UNCLASSIFIED

ORIGINAL

TECHNICAL MANUAL

for

GENERAL PURPOSE TRANSMITTER

MODEL SBT-1KA6

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

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IN-1001/A6

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NOTICE

FOREWORD

TMC's General Purpose Transmitter, Model SBT-1KA6 (sometimes called Sideband Transmitter) consists of a rack (equipped with cabling and bolted-down components) and seven removable drawers of equipment as follows:

SWR-1K Standing Wave Ratio Indicator

RFD-1B (P/O PAL-1KB2) RF Power Amplifier

VOX-5 Variable Frequency Oscillator

(P/O SBE-8) Exciter Unit, Transmitting Mode Selector

A1397 (P/O SBE-8) Power Supply, Transmitting Mode Selector

PS-4B (P/O PAL-1KB2) Low Voltage Power Supply

PS-5B (P/O PAL-1KB2) High Voltage Power Supply

These seven basic units are also included in different combinations in various TMC transmitter and receiving systems, as well as in the SBE-1KA6. To satisfy this condition most practically, individual manuals on each unit are written, then combined as required to cover any of SBT-1K's multi-model transmitters. In this way, the "building-block" manuals may be assembled in many arrangements in order to fully describe a great many specific equipments. The SBT-1KA6 manual is made up of individual manuals as described in Table of Contents of General Purpose Transmitter, Model SBT-1KA6.

The following colloquial terms are used in this manual to simplify formal nomenclature terminology.

FORMAL	COLLOQUIAL
Transmitting Set, Radio, AN/URT-19(V)	General Purpose Transmitter, SBT-1KA6
Indicator, Standing Wave Ratio, IM-166/URT	Standing Wave Ratio Indicator, SWR-1K
Amplifier Power Supply Group, AN/URA-( )	Linear Power Amplifier, PAL--1K(B2)
Oscillator, Radio Freq-qency, 0-330(B)/FR	Variable Frequency Oscillator, VOX-5
Modulator Power Supply Group, AN/URA( )	Transmitting Mode Selector, SBE-8

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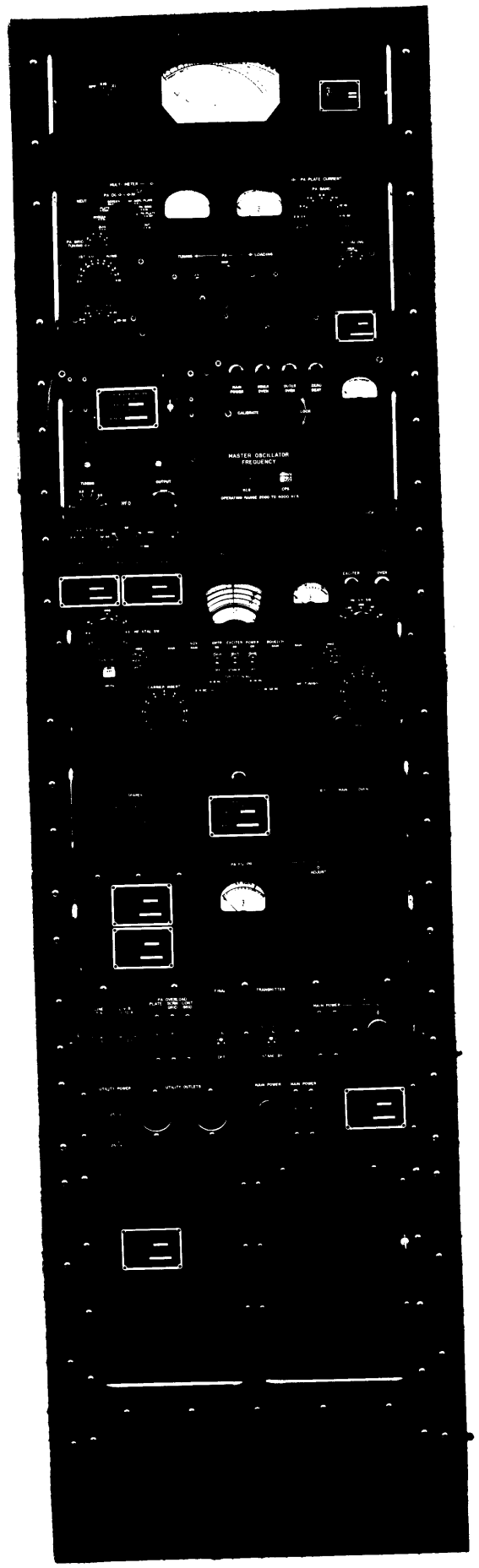


302-I-1

Figure 1-1. Front View, SBT-1KA6 General Purpose Transmitter

SECTION 1
GENERAL INFORMATION

1-1. INTRODUCTION

Technical Materiel Corporation's General Purpose Transmitter, model SBT-1KA6, frequently called Sideband Transmitter, has an output of 1 kilowatt (PEP) continuously adjustable through the frequency range of 2 to 32 megacycles. The transmitter operates in the following modes:

CW (telegraphy)

SSB (single sideband) with suppressed or adjustable carrier

DSB (double sideband) with suppressed or adjustable carrier

ISB (isolated sidebands) with suppressed or adjustable carrier

AME (amplitude modulation Equivalent)

1-2. FUNCTIONAL DESCRIPTION

Figure 1-1 is used for a brief functional description of the transmitter. Functions of each removable drawer are described in the following paragraphs in the order as they appear reading from top to bottom.

(a) Standing Wave Ratio Indicator, model SWR-1K - This unit provides accurate indication of the Voltage Standing Wave Ratio in the antenna circuit providing simultaneous indication of forward and reflected power.

(b) Amplifier Unit Model RFD-1B - RFD-1B, part of Linear Amplifier model PAL-1K(B2) amplifies the output of the Exciter (SBE) up to 1 kilowatt (PEP).

(c) Variable Frequency Oscillator, Model VOX-5 - This unit is a precision, highly stable variable frequency oscillator that supplies a continuously adjustable injection frequency to the Exciter.

(d) Transmitting Mode Selector, Model SBE-8 - The SBE translates intelligence from two audio input channels or mike input into single, double or independent sidebands with suppressed or any degree of carrier and translates this intelligence by various oscillator and conversion stages. The resultant is a highly stable output signal in the 2 to 32 mc frequency range.

(e) Power Supply (A1397) - This unit is the power supply for the SBE-8.

(f) Power Supply, Model PS-4A - This unit is the medium voltage power supply unit for the PAL -1K(B2) RF Linear Amplifier.

(g) Auxiliary Power Panel Model APP-4 - This unit functions as a distributor for line voltage to the modular units and also contains wiring connection for audio input and keyer. Contacts are provided for wiring this transmitter into a larger transmitter system and/or a transmitter/receiver system utilizing a common antenna. Associated with this function are relays located in the AX-198 RF output chassis at the top of the rack mounted in back of the SWR-1K.

(h) High Voltage Power Supply, PS-5B - This unit is the high voltage power supply of the PAL-1K(B2) RF Linear Amplifier.

Additional capabilities of the transmitter are found in the individual modular unit - Technical manuals. These units may be used by themselves, without removing them from the rack.

1-3. PHYSICAL DESCRIPTION

The transmitter shown in figure 1-1, is contained in a single standard relay type rack measuring 72-1/4 inches high x 20-5/8 inches wide x 22-1/2 inches deep. This rack is base mounted and mounting holes in the base are for bolting the rack directly to the floor. The transmitter weighs approximately 675 pounds and is manufactured in accordance with MILITARY specifications wherever practicable. All parts meet or exceed the highest quality standards.

1-4. REFERENCE DATA

The SBT-1KA6, crated for shipping, is divided into 5 crates with sizes and gross weights as follows:

Crate No.	size of crate (inches)	gross weights (lbs)
1	78-1/2 x 23-1/8 x 31-1/2	485
2	26-3/4 x 22-3/4 x 20-5/8	97
3	31-1/2 x 23-3/4 x 29	210
4	31-1/2 x 23-7/8 x 30-3/4	216
5	31-1/2 x 23-7/8 x 30-3/4	284
		1,292 lbs total

Electrical characteristics are given in Table 1-1.

TABLE 1-1. TECHNICAL SPECIFICATIONS, SBT-1KA6

Output power:	1000 watts PEP for all modes
Frequency range:	2 to 32 megacycles
Modes of operation:	CW, SSB, DSB, ISB, AM (sideband modes with suppressed carrier or any degree of carrier)
Output impedance:	50 ohms unbalanced
Harmonic suppression:	2nd harmonic at least 40 db below PEP 3rd harmonic at least 50 db below PEP
Signal/distortion ratio:	2-22 mc: Distortion at least 40 db below either tone of a standard two tone test 22-32 mc: Distortion at least 35 db below either tone of a standard two tone test
Frequency stability:	1 part in 1 x 10^6/day
Unwanted sideband rejection:	1000 cps tone at least 60 db below PEP
Carrier insertion:	-55db to full output
Audio response:	Flat within 3db in 250 to 3040 cps range
Audio input:	Two 600-ohm channels balanced or unbalanced -20dbm to +20dbm

TABLE 1-1. TECHNICAL SPECIFICATIONS, SBT-1KA6 (Cont)

Audio input: (Cont)	One 500,000-ohm input for crystal or dynamic mike, -50dbm for full output
Tuning:	All tuning and bandswitching controls on front panels (no plug-in components)
Metering:	Front panel meters indicate operation of all critical circuits
ALDC:	An automatic load and drive control is furnished to limit distortion during high drive peaks or load changes.
T/R function:	A co-axial antenna relay and receiver muting circuit is provided to facilitate half-duplex operation.
Cooling:	Pressurized cabinet, filtered forced air for maximum heat dissipation
Safety features:	1. Full interlock protection 2. Full overload and fuse protection
Environmental conditions:	Designed to operate in any ambient temperature between 0° and 50°C., and any value of humidity up to 90%.

SECTION 2
INSTALLATION

2-1. UNPACKING AND HANDLING

The transmitter is shipped in boxes as shown by (figures 2-2 and 2-3). The box number is stenciled on the outside of each box and the contents are listed on the packing list. Inspect all boxes for possible damage when they arrive at the operating site. With respect to equipment damage for which the carrier is liable, the Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

Inspect the contents of each box for possible damage and inspect the packing material for parts that may have been shipped as loose items.

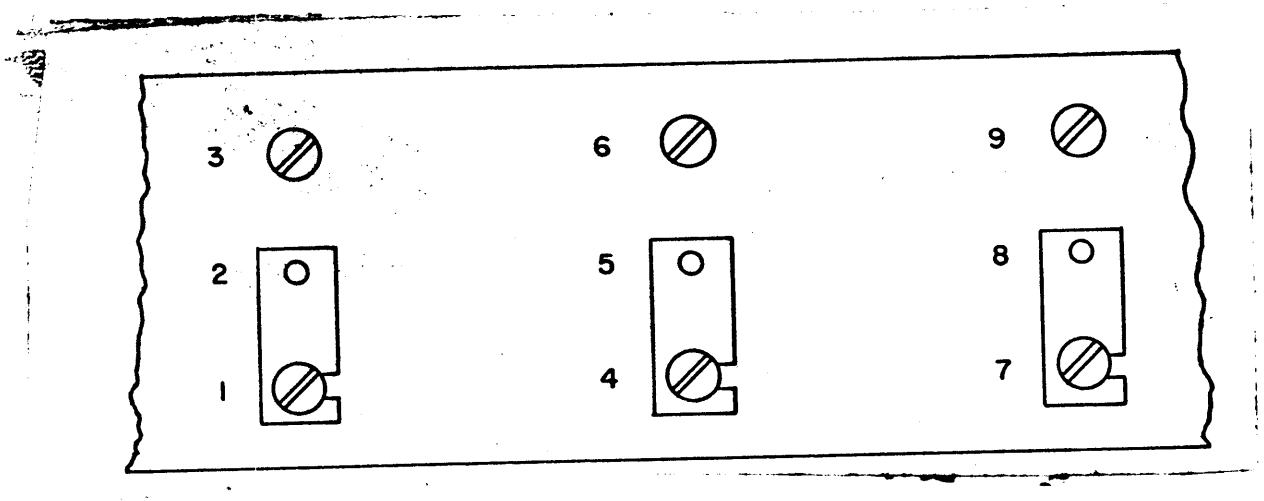
2-2. POWER REQUIREMENTS

All units of the transmitter leave the factory wired for 115-volt, 50/60 cycle, single phase line voltage unless ordered otherwise. Change may be made to 230-volt, 50/60 cycle, single phase operation by making minor wiring changes in modular units listed in Table 2-1. (also see Fig. 2-1). Consult the installation information and schematic diagrams provided in the individual modular-unit manuals for wiring-change information.

CAUTION

If 230 volt, 50/60 cycle operation is used, all line fuses except those in LV Power Supply PS-4A and Power Supply PS-5B must be reduced to one half their rated current values to assure adequate circuit protection. Regulated and high voltage fuses remain the same with either line voltage.

Power consumption of the SBT-1K is approximately 3000 watts; power cabling of sufficient size to provide 30 amperes at 115 volts a-c, single phase, is adequate.



APP BUS STRAP ARRANGEMENT

NOTES:

1. For 115VAC operation, connect terminals 1 and 2, 4 and 5, 7 and 8.

2. For 230VAC operation, connect terminals 2 and 3, 5 and 6, 8 and 9.

Figure 2-1. 230V Line Voltage Modification Diagram, APP-4

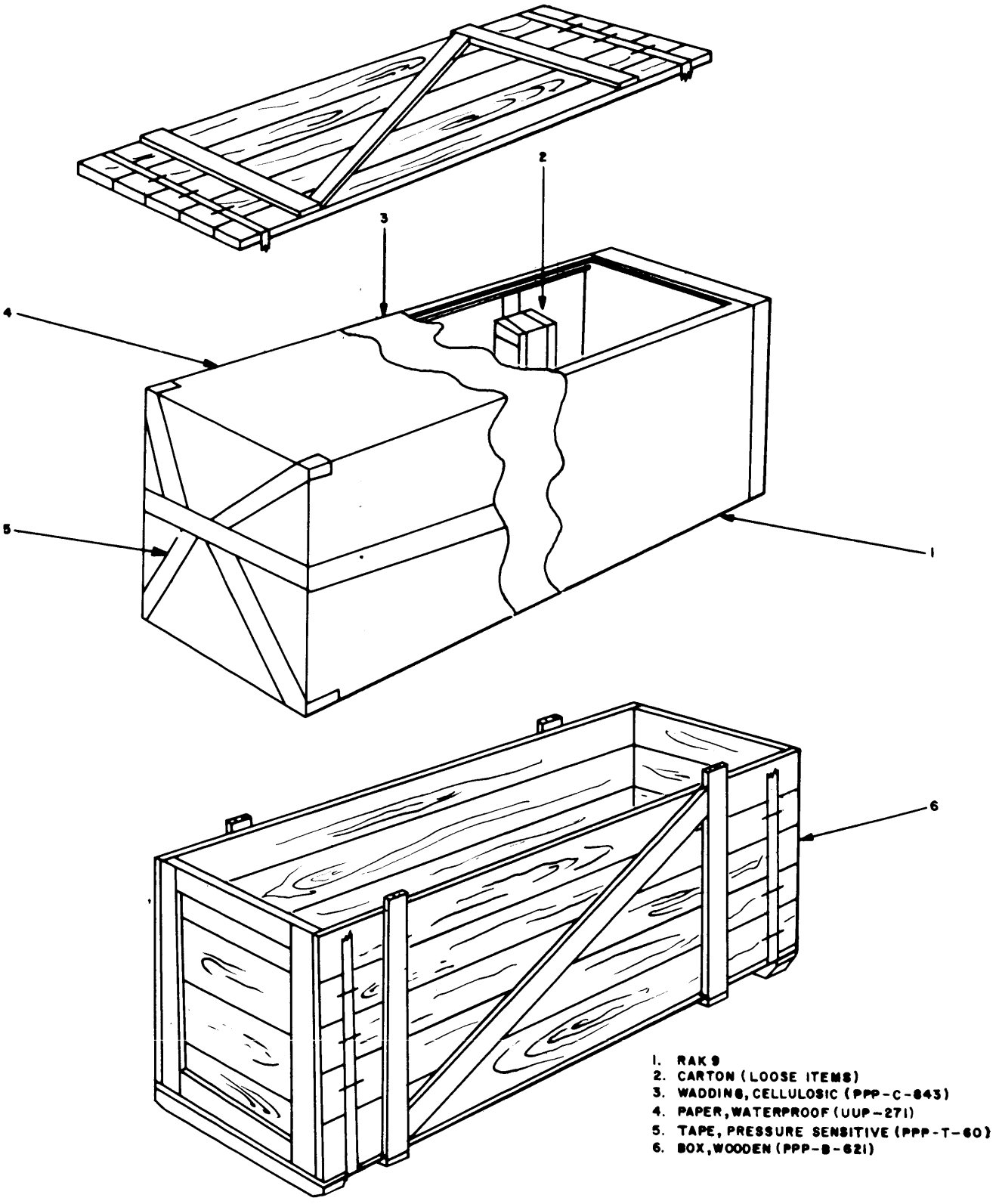
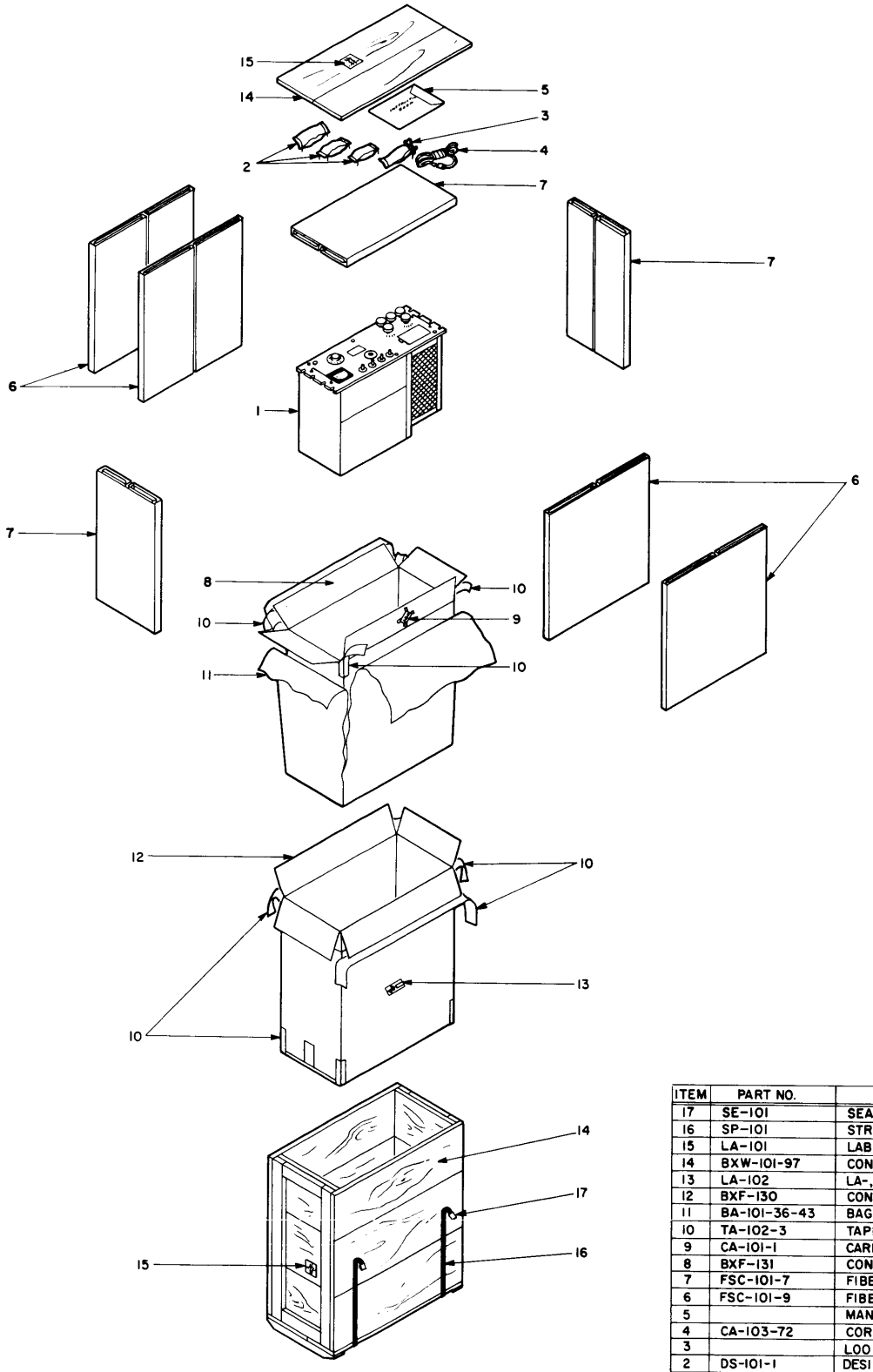


Figure 2-2. Rack, Preparation for Shipment



ITEM	PART NO.	DESCRIPTION
17	SE-101	SEALS, STRAPPING
16	SP-101	STRAPPING, STEEL
15	LA-101	LABEL, FRAGILE
14	BXW-101-97	CONTAINER, SHIPPING
13	LA-102	LA-, METHOD II
12	BXF-130	CONTAINER, OUTER
11	BA-101-36-43	BAG, BARRIER
10	TA-102-3	TAPE, PRESSURE SENSITIVE
9	CA-101-1	CARD, HUMIDITY INDICATOR
8	BXF-131	CONTAINER
7	FSC-101-7	FIBERBOARD SHEET, CREASED
6	FSC-101-9	FIBERBOARD SHEET, CREASED
5		MANUALS, INSTRUCTION
4	CA-103-72	CORD, LINE
3		LOOSE ITEMS
2	DS-101-1	DESICCANT, 16 UNIT
1		MODULAR UNIT

329-3*

Figure 2-3. Modular Units, Preparation for Shipment Typical

TABLE 2-1. WIRING CHANGES, 115-VS 230-VOLT LINE SUPPLY

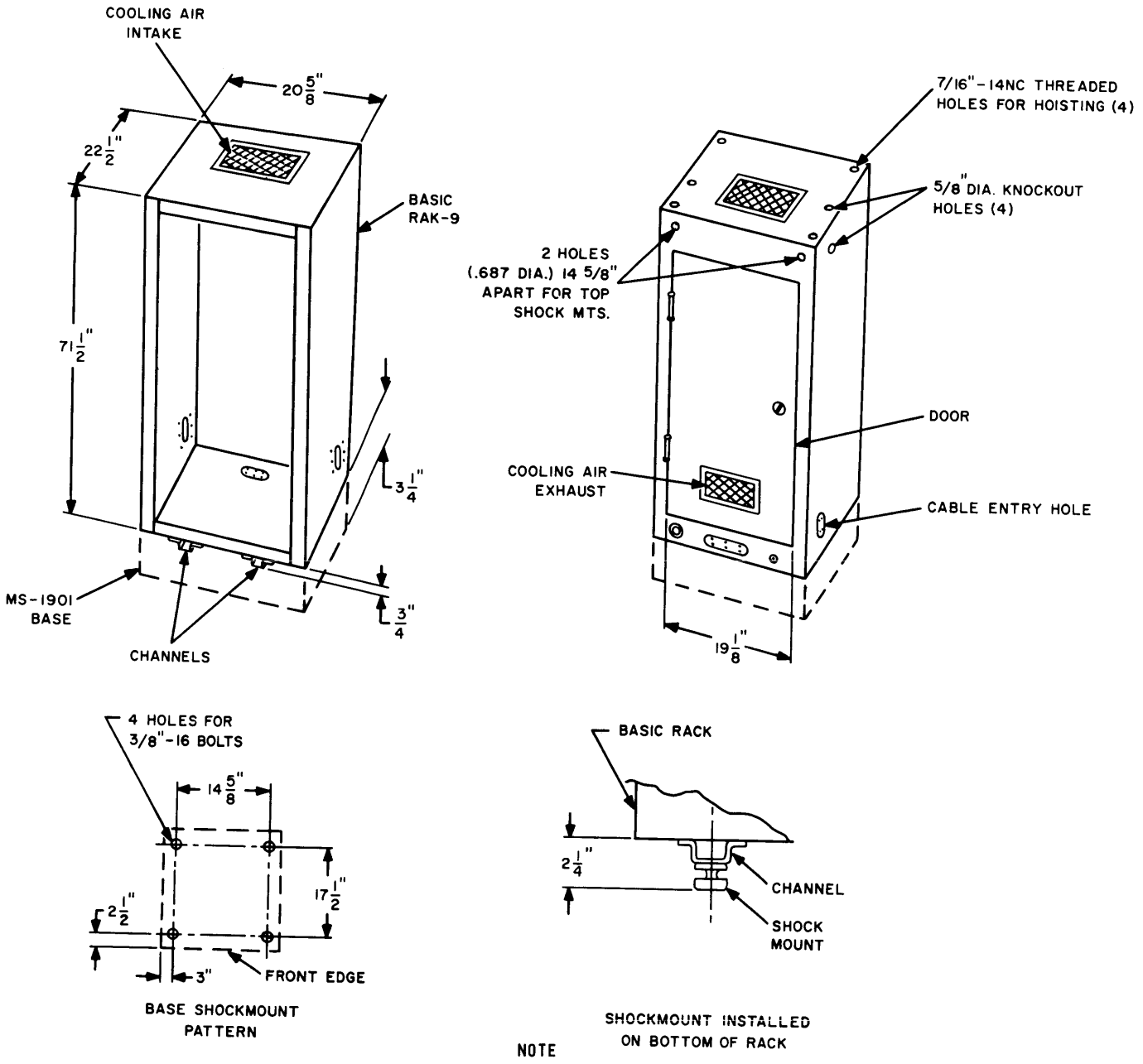
MODULAR UNIT	WIRING CHANGE MADE AT:	MANUAL REFERENCE
LV Power Supply PS-4A*	Circuit Breaker CB301 Transformer T301	PAL-1K(B2) PAL-1K(B2)
IIV Power Supply PS-5B*	Transformer T401	PAL-1K(B2)
Variable Frequency Oscillator VOX-5	Transformer T101 Crystal Oven Terminal Boards E301 and E302	VOX-5
Exicter Unit SBE-8	Crystal Oven Terminal Board TB101	SBE-8
Power Supply A-1397	Transformer T401	SBE-8
Auxiliary Power Panel APP-4	Circuit Breaker CB501	APP-4

* Do not replace fuses in these units.

2-3. INSTALLATION

a. LOCATION OF TRANSMITTER - Before attempting to install the transmitter ensure that adequate power (paragraph 2-2) is available at the selected site or location. Refer to outline dimensional drawing figure 2-4 when choosing the operating location. The room (or van) in which the transmitter is located must have a ceiling height of at least 7 feet. Adequate ventilation must be provided; operation of the transmitter in a poorily ventilated room will cause the surrounding temperature to become too high. Also, a clearance of about two feet at the rear of the rack is needed for opening the door.

After unpacking and inspecting the cabinet, place it in its operating location. It is advisable to do this while modular units are not installed because the added weight of the assembled transmitter will make movement more difficult. The four holes in the top of the rack and the four eyebolts included as loose parts in the



NOTE

The shock mounts shipped with a particular SBT are determined by the weight applied to each shockmount and the size shown above is correct for installation of all various shock mounts used.

329-4

Figure 2-4. Outline Dimensional and Installation Drawing

shipment are for moving the rack with a crane hoist. Holes in the base are for rigid-mounting or shock mounting the rack to the floor. Holes along the top of the rear wall are for the top shock mounts. Use these holes as a template for drilling holes in the shelter or van.

NOTE

When equipment is to be shockmounted, a shockmounting kit and separate installation instructions are supplied.

b. INSTALLATION OF MODULAR UNITS. - Refer to figure 2-6 for information regarding cabinet location of all modular units.

NOTE

If the transmitter is used without Variable Frequency Oscillator VOX, Exciter Unit SBE requires crystal installation and adjustment before operation (refer to SBE manual).

All modular units are slide mounted except for Power Supply A-1397, and Auxiliary Power Panel APP-4. Auxiliary Power Panel APP-4 is installed in the rack prior to shipment. To instal any slide-mounted unit in its compartment,refer to figure, 2-5 and proceed as follows:

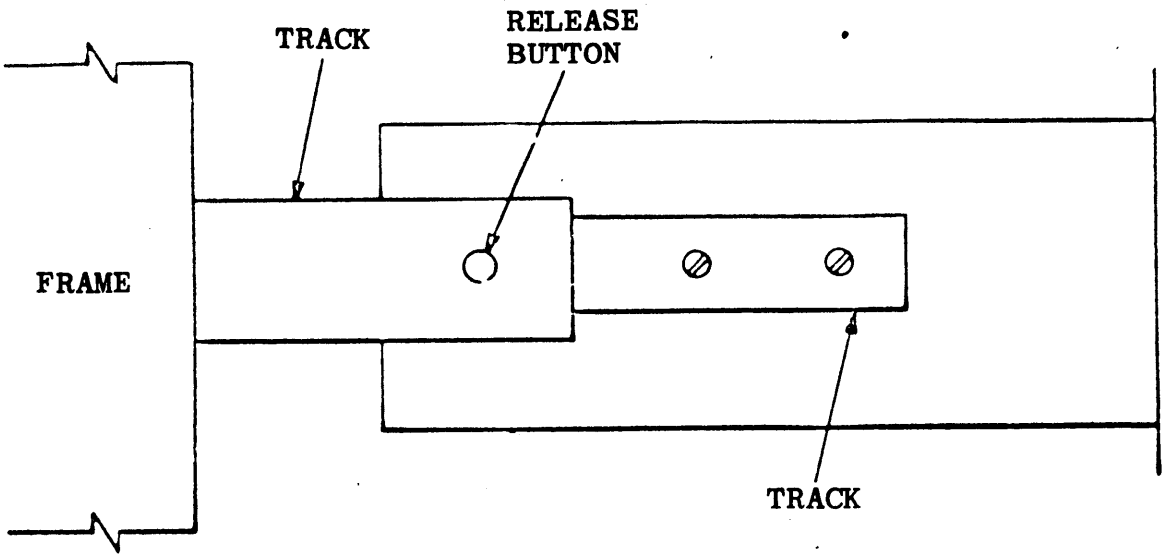
(1) Untape or unstrap cable assemblies and all other components secured to the rack frame for shipment.

(2) Pull center section of associated compartment track out until it locks in an extended position.

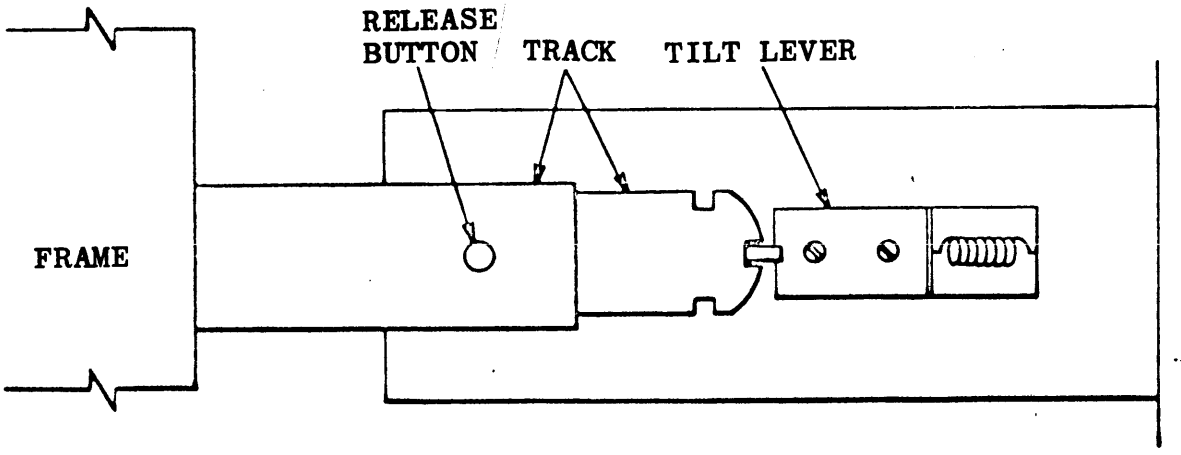
(3) Position slide mechanisms of modular unit in tracks, and ease modular unit forward into rack until release buttons engage hole in track.

(4) Start at the bottom and proceed up to prevent the rack from tipping over.

(5) Make the necessary cable and electrical connections as described in paragraph 2-3c. To prevent the cables extending from Amplifier RFD and LV Power Supply PS-4A from snagging, utilize the reel-mounted springs located inside the rack.



NON-TILT CHASSIS SLIDE



TILT CHASSIS SLIDE

Figure 2-5. Slide-Mounting Details

(6) Depress release buttons and slide modular unit completely into compartment.

(7) Secure front panel of modular unit to the rack with screws.

c. INTERCONNECTION OF MODULAR UNITS. - Figure 2-7 illustrates the cabling and wiring interconnection between the various modular units contained in the transmitter. Refer to figure 2-7 and connect modular units as indicated.

d. INITIAL ADJUSTMENTS - The SBT has been factory tested and adjusted before disassembly for crating. No initial adjustments of chassis mounted variable components are necessary before operation.

e. CONNECTION OF EXTERNAL EQUIPMENT

(1) GENERAL. - Auxiliary Power Panel APP is a standard modular unit present in all SBT-1K transmitters. Besides functioning as a distributor for line voltage, the APP- provides two terminal blocks to facilitate connection of external equipment to transmitter. Except for the MIKE connection on Exciter Unit SBE, all external connections may be made at terminal blocks E501 and E502 located at the rear of Auxiliary Power Panel APP- . Figure 2-6 and the following paragraphs illustrate the possible external connections to SBT-1KA6. Schematic diagrams in the individual modular-unit manuals should be used as an aid for tracing wiring.

(2) REMOTE TRANSMITTER PLATE RELAY - Terminals 1 and 2 of E501 are provided for attachment to the coil of a relay supplying plate voltage to an additional stage of RF amplication external to the SBT. This enables control of the entire transmitter at the SBE by means of the XMTR OFF/ON switch. such a relay is sometimes employed in transmitter systems of which SBT is a sub-assembly.

(3) REGULATED 115VAC - Terminals 3 and 4 are available for an extension source of the regulated 115VAC used in the PS-4A unit.

(4) EXTERNAL INTERLOCKS - Terminals 5, 6, 7 and 8 are provided for con-

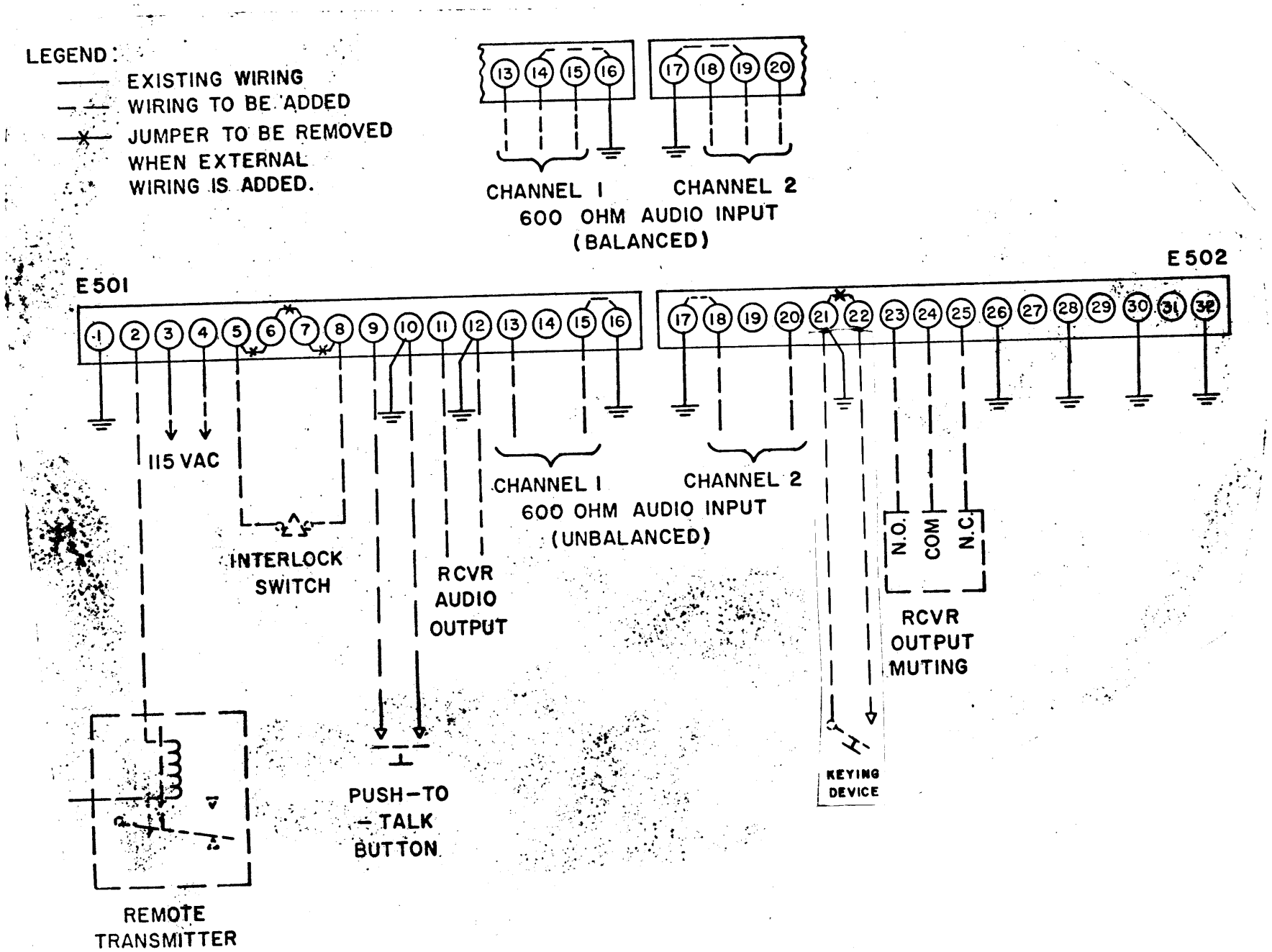


Figure 2-6. Connection Diagram, External Equipment to SBT-1KA6.

nection of additional safety interlock/s external to the SBT transmitter. Such additional interlock/s will be in series with the SBT-1KA6 interlocks and form another link in the interlock circuit. When these terminals are not used in this way, the jumpers remain in place.

(5) PUSH-TO-TALK SYSTEM - Terminals 9 and 10 are provided for a push-to-talk button attachment. A push-to-talk system may be used in lieu of or along with the voice-operated (VOX) circuit available in the SBE-8 unit.

(6) RECEIVER SQUELCH - Terminals 11 and 12 are provided for the attachment to receiver audio output, if receiver "squelch" is desired when using the VOX (voice-operated) feature in the SBE-8 unit. Receiver squelch is used in order to prevent sound from a nearby receiver or other source from automatically actuating the VOX circuit.

(7) AUDIO INPUT - CHANNELS 1 and 2 - Terminals 13 through 20 are provided for the attachment of two separate sources (or channels) of intelligence in the form of 600-ohm audio. Figure 2-6 illustrates connections for either balanced or unbalanced inputs.

(8) KEY LINE - Terminals 21 and 22 of terminal block E502 are provided for the attachment of a keying device in CW mode of transmission. Pushing down on key grounds the cathode circuit of first r-f amplifier V118 in Exciter Unit (SBE-8) enabling it to operate.

(9) RECEIVER MUTING - Terminals 23, 24 and 25 are provided for a receiver muting feature. The purpose of this feature is to automatically disable the receiver when the transmitter is sending and enable it when the transmitter is in OFF or STANDBY condition. This automatic feature may be had along with a common antenna by the addition of a Tone Intelligence Unit, Model TIS-3A and modifications of interconnections. The addition of the TIS-3A unit allows this system to operate FSK and FAX and provides circuitry to CW Key the input applied to the SBE (See paragraph 2-3 f). The other modifications are rewiring the existing equipment. The system described in paragraphs 2-3 h and 4-2 b is a manually operated T/R control system.

f. RESERVED TERMINALS - Terminals 26 through 32 of E502 are present in all standard APP-4 Auxiliary Power Panels for the interconnection (within certain models of the SBT-1K series) of necessary equipment for FSK (Frequency Shift Keying) and FAX (Facsimile) modes of transmission. The SBT-1KA6 transmitter does not transmit FSK and FAX and these terminals should not be used for connection of external equipment.

g. ANTENNA - RF receptacle J609 on AX-198 RF Output Chassis and mating plug P606 are provided for the antenna connection. J609 is an adapter with a nominal impedance of 50-ohms, adapting a UHF type of connection on the inside of the chassis to a QDS type on the outside. P606 is a QDS type plug with a nominal impedance of 50-ohms. Use RG-8/U or RG-10/U cable running to antenna connection.

h. TRANSMITTER/RECEIVER ANTENNA - RF receptacle J606 on AX-198 RF Output Chassis and mating plug P624 are provided for connecting the transmitting antenna to a receiver input, thus making the transmitting antenna double for a receiving antenna. Manually controled antenna relay (K601) circuitry switches the antenna from transmitter to receiver system and back. When the transmitter is sending the antenna is connected to the transmitter and disconnected from the receiver. When the transmitter is not sending, the antenna is disconnected from the transmitter and connected to the receiver.

i. MIKE - The MIKE jack on SBE-8 control panel is for the connection of a 50,000-ohm high impedance crystal or dynamic microphone.

j. EXTERNAL ALDC - When ALDC switch located at the rear of RFD-1B amplifier is placed in INT position, the output of the amplifier acts on its own input stage to effect ALDC (automatic load and drive control). When ALDC switch is placed in EXT position, the ALDC signal is, instead, routed to the SBE to control the exciter output level. The latter position (EXT) is preferable, when the RFD-1B is used in the SBT, since it is more effective in preventing overdrive conditions in the RFD

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK
MODEL SBT-IKA-1 @ 2.5 & SBT-IKL-1 @ 2.5 CK-567-H

* AX-198 MOUNTED ON REAR OF CABINET J606, 607, 609 & E603 ARE MOUNTED ON BOTTOM OF AX-198.

\# CA491 CONNECTIONS ARE DIRECTLY PIN TO PIN.

CA-506 TERMINATING POINTS

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

CA507 TERMINATING POINTS

ITEM	FROM	TO
2	P609, PIN G	E101 TERM 1
3	H	3
4	J	4
5	K	6
6	L	7
7	M	8
8	N	10
9	P	11
10	R	12
11	S	13
12	P609, PIN X	E101 TERM 14

CA1339 TERMINATING POINTS

ITEM	FROM	TO
1	P600, PIN A	APP-4, C514
2	B	E503
3	C	C518
4	P600 PIN D	APP-4, C519

REDUCE TO 13-1/8

CA-506 (W610)
CA-480-9-78
CA-480-6-49
CA-512-2-23 (W604)
CA-507 (W609)
CA-480-9-78 (W607)
CA-506 (W610)
CA-1339(W601)
\# (W606) CA-491
CA-480-3-80
PO-PS-5
CA-507 (W609)
CA-588-1
CA-509 (W611)
CA-490
CA-493(W612)
CA-512-2-23 (W603)
CA-575-10 P/O VOX
CA-346-3.9
W-401(CA-555-4)
W101
P/O RFD
CA-490 (W605)
\# CA-491 (W606)
(W505)
(W608)
(W607)

ANTENNA J305 P602
J610 P610
* J607 P607
* E603 J606
P624 (LOOSE ITEM)
E202(MATES WITH E203)
J202
J201 P612
W201
W104 P/O VOX
P102 J203 VFO CP695 P604
RF MONITOR J102 J104 VMO IN J103 RF OUT P611 P613
E101 E605
J113 ALDC INPUT P636
J109 P102
J401 P401
J402 P101
J702 P401
J701 P614
E701 E604
J704 EXT. ALDC P635
J100 P600 (PS-4B ONLY)
J703 P601
E503
J602 20, 21 UTILITY AC INPUT
S601 S602
J501 P609
J401 P65
P620 (LOOSE ITEM)
J601 AC INPUT
E501
E502
P/O PS-5
SWR-1K P605 J304 TRANSMITTER
AX-198 J608 P608 E602(MATES WITH E203) RECEIVER * J606 ANTENNA * J609
P606 (LOOSE ITEM)
RFD-1A/OR RFD-1B
VOX-5
A-1397 (SBE)
PS-4A(FOR SBT-1KA6), AND PS-4B
PS-5 (PS-5B FOR SBT-1KA6)
APP-4
MS-1872 J P201 J P202 J P401 J P402
P201 P402
AO-101-8(P/O SBE-6) FOR SBT-1KA5, SBT-1KA6
AO-101 (P/O SBE-3) FOR SBT-1K1
A-1516 (P/O SBE-2) FOR SBT-1KA
AX-670 J612 J613 J614
B601 BLOWER A-2036 BLK GRN YEL RED P603 J603 C613 E601

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
CHANNEL RECEIVER MUTING KEY LINE INPUT
KEY FAX VOX -XFK
FAX -T1S-3
PUSH TO SQUELCH DISABLE TALK THRU
REMOTE 115V POWER RELAY CONTROL
EXTERNAL INTERLOCKS
AC OUTPUT
AC INPUT
BL/WH BLK WH

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

REDUCE TO 23-1/2

Figure 2-7. Interconnection and Cabling Diagram, General Purpose Transmitter, SBT-1KA6

007671001/A6

SECTION 3
OPERATOR'S SECTION

3-1. GENERAL

There are numerous equally good procedures for tuning the transmitter.

In Section 3 of each detailed manual (PAL-1KB2, VOX-5 and SBE-8) there is a complete tuning procedure which presents reasons for each operation. Accordingly the turn-on procedure given below is an abridged procedure, simulating a system check-off list.

3-2. RECOMMENDED TURN-ON CHART

The SBE is the key equipment, since it is the exciter for the (PAL-1K). The first consideration is whether the medium frequency 1.75-4 MC is to be supplied by an external VMO or an internal crystal. The MF XTAL SW either connects the VMO or selects the proper crystal. More information on this phase of operation is given in the discussion below of medium frequency circuit controls.

The output frequency (f_o) desired requires the use of the proper medium frequency (f_{mf}) whether supplied by an external VMO or a crystal. If the desired output frequency (f_o) is between 4.25 and 32.25 mc, adjust the BAND MCS switch to the frequency range containing the output frequency desired. Located below the desired frequency range on the BAND MCS dial is a number hereafter referred to as the Dial Numeric. This Dial Numeric is used to compute the crystal or VMO frequency (f_x).

This frequency is computed by using the following formula:

$$f_x = (2N - f_o) + 0.250 \text{ mc.}$$

where: f_x = Internal crystal or external VMO frequency.

f_o = output frequency.

N = Dial Numeric (see chart below and figure 3-3).

0.250 mc = Internally generated mixing frequency.

TABLE 3-1. TUNE-UP OF CARRIER, SBT-1KA6.

STEP	CONTROLS	OPERATIONAL DETAILS
1	See paragraph 3-2.	Compute SBE's high frequency and VOX's medium frequency oscillator settings for PAL-1K's output frequency.
2	See Section 3 of VOX-5 manual; 66, 67.	Calibrate VOX-5. This will require rack power; MAIN POWER breaker (66) of APP-4 unit must be in an ON position; MAIN POWER indicator (67) must be lit.
3	17,14,15,27	POWER (17), ON; BEAT (14), ON; METER (15) to VMO; MASTER FREQUENCY OSCILLATOR (27) to desired frequency. Follow "calibration" procedure as described in section 3 of VOX-5 manual, omitting HFO tuning portion.
4	See Section 3 of SBE-8 manual	Tune up on carrier.
5	37,51,48,55,54,43,44,38,34,53,52,42	EXCITER switch (37), ON; VOX GAIN (51), fully CCW; SQUELCH GAIN (48), fully CCW; LSB (55) OFF/GAIN (54), fully CCW; USB (43), OFF/GAIN (44), fully CCW; POWER toggle sw. (38), ON (oven lights); MF XTAL SW (34), VMO position; BAND MCS (53) to proper MF frequency; CARRIER INSERT (52), fully CW; METER SW (42), MF position.
6	50,49,35	OUTPUT TUNING switch: knob (50) (coarse setting) for proper band and disc (49) (vernier setting) for a frequency slightly below the desired output frequency on multiscale dial (35).
7	47,39,52,35	MF TUNING knob (47), tune MF; peak SBE's meter (39) reading. Decrease CARRIER INSERT (52) as necessary to avoid an off-scale reading. The reading on single scale dial (35) should agree with the frequency of VMO.
8	49,39,50	METER SW, RF position; OUTPUT TUNING disc (49), tune RF. Peak SBE meter (39) reading. Advance the OUTPUT TUNING vernier switch (50) slightly to peak the reading on the SBE's meter (39).
9	45	Adjust OUTPUT knob (45) to control magnitude of RF output. Output level should be small for following RFD tune up.

TABLE 3-1. (Cont'd)

STEP	CONTROLS	OPERATIONAL DETAILS
10	68	Before turning on the PAL-1K, check that its output is properly terminated, that VSWR's OFF/X10/X1 switch (68) is in OFF position.
11	59,58,61,60,62,63,56	The PAL-1K should be turned on under the following initial conditions: (i) Output of all PS-4B voltages normal. Check that MAIN POWER circuit breaker (59) is in the ON position; that MAIN POWER indicator (58) is lit; that TRANSMITTER VOLTAGES switch (61) is in STANDBY and its indicator (60) is not lit; that FINAL VOLTAGES switch (62) is OFF and its indicator (63) is not lit. PA FIL PRI meter (56) should read 115 volts. PAL-1K's PS-4B PA OVER-LOAD circuit breakers should be ON. MODE SWITCH S100 should be set at NML. (ii) Under these conditions the PAL-1K may be turned on by setting TRANSMITTER VOLTAGES switch (61) to ON. Indicator (62) now lights.
12	2	Turn the MULTIMETER switch (2) to the 1ST AMPL PLATE position
13	45,3	Increase SBE's OUTPUT (45) until a usable reading is obtained on MULTIMETER (3).
14	7,3	Rotate 1ST AMPL TUNING (7) to maximize reading on MULTIMETER (3). Reduce SBE's OUTPUT (45) to bring approximately 1/4 scale reading on MULTIMETER (3).
15	2	Turn the MULTIMETER switch (2) to the PA Eg position.
16	6,3	Rotate the PA GRID TUNING (6) to maximize reading on MULTIMETER (3).
17	45,3	Turn SBE's OUTPUT (45) fully CCW.
18	10	Turn PA TUNING sw. (10) for desired output frequency (see tuning chart).
19	13	Turn PA LOADING sw. (13) for desired output frequency (see tuning chart).

TABLE 3-1. (Cont'd)

STEP	CONTROLS	OPERATIONAL DETAILS
20	11	Turn PA LOADING knob (11) for desired output frequency (see tuning chart).
21	63,62	Turn FINAL VOLTAGES switch (63) to ON; indicator (62) should light.
22	45,4	Increase SBE's OUTPUT (45) until PA PLATE CURRENT (4) meter indicates 300 ma.
23	10,4	Adjust PA TUNING sw. (10) observing the PA PLATE CURRENT (4) meter for a dip.
24	11,4	Increase PA LOADING sw. (11) until the plate current rises.
25	45,4	Readjust SBE's output until PA PLATE CURRENT (4) meter indicates 300 ma.
26	10,4	Adjust PA TUNING sw. (10) observing the PA PLATE CURRENT (4) meter for a dip.
27	10,11,4,45	Repeat PA TUNING and PA LOADING adjustments until the desired power output is reached with minimum output on SBE as indicated on RFD MULTIMETER (PA Eg). Observe SBE's RF output on meter (39) with METER SW (42) in RF position. The screen current (PA Isg) is (with a resistance load) usually less than 15 ma. At no time should the screen current reading exceed full scale.
28	45	Turn SBE's OUTPUT (45) fully CCW, momentarily.
29	68,45	Turn VSWR's OFF/X10/X1 switch (68) to the X1 position and slowly increase SBE's OUTPUT (45) until VSWR gives a good indication of forward watts and reflected watts on SBE's low drive. If a satisfactory voltage standing wave ratio is indicated, turn VSWR's OFF/X10/X1 switch (68) to the X10 position and increase SBE's OUTPUT (45) for PAL-1K's full (1 kw) output power. Check that the VSWR still indicates a satisfactory voltage standing wave ratio.

TABLE 3-1. (Cont'd)

STEP	CONTROL	OPERATIONAL DETAILS
30		The SBT-1KA6 is now fully tuned and loaded on carrier. The following tables list the additional steps required to enable SBT-1KA6 to provide any of its six modes of transmission.

TABLE 3-2. TUNING CHART, CW (KEYED CARRIER) MODE, SBT-1KA6

STEP	CONTROLS	OPERATIONAL DETAILS
1		Perform steps outlined in Table 3-1.
2		Check that telegraph key is connected to terminals 21 and 22 of E502 on APP-4 as shown in figure 2-6.

TABLE 3-3. TUNING CHART, SSB MODE WITH SUPPRESSED CARRIER, SBT-1KA6

STEP	CONTROLS	OPERATIONAL DETAILS
1		Perform steps outlined in Table 3-1.
2	52	Turn SBE's CARRIER INSERT (52) fully CCW.
3	55,54,69,39	Turn SBE's LSB selector switch (55) to CH 1 and slowly increase LSB GAIN potentiometer (54) until VSWR's meter (69) indicates desired output on speech peaks and a satisfactory voltage standing wave ratio. Do not advance LSB GAIN to point that brings LSB reading on meter (39) beyond 100%.

TABLE 3-4. TUNING CHART, SSB MODE WITH A DEGREE OF CARRIER, SBT-1KA6
(Example: LSB Operation on Channel 1 with 10% Carrier)

STEP	CONTROLS	OPERATIONAL DETAILS
1		Perform steps outlined in Table 3-1.
2	42,39	Set SBE's METER SW (42) at RF position and note reading on SBE's meter (39).

TABLE 3-4. (Cont'd)

STEP	CONTROLS	OPERATIONAL DETAILS
3	52,55,42,54	Turn CARRIER INSERT (52) fully CCW. Set LSB switch (55) at CH 1. Set METER SW (42) at LSB position. Turn up LSB GAIN (54) to bring 100% of step 2 reading on audio peaks.
4	42,45,52	Set METER SW (42) at RF. Turn OUTPUT (45) down to bring 90% of step 2 reading on audio peaks. Then turn CARRIER INSERT (52) up to bring 100% of step 2 reading on audio peaks.
5	45,68,39	Adjust OUTPUT (45) to bring satisfactory output peaks and SW ratio on SWR-1K meter (68). Do not exceed "100%" mark on SBE meter (39) scale.

TABLE 3-5. TUNING CHART, DSB OR ISB MODE, WITH SUPPRESSED CARRIER, SBT-1KA6
(Examples: CH 1 on USB and LSB for DSB. CH 1 on USB, CH 2 on LSB for ISB)

STEP	CONTROLS	OPERATIONAL DETAILS
1		Perform steps outlined in Table 3-1.
2	42,39,52	Set SBE's METER SW (42) at RF and note reading on meter (39). Then set CARRIER INSERT (52) fully CCW.
3	43,55,44	Turn USB selector switch (43) to CH 1 and LSB selector switch (55) to OFF. Slowly increase USB GAIN (44) to obtain 50% of step 2 reading on meter (39) on audio peaks. Turn LSB selector switch (55) to CH 1 (DSB mode) or CH 2 (ISB mode) and USB selector switch (43) to OFF. Slowly increase LSB GAIN (44) to obtain 50% of step 2 reading on meter (39) on audio peaks. Set USB selector switch (43) to CH 1.
4	45,68	Adjust OUTPUT (45) to bring satisfactory output peaks and SW ratio on SWR-1K meter (68). Do not exceed "100%" mark on SBE meter (39) scale.

TABLE 3-6. TUNING CHART, DSB OR ISB MODE WITH A DEGREE OF CARRIER
(Examples: CH 1 on USB and LSB, with 10% carrier, for DSB. CH 1 on USB, CH 2 on LSB, with 10% carrier, for ISB).

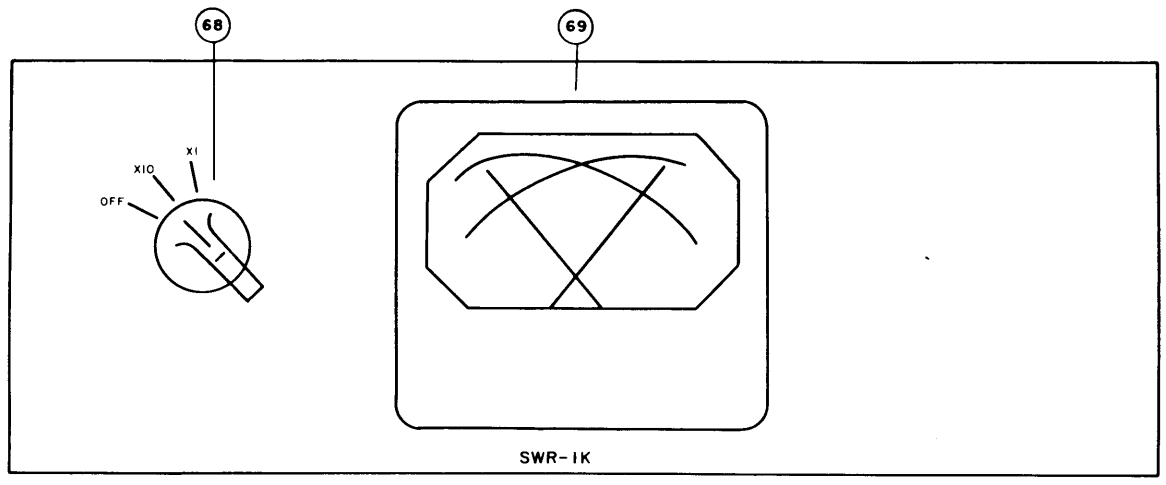
STEP	CONTROLS	OPERATIONAL DETAILS
1		Perform steps outlined in Table 3-1.
2	42,39,52	Set SBE's METER SW (42) at RF and note reading on meter (39). Then set CARRIER INSERT (52) fully CCW.
3	43,55,44,39,52	Turn USB selector switch (43) to CH 1 and LSB selector switch (55) to OFF. Slowly increase USB GAIN (44) to obtain 45% of step 2 reading on meter (39) on audio peaks. Turn LSB selector switch (55) to CH 1 (DSB mode) or CH 2 (ISB mode) and USB selector switch (43) to OFF. Slowly increase LSB GAIN (44) to obtain 45% of step 2 reading on meter (39) on audio peaks. Set USB selector switch (43) to CH 1. Then increase CARRIER INSERT (52) to obtain 100% of step 2 reading on meter (39) on audio peaks.
4	45,68,39	Adjust OUTPUT (45) to bring satisfactory output peaks and SW ratio on SWR-1K Meter (68). Do not exceed "100%" mark on SBE meter (39) scale.

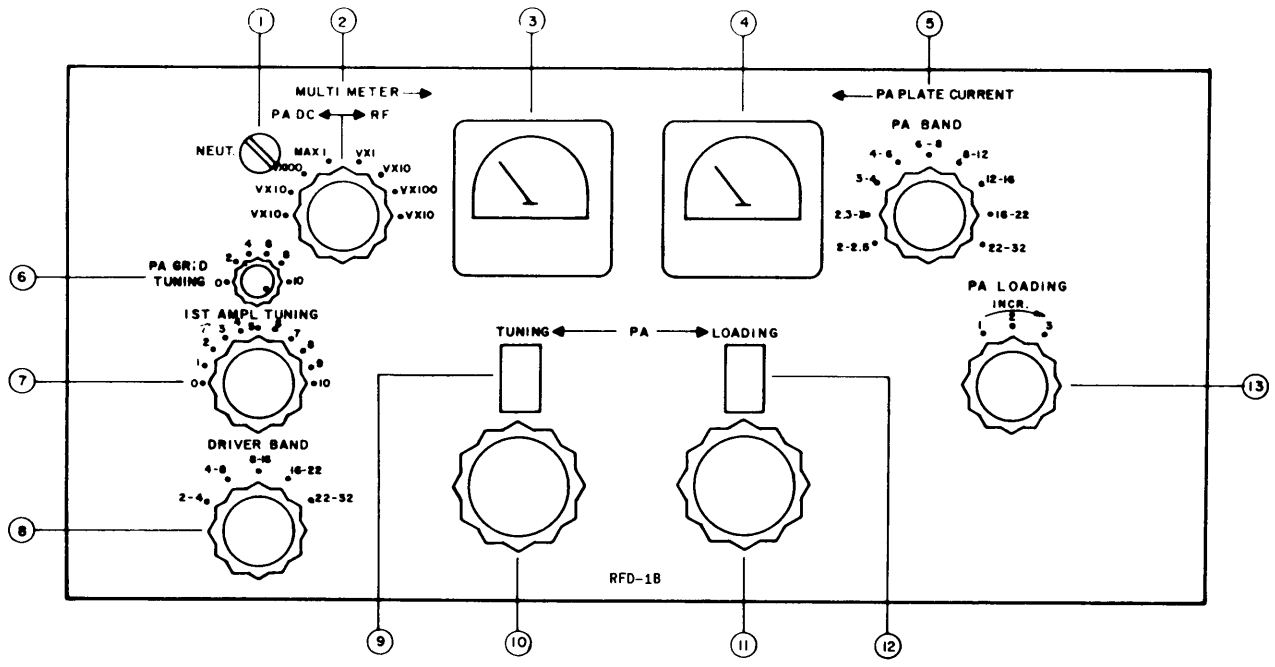
TABLE 3-7. TUNING CHART, AM MODE
(Example: CH 1 on USB and LSB)

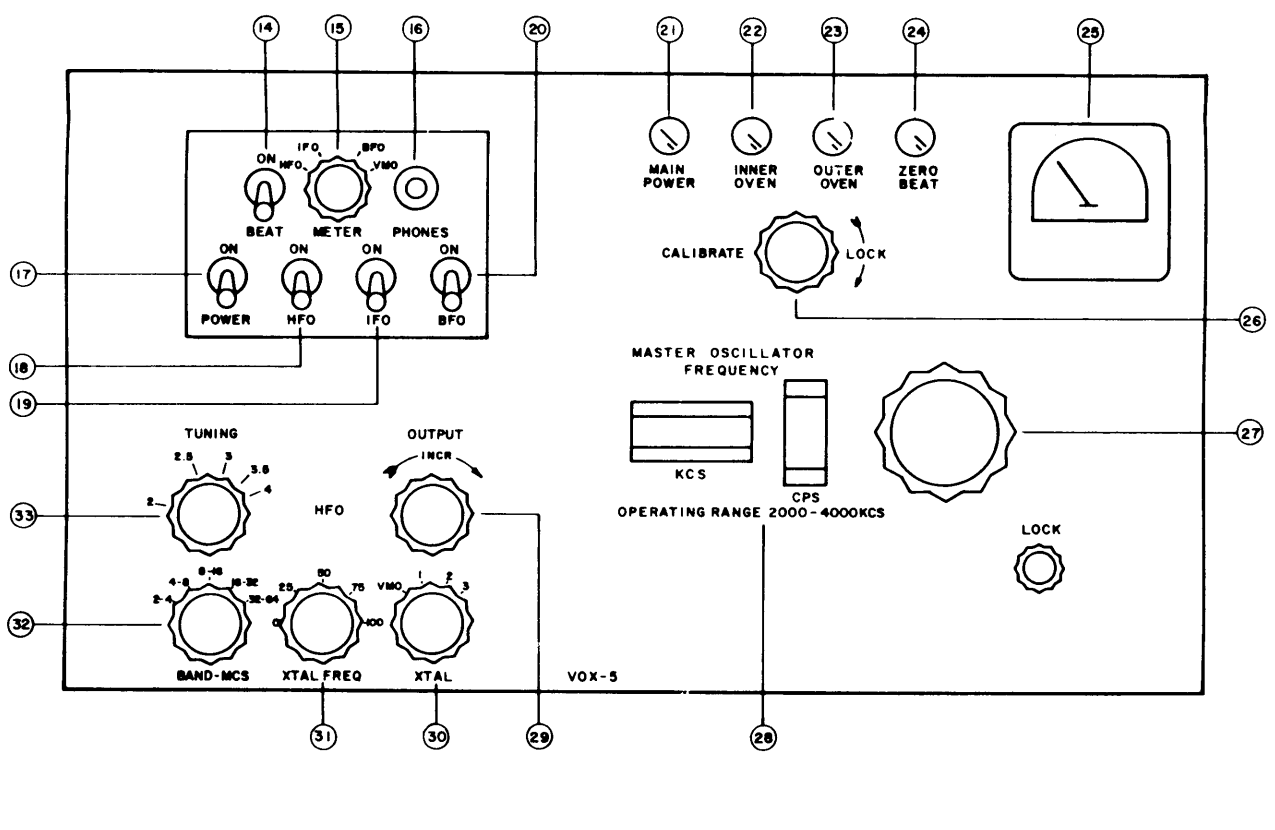
STEP	CONTROLS	OPERATIONAL DETAILS
1		Perform steps outlined in Table 3-1.
2	42,39,52	Set SBE's METER SW (42) at RF and note reading on meter (39). Then set CARRIER INSERT (52) fully CCW.
3	43,55,44,39,52	Turn USB selector switch (43) to CH 1 and LSB selector switch (55) to OFF. Slowly increase USB GAIN (44) to obtain 25% of step 2 reading on meter (39) on audio peaks. Turn LSB selector switch (55) to CH 1 and USB selector switch (43) to OFF. Slowly increase LSB GAIN (44) to obtain 25% of step 2 reading on meter (39) on audio peaks. Set USB selector switch (52) to obtain 100% of step 2 reading on meter (39) on audio peaks.

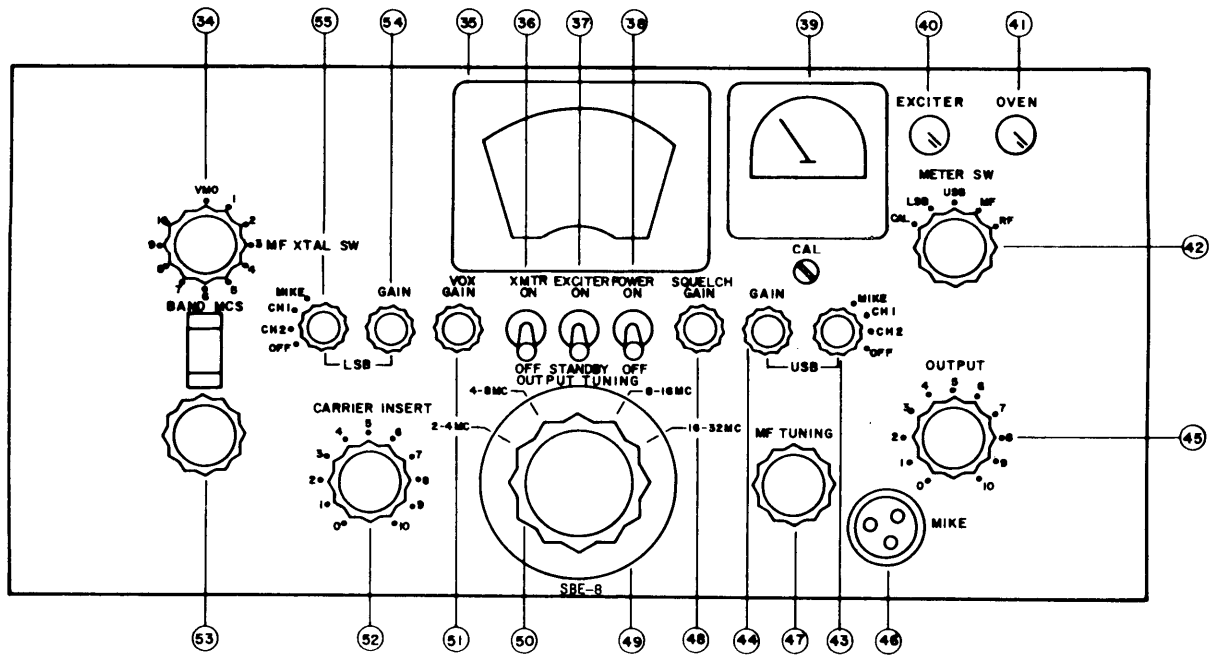
TABLE 3-7. (Cont'd)

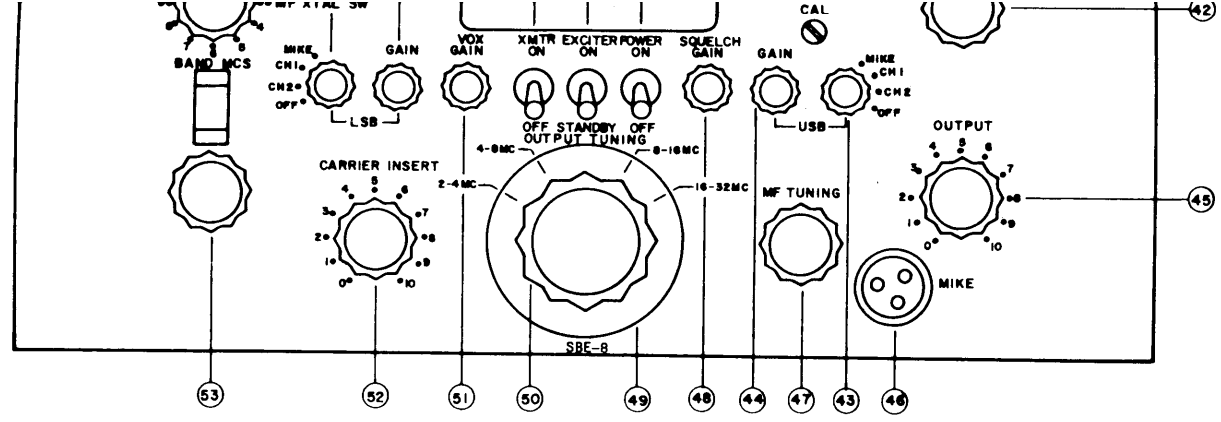
STEP	CONTROLS	OPERATIONAL DETAILS
4	45,68,39	Adjust OUTPUT (45) to bring satisfactory output peaks and VSW ratio on SWR-1K meter (68). Do not exceed "100%" mark on SBE meter (39) scale.


68
69
XI0
XI
OFF
SWR-1K

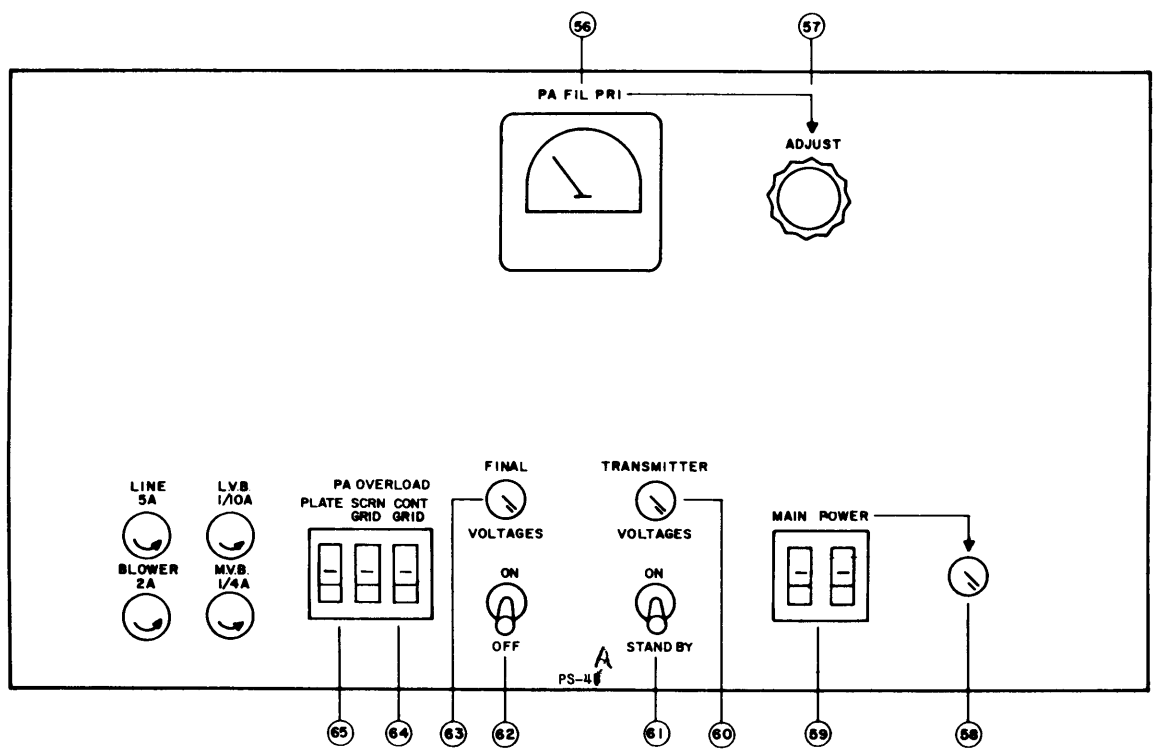

1
2
3
4
5
MULTI METER
PA DC
RF
NEUT.
MAX
VXI
VX10
VX100
VX1000
VX10
VX10
VX100
VX10
PA GRID TUNING
6
IST AMPL TUNING
7
DRIVER BAND
8
4-8
8-16
16-22
2-4
22-32
TUNING
PA
LOADING
9
10
11
12
RFD-1B
PA PLATE CURRENT
PA BAND
4-6
6-8
8-12
3-4
12-16
2.3-3
16-22
2-2.8
22-32
PA LOADING
INCR.
13

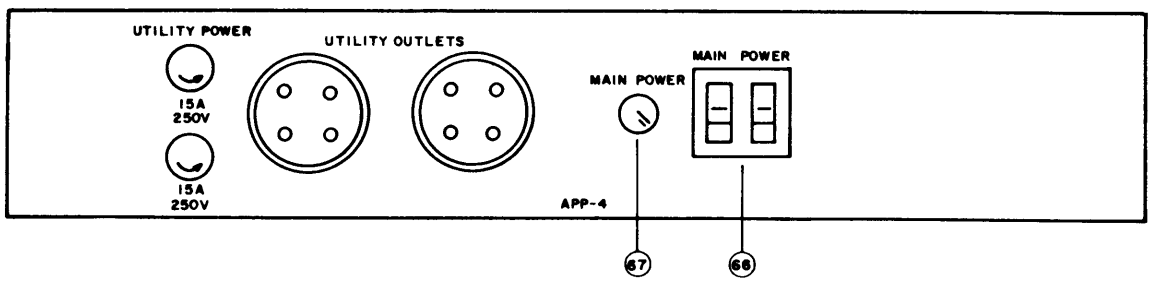

14
15
16
20
21
22
23
24
25
ON
IFO
BFO
HFO
VMO
BEAT
METER
PHONES
MAIN POWER
INNER OVEN
OUTER OVEN
ZERO BEAT
CALIBRATE
LOCK
17
POWER
HFO
IFO
BFO
18
19
26
MASTER OSCILLATOR FREQUENCY
KCS
CPS
OPERATING RANGE 2000-4000KCS
27
TUNING
OUTPUT
INCR
HFO
33
LOCK
32
BAND-MCS
XTAL FREQ
XTAL
VOX-5
31
30
29
28


34
55
54
35
36
37
38
39
40
41
VMO
MF XTAL SW
BAND MCS
MIKE
CH1
CH2
OFF
LSB
GAIN
VOX GAIN
XMTR ON
EXCITER ON
POWER ON
SQUELCH GAIN
CAL
EXCITER
OVEN
METER SW
CAL
LSB
USB
MF
RF
42
USB
OUTPUT
45
CARRIER INSERT
OFF STANDBY OFF
OUTPUT TUNING
4-8MC
8-16MC
2-4MC
16-32MC
MF TUNING
MIKE
SBE-8
53
52
51
50
49
48
44
47
43
46



A-1397





PS-5B

Figure 3-1. Controls and Indicators, SBT-1KA6 Transmitter

SECTION 4
PRINCIPLES OF OPERATION

4-1. INTRODUCTION

Figure 4-1 is a functional block diagram of the SBT-1KA6 transmitter, showing the main interrelationships of the SWR-1K, PAL-1K(B2), VOX-5 and SBE-8. For a complete functional block diagram and schematic diagram of each unit, refer to the individual manual for the unit. Schematic diagrams for AX-198 Transmit/Receive Switching Unit, APP-4 Auxiliary Power Panel are shown in the appropriate Technical Information Manual.

4-2. OPERATION

a. GENERAL - As shown in figure 4-1, an audio input is translated into sideband or AM signals in the 2-32 mc range. The VOX-5 furnishes a continuously adjustable 2-4 mc as an injection frequency for one of SBE's modulation stages, thereby providing continuous adjustment for SBT-1K's 2-32 mc output.
The output of the SBE is amplified up to 1 kilowatt by PAL-1K. The SWR-1K serves to reflect the VSWR (Voltage Standing Wave Ratio) on the antenna, in order to aid in tuning adjustments to match SBT-1KA6 to the antenna. In CW transmission, the VOX-5 generates the2-4 mc signal which is raised to 2-32 mc range in the SBE and amplified in the PAL-1K. Keying is accomplished in the PS-4A (P/O PA-1K(B2). Although VOX-5 is capable of delivering 2-64 mc, only the output of its 2-4 mc master oscillator is used in the SBT-1KA6.

b. TRANSMITTER/RECEIVER (T/R) ANTENNA SYSTEM- (fig. 4-2) - If suitable connections are made to a receiver (as shown in Figure 2-6). at terminals 23 through 25 of E502 in APP-4 and J606 on AX-198, a T/R antenna system may be had. In this system, the receiver and transmitter share the same antenna. K601 relay action, controlled by the TRANSMITTER VOLTAGES switch, serves to switch the antenna between receiver and transmitter. A receiver muting action is also possible in which case the receiver is muted while the antenna is connected to the

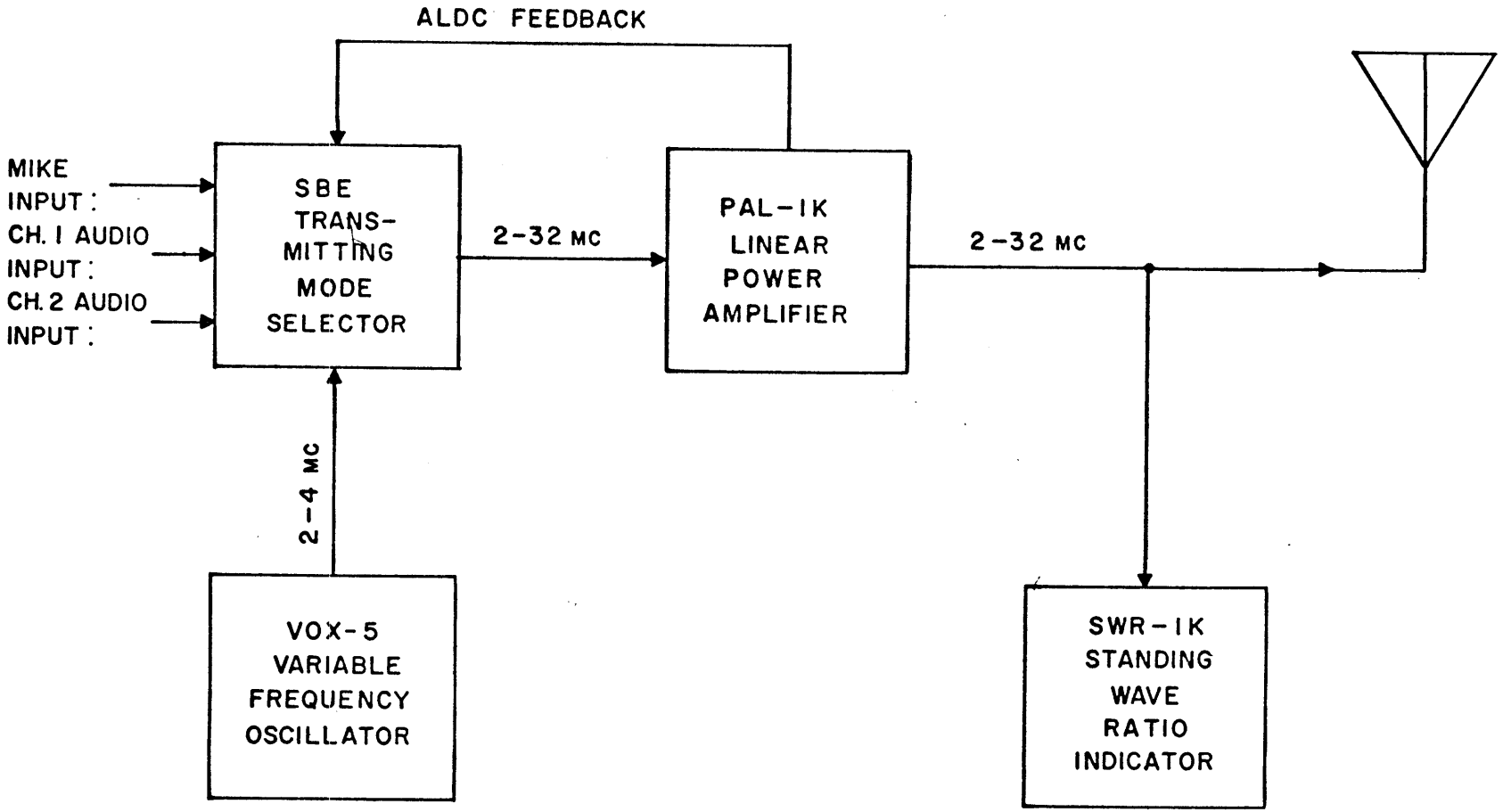


Figure 4-1. Functional Block Diagram, SBT-1KA6

transmitter.

In order to make SBT-1KA6 adaptable to an external (Figure 4-2) antenna system and receiver muting system relay K601 is inserted in the circuitry. When TRANSMITTER VOLTAGES switch (S702) is closed, the +500VDC source in PS-4B completes 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 gound through normally closed contacts of K602 and P607 and J607 pin G. The resulting current through K703 coil energized 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 a-c current to the coil of K602 relay. The resulting energization of this relay causes the -200VDC source and the +500VDC 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 (S703) remains in the ON position. However TRANSMITTER VOLTAGES switch control has the additional feature of switching a common antenna over to a receiver when the transmitter is in STANDBY. 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 sequency. These sequences prevent the antenna from becoming disconnected at an instant when the high plate voltages are still applied to the RFD-1B amplifier.

c. INTERLOCK SYSTEM - Figure 4-2 shows the complete safety interlock system through the transmitter, with its relationship to the TRANSMITTER VOLTAGES and FINAL voltages switches. The purpose of the interlock system is to prevent the

transmitter from operating when any one of a series of undesirable conditions exist, in order to protect personnel and equipment. Essentially, a negative voltage (-2000VDC), originated in the PS-4B 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 (only K703 coil shown in figure 4-2). Energization of K703 furnishes +500VDC supply to RFD-1B driver tube plate and +250VDC to RFD-1B 1st amplifier tube plate and ALDC. 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 SBT-1KA6 interlock system is the same as the PAL-1K (B1) interlock system with an additional link running through the APP-4B and AX-198 units. The complete series of links capable of opening the interlock circuit are summerized in table 4-1.

d. REMOTE CONTROL CIRCUITRY. (See Schematic Diagram of PS-4 contained in the modular manual.) Included in the PS-4B when used is circuitry for remote control of CW Keying or PTT operation or normal operation. Two additional relays control the bias level of the 1st Amplifier and Driver section of the RFD-1B. Under normal transmitting conditions, relay K101 is energized thus providing a path for the bias level to be applied to the RFD. For a detailed description of CW keying in this manner and PTT operation see the technical manual for Linear Power Amplifier, Model PAL-1K (B).

TABLE 4-1. INTERLOCK CIRCUIT COMPONENTS

UNIT	INTERLOCK OR CIRCUIT BREAKER	WHEN 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

TABLE 4-1. (Cont'd)

UNIT	INTERLOCK OR CIRCUIT BREAKER	WHEN CLOSED
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 in 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 the top cover of PS-5B is secured in position
PS-5B	Door interlock S402	When PS-5B is secured in the rack
RAK-9A	Door interlock S602	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

SBE-8

FIRST RF AMPLIFIER V118 6AH6

S104 TRANSMITTER SWITCH

OFF

ON

TO VOX CIRCUIT

5 14 3 4 1 E101 E605

CA-507

POWER AMPLIFIER

E303 E903 CA-597 J911 P626

2 6 1 5

RACK INTERCONNECT

(REFER TO PARAGRAPH 2-3)

APP-4

P609 J501

X A H J G

9 PUSH TO TALK

10

1 REMOTE TRANSMITTER PLATE

2

22 KEY LINE

21

32

5

6 JUMPERS

7

8 EXTERNAL INTERLOCK

NO 23

C 24 RECEIVER MUTING

NC 25

RACK MAIN CABLE

AX-198 ASSEMBLY

CONTROL RELAY K602 (IN RECEIVE POSITION)

AC COIL

ANTENNA RELAY K601 (IN RECEIVE POSITION)

DC COIL

J610 CP610, CP613

W601

J609 P606

J606 P624

J608 CP609, CP612

TO E203 ON RFD-

E602

R601

S604 INTERLOCK

2 3 1 E603

S603 INTERLOCK

NOTE: S603 CLOSED BY PUSHING RFD INTO RACK

G J K B C D A H E F L J607 P607

RACK MAIN CABLE CA-506

S602 RACK REAR DOOR INTERLOCK

PS-4A

R314

3 TO +500 VDC

9

4

6 115 VAC

5

7 ON S702 TRANSMITTER VOLTAGES

8 STAND BY

E604 E701

K702 CONTROL RELAY

R717

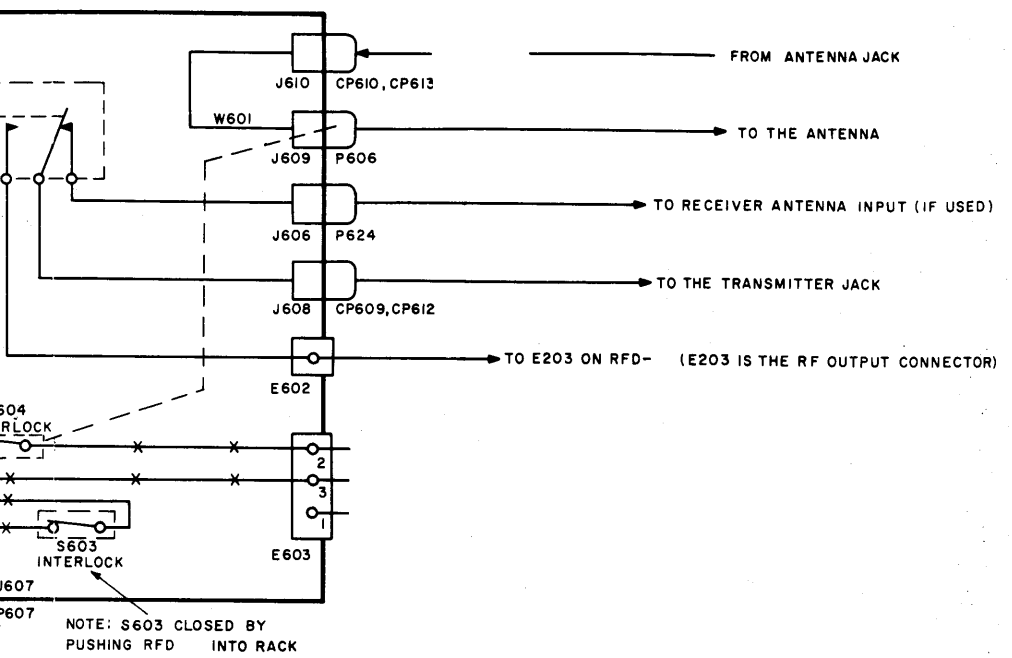
K703 TRANSMITTER PLATES RELAY

CB3C PA SCR OVERL

– 150 V DC

LEGEND

INTERLOCK CIRCUIT



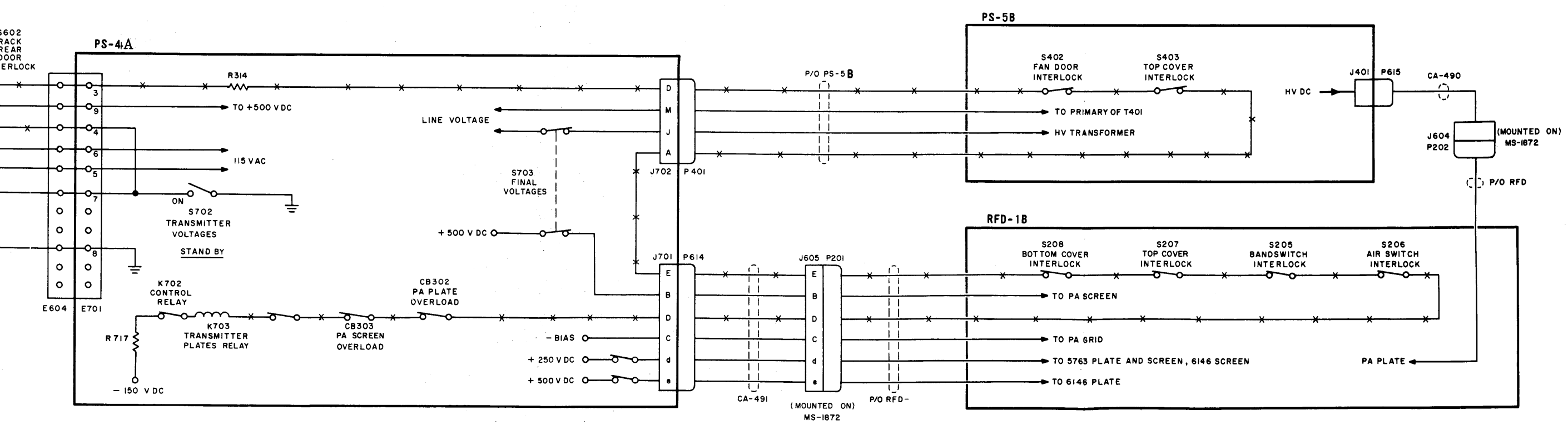


Figure 4-2. Operational Schematic Illustrating AX-198 Assembly Functions as Used in SBT-1KA6 Transmitter.

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.

Often it is unnecessary to follow a lengthy and orderly course of trouble-shooting in order to localize and isolate the faulty part. When a piece of equipment has been working satisfactorily and suddenly fails, the cause of failure may be apparent either because of circumstances occurring at the time of failure or because of symptoms analogous to past failures. Ascertain that

all tubes and fuses are in proper working order; also that equipment receives proper supply voltages. Many times this will eliminate further investigation. Sometimes excessive vibration will cause failure; for example with soldered joints or when components normally isolated from others are shaken together. Such failures are more difficult to locate.

If trouble occurs during operation of the SBT, some general rules may be followed that will sometimes give a quick clue in determining which major unit (PAL-1K, SBE or VOX) is at fault. In many cases the faulty unit may be evident from referring to tuning tables 3-1 through 3-7 and control function tables in the individual manuals. If the various lights and indicators have responded correctly as described in the "operation" column up to a certain step and do not respond in that step, the faulty unit may be pointed out in this way.

Besides this, other generalizations may be stated as listed below:

TROUBLE	CHECK
SBT output frequency is off	VOX master oscillator or SBE crystal oscillators
SBT output power cannot be brought up to desired level	RFD PA tube
SBT has distorted output	RFD amplifier tubes or SBE output frequency or VOX output frequency
SBT output frequency is unstable	VOX output frequency stability
SBT is inoperative	Interlock system (see table 4-1)*

*NOTE

Failure of the operator to check all the interlocks, particularly the one at the antenna output connector J606, is the most common cause of trouble in this transmitter. The mating plug, P606, shipped with the transmitter must be used to make up the antenna cable. This plug has the necessary flange on it to close S604 interlock switch in the AX-198 unit.

5-3. REPAIR AND REPLACEMENT.

Repair and replacement of parts is an aftermath of troubleshooting as discussed in paragraphs 5-1 and 5-2. With the exception of those cases when components suddenly fail for no apparent good reason or under extenuating circumstances, an intelligent program of preventive maintenance should produce minimum equipment outage.

After a defective part has been localized and isolated by the troubleshooting techniques presented in the various manuals, replacement generally presents no major problem particularly in the case of failure of non-complex electrical and mechanical components.

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

PARTS LIST

for

RACK EQUIPMENT ELECTRICAL, RAK-9A2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B601	FAN, AXIAL: 115 VAC, 50/60 Hz, single phase, power rating 35 watts; 450 cfm free delivery at 60 Hz.	BL101
C601	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C602 thru C612	Same as C601.	
C613	CAPACITOR, FIXED, PAPER DIELECTRIC: 2 uf, ±10%; 600 WVDC. Part of W610.	CP53B1EF205KI
CP601	CONNECTOR, ADAPTER, ELECTRICAL: 2 male/female contacts; styrene dielectric; 500 volt peak; impedance 50 to 70 ohms; single angle, series UHF.	SA129
CP602 thru CP605	Same as CP601.	
CP606	CONNECTOR, ADAPTER, ELECTRICAL: 1 male contact, silver plated; teflon dielectric; series UHF.	SA104
CP607	Same as CP606.	
CP608 thru CP614	NOT USED.	
CP615	CONNECTOR, ADAPTER, ELECTRICAL: tee type; impedance 52 ohms; 1-9/32" x 1-1/16". (Supplied as loose item). Part of W608.	UG274*/U
E601	TERMINAL BOARD, BARRIER: two 6-32 thd. x 1/4" long binder head machine screws; black bakelite body. Part of W610	TM102-2
E602	CONTACT, RADIO FREQUENCY: beryllium copper, silver plated.	AX154
E603	TERMINAL STRIP, BARRIER: three 6-32 thd. x 1/4" long binder head machine screws; black bakelite body.	TM100-3
E604	TERMINAL BOARD, FANNING: 11 terminals, angle type; left end feed. Part of W610.	TM105-11AL

PARTS LIST

for

RACK EQUIPMENT ELECTRICAL, RAK-9A2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E605	TERMINAL BOARD, FANNING: 14 terminals, angle type; right end feed. Part of W609.	TM105-14AR
J601	CONNECTOR, RECEPTACLE, ELECTRICAL: 3 male contacts; polarized; current rating 30 amps at 250 VAC/DC; twist lock type. Part of W612.	JJ297-1
J602	CONNECTOR, RECEPTACLE, ELECTRICAL: AC; 2 prong contact.	JJ100
J603	CONNECTOR, RECEPTACLE, ELECTRICAL: female. Part of W610.	MS3102A14S2S
J604	CONNECTOR, RECEPTACLE, ELECTRICAL: female. Part of W605.	MS3102A18-16S
J605	CONNECTOR, RECEPTACLE, ELECTRICAL: female. Part of W606.	MS3102A32-7S
J606	CONNECTOR, RECEPTACLE, ELECTRICAL: 1-13/32" long x 3/8" diameter; feed thru, BNC series.	UG492*/U
J607	CONNECTOR, PLUG, ELECTRICAL: male.	MS3102A20-27P
J608	CONNECTOR, ADAPTER, ELECTRICAL: 1 female contact, copoly dielectric; beryllium copper, silver plated; UHF series.	UG307*/U
J609	CONNECTOR, ADAPTER, ELECTRICAL: 2 female contacts; teflon dielectric; maximum peak operating voltage 5,000 volts, nominal impedance 50 ohms; series QDS to UHF.	JJ147
J610	Same as J608	
J611	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 female contact; teflon dielectric; maximum peak operating voltage 1000 volts, nominal impedance 50 ohms; UHF series.	JJ195
J612	CONNECTOR, RECEPTACLE, ELECTRICAL: 3 wire; current rating 15 amps at 250 V; black plastic insulation.	JJ337
J613	Same as J612	
J614	Same as J612.	

PARTS LIST

for

RACK EQUIPMENT ELECTRICAL, RAK-9A2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K601	RELAY, COAXIAL: RF switch SPDT; Auxiliary switch DPDT; operating voltage 220 VDC at 2 watts.	RL139-4-220DC
K602	RELAY: general purpose; AC; 2 contacts, rated for 5 amps non-inductive at 115 volts.	RL116AC2C115
MP601	FILTER, AIR CONDITIONING: replaceable item; aluminum mesh, steel frame; 10-1/8" x 9-7/8" x 1/2".	AD103-9
MP602	FILTER, AIR CONDITIONING: replaceable item; aluminum mesh, steel frame; 16-7/8" x 7-5/8" x 1/2".	AD103-5
P101	CONNECTOR, PLUG, ELECTRICAL: male. Part of W101.	MS3106B20-27P
P102	CONNECTOR, PLUG, ELECTRICAL: female. Part of W101.	MS3106B20-27S
P401	CONNECTOR, PLUG, ELECTRICAL: 2 female contacts rated for 10 amps at 250 V; polarized; twist lock; midget sized; brown bakelite. Part of W401.	PL176
P402	CONNECTOR, PLUG, ELECTRICAL: AC; 3 prong; polarized; with removeable ground connection. Part of W401.	PL218
P600	CONNECTOR, PLUG, ELECTRICAL: female. Part of W601.	MS3106A14S2S
P601	CONNECTOR, PLUG, ELECTRICAL: female; 3 wire contact; current rating 20 amps at 250 VAC/DC or 10 amps at 600 VAC; polarized. Part of W611.	PL134NG
P602	CONNECTOR, PLUG, ELECTRICAL: 1 male contact, teflon dielectric; series BNC. Part of W604.	PL169
P603	CONNECTOR, PLUG, ELECTRICAL: male. Part of W610.	MS3108A14S2P
P604	CONNECTOR, PLUG, ELECTRICAL: 1 male contact; maximum operating voltage 500 volts, nominal impedance 50 ohms; silver plated. Part of W608.	UG260*/U
P605	CONNECTOR, PLUG, ELECTRICAL: RF; series QDS. Part of W603.	PL149
P606	CONNECTOR, PLUG, ELECTRICAL: 1 male contact, teflon dielectric; maximum peak operating voltage 5000 volts, nominal impedance 50 ohms; series QDS with switch plate. (Supplied as loose item)	PL150
P607	CONNECTOR, PLUG, ELECTRICAL: female. Part of W610.	MS3106B20-27S

PARTS LIST

for

RACK EQUIPMENT ELECTRICAL, RAK-9A2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P608	CONNECTOR, PLUG, ELECTRICAL: UHF; 1 male coaxial contact, straight type; teflon dielectric. Part of W603.	PL259A/TEF
P609	CONNECTOR, PLUG, ELECTRICAL: male. Part of W609.	MS3106B28-11P
P610	Same as P608. Part of W604.	
P611	Same as P604. Part of W607.	
P612	Same as P608. Part of W607.	
P613	Same as P604. Part of W608.	
P614	CONNECTOR, PLUG, ELECTRICAL: male. Part of W606.	MS3106B32-7P
P615	CONNECTOR, PLUG, ELECTRICAL: male. Part of W605.	MS3106B18-16P
P616	Same as P608.	
P617	Same as P604.	
P618	Same as P608.	
P619	Same as P608.	
P620	CONNECTOR, PLUG, ELECTRICAL: AC; 3 prong, female. (Supplied as loose item)	PL190NG
P621 thru P623	NOT USED.	
P624	Same as P604. (Supplied as loose item)	
P625	NOT USED.	
P626	NOT USED.	
P627	CONNECTOR, PLUG, ELECTRICAL: 2 female contacts, rated for 10 amps at 250 volts; polarized; twist lock; midget size; brown bakelite. (Supplied as loose item)	PL176
P628 thru P634	NOT USED.	

PARTS LIST

for

RACK EQUIPMENT ELECTRICAL, RAK-9A2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W610	WIRING HARNESS, BRANCHED: consists of 1 capacitor, C613, 2 terminal boards, E601, E604, 3 connectors, J603, P603, P607 and 2 switches, S601, S602.	CA506
W611	CABLE ASSEMBLY, ELECTRICAL: power; consists of 1 connector, P601.	CA509
W612	CABLE ASSEMBLY, ELECTRICAL: power; consists of 1 connector, J601.	CA493
W613 thru W628	NOT USED.	
W629	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors, P635, P636.	CA480-3-80

PARTS LIST

for

RACK EQUIPMENT ELECTRICAL, RAK-9A2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P635	Same as P602. Part of W629.	
P636	Same as P602. Part of W629.	
R601	RESISTOR, FIXED, WIREWOUND: 35,000 ohms, current rating 17 m.a.; 10 watts.	RW109-40
S601	SWITCH, PUSH-PULL: SPDT; 15 amps at 120/250 VAC, .2 amps at 250 WVDC. Part of W610.	SW230
S602	Same as S601. Part of W610.	
S603	Same as S601.	
S604	SWITCH, PUSH, MICRO: voltage rating 30 VDC inductive, 10 amps at sea level, 6 amps at 50,000 feet.	SW189
W101	CABLE ASSEMBLY, ELECTRICAL: power; consists of 2 connectors, P101, P102.	CA346-3-9
W401	CABLE ASSEMBLY, ELECTRICAL: power; consists of 2 connectors, P401, P402.	CA555-4
W601	CABLE ASSEMBLY, ELECTRICAL: special purpose; consists of 1 connector, P600.	CA1339
W602	PART OF AX198	CA480-9-11.25
W603	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors, P605, P608.	CA512-2-23
W604	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors, P602, P610.	CA512-2-2
W605	LEAD, ELECTRICAL: hi-voltage; consists of 2 connectors, J604, P615.	CA490
W606	CABLE ASSEMBLY, ELECTRICAL: special purpose; consists of 2 connectors, J605, P614.	CA491
W607	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors, P611, P612.	CA480-9-78
W608	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 3 connectors, CP615, P604, P613.	CA480-6-49
W609	CABLE ASSEMBLY, ELECTRICAL: special purpose; consists of 1 terminal board, E605 and 1 connector, P609.	CA507