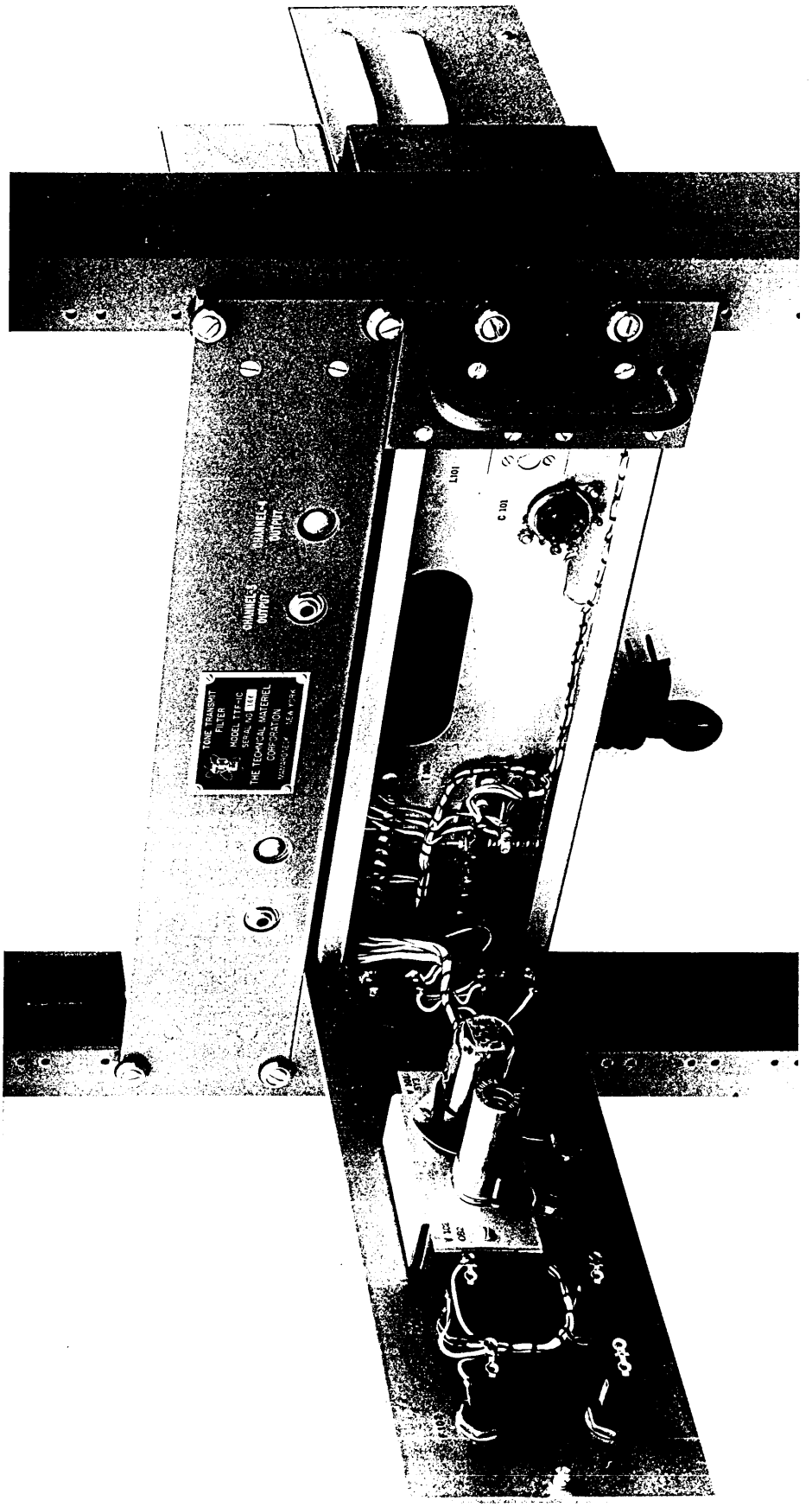
Power Requirements:	110/220 volts, 50/60 cycles, 170 watts.
Controls:	(a) Power switch, channel 1 (b) Power switch, channel 3
Dimensions:	5-1/4 inches high x 15 inches deep x 19 inches wide.
Weight:	26 pounds (with TTU-1 and TTU-2).



PH-10251

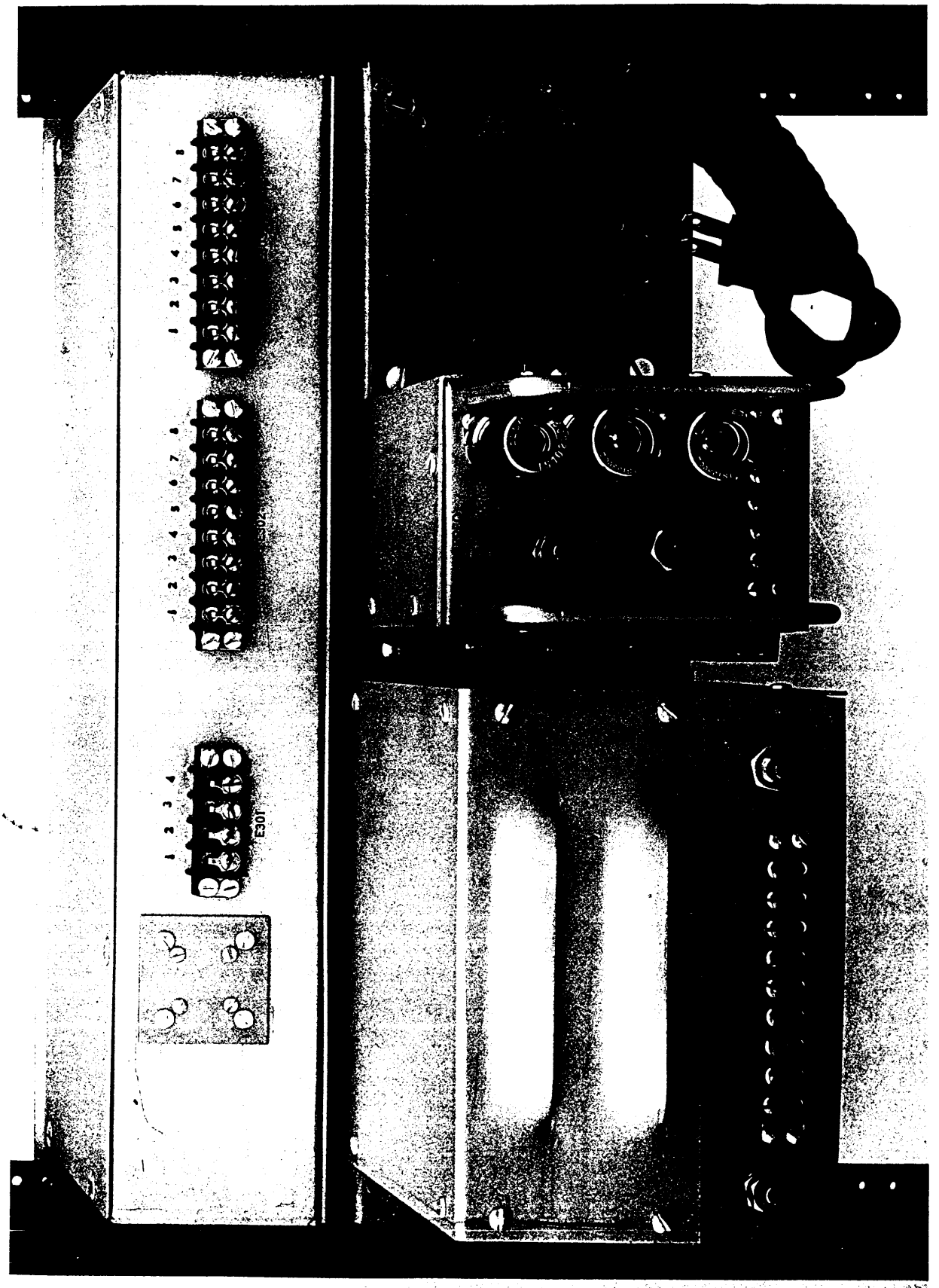
F/S AND TONE INTELLIGENCE SYSTEM-2

TMC MODEL TIS-2



PH-10250
F/S AND TONE INTELLIGENCE SYSTEM-2 POWER SUPPLY PANEL OPEN

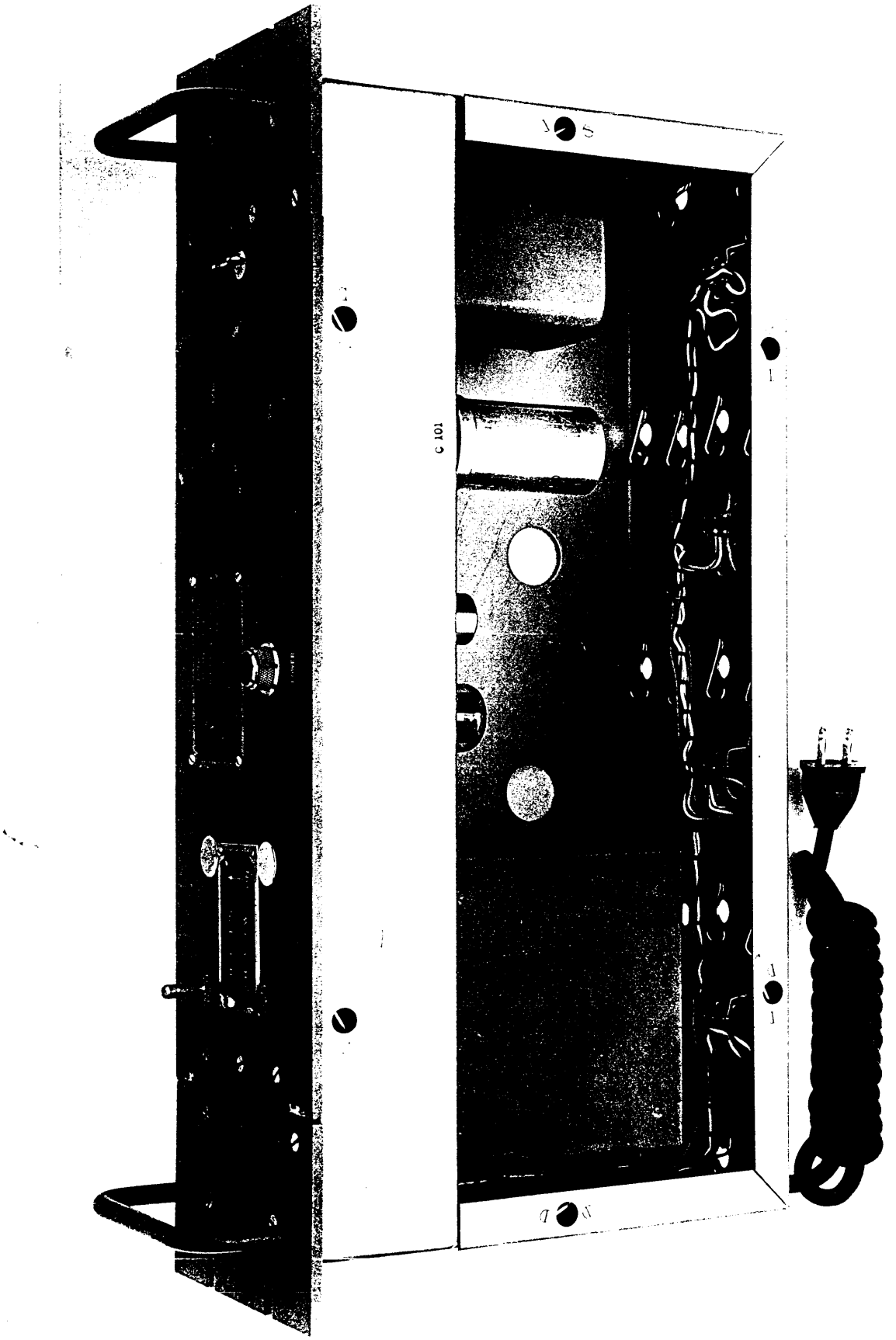
TMC MODEL TIS-2



PH-10254

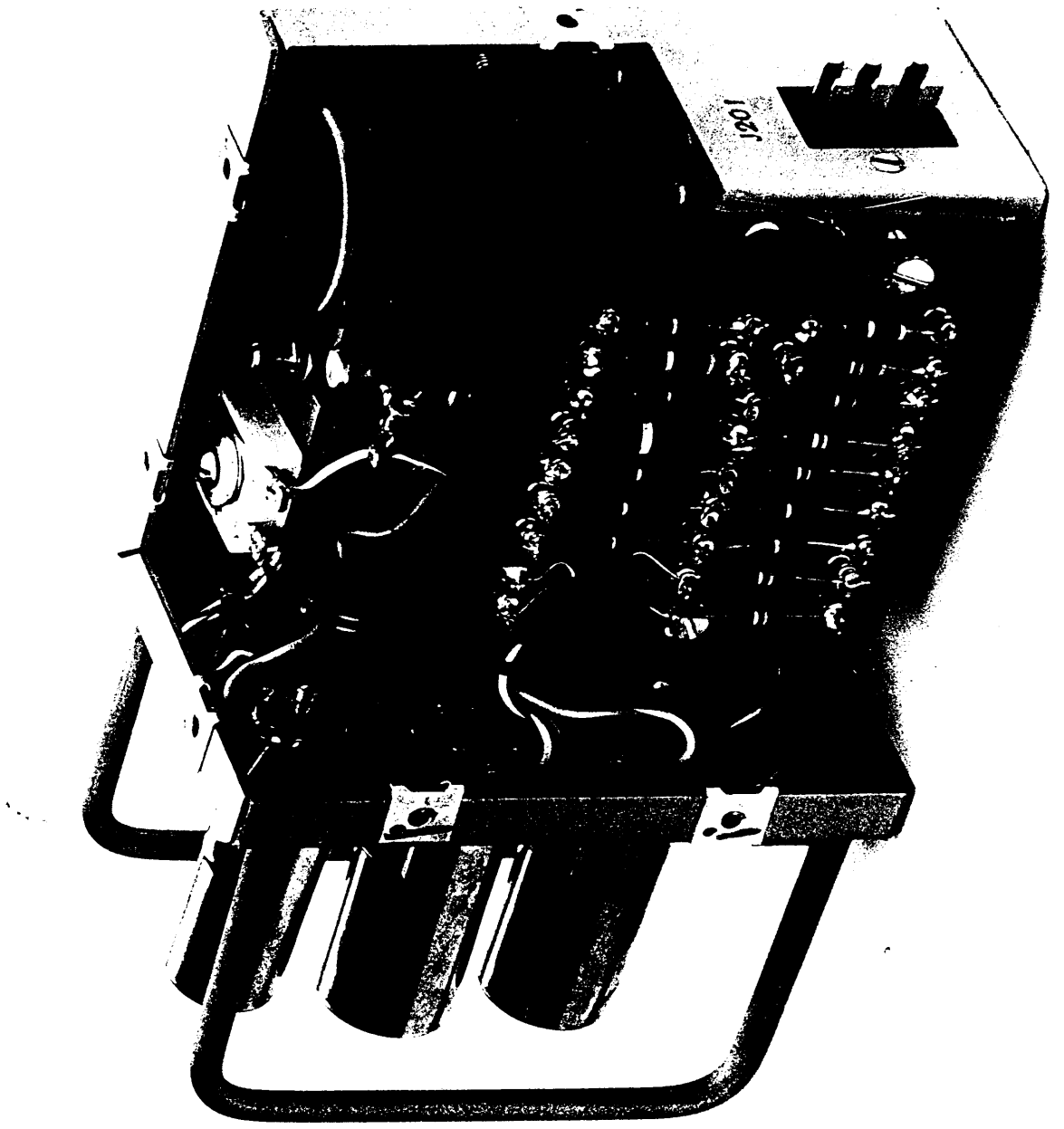
F/S AND TONE INTELLIGENCE SYSTEM-2 REAR VIEW

TMC MODEL TIS-2



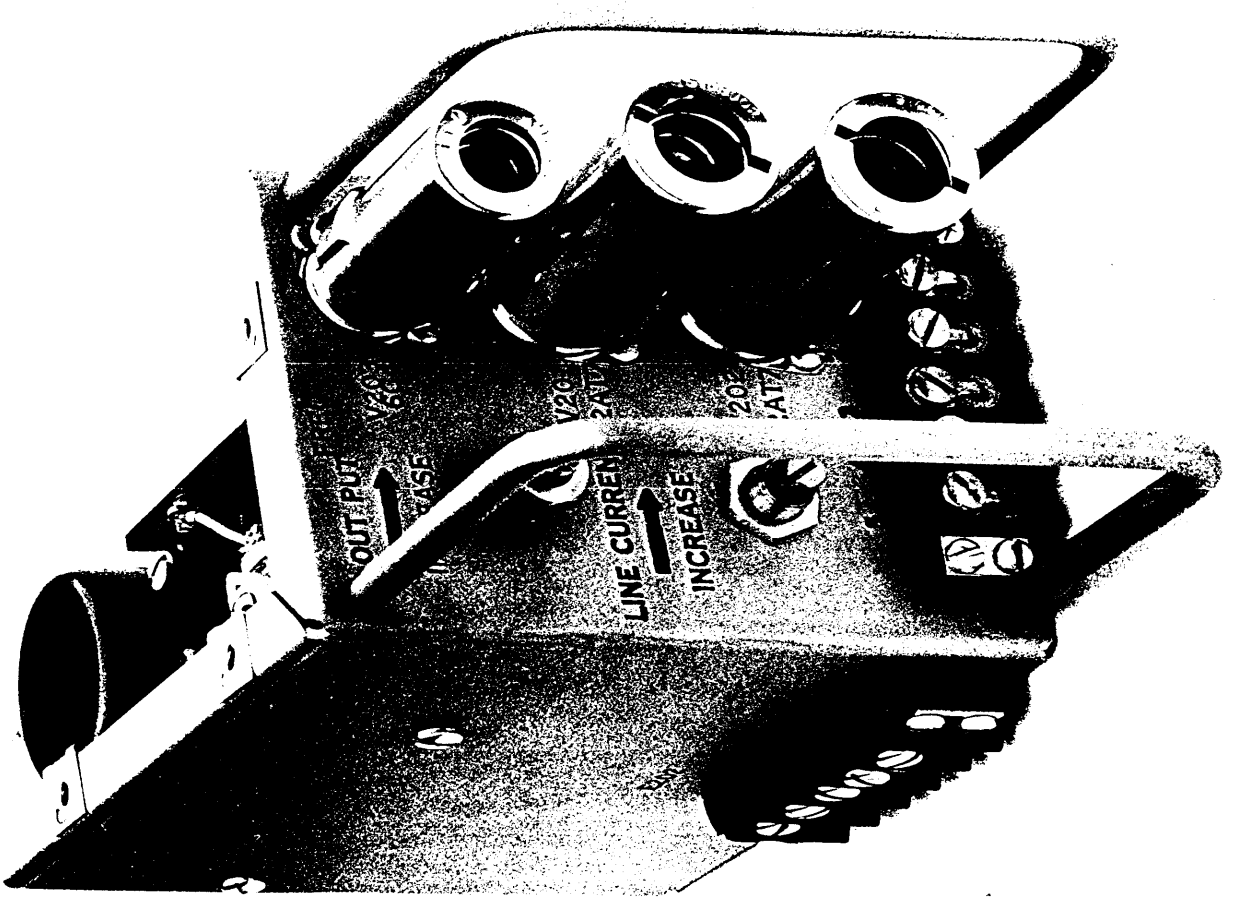
PH-10258

F/S AND TONE SYSTEM TRANSMITTER-2 (COVER REMOVED)
TMC MODEL TST-2



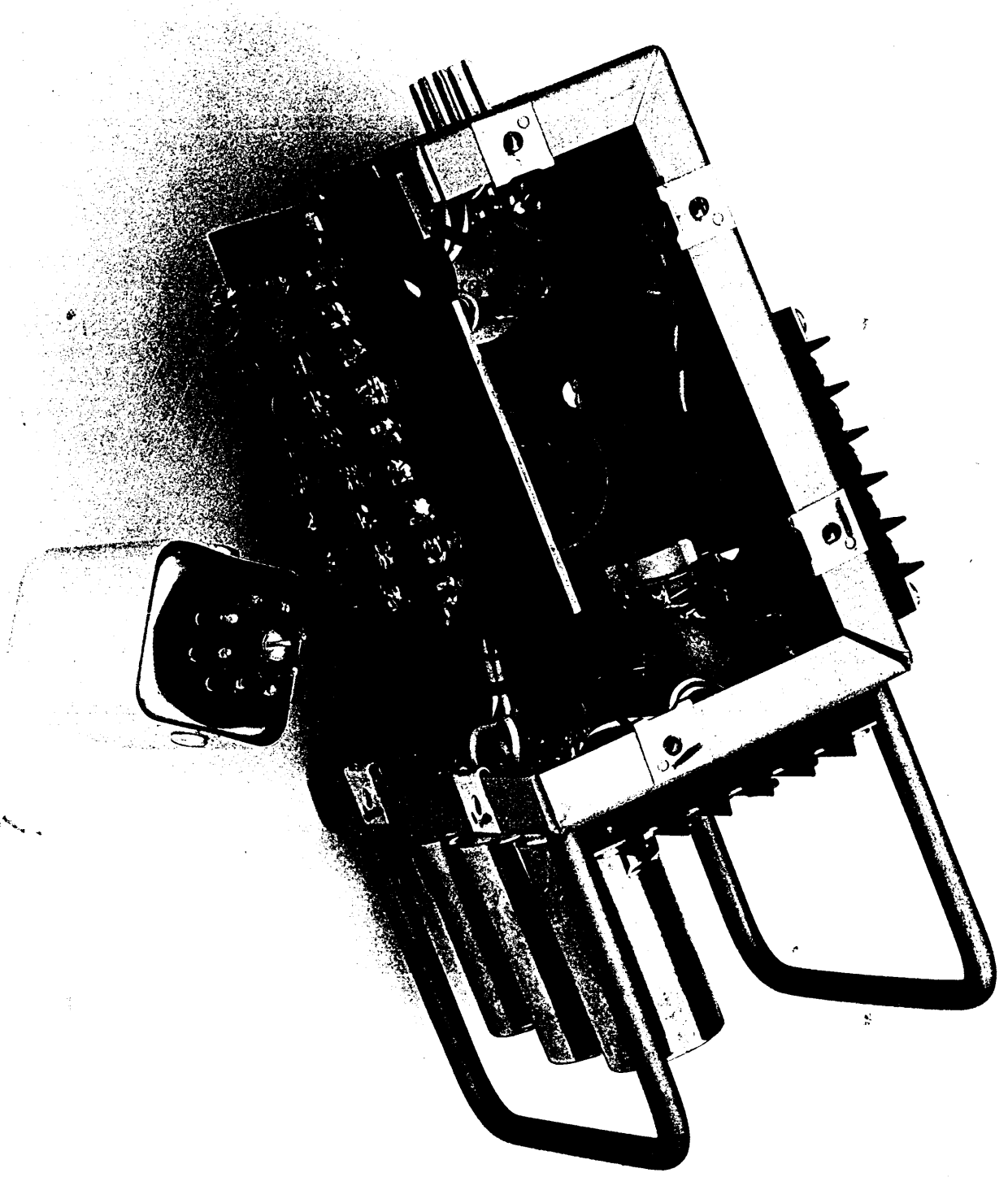
PH-10255

1500 C/S TONE TRANSMIT UNIT-1 3/4 VIEW
TMC MODEL TTU-1



PH-10257

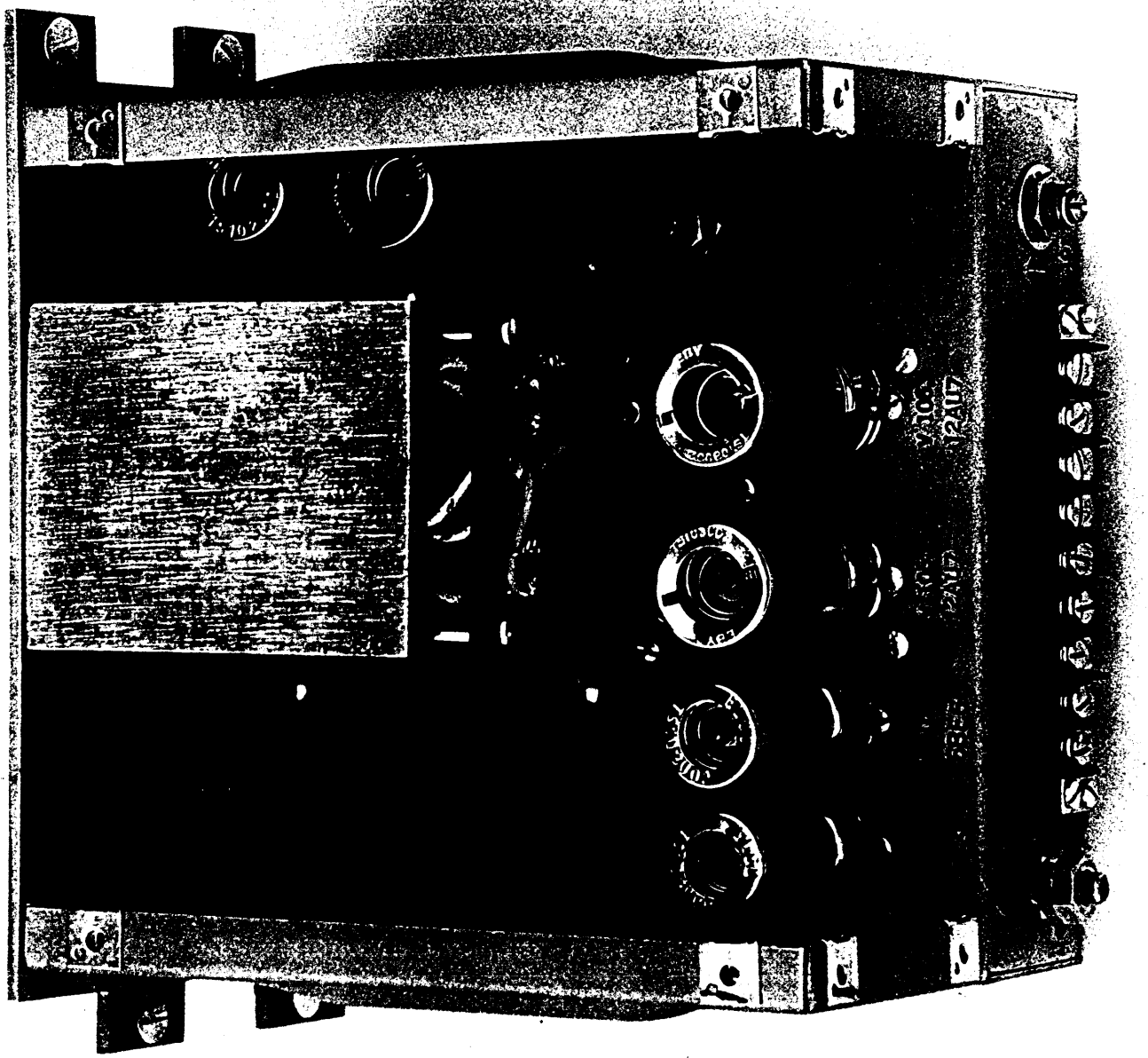
1500 C/S TONE TRANSMIT UNIT-1 3/4 VIEW (COVER REMOVED)
TMC MODEL TTU-1



PH-10256

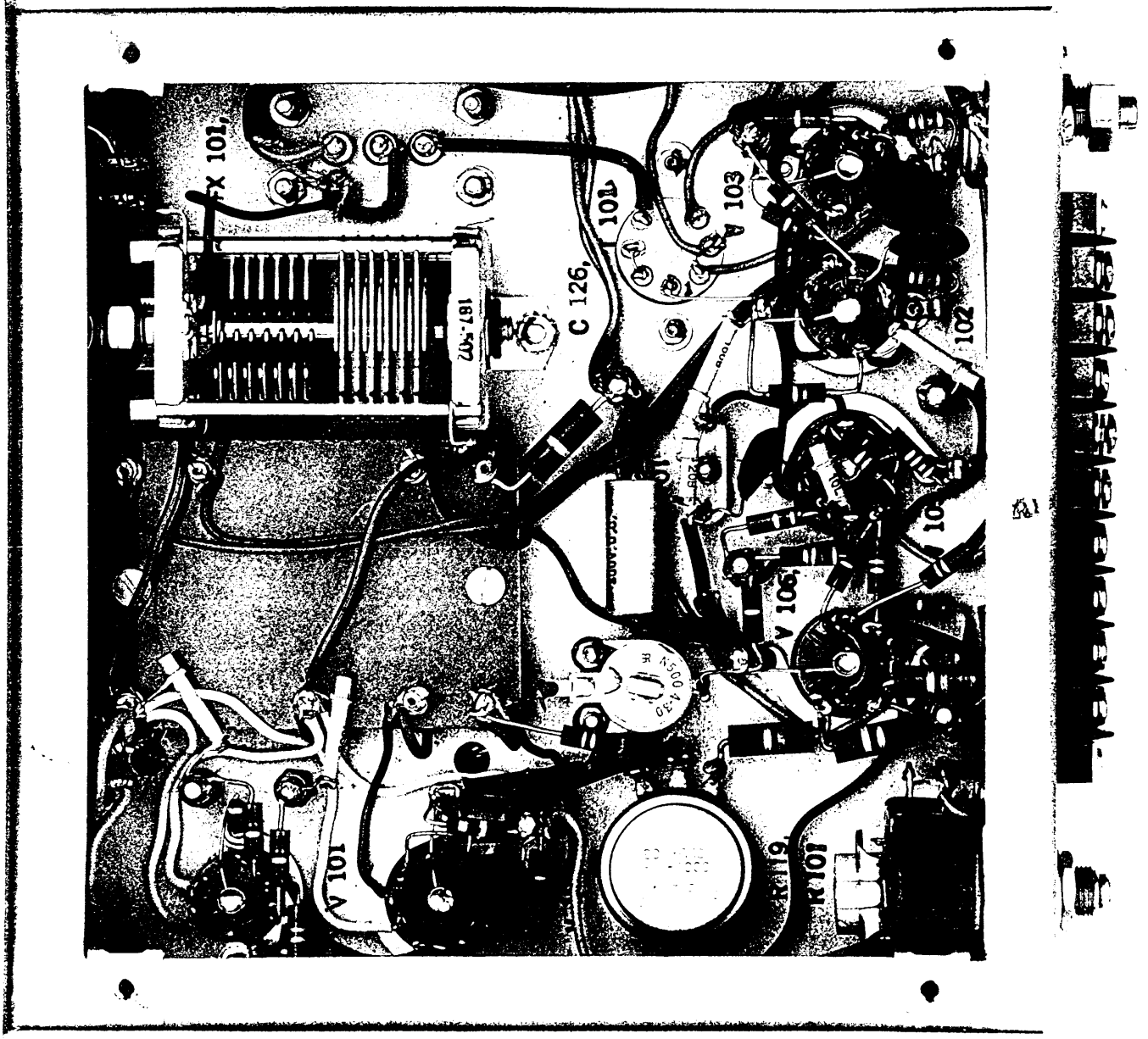
1500 C/S TONE TRANSMIT UNIT-1 (SHOWING FREQ. DETERMINING NETWORK DEMOUNTED)

TMC MODEL TTU-1



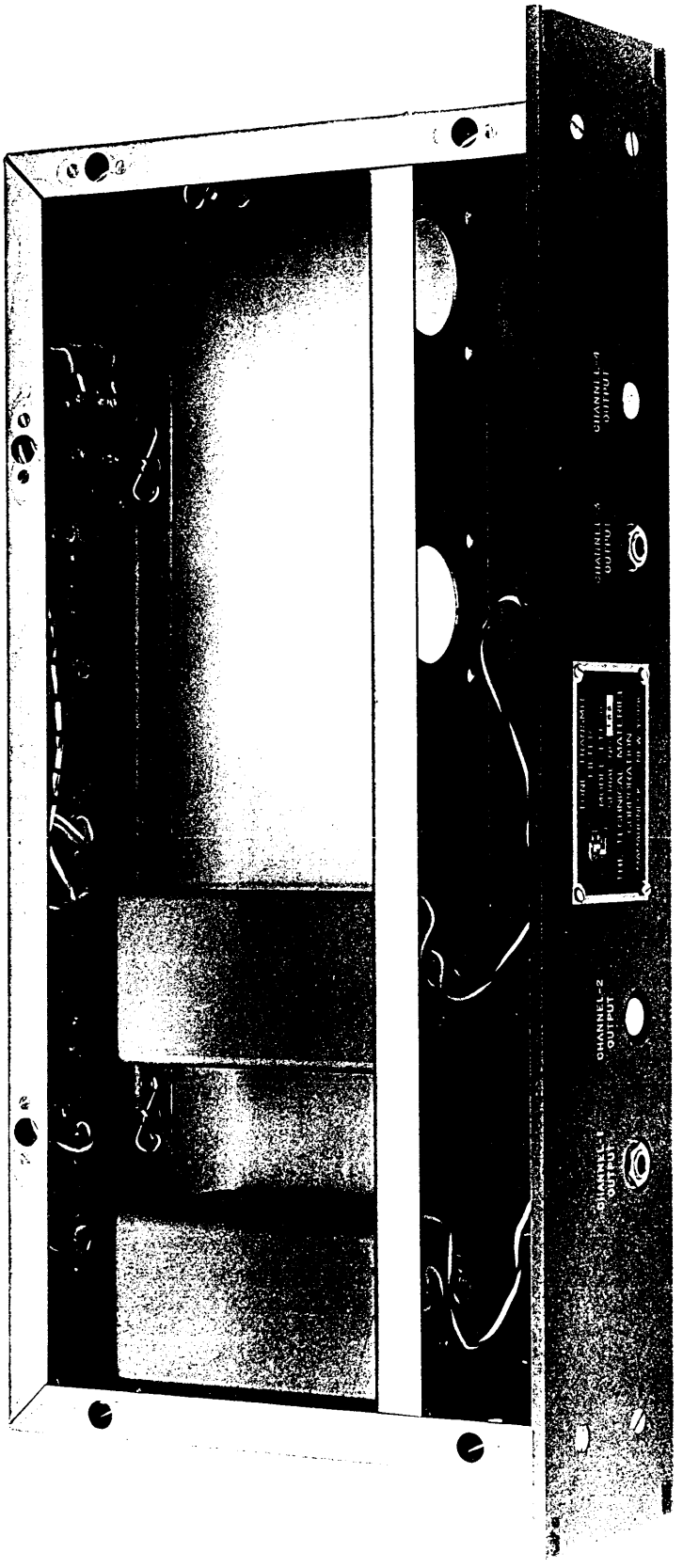
PH-10259

F/S TRANSMIT UNIT-2 TOP VIEW (COVER REMOVED)
TMC MODEL TTU-2



PH-10252

F/S TRANSMIT UNIT-2 BOTTOM VIEW (COVER REMOVED)
TMC MODEL TTU-2



PH-10253

F/S AND TONE TRANSMIT FILTER-2 (COVER REMOVED)

TMC MODEL TTF-2

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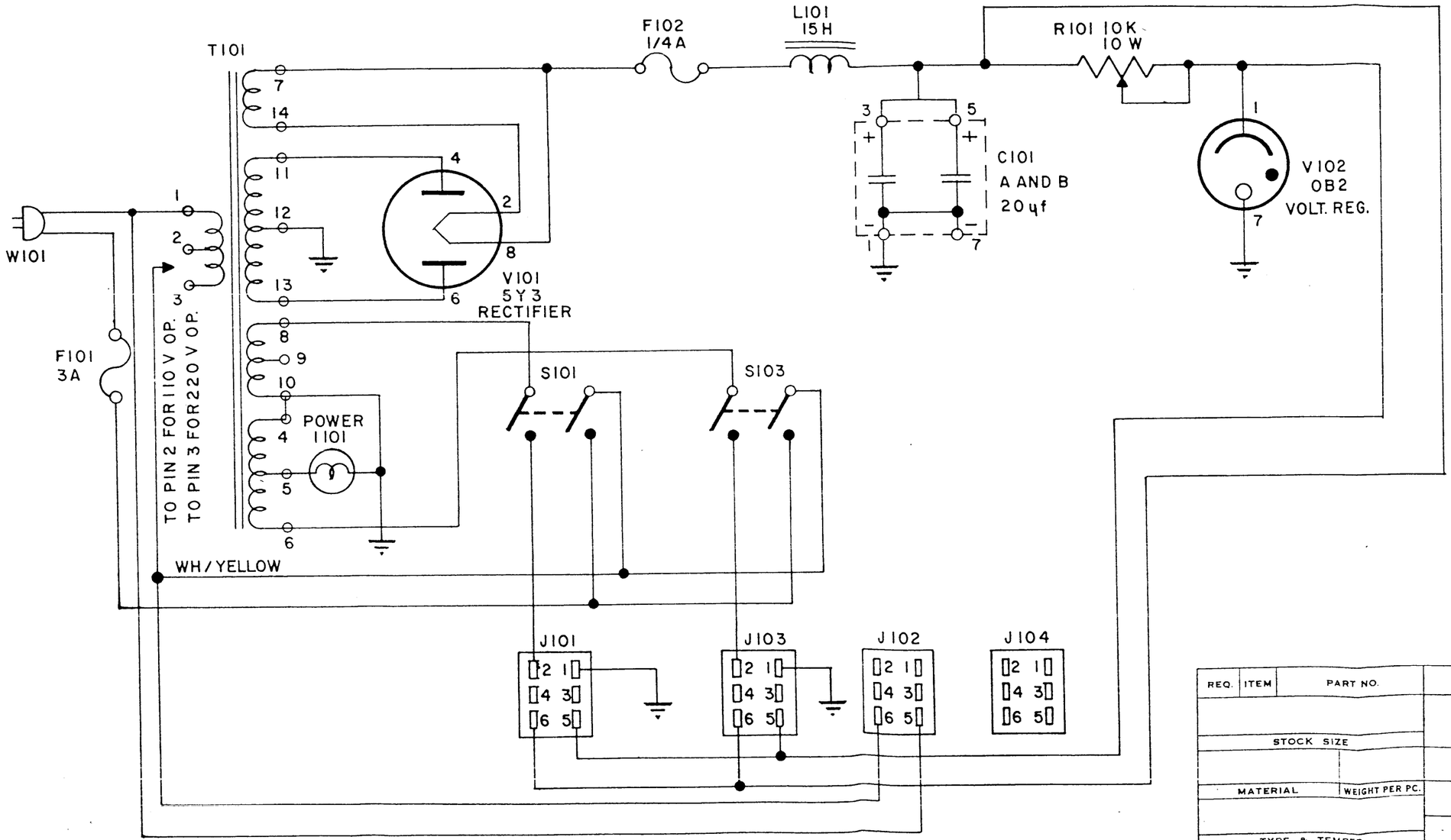
MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION.
REMOVE ALL BURRS AND SHARP EDGES

CK10321



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ISSUE	ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS	CHECKER	ENG. APP.

TOLERANCES

ALL OTHERS: DEC. DIM. ±; FRAC. DIM. ±; ANGULAR DIM. ±

SCALE:

DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED.

MODEL	PROJECT NO.	ASS'Y. NO.	DATE
TIS 2	CE 5005		AUG 20/59

USED ON

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL

STOCK SIZE

MATERIAL | WEIGHT PER PC.

TYPE & TEMPER

HEAT TREAT. SPEC.

FINISH & SPEC. NO.

TMC (Canada) LIMITED
OTTAWA ONTARIO

SCHEMATIC

TST-2

DRAWN	ELEC. DES. APP.	MECH. DES. APP.
DCM	M. Kr.	

CHECKED | FINAL APPROVAL

CK10321

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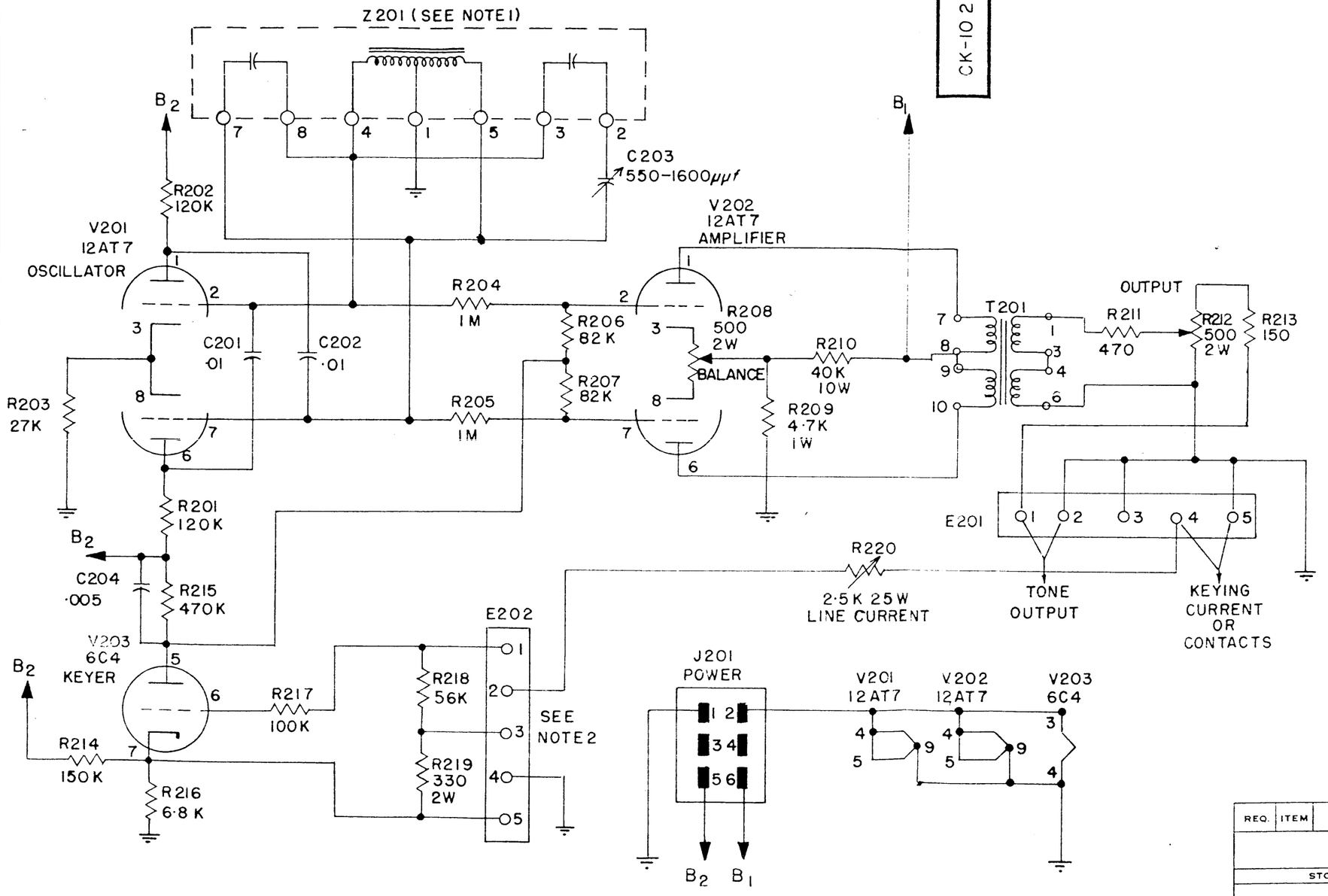
MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES

D

CK-10 272



NOTE1
Z201 FREQ DETERMINING ELEMENT

CHANNEL FREQ CPS	PART NUMBER
425	NF-103-425
595	NF-103-595
765	NF-103-765
935	NF-103-935
1105	NF-103-1105
1275	NF-103-1275
1445	NF-103-1445
1615	NF-103-1615
1785	NF-103-1785
1955	NF-103-1955
2125	NF-103-2125
2295	NF-103-2295
2465	NF-103-2465
2635	NF-103-2635
2805	NF-103-2805
2975	NF-103-2975

NOTE 2
A - FOR POSITIVE PULSE KEYING
CONNECT 2-5, 3-4 ON E202
B - FOR NEGATIVE PULSE KEYING
CONNECT 2-3, 4-5 ON E202
C - FOR CONTACT KEYING
CONNECT 1-2 ON E 202

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ALL RESISTORS ARE 1/2 W UNLESS OTHERWISE NOTED
ALL CAPACITORS ARE IN μf UNLESS OTHERWISE NOTED

ISSUE	ITEM	CHANGED FROM	DATE	CN. NO	DRAFTS	CHECKER	ENG. APP.
D		REDRAWN FROM 259-C C 204 ADDED	DEC. 22'58	4	DM		

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

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

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL

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

TMC (Canada) LIMITED
OTTAWA ONTARIO

SCHEMATIC DIAGRAM

TTU

DCM — DRAWN
ELEC. DES. APP. | MECH. DES. APP.
CHECKED
FINAL APPROVAL

CK-10 272

FORM — 128

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND OPERATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES

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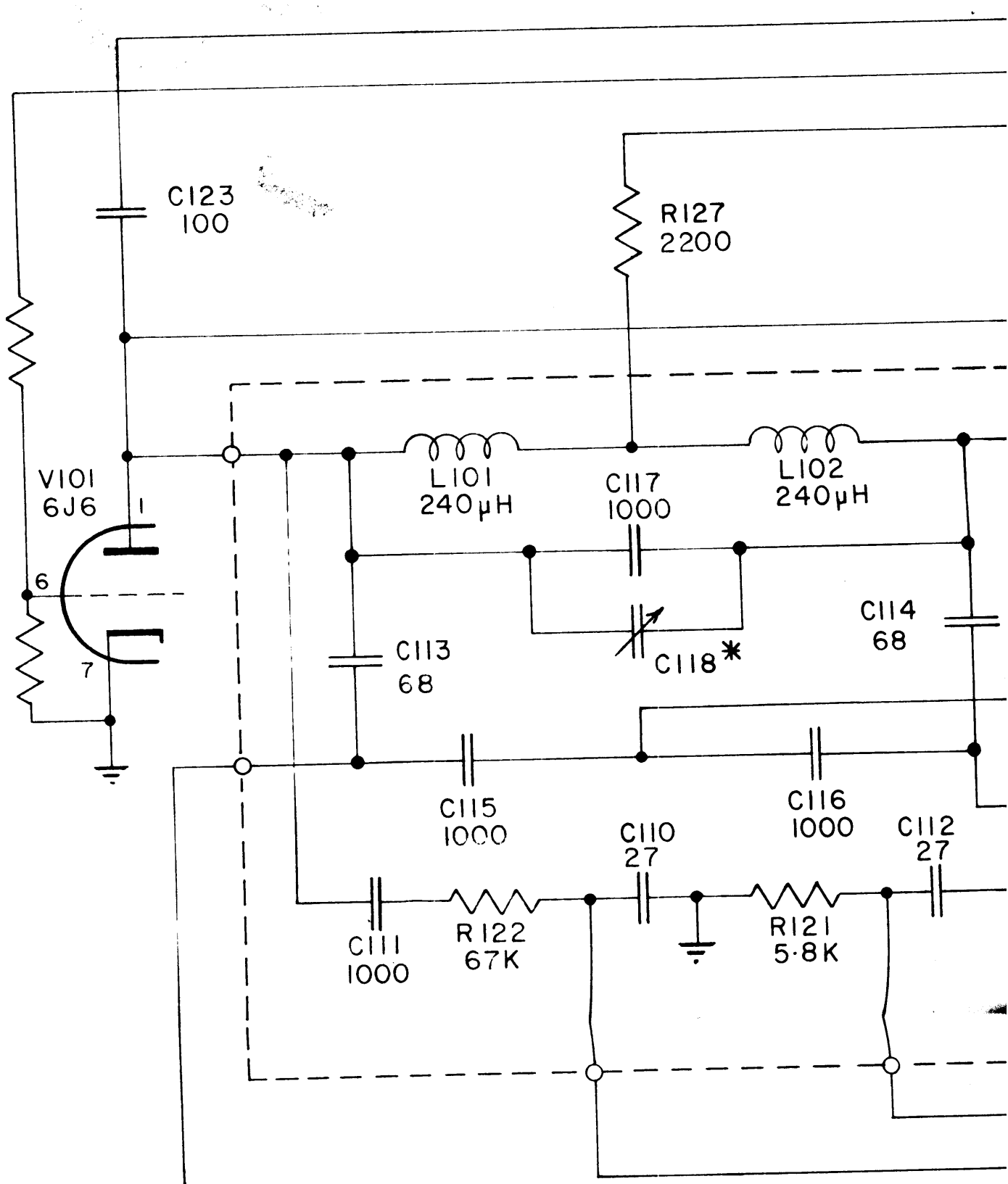
ALL CAPACITANCES IN uuf UNLESS OTHERWISE STATED
ALL RESISTANCES IN OHMS —— " ——
ALL RESISTORS 1/2 WATT —— " ——



NOTE:
* C118: 110-395 uuf ADJUSTED BY MANUFACTURER

A: FOR POSITIVE PULSE KEYING, CONNECT 6 AND 9, 7 AND 8 ON E101.

B: FOR NEGATIVE PULSE KEYING, CONNECT 6 AND 7, 8 AND 9 ON E101.

C: FOR CONTACT KEYING, CONNECT 5 AND 6 ON E101.

D: KEYING CURRENT OR CONTACTS ON 3 AND 4, E101

LAST SYMBOLS:—
LAST C USED — C130
LAST FX USED — FX101
LAST J USED — J102
LAST L USED — L102
LAST R USED — R138
LAST T USED — T101
LAST TH USED — TH101
LAST V USED — V106
LAST Y USED — Y101

+150

R119
10K
2W

R107
10K
1W

R108
180K
1W

R109
1MEG

V106
12AU7A(1/2)
KEYER

C107
·01μf

C108
4-30

R120
100K

C126
5-50

V106
12AU7A
KEYER

C124
100

R126
100

R125
100K

V104
12AU7A
REACTANCE TUBE

R118
1K

R117
1K

C109
·01

R116
3·9K

R102
6·8K

T101

FX101

LOW
PASS
FILTER

B+250

V102
6BE6
MIXER

V103
6BE6
MIXER

R130
100

R131
100

C128
·01

C129
·01

R132
470K

R112
470K

B+150

R109
1MEG

R104
150K

R106
100K

R105
56K

R103
330
2W

R102
6·8K

E101

R101
2·5K
25W

J102

E102 (OVEN)

R136

R138, 1

THI01

C130, ·05

CK10300 B

J101

B+250

B+150

R115
82K
1W

V101 6J6 | V102 6BE6 | V103 6BE6 | V104 12AU7A | V105 12AU7A | V106 12AU7A

FX101

LOW PASS FILTER

R135
500, 2W

B+150

C105

R114
100K

C104
·01μf

V105
12AU7A
XTAL OSC.

C103
22

Y101

C102
220

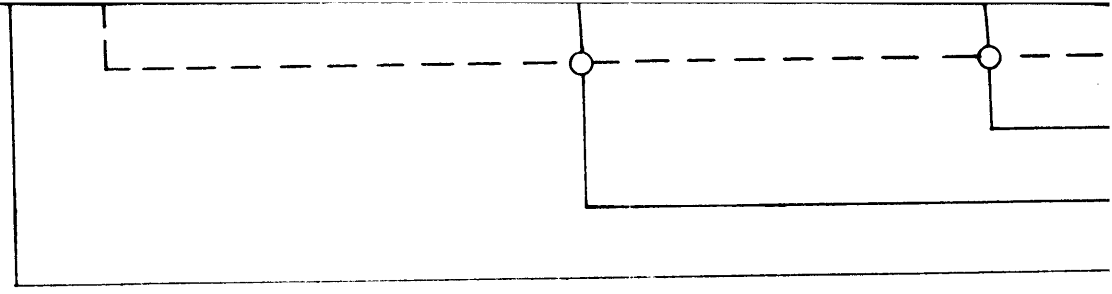
C106
10

R113
470K

C101
100

R111
56

NOTIC[illegible] RECEIVING T[illegible] DRAWING
THE TECHNI[illegible] CORPO[illegible]TION claims



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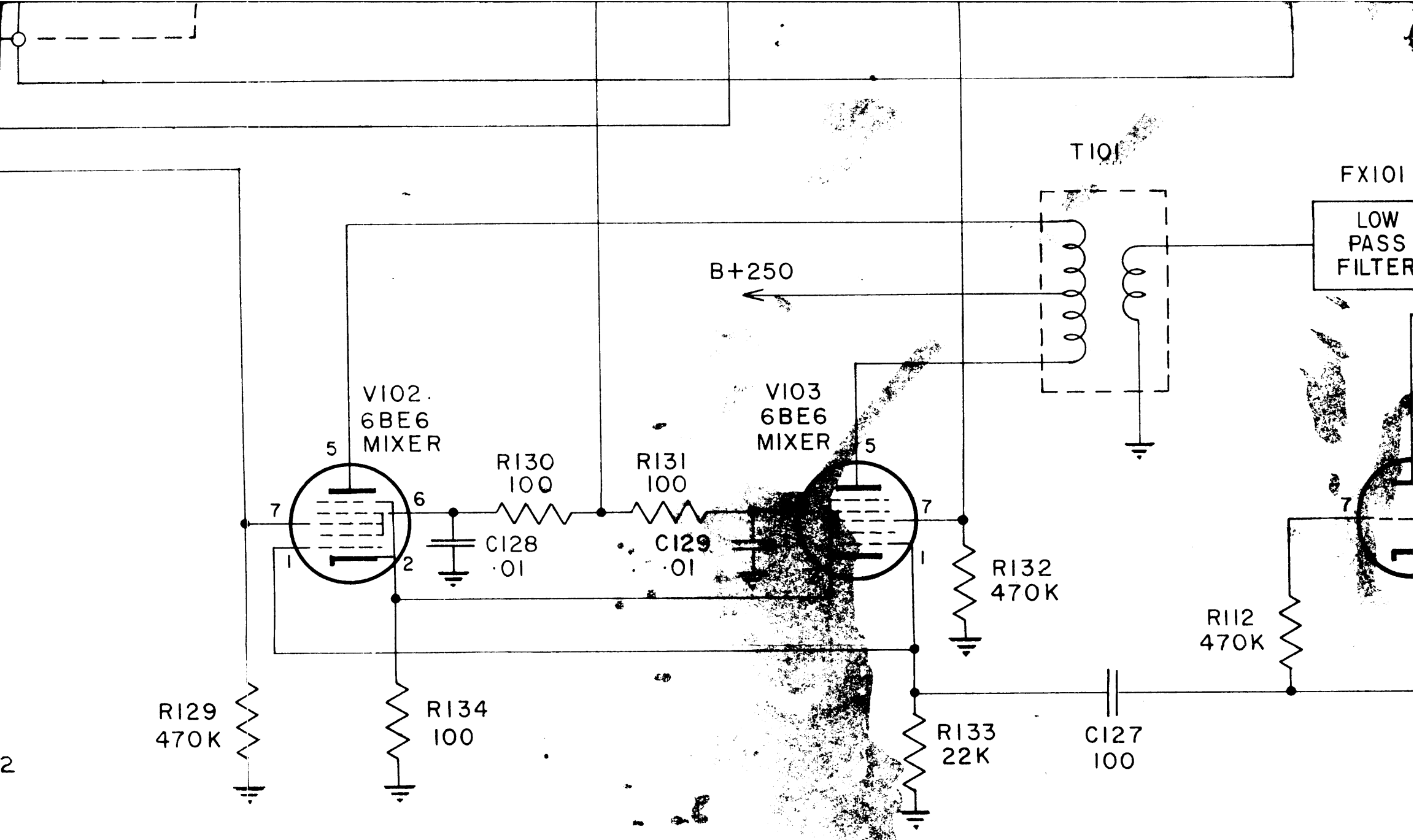
LAST SYMBOLS:—

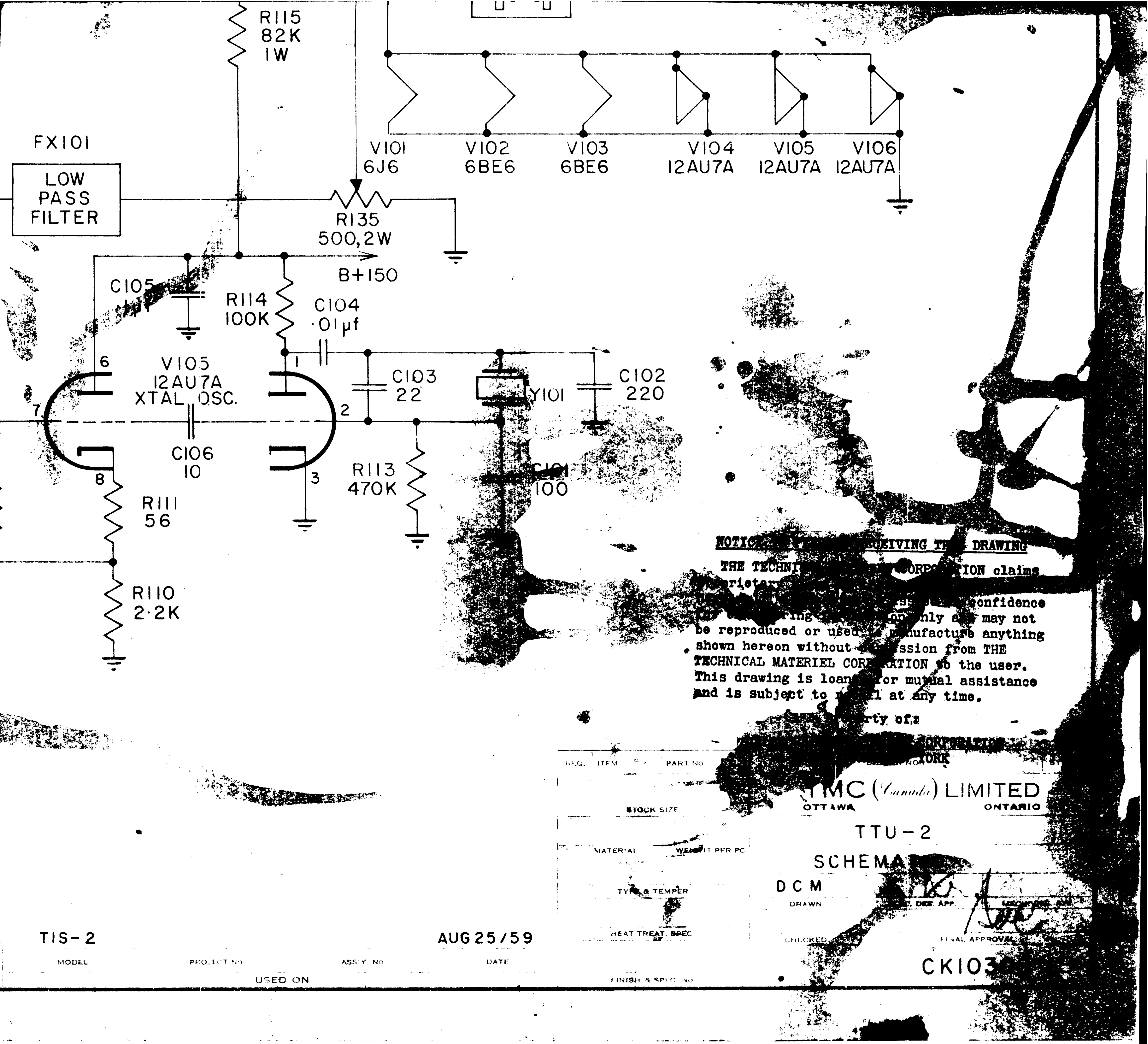
LAST C USED — C130
LAST FX USED — FX101
LAST J USED — J102
LAST L USED — L102
LAST R USED — R138
LAST T USED — T101
LAST TH USED — TH101
LAST V USED — V106
LAST Y USED — Y101

MISSING:—

R128, C120, C121, C119, C125, C122

B		C122 DELETED	JAN 7 60		DCM		
A		REDRAWN:- TH101 ADDED. R128, C120, C121 C119 DELETED, OVEN CHANGED.	AUG 25 59		DCM		


T101
FX101
LOW PASS FILTER
B+250
V102
6BE6
MIXER
V103
6BE6
MIXER
R130
100
R131
100
C128
·01
C129
·01
R132
470K
R112
470K
R129
470K
R134
100
R133
22K
C127
100


R115
82K
1W
FX101
LOW PASS FILTER
V101
6J6
V102
6BE6
V103
6BE6
V104
12AU7A
V105
12AU7A
V106
12AU7A
R135
500,2W
B+150
C105
R114
100K
C104
·01µf
6
V105
12AU7A
XTAL OSC.
1
C103
22
Y101
C102
220
7
2
C106
10
8
3
R113
470K
C101
100
R111
56
R110
2·2K
NOTIC... ...ECEIVING TH... DRAWING
THE TECHNI... ...ORPO...TION claims
...rietary...
...s... ...confidence
...ring ... ...on...nly a... may not
be reproduced or used ... ...nufacture anything
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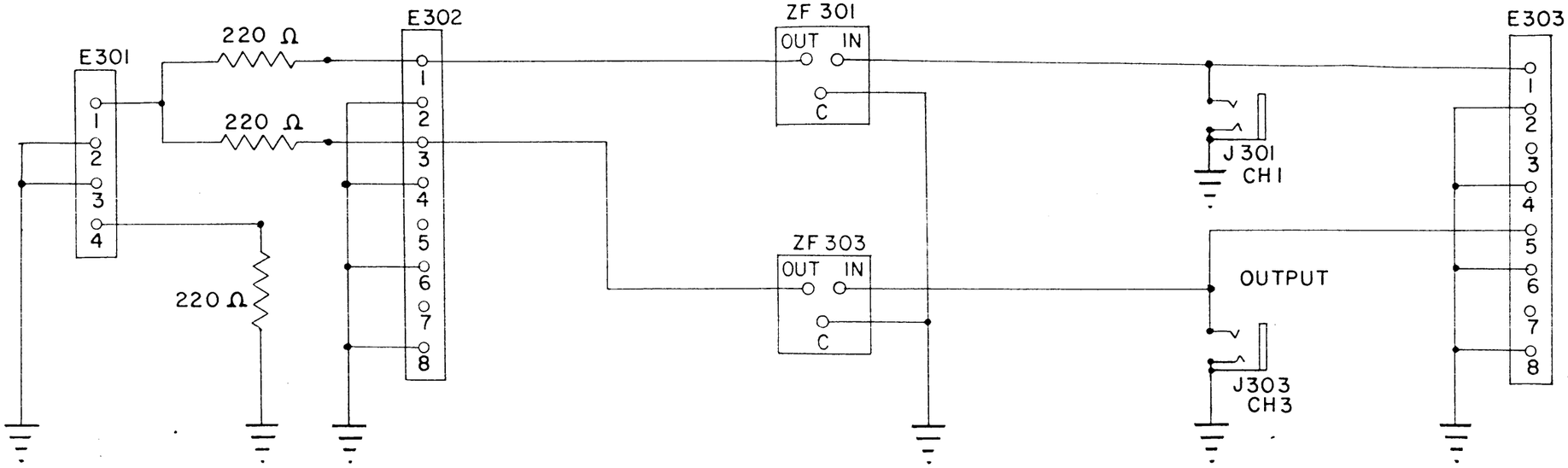
TECHNICAL MATERIEL COR...RATION to the user.
This drawing is loan... ...or mutual assistance
and is subject to ...l at any time.
...rty of:
...CORPORATION
...YORK
REQ.
ITEM
PART NO
STOCK SIZE
MATERIAL
WEIGHT PER PC
TYPE & TEMPER
HEAT TREAT. SPEC
FINISH & SPEC NO
TMC (Canada) LIMITED
OTTAWA
ONTARIO
TTU-2
SCHEMA...
DCM
DRAWN
CHECKED
DES. APP.
FINAL APPROVAL
CK103...
TIS-2
MODEL
PROJECT NO
ASS'Y. NO
AUG 25/59
DATE
USED ON

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

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

CK 10325



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ISSUE	ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS	CHECKER	ENG. APP.

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

MODEL	PROJECT NO.	ASS'Y. NO.	DATE
TIS 2	CE 5005		AUG 27/59

USED ON

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL

STOCK SIZE

MATERIAL — WEIGHT PER PC.

TYPE & TEMPER

HEAT TREAT SPEC.

FINISH & SPEC. NO.

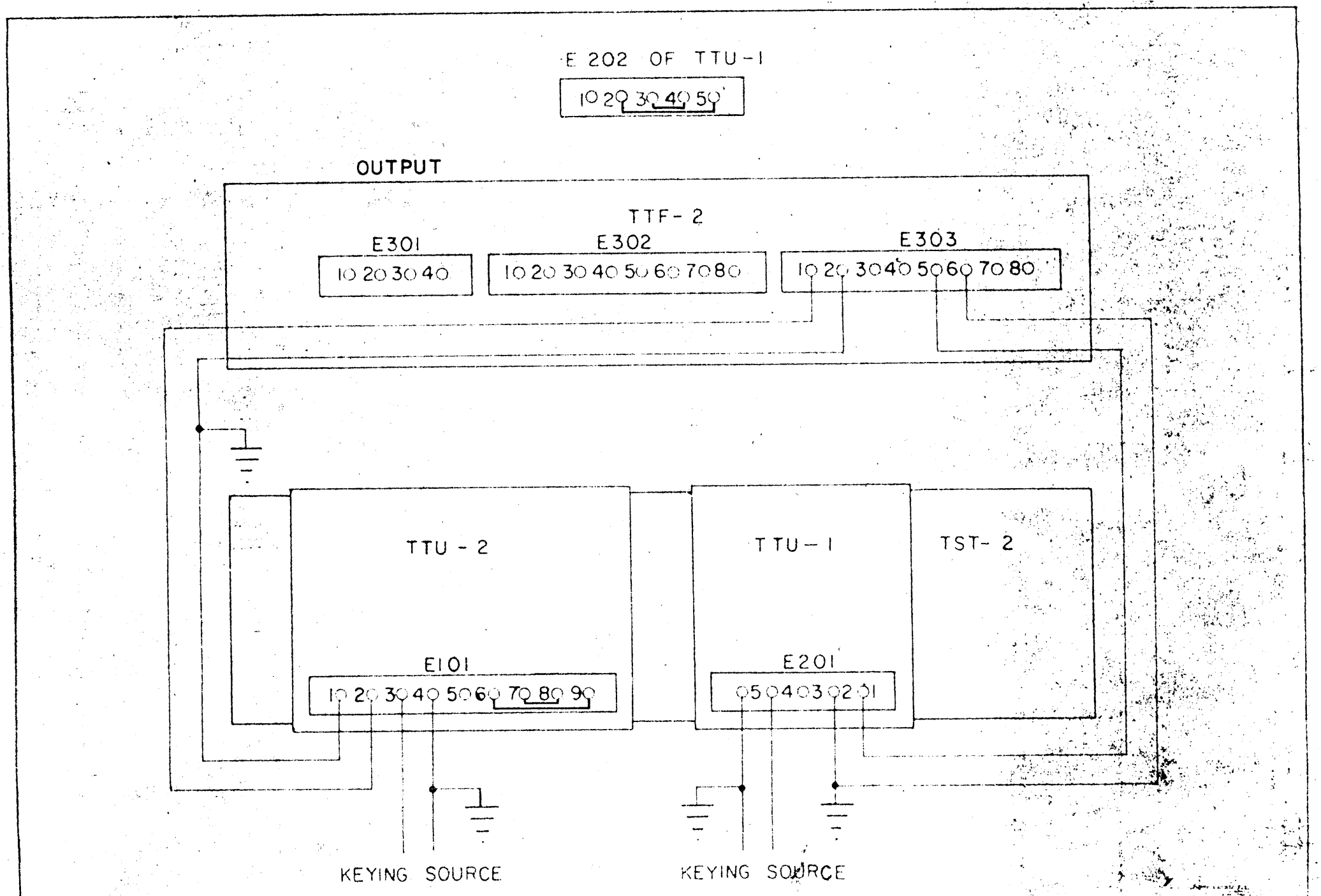
TMC (Canada) LIMITED
OTTAWA ONTARIO

SCHEMATIC TTF-2

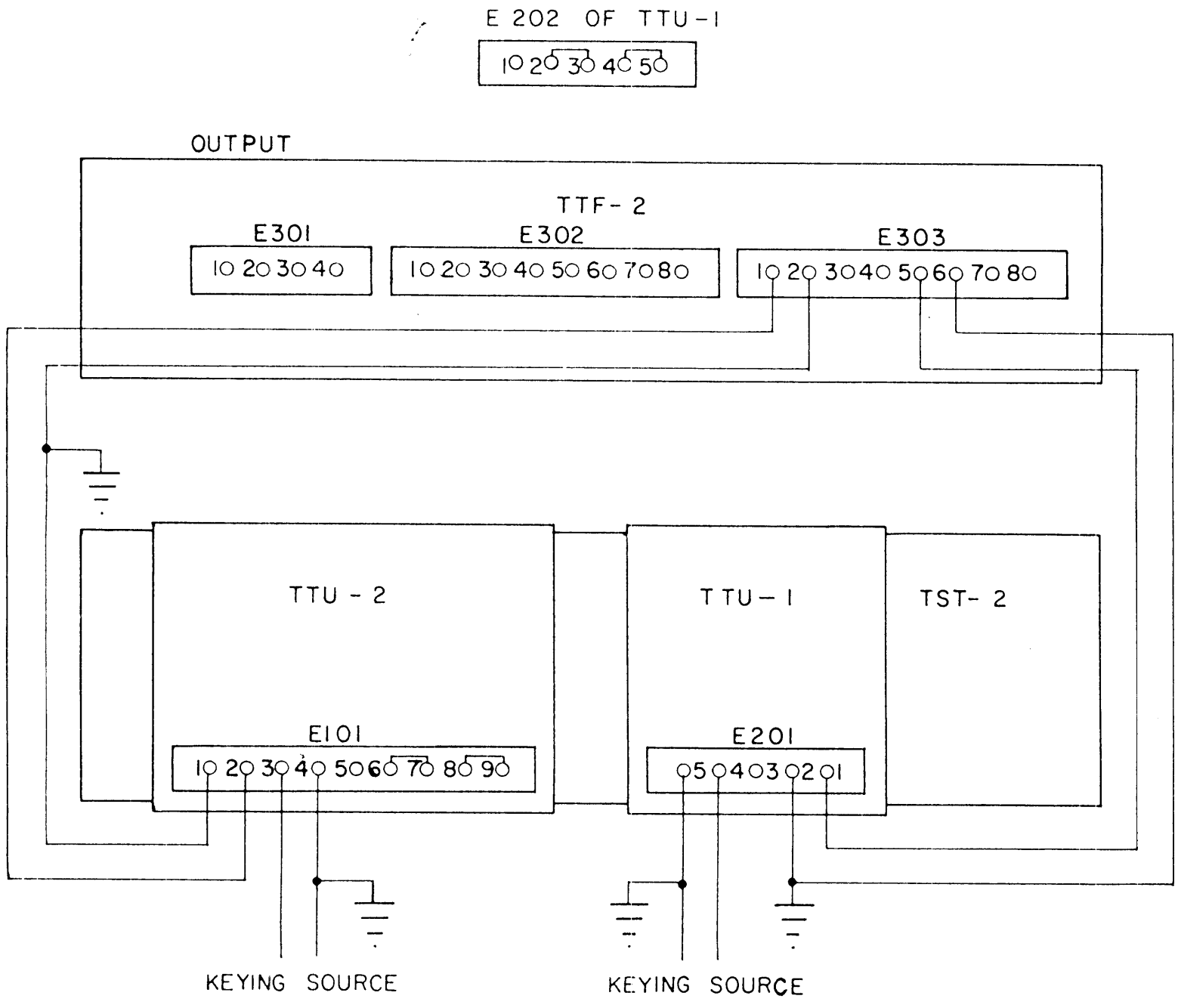
JPC		
DRAWN	ELEC. DES. APP.	MECH. DES. APP.
CHECKED	FINAL APPROVAL	

CK 10325

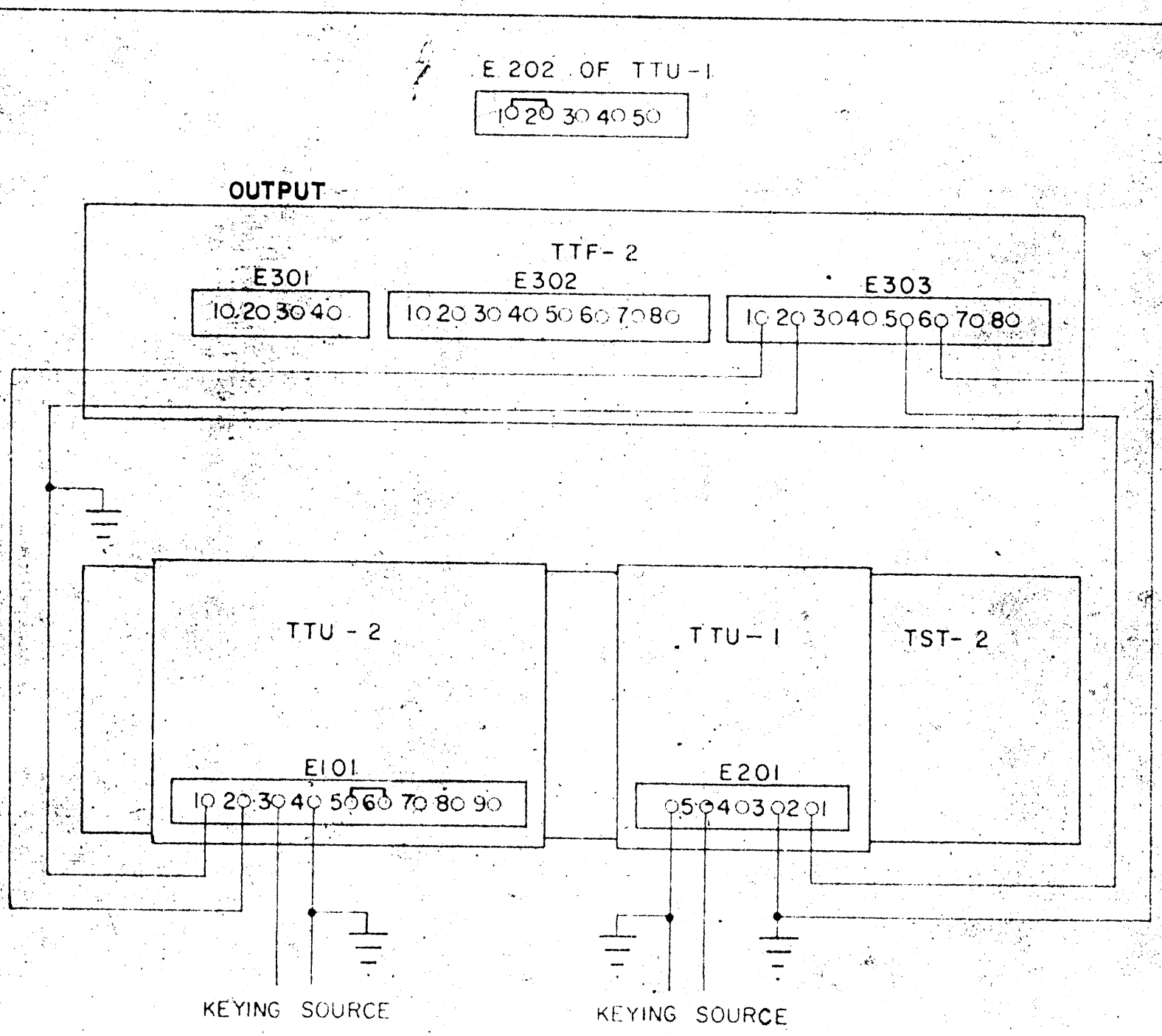
FORM — 138



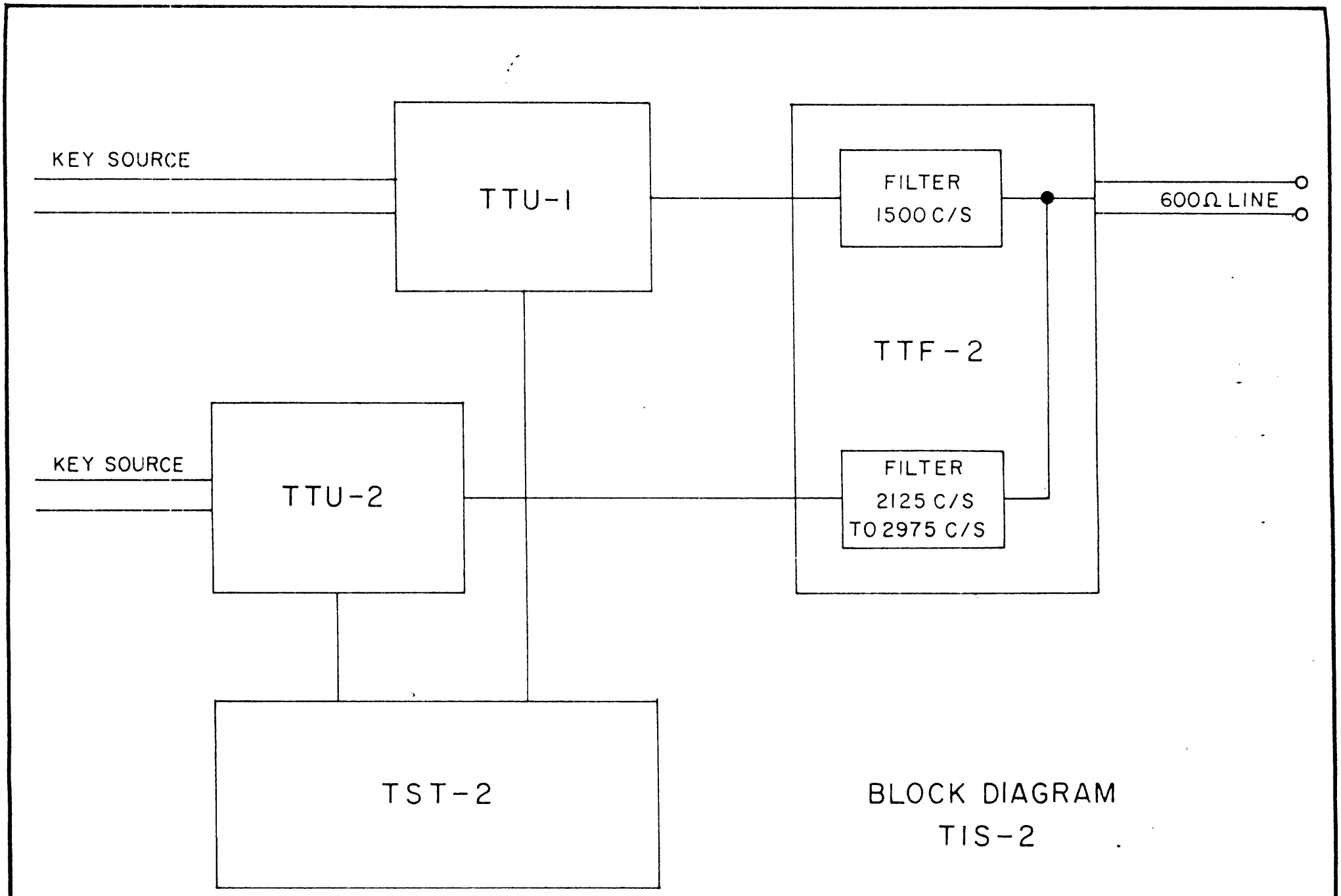
INTERCONNECT DIAGRAM FOR POSITIVE PULSE KEYING



INTERCONNECT DIAGRAM FOR NEGATIVE PULSE KEYING



INTERCONNECT DIAGRAM FOR CURRENT KEYING



BLOCK DIAGRAM
TIS-2

CK10326