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TECHNICAL MANUAL

for

CONTROL TERMINATOR

MODEL LRCA-1



THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

OTTAWA, ONTARIO



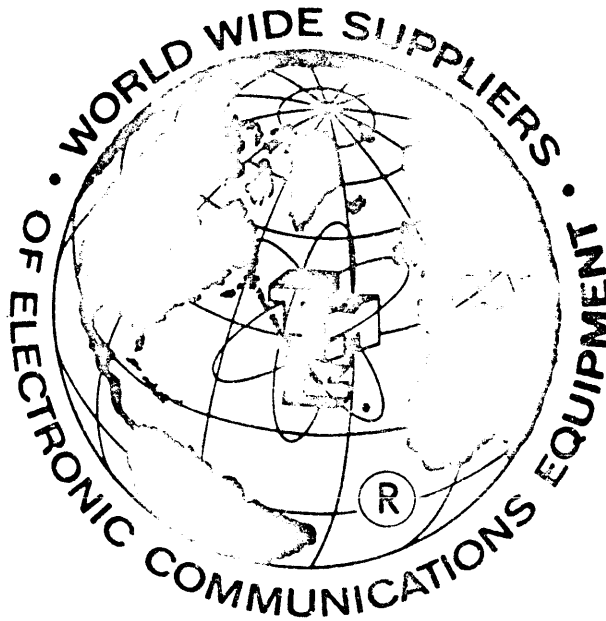
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TECHNICAL MANUAL

for

CONTROL TERMINATOR

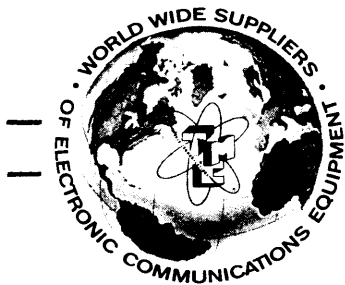
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THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

OTTAWA, ONTARIO

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C O M M U N I C A T I O N S E N G I N E E R S

700 FENIMORE ROAD

MAMARONECK, N. Y.

W a r r a n t y

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,*fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes*furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

1. Quantity Required.
2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

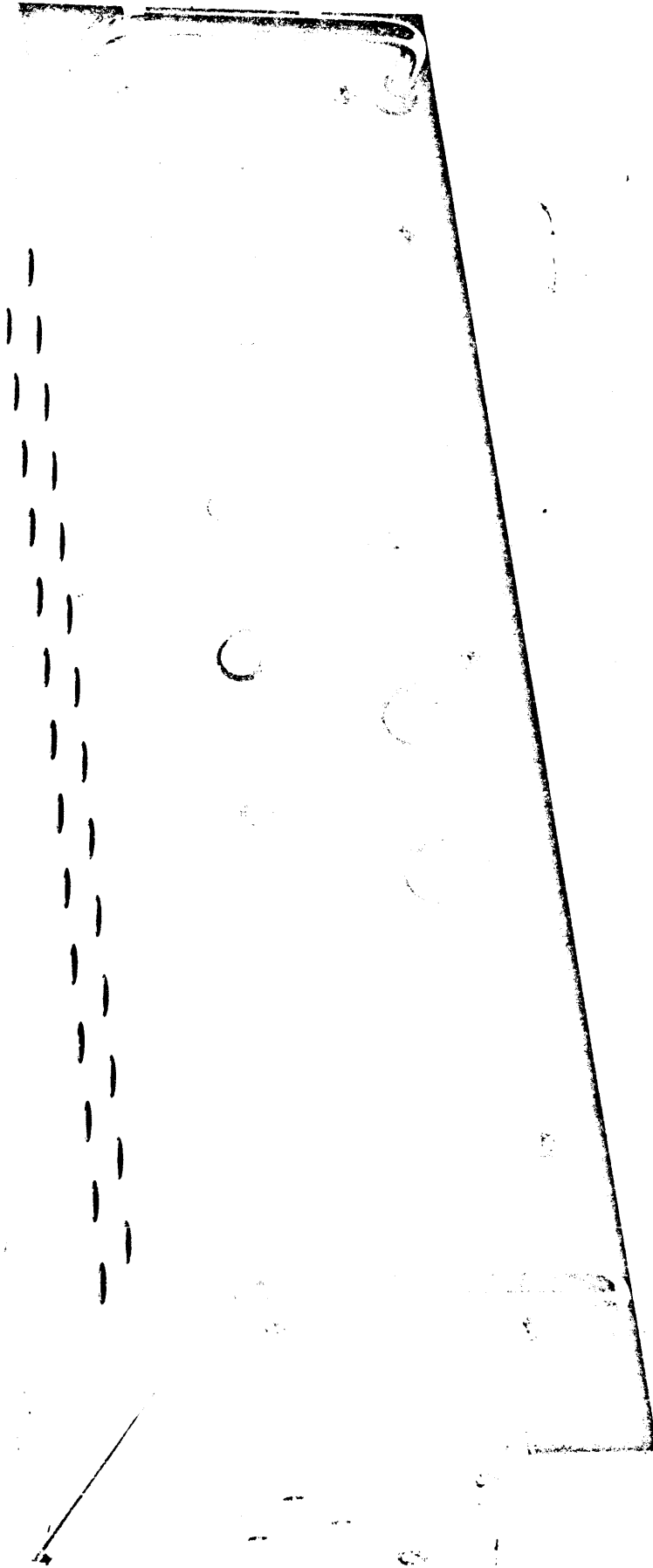
THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York

TABLE of CONTENTS

| <u>Paragraph</u> | | <u>Page</u> |
|--|------------------------------------|-------------|
| <u>SECTION 1 - GENERAL INFORMATION</u> | | |
| 1-1 | Functional Description | 1-1 |
| 1-2 | Physical Description | 1-1 |
| 1-3 | Technical Specifications | 1-1 |
| <u>SECTION 2 - INSTALLATION</u> | | |
| 2-1 | General | 2-1 |
| 2-2 | Mechanical Installation | 2-1 |
| 2-3 | Electrical Installation | 2-1 |
| <u>SECTION 3 - OPERATOR'S SECTION</u> | | |
| 3-1 | General | 3-1 |
| <u>SECTION 4 - PRINCIPLES OF OPERATION</u> | | |
| 4-1 | Introduction | 4-1 |
| 4-2 | Circuit Analysis | 4-1 |
| <u>SECTION 5 - MAINTENANCE</u> | | |
| 5-1 | Preventive Maintenance | 5-1 |
| 5-2 | Troubleshooting | 5-2 |
| 5-3 | Repair and Replacement | 5-3 |
| <u>SECTION 6 - PARTS LIST</u> | | |
| 6-1 | Introduction | 6-1 |
| <u>SECTION 7 - SCHEMATIC DIAGRAMS</u> | | |

LIST OF ILLUSTRATIONS

| <u>Figure</u> | | <u>Page</u> |
|--|--|-------------|
| <u>SECTION 1 - GENERAL INFORMATION</u> | | |
| 1-1 | Control Terminator, Model LRCA-1 | 1-0 |
| 1-2 | Functional Block Diagram, LRCA | 1-2 |
| <u>SECTION 2 - INSTALLATION</u> | | |
| 2-1 | Transformer Wiring Diagram, LRCA | 2-2 |
| 2-2 | Rear Panel, LRCA | 2-3 |
| 2-3 | Electrical Connections, LRCA | 2-3 |
| <u>SECTION 3 - OPERATOR'S SECTION</u> | | |
| 3-1 | Controls and Indicators, LRCA | 3-2 |
| <u>SECTION 5 - MAINTENANCE</u> | | |
| 5-1 | Component Locations, Top View, LRCA | 5-4 |
| 5-2 | Component Locations, Bottom View, LRCA | 5-5 |
| <u>SECTION 7 - SCHEMATIC DIAGRAMS</u> | | |
| 7-1 | Schematic Interconnect (CK1185) | 7-1 |
| 7-2 | Schematic Relay, Card Z1 (CK1194) | 7-2 |
| 7-3 | Schematic Relay, Card Z2 (CK1193) | 7-3 |



9815-1

Figure 1-1. Control Terminator, Model LRCA-1

SECTION 1
GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION.

Control Terminator, Model LRCA-1 (figure 1-1), receives binary coded signals, supplied by an associated remote control unit, that are used to activate relays within the LRCA and extend the signals to activate an 8-channel selector switch in an associated exciter; the LRCA also provides readback signals to the remote control unit to indicate operational conditions of the associated transmitter, and supplies signals for remote control of overload reset, main power on/off, and high voltage on/off conditions, as desired by the remote operator.

The relationship of the LRCA to other units of a remote transmitter system is illustrated in the functional block diagram (see figure 1-2).

1-2. PHYSICAL DESCRIPTION.

The LRCA is designed for installation in a standard 19-inch wide equipment cabinet; the unit is 10 3/4 inches deep, 5 1/4 inches high, and weighs approximately 17 pounds. All controls and indicators are located on the front panel. Removable top and bottom protective metal covers are provided.

1-3. TECHNICAL SPECIFICATIONS.

Technical specifications for the LRCA are as follows:

Inputs: Bit codes, dry contact to ground.

Outputs: +28 vdc, for selected function.

Power Requirements: 115/230 vac, single phase, 50/60 cps (Hz).

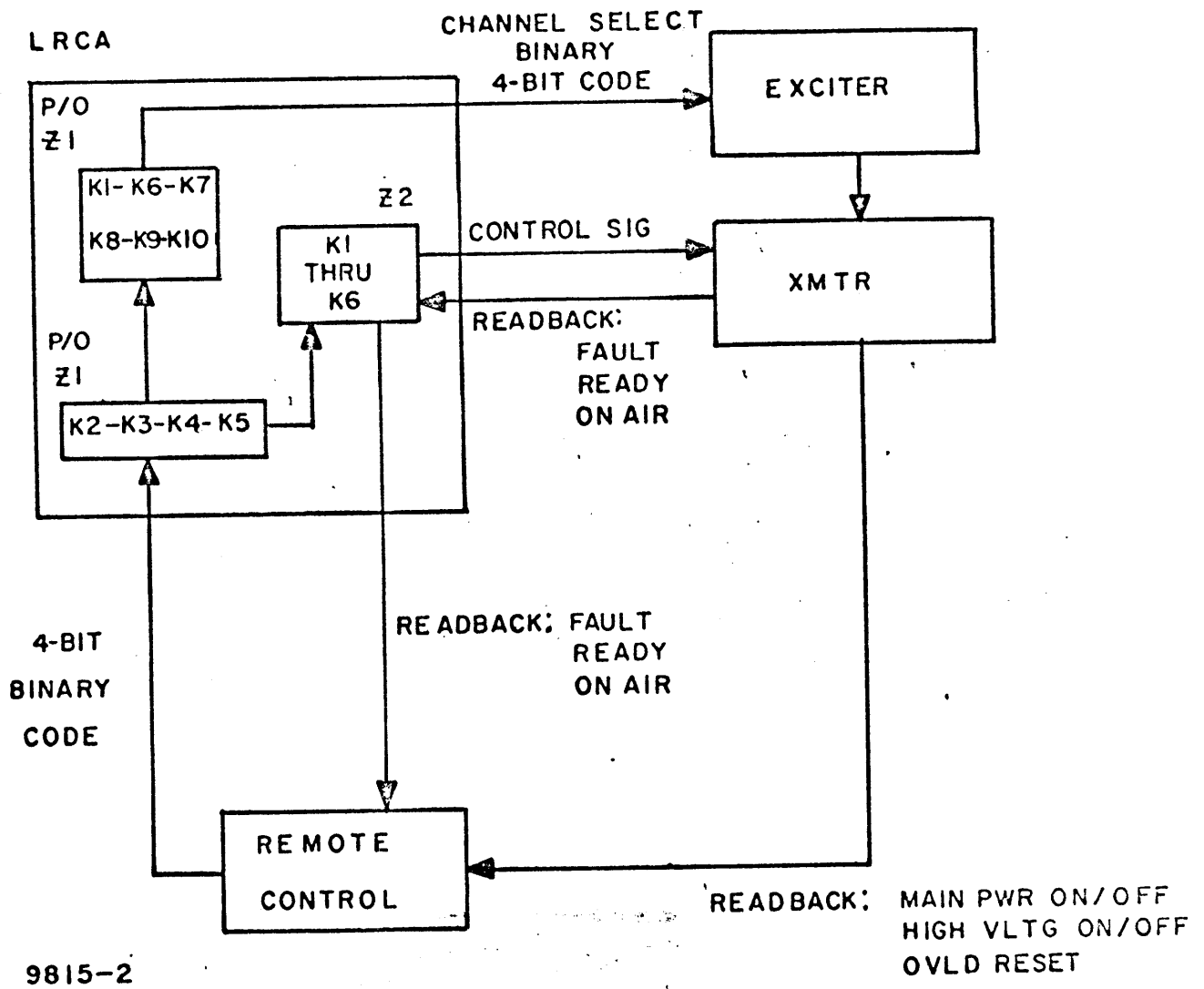


Figure 1-2. Functional Block Diagram, LRCA

SECTION 2
INSTALLATION

2-1. GENERAL.

The LRCA is tested at the factory and is carefully packaged to prevent possible damage during shipment. When the unit is delivered at the operating site, inspect the packing case and its contents for damage that might have occurred during transit. Unpack the equipment carefully, and inspect all packing material for parts that may have been shipped as loose items. With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts.

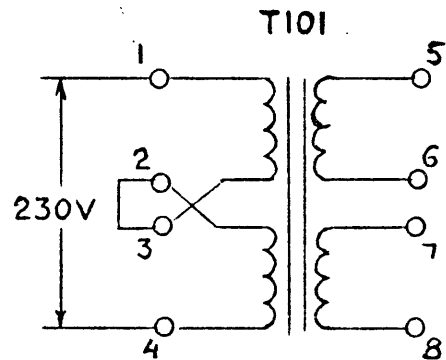
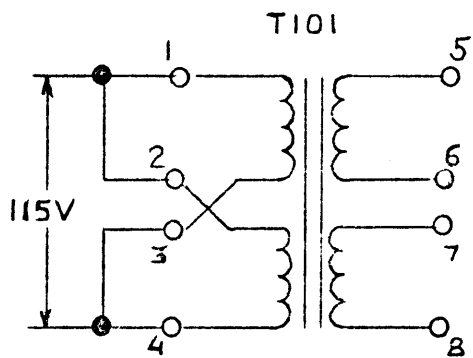
2-2. MECHANICAL INSTALLATION.

The LRCA is equipped with a 19-inch wide front panel for mounting into any standard width equipment rack. Fasten the unit to the rack with the mounting screws and washers (supplied).

2-3. ELECTRICAL INSTALLATION.

The LRCA is wired at the factory for 115 vac, 50/60 cps, single phase operation; for 230 vac operation, transformer T101 must be rewired, as shown in figure 2-1.

The a-c primary input power is applied to the LRCA at connector J101 on the rear panel (refer to figure 2-2). Refer to the system wiring diagram provided in the system manual and make the necessary cabling connections between the LRCA and related units as indicated.



9815-3

NOTE

For 115 vac operation, 1.6 ampere fuses (F101,F102)

For 230 vac operation, 0.8 ampere fuses (F101,F102)

Figure 2-1. Transformer Wiring Diagram, LRCA

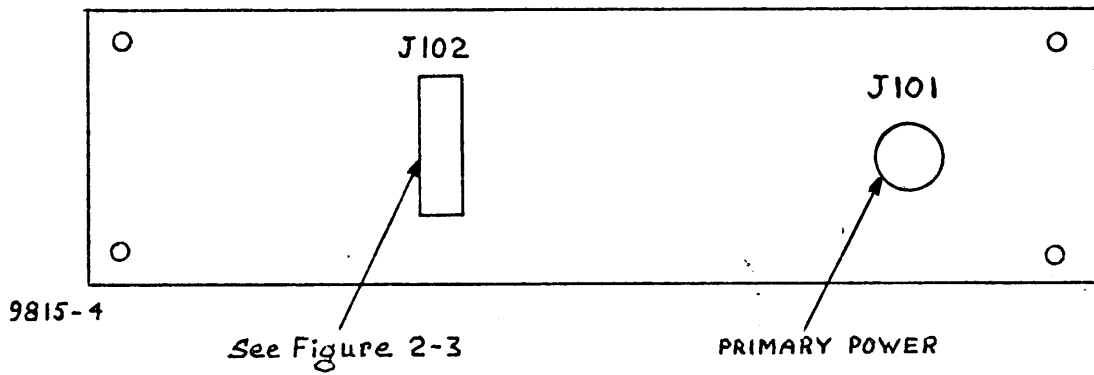


Figure 2-2. Rear Panel, LRCA

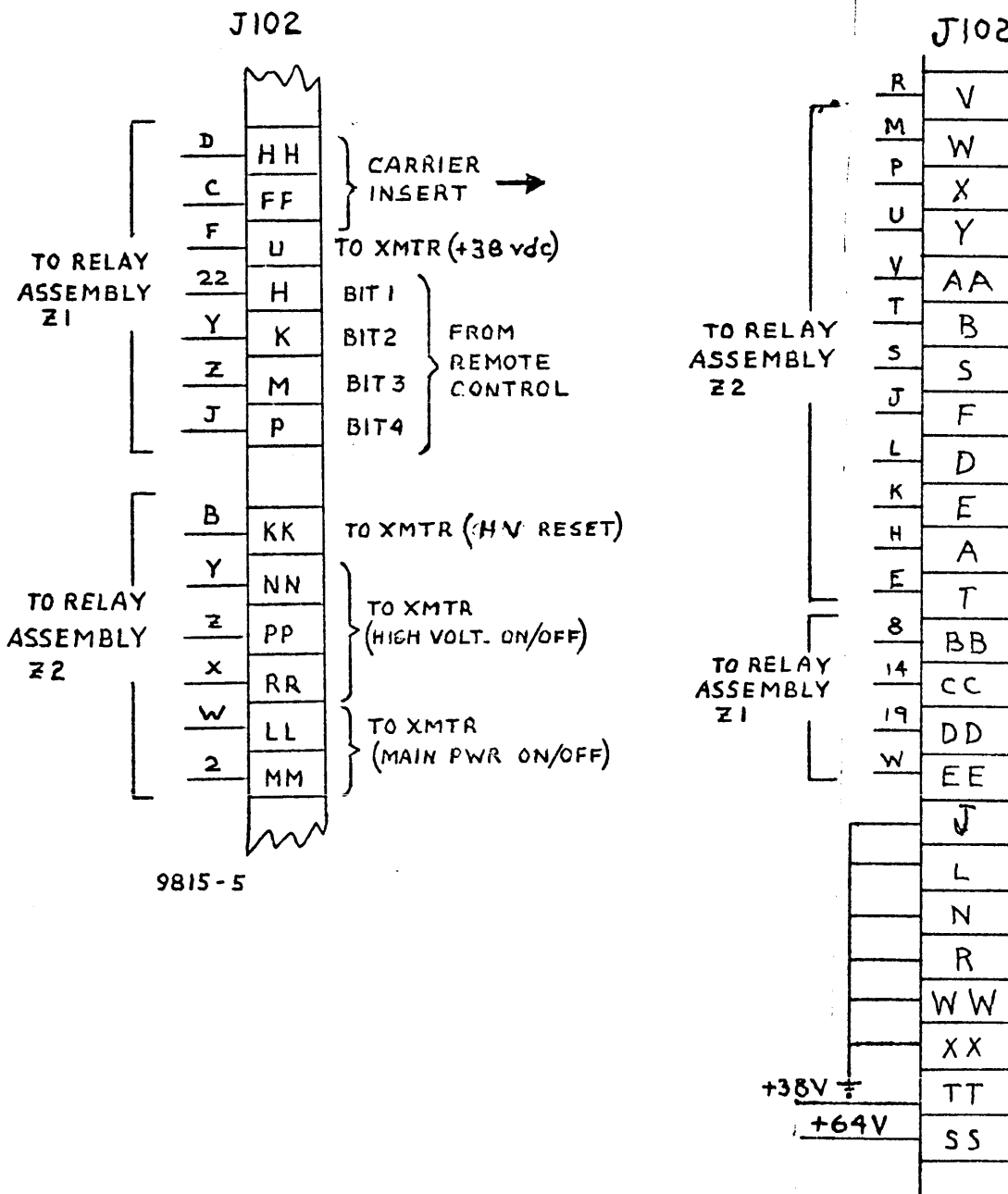


Figure 2-3. Electrical Connections, LRCA

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL.

All controls (switches) and indicators (lamp and fuses) necessary for the operation of the LRCA are located on the front panel, as shown in figure 3-1.

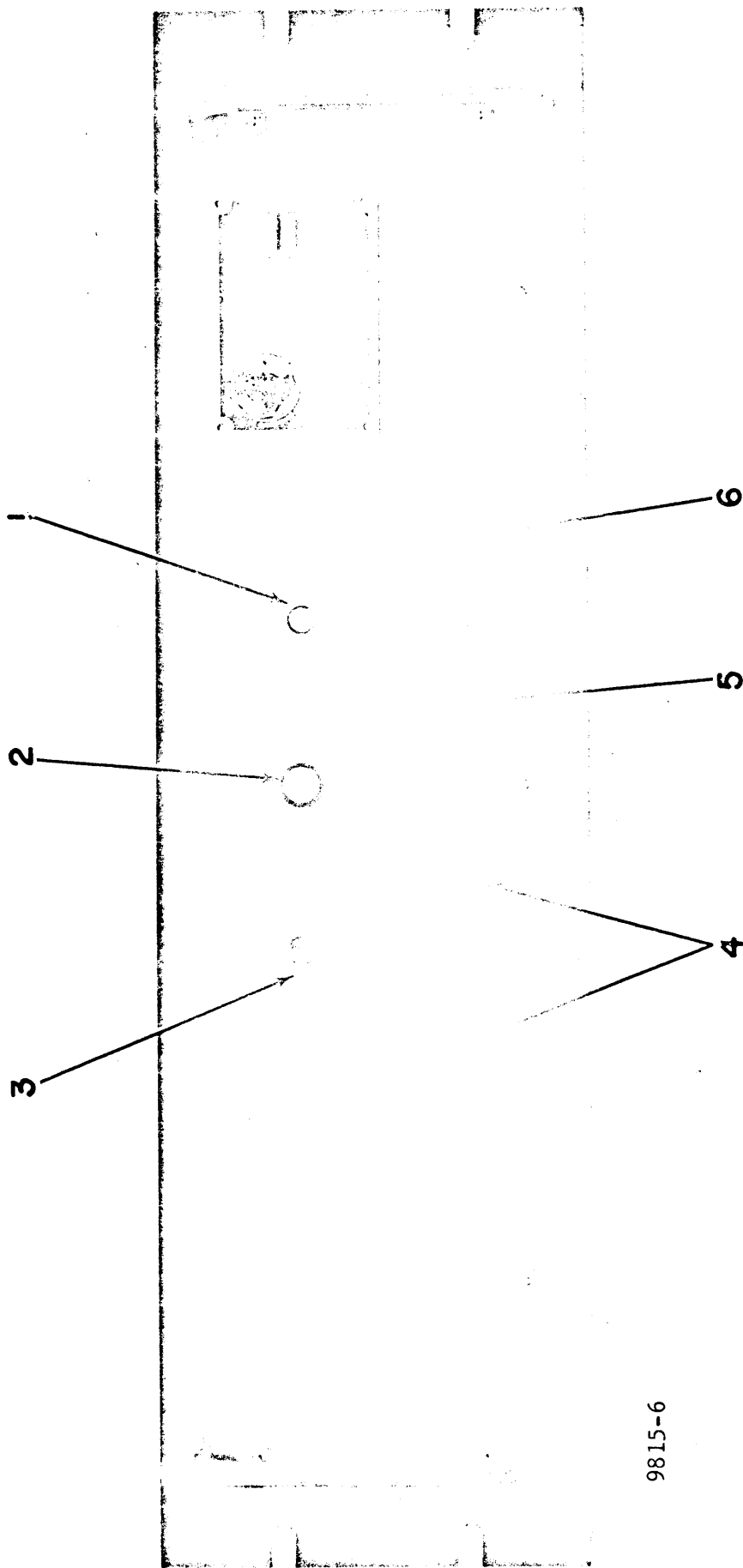
The operator is required to set two switches, as follows:

When the ON/OFF switch (1, figure 3-1) is set at ON, primary power is applied to the unit and the POWER lamp (2) will light.

When manual operation of the transmitter is desired, the LOCAL/REMOTE switch (3) must be set at LOCAL.

When remote control operation of the transmitter is desired, the LOCAL/REMOTE switch (3) must be set at REMOTE.

The AC fuses (4), the +28V d-c fuse (5), and the +60V d-c fuse (6) are indicating types; when the fuse cap lights it indicates that the fuse has blown.



9815-6

Figure 3-1. Controls and Indicators, LRCA

SECTION 4

PRINCIPLES OF OPERATION

4-1. INTRODUCTION

The LRCA operates in conjunction with other units of a remotely-controlled transmitter system to extend binary coded signals, supplied by a remote control unit, that are used to control an associated exciter and transmitter. Readback signals from the associated transmitter are routed through the LRCA to the remote control unit to furnish indications of operating conditions.

4-2. CIRCUIT ANALYSIS (figures 7-1, 7-2, and 7-3)

a. GENERAL. - The LRCA receives a 4-bit parallel input signal (supplied by an associated remote control unit) at pins H, K, M, and P of connector J102 (see figure 7-1); the 4-bit signal is extended to pins 22, Y, Z, and J of connector J104 to activate relays K1, K7, K8, K9, and K10. If the 4-bit code is a channel-select code (for the associated exciter), relay K6 on card Z1 (see figure 7-2) is de-energized. The original 4-bit input signal is thus extended to pins 8, 14, 19, and W of connector J104 (see figure 7-1) and then routed to pins BB, CC, DD, and EE of connector J102, and the coded signal is now used to operate a channel selector switch in an associated exciter. If the 4-bit code is a control code (for the associated transmitter), relay K6 on card Z1 is energized, thus disabling the channel-select relays.

b. CHANNEL-SELECT CONDITION - Whenever a 4-bit signal from a remote control unit associated with the LRCA contains a code that will activate the channel selector switch in the associated exciter, relay K6 on card Z1 (see figure 7-2) will be de-energized and will extend a ground to pin D. This ground at pin D is extended to pin HH of connector J102 (see figure 7-1) and is used to remove the carrier

during band-changing operations.

When relay K6 on card Z1 (see figure 7-2) is de-energized, +38 vdc is extended through contacts 9/8 of relay K6 to contacts 6/7 of energized relay K1, and the +38 vdc is routed to contacts 16/15 of relays K7, K8, K9, and K10; the +38 vdc is thus applied to pins 8, 14, 19, and W of connector J103 and extended to pins BB, CC, DD, and EE of connector J102 (see figure 7-1) and used to operate the channel selector switch in the associated exciter.

c. TRANSMITTER CONTROL CONDITION - The band-changing relay logic in the LRCA will not activate when a MAIN POWER ON/OFF, HIGH VOLTAGE ON/OFF, or HV RESET operational condition exists in the associated transmitter. Operational condition readback signals from the associated transmitter are routed simultaneously to the LRCA and the remote control unit.

A signal from pin 1 of connector J104 (see figure 7-1) is extended to pin 21 of connector J103, thus energizing relay K1 on card Z2 (see figure 7-3), and +38 vdc is thus removed at contacts 5/6; +38 vdc is now extended from contacts 6/7 of energized relay K1 to contacts 6/5 of de-energized relay K5, routed to pin W of connector J103 and then to pin LL of connector J102 (see figure 7-1). This MAIN POWER ON control signal is routed to the associated transmitter.

A signal from pins 2 or 5 of connector J104 (see figure 7-1) is extended to pins A and 18 of connector J103, energizing relay K6 on card Z2 (see figure 7-3), completing a control signal at contacts 6/7 and routing the signal through pins Z and X of connector J103 to pins PP and RR, respectively, of connector J102 (see figure 7-1). This HIGH VOLTAGE ON control signal is routed to the associated transmitter.

A signal from pin 20 of connector J104 (see figure 7-1) is extended to pin F of connector J103, energizing relay K2 on card Z2 (see figure 7-3) and closing con-

relay K4 on card Z2 (figure 7-3), and applied to the time-delay circuit (transistor Q1). When transistor Q1 operates, +38 vdc is applied through Q1 to energize relay K4 and +38 vdc is now extended through contacts 6/7 of relay K4, completing the operate path of the relay. (The time-delay circuit Q1 will be reset.) When relay K4 is energized, pins M, P, N, and V of connector J103 extend the signal to pins W, X, and AA, respectively, of connector J102 (figure 7-1), thus routing it to the associated transmitter to keep the servos off.

In order to reactivate the servos and to reset the time-delay relay K4, the TUNE button (switch) on the associated remote control unit must be pressed to momentarily de-energize relay K6 on card Z1 (figure 7-2), thus interrupting the +38 vdc at pin F of connector J103.

tacts 6/7 to route the ground to pin KK of connector J102 (see figure 7-1). This HV RESET control signal is routed to the associated transmitter.

d. READBACK TRANSMITTER CONDITIONS - When an ON AIR condition exists at the associated transmitter, the voltage signal is received at pin T of connector J102 and is routed to pin 3 of connector J103 (figure 7-1), thru contacts 12 and 13 of energized relay K1; therefore energizing relay K3 on card Z2 (figure 7-3). When relay K3 on card Z2 is energized, the voltage signal from pin E of connector J102 will be extended to pin K of connector J103, through contacts 6/7 of relay K3 on card Z2, to pin H of connector J104 (figure 7-3), to pin A of connector J102, thus providing the ON AIR condition signal to the remote control unit.

When a READY (Standby) condition exists at the associated transmitter, the voltage signal is received at pin F of connector J102 and is routed to pin J of connector J103 (figure 7-3). If relay K3 on card Z2 is energized, the signal will then be extended through contacts 9/10 to pin L of connector J103 and routed to pin D of connector J102, thus providing the READY condition signal to the remote control unit.

If the associated transmitter fails to tune, relay K4 on card Z2 will be energized and contacts 12/13 will be closed (figure 7-3), thus routing the HV ON signal from pin E (J102) to pin T of connector J103, and then to pin B of connector J102 (figure 7-1), thus providing the FAULT condition signal to the remote control unit.

If the time-delay circuit (transistor Q1, resistors R1 and R8, and capacitor C1) has not energized relay K4 on card Z2 (figure 7-3), relay K3 will remain energized and the ON AIR condition signal will be indicated at the remote control unit. The time-delay circuit on card Z2 (figure 7-3) is normally set for 30 seconds.

If the associated transmitter drifts off frequency, +38 vdc is routed from pin S of connector J102 (figure 7-1) to pin S of connector J103, extended to contacts 6/5 of

SECTION 5
MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to.

At periodic intervals, the equipment should be removed from its mounting for cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or methyl chloroform may be used, providing the necessary precautions are observed.

WARNING

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work", etc. is prohibited in the immediate area.

CAUTION

When using trichlorethylene, avoid contact with painted surfaces, due to its paint removing effects.

5-2. TROUBLESHOOTING.

When a piece of equipment has been operating satisfactorily and suddenly fails, the cause of failure may be due to circumstances occurring at the time of failure, or to conditions similar to those that have occurred in the past. Therefore, the first check is to ascertain that proper equipment voltages are present and that all interconnecting wires are secure.

If these checks fail to locate the fault, the unit should be removed from the rack and visually checked for corrosion, dirt, or other harmful conditions.

When troubleshooting, refer to the schematic diagrams contained in section 7.

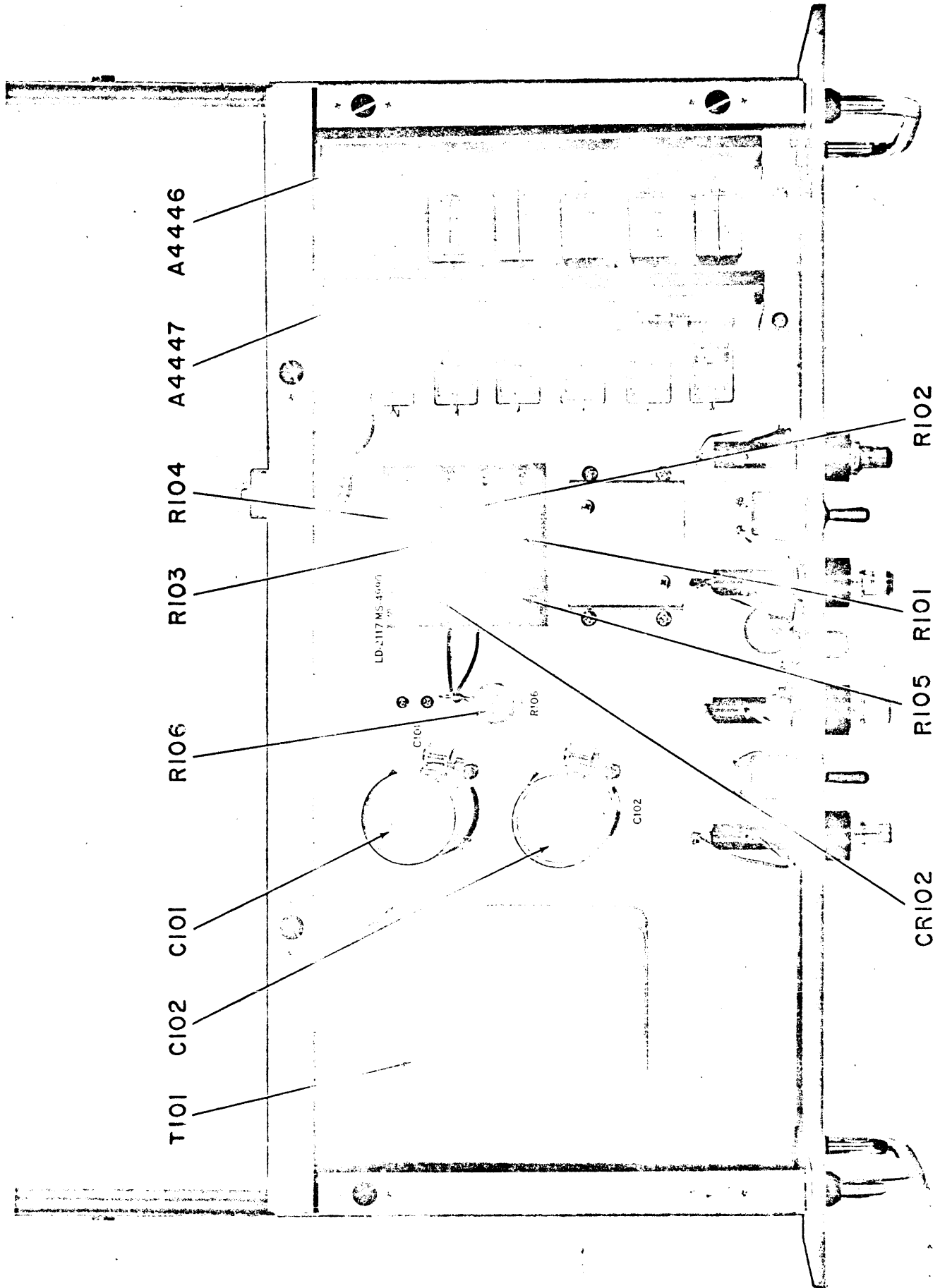
To check relay operation, proceed as follows:

- a. Connect power source to connector J101; set POWER switch S102 at ON, and LOCAL/REMOTE switch S101 at LOCAL.
- b. Using a Simspon 260 (or equivalent) multimeter, check for +38 vdc at pin TT of connector J102, and for +64 vdc at pin SS.
- c. Check for +38 vdc at pin B of connector J104, and at pins 4, 20, and 22 of connector J104.
- d. Set LOCAL/REMOTE switch S101 at REMOTE, and check for +64 vdc at pin H of connector J104.
- e. Apply a ground at pin P of connector J102: relays K2 and K10 on card Z1 will energize.
- f. Apply a ground at pin M of J102: relays, K1, K3, and K9 on card Z1 will energize, and relay K6 will de-energize.
- g. Apply a ground at pin K of J102: relays K1, K4, and K8 on card Z1 will energize, and relay K6 will de-energize.
- h. Apply a ground at pin H of J102: relays K1, K5, and K7 on card Z1 will energize, and relay K6 will de-energize.

- i. Set LOCAL/REMOTE switch S101 at REMOTE.
- j. Connect a lead from Pin TT of J102 to pin F of J103: relay K2 on card Z2 will energize.
- k. Connect a lead from pin TT of J102 to pin 17 of J103: relay K5 on card Z2 will energize.
- l. Connect lead from pin TT of J102 alternately to pin D and pin 17 of J103: relay K1 contacts on card Z2 will operate.
- m. Connect lead from pin TT of J102 alternately to pin 18 and pin 21 of J103: relay K6 contacts on card Z2 will operate.
- n. Connect lead from pin TT of J102 to pin 3 of J103: relay K3 will energize.
- o. Connect lead from Pin TT of J102 to pin S of J103: relay K4 will energize within approximately 30 seconds, depending on setting of time-delay circuit (Q1).

5-3. REPAIR AND REPLACEMENT.

Maintenance of the LRCA will consist mainly of component replacement. It should be noted that when replacing components having many wire connections, such as switches, relays, etc., the wires should be tagged and marked for accurate identification. Use of the schematic diagrams in section 7 is advisable when replacing or disconnecting components.



T101 C102 C101 R106 R103 R104 A4447 A4446

CR102 R105 R101 R102

9815-7

Figure 5-1. Component Locations, Top View, LRCA

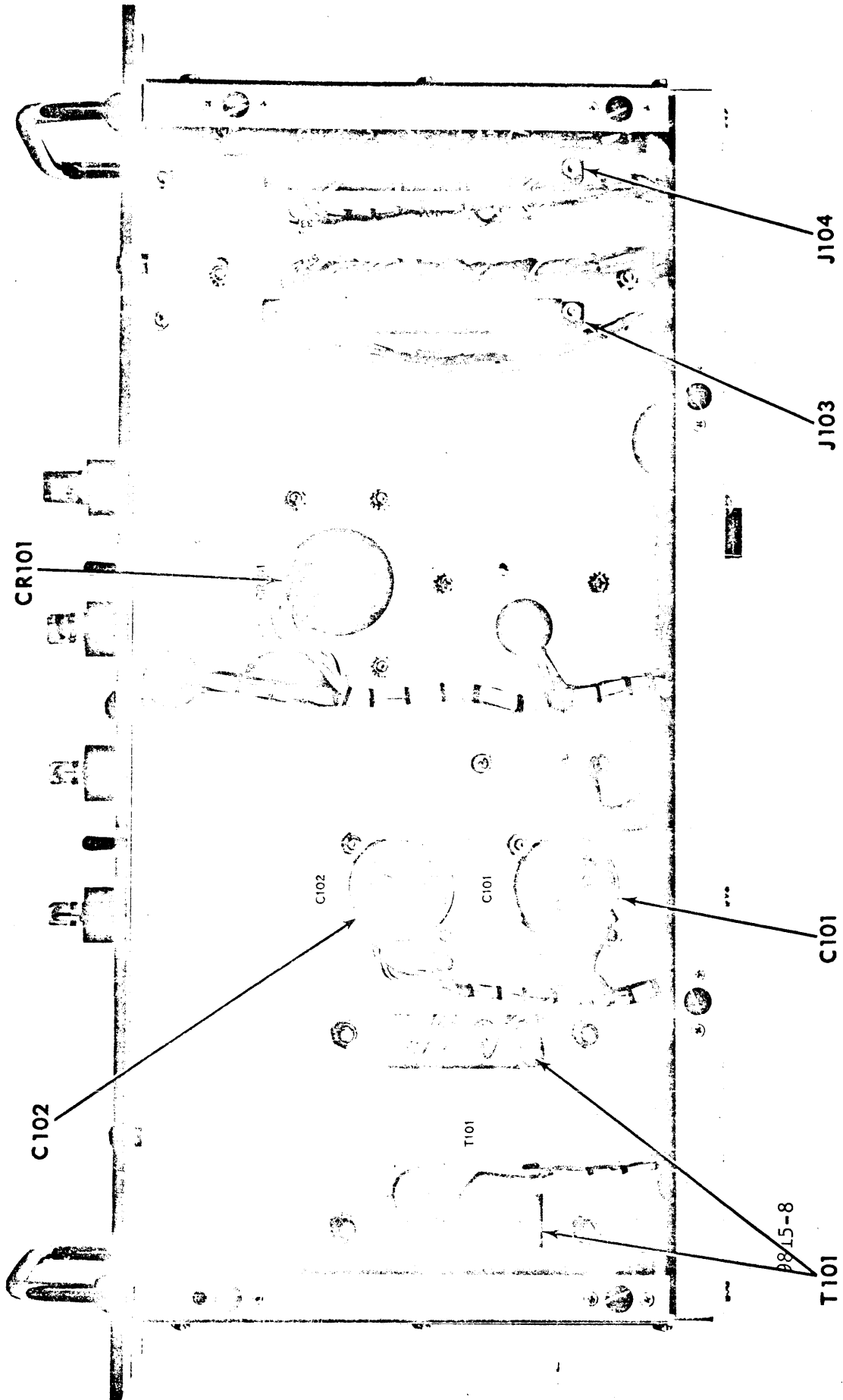


Figure 5-2. Component Locations, Bottom View, LRCA

SECTION 6

PARTS LIST

6-1. INTRODUCTION

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

- a. Reference symbol.
- b. Description as indicated in parts list.
- c. TMC part number.
- d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

For replacement parts not covered by warranty (refer to warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York

| <u>Assembly or Sub-assembly</u> | <u>Page</u> |
|--|-------------|
| CONTROL TERMINATOR, MODEL LRCA-1 | 6-2 |
| RELAY ASSEMBLY, A4446 | 6-4 |
| RELAY ASSEMBLY, A4447 | 6-6 |

PARTS LIST
for
CONTROL TERMINATOR, MODEL LRCA-1

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|---------------|--|--------------------|
| C101 | CAPACITOR, FIXED, ELECTROLYTIC: 2,600 uf, 50 WVDC; polarized. | CE112-6 |
| C102 | CAPACITOR, FIXED, ELECTROLYTIC: 1,700 uf, 75 WVDC; polarized. | CE112-8 |
| CR101 | SEMICONDUCTOR DEVICE, DIODE: rectifier bridge; peak reverse voltage 200 V; output current 10 ADC at 55°C; one cycle peak surge current 250 amps, recurrent forward current 60 amps; max. forward voltage drop 1.0 V at 5 amps DC; molded plastic case. | DD131-200-10 |
| CR102 | SEMICONDUCTOR DEVICE, DIODE: rectifier bridge; peak reverse voltage 200 V; output current 1.5 amps DC at 50°C or 1.0 amps DC at 100°C; one cycle surge current 15 amps, recurrent forward current 5 amps; max. forward voltage drop 1 V at 100°C; molded plastic case. | DD130-200-1.5 |
| DS101 | LAMP, INCANDESCENT: 28 VAC/DC; 0.04 amps; single contact, T-1-3/4 bulb. | BI110-7 |
| F101 | FUSE, CARTRIDGE: 1-1/2 amps; 1-1/4" long x 1/4" dia.; quick acting. | FU100-5 |
| F102 | Same as F101. | |
| F103 | FUSE, CARTRIDGE: 5 amps; 1-1/4" long x 1/4" dia.; quick acting. | FU100-5 |
| F104 | FUSE, CARTRIDGE: 1/4 amp; 1-1/4" long x 1/4" dia.; quick acting. | FU100-.250 |
| J101 | CONNECTOR, RECEPTACLE, ELECTRICAL: AC power; 2 male contacts rated for 10 amps at 250 V; polarized. | JJ175 |
| J102 | CONNECTOR, RECEPTACLE, ELECTRICAL: 44 female contacts rated for 5 amps at 1,800 V RMS; polarized. | JJ319-22DFE |
| J103 | Same as J102. | |
| J104 | CONNECTOR, RECEPTACLE, ELECTRICAL (Part No. to be supplied at a later date) | |
| R101 | RESISTOR, FIXED, WIREWOUND: 1 ohm, ±5%; 5 watts; non-inductive. | RR114-1W |

PARTS LIST (CONT)

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|--|-----------------|
| R102 | Same as R101. | |
| R103 | RESISTOR, FIXED, COMPOSITION: 3,300 ohms, $\pm 5\%$; 2 watts. | RC42GF332J |
| R104 | RESISTOR, FIXED, COMPOSITION: 56 ohms, $\pm 5\%$; 1 watt. | RC32GF560J |
| R105 | Same as R101. | |
| R106 | RESISTOR, FIXED, WIREWOUND: 100 ohms, current rating 500 ma; 25 watts. | RW111-9 |
| S101 | SWITCH, TOGGLE: DPST; 28° angle of throw; but type handle. | ST22K |
| T101 | TRANSFORMER, POWER: primary 115/230 V, 50/60 cps (Hz); secondary 27 V RMS at 3.5 ADC, 57 V RMS at 60 MADC. | TF340 |
| XDS101 | LIGHT, INDICATOR: yellow lens, sub-miniature type. | TS153-3 |
| XF101 | FUSEHOLDER: lamp indicating; accomdates cartridge fuse 1-1/4" long x 1/4" dia.; 22 to 33 V, 20 amps; incandescent lamp type with a 330 ohm lamp resistor; transparent amber flat sided knob; brown body. | FH104-11 |
| XF102 | FUSEHOLDER: lamp indicating; accomdates cartridge fuse 1-1/4" long x 1/4" dia.; 44 to 60 V, 20 amps; incandescent lamp type with a 1,200 ohm lamp resistor; transparent amber flat sided knob; brown body. | FH104-13 |
| XF103 | FUSEHOLDER: lamp indicating; accomodates cartridge fuse 1-1/4" long x 1/4" dia.; 20 to 250 V, 20 amps; incandescent lamp type with a 220 K ohm lamp resistor; transparent clear flat sided knob; black body. | FH104-3 |
| XF104 | Same as XF103. | |

PARTS LIST
FOR
RELAY ASSY, A4446

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|---------------------|--|--------------------|
| C1 | CAPACITOR, FIXED ELECTROLYTIC: 50 uf, -10% +150% at 120 cps (Hz) at 25°C; 50 WVDC; polarized. | CE105-50-50 |
| CR1 | SEMICONDUCTOR DEVICE, DIODE | 1N2484 |
| CR2 thru CR7 | Same as CR1. | |
| CR8 | SEMICONDUCTOR DEVICE, DIODE | 1N270 |
| CR9 thru CR16 | Same as CR8. | |
| K1 | RELAY, ARMATURE: DPDT; 700 ohms, <u>+10%</u> DC resistor operating voltage 24 VDC; current rating 35 ma; power rating 700 mw at 25°C; 8 contacts rated for 5 amps at 29 VDC or 3 amps at 115 VAC; clear high impact styrene dust cover case. | RL156-1 |
| K2 | RELAY, ARMATURE: 4PDT; 10,000 ohms, <u>+10%</u> DC resistance; operating voltage not rated; current rating 4.5 ma; power rating 175 mw at 25°C; 14 contacts rated for 1 amp at 29 VDC or 0.5 amps at 115 VAC; clear high impact styrene dust cover case. | RL156-18 |
| K3 thru K5 | Same as K2. | |
| K6 | Same as K1. | |
| K7 | RELAY, ARMATURE: 4PDT; 700 ohms, <u>+10%</u> DC resistance; operating voltage 24 VDC; current rating 35 ma; power rating 700 mw at 25°C; 14 contacts rated for 5 amps at 29 VDC or 3 amps at 115 VAC; clear high impact styrene dust cover case. | RL156-8 |
| K8 thru K10 | Same as K7. | |
| R1 | RESISTOR, FIXED, COMPOSITION: 100 ohms, <u>+5%</u> ; 1/2 watt. | RC20GF101J |
| R2 | RESISTOR, FIXED, COMPOSITION: 82 ohms, <u>+5%</u> ; 1/2 watt. | RC20GF820J |

PARTS LIST (CONT)

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|---------------------|--|--------------------|
| R3 thru R5 | Same as R2. | |
| XK-1 | SOCKET, RELAY: w/retainer; 12 male beryllium copper gold plated contacts; black phenolic body. | TS171-4 |
| XK2 | SOCKET, RELAY; w/retainer; 6 male beryllium copper gold plated contacts; black phenolic body. | TS171-5 |
| XK3 thru XK5 | Same as XK2. | |
| XK6 | Same as XK1. | |
| XK7 thru XK10 | Same as XK2. | |

PARTS LIST
for
RELAY ASSY, A4447

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|--------------------|---|--------------------|
| C1 | CAPACITOR, FIXED, ELECTROLYTIC: 100uf, -10% +150% at 120 cps (Hz) at 25°C; 25 WVDC; polarized. | CE105-100-25 |
| CR1 | SEMICONDUCTOR DEVICE, DIODE | 1N270 |
| CR2 thru CR6 | Same as CR1. | |
| CR7 | SEMICONDUCTOR DEVICE, DIODE | 1N2070 |
| K1 | RELAY, ARMATURE: DPDT; 475 ohms, <u>+10%</u> DC resistance; operating voltage 24 VDC; current rating 49 ma; power rating 1,200 mw at 25°C; 8 contacts rated for 5 amps at 29 VDC or 3 amps at 115 VAC; clear high impact styrene dust cover case. | RL156-9 |
| K2 | RELAY, ARMATURE: DPDT; 700 ohms, <u>+10</u> DC resistance: operating voltage 24 FDC; current rating 49 ma; power rating 700 mw at 25°C; 8 contacts rated for 5 amps at 29 VDC or 3 amps at 115 VAC; clear high impact styrene dust cover case. | RL156-1 |
| K3 | Same as K2. | |
| K4 | RELAY, ARMATURE: 4PDT; 185 ohms, <u>+10%</u> DC resistance; operating voltage 12 VDC; current rating 60 ma; power rating 700 mw at 25°C; 14 contacts rated for 2 amps at 29 VDC or 1 amp at 115 VAC; clear high impact styrene dust cover case. | RL156-2 |
| K5 | Same as K2. | |
| K6 | Same as K1. | |
| Q1 | TRANSISTOR | 2N492 |
| R1 | RESISTOR, FIXED, COMPOSITION: 100 ohms, <u>+5%</u> ; 1/2 watt. | RC20GF101J |
| R2 | RESISTOR, FIXED, COMPOSITION: 68 ohms, <u>+5%</u> ; 1/2 watt. | RC20GF680J |
| R3 thru R5 | Same as R2. | |
| R6 | Same as R1. | |

PARTS LIST (CONT)

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|--|-----------------|
| R7 | RESISTOR, FIXED, COMPOSITION: 220 ohms, $\pm 5\%$; 2 watts. | RC42GF221J |
| R8 | Same as R7. | |
| R9 | RESISTOR, VARIABLE, COMPOSITION: 500 ohms, $\pm 10\%$; linear taper. | RV111U501A |
| XK1 | SOCKET, RELAYL w/retainer; 12 male beryllium copper gold plated contacts; black phenolic body. | TS171-4 |
| XK2 | Same as XK1. | |
| Xk3 | Same as XK1. | |
| XK4 | SOCKET, RELAYL w/retainer; 6 male beryllium copper gold plated contacts; black phenolic body. | TS171-5 |
| XK5 | Same as XK1. | |

SECTION 7

SCHEMATIC DIAGRAMS

7

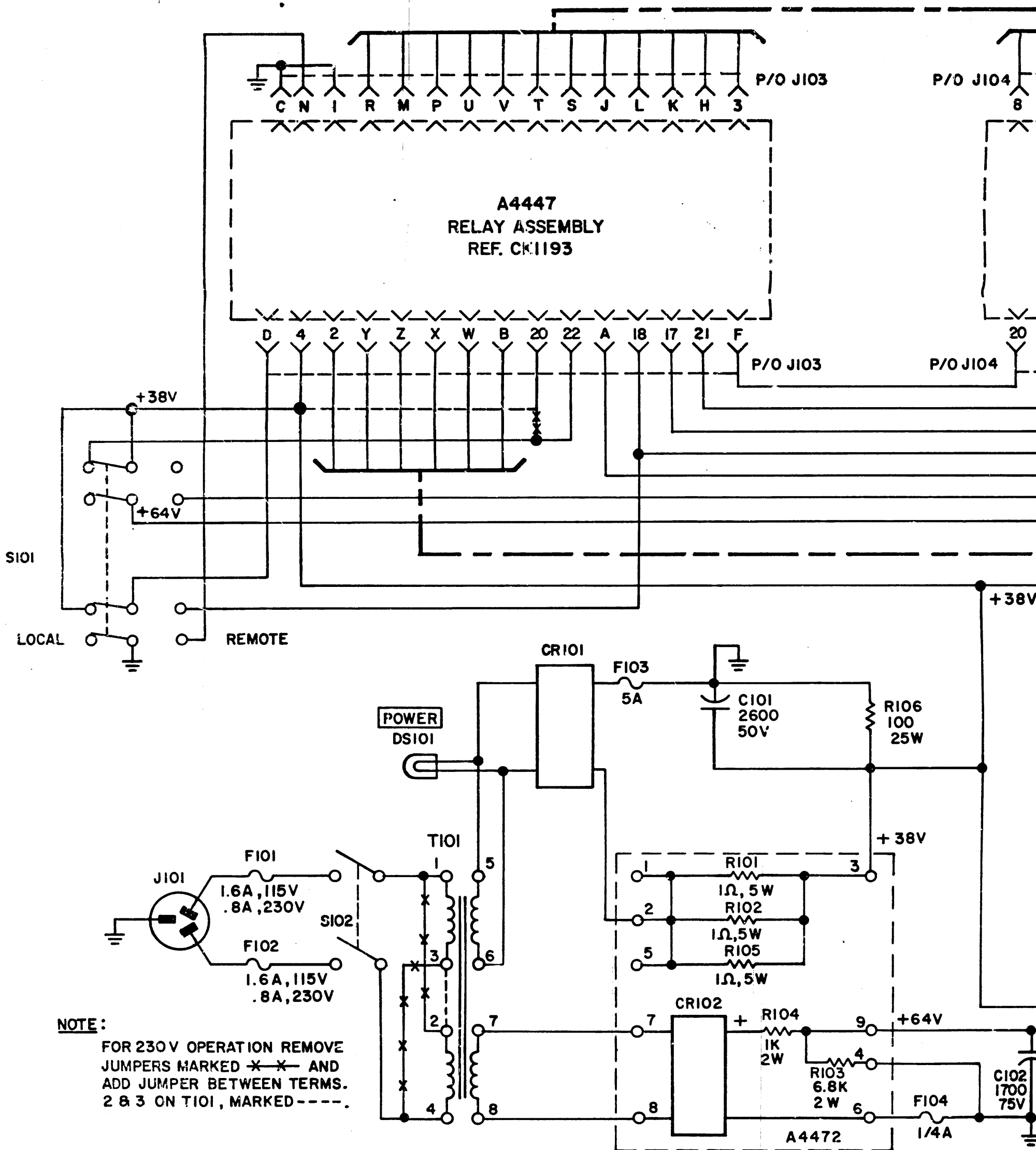
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NOTE: WHEN UNIT IS USED WITHOUT REMOTE CONTROL OF MAIN POWER, REMOVE CONNECTION MARKED *** AND ADD CONNECTION -----.

| REVISIONS | | |
|-----------|--|---------|
| SYM | DESCRIPTION | DATE |
| D | ALL +64V WERE +60V, R104 WAS 5.6K/W, R103 WAS 3.3K | 15-8-67 |



NOTE:
 FOR 230V OPERATION REMOVE JUMPERS MARKED * * * AND ADD JUMPER BETWEEN TERMS. 2 & 3 ON T101, MARKED -----.

UNLESS OTHERWISE SPECIFIED.
 ALL RESISTANCE VALUES ARE IN OHMS.
 ALL CAPACITANCE VALUES ARE IN MICROFARADS.

NOTES

| | |
|---|------------|
| LRCA-1 | |
| QTY/UNIT | MODEL USED |
| SCALE | C DE |
| THE CONTENTS OF THIS DRAWING ARE OF THE TECHNICAL MATERIAL CORP. REPRODUCTION IN WHOLE OR IN PART | |

7

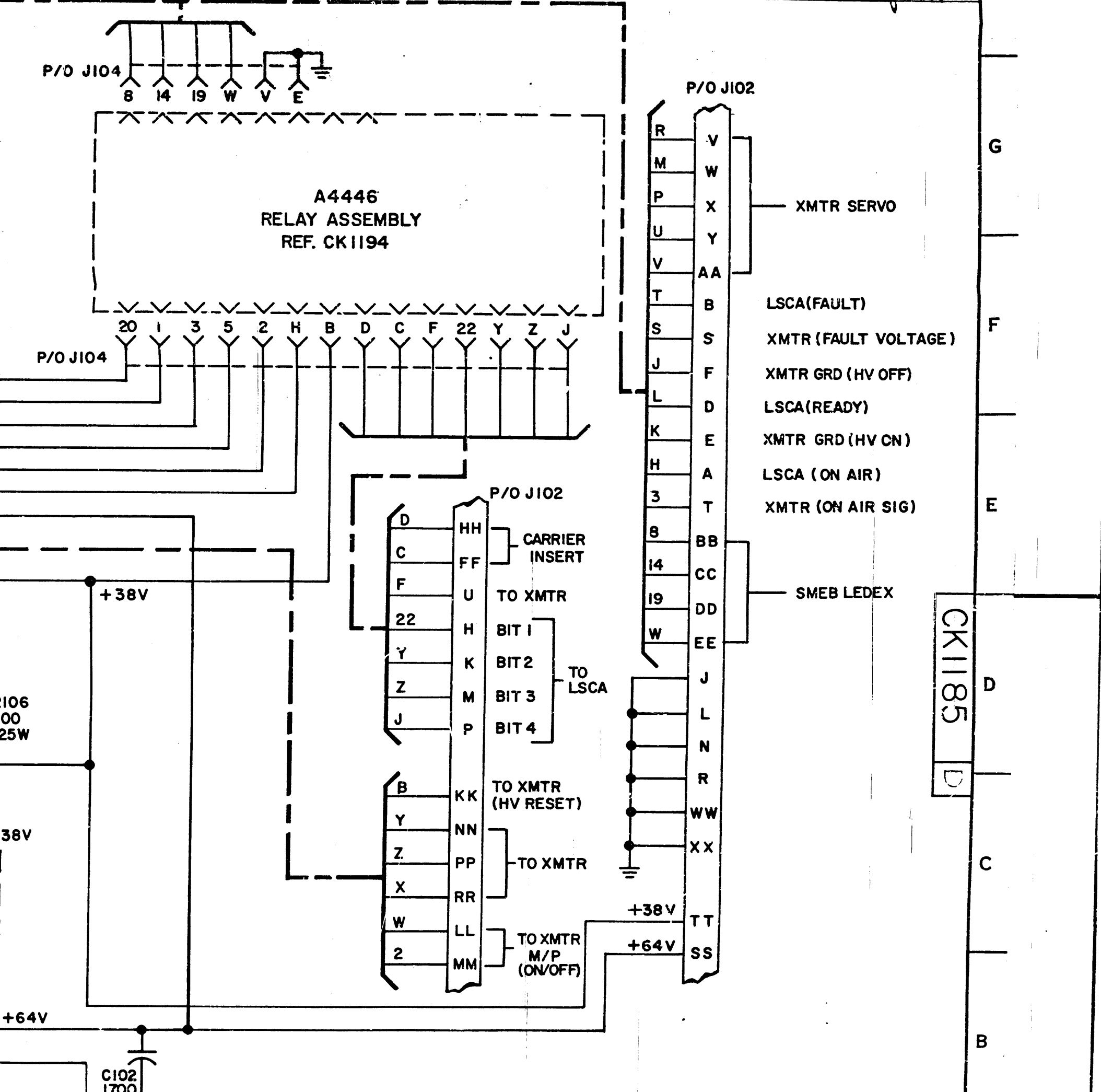
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4

TMC FORM 110

| REVISIONS | | | |
|-----------|----------|--|----|
| REV | DATE | DESCRIPTION | BY |
| X | 85-03 | EXPERIMENTAL RELEASE | |
| X1 | 9-12-63 | DWG. CLARIFIED | |
| Q | 8-15-60 | ORIGINAL RELEASE FOR PROD | |
| A | 10-27-64 | SI01 WAS 2PDT. J103 & J104 REVERSED | |
| B | 12-15-64 | DRAWING UPDATED | |
| C | 1-12-67 | "LOCAL SEND" ALLOCATED. HV WAS +28V. CHASE SYMBOL ADDED TO F101, R102 & R105 | |



| REQ'D | ITEM | PART NUMBER | DESCRIPTION | SYMBOL |
|--------------------------|------|-------------|------------------------------|--------|
| F-EATON LIST OF MATERIAL | | | | |
| MATERIAL | | | THE TECHNICAL MATERIEL CORP. | |
| | | | MAMARONECK, NEW YORK | |
| FINISH | | | | |

UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES AND INCLUDE
 CHEMICALLY APPLIED OR PLATED FINISHES

Figure 7-1. Schematic Interconnect (CK1185)
 7-1

| LRCA-1 | MODEL USED ON | ALPH. NO. |
|--------|---------------|-----------|
| | | |

CONTENTS OF THIS DRAWING ARE THE EXCLUSIVE PROPERTY
 OF TECHNICAL MATERIEL CORP. ITS UNAUTHORIZED USE OR
 REPRODUCTION IN WHOLE OR IN PART IS STRICTLY FORBIDDEN.

| DECIMALS | TOLERANCES | FRACTIONS | ANGLES | REVISIONS | DATE | SHEET | REV. LTR. |
|-------------|------------|-----------|--------|-----------|------|-------|-----------|
| .X ± .05 | | ± 1/64 | | | | | |
| .XX ± .01 | | | | | | | |
| .XXX ± .005 | | | | | | | |

7

6

5

4

H

G

F

E

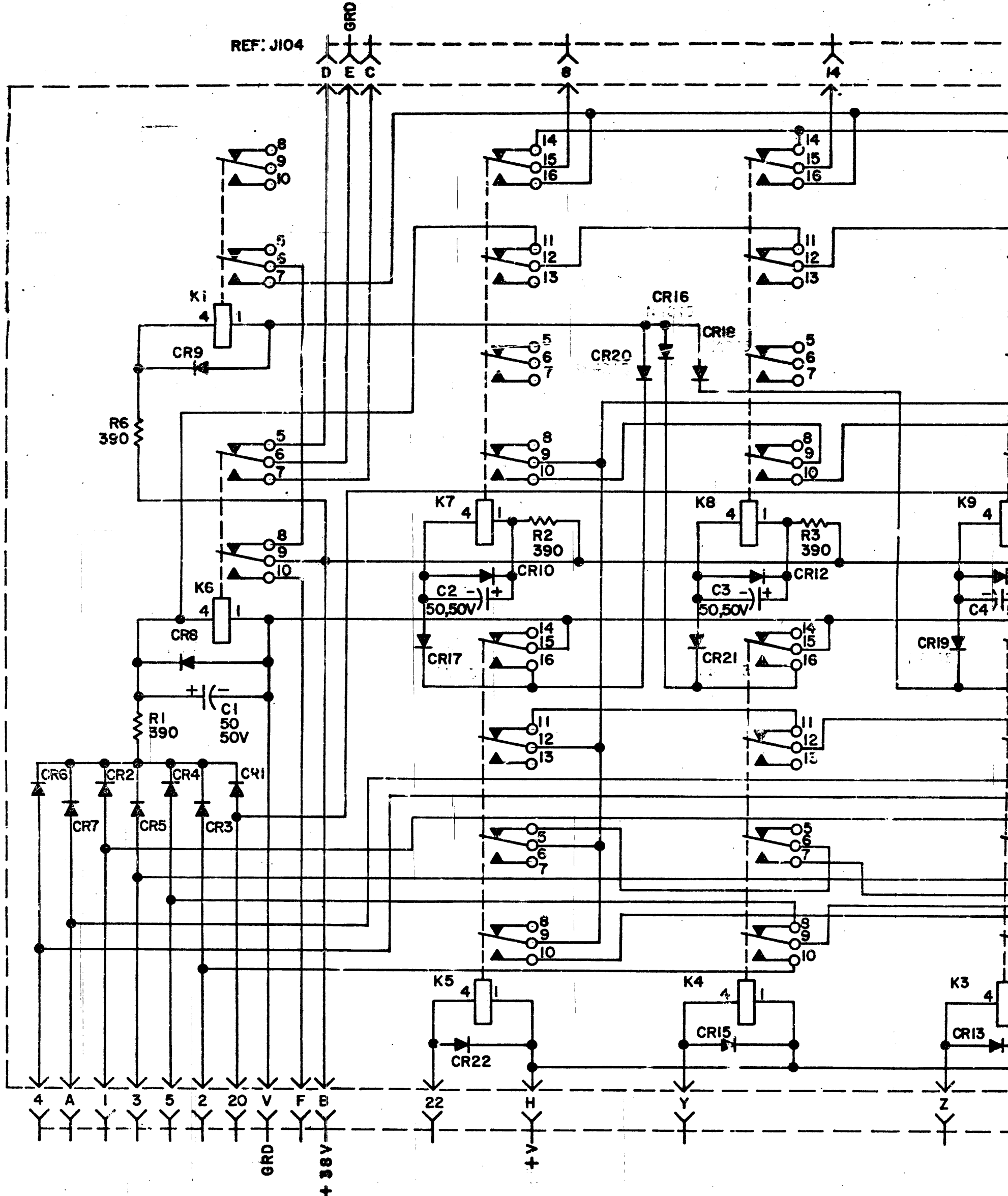
D

C

B

A

REF: J104



TMC FORM 110

7

6

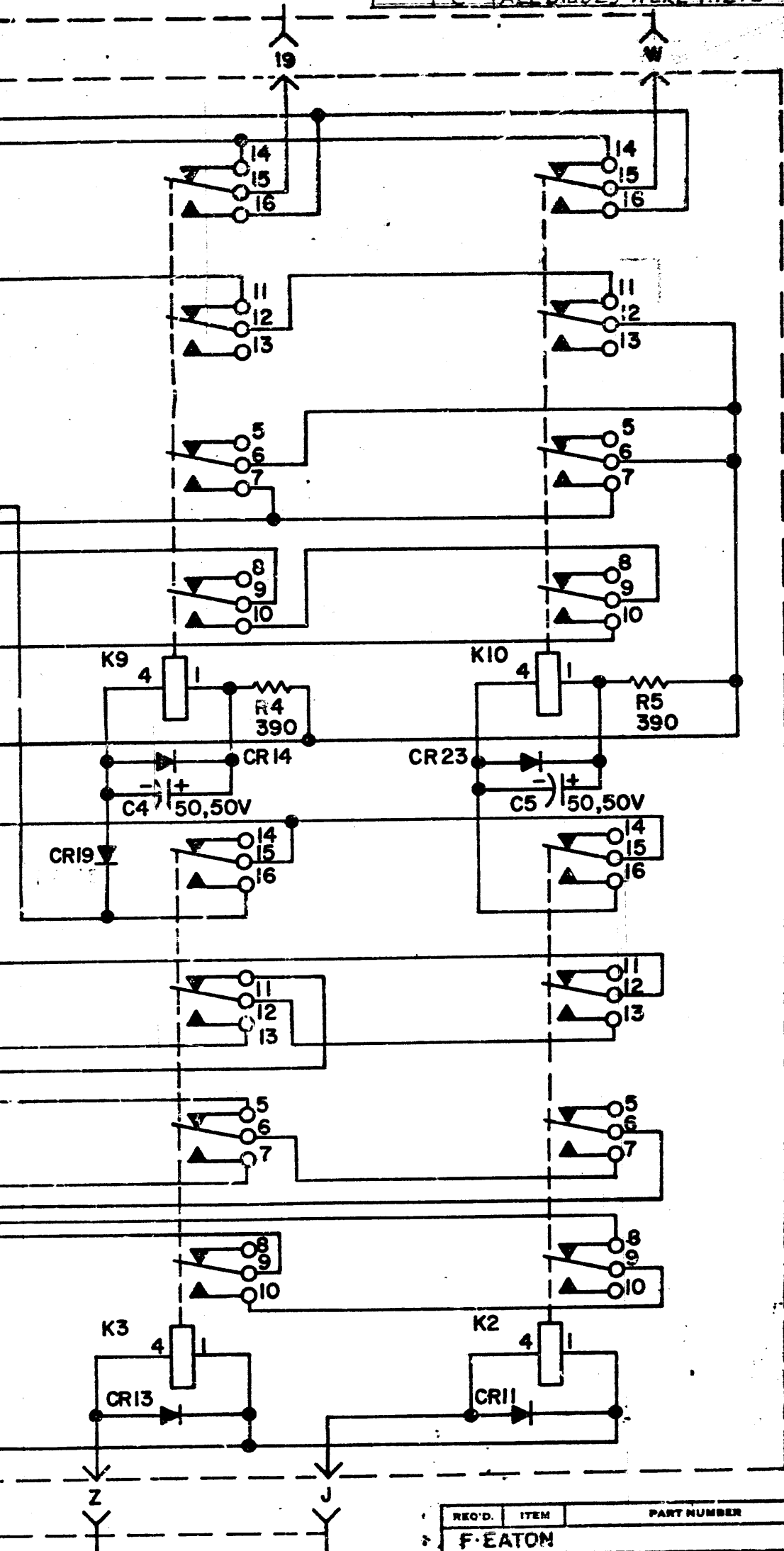
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4

NOTES

| | |
|---|-----------|
| LRCA-1 | |
| QTY/UNIT | MODEL USE |
| SCALE | CODE |
| THE CONTENTS OF THIS DRAWING OF THE TECHNICAL REPRODUCTION IN | |

| REVISIONS | | | | | | |
|-----------|-----|---|---------|----------|--------|------|
| ZONE | SYM | DESCRIPTION | DATE | ENK. NO. | DRAFT | APPR |
| | X | EXPERIMENTAL RELEASE | | | H.A. | |
| | B | ORIGINAL RELEASE FOR PRODUCTION | 5-15-64 | 5 | R.M.E. | |
| | A | R1 THRU R5 WERE 52; POS 8490N K15 REWIRED; R6 ADDED; +50V WAS +20V'S ONTES; NOTE 1 WATT WAS 1/2 WATT. | 11-2-67 | 17663 | W.D. | |
| | B | C2 THRU C5 WERE 20; CR1, 19 & 21 PTING WAS IN 24EA. | 11-2-67 | 17664 | L.A.K. | |
| | C | ALL DIODES WERE 1N270 | 7-6-67 | 18334 | L.A.K. | |



UNLESS OTHERWISE SPECIFIED
 ALL RESISTANCE VALUES ARE IN OHMS, 1 WATT.
 ALL CAPACITANCE VALUES ARE IN MICROFARADS.
 ALL DIODES ARE 1N4245

| RELAY COIL RATING CHART | | | |
|-------------------------|---------|---------|------------|
| SYMBOL | VOLTAGE | CURRENT | RESISTANCE |
| K1, K6 | 24 VDC | — | 700 |
| R2 THRU K5 | — | 4.5MADC | 10K |
| K7 THRU K10 | 24 VDC | — | 700 |

| LAST SYMBOLS |
|--------------|
| C5 |
| CR23 |
| K10 |
| R6 |

CK1194
C

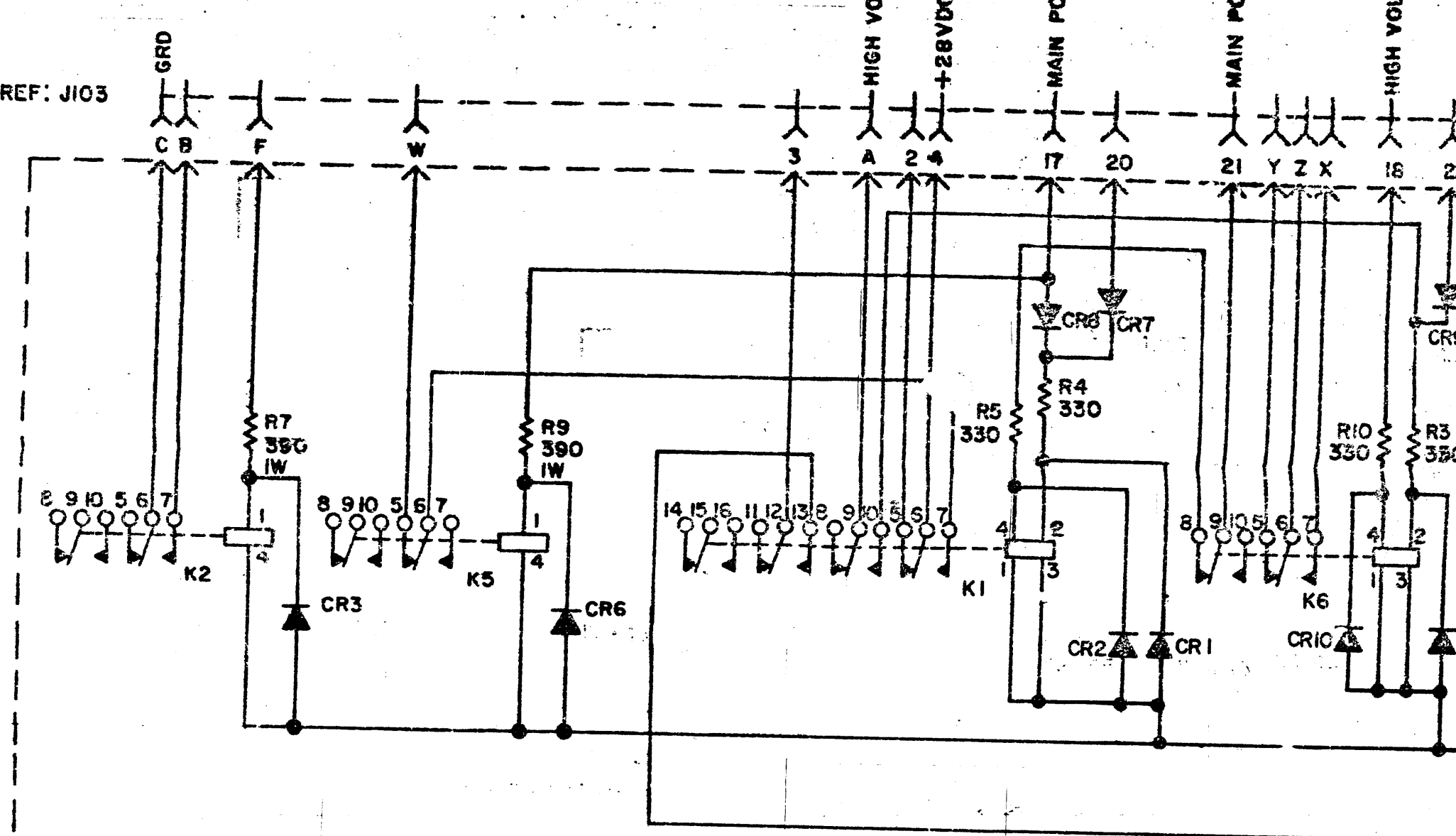
REF: PC 285

| REQ'D. | ITEM | PART NUMBER | DESCRIPTION | SYMBOL |
|--|------|-------------|-------------|--------|
| F-EATON LIST OF MATERIAL | | | | |
| THE TECHNICAL MATERIAL CORP. | | | | |
| MATERIAL | | | | |
| FINISH | | | | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND IN DECIMALS CHEMICALLY APPLIED OR PLATED FIN | | | | |
| DECIMALS | | TOLERANCES | | FRAC |
| .X ± .05 | | ± | | 1/16 |
| .XX ± .01 | | ± | | 1/32 |
| .XXX ± .005 | | ± | | 1/64 |

LRCA-1
 MODEL USED ON
 ASSY. NO.
 CODE
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Figure 7-2. Schematic Relay, Card Z1 (CK1194)

REF: J103



| LAST SYMBOLS | |
|--------------|--|
| C2 | |
| CR11 | |
| K6 | |
| Q1 | |
| R10 | |

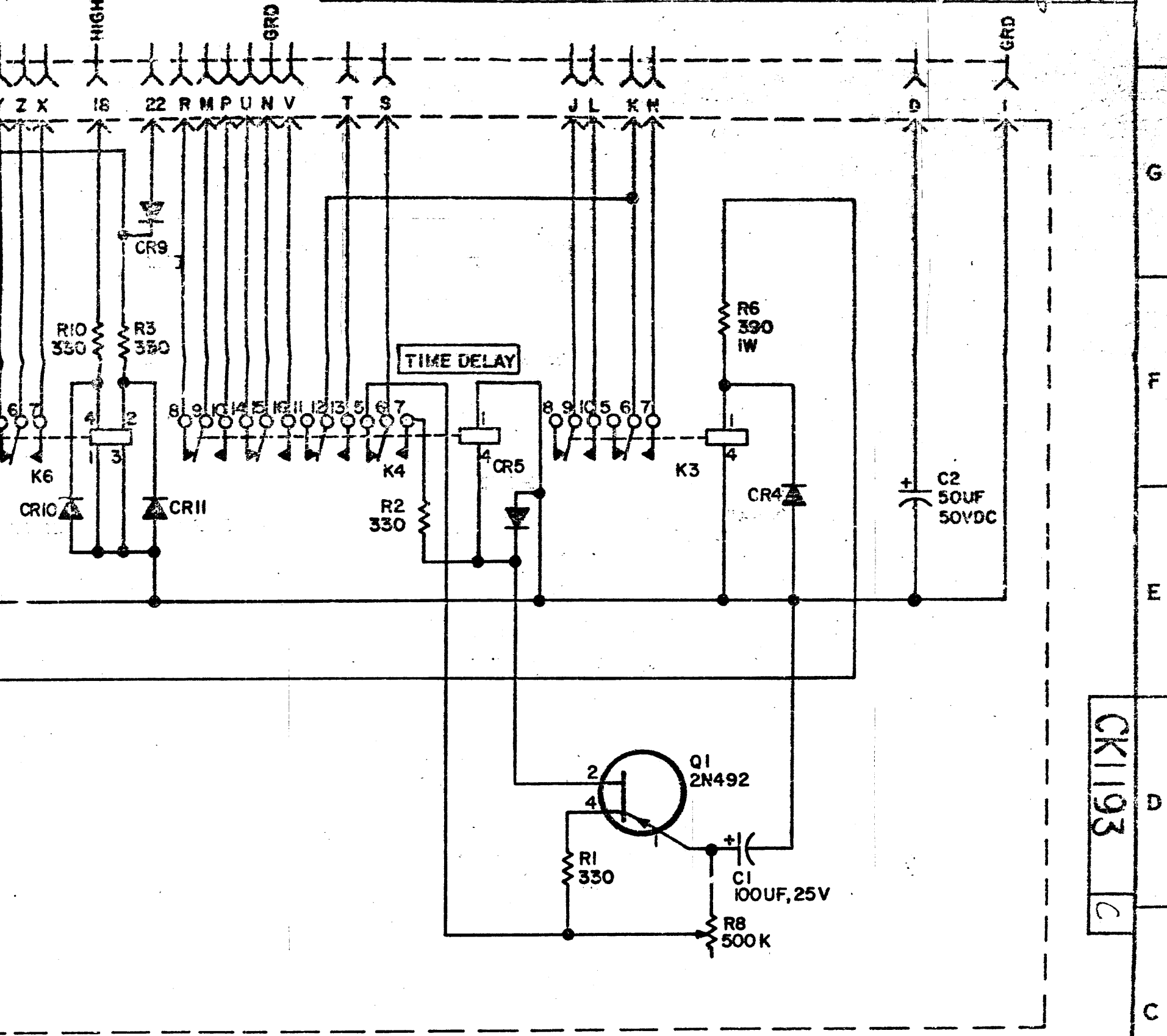
UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTANCE VALUES ARE IN OHMS, 2W.
 2. ALL DIODES ARE IN4245

| RELAY COIL RATING | | |
|-------------------|---------|---------|
| SYMBOL | VOLTAGE | CURRENT |
| K1, K6 | 24VDC | — |
| K2, K3, K5 | 24VDC | — |
| K4 | 12VDC | — |

NOTES

| | |
|---|---------------|
| LRCA-1 | |
| QTY./UR | MODEL USED ON |
| SCALE | CODE |
| THE CONTENTS OF THIS DRAWING ARE THE PROPERTY OF THE TECHNICAL MATERIAL CORP. ITS REPRODUCTION IN WHOLE OR IN PART IS PROHIBITED. | |

| REVISIONS | | | | | | | |
|-----------|------|--|----------|------------|--------|-------|--------|
| ZONE | REV. | DESCRIPTION | DATE | D.M.N. NO. | DRAFT | CHECK | APPRO. |
| | X | EXPERIMENTAL RELEASE | 9-15-58 | | HLA | | |
| | Ø | ORIGINAL RELEASE FOR PRODUCTION | 9-19-58 | Ø | RME | | |
| | A | K1 WAS 2PDT & CIRCUITRY REVISED C2 ADDED | 10-16-58 | 1133 | WJO | | |
| | B | R1, 2 WERE REWOUND WITH R3, 2 OF 50 OHMS R4, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100 | 11-2-57 | 1743 | WJO | | |
| | C | ALL DIODES WERE 1N270 | 7-6-67 | 18354 | L.A.K. | | |



| VOLTAGE | CURRENT | RESISTANCE |
|---------|---------|--------------|
| 24VDC | — | 485 EA. COIL |
| 24VDC | — | 700 |
| 12VDC | — | 185 |

| REF: PC295 | | | |
|------------|------|------------------------------|-------------|
| REQ'D. | ITEM | PART NUMBER | DESCRIPTION |
| F. EATON | | | |
| MATERIAL | | LIST OF MATERIAL | |
| | | THE TECHNICAL MATERIEL CORP. | |
| | | MAMARONECK, NEW YORK | |
| FINISH | | | |
| | | | |

| | | |
|--|------|-----------|
| LRCA-1 | | ASSY. NO. |
| MODEL USED ON | CODE | |
| CONTENTS OF THIS DRAWING ARE THE EXCLUSIVE PROPERTY OF THE TECHNICAL MATERIEL CORP. ITS UNAUTHORIZED USE OR REPRODUCTION IN WHOLE OR IN PART IS STRICTLY PROHIBITED. | | |

| | |
|---|-----------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISH | |
| DECIMALS | FRACTIONS |
| .XX ± .05 | ± 1/64 |
| .XXX ± .01 | ANGLES |
| .XXX ± .005 | ± 0° 30' |
| TOLERANCES | |

Figure 7-3. Schematic Relay, Card Z2 (CK1193)

CK1193