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TECHNICAL MANUAL

for

POWER SUPPLY

MODEL CPP-2

(PP-2562/URA-31)

COMPONENT OF

CONTROLLED PRECISION

OSCILLATOR

MODEL CPO-1

(AN/URA-31)



THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N. Y.

OTTAWA, ONTARIO



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Change F502 1A/115V 5A/230V
FILAMENT to F502 2A/115V
1A/230V FILAMENT

2/7/62

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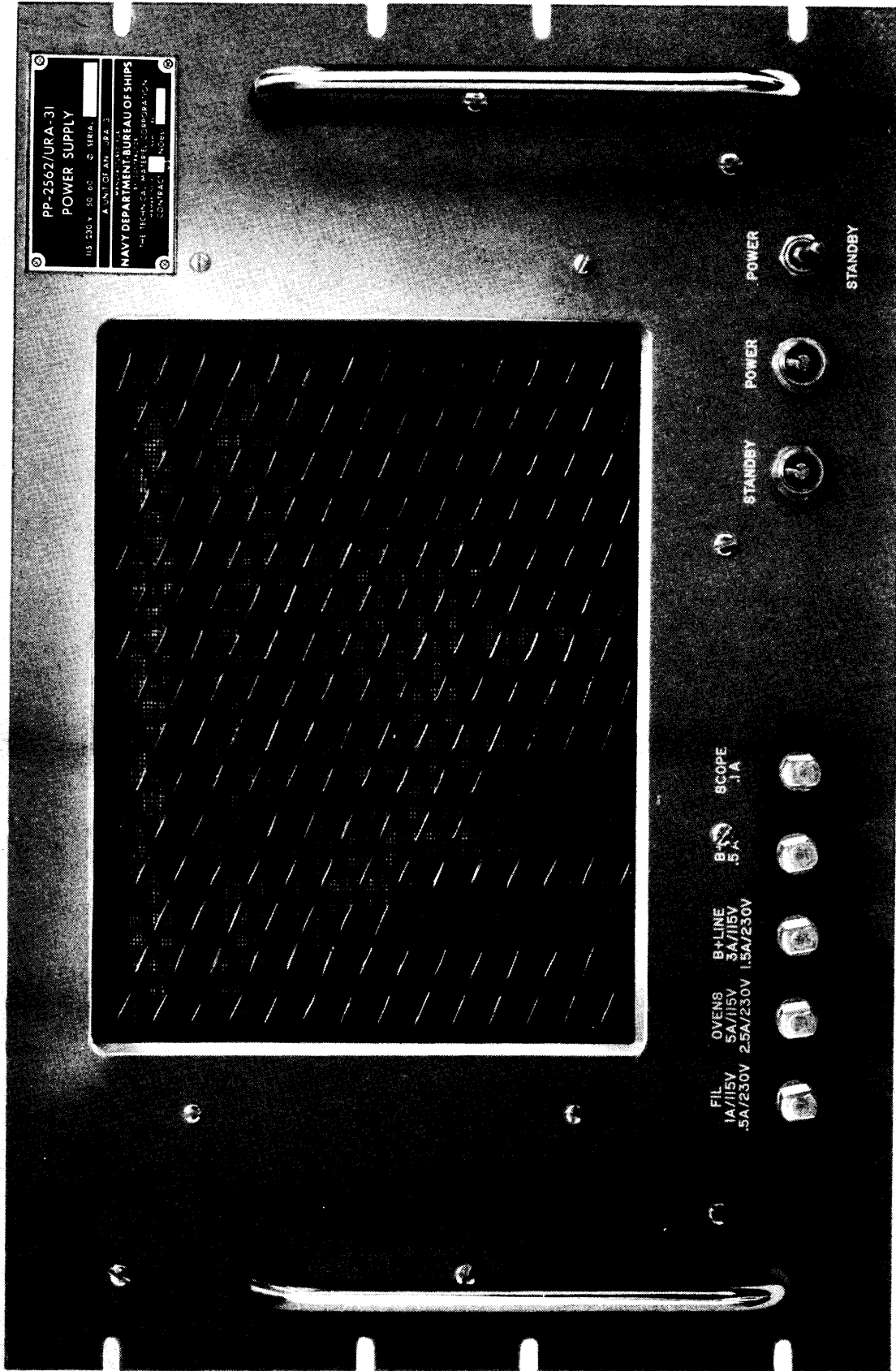


Figure III(F)-1-1a. Power Supply CPP-2, Front View

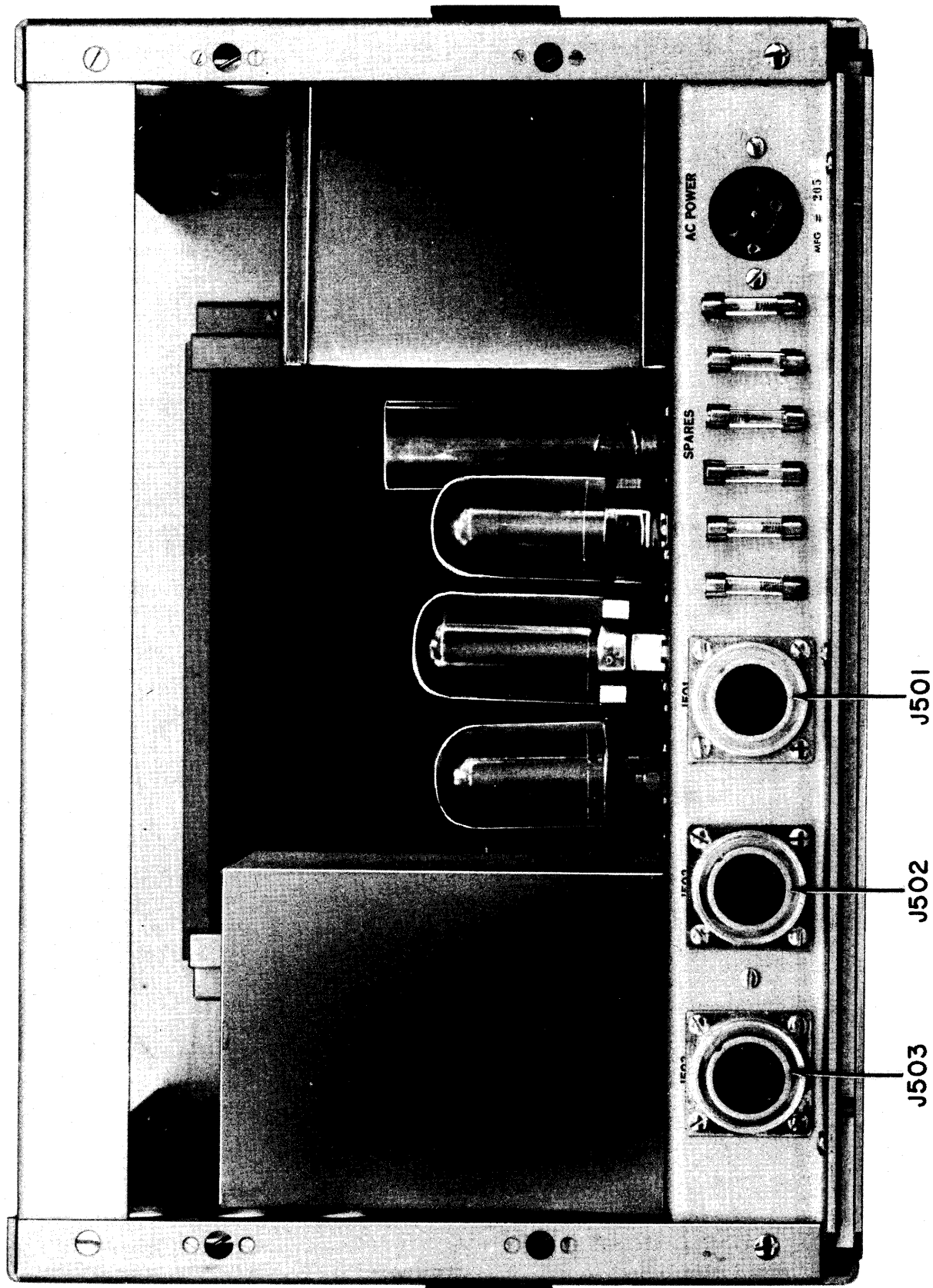


Figure III(F)-1-1b. Power Supply CPP-2, Rear View

SECTION 1

GENERAL DESCRIPTION

III(F)-1-1. PURPOSE AND BASIC PRINCIPLES.

Technical Materiel Corporation's Power Supply, CPP-2, is a conventional power supply that operates from 115 or 230 VAC line power.

CPP-2 is associated with three other units in Controlled Precision Oscillator, CPO-1, as follows:

a. Controlled Oscillator, CLL-1, receives +380 VDC (unregulated), -400 VDC (unregulated), +160 VDC (regulated), -75 VDC (regulated), -6 VDC (regulated), 6.3 VAC (regulated) and 115 or 230 VAC oven power from the CPP-2.

b. Controlled Master Oscillator, CMO-1, receives +380 VDC (unregulated), +160 VDC (regulated), -6 VDC (regulated), 6.3 VAC (regulated), and 115 or 230 VAC oven power from the CPP-2.

c. Frequency Amplifier, CHG-1, receives +160 VDC (regulated), -6 VDC (regulated), and 6.3 VAC (regulated) from the CPP-2.

III(F)-1-2. DESCRIPTION OF UNIT.

The CPP-2 is shown in figures III(F)-1-1a and III(F)-1-1b. The front panel is 3/16-inch thick by 19 inches long and 12-1/4 inches high and is finished in TMC gray enamel. The chassis extends 16 inches behind the panel and is self-supporting. The unit weighs 67 pounds.

Controls and indicators for operation of the unit are located on the front panel. The equipment is manufactured in accordance with JAN/MIL standards, whenever practicable. All parts and assemblies meet or exceed the highest quality standards.

III(F)-1-3. REFERENCE DATA.

The crated dimensions of the CPP-2 are 26 by 21-1/2 by 16 inches. The unit weighs 116 pounds, gross, packed for shipment. Tables III(F)-1-1 through III(F)-1-3 contain additional reference data pertinent to the CPP-2.

TABLE III(F)-1-1. ELECTRICAL CHARACTERISTICS

ITEM	CHARACTERISTICS
Input power:	115- or 230-volts, 60-cps, single phase, less than 1000-watts
Output voltages:	+380 VDC (less than 1/2 amp.) -400 VDC (less than 1/10 amp.) +160 VDC (less than 1/2 amp.) -75 VDC (less than 1/10 amp.) -6.3 VDC (less than 1/10 amp.) 6.3 VAC (less than 1 amp.) 115- or 230-volts, 60-cps, single phase AC

TABLE III(F)-1-2. FRONT PANEL CONTROLS

CONTROL	FUNCTIONS
B+ LINE 3A/115V 1.5A/230V fuseholder:	Contains B+ line fuse, glows when fuse is blown.
B+ .5A fuseholder:	Contains B+ fuse. Glows when fuse is blown.
FIL 2A/115V 1A/230V fuseholder:	Contains filaments fuse. Glows when fuse is blown.
OVENS 5A/115V 2.5A/230V fuseholder:	Contains ovens fuse. Glows when fuse is blown.
POWER indicator:	Lights when POWER-STANDBY switch is in POWER position.
POWER-STANDBY switch: POWER position: STANDBY position:	Supplies B+ power to CPP components. Supplies power to ovens of the CLL and CMO.
SCOPE .1A fuseholder:	Contains scope fuse. Glows when fuse is blown.
STANDBY indicator:	Lights when POWER-STANDBY switch is in STANDBY position.

TABLE III(F)-1-3. VACUUM TUBE COMPLEMENT

SYMBOL	TYPE	FUNCTION
V501	6080	DC regulator
V502	6080	DC regulator
V503	5U4	Rectifier
V504	6AH6	DC amplifier
V505	OC2	Voltage regulator

SECTION 2 INSTALLATION

III(F)-2-1. GENERAL.

Technical Materiel Corporation packages test and exciter units as follows:

a. The unit is wrapped with paper to prevent scratching and wedged in a cardboard carton with heavy cardboard corrugated fillers. Dessicant, accessories, and spare parts, if practical, are placed in the carton and it is sealed.

b. The carton is sealed in a moisture-proof barrier bag.

c. The carton in the barrier bag is placed in a waterproof outer carton and it is sealed.

d. The sealed carton is wedged to tightness in a strong wooden packing box.

e. The packing box is encircled with two steel straps. The top side of the box may be located by observing the seals on the straps. When the seals are removed, this side of the box may be readily pried open.

III(F)-2-2. INITIAL INSPECTION.

Each CPP-2 has been tested and calibrated before shipment. Only minor preparations are required to put the unit into operation.

Upon arrival at the operating site, inspect the packing case and its contents immediately for possible damage. Unpack the equipment carefully. Inspect all packing material for parts which may have been shipped as "loose items". Although the carrier is liable

for any damage to the equipment, Technical Materiel Corporation will assist in describing and providing for repair or replacement of damaged items.

The equipment is shipped with plug-in components installed. Check that all such components are properly seated in their sockets.

III(F)-2-3. 115- VS 230-VOLT POWER SUPPLY CONNECTIONS.

CPP-2 is normally operated from 115- or 230-volt, 60-cycle, single-phase power; it is factory wired for 115-volts. If 230-volt operation is required, make the connections shown in figure III(F)-8-1.

III(F)-2-4. INTERCONNECTIONS.

Figure I-2-1 indicates the following interconnections:

a. Power Supply (J501) of CPP-2 to J706 of CLL-1 via CA-551-2, W3003 (P3040, P3041).

b. Power Supply (J502) of CPP-2 to J304 of CMO-1 via CA-551-3, W3004 (P3042, P3043).

c. Power Supply (J503) of CPP-2 to J101 of CHL-1 via CA-551-4, W3005 (P3044, P3045).

d. AC Power to J504 of CPP-2 from 115-volt multiple, jack 3013.

III(F)-2-5. INITIAL ADJUSTMENTS.

See alignment procedure contained in III(G)-4, Test Procedure for Power Supply.

SECTION 3 OPERATOR'S SECTION

III(F)-3-1. CPP-2 is a unit of the Controlled Precision Oscillator CPO-1. The operating chart contained in table I-3-1 provides the information necessary for operation of the CPP-2 as a component of the CPO-1.

NOTE

When the POWER/STANDBY switch is in the POWER position, the CPP-2 supplies all output voltages listed in table III(F)-1-1. When the POWER/STANDBY switch is in the STANDBY position, the CPP-2 supplies only 115- or 230-volts to the ovens of the CMO-1 and CLL-1.

SECTION 4 PRINCIPLES OF OPERATION

III(F)-4-1. INTRODUCTION.

CPP-2 is described briefly in paragraph I-4-9 and figure I-4-12. The CPP-2 provides:

- a. +380 VDC (Unregulated).
- b. -400 VDC (Unregulated).
- c. +160 VDC (Regulated).
- d. -75 VDC (Regulated).
- e. -6 VDC (Regulated).
- f. 6.3 VAC (Regulated).
- g. 115- or 230-volt 60 cycle ac to CLL-1 and CMO-1 ovens.

Figure III(F)-8-1 is a schematic diagram of the CPP-2.

III(F)-4-2. +380 V DC CIRCUIT.

Full-wave rectifier V503 supplies +380 VDC unregulated power via time delay relay K501 and B+ fuse

F505 to the plates of dc regulators V501, V502, pin 8 of J501, and pin 8 of J502. Pin 8 of J501 supplies +380 VDC to CLL-1. Pin 8 of J502 supplies +380 VDC to CMO-1.

III(F)-4-3. -400 V DC CIRCUIT.

B- rectifiers CR501, CR502 supply -400 VDC unregulated to pin 5 of J501 via filter (C501, L502, C502) and .1A SCOPE fuse F504. Pin 5 of J501 supplies pin 5 of J706 in the CLL-1 with -400 VDC unregulated voltage that finally reaches oscilloscope V713 of the CLL-1.

III(F)-4-4. +160 V DC CIRCUIT.

Parallel-connected dc regulators V501/V502, plate to cathode, are in tandem with dc amplifier V504, screen grid to cathode. The terminals of R504, R505, R508, and R518, remote from V501 and V502 cathodes, connect to the +160 VDC regulated bus.

Series circuit R515, R514, R513 and V505 is connected from the +160 VDC regulated bus to ground. Control grid 1 of dc amplifier V504 is connected to the arm of potentiometer R514. These components provide V504 with approximately 10 volts bias.

The voltage on the +160 VDC regulated bus does not change appreciably with small changes in the voltage on the +380 VDC regulated bus. The emission of V504 is increased by an increase in its grid bias and plate voltage; the emissions of V501 and V502 are increased by an increase in their plate voltages. The circuit parameters compensate for such changes; as a result the voltage on the +160 VDC bus remains unchanged with small changes of voltage on the +380 VDC unregulated bus.

III(F)-4-5. -75 V DC CIRCUIT.

Voltage regulator V505 provides -75 VDC regulated voltage via B- rectifiers CR501 and CR502; filter C501, L502, and C502; fuse F504 and resistor R510.

III(F)-4-6. -6 V DC CIRCUIT.

Transformer T502 is a regulated transformer. The output voltage of its AC filament windings is constant within its operating range. -6 VDC rectified voltage from CR503 and CR504 is also constant. The -6 VDC regulated voltage goes to pin 1 of J503, pin 1 of J101 of the CHL-1, and to filaments 3 and 4 of V105 in the CHL-1.

III(F)-4-7. 6.3 V AC CIRCUIT.

Regulated transformer T502 provides regulated 6.3 VAC filament voltage via windings 8 to 9 (115-V) or 8 to 10 (230V).

SECTION 5 TROUBLE-SHOOTING

III(F)-5-1. INTRODUCTION.

General trouble-shooting involving CPP-2 is discussed in I-5. Detailed trouble-shooting involving CPP-2 is discussed below.

III(F)-5-2. VOLTAGES AND RESISTANCES.

Table III(F)-5-1 lists voltages and resistance measurements at tube pins in the CPP-2.

III(F)-5-3. PARTS LOCATION DATA.

Figures III(F)-5-1 and III(F)-5-2 locate major electronic components in the CPP-2.

III(F)-5-4. TROUBLE-SHOOTING BASED ON CIRCUIT SECTIONALIZATION.

Refer to III(G)-6.

TABLE III(F)-5-1. VOLTAGE AND RESISTANCE MEASUREMENTS

DC VOLTAGES (MAIN POWER ON-LOADS CONNECTED)

TUBE	PIN NO.							
	1	2	3	4	5	6	7	8
V501	110	300	160	110	300	160	FIL	FIL
V502	110	300	160	110	300	160	FIL	FIL
V503	-	300	-	400(AC)	-	400(AC)	-	300
V504	-4	0	FIL	FIL	110	160	0	FIL
V505	0	-75	-	-75	0	-	-75	-

RESISTANCES (MAIN POWER OFF)

TUBE	PIN NO.							
	1	2	3	4	5	6	7	8
V501	100K	15K	500	100K	15K	500	FIL	FIL
V502	100K	15K	500	100K	15K	500	FIL	FIL
V503	-	120K	-	30	-	30	-	120K
V504	4K	0	FIL	FIL	70K	50K	0	FIL
V505	0	100K	-	100K	0	-	100K	-

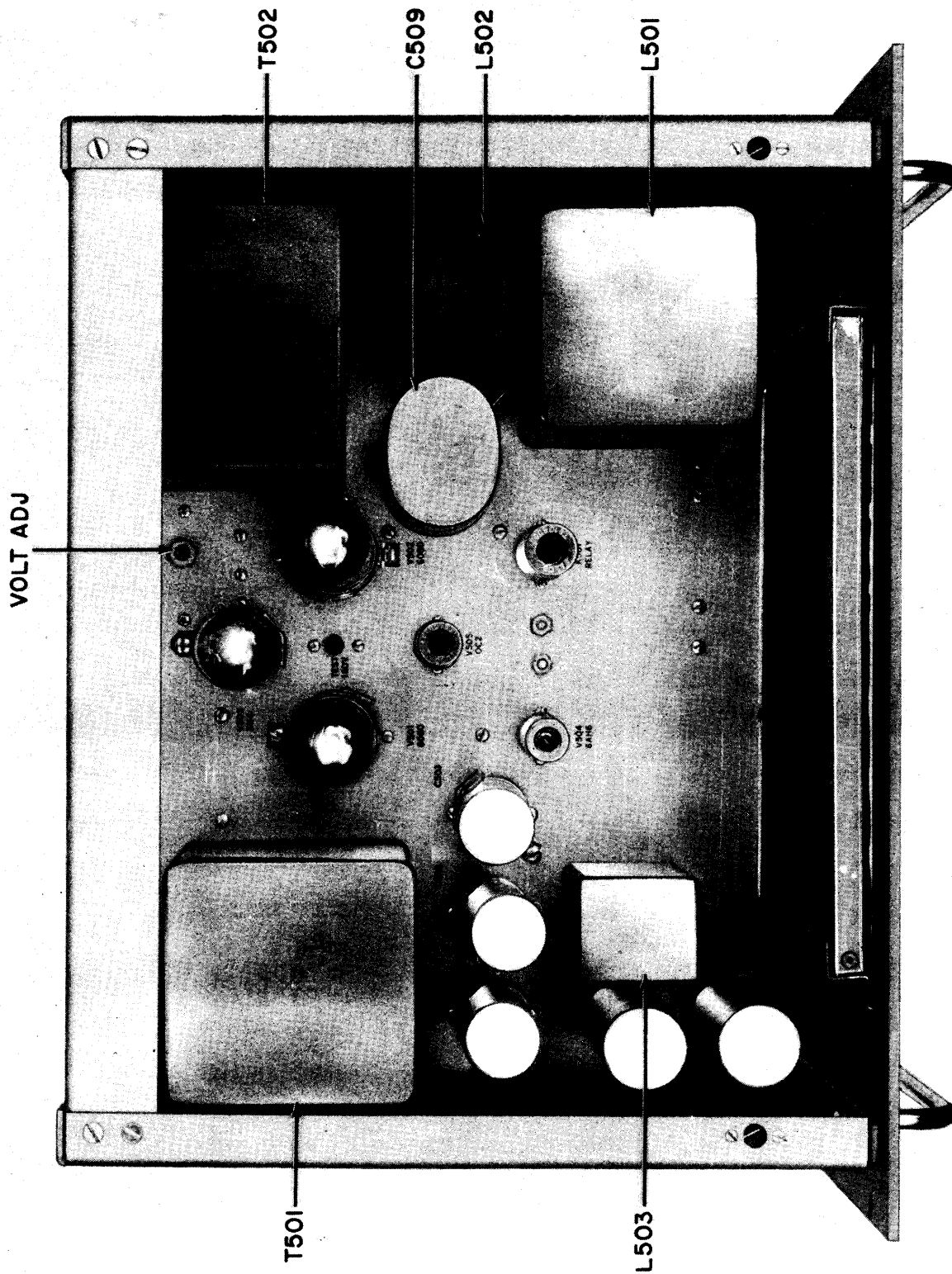


Figure III(F)-5-1. Location Diagram of Major Electronic Equipment Components, Top View

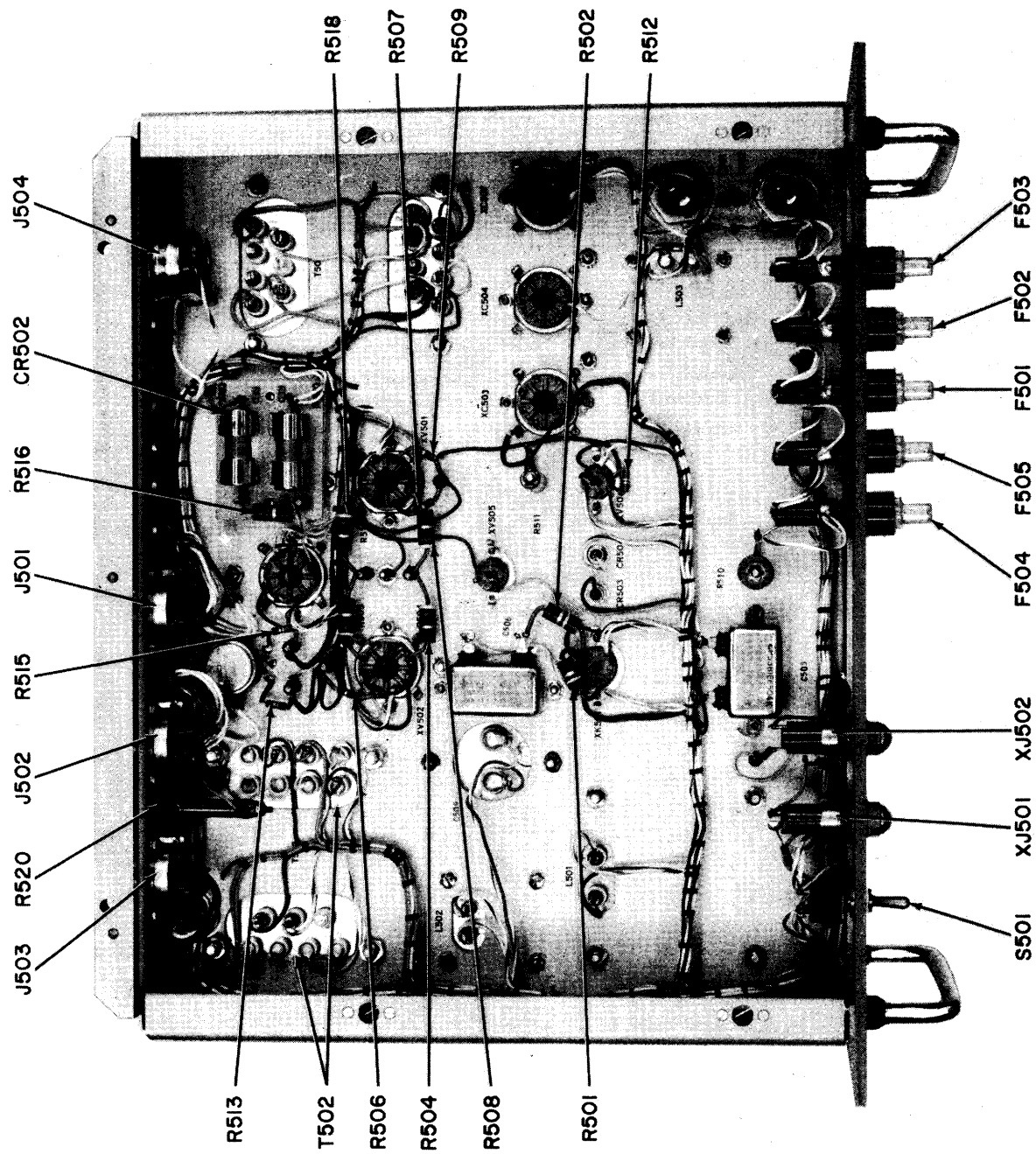


Figure III(F)-5-2. Location Diagram of Major Electronic Equipment Components, Bottom View

SECTION 6 MAINTENANCE

III(F)-6-1. INTRODUCTION.

General maintenance involving CPP-2 is discussed in I-6. Detailed maintenance involving CPP-2 is discussed below.

III(F)-6-2. CORRECTIVE MAINTENANCE.

Refer to III(G)-6.

SECTION 7 PARTS LIST

INTRODUCTION

Reference designations have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as a resistor, amplifier, electron tube, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug-in device, such as electron tube or fuse, are identified by reference designation which include the

reference designation of the plug-in device. For example, the socket for tube V501 is designated XV501. Column 1 of the parts lists gives reference designations of the parts in alphabetical and numerical order. Column 2 gives the name and describes the various parts. Major part assemblies are listed in their entirety; subparts of a major assembly are listed in alphabetical and numerical order with reference to its major assembly. Column 3 indicates how the part is used within a major component. Column 4 lists each Technical Materiel Corporation part number.

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
C501	CAPACITOR, fixed: paper; 4 mfd, $\pm 10\%$; char. F; 600 wvdc; oil filled and impregnated, hermetically sealed cylindrical metal case.	Filter	CP41B1FF405K
C502	Same as C501.	Same as C501	
C503	CAPACITOR, fixed: dry electrolytic, polarized, 80 mfd; 450 wvdc.	RF Bypass	CE51F800R
C504	Same as C503.	Same as C503	
C505	CAPACITOR, fixed: paper; .5 mfd., $\pm 10\%$; char. E; 600 wvdc; oil filled and impregnated, hermitically sealed bathtub case.	Coupling	CP53B1EF504K
C506	CAPACITOR, fixed: paper; .1 mfd, $\pm 10\%$, char. E; 600 wvdc; oil filled and impregnated, hermetically sealed bathtub metal case.	DC Blocking	CP53B1EF104K
C507	CAPACITOR, fixed: dry electrolytic; polarized, 1,500 mfd, 15 wvdc.	Filter	CE51C152F
C509	CAPACITOR, fixed: oil filled; 3 mfd; 660 wvdc.	RF Bypass	CP-109
CR501	RECTIFIER, selenium cartridge: 30 cells in series; 1440 volts peak inverse.	B- Rectifier	RX-107-1
CR502	Same as CR501.	B+ Rectifier	
CR503	RECTIFIER, silicon diffused; junction type; peak inverse voltage 100 volts at 3.5 amps; hermetically sealed.	Filament	RX-106
CR504	Same as CR503.	Same as CR503	
F501	FUSE, cartridge: time-lag; 3 amps.	Main Power	FU-102-3
F502	FUSE, cartridge: time-lag; 2 amp.	Power	FU-102-2
F503	FUSE, cartridge: time-lag; 5 amps.	Oven	FU-102-5
F504	FUSE, cartridge: time-lag; 1/10 amp.	Volt. Regulator	FU-102-.1
F505	FUSE, cartridge: time-lag; 1/2 amp.	B+	FU-102-.5
I501	LAMP, neon: miniature; 110 volts, 1/25 watt; T-3-1/4 clear bulb; bayonet base.	POWER Indicator	BI-100-51H
I502	Same as I501.	STANDBY Indicator	
J501	CONNECTOR, receptacle: female, 16 contacts, shell-aluminum alloy, contacts - brass, silver plated; mates with PL-187.	Power Output, CLL	JJ-184
J502	Same as J501.	Power Output, CMO	
J503	Same as J501.	Power Output, CHL	

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SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
J504	RECEPTACLE, plug: twist lock type; male.	Power Input	JJ-175
J505	JACK, receptacle: red body; silver plated contacts.	Test Point	JJ-114-2
K501	RELAY, thermal; delay; 60 second; ± 12 sec. 115 V, 2 amps, 220 V, 1 amp; SPST; normally open voltage breakdown contact 1000 V, heater to contact 1500 V; heater wattage 2.5 W; heater voltage 6.3 V; miniature 9 pin.	Time Delay	RL-111-6N060T
L501	REACTOR, 7 hy: 350 ma DC; resistance 55 ohms, insulated test at 2000 V.	Filter Choke, V503	TF-5013
L502	REACTOR, filter: 50 hy; DC resistance approximately 800 ohms; 30 ma DC; insulated for 1500 v.	Filter Choke, V505	TF-166
L503	CHOKE, reactor: .03 hy; 1.2 amps DC, approx. .4 ohms DC resistance, insulated test 1000 volts.	Filter Choke, T502	TF-221
P501	CONNECTOR, plug: twist lock; female, (polarized) midget size, black bakelite.	Power Plug	PL-176
P502	CONNECTOR, plug: male; AC two prong.	Power Connector	PL-171
R501	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$, 2 watts.	Voltage Dropping	RC42GF104K
R502	Same as R501.	Voltage Dropping	
R503	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$, 1/2 watt.	Grid, V502	RC20GF102K
R504	RESISTOR, fixed: composition; 47 ohms, $\pm 10\%$, 2 watts.	Cathode, V502	RC42GF470K
R505	Same as R504.	Same as R504	
R506	Same as R503.	Grid, V502	
R507	Same as R503.	Grid, V501	
R508	Same as R504.	Cathode, V501	
R509	Same as R503.	Same as R507	
R510	RESISTOR, fixed: wire wound; 20,000 ohms, $\pm 5\%$, 20 watts.	Plate Load, V505	RW-110-44
R511	RESISTOR, fixed: wire wound; 12,500 ohms, $\pm 5\%$, 10 watts.	Screen, V504	RW-109-35
R512	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$, 1/2 watt.	Plate Load, V504	RC20GF104K
R513	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$, 1/2 watt.	Voltage Divider	RC20GF223K
R514	RESISTOR, variable: composition; 25,000 ohms, $\pm 20\%$, 2 watts.	Same as R513	RV4ATXA253B

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
R515	RESISTOR, fixed: composition; 56,000 ohms, $\pm 10\%$, 1/2 watt.	Same as R513	RC20GF563K
R516	RESISTOR, fixed: composition; 1200 ohms, $\pm 10\%$, 2 watts.	Voltage Dropping	RC42GF122K
R517	RESISTOR, fixed: composition; 220,000 ohms, $\pm 10\%$, 1/2 watt.	Same as R517	RC20GF224K
R518	Same as R504.	Cathode, V501	
R519	Same as R517.	Same as R516	
R520	RESISTOR, fixed: wire wound; 3000 ohms, $\pm 5\%$, 10 watts.	Same as R516	RW-109-30
S501	SWITCH, toggle: dpdt; 3 amps; 250 V.	POWER-STANDBY switch	ST-22N
T501	TRANSFORMER, power: 115 vac at 50/60 cps; single phase, electrostatically shielded, hermetically sealed.	Main Power	TF-5014
T502	TRANSFORMER, power: step-down; primary, 115/230 vac, 50/60 cps; secondary #1, 6.3 vac at 12 amps; secondary #2, 6.3 vac.	Regulator	TF-223
V501	TUBE, electron, DC regulator.	DC Regulator	6080
V502	Same as V501.	Same as V501	
V503	TUBE, electron: full-wave rectifier; octal base.	Rectifier	5U4
V504	TUBE, electron: sharp cutoff R. F. pentode; 7 pin miniature.	DC Amplifier	6AH6
V505	TUBE, electron: voltage regulator.	Voltage Regulator	0C2
W501	CABLE ASSEMBLY, power: AC; coiled length 12".	Power Cable	CA-555-1
XC503	SOCKET, electron tube: octal; high crown.	Socket C503	TS101P01/A
XC504	Same as XC503.	Socket C504	
XC507	Same as XC503.	Socket C507	
XF501	FUSE HOLDER, bayonet base: 100/250 volts, neon lamp, clear knob, black plastic body.	Holder F501	FH-104-3
XF502	Same as XF501.	Holder F502	
XF503	Same as XF501.	Holder F503	
XF504	Same as XF501.	Holder F504	
XF505	Same as XF501.	Holder F505	
XI501	LIGHT, indicator: with red frosted lens; for miniature bayonet base, T-3-1/4 bulb.	Holder I501	TS-106-1

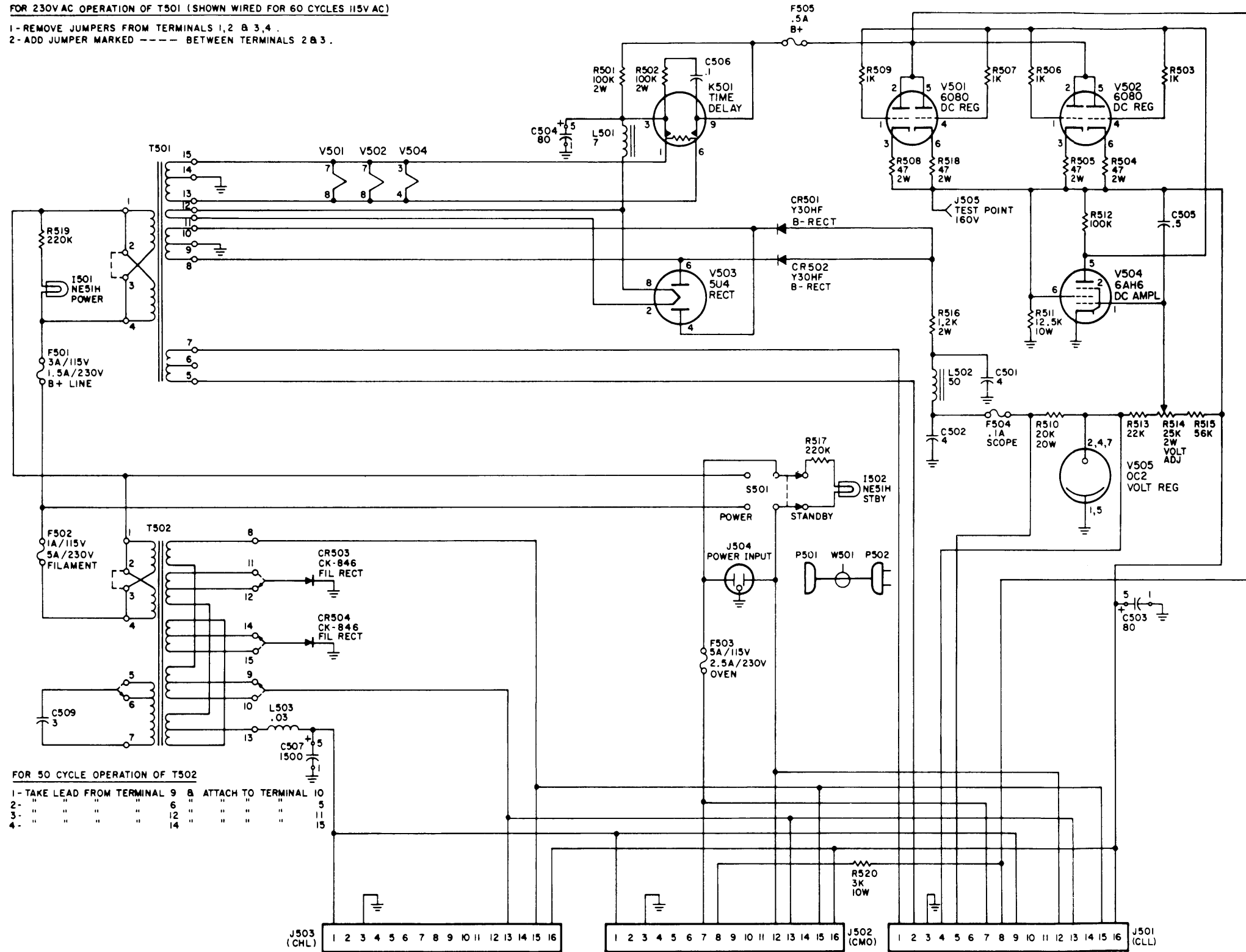
POWER SUPPLY CPP-2

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
XI502	LIGHT, indicator: with clear white lens; for miniature bayonet base, T-3-1/4 bulb.	Holder I502	TS-106-2
XK501	SOCKET, electron tube: 9 pin miniature.	Socket K501	TS103P01
XV501	Same as XC503.	Socket V501	
XV502	Same as XC503.	Socket V502	
XV503	Same as XC503.	Socket V503	
XV504	SOCKET, electron tube: 7 pin miniature.	Socket V504	TS102P01
XV505	Same as XV504.	Socket V505	

SECTION 8
SCHEMATIC DIAGRAMS

FOR 230V AC OPERATION OF T501 (SHOWN WIRED FOR 60 CYCLES 115V AC)

- 1- REMOVE JUMPERS FROM TERMINALS 1, 2 & 3, 4 .
- 2- ADD JUMPER MARKED ---- BETWEEN TERMINALS 2 & 3 .



FOR 50 CYCLE OPERATION OF T502

- 1- TAKE LEAD FROM TERMINAL 9 & ATTACH TO TERMINAL 10
- 2- " " " " 6 " " " 5
- 3- " " " " 12 " " " 11
- 4- " " " " 14 " " " 15

UNLESS OTHERWISE SPECIFIED
 ALL CAPACITORS ARE IN MICROFARADS.
 ALL COILS ARE IN HENRIES.
 ALL RESISTORS ARE 1/2 WATT.

Figure III(F)-8-1. Power Supply
 CPP-2, Schematic Diagram