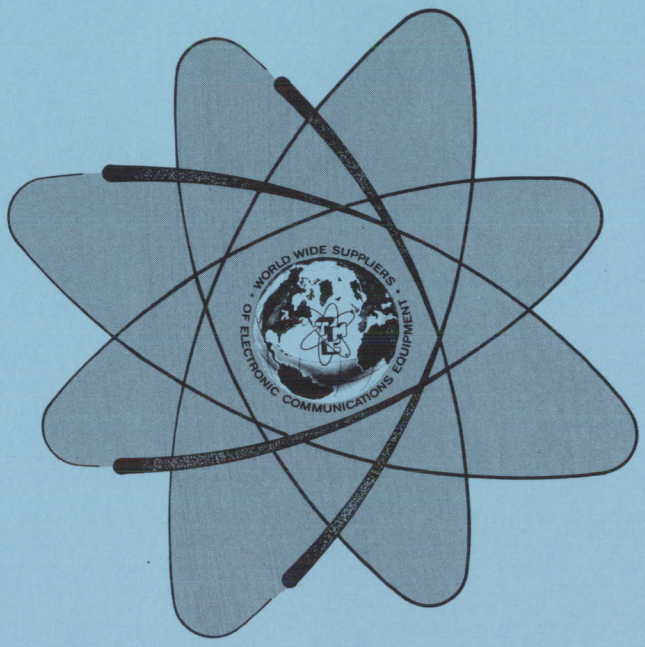
TECHNICAL MANUAL
for
MULTI-MODE EXCITER
MODEL MMX(A)-2A



THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. OTTAWA, ONTARIO

Printed in U.S.A.

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for

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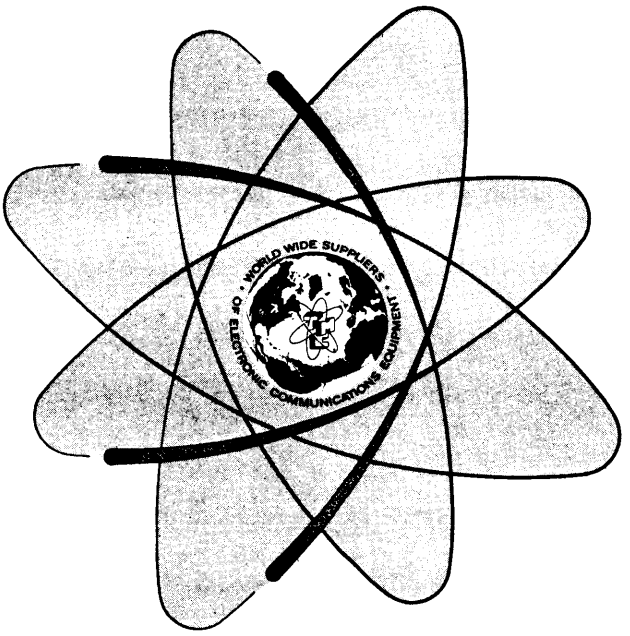

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

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NOTICE

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

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

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

A-1. Introduction

The MMX(A)-2A 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)-2A, 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)-2A.

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)-2A 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)-2A, 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)-2A 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)-2A 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)-2A 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)-2A is at fault.

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

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. Sideband Capability

The MMX(A)-2A exciter is not capable of lower sideband (LSB) operation. This modification has been accomplished by the replacement of the sideband generator Z107. The sideband generator assembly A4524 of the MMX(M)-2 is replaced with A4884 in the MMX(A)-2A. Additionally, there is no LSB MIKE/LINE gain control on the front panel of the MMX(A)-2A.

(a) In Section 1, General Information any references to LSB, and consequently ISB, should be removed. Under AUDIO RESPONSE on table 1-1, item 1 should be changed to read, "Flat within ±1.5 db, 350-2400 Hz, upper sideband only". Under AUDIO INPUT LEVEL, item 1 should be changed to read, "For SSB, a 600 ohm channel balanced or unbalanced, -20 dbm to +5 dbm". Change the AUDIO CONTROL specification to read, "A front panel "fader" control allows ease in selecting microphone or line input into the upper sideband."

(b) In Section 2, Installation, no external interconnect should be made to the LSB audio input (terminals 7, 8, 9 and 10) of TB104, since this capability does not exist. Additionally, in paragraph 2-5, Initial Checkout Procedure, any steps or references to LSB should be deleted. With the lower sideband inoperative, there is no ISB capability; however, the ISB position of the MODE switch still provides an output (USB and a degree of carrier).

(c) In Section 3, Operation, it should be noted in table 3-1. that the LSB position of the METER switch, the LSB MIKE/LINE control, and the LSB position of the MODE switch are not applicable to the MMX(A)-2A exciter. In the operating procedure for single sideband (paragraph 3-4.) any references to LSB should be deleted. With the LSB capability inoperative, the operating procedure for ISB (paragraph 3-5.) will only be a repetition of SSB operation (with the exception of the MODE switch position), and this procedure should be deleted.

(d) In Section 4, Principles of Operation, the sixth paragraph under paragraph 4-3. should be corrected to read as follows:

"The sideband generator board Z107 contains a microphone audio preamplifier and an audio impedance-matching transformer, translating the external 600 ohm balanced or unbalanced audio line for application to the upper sideband (USB) and AM modulator circuits. A balanced modulator produces the upper sideband intelligence from the 250 kHz signal subcarrier and the incoming USB audio signal; the 250 kHz subcarrier is suppressed. The resulting USB signal sent is to the frequency shift generator board Z108."

Paragraph 4-4. (e) should be corrected to read as follows:

"e. SIDEBAND GENERATOR ASSEMBLY Z107. The sideband generator includes an upper sideband circuit. The sideband generator also contains a microphone audio preamplifier, and an audio impedance-matching transformer for translation of externally applied 600 ohm USB line audio (balanced or unbalanced) for application to a balanced modulator. When a microphone input is used, the front panel EXCITER switch is set to the push-to-talk (PTT) position to furnish a PTT ground enable to the carrier generator via the mode switching network; in all other modes, the EXCITER switch is set to the ON position, which supplies a permanent ground to the same point, except in the case of CW. Microphone audio from 350 Hz to 2400 kHz is applied to the sideband generator audio preamplifier circuit,

is routed to the modulation input of the sideband generator; in the AM mode, the respective audio signal is applied to the AM amplifier in carrier generator Z109. USB audio amplitude is controlled by the USB front panel MIKE/LINE gain control.

The SSB modulation section of the sideband generator accepts both a 250 kHz subcarrier input and the USB audio signal via the MODE switch. These two signals are applied to a balanced modulator to derive the upper sideband intelligence; the 250 kHz subcarrier is suppressed. The resulting USB signal is supplied to the mode switching network and is then routed to the converter section of frequency shift generator Z108."

Any further references to LSB should be deleted from paragraphs 4-3. and 4-4. and from figures 4-2. and 4-3.

(e) In Section 5, Maintenance, the alignment procedure for the sideband generator Z107 (paragraph 5-3(i)) delete entirely steps 7 through 11. On figure 5-8 delete TP-1, TP-9, and R60.

(f) This modification, the elimination of LSB circuitry, along with other modifications changes additional portions of the alignment procedure. A complete replacement of paragraphs 5-3(p) and (q) is included in this addendum and located at the rear of the addendum.

A-4. Automatic Control of Exciter Functions

Since the MMX(A)-2A 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)-2A 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)-2A 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.

The MMX(A)-2A exciter is capable of providing automatic upper sideband with a degree of carrier (A3H) when the frequency selector switches are positioned at the following emergency frequencies: 2003, 2182, and 2638 kHz. When the emergency frequencies are selected, the exciter's MODE switch is bypassed and carrier (suppressed 6 db) is automatically selected, regardless of the setting of the CARRIER switch.

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 changes should be noted on table 1-1:

(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.

(2) To MODES OF OPERATION add: Automatic A3H on emergency frequencies of 2003, 2182 and 2638 kHz.

(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)-2A 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)-2A: 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)-2A, 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)-2A 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)-2A exciter with S116, a four position switch for the selection of carrier level. A 250 kHz signal is supplied (from J109-M) 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 carrier level which is suppressed 6 db is directly tied to a contact on EMERGENCY relay K103 and utilized in the automatic A3H operation of the exciter on emergency frequencies. The wiper arm of the CARRIER switch connects the selected carrier level to the MODE switch.

The upper sideband intelligence with 250 kHz suppressed (J107-S) is also routed, via contacts on the de-energized EMERGENCY relay K102, to the MODE switch. In the USB and ISB positions of the MODE switch, the USB 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.

(4) Automatic A3H

The MMX(A)-2A will provide automatic A3H operation when the following emergency frequencies are selected: 2003, 2182, and 2638 kHz. A ground is supplied to the wiper of the S107C rear wafer of the 10 MHz selector. This ground will be routed through contacts on the wafers of the 1 MHz, 100 kHz, 10 kHz, and 1 kHz selector switches when one of the emergency frequencies is selected. The routing of the ground is accomplished on the following switch wafers: S107C rear, S106H front, S105C front, S104B front, S104B rear, and S103B rear. This ground will cause EMERGENCY relay K105 to energize, which in turn will energize EMERGENCY relays K102 and K103. with these relays energized the following conditions will exist, regardless of the MODE and CARRIER switch positions: Carrier suppressed 6 db will be routed through contacts of the energized K103 and the deenergized K104 to J108-2 for application to the 3 MHz balanced mixer on Z108. Intelligence from the USB MIKE/LINE control will be routed via contacts of the K105 relay directly to J107-C, bypassing the MODE switch. Z107 provides translation of the intelligence to the 250 kHz sub-carrier, and suppression of the sub-carrier. The translated intelligence is also applied, via contacts of the energized K102 and the deenergized K104, to J108-2. The contacts of the energized EMERGENCY relays will also disable the AM, FSK, FAX and CW modes of operation.

A-5. RF Gain Control

The RF gain control of the MMX(A)-2A 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)-2A 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)-2A 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)-2A (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)-2A'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-6. Alignment Procedures

The following alignment procedures for the MMX(A)-2A will replace paragraph 5-3.p. FINAL ALIGNMENT, and paragraph 5-3.q. MODULATION LEVEL CHECK AND ADJUSTMENT in the MMX(M)-2 technical manual.

p. FINAL ALIGNMENT

NOTE

To be completed after individual circuit boards have been adjusted in accordance with the previous procedures.

(1) Preliminary Steps:

Insure that all cards are inserted and aligned.
Adjust RF OUTPUT control fully CCW (screw driver adjustment).
Set front panel frequency selectors to display 29.9999 MHz.
Set the CARRIER switch to FULL postion.
Set the MODE switch to USB position.
Place the STANDBY-ON switch to ON.

(2) Connect the audio generator HP-200CD to the 600 ohm USB sideband input in the rear panel. Adjust generator for a 1 kHz output at a level of 78 millivolt RMS unbalanced.

(3) Set the exciter controls as follows:

Set USB MIKE/LINE control to "0".
Rotate the ALDC control on the rear panel fully CCW.
Turn METER switch to Q1. The MONITOR needle should indicate in the green region marked Q1.
Turn METER switch to Q2. The MONITOR needle should indicate in the green region marked Q2.
Turn METER switch to Q3. The MONITOR needle should indicate in the green region marked Q3.

(4) Connect an oscilloscope to TP4 of Z107 (see Figure 5-8) and set USB MIKE/LINE control clockwise for 44 millivolts P-P as indicated on oscilloscope. Set METER switch to USB position, the MONITOR meter should indicate 2/5 of full scale. Return USB MIKE/LINE control to zero.

(5) Connect the Spectrum Analyzer LA-40A to the RF MONITOR jack on the rear of the MMX.

(6) Connect a 50 ohm (2 watt non-inductive) load resistor to the RF OUTPUT jack on the rear of the unit and connect the HP-411A VTVM across the 50 ohm load.

(7) Remove Z109 and insert into chassis with extender card.

(8) Turn MODE switch to USB position.

(9) Connect scope to J109 Pin N and adjust the 250 kHz signal with R27 on Z109 (see figure 5-7) for a level of 70 millivolts P-P on the scope.

(10) Set the CARRIER switch to "0" position and adjust the RF OUTPUT control (screw driver adjustment on front panel) for 3.5 volts RMS on the VTVM.

(11) Connect the oscilloscope across the 50 ohm load. Use the front panel frequency selectors to choose frequencies at random.

CAUTION

KEEP RF OUTPUT BELOW 6.0 VOLTS RMS ON VTVM
USING RF OUTPUT CONTROL.

(12) Examine the resultant sine waves by moving the TIME/CM oscilloscope controls through a wide range. There should be no trace of modulation. Remove oscilloscope.

(13) Set the MMX frequency to 29.2500 MHz. With CARRIER switch at "0", adjust RF OUTPUT control (front panel screw driver adjustment) for 2.5 volts on the VTVM. Set MMX frequency to 29.7500 MHz, and adjust R109 on Z112 for the same output level. (Some models only)

(14) Vary the frequency selectors from 29.0000 to 29.9999 MHz and find the frequency with the lowest indicated output amplitude. Then adjust R97 on Z112 (see figure 5-16) for maximum signal at that frequency.

(15) Turn the MODE switch to the CW position.

(16) Select 29.0000 - 29.9999 MHz on the front panel.

(17) Adjust RF OUTPUT control (front panel screw driver adjustment) fully clockwise; adjust R58 on Z108 (see figure 5-9) for 5.0 VRMS on the VTVM.

(18) Turn MODE switch to ISB position and set the CARRIER switch to "0".

(19) Set front panel frequency selectors to 12.0000 MHz.

(20) Adjust the RF OUTPUT control (front panel screw driver adjustment) for 3.5 VRMS on HP-410B VTVM. (DO NOT touch RF OUTPUT control for the rest of these adjustments unless told to do so). Observe that one signal is present on the spectrum analyzer. Adjust the spectrum analyzer display so that this signal is at 0 DB reference.

(21) Turn MODE switch to CW position.

(22) Adjust R20 on Z109 (mounted on extender card) for 3.5 VRMS on the VTVM. Observe that one signal is present at 0 DB level on the spectrum analyzer.

(23) Switch from ISB (Full Carrier in (0 DB) no audio) to CW; there should be no change on the VTVM RF output voltage indication.

(24) Turn MODE switch to AM (no modulation applied).

(25) Adjust R69 on Z109 for an indication of 1.75 VRMS on VTVM.

NOTE

The signal level displayed on the analyzer should be at a -6 DB level. This should change 6 DB when the MODE switch is placed in the CW or USB Full Carrier positions.

(26) Remove Z109 from the extender card and replace it in its chassis socket.

(27) Remove Z108 and mount it to the chassis on the extender card.

(28) Turn MODE switch to FSK position.

(29) Adjust R56 on Z108 (see figure 5-9) for 3.5 VRMS on the VTVM.

NOTE

Maintain RF output control adjustment from previous procedure (0 DB rf level indicated on spectrum analyzer).

(30) Remove Z108 from extender card and replace it in its chassis socket.

(31) With front panel CARRIER switch set at "0" the following voltages should be observed on the VTVM connected to the RF output. One signal should be displayed on the analyzer at the following specified DB levels:

MODE	VTVM	ANALYZER
AM	1.75 VRMS	-6.0 DB
USB	3.5 VRMS	0.0 DB
CW	3.5 VRMS	0.0 DB
FSK	3.5 VRMS	0.0 DB
FAX	3.5 VRMS	0.0 DB

q. MODULATION LEVEL CHECK AND ADJUSTMENT

(1) Set front panel selectors to 12.0000 MHz.

(2) Turn MODE switch to ISB and set CARRIER control to "0".

(3) Insure that USB MIKE/LINE controls are set at "0".

(4) Adjust RF output control for a reading of 2.24 VRMS across the 50 ohm load connected to RF Out jack J124.

NOTE

DO NOT change RF output position for the following adjustments.

(5) Connect spectrum analyzer to RF MON jack J125 and adjust display to indicate 0 DB.

NOTE

A single tone (Carrier) should be displayed on the spectrum analyzer.

(6) Set CARRIER switch to the FULL position signal on analyzer should decrease to -55 DB (or lower).

(7) Set METER switch to USB. Adjust USB-MIKE/LINE for 4/5 full scale reading. The VTVM on dummy load (J124) shall indicate 2.24 VRMS. IF not, adjust R9 on Z107 (see Figure 5-8) until it does.

(8) Rotate USB-MIKE/LINE control 0 on meter.

(9) Remove the audio generator from the USB sideband input on the rear panel and connect a two-tone generator (TTG) to rear panel sideband input. (Two tones at a level of 78 millivolts)

(10) Set METER switch to USB position and adjust USB-MIKE/LINE control for 4/5 full scale indication on meter.

(11) Adjust RF OUTPUT control for 2.24 VRMS out on the VTVM connected across 50 ohm dummy load. Two rf tones should be displayed on the spectrum analyzer. Distortion products should be down -40 DB from the displayed two-tone signals.

(12) Rotate USB-MIKE/LINE control to "0".

(13) Adjust the output of the two tone generator for one tone out at a level of 78 millivolts RMS.

(14) Rotate USB-MIKE/LINE control to 4/5 of meter scale.

(15) Set MODE switch to AM position.

(16) Observe that VTVM across output indicated 2.24 VRMS.

(17) Observe that the distortion products on the spectrum analyzer are down -25 DB or lower from the carrier spike and the upper sideband tone is down approximately -7 DB from the carrier as shown in figure 5-17.

A-7. 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)-2A:

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

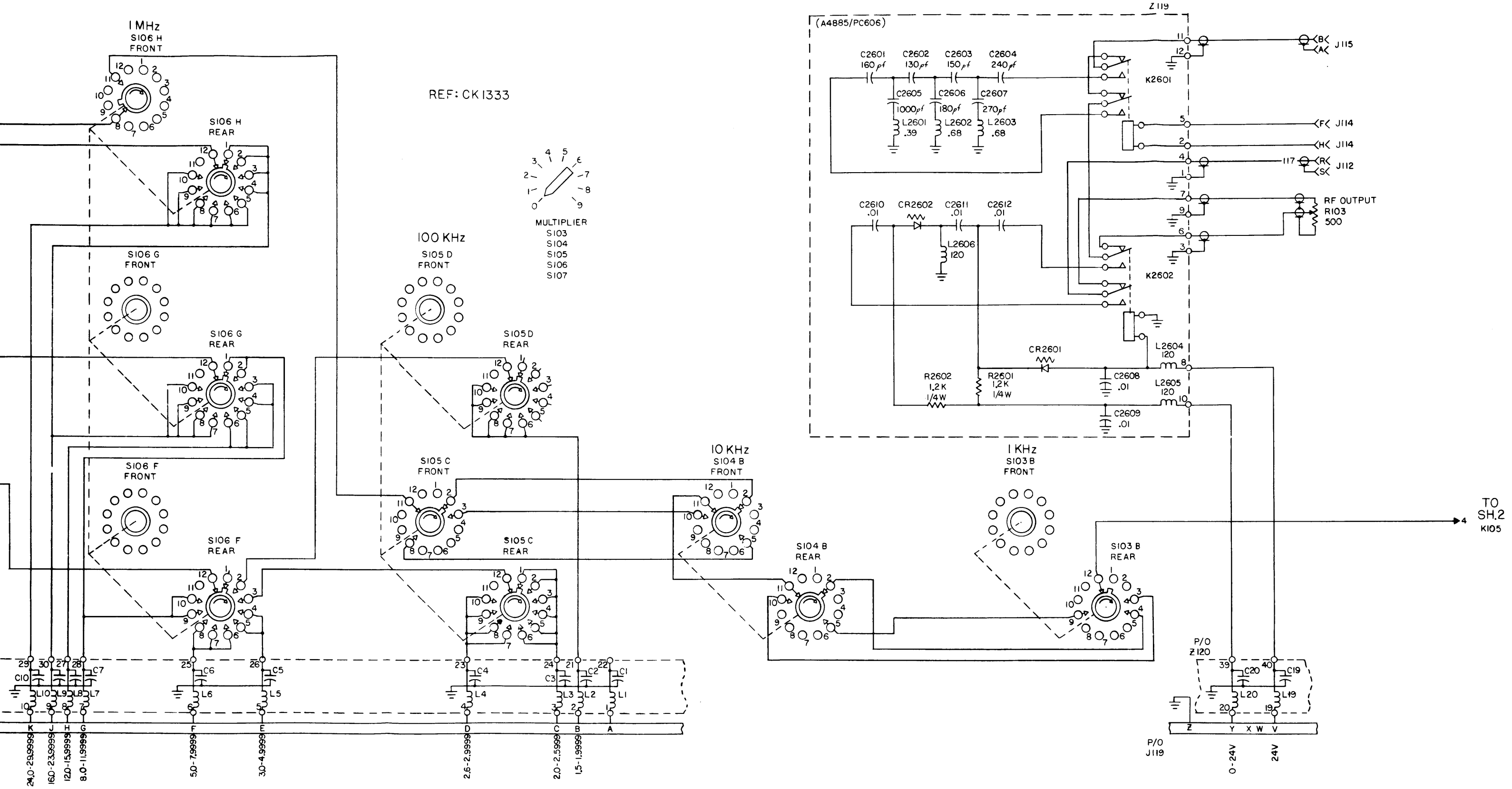
1. Change Z107 part number from A2524 to A4884.
2. Change Z119 part number from A4751 to A4885.
3. Delete R102A,B and R105.
4. Add Z120 Assembly Circuit PC BD Line Filter, A4888.
5. Add the following components to MMX(M)-2 parts list.

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
Z107	CIRCUIT CARD ASSEMBLY, Sideband Generator	A4884
Z119	CIRCUIT CARD ASSEMBLY, RF Adjust, High Pass Output Filter	A4885
Z120	CIRCUIT CARD ASSEMBLY, Line Filter	A4888

A-8. 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)-2A.



ADDITIONS TO LAST & MISSING SYMBOLS CHARTS (CK1333)

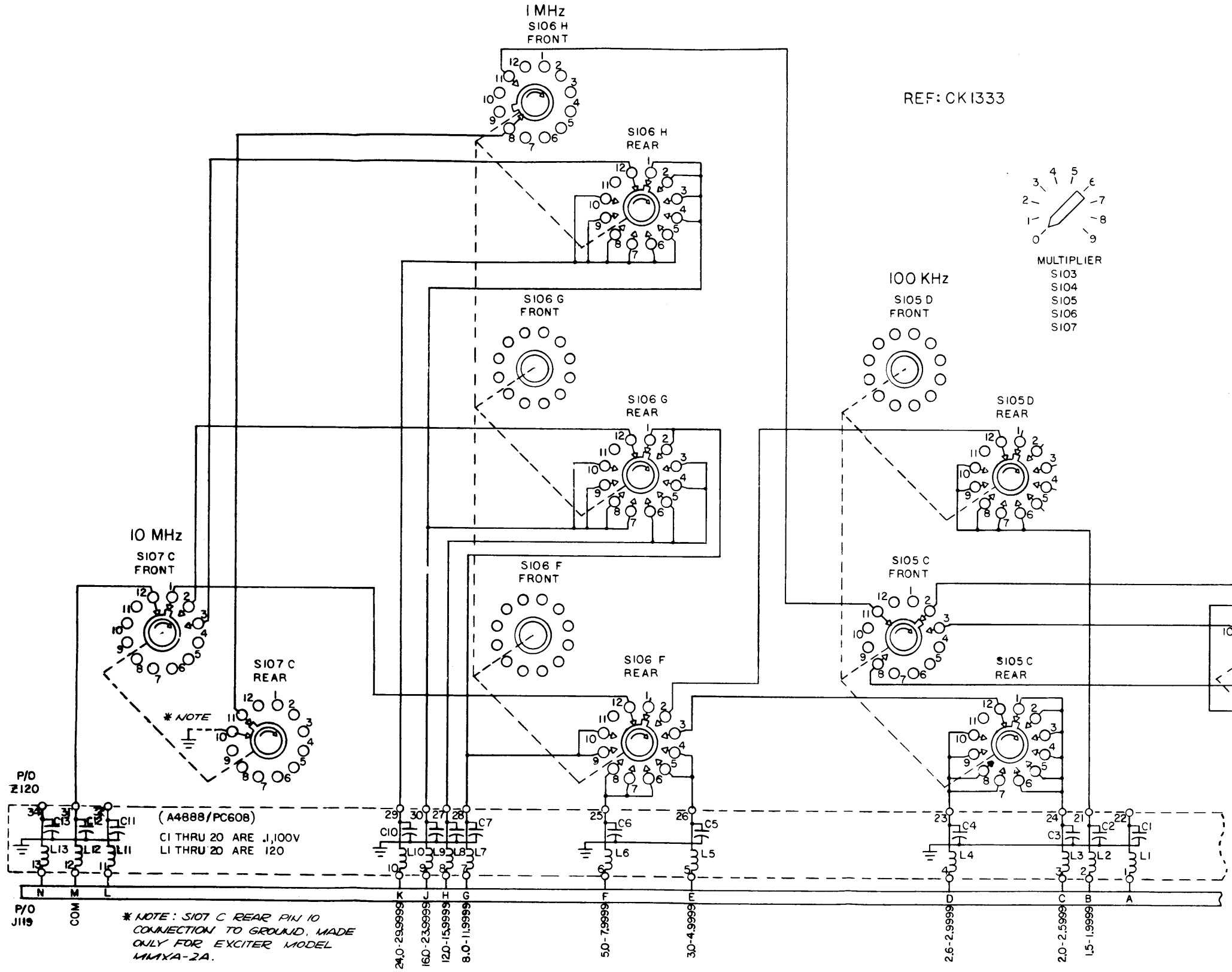
100 SERIES		200 SERIES	
LAST	MISSING	LAST	MISSING
K105 S116 XK105 Z120	R102 XK101,2,3	C201 CR202 L201 R209	

Z107 (A4524) REPLACED BY (A4884).(REF. CK1875)

(CK1881B)

Figure A1. Schematic Wiring Diagram MMX(A)-2A (Sheet 1 of 2)

REF: CK1333



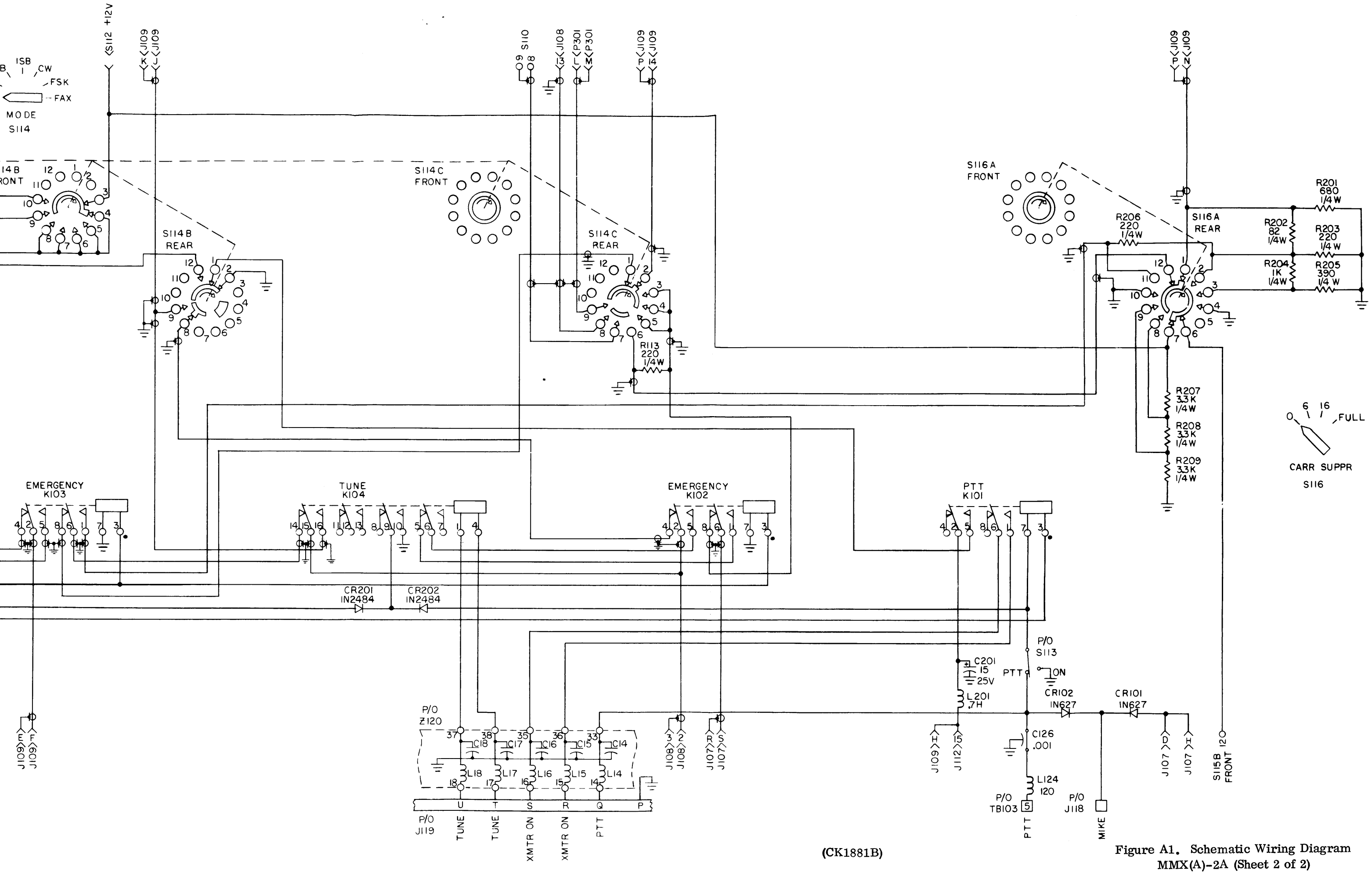
UNLESS OTHERWISE SPECIFIED:

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

ADDITIONS TO LAST & MISSING SYMBOLS CHARTS (CK1333)

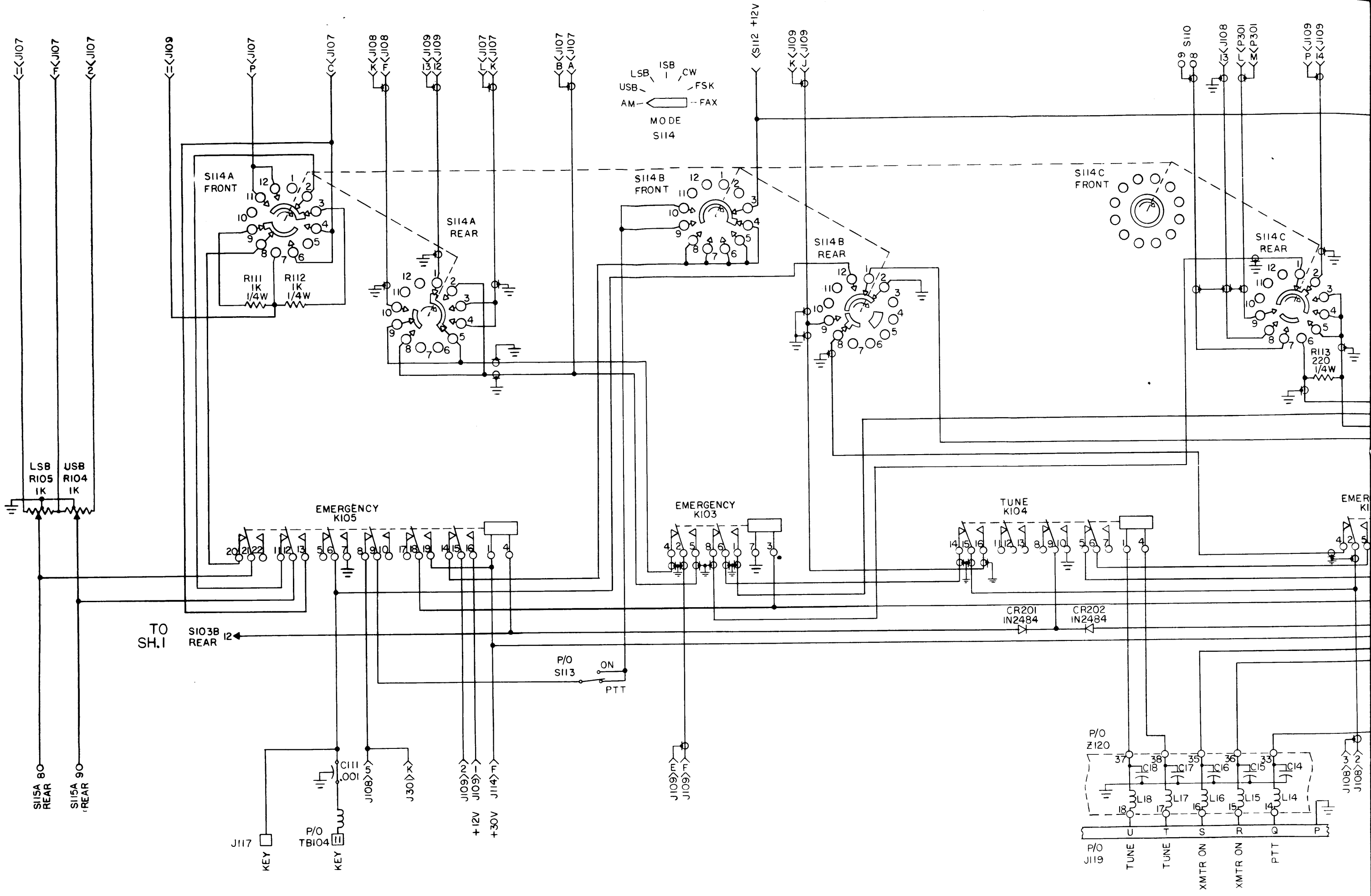
100 SERIES		200 SERIES	
LAST	MISSING	LAST	MISSING
K105 S116 XK105 Z120	R102 XK101,2,3	C201 CR202 L201 R209	

Z107 (A4524) REPLACED BY (A4884), (REF. CK1875)



(CK1881B)

Figure A1. Schematic Wiring Diagram MMX(A)-2A (Sheet 2 of 2)


J107
J107
J107
J109
J107
J108
J108
J109
J109
J107
J107
J107
J107
S112 +12V
J109
J109
S110
J108
J301
J301
J109
J109
LSB
ISB
CW
USB
FSK
AM
FAX
MODE
S114
S114A
FRONT
S114A
REAR
S114B
FRONT
S114B
REAR
S114C
FRONT
S114C
REAR
R111
1K
1/4W
R112
1K
1/4W
R113
220
1/4W
LSB
R105
1K
USB
R104
1K
EMERGENCY
K105
EMERGENCY
K103
TUNE
K104
EMER
K
CR201
IN2484
CR202
IN2484
TO
SH.1
S103B
REAR
12
P/O
S113
ON
PTT
S115A
REAR
80
S115A
REAR
90
C111
.001
J108
5
J30
X
J109
N
J109
—
J114
T
+12V
+30V
J109
M
J109
L
J117
KEY
P/O
TB104
E
KEY
P/O
Z120
C18
C17
C16
C15
C14
L18
L17
L16
L15
L14
J109
J
J108
N
P/O
J119
TUNE
TUNE
XMTR ON
XMTR ON
PTT