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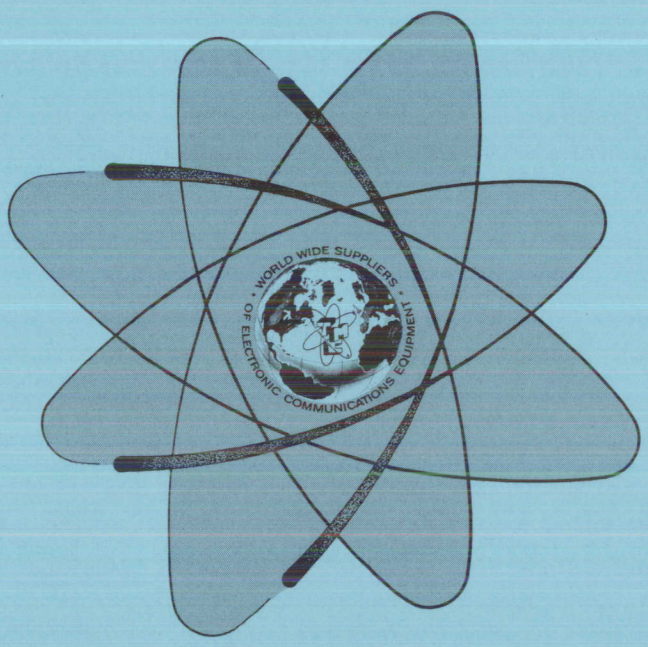
TECHNICAL MANUAL

for

MULTI-MODE EXCITER

MODEL MMX(A)-2



THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

Printed in U.S.A.

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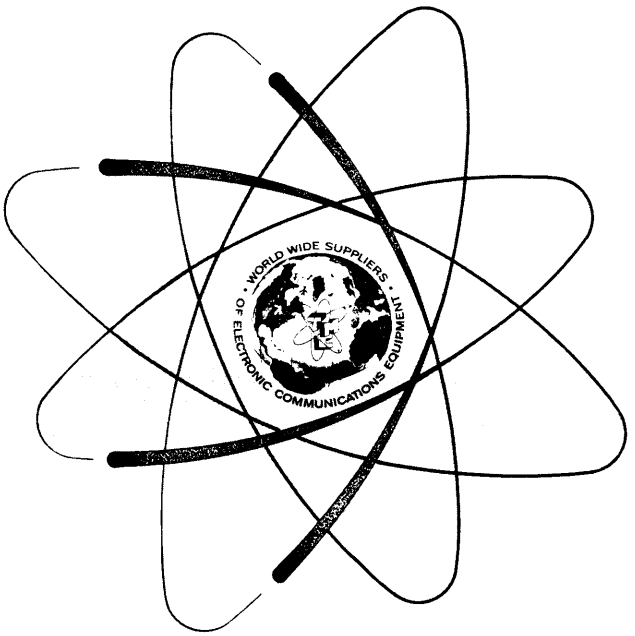

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MULTI-MODE EXCITER
Model MMX(A)-2
(Automated)

A-1. Introduction

The MMX(A)-2 Multi-Mode Exciter is similar to the MMX(M)-2. The technical manual for Multi-Mode Exciter, Model MMX(M)-2 will apply to the MMX(A)-2, when the additions, deletions and corrections outlined in this addendum have been incorporated. All references to MMX(M)-2 within the technical manual will then apply to the MMX(A)-2.

The modifications fall into specific categories, and each category is covered separately in this addendum. A general description of each modification is given. Additionally, the effect of the modification on particular sections of the technical manual is discussed, and an engineering drawing of the modifications is provided.

A-2. Pre-Position Switching

The MMX(A)-2 is designed to operate within an automated transmitting system. When a carrier frequency is selected by the manual positioning of the frequency selector switches on the front panel of the MMX(A)-2, the exciter will provide proper interconnections, via contacts on the frequency selector switches, for routing of bandswitch information to the associated transmitter. This bandswitching information will be utilized by the transmitter, to automatically pre-position the transmitter's bandswitch(es) to a band which includes the selected carrier frequency.

The pre-position switching modification is shown on figure A-1. The 10 MHz, 1 MHz, and 100 kHz switches have been replaced by switches with additional wafers for the routing of bandswitching information. An additional jack, J119, has been added for interconnection of the bandswitching information to the transmitting system.

(a) In Section 2, Installation, it should be noted that J119 (Remote Input) is not optional, as indicated in table 2-1 and on figure 2-2. The location of J119 is shown on figure 2-2, and it should be connected when installing the MMX(A)-2 in an automated transmitting system, which utilizes the pre-position bandswitching information provided by the exciter.

(b) The following description of the pre-position bandswitching circuit of the MMX(A)-2 is an addition to Section 4, Principles of Operation. This modification, however, does not change the circuit descriptions or block diagrams already contained in Section 4.

Refer to figure A-1. A common input from an associated transmitting system is applied at pin M of J119. This common is routed through

contacts on the wafers of frequency selector switches S107, S106, and S105 (10 MHz, 1 MHz, and 100 kHz respectively) to various output pins on J119. An example of the frequency selection of 23.5750 MHz is given as follows: The common at J119-M is routed to the wafer pin 12 of S107C. The 10 MHz selector is in position 3 for 20 MHz selection, routing the common from pin 3 to the wafer pin 12 of S106H. The 1 MHz selection, routing the common from pin 4 to pin J of J119. The common is also routed to pin 7 of S106G (also in position 4), but pin 7 is open with S106 in position 4. When 23.5750 MHz is selected, the common is routed through the 10 MHz and 1 MHz selector switches to pin J. The common at pin J will be utilized by the associated transmitter to pre-position its bandswitch(es) in the 16.0 to 23.9999 MHz band.

(c) The following troubleshooting procedure for the pre-position bandswitching circuit of the MMX(A)-2 is an addition to Section 5, Maintenance. When the exciter is operating in an automated transmitting system and if the associated transmitter's bandswitch(es) will not position automatically, the following troubleshooting procedure will determine if the pre-position circuitry of the MMX(A)-2 is at fault.

1. Disconnect the cable at J119 of the MMX(A)-2.

2. Connect a multimeter, using the resistance scale, between J119-M and each individual pin of J119 which provides bandswitching information (refer to figure A-1).

3. The multimeter reading will be determined by the setting of the 10 MHz, 1 MHz, and 100 kHz selector switches. For example, with the switches set for 02.7 MHz, the multimeter should read zero ohms across pins M and D. All other pins should read open.

4. If the proper routing of the common is not being provided by the exciter, troubleshoot the associated interconnect wiring between J119 and the wafers of S107, S106, and S105.

A-3. Automatic Control of Exciter Functions

Since the MMX(A)-2 is primarily designed for operation in an automatically tuned transmitting system, modifications have been made to the exciter, allowing several of the exciter functions to be automatically controlled. Additionally, the exciter has been modified so that it is capable of providing specific functions, which are utilized in the operation of the associated automatic transmitter.

The MMX(A)-2 will provide carrier, at the selected carrier frequency, for automatic tuning of the associated transmitter.

The exciter's push-to-talk (PTT) function is bypassed during the tuning of the associated transmitter. During operation of the transmitter, however, the exciter's PTT function controls the transmitter output.

The CARRIER control on the MMX(A)-2 is a four position switch, providing full carrier in the 0 position, carrier suppressed 3 to 6 db in the 6 db position, carrier suppressed 16 ± 2 db in the 16 db position, and carrier suppressed at least 40 db in the FULL position.

This automatic control of exciter functions has been provided by the addition of wafers to various exciter selector switches and by the addition of TUNE, PTT, and EMERGENCY relays. The circuitry is shown on figure A-1.

(a) In Section 1, General Information, the following change should be noted on table 1-1:

CARRIER INSERTION: Selectable in four positions: 0 providing carrier suppressed 3 to 6 db; 16 db providing carrier suppressed 16 db ± 2 db; FULL providing carrier suppressed at least 40 db.

(b) In Section 2, Installation, any references to the adjustment of the CARRIER control should be changed as follows: for an adjustment of the CARRIER control fully counterclockwise, the CARRIER switch should be placed in the FULL position; for an adjustment of the CARRIER control fully clockwise, the CARRIER switch should be placed in the 0 position.

(c) In Section 3, Operator's Section, on table 3-1, item 13 should be changed to read, "CARRIER switch; selects the amount of carrier suppression used (0, 6 db, 16 db, or full)." It should be noted on figure 3-1 that the CARRIER is a four position switch and not the continuously variable control indicated. Any references in the operating procedures (paragraphs 3-4 through 3-5) to the CARRIER control adjustment should be changed as follows: for a counterclockwise adjustment, the CARRIER switch should be placed in the FULL position; for a full clockwise adjustment, the CARRIER switch should be placed in the 0 position.

(d) In Section 4, Principles of Operation the following descriptions of the automatic control of exciter functions should be added. All descriptions refer to figure A-1 in this addendum.

(1) Carrier for Automatic Tuning

An associated automatic transmitter provides the necessary 24 vdc to the MMX(A)-2 at J119-T, when the transmitter is in a tune state. This input energizes TUNE relay K104, which causes PTT relay K101 and EMERGENCY relays K105, 103 and 102 to energize. With all relays energized the following conditions will exist regardless of the position of the exciter's MODE, CARRIER, and EXCITER switches or intelligence inputs to the MMX(A)-2: The 250 kHz used in normal CW operation (J109-J) will be routed via contacts on the TUNE relay to J108-2. On Z108 the 250 kHz will be mixed with 2.75 MHz, producing the 3 MHz signal utilized in translation to provide the carrier frequency output required by the associated transmitter for tuning. By means of contacts on the energized relays, AM, FSK,

FAX, and sideband generation circuitry will be defeated during transmitter tuning. Additionally, the MMX(A)-2, via contacts on the PTT relay, will route a ground (from J119-R to J119-S). This ground is supplied from the exciter for control of the associated transmitter output, and in a system it will be connected so that the transmitter amplifiers will be biased on during the tune sequence.

(2) Push-To-Talk Circuitry

The MMX(A)-2 has a push-to-talk relay K101, which controls PTT circuitry within the exciter and within an associated automatic transmitter. When K101 is energized, a ground is routed through its contacts from the MODE switch (AM, USB, and ISB positions only) to J109-11, enabling the operation of the final amplifier on Z112, which is a part of the amplifier stages for the exciter's final output. The energized K101 also routes a ground to J119-S. This ground is supplied from the exciter for control of the associated transmitter output, biasing its amplifiers on when the exciter's PTT relay is energized. The PTT relay K101 is energized in several ways: (1) the EXCITER ON/PTT switch in the ON position, (2) contacts on the TUNE relay K104 when it is energized, (3) when the EXCITER ON/PTT switch is in the PTT position, an external mike input (J119-Q or J118) or a ground supplied externally (TB-103-5) will energize K101 and will also enable the mike input amplifiers on Z107.

(3) Carrier Suppression

The carrier insertion control R102A on figure 7-1 in the MMX(M)-2 manual is replaced in the MMX(A)-2 exciter with S116, a four position switch for the selection of carrier level. A 250 kHz signal is supplied (from J109-N) directly to the 0 position on S116; the signal is also supplied to the 6 db and 16 db positions of the switch via voltage dropping networks. A ground is supplied to S116 in the FULL position. The wiper arm of the CARRIER switch connects the selected carrier level to the MODE switch.

The upper sideband intelligence and/or lower sideband intelligence (with the 250 kHz subcarrier suppressed) (J107-S) is also routed, via contacts on the de-energized EMERGENCY relay K102, to the MODE switch. In the USB, LSB, and ISB positions of the MODE switch, the USB and/or ISB intelligence and reinserted carrier are combined and applied via contacts on the deenergized relays, EMERGENCY K103 and TUNE K104, to J107-8 for application to 3 MHz balanced mixer on Z107.

A-4. RF Gain Control

The RF gain control of the MMX(A)-2 is designed to be controlled by an associated automatic transmitting system, when it is operating in such a system. There is no knob on the front panel for adjustment of RF OUTPUT. The R103 control for the RF OUTPUT has been recessed from the front panel. This control is not connected in the exciter's circuitry, when the MMX(A)-2

is connected into an associated transmitting system. The control should only be utilized for adjustment of gain, when the exciter is removed from the transmitting system. In the MMX(A)-2 Z119 is an A-4885 and not the A-4751 utilized in the MMX(M)-2.

(a) In Section 1, General Information add the following to the OUTPUT POWER specification on table 1-1: "Output power level may be controlled by an external source."

(b) In Section 2, Installation the following should be noted in the initial checkout procedure of the MMX(A)-2 (paragraph 2-5): If the exciter is not connected in an automatic transmitting system, the RF OUTPUT must be controlled by means of a screw driver adjustment of R103 (recessed, but accessible from front panel). If the exciter is connected in an automatic transmitting system, the exciter's rf output will be adjusted by the transmitter's RF GAIN control.

(c) In Section 3, Operator's Section the function of item 1 on table 3-1. should be changed to read, "Adjusts rf output level, when exciter is not connected in an automatic transmitting system." The same notations made in Section 2 for control of the exciter's rf output should be made in the operating procedures for Section 3 (paragraphs 3-4 through 3-9).

(d) In Section 4, Principles of Operation the following description of rf gain control should be added. The description refers to figure A-1 in this addendum.

When operated in an automatic transmitting system, the MMX(A)-2's rf output is controlled by external inputs to Z119 in the exciter. A fixed +28 volts (J119-V) and a variable dc voltage (J119-Y are supplied to Z119 from the transmitter. The fixed +28 vdc will energize the remote controlled gain circuitry on Z119 and will remove the exciter's rf gain control (R103) from the circuit. The variable dc voltage will be used to control the actual gain of the exciter's rf which is routed into Z119 at pin 1 and out of Z119 at pin 3.

When the exciter is operated independent of an automated transmitter, there will be no +28 vdc or variable dc voltage inputs to Z119 and the exciter's rf gain control (R103) will be switched into the circuit.

Z119 also contains a high pass filter. The switching of this filter into the rf output line is controlled by the 10 MHz selector switch.

(e) In Section 5, Maintenance the same notations made in Section 2 for control of the exciter's rf output should be made in the alignment procedures (para 5-3).

A-5. Parts List

In Section 6 of the MMX(M)-2 technical manual the following additions, corrections, and deletions should be made so that it will be applicable to the MMX(A)-2:

Multimode Exciter MMX(M)-2 component changes for conversion to MMX(A)-2:

1. Change Z119 part number from A4751 to A4885.
2. Delete R102A,B and R105.
3. Add Z120 Assembly Circuit PC BD Line Filter, A4888.
4. Add the following components to MMX(M)-2 parts list.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C201	CAPACITOR, Fixed, electrolytic	CE105-15-25
CR201	SEMICONDUCTOR DEVICE, Diode	1N2484
CR202	Same as CR201	
J119	CONNECTOR, Receptacle, male, 24/c	MS3102A24-28P
K101 thru K103	RELAY, Armature, DPDT	RL143-H
K104	RELAY, Armature, 4PDT	RL156-8
K105	RELAY, Armature 6PDT	RL156-5
L201	CHOKE	TF418
R201	RESISTOR, Fixed composition, 680 ohm, 1/4 watt ±5%	RC07GF681J
R202	RESISTOR, Fixed composition, 82 ohm, 1/4 watt ±5%	RC07GF820J
R203	RESISTOR, Fixed composition, 220 ohms 1/4 watt ±5%	RC07GF221J
R204	RESISTOR, Fixed, composition, 1000 ohm 1/4 watt ±5%	RC07GF102J
R205	RESISTOR, Fixed, composition, 390 ohm 1/4 watt ±5%	RC07GF391J
R206	Same as R203	
R207 thru R209	RESISTOR, Fixed, composition, 3300 ohm 1/4 watt ±5%	RC07GF332J
S103	SWITCH, Rotary	SW470
S104	SWITCH, Rotary	SW468
S105	SWITCH, Rotary	SW467
S106	SWITCH, Rotary	SW471
S107	SWITCH, Rotary	SW469
S108 thru S115	NOT USED	
S116	SWITCH, Rotary	SW466

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XK104	SOCKET, Relay	TS171-3
XK105	SOCKET, Relay	TS171-2
Z119	CIRCUIT CARD ASSEMBLY, RF Adjust, High Pass Output Filter	A4885
Z120	CIRCUIT CARD ASSEMBLY, Line Filter	A4888

A-6. Schematic Diagrams

In Section 7, Diagrams note that the circuitry on figure A-1 is a part of the schematic wiring diagram, figure 7-1, in order for the diagram to apply to the MMX(A)-2.

1 MHz
S106 H
FRONT

S106 H
REAR

S106 G
FRONT

S106 G
REAR

S106 F
FRONT

S106 F
REAR

REF: CK1333

MULTIPLIER
S103
S104
S105
S106
S107

100 KHz
S105 D
FRONT

S105 D
REAR

S105 C
FRONT

S105 C
REAR

10 KHz
S104 B
FRONT

S104 B
REAR

1 KHz
S103 B
FRONT

S103 B
REAR

(A4845/PC605)

C2601 160pf
C2602 130pf
C2603 150pf
C2604 240pf
C2605 1000pf
C2606 180pf
C2607 270pf
L2601 .39
L2602 .68
L2603 .68
K2601

C2610 .01
CR2602
C2611 .01
C2612 .01
L2606 120

R2602 1.2K 1/4W
R2601 1.2K 1/4W
CR2601
C2608 .01
L2604 120
L2605 120
C2609 .01

J115 (B, A)
J114 (F, H)
J112 (R, S)
RF OUTPUT R103 500

TO SH.2 K105

P/O Z120
C20
C19
L20
L19
Z Y X W V
P/O J119
0-24V
24V

C7 L7
C6 L6
C5 L5
C4 L4
C3 L3
C2 L2
C1 L1
25 26 23 24 21 22
F E D C B A

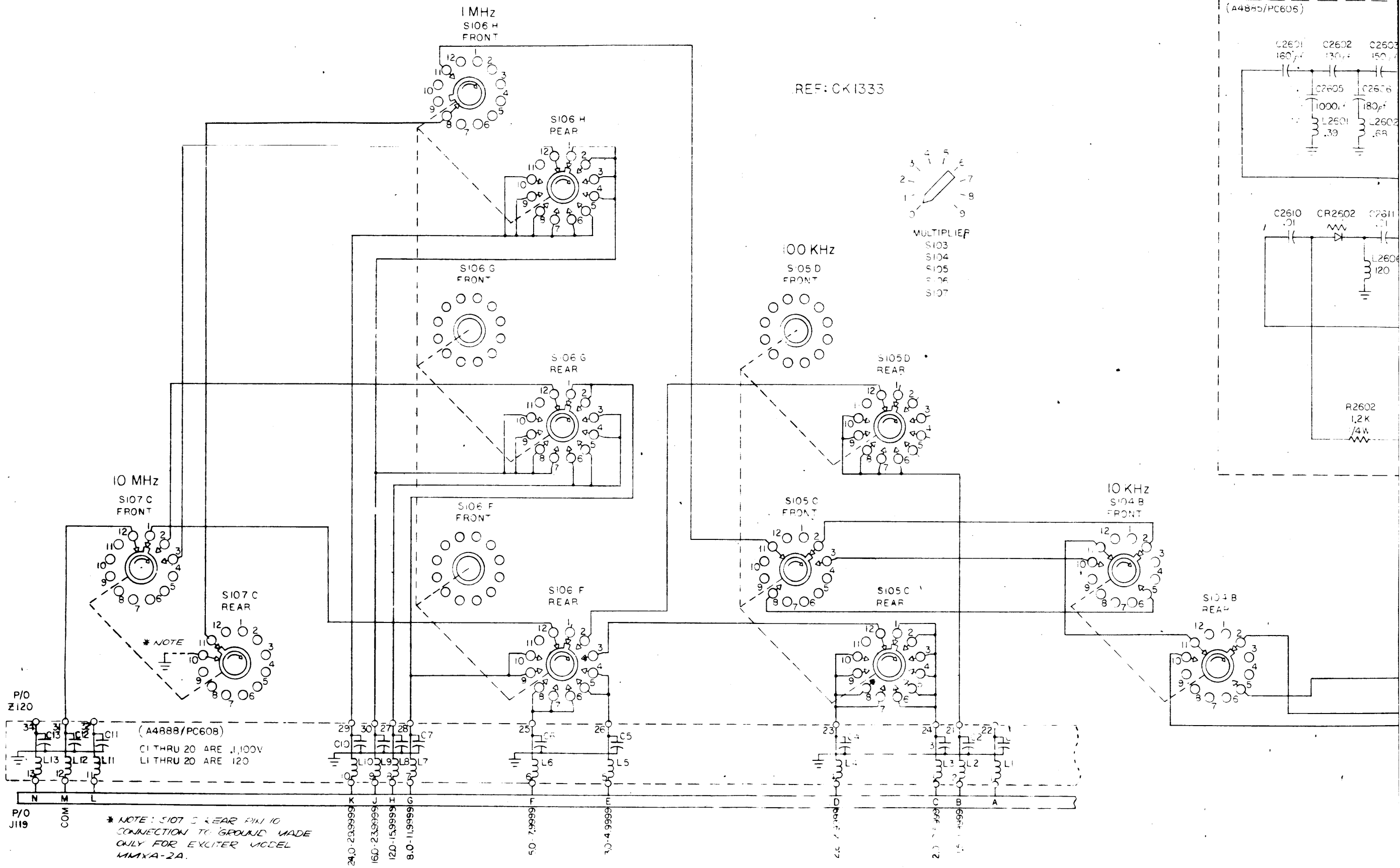
50-79999
30-49999

LAST & MISSING SYMBOLS CHARTS (CK1333)

200 SERIES	
LAST	MISSING
C201	
CR202	
L201	
R209	

Z107 (A4524) REPLACED BY (A4834) (REF. CK 875)

FIGURE A-1
SCHEMATIC WIRING DIAGRAM
(Sheet 1 of 2)



UNLESS OTHERWISE SPECIFIED:

1. RESISTORS ARE IN OHMS, 1/2 W.
2. CAPACITORS ARE IN μF.D.
3. INDUCTORS ARE IN μH.

ADDITIONS TO LAST & MISSING SYMBOLS CHARTS (CK1333)

100 SERIES		200 SERIES	
LAST	MISSING	LAST	MISSING
K105 S116 XX105 Y120	R102 KK101,2,3	C201 CR202 L201 R209	

Z107 (A4524) REPLACED BY (A4884), (REF CK1333)

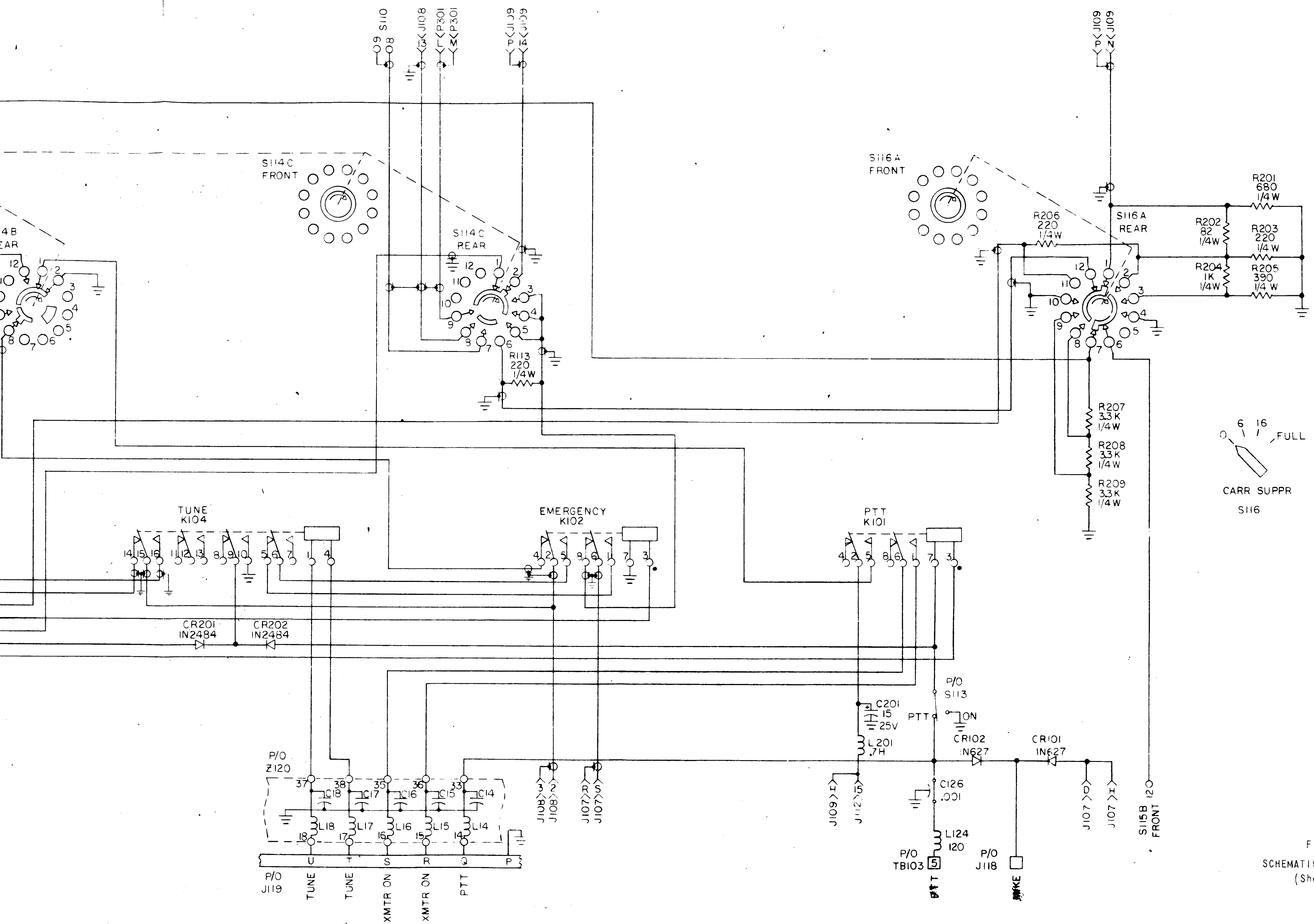
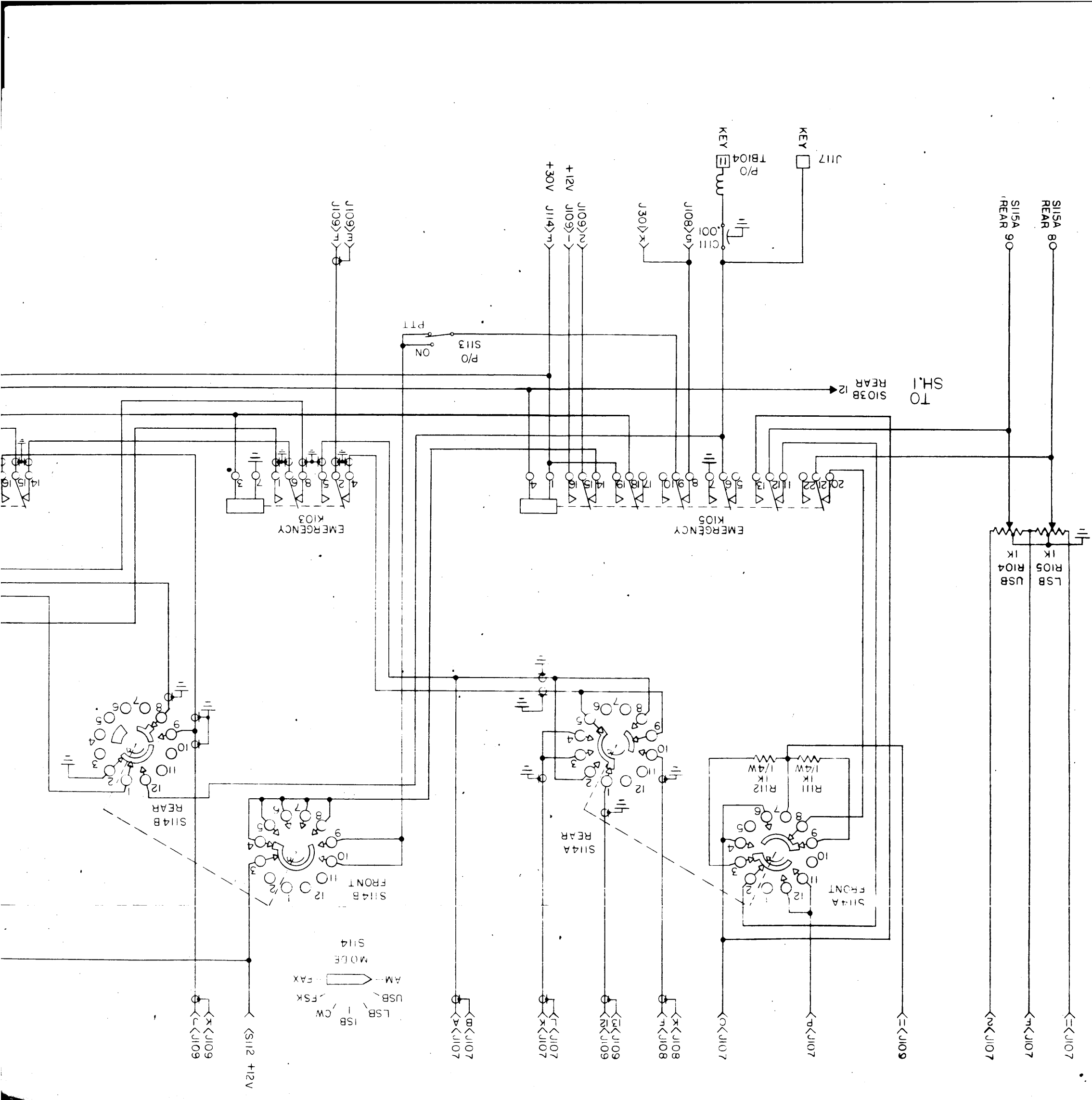


FIGURE A-1
SCHEMATIC WIRING DIAGRAM
(Sheet 2 of 2)


KEY
J117
P/O TB104
KEY
+12V
+30V
J109
J114
J108
J301
C111 .001
SII5A REAR 9
SII5A REAR 8
P/O SII3
PTT
ON
TO SH.1
SI03B REAR 12
EMERGENCY K103
EMERGENCY K105
LSB R105 1K
USB R104 1K
RIII 1K 1/4W
RII2 1K 1/4W
SII4A FRONT
SII4A REAR
SII4B FRONT
SII4B REAR
MODE SII4
LSB
USB
ISB
CW
FSK
AM
FAX
J107
J108
J109
J106
(SI12 +12V