UNCLASSIFIED

PRELIMINARY

TECHNICAL MANUAL

for

GENERAL PURPOSE TRANSMITTER

MODEL SBTM-1KJK SYSTEM

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. **OTTAWA, CANADA**

PRELIMINARY

SYSTEM MANUAL

for

GENERAL PURPOSE TRANSMITTER

MODEL SBTM-1KJK

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. **OTTAWA, CANADA**

IN-1041

ISSUE DATE: March 24, 1970

FOREWORD

This instruction manual for SBTM-1KJK consists of the following Technical Manuals.

1 each	System Technical Manual for SBTM-1KJC with addendum
1 each	Technical Manual for PAL-1KB3
1 each	Technical Manual for MMX( )2
1 each	Technical Manual for APP-4D
1 each	Technical Manual for TIS-3D

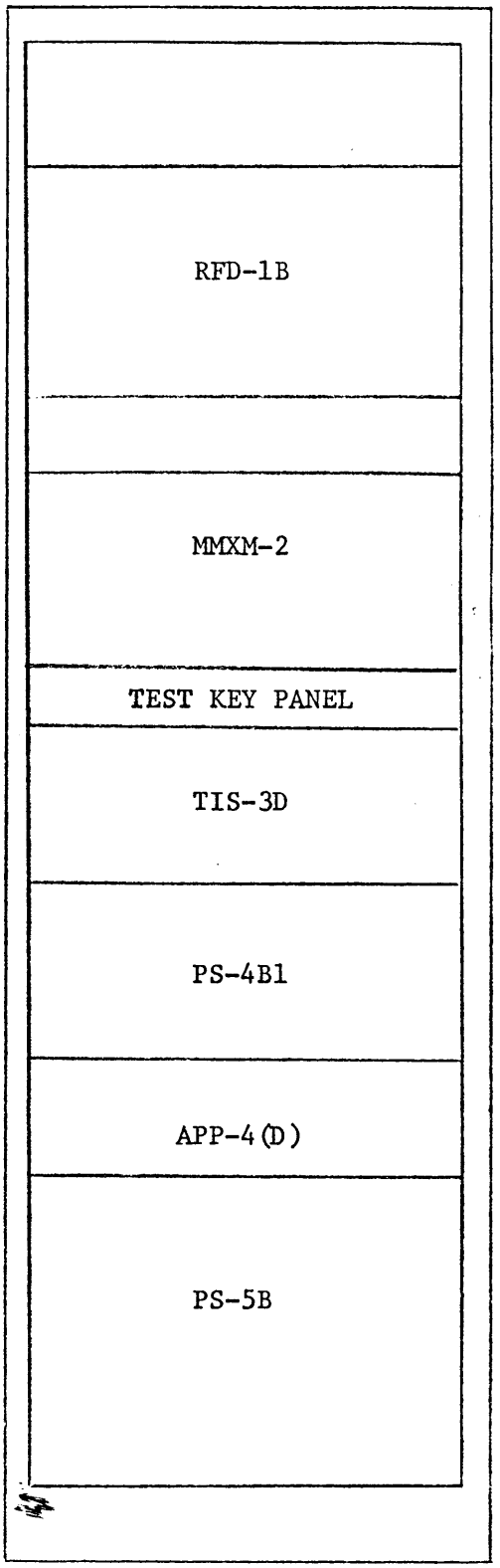


Figure 1-0. Front View General Purpose Transmitter Model SBTM-1KJK

SIDEBAND TRANSMITTER

Model SBTM-1KJK

TMC Model SBTM-1KJK Sideband Transmitter is similar to the Model SBTM-1KJC, with the exception that Model TIS-3D Tone Intelligence System is added and ATS-2A Antenna Tuning System is deleted. For system description, operation and maintenance purposes, the technical manual for the SBTM-1KJC, plus this addendum will provide adequate system information.

All references to Model SBTM-1KJC should be read as SBTM-1KJK. In addition, the following additions, deletions, and/or changes should be incorporated into the technical manual:

SECTION	ADDITION/DELETION/CHANGE
Figure 1-0	REPLACE Figure 1-0 with the new Figure 1-0 supplied.
1-1	ADD, to modes of operation list, the following: LSB (Lower sideband) with suppressed or continuously adjustable carrier. ISB (Independent sideband) with suppressed or continuously adjustable carrier. CHANGE exciter output spec from "...about a 100 mw output..." to "...up to 1 watt output..." Change paragraph 1.2a: a. Tone Intelligence Unit Model TIS-3D. - The TIS is an audio shift keyer designed to be used with a synthesised exciter.
Table 2-1	ADD the following, in the proper tabulated columns: Tone Intelligence Unit TIS-3D Transformer T1 TIS-3D Terminal Board E2

SECTION	ADDITION/DELETION/CHANGE
2-3d	CHANGE, "...SET..." to "...SBT..."
2-3e(1)	CHANGE third sentence to read: "All external connections are made at terminal blocks E501 and E502 located at the rear of Auxiliary Power Panel APP; in addition, mike and key connections may be made directly to the MMX( )2, via appropriate front-panel connectors."
	DELETE last word on subtitle, which is the word SYSTEM.
2-3e(4)	ADD, immediately before last word on second line ("circuits"), the abbreviation "VOX".
2-3e(5)	CHANGE, to read: "SBTM operates on the upper and/or lower sideband; thus, two channel inputs may be required, depending on operational modes desired. E501 terminals 13, 14 and 15 are wired to the upper sideband input of the MMX( )2 via the TIS-3D EXCITER switches. E502 terminals 18, 19 and 20 are wired to the lower sideband input of the MMX( )2 via the TIS-3D EXCITER switches. Figure 2-7 illustrates connections for either balanced or unbalanced input.
2-3f	CHANGE first word of last line from "...GAX..." to "...FAX..."
Figure 2-7	ADD "bracket" emcompassing terminals 27-32 inclusive, of E502. Label this FSK-FAX-TIS-3.
Figure 2-8	REPLACE Figure 2-8 with new Figure 2-8 supplied.
Section 3 (text)	REPLACE section 3 text with new section 3 text supplied. DELETE Figure 3-1.
Section 4 (text)	REPLACE section 4 text with new section 4 text supplied.

SECTION	ADDITION/DELETION/CHANGE
Figure 4-1	REPLACE Figure 4-1 with new Figure 4-1 supplied. NOTE: Modify Figures 4-2 and 4-3 as follows: Figure 4-2 - Disregard all references and connections made to Monitor Control, Unit-MCU-2, Directional Coupler-CU-2 and Antenna Tuning Unit-TU-2. Make a connection from J606 to J610. Change designation of "RF INPUT" to "RF OUTPUT" and connect line directly to Antenna. Figure 4-3 - Disregard enclosed box labeled "MCU-2". Place jumper across E603 terminal #2 and terminal #3.
5-2	ADD, to parenthetical phrase in third line of second paragraph, "...TIS..." and Delete ATS-2A. ADD, to CHECK side of troubleshooting list in third paragraph, the following: on first entry --- "TIS center freq. setting" " second " --- "TIS LEVEL ADJ. setting" " second " --- "MMXM OUTPUT control setting"
Section 6	Parts List to be supplied.

This completes the Addendum; the manual should now be essentially representative of TMC Model SBTM-1KJK. The following pages contain those sections and figures supplied for replacement purposes, as previously noted.

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL

The following paragraphs discuss the standby and output operating procedures of the SBTM-1KJK transmitter system. Before operating any of the controls on the transmitter, it is recommended that the operator first familiarize himself with the controls and indicators of each unit. They are explained in the accompanying modular manuals.

3-2. STANDBY OPERATION

EXCITER

CONTROL	POSITION
1) EXCITER switch	ON
2) STANDBY switch	STANDBY
3) RF OUTPUT control	fully CCW

NOTE

For satisfactory stability, the MMX( )2 requires a 1/2 hour warm up period.

AUXILIARY POWER PANEL

1) MAIN POWER circuit breaker	ON

LINEAR POWER AMPLIFIER (PAL-1K)

1) FINAL VOLTAGES switch	OFF
2) TRANSMITTER VOLTAGES switch	STANDBY
3) PA PLATE, SCRN, and CONTR GRID overload circuit breakers	ON
4) MAIN POWER circuit breaker	ON
5) PA FIL PRI meter adjust knob	Adjust for 115 VAC indicated on Filament Primary meter.
6) Mode Switch (located on rear PS-4)	P.T.T. (for ALL modes of operation)

3-3. OPERATING PROCEDURE

CAUTION

Before tuning transmitter, make sure either a Dummy Load or an antenna is connected to the output.

1. Set EXCITER switch at ON.
2. Set POWER switch at ON.
3. Set MMXM frequency selector switches to desired carrier frequency.
4. Set MODE switch to CW.
5. Set RF OUTPUT control to full CCW position.
6. Set TEST KEY to its uppermost position (key will remain in this position).

RF OUTPUT control will now adjust drive to the SBT. At this point, the operator should refer to the PAL-1KB(3) technical manual for transmitter tuning instructions and tuning charts.

Once having tuned and loaded the transmitter on frequency, it is necessary only to set the MMX( )2 to the desired emission mode, as described in the MMX( )2 technical manual. However, when operating FSK/FAX with the TIS, see paragraphs 3-6 and 3-7.

3-4. CW OPERATION

1. Place MODE switch on MMX( )2 to CW (keyline must be closed with external keying device).
2. Test switch on TEST KEY PANEL should be in the neutral position.
3. Remove jumper from terminals 21 and 22 on E502 of APP-4.
4. Follow CW operating procedures outlined in MMX( )2.

3-5. PTT OPERATION

1. Turn TRANSMITTER VOLTAGE switch to STANDBY.
2. Set EXCITER switch to PTT.
3. Insert mike in panel of MMX( )2, or externally wire through terminals 9 and 10 of E501 on APP-4.

3-5. PIT OPERATION (Cont.)

4. Follow PTT operating procedure outlined in MMX( )2 manual.

NOTE

When PTT is activated, transmitter voltages are energized.

3-6. FSK OPERATION

1. Place Mode switch on MMX( )2 to USB, LSB, or ISB, as desired.

2. Externally wire FSK input to appropriate terminals on APP-4.

3. Follow FSK operating procedure outlined in TIS manual and USB, LSB, or ISB operating procedure in MMX( )2 manual, as applicable.

4. Set EXCITER switch on TIS corresponding to the channel(s) to be used for FSK to the FSK/FAX/CW position.

3-7. FAX

1. Place MODE switch on MMX( )2 to USB, LSB, or ISB, as desired.

2. Externally wire FAX input to appropriate terminals on APP-4.

3. Follow FAX operating procedure outlined in TIS manual, and USB, LSB, or ISB operating procedure in MMX( )2 manual, as applicable.

4. Set EXCITER switch on TIS corresponding to the channel(s) to be used for FAX to the FSK/FAX/CW position.

SECTION 4

PRINCIPLES OF OPERATION

4-1. INTRODUCTION

Figure 4-1 is a functional block diagram of the SBTM-1KJK transmitter, showing the main interrelationships of the APP-4A, MMXM, TIS, PAL-1KB3, AX5040 and AX198. For a complete functional block diagram and schematic diagram of each unit, refer to the individual manual for the unit.

4-2. BLOCK DIAGRAM DESCRIPTION (Refer to figure 4-1).

a. SIGNAL GENERATION AND AMPLIFICATION. - The Auxiliary Power Panel APP-4A is a distribution panel providing interconnection between internal and external transmitter circuitry. The APP-4 distributes the primary ac input power to the PS4, and to Jacks J613 and J614, which provide primary ac power to the MMXM-2, and TIS. The APP-4 also has two AC utility outlets. The Push-to-talk, keying, audio line, FAX, and FSK inputs are applied through the APP-4.

The audio and keying input signals enter the APP-4 at E501 and E502. They are then coupled to terminal boards, TB103, TB104 and TB105 of the multimode exciter MMXM-2. The MMXM-2 provides an r-f output signal in the range of 1.6-29.9999 MHz at up to 250 mw in the SSB, ISB, AM and AME modes of operation. In the CW, FSK, and FAX modes, up to 1 watt of output is available. When the MMXM-2 is in the CW mode, a circuit test may be performed by using switch S1001 on the test key panel.

The output signal from the MMXM-2 is applied to jack J201 of the linear power amplifier RFD-1B. The signal is then passed through three stages of amplification in the RFD, producing a 1 kilowatt (PEP) peak envelope power output signal at E203. The 1 kilowatt signal is coupled to terminal E602 of the Transmit/Receive unit, AX198, where it passes through one set of contacts on coaxial T/R relay K601. The signal is then applied to the antenna.

b. AUTOMATIC LOAD AND DRIVE CONTROL. - When switch S209 in the RFD is turned to the external position, the ALDC signal is fed out of the RFD to the PS4 where it is

coupled back to the MMXM2.

c. TRANSMITTER/RECEIVER (T/R) ANTENNA SYSTEM. - If suitable connections are made to a receiver (refer to figures 2-7 and 4-2) at terminals 23 through 25 of E502 in APP-4 and J606 on AX-198, a T/R antenna system may be incorporated. In this system, the receiver and transmitter share the same antenna. AX198 T/R relay K601, controlled by the TRANSMITTER VOLTAGES switch, serves to switch the antenna between receiver and transmitter. Receiver muting is also possible, in which the receiver is muted while the antenna is connected to the transmitter.

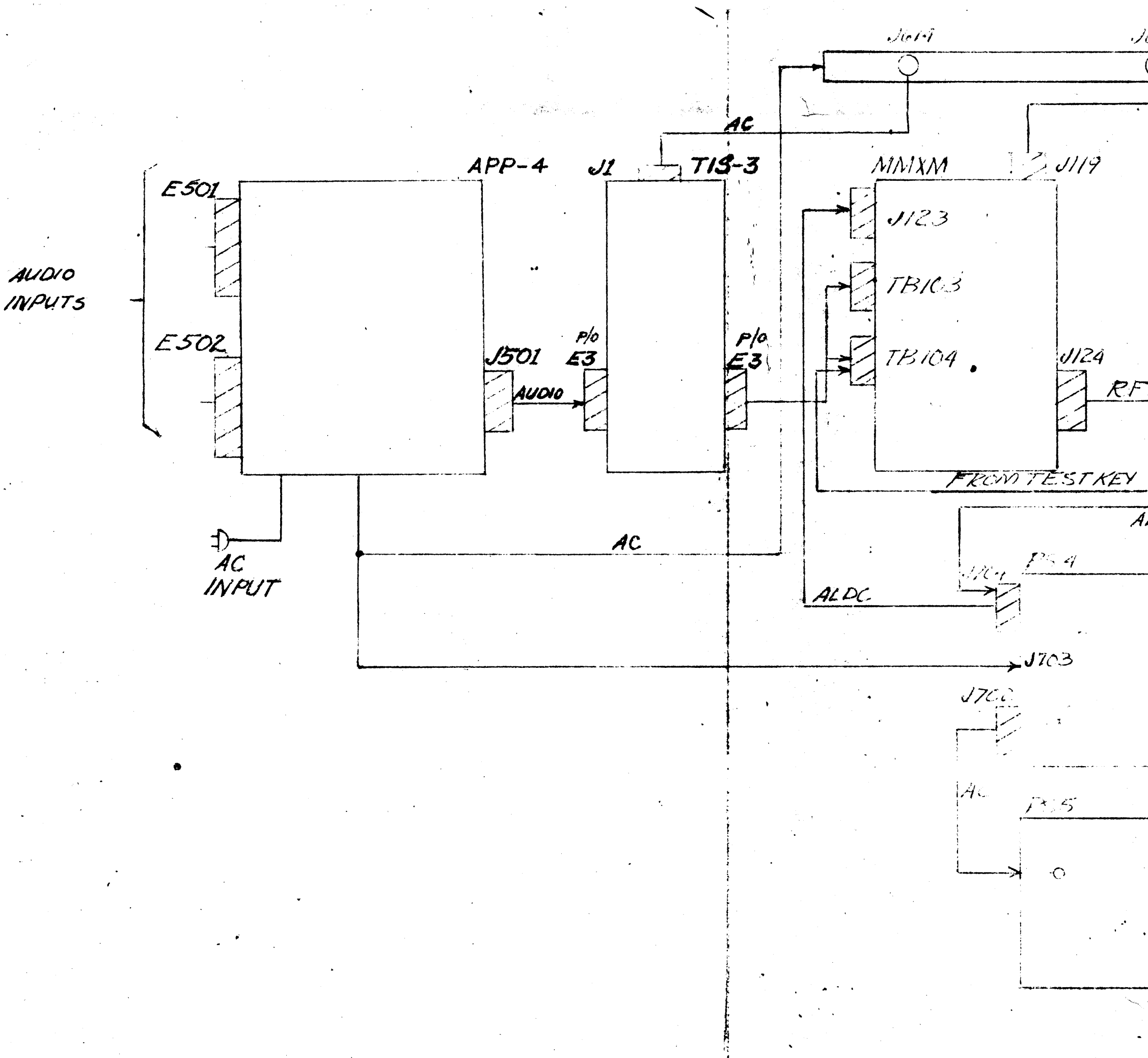
In order to make SBTM adaptable to an external antenna system and receiver muting system, relay K601 is inserted in the circuitry. When TRANSMITTER VOLTAGES switch (S703) is closed, relay K703 is energized, providing a path for the +500 VDC source in the PS-4, completing a circuit to ground through E701 terminal 9, P607 and J607 pin F, K601 relay coil, normally closed contacts of K602 relay, P607 and J607 pin E and TRANSMITTER VOLTAGES switch (S702). This energizes K601 relay, closing a set of contacts and thereby connecting the output of RFD amplifier to the antenna. Another set of contacts on K601 also close, providing the -200VDC source for the interlock circuit a path to ground through normally closed contacts of K602 and P607 and J607 pin G. The resulting current through K703 coil energizes this relay and the RFD receives its medium plate voltages. The next step in operating the transmitter is to close the FINAL VOLTAGES switch, in order to supply the RFD amplifier with high voltage. This action also supplies AC to the coil of K603 relay. The resulting energization of this relay cause the -200VDC source and the +500 VDC source to switch paths to ground. From this point on, it becomes possible to obtain on-off control of the transmitter by manipulation of the TRANSMITTER VOLTAGES switch (S702) as long as FINAL VOLTAGES switch closure also causes antenna changeover. Note that antenna switching is dependent upon FINAL VOLTAGES switch, which is itself dependent upon TRANSMITTER VOLTAGES switch (S702). When TRANSMITTER VOLTAGES switch is returned to STANDBY, relays K703, K602 and K601 become de-energized in that sequence; when

switch is returned to ON position relays K601, K703 and K602 become energized in that sequence. The sequences prevent the antenna from becoming disconnected at an instant when the high plate voltages are still applied to the RFD-1B amplifier.

d. INTERLOCK SYSTEM. - (Refer to figure 4-3: Interlock Diagram) A complete safety interlock system is provided throughout the transmitter. The purpose of the interlock system is to prevent the transmitter from operating when any one of a series of dangerous conditions exist. Essentially, a negative voltage (-200VDC), originated in the PS-4 unit, completes a circuit through a series of interlocks when TRANSMITTER VOLTAGES switch is closed. The completion of this circuit sends current through K703 relay coil. Energization of K703 furnishes +500VDC supply to RFD-1B driver tube plate and +250VDC to RFD-1B 1st amplifier tube plate. The subsequent manual closing of FINAL VOLTAGES switch sends +500VDC to PA tube screen in RFD-1B and line voltage to PS-5B High Voltage Power Supply which, in turn, supplies +3000VDC to RFD-1B PA tube plate. The SBTM interlock system is the same as the PAL-1K (B2) interlock system with an additional link through the APP-4 and AX-198 units. The complete series of links capable of opening the interlock circuit are summarized in table 4-1.

TABLE 4-1. INTERLOCK CIRCUIT COMPONENTS

UNIT	INTERLOCK OR CIRCUIT BREAKER	CLOSED
PS-4	PA OVERLOAD CONT GRID circuit breaker CB702	When no overload condition exists in the RFD-1B PA grid circuit
PS-4	PA OVERLOAD SCRN GRID circuit breaker CB703	When no overload condition exists in the RFD-1B screen grid circuit
PS-4	PA OVERLOAD PLATE circuit breaker CB704	When no overload condition exists in the RFD-1B PA plate circuit
RFD-1B	Air switch interlock S206	When blower motor B201 is operating normally
RFD-1B	Band switch S205	When PA BAND switch S202 is properly set in a detent
RFD-1B	Top cover interlock S207	When top cover of the RFD-1B is secured in position
RFD-1B	Bottom cover interlock S208	When the bottom cover of the RFD-1B is secured in position
PS-5B	Top cover interlock S403	When top cover of PS-5B is secured in position
PS-5B	Door interlock S402	When PS-5B is secured in the rack
RAK-9( )	Door interlock S602	When rear door of rack is closed
B601	Door interlock S601	When rear door of rack is closed
AX-198	Push-button interlock S603	When RFD-1B is secured in rack
AX-198	Switch interlock S604	When antenna cable is connected to AX-198 at J609


J614
AC
APP-4
J1
TIS-3
MMIXM
J119
E501
E502
AUDIO INPUTS
J123
TB103
TB104
J124
RF
J501
AUDIO
P/O E3
P/O E3
FROM TEST KEY
AC
AC INPUT
AC
AL DC
J703
J705
J704

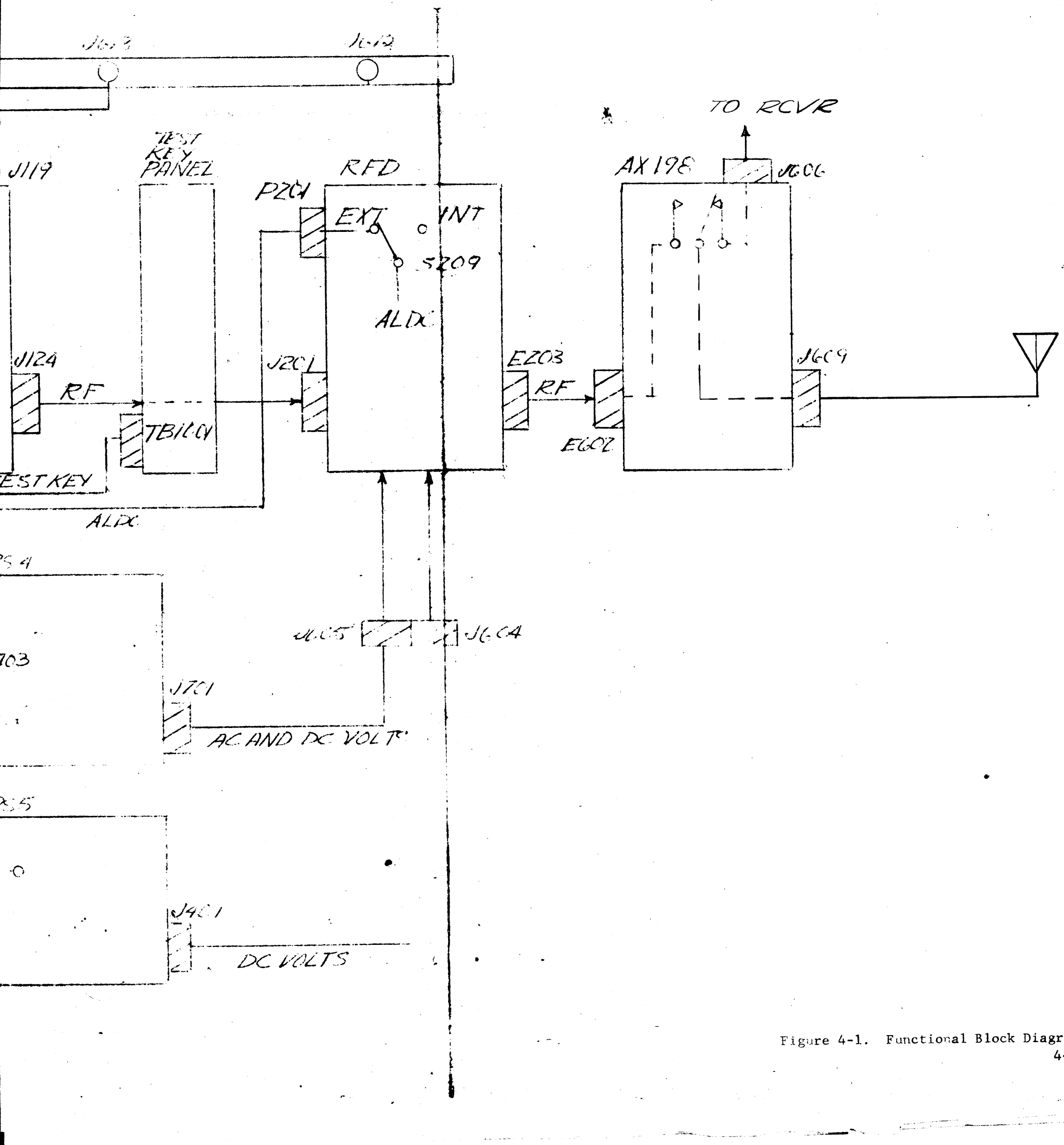
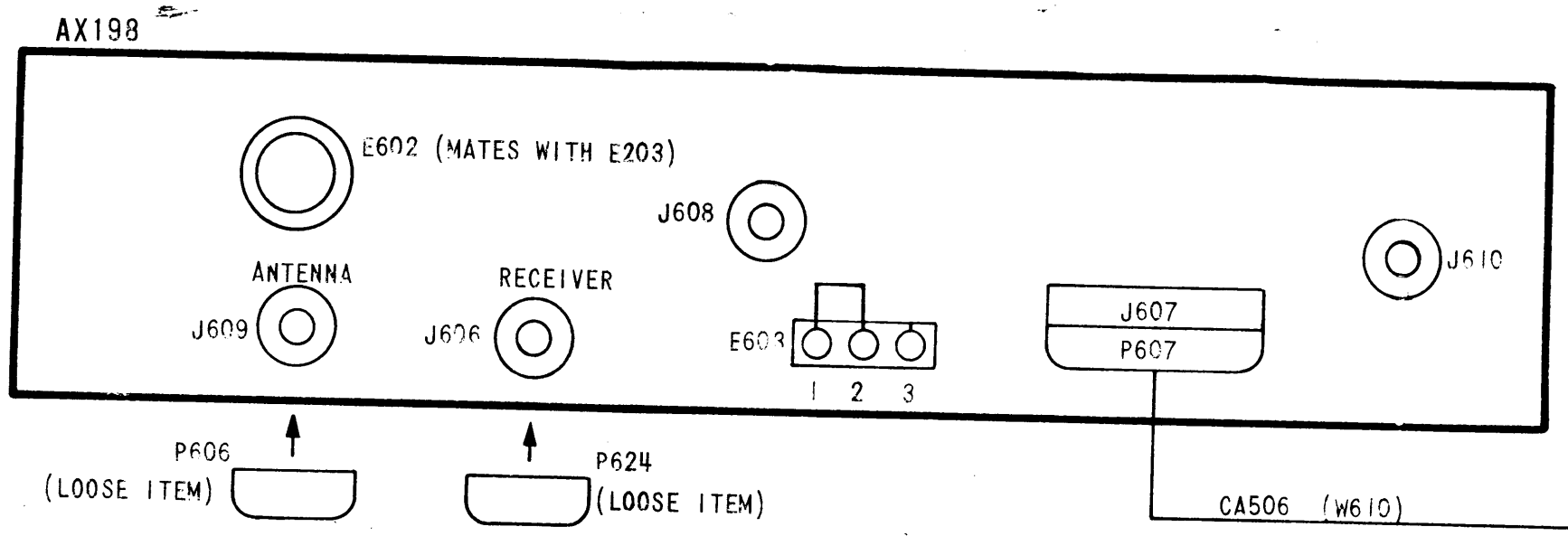


Figure 4-1. Functional Block Diagram



AX198 MOUNTED ON REAR OF CABINET J606, J607. J609 AND E603 ARE MOUNTED ON BOTTOM OF AX198

CA506 (W610)

CA506 TERMINATING POINTS		
ITEM	FROM	TO
1	P607, PIN J	APP-4, C504
2	E701, TERM 4	APP-4, C501
3	P607, PIN H	E701, TERM 6
4	↕ G	APP-4, GRD
5	↕ F	E701, TERM 9
6	↕ E	E701, TERM 4
7	↕ D	APP-4, C517
8	↕ C	APP-4, C516
9	↕ B	APP-4, C515
10	↕ A	E701, TERM 5
11	↕ K	APP-4, C505
12	↕ H	↕ C502
13	P607, PIN A	↕ C503
14	E701, TERM 8	APP-4, GRD
15	E701, TERM 1	E601
16	S601	E601
17	S601	E701, TERM 2
18	S602	E701, TERM 3
19	S602	P607, PIN L
20	J602	APP-4 (UTILITY)
21	J602	APP-4 (UTILITY)
38	P607, PIN N	E701, TERM 1
39	P607, PIN M	E701, TERM 2

RFD-1B

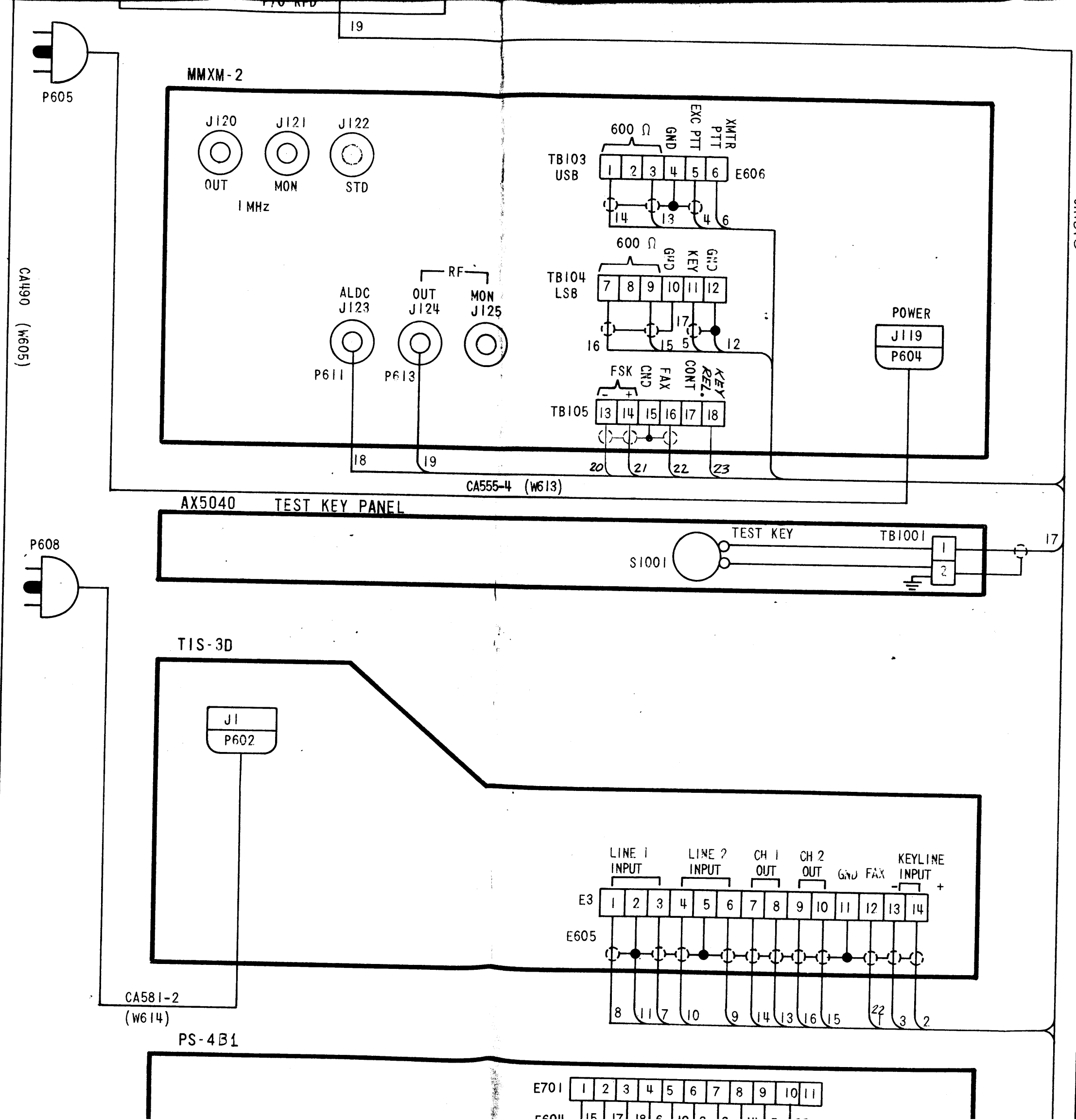
MMXM-2

CA1578

CA1578 TERMINATIONS		
ITEM	FROM	TO
1	P607, PIN P	APP-4, C504
2	E701, TERM 5	APP-4, C501
3	P607, PIN R	E701, TERM 7
4	↕ G	APP-4, GRD
5	↕ F	E701, TERM 10
6	↕ E	E701, TERM 5
7	↕ D	APP-4, C517
8	↕ C	APP-4, C516
9	↕ B	APP-4, C515
10	↕ A	E701, TERM 6
11	↕ K	APP-4, C505
12	↕ H	↕ C502
13	P607, PIN S	↕ C503
14	E701, TERM 9	APP-4, GRD
15	E701, TERM 2	E601
16	S601	E601
17	S601	E701, TERM 3
18	S602	E701, TERM 4
19	S602	P607, PIN T
20	J602	APP-4 (UTILITY)
21	J602	APP-4 (UTILITY)
38	P607, PIN U	E701, TERM 2
39	P607, PIN V	E701, TERM 3

19	S602	P607, PIN L
20	J602	APP-4 (UTILITY)
21	J602	APP-4 (UTILITY)
38	P607, PIN N	E701, TERM 1
39	P607, PIN M	E701, TERM 2

CA1578 TERMINATIONS		
ITEMS	FROM	TO
1	P609, PIN B	E3 TERM 12
2	D	E3 TERM 14
3	F	E3 TERM 13
4	G	TB103 TERM 5
5	H	TB104 TERM 11
6	J	TB103 TERM 6
7	K	E3 TERM 3
8	M	E3 TERM 1
9	N	E3 TERM 6
10	R	E3 TERM 4
11	X	E3 TERM 2
12	P609, PIN X	TB104 TERM 12
13	E3 TERM 8	TB103 TERM 3
14	E3 TERM 7	TB103 TERM 1
15	E3 TERM 10	TB104 TERM 9
16	E3 TERM 9	TB104 TERM 7
17	TB1001 TERM 2	TB104 TERM 11
18	P635	P611
19	P613	P612
20	P609 PIN S	TB105 TERM 13
21	P609 PIN L	TB105 TERM 14
22	TIS-3D E3-12	TB105 TERM 16
23	PS4B1 E701-10	TB105 TERM 18



E605

CA581-2
(W614)

8 11 7 10 9 14 13 16 15 22 3 2

PS-4B1

E701 1 2 3 4 5 6 7 8 9 10 11

E604 15 17 18 6 10 3 2 14 5 23 CA506

J703
P601

J704
EXT
ALDC
P628

J701
P614

J702
P401

CA509
(W611)

∓(W606) CA491

P/O PS-5B

18 CA1483

CA588-1 (W615)

APP-4D

FOR 115V OPERATION
CONNECT: 1 AND 2
4 AND 5
7 AND 8

FOR 230V OPERATION
CONNECT: 2 AND 3
5 AND 6
8 AND 9

UTILITY AC
20
21

WHT
BLK
BL/WH

AC OUTPUT

AC INPUT

CA493 (W612)

2 12 13 1 11 CA506 9 8 7 4,14

C501 C502 C503 C504 C505 C515 C516 C517

REMOTE XMTR PLATE
115V ANT RELAY
EXTERNAL INTERLOCKS
PUSH TO TALK
MMX FSK - +
CHANNEL 1 INPUT
CHANNEL 2 INPUT
KEY LINE
RECEIVER MUTING NO C NC
FSK - +
FAX TIS-3
KEY
FAX
VOLT-XFK

E501 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 E502

J501
P609

NOTE: WHEN NOT USING EXTERNAL INTERLOCKS OR KEYING, CONNECT JUMPERS BETWEEN TERMINALS 5 & 6, 7 & 8, 21 & 22 AS SHOWN

CA1578
(W609)

PS-5B

J401
P615

(W605) CA490

P/O PS-5B

∓ CA491 CONNECTIONS ARE DIRECTLY PIN TO PIN

ZONE | LTR | DESCRIPTION | REVISIONS

4 3 2

CA588-1 (W615)

APP-4D

FOR 115V OPERATION
CONNECT: 1 AND 2
4 AND 5
7 AND 8

FOR 230V OPERATION
CONNECT: 2 AND 3
5 AND 6
8 AND 9

UTILITY AC

WHT
BLK
BL/WH

AC INPUT

AC OUTPUT

CA506

C501 C502 C503 C504 C505 C515 C516 C517

REMOTE 115V XMTR PLATE
ANT RELAY
EXTERNAL INTERLOCKS
PUSH TO TALK
MMX FSK
CHANNEL 1 INPUT
CHANNEL 2 INPUT
KEY LINE
RECEIVER MUTING NO C NC
FSK
FAX TIS-3
KEY
FAX
VOLT-XFK

E501 E502

J501
P609

CA1578 (W609)

CA493 (W612)

NOTE: WHEN NOT USING EXTERNAL INTERLOCKS OR KEYING, CONNECT JUMPERS BETWEEN TERMINALS 5 & 6, 7 & 8, 21 & 22 AS SHOWN

‡ CA491 CONNECTIONS ARE DIRECTLY PIN TO PIN

PS-5B

J401
P615

(W605) CA490

P/O PS-5B

P620
(LOOSE ITEM)

J601
AC INPUT

S601 S602

P607
(LOOSE ITEM)

J602
UTILITY AC INPUT

CA506 (W610)

P603
J603

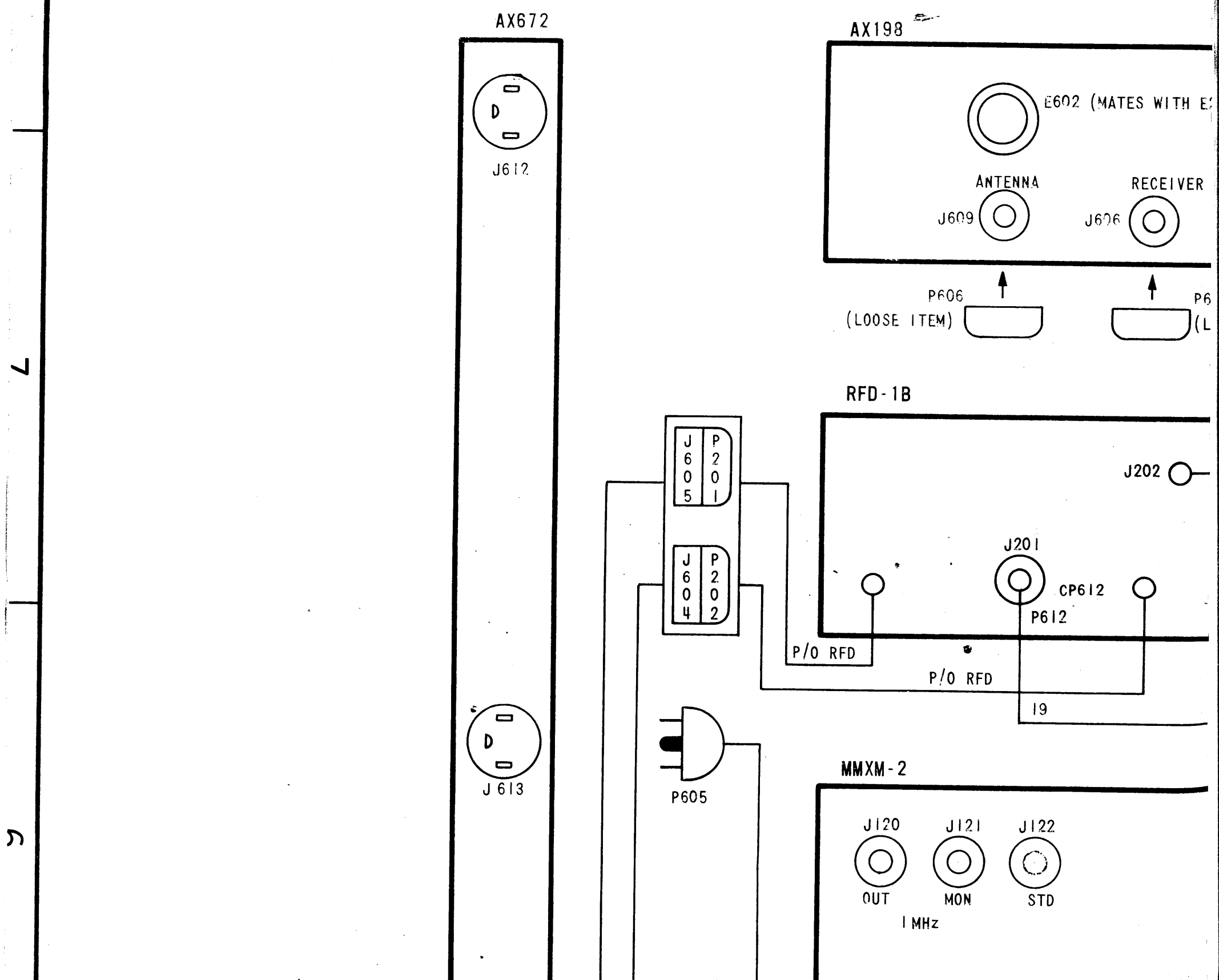
REVISIONS

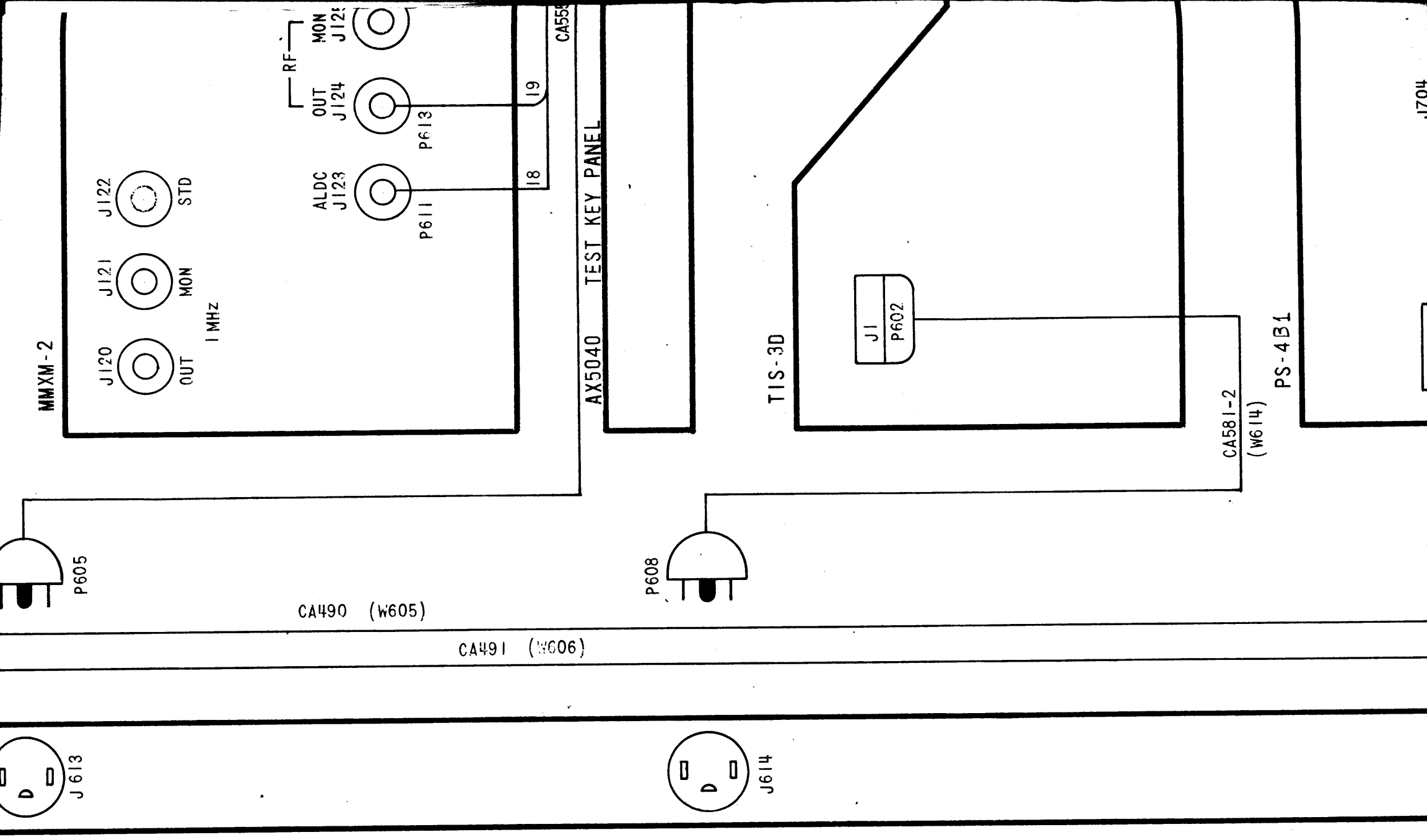
ZONE	LTR	DESCRIPTION	DATE	E.M.N NO	DRAFT	CHKD	APPD

CK 1770

3 2 1

B C D

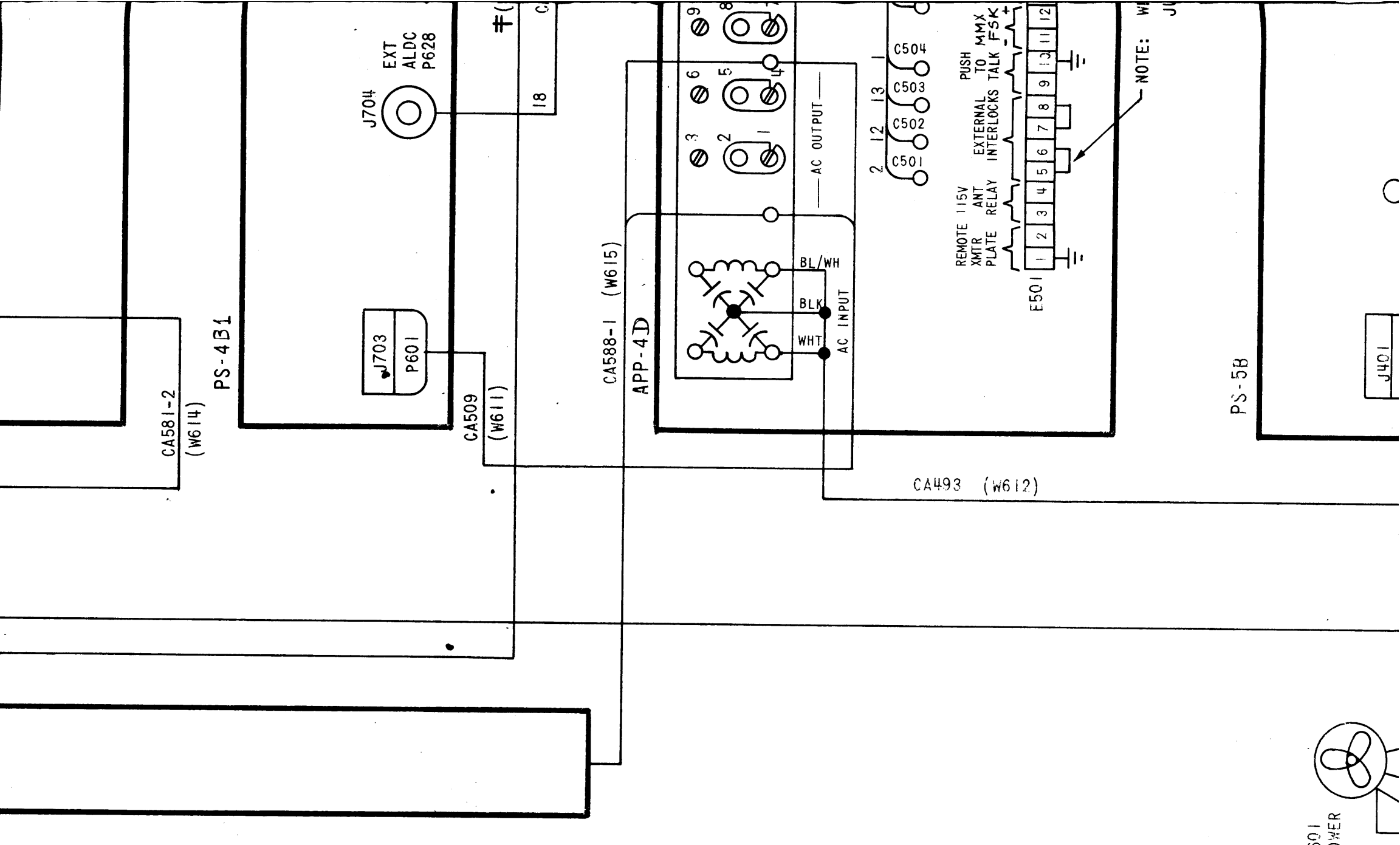

AX672
D
J612
D
J613
AX198
E602 (MATES WITH E
ANTENNA
J609
RECEIVER
J606
P606
(LOOSE ITEM)
P6
(L
RFD-1B
J202
J605
P201
J604
P202
J201
CP612
P612
P/O RFD
P/O RFD
19
P605
MMXM-2
J120
J121
J122
OUT
MON
STD
1 MHz



	SBTM-1KJK
QTY / UNIT	MODEL USED ON
APPLICATION	
	CODE

NOTICE TO PERSONS RECEIVING THIS DRAWING

THE TECHNICAL MATERIEL CORPORATION claims proprietary right in the mater
This drawing is issued in confidence for engineering information only and may not b
to manufacture anything shown hereon without permission from **THE TECHNICAL MA**
to the user. This drawing is loaned for mutual assistance and is subject to recall a



	SBTM-1KJK	
NIT	MODEL USED ON	ASS'Y NO.

APPLICATION

	CODE	

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

TOLERANCES ON

DECIMALS	FRACTIONS
.X ± .05	± 1/64
.XX ± .01	ANGLES
.XXX ± .005	± 0° 30′

MATERIAL

FINISH

FINAL APPROVAL	DATE	3/16/70
MECH. DES	DATE	
ELECT. DES	DATE	3/16/70
CHECKED	DATE	3/24/70
DRAWN J. ANGER	DATE	3/16/70

LIST OF MATERIAL

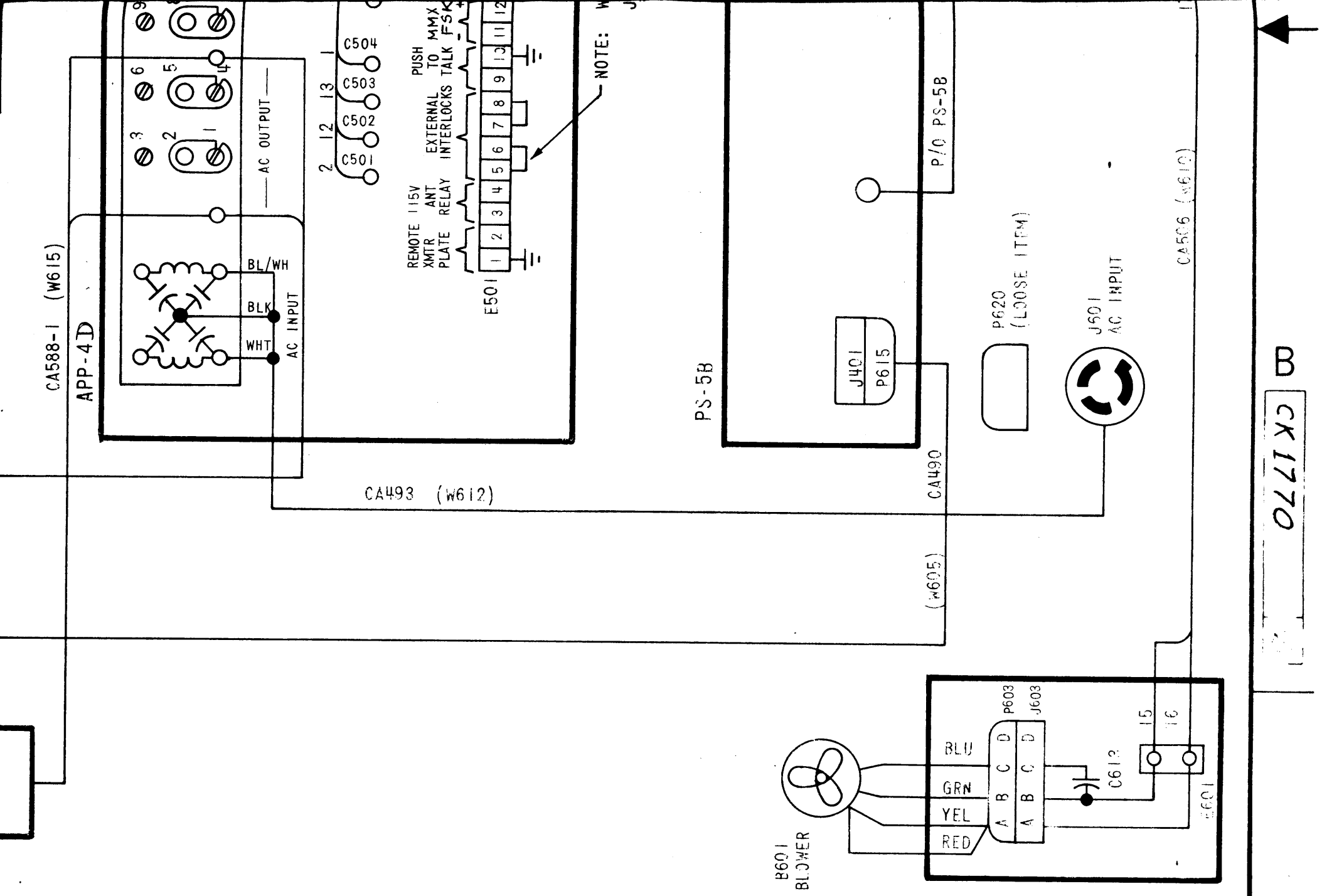
THE TECHNIC

MAMARO

DIAGRAM

SIZE	CODE IDENT.NO.	DWG
D	82679	

SCALE –



LIST OF MATERIAL

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

TOLERANCES ON

DECIMALS	FRACTIONS
.X ± .05	± 1/64
.XX ± .01	ANGLES
.XXX ± .005	± 0° 30′

MATERIAL

FINISH

FINAL APPROVAL		DATE 3/16/70
MECH. DES		DATE
ELECT. DES		DATE 3/16/70
CHECKED		DATE 3/24/70
DRAWN	V. ANGER	DATE 3/16/70

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK

DIAGRAM, WIRING

Figure 2-8.

SIZE	CODE IDENT.NO.	DWG NO.	ISSUE
D	82679	CK 1770	
SCALE –			SHEET / OF /