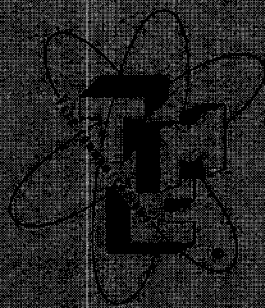


PRELIMINARY
INSTRUCTION MANUAL
LOW FREQUENCY SHIFT ADAPTER
MODEL LFA
IN-186



THE TECHNICAL MATERIEL CORP.

Manhasset, N. Y.

Greene, Ontario

PRELIMINARY
INSTRUCTION MANUAL
LOW FREQUENCY SHIFT ADAPTER
MODEL LFA

The Technical Materiel Corporation
Mamaroneck, New York

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SECTION I

GENERAL DESCRIPTION

1. PURPOSE AND BASIC PRINCIPLES

The Low Frequency Shift Adapter, Model LFA is a highly-stable, low frequency shift adapter utilizing untuned amplifiers. The unit is designed for use with any frequency-shift exciter, operating with an output of 2 hrs., to produce an extended operating range, between 50 and 500 kcs. The Model LFA imposes no additional restrictions on the frequency stability of shift characteristics of any such exciter, since the degree and manner of shift are dependent upon the characteristics of the exciter alone.

The Model LFA consists of an oscillator, a mixer, a phase inverter, voltage and power amplifiers and a temperature-controlled oven, with mounting facilities for three crystals. The amplifiers and output transformer employ push-pull circuitry, characterized by excellent linearity and stability. This feature means that the harmonic distortion in this unit is less than 5% throughout the entire frequency range, when properly terminated in a 75 ohm load.

2. DESCRIPTION OF UNIT

The Low Frequency Shift Adapter, Model LFA is an enclosed panel-board chassis assembly, designed for mounting in a standard 19" or 21" rack. The adapter contains a power supply section, and a separate oven-enclosed crystal oscillator, operating in the range of 2.05 to 2.50 Mc., all on the one chassis. The panel is 3/16" thick, 18" wide, 12" deep and 1 1/2" high, and is finished in TMC grey enamel.

A. TECHNICAL SPECIFICATIONS

FREQUENCY RANGE: 50 to 500 Kc.

OUTPUT POWER: 0 to 5 watts, continuously variable.

HARMONIC DISTORTION: Less than 5%.

OVEN TEMPERATURE: 70°C.

CRYSTAL FREQUENCY: $F \text{ output (Mc.)} = F \text{ xtal (Mc.)} \times 2 \text{ (Mc.)}$.

CRYSTAL SOCKETS: Provisions for both HC-6/U and FS-2bC, for each position.

CRYSTAL POSITIONS: Three.

OUTPUT IMPEDANCE: 75 ohms coaxial with BNC connector.

INPUT IMPEDANCE: 75 ohms coaxial with BNC connector.

INPUT FREQUENCY: FS signal centered on 2.0 Mc.

1. Keying Speed: 1000 wpm maximum when used with the EW Exciter Model XPK, otherwise keying speed is dependent upon Exciter used.

2. Facsimile: Capable of handling facsimile with XPK, otherwise dependent upon Exciter employed.

METERING: Output voltage.

FRONT PANEL CONTROLS: Output Control, Crystal Selector Switch, Main Power Switch, Plate Power Switch.

REAR CONTROLS: Coarse Output Adjustment.

PRIMARY POWER: 110/220 volts, 50/60 cps. Oven heaters off-70 watts. Oven heaters on-110 watts.

WEIGHT: 32 lbs.

MOUNTING: Standard WG or RMA relay rack.

SIZE: 19" wide x 12" deep x 7" high.

TUBE COMPLEMENT:

1 each	6C4	Crystal Oscillator
1 each	6BE6	Mixer
1 each	6C4	Phase Inverter
1 each	12AT7	Voltage Amplifier
2 each	6AQ5	Power Amplifiers
1 each	5Y4G	Rectifier
1 each	0A2	Voltage Regulator

SECTION II

THEORY OF OPERATION

1. GENERAL DESCRIPTION OF CIRCUITS

Reference to the Functional Block Diagram, Figure 1, will serve to illustrate the basic composition of the Model LFA. The following describes the circuits in sequence from input to output:

Oscillator (V101) and the three frequency determining crystals are contained in a temperature-controlled oven to provide high stability in operation. Switch S101, provides for crystal selection or external drive, and is mounted on the front panel, for control of the output frequency.

The incoming frequency-shift signal, centered around 2.0 Mc., is sent through a band-pass filter (R109, L101 and C106); whence, it is mixed with the crystal oscillator frequency voltage in the mixer tube, V102. The difference-frequency between the two voltages is then picked off by the action of the low band-pass filter (C112, L102, L103, C113) between the mixer and the next stage.

Push-pull voltage amplification in V104 is secured with resistance-capacitance coupling, by using phase-inverter, V103, to provide the necessary phase shift. The output from V104 is then further amplified by V105 and V106, which provides maximum power output with a minimum of distortion. A meter is provided by means of a rectifying device (C1101) and its associated filter circuit, for monitoring the output voltage, which is adjustable from zero to its maximum value, by means of a front panel control.

A regulated power supply is self-contained in the unit, providing the necessary filament and B+ voltages, necessary for operation. A front panel plate power switch (S103), controls the application of B+ voltage to the various tubes.

SECTION III

INSTALLATION AND OPERATION

1. INSTALLATION

A. UNPACKING

The Model LFA has been designed for ease of installation and operation. The unit is packed in its own shipping container and should be carefully unpacked. A close visual inspection should be made, to ascertain any physical damage incurred during shipment, and to make certain that all tubes are firmly seated in their respective sockets.

B. POWER SOURCE

The power supply circuit is integral with the unit. The unit is released from the factory wired for 110 volts A.C., 50/60 cycles; unless it is specifically ordered for 220 volts A.C., 50/60 cycles operation; in which event, it will be clearly so tagged.

Should it be necessary, at any time, to convert the equipment from 110 volt to 220 volt operation, two changes are required:

- (1) Transformer T101 primary windings must be re-wired, as shown on the schematic. Specifically, remove the jumpers between terminals 1 and 2, and between 3 and 4. Add a jumper between terminals 2 and 3.
- (2) The oven must be re-wired, as shown on the schematic. Specifically, remove the jumpers between terminals 1 and 5, and between 2 and 6. Add a jumper between terminals 1 and 6.

C. ELECTRICAL CONNECTIONS

The panel is equipped with standard slots for rack mounting, and the unit should be mounted in its operating position in the rack. The input line should be a coaxial cable of 75 ohms, with a BNC type connector, and should be connected at the terminal marked "Shift Input", at the rear of the chassis. Similarly, the "Output" termin, also at the rear of the chassis, should be connected by a suitable length of 75 ohm coaxial cable, with BNC type connector. Should it be desired to use an external oscillator to replace the crystal oscillator within the unit, a coaxial cable of 75 ohms, with the required signal level (from 2.05 Mc to 2.50 Mc at about 4 VRMs) and frequency, should be connected to the terminal labeled "External".

2. OPERATION

A. INITIAL ADJUSTMENTS

Before operating the equipment, it is necessary to select the proper crystal for the desired output frequency. This may be done according to the following formula:

$$F_o = F_x - 2, \text{ where}$$

F_o = output frequency in megacycles

F_x = crystal frequency, in megacycles.

The crystal used should preferably be the new hermetically-sealed JAN unit, CR-27/U, as per specification MIL-C-3098. The crystal should be inserted in one of the appropriate crystal sockets, inside the oven. The oven opening is conveniently placed on the front panel.

B. OPERATING PROCEDURE

To obtain high oscillator stability, the Model LFA should be given an initial warm-up of at least 2 1/2 hours. When the Model LFA, Low Frequency Adapter, is used in combination with the Model XFK, Frequency Shift Exciter, in the TMC Model XFL-2, Frequency Shift Exciter System, a 2.2 Mc crystal should be inserted in the Model XFK, and the lower sideband (2 Mc) be chosen in its output.

Initially, the operator should perform the following functions:

- (1) Turn the power switch to the "On" position. The red light on the "Oven" lamp on the front panel should go on.
- (2) Turn the Plate Switch to the "On" position.
- (3) Set the Xtal selector switch to the desired crystal.
- (4) Increase the "Output" control until the desired output power is reached. The front panel meter has been so adjusted that the full-scale meter position reads 25 volts.

In order to insure that the amplifiers are not overdrive, the operator should connect a 75 ohm load at the "Output" terminal, and with the fine "Output" control (R112) turned fully clockwise, adjust the coarse "Output" control on the rear of the chassis, until a reading of .8 ma (20 volts) is reached on the front panel meter. Once this adjustment has been concluded, the coarse "Output" (R111) SHOULD NOT BE DISTURBED.

SECTION IV
MAINTENANCE

1. GENERAL

The Model LFA should maintain its correct factory adjustments over a reasonably long period of time. It has been designed for rugged use under severe conditions of operation, and yet it has all the components ready for easy replacement. All parts are mounted with screws and nuts, rather than with rivets, while the wiring is in the form of laced cable, and point to point contact. It is recommended that any maintenance to the equipment be done only by a competent maintenance technician.

2. EMERGENCY

Two separate fusing systems have been incorporated in the Model LFA; one to protect the ovens; the other, to protect the power supply. Vacuum tubes should be checked periodically, one at a time, in a reliable tube-tester. Tube replacement is recommended if the tube characteristics do not fall within the manufacturers tolerances.

The unit should be kept clean, and inspected regularly for evidence of dirt, dampness, moulding, charring and corrosion.

Voltage, resistance and continuity measurements will aid in locating any faults which may develop. An oscilloscope connected at the output terminal (J103), will show any harmful distortion effects, with a proper input signal to the unit.

RESISTOR PARTS LIST

<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
C101	CAPACITOR, fixed: paper; .05 mfd, $\pm 20\%$ 400 wvdc; plastic tubular case.	GM-100-3	Thermostat arc suppressor
C102	CAPACITOR, fixed: mica; 51 mfd, $\pm 5\%$ char. C; 500 wvdc.	GM20C510J	Crystal load
C103	CAPACITOR, fixed: mica; 1000 mfd, $\pm 10\%$ char. A; 500 wvdc.	GM20A102K	Osc. crystal coupling
C104	Same as C103.	GM20A102K	Osc. plate de- coupling
C105	Same as C103.	GM20A102K	Osc. mixer coupling
C106	CAPACITOR, fixed: mica; 220 mfd, $\pm 5\%$ char. C; 500 wvdc.	GM20C221J	Mixer input filter
C107	Same as C103.	GM20A102K	Mixer grid coupling
C108	Same as C103.	GM20A102K	Mixer cathode bypass
C109	CAPACITOR, fixed: mica; .01 mfd, $\pm 10\%$ char. A; 300 wvdc.	GM35A103K	Mixer plate decoupling
C110	Same as C103.	GM20A102K	Mixer plate coupling
C111	Same as C109.	GM35A103K	Mixer screen decoupling
C112	CAPACITOR, fixed: mica; 15 mfd, $\pm 5\%$ char. C; 500 wvdc.	GM20C150J	Mixer plate filter
C113	Same as C102.	GM20C510J	Mixer plate filter
C114	Same as C112.	GM20C150J	Mixer plate filter
C115	Same as C109.	GM35A103K	Inverter plate decoupling
C116	Same as C103.	GM20A102K	Inverter-Ampli- fier coupling

ELECTRICAL PARTS LIST

<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
C117	Same as C109.	CM35A103K	Inverter-Amplifier coupling
C118	Same as C103.	CM20A102K	Inverter-Amplifier coupling
C119	Same as C109.	CM35A103K	Amplifier plate decoupling
C120	Same as C103.	CM20A102K	Amplifier coupling
C121	Same as C103.	CM20A102K	Amplifier coupling
C122	Same as C109.	CM35A103K	Amplifier plate decoupling
C123	Same as C109.	CM35A103K	Meter filter
C124	Same as C109.	CM35A103K	Meter coupling
C125	CAPACITOR, fixed: paper; 1/2 mfd, ±10%; 500 vdc; oil-filled and impregnated, hermetically sealed metal case.	CP40C2DF405V	B+ filter
C126	Same as C125.	CP40C20F405V	B+ filter
C127	Same as C125.	CP40C2DF405V	Regulator bypass
C128	Same as C109.	CM35A103K	Filament bypass
C129	Same as C109.	CM35A103K	Meter bypass
CR101	CRYSTAL UNIT: rectifying; germanium type.	IN34	Output rectifier
E101	BOARD, terminals: 4 short-turret, brass, lug terminals; 3-3/16" lg x 1-3/8" wd x 1/8" thk; phenolic body.	PI-107	Oven elements connections
E102	BOARD, terminals: 6 short-turret, brass lug terminals; 2-13/16" lg x 1/2" wd x 1/8" thk; phenolic body.	PI-108	Oven elements connections

ELECTRICAL PARTS LIST

<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
F101	FUSE, cartridge: 3 amp; oper. in one hour at 135% load and in 25 sec. at 200% load; rated continuous at 110% load; 250 volts; one time; 1 $\frac{1}{4}$ " lg x $\frac{1}{4}$ " dia.	FU-100-3	Power supply fuse
F102	Same as F101.	FU-100-3	Power supply fuse
I101	LAMP, neon: 110 volts; T-3 $\frac{1}{2}$ bulb, clear; 1/25 watt; 1-13/16" lg overall; miniature bayonet base.	BI-100-51	Oven indicator
I102	LAMP, incandescent: 6-8 volts; 0.25 amp; T-3 $\frac{1}{2}$ bulb, brown; 1-3/16" lg overall; miniature bayonet base.	BI-101-44	Power On-Off indicator
J101	CONNECTOR, receptacle: coaxial female contact; BNC type; single hole mounting.	UC-625/U	External drive connector
J102	Same as J101.	UC-625/U	Shift input connector
J103	Same as J101.	UC-625/U	Output connector
J104	CONNECTOR, receptacle: male contact; 2 non-polarized locking type blades; 15 amps. 125 volts or 10 amps. 250 volts.	JJ-100	AC input receptacle
L101	COIL, radio-frequency: variable, 20.2-36.2 microhenries; slug tuned.	A-204	Mixer input filter
L102	CHOKER, radio-frequency: 5 millihenries 50 ma, 100 ohms; ceramic body.	CL-104-2	Mixer plate choke
L103	Same as L102.	CL-104-2	Mixer plate choke
L104	CHOKER, radio-frequency: 750 microhenries, $\pm 20\%$; 75 ma, 17 ohms; bakelite form.	CL-100-5	Amplifier plate choke
L105	Same as L104.	CL-100-5	Amplifier plate choke
L106	REACTOR, filter: 10 henries; 125 ma DC, 1000 volts RMS test.	TF-5001	Power supply filter
L107	Same as L106.	TF-5002	Power supply filter

ELECTRICAL PARTS LIST

<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
R101	METER, panel: DC; 0-1 milliammeter	MR-100-1	Output tuning
R101	RESISTOR, fixed: composition; 100 ohms $\pm 10\%$; 1/2 watt.	RC20GF101K	Thermostat arc suppressor
R102	RESISTOR, fixed: composition; 220,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF224K	Neon current limiter
R103	RESISTOR, fixed: wire wound; cartridge heater type; 15 watts, at 115 volts AC $\pm 10\%$; 1,000 v. insulated to shell.	RR-102-1	Oven heater element
R104	Same as R103	RR-102-1	Oven heater element
R105	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF104K	Oscillator grid leak
R106	RESISTOR, fixed: composition; 2,700 ohms, $\pm 10\%$; 1/2 watt.	RC20GF272K	Oscillator cathode bias
R107	RESISTOR, fixed: composition; 47,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF473K	Oscillator plate load
R108	Same as R106	RC20GF272K	Oscillator plate decoupling
R109	Same as R107	RC20GF473K	Mixer input filter
R110	RESISTOR, fixed: wire wound; 100 ohms, 3/6 ma; 2 1/2 watts.	RW-108-8	RF load
R111	RESISTOR, variable: composition; 1500 ohms, $\pm 10\%$; 2 watts; 1/4" lg. slotted shaft.	RVLATSAL52A	Course output control
R112	RESISTOR, variable: composition; 1500 ohms, $\pm 10\%$; 2 watts; 7/8" lg. round shaft.	RVLATFE152A	Fine output control
R113	Same as R105	RC20GF104K	Mixer grid leak
R114	Same as R105	RC20GF104K	Mixer cathode bias
R115	Same as R105	RC20GF104K	Grid leak

ELECTRICAL PARTS LIST

<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
R116	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF103K	Mixer plate load
R117	RESISTOR, fixed: composition; 27,000 ohms, $\pm 10\%$; 2 watts.	RC42GF273K	Mixer screen dropping
R118	RESISTOR, fixed: composition; 2200 ohms, $\pm 10\%$; 1/2 watt.	RC20GF222K	Mixer plate filter
R119	Same as R116	RC20GF103K	Inverter grid leak
R120	RESISTOR, fixed: composition; 1,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF102K	Inverter cathode bias
R121	RESISTOR, fixed: composition; 4,700 ohms, $\pm 10\%$; 1/2 watt.	RC20GF472K	Inverter de-coupling
R122	Same as R118.	RC20GF222K	Inverter plate load
R123	Same as R121.	RC20GF472K	Inverter decoupling
R124	Same as R105.	RC20GF104K	Amplifier grid leak
R125	Same as R105.	RC20GF104K	Amplifier grid leak
R126	RESISTOR, fixed: composition; 470 ohms, $\pm 10\%$; 1/2 watt.	RC20GF471K	Amplifier cathode bias
R127	RESISTOR, fixed: composition; 6800 ohms, $\pm 10\%$; 1/2 watt.	RC20GF682K	Amplifier plate load
R128	Same as R127.	RC20GF682K	Amplifier plate load
R129	Same as R121.	RC20GF472K	Amplifier plate filter
R130	Same as R121.	RC20GF472K	Amplifier plate filter
R131	Same as R105.	RC20GF104K	Power Amp. grid leak
R132	Same as R105.	RC20GF104K	Power Amp. grid leak

BIBERICAL PARTS LIST

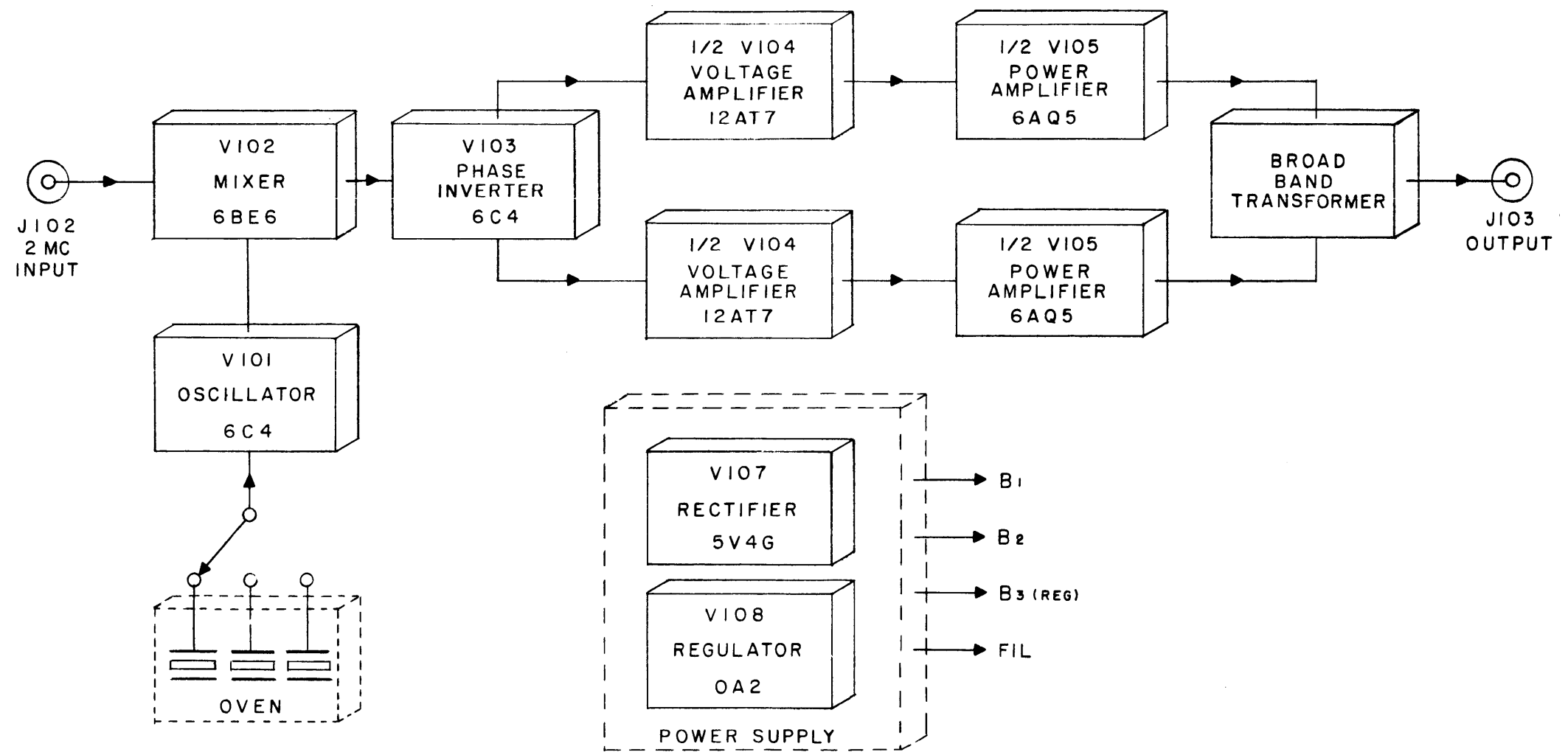
<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
R133	RESISTOR, fixed: wire wound; 150 ohms, 182 ma; 5 watts.	RW-107-20	Power Amp. cathode bias
R134	RESISTOR, fixed: composition; 30,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF303K	Crystal load
R135	RESISTOR, fixed: wire wound; 2000 ohms, 70 ma; 10 watts.	RW-109-28	B+ dropping
R136	RESISTOR, fixed: wire wound; 4500 ohms, 10.5 ma; 10 watts.	RW-104	B+ dropping
R137	RESISTOR, fixed: wire wound; 0.2 ohms, $\pm 10\%$; 2 watts.	A-238	Filament dropping
R138	RESISTOR, fixed: wire wound; 12 ohms, $\pm 10\%$; 2 watts.	RCh2GF120K	Lamp current limiter
S101	SWITCH, rotary: one section, four positions; non-shorting contacts; mycalax insulation; 1-5/16" wafers.	SW-105	Ktal selector
S102	SWITCH, thermostatic: bi-metallic; operate at $\pm 70^\circ \text{C.} \pm 2^\circ \text{C.}$	SS-100-2	Ktal oven control
S103	SWITCH, toggle: SPST, 6 amp, 250 volts; phenolic body; solder lug terminals.	ST-12A	Plate power switch
S104	SWITCH, toggle: DPST; 6 amps, 250 volts; phenolic body; solder lug terminals.	ST-22K	Power On-Off
TR01	TRANSFORMER, power: pri 110/220 v, 50/60 cps, single phase; sec #1, 350-0-350 v at .125 amps DC; sec #2, 6.3 v at 4 amps; sec #3, 5 v at 3 amps; hermetically sealed metal case.	TR-105	Power transformer
TR02	TRANSFORMER, HF: output impedance matching; ring type core; rectangular steel case; ceramic terminals.	TR-019	Output transformer

ELECTRICAL PARTS LIST

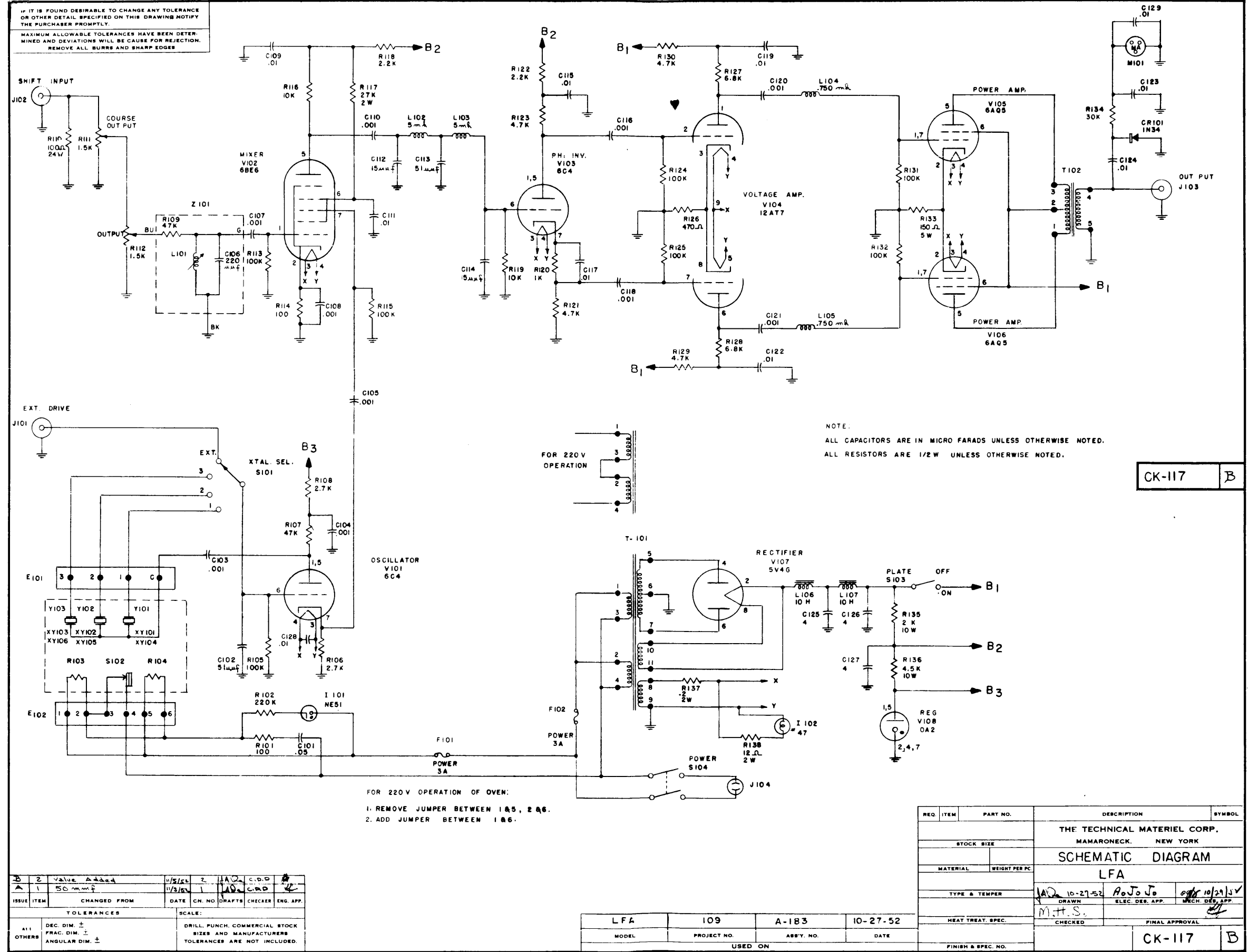
<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
V101	TUBE, electron: 6Ch; miniature 7 pin.	6Ch	Oscillator
V102	TUBE, electron: 6BE6; miniature 7 pin.	6BE6	Mixer
V103	Same as V101.	6Ch	Phase Inverter
V104	TUBE, electron: 12AT7; miniature 9 pin.	12AT7	Voltage Amplifier
V105	TUBE, electron: 6AQ5; miniature 7 pin.	6AQ5	Power Amplifier
V106	Same as V105	6AQ5	Power Amplifier
V107	TUBE, electron: 5V1G; octal.	5V1G	Rectifier
V108	TUBE, electron: OA2; miniature 7 pin.	OA2	Voltage Regulator
XF101	FUSEHOLDER; extractor post type; for single AGC fuse.	FH-100-2	F101 Socket
XF102	Same as XF101	FH-100-2	F102 Socket
XI101	LIGHT, indicator; w/red frosted lens; T-3 $\frac{1}{2}$ bulb, miniature bayonet base.	TS-106-1	Socket for I102
XI102	LIGHT, indicator; w/clear white lens; T-3 $\frac{1}{2}$ bulb; miniature bayonet base.	TS-106-2	Socket for I101
XV101	SOCKET, tube: miniature 7 pin; moulded plastic insulation.	TS-102-F01	Socket for V101
XV102	Same as XV101.	TS-102-F01	Socket for V102
XV103	Same as XV101.	TS-102-F01	Socket for V103
XV104	SOCKET, tube: miniature 9 pin; moulded, plastic insulation.	TS-103-F01	Socket for V104
XV105	Same as XV101.	TS-102-F01	Socket for V105
XV106	Same as XV101.	TS-102-F01	Socket for V106
XV107	SOCKET, tube: octal; moulded plastic insulation.	TS-101-F01	Socket for V107
XV108	Same as XV101.	TS-102-F01	Socket for V108

ELECTRICAL PARTS LIST

<u>SYMBOL NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>FUNCTION</u>
XY-101	SOCKET, crystal: .487" spacing for .095" pins.	TS-105-1	Xtal socket A for Xtal #1
XY-102	Same as XY-101.	TS-105-1	Xtal socket B for Xtal #2
XY-103	Same as XY-101.	TS-105-1	Xtal socket C for Xtal #3
XY-104	SOCKET, crystal: .487" spacing for	TS-104-1	Xtal socket B for Xtal #1
XY-105	Same as XY-104.	TS-104-1	Xtal socket B for Xtal #2
XY-106	Same as XY-104.	TS-104-1	Xtal socket B for Xtal #3



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



NOTE:
 ALL CAPACITORS ARE IN MICRO FARADS UNLESS OTHERWISE NOTED.
 ALL RESISTORS ARE 1/2 W UNLESS OTHERWISE NOTED.

CK-117 B

FOR 220V OPERATION OF OVEN:
 1. REMOVE JUMPER BETWEEN 1 & 5, 2 & 6.
 2. ADD JUMPER BETWEEN 1 & 6.

REV	2	Value Added	1/3/52	2	HAO	CDD	
ISSUE	1	50 mm ²	1/3/52	1	HAO	CDD	
ISSUE	ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS	CHECKER	ENG. APP.
TOLERANCES		SCALE:					
ALL	DEC. DIM. ±	DRILL PUNCH, COMMERCIAL STOCK					
OTHERS	FRAC. DIM. ±	SIZES AND MANUFACTURERS					
	ANGULAR DIM. ±	TOLERANCES ARE NOT INCLUDED.					

LFA	109	A-183	10-27-52
MODEL	PROJECT NO.	APPY. NO.	DATE
USED ON			

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK			
SCHEMATIC DIAGRAM			
LFA			
TYPE & TEMPER	10-27-52	HAO	CDD
DRAWN	10-27-52	HAO	CDD
ELEC. DES. APP.			
MECH. DES. APP.			
HEAT TREAT. SPEC.			
FINISH & SPEC. NO.			
CHECKED			FINAL APPROVAL
			CK-117 B